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SERIES A: AGRICULTURAL.

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ERRATA.

Page	2 line	18 for	"*Psylla*"	read	"*Psila*"
,,	26	,,	19 & 21 for "*subnitidus*"	,,	"*subnitida*"
,,	30	,,	23 for "*Aphis pom*"	,,	"*Aphis pomi*"
,,	32	,,	30 ,, "pine"	,,	"pin"
,,	34	,,	36 ,, "*Pogonocherus*"	,,	"*Pogonochaerus*"
,,	49	,,	19 ,, "*Sitrodrepa*"	,,	"*Sitodrepa*"
,,	52	,,	16 ,, "*Lagochirus*"	,,	"*Lagocheirus*"
,,	52	,,	25 ,, "San Vicente"	,,	"St. Vincent"
,,	55	,,	21 ,, "*Callotropis*"	,,	"*Calotropis*"
,,	60	,,	51 ,, "*Quercus ilatata*"	,,	"*Quercus dilatata*"
,,	61	,,	13 ,, "*Lagacus*"	,,	"*Logaeus*"
,,	70	,,	32 ,, "NEWEL"	,,	"NEWELL"
,,	106	,,	34 ,, "*soltitialis*"	,,	"*solstitialis*"
,,	119	,,	19 ,, "*Crematogaster*"	,,	"*Cremastogaster*"
,,	121	,,	30 ,, "*unipunctata*"	,,	"*unipuncta*"
,,	124	,,	22 ,, "*Perrisopterus*"	,,	"*Perissopterus*"
,,	127	,,	41 ,, "*Dryocoetus*"	,,	"*Dryocoetes*"
,,	127	,,	48 ,, "*tenebriodes*"	,,	"*tenebrioides*"
,,	141	,,	16 ,, "*Vannessa*"	,,	"*Vanessa*"
,,	142	,,	39 ,, "*Calocasia*"	,,	"*Colocasia*"
,,	149	,,	22 ,, "*lapsiligni*"	,,	"*lapisligni*"
,,	156	,,	40 ,, "*Euthirrhinus*"	,,	"*Euthyrrhinus*"
,,	161	,,	14 ,, "*Derostemus*"	,,	"*Derostenus*"
,,	163	,,	17 ,, "*melonella*"	,,	"*mellonella*"
,,	175	,,	35 ,, "FRIEDRICHS"	,,	"FRIEDERICHS"
,,	194	,,	42 ,, "*saglignia*"	,,	"*saligna*"
,,	198	,,	11 ,, "*Teinotachyum*"	,,	"*Teinostachyum*"
,,	214	,,	33 ,, "*thoantides*"	,,	"*thoantiades*"
,,	244	,,	6 ,, "*Cyrtacanthris*"	,,	"*Cyrtacanthacris*"
,,	248	,,	5 & 14 for "ROSEWELL"	,,	"ROSEWALL"
,,	258	,,	10 for "*Spatulicraspida*"	,,	"*Spatulicraspeda*"
,,	260	,,	40 ,, "(*Laemophloeus ferrugineus*)"		omit brackets
,,	262	,,	28 ,, "WAHL (R.)"	read	"WAHL (B)"
,,	278	,,	1 after "BURKE (H. E.)"	insert	"& HERBERT (F. B.)"
,,	283	,,	23 ,, "*Singapore*"	,,	"ii, no. 7"
,,	286	,,	45 for "*Aphalura*"	read	"*Aphalara*"
,,	318	,,	18 & 33 for "*krauhniae*"	,,	"*kraunhiae*"
,,	328	,,	30 for "*melonella*"	,,	"*mellonella*"
,,	330	,,	1 ,, "*Mellissoblaptes*"	,,	"*Melissoblaptes*"
,,	334	,,	21 ,, "*Crematogaster*"	,,	"*Cremastogaster*"
,,	335	,,	34 ,, "*Ptergogramma*"	,,	"*Pterygogramma*"
,,	341	,,	21 ,, "*Phyllorycles*"	,,	"*Phyllorycter*"
,,	351	,,	42 ,, "*Ceathorrhynchus*"	,,	"*Ceuthorrhynchus*"
,,	356	,,	28 ,, "*padellus*"	,,	"*cognatellus*"
,,	370	,,	50 ,, "and"	,,	"had"
,,	373	,,	38 ,, "*ainslei*"	,,	"*ainsliei*"
,,	411	,,	29 ,, "349"	,,	"249"
,,	425	,,	45 ,, "BURCKHARDT"	,,	"BURKHARDT"
,,	439	,,	3 ,, "*avellana*"	,,	"*avellanae*"

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Page	450	line	7	for	" *ainslei* "	read " *ainsliei* "
,,	464	,,	31	,,	" *Colamagrostis* "	,, " *Calamagrostis* "
,,	473	,,	12	,,	" *Pachidiplosis* "	,, " *Pachydiplosis* "
,,	493	,,	19	,,	" *ostentatus* "	,, " *ostentans* "
,,	494	,,	9	,,	" *Liagryllus* "	,, " *Liogryllus* "
,,	499	,,	39	,,	" *Echnidnophaga* "	,, " *Echidnophaga* "
,,	520	,,	25	,,	" *fimbria* "	,, " *craspeda* "
,,	541	,,	35	,,	" *vittula* "	,, " *cruciferae* "
,,	542	,,	1	,,	" FREDERICHS "	,, " FRIEDERICHS "

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REVIEW

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SERIES A.

VOL. VIII.] [1920.

MORRIS (F.). **Report on Insects for the Year; Division no. 5, Peterborough District.**—*49th Ann. Rept. Entom. Soc. Ontario 1918*; *Toronto*, 1919, pp. 17–19. [Received 28th October 1919.]

This report deals chiefly with Cerambycids as in the previous year [*A.E.R.*, A, vii, 26].

NOBLE (J. W.). **Report on Insects for the Year; Division no. 6, Essex District.**—*49th Ann. Rept. Entom. Soc. Ontario 1918*; *Toronto*, 1919, pp. 19–20. [Received 28th October 1919.]

Grasshoppers and crickets appeared in greater abundance than in previous years; the numbers of cutworms in certain areas necessitated the replanting of tobacco. A number of the usual fruit and vegetable pests are recorded.

ROSS (W. A.). & CAESAR (L.). **Insects of the Season in Ontario.**—*49th Ann. Rept. Entom. Soc. Ontario*; *1918 Toronto*, 1919, pp. 23–27. [Received 28th October 1919.]

The pests recorded include *Aspidiotus perniciosus* (San José scale), which was destroyed in large numbers by the severe winter of 1917–18; *Aphis pomi* (green apple aphis), which was kept under control by the dry weather and insect enemies; *Hemerocampa leucostigma* (white-marked tussock moth), which was very abundant but was also heavily parasitised; *Eriocampoides limacina* (*Caliroa cerasi*) (pear and cherry slug), which caused severe damage to pear and plum trees, but was heavily parasitised by *Trichogramma minutum*, Riley; *Psylla pyricola* (pear psylla); *Tortrix argyrospila* (fruit-tree leaf-roller); *Rhagoletis cingulata* and *R. fausta* (cherry fruit-flies), the Braconid parasite, *Opius ferrugineus*, Gahan, being found ovipositing in maggot-infested cherries; *Eucosma* (*Tmetocera*) *ocellana* (bud moth); *Oxygrapha* (*Acleris*) *minuta* (lesser apple leaf-roller); *Schizura concinna* (red-humped apple worm); *Datana ministra* (yellow-necked apple caterpillar); *Hyphantria cunea* (fall webworm); *Taeniothrips inconsequens* (pear thrips), which is recorded for the first time in Ontario. *Fenusa* (*Metallus*) *bethunei* or F. (*M.*) *rubi* (blackberry leaf-miner) was very abundant, but all attempted remedial measures failed. *Anthonomus signatus* (strawberry weevil) caused the destruction of 30 to 50% of the crop; in certain districts it was checked by a heavy application of a dust consisting of 80 parts of sulphur, 10 parts lead arsenate and 10 parts of some diluent. *Ancylis comptana* (strawberry leaf-roller) and *Tetranychus telarius* (red spider) were also abundant.

Insects recorded as injurious to vegetable crops include: *Phorbia* (*Chortophila*) *brassicae* (cabbage root-maggot) on cabbage, cauliflower, radishes and turnips; *P. fusciceps* (seed corn maggot); *P. vicina* (beet leaf-miner); *Hylemyia antiqua* (onion maggot); *Pieris* (*Pontia*) *rapae* (cabbage worm), which was unusually abundant; *Depressaria heracleana* (parsnip webworm); *Psylla rosae* (carrot rust fly) and cutworms. Pests of field crops were not numerous, those recorded including: *Thecodiplosis mosellana*, Gehin (wheat midge); *Mayetiola destructor* (Hessian fly); *Isosoma tritici* (wheat joint-worm) and a wireworm, *Agriotes mancus*. Other miscellaneous pests include: *Neocerata* (*Dasyneura*) *rhodophaga* (rose midge); *Tortrix* (*Cacoecia*) *rosaceana* (rose leaf-roller); undetermined Nematodes on cyclamen; *Chermes abietis* and *C. similis* causing galls on spruce trees; and *Lyctus striatus* (powder post beetle), which was found seriously damaging oak floors and furniture.

MAHEUX (G.). **Insects of the Season in Quebec District, 1918.**—*49th Ann. Rept. Entom. Soc. Ontario 1918*; *Toronto*, 1919, pp. 27–28. [Received 28th October 1919.]

During the year under review the most serious damage was caused by *Epitrix cucumeris* (potato flea-beetle) to potatoes and tomatoes, and *Pieris rapae*, L. (cabbage worm) to cabbages. Other insects recorded are: *Phorbia brassicae*, Bch., (cabbage maggot); *Lachnosterna* sp. on potatoes; *Ceramica picta*, Harr. (zebra caterpillar); *Phorbia fusciceps*, Zett. (corn maggot); *Bruchus pisorum*, L. (pea Bruchid); *Pteronus ribesii*, Scop. (currant worm) on currant and gooseberry bushes; *Myzus ribis*, L. (currant aphis); *Datana ministra*, Dru.; *Schizura concinna*, S. & A.; *Hemerocampa leucostigma*, S. & A.; and *Vanessa antiopa*.

BAKER (A. C.). **Aphids; their Human Interest.**—*49th Ann. Rept. Entom. Soc. Ontario 1918*; *Toronto*, 1919, pp. 28–32. [Received 28th October 1919.]

A popular account is given of the economic value of Aphids as gall-makers and their importance as agricultural pests. The species dealt with include *Melaphis chinensis*, the galls of which are used in the manufacture of ink and dyes. The factors controlling the appearance of alate and apterous generations, as well as studies on the pre-determination of sex, are discussed.

CRIDDLE (N.). **Some Insect Problems in the Prairie Provinces.**—*49th Ann. Rept. Entom. Soc. Ontario 1918*; *Toronto*, 1919, pp. 32–35. [Received 28th October 1919.]

It is frequently erroneously thought that the life-cycle of an insect is similar in the different areas in which it occurs. Owing to this tendency the Western wheat-stem sawfly, *Cephus cinctus*, was originally confused with the European *C. pygmaeus*, and the remedial measures for the latter were in consequence applied to the former. Tiger beetles (*Cicindela*), wireworms and the Hessian fly [*Mayetiola destructor*] are examples of insects that exhibit variations in their habits and life-cycle in different localities. These variations depend chiefly on climatic and meteorological changes, which in the Prairie Provinces as a rule tend to prolong the life-cycle, although in the case of the Colorado potato beetle [*Leptinotarsa decemlineata*] the lack of snow has been responsible for the extinction of the species. Other noxious insects dealt with as regards variations in their life-cycle include: *Meromyza americana* (greater wheat-stem maggot), *Oscinella* (*Oscinis*) *frit* (frit-fly) and *Melanoplus atlantis* (lesser migratory locust).

TOTHILL (J. D.) & MCLAINE (L. S.). **The Recovery in Canada of the Brown-tail Moth Parasite,** *Compsilura concinnata* **(Diptera, Tachinidae).**—*49th Ann. Rept. Entom. Soc. Ontario 1918*; *Toronto*, 1919, pp. 35–39, 3 figs. [Received 28th October 1919.]

The process of the establishment of *Compsilura concinnata* in Canada, here described, has been very slow. This Tachinid parasite was first liberated about seven years ago from material collected in Massachusetts; since this time several fresh colonies have been liberated amounting to a total of about 30,000 flies. Recent observations show that it has at last become definitely established in New Brunswick and exercises a valuable check on the numbers of the brown-tail moth [*Nygmia phaeorrhoea*], gipsy moth [*Lymantria dispar*] and white-marked tussock moth [*Hemerocampa leucostigma*].

DAVIS (J. J.). **Present Day Problems in Entomology.**—*49th Ann. Rept. Entom. Soc. Ontario 1918*; *Toronto*, 1919, pp. 47–59, 9 figs. [Received 28th October 1919.]

As a result of the War and the effort for increased production of cereals the present conditions offer every advantage to the increase of insect pests. In certain districts where the growing of spring wheat was discontinued some years ago owing to the ravages of insect enemies it has now been resumed, thus making insect control more difficult. In many cases where successful remedial measures have been worked out their application is prevented owing to the necessitated expenditure or shortage of labour. Attention is drawn to the necessity of a publication in a popular and concise form to meet the requirements of county agents, and certain suggestions for this are made. To prevent infestation from neighbouring farms and orchards, where the owners have disregarded the recognised remedial measures, it is suggested that legal powers should be taken or the farmer supplied from State or county funds with the necessary materials for combating insect outbreaks. The importance of co-ordination of workers in related branches of science is emphasised.

Caesar (L.). **Insects as Agents in the Dissemination of Plant Diseases.** —*49th Ann. Rept. Entom. Soc. Ontario 1918*; *Toronto,* 1919, pp. 60–66. [Received 28th October 1919.]

Many fungus, bacterial and physiological diseases are disseminated by insects; those here discussed include ergot of rye (*Claviceps purpurea*) transmitted by flies; downy mildew of lima beans (*Phytophthora phaseoli*) by bees; chestnut blight (*Endothia parasitica*) by the Cerambycid, *Leptostylus macula*; white pine blister rust (*Cronartium ribicola*) by gipsy moth [*Lymantria dispar*] larvae; gooseberry twig disease, which enters through the wounds apparently made by a cambium miner, *Opostega nonstrigella*; canker on apples (*Leptosphaeria coniothyrium*), encouraged by attacks of *Oecanthus niveus,* the same fungus being introduced into raspberry canes by *O. nigricornis.* *Plagionotus speciosus* (maple borer) causes wounds through which heart-rot enters; the weevil, *Cryptorrhynchus lapathi,* transmits European poplar canker (*Dothichiza populnea*). Although brown rot of fruits (*Sclerotinia cinerea*) is not directly insect-borne, fruit attacked by the plum curculio [*Conotrachelus nenuphar*] and cherry fruit-flies [*Rhagoletis*] are more susceptible to it.

The insect-borne bacterial diseases include: cucumber wilt (*Bacillus tracheiphilus*), transmitted by *Diabrotica vittata* (striped cucumber beetle) and *D. duodecimpunctata*; and pear blight (*B. amylovorus*), probably disseminated by ants.

Other diseases include the mosaic diseases of sweet peas, tobacco, and cucumber transmitted by Aphids; curly top of sugar-beets spread by *Eutettix tenella* (beet leaf-hopper), and spinach blight by *Macrosiphum solanifolii, Myzus* (*Rhopalosiphum*) *persicae* and *Lygus pratensis* (tarnished plant-bug).

Huckett (H. C.). **The Cabbage Root Maggot** (*Chortophila brassicae*).—*49th Ann. Rept. Entom. Soc. Ontario 1918*; *Toronto,* 1919, pp. 67–69. [Received 28th October 1919.]

Recent experiments with regard to the control of the cabbage root maggot, *Phorbia* (*Chortophila*) *brassicae,* show that the application of corrosive sublimate is more efficacious than the use of tarred felt discs. This poison should be applied directly to the roots by means of a watering can at a strength of 1 part to 1,000 parts of water or 1 oz. to 50 pints of water. The first application was given four days after the plants were set out and this was followed by three more at intervals of seven days. It has not yet been tested for radishes, and further investigations are necessary to determine the best time for applications and the strength which should be used for this crop.

Lochhead (W.). **Some Chapters of the early History of Entomology.** —*49th Ann. Rept. Entom. Soc. Ontario 1918*; *Toronto,* 1919, pp. 69–81. [Received 28th October 1919.]

The evolution of entomological knowledge from the earliest days is reviewed. Mention is made of the great insect ecologists and systematists, and the earlier systems of classification of insects are described. The beginnings of parasitic work and natural methods of control are also dealt with.

Ross (W. A.). **The Pear Psylla in Ontario.**—*49th Ann. Rept. Entom. Soc. Ontario 1918*: *Toronto*, 1919, pp. 81–90, 9 figs. [Received 28th October 1919].

The life-history of the pear psylla (*Psylla pyricola*) is reviewed and the various stages are described, together with recommendations for control [*A.E.R.*, A, vii, 129].

Conradi (A. F.). **Report of the Entomology Division.**—*31st Ann. Rept. South Carolina Expt. Sta., Clemson College, S.C.*, November 1918, pp. 27–33. [Received 14th October, 1919.]

The investigations on the life-cycle of the wireworm [*Melanotus* sp.] that had been begun three years previously have been continued. The principal food-plant is maize, but many other crops, a list of which is given, have been attacked under laboratory conditions.

The chief injury is caused by the larvae boring into the seed, which is frequently completely gnawed out; the young stalks and larger roots may also be attacked. The eggs are probably deposited during July and August, the beetles being most numerous and active at this time. The larvae burrow into the soil to the depth of about 6 to 8 inches, where they remain until about March and then return to maize as soon as it is planted. Oats planted on infested areas in 1916 were not attacked. The larvae moult at irregular intervals, the average period between moults under laboratory conditions being about 50 days. The number of instars has not yet been determined. Pupation occurs in an earthen cell and extends over an average period of about fourteen days under cage conditions. The adults emerge towards the end of June. Porous black clay soils are most heavily infested, especially if filled with decayed vegetable matter to a depth of six to eight inches and having a stiff blue clay subsoil which cracks during drought. These soils are very acid. High-lying sandy soils are rarely infested.

Owing to the acidity of the soil liming was tried as a remedial measure, but the result was a failure. The various repellents with which the seed was treated before planting also proved useless. The infested area has now been drained by means of tiles placed 100 feet below the surface [*sic*], but the effect of this has not yet been ascertained.

Hukkinen (Yrjö). **Om Rapsbaggen** (*Meligethes aeneus*, **Fabr.**) **och dess Avvärjande.** [On *Meligethes aeneus*, F., and Control Measures against it.]—*Meddelanden till Landtmän no. 58 fran Agrikulturekonomiska Försöksanstalten i Finland, Entom. ardeln., Helsingfors*, 8 pp., 6 figs., 1919.

Meligethes aeneus is the worst enemy of cruciferous plants grown for seed in Finland, and since 1897 it has been mentioned almost every year in the annual reports on noxious insects. The beetles hibernate when full-grown, and appear very early in spring, gnawing holes in the flower-buds of cruciferous plants and devouring the stamens and pistils. The eggs are afterwards deposited in any buds left uninjured by the adults and the larvae in the course of their development completely destroy the young ovaries. At the beginning of July the larvae are full-grown and enter the ground in which they pupate. The beetles of the new generation appear in a fortnight and attack late-flowering cruciferous plants during the rest of the summer. Whether in favourable circumstances two generations a year occur in Finland is not yet settled.

As a remedial measure spraying the plants with arsenical sprays as soon as the beetles appear is suggested. It is also easy to collect the larvae and the beetles in various ways. Collection must be carried out during warm and sunny weather, when the beetles are active, and can be effected either with nets or with a funnel made of sheet-iron with a bag tied at the bottom. A useful apparatus consists of 4 or 5 wooden boards attached by sticks 12–16 inches long to a pole about 6 ft. 6 ins. long; the boards are covered with tar and a wire is fastened in front of the pole. The pole is carried through the fields by two men, so that the boards are drawn between the rows of plants, and the larvae and beetles, disturbed by the wire touching the plants, drop and are caught on the boards. The destruction of cruciferous weeds is also a very important measure against this beetle, and the keeping of bees has proved very effective, since the bees disturb the beetles when visiting the flowers, often dislodging them and thus lessening the damage done by them to a considerable degree.

Tullgren (A.). **Axsugaren (*Miris dolabratus*, L.) ett hittills föga beaktat Skadedjur pa Sädesslagen och Gräsen.** [The Meadow Plant Bug, a Pest of Cereals and Grasses hitherto overlooked.]—*Centralanstalten för Försöksväsendet på Jordbruksområdet, Linköping*, Medd. 182, Entom. Avdeln., no. 33, 19 pp., 18 text-figs. [With a German summary.]

A detailed account is given of the external morphology of this bug, with special reference to the genital armature and the developmental stages. In the summer of 1917 *M. dolabratus* occurred in great numbers on cereals and grasses in many parts of Sweden. The leaves and stalks become white as a result of attack and the spikes fail to develop normally. The bugs were so numerous in many places that about 200 individuals could be collected on an area of about 11 square feet. They were found from May to July; at the end of June they were full-grown and oviposition then took place. The females produce about 50 eggs, which are inserted by means of the saw-shaped ovipositor into the stalks at the lowest joints. The eggs hibernate and probably hatch at the beginning of May. There are five nymphal instars and development is completed in about six weeks. The bugs mainly attack the borders of cornfields, since they migrate from the meadows and the grasses growing along the ditches. Numerous Nabids occurred in company with *Miris dolabratus*, especially *Nabis flavomarginatus*, Scholtz, and *N. ferus*, L., and the author believes them to be predaceous on it.

Ploughing the attacked fields in order to destroy the eggs is suggested as a remedial measure.

Marié (P.). **Service d'Entomologie Agricole. A propos de l'Echenillage.**—*Bull. Soc. Agric. France, Paris*, October, 1919, pp. 246–247.

Attention is drawn to the necessity of adopting systematic control measures owing to the increased number of larvae of *Nygmia* *phaeorrhoea* (*Liparis chrysorrhoea*) (brown-tail moth) present on fruit trees in the environs of Paris. The winter collection of nests is advocated as the best means of dealing with this pest.

MARSHALL (G. A. K.). **On the Genus *Aorus*, Schh. (Coleoptera, Curculionidae).**—*Ann. Mag. Nat. Hist., London*, iv, no. 23, November 1919, pp. 338–343.

The species dealt with include: *Aorus castaneus*, Gerst., on grass in Northern Rhodesia, and *A. ferrugineus*, Boh., on ears of rice in Tonkin. Two new species are described from Africa, and a key to the eight species of the genus is given.

Pink Boll Worm and Cotton Stem Weevil and their Attacks upon Cambodia Cotton.—*Trop. Agriculturist, Peradeniya*, liii, no. 3, September 1919, pp. 197–199.

The rise in the price of cotton during the War has induced growers of Cambodia cotton to leave their crop in the ground for two or even three years instead of practising the usual rotation of crops. The result has been that the pink bollworm, *Pectinophora gossypiella*, has increased enormously, in some fields over 80 per cent. of the cotton bolls being attacked. As the maximum length of the life-cycle is 34 days, by clearing infested land of cotton for two or three months the damage can be reduced to a minimum.

Pempheres affinis (cotton stem weevil) is another dangerous menace to the cotton industry of South India, 70 or even 100% of the cotton in some fields being attacked.

The only means of keeping these two pests in check is by clearing the land of cotton for a definite period of the year and by pulling up and destroying their food-plants over wide areas. It is to enforce these measures that the Madras Pest Act [*R. A. E.*, A, vii, 360] has been passed.

A Useful Combined Spray.—*Agric. Gaz. N.S.W., Sydney*, xxx, no. 9, 2nd September 1919, p. 624.

In experiments with various arsenates for the control of codling moth [*Cydia pomonella*] it has been found essential in hot dry seasons to add some form of spreader to the mixture. Flour paste is unsatisfactory, but soft-soap has given very good results, the lead arsenate being spread out like a thick bloom on the fruit.

The formula used was 8 lb. soft-soap, $\frac{1}{4}$ pint tobacco extract, with 4 lb. lead arsenate, to 80 gals. water. Of fruit so sprayed only 4·8% was affected by codling moth, and woolly aphis [*Eriosoma lanigerum*] and scale-insects were killed by the same treatment.

FROGGATT (W. W.). **The Lantana Fly (*Agromyza lantanae*).**—*Agric. Gaz. N.S.W., Sydney*, xxx, no. 9, 2nd September 1919, pp. 665–668. 6 figs.

Whenever lantana flies have been introduced into a new country with a suitable climate they have spread with great rapidity over all open land or areas that have been neglected and become over-run with weeds and shrubs. This has occurred in Hawaii, Fiji, New Caledonia and the coastal districts of New South Wales and Queensland. During the last ten years many residents in lantana-infested areas on the Tweed and Richmond Rivers have requested the Department of Agriculture to distribute lantana flies in New South Wales. It is recognised, however, that insects introduced into a different climate with a new and varied fauna may desert their original food-plant for allied vegetation, useful or otherwise, and therefore the introduction was not carried out, especially as this fly would not exterminate the existing lantana scrub, even if it destroyed a large percentage of the seeds.

Although there is no record of the lantana fly ever having been introduced artificially into New South Wales, early in May 1919 the existence of the true lantana fly or of a closely allied species was recorded, and it is now found to be checking the spread of the plant in many localities. Eggs are laid in the immature berries and the larvae feed on the pulp, afterwards eating out the seed and pupating in the seed cavity or in the pulp, and thus destroying the fertility of the seed.

The New South Wales species has not been compared with that occurring in Hawaii and therefore its determination is doubtful, but from a superficial examination it agrees with the fly originally described as *Agromyza lantanae*.

Davis (J. J.). **Miscellaneous Aphid Notes. 1.**—*Canad. Entom., London, Ont.* li, no. 10, October 1919, pp. 228–234, 1 plate, 5 figs.

The species dealt with include: *Aphis setariae*, Thos., for which a new genus, *Heteroneura*, is erected, found on maize, sugar-cane, *Eragrostis* sp., *Sorghastrum nutans*, *Panicum capillare*, *Paspalum dilatatum* and Bermuda grass (*Cynodon dactylon*) in various States in America. *Aphis scotti*, Sand., *A. prunicoleus*, Ashm., and *A. bituberculata*, Wils., are synonyms of this species. It is suggested that the name *A. heraclella* should be substituted for *A. heraclii*, Cowen, preoccupied by *A. heraclei*, Koch. *A. rociadae*, Ckll., which is redescribed, is recorded on *Delphinium tricorne* in Indiana, and on larkspur in Montana.

The new species described include: *A. cuscutae* taken on dodder (*Cuscuta epithymum*) growing among lucerne in Utah, *Lysiphlebus* (*Aphidius*) *testaceipes*, Cress., and *Syrphus opinator*, O. S., being reared from it; *Macrosiphum ribiellum*, previously erroneously recorded as *M. cynosbati*, Oestl., taken on *Ribes*, the latter being taken on flowering currant (*Ribes aureum*).

A. houghtonensis is probably a synonym of *A. cynosbati*, but further observations are necessary to determine this question. Examination of the type of *Siphonophora achyrantes*, Mon., shows this species to be identical with *Myzus persicae*, Sulz.

Davidson (W. M.). U.S. Bur. Entom. **Notes on** ***Allograpta fracta*****, O.S. (Diptera: Syrphidae).**—*Canad. Entom., London, Ont.* li, no. 10, October 1919, pp. 235–239, 1 fig.

The Syrphids collected in the Imperial Valley of Southern California include: *Mesograpta geminata*, Say; *M. marginata*, Say; *Ceria* sp.

found breeding in wounds in trunks and limbs of cotton-wood (*Populus fremontii*): *Eupodes volucris*, O. S.; *Syrphus americanus*, Wied.; *Lasiophthicus* (*Catabomba*) *pyrastri*, L.; *Allograpta obliqua*, Say: and *A. fracta*, the last-named being the most abundant species from February to July. Owing to the mild winter adults were observed as early as the 3rd January. During June they were very abundant in barley and maize fields and were apparently responsible for the almost total destruction of the Aphids present.

The larvae of *A. fracta* exercise an undoubted check on *Aphis maidis*, Fitch. About 25% of the infested heads of grain showed the presence of larvae destroying the Aphids. As experiments indicate that a larva can destroy all the Aphids on from 3 to 4 heads in an average infestation, it may be concluded that 75% to 100% of the Aphids infesting a field will be killed in due course, provided that *A. fracta* is found over a quarter of the area. This Syrphid has only been bred from *Aphis maidis*, and one larva was found attacking *Aphis pseudobrassicae*, Davis. Examination of colonies of *Aphis brassicae*, L., *Myzus persicae*, Sulz., and *Acyrthosiphon* (*Macrosiphum*) *pisi*, Kalt., yielded negative results.

The various stages of this Syrphid are described in detail. Eggs deposited on the 22nd March hatched in from 2 to 3 days. After about 11 days the larvae pupate and the adults emerge in from 5 to 12 days. The average daily temperature during these observations ranged from a minimum of 58° F. to a maximum of 86° F.

From puparia collected in the field imagines of a Pteromalid, *Pachyneuron* sp., and some Ichneumonids, of which the majority were *Diplazon laetatorius*, F., were bred.

Patterson (W. H.). **Report of the Entomologist.**—*Gold Coast Rept. Agric. Dept. 1918*; *Accra*, 1919, pp. 20–21.

No important change in the general position of cacao pests during 1918 is recorded, though in certain localities, *Sahlbergella singularis*, Hagl., and *S. theobromae*, Dist., were controlled by handpicking. The cacao mosquito, *Helopeltis bergrothi*, Reut., was very abundant on nursery plants. *Glenea* sp. was less common than usual. Another cacao pest, *Homoeocerus* sp. [*R. A. E.*, A. vi. 133] also caused serious damage to avocado pears and was noticed breeding upon shoots and fruits of *Jatropha multifida*.

A Hispid beetle [*Coelaenomenodera elaeidis*, Maulik] caused serious damage to oil palms. Remedial measures against this pest are extremely difficult to carry out as the larvae infest the leaflets, of which they destroy the tissue between the upper and lower surface. Owing to the marked increase of *Archon centaurus*, Burm. (rhinoceros beetle) in certain coconut plantations the advisability of legislative measures against it is suggested.

Other pests include: *Rhynchophorus phoenicis* (African palm weevil); the moths, *Othreis fullonica* and *Achaea obvia*, on citrus fruit; and *Sesamia* sp. on maize, which may be controlled by the early removal of all small infested plants. Stored maize for seed may be preserved from weevils by mixing it with dry wood ashes. A bug, *Riptortus* sp., infests peas, beans and other Leguminous crops, including *Tephrosia vogeli*.

CHAMPION (G. C.). **Some Indian Coleoptera.**—*Entomologist's Mthly. Mag., London,* nos. 58 & 59, October & November 1919, pp. 236–246.

The insects dealt with include the following new species: *Teredolaemus major* found under bark of *Pinus longifolia* and probably predaceous on beetle larvae; *Mycetophagus bifasciatus* in a hard *Polyporus* on an old pine stump; *Cnopus pinicola* found by beating *Pinus longifolia*; *Bruchus caeruleus* bred from pods of *Lespedeza stenocarpa*, a parasitic Chalcid, *Entedus* sp. ?, having been bred from the same pods; and *B. maculipyga* bred in July from seeds of *Acacia gagiana*.

SPESSIVTSEV (P.). **New Bark-Beetles from the Neighbourhood of Vladivostok (East Siberia).**—*Entomologist's Mthly. Mag., London.* no. 59, November 1919, pp. 246–251, 2 plates.

The following new species are described: *Scolytus* (*Eccoptogaster*) *jacobsoni* and *S.* (*E.*) *semenovi* in *Ulmus* sp.; *Hylesinus eos* in *Fraxinus manshurica* and *Juglans manshurica*; *Xylechinus bergeri* in branches of *Phellodendron amurense*; *Myelophilus pilifer* in *Pinus koraiensis*; and *Hylastinus* (? *Hylastinoides*, subgen. n.) *alni* in *Alnus* sp.

HEWITT (C. G.). **The Use of the Aeroplane in Entomological Work.**—*Agric. Gaz. Canada, Ottawa,* vi, no. 10, October 1919, p. 877, 1 fig.

It is pointed out that aeroplanes can be used with great advantage in carrying out surveys of mosquito breeding places, and the difficulty of mapping out swampy areas and other haunts quickly and accurately is solved by aeroplane photographic surveys. In forest protection work also aircraft should be useful in making surveys of timber that is being killed or has already been destroyed by forest insects; this at present is often a very arduous and lengthy task.

MORRILL (A. W.). **Insect Pests of Interest to Arizona Cotton Growers.**—*Univ. Arizona Agric. Expt. Sta., Tucson,* Bull. 87, December 1918, pp. 173–205, 1 plate, 29 figs. [Received 10th November, 1919.]

This bulletin has been compiled with the object of presenting in concise form general information concerning the principal cotton pests, including those already occurring in Arizona and those that have not yet been introduced. The general appearance and methods of attack of the commoner species are described.

The indigenous pests dealt with include:—Lepidoptera, *Heliothis obsoleta*, F., *Alabama argillacea*, Hb., *Estigmene acraea*, Dru., and *Bucculatrix thurberiella*, Busck (cotton leaf-perforator); Rhynchota, *Lygus elisus hesperus*, Knight, and *L. pratensis oblineatus*, Say (cotton square daubers), *Dysdercus albidiventris*, Stål, and *Euschistus impictiventris*, Say; and a thrips, *Thrips arizonensis*, Morg.

Quarantine Order no. 15 directed against the introduction of *Anthonomus grandis* and *Pectinophora gossypiella* into Arizona is quoted in full.

HERBERT (F. B.). U.S. Bur. Entom. **A New Species of *Matsucoccus* from Pines in California (Hemip.-Homop.).**—*Proc. Entom. Soc. Washington, D.C.*, xxi, no. 7, October 1919, pp. 157–161, 2 plates.

Matsucoccus fasciculensis, sp. n., is described from the needles of digger pine (*Pinus sabiniana*) in various localities in California. Other examples have also been taken from yellow pine (*P. ponderosa*). This Coccid is closely related to *M. matsumurae*, Kuw., and is the first representative of the genus recorded from America. The scales are usually found on needles that are one or two years old. Judging from the appearance of cast skins found, there are probably two larval stages preceding the apodous form.

GAHAN (A. B.). U.S. Bur. Entom. **Descriptions of Seven New Species of *Opius* (Hymenoptera-Braconidae).**—*Proc. Entom. Soc. Washington, D.C.*, xxi, no. 7, October 1919, pp. 161–170.

The new species described include *Opius cupidus*, collected on beet and parasitic on *Pegomyia hyoscyami*, Panz.; *O. turneri*, reared from a Dipterous leaf-miner on cowpeas; *O. downesi*, from pupae of *Rhagoletis pomonella*; *O. richmondi* and *O. lectus*, swept from blueberry barrens, where they occur in company with *O. melleus*, Gah., and may have the same host, viz., *Rhagoletis pomonella*.

In addition to the above species from North America, *O. trinidadensis* and *O. cereus* are described as parasitic on the fruit-flies, *Anastrepha striata*, Schin., and *A. serpentina*, Wied., in Trinidad; the former may be only a geographical race of *O. crawfordi*, Vier.

TAKAHASHI (R.). **Notes on some Japanese Aphididae.**—*Proc. Entom. Soc. Washington, D.C.*, xxi, no. 7, October 1919, pp. 173–176, 1 fig.

Myzocallis zelkowae, sp. n., is described from the winged viviparous female, the sexuales not having been found. This Aphid is common on the underside of the leaves of *Zelkowa keaki* in Tokyo and also on cultivated beans. *Greenidea kuwanae*, Perg., is frequently found on young shoots of *Quercus* from May until the end of summer.

Nippolachnus piri, Mats., is one of the most injurious pear Aphids in Japan, occurring on the underside of the leaves. Most of the Aphids of this group have no alternate food-plants and are found on the branches or stems of trees, but *N. piri* spends the winter and spring on *Eriobotrya japonica* and the summer and early autumn on pear trees.

Chaitophorinella acerifoliae, Tak., is common on the leaves of *Acer palmatum* in spring and is also found on *A. carpinifolium* and *Aesculus* sp. *C. koelreuteriae*, Tak., occurs on *Koelreuteria macroculata*. *C. kuwanai*, n. n., previously recorded as *Chaitophorus japonica*, Essig & Kuw., is found on *Acer pictum*.

Stomaphis yanonis, Tak., occurs on *Celtis sinensis*. In *S. quercus*, L., winged females appear three times in a year, but in *S. yanonis* only a few individuals of the second generation are usually winged.

Rhopalosiphum sambucicola, Tak., is closely related to *R. magnoliae*, Essig & Kuw. The winter and early spring generations occur on *Sambucus racemosa* and the summer ones on *Dioscorea japonica*, *Lagerstroemia indica*, *Celastrus articulatus* and *Citrus* sp.

Marlatt (C. L.). **The Federal Plant Quarantine Act.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, viii, no. 8, August 1919, pp. 439–443. [Received 12th November 1919.]

The conditions that necessitated the formation of a federal quarantine in the United States and eventually resulted in the inauguration of the Federal Plant Quarantine Act, which was passed by Congress in 1912, are discussed. This Act has enabled the Federal Horticultural Board to prohibit the introduction of many noxious pests and to minimise the danger caused by those that have been inadvertently admitted. Further quarantine measures are now being considered, directed against the Oriental peach moth [*Cydia molesta*] and the Japanese beetle [*Popillia japonica*], and for the possible extermination of the European corn borer [*Pyrausta nubilalis*, Hb.], which will entail an expenditure of about £100,000.

Henderson (W. W.). **Interstate Quarantine on Alfalfa Weevil.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, viii, no. 8, August 1919, pp. 461–469. [Received 12th November 1919.]

As the quarantine laws directed against territory infested with the alfalfa weevil, *Hypera variabilis* (*postica*), have proved inimical to commercial interests without resulting in a proportionate benefit to the States formulating them, an appeal is made for a general revision and modification of these laws.

The various quarantines enacted since 1912 are reviewed. One of the underlying factors of most of these was apparently the hypothetical conclusion that the weevils spread by flight. To test this a series of flight experiments were made, details of which are given. These show that from the 25th March to the 22nd November only an average of 3·95 weevils were caught per square foot on the exposed screens.

As it is now considered evident that contact is the only means of contamination and that by this means the weevils spread very slowly at the rate of about ten miles a year, unconditional quarantine is only justifiable in the case of lucerne hay and should not be enforced against the numerous other commodities listed, unless, as in the case of potatoes, these have been packed in, or have been otherwise in direct contact with weevil-infested lucerne.

Hagan (H. R.). **Alfalfa Weevil Control in Utah.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, viii, no. 8, August 1919, pp. 469–477. [Received 12th November 1919.]

The bulk of the information here given on *Hypera variabilis* has been noticed previously [*R.A.E.*, A, vi, 339]. Experiments having shown that spraying with lead arsenate is comparable with cultural methods in effectiveness and cost, this measure is to be tried in several cases in Utah in 1919. The introduction of the parasite, *Bathyplectes curculionis*, the eggs of which are inserted into the body of the larval host, has also given satisfactory results.

In the discussion following this paper it was stated that in Colorado spring cultivation cannot be considered to have any remedial effect; although a better crop of lucerne is produced owing to stimulation of the growth early in the season, the number of weevils and larvae present equal those found on control plots. Sprays directed against the overwintering adults are of little value, later ones being more effective.

MARLATT (C. L.). **The Pink Bollworm.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, viii, no. 8, August 1919, pp. 478–485. [Received 12th November 1919.]

Although the pink bollworm [*Pectinophora gossypiella*] was originally introduced into America from Egypt, Mexico is apparently the chief source of danger of infestation in Texas. The general situation in this State and the drastic measures taken there are reviewed [*R.A.E.*, A, vi, 544]. The infested area was examined in 1918, but not a single pink bollworm was found. Owing to the success of this extermination work, permission has been granted to grow cotton under licence for the 1920 crop in the districts where it had previously been prohibited.

MASKEW (F.). **Report for the Month of July, 1919.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento.*, viii, no. 8, August 1919, pp. 495–496. [Received 12th November 1919.]

The insect pests intercepted during July included: from Central America, *Pseudococcus* sp., *Aspidiotus* sp. and *A. cyanophylli* on bananas; *Bruchus obtectus* in beans: from Mexico, Coleopterous and Lepidopterous larvae in guamuchil seeds; *Lepidosaphes beckii* on limes: from Arizona, *Heliothis* (*Chloridea*) *obsoleta* in green maize: from Iowa, *Pseudococcus* sp., *Coccus hesperidum* and *Hemichionaspis aspidistrae* on Boston fern: from Peru, larvae of an undetermined weevil in potatoes: from Hawaii, *Diaspis bromeliae* and *Pseudococcus bromeliae* on pineapples; an undetermined weevil in seed pods and larvae of *Dacus* (*Bactrocera*) *cucurbitae* in cucumbers: from Tahiti, *Lepidosaphes beckii* on oranges; *Pseudococcus* sp. on croton plants: from Japan, Lepidopterous larvae in peanuts and beans.

ROARK (R. C.) & KEENAN (G. L.). **The Adulteration of Insect Powder with Powdered Daisy Flowers** (*Chrysanthemum leucanthemum*, **L.**).—*U.S. Dept. Agric. Washington, D.C.*, Bull. 795, 28th July 1919, 12 pp, 2 plates, 1 fig. [Received 13th November 1919.]

Insect powder is frequently adulterated with a great variety of substances. Flowers of other plants of the family Compositae naturally suggest themselves for this purpose, particularly *Chrysanthemum leucanthemum* (ox-eye daisy) and other species of this genus that resemble *C. cinerariaefolium*. Chemical analysis is insufficient to show adulteration of insect powder with daisy flowers, but this can be definitely determined by microscopic examination. Powdered daisy flowers are distinguishable by the irregular, dark red fragments of the achene, and the palisade-like cells comprising the costal tissue of the achene.

WELCH (P. S.). **The Aquatic Adaptations of *Pyrausta penitalis*, Grt. (Lepidoptera).**—*Ann. Entom. Soc. America, Columbus, Ohio*, xii, no. 3, September 1919, pp. 213–226.

The Pyralid, *Pyrausta penitalis*, Grt., is a moth that presents aquatic adaptations, showing transition from terrestrial to aquatic habits and also developing certain physiological adaptations parallel to those of other unrelated Lepidoptera. The insect occurs abundantly in certain protected situations about Lake Erie where its favourite food-plant, *Nelumbo lutea*, grows. The life-cycle is imperfectly known; eggs have recently been found for the first time in a mass on the upper side of a leaf of *N. lutea*. Differing from previous writers, who record stalks of maize and raspberry canes as hibernating quarters, the author inclines to the belief that *P. penitalis* has at least two generations and that hibernation may occur in connection with aquatic food-plants. While this species thrives in aquatic surroundings, no structural features of aquatic importance have appeared, its adaptations to water being largely, if not entirely, physiological.

In the Sandusky Bay region *P. penitalis* was found on *Nelumbo lutea* only, but other writers have reported it on *Polygonum incarnatum*, *P. hydropiperoides*, *Eupatorium* sp. and *Nelumbo nucifera* (Egyptian lotus). The larvae feed first on the surface of the leaf and the chlorophyll-bearing tissue, weaving a silken webbing which protects them from the water and from being washed off by waves. Whether this period is confined to certain instars has not been determined. After a time the larva begins to tunnel lengthwise into the upper end of the petiole, boring through from the upper surface, and, having constructed a burrow, uses this as a shelter whence it emerges for feeding. Larvae removed from these tunnels and dropped lightly on the water remain supported on the surface, and swim actively about. The larva, however, remains a typical air-breather and requires direct exposure to the atmosphere. All the burrows examined seemed remarkably free from water, although at least a part of each of them is below the water-level. When fully grown, the larva constructs a closely-woven silken cap or plug at the upper end of the tunnel, completely closing it, and pupation occurs within this.

HUNTER (S. J.). **Report of State Entomologist.**—*Rept. Kansas Entom. Commiss., 1917–1918, Topeka*, 1919, pp. 12–19. [Received 13th November 1919.]

The federal quarantine law of 1912, requiring the inspection of nursery stock admitted into the southern part of Kansas, has resulted in the interception of *Aleurodes* sp., *Lepidosaphes ulmi*, and some Oniscids (woodlice) in packing. The control of San José scale [*Aspidiotus perniciosus*] has been left largely to fruit-growers owing to lack of funds. Native grasshoppers were abundant in some orchards on the eastern side of the State and were controlled by poison bran mash. Bagworms were frequently injurious to evergreens and lawns, and were removed by hand-picking and destruction of the bags. Leaf-hoppers were troublesome on young beans, but did no permanent injury.

In 1916–1917 the greatest problem was that of the spring canker worm [*Palaeacrita vernata*, Peck], which has been the subject of a special bulletin [*R.A.E.*, A, vi, 546]. In the following year the state Entomologist, acting under the Entomological Commission Law, ordered a general banding of all trees in public places, and of all susceptible trees on private properties. The result was that no trees within the city were defoliated, while many in adjoining woods were stripped of their leaves.

Laws, Rules and Regulations.—*Rept. Kansas Entom. Commiss., 1917–1918*; *Topeka*, 1919, pp. 45–67. [Received 13th November 1919.]

The enactments passed in 1907 providing for the creation of the State Entomological Commission and making an appropriation for that purpose are given in full, and certain rules and regulations governing its activities are appended. The Apiary Inspection Law of 1911, creating the office of bee inspector, defining his duties, and making an appropriation for his work is also quoted.

A synopsis of laws regulating nursery shipments, compiled under the name of each State, is given.

Parks (T. H.) & Stover (W. G.). **The Control of Garden Insects and Diseases.**—*Ohio Sta. Univ. Agric. Coll. Columbus*, Exten. Bull. xiv, no. 9, 1918–19, 32 pp., 2 figs. [Received 15th November 1919.]

This bulletin has been prepared chiefly for the use of amateur gardeners, in order to prevent much of the waste that occurs from insect pests and plant diseases. The garden crops are arranged in alphabetical order, and under each is given a list and short description of the insects and diseases most liable to attack it, with instructions for using the most efficient remedies that can be conveniently prepared at small cost. A brief account of spraying equipment and materials is given, with a table and formulae for seed disinfection and standard formulae for spraying potatoes.

Weiss (H. B.). *Tinea cloacella*, **Haworth, bred from Fungi (Lepid.).**—*Entom. News, Philadelphia*, xxx, no. 9, November 1919, pp. 251–252.

While there has been some doubt about previous records of *Tinea cloacella*, Haw., in the United States, larvae of this moth have now been found in a fungus, *Polyporus sulphureus*, taken from a telegraph pole in New Jersey. From these larvae adult moths were reared; they have also been obtained from *P. tsugae* in the same State. This species hibernates as a larva and pupates in the spring within the fungus. *P. tsugae* occurs on or about stumps and trunks of hemlock and pine; *P. sulphureus* is found on both deciduous and coniferous trees, including oak, chestnut, maple, black walnut, butternut, alder, locust, apple and pear, and is widely distributed throughout the United States and Canada and most of the forest regions of Europe. Descriptions are given of the full-grown larva, pupa and adult of *T. cloacella*.

Howard (L. O.). **On the Hymenopterous Parasites of *Kermes* (Homop., Coccidae).**—*Entom. News, Philadelphia*, xxx, no. 9, November 1919, pp. 255–259.

Reference is made to a previous paper giving much information on *Euclemensia bassettella*, Clemens, a parasite of *Kermes* [*R.A.E.*, A, vii, 263]. The following list is given of Hymenopterous parasites of *Kermes*, compiled from the records and bred specimens in the Bureau of Entomology and the National Museum and from the literature, the localities being from the United States unless otherwise stated: *Aenasioidea kermicola*, Timb., from *Kermes galliformis*, Riley, and *K. essigi*, King; *A. latiscapus*, Gir., from *K. pubescens*; *Aenasioidea* (*Aphycus*) *pulchella*, How.; *A. tenuicornis*, Timb., from *K. miyasakii*, Kuw., in Japan; *Blastothrix longipennnis*, How., from *K. pubescens*, Bogue, in Canada; *Chiloneurus lineascapus*, Gah., *C. dubius*, How., and *C. cushmani*, Cwfd.; *Comys*, sp. n., from *K. nigropunctatus*, Whitt.; *Comys* sp. (probably *fusca*); *Cristatithorax pulcher*, Gir., from *K. pubescens*; *Encyrtus* sp.; *Microterys speciosissimus*, Gir., and *M. cincticornis*, Ashm., from *K. pubescens*; *Coccophagus*, sp. n., from *K. quercus* (*undulata*); *C. scutatus*, How., from *K. nigropunctatus*; *Myiocnema comperei*, Ashm., from *K. acaciae*, Mask., in New South Wales; *Prospaltella citrella*, How., from *K. quercus*; *Gyrolasia* sp., and (?) *Pachyneuron micans*, How., from *K. pubescens*.

A list is also given of rearings by Giraud published in 1877, in which the identification of the hosts as *Kermes* is open to doubt, judging from the food-plants on which they occurred. True species of *Kermes* are found only upon oak, whereas the plants in the French list include a variety of genera.

A note by Mr. Harold Morrison is appended in which the probable identity of the different scale-insects classed as *Kermes* in Giraud's list is given.

Colorado's Amended Horticultural Inspection Law.—*Office of State Entomologist. Fort Collins, Col.*, Circ. 22, May 1917, 8 pp. [Received 15th November 1919.]

This Act as constituted in 1909 and amended in 1917 is given verbatim. It provides for the prevention of the introduction and spread of injurious insects and plant diseases in Colorado and their extermination when found in the State. A quarantine is provided for nursery stock, potatoes, etc., infested with insect pests or plant diseases occurring within the State. The act also empowers the State Entomologist to deal with such matters.

Matheson (R.). **A Study of the Plant Lice injuring the Foliage and Fruit of the Apple.**—*Cornell Univ. Agric. Expt. Sta., Ithaca N.Y.*, Mem. 24, June 1919. pp. 683–762, 23 plates, 10 figs. [Received 17th November 1919.]

The three apple-infesting Aphids dealt with in this paper are *Aphis pomi*, DeG. (*mali*, F.) (green apple aphis), *A. sorbi*, Kalt. (rosy apple aphis) and *Siphonaphis padi*, L. (*A. avenae*, F.) (grain, oat, or apple-bud aphis).

A. pomi is the most abundant and widespread species, causing much injury every year in bearing orchards and in nurseries, and remaining upon apple throughout the season, without migration to other hosts. The characteristics distinguishing the three species are detailed. To avoid confusion in the identity of *A. pomi*, the synonymy is discussed at length and a useful bibliography is given. The view is expressed that this species had been imported into America prior to 1851.

A summary of the life-history of *A. pomi* has been given previously [*R.A.E.*, A, iv, 481]. Brittain has reported that in Nova Scotia on different varieties of apple the eggs hatch at the time when the buds on such varieties are showing green. Whether this will prove correct for other parts of the country remains to be seen. It is known that a very large percentage of the eggs do not hatch, so that predictions as to outbreaks cannot be made from any examination during the dormant season. Factors that are generally considered to hinder the eggs from hatching are climatic conditions, such as sudden drops in temperature or periods of cold rain, predaceous birds and insects, and non-fertilisation of the eggs. It is doubtful whether non-fertilised eggs of this species will survive the winter and hatch in the following spring. The activities and reproductive capacity of the various generations is discussed and recorded in a series of tables, reproduction in the stem-mother being found to extend from the beginning of the blossoming period almost up to the beginning of the normal June fruit-dropping period. The various nymphal stages are described. From early June onwards there are 14 viviparous generations following in rapid succession and requiring from 8 to 12 days to reach maturity, the maximum period being for the 8th generation at the end of July and the 10th generation in the latter half of August. The third and later generations are the most injurious, congregating not only on the leaves and causing them to curl, but also on the rapidly growing shoots, the fruit stems and the fruit. The young shoots become stunted or die, and the young fruit is dwarfed and gnarled, though the rosy aphis (*A. sorbi*) is the more seriously injurious in these respects.

The maximum productive period (31·6 days) is for the stem-mothers, the next being 30·2 days for the 13th generation. The minimum productive period (13·7 days) is for winged females of the second generation. The productive period varied considerably for the other generations, though it was in general shorter during the warmer part of the summer. The average daily production increased from 1·85 in the case of stem-mothers to 4·13 for the 5th generation and then gradually declined to 1·77 for the 13th generation. In the rearing cages the 14th generation produced the sexual forms, the males however constituting scarcely 1 per cent. of the sexual generation. In the case of *A. pomi*, the production of winged forms is for the purpose of distribution only and not for migration to different food-plants. In the rearing-cage work practically every generation produced a few winged forms, though the earlier generations give rise to the highest proportion in order to ensure widespread distribution. Although the factor of crowding was eliminated in the author's rearing work, the percentage of winged forms for any one generation did not seem to vary. This question of the production of winged forms requires further study and the results may prove of great economic importance.

A. sorbi, Kalt. (rosy apple aphis) is dealt with on the basis of extensive rearing experiments carried out in Ithaca in 1914–1916. The synonomy of the species is discussed, the author differing from the view expressed by Baker and Turner that the American species is distinct and should be known as *A. malifoliae*. [*R.A.E.*, A, v, 49.] He considers the correct synonomy to be as follows :—*A. sorbi*, Kalt. (*A. pyri*, Boyer of Koch, not *A. pyri*, Boyer ; *A. malifoliae*, Fitch ; *A. kochii*, Schout., of Theobald, not *A. kochii*, Schout. ; *A. pyri*, Boyer of Gillette & Taylor).

The preferred, if not essential, summer food-plant of *A. sorbi* is the thin-leaved plantain, *Plantago lanceolata*, there being a remarkable parallel between the introduction and spread of this plant and the spread and increasing destructiveness of the Aphid. The life-history and the severe curling of the foliage caused by this species have previously been described [*R.A.E.* A, iv, 484.]. The reproductive capacity of the various generations is shown in a table, the maximum period for the stem-mother being during the last week in May and the first week in June. A description of all stages of the insect is given. At Ithaca the migratory forms of *A. sorbi* may consist of the winged females of the second, third or fourth generation. The author did not succeed in rearing more than four generations on the apple, though in some years there are undoubtedly more. In Nova Scotia the migratory forms have been found to be adults of the third generation. The factors that influence the early or late production of migratory forms have not been sufficiently studied ; the necessity for investigating the influence of climatic factors is urgent, as it has a large bearing upon problems of insect control.

It has been reported that *A. sorbi* has been reared throughout the season upon apple in Ontario, and the offspring of migratory forms on plantain have been transferred to apple and have there produced another generation. The ability of the species to maintain itself on apple alone has not however been confirmed ; if this proves to be the case it may become a pest of the greatest importance.

The longevity and reproductive capacity of the spring and autumn migrants, as well as the true summer forms on *Plantago lanceolata*, are illustrated by charts. It is noticeable that the spring migrant has a shorter life and greater reproductive capacity than the spring forms on apple. It has been supposed that as the summer winged forms are produced in such relatively small numbers, they cannot be of great importance in the life-history of the species. The author does not consider a single season's work to be conclusive evidence on this subject, and points out that the greater numbers of enemies encountered on plantain necessitates a high productive capacity and also ability to spread to more distant food-plants.

The autumn migrants begin to return to the apple in Ithaca in late September, the winged females developing first. The males begin to appear somewhat later and continue migrating to the apple well into November. Descriptions are given of these forms. The oviparous females which are the immediate descendants of the autumn migrants infest the smaller twigs and branches, where mating takes place. The eggs, which average about six for each female, are deposited around the base of buds, under small pieces of bark, or in any sheltered position.

In the case of *Siphonaphis padi*, L. (*Aphis avenae*, F.) (apple-bud or oat aphis) the author does not follow Baker [*R.A.E.*, A, vi, 47] in treating the insect infesting apple in North America as a distinct species, *A. prunifoliae*, Fitch. Its life-history and habits in relation to apple are discussed [*R.A.E.*, A, iv, 484] and the various forms and stages of each form are described. This species is not seriously injurious to apple.

The effects of attacks of Aphids on the apple tree and its fruit are discussed [*R.A.E.*, A, vii, 494]. The latter part of June is always the most serious period for Aphid infestation, especially if temperature and moisture conditions are favourable. During that time the stem-mothers probably cease reproducing and most of them die. The second and third generations are reproducing at their maximum rate, and the fourth generation reaches its maximum about the last days of June. After that time, the number of Aphids gradually decreases, in spite of the fact that the young of *A. pomi* are being produced with great rapidity. Weather conditions are however more favourable for parasitic and predaceous enemies and these are then able to gain the upper hand.

Jardine (N. K.). **The Tea Tortrix** (*Homona coffearia*, **Nietner**).—*Spolia Zeylanica, Colombo*, xi, no. 41, October 1919, pp. 191–192.

The tea tortrix, *Homona coffearia*, is redescribed in this note.

de Monchaux (D.). **De l'Influence des Migrations et des Introductions accidentelles.**—*Bull. Soc. Nat. Acclimat. France, Paris*, lxvii, no. 10, October 1919, pp. 308–316.

Attention is drawn to the influence that insect migrations exercise on the distribution of plant pests and diseases. The importance of this question is increased by the fact that migration is frequently the result of changes in environment. Many examples to illustrate this, as well as the adaptation of insects to new surroundings, are quoted.

Gahan (A. B.). **Report on a small Collection of Indian Parasitic Hymenoptera.**—*Proc. U.S. Nat. Mus., Washington, D. C.*, 1919, lvi, no. 2299, pp. 513–524. [Received 20th November 1919.]

The new species described include: the Eurytomids, *Bruchophagus mellipes*, reared from galls in daincha [*Sesbania*] pods and pods of *Vigna sinensis* (red gram), *Eurytoma parasae*, parasitic on *Parasa lepida* and *Thosea* sp., and *E. denticoxa*, from maize seeds; a Chalcid, *Stomoceras ayyari*, from cocoons of *Parasa lepida*; an Encyrtid, *Aphycus fuscidorsum*, parasitic on scale-insects on lab-lab, probably *Dolichos* sp.; and a Pteromalid, *Eupteromalus parnarae*, parasitic on the Hesperid, *Parnara mathias*, on rice.

Pemberton (C. E.). **Leafhopper Investigations on Hawaii.**—*Hawaiian Planters' Record, Honolulu*, xxi, no. 4, October, 1919, pp. 194–221, 10 figs.

This is a preliminary report of investigations during June and July on the sugar-cane leaf-hopper in Hawaii [*Perkinsiella saccharicida*], with particular reference to its parasites and the causes of its continued abundance in spite of remedial measures.

It is evident that *P. saccharicida* may attack and live upon plants other than sugar-cane. During the present investigations eggs have been found in seven different kinds of grasses and three species of sedge-like plants in Hawaii. These plants have been submitted for determination. Some of the grasses in question are very common, probably over most of the lowland portions of the Islands. Many of the eggs in these grasses were found to be parasitised by *Paranagrus optabilis* and a few by *Ootetrastichus formosanus.* Examinations of the grasses in many localities have been made and the numbers of hoppers and parasites bred from them are recorded. The presence of parasites in the grasses explains how these can survive in the vicinity of harvested fields where no cane may be present for some time and where no hopper eggs or parasites would exist without the grass. Only those fields adjoining cane-fields, or in their immediate vicinity, have as yet been examined ; it remains to determine the extent to which the eggs occur in the various grasses at gradually increasing distances from canefields. It is expected that as the distance is lengthened between the grasses and the cane-fields a rapid decrease will be found in the number of hoppers present, and a zone will soon be reached where no hoppers occur.

An important enemy of leaf-hopper parasites has been discovered, namely, a large black earwig, *Chelisoches morio,* very abundant in the cane-fields of the rainy belt in Hawaii. This earwig feeds readily on adults of *P. optabilis* and the indications are that it prefers this food to the leaf-hopper, although it certainly devours the latter to some extent and has always been regarded as beneficial. Another enemy of *P. optabilis* is a green Chrysopid. This has not been observed to any extent, but one larva of the fly was seen within five minutes to capture and suck the body fluids of four adults of *P. optabilis.* If these enemies of the parasite are proved to be of serious importance, the burning of trash should help to rid the fields of the earwig. Excessive rainfall is also very detrimental to the parasites of the leaf-hopper,destroying very many adults of *P. optabilis* and preventing their oviposition, while the leaf-hopper shows a decided ability to seek protection under the leaves and is far better able to resist heavy rain.

The question of contamination of young sugar-cane by hoppers from older, adjoining cane is discussed. The isolation of fields and the practice of harvesting all the cane at one time seems decidedly advantageous. A typical flight or migration of *P. saccharicida* is described. The adults fly low and slowly and alight upon cane or grasses near by. This migration shows that a centre of dispersion, such as a half-grown field of heavily infested cane, may provide all adjacent territory with leaf-hoppers. The hoppers fly on fine, still evenings and no particular direction is taken. Since they are nearly always flying at dusk in one locality or another, it is considered that such predators as bats and swallows would be of great benefit if introduced. Poorly cultivated fields are frequently less infested with leaf-hoppers than well-cared-for plantations ; this is probably because the cane has not grown so rapidly and the leaves are not so tender, and also because *Xiphidium varipenne,* the green grasshopper that oviposits on various grasses and feeds on hoppers, becomes much more numerous where the grass is not so consistently kept down. The subject of preference for various types of cane shown by *P. saccharicida* will be further investigated. As the question of the effect of volcano fumes upon *Paranagrus optabilis* has frequently been discussed, experiments in this connection were undertaken, and indicate that it is entirely unaffected by these fumes.

The practice of stripping off the low green leaves of infested cane and allowing them to remain on the ground, with a view to reducing the number of hoppers without destroying the parasites, is undoubtedly beneficial in localities where the rainfall and humidity are low, but is useless in the upper fields in localities where rain is frequent and humidity high, as the leaves remain in a soft condition and allow both hoppers and parasites to hatch. The distance and rapidity of dissemination of *P. optabilis* have not yet been accurately determined, but are being ascertained by experiment.

In the examination of 5,361 individuals of the leaf-hopper, only 27·7% were males; no infertile eggs have, however, been found in cane, though the species is not parthenogenetic. Only 43 of these 5,361 individuals were parasitised by flies of the genus *Pipunculus*; no Dryinid parasites were found among them and *Ootetrastichus formosanus* was rare.

Remedial measures against the leaf-hopper include the use of contact sprays; while these have never been tried to any extent, it is felt that there are possibilities in the application of a good spray where hoppers are abundant and within reach of such treatment. Descriptions and illustrations are given of suitable parasite hatcheries and field shed boxes for use in the distribution of parasites, which are considered to be the chief factor in the reduction of leaf-hoppers. They are particularly successful in fields where the hoppers have not had time to become numerous, where there are few eggs and, in consequence, few parasites. By liberating parasites in such fields the percentage of parasitism is quickly raised and the leaf-hopper infestation reduced to a minimum. It is pointed out that the distribution of parasites as a measure for hopper control is of little use unless carried out on a large scale. When boxes containing leaf midribs infested with parasitised eggs are used in fields of young cane, one box for every two acres is considered sufficient. Each box should contain from 2,000 to 4,000 midribs and these should be frequently replaced, the work being continued for at least three months.

HASWELL (W. A.). **Wheat, Weevils and Bulk-Handling.**—*Science and Industry, Melbourne*, i, no. 5, September 1919, pp. 304–307.

Attention is drawn to the increased danger of weevil infestation in wheat handled in bulk in Australia. Even when stored wheat is apparently shielded from rain and damp soil, it is able during certain stages in maturing to absorb moisture from the air, thus becoming a more favourable medium for the increase of grain weevils such as *Calandra granaria* and *C. oryzae*. The remedial measure advocated is airtight storage [*R. A. E.*, A, vii, 94, 529].

HINDS (W. E.). **Report of Entomologist.**—*31st Ann. Rept. Alabama Agric. Expt. Sta., Auburn*, January 1919, pp. 27–29. [Received 20th November 1919.]

The use of trap-crops for concentrating the first generation of *Calandra* and other species, so that they may be destroyed while still in the grain, thus safeguarding the later-maturing maize, has proved successful. Damage to stored maize by weevils has been considerably reduced, partly owing to the exceptionally severe winter and partly to the cultivation of the more resistant varieties of maize.

Experiments with lead arsenate and other poisons in dust form against the boll weevil [*Anthonomus grandis*] on cotton are being continued. Other experiments show that soil fumigation with sodium cyanide at the rate of 1 oz. in 8 U. S. gals. of water is a successful remedial measure against various soil-infesting insects, including white grubs [*Lachnosterna*], termites, etc. This quantity proved sufficient for about 10 to 12½ sq. ft. of ground. Fumigation of sweet potatoes with carbon bisulphide against the sweet potato root-borer [*Cylas formicarius*] failed to kill all stages of this weevil and increased the tendency of the potatoes to rot.

TROOP (J.). **Entomology.**—*31st Ann. Rept. for the Year ending 30th June 1918, Purdue Univ. Agric. Expt. Sta., Lafayette, Ind.*, 1st November 1918, pp. 30–31. [Received 20th November 1919.]

The noxious insects reported for the year under review include: *Papaipema nebris* (*nitela*) (stalk borer); *Phorbia fusciceps*, Zett. (*Anthomyia zeae*, Ril.) (seed-corn maggot); an Aphid, *Geoica squamosa*, which caused considerable damage to barley and rye; cutworms, against which the substitution of sawdust for bran mash proved successful; Hessian fly [*Mayetiola destructor*], which was less abundant but is expected to increase in the near future; the wheat joint-worm [*Isosoma tritici*] and the wheat midge [*Contarinia tritici*] which were very destructive; and a Membracid which was found damaging beans by attacking the stem below the surface of the soil.

PADDOCK (F. B.). **The Beemoth or Waxworm.**—*Texas Agric. Expt. Sta., College Station*, Bull. 231, June 1918, 38 pp. [Received 22nd November 1919.]

The bulk of this information on *Galleria mellonella* has been noticed elsewhere [*R.A.E.*, A, i, 453; ii, 379]. The incubation period of the egg varies with the brood and climate. Under laboratory conditions the duration was from 7 to 22 days, when kept at an irregular temperature averaging about 80° F. The average duration of the larval stages of different generations under laboratory conditions is 49 days in spring at a normal temperature. Under the same conditions in autumn the average was 35 days, and during winter with artificial heat it was 110 days. The pupal stage is longest during the autumn and winter; its average length is 50 days during January and March without artificial heat, about 7¾ days during August at a normal temperature, and from 18 to 35½ days during October to December with normal artificial heat. The average length of life of the adult female is 12 days, that of the male 21 days.

EHRHORN (E. M.). **Division of Plant Inspection.**—*Hawaiian Forester and Agriculturist, Honolulu*, xvi, nos. 8 and 9, August and September 1919, pp. 205–206 and 233–234.

The pests intercepted during July and August included: mites on seeds of *Rubus* and mango from Manila; *Aphis* sp. on bulbs of *Gladiolus* from the United States and on castor beans from India; *Bruchus pisorum* in peas and Lepidopterous larvae in cucumber seeds from Japan; codling moth [*Cydia pomonella*] on crab-apples from San Francisco.

RANE (F. W.). **Fifteenth Annual Report of the State Forester, 1918.**—*Massachusetts State Forester, Boston,* Public Document no. 73, 1919, 54 pp., 4 plates. [Received 25th November 1919.]

The campaign against the gipsy moth [*Porthetria dispar*] has been continued successfully and included thinning and spraying operations. In districts where the moth has spread from the forest to the cranberry bogs work has been carried out in cooperation with the Cape Cod Cranberry Growers Association and has consisted mainly in the removal of trees from the land immediately adjacent to these bogs.

JEGEN (G.). **Die Schädlingsbekämpfung im Winter.** [Winter Work against Insect Pests.]—*Schweiz. Zeitschr. Obst- u. Weinbau, Frauenfeld,* xxviii, no. 23, 31st October 1919, pp. 380–383.

From an agricultural point of view work done in winter against insect pests has obvious advantages. The insects amenable to winter treatment include *Eriosoma lanigerum* and other Aphids, *Cheimatobia brumata* in the egg-stage, *Anthonomus pomorum*, *Cydia pomonella* in the larval and pupal stages, and various plant-bugs. The trees must be scraped, all the débris being burnt, and then sprayed with a 5 per cent. solution of soft-soap.

Nashi-hime-shinkui. [Smaller Pear Borer, *Laspeyresia molesta*, Busek].—*Assoc. for Pear Protection, Kashima Village, Shizuoka Prefecture,* July 1919, 18 pp., 1 plate.

Cydia (*Laspeyresia*) *molesta*, Busck, known as the Oriental peach moth in the United States and commonly called the smaller pear-borer in Japan, is one of the most destructive insects in the latter part of the world. It occurs in nearly all the Provinces of the Empire, and where it is most numerous 80% or 90% of the pear crop may be destroyed by it. Unfortunately no effective measures have as yet been found for dealing with it. There are four—or according to the most recent observations—five generations in a year, the time of appearance varying with the climate of the locality. It passes the winter in the larval state within cracks in the bark, etc., and pupates at the end of March. The newly emerged moth of the first generation lays its eggs singly on the shoots of peach or flowering cherry. It is a remarkable fact that if there are plantations of peach or cherry trees in the neighbourhood of pear orchards, the eggs of the first and second generations are invariably laid on the shoots of these plants in preference to those of pears. The eggs of the third generation however are laid on the fruit of pear, the shoots of peach and cherry having at this time become less tender. If however the pear orchard has no peach or cherry trees in its vicinity, the insect may breed entirely on pear trees from the first generation onwards. The insect always migrates to the youngest shoots, especially in rainy weather or after rain.

As regards remedial measures, winter shelters such as bands and ties on the trunks, cracks in the bark, etc., should be examined and cleaned. In spring and summer infested fruits and injured twigs should be removed. Kerosene emulsion with insect powder is a useful remedy and should be sprayed thrice in May, July and August and twice in June. Various methods of protecting the fruit, such as covering them with paper bags, are considered, but are not recommended on account of their cost.

KAJITANI (K.). **Soju no Gaichu Chimadara-yokobai ni genin suru Sanji no Koku-han.** [Black Patches on Silkworms caused by a Mulberry-infesting Leaf-hopper, *Zygina mori*, Mats.]—*Dainihon Sanshi-Kwaiho* [*Jl. Japan Silk Assoc.*,] *Tokyo*, xxviii, nos. 333 and 334, 1st October and 1st November, 1919, pp. 712–715 & 794–798.

The fact that black patches occur on silkworms owing to the attacks of various enemies has already been recorded [*R.A.E.*, A. vi, 502; vii, 152]. Somewhat similar symptoms are caused by a leaf-hopper, *Zygina mori*, Mats., which is a common pest of mulberries. The Chinese race of sikworms is more liable to attack than the indigenous Japanese one, but the pupa is not affected.

The black patch produced by this insect is characterised by being circular or elliptical in shape with a jagged edge and is usually of a lighter colour in the centre. It can be distinguished from similar symptoms caused by other organisms in the following points. The patches caused by pebrine are irregular, or polyhedral in shape and are usually darkest in the centre; those caused by the gold-tail moth [*Arctornis chrysorrhoea*] have smooth edges; those caused by the mite (*Pediculoides*) are larger and rather irregular, and are found usually on the ventral surface.

YAGI (N.). **Sanyo ni mii daseru Shishu no Dani.** [Four Species of Mites found on the Silkworm Pupa.]—*Dainihon Sanshi-Kwaiho* [*Jl. Japan Silk Assoc.*], *Tokyo*, xxviii, no, 334., 1st November, 1919, pp. 787–790, 1 plate.

The mites recorded on silkworm pupae, in addition to *Pediculoides* are:—*Tyroglyphus* sp., a Canistrinid, *Gamasus* sp., and *Cheyletus* sp.

AMARI (S.). ***Pediculoides*-Dani ni yoru Sanji, Sangyo, Sanga no Hanten ni tsuite (Yoho).** [On the black Patch in Silkworms caused by a Mite, *Pediculoides* (Preliminary Report)].—*Dainihon Sanshi-Kwaiho* [*Jl. Japan Silk Assoc.*], *Tokyo*, xxviii, no. 334, 1st November, 1919, pp. 790–792.

The author has observed that all stages of *Bombyx mori*, when infested by a mite (*Pediculoides*) [*R.A.E.*, A, vii, 152] exhibit black patches on the body. In 1917, the experiment of placing the mites on healthy silkworms proved negative, although the hosts died. In 1919, the experiment was repeated with silkworms that were about to moult, with the result that black patches made their appearance. The development of these symptoms seems to be independent of temperature and may be produced at any time of year. They may also occur in any stage, though in the adult moth they are not readily seen owing to their being concealed by the scales and hairs. These patches seem to be caused partly by the mechanical sucking action of the mite and partly by the poisonous nature of the injected fluid, which is weakly acid.

Bezzi (M.). **A new Australian Species of *Rioxa*, with a remarkable Life-habit. (Dipt. Trypaneidae.)**—*Bull. Entom. Research, London*, x, no. 1, November, 1919, pp. 1–5, 1 fig.

Rioxa musae, Froggatt, is recorded from bananas brought to Australia from the New Hebrides, and has subsequently been found breeding in both cultivated and native fruits in Queensland and New South Wales.

R. termitoxena, sp. n., is described from North Australia, where it has been bred from the galleries of a termite, *Mastotermes* sp., in tree-trunks.

Veitch (R.). **Notes on the More Important Insects in Sugar-cane Plantations in Fiji.**—*Bull. Entom. Research, London*, x, no. 1, November 1919, pp. 21–39, 8 figs.

Sugar-cane in Fiji is generally grown on comparatively small and isolated blocks of land, frequently in narrow strips along the coast or the banks of rivers, large compact areas such as exist in Hawaii being practically unknown. The cultivated soils are of various kinds, including alluvial flats, which are the most profitable for sugar-cane, red hill-soils, sand, stiff clay and reclaimed salt-marshes. The most destructive pest of sugar-cane on the island is *Rhabdocnemis obscura*, Boisd. (cane beetle borer) [*R.A.E.*, A, v, 52–54, etc.]. The life-history and habits of this weevil are described. The percentage of stalks damaged by the borer found in the Fiji mills in 1917 was 14, a high figure when it is remembered that the injury materially reduces the sugar content of the untunnelled portions of infested stalks. Injured stalks are also liable to fall to the ground, where they quickly rot. Remedial measures that have proved of great assistance in Fiji include the use, for seed purposes, of uninfested cane only, the burning of trash on badly-infested fields immediately after cutting, the ploughing of fields to be replanted as soon as possible after harvesting, and the collection of beetles by means of traps of split canes. For four years attempts have been made to introduce into Fiji the Tachinid parasite, *Ceromasia sphenophori*, Vill., which has proved so successful in Hawaii, but these attempts have been unexpectedly disappointing, the colonies gradually dying out as soon as the breeding cages were removed. It is thought probable that the large jumping spiders and the small brown ants, combined with peculiarities in agricultural methods and in the habits of growth of the leading variety of cane are responsible for this failure.

A less important sugar-cane pest is another weevil, *Trochorrhopalus strangulatus*, Gyl., which is much smaller than *R. obscura* and not very seriously destructive, as it apparently never attacks perfectly sound cane, but generally breeds in rotten or weak stalks. The remedial measures described above would also be useful against this species.

White grubs that attack cane on an extensive scale are the larvae of *Rhopaea vestita*, Arrow, and *R. subnitida*, Arrow, both of which are natives of Fiji. These beetles never occur together; *R. vestita* is the more destructive and is found only in sandy soils; *R. subnitida* occurs in small numbers in alluvial soils, and is sometimes very injurious in red hill-soils. *R. vestita* deposits from 20 to 30 eggs singly in June and July at a depth of 15 to 20 inches and the grubs emerge in 28 to 34 days and begin feeding on humus and living vegetable matter, being most destructive from January to March. When full-grown they pupate in April or May in earthen cells at a depth of 6 to 18 inches, the adults emerging after 31 days and remaining on the ground for another week or two. Sugar-cane of all ages is attacked; fields replanted from January to March suffer severely. Enemies of these grubs are a wireworm, *Monocrepidius pallipes*, Esch., and a Scoliid parasite, *Discolia ovalauensis*, Sauss. Mites attack the grubs in considerable numbers in captivity, but apparently do not exercise much control in the field. Cane should not be planted in infested fields until April; it will then be free from serious infestation until December or January, when it will be well established and better able to resist attack. Beetles and grubs should be collected by hand when possible, and the frequent ploughing of infested fields will expose many of the grubs to destruction by minah birds. *R. subnitidus* is very similar in life-history, seasonal occurrence and habits. As the reproductive powers of both species are similar, the relative scarcity of *R. subnitidus* is worthy of further investigation; it is probably due to some enemy peculiar to this species that has escaped attention, or to some factor in the soils frequented by the grub. The remedial measures for both are similar.

Adoretus versutus, Har. (rose beetle) is not generally regarded as a pest of sugar-cane, but has been found attacking the germinating eyes of recently planted canes. The grubs occur in all types of soil, usually within 6 inches of the surface, and the beetles are found throughout the year. Only slight damage is done to sugar-cane.

Scolia manilae, Ashm., the parasite introduced to control white grubs in Hawaii with so much success, has been imported into Fiji and liberated. While the success of this experiment cannot yet be determined, grubs of *R. vestita* and *A. versutus* have undoubtedly been attacked by the parasite and adults were subsequently reared.

Wireworms occurring in Fiji cane-fields include *Simodactylus cinnamomeus*, Boisd., *Lacon stricticollis*, Fairm. and *Monocrepidius pallipes*, Esch. The first two species are very destructive to young cane, while the third is beneficial, as it is a formidable enemy of *R. vestita*. *S. cinnamomeus* is by far the most abundant species, being found in all types of soil, but reaching its maximum numbers in rich low-lying flats. Its life-history and habits have been described [*R.A.E.*, A, v, 182]. While this beetle is very difficult to control, beneficial results have been obtained by continuous planting of a certain proportion of the rows, transplanting being done only in wet weather. Cane on alluvial flats should be second ratooned, as by this means the annual planting area is reduced: drainage should be improved wherever possible and the importance of clean cultivation cannot be overestimated. *L. stricticollis* is neither so abundant nor so voracious; its feeding habits are similar and remedial measures identical. *M. pallipes* is found only in sandy soils, and has never been known to attack cane.

Cirphis unipuncta, Haw. (sugar-cane army worm) causes considerable damage to young crops, the caterpillars being most abundant during the cooler months; the damage in Fiji has never yet been serious. The caterpillars feed at dusk on the tips of the leaves, feeding at first on tender grasses until they are able to attack the harder tissues of cane leaves. The larval stage lasts three weeks, pupation occurring in the soil and lasting 10 or 11 days. Enemies include the minah bird, a hornet, *Polistes macaensis*, F., a Tachinid, *Sturmia bimaculata*, Htg., a Braconid, *Apanteles* sp., and certain Carabids. These enemies generally hold the pest in check, but, if necessary, poison-sprays could be used with good effect. *Cirphis loreyi*, Dup., is occasionally destructive to cane, but its attacks are seldom serious. *Prodenia litura*, F. (Mauritius-bean army-worm) is present in most plantations, Mauritius beans being used as a covering crop about once in four years, and ploughed in as green manure. The usual food is tobacco [*R.A.E.*, A, vi. 379]. Remedial measures are seldom necessary, enemies, including the brown ant, *Pheidole megacephala*, F., destroying large numbers of the eggs. *Brachyplatys pacificus*, Dall. (Mauritius bean bug) is another pest of Mauritius beans and the weeds of cane-fields and is largely controlled by an egg-parasite, *Ooencyrtus pacificus*, and a species of *Isaria* fungus. *Trachycentra chlorogramma*, Meyr., is chiefly injurious in the low-lying reclaimed swamps which frequently contain a considerable proportion of sickly canes; apparently healthy stalks of Badila cane are also attacked. The damage by this moth is similar to that caused by *R. obscura*, but the tunnels are wider and shorter, and are frequently abandoned and a new one begun in the same or another stalk. The larva drags about with it a case in which it can quickly seek protection and pupation occurs in a very tough case made of cane fibre, generally within the larval tunnel. The burning of trash after harvesting and the exposure of tunnelled stalks to the heat of the sun will largely check the increase of this insect.

A new species of *Cosmopteryx* (cane leaf-miner) tunnels in the mid-ribs of cane, especially in young plants. It is kept down to a considerable extent by parasites.

A leaf-hopper, *Perkinsiella vitiensis*, Kirk., in its young stages feeds on the cane, sucking the sap and excreting honey-dew, on which a black fungus grows; the injury is, however, slight, the hoppers being controlled by the egg-parasites, *Ootetrastichus*, *Paranagrus*, and *Anagrus*. A Stylopid, *Elenchus tenuicornis*, Curt., also attacks both the young and adult stages. *Aleurodes comata*, Mask., is occasionally very numerous on the under-surface of cane leaves, but is never an important pest and is largely controlled by a Syrphid larva which feeds on all stages, and is an unidentified species of *Xanthogramma*. *Pseudococcus bromeliae*, Bch. (cane mealy-bug) is a minor pest of cane. The locusts, *Locusta danica*, L., and *Cyrtacanthacris guttulosa*, Wlk., are sometimes numerous along the edges of cane-fields where they strip the cane leaves to the mid-ribs. The minah bird is a very effective check on these locusts, which constitute its chief food.

The hornet, *Polistes macaensis*, F., has only occurred in Fiji for the last 15 years or so, but is already one of the commonest insects in the islands. The fertilised females, after hibernating during August and September, begin nest-building in October. The first generation requires 30 to 40 days for its life-cycle, and by April the nest may be about 12 inches in diameter. Towards the end of April both males and females appear and mating takes place in June and July. These hornets act as a check on many pests in Fiji, and should be regarded as beneficial, though their sting is very painful to man and necessitates the expense of canvas suits, gloves and veils for the workers that in certain districts are obliged to enter the fields and destroy the nests before the cane can be thrashed. In most localities, however, the cane is cut during the hibernating period so that this difficulty does not arise.

Distant (W. L.). **A new Lygaeid Bug found among Stored Rice in Java.**—*Bull. Entom. Research, London*, x, no. 1, November 1919, p. 41, 1 fig.

Ampera intrusa, gen. et sp. n., from stored rice in Java is figured and described.

Cleare (L. D.). **A Useful Breeding Cage.**—*Bull. Entom. Research, London*, x, no. 1, November 1919, pp. 43–44, 1 fig.

A useful, easily constructed and portable breeding cage is described and illustrated. It consists of cylinders of brass mosquito-proof wire netting, 20 meshes to the inch, held together by brass paper-fasteners. Covers for the top and bottom may consist of glass petri dishes, 8 to 10 inches in diameter or galvanised iron pans may be used. These could be packed in nests and the wire carried in rolls. These cages have the advantage of being rat-proof. Where earth is necessary for pupation, the cylinder may be fitted outside the bottom and this facilitates lifting off to replace the food-plant. When used for tick-breeding experiments the cages were placed in larger dishes containing water and kerosene, to prevent their escape; this also renders them ant-proof.

Baker (A. C.). U.S. Bur. Entom. *Neotoxoptera violae*, **Theo., and its Allies.**—*Bull. Entom. Research, London*, x, no. 1, November 1919, pp. 45–46, 1 plate.

The Aphid discussed in this paper was recorded by Theobald on violets in Africa and was described by him as *Neotoxoptera violae* [*R.A.E.*, A, iii, 749]. Investigation shows this species to be only an aberration of *Rhopalosiphum violae*, Perg., which occurs in greenhouses in the United States and Canada.

This species and *Macrosiphum kirkaldyi*, Full., for which del Guercio erected the genus *Fullawayella*, are closely related and undoubtedly belong to the same genus; they should therefore both be placed in *Fullawayella*. The genus *Micromyzus*, which was erected by Van der Goot for *M. nigrum*, which is evidently closely related to *F. kirkaldyi* and is congeneric with it, must also become a synonym of *Fullawayella*. Another allied genus is *Microparsus*, with *M. variabilis*, Patch, as its type.

A key is given to these genera and to the species contained in them.

HODGKISS (H. E.). **Control of Green Apple Aphis in Bearing Orchards.**—*New York Agric. Expt. Sta., Geneva, N.Y.*, Bull. 461, June 1919, pp. 97–134, 10 plates. [Received 20th November 1919.]

The author's conclusions are as follows: The green apple aphis [*Aphis pomi*] lives on apple trees throughout the year. On account of a late spring migration of winged forms and the later breeding of the insect, the pest is difficult to control by a single spraying in the season. If control measures are unduly delayed the insect's activities may result in severe injuries, such as curling of leaves or deforming of fruits. Curled foliage and the stems of fruits, as well as the clusters of apples, afford hiding places for the Aphids, which are difficult to reach with the spraying mixture unless it is applied generously and with considerable force. Applications of coarse sprays in liberal quantities are necessary to wet the leaves and the insects thoroughly. Such treatments often reach Aphids that escape mist sprays, and by thorough and timely spraying the summer broods can be controlled even on trees of considerable size. The delayed dormant spray, by protecting the trees from early infestations, diminishes the opportunities for serious reinfestations from the late spring migrations. A nicotine sulphate and soap spray is a very satisfactory aphidicide on account of its rapidity in killing, ease of application, and its spreading and adhesive properties.

Nicotine sulphate and lime is especially advantageous on trees of medium size with large amounts of succulent growth, because of its deterrent influence on the insects in addition to its immediate killing properties. In planning spraying operations against the green apple aphis, chief dependence should be placed on the nicotine sulphate-soap spray for trees of unusual height. With plantings of younger trees or those newly set, especially where succulent stems are likely to be seriously injured, an application of nicotine sulphate and lime will prove an efficient and satisfactory treatment.

The following formulae are given for the above sprays.

Nicotine sulphate-soap solution:—Nicotine sulphate (Blackleaf 40) $\frac{3}{4}$ U.S. pint (1 pint in severe attacks) and soap 4 lb. to 100 U.S. gals. water.

Nicotine sulphate-lime wash:—Stone or hydrated lime 60 lb., copper sulphate 2–4 lb. and nicotine sulphate $\frac{3}{4}$ U.S. pint (1 pint in severe attacks) to 100 U.S. gals. water.

WOGLUM (R. S.). U.S. Bur. Entom. **A Dosage Schedule for Citrus Fumigation with liquid Hydrocyanic Acid.**—*Jl. Econ. Entom. Concord, N.H.* xii, no. 5, October 1919, pp. 357–363.

Further experiments have been made with regard to the comparative efficacy of liquid hydrocyanic acid and pot-generated gas which confirm previous observations [*R.A.E.*, A. vii, 228]. The present experiments were conducted chiefly against black scale [*Saissetia oleae*], purple scale [*Lepidosaphes beckii*] and red scale [*Chrysomphalus aurantii*]. A dosage schedule based on field experience is given according to which the small trees are practically dosed in proportion to their cubic contents, whereas larger ones approximate to the ratio of surface area of a domeshaped figure to its cubic content. The experiments against *Lepidosaphes beckii* with liquid hydrocyanic acid at the rate of 16·56 c.c. as equivalent to 1 ounce of sodium cyanide show better results at the bottom of the trees than with pot-generated gas, whereas the reverse was found to be the case at the top of the tree. The total result for the whole tree is slightly favourable to the pot treatment showing that the above amount of liquid hydrocyanic acid is insufficient, to produce results equivalent to one ounce of sodium cyanide in pot-generation.

The experiments were conducted on medium-sized trees at a temperature of from 65° to 70° F. In experiments performed under similar conditions but at higher temperatures of fumigation and with the use in some cases of 21 to 22 c.c. of liquid hydrocyanic acid as equivalent to the ounce of sodium cyanide, the mortality averaged above 99 per cent. It is apparent that from 16·56 to 21 c.c. of the liquid are required to produce results similar to those secured by pot generation, 18 c.c. being the average equivalent of one ounce of sodium cyanide on average-sized trees at the ordinary temperatures of treatment. A table is given of the results of experiments against *Chrysomphalus aurantii* on small trees, which show that the liquid hydrocyanic acid is less efficient in this case.

At low temperatures, such as 40°F., it is necessary to increase the dosage of liquid hydrocyanic acid, as its superiority to pot-generated gas is less marked than at higher temperatures of fumigation.

Peterson (A.). **Response of the Eggs of *Aphis avenae*, Fab., and *Aphis pom* , DeG., to various Sprays, particularly concentrated Lime-Sulphur and Substitutes, Season of 1918-1919.**—*Jl. Econ. Entom. Concord, N.H.*, xii, no. 5, October 1919, pp. 363-386.

With a view to determining the most efficient insecticide to be used against the eggs of *Aphis avenae*, F., *A. pomi*, DeG., and *A. sorbi*, Kalt., experiments were carried out during the season under review the results of which are almost identical with previous ones, [*R.A.E.*, A., vi, 110].

The present observat ons were made on a larger scale and special precautions were taken to avoid possible errors. In a footnote (presumably by the Editor) it is stated that the species referred to as *A. avenae* is apparently *A. prunifoliae*, Fitch, and as *A. sorbi* is *A. malifoliae*, Fitch [see also *R.A.E.*, A, vi, 47, 298 ; viii, 18, 19].

It was noticed that although *A. avenae* was very abundant, comparatively few leaves were curled when this was the only species on the tree, but if *A. pomi* or *A. sorbi* were present, even in very small numbers, the leaves were badly curled and stunted. All three species were present on the petioles of flowers in the pink bud and flower stage and they probably injure the set of the fruit. So far as is known, *A. avenae* does not cause small distorted fruit as does *A. sorbi*. The latter lives on the apple plant for 3 or 4 generations and does not migrate until the end of June, whereas *A. pomi* remains throughout the year on the apple ; the stem-mothers of *A. avenae* give rise to nymphs the majority of which develop wings and migrate to other plants, completely disappearing by the end of May. The damage caused by *A. avenae* is so slight that, unless it is accompanied by other species, its presence may be completely ignored. As *A. pomi* and *A. sorbi* hatch 10 to 14 days after *A. avenae*, their presence may be determined by this means; but in districts where *A. pomi* and *A. sorbi* hatch too late for a dormant spray of lime-sulphur and nicotine to be applied with safety, the question of their presence must depend on the determination of adults in the autumn.

The insects used for the experiments were kept out of doors and exposed to all changes of weather. *A. avenae* was sprayed on 7th December, 9th January, 10th February, and 1st, 10th and 21st March; *A. pomi* on 18th February, 3rd, 12th and 21st March. Sprays cannot be applied with safety after the buds show green. A list of the many insecticides tested is given with comparative tables of the results obtained; from these it is evident that concentrated liquid lime-sulphur (1–9) is superior to all other sprays when used at their respective recommended strengths and killed 92 to 94% of all the eggs of *A. avenae* and 89 to 96% of all those of *A. pomi*. Used at a strength of 1–6 it is slightly more efficacious, but does not even then effect a complete destruction. The addition of 1 gm. per 100 cc. of casein lime, composed of 50% casein (lactic) and 50% hydrated lime, greatly increased the effectiveness of this spray. Dry lime-sulphur is less effective. At a strength of 15 lb. to 50 U.S. gals. only 78% of the eggs of *A. avenae* were killed. Used as a dust it proved even less effective. Barium sulphur at the rate of 15 lb. to 50 U.S. gals. was somewhat superior to coarse dry lime-sulphur, but very inferior to concentrated liquid lime-sulphur. The most effective spray after concentrated liquid lime-sulphur was sodium-sulphur (commercially known as soluble sulphur, and largely consisting of sodium polysulphide) at the rate of 15 lb. to 50 U.S. gals. The addition of nicotine (1–500) increased the efficacy of all sprays. A combination of fish oil soap (1 gm. per 50 cc.) and nicotine (1–500) killed 99 per cent. of the eggs of *A. avenae* when applied on 21st March, but was decidedly less effective when applied earlier. Nicotine (1-500) added to sodium sulpho-carbonate (1–9) gave almost complete control and may prove as effective as concentrated liquid lime-sulphur, though further observations are necessary, as its effect upon the plants is not known. The addition of ordinary laundry soap at the rate of 1 gm. per 200 cc. to sodium sulpho-carbonate apparently made no difference, whereas the addition of fish oil soap in the varying strengths of 1 gm.-50 cc., 1 gm.-100 cc., and 1 gm.-200 cc., materially reduced its efficacy. Other insecticides tested included hydrated lime, the toxicity of which never exceeded 81 per cent. This was slightly increased by the addition of casein-lime. Experiments with the miscible oil, "scalecide," were not successful.

The most important reaction of all insecticides is their toxic effect on the embryo. The period of maximum susceptibility of the eggs is when they commence to hatch. Contrary to previous experiments [*loc. cit.*], the susceptibility of the eggs of *A. avenae* and *A. pomi* to various sprays are approximately the same.

CROSBY (C. R.) & LEONARD (M. D.). **An injurious Leaf-miner of the Honeysuckle.**—*Jl. Econ. Entom. Concord, N.H.*, xii, no. 5, October 1919, pp. 389–392, 6 figs.

A serious outbreak of *Phyllorycter* (*Lithocolletis*) *fragilella*, Frey & Boll, was noticed in 1917 in New York State on Belgica honeysuckle. The damage caused necessitated the substitution of hard wood instead of green-cuttings for propagation.

All the stages of this moth are described. The eggs are laid singly on the underside of the leaves. The emerging larva forms a linear mine which gradually widens and extends along a vein for about $\frac{1}{4}$ of an inch, after which it enlarges into a blotch about $\frac{1}{2}$ an inch in diameter. As a rule there is only one larva in each mine, though there may be several mines in one leaf. In the penultimate stage the larva lines the mine with silk and folds the leaf and puckers the surface of the mine. At this time it eats holes in the upper parenchyma around the edges of the mine, and these may be seen as a series of pale spots. This process continues in the last stage, during which the leaf is frequently doubled over. The cocoon in which pupation occurs is attached closely to the upper lining of the mine and loosely to the lower. When about to emerge, the pupa works its way partly out of the mine. All stages were present on plants out of doors on 26th August.

Mosher (E.). **Notes on the Pupae of the European Corn Borer, *Pyrausta nubilalis,* and the closely related Species, *P. penitalis.*—** *Jl. Econ. Entom., Concord, N.H.,* xii, no. 5, October 1919, pp. 387–389., 6 figs.

The pupae of the closely related moths, *Pyrausta nubilalis* and *P. penitalis,* are more easily distinguished than the larvae. The chief points of differentiation are therefore here described and illustrated in detail.

Fink (D. E.). **Hibernating Habits of two Species of Ladybirds.—** *Jl. Econ. Entom., Concord, N.H.,* xii, no. 5, October 1919, pp. 393–395, 1 plate.

During late autumn, although Aphids were still present on spinach, kale and cabbage, *Megilla maculata,* De G., was noticed seeking shelter elsewhere. The beetles were apparently attracted by different species of trees, as colonies were found hibernating on pine oak (*Quercus palustris*), hard maple (*Acer saccharum*), red mulberry (*Morus rubra*) and red cedar (*Juniperus virginiana*). The beetles arrive singly and in couples, settling on the ground at the base of the tree, afterwards crawling up the trunk and seeking shelter in cracks and crevices of the bark. At first groups may be found all over the tree, but as the frost increases only the areas facing the south and east are occupied. At no time during the winter are the beetles entirely dormant. In the early spring they migrate from the trees to the surrounding fields.

Many theories have been propounded concerning the return of Coccinellid beetles in successive years to the same trees. In view of various experiments here described it is concluded that hibernation on the same trees is purely accidental. The hibernating habits of *Epilachna borealis,* F., a pest of watermelons, are very similar to those of *Megilla maculata.* They differ only in that *E. borealis* does not utilise the same trees each year. This may be accounted for by the fact that their food-plants are often shifted, crop rotation being a common practice in watermelon culture.

WELLHOUSE (W. H.). *Xanthonia villosula*, Melsh., injuring Forest Trees (Coleoptera, Chrysomelidae).—*Jl. Econ. Entom., Concord, N.H.*, xii, no. 5, October 1919, pp. 396–397.

During the summer of 1918 the Chrysomelid beetle, *Xanthonia villosula*, Melsh., was found causing serious damage in forests near Ithaca. Small trees with foliage near the ground were nearly defoliated and larger trees had most of the leaves perforated by the characteristic chain of small holes. Hornbeam (*Carpinus caroliniana*) and ironwood (*Ostrya virginiana*) were the trees chiefly attacked.

The adults were found feeding from 27th June to 2nd August. They drop quickly to the ground when disturbed and may readily be beaten down into a net. The eggs are laid in moist earth below the surface of the ground, as many as 19 having been found glued together in a mass. The larvae have not yet been found, but probably feed upon roots of plants.

DE ONG (E. R.). An Imported Feeder on Stored Peanuts.—*Jl. Econ. Entom., Concord, N.H.*, xii, no. 5, October 1919, pp. 407.

A moth, resembling *Ephestia kühniella*, and subsequently identified as *Aphomia* (*Paralipsa*, *Melissoblaptes*) *gularis*, Z., has been found infesting peanuts imported into the United States from China. In bags that were piled about ten deep, only the two or three upper layers appear to have been infested. Pupation occurred in the sacks or on the walls and ceiling of the store. Caterpillars that pupated in October emerged in the laboratory in the first part of April. This is apparently the first record of this Galleriid moth in the United States.

FROST (S. W.). The imported Red Spider (*Paratetranychus pilosus*, Can. & Fanz.) attacking Apple Foliage.—*Jl. Econ. Entom., Concord, N.H.*, xii, no. 5, October 1919, pp. 407–408.

The red spider, *Paratetranychus pilosus*, Can. & Fanz., is recorded for the first time in the United States:* it has been found on apple, sour cherry, pear, peach, hawthorn, mountain ash, rose and European plum in Canada and on apple in Pennsylvania. The plum seems to be its preferred food-plant.

FELT (E. P.). European Corn Borer (*Pyrausta nubilalis*, Hübn.).—*Jl. Econ. Entom., Concord, N. H.*, xii, no. 5, October 1919, p. 408.

Attention is drawn to the discovery of *Pyrausta nubilalis*, Hb., in Erie County, an area that is three hundred miles west of any other known infestation. This suggests the possibility of the moths having been carried by railway trains. In certain areas of New York State only one generation of the pest is predicted for 1920.

BLACKMAN (M. W.). Notes on Several Species of *Pityophthorus* breeding in the Limbs and Twigs of White Pine.—*Psyche, Boston, Mass.*, xxvi, no. 5, October 1919, pp. 134-142. 3 plates.

Pityophthorus cariniceps, Lec., is a large Scolytid found in spruce and white pine in the eastern States. Observations were made on

*[It has been reported previously from New Jersey (*R.A.E.*, A, iii, 566).—ED.]

adults starting burrows on 24th April in small, storm-broken limbs and twigs of white pine, nearly always beginning near the axil of a smaller branch. The male invariably started the burrow. One burrow examined 9 days after its commencement was found to have already three egg-galleries radiating from the nuptial chamber, with eggs in the niches along each side. Adults of a second generation emerged in the following month and were numerous in early July. It is therefore evident that several generations may occur during a single season, and it seems probable that two generations a year are usual in central New York. This however depends largely upon temperature and moisture conditions, in cool, shady situations only 1 or $1\frac{1}{2}$ generations being produced in a season. The brood burrows are excavated almost entirely in the sap-wood, though the larvae at first feed chiefly on the bark.

P. canadensis, Swaine, was taken in New York State on 20th June, from white pine. This species both in appearance and type of injury closely resembles *P. cariniceps*. *P. granulatus*, Swaine, is commonly found in thin-barked white pine in central New York, especially in small, suppressed trees. The burrows are unusually long and fine, and can be distinguished by their being full of frass. It is probable that one generation occurs in a year. Since the species almost always attacks dying trees it can scarcely be considered injurious. *P. nudus*, Swaine, breeds in white spruce and is very similar in structure and habits to *P. granulatus*, with which it is frequently associated. The galleries, however, are shorter. *P. puberulus*, Lec., found in the eastern portion of the United States and Canada, breeds in pine and balsam fir. Small terminal twigs of diseased trees, or limbs freshly broken from the trees, are attacked for preference. This species eats out the inner bark and a good deal of the wood, sometimes continuing the burrow into the pith. It is peculiar in that it makes no effort to avoid any pitch it encounters, but on the contrary devours it, apparently with relish. It also rarely attacks perfectly healthy twigs and is therefore not nearly so injurious as it would otherwise be.

Other beetles found in company of the above-named, chiefly in suppressed or dying trees, include *Pityogenes hopkinsi*, Swaine, *Chrysobothris femorata*, F., *C. dentipes*, Germ., *Pogonocherus mixtus*, Hald., *Leptostylus sexguttatus*, Say, the Clerid, *Phyllobaenus dislocatus*, Say, and, in the case of *Pityophthorus granulatus*, a predator, *Hypophloeus tenuis*, Lec. Cocoons of a small Hymenopterous parasite have been also found at the ends of the larval burrows of *P. granulatus*, but have not been reared.

Notes in connexion with Insect Pests.—*Rept. Agric. Dept., British Virgin Islands 1918–1919, Barbados,* 1919, pp. 7–8. [Received 27th November, 1919.]

As certain cotton pests, and notably *Eriophyes gossypii* (leaf-blister mite), are responsible for a great reduction in the cotton crop, serious consideration has been given to the question of introducing legislation to enforce a close time for cotton, that is, a period when no living cotton plants would be allowed to exist. It was decided to postpone the introduction of legislation and attempt to attain this object by voluntary co-operation, but probably recourse will have to be made to legislation in the near future. *Alabama argillacea* (cotton worm appeared in large numbers late in the season. Little is done by the peasants to check the pest. The "Jack Spaniard" wasp [*Polistes*], which is a valuable enemy of the cotton worm, has not been seen in Tortola since the cyclone of 1916.

A large Longicorn beetle, *Batocera rubus*, was introduced into Tortola about 1914, probably from the eastern tropics, and has attacked and killed nearly all the native fig-trees. It will attack almost any plant having a thick bark or possessing laticiferous vessels. *Diaprepes abbreviatus* was not quite as abundant as in some seasons; this weevil is a serious pest of citrus and bay trees and also attacks many useful and ornamental plants, including cassava and *Andira inermis*. A bird, *Tyrannus dominicensis*, feeds on the adults to some extent. The sweet potato caterpillar, *Protoparce cingulata*, was abundant late in the year in several districts; few measures are taken against this pest, though domestic fowls eat numbers of the larvae.

Ross (W. A.). **Aphids injurious to Fruit Trees in Ontario.**—*Ontario Fruit Growers' Assoc., 50th Ann. Rept. 1918, Toronto*, 1919, pp. 19–20.

A brief and popular account is given of the chief injurious Aphids in Ontario including the green apple aphis [*Aphis pomi*], rosy apple aphis [*A. sorbi*], oat aphis [*Siphonaphis padi*], woolly aphis [*Eriosoma lanigerum*], black cherry aphis [*Myzus cerasi*] and the mealy plum aphis [*Hyalopterus arundinis*]. The life-histories of these species are briefly described and the usual remedial measures for them are discussed.

Froggatt (W.W.) **A new Species of Wax Scale** (*Ceroplastes murrayi*) **from New Guinea.**—*Proc. Linn. Soc. N.S.W., Sydney*, xliv, part 2, no. 174, 2nd October 1919, pp. 439–440, 1 plate.

Ceroplastes murrayi, sp. n. (wild mango wax scale), of which all stages are described, has been found in abundance on branches of wild mango in the forest of British New Guinea.

Chimenti (E.). **La Cochenille du Figuier en Calabre.**—*Bull. bimens. Off. Gouv. Gen. Alger., Paris*, xxv, no. 10, 15th October 1919, p. 159.

The fig scale [*Lepidosaphes ficus*] does considerable damage in Italy by sucking the sap of fig trees and secreting a sticky substance that gives rise to a sooty fungus on the leaves, branches and flowers, greatly inhibiting their development. The natural enemies of this scale, which include predaceous Coleoptera, are not in themselves sufficient to effect control. A lime-sulphur mixture of 13 gals. of water and 10 lb. of quick lime, to which 20 lb. of sifted sulphur have been added and the whole continually stirred and boiled for one hour, is the best spray against the young larvae in May. This should be diluted at the rate of 4 to 8 parts to 100 of water and applied in the spring and summer at intervals of about a fortnight.

PAILLOT (A.). **La Karyokinetose; Faits nouveaux et Considerations générales.** —*C.R. hebdom. Acad. Sci., Paris*, clxix, no. 17, 27th October 1919, pp. 710–712.

Karyokinetosis, a reaction of immunity, has been noticed in additional species [*R.A.E.* A, vii, 186] especially in Lepidopterous pests of cabbages belonging to the genus *Mamestra*. All entomophytous organisms experimented with gave the same result, even the most pathogenic coccobacilli such as *Bacillus melolonthae liquefaciens* α, and *B. lymantriae adiposus*.

Karyokinetosis may be considered to be a direct microbic reaction on the nucleocytes of the blood and is a phenomenon independent of phagocytosis. It has not been actually observed in the cockchafer [*Melolontha*] and its larvae or the caterpillars of *Vanessa urticae*, *Eriogaster lanestris*, *Pieris brassicae* and *P. rapae*. Phagocytosis is more or less active in these species, especially in respect of certain microbes such as *Bacillus liparis*; in spite of this, mortality is considerable amongst inoculated caterpillars. In caterpillars of greater resistance, such as *Lymantria dispar*, immunity is incomplete. Certain caterpillars including those belonging to the genus *Lymantria* proved absolutely immune to a *Coccobacillus* isolated from a cockchafer, although this organism is no more phagocytised than is *B. liparis*. It also gives rise to more intense karyokinetosis than any other organism.

DE FARIA (D.). **Os Inimigos dos nossos Livros.** [Enemies of our Books.]—*Serviço Sanit. do Estado de São Paulo, S. Paulo*, N.S. no. 4, 1919, 40 pp., 5 plates.

This paper describes measures against insects that destroy books in the Brazilian State of S. Paulo. The only Coleoptera are two Anobiids, *Catorama herbarium* and *Dorcatoma bibliophagum brasiliense*. The damage they do is very extensive, *Lepisma* and other book pests being of little importance. *D. bibliophagum* appears to be exclusively a book pest, while *C. herbarium* attacks furniture and other woods as well. They are crepuscular or nocturnal in habit and in hot summer evenings have been seen at nightfall to issue from books and go to the windows. The eggs are laid on the binding or on the edges of the leaves. The larvae hatch in 5-6 days and burrow in search of pasted portions; when their mandibles become stronger they begin to feed on the binding and continue to do so until the pupal stage. They then return to the external surface, which in the case of books on library shelves is the backs. Here they increase the size of the mine and cover it with a roof of excreta and paper. The adult emerges through a hole in the thin wall of the chamber and the perforations seen on the backs of books are these exit-holes. These may subsequently be used for oviposition, though the primary infestation is due to larvae that have hatched on the surface of the books into which they burrow through minute holes. As a general rule the development of these beetles in S. Paulo takes place from October to December. Different stages occur at the same time. Eggs have not been found, nor was the act of oviposition observed.

To be effective against these beetles an insecticide must destroy all stages from egg to adult, and sulphurous anhydride is recommended for this purpose. The pressure necessary for all parts of the books to be disinfected is attained when the fumigation chamber contains 12 per cent. of the gas as measured by a densitometer placed in the uppermost zone. Fumigation must be continued for 30 minutes at 12 per cent. strength, and a longer period is unnecessary. The books must first be removed from their shelves and their leaves separated; they must be brushed and then replaced in such a manner as to allow the gas free access to all portions. To facilitate this an apparatus is recommended by means of which a book may be slung on wires from the top and bottom of its back, which is then uppermost. To prevent discolouration of the pages a very necessary precaution must be taken before fumigating books standing on shelves. This consists in covering the top of the book with a sheet of paper projecting on all sides. Sulphurous anhydride must not be used for very damp books or rooms, since in the presence of water it produces sulphuric acid, which is destructive to paper.

STAEGER (R.). **Aus dem Leben der Larve von *Pontania vesicator*, Bremi.** [Notes on the Larva of *Pontania vesicator*.]—*Rev. Suisse Zool., Geneva*, xxvii, no. 9, October 1919, pp. 333–346.

A description is given of the process of feeding in the galls and the formation of the cocoons of *Pontania vesicator*, Bremi, which infests leaves of *Salix daphnoides* in the vicinity of Berne. This sawfly pupates in the ground.

LICHTENSTEIN (J. L.). **Notes biologiques sur les Hyménoptères méditerranéens. 2e Note.**—*Bull. Soc. Entom. France, Paris*, 1919, no. 15, 8th October 1919, pp. 270–275.

This list includes the Ichneumonids, *Xylonomus propinquus*, Tschek., the presence of which in Hérault has been confirmed by its being found in *Hesperophanes griseus*, F., from fig-trees, and *Ischnocerus rusticus*, Fourcr. (*filicornis*, Kriechb.), which has been recorded from various Cerambycid hosts and which the author has bred from larvae of *Rhagium mordax*, DeG. Chalcidids include the Torymid, *Philotrypesis caricae*, Hass., found for the first time in France in *Ficus carica*, L., though this species may have existed for a long time in wild figs, as does *Blastophaga psenes*, L. *Torymus tipulariarum*, Zett., is a parasite of Cecidomyids, found in dipterous galls on willow and in the deformations caused by *Asphondylia verbasci* on *Verbascum sinuatum*. Individuals from *Salix alba* were obtained in April and from *Verbascum* in October; perhaps this denotes a change in seasonal occurrence due to the absence of one of the hosts. *T. viridis*, Först., has been taken in Montpellier from galls of *Rhodites eglanteriae*, Hart., from which it emerges in April; *T. artemisiae*, Mayr, was taken from galls of *Cecidomyia artemisiae*, Lw.; *T. viridissimus*, Boh., was bred from oak-galls produced by *Biorrhiza pallida*, Ol.; *Cleonymus depressus*, F., emerges in October from branches of nut trees containing larvae of *Gracilia minuta*, F.; *Eupelmella degeeri*, Dalm., has a number of hosts and was taken in Montpellier from larvae of a Trypetid (*Myopites?*); *Pseudocatolaccus asphondyliae*, Masi, was taken in October from flowers of *Verbascum* deformed by *Asphondylia verbasci*, Vallot; and *Stenomesius rufescens* (Rossi) Th., is parasitic upon *Hemerophila* (*Simaethis*) *nemorana*, Hb., in fig-trees.

DEGRULLY (L.). **Contre la Cochylis et l'Eudémis.**—*Progrès Agric. Vitic., Montpellier*, lxxi, no. 7, 16th February 1919, pp. 145–149, 10 figs. [Received 4th December 1919.]

The usual treatments against *Clysia ambiguella* and *Polychrosis botrana* are reviewed, and descriptions are given with illustrations of suitable implements for the various processes advocated for scraping, brushing, etc. of the bark.

BONET (J.). **Contre la Cochylis, l'Oidium, etc. Le Chaulage des Grappes, etc.** *Progrès. Agric. Vitic., Montpellier*, lxxi, no. 9, 2nd March 1919, pp. 200–202. [Received 4th December 1919.]

The dates for dusting with quick lime against the vine moths [*Clysia ambiguella* and *Polychrosis botrana*] [*R.A.E.*, A, vii, 46] should be regulated by those of emergence of the young larvae in the district under observation.

Owing to the abundance of *Sparganothis pilleriana*, 1 lb. of lead arsenate dissolved in water was added to every 9 gals. of Bordeaux mixture used for spring spraying. This treatment was repeated at an interval of ten days, after which no larvae were seen and no scorching was noticed.

DEGRULLY (L.). **Traitements insecticides de Printemps: Altise, Cigarier, Pyrale, Cochylis, Eudémis.**—*Progrès Agric. Vitic., Montpellier*, lxxi, no, 13, 30th March 1919, pp. 292–295.

The principal insecticides in common use against vine pests are reviewed and formulae given for their preparation.

BERTRAND (G). **Sur la haute Toxicité de la Chloropicrine vis-à-vis de certains Animaux inférieurs et sur la Possibilité d'Emploi de cette Substance comme Parasiticide.**—*Progrès Agric. Vitic., Montpellier*, lxxi, no. 16, 20th April 1919, pp. 376-378. [Received 4th December 1919.]

The larvae of *Sparganothis pilleriana, Polychrosis botrana*, the poplar sawfly and Aphids on Japanese spindlewood [*Euonymus*] were used in the experiments here described. From 10 to 20 parts per 1000 of chloropicrin were found sufficient to kill all larvae and Aphids after an exposure of from 5 to 10 minutes. Used at half this strength it proved equally effective against the larvae, all of which died within 24 to 48 hours after exposure.

THÉRY (A.). **Un Ennemi de la Vigne au Maroc.**—*Progrès Agric. Vitic., Montpellier*, lxxi, no. 23, 3rd June 1919, pp. 544–545, 2 figs. [Received 4th December 1919.]

The Longicorn, *Cyrtognathus fornicatus*, L., has been recorded as attacking vines in Morocco during 1918. The injury is caused by the larvae attacking the roots two or three inches below the surface of the ground, and they are able to cut through vines of a diameter of $\frac{3}{5}$ to $\frac{4}{5}$ of an inch. The adults appear in July, but are seldom seen. The native food-plant of this beetle is a dwarf palm, and it probably attacks vines only when there is a scarcity of this plant.

As the larvae live for several years, infestation can only be prevented by planting vines at a distance from these palms, or in cases where this is impossible careful and systematic collection of the larvae should be made.

The distribution of this beetle is not well known, but in the locality in question it is found in very light sandy soil and only in the vicinity of palms.

Coulanges (—). **Les Ennemis des Plantations de Tabacs indigènes.**—*Progrès Agric. Vitic., Montpellier*, lxxi, no. 21, 25th May 1919, pp. 491–493. [Received 4th December 1919.]

The pests of tobacco plants include wireworms, which are successfully kept in check by the use of baits consisting of potato scraps; mole-crickets [*Gryllotalpa* sp.], which may be destroyed by pouring oil suspended in water into their galleries; and Noctuid caterpillars, the ravages of which can only be prevented by hardening the ground, various methods of which are suggested.

Rives (L.). **Observations sur les Moeurs de la Pyrale du Mais et ses Dégats dans le Pays Toulousan.**—*Progrès Agric. Vitic., Montpellier* lxxi, no. 26, 29th June 1919, pp. 610–611. [Received 4th December 1919.]

Pyrausta (*Botys*) *nubilalis* has been very destructive during the past two years in the environs of Toulouse. The excessively dry summers were probably responsible for the increase of this moth in maize fields. Two generations have been observed in the locality under review. The moths of the first generation appear in June. The young caterpillars on hatching bore into the stalk. The second generation appears in August. Hibernation takes place in the larval stage. A Tachinid parasite infests both generations of the caterpillars and in 1918 destroyed more than 20 per cent. in some districts.

Antoniadis (P.). **Recherches sur la Pyrale.**—*Progrès Agric. Vitic., Montpellier*, lxxii, no. 28, 13th July 1919, pp. 31–33. [Received 4th December 1919.]

Recent observations on the vine Pyralid [*Sparganothis pilleriana*] confirm those made previously [*R.A.E.*, A, vi, 140] and show that the hot water treatment is most efficacious provided it is conscientiously and systematically carried out. On all the branches examined the only living insects were found where the jet had not penetrated sufficiently, *i.e.*, the cracks at the junction of the branches with the main stem or on the under surface of their branches which the water had not reached directly and had therefore lost its heat.

Chaine (J.). **Protection des Plantes contre les Termites, par Traitement interne.**—*Progrès Agric. Vitic., Montpellier*, lxxii, no. 29, 20th July 1919, pp. 61–67. [Received 4th December 1919.]

An account is given of experiments that were interrupted by the War and which have led to no very definite conclusions. In Lower Charente all kinds of vegetation are liable to attack by termites some of them being regularly infested, such as young elms and pelargoniums, and others only occasionally. Both the upper and underground portions of the plants are attacked and even the fruits. Generally it is the underground portions only that suffer, but if the branches are weakened or damaged in any way infestation frequently occurs in such spots.

After many preliminary trials with plants in pots, four substances were selected for trial upon trees; these were mercury bichloride and sea-salt, potassium ferricyanide, potassium ferrocyanide and sodium hyposulphite. These were used in a 3 per cent. solution of the liquids applied in the preliminary trials. A trench was dug round each tree large enough to take 40 to 60 gals. of water in which 3 per cent. of one of the solutions had previously been mixed. This application was repeated two or three times at two days' interval; the hole was then filled up. In 1911 a spring and autumn treatment was given, in 1912 a winter treatment was added. The results showed that at least two years' treatment was necessary to make any very appreciable difference to the trees. The sodium hyposulphite proved useless, the trees showing no change after treatment. After two years, trees treated with bichloride of mercury or ferrocyanide of potassium showed no trace of termites; those treated with ferricyanide of potassium showed a decided improvement in their general condition.

Another series of experiments was conducted with plants used for food, such as potatoes, oats, etc., the same solutions at suitable strength being used and applied to the soil only, never to the leaves. As many as ten applications were made, and about 10 days after the last one the plants were taken up and chemically examined. The results of this analysis on potatoes, oats and wallflowers are given and also of a similar experiment with cabbage, beans and potatoes. The plants thus analysed showed distinct traces of the substances with which they had been treated; their vitality with regard to germination was, however, in no way impaired. Cabbages treated with each of the three solutions were after 4 days given to rabbits which had previously been fasting for 12 hours, apparently without any harmful results. These experiments would have been continued in the field during 1914 if the War had not intervened.

Roepke (W.). **Het Orchideeën-Blauwtje** (*Chliaria dendrobii*). [The Orchid Lycaenid. *C. dendrobii*.]—*Teysmannia, Batavia*, xxx, no. 3, 1919, pp. 115–121, 1 plate.

At the end of 1917 a Lycaenid caterpillar was observed destroying the flowers of an orchid, *Dendrobium phalaenopsis*, and it is here described as *Chliaria dendrobii*, sp. n. These butterflies are often seen near orchids on the flower-clusters and stalks of which the eggs are laid, the buds of *Spathoglottis* being especially preferred. The young caterpillars immediately bore into the buds and feed in the interior. The open flowers of *Spathoglottis* seem unsuitable and the majority of young caterpillars found in them perish. The orchids attacked include *Dendrobium* spp., *Phalaenopsis* spp., and *Arundina* spp. To combat this pest the capture of the adults is advised, or the eggs may be collected from the plants.

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CONTENTS.

CONTENTS—*cont.*

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NICOLLE (C.), BLANC (G.) & CAILLON (L.). **Etude sur des Bactéries du Groupe** *Coccobacillus acridiorum* **(d'Hérelle).**—*Arch. Inst. Pasteur, Tunis,* xi, no. 2, October 1919, pp. 81–93.

The experiments described in this paper have led to the following conclusions. The organism of d'Hérelle (*Coccobacillus acridiorum*) belongs to a group of saprophytic bacteria from which it can be separated by agglutinating reaction alone, just as this reaction distinguishes one from another all the other intestinal bacteria of the same group that have been studied by the authors. Excepting for the effect of this reaction the original Mexican sample of d'Hérelle has no character specifically distinguishing it from allied African species. In the case of intestinal contents the method of passage from insect to insect does not, on re-inoculation, give (regularly, at least) the microbe that was inoculated, but often yields the ordinary saprophyte of the intestine of the locust experimented with. The black diarrhoea of locusts is not specific to inoculation, for it occurred in uncontaminated individuals. These conclusions do not therefore prove the efficacy of d'Hérelle's method, but on the other hand they do not prove it to be inactive. It is quite possible that under favourable conditions virulence may be acquired and epizootics caused. It is also possible that in the Mexican epidemic the causal agent may have been some other bacterium of the same group or even one of the invisible micro-organisms which scientific men suggest as a causal agent in cases that otherwise appear incapable of explanation.

BÉGUET (M.). **Etude des Caractéristiques des Coccobacilles d'Acridiens isolés en Algérie de 1913 à 1916.**—*Arch. Inst. Pasteur, Tunis,* xi, no. 2, October 1919, pp. 94–106.

The cultural characters and agglutinary reactions of coccobacilli isolated from excreta of healthy and diseased locusts have been studied, and it is found that they possess the same general characteristics as given by d'Hérelle for *Coccobacillus acridiorum*. They form a group with many common characters and often can be distinguished only by agglutination. Their virulence is independent of the characters shown by agglutination or culture. All of them that were passed through locusts were increased in virulence in the same conditions as typical *C. acridiorum*.

BALLOU (H. A.). **Insect Pests in British Guiana.**—*Agric. News, Barbados,* xviii, no. 457, 1st November 1919, pp. 346–347.

These notes are taken from the report of Mr. H. W. B. Moore on sugar-cane pests in 1918, some of those mentioned in the report for 1917 being also dealt with. *Castnia licus* (large moth borer) was abundant on certain estates. Large numbers of both adults and caterpillars were collected by hand. The practice of flooding sugar-cane plantations is of two kinds: long flooding, when land is kept under water for from six months to a year, and short flooding, when the flood is maintained only long enough to kill *C. licus* and other insects. Fields intended for immediate planting might be flooded; this would

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kill many of the insects and plant material in the soil and would also prevent the growth of cane sprouts and other vegetation that would be liable to infestation.

The small moth borers continued to be the most injurious pests of sugar-cane. *Diatraea canella* is generally the dominant species from January to September, except during periods of long and severe drought, when *D. saccharalis* increases in numbers and *D. canella* decreases. It is thought that *D. canella* is the more vigorous species and is able to check or prevent the development of *D. saccharalis* under normal conditions. While collection of egg-clusters is some check against *D. saccharalis,* it is useless against *D. canella.* The best method of dealing with the latter species is by repeated, systematic cutting out of the borers as soon as the stools start to sprout and until growth is too far advanced. A new small moth borer recorded in 1917 has been identified as *Elasmopalpus lignosellus.* This has been numerous on a few estates only, causing severe local damage. It has made its heaviest attacks only in dry weather, but appears to have possibilities as a serious pest.

Dyscinetus bidentatus (small black hard-back) is usually observed during the rainy season (May to August); in 1917 it was particularly severe and rather less so in 1918. *D. geminatus* (larger black hard-back) did severe damage on one estate, the grubs boring into the cane tops and killing large numbers. It is stated that the grubs came from decaying vegetable matter and rank grasses in the field prior to planting.

The locust, *Schistocerca paranensis*, appeared in great numbers in 1917. Many were driven against sheets smeared with molasses and tar and others into a canal; millions of eggs were also collected.

Froghoppers occurred only on certain widely separated estates. It is remarked in connection with this pest that while direct methods of control are undoubtedly beneficial, it is of the utmost importance, particularly during the rainy season, that clay soils should be kept open so that they do not become cold and water-logged; the formation of an environment that will produce healthy and vigorous cane by this means is the best safeguard against attack.

HEADLEE (T. J.). **Reports of the Department of Entomology, 1916 and 1917.**—*New Jersey Agric. Expt. Sta., New Brunswick, N.J.*, 1917, pp. 465–511, 4 plates, 3 figs., & 1918, pp. 425–479, 1 plate. [Received 2nd December 1919.]

The insects dealt with include *Malacosoma americana,* Harr., which was present to some extent throughout the State in 1917, but was most injurious in the north-eastern section. *Anisota senatoria,* S. & A. (oak worm) was abundant on scrub oak in scattered localities in the autumn of 1917; birch was apparently the only other tree attacked.

Aphids were abundant on vegetables, the most injurious species being *Myzus persicae,* Sulz. (green peach aphis) on cabbage, potato, tomato, and egg-plant, and *Aphis pseudobrassicae* on beans. The last-named had not previously been taken in New Jersey, but evidence indicates that it has occurred undetected for some years. The remedie advocated against it in an earlier paper [*R.A.E.*, A, iv, 440] are quoted. Experiments in a badly-infested turnip field showed that an orchard sprayer used an excessive amount of spray material. An apparatus was therefore devised which could be attached to a traction sprayer for lifting the foliage in such a manner as to expose the underside of the turnip leaves to the mist delivered by the nozzles of a potato sprayer. Maintenance of high pressure is essential to success with this apparatus.

Many experiments have been concerned with the most injurious orchard Aphids, the results of which have been discussed elsewhere [*R.A.E.*, A, viii, 30]. During 1918, no serious harm was done by any of these species in orchards that were properly sprayed.

The plum curculio [*Conotrachelus nenuphar*] was more seriously injurious than at any time during the previous five years, the infestation showing conclusively that the mere following out of a spraying schedule is not sufficient protection against this pest. Clean cultivation early in the season, followed by a cover crop not producing a dense sod, the removal of stumps and the clearing of overgrown hedges will destroy the hibernating quarters of this weevil and greatly reduce its numbers. The potato flea-beetle [*Epitrix cucumeris*], cabbage caterpillars and June bugs were all more than usually abundant. The rose-bug [*Macrodactylus subspinosus*] appeared in such numbers that the self-boiled lime-sulphur spray recently used against it in apple orchards was in 1917 extended to grape, peach and cherry with satisfactory results. The three tussock moths, *Hemerocampa leucostigma*, S. & A., *Halisidota caryae*, Harr., and *H. tessellaris*, S. & A., attacked the foliage of elm, maple and other shade trees to an alarming extent from August to October.

In greenhouses *Diarthronomyia hypogaea* (chrysanthemum midge) was found to have become established in many localities. The small brown leaf-beetle, *Typophorus canellus*, F., var. *quadrinotatus*, Say, was discovered riddling the foliage of roses under glass. Fumigation with hydrocyanic acid gas nearly exterminated it in August, but it reappeared in October.

One of the most important developments was the discovery of a serious infestation of *Popillia japonica*, recently introduced from Japan. It is expected that the State Department of Agriculture will undertake a campaign for the eradication of this pest [*R.A.E.*, A, vii, 511]. *Trioza alacris*, a European Psyllid introduced into New Jersey, apparently from Belgium, several years previously, attacks the foliage of bay trees both under glass and in the open. There are two generations in the field during the summer, the eggs being laid on the underside of the leaves near the margins. Hibernation occurs on the tree in the adult stage, the insects again becoming active when the trees are removed from cold storage and placed outside. Fumigation with hydrocyanic acid gas or tobacco during the winter destroys the insects. The infestation of *Gryllotalpa gryllotalpa* described in the report for 1915 [*R.A.E.*, A, v, 322] is still present, but does not seem to have extended. The nests are searched for and destroyed during June and July. The importance of scouting operations as a means of preventing such infestations is emphasised.

Experiments have been undertaken to determine the effect of atmospheric humidity on the Angoumois grain moth [*Sitotroga cerealella*] and the bean weevil [*Bruchus obtectus*]. The results of the work of 1916 and 1917 show that for both of these widely different pests an increase in atmospheric humidity means an increase in the rate of metabolism as measured by the length of the life-cycle. The optimum percentage of atmospheric humidity is the highest that will not encourage a heavy growth of fungi. An atmospheric humidity of 100 per cent. destroys by encouraging the growth of fungi, while low atmospheric moisture destroys directly, probably by the abstraction of water. The egg-stage, at least in the case of the bean Bruchid, is most sensitive to the effect of low atmospheric humidity, though all stages are unfavourably affected. It is thought that this fact might be utilised against certain other species of insects infesting stored grain.

The study of remedial measures against the pear psylla [*Psylla pyricola*] [*R.A.E.*, A, v, 321] has been continued and extended on account of the contradictory results reported by growers. Experience indicates that while the numbers destroyed by the treatments at present advocated may be sufficient to prevent staining of the fruit, damage is likely to occur to the foliage and under certain conditions to the fruit also. It is possible that spraying just before the blossoms open with commercial lime-sulphur (1 to 9), to which nicotine has been added at the rate of $\frac{3}{4}$ pint to 50 U.S. gals., would destroy both the eggs and surviving adults and thus form an efficient remedy. What effect this mixture would have on the opening blossoms is not known. Work on the control of the strawberry weevil [*Anthonomus signatus*] has been previously described [*R.A.E.*, A, vii, 256].

Bean seeds have been mined before the plants were above ground by a maggot, presumably the seed corn maggot, *Pegomyia fusciceps*, Zett. An early spring generation of flies oviposits in the soil upon or near the bean seed, and the larvae enter the seed and destroy it. Experiments described in this report indicate the value of a continuous wide band of tarred sand or a strip of tarred paper around the plots.

Some study has been made of the use of hydrocyanic acid gas for greenhouse fumigation. It is recognised that its use is greatly limited by fear of damaging the plants and that the dosage or time of exposure or both should vary with the species of plant and its state of development, the construction of the house, and possibly with temperature and moisture. The variation in results in different houses lies primarily in the distribution and density of the gas atmosphere, and some way of determining this density must be devised before much progress with fumigation can be made. An apparatus for this purpose is described. The evidence gathered from the tests indicated that the gas reached its maximum general concentration within eight minutes or less of the time when fumigation began. There was first a swift up-rush of the gas that produced a heavy concentration entirely above the plants ; the gas then distributed outwards and downwards until the maximum general concentration was reached. After that concentration gradually decreased until it fell below the minimum dosage for insects. Irregularities in distribution occurred which are at present without adequate explanation, and such irregularities may be sufficient to damage the plants if concentration is markedly greater, or to fail to kill the insects if the converse occurs. These irregularities may be partly overcome by increasing the number of generators.

Peterson (A.). **Peach Tree Borer. Some Experiments on the Adults and Eggs and other Notes.**—*Rept. Dept. Entom. 1917, New Jersey Agric. Expt. Sta., New Brunswick, N. J.*, 1918, pp. 449–463, 1 plate. [Received 2nd December 1919.]

Observations are recorded on the peach-tree borer [*Aegeria exitiosa*] during the summer of 1917, a series of experiments having been conducted under two large screen cages in a severely infested orchard. As the adult moths were never seen to feed or to show any desire for food, the use of poison-baits or sprays against this stage is evidently useless. The results of the experiments were largely negative as far as remedial measures are concerned. Certain chemicals had a partially repellent effect on the female while ovipositing, and certain sprays resulted in partial destruction of the eggs. Various chemical and mechanical tree protectors are now being tested, but their value is not yet determined. In the author's opinion the question of controlling *A. exitiosa* will be solved by a mechanical or chemical barrier that will kill the larva or otherwise prevent it from entering the tree. It is not considered advisable to attempt to kill the larva once it has done so.

Peterson (A.). **Soil-infesting Insect Investigations.**—*Rept. Dept. Entom. 1917, New Jersey Agric. Expt. Sta., New Brunswick, N. J.*, 1918, pp. 469–479. [Received 2nd December 1919.]

Laboratory and field experiments with sodium cyanide and other chemicals such as lime-sulphur, sodium sulphocarbonate, pyridine and a commercial product known as carbol-sul, which is composed of 40 per cent. to 50 per cent. carbon bisulphide, have shown that wireworms in the soil can be killed with large quantities of sodium cyanide, but the amount necessary to ensure efficient control renders the treatment too expensive for ordinary use in the field. A system of crop rotation designed to meet the problem of wireworm control has been worked out and will be tested during the coming season.

Peterson (A.). **Some Studies on the Eggs of Important Apple Plant Lice.**—*New Jersey Agric. Expt. Sta., New Brunswick*, Bull. 332, [n.d.] 63 pp., 2 plates. [Received 2nd December 1919.]

Recent investigations on the structure, behaviour and susceptibility of the eggs of *Aphis avenae*, F., *A. pomi*, DeG., and *A. sorbi*, Kalt., in connexion with the results obtained in 1916–17 [*R.A.E.*,A,vi,110.] are discussed. A morphological study of the eggs of three apple Aphids, *A. avenae, A. pomi* and *A. sorbi*, shows the presence of two distinct layers in the egg-shell, an outer semi-transparent one that is soft and glutinous when the egg is deposited, but hardens and becomes somewhat tough and impervious upon long exposure to weather, and an inner soft, elastic, membranous, black layer. A third layer, thin and membranous, may be seen about the nymph when it starts to emerge. This skin is probably the first exuvium, since it is shed by the nymph as it emerges. Under out-of-door conditions the outer layer of the egg usually splits along the dorso-mesal line a number of days (2 to 30 or more for *A. avenae*) before the nymph emerges. So far as observed under greenhouse conditions, the eggs of all three species split their outer covering at least a few hours before the pigmented layer is severed. In 1918 the first eggs of *A. avenae* with split outer coverings were seen on 15th February, and when the first nymphs emerged, on 21st March, approximately 95 per cent. of the normal living eggs (45–50 per cent. of the eggs were dead) had split their outer semi-transparent covering.

These observations on the morphology and behaviour of the egg coverings show conclusively that the egg is not a hard resistant body, and that it goes through a critical change previous to the emergence of the nymph. It is in the midst of this critical period that the egg is most susceptible to evaporating factors and certain contact insecticides.

The outer semi-transparent layer of the egg is somewhat impervious to water; consequently, the water content of the embryo does not undergo very much evaporation in moist weather, or in other words, when low evaporating factors exist, such as high humidity, low temperature and probably small wind velocity. The outer layer, however, is not entirely impervious, for extreme drought will cause the vast majority of the eggs to shrivel and fail to hatch. In other words, low humidity, high temperature and probably air velocity undoubtedly bring about a greater evaporation of the water content of the embryo, and thus destroy the living form.

The inner pigmented (black) layer of the egg is not an efficient protector against evaporation. Numerous and varied experiments in the laboratory and observations made on the percentage of hatched eggs of *A. avenae* during the past two totally different seasons, 1917 and 1918, show conclusively the pervious nature of this layer.

The eggs are most susceptible to evaporating factors and contact insecticides during the latter part of March, or in other words, when the greatest number show a split outer layer, and this occurs when the first nymphs start to emerge.

Experiments conducted in the laboratory under controlled percentages of moisture and also experiments where similar eggs of *A. avenae* were kept out-of-doors during the critical period 15th February to 31st March, and the especially important period 15th March to 31st March, which was wet in 1917 and dry in 1918, show quite conclusively that the percentage of hatched eggs is much higher in a low evaporating environment than in a high evaporating medium.

Contact insecticides probably prevent in several ways the eggs from hatching. Substances such as lime-sulphur tend to harden the outer layer so that the nymphs cannot emerge; the same hardening may occur through desiccation. Crude carbolic acid and cresols soften and disintegrate the outer impervious layer and thus expose the inner layer to evaporating factors. It is probable however that the toxic effect upon the embryo is of greater importance. No technique has at present been discovered for determining the penetrative ability of the various chemicals used. The best insecticides and the suitable dates for their application are discussed. [*R.A.E.*, A, viii, 30].

HEADLEE (T. J.). **Vegetable Plant Lice.**—*New Jersey Agric. Expt. Sta., New Brunswick*, N.J., Circ. 107, 26th February 1919, 21 pp. 14 figs. [Received 2nd December 1919.]

This circular has been prepared to meet the need that has been experienced during the last few years for a publication that will bring together in concise form a knowledge of the different Aphids that injure vegetables crops in New Jersey, with some account of their habits and directions for insecticide sprays.

The species dealt with include:—*Macrosiphum solanifolii*, Ashm. (pink and green potato aphis), *Myzus persicae*, Sulz. (green peach aphis), *Acyrthosiphon* (*Macrosiphum*) *pisi*, Kalt. (green pea aphis), *Aphis rumicis*, L. (bean aphis), *Brevicoryne* (*Aphis*) *brassicae* (cabbage aphis), *A. pseudobrassicae* (false cabbage aphis) and *A. gossypii* (melon aphis). The life-histories of these species are briefly described and illustrated.

The weather is largely the determining factor in Aphid outbreaks. Clean cultivation is very necessary in order to destroy the plants and vegetable refuse on which the Aphids pass the winter. As soon as the beginning of infestation is noted a spray should promptly be applied, using 1 part 40 per cent. nicotine to 500 parts water, with the addition of 2 to 5 lb. (according to hardness of the water) of soap to 50 U.S. gals. water. Suitable apparatus and machinery for use on garden and field crops are described and illustrated.

URBAHNS (T. D.). U.S. Bur. Entom. **Grasshoppers and Control Measures.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, viii, no. 9, September 1919, pp. 518–528, 8 figs.

Although agriculture and cultivation have extended over vast areas of the western States, there are still large stretches of land west of the Sierra Nevada Mountains where the breeding grounds of grasshoppers remain practically unchanged. In addition to this, many of the species have become adapted to lucerne and other cultivated fields, so that the source of a destructive grasshopper outbreak is not necessarily from the hills and dry lands as generally supposed, but severe annual losses are experienced in fields and orchards from swarms of the pest that have bred in the near vicinity.

The most destructive species occurring in California are *Melanoplus differentialis*, Thom., which apparently prefers lucerne to any other food-plant, but frequently also attacks orchards and gardens; *M. atlantis*, Riley (lesser migratory grasshopper), which breeds freely in lucerne and other grass-lands and also feeds on melons, beans and many other plants; *Camnula pellucida*, Scud. (yellow-winged grasshopper), which breeds chiefly on grasslands and is destructive to native meadows, maize, oats, beans, and in young orchards and gardens; *Melanoplus marginatus*, which breeds in lucerne fields, foothills and grasslands, and is injurious to lucerne and in orchards and gardens; *Oedaleus enigma*, which breeds in large numbers in dry grasslands and is destructive in lucerne and young orchards; *Melanoplus devastator*, Scud., which breeds on dry lands and lucerne fields and is destructive to lucerne and in vineyards, orchards, gardens and bean fields; and *Schistocerca venusta*, which breeds in lucerne fields of the Imperial and San Joaquin valleys and frequently flies in swarms in maize fields. Each of these species is figured and briefly described.

In the majority of cases a recurrence of the enormous losses caused by grasshoppers could be prevented by sufficiently energetic co-operation between individuals and communities. The conditions peculiar to each infested locality should be considered independently, and a thorough knowledge of the breeding-places, habits and control measures should be acquired by every farmer. The species that prefer grass-covered slopes in the hills for their breeding-grounds hatch in early spring, feed upon the green grasses for a time and then migrate down the gulches, where they at first accumulate in great hordes. They can then be most effectively poisoned before they are able to reach the valuable crops and orchards in the cultivated areas. Grasshoppers can sometimes be driven into definite areas and concentrated for more effective control by herding a large drove of sheep slowly around the infested area. A farming community threatened with grasshoppers working their way in from range lands should co-operate and by burning a strip of grassland one-fourth of a mile wide along the edge of the cultivated area may save their land from further infestation. When waste areas and fence lines are burned to destroy the pest every precaution should be taken to ensure that the insects will not be driven ahead of the flames, and burning should preferably be done at night. In young orchards every effort should be made to keep the grasshoppers out of the trees. Clean cultivation of orchards, fence lines and roadsides will keep the pest in check, but if the grasshoppers are already in the trees poison bran should be spread broadcast between the rows (not at the base of the trees). The insects should be regularly brushed out of the trees so that they will hop to the ground and pick up the poison. Hopperdozers have been used for many years and have caught immense numbers of grasshoppers, but the author considers poisoned bran mixtures the more practical for general use.

Grasshoppers that breed on irrigated lands first appear in May and early June along the higher ridges such as ditch banks, fence lines, etc. Poisoning should begin as soon as they have hatched and before they spread over entire fields. A formula that has been found very effective against grasshoppers consists of 1 lb. Paris green or white arsenic and 2 quarts cheap molasses stirred into 4 U.S. gals. of water. Half a dozen chopped lemons are added and the mixture slowly poured over 25 lb. wheat bran or lucerne meal. If the latter material is substituted an extra gallon of water should be used. This is sufficient for five acres. When the area to be covered is too great to spread by hand, an end-gate grain-seeder attached to the rear of a farm wagon and geared from one of the rear wheels should be used. The poison should be spread as finely as possible and should be used while fresh. It should be applied in the afternoon, shortly before the hoppers seek their evening meal, and shortly before rather than after irrigation, and before cutting lucerne rather than when the field is bare. Two or three days later the grasshoppers generally begin to collect in the crowns of plants and other shaded spots and die in numbers, the dead insects being frequently destroyed by beetles, ants and other insects. It is considered that there is no danger to livestock from the poison, but it should not be left where it can be eaten in large quantities by domestic birds or animals.

MASKEW (F.). **Reports for the Months of August and September 1919.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento,* viii, no. 9, September 1919, pp. 544–547.

Insect pests intercepted during August and September included :— From Belgium, *Coccus hesperidum* and *Aspidiotus britannicus* on bay trees : from Central America, *Pseudococcus* sp., *Aspidiotus cyanophylli* and undetermined ants on bananas : from China, Lepidopterous larvae in shelled peanuts and yams ; *Calandra oryzae* and *Tenebroides mauritanicus* in maize ; undetermined weevils in seeds : from France, undetermined mites on lily bulbs : from Hawaii, *Diaspis bromeliae* and *Pseudococcus bromeliae* on pineapples ; *Dacus cucurbitae* in green peppers and cucumbers ; larvae of an undetermined Trypetid in tomatoes ; *Coccus longulus* on betel leaves and *Cylas formicarius* in sweet potatoes : from Japan, Lepidopterous larvae in herbs and roots and in dried fruit ; larvae of borers in filberts ; and an undetermined ant on dry roots : from Jerusalem, *Chrysomphalus* sp. and *Pseudococcus citri* on citron : from Mexico, *Tribolium ferrugineum* and an ant in maize meal ; an undetermined ant in Guamuchil seed ; and *Ischnaspis longirostris* on mangoes : from New York, *Sitrodrepa panicea* in coriander seed and *Parlatoria pergandei* on a citrus tree : from Michigan, *Cydia* (*Laspeyresia*) *pomonella* in apples and pears : from Nevada, *Heterodera radicicola* in potatoes : from Oregon, *Tetranychus* sp. on pears, and *Aspidiotus perniciosus* and *Cydia pomonella* on apples and pears : from Rhode Island, *Diaspis boisduvali*, *Aspidiotus hederae* and *Cerataphis lataniae* on orchids : from Utah, *Cydia pomonella* on pears : from Washington, *Aspidiotus perniciosus* and *Cydia pomonella* on pears : from Papeete, *Pseudococcus* sp. on coconuts : from Tahiti, *Lepidosaphes beckii* on oranges and limes.

KEMNER (N. A.). **Studier över Jordlopporna. I. Allmänna eller blå Jordloppan** (*Haltica oleracea,* **L.**). **Ett landtbruksentomologiskt Misstag.** [Studies on Flea-beetles. I. The Common or Blue Flea-beetle. An agricultural-entomological Error.]—*Meddelande* no. 185 *från Centralanstalten för Försöksväsendet på Jordbruksområdet,* Entom. Avdel. no. 34, *Linköping,* 1919, 17 pp., 12 figs.

Haltica oleracea, L., hitherto commonly regarded as one of the noxious flea-beetles, is quite a harmless species, as already pointed out in 1912 by Heikertinger in Austria. Its food-plant is *Epilobium angustifolium,* on which it is very common in Sweden. Earlier records of its occurrence on hazel and oak are due to a confusion with *H. brevicollis,* Foudr., and *H. saliceti,* Weise. On cruciferous plants this species will not feed even in captivity, all earlier records of injury to these plants being erroneous. Of more than 200 records of injuries caused by flea-beetles during 1917–1918 and accompanied by samples of the beetles, *H. oleracea* was not found in a single case. *Meligethes aeneus* on the other hand was often mistaken for a flea-beetle and sent in as such.

At the beginning of June the eggs are found on the underside of the leaves of *Epilobium angustifolium* ; at the end of July the larvae are full grown and descend to the ground, where they pupate, the imagines making their appearance at the end of the summer and hibernating.

The error of treating *H. oleracea*, L., as a noxious species originated with Linnaeus, who in *Fauna Suecica* Ed. II. 1761, says "*Habitat in oleribus frequens*," a statement afterwards quoted both by De Geer and Goeze. Linnaeus, however, apparently included several species of flea-beetles under the name *oleracea*.

KEMNER (N. A.). **De svenska Arterna af Släktet** *Haltica*. [The Swedish Species of the Genus *Haltica*].—*Entom. Tidskrift, Upsala*, xl, no. 3–4, 1919, pp. 143–165, 10 figs.

The species of *Haltica* that have been recorded in Sweden are:—*H. oleracea*, L., *H. lythri*, Aubé, and *H. tamaricis*, Schrank (*consobrina*, Duft.). The species hitherto called *lythri*, Aubé, is however identical with *H. brevicollis*, Foudr., and *H. tamaricis*, Schr., does not occur in Scandinavia, the specimens identified with it being found by the author to be partly small specimens of *H. oleracea*, partly a species new to Scandinavia, *H. palustris*, Weise, and partly *H. engstromi*, Sahlb. In addition to these the author has found *H. saliceti*, Weise, and a new species, *H. sandini*.

The food-plant of *H. palustris* is not yet known, but it is generally found in swamps and marshes. *H. brevicollis* feeds on young hazel, the imagines gnawing circular holes in the leaves and the damage done by the larvae being confined to one side of the leaf. The eggs are yellow and placed 4–8 together on the underside of the leaves. The young larvae are at first yellow with two pairs of black spots at the sides of the meso- and metathorax, but turn black after a few hours. *H. saliceti* is found on oaks in Southern Sweden. Both the larvae and the imagines skeletonise the leaves. The larvae are found on oak from July to September; when full grown, they descend to the ground to pupate.

KEMNER (N. A.). **Notizen über Schwedische Borkenkäfer.**—[Notes on Swedish Bark-beetles].—*Entom. Tidskrift, Upsala*, xl, no. 3–4, 1919, pp. 170–176, 4 figs.

Scolytus laevis, Chap., occurs in the smaller branches of elm trees as far north as the vicinity of Stockholm. It has not been previously recorded north of Denmark.

S. loevendali, Eggerts, is not specifically distinct from *S. laevis*, which has also been found attacking shoots of young cherry-trees in Sweden. *Scolytus ratzeburgi*, Jans., in Dalecarlia has attacked birch trees previously defoliated by *Coleophora fuscedinella*, Zell. *Pityophthorus glabratus*, Eich., is recorded for the first time in Sweden.

CUNLIFFE (R. S.) & VAN HERMANN (H. A.). **El Cultivo de las Plantas Cítricas en Cuba. Insectos y Enfermedades.**—*Estacion Expt. Agrón, Santiago. de las Vegas, Cuba*, Bol. 32, September 1916, pp., 32–37 2 plates. [Received 3rd December 1919.]

Although a number of insects and diseases of citrus trees occur in Cuba, they do not often attain the dimensions of a serious infestation. One of the commonest insect pests is the ant, *Atta insularis*, various machines for fumigating the nests of which are described and illustrated. Another ant, *Solenopsis geminata*, may cause considerable damage by constructing covered galleries on the trunks and larger branches; sometimes these pests also make a circular incision in the tree and injure the young leaves, shoots and fruit. The only remedy is to clean the trunks periodically and sprinkle the base of the tree and the surrounding soil surface with a strong solution of soap or 5 per cent. creoline. *Pachnaeus litus* oviposits on the leaves. The larvae drop to the ground and descend to the roots, and, if sufficiently numerous, may kill the tree. The damage is particularly severe in well cultivated orchards, as the beetles concentrate on the trees instead of ovipositing on grasses, etc. The adults injure the ripening fruit and leave scars that reduce their market value. The larvae can be treated with 5 per cent. creoline solutions but this is a dangerous remedy as the trees may be killed by excessive doses. The adults can be sprayed with poison while they are feeding, but this remedy is useless in rainy weather. Fowls and birds will destroy many of the beetles, and others can be shaken into a cloth stretched below the tree during the early morning while the dew is still on the leaves. The same remedies can be applied to June bugs, which are also the cause of scarred and deformed fruit.

Whiteflies and scale-insects should be treated with copious sprays of whale-oil soap, given every 20 days. The black fly, *Aleurocanthus woglumi*, has recently been discovered infesting a small area, but as this area has promptly been isolated and energetic measures taken to combat the pest it is hoped that it will soon be exterminated. A minute mite is responsible for mottling and discolouring the rind of the orange and thus lowering its value, without however affecting the quality of the fruit. The remedy is to dust the trees with sulphur every 30 days, or sprinkle them with flour and sulphur or with a lime-sulphur solution. Thrips, if present on the trees, should be treated with a tobacco solution, once when the trees are in bloom and once or twice while the fruit is small.

Roig (J. T.) & Fortun (G. M.). **Las Variedades Cubanas de Boniato.** [Sweet Potato].—*Estacion Expt. Agrón., Santiago de las Vegas, Cuba*, Bol. 33, November 1916, 76 pp., 31 plates. [Received 3rd December 1919.]

The most destructive insect pest of sweet potato in Cuba is *Cylas formicarius* (sweet potato weevil). No efficient remedial measure against this species has been found, the introduction of insect enemies having proved inadequate. Tubers planted from August to October are least likely to suffer, if the crop is gathered not more than six months later. The damage is also minimised by digging the furrows very deep. Only healthy sets should be sown and two successive crops should not be sown in the same ground.

Minor insect pests include a leaf-miner, *Agromyza jucunda*, Wulp, a mite, *Eriophyes ipomaea*, Cook, and two species of whiteflies, one being *Aleurodes trachoides*, Bacg., and the other being unidentified. A Lepidopterous caterpillar has been found devouring the leaves, but without causing serious injury.

CUNLIFFE (R. S.). **Yuca. Insectos y Enfermedades.**—*Estacion Expt. Agrón., Santiago de las Vegas, Cuba*, Bol. 34, July 1916, pp. 56–59. [Received 3rd December 1919.]

A section of this bulletin upon the cultivation of cassava (*Manihot utilissima* and *M. aipi*), its starch content and usefulness, deals with a description of the insects and diseases that attack it. The insect pests include a Sphingid, *Erinnyis* (*Dilophonota*) *ello*, which is most abundant from March to May and from October to December. Eggs are laid on the upper surface of the leaves and hatch after five days. The larvae pass through five stages, and pupation occurs in the ground. Various parasites attack this moth, including *Microgaster flaviventris*. If these are not a sufficient check, the plants should be sprayed with Paris green or lead arsenate, using 1 lb. of the former to 50 gals. of water, or 1 lb. of the latter to 15 to 25 gals. of water. As the eggs are conspicuous they can be collected by hand when labour is cheap. The larvae of a Longicorn, *Lagochirus obsoletus*, cause considerable damage, as in the other countries where cassava is grown. The insects are present throughout the year, but chiefly in the spring and summer months, when the adult beetles oviposit in the trunks and branches. The larvae construct galleries in the stems, lowering the vitality of the tree and decreasing the crop. As the adults eat the foliage, spraying as for *E. ello* will check their numbers, but all infested stems should be cut away and burnt during February, March and April. Another borer, *Cryptorrhynchus* sp., has been found in the Isle of San Vicente, for which the same treatment should be given. *Lonchaea chalybea* does serious damage, particularly to the young shoots, the flies being most common from April to December. The eggs are laid under the young leaves and the young larvae bore into the terminal shoots, causing the formation of a gummy secretion which renders poison-sprays useless. The only remedy is to cut out and burn all infested shoots. Minor pests are a scale, *Lepidosaphes alba*, which is generally controlled by a parasite, and a mite, *Tetranychus telarius* (*bimaculatus*), both of which attack the leaves; these pests may be checked by spraying with whale-oil soap or lime-sulphur while the dew is on the leaves. A Longicorn, *Leptostylus biustus*, mines the shoots and stems. The larvae of *Pachnaeus litus*, which is generally a pest of citrus fruits, attacks the roots of cassava. Hand collection of the beetles in the morning is recommended, as well as turning fowls among the trees, while good cultivation should be practised. The plants are also frequently attacked by a leaf-cutting ant, *Atta insularis*, the nests of which should be destroyed.

JOHNSTON (J. R.) & BRUNER (S. C.). **Enfermedades del Naranjo y otras Plantas Cítricas.** [Diseases of the Orange and other Citrus Plants.]—*Estacion Expt. Agrón., Santiago de las Vegas, Cuba*, Bol. 38, August 1918, 54 pp., 15 plates. [Received 3rd December 1919.]

One of the commonest blemishes in citrus fruits is the mottling caused by the mite, *Eriophyes oleivorus*. The fruit may be attacked at any time after the petals have fallen, but the damage is always more severe during periods of dry weather. The Acarids known as red spiders are also important enemies of citrus fruit. *Tetranychus* *telarius*, L. (*sexmaculatus*, Riley) is apparently the commonest in Cuba. The principal damage is to the leaves, but the fruit also is occasionally attacked ; the discoloration however is not serious. *Schizotetranychus* (*T.*) *mytilaspidis*, Riley, damages both leaves and fruit, producing light, discoloured patches, but the climate of Cuba does not seem to encourage heavy infestations of this mite. *Tenuipalpus californicus*, Banks, is a less abundant species and the injury caused by it is unimportant. *Tarsonemus latus*, Banks, has as yet been found only on lemons and citrons ; should it become very abundant, it would be a very serious pest. These species can be controlled by the same remedies as other mites. The oil emulsions employed against Coccids are also effective against them.

Barreto (B. T.). **La Bibijagua y Modes de Combatirla.** [*Atta insularis*, Guér., and its Control.]—*Estacion Expt. Agrón., Santiago de las Vegas, Cuba*, Bol. 42, August 1919, 23 pp., 8 figs. [Received 3rd December 1919.]

The leaf-cutting ant, *Atta insularis*, Guér., is one of the most destructive pests in Cuba, other species being *A. octospinosa* and *A. borinquenensis*. These ants eat holes in the edges of leaves of oranges and other plants and also cultivate a fungus on which they feed. Small colonies can be destroyed by carbon bisulphide, but for large ones injections of arsenious acid and sulphur anhydride, produced by burning 85 parts of white arsenic with 15 parts sulphur, are necessary. These fumes kill the larvae and adults but not the eggs, and therefore a second treatment should be given a fortnight later. The only known enemy of *A. insularis* is another ant, *Pheidole megacephala*. It is hoped to make further investigations regarding the economic value of this species.

Calvino (M.). **La Cotorrita de Australia.** [*Cryptolaemus montrouzieri*.]—*Rept. 1917–1918, Estacion Expt. Agrón., Santiago de las Vegas, Cuba,* 1919, pp. 50–51, 1 fig. [Received 3rd December 1919.]

The Coccinellid, *Cryptolaemus montrouzieri*, has recently been introduced into Cuba and has become established as a check on the numbers of mealy bugs [*Pseudococcus*] that attack cane, plantain, pines and many cultivated plants.

Calvino (M.). **El Tetuan del Boniato.** [*Cylas formicarius*].—*Rept. 1917–1918, Estacion Expt. Agrón., Santiago de las Vegas, Cuba,* 1919, pp. 137–140. [Received 3rd December 1919.]

Much of the information here given concerning *Cylas formicarius* (sweet potato weevil) in sweet potatoes has been noticed elsewhere. The rotation of crops recommended for Cuba is maize (May-August), sweet potato (September-February) and French beans (February-May). Infestation can also be avoided by planting seedlings. The simplest insecticide solution for seedlings consists of 1lb. yellow soap dissolved in 1 gal. water ; they should be steeped in this for half an hour before sowing.

A system of cultivation that is adopted in Mexico has proved very successful on Cuban estates. Heaps about 20 inches high are made about 1 yard apart, and manure can be placed between them. The seedlings are planted one on each side of each heap, about half-way up the sides, which are made very steep. When the shoots are sufficiently grown they are entwined with those on the other side of the heap and remain interlaced over the crest. The tops of the heaps thus always remain dry and do not encourage the plants to send out roots even when they touch the earth. The plant has thus only one main root and matures very quickly, large tubers forming in about half the usual time required, and the tubers remain free from infestation by *C. formicarius*, because although the plants above-ground may show signs of attack, they are too far below the surface to be reached by the weevils. Moreover the larvae, being unable to reach the tubers, remain exposed to the attacks of predaceous enemies such as ants.

CALVINO (M.). **Fruta Bomba** (*Carica papaya*).—*Rept. 1917–1918, Estacion Expt. Agrón., Santiago de las Vegas, Cuba,* 1919, pp. 402–414, 5 figs. [Received 3rd December 1919.]

Carica papaya (papaw), which is cultivated for its fruit in Cuba, has a number of enemies that may spoil the entire crop. The larva of a Sphingid, *Erinnyis* (*Dilophonota*) *alope*, attacks the leaves, but is largely controlled by a parasite, *Microgaster flaviventris*, Cress., which attacks the larva. A Microlepidopteron, *Eucardinia caricae*, damages the bark, but the most injurious pest is the larva of a fruit-fly, *Toxotrypana curvicauda*, Gerst., which oviposits in the fruit before it is ripe, the larvae on hatching devouring the young seeds and causing the falling and decay of the fruit. As a protection against this pest the fruits should be enclosed, as soon as they are fertilised, in bags of double cheesecloth.

CARDIN (P.). **Departamento de Entomología y Patologia Vegetal. Informe Annal.**—*Rept. 1917–1918, Estacion Expt. Agrón., Santiago de las Vegas, Cuba,* 1919, pp. 458–465. [Received 3rd December 1919.]

Studies have been carried out on the life-history of *Aleurocanthus woglumi*. The life-cycle during summer and autumn is found to occupy an average of 65 days. It follows therefore that insecticide treatments must be repeated within a minimum of 60 days to destroy all stages of the insect. The Hymenopterous parasites of white-flies have been studied and many additional species found ; these do not however give adequate control. The enemies of textile and oleaginous plants have received attention. On Higuereta, which is valuable for the motor oil extracted from it, a destructive species of *Corythuca* occurs ; this can be controlled by soapy insecticides, but substances are being sought for that will be both cheap and effective. Studies have been made on the life-history of *Anastrepha* sp., which injures mangos and other fruit. The late varieties are those most generally attacked. The best remedy is to clear away the infested fruit from under the new growth, and burn it. The foliage below the new shoots and the undergrowth around should be sprayed with a sweetened poison solution.

Carié (P.). **L'Oeuvre de la Direction de l'Agriculture à l'Ile Maurice.**—*Bull. Soc. Nat. Acclimat., France, Paris,* lxvii, no. 10, October 1919, pp. 317–326, 1 fig.

The work of the Department of Agriculture of Mauritius is reviewed since its establishment a few years ago, particularly with respect to the discovery in the island of the sugar-cane pest, *Phytalus smithi*, Arrow, and to the introduction of its parasite, *Tiphia parallela*, Smith [*R.A.E.*, A, v, 502 etc.].

Other sugar-cane pests studied in the island include *Oryctes tarandus*, against which the Scoliid parasites, *Scolia oryctophaga, S. viridicolor, S. caffra, Elis pfeifferi, E. romandi* and *E. thoracica* have been introduced, and the Lepidoptera, *Sesamia vuteria*, Stoll, *Diatraea venosata*, Walk. (*striatalis*, Snell), *Argyroploce* (*Grapholitha*) *schistaceana*, Van Dev., and *Alucita sacchari*, Bojer.

van der Goot (P.). **Notes on Some Indian Aphides.**—*Records Indian Museum, Calcutta,* xiii, no. 4, August 1917, pp. 175–183. 6 figs. [Received 3rd December 1919.]

The new Aphids from India here described are *Macrosiphum gravelyi, Rhopalosiphum vagans, Trichosiphum dubium, T. montanum, Lachnus himalayensis* and *L. similis*, the food-plants being unknown.

Aphis nerii, Boyer (*asclepiadis*, Pass.) is recorded on *Callotropis gigantea* and *Tylophora asiatica* ? ; *Siphonaphis maidis*, Fitch, on maize ; and *S. nymphaeae*, L., on water-hyacinth.

Bodkin (G. E.). **Notes on the Coleoptera of British Guiana.**—*Entom. Mthly. Mag., London,* 3rd Series nos. 58, 59 & 60, October, November and December 1919, pp. 217–219, 264, 265–272.

This list which is a continuation of one previously noticed [*R.A.E.*, A, vii, 484] includes : *Oxyligyrus zoilus*, Oliv., which bores into fully-grown tubers of tannias (*Colocasia xanthosoma*) ; *Macraspis chrysis*, L., which attacks mangoes, roses, etc. ; a Buprestid, *Stenogaster linearis*, L., on black sage (*Cordia aubletti*) ; an Elaterid, *Eudactylus interruptus*, Oliv., taken from the leaf-base of coconut palm affected with bud-rot ; a Ptinid, *Lasioderma serricorne*, Steph., in stored grain, and also attacking leather, tobacco in all forms, books, paper, biscuits and other dried foodstuffs ; the Curculionids, *Rhynchophorus palmarum*, L., the larvae of which are found in decaying or diseased coconut palms and sugar-cane ; *Metamasius hemipterus*, L., which breeds in sugar-cane and will attack the cane "tops" when placed in the soil, thus destroying the eyes of the cane ; and *Calandra oryzae*, L.; the Cerambycids, *Macrodontia cervicornis*, L., which has been bred in a decaying trunk of coconut palm ; *Chlorida festiva*, L., sometimes injuring *Hevea* rubber ; *Orthomegas cinnamoneus*, L., found boring into dead and dry stems of *Hevea* rubber ; *Trachyderes succinctus*, L., on Para grass ; *Stirastoma depressum*, L., which is not so dangerous to cacao as it is in Trinidad ; *Oncideres repandator*, F., on mango trees ; and *O. albomarginata*, Th., destroying the bark of the kola nut tree ; the Bruchids, *Pachymerus* (*Caryoborus*) *nucleorum*, F., attacking various palm seeds including those of *Bactris major, Elaeis guineensis* (West African oil palm) and

Maximiliana regia (cokerite palm); and *Spermophagus subfasciatus*, Boh., in beans; the Chrysomelids, *Myochrous armatus*, Baly, which damages the immature foliage of sugar-cane by gnawing into the shoot; *Colaspis hypochlora*, Lef., on rose trees; *C. flavicornis*, F., on solanaceous plants; and *Rhabdopterus limbalis*, Lef., on young cacao leaves.

Laing (F.). **Two Species of British Aphides.**—*Entom. Mthly Mag., London*, 3rd Series no. 60, December 1919, pp. 272–274, 2 figs.

Macrosiphoniella asteris, Wlk., and *Aphis tripolii*, sp. n., from Shoeburyness on *Aster tripolium* are described.

Waterston (J.). **A New Sycophagine (Agaonidae, Chalcidoidea) Genus and Species from the Gold Coast.**—*Entom. Mthly. Mag., London*, 3rd Series, no. 60, December 1919, pp. 274–277.

Seres armipes, gen. et sp. n., is described from the Gold Coast.

Spessivtsev (P.). **New Bark-Beetles from Vladivostok: a Correction.**—*Entom. Mthly. Mag., London*, 3rd Series, no. 60, December 1919. p. 279.

It is noted that the author's subgenus, *Hylastinoides* [*R.A.E.*, A, viii, 10] is synonymous with *Alniphagus*, Swaine.

Harwood, (B. S.). ***Sarothrus areolatus*, Htg., bred.**—*Entom Mthly. Mag., London*, 3rd Series, no. 60. December 1919, p. 280.

Attention is drawn to *Sarothrus areolatus*, a Cynipid parasite of *Phorbia lactucae.* The adult parasites are found on flower-heads of lettuce in June and July. Both the host-flies and their parasites remain in the puparium throughout the winter, emerging in June of the following year.

Rennie (J.) & Harvey (E. J.). ***Nosema apis* in Hive Bees.**—*Scottish Jl. Agric.* ii, no. 4, October 1919, pp. 15–36.

Observations have been made to ascertain the course of *Nosema apis* in artificially infected and naturally infected stock, as well as its relation to Isle-of-Wight disease and mode of transmission. *Nosema apis* does not destroy bee colonies in the rapid and virulent manner common in cases of Isle-of-Wight disease, but the yield of honey is considerably diminished. During the summer the presence of the disease will not cause great loss, provided that the queen is healthy and normal reproduction is continued; should the queen become infected the disease may be expected to spread steadily within the colony as long as she survives, but the frequency with which death of the queen occurs is in striking contrast to her survival in Isle-of-Wight disease. The survival of stock infested with *Nosema apis* does not imply immunity against Isle-of-Wight disease.

The chief point about *Nosema apis* is its weakening effect on the colony, and should conditions favourable to the development of dysentery arise, it may become seriously pathogenic to bee stocks.

JOHNSON (W. F.). *Rhyssa persuasoria* **in the Counties of Down and Fermanagh.**—*Irish Naturalist, Dublin*, xxviii, no. 10, October 1919, pp. 115–118.

The Ichneumonid, *Rhyssa persuasoria*, L., is recorded as boring into the bark of silver fir, the wood attacked being dead, but not rotten. In close proximity to the part attacked holes of *Sirex gigas* were usually found, into which the parasite was seen to insert its ovipositor, and investigations revealed larvae of *Sirex gigas* immediately beneath the part of bark selected for oviposition.

GATENBY (J. B.). **Notes on the Bionomics, Embryology and Anatomy of certain Hymenoptera Parasitica, especially of** *Microgaster connexus*, **Nees.**—*Linn. Soc. Jl., Zoology, London*, xxxiii, June 1919, pp. 387–416, 3 plates, 15 figs. [Received 8th December 1919.]

Previous work on the *modus operandi* of the parasitic larvae of *Apanteles* and *Microgaster* is reviewed. Although the parasites of the larvae of *Arctornis chrysorrhoea* (*Porthesia similis*) and *Pieris brassicae* include Chalcids, Ichneumonids and Tachinids, the majority are Braconids.

Microgaster connexus, Nees, lays on an average about 30 eggs in the body of small caterpillars of *A. chrysorrhoea*, and in some cases as many as sixty parasites have been bred from one individual. The parasitic larvae emerge from the body of the host just about the time the latter is ready to pupate. Soon after emergence they commence spinning cocoons, which may be attached to the body of the host. Hibernation usually occurs in this stage. *M. connexus* is itself parasitised by an Ichneumonid, *Mesochorus pallidus*, Brisch., the eggs of which are probably laid upon *M. connexus* while the latter is still within its larval host. This hyperparasite does not kill the parasite until the latter has spun its cocoon, which the hyperparasite utilises. *Mesochorus pallidus* has not been bred from *Apanteles glomeratus*, but another Ichneumonid apparently stands in the same relation to it as does *M. pallidus* to *Microgaster connexus*.

The majority of Chalcidids and Cynipids associated with Aphids are probably hyperparasites, the Cynipid, *Allotria flavicornis*, having been proved to be so.

TRABUT (—.). **La Défense contre les Cochenilles par les Coccinelles.**—*Rev. Hortic. de l'Algérie, Algiers*, xxiii, no. 8–10, August–October 1919, pp. 293–296, 3 figs. [Received 8th December 1919.]

Owing to the abundance of *Pulvinaria psidii* on *Ficus* the predaceous Coccinellid, *Cryptolaemus montrouzieri*, has been imported from the United States against it. All stages have been liberated, but it has not yet become established under natural conditions, so that laboratory-bred colonies must be relied upon for insect control. It has also been liberated in orange groves, where it is hoped it will attack *Pseudococcus adonidum*. It may also prove useful against *P. vitis*.

Bertrand (G.), Brocq-Rousseu & Dassonville. **Destruction du Charançon par la Chloropicrine.**—*C. R. hebdom. Acad. Sci., Paris,* clxix, no. 19, 10th November 1919, pp. 880–882.

Experiments here described show that chloropicrin is a valuable agent in the destruction of *Calandra oryzae*, L., in stored grain. The method of application recommended is to spray the bags of grain with $\frac{2}{3}$ to $\frac{3}{4}$ oz. of chloropicrin, after which they should be left in a closed place for about 20 hours at a temperature of from 50° to 55° F. After this treatment the dead insects may easily be eliminated by means of a winnowing machine and the grain fed to animals. This method also insures destruction of the weevils that have migrated from the grain to the floor, walls, etc.

Bertrand (G.), Brocq-Rousseu & Dassonville. **Influence de la Température et d'autres Agents physiques sur le Pouvoir insecticide de la Chloropicrine.**—*C.R. hebdom. Acad. Sci., Paris,* clxix, no. 22, 1st December 1919, pp. 1059–1061.

The insects used for these experiments were chiefly grain pests. The observations described show that the insecticidal properties of chloropicrin are accelerated by a rise in temperature though the humidity of the atmosphere and the presence or absence of light do not influence its insecticidal powers in any way.

The Pine Tree Aphis (*Chermes pini*).—*Agric. Gaz. N.S.W., Sydney,* xxx, no. 10, October 1919, p. 742.

Chermes pini, Koch, is reported on *Pinus insignis* from the north coast of New South Wales, and attention is therefore drawn to the necessity of dipping young trees in kerosene emulsion before they are planted out.

Jackson (Miss D. J.). **Notes on the Aphides of Ross-shire, with Descriptions of two Species new to Science.**—*Scottish Naturalist, Edinburgh,* April 1918, pp. 81–91, 1 plate, 2 figs. [Received 12th December 1919.]

The species dealt with include: *Macrosiphum jaceae*, L., on thistle (*Carduus* sp.) in August; *M. scabiosae*, Schr., on scabious in August; *M. hieracii*, Kalt., on hawkweed (*Hieracium* sp.) in August; *M. sonchi*, L., on sowthistle in August; *M. kaltenbachi*, Schout., and *M. lactucae*, Schr., on endive in August, the latter being attacked by Cecidomyid larvae and a fungus, *Empusa aphidis*; *M. dirhodum*, Wlk., on oats in August; *Amphorophora viciae*, Kalt., on broad bean and *Vicia sativa* in July; *Rhopalosiphum dianthi*, Schr., on cabbage, turnips and swedes in August; *R. lactucae*, Kalt., on sowthistle in August; *Cavariella capreae*, F., on willow in August; *Brevicoryne* (*Siphocoryne*) *brassicae*, L., on turnips and swedes in August; *S. xylostei*, Schr., on honeysuckle (*Lonicera*) in August; *Hyalopterus pruni*, F., on leaves of plum trees in July, being parasitised by a Chalcid and preyed upon by Cecidomyid larvae; *Aphis idaeus*, v.d.Goot, on raspberry shoots in July; *A. kochi*, Schout., on apple leaves in July; *A. hederae*, Kalt., on ivy in July; *A. chaerophylli*, Koch, on *Chaerophyllum* in August; *Siphonaphis* (*A.*) *padi*, L., on leaves of bird cherry (*Prunus padus*) in October; *Myzus whitei*, Theo., on currant and fir trees in August; *M. cerasi*, F., on wall cherries from end of July to September, being preyed upon by Cecidomyid larvae; *M. rosarum*, Kalt., on rose leaves in October; *Callipterus nigritarsis* on birch in August; *Eucallipterus tiliae*, L., on lime (*Tilia*) in August; *Phyllaphis fagi*, L., on beech in October; *Eriosoma lanigerum*, Haus., on apple and elm in August, individuals on elm being attacked by larvae of *Syrphus vitripennis*, Meig.; *Pemphigus bursarius*, L. (*lactucarius*, Pass.) on lettuce roots in October; *Chermes abietis*, L., galls of which were found on spruce in July; *C. piceae*, Ratz., on the bark of silver fir (*Abies pectinata*) in October; *Chermes* (*Cnaphalodes*) *strobilobius*, Kalt., on larch twigs and needles in October.

The new species described are *Pemphigus glebae* found in October, the food-plant being unknown, and *Macrosiphum allii* on leeks (*Allium porrum*) in August. This species has been recorded by Lichtenstein as *Aphis allii* on *Allium*, but has not been previously described. Other species dealt with have been recorded elsewhere. [*R.A.E.*, A, vii, 542.]

Moreira (C.). **Gurgulhos do Milho, do Feijão, do Arroz e do Café.** [Weevils infesting Maize, Beans, Rice and Coffee.]—*Chacaras e Quintaes, S. Paulo*, xix, no. 4, 15th April 1919, pp. 281–284, 5 figs. [Received 10th December 1919.]

A popular account is given of beetles infesting stored grain, etc., including *Calandra oryzae*, *C. granaria*, *Araecerus fasciculatus* and *Bruchus obtectus*. The last-named is said to have 8 generations a year in the State of Rio de Janeiro. The methods of storing grain in metal silos and of fumigating it with carbon bisulphide are described.

Bezzi (M.). **Nota sul Genere *Cryptochaetum* (Dipt.) con Descrizione di una nuova Specie delle Filippine.**—*Atti Soc. Ital. Sci. Nat., Pavia*, lviii, 1919, pp. 237–252. [Received 13th December 1919.]

The first part of this paper is a historical review of the Agromyzid genus *Cryptochaetum*, and a key is given to the known species. *Cryptochaetum fastidiosum*, sp. n., is described from the Philippines, where it is reported to be a pest owing to its habit of flying into the human eye.

The larvae of *Cryptochaetum* are distinctly beneficial in that they destroy the injurious Coccids of the sub-family Monophlebinae belonging to the genera *Monophlebus*, *Drosicha*, *Walkeriana* and *Icerya* [*R.A.E.* A, v, 11, 289] Their usefulness against *Icerya* has been obscured by the success of *Novius cardinalis*, but it is of marked value.

Lima Mindello (J. F. de). **The Damage done by *Pectinophora gossypiella* in the Brazilian State of Parahyba.**—*A Lavoura, Rio de Janeiro*, xxii, no. 9–12, 1918, p. 664. [Received 18th December 1919.]

It is stated that in 1917 the cotton crop in the State of Parahyba was reduced by 80 per cent. owing to attack by the pink bollworm (*Pectinophora gossypiella*).

Rostrup (Sofie). **Raevehalemyggens** (*Oligotrophus alopecuri*) **Optraeden i Danmark og Forsøg med Midler til dens Bekaempelse.** [The Distribution of the Foxtail Midge in Denmark and Experiments in Methods for its Destruction.]—*133 Beretning Statens Forsögsvirks. i Plantekultur* ; *Tidsskr. Planteavl., Copenhagen*, xxvi, 1919, pp. 37–51.

The English summary of this paper states that in almost all the specimens of meadow-foxtail seed sent in to the State Seed-testing Station, more or less severe attacks of the larvae of the foxtail midge (*Oligotrophus alopecuri*) are observed. Only in localities where meadow-foxtail [*Alopecurus pratensis*] has not previously been grown for seed, and where there is but little of this plant, is the seed crop able to escape attack to some extent. Continued cultivation of foxtail for seed increases the attack.

The larvae of the foxtail midge hibernate in the seed, where a large percentage survives the various processes of threshing, cleansing and drying, to which the seed is subjected from the time it leaves the field until it is again sown.

In order to prevent infestation through the seed, various experiments were made in 1912 and 1913 that aimed at killing the larvae without destroying the germinating power of the seed.

The following methods may be adopted :—(1) Dry heating for 35 minutes to a temperature of 59°–60° C. (2) Treatment with carbon bisulphide (1 gm. CS_2 per litre air) in a sealed room for 9 hours.

As the midges hatch out during the first year, and the germinating power of the seed does not diminish appreciably by being kept over for a year, infestation may be avoided by using seed from the preceding year.

Beeson (C. F. C.). **Notes on the Larvae and Life-Histories of Prionine Beetles (Coleoptera, Cerambycidae, Prionini).**—*Indian Forest Records, Calcutta*, vii, pt. v, 1919, 23 pp, 2 plates. [Received 12th December 1919.]

The Coleoptera boring in sundri (*Heritiera fomes*) include an Anthribid, *Ozontomerus maculosus*, Perr. ; a Bostrychid, *Schistoceros malayanus*, Lesne ; a Lamiid, *Glenea* sp. ; the Cerambycids, *Ceresium zeylanicum*, White, *Derolus discicollis*, Gahan, *Diorthus cinereus*, White, *Gelonaetha hirta*, Fairm., and *Macrotoma plagiata*, Waterh. ; the Scolytids, *Progenius riehlii*, Eichh., *Xyleborus schlichi*, Steb., *Crossotarsus squamulatus*, Chap., *C. saundersi*, Chap., and *Platypus uncinatus*, Bldfd., var. nov. ; and a Buprestid, *Chrysobothris* sp. In the majority of cases the tree is attacked subsequent to its death or when it is in a diseased condition.

The life-cycle of *Macrotoma plagiata* varies from 1 to 5 years. The larval galleries in *Heritiera fomes* run irregularly through the heartwood, both across and with the grain, and frequently reach a diameter of $\frac{3}{4}$ of an inch. The pupal chamber is a simple expansion of this gallery. The galleries are tightly packed with fibres and wood dust. This pest is recorded from North India and Bengal, and its early stages and those of the following are discussed in detail.

Macrotoma crenata, F., has been reported in *Bombax malabaricum*, *Tamarix articulata* and *Quercus ilatata*, the larvae being found in dead and dry trees. The galleries run irregularly, deep in the core, with a diameter of from $\frac{3}{4}$ to $1\frac{1}{4}$ inches. They are packed with fibres. The pupal chamber measures about 4 inches by $1\frac{3}{4}$ inches and the exit tunnel runs almost horizontally to the side. It has been recorded from India, Burma and Ceylon.

Another Longicorn, *Remphan hopei*, has been found in the heart-wood of *Dipterocarpus turbinatus*. The galleries run transversely and are much deeper than wide, measuring from $2\frac{3}{4}$ to $4\frac{1}{4}$ inches by $\frac{5}{8}$ to 1 inch. It has a wide distribution, extending from India to Siam and Borneo. Other larvae described include those of :—*Acanthophorus serraticornis*, Oliv., or an allied species, in *Shorea robusta* and *Dalbergia sissoo* ; *Lophosternus hügeli*, Redt., or an allied species, in *Quercus incana* ; and *Lagaeus subopacus*, Waterh.

LLOYD (L.). **The Glasshouse Tomato Moth and its Control.**—*Mthly. Circ., Lea Valley and Dist. Nurserymen's and Growers' Assoc. Ltd.*, i, no. 4, December 1919, 10 pp.

Unless special remedial measures are adopted against the glass-house tomato moth *Polia* (*Hadena*) *oleracea*, the annual loss from this pest in the Lea Valley will amount to from £5 to £10 or more per acre. Early spraying is most essential and should be done just after planting out and repeated about 4 weeks before the first fruit is picked. The plants should be sprayed from above with a solution containing 2 oz. of lead arsenate to 2 gals. of water or 6 lb. to 100 gals. Saponin at the rate of a small half-teaspoonful in two gallons or 2 oz. in 100 gals. should be added to the water before the lead arsenate paste to ensure its even distribution. The plants should not be watered again until the day after spraying. Experiments are being carried out with sprays that are non-poisonous to man and may be safely used on older plants. This spraying, although essential, cannot be relied on without subsequent trapping of the caterpillars and moths and destruction of the pupae. The caterpillars may be trapped by means of old sacks loosely folded and placed under the gutters on the pipes or on the lower wires. These sacks should be collected on the 21st day and dipped for half a minute in boiling water after which all dead insects may be shaken out and the sacks replaced. The moths can be trapped by means of preserving jars, which should be fairly deep in proportion to their width, have a pronounced shoulder and a mouth-opening at least $1\frac{1}{2}$ inches across. Each jar should contain an inch of fluid consisting of one part of thick brown treacle to two parts of ale and sodium fluoride 1 per cent. The treacle and ale should be well mixed and the sodium fluoride added to each jar at the rate of as much as can be picked up on a sixpence to 3 oz. of fluid. At least 6 jars should be used for each 200 ft. house and these should be emptied and rebaited at the end of 4 weeks. The traps should be placed in each block as the heat is put into it and should remain in use throughout the year. If possible the houses should be drenched with boiling water before the mulch is removed to destroy the pupae. Boiling water is more effective than carbolic acid for this purpose. Some of the pupae collected from various parts of the house after it has been drenched should be kept in earth for 3 or 4 weeks, and if then found to be still alive, a second drenching will be necessary.

The pupae in the crevices of wood-work, etc., may be killed by passing the flame of a painter's blow-lamp over all suspected corners. The market baskets and strikes should never be allowed in the glass-houses, and these, as well as those used for picking, should be dipped from time to time in boiling water as they frequently contain pupae. All weeds should be removed inside as well as in the neighbourhood of the houses, as this moth thrives better on weeds such as *Chenopodium* and *Polygonum* than on tomato leaves only.

JARVIS (E.). **Insects attacking Peanuts in Queensland.**—*Queensland Agric. Jl., Brisbane,* xii, no. 4, October 1919, pp. 200–204, 1 plate.

Most of the injury to peanuts in Queensland is caused by a species of *Pseudococcus* closely resembling *P. trifolii,* Forbes, which has been recorded on *Trifolium pratense* in South America. This mealy bug was found on the roots and underground portions of the plants at a depth of from 1 to 4 inches, as well as on the nuts, where all stages were found simultaneously. The larva and summer female are described and illustrated.

Other insect pests of this plant are a Pyralid, probably a species of *Glyphodes,* which feeds on the young shoots in March and of which the pupal stage occupies about 2 weeks; a Liparid, *Laelia* sp., larvae of which were found devouring the foliage in February, pupation commencing on 3rd February and the imago emerging 12 days later; the Noctuids, *Heliothis* (*Chloridea*) *assulta,* Gn., of which the larvae bore into the ends of the stems, pupation occurring in March and lasting about 2 months, and *H. obsoleta* on young leaves; the grasshoppers, *Atractomorpha crenaticeps,* Blanch., and *Cyrtacanthacris* sp.; and a Dynastid beetle, *Isodon puncticolle,* which cuts the stalks about 2 inches beneath the surface.

Insects attacking stored peanuts include a Phycitid moth, *Homoeosoma vagella,* Z., a Tenebrionid, *Tribolium ferrugineum,* F., and a Nitidulid, *Carpophilus* sp.

ILLINGWORTH (J. F.). **Cane Grub Investigation.**—*Queensland Agric. Jl., Brisbane,* xii, no. 4, October 1919, pp. 204–207.

Experiments with soluble arsenic as a means of killing the trees on which sugar-cane beetles [*Lepidiota*] feed, show that the best results are obtained by ringing them as close to the ground as possible. The cut surfaces of the wound should then be thoroughly wetted with a solution consisting of one pound of arsenic, two pounds of washing soda and one gallon of water. Suckers from old stumps may easily be destroyed by cutting into the live wood and applying a small quantity of the poison.

Attention is drawn to the continued efficacy of the Agromyzid fly introduced in 1917 from Hawaii for the destruction of the weed *Lantana camara.*

MILLER (D.). **The Economic Bearing of Hymenopterous Insects.**—*N.Z. Jl. Agric., Wellington,* xix, no. 4, 20th October 1919, pp. 201–208, 11 figs.

The beneficial insects discussed include: *Paniscus productus,* which parasitises the army worm, *Cirphis unipuncta,* and the New Zealand flax grub, *Xanthorhoe praefectata*; *Mesostenus albopictus*, a parasite of *C. unipuncta*; *Lissopimpla semipunctata*, a parasite of *C. unipuncta* and *Porina servinata*; *Rhyssus fractinervis* parasitising wood-boring beetles; and *Entedon epigonus* and *Platygaster minutus*, which have been responsible for the control of the Hessian fly, *Mayetiola* (*Phytophaga*) *destructor*, Say, in New Zealand.

Predators of economic value include: *Pompilus fugax* and *Polistes tasmanicus*.

Injurious Hymenoptera include: the pear and cherry slug, *Eriocampoides limacina* (*cerasi*), *Sirex juvencus*, which bores into conifer stems, and *Xiphydria accepta*, the larvae of which burrow in living and dead timber.

Compatibility of Spray Mixtures.—*N.Z. Jl. Agric., Wellington*, xix, no. 4, 20th October 1919, pp. 244–245.

This is a summary of a paper by W. C. Morris, presented to the New Zealand Institute Science Congress. Much of the information given has previously been noticed [*R.A.E.*, A., ii, 662]. Incompatibility of sprays also refers to the order in which they are applied to the trees, thus lime-sulphur followed by lead arsenate has proved more effective than when applied in the reverse order. Attention is drawn to the danger of using second-hand casks from which the previous spraying mixture has not been entirely eliminated.

Davidson (W. M.). U.S. Bur. Entom. **New Aphids from Oaks.**—*Canad. Entom., London, Ont.*, li, no. 11, November 1919, pp. 245–248, 1 plate.

The new species, *Vacuna californica* on *Quercus lobata* and *Q. macrocarpa*, *Myzocallis quercifolii* on *Quercus douglasi* (blue oak), and *Myzocallis californicus*, Baker, var *pallidus*, n., on *Quercus dumosa* are described from California.

A key is given to the species of the genus *Myzocallis*.

Ferris (G. F.). **Notes on Coccidae—iv. (Hemiptera).**—*Canad. Entom., London, Ont.*, li, no. 11, November 1919, pp. 249–253, 3 figs.

The species dealt with in this continued list [*R.A.E.*, A. vii, 336] include: *Sphaerococcus casuarinae*, Mask., on *Casuarina quadrivalvus* in Australia; *Amorphococcus leptospermi*, Mask., in a gall on *Leptospermum* sp. in Australia; *Kuwanina obscurata*, Mask., of which the penultimate and first stages are described from *Eucalyptus* in New South Wales; and *Eremococcus*, gen. n., erected for *E. pirogallis*, Mask.

Davis (J. J.). **Correction (Aphididae).**—*Canad. Entom., London, Ont.*, li, no. 11, November 1919, p. 263.

As it has been brought to the author's notice that the genus *Heteroneura* [*R.A.E.* A, viii, 8], suggested for the reception of *Aphis setariae*, Thos., is preoccupied, the name *Hysteroneura* is proposed in place of it.

FERNALD (H. T.). **Notes on the Larch Case-bearer** (*Coleophora laricella*, **Hbn.)**—*Canad. Entom., London, Ont.*, li, no. 11, November 1919, p. 264.

During 1919 *Coleophora laricella*, Hb., caused great damage to larches in Massachusetts. The work of this moth had apparently ceased by the middle of June, but on the 18th July eggs and newly hatched larvae were found in abundance. A description of the egg is given. It is usually placed on the upper side of the leaf, but may appear on either side. The emerging larvae enter the leaf and form mines along one edge of it.

COLEMAN (L. C.) & KUNHI KANNAN (K.). **Ground Beetles attacking Crops in Mysore.**—*Mysore State Dept. Agric., Bangalore*, Entom. Ser. Bull. 5, 1918, 16 pp., 1 plate, 7 figs. [Received 19th December 1919.]

The Tenebrionid ground beetles, *Gonocephalum* (*Opatrum*) *hoffmannseggi* and *G. depressum*, occur in Mysore, but as yet only the former species has been known to do any damage of importance, though the latter might become a serious pest under favourable conditions. The life-histories of both are similar. The eggs of *G. hoffmannseggi* are laid loose in the soil or in excavations made in the plant attacked. The larvae hatch in two or three days, and usually attack the roots of grasses and also of ragi (*Eleusine coracana*), gnawing through the seedling plants just beneath the surface of the soil, much in the manner of cutworms. When potatoes are attacked, the beetles seem to do the greatest amount of damage, gnawing into and tunnelling the stems until the plants are seriously weakened or killed outright. Shallow excavations may also be made in the tubers.

The number of moults may vary from 8 to 16, the larval stage varying much in length. Pupation occurs in the soil, the adults emerging in less than a week. The beetles are nocturnal in habit and when disturbed exude a secretion that acts as a violent repellent. Under normal conditions there is probably only one generation a year. Several species of birds devour the adults of *G. depressum* and probably of *G. hoffmannseggi* also. Other enemies are a species of Acarid and two Hymenopterous parasites, but these do not constitute an efficient check.

Eleusine coracana is attacked only in regions of deficient rainfall when the rains are delayed after sowing and the larvae have not sufficient moisture to pupate. A second generation is possible in years when the first heavy showers are followed by a drought of two or three months. Remedial measures are difficult to apply. The area to be treated is too large for the use of gaseous or liquid poison by the natives. Tobacco dust and other repellents are impracticable and seem to have no effect on the larvae. Remedies must therefore be directed against the adult stage. The best bait has proved to be fresh weeds pulled up by their roots and spread along the bunds an hour or so before sunset. The beetles should be collected soon after nightfall, when they emerge from hiding and begin to feed. When potatoes are attacked, the best bait consists of chopped grass, with which 1 lb. sodium arsenite dissolved with 8 lb. jaggery [palm sugar] or molasses in 10 gals. water, is mixed. Such collection and destruction should be carried out systematically for three or four years, whether the pest is numerous or not. Once this has been done the infestation will not be severe even in seasons of uncertain rainfall.

Kunhi Kannan (K.). **Pulse Beetles (Store Forms).**—*Mysore State Dept. Agric., Bangalore,* Entom. Ser. Bull. 6, 1919, 31 pp. 18 figs. [Received 19th December 1919.]

Almost all pulse crops, such as gram, lablab, peas and beans, are liable to infestation by Bruchids. The commonest species found in stores in Mysore is *Bruchus* (*Pachymerus*) *chinensis.* Since the life-history of all the species concerned is very similar, this one only is described in detail. The eggs are laid on the seed, to which they are firmly attached by an adhesive substance. The larva hatches in from 4 to 7 days, according to the season. A remarkable feature of this stage is the presence of a curved, H-shaped, chitinous plate, situated dorsally on the first thoracic segment. The larva upon hatching enters the seed and before beginning excavation, the H-shaped plate is fixed against the egg-shell as a support, the angle at which it is fixed determining the inclination of the head and consequently the part of the hole that the larva works on at a particular moment. Soon after entering the seed the larva casts its skin and is no longer provided with the chitinous process. It pupates near the seed surface, in which the beetles cut out circular holes for emergence. The life-cycle varies from 19 days to a month and 21 days, the longest period being during the coldest weather. The adults apparently take no food, but mate and oviposit soon after emergence. They have a very marked instinct to reach the surface of stored seeds, whither they arrive from any part of the receptacle, and where they mate, ovipositing only on the top layers of seeds. An experiment is described proving that the reason for this upward migration is to get relief from the weight of seed above them. Apparently the survival of the pest from year to year is carried on by a few adults ; these have been captured near stored seeds and also in the field before the crops that they attack are ripe.

Hymenopterous parasites have been observed to bore through seeds to reach the insect within them ; these include *Bruchocida orientalis*, Crawf., *Bruchobius colemani*, Crawf., and an undetermined species. Another enemy is a mite, probably *Pediculoides ventricosus*, Newp. None of these enemies is an efficient check, however, and it is essential that all seeds should be dried in the sun for three days before storage.

The remedy usually suggested for infested seed is fumigation before storage or whenever it is found to be attacked. The dose required is 2 lb. carbon bisulphide per thousand cubic feet of space, though in small chambers of a few cubic feet it is usually doubled. If hydrocyanic acid gas is used, the dose for 100 cub. ft. is 1 oz. of 98 per cent. grade potassium cyanide in 1 oz. of sulphuric acid diluted with 3 oz. of water. As neither of these methods is safe for the natives to use, investigations have been made as to the most suitable methods of storage. Since only the top layers are infested, it is obvious that a receptacle that is large and wide at the bottom and very narrow at the top is advantageous. The natives do, in fact, use such a receptacle, made of plaited straw, the seed being taken out of a hole just large enough for the hand to pass through. The top layers of seeds are further protected by castor oil smeared over them. This prevents the adherence of the egg to the seed, and fails to furnish the larva with the necessary support for boring into it. For small quantities of seed, a little mercury placed in the receptacle is quite effective and does not affect germination.

Pulse crops may also be stored under a layer of several inches of grains of *Eleusine coracana* (ragi) or *Panicum frumentaceum* (savai), which are not attacked by these beetles. A flat paper disc, closely adjusted to the surface of the seeds and in which semicircular cuts, large enough for the beetles to pass through, have been punched from below, will prevent their return to the seeds, but needs most careful adjustment. The best remedy discovered was to use a narrow-necked receptacle and to cover the seeds with a layer of sand some two inches deep. The seeds should be left for at least a month before any are withdrawn, to allow time for any adults emerging from infested seeds to come to the top and die.

This latter remedy probably has a wider application, for the same instinct to seek the top surface has been found in such widely differing species as *Tribolium castaneum, Lasioderma serricorne, Calandra oryzae, Gibbium scotias* and *Rhizopertha dominica*, though whether the sand layer would be effective against them has not been tested.

Other beetles infesting stored pulses in Mysore are *Bruchus analis*, which attacks cow-peas for preference, *B. quadrimaculatus*, which has been taken in the field in seeds of lablab [*Dolichos lablab*] in open pods, and multiplies in the stores, but only under moist conditions, and an unidentified species that also infests stored lablab. The identification of these species should be regarded as provisional.

NOWELL (W.). **The Red Ring or Root Disease of Coconut Palms.**—*West Indian Bull., Barbados*, xvii, no. 4, 1919, pp. 189–202, 9 plates. [Received 19th December 1919.]

Red ring or root disease of coconut palms is believed to be caused by a Nematode, the reason for this belief being that the worms are invariably associated with the initial stages of the disease. They breed in the zone of the stem known as the red ring, and infest the leaf-petioles, and are also associated with a discoloured condition of the roots. The red zone is most developed at the base of the stem and diminishes in intensity towards the apex where it is represented by scattered red dots containing Nematodes and their eggs. It is thought that the disease can be communicated from one tree to another. It is advisable not to plant nuts that have been lying on the ground in the neighbourhood of infested trees and to destroy promptly all infested palms, especially those in the early stages of the disease. Suggestions are also made for detecting infested trees and for protecting young trees in the field.

Cobb (N. A.). **A Newly discovered Nematode** (*Aphelenchus cocophilus*, **sp. n.) connected with a serious Disease of the Coconut Palm.**—*West Indian Bull., Barbados*, xvii, no. 4, 1919, pp. 203–210, 5 figs. [Received 19th December 1919.]

The new Nematode, *Aphelenchus cocophilus*, here described was taken from the roots of coconut palms in Grenada. The genus *Aphelenchus* is closely allied to *Tylenchus* and *Heterodera*, and includes some 30 or 40 species, of which a considerable number are serious agricultural pests. The two sexes were found in about equal numbers in the roots, the tissues being softened and discoloured.

Suggestions for remedial measures are based upon these investigations and include attention to drainage. It is pointed out that drainage currents are capable of distributing the worms. Many plant and soil-infesting Nematodes can be drowned by flooding and it is advisable to determine what the palm roots can stand in this respect and what the effect of salt-water on them would be. The destruction of all diseased material by fire or some other inexpensive method is strongly recommended. Where legal means exist, plant quarantines should be established to prevent the spread of the disease from one locality to another. The worms are most abundant about half-way between the outer surface of the root and the central strand.

Certain points which it is desirable to elucidate include the resistance to drought shown by the Nematode, the possibility of artificial infestation of healthy roots, the length of life of Nematodes within the roots, and the possibility of their having other food-plants.

Ballou (H. A.). **Cotton and the Pink Bollworm in Egypt.**—*West Indian Bull., Barbados*, xvii, no. 4, 1919, pp. 237–292, 13 figs. [Received 19th December 1919.]

A general review is given of the development of the cotton industry in Egypt and of the falling rate of yield, for which several reasons are assigned.

The principal insect pests of cotton in Egypt are *Prodenia litura* (cotton worm), *Earias insulana* (bollworm), *Oxycarenus hyalinipennis* (cotton-stainer) and *Pectinophora* (*Gelechia*) *gossypiella* (pink bollworm). These do not seem to have had any influence in reducing the average yields of cotton, with the exception of *P. gossypiella*, which has certainly caused serious losses since 1912.

O. hyalinipennis has been known in Egypt since about 1860, and there seems to be no record of the exact nature and extent of the injury caused by it. It occurs in great numbers every season and is believed to give rise to some injury and loss in the cotton crops. Legislation has for some years past enforced the collection of the eggs of *P. litura*, but in spite of this the average yield of cotton has steadily become smaller.

The native habitat and distribution of *P. gossypiella* are discussed; the moth is described and an account given of its life-history and habits. The most important characteristic of the life-history is the ability of certain of the larvae to enter into a resting stage. Normally when they are fully fed, they pupate and adults emerge within a short time, so that there are several generations during the cotton growing season, of four to five weeks each. A small proportion of the larvae, however, spin a particularly tough cocoon within the seed in which they have been feeding or within a double seed, and enter into a resting stage in which they may remain during two winters and the intervening summer, and perhaps much longer. There is apparently no difference between the short-cycle larvae and those that will enter the resting stage, and it is not known what factors give rise to this condition; temperature and moisture do not seem to determine it. It is during the resting period that remedial measures can be most easily applied.

The nature of the damage caused by *P. gossypiella* and its effect upon the yield of cotton is discussed [*R.A.E.*, A, vii, 489]. The first infestation of the season results from the moths developing from larvae that have passed the winter in the resting stage, and the attack generally begins in May or early June, and increases rapidly throughout the season.

Various opinions are quoted regarding the attraction of the moths to light. It has been the author's experience that the pink bollworm is attracted to lights in Egypt, both in the field and in storage. The moths are evidently crepuscular, their activities being greatest shortly after sunset. Experiments in the insectary indicate that they probably do not come to light on the first night of their adult existence, but that their impulse on emerging is to make for the open field. The relative abundance of *E. insulana* and *P. gossypiella* in recent years is discussed [*loc. cit.*].

Several natural enemies of *P. gossypiella* exist, but either through lack of numbers or owing to the time of their occurrence they exercise very little control. The most important of these is *Pediculoides ventricosus*. This mite attacks and destroys large numbers, but its attacks come very late in the season. Moreover it also attacks human beings, producing great irritation of the skin. Several Hymenopterous parasites also occur, but are inefficient checks. It is only late in the season when there are many open bolls exposing the bollworms that the parasites have much opportunity of attack. It is hoped that an egg-parasite may be discovered.

The most important consideration in attempting to exterminate the pink bollworm in Egypt is the destruction of the larvae at the end of the season, both those left in bolls in the field and those removed with the crop. It is essential that all infested material left in the field should be collected and disposed of, and this is provided for by law. The cotton sticks are all inspected before being taken into the villages and any old cotton left on them is carefully cleaned off. Various methods of cleaning the sticks are described. A machine for this purpose has been devised and is very promising; moreover it provides for conserving all the waste materials removed from the sticks, which can be used as fuel.

The most successful treatment for infested cotton seed is found to be heat [*R.A.E.*, A, vi, 42]. Seed cotton or cotton seed may be stored in Egypt only in licensed warehouses, the doors and windows of which are protected so as to prevent the emergence of moths that develop from larvae in the seeds. Early ripening varieties of cotton are a great advantage in minimising pink bollworm attacks. Early ripening can to a certain extent be induced by withholding irrigation after a certain date and also by removing the tips of the shoots, which prevents the formation of new bolls and flowers. Sheep and goats can be advantageously grazed in standing cotton after the crop is off and will destroy many of the old bolls left in the field.

Gunn (D.). **The Fig and Willow Borer** (*Phryneta spinator*).—*Union of South Africa, Dept. Agric., Pretoria*, Bull. 6, 13th June 1919, 22 pp., 16 figs. [Received 20th December, 1919.]

The Longicorn beetle, *Phryneta spinator*, has for several years caused serious damage to fig trees in the four Provinces of the Union, as well as in Rhodesia, British East Africa, Nyasaland and the Belgian Congo. A willow, *Salix capensis*, is probably its native food-plant, but it also attacks apple, apricot, nectarine, peach, pear and plum, as well as grape-vines, *Melia azedarach*, *Cupressus lusitanica* and *C. horizontalis*.

The various stages are described. The female searches for a suitable position on the bark of the stem, usually from about ½ an inch below to 12 inches above the soil surface, on which she proceeds to make a transverse, vertical or T-shaped slit. Below this a cavity is made into which the eggs are inserted and covered with a gelatinous substance. Usually only one egg is laid in each cavity, but if several are deposited, the strongest larva generally develops cannibal habits and devours the others. Under natural conditions in Pretoria, oviposition occurs from the middle of November to about the middle of March, each female depositing from 18 to 34 eggs.

The eggs hatch in from 10 to 18 days. The emerging larvae feed on the tissues surrounding the egg-slit. The chief damage is caused by the subsequent borings of the larvae in the soft tissue, and these by the end of the first summer have become a broad irregular, semi-circular gallery beneath the bark. The presence of the pest is indicated by the appearance of a yellowish brown dust and sticky exudation at intervals on the stem of the tree. Trees may become completely girdled and die, or if the injury is not sufficient to kill the tree, the crop of figs gradually diminishes.

The larvae are less active during the winter months than in the summer. At the end of the first year the tunnels penetrate the hard wood and usually are continued in a downward direction. The burrows examined in 1917 varied from 1½ to nearly 3 feet in length, 1 to 1½ inches in diameter and from 1 to 1¾ inches in depth. About June the pupal cells are excavated, the process occupying from 3 to 4 months. After the completion of the pupal cell 2 or 3 weeks may elapse before pupation occurs. The larval period lasts about 32 to 34 months and the pupal stage from 8 to 21 weeks. The adult remains for several days in the pupal cell before boring its way to the exterior. The beetles seldom fly any distance from their native tree; they emerge from the middle of November to the end of February and gradually begin disappearing in March. In cage-experiments the life of individuals varied from 172 to 207 days. The ratio of females to males is thought to be about 3 to 1. The fig trees used for these observations varied in age from about 6 to 15 years, and it was noticed that the larval period is slightly shorter in the younger trees.

In willow trees the slits made for oviposition are found in different parts of the trunk and even in the branches. If severely infested, growth is retarded and the tree may die, and many trees are killed by the entrance of parasitic fungi through the burrows. The work of the larvae in willow is similar to that in fig trees, except that the burrows do not penetrate so deeply and are not so long. The adults emerge from willow trees by means of round exit-holes, giving the tree the appearance of being riddled with bullet holes. These holes have not been noticed in fig trees. Owing to the position of the eggs in young fig trees there is not much chance of parasitic infestation. But from December to February the beetles suffer from a disease caused by a fungus, *Isaria* sp., although no reliance can be placed on this as a means of control, as it only appears in the summer months when the rainfall is heavy.

Various remedial measures are discussed. Insecticides have proved practically useless. Red oxide and white lead paint apparently prevent infestation, but also cause injury to the bark of fig trees. The measures advocated include the growing of trees on a single stem, the clearing away of undergrowth that affords protection for the beetle and planting as far away from willows as possible. The larvae should be cut out, but if they cannot be reached with a pointed knife or wire they may be destroyed in their burrows by injecting 3 ounces of paraffin or 2 ounces of carbon bisulphide and plugging the hole with cotton wool or moist clay to prevent the fumes escaping. The wounds made in cutting out the larvae should be painted to prevent fungus and bacterial infection. For this purpose lead paint may be used, provided that it does not contain turpentine. To prevent reinfestation the trees should be protected by means of wire netting placed round the base. This may be removed during the winter, from April to November, as oviposition only occurs during the summer months. All heavily infested material should be destroyed.

Newel (W.). **The European Corn Borer.**—*Qtrly. Bull., Florida State Plant Bd., Gainesville,* iv, no. 1, October 1919, pp. 1–9, 4 figs.

Owing to the rapid spread of the European corn borer, *Pyrausta nubilalis*, Hb., in various States there is every reason to fear its introduction into Florida. In the south there would probably be three or four generations a year and the range of food-plants would possibly extend and might include sugar-cane. At present the shipment of nursery plants which are known to be attacked by this moth is prohibited, but the pest may easily be introduced in packing, etc. At the next meeting of the State Plant Board quarantine rules are to be adopted for the elimination of this danger, but the co-operation of all citizens is required to keep the pest out of Florida.

Report of Quarantine Inspection Department for the Quarter ending 30th September 1919.—*Qrtly. Bull., Florida State Plant Bd., Gainesville,* iv, no. 1, October 1919, pp. 15–16.

The pests intercepted during the period under review include: *Aleurocanthus woglumi* (black fly) on Spanish lime from the Bahamas; *Aspidiotus cocotiphagus* and *A. orientalis* on palm from Cuba;

A. sacchari on sugar-cane, *Pseudischnaspis alienus* on guava and palms, and *Vinsonia stellifera* on sapodilla from Cuba; *Aspidiotus destructor* on palms from Cuba and the Isle of Pines; and the seed-infesting Hymenopteron, *Bephrata cubensis*, in soursop from Cuba.

BLAIR (K. G.). **Pests of Almond Trees in Palestine.**—*Entom. Mthly. Mag., London*, 3rd Ser. vi, no. 61, January 1920, p. 13.

A Buprestid, *Capnodis carbonaria*, Klug, a Scolytid, *Scolytus amygdali*, Guér., and an Aphid, *Tuberodryobius persicae*, Cholodk., are reported as injuring almond trees in Palestine. Nearly full grown larvae of *C. carbonaria* have been found boring between the inner bark and the wood of the stem undergrowth and in the roots. In many cases the stems were completely girdled. Pupae were found in an enlarged hollow of the boring about two inches below the surface.

In an editorial footnote it is stated that *Capnodis tenebrionis*, L., and *Chalcophora stigmatica*, Dalm., have been reported from Salonika on apricot and other fruit trees.

COTTON (R. T.). **Insectos que atacan las Hortalizas en Puerto Rico.** [Insects attacking Garden Plants in Porto Rico.]—*Rev. Agric. Puerto Rico, San Juan*, i, no. 3, June 1918, pp. 119–131, 8 figs. [Received 27th December 1919.]

It is considered that no less than 20 per cent. of the vegetable-garden crops of Porto Rico are destroyed by insects. The present paper has been issued to give in popular form the necessary information about them, and the remedial measures against them [*R.A.E.*, A, vii, 248]. Instructions are given for the making and use of the usual insecticides.

SMYTH (E. G.). **Como combatir el Gorgojo de la Batata.** [Measures against the Sweet Potato Weevil.]—*Rev. Agric. Puerto Rico, San Juan*, i, no. 3, June 1918, pp. 136–139. [Received 27th December 1919.]

Cylas formicarius (sweet potato weevil) destroys sometimes more than 75 per cent. of the sweet potato crop in Porto Rico, and in many instances a crop so damaged is allowed to rot in the ground, thus forming an ideal breeding-place for large colonies of the pest. In order to ensure a clean crop, the same land should not be sown with potatoes at less than two years' interval, and any old plants should be removed from the ground at least one month before the potatoes are sown. Potatoes that are quite free from infestation should be bought for seed, or if the best of a previous crop are used they should be fumigated with 2 or 3 oz. of carbon bisulphide per bushel for 24 hours. When a large area is found to be infested the only remedy is to gather the whole crop as soon as the infestation is discovered. The crop should then be divided into three classes, namely, those fit for sale, which should be despatched at once and the few kept for seed immediately fumigated; those without commercial value, which should be boiled and then given to stock; and those that are too bitter to be given to animals, which should be burned or buried more than 1 ft. deep. The tubers in the ground should then be turned up with a rake or harrow and cattle or pigs allowed access to them. Turning pigs loose in the fields after only the marketable tubers have been gathered is useless as they will not eat the badly infested tubers and thus the principal danger remains.

AGEE (H. P.) & SWEZEY (O. H.). **Director's Report.**—*Rept. Committee in Charge Expt. Sta., Hawaiian Sugar Plant. Assoc., for Year ending 30th September 1919, Honolulu*, 1919, pp. 7–49.

The reduction in the numbers of the leaf-hopper [*Perkinsiella saccharicida*] noticed during 1918 [*R.A.E.*, A, vii, 412] has continued except for a few scattered outbreaks. In the upper lands at Olaa the pest has persisted throughout the summer, probably owing to the excessively heavy rains in the winter which destroyed its parasites in great numbers and allowed it to gain an ascendency that it maintains for a long period. The Formosan species of *Ootetrastichus*, introduced as a parasite in 1916, has become very generally established throughout the Islands.

A visit was made early in 1919 to North Queensland to study the leaf-hopper parasites there, and a number of beneficial insects have been brought to Hawaii in good condition. These include 136 individuals of *Drypta* spp., including *D. australis*, and allied beetles that should be of great importance when they have become sufficiently numerous, and 31 Staphylinid beetles, which should increase with even greater rapidity. These are all predaceous on the leaf-hoppers. Other insects imported were beetles of the genus *Chlaenius* predaceous on army-worms; *Coccinella arcuata* and *C. repanda* predaceous on Aphids; and Syrphid flies, that were liberated in Aphid-infested sugar-cane, together with Hemerobiids that were reared en route.

Anomala orientalis is now fully controlled by the Philippine wasp, *Scolia manilae*, which was first introduced into the Islands in 1915–1916. This is considered a remarkable example of the control of an insect pest by an introduced parasite. The parasites maintain their existence in regions previously infested by *Anomala* by breeding on *Adoretus umbrosus* (Japanese rose beetle). The distribution of this parasite is discussed. The cane-borer [*Rhabdocnemis obscura*] continues to be controlled by the imported Tachinid [*Ceromasia sphenophori*].

BOVELL (J. R.) & D'ALBUQUERQUE (J. P.). **Parts i and ii. Manurial Experiments with Sugar Cane.**—*Barbados Dept. Agric., Rept. Sugar-Cane Expts., 1917–1919*; 1919, pp. 4–19.

In the course of manurial experiments with sugar-cane in Barbados, some statistics have been gathered regarding the numbers of *Diaprepes abbreviatus*, L. (root-borer) and *Phytalus smithi*, Arrow (brown hard-back), on sugar-cane and the losses caused by these beetles. On one estate examined the loss from these two beetles was 4·36 tons of canes per acre, the minimum monetary loss being nearly £8 per acre. From a series of experiments on three estates the loss due to *Diatraea saccharalis*, F. (moth borer) was found to be an average of 6·25 tons of canes per acre with a monetary loss of about £12 10*s*. per acre, while in the factory the loss was reckoned at an average of 585 lb. of saccharose per acre with an equivalent value of £6 5*s*.

D'Emmerez de Charmoy (D.). **Division of Biology.**—*Mauritius Dept. Agric. Ann. Rept. for 1918*, pp. 10–12. [Received 19th December 1919.]

Investigations on the root disease of sugar-cane have resulted in the discovery of the eel-worm, *Tylenchus sacchari*, which has been detected wherever root-disease is reported, and which may be responsible to a great extent for the disease in Mauritius. Further investigations are being carried out.

Lepidopterous pests have damaged pigeon-pea pods to such an extent as to cause in some cases total destruction of the crop. *Lampides* (*Polyommatus*) *baeticus*, *Pyrausta* (*Botys*) sp. and an undetermined *Tortrix* were the most injurious, both to the pods and flower-buds. Spraying with lead arsenate was not very effective owing to windy weather at the time of flowering, continuous flowering of the plant which would necessitate repeated spraying, insufficient adherence of the poison, and the sensitiveness of the plant to arsenical compounds. Citrus trees were badly infested with black aphis [*Aphis tavaresi* ?], which was controlled by the commercial preparation "Katakilla." Peaches were seriously attacked by *Cydia pomonella*, especially early in the season. No poison-sprays could be used as the fruits are infested when nearly mature. Nectarines, guavas and granadillas are increasingly damaged by the fruit-fly, *Ceratitis catoiri*. The importation of *Scolia oryctophaga* against *Oryctes tarandus* has been successful and it has now become established. *Tiphia parallela* has been recovered from *Phytalus* larvae far away from its original centre of liberation. The campaign against *Phytalus* has been extended, the number of beetles destroyed being 49,006,813.

Willcocks (F. C.). **Collembola or Springtails injuring Cotton.**—*Bull. Soc. Entom. Egypte, Cairo*, 1918, no. 1 & 2, January-June, pp. 34–35. [Received 29th December 1919.]

A number of young cotton plants from Gizeh were found to be injured by springtails or Collembola; the foliage being small and crinkled or malformed and in some cases showing holes. The soil in the field where these plants had grown was low-lying and moist, poorly tilled and swarming with springtails. This is thought to be the first record of injury to a field crop by these insects in Egypt, though damage has been noticed in seedling flowering plants such as *Cineraria*, *Antirrhinum*, etc., for some years past.

Gough (L. H.). **Further Notes on *Ephestia*, an Insect injurious to Stored Dates in Khargeh Oasis.**—*Bull. Soc. Entom. Egypte, Cairo*, 1918, no. 3, July-August, pp. 68–75. [Received 29th December 1919.]

It was found during investigations in 1917 [*R.A.E.*, A, vi, 462] that the date worm found in the Khargeh Oasis, and now identified as *Ephestia calidella*, Gn., does not attack the Saidi date until it has fallen off the fruiting stem. It was therefore suggested that dates for export should be graded into two qualities, the first to be packed immediately, and the second to be made into pressed dates. Tests were then made in fumigating both grades. The method of fumigation for the purpose of experimentation is described. Sulphur fumes were used and the receptacle closed for about 12 hours. Two weeks later the fumigated material was examined and compared with unfumigated dates from the same lot. The superiority of selected dates over the second grade was great, and fumigation greatly improved both grades. The first quality dates after fumigation were practically free from worms. A single worm in a package, however destroys several dates. The cost of fumigation is practically nil, and this process does not affect the colour, texture or flavour of the dates.

One modification of the existing practice would be necessary. The bunches would have to be cut when about one-third are still yellow, instead of waiting until all have fully ripened. Most of the yellow ones will ripen after packing. There is no doubt that eggs are laid on the hanging as well as the fallen fruit.

Attention is drawn to the resemblance between the life-history of *E. calidella* and that of the pink bollworm [*Pectinophora gossypiella*]; in both species some of the larvae enter upon a resting stage which carries the insect over from one year to another. The former moth is the more suitable for experiment and may be the means of solving this puzzling phase in the life-history of both insects.

Gough (L. H.). **Preliminary Note on the Infestation of** ***Hibiscus esculentus*** **Pods by the Pink Boll Worm.**—*Bull. Soc. Entom. Egypte, Cairo,* 1918, no. 4, September-December, pp. 79–82. [Received 29th December 1919.]

While it has been stated in America that cotton is the only known food-plant of the pink bollworm, *Pectinophora* (*Gelechia*) *gossypiella*, it has long been known in Egypt that other plants are attacked. In particular, *Hibiscus esculentus* and *H. cannabinus* are known to be food-plants in Egypt, and while the fact has little economic importance in that country, it is significant in view of the American legislation which prohibits the growing of cotton in a known area of bollworm infestation, but does not prohibit the growing of okra (*Hibiscus*), which is cultivated as a vegetable in the Southern United States. Material has therefore been collected and examined for the percentage of infestation of this plant and the results prove that both species of *Hibiscus* are naturally largely infested and are sufficiently important food-plants to render legislation against cotton alone a defective measure.

Pemberton (C. E.). **Artificial Distribution of Beneficial Ladybirds in California by the Ton.**—*Hawaiian Planters' Record, Honolulu,* xxi, no. 5, November 1919, pp. 260–262.

The method of collecting and distributing aphidivorous Coccinellids, especially *Hippodamia convergens*, in California is described. During 1913, 75,000,000 individuals of this beetle were distributed and immense numbers have been handled each year since. The possibility of introducing this species into Hawaii in large quantities has been considered and some attempts have already been made to do so, but apparently it has not become established. There are difficulties connected with the transportation; storage for ten weeks or more after removal from the natural hibernation quarters causes a high mortality among the Coccinellids; moreover they are not a tropical species and might not survive in Hawaii. In view of the importance of its activites in California, however, it is thought that further attempts should be made to add it to the beneficial species that have already been introduced into Hawaii with very great advantage.

FERNALD (H. T.) & BOURNE (A. I.). **Department of Entomology.**—*31st Ann. Rept. Massachusetts Agric. Expt. Sta., Boston, Mass.*, Parts i and ii, Pub. Doc. 31, January 1919, pp. 39a–43a. [Received 29th December 1919.]

Tests of standard insecticides to determine their action and the causes of burning of foliage have been continued. Pure materials have previously been tested and commercial brands are now being tried in the same way. Calcium arsenite cannot be recommended for ordinary use as too many precautions are necessary for safety; the study of calcium arsenate to replace it has therefore been undertaken.

Several proprietary insecticides have been tested during the year. The most successful of these was "Plant Lice Killer" for use against Aphids. The oily nature of this mixture makes it difficult to prepare, but when properly mixed and maintained it is effective, 1 part to 15 or 20 of water killing practically all the insects reached and 1 to 30 killing about 90 per cent. of them. At a strength of 1 : 15 only the most delicate foliage was injured; with 1 : 20, no injury was noticed.

Bordeaux mixture, Pyrox and Insecto were tested during the summer of 1918 to determine their value against potato pests, nicotine sulphate 40 per cent. in 1 to 800 dilution being added to each. The last-named had rather poor suspension qualities, giving poor distribution and clogging the nozzle. Home-made Bordeaux gave the best distribution and Pyrox was nearly as good. Flea-beetles were well controlled by all three materials, the nicotine sulphate combining with them without difficulty.

The work on digger wasps as parasites has progressed, but no results can as yet be reported. Remedies against the onion maggot [*Hylemyia antiqua*] were practically limited in 1918 to tests of traps for the adult flies. Six traps placed in an area of about one-fourth of an acre captured about 48,000 flies, of which about 4,500 were those of *H. antiqua* during May and June. These experiments will be continued.

With regard to the codling moth [*Cydia pomonella*] it had been decided that no second brood is present in Massachusetts except for a few scattered individuals. A second brood of considerable size was noticed however in 1918 and it has been decided to carry the investigations further.

LARRIMER (W. H.) & FORD (A. L.). U.S. Bur. Entom. **The Migration of *Harmolita grandis* Form *minutum*: an important Factor in its Control.**—*Jl. Econ. Entom., Concord, N. H.*, xii, no. 6, December 1919, pp. 417–425, 1 plate, 3 figs.

Recent observations show that the first generation of the wheat pest, *Harmolita grandis*, which is wingless, does not travel very far from its place of hibernation in standing stubble. Infestation by this Chalcid in fields adjacent to such stubble was found to vary from 12·1 per cent. at the edge to 0·10 per cent. at a distance of 90 yards. As the infestation is practically negligible beyond a radius of 30 yards, wheat planted at this distance from stubble or self-sown wheat will be fairly safe from attack. If the first generation is thus deprived of its natural breeding-places it will obviously mean great reduction in the amount of infestation later in the season. All self-sown wheat, especially that growing in stubble, should be destroyed as it provides a breeding-place from which the second generation, which can fly strongly, will infest the adjacent and neighbouring fields, such infestation amounting to 6·4 per cent. having been noticed at a distance of 150 yards.

MOZNETTE (G. F.). U.S. Bur. Entom. **Notes on the Bronze Apple-Tree Weevil.**—*Jl. Econ. Entom., Concord, N. H.*, xii, no. 6, December 1919, pp. 426–429, 1 plate.

The bronze apple-tree weevil, *Magdalis aenescens*, Lec., has been very prevalent in Oregon. It was found on apple, *Crataegus* and Italian prune trees, but all trees attacked were either devitalised or dying. The roughened portion of the bark is chosen by the female for oviposition in preference to the smooth parts. Eggs were deposited about 26th April in cavities excavated under the bark and the cavity was sealed with frass. These eggs hatched on 14th and 15th May. The larvae burrow immediately into the bark in any direction, and may include a little of the wood in their tunnel. The tunnels are very small, measuring about ½ mm. at first and about 2 mm. when completed. The larvae continue feeding on the bark and surface-wood during the winter, and in the spring an oval cell is excavated at the end of the burrow between the bark and wood in which pupation occurs about the beginning of April. The larval period lasts ten to eleven months. The duration of the pupal stage depends on weather conditions. The adults usually emerge about five days after pupation and feed on the foliage, especially the upper surface of the leaves, into which they eat peculiar round holes. The adult life is brief.

About 50 per cent. of this pest was apparently attacked by parasites, including *Tetrastichus* sp. and a Braconid, *Calyptus* sp.

ROBINSON (R. H.). **The Beneficial Action of Lime in Lime Sulfur and Lead Arsenate Combination Spray.**—*Jl. Econ. Entom., Concord, N. H.*, xii, no. 6, December 1919, pp. 429–433.

Experiments made with combined sprays show that greater decomposition takes place when lime-sulphur is mixed with lead hydrogen arsenate than with neutral arsenate. The efficiency of the spray is decreased by about 35 per cent. and severe scorching may occur owing to the presence of arsenic as a soluble salt. The addition of lime at the rate of about 10 lb. to 100 U.S. gals. of lime-sulphur, before the lead arsenate is added, prevents this reaction to a certain extent, and this combination after two days showed 75 per cent. of the lime-sulphur to be unchanged, whereas the mixture without the addition of lime in the same length of time completely transformed to lead sulphide or thiosulphate.

Baker (A. C.). U.S. Bur. Entom. **The Houghton Gooseberry Aphis.**—*Jl. Econ. Entom., Concord, N. H.*, xii, no. 6, December 1919, pp. 433–437.

The eggs of *Aphis houghtonensis* are laid as early as the first week in October in confinement upon the bark or under the loose bark of the twigs of gooseberry bushes and occasionally about the bases of the buds and upon the thorns. They hatch about the middle of April and the young stem-mothers feed on the opening leaves and are found either on the under-surface of the leaves or on the petioles. The leaves curl and completely hide the stem-mother as well as the young, which may remain enclosed in the leaf or migrate to new leaves. Alate viviparous forms occurred in every generation in which specimens were reared from the second onward. Part of the offspring of the stem-mothers thus became winged, but all individuals of this form died without reproducing when placed on gooseberry, thus indicating that for certain individuals at least an alternate food-plant is necessary. The summer apterous forms first appeared on the 9th May and commenced feeding on the leaves, causing the same curling as the stem-mothers; they also attacked the tender shoots. The sexes, both of which are apterous, appear in September and October. The various stages are described.

Weiss (H. B.) & Dickerson (E. L.). **The Life History and early Stages of *Macropsis virescens* var. *graminea* (Fabr.), a Poplar Leaf Hopper in New Jersey (Hom.).**—*Jl. Econ. Entom., Concord, N. H.*, xii, no. 6, December 1919, pp. 437–440.

The eggs of *Macropsis virescens* var. *graminea* are laid during the end of June and beginning of July beneath the bark tissue of Lombardy poplars, the bark over the egg being slightly raised. During the first week in May the nymphs emerge and may be found on the unfolding leaves and leaf-petioles; sometimes as many as 3 or 4 occur on one leaf. They gradually disperse to the stems and rest in the axils of the leaves or occasionally on the petioles. There are 5 nymphal stages, their total duration being about one month. The adults appear from the beginning of June to July. Hibernation takes place in the egg-stage. All stages are described.

Wellhouse (W. H.). **Lace Bug on Hawthorn, *Corythucha bellula*, Gibson (Tingididae, Hemiptera).**—*Jl. Econ. Entom., Concord, N. H.*, xii, no. 6, December 1919, pp. 441–446, 2 figs.

The lace bug, *Corythuca bellula*, Gibs., is recorded from several localities in New York round Ithaca. The only previous record is apparently from Ohio. The food-plants include *Crataegus neofluvialis*, *C. albicans* and *C. punctata*, and these are probably preferred owing to the abundance of pubescence along the veins on the lower sides of the leaves.

The eggs are laid in groups of from 18 to 20 on the under-surface of the leaf in the axil formed by the midrib and its lateral branches. The egg-laying period extends over several weeks, so that all stages may be found together during July and August. There are two generations in Ithaca. The first brood hatches in July from eggs laid in May and June and the second in August and September from eggs laid in July and August. During the cooler weather of June the eggs hatch in about 37 days, but in August the nymphs emerge after 18 days. They feed in colonies on the under-surface of the leaves, sucking the sap and causing the leaves to turn brown and fall off. The nymphs moult five times and feed from 3 to 4 days between the earlier moults and 5 to 6 in the later stages requiring a total of from 20 to 25 days. The adults also feed on the leaves and those of the second brood which emerge in September continue feeding until the leaves fall. They hibernate in this stage in the crevices of the bark or on the leaves with which they have fallen. The hibernating adults recommence feeding towards the end of May, but as comparatively few of them survive the winter the first brood causes little injury. Many of the last stage nymphs are preyed upon by spiders. Should the nymphs of the second brood become too numerous they may be controlled by one of the nicotine sprays in use against leaf-bugs on apple. The spray should be directed upwards so as to ensure reaching the under-surface of the leaves. The nymphal stages are described.

Frost (S. W.). **The Function of the Anal Comb of certain Lepidopterous Larvae.**—*Jl. Econ. Entom., Concord, N. H.*, xii, no. 6, December 1919, pp. 446–447, 1 fig.

Hitherto the anal comb of certain Lepidopterous larvae such as *Cydia* (*Laspeyresia*) *molesta*, Busck, *C.* (*L.*) *prunivora*, Walsh, and *C.* (*L.*) *pomonella*, Clem., has been a useful character in separating such closely allied species, but no definite function has been attributed to it. Whilst examining a larva of *Sparganothis indocusalis*, Wlk., it was noticed that this organ is instrumental in disposing of the frass, which it removes from the neighbourhood of the body. It was further noticed only in some external feeders and it is wanting in case-bearers, leaf-miners and borers such as *Mincola indiginella*, Z., *Eucosma* (*Tmetocera*) *ocellana*, Schiff., *Tischeria malifoliella*, Clem., *Phyllorycter* (*Lithocolletis*) *blancardella*, F., and *Parornix* (*Ornix*) *geminatella*, Pack., which would have no use for such a structure owing to their habits.

Holloway (T. E.) & Loftin (U. C.). U.S. Bur. Entom. **Insects attacking Sugar Cane in the United States.**—*Jl. Econ. Entom., Concord, N. H.*, xii, no. 6, December 1919, pp. 448–450.

This list of sugar-cane pests in the United States includes: *Diatraea saccharalis crambidoides*, Grote, parasitised by *Trichogramma minutum*, Riley, *Ufens niger*, Ashmead, and *Euzenilliopsis diatraeae*, Towns.;

Diatraea lineolata, Wlk.; *Pseudococcus calceolariae*, Mask.; *P. calceolariae minor*, Mask.; *Ligyrus rugiceps*, Lec.; *Lachnosterna antennata*; *L. burmeisteri*; *L. crassissima*; *L. congrua*; *Cyclocephala villosa*, Burm.; *Dyscinetus trachypygus*, Burm.; *Sphenophorus cariosus*, Oliv.; *Limnobaris* sp.; *Draeculacephala mollipes*, Say, parasitised by *Abdella acuminata*, Ashm., and *Gonatocerus koebelei*, Perk.; *D. mollipes minor*, Wlk.; *Tomaspis bicincta*, Say; *Aphis bituberculata*, Wilson; *Sipha flava*, Forbes; and *Leucotermes flavipes*, Kollar.

Other insects and mites that rarely cause much damage, but are included in this list, are: *Frankliniella gossypii*, Morg.; *Uropoda* sp.; *Tetranychus modestus*, Bnks.; *Bryobia pratensis*, Garm.; *Galumna robusta*, Bnks.; *Hypoaspis* sp.; and *Laphygma frugiperda*, S. & A.

Illingworth (J. F.). **Investigation of Control Measures for White Grubs affecting Sugar Cane in Queensland.**—*Jl. Econ. Entom., Concord, N. H.*, xii, no. 6, December 1919, pp. 451–455.

Tremendous losses are sustained in the sugar-cane growing districts of Queensland owing to the ravages of white grubs [*Lepidiota* sp.]. Two years' investigation shows that the most important remedial measures consist in stimulating the vigour of the plant, destroying the eggs by cultivation, application of poison and removal of feeding trees. [*R.A.E.*, A., vi, 526; vii, 200, 411; viii, 62.]

Illingworth (J. F.). **A Successful Method of Breeding Parasites of White Grubs.**—*Jl. Econ. Entom., Concord, N. H.* xii, no. 6, December 1919, pp. 455–457, 1 plate.

During observations on the breeding of *Campsomeris tasmaniensis* and *C. formosus* under laboratory conditions it was noticed that when several white grubs [*Lepidiota*] were placed in the jar with these wasps they were all immediately paralysed by them, although eggs were never deposited on more than one individual. The method of breeding the parasites is discussed. [*R.A.E.*, A. vi, 495.]

Illingworth (J. F.). **The Sugar Cane Beetle Borer Parasite** (*Ceromasia sphenophori*) **in Queensland.**—*Jl. Econ. Entom., Concord, N. H.*, xii, no. 6, December 1919, pp. 457–459.

In certain districts in Queensland the sugar-cane beetle borer, *Rhabdocnemis obscura*, is no longer a serious pest owing to the establishment of its Tachinid parasite, *Ceromasia sphenophori*, which is responsible for the destruction of about 90 per cent. of the grubs [*R.A.E.*, A, vii, 167]. Attempts are being made to extend the distribution of this parasite over a wider area.

Smith (R. H.). **A Preliminary Note concerning a serious Nematode Disease of Red Clover in the North Western States.**—*Jl. Econ. Entom., Concord, N. H.*, xii, no. 6, December 1919, pp. 460–462.

Tylenchus dipsaci, Kühn (*devastatrix*, Kühn) has been found to be the cause of severe losses amongst red clover in Idaho. At present red clover is the chief food-plant of this Nematode and it has only occasionally been recorded on alsike and white clover. The limited range of food-plants may probably be explained by the theory of the existence of different biological strains [*R.A.E.*, A, v, 441 ; vii, 356].

The Nematodes apparently enter the plants at the surface of the ground, at first attacking the stipules of the leaves and later the stems. Malformations of the plant are the result, and these are most marked in the autumn and early winter. The death of the plants is usually hastened by secondary agents, including a mite, *Rhizoglyphus rhizophagus*, Bnks., a Mycetophilid, *Sciara trifolii*, Pett., and a weevil, *Sitones hispidulus*, Germ. The chief injury is caused during the second year after seeding, when both Nematodes and other insects are most abundant.

Brooks (F. E.). U.S. Bur. Entom. **A migrating Army of Millepedes.** —*Jl. Econ. Entom., Concord, N. H.* xii, no. 6, December 1919, pp. 462–464.

Attention is drawn to the sudden appearance of a great army of millipedes, *Fontaria virginiensis*, Drury, in West Virginia. The army, estimated to consist of over 65 million individuals, had probably migrated to a farm from the neighbouring woodland and covered at least 75 acres of land. The water in the infested district was contaminated, the springs being filled to a depth of from 6 to 8 inches with drowned millipedes. The invasion passed in a southerly direction, but stumps, posts, rails and decaying boards all bore evidence of its passage, as they were gnawed white in many places and covered with excrement. Previous invasions of *Fontaria brunnea* in strawberry beds, where it feeds on the over-ripe fruit, are also recorded.

Zetek (J.). **The Cocoanut Butterfly,** *Brassolis isthmia*, **on Banana.**— *Jl. Econ. Entom., Concord, N. H.* xii, no. 6, December 1919, p. 465.

Attention is drawn to the readiness with which larvae of *Brassolis isthmia*, Bates, will attack banana leaves in the Panama Canal Zone, though this butterfly is principally a pest of coconut plams.

Remedial measures advocated include burning of the nests in the palms and the use of an arsenical spray.

LEGISLATION.

Per la Difesa dell'Agricoltura algerina. [In Defence of Algerian Agriculture.]—*L'Agric. Colon., Florence*, xiii, no. 11, 30th November 1919, pp. 483–485.

On 14th August 1919 the existing Algerian law against *Phylloxera* was modified. One clause of the new law places the importation into Algeria of vines or other material on which the insect might be introduced under the authority of the Governor General, who may, on the advice of the Minister for Agriculture, prohibit the importation or order the destruction of such material.

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CONTENTS.

CONTENTS—*cont.*

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VOL. VIII. Ser. A. Part 3.—pp. 81-136. MARCH, 1920.

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HASEMAN (L.). **Swarms of Cotton Worm Moths visit Missouri.**—*Jl. Econ. Entom., Concord, N. H.* xii, no. 6, December 1919, p. 467.

The appearance in September and October 1919 of great numbers of the cotton-worm moth, *Alabama argillacea*, Hb., in Missouri is recorded. Great injury was caused to ripe fruit.

MORRISON (H.). U.S. Bur. Entom. **A new Genus and Species of Coccid from** *Loranthus*. **(Hem.-Hom.).**—*Proc. Entom. Soc. Washington, D. C.*, xxi, no. 9, December 1919, pp. 197–203, 1 plate.

Macrocepicoccus loranthi, gen. et sp. nov., is described from *Loranthus* sp., a parasitic plant related to mistletoe, growing in the present case on *Anona muricata* in the Botanic Gardens at Georgetown, British Guiana. Only one colony was observed, though many plants were examined.

OLSEN (C. E.). *Kermes kingii*, **Cockerell, parasitised by a Micro-lepidopteron.**—*Bull. Brooklyn Entom. Soc., Brooklyn, N.Y.*, xiv, nos. 4 and 5, October-December 1919, pp. 141–142.

Examples of the gall-making scale, *Kermes kingi*, Ckll., collected on red oak, were found a few weeks later to be accompanied by a micro-lepidopterous parasite, identified as *Euclemensia bassettella*. Clem. [*R.A.E.*, A, vii. 263.]

LAING (F.). **Insects damaging Lead.**—*Entom. Mthly. Mag., London*, 3rd Series, nos. 60 & 61, December 1919 and January 1920, pp. 278–279 & 12.

The insects recorded as damaging lead include: *Monochamus* (*Monohammus*) *confusor*, Kirby, which bored through a lead pipe $2\frac{1}{2}$ inches thick; *Hylotrupes bajulus*, L.; *Tetropium gabrieli*, Weise, perforating the lead lining of wooden vats; *Buprestis japonensis*, Saund.; *Lyctus* sp.; *Anobium* sp.; *Ptinus sexpunctatus*, Pz.; *Sinoxylon ruficorne*, Thr., in lead-covered, aerial cables in South Africa;* *Bostrychopsis jesuita*, F., and *Xylopertha* sp., in Queensland; *Xylothrips gibbicollis*; *Scobicia pustulata* in Europe; *Sirex gigas*, L., in the South of France; *Bostrychus capucinus*, L.; *Callidium sanguineum*, L.; *Sirex juvencus*, L.; *Cetonia aurata*, L.; and *C. opaca*, F.

SCOTT (H.). **Insects damaging Lead and other Metal Work.**—*Entom. Mthly. Mag., London*, 3rd Series, no. 61, January 1920, pp. 10–12.

The insects recorded include: *Lyctus canaliculatus* piercing thick lead pipe in Tasmania; *Sirex gigas* boring through tin and $\frac{1}{2}$ inch steel plates in Austria. Perforations found in lead from the roof of a disused bakery are thought to have been made by *Tenebrio molitor*, living larvae and pupae of which were found in close proximity.

[* Similar injury in California has been done by *Xylopertha* (*Sinoxylon*) *declive*, Lec., identified by Dr. E. C. van Dyke.—ED.]

(654) Wt. P1921/144. 1,500. 3.20. B.&F.Ltd. Gp.13. A

Olsen (C. E.). *Idiocerus cognatus*, **Fieber, established in North America.**—*Jl. N. Y. Entom. Soc., Lancaster, Pa.*, xxvii, no. 2–3, June-September 1919, pp. 126–128, 1 plate.

Attention is drawn to the establishment of a species of *Idiocerus* on white poplar (*Populus alba*) in North America. Until further comparisons have been made with European forms, this leaf-hopper is provisionally identified as *Idiocerus cognatus*, Fieb. (*distinguendus*, Kirschb.). A description of the adults is given.

Dickerson (E. L.) & Weiss (H. B.). **Notes on the Early Stages and Life History of** *Idiocerus cognatus*, **Fieb., in New Jersey.**—*Jl. N.Y. Entom. Soc., Lancaster, Pa.*, xxvii, no. 2–3, June-September 1919, pp. 129-132. [Received 30th December 1919.]

The eggs of *Idiocerus cognatus*, Fieb., which are generally deposited singly during the middle or end of July under the bark of the new growth and terminal twigs of *Populus alba*, hatch about the end of May. The emerging nymphs are usually found on the upper surface of the unfolding leaves, but moulting always takes place on the lower leaf-surface. The nymphal stages, of which there are five, require from 3 to 6 days each, making a total of about one month. The adults appear towards the end of June and beginning of July and have been found as late as October. There is only one generation a year. No appreciable damage is caused to the food-plant by the feeding nymphs, but should they be very abundant a slight malformation and whitening due to the abstraction of sap is noticed on the young leaves. The egg and nymphal stages are described.

Timberlake (P. H.). **Notes on the North American Species of** *Hippodamia* **(Coleoptera).**—*Jl. N.Y. Entom. Soc., Lancaster, Pa.*, xxvii, no. 2–3, June-September 1919, pp. 162–174.

The work of previous authors is reviewed and the synonymy of these Coccinellids, as well as points of differentiation of thirteen species of *Hippodamia*, are discussed. These include: *Hippodamia parenthesis*, Say, *H. convergens*, Guér., and *H. glacialis*, F.

Nicolay (A. S.) & Weiss (H. B.). **Additions and Corrections to the Review of the Genus** *Buprestis* **in North America.**—*Jl. N.Y. Entom. Soc., Lancaster, Pa.*, xxvii, no. 2–3, June-September 1919, p. 241. [Received 30th December 1919.]

Buprestis viridisuturalis [*R.A.E.*, A, vii, 157] has been found breeding in cottonwood and alder. It occurs at less than 1,000 feet elevation and in certain valleys in the interior at 4,500 feet.

Musy (M.). **Les Chenilles du Chou, leurs Ennemis et les Moyens de les combattre.**—*Bull. Soc. Fribourgeoise Sci. Nat., Fribourg*, xxiv, 1916–1918, pp. 120–122.

Attention is drawn to the increased abundance of *Pieris* spp. on cabbages in the vicinity of Fribourg, Switzerland ; this may probably be accounted for by the exceptional scarcity of sparrows. It was also noticed that cabbages planted in the immediate neighbourhood of tomatoes apparently suffered less from these pests than those further off. The probability of the odour of tomatoes acting as a repellent is suggested as an explanation of this fact [*R.A.E.*, A, iii, 340]. The Braconid parasite, *Apanteles* (*Microgaster*) *glomeratus*, was noticed ovipositing on the caterpillars and its mode of attack is discussed. The protection of bird life during the winter is advocated as a remedial measure.

Il "Daco," Mosca distruttice delle Olive. [The Olive Fly.]—*L'Agric. Colon., Florence*, xiii, no. 11, 30th November 1919, pp. 501–502.

In September and October 1919 the olive fly [*Dacus oleae*] appeared in the Menzel bou Zelfa district of Tunisia and attacked the large, mature "October" olives. None of the usual methods against it being feasible, recourse was had to the immediate harvesting of these fruits. Their removal will deprive the pest of its food-supply, and if the weather has become cool by the time that others are mature, it may disappear altogether.

Fletcher (T. B.). **Report of the Imperial Entomologist.**—*Scient. Repts. Agric. Research Inst., Pusa, 1918–19, Calcutta*, 1919, pp. 86–103, 3 plates. [Received 30th December 1919.]

The determination of the relative immunity of varieties of cotton to bollworm attack was greatly hampered by the infestation of the plants with *Pseudococcus corymbatus*, *Phenacoccus hirsutus* and a mite, *Eriophyes* sp., probably *E. gossypii*. The appearance of *P. corymbatus* was traced to an adjoining plot of soy beans. A Bethylid, ? *Parasierola* sp., was found in cotton bolls containing larvae of *Pectinophora* (*Platyedra*) *gossypiella*.

Thespesia populnea is apparently not an alternative food-plant of *P. gossypiella*, but larvae of a Phycitid were found boring in the pods. A Gracilariid, *Acrocercops* sp., is recorded for the first time on cotton. The larvae mine under the bark, causing it to peel off even from the leaf-stalks.

The work connected with borers infesting rice has been continued. These include *Schoenobius incertellus* (*bipunctifer*), *Sesamia inferens*, *Chilo* sp. and a Halticid beetle, the grub of which bores into the stems of rice and millet seedlings from the outside, giving rise to a dead heart.

Investigations with regard to the degree of parasitism of the indigo Psyllid, *Arytaina isitis*, have been continued, and show that it is at its highest at the end of May and September after which date it gradually declines and reaches its minimum in February.

It has been definitely ascertained that the mulberry disease "tukra" is caused by a mealy-bug, *Phenacoccus hirsutus*, which is found in company with *Pseudococcus virgatus*. *P. hirsutus* completes ten generations during the year and is also known to attack cotton, guava fruits, grape vines and *Tecoma grandiflora*. Its numbers are reduced by three Chalcids, as well as by a butterfly, *Spalgis epius*, a Noctuid moth, *Eublemma quadrilineata*, and a Cecidomyiid.

With the exception of *Scirpophaga xanthogastrella*, which bores in the top shoots, the borers occurring in Pusa do comparatively little damage to grown sugar-cane. The cutting out of "dead hearts," especially in the case of the young crop, has proved useless and also injurious by interfering with proper tillering. The species previously referred to as *Chilo* sp. in rice and *Diatraea* sp. in sugar-cane [*R.A.E.*, A, vii, 132] have since been identified as *Argyria tumidicostalis*. In addition to sugar-cane, *Saccharum spontaneum* and *S. arundinaceum*, *S. fuscum* is recorded as a food-plant of *Scirpophaga xanthogastrella*. Great damage was caused to sugar-cane by the Dynastine beetles, *Alissonotum impressicolle*, *A. piceum* and *Heteronychus sublaevis*. These beetles breed among the roots of various wild grasses. The severe infestation by them of sugar-cane in April 1919 was probably due to the retarded emergence of the adults owing to the drought. Parasitism of the Aleurodid, *Aleurolobus barodensis*, destructive to sugar-cane, was found to be highest at the end of November 1918, reaching a maximum of 98 per cent., after which both host and parasite rapidly diminished.

New fruit pests include several weevils. The eggs of *Alcides mali*, Mshl., are deposited in holes made in the tender shoots of apple trees. The larvae tunnel in the stem, in which they remain for pupation. The adults should be collected and the affected twigs cut off. *Aclees cribratus*, Gyl., was found boring in the main stems of fig trees, *Ficus carica*, in June and July. The beetles may be collected on the stems by day. Another weevil belonging to a new genus, *Deiradolcus*, was found in June and July on mulberry, apple, pear and other fruit trees. *Dyscerus malignus*, Mshl., oviposits in small excavations made in the apple fruits and fruits of *Prunus nepalensis*. All stages complete their development within the fruit. *D. fletcheri*, Mshl., also infests apple and has a similar life-history. A Lamiid, *Linda nigroscutata*, Fairm., damages apple trees by girdling the twigs and depositing eggs under the bark. The larvae bore into the twigs, causing them to die off. The only remedy is hand collection of the adults and the removal of attacked twigs. A Cerambycid, *Chelidonium cinctum*, Guér., was found depositing eggs in June in the axils of young living twigs of orange trees. The larvae bore in the twig and cause its death and eventually bore into the main branches, making tunnels about one inch in diameter. Hand collection and removal of affected twigs are advocated.

A Sphingid, *Oxyambulyx sericeipennis*, Butl., occurred in July on walnut, and *Theretra gnoma*, F., on grape vines; another species, probably *Langia zeuzeroides*, occurred on apples and pears. Other Lepidopterous pests included the Saturniids, *Actias selene*, Hb., on apple, pear, walnut, *Betula alnoides* and *Odina wodier*, etc., and *Antheraea roylei*, on apple and pear; a Pyralid, *Heterographis bengalella*, Rag., on custard apple; a Carposinid, *Meridarchis reprobata*, Meyr., on olives and *Eugenia jambolana*; an unidentified Eucosmid on apple causing injury similar to that caused by *Cydia pomonella*; and a Gracillariid, *Acrocercops* ? *hierocosma*, Meyr., infesting litchi fruits in May.

Insects reared during the year included: a weevil, *Sternochetus* (*Cryptorrhynchus*) *gravis*, which deposits its eggs in mango fruits, the shortest period for completion of the life-cycle being about 3 weeks;

a butterfly, *Virachola isocrates*, on peach fruit in May; *Earias fabia* and *E. insulana* in flower buds of *Hibiscus rosa-sinensis*; and larvae of *Heliothis peltigera* on leaves of *Carthamus tinctorius*.

ZETEK (J.). **El Gusano dañino de las Palmas in Panama.** [The Larva of *Brassolis isthmia* in Panama.]—*Revista La Salle, Panama*, October 1919, pp. 6–8.

This information concerning the life-history and habits of *Brassolis isthmia*, which is the most injurious pest of coconut palms in Panama, has been taken largely from a previously published paper [*R.A.E.*, A, vi, p. 19]. Of especial importance in Panama is the fact that the larvae have recently been found to attack banana leaves [*R.A.E.*, A, viii, 80] and it is possible that it may prove an injurious pest of plantain in that region. The formula and instructions for making a suitable arsenical spray are given with directions for the kind of spraying machinery suitable against this butterfly.

SMITH (R. E.), ESSIG (E. O.) & GRAY (G. P.). **Handbook of Plant Disease and Pest Control.**—*Univ. California, Agric. Expt. Sta., Berkeley*, Circ. no. 204, August 1918, 36 pp. [Received 30th December 1919.]

The insect pests, under their popular names, of varied crops are briefly noted, together with the usual remedial measures. Formulae and instructions for the preparation of various insecticides and poison baits are appended.

PATTEN (A. J.) & O'MEARA (P.). **The Probable Cause of Injury reported from the Use of Calcium and Magnesium Arsenates.**—*Michigan Agric. Expt. Sta. Qtrly. Bull., East Lansing*, ii, no. 2, November 1919, pp. 83–84.

Reports of injury to foliage from the use of calcium and magnesium arsenates have been steadily increasing. Experiments here described show that the large quantities of carbon dioxide liberated by the leaves during the night are the probable cause of injury, owing to the solubility of calcium and magnesium arsenates in carbon dioxide. The addition of lime to these sprays may possibly lessen the danger of injury, but further investigations are necessary to confirm this.

SCHUMACHER (F.). **Der gegenwärtige Stand unserer Kenntnis von der Homopteren-Fauna der Insel Formosa.** [Our present Knowledge of the Homoptera of Formosa.]—*Mitt. Zool. Mus., Berlin*, viii, no. 1, September 1915, pp. 73–134.

This list of Homoptera includes a Cicadid, *Mogannia hebes*, Wlk., which is a pest of sugar-cane.

Cercopids: *Cosmoscarta uchidae*, Mats., found in large numbers under the leaves of wild bananas; *C. bispecularis*, White, very harmful to mulberry trees; *Poophilus costalis*, Wlk., damaging sugar-cane and rice, and very widely distributed throughout India and Africa.

Jassids: *Tettigonia viridis*, L., damaging shrubs and fruit trees by laying its eggs in the young branches; *T. subvirescens*, Stål, damaging sugar-cane and also found in the Philippines, Assam, India and Java; *T. spectra*, Dist., harmful to sugar-cane and widely distributed; *Kolla albomarginata*, Sign., destructive to various cultivated plants, particularly sugar-cane, and widely distributed from eastern Siberia to New South Wales; *Penthimia theae*, Mats., on tea; *Nirvana pallida*, Mel., destructive to sugar-cane and grasses; *N. suturalis*, Mel., attacking sugar-cane and also found in Ceylon and Burma; *Parabolocratus okinawensis*, Mats., found on tea; *Parabolopona guttata*, Uhl., on camphor, and also occurring in Japan; *Strongylocephalus agrestis*, Fall., attacking sugar-cane and rice, and widely distributed; *Tartessus ferrugineus*, Wlk., on figs and oranges, and found in India, China, Japan, etc.; *Pediopsis apicalis*, Mats., on *Quercus* in China and Japan; *Idiocerus niveosparsus*, Leth., doing great damage in India to mangos, and attacking the same plant in Formosa, as also does *I. clypealis*, Leth.; *Deltocephalus dorsalis*, Motch., known in India, Ceylon, Borneo and Japan, where it attacks rice and grasses, and rice in Formosa; *D. oryzae*, Mats., very harmful in Japan to rice, wheat, oats, rye, etc.; *Nephotettix apicalis*, Motch., very injurious to rice in Formosa and other parts of tropical Asia, and also found in Africa; *Cicadula sexnotata*, Fall., destructive to sugar-cane in Formosa, to rice, wheat, rye, oats, etc., in Japan, and to cereals and meadow grass, etc., in Europe and North America; *C. warioni*, Leth., attacking rice and sugar-cane in Formosa; *Balclutha viridis*, Mats., and *B. pallidula*, Mats., harmful to sugar-cane; *Chlorita flavescens*, F., a persistent tea pest in India and other Oriental regions; *Zygina subrufa*, Motch., very harmful to rice and sugar-cane; *Z. fumosa*, Motch., in large numbers on grasses, etc., and known also in Ceylon; *Z. circumscripta*, Mats., and *Z. maculifrons*, Motch., infesting sugar-cane.

Fulgorids: *Orthopagus helios*, Mel., attacking sugar-cane; *Dictyophora sinica*, Wlk., attacking rice and sugar-cane, as also does *D. patruelis*, Stål; *Oliarus oryzae*, Mats., on sugar-cane; *O. mori*, Mats., numerous everywhere on mulberry trees; *Kirbyana pagana*, Mel., harmful to sugar-cane in Formosa and found also in India, Ceylon, China and the Sunda Islands; *Mesepora onukii*, Mats., on *Citrus*; *Vekunta nigrolineata*, Muir, *V. stigmata*, Mats., and *Kamendaka saccharivora*, Mats., attacking sugar-cane; *Diostrombus politus*, Uhler, destructive to rice, *Panicum frumentaceum* and sugar-cane; *Phenice moesta*, Westw., widely distributed and harmful to sugar-cane in Formosa; *Hisia atrovenosa*, Leth., on sugar-cane and rice in Formosa; *Ricania simulans*, Wlk., var. *japonica*, Mel., on mulberry and tea; *R. taeniata*, Stål, on sugar-cane and also found in the Philippines and in Japan; *Purohita cervina*, Dist., and *P. taiwanensis* Muir, on bamboo; *Tropidocephala saccharivorella*, Mats., *T. formosana*, Mats., *Delphacodes vastatrix*, Bredd., *Stenocranus sacchari*, Mats., *Delphax graminicola*, Mats., and *D. propinqua*, Fieb., all attacking sugar-cane; *D. furcifera*, Horv., destructive to rice in Japan and to sugar-cane in Formosa; and *Dicranotropis fumosa*, Mats., infesting sugar-cane.

Carsner (E.). **Susceptibility of various Plants to Curly-top of Sugar Beet.**—*Phytopathology, Baltimore,* ix, no. 9, September 1919, pp. 413–421, 7 figs.

Various experiments have been made to determine from whence the leaf-hopper, *Eutettix tenella*, Baker, obtains the virus of curly-top disease of sugar-beet in the spring. Although the insect has been known to retain the virus for 58 days when fed on non-susceptible plants, it cannot retain it during the whole winter. Observations show that the red stem filaree, *Erodium cicutarium*, which appears soon after the winter rains, is accessible to the leaf-hopper as food and for breeding. The disease apparently overwinters in this plant, from which it is transmitted to beet in the spring.

Snell (W. H.). **Observations on the Relation of Insects to the Dissemination of** *Cronartium ribicola*.—*Phytopathology, Baltimore,* ix, no. 10, October 1919, pp. 451–464.

These observations show that although the spread of *Cronartium ribicola* by means of insects from pines to *Ribes* and *vice versa* is comparatively rare and accidental, the spread of the uredinial stages upon *Ribes* probably occurs with some regularity. A beetle, *Serica sericea*, feeding on a red currant bush was found to have aeciospores on its body, and the sawfly, *Neodiprion pinetum*, has been found on *Ribes* and is known to feed upon *Pinus strobus*.

Stone (R. E.). **Kerosene Injury to Shade Trees.**—*Phytopathology, Baltimore,* ix, no. 10, October 1919, pp. 476–477.

Between 1917 and 1918 many shade-trees, especially maple, were dying from an apparently unknown cause. Subsequent investigations showed that three years previously in order to prevent the caterpillars of the tussock moth [*Hemerocampa*] from crawling up the tree-trunks bands of cotton wool had been placed round them and saturated on several occasions with kerosene, the surplus oil being allowed to run down the trunks. It is considered evident that this was the cause of the damage.

Hopkins (A. D.). **The Bioclimatic Law as applied to Entomological Research and Farm Practice.**—Separate from *Scientific Monthly* [*sine loco*], June 1919, pp. 496–513, 3 figs.

The bioclimatic law is founded on the determined country-wide average rate of variation in the time at which periodical events occur in the seasonal development and habits of plants and animals at different geographical positions within the range of their distribution. Other things being equal, this variation is at the rate of 4 days for each degree of latitude, 5 degrees of longitude and 400 feet of altitude. Owing however to topographical variations, as well as those of soil conditions and weather, etc., a greater or less departure of the actual from the computed date of a periodical event for a given place is often found. The amount of this is in direct proportion to the intensity of the controlling influences, which can therefore be measured in terms of days or the equivalent in degrees of latitude or feet of altitude with the computed date as a constant. Thus from the date of a periodical event or practice at an established base in any given season a corresponding date constant of the event for any other place within the range of the species or periodical practice involved, may be estimated by means of the time constants of the law and their equivalents in latitude, longitude and altitude. The possible geographical range in which the species under its other environmental requirements would survive and thrive might be similarly determined.

With regard to the application of this law to economic entomology the following species are dealt with.

The most destructive enemy of southern pine timber is the southern pine beetle, *Dendroctonus frontalis*, Zimm., the normal distribution of which corresponds to that of the long-leaf and loblolly pines and the greater part of the range of the short-leaf eastern yellow pine south of Virginia and West Virginia. Under favourable climatic conditions it may extend and become temporarily established in the spruce areas of North Carolina, West Virginia and the pine areas of southern Pennsylvania. In the northern and highest limits of distribution two complete generations occur annually, but in the more southern regions as many as 5 or more generations occur with a most complex overlapping of the broods of several generations from the late spring to the early autumn months. Remedial measures must be carried out during the period beginning at the end of the flight of the beetles in the autumn and ending before flight begins in the spring. This will vary according to latitude and altitude, beginning in September in the north and higher altitudes and farther south towards sea-level in December, and ending from February along the Gulf coast to the middle of May at the northern or highest limit. Knowing the location of an infested area, the beginning and ending of control operations may be recommended through the application of the bioclimatic law without preliminary investigation.

The distribution of *Dendroctonus brevicomis*, Lec. (western pine beetle) throughout the Pacific Slope and the drainage area of the Columbia River eastward to central Montana and Wyoming, southward into Utah and Nevada and northward into British Columbia, is represented by the latitude and altitude range of its food-plant, the western yellow pine, *Pinus ponderosa*. Towards the highest altitude limits one complete and a partial second generation occur; the latter may be completed at lower altitudes. Remedial measures should be applied as for *D. frontalis*, beginning at the end of the flight season in the autumn and ending in the spring before general flight begins. As the lower altitude limit of the western yellow pine rises southward at the general average rate of about 400 feet to each degree of latitude, the influence of latitude is balanced by the influence of altitude, and the application of the law to the determination of the time constants for different localities relates almost entirely to the variation in altitude. The variation in the time for the beginning and ending of the critical period of control between the lowest and highest altitude limits in any latitude is 30 to 40 days or more. That this species is extremely sensitive to local influences affecting the temperature is evident from the results of an experiment which shows that larvae placed on the south side of a tree developed into pupae in 20 days, the first adult emerging 35 days before those placed simultaneously on the north side. This fact must be taken into consideration in connection with the study of departures from the computed constant in the seasonal events of this species.

The range of the mountain pine beetle, *Dendroctonus monticolae*, Hopk., extends throughout the pine zones of the Pacific Slope and into Wyoming, Montana and British Columbia, with a range of altitude from near sea-level on the shores of Puget Sound to near timber line in the northern Rocky Mountains and Cascades, and to 10,000 feet or more in the southern Sierra Nevadas. Food-plants include western white pine, lodgepole pine, sugar pine and western yellow pine. Normally only one generation a year occurs, but towards the southern and lowest altitude range a partial second generation occasionally follows; whilst towards the highest altitude from 2 to 3 years are sometimes required for the development from the first eggs to the last beetle of one generation, in which case, owing to the overlapping of the broods of one, two and three year generations, no choice is left as to taking advantage of a critical period in which control operations can be carried on.

In the case of *Chermes* (*Pineus*) *strobi*, Htg. (pine bark louse or spruce gall louse), which requires two food-plants for its development, and allied species, remedial measures such as contact insecticides should be applied, during the critical period of activity, which is always coincident with the beginning of new growth on the infested pine and the opening of the buds on the spruce. As this is the only reliable guide to the time for spraying, departures due to local influences need not be considered.

With regard to the gall-making species of *Chermes* on blue and Engelmann spruces there is a close relation between the opening of the buds and the hatching of the eggs, the number of days departure from the constant not being sufficient to indicate that they are due to local influences.

The critical period in the seasonal history of the Hessian fly [*Mayetiola destructor*] is the period of its emergence in the autumn, and it has been found that if wheat is sown at the close of the general flight period of the fly, the danger of serious injury will have passed by the time the wheat is above ground and exposed to attack. The time of emergence is controlled primarily by climatic conditions and secondarily by weather, local soil and topographical influences. A fly-free date for different localities and for an average season may thus be determined by the application of the bioclimatic law, by which also farm practice in general may be adjusted to geographical requirements with a view to producing the best results.

QUAYLE (H. J.). i. **Fumigation with Liquid Hydrocyanic Acid.**

GRAY (G. P.) & HULBIRT (E. R.). ii. **Physical and Chemical Properties of Liquid Hydrocyanic Acid.**—*Univ. Cal. Agric. Expt. Sta. Berkeley, Cal.*, Bull. 308, June 1919, pp. 393–428, 4 figs. [Received 30th December 1919.]

Liquid hydrocyanic acid, which was first used as a fumigant on a commercial basis in 1917, has rapidly come into favour as an insecticide. Under a tent the most marked killing-effect with the liquid form is at the bottom of the tree, while with the pot or portable generator the greatest toxicity is at the top. Besides scale-insects, 75,000 Cocinellids have been used to obtain the index of results. The greatest possible yield is 108 lb. or 18·56 U.S. gals. of anhydrous liquid hydrocyanic acid from 200 lb. sodium cyanide (51–52 per cent. cyanogen). The amount of liquid hydrocyanic acid (95–98 per cent.) that has been recovered during the past year has been about 78 per cent. of the total available. The amount of gas evolved by the pot or portable generator is estimated at 90 per cent. of the total available gas. During 1918, 75 per cent. of the gas from a given amount of cyanide in the liquid form was made to cover the same ground as 90 per cent. from the same amount by the ordinary methods of generation. Thus, while there has been a discrepancy of 10 or 15 per cent. in the actual amount of gas used through the liquid method, the results in the field have not indicated any important difference on the scale-insects experimented with. In the present tests, examinations were made of the whole tree including the top. If the results at the centre and bottom only were considered, as is usual in fumigation tests, there was practically no difference between the liquid and the pot methods, and this is confirmed by results in the field. When the centre and top only are considered, the pot method proved more efficient than the liquid. In considering the whole tree, it is found necessary to use about 20 c.c. of liquid hydrocyanic acid (96 or 98 per cent.) to equal 1 oz. of sodium cyanide as given in the schedules of dosage now in practical use. The atomising machines should therefore be graduated to deliver 20 c.c. for each oz. required by the schedules.

In discussing the physical and chemical properties of liquid hydrocyanic acid, it is stated that material of 95 per cent. or greater purity is considered a satisfactory grade. As the necessary information is accumulated it is confidently anticipated that the yield in the future will be equal to or even greater than that now obtained from portable generators. The adoption of the weight basis for commercial transactions in preference to the volume basis is strongly urged. A table is included showing the weights and corresponding volumes of various grades of commercial liquid and the quantities corresponding to various percentages of the maximum yield. The acid is miscible with water in all proportions and will not stratify upon standing. Hydrocyanic acid evaporates more rapidly than water from dilute mixtures of the two.

Reference tables appended to this bulletin, containing data on the specific gravity of commercial liquid hydrocyanic acid and on the extent of variation of hydrometer readings as affected by temperature, make it possible to determine in a moment the quality of a given liquid by the use of a hydrometer graduated either in specific gravity or Baumé degrees. A cyanometer, *i.e.*, a hydrometer graduated directly in percentages of hydrocyanic acid and provided with a simple table of temperature corrections has been constructed for this purpose. The development of any colour (usually yellow) or an odour of ammonia indicates incipient decomposition of the liquid. Factors favouring decomposition are the presence of more than 5 per cent. of water, high temperature, residue from a decomposed liquid, all alkalies, nitric acid, sodium cyanide, soap, or contact with lead, commercial tin, impure zinc, solder, cast iron or steel. Aluminium, brass, block tin, pure zinc, nickel, silver and copper are all highly resistant to the acid and the first-named is recommended for the construction of delivery drums, brass fittings being permissible.

ESSIG (E. O.). **The Olive Insects of California.**—*Univ. California Agric. Expt. Sta., Berkeley, Cal.*, Bull. 283, September 1917, pp. 43–64, 21 figs. [Received 30th December 1919.]

Among the more important olive pests in California are *Saissetia oleae*, Bern. (black scale), *Aspidiotus hederae*, Vall. (ivy or oleander scale), *Polycaon confertus*, Lec. (olive twig borer) and *Luperisinus californicus*, Swaine (olive bark-beetle). The last-named is a comparatively little-known insect, but may possibly become a serious pest. This beetle resembles the fruit-tree bark-beetle, *Scolytus* (*Eccoptogaster*) *rugulosus*, Ratz., in appearance and also in its manner of constructing small burrows through the cambium layer, sometimes girdling the infested portions of the trees. The beetles apparently prefer sickly or dying trees and breed abundantly in them as well as in dead prunings. They have, however, been found attacking healthy olive-trees in proximity to their breeding-places, especially if an entrance can be made through a sunburned or wounded spot. The distribution of the species is not well known, and no other food-plants than olives have been recorded. Adults were first taken in 1909 in sweepings from Fresno County at an elevation of 3,000 feet and the species was described in 1916 [*R.A.E.*, A, iv, 384]. The first essential in avoiding attacks is to maintain a healthy condition of the trees and to prevent sunburn and injuries that encourage infestation. Prunings should be immediately burnt. All infested limbs or trees should be cut out and burnt. A Hymenopterous parasite, *Ecphylus* sp. (probably *E. schwarzi*, Roh.) attacks the immature stages in the burrows, but is not an effective agent in control.

Minor olive pests in California include *Scirtothrips citri*, Moult. (citrus thrips), *Heliothrips fasciatus*, Perg. (bean thrips), *Platypedia areolata*, Uhl. (net-winged cicada), *Prociphilus fraxinidipetalae*, Essig (mountain ash aphis), *Chrysomphalus aurantii*, Mask. (red scale), *Lepidosaphes beckii*, Newm. (purple scale), *Aspidiotus rapax*, Comst. (*camelliae*, Sign.) (greedy scale), and a Geometrid, *Sabulodes caberata*, Gn.

Some of the principal insects attacking olive trees in other States and countries are also figured and briefly described.

HOUSER (J. S.). **The European Corn Borer.** [A new Insect Pest attacking many Farm Crops.]—*Ohio Agric. Expt. Sta., Mthly. Bull., Wooster*, iv, no. 6, June 1919, pp. 185-190, 7 figs. [Received 30th December 1919.]

Attention is drawn to the necessity of maintaining a constant vigilance against the possible introduction of the European corn borer [*Pyrausta nubilalis*] into Ohio. The life-history and control measures are discussed [*R.A.E.*, A., vii, 224, 411]. Any suspected material should be at once forwarded for identification.

GUYTON (T. L.). **Controlling Asparagus Beetles.**—*Ohio Agric. Expt. Sta., Mthly. Bull., Wooster,* iv, no. 6, June 1919, pp. 197–199, 2 figs. [Received 30th December 1919.]

The asparagus beetle, *Crioceris asparagi*, emerges from hibernation under rubbish, etc., at the time that the first asparagus buds come through the ground. The eggs are deposited on the young shoots and hatch in from 3 to 8 days. The larvae are full-grown in from 10 to 14 days and feed on the developing shoots. When mature they enter the ground to a depth of about 1 inch for pupation which lasts about 8 days, the total life-cycle from egg to adult lasting about 30 days. There are three generations a year, the second appearing in July and the third in August ; the adults of the latter hibernate. Their natural enemies include predaceous insects and birds. The remedial measures suggested include hand-picking for small areas and the application of fresh air-slaked lime as a dust early in the morning before the dew is off the plants. Plants should be allowed to grow at intervals as traps and dusted once a week with arsenicals, but such plants must not be used for food. In very hot weather brushing the larvae on to the hot ground will kill them.

A dust consisting of a mixture of 4 lb. of powdered lead arsenate and 1 barrel of air-slaked lime or a spray of 2 lb. of powdered lead arsenate, 50 U.S. gals. of water or Bordeaux mixture and 2 lb. of soap, are effective in destroying both the larvae and adult beetles.

Crioceris duodecimpunctata, which is less common in Ohio, may be controlled in the same manner.

COTTON (E. C.). **Wheat Insect Survey for 1919.**—*Mthly. Bull. Ohio Agric. Expt. Sta., Wooster,* iv, no. 8, August 1919, pp. 241–245, 1 map. [Received 30th December 1919.]

The wheat survey of 1919 in Ohio followed the lines of that of the previous year [*R.A.E.*, A, vii, p. 80]. A number of fields under about average conditions were examined in each of the 39 counties. The joint-worm [*Harmolita*] was again the most important insect damaging wheat, the injury reaching an average of 31·4 per cent., and rising to a maximum of 89 per cent. The greatest losses occurred in the western half of the State. No cultural or other method of control has been devised ; early and late planting do not yield consistent results either in neighbouring fields in the same year or in consecutive years in the same field. The eggs are usually laid from late April to early June in the highest joint of the wheat stems. Owing to favourable growing conditions the young wheat in 1919 made such vigorous growth that most of the galls formed by the larvae were high up on the stalk and therefore most of the insects were removed in the straw instead of being left in the stubble as is usually the case. The infestation in 1920 should therefore be materially reduced. Any fallen wheat is liable to be infested either with *Harmolita* or Hessian fly [*Mayetiola destructor*] ; this should all be raked up thoroughly, preferably when wet with dew or light rain, when the straws are tough and have a tendency to wrap round the teeth of the rake and be pulled up by the roots. These rakings should be run through a separator if possible, as many of the larvae are killed by this process.

Frequently also the portion of the straw enclosing the gall passes out with the grain because of its weight. These galls, which contain the larvae, should therefore be passed through a sieve and burned in the mill, if not before. There seems to be little danger of infestation of wheat by the insects emerging from the straws in stacks. If the straw is trampled under by livestock or enters commercial channels the adults upon emerging are not likely to find wheat on which to oviposit.

While the Hessian fly [*Mayetiola destructor*] infestation in 1918 was heaviest in the north-western portion of the State, in 1919 the greatest damage was further east, the average infestation for the State being 14·4 per cent. There has been a distinct increase of this pest in Ohio as a whole since 1918, and the recommended dates for wheat planting as shown on a map should be closely followed, even though late-sown wheat may be threatened with unfavourable weather. The object of the late planting is to delay until most of the adult flies have died without depositing any of their eggs. Examination of experimental plots in Miami county on 30th November 1918 showed the "fly free" date to be somewhere between 23rd and 30th September, probably about the 25th. As the maximum yield was secured from plots sown between these dates there is every reason for following the recommendation. The ever-growing demand during recent years for more wheat has compelled the farmer to plant part of his acreage very early and continue sowing as late as possible, while avoiding winter injury. Increasing losses from Hessian fly are, however, unavoidable if the fly-free dates are not adhered to. Close co-operation amongst farmers is of course essential in this respect. Miami county, after suffering severe losses for several successive seasons, was cleared of the pest in a single one by this co-operative procedure. If wheat is obviously likely to suffer from either fly or weather the substitution of some other crop is advisable.

Damage by the wheat midge [*Contarinia tritici*] was almost negligible: the chinch bug [*Blissus leucopterus*] was present in moderate numbers.

HOWARD (L. O.). **Report of the Entomologist.**—*U.S. Dept. Agric., Bur. Entom., Washington, D.C.*, 14th August 1919, 27 pp. [Received 30th December 1919.]

The European corn borer [*Pyrausta nubilalis*] was recorded in the previous report [*R.A.E.*, A, vii, p. 100] as being established in Eastern Massachusetts throughout some 500 square miles. Much good work was done in preventing its extension under State appropriations, but in 1919 the requisite Federal appropriation was not granted, with the result that by August the moth had spread over an area of 1,000 square miles. A great deal of information regarding this pest has been published during the year [*R.A.E.*, A, vii, 224, 411, etc.], and a large number of entomologists are now studying the possibilities of its control. The Hessian fly [*Mayetiola destructor*] is rapidly increasing in many localities, and wheat-growers have been advised of the most suitable dates for planting in the autumn of 1919. The true army worm [*Cirphis unipuncta*] appeared in numbers, the usual remedies proving successful. It has recently been found that the southern corn rootworm [*Diabrotica duodecimpunctata*] does not attack maize in Georgia, or North and South Carolina, if planted before 31st March or after 10th May ; the coastal region from Virginia to Florida does not, however, seem to come under any definite regulation of planting. A successful and inexpensive method of spraying lucerne as a remedy for the alfalfa weevil [*Hypera variabilis*] has been devised, and successful treatments have been given against grasshoppers, jointworms [*Harmolita*], alfalfa seed Chalcid [*Bruchophagus funebris*] and coulee cricket [*Peranabrus scabricollis*].

In investigations on insects affecting stored products, fumigation has given good results, and tests are being made with electricity for dealing with insects in cereals in package form. The latter treatment is promising, and should result in great saving to both producers and consumers. The value of cold storage has already been proved and detailed data regarding this method are being secured. The frequent inspections of Army food and clothing supplies that were carried out by the Bureau during the war proved so satisfactory that they have remained in force and are being extended to other food depots of both Army and Navy.

Studies of fruit insects have revealed much new information regarding the codling moth [*Cydia pomonella*], which has caused a loss to the apple industry in one State of about £400,000. In Oregon a basis of data for a spraying schedule has been obtained ; in the Ozark region of Arkansas it seems that dusting cannot be substituted for spraying. There are three full generations in this region and a partial fourth ; a spraying schedule will shortly be prepared. Apple Aphids have been studied, particularly with a view to the exact determination of alternate food-plants and the identity of certain forms.

Grape pests under observation include the grape-berry moth [*Polychrosis viteana*], which can apparently be controlled by two applications of lead arsenate spray ; eventually, when there are no badly infested vineyards, a single spraying should be sufficient. For the grape mealybug [*Pseudococcus bakeri*], fumigation with sodium cyanide and with sulphur fumes, particularly the latter, has been satisfactory in the dormant season at night, January being the best month for treatment. Spraying proved less effective than fumigation. A survey has been made to determine the influence of the physical nature of soils on the degree of infestation of vineyards by *Phylloxera*. The grape sphinx moth [*Pholus achemon*] appeared in numbers in Tulare County, California, and at an outlay of about £2,400 for labour, spraying, materials and machinery, the grape crop, valued at about £36,000 was saved. Against pecan insects arsenical dusts and sprays are being tried ; in some groves 90 per cent. of the nut crop was lost in 1918 owing to insect injury.

The investigations on cranberry insects have been continued. On bogs badly infested with the blackhead fireworm [*Rhopobota vacciniana*] satisfactory results have been obtained from three applications at intervals of from 17 to 21 days between 1st May and 1st July of nicotine sulphate containing 40 per cent. nicotine at 1 : 800, with the addition of 2 lb. fish-oil soap to each 50 U.S. gals. of spray. Life-history studies of this insect and of the cranberry root weevil [*Rhabdopterus picipes*] are being completed. The latter can be controlled by spraying the foliage during May and June with 2 lb.

lead arsenate to 50 U.S. gals. Bordeaux mixture. Against the peach borer [*Aegeria exitiosa*] tests with paradichlorobenzene have been continued throughout the past three years. It is found that ¾ oz. to 1 oz. of the chemical applied to each tree in the autumn after oviposition will destroy about 95 per cent. of the larvae. Trees of 6 years or older are uninjured by this treatment, but younger trees, on account of their thinner bark, have sometimes been damaged. For plum curculio [*Conotrachelus nenuphar*] and certain peach diseases the dusting method seems to compare favourably with spraying, even under the worst conditions. Measures against the Japanese beetle [*Popillia japonica*], recently introduced from Japan into New Jersey, are discussed [*R.A.E.*, A, vii, 511].

Investigations into the value of various insecticides have been made, including a study of the material known as derris [*R.A.E.*, A, vii, 496]. Additional experiments have confirmed the conclusion that calcium arsenate may always be substituted for Paris green, and that for pomaceous fruits it forms a good substitute for lead arsenate when used with lime or fungicides containing lime. Studies of insect-destroying fungi have been continued, especially regarding a fungous disease of cutworms and an obscure disease of the periodical cicada [*Tibicen septemdecim*].

The conditions in regard to the sweet potato weevil [*Cylas formicarius*] in various localities are discussed and the method of dealing with the pest in each, under a fiscal grant of about £10,000, is outlined. Other vegetable pests include the potato aphis [*Macrosiphum solanifolii*], which was unexpectedly abundant and was controlled by strong nicotine sprays. The bean ladybird [*Epilachna corrupta*] has been controlled by lead arsenate and zinc arsenite sprays. The great increase in bean-growing, owing to War conditions, has resulted in a corresponding increase in the numbers of the corn earworm [*Heliothis obsoleta*], which seriously injured the crop, and with the reduction of the bean acreage this season serious damage is likely to result from the abundance of the pest. The pea moth [*Cydia nigricana*?] is increasing to a serious extent, having been imported from Canada into Wisconsin. It has been demonstrated that the celery leaf-tier [*Pionea ferrugalis*] can be controlled by spraying with 1 lb. lead arsenate to 50 U.S. gals. of water, the first treatment being made when the eggs are hatching and being repeated every two weeks. The cost of this treatment, which was continued until the insects had disappeared, was about 8*s*. per acre.

Exhaustive studies have been made of insects affecting forest trees and much new information has been gained. The inter-relations of forest fires and insects have been studied on an area of about 8,000 acres in southern Oregon. This area had been under observation since 1914 and the fire had burned over it in 1918. Records show that previous to the fire the insects had killed 485,000 board feet of timber. The fire killed 170,000 feet and subsequently the slightly-fire-injured as well as the uninjured trees in the burned area were killed by beetles attracted from the surrounding areas. Infestation in the burned area increased more than 1,000 per cent., but decreased in the surrounding areas. The broods of the beetles in the fire-scorched trees did not increase to any appreciable extent. The fire therefore, contrary to expectations, did not contribute to an increase of the beetles in the general area or to the starting or extension of an epidemic of beetles. On an area of about 48,000 acres of badly infested pine forest, a count of young and matured beetles that developed in an average foot of bark, and of the exit-holes, showed that there is a notable decrease in numbers during the development of the broods each year on account of the increase of natural enemies and other disturbing factors. This offers some explanation of the epidemics of beetles that rise and fall within a limited period, and why the western yellow pine forests are naturally protected from total destruction. While many beetles die in their earlier stages, normally an average of 150 beetles to the square foot of bark develop into adults in a case of average infestation, and since it requires an average of about 10 beetles to the square foot to kill a vigorous, healthy tree, it is obvious that all the pine timber of the western forests would soon be destroyed if it were not for natural and artificial control. Destruction of timber by insects can largely be prevented by cutting the trees in late autumn and early winter and piling the wood loosely until it is thoroughly dry. Damage to posts can be prevented by laying them on the ground where they will receive the full force of the sun, and turning them occasionally so that the young stages of the borers will be killed by the heat. Attention has lately been drawn to several instances of beetles damaging lead [see also *R.A.E.*, A, viii, 81]. A particularly serious instance occurs in California, where a wood-boring species is able to throw hundreds of telephones out of order by boring holes in the cables through which water can enter, rendering the connections useless. It has been found that for the control of wood-boring insects chemical substances are very seldom as effective as management in logging and manufacture to render the bark and wood unfavourable to attack. For example, one of the most destructive species of termites cannot live if deprived of moisture in ground or foundation timber.

The work for the suppression of the gipsy moth [*Porthetria dispar*] and brown-tail moth [*Nygmia phaeorrhoea*] during the year is reviewed [*R.A.E.*, A, vii, 60, 103, 104, 176, 341]. Investigations into the spread of the parasites showed that *Schedius kuvanae* could not survive the winter in New Hampshire, and was scarce in Massachusetts ; *Anastatus bifasciatus* showed better results ; large colonies of each have been liberated in the autumn. The situation with regard to the parasites, *Compsilura concinnata*, *Blepharipa scutellata*, *Apanteles melanoscelis* and *Calosoma sycophanta* is discussed, no remarkable change having occurred in their status since the previous report. *Nygmia phaeorrhoea*, while confined to a smaller area, increased slightly in numbers in the Eastern part of the territory. *Apanteles lacteicolor* was present in small numbers in about 10,000 larvae examined ; *Meteorus versicolor* was much less abundant. The commonest parasite found in these collections was *Zygobothria nidicola*, about 20 per cent. of the caterpillars being parasitised by it.

The extension and demonstration work carried out during the year is described. The use of powdered lead arsenate or calcium arsenate against the cotton boll weevil [*Anthonomus grandis*], which was advocated in last year's report, is being greatly extended with promising results, but care is required in its application and instructions are being distributed for this purpose. As a remedy against the moth borer of sugar-cane [*Diatraea saccharalis crambidoides*] every effort is being made to establish parasites introduced from Cuba [*R.A.E.*, A, vii, 280, 408]. The tobacco flea-beetle [*Epitrix parvula*] has been successfully controlled in Florida by insecticides and serious losses have been averted. For tobacco thrips [*Frankliniella fusca*] 14 oz. nicotine sulphate, with 3 lb. soap to 50 U.S. gals. water, has proved a successful spray if applied properly once a week during the emergency period. The time of application is important.

Apiary work during the year is described. The demand for bee-keepers' supplies and literature is greater than ever before in the country.

A general summary is given of the War activities of the Bureau of Entomology.

Proceedings of the Conference on the European Corn Borer held by National Association of Commissioners of Agriculture.—*State of New York Dept. Farms and Markets, Div. Agric., Albany, N.Y., & Boston, Mass.*, Bull. 123, August 1919, 74 pp., 11 plates. [Received 30th December 1919.]

The object of the conference held at Albany and Boston on the 28th and 29th August 1919 was to bring forward all information relative to the possible damage that might occur if stringent measures were not resorted to for the extermination of the European corn stalk borer, *Pyrausta nubilalis*, and this bulletin collates the addresses delivered by the various speakers present.

The plan of action suggested by Dr. L. O. Howard includes a thorough survey of suspected regions for the purpose of determining as definitely as possible the exact limits of infested areas, the adequate enforcement of inter-State quarantine regulations to prevent artificial distribution of *P. nubilalis* and control or repressive measures embracing every practicable means of destroying the pest. Such a scheme would require a supplementary appropriation of about £100,000 in addition to the £50,000 already granted. A detailed statement showing the proposed allocation of the funds is appended. In this no provision has been made for an emergency fund for use in the event of the discovery of additional infested areas, for which purpose not less than £20,000 would be needed.

Dr. E. P. Felt considered the extermination of the pest in New York to be reasonably possible, provided that there is an organisation capable of maintaining a high standard of efficiency, and that there be sufficient funds available to use at all times. As there are at present no satisfactory remedial methods adapted to field conditions, experiments and field tests will have to be conducted on a large scale and duplicated under varied conditions, so as to eliminate every possibility of wrong interpretation or to avoid a really effective method being overlooked. Owing to the rapid spread of the borer immediate action is necessary, and the work would be comparatively easy in New York, as apparently maize is the only plant attacked there. Investigations show that individual moths may live more than 30 days and deposit as many as 1,200 eggs, the descendants of one moth being estimated at from 100,000 to 300,000 individuals in the course of a season.

According to Mr. G. G. Atwood the distribution of *P. nubilalis* in New York embraces 1,954 square miles within four counties, the actual infested area covering about 400 square miles. The only way to control this pest is to destroy the plant containing the larvae and pupae. Various suggestions relative to remedial measures are submitted for consideration. The maize maturing before 1st September should at once be cut and used for food or placed in silos; the stubble should be ploughed under, after which the land should be heavily rolled, and the subsequent harrowing should not bring the stubble to the surface. No stubble within the quarantined area should be ploughed after 1st September. Maize maturing after 1st September should be cut very close to the ground and placed in silos or cured and saved as fodder, in which case the portions not used by the 1st May must be burned. All dry maize stalks, as well as those mixed with manure, must be destroyed. No maize on the cob, on the ear or any part of the plant susceptible to injury as well as weeds dry or green should be taken out of the quarantined area for any purpose. All maize should be shelled prior to 1st May and the cobs burned. Maize should be grown in hills rather than in drills to facilitate cleaning up processes, and more extensive use should be made of silos in infested areas. A further suggestion is made for the limiting of the planting of maize within the infested area, excepting such as is permitted for trap-plots. The quarantine referred to is that placed on the four counties in which infested maize stalks were found.

Mr. W. Wheeler in reviewing the situation in Massachusetts stated that *P. nubilalis* is known to exist in 93 towns, as well as in 3 towns in New Hampshire, comprising an area of over 1,200 square miles.

Points regarding the life-history of *P. nubilalis* were dealt with by Mr. D. J. Caffrey. Adults have been reared from 48 varieties of plants, of which the following are additional to those previously noticed [*R.A.E.*, A, vii, 224], tomato, geranium, oats, purslane (*Portulaca*), turnips, sunflower, cabbage, asparagus, chicory, rhubarb, Hungarian millet, buckwheat, sow-thistle (*Sonchus*) and asters. Probably, within certain limits, the species of plant selected depends more upon its location with reference to other badly infested plants or its accessibility to the ovipositing females than upon its character as a plant. Individual females have been observed to make single flights for a maximum of 287 yards up to a height of 50 feet, after which they were lost to view. Marked females were recovered at a maximum distance of 600 yards from the point of liberation. In confinement their life averaged about 19 days, with a maximum of 33 days, a period that would allow them to travel considerable distances in a series of flights. During May and June the average number of eggs deposited by one female was 386, with a maximum of 1,192, these being laid in separate clusters containing on an average 17 eggs. The moths of the second brood are apparently able to exceed these numbers. The adults are not attracted to any extent to stationary lights of any colour or candle-power, and the poison-baits in common use for Lepidopterous insects have not proved attractive to them. In captivity they readily feed on the decaying juices of tomato and pear. Experiments with regard to the ploughing under of infested material show that the depth does not greatly influence mortality, but no adults emerged from material buried 12 inches deep. The burying of material containing pupae gave similar results and although many larvae and pupae are thus destroyed, it cannot be considered as a possible means of extermination. A comparison of treated and control plants does not reveal any marked protection due to the application of arsenicals. A Hymenopterous parasite, *Trichogramma minutum*, Riley, was found parasitising about 30 per cent. of the eggs of the second generation and is apparently widely distributed. Of the six Dipterous and six Hymenopterous parasites known, *Compsilura concinnata*, Meig., is the only imported species.

A resolution was passed that most energetic efforts on the part of the Federal and State agencies should be made to control and if possible exterminate the pest, including vigorous quarantines to prevent its distribution. It is urged that Congress should make an appropriation of £4,000,000 for the year 1920 to carry out this work, and for this purpose a committee representing the Commissioners of Agriculture, official Entomologists and the Plant Pest Committee should be appointed.

This bulletin ends with a paper by Mr. C. L. Marlatt explaining that the action of federal quarantine has so far been withheld pending recommendations which shall result from the conference. It is apparent that any quarantine covering merely known invaded areas would not be worth while or practicable ; to be efficient it must cover New England and New York as a whole. The restrictions should cover all articles of general commerce for food purposes which have been shown capable of carrying the pest. The regulations could be modified to allow of movement by inspection and certification in the uninfested territory.

FLETCHER (T. B.) & OTHERS. **Second Hundred Notes on Indian Insects.**—*Agric. Research Inst., Pusa*, Bull. 89, 1919, 102 pp., 58 figs. [Received 30th December 1919.]

In this continuation of a previous list [*R.A.E.*, A, iv, 438] some of the information given has been noticed elsewhere [*R.A.E.*, A, iv, 96, 387 ; v, 359].

The insects dealt with include :—*Pentodon bengalense*, Arr., which is probably widely distributed over India, but is only reported from Peshawar as a pest. The adults begin tunelling at the soil surface in sugar-cane until they reach the base, causing a dead heart and often eating right through the base. Larvae collected on 20th May 1906 and 1st May 1909 pupated on 24th June and 2nd July respectively, the adults emerging on the 3rd and 12th July. Larvae of *Anomala bengalensis* were also found attacking sugar-cane underground. They hibernate in the larval stage, pupation occurring about the end of March and the adults emerging about the middle of April. Considerable damage is caused to bael trees (*Aegle marmelos*) in June and July by a Chrysomelid beetle, *Clitea picta*, of which the larva is described. The larvae burrow in the midribs of leaves, tender shoots, spines, axils of branches and young setting fruit, whilst the adults eat holes in the leaves. Pupation occurs in the larval burrow or in the soil and lasts 5 or 6 days. The fruit-flies, *Dacus* (*Chaetodacus*) *diversus*, infesting plantains in Burma, and *Stictaspis ceratitina* and *S. striata* attacking young bamboo shoots, are recorded. *Eublemma dimidialis*, F. (*hemirhoda*, Wlk.) sometimes causes serious damage to *Phaseolus mungo*, usually in association with other Lepidopterous larvae such as *Catochrysops cnejus*, *Eucosma melanaula* and *Anarsia ephippias*. The larvae bore into the flower-buds, flowers and seed-pods, eating out their contents. Several flowers are tied together with silk, thus concealing the working larva. Pupation occurs in a cocoon in any convenient shelter and lasts from 7 to 11 days.

The Pyralid, *Polyocha saccharella*, Ddgn., the larva of which bores in sugar-cane, is noted as being identical with *Papua depressella*, Swinh., which is now placed by Hampson in the genus *Emmalocera*. Another sugar-cane pest, *Ancrastia ablutella*, Z. [*R.A.E.*, A, i, 169], is now placed in the genus *Raphimetopus*, Hmp., and *A. bimaculella*, Rag., is a synonym of it. The pests of red gram recorded as *Laspeyresia trichocrossa* [*R.A.E.*, A, iv, 439] and *Eucosma ludicra*, Meyr., are now considered to be synonyms of *Eucosma critica*, Meyr.

The predaceous insects recorded include an Elaterid, *Agrypnus fuscipes*; the larva, which is redescribed, lives under the soil surface and is predaceous on cockchafer grubs. In confinement it feeds readily on the caterpillars of *Prodenia litura*, *Utetheisa pulchella*, *Papilio demoleus*, *Bombyx mori*, etc., Lepidopterous pupae and even dead moths such as *Agrotis ypsilon*. The adults also feed on caterpillars and pupae in confinement. The normal life-cycle is thought to extend over 2 or 3 years, depending probably on the amount of food available. The adults apparently emerge about May or June. A Coccinellid beetle, *Sumnius renardi*, has been found preying on *Monophlebus stebbingi octocaudatus*. The larva and its method of feeding are described. Pupation occurred in April and lasted from 8 to 9 days. Another Coccinellid, *Brumus suturalis*, F., was reared from larvae found feeding on *Phenacoccus insolitus* on leaves of *Sida spinosa* in July and in February from a larva found in an egg-mass of *Pseudococcus* sp. on cotton. Pupation in July lasts about seven days and occurs on a leaf amongst the larval prey. It is parasitised by a small black Hymenopteron.

Both larvae and adults of a Carabid, *Calosoma indica*, Hope, were found feeding freely on caterpillars of *Cirphis unipuncta* in wheat and oat fields in April. In October they were also noticed in a field of *Phaseolus aconitifolius* preying on caterpillars of *Phytometra* (*Plusia*), *Remigia* and *Thermesia*. Pupation lasts from 4 to 6 days. In confinement the larvae are cannibalistic. The early stages of *Broscus punctatus*, Klug, are not known, but the adults, which live from about March to June, are predaceous on the larvae of *Agrotis ypsilon*, *Prodenia litura*, *Pieris brassicae* and *Chilo simplex*.

A list of the hosts of 18 species of Indian Ichneumonids by Mr. G. R. Dutt is included in these notes.

Mr. Y. Ramachandra Rao describes the damage caused to mulberry trees by a Longicorn, *Sthenias grisator*, in December. The eggs are inserted under the bark and hatch in about 9 days; the emerging larvae at once bore into and feed on the woody tissue. Pupation occurs in the tunnel. Under natural conditions the life-cycle occupies 4 to 5 months. *Cosmopteryx phaeogastra*, sp. n., the larvae of which were found mining the leaves of beans, and *C. bambusae* mining the leaves of bamboo are described by Mr. Meyrick.

Mr. E. Ballard notes a Capsid, *Megacoelum stramineum*, Wlk., as probably occurring all over India. The chief food-plant is *Andropogon sorghum* (cholam), of which the variety harvested in January and February suffers most; various other crops are attacked such as groundnut and gingelly. This bug is usually associated with *Calocoris angustatus*, supplementing the work of the latter by depositing its eggs in the ripening grains. About 150 to 200 eggs are laid by one female in March and hatch in from 5 to 6 days. The nymphs mature in 10 to 11 days, during which time 5 moults take place. The different instars are described.

Notes by Mr. Ramakrishna Ayyar deal with the weevil, *Apoderus tranquebaricus*, F., a pest of mango fruit, the usual food-plant being the native almond tree, *Terminalia catappa*. The bulk of the information concerning *Contheyla rotunda*, Hmp., a Limacodid pest of coconuts, has been noticed elsewhere [*R.A.E.*, A, vi, 47]. The Hesperid, *Parata alexis*, F., caused very serious damage to the foliage of *Pongamia glabra* trees in November. Each larva folds the leaf in the form of a tube in which after feeding on the leaf-tissue it pupates; the adult emerges after from 9 to 10 days. Notes are also given on 56 new or previously unrecorded species of Indian Coccids. These include *Phenacoccus ballardi*, Green, and *Lecanium adersi*, Newst., on mango. [See also *R.A.E.*, A, vii, 402.]

Beeson (C. F. C.). **The Construction of Calcareous Opercula by Longicorn Larvae of the Group Cerambycini (Coleoptera, Cerambycidae).**—*Forest Res. Inst., Dehra Dun, U.P.*, Forest Bull. 38, 1919, 10 pp., 1 plate. [Received 31st December 1919.]

Attention is drawn to the power possessed by certain species of Longicorn beetles of economic importance of secreting lime in large quantities during the larval stage while feeding in the bark and sap-wood of the food-plants.

Before pupation the larva regurgitates the lime secreted during the larval development, and this, mixed with a variable proportion of gummy or silky matter, forms a plastic material which is moulded by the larva to a design constant for each species and exhibiting generic, if not specific, characters. The remains of this operculum in timber thus afford valuable means of identification.

The species in which this habit is described include *Aeolesthes holosericea*, F., *Hoplocerambyx spinicornis*, Newm., *Diorthus cinereus*, F., *Dialeges pauper*, Pasc., *Plocaederus obesus*, Gah., *Pachydissus* sp., and *Derolus* spp.

Investigations on the function of this calcareous operculum at the entrance to the pupal chamber in *Aeolesthes*, *Hoplocerambyx*, *Derolus* and *Pachydissus*, in which a simple cap-shaped operculum is formed, show that, being impermeable, it prevents excessive loss of moisture through the prepupal gallery, which is in direct communication with the outer air.

In *Plocaederus*, *Diorthus* and *Dialeges*, which prepare a complete egg-shell-like lining to the pupal chamber, the object is to prevent desiccation and to maintain a constant degree of humidity in the pupal cell.

A list of the food-plants of the respective beetles concerned is given, and from this it is shown that those in the first category live mainly in trees with a hard heart-wood, while the food-plants of the second comprise soft-woods or timbers with a very broad sapwood, in which the pupal chamber is formed. It is therefore concluded that the simple type of operculum has been evolved by species normally breeding in hardwoods which do not lose or absorb large quantities of water from the heart-wood, and that the complete egg-shell type is found in species that breed in soft-woods which are liable to rapid desiccation and greater extremes of moisture conditions.

ZVIEREZOMB-ZUBOVSKY (E.). **Зимняя Борьба съ Вредителями въ Саду.** [Winter Control of Garden Pests.]—**Донское Бюро по Борьбѣ съ Вредителями Сельско-Хозяйствен. Растенiй, Новочеркасскъ.** [*Don Bureau for Control of Pests of Agricultural Plants, Novotcherkassk.*] Leaflet no. 1, 4 pp., 4 figs. [Received 1st January 1920.]

Special attention is called to the necessity of winter treatment of orchard trees, since all insecticides required for later treatment are practically unobtainable in the south of Russia in present circumstances. The remedial measures advocated include the destruction of winter nests of *Aporia crataegi*, L., and of the gold-tail moth [*Arctornis chrysorrhoea*, L.], as well as the egg-masses of the lackey moth [*Malacosoma neustria*, L.] and the gipsy moth [*Porthetria dispar*, L.]. All overwintering larvae, such as those of *Cydia*, should be removed from cracks, etc., in the bark and burned, the bark being painted with a mixture of 4 lb. of freshly slaked and sifted lime, and half a glass full of clay to 1 bucket of water. The soil in orchards should be well dug over so as to destroy any pests hibernating in it.

ZVIEREZOMB-ZUBOVSKY (E.). **Очередныя Работы по Борьбѣ съ Вредителями въ Полѣ.** [Routine Work for the Control of Pests in the Field.]—**Донское Бюро по Борьбѣ съ Вредителями Сельско-Хозяйствен. Растенiй, Новочеркасскъ.** [*Don Bureau for Control of Pests of Agricultural Plants, Novotcherkassk.*] Leaflet no. 2, 3 pp., 3 figs. [Received 1st January 1920.]

The necessity for the collection and burning of all stubble of maize and sunflower plants in the early spring to ensure the destruction of the hibernating larvae of the European corn borer [*Pyrausta nubilalis*, Hb.], [*Mordellistena parvula*, Gyll.] and the Longicorn [*Agapanthia dahlii*, Richt.], is emphasised.

ZVIEREZOMB-ZUBOVSKY (E.). **Очередныя Работы по Борьбѣ съ Вредителями въ Амбарѣ.** [Routine Work for the Control of Pests in Storage.]—**Донское Бюро по Борьбѣ съ Вредителями Сельско-Хозяйствен. Растенiй, Новочеркасскъ.** [*Don Bureau for Control of Pests of Agricultural Plants, Novotcherkassk.*] Leaflet no. 3, June 1918, 3pp. [Received 1st January 1920.]

This bulletin deals in a popular form with methods of cleaning out barns and other storage places in summer in preparation for storing the harvest. All floors should be taken up and any grain that has fallen between the boards should be cleared out, and the foundation as well as the walls should be washed with 4 lb. of freshly slaked lime to a bucket of water. The wooden parts of the building may be washed with soda and lime. Pots containing a liquid consisting of barium chloride and water (in the proportion of ½ lb. to one bucket of water) should be placed in the buildings during hot weather as traps [*R.A.E.*, A, v, 299].

ZVIEREZOMB-ZUBOVSKY (E.). **Червивость Вишень и Ворьбъ съ ней.** [The Cherry Maggot and its Control.]—**Донское Бюро по Борьбѣ съ Вредителями Сельско-Хозяйствен. Растеній, Новочеркассъ.** [*Don Bureau for Control of Pests of Agricultural Plants, Novotcherkassk.*] Leaflet no. 4, 2 pp., 4 figs. [Received 1st January 1920.]

Great damage is caused to cherries in south Russia by the larvae of the cherry fruit-fly [*Rhagoletis cerasi*, L.]. The eggs are inserted into the fruit when it begins to ripen and the larvae feed on the flesh. When mature they drop to the ground, which they enter to a depth of about one inch for pupation, the adults emerging the following spring. The chief remedial measure is the destruction of the hibernating larvae by digging over the ground in the autumn.

ZVIEREZOMB-ZUBOVSKY (E.). **Краткій Отчетъ о Дѣятельности Донского Бюро по Борьбѣ съ Вредителями Сел.-Хоз. Растеніи въ 1917 г. и Обзоръ Враговъ Сельскаго Хозяйства Донской Области.** [Brief Report on the Work of the Don Bureau for the Control of Pests of Agricultural Plants for 1917, and Review of the Pests of Agriculture in the Don Province.] *Rostoff*, 1918, 36 pp., 10 figs. [Received 1st January 1920.]

The work of investigation into the life-histories of agricultural pests was very limited during 1917. This was the first year of existence of the Bureau and the equipment required, including microscopes and various laboratory requisites, was obtained with great difficulty.

A provisional list has been drawn up of all pests found in the Don Province. These include :—the Acarids, *Eriophyes tiliae*, Pag., var. *liosoma*, Nal., on limes ; *Tetranychus telarius*, L., on apple trees ; *Tyroglyphus farinae*, Koch ; *Tyroglyphus* sp. in flour ; *Eriophyes* (*Phytoptus*) *vitis*, Land., for which the chief remedial measure is the collection and destruction by fire of all fallen vine leaves ; *Damaeus radiciphagus*, Dement., causing the abandonment of viticulture in some districts ; *Hoploderma elipsoidalis*, Dement., on vines.

The Orthoptera include :—*Locusta* (*Pachytylus*) *migratoria*, L. ; *L.* (*P.*) *danica*, L. ; *Calliptamus italicus*, L. ; *Oedaleus nigrofasciatus*, DeG. ; *Oecanthus pellucens*, Scop. ; *Gryllotalpa gryllotalpa*, L.

Thysanoptera:—*Haplothrips tritici*, Kurdj., in early June on rye, wheat and also on late wheat.

Rhynchota :—*Eurygaster integriceps*, Put., on wheat, this bug being parasitised by *Telenomus semistriatus*, Nees, and *T. rufiventris*, Mayr; *E. maura*, L.; *Aelia acuminata*, parasitised by *Phasia*?; *A. furcula*, Fieb.; *Eurydema ornatum*, L., on cabbage; *Stephanitis pyri*, F., on pears; *Adelphocoris lineolatus*, Goeze, on lucerne; *Poeciloscytus cognatus*, Fieb., on beet; *Trigonotylus ruficornis*, Geoff., of which adults were found on maize in July; *Eriosoma* (*Schizoneura*) *lanuginosum*, Hrt.; *E.* (*S.*) *ulmi*, L.; *Tetraneura ulmi*, DeG., in colonies on the roots of maize in June, the galls on elms appearing at the end of April; *Brevicoryne* (*Aphis*) *brassicae*, L., recorded for the first time and present in great numbers; *A. laburni*, Kalt., on white acacia; *Myzus ribis*, L., on red currant in May; *Phylloxera vastatrix*, Planch., against which all infested vine-cuttings were destroyed in the presence of a special commission; *Lepidosaphes ulmi*, L. (*Mytilaspis pomorum*, Bch.), on apples; *Eulecanium* (*Lecanium*) *bituberculatum*, Targ.; *Pulvinaria vitis*, L.

Lepidoptera:—*Tinea granella*, L., in stored grain; *T. misella*, Z.; *Tineola biselliella*, Humm., appearing at end of January; *Phyllorycter* (*Lithocolletis*) *populifoliella*, Fr., on poplars in June, pupation occurring about 16th June and lasting about 8 days; *Lyonetia* sp. on apples; *Hemerophila* (*Simaëthis*) *pariana*, Cl., on apples at the end of September; *Eucosma* (*Tmetocera*) *ocellana*, F., in June; *Argyroploce* (*Olethreutes*) *variegana*, Hb., on apples, the adult moths appearing at the beginning of May; *Swammerdamia pyrella*, Vil., on apples; *Hyponomeuta malinellus*, Z., on apples, pupation being observed on the 22nd May and lasting until 2nd June; *H. variabilis*, Z., adults appearing in great numbers in June; *H. padi*, Z.; *H. euonymellus*, Scop.; *Plutella maculipennis*, Curt. (*cruciferarum*, Z.), which has three generations; *Sitotroga cerealella*, Ol., in stored and growing wheat; *Clysia* (*Conchylis*) *ambiguella*, Hb.; *Sparganothis* (*Tortrix*) *pilleriana*, Schiff.; *T. rosana*, L. (*laevigana*, Schiff.); *T. viridana*, L.; *T.* (*Pandemis*) *ribeana*, Hb., and *T.* (*P.*) *heparana*, Schiff., in May; *Cydia pomonella*, L., the first adults appearing about 11th May and hibernation commencing at the beginning of August; *Paranthrene* (*Sciapteron*) *tabaniforme*, Rott., on poplars in company with *Trochilium apiforme*, Cl., and *Aegeria* (*Sesia*) *culiciformis*, L., hibernation occurring in the larval stage; *Cossus cossus*, L., larvae of which were found in May, July and August and are parasitised by a Tachinid; *Zeuzera pyrina*, L., on ash and lilac, as well as on many fruit and ornamental trees; *Pyralis farinalis*, L.; *Aglossa pinguinalis*, L., in barns; *Loxostege sticticalis*, L.; *Pyrausta nubilalis*, Hb.; *Evergestis extimalis*, Sc.; *Cledeobia moldavica*, Esp., in June; *Dioryctria abietella*, F.; *Acrobasis obtusella*, Hb.; *Ephestia kühniella*, Z.; *E. elutella*, Hb.; *Plodia interpunctella*, Hb.; *Etiella zinckenella*, Tr., the adult moths appearing in May and August; *Homoeosoma nebulella*, Hb., with *H. nimbella*, Z., on sunflowers; *Galleria mellonella*, L., adults seen in May; *Crambus luteellus*, Schiff., on wheat; *C. jucundellus*, H.S.; *Aporia crataegi*, L.; *Pieris brassicae*, L., the caterpillars appearing on 25th June, pupation occurring on 9th July and adults on 21st July; *P. rapae*, L., on cabbages; *P. daplidice*, L., the adult butterflies being found in April, June, July and September; *Vanessa polychloros*, L., on elms in May, the adults appearing in June; *Melitaea maturna*, L., *Lasiocampa lanestris*, L., and *L. quercus*, L., on roses and lilac; *L. neustria*, L., on fruit trees and poplars, pupation beginning in May and adults appearing in the middle of June; *Gastropacha quercifolia*, L., on apples in June; *Cilix glaucata*, Sc., on young apple trees, pupation occurring on 29th September, in which stage hibernation takes place, there being two generations; *Dicranura vinula*, L., on poplars (*Populus suaveolens* and *P. tremula*); *Exaereta ulmi*, Schiff., on elms, adults being seen in April, the larvae from 1st to 26th May, and there being one generation a year; *Pygaera anachoreta*, F., on poplars on 9th July, pupation occurring on 20th July, adults 26th July, and the first caterpillars of the next generation on 4th August, being parasitised by Tachinids; *Phalera bucephala*, L., of which there are two generations; *P. bucephaloides*, O., on oak; *Acherontia atropos*, L., on potatoes in September; *Sphinx ligustri*, L., on lilac; *Smerinthus ocellatus*, L., on apples in July; *Amphidasys betularia*, L., in April and May; *Abraxas grossulariata*, L., on gooseberries in May and June; *Anisopteryx aescularia*, Schiff., on elm, adults appearing in March, larvae in April and pupation occurring about 23rd May; *Porthetria* (*Ocneria*) *dispar*, L.; *Stilpnotia salicis*, L., on poplars; *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, L.), both oak and apple trees being attacked by the caterpillars, which are heavily parasitised by *Tachina fera*, L.; *Arctornis chrysorrhoea*, L. (*E. similis*, Fuessl.); *Orgyia antiqua*, L.; *Dasychira pudibunda*, L.; *Calocasia coryli*, L., on maples in April; *Cymatophora octogesima*, Hb., on poplars; *Catocala nupta*, L., on poplars; *Phytometra confusa*, Steph. (*Plusia gutta*, Gn.); *Phytometra gamma*, L.; *Acronycta psi*, L., of which there are two generations; *A. tridens*, Schiff., on apples; *A. aceris*, L., on maple, being parasitised by ? *Euplectrus* and Tachinids; *A. rumicis*, L., on fruit trees, roses and lilac, hibernation occurring in the pupal stage; *A. megacephala*, F., on poplars; *Trachea* (*Hadena*) *basilinea*, F., on cut and standing wheat; *Trachea atriplicis*, L.; *Oria musculosa*, Hb., on wheat and oats, there being two generations a year; *Calymnia trapezina*, L.; *Brotolomia meticulosa*, L.; *Laphygma* (*Caradrina*) *exigua*, Hb.; *Athetis clavipalpis* (*C. quadripunctata*, F.); *Heliothis dipsacea*, L.; *H. scutosa*, Schiff.; *Euxoa* (*Agrotis*) *segetum*, Schiff., of which there are two generations a year; *A. ravida*, Schiff. (*obscura*, Brh.); *A. pronuba*, L.; *A. c-nigrum*, L.; *A. plecta*, L.; *Feltia* (*A.*) *exclamationis*, L.; *Euxoa* (*A.*) *tritici* var. *aquilina*, Hb.; *A. ypsilon*, Rott.; *Euxoa* (*A.*) *vestigialis*, Rott.; *Barathra* (*Mamestra*) *brassicae*, L., on beets; *Polia* (*M.*) *oleracea*, L., on apples, hibernation occurring in the pupal state; *P.* (*M.*) *persicariae*, L.; *Scotogramma* (*M.*) *trifolii*, Rott.; *Polia suasa*, Schiff. (*M. dissimilis*, Knoch.); *Charaeas graminis*, L.; and *Hylophila prasinana*, L., on oak.

Coleoptera include:—*Ophonus calceatus*, Duf.; *Tenebroides* (*Trogosita*) *mauritanicus*, L.; *Laemophloeus ferrugineus*, Steph.; *Sylvanus* (*Oryzaephilus*) *surinamensis*, L.; *Agrilus* sp. on raspberries; *Agriotes lineatus*, L., on potatoes: *Xylonites retusus*, Oliv., on elm; *Sitodrepa panicea*, L., and *Ptinus fur*, L., in flour; *Lytta vesicatoria*, L., on ash; *Mylabris* sp. on potatoes, lucerne, mustard, flax, etc.: *Mordellistena parvula*, Gyll., of which about 18 adults were found in one sunflower stalk; *Opatrum sabulosum*, Bjerk.; *Tenebrio molitor*, L., and *T. obscurus*, F., in flour; *Alphitobius piceus*, Oliv.; *Tribolium castaneum*, Hbst., (*ferrugineum*, F.), first record; *Palorus* (*Caenocorse*) *depressa*, F., all stages being found at once in stored flour, and both adults and larvae hibernating: *Stromatium unicolor*, Ol.; *Pyrrhidium sanguineum*, L., in oak timber, pupation occurring in the spring and there being only one generation; *Plagionotus arcuatus*, L., on elm, oviposition occurring in May and pupation in early spring; *Dorcadion carinatum*, Pall.; *Agapanthia dahlii*, Richt., on sunflowers; *Mesosa myops*, Dalm., in old dead oaks; *Lema melanopa*, L., and *L. cyanella*, L., on oats; *Crioceris duodecimpunctata*, L., on asparagus; *Labidostomis* sp. causing great damage to young grape plants; *Colaphus hoefti*, Mén., on mustard; *Entomoscelis adonidis*, Pall., on rape in May; *Melasoma tremulae*, F., *M. populi*, L., and *M. saliceti*, Wse., on poplars; *Galerucella luteola*, Müll., apparently having two generations a year in April and September and feeding on elm; *Chaetocnema aridula*, Gyll.; *Haltica quercetorum*, Foudr., on oak; *Phyllotreta vittula*, Rdtb.; *P. nemorum*, L., on flax; *Aphthona euphorbiae*, Schr.; *Cassida nebulosa*, L.; *Bruchus pisorum*, L. (*pisi*, L.); *B. lentis*, Boh.; *Sciaphobus squalidus*, Scop.; *Bothynoderes punctiventris*, Germ., on beet; *Ceuthorrhynchus macula-alba*, Hbst.; *Calandra granaria*, L.; *Anthonomus pomorum*, L.; *Magdalinus aterrimus*, L.; *Apion pomonae*, L.; *Rhynchites aequatus*, L., in May; *R. auratus*, Scop.; *R. bacchus*, L.; *R. pauxillus*, L.; *Byctiscus betulae* (*R. betuleti*, F.), on grapes; *Gasterocercus depressirostris*, F., on oak; *Scolytus* (*Eccoptogaster*) *scolytus*, F., in birch and elm, in which it has two generations; *S.* (*E.*) *pygmaeus*, F., with two generations a year; *S.* (*E.*) *multistriatus*, Marsh., with two generations a year, except in elm in which only one occurs; *S.* (*E.*) *kirschi*, Skal., in elm and birch; *S.* (*E.*) *ensifer*, Eich.; *S.* (*E.*) *intricatus*, Koch; *S.* (*E.*) *rugulosus*, Koch, with two generations and hibernating in the larval stage; *Phloeotribus caucasicus*, Reitt., in ash; *Hylesinus crenatus*, F., in ash; *H. oleiperda*, F.; *H. fraxini*, Panz., doing very serious damage to ash, necessitating the planting of trap-trees; *Pteleobius vittatus*, F., in elm, with one generation and hibernating in the adult stage; *P. kraatzi*, Eichh.; *Ernoporus tiliae*, Panz., in lime; *Xyleborus monographus*, Rtzb., in oak; *Xyleborus* (*Anisandrus*) *dispar*, F.; *Lethrus apterus*, Laxm., on grapes; *Rhizotrogus aequinoctialis*, Hbst.; *Amphimallus solstitialis*, L.; *Polyphylla fullo*, L.; *Anoxia pilosa*, F.; *Anisoplia austriaca*, Hbst., on oats and rye; *A. cyathigera*, Scop.; *A. zwickii*, Fisch.; *A. segetum*, Hbst.; *A. deserticola*, Fisch.; *Pentodon monodon*, F., on maize, the adults hibernating; *Epicometis* (*Tropinota*) *hirta*, Poda, on rye and mustard; and *Oxythyrea funesta*, Poda.

Diptera include:—*Mayetiola destructor*, Say, on wheat, parasitised by *Merisus destructor*, Say, and *Polygnotus minutus*, Lind.; *Rhagoletis* (*Spilographa*) *cerasi*, L., on cherries; *Chlorops taeniopus*, Meig.; *Oscinella frit*, L., on wheat; *Hydrellia griseola*, Fall., on oats.

Hymenoptera include:—*Hylotoma rosae*, L. on roses; *Trichiocampus ulmi*, L. (*Cladius uncinatus*, Hart.), on birch and elm, with two or three generations a year and hibernating in the larval stage, the eggs being laid in the second half of April in the central vein of the leaves; *Cladius* sp. on poplars; *Athalia colibri* (*spinarum*, F.), on rape and mustard; *Macrophya punctum-album*, L., on ash; *Eriocampoides limacina*, L. (*Eriocampa adumbrata*, Kl.), on cherries and pears; *Xyphidria longicollis*, Geoffr. (*annulata*, Jur.), on oak; and *Cephus pygmaeus*, L., on wheat.

ZVIEREZOMB-ZUBOVSKY (E.). **Обзоръ Вредителей.** [Review of the Pests of Agriculture.]—**Отчетъ о Дѣятельности Донского Бюро по Борьбѣ съ Вредителями Сельскохозяйственныхъ Растенiй за 1918 Годъ.** [*Report on the Work of the Don Bureau for the Control of Pests of Agricultural Plants for 1918*], *Rostoff*, 1919, pp. 8–29, 15 figs. [Received 1st January 1920.]

Owing to adverse circumstances as a result of general conditions in the Don district the experimental work planned for the year under review had to be abandoned and the general activities of the Bureau very much reduced.

The list of noxious insects has been augmented and contains a number of new ones in addition to most of these in the previous one [see preceding paper].

Acarids include :—*Eriophyes pyri*, Pgst., on pears.

Rhynchota :—*Stephanitis pyri*, F., on apples, pears and hawthorn ; *Aphis gossypii*, Glov., on melons and pumpkins ; *Aleurodes* sp. causing serious damage to geraniums in hot-houses, there being about 10 generations a year and the life-cycle occupying about 36 days (this white-fly may also migrate to roses under laboratory conditions).

Lepidoptera :—*Tortrix* (*Cacoecia*) *rosana*, L., on elm, ash, maple, lilac and rose ; *T.* (*C.*) *xylosteana*, L., on ash and raspberry ; *T.* (*Pandemis*) *heparana*, Schiff., on pears, plums, cherries and apricots ; *Cydia* (*Grapholitha*) *dorsana*, F., on peas ; *Enarmonia* (*Semasia*) *minutana*, Hb., on poplars ; *Trochilium apiforme*, Cl. ; *Aegeria* (*Sesia*) *myopaeformis*, Bkh., in June and July ; *Plodia interpunctella*, Hb., in dried cherries ; *Pieris napi*, L., on the wing from March to May, from mid-June to the end of July and end of August to about 20th of October ; *Eriogaster lanestris*, L., on cherry leaves ; *Pygaera curtula*, L., on poplars in June ; *Biston hirtarius*, Cl. ; *Demas coryli*, L. ; and *Agrotis saucia*, Hb., in July.

Coleoptera include :—*Sylvanus* (*Oryzaephilus*) *surinamensis*, L. ; in dried cherries and grain ; *Crioceris asparagi*, L., and *C. quatuordecimpunctata*, Scop. ; *Rhynchites giganteus*, Kryn., causing great damage to winter pears in May ; *Myelophilus piniperda*, L., in pine trees ; *Rhizotrogus aestivus*, Oliv. ; *Melolontha hippocastani*, F., on pines.

Diptera, *Scenopinus* sp. in flour.

Hymenoptera :—*Lyda* sp. on common pine, but not attacking Austrian pine ; *Trachelus tabidus*, F., attacking rye, both winter and spring wheat and oats.

ZVIEREZOMB-ZUBOVSKY (O.). **Къ Бiологiи и Морфологiи Мавританской Козявки.** [On the Biology and Morphology of *Tenebroides mauritanicus*, L.]—**Отчетъ о Дѣятельности Донского Бюро по Борьбѣ съ Вредителями Сельскохозяйственныхъ Растенiи за 1918 Годъ.** [*Report on the Work of the Don Bureau for the Control of Pests of Agricultural Plants for* 1918], *Rostoff*, 1919, pp. 1–8, 10 figs. [Received 1st January 1920.]

The adult beetles of *Tenebroides mauritanicus*, L., have been found to be predaceous on the larvae of various bark-eating insects, but in captivity they have been reared entirely on flour. The first adults were noticed in store-houses at the beginning of April. Oviposition began about the 20th April in the super icial layer of the flour. The eggs are laid in batches of from 18 to 27 at intervals of from 7 to 14 days, and hatch in from 7 to 24 days. The larvae moult after about 27 to 31 days, the subsequent 3 moults occurring at intervals of from 9 to 10, 10 to 14, and 20 to 23 days respectively. About 22 to 27 days after the fourth moult the last skin is shed and the larva is ready to pupate, the prepupal stage lasting about 10 days under normal temperature, which is about 68° F. The pupal stage lasts from 8 to 30 days and the females commence oviposition about 5 to 7 days after emergence in the spring and summer whereas later individuals hibernate and begin laying the following spring. The exact length of adult life has not been determined, but individuals emerging in the autumn are thought to live from 9 to 10 months. There is only one generation a year, but owing to the prolonged period of oviposition extending from April to September all stages may be found simultaneously. The larvae emerging in the autumn hibernate in this stage.

Stored products should be kept at a low temperature, as apparently these larvae cannot withstand cold. All remedial measures in use against other pests of stored grain may be equally applied to *T. mauritanicus*.

Zvierezomb-Zubovsky (E.). **Къ Вопросу о Методикѣ Анализа Зерна на Зараженіе его Вредителями.** [On the Method of Analysing Grain for Insect-infestation.]—Circular of *Don Bureau for Control of Pests of Agricultural Plants, Novotcherkassk*, 8 pp. [Received 1st January 1920.]

The bulk of the information contained in this paper has been previously noticed [*R.A.E.*, A, v, 299, 455].

Zvierezomb-Zubovsky (E.). **Историческій Очеркъ Возникновенія Донского Бюро по Борьбѣ съ Вредителями Сельскохозяйственныхъ Растеній, его Задачи, Нужды и Современное Состояніе.** [Historical Outline of the Inauguration of the Don Bureau for the Control of Pests of Agricultural Plants, its Problems, Requirements and Present Condition.]—**Отд. Оттискъ изъ Журнала Юго Восточный Хозяинъ, Ростовъ на Дону.** [Separate from the *Jo rnal of S uth-Eastern Husbandry*], *Rostoff*, no. 1–4, 1918. 15 pp. [Received 1st January 1920.]

The contents of this paper are indicated by the title.

Ballou (H. A.). **The Toad in the West Indies.**—*Agric. News, Barbados*, xviii, no. 459, 29th November 1919, pp. 378–379.

It is suggested that it would be advantageous to increase the number of toads in the West Indies, as they are well known insect-feeders. The common species are *Bufo marinus* and *B. agua.* It is supposed that their numbers have decreased owing to the gradual drainage of ponds, planting of pasture-land and the clearing of ravines and gullies. To restore their numbers individuals could be brought from some part of the islands where they are more abundant, or egg-masses might be imported from the United States or Mexico.

Madan Mohan Lal. **Report of the Assistant Professor of Entomology.**—*Rept. Dept. Agric. Punjab, Year ended 30th June* 1917, *Lahore*, 1917, [Appendix iv, pp. ix–x]. [Received 5th January 1920.]

The pests recorded include :—*Earias insulana*, Boisd., and *E. fabia*, Stoll (cotton bollworms), the damage by which has been reduced from 20 per cent. to 4 or 5 per cent. owing to the parasite *Rhogas* sp. ; *Myllocerus blandus*, Fst., reported for the first time as a serious pest of cotton, confines itself to maize when this is used as a trap-crop ; *Oxycarenus laetus*, Kirby (dusky cotton-stainer) and *Dysdercus cingulatus*, F. (red cotton-stainer) on cotton. A scale-insect, *Monophlebus stebbingi*, Green, and Jassids, *Idiocerus* spp., infested mangoes, remedial measures against the latter insects being the thinning out of the groves and the breaking up of the soil surface round the roots to increase the vitality of the trees ; five sprayings of 1 lb. of fish-oil resin soap to 15 gals. of water applied from February to March ensures the setting of the fruit. Date palms were attacked by *Rhynchophorus ferrugineus*, Oliv., during September and October. Various remedial measures were tried ; of these the erection of mud enclosures filled with water round the infested trunks proved the most successful. Spraying with ½ pint of crude oil in 4 gals. of water proved effective against a Psyllid, *Euphalerus citri*, on *Citrus*. The food-plants of *Euproctis flava*, F., include castor-oil plants, cotton, peaches, pomegranates and roses. A powerful water spray proved the most effective remedial measure against these caterpillars.

Madan Mohan Lal. **Report of the Assistant Professor of Entomology.**—*Rept. Dept. Agric. Punjab, Year ended 30th June 1918, Lahore*, 1918. [Appendix iv, p. viii.] [Received 5th January 1920.]

Owing to the presence of the parasite *Rhogas* sp. the damage done by *Earias insulana*, Boisd., and *E. fabia*, Stoll, to cotton has greatly diminished. New parasites of these bollworms that have been discovered are a Tachinid fly parasitising the larvae and a Braconid and a black Chalcid infesting the pupae. Bands of well-carded cotton-wool with the fluffy side outwards and grease bands of crude vaseline or rape oil applied to the trunks proved most effective in preventing *Monophlebus* sp. from reaching the blossoms of mango trees.

Spraying in March and June with crude oil and tobacco decoction was successfully tried against the Psyllid, *Euphalerus citri*, which has been causing great damage to *Citrus*.

Jardine (N. K.). **Tortrix Flight Breaks. Field Experiments with Anti-Tortrix Fluids.**—*Ceylon Dept. Agric., Peradeniya*, Bulls. 45 & 46, September & November 1919, 4 pp., 1 plate, & 23 pp., 4 plates. [Received 5th January 1920.]

Details are given of the experimental work of the investigation dealing with the control of tea tortrix [*Homona coffearia*] in Ceylon. The results of these investigations have previously been noticed [*R.A.E.*, A, vii, 113 & 404].

SPEYER (E. R.). **Recommendations for the Control of Shot-hole Borer of Tea.**—*Trop. Agriculturist, Peradeniya*, liii, no. 1, July 1919, pp. 36–37. [Received 5th January 1920.]

Young tea plants are seldom attacked by the shot-hole borer beetle [*Xyleborus fornicatus*], and if they are not left more than 18 months in the nurseries and are cut down to six inches before planting out, the danger of introducing the borer into new, isolated clearings is minimised. After cutting down, the upper portions should be immediately burned. In new clearings, when "centering," the branches of each bush in the clearing should be bent down and all that break owing to borer infestation should be cut from the base and burned. When bringing the tea into bearing, all slashing should be avoided and the bushes should be allowed to grow for an extra period and then pruned down as low as required. The prunings should be burnt or the leaves and small twigs cut off and buried and the larger wood burnt. If the tea, or the surrounding fields, are badly infested, the bushes should be painted immediately after pruning, with a paint composed of 10 lb. bar soap, sliced up and heated until it melts, and five pounds of fir resin added and stirred in; this should be allowed to boil at an even temperature, over-boiling being avoided, until all the water in the soap is boiled off and a dark amber-coloured liquid results, into which 1 gal. of crude fish-oil is poured. This liquid is allowed to cool and set, and is cut into bars. For application, 6 lb. of the emulsion is squeezed with the hand into 2 gals. warm water, and the thick white liquid, which must be kept stirred, can then be put on the bushes, by hand for preference. If this paint cannot be procured, all branches that do not put out new shoots after pruning should be cut off and burned within 2 months at elevations of 100 to 2,000 feet; within 3 months at elevations of 2,000 feet to 4,000 feet; and within 4 months at elevations of 4,000 feet and upwards. Tea in the flush should be cut as described when "centering," within 9 months after pruning, or, at high elevations when pruning is done at more than two years' interval, once within the first 12 months after pruning and once again between the 16th and 24th months after pruning. The only economic method of dealing with tea prunings is to slash off the leaves and small twigs from the branches after they have been cut from the bushes. The latter are buried in holes or forked into the soil and the thicker wood immediately burned. Prunings, whether left on the ground or buried, allow the beetle to escape. Good cultivation is essential, and insoluble manures such as cattle bulk, and such green manure plants as dadap, are recommended. Dadap (*Erythrina*), *Tephrosia*, *Crotalaria* and *Albizzia* are all attacked by *X. fornicatus*, and should be kept under control. Castor-oil plants are favourite food-plants, and should not be grown near tea. They are not recommended as traps.

HUTSON (J. C.). **Progress Report of the Entomologist for Quarter, July-September, 1919.**—*Trop. Agriculturist, Peradeniya*, liii, no. 5, November 1919, p. 341. [Received 8th January 1920.]

Xyleborus fornicatus is reported from several estates previously uninfested. Other pests of tea include a termite, probably *Calotermes militaris*, which apparently enters the bush high up and works up and down the branches and into the main stem, causing the tops of trees to die back. All dead wood must be cut out and the wounds tarred. *Saissetia hemisphaerica* and a bag-worm, probably *Psyche albipes*, are also reported.

Miscellaneous pests include: *Leptocorisa acuta* (rice bug); *Orgyia postica* (tussock moth) on dadap; *Terias silhetana* on *Albizzia*; a Hesperid, *Parnara* sp., on coconuts; Melolonthid beetles on roses: and cutworms, *Agrotis ypsilon*.

Duport (L.). **Rapport à Monsieur le Président de la Chambre d'Agriculture du Tonkin et du Nord-Annam sur quelques nouvelles Observations effectuées à la Station Entomologique de Cho-Ganh.**—*Supplement to Bull.* 122, *Chambre d'Agric. Tonkin & Nord-Annam*, no. 4, April–May 1919, 10 pp. [Received 5th January 1920.]

From investigations on the coffee borer [*Xylotrechus quadripes*, Chevr.] that have been continued since the publication of the last report [*R.A.E.*, vii, 269] it is evident that the life-history of the beetle varies considerably according to circumstances, so much so, in fact, as to render research very difficult. It has been proved that repellent washes on the trunks and the treatment of diseased bushes are futile and that more knowledge must be acquired as to the habits of the borer before remedial measures can be successful. Investigations and cage experiments have revealed several new food-plants, some of which are chosen by the borer for oviposition in preference to coffee. Among these is *Oroxylon indicum*, the fruit of which is edible and the wood useful for making sabots. This tree is common and, although both wood and bark are very different from coffee, it is frequently preferred to the latter for oviposition; it does not appear however to be well adapted to the development of the insect as the larvae obtained from it were as a rule rather small. Examples were reared on this plant in 5½ months after the date of oviposition. Eggs deposited upon *Canarium* sp., of which the bark is almost smooth, on 20th December, produced insects from 21st to 30th May. From two stems of *Randia dumetorum* with smooth bark and many spines, chosen for oviposition, adults have emerged after five months. An adult has also emerged from *Rhus* sp. Several other native food-plants are mentioned, and others will doubtless be found. Oviposition on dry bamboo seems to be accidental, any larvae that hatched dying almost immediately. From bamboo stems riddled by galleries resembling those of *X. quadripes* only *Chlorophorus annularis*, Fairm. (bamboo borer) was bred, the adults emerging ten months after the stems were placed in the cages. The life-cycle of this borer is therefore considerably longer than that of *X. quadripes*.

The factors that influence the females of *X. quadripes* in oviposition are complex and not yet understood, for the insects do not show consistent habits, even on coffee. The life-cycle obviously varies, not only with the season of oviposition but also with the individual, the plant on which it is living and the particular conditions under which the larval and nymphal stages are passed. On the cut branches of plants other than coffee the life-cycle has been found to vary from 4 to 6 months; on coffee the variation is from 4 to 8 months at least. Further attempts to infest coffee with the bamboo borer, *Chlorophorus annularis*, have given negative results.

For the first time in the course of these investigations, begun in 1914, infested coffee branches have produced a Hymenopterous parasite, an Ichneumonid of which three larvae have been found living as parasites of the borer. Unfortunately, it has not yet been possible to breed this. Similar parasites have emerged from teak infested with *X. quadripes*. From dry bamboo stems, kept in the laboratory for rearing *C. annularis*, some 50 individuals of a somewhat similar Ichneumonid were bred. Observations showed that this parasite will not attack well-grown larvae of *C. annularis*, but seeks out the oviposition marks of this borer and deposits eggs upon the mature eggs or young larvae. In cages this species also parasitised the young larvae of *X. quadripes* on coffee; further investigations will be made to determine whether this parasite can be utilised as an important factor in control. Meantime, it is being sent away for identification.

Recent observations indicate that *Coffea robusta* and *C. liberica*, of which the susceptibility to attack by *X. quadripes* has been in doubt [*R.A.E.*, A, vii, 51], are highly resistant to attack, particularly the former; this variety of coffee, although infested by the borer, did not produce any adults or apparently suffer in vitality.

On coffee plantations the attacks of the borer are still severe. It is possible in the course of working on the bushes to capture a number of the insects when just ready to emerge or after emergence, and a reward might be offered for any taken in this way. None of the toxic substances applied to the infested bushes has given any success or hindered the emergence of the adults.

Rice of the 5th month harvest in the neighbourhood of Cho-ganh has suffered somewhat from caterpillars perforating the stems, but this crop generally suffers less than that of the 10th month harvest. On one area the infested stems have been cut out and burned. The larvae of *Schoenobius incertellus*, Wlk., have been much less abundant in the rice stems than in the previous year at the same season. The caterpillars of several other moths that are under observation have damaged the stems, and prevented formation of the grain.

FROGGATT (W. W.). **The Black Banana Stem Weevil** (*Cosmopolites sordidus*, **Germ.**)—*Agric. Gaz. N.S.W., Sydney*, xxx, no. 11, November 1919, pp. 815–818, 6 figs.

Cosmopolites sordidus, Germ. (black banana borer) is now recorded from several localities in New South Wales, and, although at present not widely distributed or increasing very rapidly, it may at any time become a very serious banana pest. The appearance, life-history and habits of this weevil are described and banana growers are asked to be on the watch for its occurrence.

FERRIS (G. F.). **A New Species of** *Pseudodiaspis* **(Hemiptera; Coccidae).**—*Entom. News, Philadelphia*, xxx, no. 10, December 1919, pp. 275–276, 1 fig.

Pseudodiaspis multipora, sp. n., is described, this genus being represented only in the south-western part of the United States and Mexico. The scale was taken from a herbarium specimen of *Phoradendron flavescens* from oak in California.

NOUGARET (R. L.). **The Achemon Sphinx Moth** (*Pholus achemon*, **Drury**).—*Mthly. Bull. Cal. Dept. Agric. Sacramento*, viii, no. 10, October 1919, pp. 560–584, 17 figs.

Pholus achemon, Drury (grape-vine sphinx moth) occurs in all parts of the United States and Canada where grapes are grown, but outbreaks of this pest have not been reported outside California. Several cases of sudden severe infestations are described, in which grape-vines were completely defoliated. During these attacks attention was entirely given to controlling the pest until the larvae were completely killed off, so that there was little possibility of investigations into the life-history. It is now known that the eggs are deposited singly on the upper surface of fully-developed leaves, never on the tender growing leaves of the shoots. The number of eggs laid by one female and the period of incubation have not been discovered. There are three larval stages, lasting on an average 7½ days, 7 days and 9 days respectively. During the whole larval period feeding continues voraciously, the leaves being entirely skeletonised. The vine frequently puts forth a fresh growth of leaves within about a week or 10 days, and this new growth can be hastened by irrigation, but in the meantime the development of the fruit has been arrested and the berries may shrivel and drop so that the crop is a total loss, and in any case they do not attain perfect maturity. When the larva is fully grown, it ceases feeding and drops or descends to the ground. It then burrows into the soil and after 5 or 6 days of this pre-pupal period, pupation begins. Apparently some moths emerge about one month later, but the majority remain in the ground until the following spring. There is therefore only one real generation in a year with a partial second. It also seems probable that a partial generation may precede the true one, from a few over-wintering pupae. The larvae are of two distinct colours, and examination indicates that reddish-tinted larvae develop into male moths, while green ones give rise to females; this point requires further investigation.

Many of the larvae are attacked by disease in the pre-pupal period and shrivel up. Many others are parasitised by a Tachinid, *Sturmia distincta*, Wied., which oviposits on them. Severe infestations occur so suddenly that time is an essential factor in successful control. An effective remedy devised by the author consists of 11 lb. lead arsenate paste, with 24 lb. atomic sulphur, 1 lb. ground glue, 1½ U.S. pints Black-leaf 40 and 200 U.S. gals. of water. This is most effective if applied a few days before the larvae are fully grown. The spray should be applied with a spray gun. In one severely infested vineyard, the treatment of which is described, an average of five outfits of two spray guns each were kept working for 17 days from 23rd May to 9th June, during which time 165,000 U.S. gallons of the spray were used. The cost of the materials, apparatus and labour amounted to about £2,200. As the crop saved was estimated by the owner to be worth about £60,000, the control work cost less than 4 per cent. of the net returns. Caterpillars of the first and second instars were very susceptible to the spray and died almost immediately after contact. After 48 hours all individuals on the vines were either dead or dying.

In infested vineyards where pupation had already taken place. turkeys were turned into them after a shallow cultivation of the soil; the birds ate numbers of the pupae, but the tough shell was responsible for the death of many of the birds, so the measure cannot be recommended. Ploughing was started early the following spring while the ground was still quite moist, and, although only a small proportion of pupae were destroyed by this means, very many were eaten by large numbers of crows that followed the plough. It was observed that these birds did not eat the tough pupal shell, but only the contents.

MASKEW (F.). **Report for the Month of October, 1919.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, viii, no. 10, October 1919, pp. 610–612.

The pests intercepted during October include:—From China, *Araecerus fasciculatus* in dried yams, and Lepidopterous larvae in dry roots and tea. From Hawaii, *Ripersia palmarum, Hemichionaspis minor* and *Chionaspis inday* on coconuts; *Howardia biclavis, Pseudaonidia clavigera, Coccus elongatus, Saissetia nigra, Pseudococcus filamentosus* and an undetermined Tetranychid on *Hibiscus*; *Aspidiotus lataniae, A. cyanophylli* and *Pseudococcus* sp. on bulbs; *Diaspis bromeliae* and *Pseudococcus bromeliae* on pineapples; *Coccus elongatus* on betel leaves. From India, *Aspidiotus lataniae* on green coconuts and Dipterous larvae in peppers. From Japan, *Bruchus chinensis* in peas; *Calandra oryzae* in maize; Lepidopterous larvae in seed pods and in onion sets; and an undetermined weevil in beans. From Manila, *Solenopsis geminata* var. *rufa* in packing; Lepidopterous larvae and an undetermined weevil in chick-peas. From Central America, *Aspidiotus cyanophylli, Pseudococcus* sp. and *Icerya purchasi* on bananas. From Mexico, *Lepidosaphes beckii* on limes and *Aspidiotus perniciosus* on apples. From Arizona, *Cydia* (*Laspeyresia*) *pomonella* in pears. From Arkansas, *Aspidiotus perniciosus* and *Lepidosaphes ulmi* on apples. From Connecticut, *Eriosoma lanigerum* and *Aspidiotus perniciosus* on apples. From Florida, *Phomopsis citri, Lepidosaphes beckii* and *Parlatoria pergandei* on grapefruit. From Idaho and Iowa, *Cydia pomonella* on apples. From Illinois, *Pseudococcus* sp. and an undetermined mite on bulbs. From Massachusetts, *Lepidosaphes ulmi* on apples. From Michigan, *Cydia pomonella* on apples. From Nevada, *C. pomonella* on apples and *Heterodera radicicola* in potatoes. From Oregon, *C. pomonella* on apples. From Ohio, *Tetranychus mytilaspidis* on roses. From Pennsylvania, *Pseudococcus* sp. and *Coccus hesperidum* on crotons and an undetermined mite and Aphid on ornamental plants and grasses. From Washington, *C. pomonella, Tetranychus* sp., and *Lepidosaphes ulmi* on apples.

WOGLUM (R. S.) & BORDEN (A. D.). **Comprehensive Demonstration of Argentine Ant Control.**—Separate from *California Citrograph, Los Angeles*, April 1919, 1 p., 3 figs. [Received 6th January 1920.]

The earliest infestation of Californian orchards by the Argentine ant [*Iridomyrmex humilis*] was recorded in 1908, and the rapid spread of this pest in a climate that is eminently suited to its development signifies the probability of its distribution throughout the State within a few years' time if adequate measures are not taken to cope with it. While the ant has been known to injure blossoms, its chief importance in citrus groves is due to the fact that mealy-bugs, scale-insects and Aphids become much more abundant as a result of its presence. Extensive experiments have proved conclusively the direct relation of the Argentine and certain other ants to the control of the mealy-bugs on citrus trees. Banding and the use of various ant-traps have been tried during recent years, but the only satisfactory measure found by the authors of the present paper was the use of a modified form of the poison syrup known as "Barber formula." For Californian use the poison syrup used consisted of 12 lb. granulated sugar, 10 U.S. pints of distilled water and $\frac{1}{4}$ oz. crystallised tartaric acid; these are boiled for 30 mins. and then allowed to cool, distilled water being added to allow for evaporation. Sodium arsenite (C. P. only) is then dissolved in hot, distilled water using $\frac{3}{4}$ oz. to 1 U.S. pint. This when cool should be added to the poison solution and stirred in well; 2 lb. strained honey is then added and mixed thoroughly. Only the purest ingredients will give success. The original "Barber formula" was found to be so concentrated as to produce rapid crystallisation in the dry Californian atmosphere, but if modified as described, it should retain its liquid form for several months.

The best containers are 2 oz. spice tins or $\frac{1}{4}$ lb. paraffined paper sacks for orchard use, the tin being preferable because of its greater resistance to weather and ease in filling. Before use a $\frac{1}{4}$ inch hole is punched near the top to hang it up by and it is then dipped completely into molten paraffin to prevent leaking and rusting. About a dozen long strands of excelsior are placed in each tin or sack, 1 to $1\frac{1}{4}$ inches of syrup added and the covers adjusted; they are then ready for distribution. One tin or sack should be attached to each tree, usually on the trunk near the main branches or on a main branch near its base. The spot is chosen with regard to the main trail of ants and on exposed trunks away from direct sunlight. Each tree should be inspected every month or six weeks and the container refilled where necessary.

Ant control about buildings and ornamental grounds is more difficult, and requires the liberal use of containers on the buildings, plants and on the ground and wherever there are heavy trails, and these should be constantly moved as new trails appear. Insecticide treatments should also be given when the infestation is bad and compost or rubbish piles likely to harbour strong colonies should be removed or treated. The best seasons for ant control are during the spring, when scales and other soft-bodied insects are not abundant, and during autumn, when cold nights interfere with the ants' foraging habits. The cost of this method is less than fumigation or spraying, not exceeding 2*d.* per tree including materials and labour, plus subsequent inspection and refills not exceeding 1*d.* per tree.

Particulars are given of the efficiency of this method where 150 acres have been treated, resulting in total eradication of the pest. A further area of about 550 acres is now under treatment.

Heinrich (C.). U.S. Bur. Entom. **Note on the European Corn Borer (*Pyrausta nubilalis*, Hübner) and its nearest American Allies, with Description of Larvae, Pupae and one New Species.**—*Jl. Agric. Research, Washington D.C.*, xviii, no. 3, 1st November 1919, pp. 171–178, 5 plates. [Received 7th January 1920.]

This paper is written with the object of enabling the positive identification and separation of *Pyrausta nubilalis*, Hb., from its nearest American allies [see also *R.A.E.*, A, vii, 395]. The new species described is *Pyrausta ainsliei*, the food-plants of which include maize, *Polygonum*, *Ambrosia*, *Xanthium* and *Eupatorium*.

Baker (A. C.) & Turner (W. F.). U.S. Bur. Entom. **Apple-Grain Aphis.**—*Jl. Agric. Research, Washington, D.C.*, xviii, no. 6, 15th December 1919, pp. 311–324, 1 fig.

When the studies on the apple-grain aphis recorded in this paper were made in Virginia during 1914–1916, opinions were divided as to whether migration was annual or biennial. At that time also the species was known as *Aphis avenae*, F., but it is now considered that the species concerned is *Rhopalosiphum prunifoliae*, Fitch.

A number of species that have very similar summer forms on grain have in the past been confused. These include *R. prunifoliae*, Fitch, which winters on apple and migrates to grains and grasses, and has been incorrectly recorded as *Aphis avenae*, F.; *R. padi*, L., which is abundant in Europe upon bird-cherry and migrates to grasses in the summer, and of which *A. avenae*, F., is a synonym and also probably *A. pseudoavenae*, Patch; and *A. cerasifoliae*, Fitch, which is common on choke-cherries and in its summer forms on grass, is almost indistinguishable from the two former species. A number of other species with very similar summer forms occur, but these are either undescribed or their life-histories are not fully known.

R. prunifoliae, with which the present paper deals exclusively, deposits its winter eggs mainly on the small branches of the lower portions of apple trees, generally on the fruit spurs, in scars, or exposed on the twigs and small branches. A few of these eggs hatch during March or earlier, but the young nymphs are usually killed off by cold. The main period of hatching is from 3rd to 10th April. The average duration of the nymphal period is 13 days, the total life of the stem-mothers varying from 23 to 49 days. The average number of young produced by seven stem-mothers examined was 99. By the time the young stem-mothers were feeding the majority of the buds had begun to open and the insects clustered upon the terminal buds, the leaves of which had completely expanded by the time they were adult. Their young migrated, almost immediately after birth, to the under-surface of the leaf. In 1915, four generations after the stem-mother were bred on apple. Each of these was partly apterous and partly alate but under normal conditions it seems as though the 4th generation is invariably winged. The average length of life of the spring apterous form was 31 days; the average nymphal life of the spring migrant forms varied from 8 to 12 days, the variation being closely connected with variations in the mean temperature. The spring migration lasted from about 1st May to 7th June. No general migration occurred with this species either in 1914 or 1915; alate insects left the apple-trees singly a day or two after becoming adults. No attempt was made to determine the species of Graminaceae upon which the insect spends the summer; in experiments it lived readily on both oats and wheat. The average number of young produced was 13, the length of life averaging 27 days. The majority of the summer forms found on oats are apterous, and congregate chiefly on the stems and lower portions of the leaves. The apterous insects frequently wander from plant to plant, though the summer migration is carried on mainly by alate individuals. The immature stages of the summer apterous form covered periods varying from 6 to 12 days, according to temperature conditions. A chart illustrates the effect of temperature on the length of the larval period.

Apterous vivipara and autumn migrants are produced promiscuously, just as are the summer forms earlier in the season. Migration, as with the spring forms, does not occur *en masse* but is distributed over a period of 3 to 4 weeks, the insects collecting always on the leaves and not on the twigs. The autumn migrants require 14 to 17 days, or three or four days more than the apterous forms, to attain maturity; this may be due to the lower temperatures prevailing in the autumn. An average of 6 young were produced by each female, the longevity apparently being about 33 days. The insects live for some days after the reproductive period is over, as do the autumn migrants of *Anuraphis malifoliae*, Fitch.

The oviparous form matures very slowly in comparison with earlier forms, requiring 16 to 20 days to reach maturity. The males leave the summer host soon after becoming mature and fly to apple trees, where they wait the appearance of the oviparous females. Mating usually occurs on the twigs. The females may lay from 1 to 7 eggs and generally die soon after depositing the last one. While the stem-mothers and spring forms on apple prefer tender, succulent foliage on which to feed, the ovipara need hard, matured leaves.

Brain (C. K.). **The Coccidae of South Africa.–IV.**—*Bull. Entom. Research, London*, x, no. 2, January 1920, pp. 95–128, 8 plates.

The genera dealt with in this paper, which is the fourth of the series [*R.A.E.*, A, iv, 134; vii, 138, 242] are *Chionaspis* (continued), *Lepidosaphes, Ischnaspis, Asterolecanium, Lecaniodiaspis, Cerococcus, Tachardia, Halimococcus* and a new genus, *Baccacoccus*.

The new species described are:—*Chionaspis scutiae*, on *Scutia indica*; *C. caffra* on *Acacia* sp.; *C. ambiguus* on lilac; *C. leucadendri* on *Leucadendron argenteum*; *C.* (*Phenacaspis*) *lounsburyi* var. *ekebergiae*, n., on *Ekebergia* sp.; *C.* (*Dinaspis*) *imbricata* on *Euclea natalensis*; *C.* (*D.*) *diosmae* on *Diosma crenata*; *Asterolecanium brevispinum* on veld bush; *A. borboniae* on leaves of gorse (*Borbonia cordata*); *A. conspicuum* on *Acacia* spp.; *A. stentae* on *Caralluma caudata, Huernia transvaalensis* and *Stapelia* sp.; *Lecaniodiaspis natalensis* on *Hibiscus*; *L. magna* on a native bush; *L. brabei* on wild almond (*Brabeium stellatifolium*); *Cerococcus passerinae* on *Passerina ericoides*; *C. royenae* on *Royena pallens*; *Tachardia minor* and *T. karroo* on *Elytropappus rhinocerotis*; *T. affluens* on *Euclea* sp. and other native plants; *Baccacoccus elytropappi*, gen. et sp. n., on *Elytropappus rhinocerotis*.

Keys are given to the South African species of *Asterolecanium*, *Lecaniodiaspis*, *Cerococcus* and *Tachardia*.

Muir (F). **On some African Delphacidae (Homoptera).**—*Bull. Entom. Research, London*, x, no. 2, January 1920, pp. 139–144, 8 figs.

A number of Delphacids are recorded from sweepings from grasses and reeds at Ibadan, Nigeria. These include the following new species, which are described:—*Delphacodes nigeriensis*, *D. bridwelli*, *Dicranotropis bridwelli*, *D. ibadanensis*, *Megamelus furcifer* var. *nigeriensis*, nov., *M. flavolineatus* and *Phyllodinus badius*.

Mansfield-Aders (W.). **Insects injurious to Economic Crops in the Zanzibar Protectorate.**—*Bull. Entom. Research, London*, x, no. 2, January 1920, pp. 145–155, 3 plates.

A short account is given of the various insects injurious to the economic crops of the Zanzibar Protectorate, which have been the subject of investigations during the last few years. The crops dealt with include cloves and coconuts (the two chief economic products of the Islands of Zanzibar and Pemba), cotton, cereals, vegetables, fruit and shade-trees and timber, miscellaneous plants and stored products.

Especial attention is devoted to the rhinoceros beetles (*Oryctes rhinoceros* and *O. boas*), which seriously infest coconuts. Young trees from 2½ to 3 years old are most usually attacked, many being killed and others partly delayed in reaching maturity. The most useful preventive measure is the trapping of the larvae in pits filled with rotting coconut and other vegetable débris and a little manure.

No definite pests of the clove tree (*Eugenia caryophyllata*) have been discovered, though the bark of unhealthy trees is attacked by termites (*Termes bellicosus*) and the dead branches are infested by Bostrychid beetles. A large Tenebrionid, *Pycnocerus passerinii*, Bertol., is found under the dead bark, but probably does not do any actual damage.

Trägårdh (Ivar). **On the Use of Experimental Plots when studying Forest Insects.**—*Bull. Entom. Research, London*, x, no. 2, January 1920, pp. 157–160, 2 figs.

The method adopted of investigating experimental plots in studying an outbreak of *Bupalus piniarius*, L. (pine-tree looper) in Sweden in 1916–1917 is described [*R.A.E.*, A, vii, 423]. It seems likely that if other outbreaks are studied in the same way, it will be possible in time to prognosticate after the first year the fate of forests attacked by this pest.

Maulik (S.). **A new Hispid Beetle injurious to the Oil Palm in the Gold Coast.**—*Bull. Entom. Research, London*, x, no. 2, January 1920, pp. 171–174, 3 figs.

The Hispid, *Coelaenomenodera elaeidis*, sp. n., here described is injurious to oil palms (*Elaeis guineensis*) in the Gold Coast, and is reported to have destroyed all the expanded foliage of many thousand palms in one district. A similar outbreak occurred in 1909, but the insects disappeared during the following rainy season and have not again occurred in injurious numbers until the present time. The larvae evidently mine into the young shoots and the adults defoliate the young leaves.

NEWSTEAD (R.). **Observations on Scale-Insects (Coccidae).–VI.**—*Bull. Entom. Research, London,* x, no. 2, January 1920, pp. 175–207, 1 plate, 27 figs.

The COCCIDAE dealt with in this paper, which forms one of a series, [*R.A.E.*, i, 258; ii, 276; v, 456, 500; vi, 85] include *Clypeococcus hempeli*, Ckll., from San Paulo, Brazil, on an unknown tree (*Mimosa*?); *Aspidoproctus gowdeyi*, sp. n., from Uganda on plumbago and rose; *Walkeriana digitifrons*, sp. n., from Uganda on *Baikea emini*; *Pseudococcus inquilinus*, sp. n., from British Guiana on an unknown plant and enclosed by ants (*Acromyrmex* sp.) in small paper nests; *Pseudococcus perniciosus*, Newst. & Willcocks, var., from British East Africa on coffee; *Pseudophilippia inquilina*, sp. n., from Jamaica on an unknown tree beneath a nest of *Crematogaster brevispinosa*, Mayr, var. *tumulifera*, For.; *Antonina waterstoni*, sp. n., from Macedonia, beneath the leaf-sheaths of *Arundo phragmites*; *Pseudokermes marginatus*, sp. n., from British Guiana on *Nectandra*; *Pulvinaria brevicornis*, sp. n., from British Guiana on *Avicennia nitida*; *P. broadwayi* var. *echinopsidis*, from British Guiana on *Echinopsis latiflora*; *Lecanium subacutum*, sp. n., from Uganda on *Coffea robusta*; *Eucalymnatus decemplex*, sp. n., from British Guiana on leaves of *Lecythis* sp.; *Lecanium inquilinum*, sp. n., from British Guiana, enclosed by ants (*Acromyrmex* sp.) in paper nests; *Eulecanium deformosum*, sp. n., in the same habitat; *Saissetia nigra* var. *nitida*, n., from Uganda on *Luzibarziba*; *Platysaissetia montrichardiae*, sp. n., from British Guiana on *Montrichardia aculeata*; *Aspidiotus longispinus*, Morg., from British Guiana on papaw; *Chrysomphalus apicatus*, sp. n., from British Guiana on *Avicennia nitida*; *C. umboniferus*, sp. n., from British Guiana on *Lecythis* sp.; *Selenaspidus articulatus* var. *magnospinus*, n., from Uganda, on an unknown plant; *Odonaspis rhizophilus*, sp. n., from British East Africa on roots of *Chloris incompleta*; *Aspidiotus fiorineides*, sp. n., from Uganda on *Coffea robusta*; *Chionaspis madiunensis*, Zehnt., from Uganda on sugar-cane; *C. tenuidisculus*, sp. n., from Uganda on a creeper with large fleshy leaves in forest; *C. praelonga*, *C. auratilis*, and *C. dura*, spp. n., from Uganda on unknown plants; *C. laniger*, sp. n., from Uganda on *Loranthus entebbiensis*.

CHITTENDEN (F. H.). **The Bean Ladybird and its Control.**—*U.S. Dept. Agric. Washington, D.C.*, Farmers' Bull. 1074, November 1919, 7 pp., 3 figs. [Received 9th January 1920.]

The bulk of this information concerning *Epilachna corrupta*, Muls., has been noticed elsewhere [*R.A.E.*, A, vi, 299]. The eggs of this beetle are destroyed by three other predaceous Coccinellids, *Hippodamia quinquesignata*, Kby., *H. convergens*, Guér., and *Coccinella transversoguttata*, F. The only other Coccinellid in the United States that attacks vegetation is *Epilachna borealis*, F. (squash ladybird). Remedial measures recommended include spraying with zinc arsenite or calcium arsenate at the rate of 1¼ lb. to 50 U.S. gals. of water.

OKAMOTO (H.). **On the Life History of the Apple Fruit Miner,** *Argyresthia conjugella*, **Zell.**—*Trans. Sapporo Nat. Hist. Soc.*, [*sine loco*] *Japan*, vi, no. 3, January 1917, pp. 213–217. [Received 8th January 1920.]

The average number of eggs laid by one female of *Argyresthia conjugella*, Z., is about 27, oviposition commencing from 2 to 7 days after the emergence of the moth. The eggs are usually deposited on the young apples, but may occasionally be found on leaves, in which case the young larvae, which appear in from 7 to 8 days under natural conditions, are forced to feed on the leaf-tissue until they can find the fruit. This they enter at once, tunnelling in all directions for about 50 days. When mature, should the fruit be still on the tree, they descend to the ground by means of a silken thread and enter the soil to spin the cocoon in which they hibernate. Pupation occurs in the following spring.

LESNE (P.). **Un Longicorne Indo-Malais nouvellement introduit à La Réunion.**—*Bull. Soc. Entom., France, Paris*, no. 17, 1919, pp. 301–302. [Received 12th January 1920.]

Although the Longicorn beetle, *Coelosterna scabrata*, F., has a wide distribution in British India it is recorded for the first time from the island of Réunion, where it has apparently been recently introduced and caused serious damage to young Casuarina trees (*Casuarina equisetifolia*).

VUILLET (A.). **Les Parasites de** *Pyrausta nubilalis*, **Hb., en France.**—*Bull. Soc. Entom. France, Paris*, no. 17, 1919, pp. 308–309. [Received 12th January 1920.]

Investigations in France have revealed the following Tachinid parasites of *Pyrausta nubilalis*, Hb. :—*Paraphorocera senilis*, Rond., and *Hydella stabulans*, Mg. It is thought that these flies could be readily acclimatised in America and thus become valuable agents in the destruction of this pest. Other parasites include unidentified Ichneumonids.

GAUTIER (C.) & RIEL (P.). **Description d'un** *Apanteles* **(Hym. Braconidae) Parasite de** *Pionea forficalis* **(Lep. Pyralidae).**—*Bull. Soc. Entom. France, Paris*, no. 17, 1919, pp. 309–312. [Received 12th January 1920.]

Pionea forficalis, L., caused great damage to cabbages during the summer of 1919 in the vicinity of Lyons. It was heavily parasitised by *Apanteles gabrielis*, sp. n., here described. The parasitic larvae emerge from the body of the host in June and July and in September and October, from 2 to 12 being bred from one individual.

LICHTENSTEIN (J. L.). **Note préliminaire au Sujet de** *Philotrypesis caricae*, **Hass. (Hym. Chalcididae).**—*Bull. Soc. Entom. France, Paris*, no. 17, 1919, pp. 313–316, 3 figs. [Received 12th January 1920.]

The method of oviposition and emergence of *Philotrypesis caricae*, Hass., from the wild fig is discussed and compared with that of *Blastophaga psenes*, L. It has not yet been elucidated whether *P. caricae* is a parasite of *Blastophaga* or whether it lives on the ovaries of the figs as does the latter. It is hoped that further investigation will decide this question.

POUTIERS (R.). **Note sur** *Prospaltella berlesei*, **How. (Hym. Chalcididae) Parasite de** *Diaspis pentagona*, **Targ.**—*Bull. Soc. Entom. France, Paris*, no. 18, 1919, pp. 334–335.

Observations on *Aulacaspis* (*Diaspis*) *pentagona*, Targ., recently introduced into France [*R.A.E.*, A, vii, 123] show that it is closely followed and kept in check by its parasite, *Prospaltella berlesei*, How.

VAYSSIÈRE (P.). **Les Insectes nuisibles aux Cultures du Maroc (1ère Note).**—*Bull. Soc. Entom. France, Paris*, no. 18, 1919, pp. 340–342.

This list of noxious insects of Morocco includes:—Orthoptera: *Schistocerca tatarica*, L.; *Dociostaurus maroccanus*, Thunb.; *Gryllotalpa gryllotalpa*, L. (*vulgaris*, L.).

Coleoptera: *Tropinota crinita*, Charp., on beans, iris and roses; *Cassida viridis*, L., on artichokes; *Colaspidema atrum*, Ol., on lucerne; *Labidostomis hordei*, F., on vine shoots; *Capnodis tenebricosa*, Ol., in nurseries on peach and cherry trees; *Bruchus* (*Laria*) *pisorum*, L., on peas; *Larinus afer*, Gyll., and *L. flavescens*, Germ., mining in artichokes; *Lixus scabricollis*, Boh., on beet; *Xyleborus dispar*, F.

Lepidoptera: *Zeuzera pyrina*, L., on fruit trees; *Cirphis* (*Leucania*) *unipunctata*, Hw., attacking especially graminaceous plants; *Sesamia vuteria* (*nonagrioides*, Steph.), on young sugar-cane; *Phthorimaea operculella*, Z., on potatoes; *Phycita diaphana*, Stgr., on castor-oil plants; *Earias insulana*, Gn., on cotton; and *Phthorimaea* (*Lita*) *ocellatella*, Boyd, on beet.

DELAMARRE DE MONCHAUX. **Surveillance des Arrivages de Pommes de Terre infestées par la Teigne.**—*Bull. Soc. Nat. d'Acclimat., Paris*, lxvi, no. 12, December 1919, pp. 376–377, 3 figs.

Attention is drawn to the danger of extending the ravages of *Phthorimaea operculella*, Z., by the transportation of diseased potato tubers. The characteristic appearance of infested material is illustrated to enable quick recognition of this moth.

SAVASTANO (L.). **La Ginestra etnea e la comune, l'Iceria e il Novius.** [Mount Etna Broom and Spanish Broom, *Icerya purchasi* and *N. cardinalis*.]—*R. Staz. Speriment. Agrum. Fruttic., Acireale*, Boll. 37, 1919, pp. 1–4. [Received 13th January 1920.]

The Coccinellid, *Novius cardinalis*, is well-known as the most important natural enemy of *Icerya purchasi*, and wherever it becomes established the scale disappears. In Sicily however the author has observed that *I. purchasi* is not attacked by it when on *Genista aetnensis* (Mount Etna broom). In fact it sometimes increases to such a degree as to kill this plant. Examination showed that *N. cardinalis* occurred on *Rhamnus* growing quite close to the broom, but never on the broom itself. This was found to be due to the fact that *N. cardinalis* deposits its eggs in positions protected from the sun. Such protection is not afforded by the few small leaves of broom, but is very necessary to this beetle in hot regions where the sun temperature rises to 122° F. (50° C.) as in Sicily. *Spartium junceum* (Spanish broom) is infested by *I. purchasi* in the same way. Neither insecticides nor fire are of practical use in Sicily in destroying the scale and it is suggested that on the coast *Opuntia ficus-indicus* should be substituted for the comparatively few plants of *Genista* there, as serious loss will result if the scale spreads inland where broom occurs on large areas and is used for fuel, etc.

De Stefani (T.). **Di taluni Insetti delle Carrube.** [Some Insects infesting Carob Pods.]—*R. Staz. Speriment. Agrum. Fruttic., Acireale,* Boll. 37, 1919, pp. 5–6. [Received 13th January 1920.]

The Pyralids, *Myelois ceratoniae,* Z., and *Ephestia calidella,* Gn., were obtained in Sicily from carob pods [*Ceratonia siliqua*] from the end of April up to about September. *M. ceratoniae* has been previously recorded from dates, dried figs, raisins and the fruits of *Cydonia japonica,* and Prof. De Joannis of Paris states that the larva has been found feeding on dried insects. This moth occurs on the Mediterranean coasts, in Africa, Madagascar and the Antilles. *E. calidella* has been found in dried figs, raisins and cork, and also attacks dried insects. It has been observed in France, England, Spain, Austria, Dalmatia, Germany and Asia Minor.

Silvestri (F.). **Contribuzioni alla Conoscenza degli Insetti dannosi e dei loro Simbionti. iv. La Cocciniglia del Prugno** (*Sphaerolecanium prunastri,* **Fonsc.**). [Contributions to the Knowledge of injurious Insects and of their Associates. iv. The Prune Scale, *S. prunastri,* Boy.]—*Boll. Lab. Zool. Gen. Agrar. R. Scuola Sup. Agric., Portici,* xiii, 1919, pp. 70–126, 38 figs. [Received 17th January 1920.]

A full description with synonymy is given of *Sphaerolecanium prunastri,* Boy., which occurs in France, Bohemia, Italy, North America and Japan. *Prunus spinosa* appears to be the preferred food-plant, then the cultivated prune and, according to some authors, the peach.

The larva of this scale hatches very soon after the egg is laid, which takes place from June to August. At an altitude of about 3,300 feet in south Italy the first adult females appear at the end of April and the first adult males early in June. There is thus one annual generation, but at lower altitudes of 800–1,600 feet a second generation was observed in September. *S. prunastri* is injurious because it sucks the plant-juices and produces a sugary secretion favourable to fungi.

The Coccinellids, *Exochomus quadripustulatus*, L., and *Hyperaspis campestris*, Hbst., are both active enemies of *S. prunastri*. The former oviposits in spring in the bodies of female scales of the previous year that have been killed by parasites and the resulting larvae attack the young scales. *H. campestris* occurs throughout Europe, but is not common. Its larva infests *S. prunastri* in the same way that *H. binotata*, Say, in North America attacks *Eulecanium nigrofasciatum*, Perg., *Pulvinaria vitis*, L., and other scales. In Italy the adult Coccinellid occurs in June and July and oviposition begins in the second half of June. In the first three larval stages moulting takes place beneath the host-scale. Pupation occurs on the twigs from mid-August onwards, and the resulting adults hibernate. Some of the larvae of *H. campestris* are parasitised by a Chalcidid, *Homalotylus flaminius*, Dalm.

An Acarid, *Pediculoides ventricosus*, Newp., is occasionally observed in dead female scales containing hibernating larvae of *Phaenodiscus aeneus*, on which it feeds, especially from September to May.

A Chalcid, *Coccophagus scutellaris*, Dalm., infests from 1 to 5 per cent. of the scales. It is found throughout Europe and probably has been introduced into America. It is also known as a parasite of *Eulecanium coryli*, *E. persicae*, *Filippia* (*Philippia*) *oleae*, *Saissetia oleae*, *Ceroplastes rusci*, and *Pulvinaria mesembryanthemi* and probably infests all other European Lecaniines. *Coccophagus howardi*, Masi, which possibly occurs throughout Europe and is known to parasitise *Filippia oleae* and *Ceroplastes rusci*, has similar habits and probably infests other scales.

Phaenodiscus aeneus, Dalm., which is fully described here, has been hitherto recorded from Sweden, Germany and Austria. In Italy cases were observed where nearly 100 per cent. of the females of *S. prunastri* were parasitised by it, though many of their progeny escape owing to death being delayed until the eggs are laid. This Chalcid is furthermore itself hyperparasitised by others such as *Cerapterocerus mirabilis*, *Pachyneuron coccorum* and *Perissopterus zebra*. The first adults of this Chalcid emerge in April from dead females of *S. prunastri* and the eggs of the first generation are laid in 4th stage females of this scale. Adults appear in about one month and they oviposit in female scales that have either not begun or not finished ovipositing. The resulting larvae remain in the host until the following April. *Phaenodiscus aeneus* has therefore two generations a year. It must be considered a special parasite of *S. prunastri*; the author doubts whether his previous record from *Eulecanium* (*Lecanium*) *persicae* is correct, while that from *Diaspis rosae* is certainly incorrect.

Cerapterocerus mirabilis, Westw., which is described, has been recorded from England, Germany and Austria. In Italy it occurs in the same localities as *Phaenodiscus aeneus*. The female is apparently unable to detect whether the female scales of *S. prunastri* actually harbour *Phaenodiscus* or not, for oviposition has been observed in non-parasitised scales. It hibernates in the larva of *Phaenodiscus* and the adult appears in May. It is an important hyperparasite, for from 30 to 50 per cent. (sometimes even 70 per cent.) of the larvae of *Phaenodiscus* may be attacked.

Pachyneuron coccorum, L., is widespread in Europe and probably has been introduced into America with European scales In Italy it occurs wherever the scales harbouring its victims are found. It parasitises the Dipteron, *Leucopis* sp., infesting *Filippia oleae,* and also parasitises the following Chalcids: *Blastothrix sericea* and *Aphycus punctipes,* infesting *Eulecanium coryli*; *Microterys lunatus,* Mayr, and *Phaenodiscus aeneus,* infesting *S. prunastri*; and *Microterys masii,* Silv., infesting *Filippia oleae.* It hibernates in the larval stage, and may perhaps also do so as an adult. Pupation occurs in April and the adult appears in May. The adult feeds on sugary substances and begins ovipositing 2 or 3 days after emergence. The complete life-cycle took 27 days in May for individuals bred from *Aphycus punctipes,* 20 days in June from *Leucopis* sp., and 21 days in September from *Phaenodiscus aeneus.* Females of *S. prunastri* yield from 1 to 5 of these hyper-parasites and those of *Eulecanium coryli* from 1 to 10. *Pachyneuron coccorum* has at least 5 generations from May to September. In a case observed in 1918 about two-thirds of the primary parasites in *Eulecanium coryli* were destroyed. This was an isolated instance, and in 1919 the parasitism of *Phaenodiscus aeneus* infesting *S. prunastri* only amounted to 3 per cent.

Perrisopterus zebra, Kurdj., has been obtained by the author only from *S. prunastri* on *Prunus spinosa.* It is a ectoparasite of *Phaenodiscus aeneus* infesting *S. prunastri,* of which it therefore is a secondary or tertiary parasite. The larva of this hyper-parasite appears at Portici in the first fortnight of September, in less than 2 days after oviposition. Five days afterwards pupation takes place, and the entire life-cycle from egg to adult requires 12 days. *Microterys lunatus,* Dalm., probably occurs throughout Europe. The adults were seen emerging from *S. prunastri* in June.

SILVESTRI (F.). **Contribuzioni alla Conoscenza degli Insetti dannosi e dei loro Simbionti. V. La Cocciniglia del Nocciuolo** (*Eulecanium coryli,* **L**). [Contributions to the Knowledge of Injurious Insects and of their Associates. v. The Hazel-Nut Scale, *E. coryli.*]—*Boll. Lab. Zool. Gen. Agrar. R. Scuola Sup. Agric., Portici,* xiii, 1919, pp. 127–192, 34 figs. [Received 17th January 1920.]

A full description and synonymy are given of *Eulecanium coryli,* L., which is widely distributed in Europe, and according to King, also occurs in North America. *E. capreae,* L., is included among the synonyms. In Italy the author has found it on *Corylus avellana,* pear, apple, *Prunus domestica, P. spinosa, Acer campestris, Ulmus campestris, Crataegus oxyacantha, C. azarolus, Salix vitellina,* and *Carpinus betulus.* Many other food-plants have been recorded, including *Rosa* sp., *Cydonia vulgaris, Prunus armeniaca, Crataegus pyracantha, C. coccinea, Quercus suber, Acer pseudoplatanus, Acer platanoides, Cornus sanguinea, Tilia* sp., *Juglans regia, Aesculus hippocastanum, Populus virginiana, Cotoneaster* sp., *Prunus laurocerasus, P. cerasus, Euonymus* sp., *Vaccinium myrtillus, Rubus* sp., and *Myrica gale.*

At Portici oviposition begins at the end of March; at higher altitudes such as 3,300 feet, it is delayed about 2 months. As many as 4,905 eggs have been counted beneath one female. The young larvae migrate from the twigs to the leaves, to the under-surface of which they attach themselves near a vein ; if the leaves are little exposed to light, attachment may take place on the upper surface. Moulting occurs in September and the second-stage female larva attaches itself to the twigs. It moults at the end of February or early in March. The second-stage male larva also appears in September and moulting also takes place about the end of February. The first adult males were observed on 22nd March. The injury done by *E. coryli* is due to the scales sucking the plant-juices, chiefly at the end of winter and early in spring. It is rarely serious, because infestation is slight. Weather conditions exercise no great direct influence on the scale.

Natural enemies include some undetermined fungi and the following insects :—

Coleoptera. The Coccinellids, *Chilocorus bipustulatus*, L., and *Exochomus quadripustulatus*, L., do not greatly reduce the numbers of *E. coryli*, because other scales provide abundant prey. *Anthribus fasciatus*, Forst., is known throughout Europe and its distribution should coincide with that of *E. coryli*, but at Portici it was not found during three years, although the scale was present. In the Province of Caserta the adults appear in June and in the following April they prey on *E. coryli*. It was not possible to ascertain what their food was during the intervening months. The eggs are laid beneath the scale, where the larvae feed on the eggs of the latter and pupate. The adult Anthribids pierce the back of the scale and emerge. The life-cycle requires a little under two months. About 50 per cent. of the scales are attacked. In 1915 Munemoto Yano recorded *Anthribus niveovariegatus* as destroying the eggs of another Coccid, *Ericerus pela*, Chav., in the Far East.

All the Hymenopterous insects mentioned are Chalcids. *Encyrtus infidus*, Rossi, probably occurs wherever *E. coryli* is found in Europe, but Imms, who recently worked on the parasites of this scale [*R.A.E.*, A, vii, 194], does not record it in England. At Portici the first adults emerge from *E. coryli* towards the end of March. At the end of March or early in April the female lays a number of eggs (frequently from 4 to 15) in a female scale. From eggs laid on 29th March the first larva appeared on 4th April. After four moults pupation takes place. Larvae hatched on 4th April yielded prepupae on the 18th, pupae on the 20th and adults on the 28th. In several hundred larvae of *E. coryli* examined from July to November no eggs or larvae of *Encyrtus infidus* were found, though many were parasitised by *Aphycus*. It therefore seems that the first generation of *E. infidus* (developed in *E. coryli*) either has an intermediate host or waits in the adult stage until autumn in order to oviposit. The first generation larvae of *E. infidus* often fail to kill the scale before it has finished ovipositing ; those of the second succeed in killing it while yet immature. In observed cases the percentage of parasitism was from 20 to 50 per cent.

Blastothrix sericea, Dalm., has been recorded from Sweden, England, Germany and Austria, and must occur in other parts of Europe. At Portici the first adults appear early in April and about two days later from 1 to 12 or more eggs are deposited in the last-stage females of *E. coryli*. It is probable that the larvae have 5 stages, though only 4 were observed. The adults emerge in May and June. They are long-lived and attain sexual maturity very late. Imms stated that in England eggs were laid in the case of *B. britannica*, Gir. (*loc. cit.*) from July to September and unhatched eggs were seen in November. It is desirable that it should be ascertained in England when the first generation of *Blastothrix* attains sexual maturity. The larvae of the second generation complete their development in February-March of the following year, the adults appearing in April as stated. About one-third of the parasitised females of *E. coryli* succeed in ovipositing in spite of the many parasites within them, though fewer eggs are produced. Infestation varies considerably, with an observed maximum of 60 per cent.

Aphycus punctipes, Dalm., has the same distribution as *B. sericea*; *A. melanostomatus*, Timb., and *A. mayri*, Timb., are considered to be synonyms of it. The first adults of the second generation of *A. punctipes* appeared at Portici at the end of March, one individual emerging from each hibernating larva of *E. coryli*. The females that appear in March-April oviposit in a day or so, from 1 to 69 eggs being laid in a last-stage female of the scale. Eggs laid on 9th April yielded pupae on 27th April and adults on 5th May. The life-cycle of the first generation therefore takes about a month. These adults appear from 26th April to 21st May and in nature the females usually lay one egg in each Coccid larva. During the summer no first- and second-stage larvae of *E. coryli* were found infested, but numerous first-stage larvae were found to be attacked from October to December, second-stage ones from November onwards and third-stage ones from 10th December. At the end of September larvae of *Pulvinaria vitis* at Avellino were infested with larvae and pupae of *Aphycus punctipes*; the adults emerged from 6th October onwards. The author suspects that from May to autumn (a period during which the larvae of *E. coryli* are large) *A. punctipes* develops in scales such as *Sphaerolecanium prunastri*, *Eulecanium corni* and *Pulvinaria vitis*, and that from October onwards it returns to *E. coryli*, from which the adults of the first generation emerge in the following spring. The number of young individuals of *E. coryli* killed in autumn and winter varied from about 4 to 45 per cent., and the spring infestation from 10 to 50 per cent. The practical value of *Aphycus punctipes* is similar to that of *Blastothrix sericea*. Both species are hyperparasitised by *Pachyneuron coccorum* [see preceding paper]. *Aphycus philippiae*, Masi, has been recorded from southern Italy and Sicily and probably occurs throughout southern Europe. It is known as a parasite of *Filippia* (*Philippia*) *oleae* and of an undetermined species of *Lecanium*. The author has obtained it from first-stage larvae of *E. coryli* on *Prunus domestica* near Portici. The first parasitic pupae were seen on 24th August and the adults appeared from 8th September to 10th October. Adults of 8th September attacked second-stage larvae of *E. coryli*, but up to 15th October no larva of that stage contained a larva of *A. philippiae*. In the summer of 1919 about 2 per cent. of the larvae of *E. coryli* were parasitised by *A. philippiae*. *Coccophagus scutellaris*, Dalm., a parasite of various Lecaniines, was obtained from *E. coryli*, about 1 per cent. of which were parasitised. *Microterys sylvius*, Dalm., has been hitherto recorded from Sweden, Germany and Austria. The author has not been able to complete his observations, but he has ascertained that the larva feeds on the eggs of *E. coryli*, in the same way as that of *Anthribus fasciatus*. Each female scale may harbour from 1 to 12 larvae, but even if more than this are present they do not succeed in eating all the eggs. The adults emerge at the end of June and early in July, their ovaries being then still much undeveloped. In Sweden, Germany and Austria *M. sylvius* has been recorded from *Coccus betulae-albae*, Dalm., *C. pruni*, and *Eulecanium aesculi*, Koll., but all these are synonyms of *Eulecanium coryli*. Rondani's record of it as a parasite of the larvae of *Aulax potentillae*, F., and *Anthribus varius* is believed to be incorrect. This paper closes with a series of tables showing the degrees of parasitism of *E. coryli* by the various species.

SILVESTRI (F.). **Descrizione e Notizie del** *Ceroplastes sinensis*, **D. Guerc. (Hemiptera Coccidae).**—*Boll. Lab. Zool. Gen. Agrar. R. Scuola Sup. Agric., Portici*, xiv, 1920, pp. 3–17, 10 figs.

This scale was introduced into Italy, probably between 1890 and 1895, possibly on ornamental plants of the genus *Muhlenbeckia*. It is now found in the south of France, but there appears to be no record of it elsewhere except in China, which seems to be its country of origin. The larvae and adult are described. Much of the information relating to food-plants and life-history has already been dealt with [*R.A.E.*, A, vii, p. 218]. The average number of eggs per female may be taken as 2,000; in one case 3,836 were counted. Larvae of the first and second stages are usually found on the upper surface of the leaves. Female third-stage larvae occur on the leaves and on twigs and stems. Those of the fourth stage gradually spread to all the branches. None of the natural enemies hitherto observed [*loc. cit.*] are of much value and others must be sought for in China if the expense of spraying is to be avoided.

BLACKMAN (M. W.) & STAGE (H. H.). **Notes on Insects bred from the Bark and Wood of the American Larch.**—*Tech. Pub. no. 10, N.Y. State Coll. Forestry, Syracuse, N.Y.*, xviii, no. 4, pt. I, May 1918, pp. 9–115. 9 plates. [Received 15 January 1920.]

This paper records the results of extensive studies of the insect pests of American larch (*Larix laricina*). The portion of the tree attacked, the life-history and habits of the borers, the parasites and enemies attacking them and the borers associated with each species are discussed. The species dealt with are mainly Coleoptera and include *Dendroctonus simplex*, Lec., *Polygraphus rufipennis*, Kirby, *Scolytus* (*Eccoptogaster*) *piceae*, Swaine, *Crypturgus pusillus*, Gyll., *Dryocoetus americanus*, Hopk., *Dryophthorus americanus*, Bedel, *Stenoscelis brevis*, Boh., *Phymatodes dimidiatus*, Kirby, *Asemum moestum*, Hald., *Monochamus* (*Monohammus*) *scutellatus*, Say, *Leptura vittata*, Oliv., *Leptostylus sexguttatus*, Say, *Neoclytus longipes*, Kirby, *Pogonochaerus mixtus*, Hald., *Melanophila fulvoguttata*, Harr., *Chrysobothris blanchardi*, Horn, *C. dentipes*, Germ., *C. sexsignata*, Say, *Anthaxia quercata*, F., *Serropalpus barbatus*, Schall., *Urocerus albicornis*, F., *Tenebrio tenebriodes*, Beau., *Adelocera brevicornis*, Lec., and *Sirex abbotii*, Kirby.

Blackman (M. W.) & Ellis (W. O.). **Some Insect Enemies of Shade Trees and Ornamental Shrubs.**—*Bull. N.Y. State Coll. Forestry, Syracuse, N.Y.*, xvi, no. 26, [n.d.], 123 pp., 2 plates, 56 figs. [Received 15th January 1920.]

This bulletin has been compiled for the benefit of the residents of New York State with the object of assisting them in the preservation of their shade-trees and ornamental shrubs. The more common insects are briefly described in non-technical terms, their habits are touched upon and the more usual methods for their suppression are outlined. A short account is given of the most successful sprays and the apparatus suitable for their use.

Gillette (C. P.). **Tenth Annual Report of the State Entomologist of Colorado for the Year 1918.**—*Office of State Entomologist, Fort Collins*, Circ. no. 27, August 1919, pp. 1–40, 13 figs. [Received 15th January 1920.]

This report includes those of various county horticultural inspections and records the following pests: *Tortrix* (*Archips*) *argyrospila* (fruit-tree leaf-roller); *Gossyparia spuria* (elm scale); *Typhlocyba comes* on poplars; and *Epilachna corrupta* on beans. The damage caused by Aphids was not very great during the year under review; Black-leaf 40 combined with an arsenate spray is advocated as a remedial measure for them. The codling moth [*Cydia pomonella*] was very abundant.

During 1917, 850 acres of lucerne and 300 acres of cover crops and pasture land were found to be infested with the alfalfa weevil, *Hypera variabilis*, Hbst. (*Phytonomus posticus*, Gyll.). This area of infestation had increased to 3,600 and 1,075 acres respectively in 1918, showing a spread westward of about 3 miles and about 10 to 12 miles to the east. The life-history work and field studies on the habits of the pest are not yet complete. Under laboratory conditions the incubation period averages 14·69 days. The larval stage lasts 21·86 days during which time 3 moults, and occasionally a fourth, occur, and pupation lasts about 15·82 days. The adults feed on lucerne, but the injury they cause is negligible as compared with the damage done by the larvae. This is at its maximum from about the time the blossom buds are forming to approximately 3 weeks after the second crop has begun to grow. Oviposition commences soon after the emergence of the adult and continues throughout the late summer and autumn. During the winter the adults hide under trash in the field, in crevices of the ground, along fences, under bands on fruit trees, etc., but emerge and become active on warm days. Experiments against this pest included cultivation, dust mulching, the introduction of parasites, and spraying with lead arsenate, zinc arsenite and lime-sulphur.

Results show that spraying is a successful and economical method of control, and the best time for it must vary with the season. The sprayed hay, whether lead arsenate 4 lb. to the gallon or zinc arsenite 2 lb. is used, is considered quite safe as food for stock. Owing to the relative isolation of the weevil-infested territory in Colorado restrictions have been placed on shipments of infested products to other localities and from other infested States into Colorado. Details are given of the quarantine measures in force with regard to this pest.

Miscellaneous pests include: The San José scale [*Aspidiotus perniciosus*]; *Eriophyes pyri* (pear-leaf blister mite); *Aphis sorbi* (rosy apple aphis), against which spraying with kerosene emulsion Black-leaf 40 or a good grade miscible oil before the buds open is advocated; *Melanoplus bivittatus, M. differentialis, M. atlantis* and *M. femur-rubrum*, against which a bran mash of 50 lb. of bran, 3 lb. of Paris green or 2 lb. of white arsenic, 1 U.S. gal. of syrup, 10 lemons or oranges and 5 U.S. gals. of water, was sufficient for about 6 acres of land. The beet webworm, *Loxostege sticticalis*, may be destroyed by the above poison bran mash or by spraying with 4 lb. of Paris green or 8 lb. of lead arsenate to 100 U.S. gals. of water.

PARKS (T. H.). **Controlling Army Worm Outbreaks in Ohio.**—*Mthly. Bull. Ohio Agric. Expt. Sta., Wooster*, iv, no. 9, September 1919, pp. 272–275, 3 figs. [Received 16th January 1920.]

A severe outbreak of army-worms [*Cirphis unipuncta*] occurred during June 1919 in Ohio. Rye was chiefly attacked, although wheat, maize, timothy and bluegrass were also damaged. In certain counties the infestation covered an area of 1,200 acres and more. The chief damage was done from about 1st to 20th June. The eggs are laid in masses of 10 to 40 under leaf-sheaths of grasses or in and about litter on the ground. The emerging larvae feed unobserved at first and develop very rapidly. During the day they remain under the soil, but emerge at night to feed voraciously on the leaves and heads of rye. Green succulent straws are frequently cut off about 4 to 10 inches above the ground. After about 3 weeks they enter the ground to a depth of 1 to 2 inches for pupation. The adults continue to emerge up to the middle of July, giving rise to the second generation which however never does damage to the same extent as the first, probably because of the extensive migration both of larvae and adults. To destroy the caterpillars, furrows should be made to stop their progress as soon as they begin to migrate. The sides of the furrow should be steep and dusty and it should be renewed every day during the migration period. In addition to this, a poison bran mash consisting of 20 lb. of bran, 1 lb. of Paris green, 2 qts. of syrup, 3 oranges or lemons finely ground and $2\frac{3}{4}$ U.S. gals. of water, should be scattered broadcast in the early evening as soon as the caterpillars begin to feed.

HOUSER (J. S.). **Winter Work in Shade Tree Insect Control.**—*Mthly. Bull. Ohio Agric. Expt. Sta., Wooster*, iv, no. 11, November 1919, pp. 345–350, 2 figs.

In order to deal successfully with pests of shade-trees it is essential that a general working plan be fixed well in advance of the season when the actual work is to be carried out.

Suggestions are here made to help in the selection of spraying apparatus and materials. By inspection in the autumn and winter it is possible to determine the scope and type of insect control measures likely to be necessary in the following season.

Gossard (H. A.). **European Corn Borer not in Ohio.**—*Mthly. Bull. Ohio Agric. Expt. Sta., Wooster,* iv, no. 11, November 1919, p. 351.

What was feared to be an infestation of European corn borer, *Pyrausta nubilalis*, Hb., in Ohio has now been identified as being due to *P. ainsliei*, which is an indigenous species that usually lives on swamp flag or cat-tail.

Hodgson (R. W.). **Fighting the Walnut Aphis**—*Cal. Cult.*, liii, no. 3, 1919, p. 53, 1 fig. (Abstract in *Expt. Sta. Record, Washington, D.C.*, xli, no. 5, October 1919, p. 457.) [Received 26th January 1920.]

A successful method of dusting walnut trees as a remedy against the walnut aphis [*Chromaphis juglandicola*] has been worked out by Mr. R. E. Smith, and is described. The mixture used consists of 74 per cent. kaolin and 24 per cent. hydrated lime upon which 2 per cent. nicotine sulphate has been sprayed. This is blown on to the trees by a dust sprayer driven by a 3 h.-p. gasoline engine. By using 2 to 3 lb. per tree, 95 per cent. of the Aphids are killed; the mixture costs $2\frac{1}{2}d.$ per lb. and from 20 to 40 acres can be treated in a day. The action of the poison is very rapid, numbers of Aphids falling dead from the trees within a few minutes, while two or three rows of trees beyond the dusted area will also be to a great extent cleared of the pest. Since re-infestation from adjoining orchards is probable, the work should be done co-operatively throughout the community affected. Lead arsenate powder should be added to the mixture as a control for the new codling moth.

Wood (R. C.) **Entomology.**—*Rept. Madras Presidency Dept. Agric., 1918-19, Madras,* 1919, p. 8. [Received 17th January 1920.]

Organised campaigns have been undertaken against the "pollu" beetle on pepper; *Hispa* sp. on rice; the cotton stem weevil, *Pempheres affinis*; *Spodoptera* sp. and *Schoenobius* sp. on rice; and insect pests on coconut.

Ramakrishna Ayyar (T. V.). **Administration Report of the Government Entomologist for the Year 1917–18.**—*Rept. Madras Presidency Dept. Agric. 1917–18, Madras,* 1918, Appendix vii, pp. 74–77. [Received 17th January 1920.]

The pests reported during the year include:—*Spodoptera mauritia*; *Schoenobius bipunctifer*; *Hispa* sp. and *Leptispa* sp. on rice; *Prodenia litura* on tobacco; *Epilachna* sp., the pumpkin beetle (*Aulacophora* sp.) and white grubs on garden vegetables; a Pentatomid, *Vitellus* sp., on oranges; an Aleurodid on *Citrus*; *Earias* sp. and *Pempheres* sp. on cotton.

Insects bred during the year included the stem weevil of cotton (*Pempheres* sp.), the shot-hole borer of castor (*Xyleborus* sp.), the brinjal leaf-webber (*Pachyzancla aegrotalis*), *Diacrisia* sp. on sweet potato, and *Pericallia ricini* on *Millingtonia*.

Urich (F. W.). **Insects affecting the Avocado in Trinidad and Tobago.**—*Bull. Dept. Agric. Trinidad and Tobago, Port of Spain*, xviii, no. 3, 19th November 1919, pp. 129–131, 2 plates. [Received 17th January 1920.]

The pests of avocado in Trinidad and Tobago include an ant, *Solenopsis geminata*, which besides fostering scale-insects and mealy-bugs bites off the young bark from the shoots and stems of young trees. It may be controlled by destruction of the nests with carbon bisulphide and sodium or potassium cyanide. The nests may also be destroyed with boiling water and puddling. A little resin added to the boiling water greatly increases its efficacy. The trees can be protected by banding with tree tanglefoot and similar mixtures for which the formulae are appended.

The nests of another ant, *Cremastogaster brevispinosa*, usually found under loose dried bark and rotten wood resulting from badly dressed pruning wounds or from dead branches left on the trees, should be cut out and the place painted with crude oil or strong resin wash.

Coccid pests include *Pulvinaria pyriformis, Aspidiotus destructor, Saissetia nigra, Pseudococcus nipae* and *P. citri*. If not sufficiently controlled by natural enemies spraying with nicotine sulphate in combination with resin wash or soap is advocated.

Stericta albifasciata, the caterpillars of which destroy the flowers and young leaves and live in nests made by webbing together the leaves and branches, can only be destroyed by cutting off and burning the nests. Care must be taken that the caterpillars do not disappear during the process, as when alarmed they drop to the ground by means of silken threads and hide. They are parasitised by a Tachinid.

Williams (C. B.). **Rainfall, Sugar Production and Froghopper Blight in Trinidad.**—*Bull. Dept. Agric. Trinidad and Tobago, Port of Spain*, xviii, no. 3, 19th November 1919, pp. 153–167, 11 figs. [Received 17th January 1920.]

Observations extending over many years show that unusual alternations of wet and dry periods and particularly a well-marked dry period in September or October is conducive to a great increase of froghoppers. It is evident that the actual number of insects (*Tomaspis saccharina*) present in a field is of less practical importance than the general ability of the sugar-cane to withstand the damage, and this condition can only be brought about by improved drainage.

Jordan (W. H.). **Director's Report for 1918.**—*New York Agric. Expt. Sta., Geneva, N.Y.*, Bull. 457, December 1918, 25 pp. [Received 23rd January 1920.].

The entomological work recorded in this report has already been noticed in previous bulletins of the Station [*R.A.E.*, A, vii, 182, 495].

Jarvis (E.). **Insect Friends of the Cane-grower.**—*Queensland Agric. Jl., Brisbane*, xii, no. 6, December 1919, pp. 301–304, 1 plate.

This paper is written with the object of enabling sugar-cane growers to recognise the earlier stages of certain useful insects associated with cane grubs. The species dealt with include the wasps, *Campsomeris tasmaniensis*, Sauss., and *C. radula*, F., which are known to attack 6 species of cane beetles with a preference for *Lepidiota albohirta*, Waterh., and *L. frenchi*, Blackb.; robber-flies such as *Asilus* sp.; the Elaterid, *Agrypnus mastersi*, MacL.; and Dexiid flies.

ILLINGWORTH (J. F.). **Cane Grub Investigation.**—*Queensland Agric. Jl., Brisbane*, xii, no. 6, December 1919, pp. 304–305.

Attention is drawn to the increasing abundance of the sugar-cane beetle borer [*Rhabdocnemis obscura*] in certain localities, and the importance of burning all trash throughout the infested area and planting clean seed is insisted upon.

ILLINGWORTH (J. F.). **Monthly Notes on Grubs and other Cane Pests. (Second Series.)**—*Queensland Bur. Sugar Expt. Sta., Div. Entom., Brisbane*, Bull. 8, 1919, 51 pp., 1 plate.

This bulletin gathers together the various monthly notes on sugar-cane pests in Queensland from July 1918 to May 1919 which have been published and noticed elsewhere [*R.A.E.*, A, vi, 526; vii, 80, 109, 167, 200, 295, 411].

FROGGATT (W. W.). **The Peach Tip Moth** (*Laspeyresia molesta*, **Busck**).—*Agric. Gaz. N.S.W., Sydney*, xxx, no. 12, December 1919, pp. 891–892.

Cydia (*Laspeyresia*) *molesta*, Busck, is now reported from Australia, where it causes severe damage to peaches. It appears to have been present since 1909, and it has only now been definitely identified, though its occurrence was recorded in 1914 [*R.A.E.*, A, ii, 493].

The larvae were found at work towards the end of October, but by the 18th of November neither larvae or pupae could be found in the damaged twigs. Bandaging as for codling moth [*Cydia pomonella*] proved the only successful remedial measure. On the 16th December the bandages contained larvae and pupae.

The moths were found attacking the peach tips in the early part of January. Pupae were found under the bandages on 3rd February, from which a parasite, *Gambrus stokesi*, which also attacks *C. pomonella*, was bred.

ALLEN (W. J.). **The Utility of the Spray Gun.**—*Agric. Gaz. N.S.W., Sydney*, xxx, no. 12, December 1919, pp. 893–894.

The utility of the spray gun is compared with that of an angle nozzle on a rod; the latter proved the more satisfactory apparatus, as the work done by the spray gun proved faulty near the tops of 11 to 12 foot trees. The spray gun is also unsuitable for the application of caustic sprays in anything but very calm weather and cannot be used to spray downwards on to the tops of trees.

The Duke of Bedford & Pickering (S.). **Science and Fruit Growing, being an Account of the Results obtained at the Woburn Experimental Fruit Farm since its Foundation in 1894.**—*London*, Macmillan & Co., Ltd., 1919, 348 pp., 4 plates, 47 figs. Price 12*s.* 6*d.* net.

Several chapters of this review of the work of the Woburn Experimental Fruit Farm are devoted to insects, the damage they do to fruit-trees and crops, and the usual methods of controlling them. The various spraying mixtures used in England are discussed, particular attention being given to paraffin and paraffin emulsions, alkaline washes, and the fungicidal and scorching action of copper.

Insects dealt with in detail include the mussel scale (*Lepidosaphes ulmi*), the currant gall-mite (*Eriophyes ribis*), woolly aphis (*Eriosoma* (*Schizoneura*) *lanigerum*), apple-sucker (*Psylla mali*), etc. Against Aphids the safest and most suitable insecticide is a solution containing 0·75 per cent. nicotine.

Polak (M. W.). **Het Steriliseeren van Grond door Middel van Stoom.** [Steam Sterilisation of Soil.]—*Meded. Landbouwhoogeschool, Wageningen*, xvii, no. 1–3, 1919, pp. 91–108, 1 plate.

Non-chemical processes for sterilising soil and methods for working out their costs are dealt with in this paper.

Insectenschade op gescheurd Grasland in 1918. [Insect Injury in 1918 on Grassland placed under Cultivation.]—*Meded. Phytopath. Dienst, Wageningen*, no. 7, December 1918, 8 pp. [Received 19th January 1920.]

The chief pests of crops planted on land previously under grass are Tipulid larvae and wireworms. *Phorbia* (*Anthomyia*) *cilicrura* injured beans, but the damage was not more marked than on land long under cultivation.

Gautier (C.). **Sur la Façon dont les Larves** *d'Apanteles glomeratus* **sortent des Chenilles de** *Pieris brassicae*.—*C. R. Soc. Biol., Paris*, lxxxii, no. 34, 27th December 1919, pp. 1369–1371.

The method of emergence of the Braconid parasite, *Apanteles glomeratus*, from *Pieris brassicae* is described. Observations show that the parasitised larvae always die before pupation.

Legendre (J.). **Note sur un Diptère Parasite des Pêches de Madagascar.**—*C.R. Soc. Biol., Paris*, lxxxiii, no. 1, 10th January 1920, pp. 8–9.

Ceratitis capitata is reported to cause serious injury to peaches in Madagascar, the damage amounting to about 80 per cent. of the total crop in January and even more in February. Each fruit may contain as many as six or seven larvae. Examples reared in the laboratory pupated after about a month, the adults emerging in about a fortnight. On the high plateaux of the island mangos and oranges are not attacked.

Jack (R. W.). **Tobacco Pests of Rhodesia. Part I.**—*Rhodesia Agric. Jl., Salisbury*, xvi, no. 6, December 1919, pp. 542–548, 5 plates.

This account of the tobacco pests of Rhodesia is a revision of earlier work [*R.A.E.*, A, i, 287]. While no new pests of importance have been observed, some further information regarding the existing ones has been obtained. The damage done by cutworms and the remedies for them are discussed [*R.A.E.*, A, vi, 536]. Other moths dealt with are *Phthorimaea heliopa*, Lwr. (stem borer), *P. operculella*, Z. (tobacco miner or splitworm), and *Heliothis* (*Chloridea*) *obsoleta* (tobacco budworm), which appears each year but is worse at some seasons than others. The life-cycle of this moth has been worked out in the United States but is not thoroughly known in South Africa. It seems probable that four or five complete broods occur in the year. The eggs are laid on the heart of the plant, or later on the seed-heads, and hatch in 3 to 5 days. The caterpillars eat into the unfolding leaves and later attack the seed-pods. Pupation occurs in the ground, the adult emerging in from 17 to 27 days in the summer. Pupation beginning in March may continue throughout the winter, the adults emerging in October, but another generation frequently occurs in April and May. The generations are therefore irregular. Ploughing, harrowing and rolling the ground before October should destroy many of the pupae and expose others. Hand-picking the caterpillars during topping operations is also recommended. A poison mixture used for bud-injury in the United States is recommended, but would need to be used at greater strength. This consists of one tablespoonful of Paris green to a quart of slaked lime, flour or maize meal, and should be dusted on the buds, care being taken not to scorch the plants.

Minor pests of tobacco are *Laphygma exigua*, Hb. (pigweed caterpillar) and *Prodenia litura*, F. (tomato caterpillar), both of which pass through several generations in a year. In cases of bad infestation the plants should be sprayed with 1 lb. lead arsenate paste to 16 gals. water, or 1 lb. powder to 30 gals.; $\frac{1}{4}$ lb. Paris green with $\frac{1}{2}$ lb. fresh lime to 40 gals. water is also recommended.

Watson (J. R.). **The Native Host-Plant of the Camphor Thrips** (*Cryptothrips floridensis*).—*Florida Buggist, Gainesville*, iii, no. 2, September 1919, pp. 25–27. [Received 22nd January 1920.]

The camphor thrips (*Cryptothrips floridensis*) has been found in Florida to have an alternative food-plant in the native bays of the genus *Tamala*, especially *T. littoralis*. It would therefore appear to be indigenous, and this discovery has led to a re-examination of the species recorded from Ceylon [*R.A.E.*, A, ii, 597; iii, 357], and it is believed that the latter is probably distinct though closely related. The life-history in Florida has not been thoroughly worked out. A single generation was reared in May 1913. The eggs hatched in 8 or 9 days and the larvae had become adults by the 24th day.

WATSON (J. R.). **A new Physothrips from Oregon.**—*Florida Buggist, Gainesville*, iii, no. 2, September 1919, p. 32. [Received 22nd January 1920.]

Physothrips blacki, sp. n., is described, taken on California poppy and dandelion in Oregon.

BENSON (E. F.). **Third Bienn. Rept. Washington State Dept. Agric., 1st July 1916 – 30th June 1918,** *Olympia, Wash.*, 1st November 1918, 191 pp., 3 plates. [Received 21st January 1920.]

During 1916, a severe outbreak of the coulee cricket [*Peranabrus scabricollis*] occurred in Grant county and after having gradually increased in numbers for several years, it became a menace to Eastern Washington. A vigorous campaign was undertaken, and by means of fencing and ditching and the use of gasoline torches many millions of crickets were killed and collected. Great devastation has also been caused during the past few years by grasshoppers in Okanogan county and the numbers are increasing [*R.A.E.*, A, vii, 510].

Experimental work with various sprays against codling moth [*Cydia pomonella*] is described. Dust sprays have been tried and have proved promising. For red spider [*Tetranychus*] in orchards a distillate oil emulsion at the rate of $1\frac{1}{2}$ gals. to 100 gals. water was sprayed on the trees and cleared them of the mites with one application. An outbreak of the Colorado potato beetle [*Leptinotarsa decemlineata*] was experienced in 1916. Hand-picking and arsenical spraying were resorted to and by organised effort the numbers were greatly reduced in 1917, while in 1918 scarcely any beetles were found.

The Hessian fly (*Mayetiola destructor*) has made its appearance in Washington State and in one locality has been so destructive that the discontinuance of wheat growing has been recommended.

CAESAR (L.). **Pear Blight.**—*Canad. Hortic. & Beekeeper, Toronto, Ont.*, xxviii, no. 1, January 1920, pp. 3–4, 3 figs.

The symptoms and cause of pear blight are discussed. Ants feed on the sweetened exudate symptomatic of the disease and thus pass it on to the blossoms on which they also feed, whence it is disseminated to other trees by bees. It may also be spread by sucking-insects feeding first on diseased twigs and then on healthy ones.

COLLINGE (W. E.). **The Food of the Nightjar** (*Caprimulgus europaeus*, **L.**)—*Jl. Minist. Agric., London*, xxvi, no. 10, January 1920, pp. 992–995, 1 fig.

The nightjar (*Caprimulgus europaeus*) generally arrives in England from its winter quarters in Africa in early May, and is of great benefit to farmers and fruit-growers until its disappearance about mid-September. During this time, out of 62 individuals examined, the whole of the food taken consisted of insects, these including *Hepialus humuli*, L., and *H. lupulinus*, L., *Cheimatobia brumata*, L., *Barathra* (*Mamestra*) *brassicae*, L., *Euxoa* (*Agrotis*) *segetum*, Schiff., *Feltia* (*A.*) *exclamationis*, L., *Agrotis* (*Triphaena*) *pronuba*, L., *Melolontha melolontha*, L. (*vulgaris*, F.), *Phyllopertha horticola*, L., *Amphimallus* (*Rhizotrogus*) *solstitialis*, L., *Geotrupes* sp., *Tipula oleracea*, L., and the remains of other moths, beetles and flies. Of the total food examined, 88 per cent. consisted of noxious insects and 12 per cent. of insects of a neutral character. The importance of affording every protection to this bird is therefore obvious.

Flower (S. S.) & Nicoll (M. J.). **The Principal Species of Birds protected by Law in Egypt, giving their English, French, Arabic and Scientific Names, their Local Status, their approximate Size, and Concise Notes on their Coloration, for Purposes of Identification.**—*Minist. Agric. Egypt, Cairo,* June 1918, 8 pp., 8 plates. [Received 28th January 1920.]

In Egypt, where ravages by insect pests are common and birds are scarce, it is of the greatest importance that beneficial species should be afforded every protection. While the law of 1912 expressly forbids the destruction of the protected species, and at least one valuable species has become re-established in consequence, it is considered that in the case of some of the smaller birds it is not being enforced with sufficient stringency.

Carpenter (C. W.) **Report of the Division of Plant Pathology.**—*Rept. Hawaii Agric. Expt. Sta. 1918, Honolulu,* 10th April 1919, pp. 35–45, 4 plates. [Received 28th January 1920.]

Pests not previously recorded for Hawaii include root knot of carrots, egg-plants (*Solanum melongena*) and tobacco due to Nematodes, galls on potatoes (*Solanum tuberosum*) due to Nematodes, and a mite attacking potatoes and tomatoes (*Lycopersicum esculentum*). The remedial measures advocated against the latter include early planting and dusting with dry sulphur or spraying with lime-sulphur.

Other pests include: red spider on bananas (*Musa cavendishi*); *Hellula undalis* (webworm) and *Pieris* (*Pontia*) *rapae* (cabbage caterpillar) on cabbages; *Peregrinus maidis* (leaf-hopper) on maize (*Zea mays*); red spider causing russeting on guava (*Psidium guayava*); thrips on onion (*Allium cepa*); and *Phthorimaea operculella* (potato tuber moth).

LEGISLATION.

Insect Pests in Sicily and Sardinia.—*R. Staz. Speriment. Agrum. Fruttic., Acireale,* Boll. 37, 1919, pp. 7–10.

A decree, dated 28th September 1919, of the Italian Ministry of Agriculture prohibits the importation into Sicily and Sardinia of citrus and other food-plants of the scale, *Ceroplastes sinensis.* Such plants may only be admitted by special permission of the Ministry if certified clean by an official plant disease expert.

A decree, dated 7th October 1919, makes it compulsory to combat the pistachio pest, *Megastigmus* (*Trogocarpus*) *bullestrerii,* in various districts of Sicily. The female flowers of *Pistacia terebinthus* and all infested pistachio fruits must be destroyed [*R.A.E.*, A, vii, 88].

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CONTENTS.

CONTENTS—*cont.*

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VOL. VIII. Ser. A. Part 4.—pp. 137-168. APRIL, 1920.

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WATSON (J. R.). **Report of Entomologist.**—*Rept. Fiscal Year ending 30th June 1917, Florida, Univ. Agric. Expt. Sta., Gainesville,* May 1918, pp. 52 R.–65 R., 1 fig. [Received 28th January 1920.]

Anticarsia gemmatalis only attacks peanuts when they are in a field adjacent to velvet beans. Although the caterpillars can be raised to maturity entirely on leaves of peanuts, the adults have never been known to oviposit on this plant under natural conditions. Experiments show that with the use of dusting machines under ordinary conditions the caterpillars may be controlled with one application of lead arsenate in the season.

The work dealing with the control of Nematodes is discussed, the results of subsequent experiments having already been noticed [*R.A.E.*, A, vii, 418].

The Sicilian mealy-bug parasite, *Paraleptomastix abnormis*, and a Coccinellid, *Delphastus catalinae*, have been imported from California to destroy scale-insects.

Other insects recorded for the year include: *Nezara viridula* (pumpkin bug), *Pentatoma punctipes* and *Leptoglossus phyllopus* (leaf-footed plant bug) which caused great damage to *Citrus* trees. The method adopted for collecting these bugs is described. Potatoes were attacked by *Nezara viridula* and *Acanthocephala femorata*; as the latter bug shows a decided preference for sunflowers these plants were successfully used as trap-crops.

Miscellaneous pests include: *Oncideres cingulata* (pecan twig girdler) on *Eucalyptus rostrata*; *Cylas formicarius* (sweet potato root weevil); *Stictocephala inermis* on beans and tomatos in late March and early April; *Gerstaeckeria hubbardi*, Lec. (cactus weevil) on cotton in April; *Strigoderma pygmaea* on cotton in April and May; wireworms, which were very destructive to cucumbers in the latter part of April; *Heterothrips haemorrhoidalis*, unusually destructive to ornamental plants in the open, especially crotons; *Epicauta vittata* (striped blister beetle) on pepper in June; *Diabrotica duodecimpunctata* (southern corn root worm), adults of which destroyed satsumas, onions, and other crops in the early part of winter; and *Aleurothrixus howardi* (woolly whitefly), which is parasitised by *Eretmocerus haldemani*.

GIRAULT (A. A.). **A New Species of *Lepidiota* from Northern Queensland (Coleoptera, Scarabaeidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, vii, no. 10–12, October-December 1919, p. 187.

Lepidiota consobrina, sp. n., infesting sugar-cane is described. The characters of this species were pointed out by Dodd and Jarvis in papers already reviewed [*R.A.E.*, A, vi, 165, 295].

RYMER ROBERTS (A. W.). **On the Life History of "Wireworms" of the Genus *Agriotes*, Esch., with some Notes on that of *Athous haemorrhoidalis*, F. Part I.**—*Ann. App. Biol., Cambridge,* vi, no. 2–3, December 1919, pp. 116–135, 1 plate, 6 figs.

The work of previous authors on wireworms is reviewed and amplified by personal observation, chiefly under laboratory conditions.

(664) Wt. P1850/163. 1,500. 4.20. B.&F.,Ltd. Gp. 11/14. A

The technique employed in obtaining and preserving the eggs is described. In England and probably also in Wales and Scotland *Agriotes obscurus* is apparently the most common species. The adult beetles appear to remain in the soil during the winter and emerge in the spring about the middle of May, oviposition occurring from the end of June to middle of July. Their food chiefly consists of the nectar of flowers. The eggs of *A. lineatus*, *A. obscurus*, *A. sputator* and *Athous haemorrhoidalis* are laid in the soil at depths varying from $\frac{1}{4}$ of an inch to 2 inches, either in batches in which as many as 52 have been found, or singly. The actual environmental conditions necessary for oviposition are not known, but it is evident that the presence of grasses whether cultivated or growing as weeds is an essential factor.

The emerging larvae at once burrow into the soil. The first moult of *A. obscurus* takes place in June, the second in July or August, and the next in the following April or May. It is thought that the larvae in general moult twice a year, in April and May and again between July and September. They feed on almost any crop and on many weeds. Mustard is apparently only attacked in the absence of other suitable food, but they will leave cereals to feed on charlock. Other foods include beans, potatoes and tomatos. Wheat does not apparently suffer as much from attacks by wireworms in England as in America, which may probably be accounted for by the time of sowing the seed, which enables it to develop before any serious damage occurs. The larvae can subsist for a long time on the decaying vegetable matter contained in the soil. In many cases a state of hibernation occurs deep in the soil, though other larvae remain in the sod near the surface feeding on the roots.

Pupation takes place in the ground within a cell prepared by the larva usually near the soil surface. The pupal stage extends over a period of about 3 weeks, the insects being found in this stage from the end of July to the middle of September.

Wireworms do not appear to be attacked by internal parasites to any great extent, but a Proctotrupid, *Phaenoserphus* sp. probably *P. fuscipes*, Hal., was bred in July from larvae of *Athous haemorrhoidalis* and larval parasites of the same family have been found in *A. obscurus*. Wireworms are also infested by a fungus of the genus *Isaria*.

Speyer (E. R.). **A Contribution to the Life History of the Larch Chermes** (*Cnaphalodes strobilobius*, **Kalt.**).—*Ann. App. Biol., Cambridge*. vi, no. 2-3, December 1919, pp. 171-182, 2 plates, 1 fig.

The life-cycle of *Chermes* (*Cnaphalodes*) *strobilobius*, Kalt., as occurring on spruce and larch in Britain, is described in detail. The author largely confirms the observations made by Steven, whose work is extensively quoted [*R.A.E.*, A, vi, 154]. In discussing remedial measures it is pointed out that spraying may prove a successful method of control, provided that it is directed against the sexual generation, which apparently oviposits only on the underside of branches and possibly only on the lower branches. The habits and structure of this generation require further study, and the presence or absence of the gallicola non-migrans in England has yet to be decided.

WADSWORTH (R. V.). **Notes on the Life-History of** *Ephestia kühniella.* —*Ann. App. Biol., Cambridge,* vi, no. 2–3, December 1919, pp. 203–206.

The adult moths of *Ephestia kuhniella* do not require any food during their life, which lasts about one month. The eggs are laid during the latter half of their existence. Light is apparently the only determining factor in the choice of place for oviposition, as the eggs are often laid at some distance from food provided the site is dark enough. The larvae hatch in about a week according to the temperature and commence feeding on the most suitable food in their vicinity. After a few days they spin a silken tube, inside which they remain until fully fed. They will readily change their diet, which includes grains of all kinds, dried vegetables, cacao beans, nuts and even jelly cubes and chocolate. Although they are not known to attack animal food in storage, they have been reared for about 6 weeks on *Ephestia* and *Tortrix* under laboratory conditions.

The larval life varies from 10 to 12 weeks, depending greatly on the food and temperature. There are from one to six generations a year, but hard food such as dried potatoes will prolong the life-cycle to an abnormal extent so that not even one generation is produced during the year. When mature the larvae leave the silken case and their food in search of a suitable place for pupation, which is frequently the ears of sacks. The larvae that pupate in the autumn may hibernate in this stage or the adults may emerge within a fortnight, in which case the eggs are laid soon after emergence and the ensuing generation hibernates in the larval stage.

FRYER (J. C. F.). **Notes.**—*Ann. App. Biol., Cambridge.*, vi, no. 2–3, December 1919, pp. 207–209.

From observations made on eggs of *Charaeas graminis*, L., protected by perforated zinc but fully exposed to the weather, and others kept in a dry, unheated shed in a glass jar, it is evident that this moth hibernates in the egg-stage. The larvae began to emerge on 7th April.

Attention is drawn to the breeding of *Sitotroga cerealella*, Oliv., in England on barley in the field. Adults of *Anthonomus pomorum*, L., were found to feed on apple foliage in captivity. During an infestation in Hereford less than 1 per cent of this weevil was parasitised by *Pimpla pomorum*, Ratz.

Phyllobius urticae, DeG., and *P. oblongus*, L., are recorded as damaging strawberries in Hereford.

ARENS (P.). **Een voor** *Hevea* **schadelijke Oeret** (*Holotrichia leucophthalma*, **Wied.**). [A White Grub, *H. leucophthalma*, injurious to *Hevea*.]—*Meded. Proefstation Malang, Batavia*, no. 28, 1919, 19 pp., 2 plates. [With an English Summary.]

There is only one known case of white grubs attacking *Hevea*, Green having recorded that in Ceylon *Lepidiota pinguis* killed thousands of stumps on a clearing by eating all the rootlets and decorticating the tap-roots. A similar case due to *Holotrichia leucophthalma* has been recently observed in Java in a clearing that was quite cleanly weeded but where, owing to the very wet weather, burning could not be properly carried out before planting. A brief description of the adult, egg, larva and pupa of this beetle is given. The life-cycle takes a year. The average duration of the egg-stage was 27 days. The period elapsing between hatching and the first moult varied from 34 to 59 days with an average of 42. The first two moults were observed: they took place in the ground in a chamber resembling the pupal chamber. The prepupal stage in the pupal chamber lasted from 12 to 27 days in the cases observed and the pupal stage proper averaged 29 days. The beetles remained in the chamber for 10–26 days, this period of rest being longest when the ground was dry. The beetles are on the wing in Java from October to January, *i.e.*, the first months of the wet season. In captivity the larvae preferred potato to *Manihot utilissima*. Other food-plants include *Amarantus gangeticus*, *A. spinosus*, *Portulaca oleracea*, *Cyperus brevifolius* and *Panicum repens*. *H. leucophthalma* has also been recorded from sugar-cane [*R.A.E.*, A, iv, 89].

The following remedial measures are advised. New clearings should be cleaned from all decaying organic matter (stumps, leaves, etc.) before the flight season. If infestation occurs, soft weeds should be allowed to grow. *H. leucophthalma* will feed on these weeds and the injury to *Hevea* will be reduced. To prevent the spread of infestation it is necessary to capture as many of the beetles as possible. During the daytime they are to be found in great numbers in the soil of the older fields near infested clearings, about 4 inches below the surface.

BRUCH (C.). **Metamórfosis de *Taphrocerus elongatus*, Gory (Coleoptero Buprestido).**—*Anales Soc. Cien. Argentina, Buenos Aires*, lxxxii, no. 5–6, November-December 1916, pp. 251–256, 5 figs.

The Buprestid, *Taphrocerus elongatus*, Gory, is abundant in the riverside woods of Rio Santiago, near La Plata, on a rush, *Scirpus giganteus*, which is common in the neighbourhood. The eggs of this beetle are laid on the upper leaf-surface and the larvae mine in the leaves. Pupation also occurs within the leaf. The various stages are described. While no exact records of parasites have been made, it is evident that several occur in spite of the protected situation of the larva. These include a number of Chalcids and probably a Braconid.

LIZER (C.). ***Psylla erythrinae*, n. sp. (Homopt.).**—*Anales Soc. Cien. Argentina, Buenos Aires*, lxxxv, no. 5–6, May-June 1918, pp. 307–310, 5 figs.

Psylla erythrinae, sp. n., is described, and an account is given of each stage in the life-history. All stages occur abundantly on the leaves of *Erythrina crista-galli* in and around Buenos Aires. It is probable that successive generations occur throughout the spring and summer and that hibernation takes place in the adult stage. The leaves of infested plants become yellow and faded owing to the attacks of this Psyllid.

SCHRAGE (R.). **Aus dem Leben verkannter Tiere.** [From the Life of misunderstood Animals.]—*Zeitschr. Forst- u. Jagdwesen, Berlin*, li, no. 4, April 1920, pp. 190–201.

The mole is generally credited with the destruction of *Melolontha melolontha* and several authorities have stated this to be the case, but a series of careful observations on this animal, both with captive and free individuals, show that it is absolutely valueless in this connection.

KRAUSSE (A.). **Zur Vertilgung der Raupen des Kiefernprozessionsspinners.** [The Destruction of the Pine Processionary Caterpillar, *Cnethocampa pinivora*, Tr.]—*Zeitschr. Forst- u. Jagdwesen, Berlin*, li, no. 4, April 1919, pp. 202–205.

In 1916, 1917 and 1918, *Cnethocampa* (*Thaumetopoea*) *pinivora*, Tr., was abundant in West Prussia, especially in some parts of the coast, and it was decided to use a poison-spray to destroy it. As the caterpillars of this moth were not available for the experiments, they were carried out with those of *Vannessa io* and *Dasychira pudibunda*. The insecticides tested were carbolineum and nicotine, and they were entirely successful in emulsions of 3 per cent. strength, though a somewhat higher percentage is advisable.

LINSBAUER (L.). **Zur Bekämpfung der Kohlweisslinge.** [Measures against *Pieris* spp.]—*Naturwiss. Zeitschr. f. Forst- u. Landw., Stuttgart*, xvii, no. 4–5, April-May 1919, pp. 147–149.

Attention is drawn to the practice obtaining in parts of France and Germany and in Carniola of protecting cabbages against *Pieris* by placing twigs of elderberry (*Sambucus nigra*) around the plants. Hemp is used for the same purpose in Styria. In the latter case the odour of the hemp plant provides a reason, but the repellent action of the elderberry does not appear to admit of this explanation.

If the protection is proved actually to exist there is perhaps a possibility of utilising the active principle in the preparation of an effective spray.

DAMMERMAN (K. W.). **On Hybrids of** *Batocera albofasciata* **and** *gigas*.—*Tijdschr. Entomologie, The Hague*, lxii (1919), no. 3–4, 15th January 1920, pp. 157–160, 2 plates.

Among the Cerambycid beetles infesting *Ficus elastica* in Java [*R.A.E.*, A, ii, 533] are *Batocera albofasciata* and *B. gigas*, and some supposed hybrids between these species are here described.

R. Osservatorio di Fitopatologia, Turin, Mthly. Leaflets, Nos. 1–12, January–December 1919, 46 pp.

The following is a brief record of some of the injurious insects reported during the year:—Lepidoptera: *Aegeria* (*Sesia*) *apiformis* on poplar; *Euxoa* (*Agrotis*) *segetum* on aster; *Cheimatobia brumata* on cherry; *Clysia ambiguella* on vine; *Cnethocampa pityocampa* on pine; *Cossus cossus* (*ligniperda*) on birch, poplar and maple; *Cydia splendana* on chestnut and walnut; *C. pomonella* on apple; *C. funebrana* on *Prunus* and apricot; *Dendrolimus* (*Gastropacha*) *pruni* on

Prunus; *Hemerophila* (*Simaethis*) *nemorana* on fig; *Hyponomeuta malinellus* on apple; *Recurvaria nanella* on pear; *Nygmia phaeorrhoea* (*Euproctis chrysorrhoea*) on pear; *Pieris brassicae* on cabbage; *Plodia interpunctella* on *Lupinus* and maize; *Polychrosis botrana* on vine; *Porthetria* (*Lymantria*) *dispar* and *Saturnia pyri* on pear.

Coleoptera: *Agriotes lineatus* on wheat; *Anthonomus pomorum* on pear; *Apion apricans* on *Medicago sativa*; *Bruchus* (*Laria*) *rufimanus* in beans; *Byctiscus betulae* (*Rhynchites betuleti*) on vine; *Calandra granaria* on wheat; *Ceuthorrhynchus sulcicollis* on turnips; *Haltica oleracea* on cabbage; *Hylobius abietis* in pine; *Magdalis cerasi* on cherry; *Oberea linearis* in hazel; and *Scolytus multistriatus* in elm.

Hymenoptera: *Hoplocampa brevis* on pear; and *Neurotoma flaviventris* on hawthorn.

Rhynchota: *Aonidia lauri* on laurel; *Aspidiotus hederae* on oleander and aucuba; *Aulacaspis pentagona* on jasmin, lilac, mulberry, peach, cherry and *Pueraria thunbergiana*; *A. rosae* on rose; *Ceroplastes rusci* on fig; *Chionaspis euonymi* on *Euonymus*; *Chrysomphalus dictyospermi* var. *pinnulifera* on *Camellia*; *Coccus* (*Lecanium*) *elongatus* on laurel; *C. hesperidum* on lemon; *Epidiaspis piricola* on pear and apple; *Eulecanium* (*Lecanium*) *persicae* on acacia; *Icerya purchasi* on lemon and acacia; *Lepidosaphes ulmi* (*Mytilaspis pomorum*) on pear; *Physokermes piceae* on fir; *Stephanitis* (*Tingis*) *pyri* on pear; *Aphis rumicis* (*papaveris*) on beans; *A. persicae* on peach; *A. pruni* on *Prunus*; *A. ribis* on currant; *A. rosae* on rose; *Chermes* (*Adelges*) *abietis* on fir; *Eriosoma* (*Myzoxylus*) *lanigerum* on apple; *Lachnus piceae* on fir; and *Phylloxera vastatrix* on vine.

Diptera: *Hylemyia antiqua* (*Anthomyia ceparum*) on onions; *Contarinia pyrivora* on pear; *Perrisia crataegi* on hawthorn; *Rhagoletis cerasi* on cherry.

Mites: *Eriophyes fraxini* on ash; *E. macrorrhynchus* on maple; *E. pyri* on pear; *E. vitis* on vine; and *Tetranychus telarius* on *Veronica*, vine, *Angelica*, horse-chestnut and peach.

MAKI (M.). **Mezurashiki Satoimo no Gaichu, Shirotenkomori ni tsuite.** [On a new Taro-infesting Insect (the White-spotted Hepialid).]—*Konchu-Sekai* [*Insect World*], *Gifu*, xxiii, no. 11, 15th November 1919, pp. 397–400, 1 plate.

The Hepialid moth, *Palpifer sexnotatus*, Moore, is stated to attack taro (*Calocasia antiquorum*) severely, the larva eating the contents of the bulb. Damage to stored taro often amounts to over 50 per cent. The author bred and obtained the first adult in March and the second in May, but was unable to observe the subsequent life-history. Fumigation with carbon bisulphide is suggested against this pest.

TAKENOUCHI (K.). **Mitsukuri-Habachi ni tsuite.** [On *Eriocampa mitsukurii*, Rohwer].—*Konchu-Sekai* [*Insect World*], *Gifu*, xxiii, no. 11, 15th November 1919, pp. 400–405, 1 fig.

The sawfly, *Eriocampa mitsukurii*, Rohwer, which attacks black alder, is a two-brooded insect: the overwintered larva pupates at the end of March and the adult emerges within ten days. The eggs hatch in about ten days and the larva matures within 20 days. The adults of the second generation appear at the end of August, and the resulting larvae pupate in the earth in the middle of September. Both sexes, especially the male, seem to be very short-lived. The larva is preyed upon to a large extent by *Polistes* sp., and parasitised by Diptera.

Maki (M.). **Ine o gaisuru Taiwansan Shiroari.** [Formosan Termites attacking Rice.]—*Konchu-Sekai* [*Insect World*], *Gifu*, xxiii, no. 12, 15th December 1919, pp. 435–439, 2 figs.

The termites injurious to rice in Formosa and here recorded are:—*Odontotermes formosanus*, Shiraki, attacking the plants in the paddy-field, and *Capritermes nitobei*, Shiraki, and *Procapritermes mushae*, Oshima & Maki, attacking the roots in dry fields.

Kazui (M.). **Noshime-Koguga,** *Plodia interpunctella*, **ni tsuite.** [On the Indian Meal-moth, *Plodia interpunctella*.]—*Konchu-Sekai* [*Insect World*], *Gifu*, xxiii, no. 12, 15th December, 1919, pp. 445–449, 1 fig.

Plodia interpunctella is recorded as occurring in the storehouses of the Imperial Agricultural Experiment Station. It is stated that the larva eats only the outer husk of the rice grain, so that the effect is to render it far whiter.

Muramatsu (S.). **Nashi-Himeshinkui.** [The Smaller Pear Borer.]—*Byochugai Zasshi* [*Journal of Plant Protection*], *Tokyo*, vi, no. 12, 5th December 1919, pp. 19–25.

The smaller pear borer or Japanese peach moth, *Cydia* (*Laspeyresia*) *molesta*, Busck, is one of the most destructive insects in Korea. This pest has three generations a year; it passes the winter in the larval state and pupates in the middle of May; the first moths appear at the end of May and lay their eggs singly on the buds or shoots of the peach, and the young larvae injure the tip of the twigs. These larvae pupate in the middle of June and the adults appear at the end of that month. The moths of this generation oviposit partly on peach-trees and partly on plum, pear, apricot and apple, the resulting larvae infesting the twigs as well as the fruits. They pupate at the beginning of August, and emerging at the end of the month, oviposit on the fruits. The larvae bore into the pulp and do considerable damage at this period.

The egg-stage usually lasts about ten days, the pupal eight days and the larval, other than that which overwinters, 23 or 24 days. The adults usually live two weeks. As regards injuries to pears, the Japanese races suffer severely, but are not often attacked. The winter is passed by the larva in a stout cocoon in crevices of bark, etc., in the orchards, and in cracks in the ceilings and floors of stores. On 100 pears examined in August an average of 5 eggs and 4 larvae per fruit were found. The preferred food-plants are pear fruits, peach fruits, apple fruits, pear shoots, peach shoots and cherry shoots in the order given.

As regards remedial measures, the removal and burning of injured twigs, the envelopment of the fruit in stout paper bags in June and July and again in August, spraying with Paris green or sodium arsenate, picking infested fruits and clean cultivation, are recommended.

HARUKAWA (T.). **I no Habachi no Kenkyu (Yoho).** [A Study of the Rush Saw-fly (Preliminary Report).]—*Byochugai Zasshi* [*Journal of Plant Protection*], *Tokyo*, vii, no. 1, 5th January 1920, pp. 4–15.

A sawfly infesting rushes (*Juncus effusus*), which are used for making mats, is known to occur in several prefectures in Japan. The insect concerned is believed by Rohwer to be a species of *Tomostethus*.

Judging by breeding experiments, the insect has two generations; overwintering mature larvae appeared as adults in May and laid eggs which hatched at the end of the month; the resulting larvae pupated in a cocoon in the earth in the middle of July and emerged at the end of September; the eggs of this generation hatched at the middle of October and constructed cocoons at the end of November. Observations in the field agree with this result to a great extent, though in nature a few adults are met with at the beginning of July. In breeding cages the females laid 7–57 eggs, and lived 4–6 days, and the males 4–10 days. As soon as the adult female emerges, it lays eggs either after or before mating and in either case the egg is fertile. The eggs are inserted singly into the tissue of the rush leaf, and the presence of the young larvae may be detected by a white patch at the infested spot. After 9–15 days within the leaf-tissue the larva comes to the surface and attacks the leaf externally, the damage it does being easily recognised at a distance by the white colour of the plant. The larva of the June–July generation remains by day at the base, and at night migrates to the tip of the leaf; in larvae of the October generation this habit is reversed. The larva may be destroyed with poison sprays or with kerosene emulsion and insect powder, and the adults may be easily captured with a net. The destruction of the cocoons in the soil is of importance. Rotation of crops is also recommended.

OKADA (T.). **Kankitsu no Shingaichu Mikan no Kuromukugemushi ni tsuite.** [On a New Black Thrips attacking Citrus.]—*Byochugai Zasshi* [*Journal of Plant Protection*], *Tokyo*, vii, no. 1. 5th January 1920, pp. 23–25, 1 plate.

This thrips is of recent occurrence as a citrus pest in the Shidzuoka Prefecture, and the infestation is believed to have come from *Eurya japonica* grown near the orange groves. When first discovered, the navel orange was attacked, but afterwards other varieties of orange as well as tea, mulberry and other trees became infested. The attacked orange fruits not only lose their value for sale, but are unsuitable for preserving. Repeated spraying with kerosene emulsion or pine resin mixture has proved to be efficacious against this pest.

Bodkin (G. E.). **Rice Pests in British Guiana.**—*Jl. Bd. Agric. British Guiana, Demerara*, xii, no. 4, October 1919, pp. 248–250. [Received 2nd February 1920.]

Rice pests include:—The moths, *Mocis* (*Remigia*) *repanda*, F., of which the larvae destroy the foliage of mature plants; *Laphygma frugiperda*, S. & A., which chiefly infests the foliage of young nursery plants; *Maenas laboulbenei*, Bar, the aquatic larva of which destroys the foliage; *Diatraea saccharalis*, L., the larvae of which bore in the stem; an ant, *Solenopsis pylades*, For., which hollows out the stems of full-grown plants; a froghopper, *Tomaspis flavilatera*, Urich; the Pentatomids, *Mormidea ypsilon*, L., which destroys the developing ears, and *Tibraca limbativentris*, Stål; and a locust, *Conocephaloides maxillosus*, F., which destroys the foliage [see also *R.A.E.*, A, ii, 568, etc.].

The Wild Birds Protection Ordinance.—*Jl. Bd. Agric. British Guiana, Demerara*, xii, no. 4, October 1919, pp. 288–290. [Received 2nd February 1920.]

A list is here given of the families of wild birds that are protected by law in British Guiana.

Lime-Sulphur Spray following Bordeaux.—*N. Z. Jl. Agric., Wellington*, xix, no. 6, 20th December 1919, pp. 371–374.

Experiments show that lime-sulphur following Bordeaux mixture, has not reduced the apple crop in any way; on the other hand the foliage is much healthier than when Bordeaux mixture only is used, the efficacy of both the sprays being the same.

McGregor (E. A.). **The Red Spiders of America and a few European Species likely to be introduced.**—*Proc. U.S. Nat. Mus., Washington, D.C.*, lvi, no. 2303, 1919, pp. 641–679, 6 plates.

A key is given to the following genera of red spiders:—*Anychus*, gen. n., containing *A. banksi*, Mcg., from Florida, and *A. rusti*, Mcg., on *Carica papaya* in Peru; *Neotetranychus*, Träg.; *Schizotetranychus*, Träg.; *Tetranychus*, Duf.; *Septanychus*, gen. n., containing *S. tumidus*, Banks, and *S. quinquenychus*, Mcg., from Florida; and *Paratetranychus*, Zach.

Keys are also given to the species of each of these genera to the number of 32 including *Tetranychus pacificus*, sp. n., on mock orange (*Philadelphus gordonianus*), *Vicia* spp., and wild currant (*Ribes* spp.) in Oregon, and on chinaberry in California.

Trägårdh in 1915 [*R.A.E.*, A, iii, 253] placed *bicolor*, Banks, and *modestus*, Banks, in *Neotetranychus*, but these species are now transferred to *Paratetranychus*. The author differs from the views of Ewing [*R.A.E.*, A, iii, 63] as to the synonyms of *Tetranychus telarius*, L. He treats *T. bimaculatus*, Harv., and *T. sexmaculatus*, Riley, as distinct species, and *T. gloveri*, Banks, as a synonym of *T. bimaculatus*. It is doubtful whether the true *T. telarius* occurs in North America at all.

Laing (F.). **On the Genus *Antheroides*, Haliday (Aphidae).**—*Entom. Mthly. Mag., London*, 3rd Series, no. 62, February 1920, pp. 38–45, 5 figs.

The genus *Antheroides*, Hal., is defined and compared with *Sipha*. Descriptions are also given of *Antheroides junci*, sp. n., on rushes in England; *A. brevicornis*, sp. n., and *A. serrulatus*, Hal., on grasses in England. *Sipha paradoxa*, Theo., is possibly a synonym of the last-named. *Antheroides hirtellus*, Hal., found on *Juncus articulatus* and grasses in England and Ireland, is redescribed.

Ramakrishna Ayyar (T. V.). **A Contribution to our Knowledge of South Indian Coccidae.**—*Agric. Res. Inst., Pusa*, Bull. 87, 1919, 50 pp., 16 plates, 36 figs. [Received 6th February 1920.]

The classification, general features and life-history of Coccids, their distribution and means of dispersal, as well as their enemies, are discussed. This list of 129 species, only 40 of which have been previously recorded from S. India, includes many that have been noticed in a previous paper [*R.A.E.*, A, vii, 402].

Haviland (M. D.). **Preliminary Note on the Life History of *Lygocerus* (Proctotrypidae), Hyperparasite of *Aphidius*.**—*Proc. Camb. Phil. Soc., Cambridge*, xix, no. 6, pp. 293–295.

Certain Braconids are well-known parasites of Aphids, pupating within the dry skin of the Aphid host. *Aphidius* is itself frequently parasitised by Cynipids, Chalcids and Proctotrupids. In the case of the last-named, there has been some doubt as to whether they are hyperparasites or merely parasites of the Aphids.

The present paper records observations in 1919 on two Proctotrupids of the genus *Lygocerus*, *L. testaceimanus*, Kieff., a hyperparasite of *Aphidius salicis*, Hal., parasitic on *Aphis saliceti*, Kalt., on willows; and *L. cameroni*, Kieff., a hyperparasite of *Aphidius ervi*, Hal., parasitic on *Macrosiphum urticae*, on nettles. While the latter species was chiefly observed, the notes probably apply to either. *L. testaceimanus* would also oviposit on *Aphidius ervi*. The larvae of these Proctotrupids are also found feeding on the larvae of Chalcid or Cynipid hyperparasites of Aphids. In one case under observation *Macrosiphum urticae* was parasitised by *Aphidius ervi*. The latter had been hyperparasitised by a Chalcid of species unknown, which immediately after pupation had been attacked by another undetermined hyperparasite, either Chalcid or Cynipid. This second hyperparasite had in turn been attacked by *L. cameroni*, the larva being in the second instar when the cocoon was opened.

L. cameroni was fairly abundant about Cambridge in 1919, from mid-July to the end of August. The female selects an Aphid cocoon containing a full-grown larva or newly-formed pupa of *Aphidius* and oviposits on to the abdomen of *Aphidius* as it lies curled within the Aphid. The egg hatches in about 20 hours, and there are four larval instars, lasting 20 to 24 hours, about 36 hours, 35 to 40 hours and about 2 days respectively. During the second instar the host usually dies and its body becomes blackened and shrunken. *L. cameroni* pupates in the cocoon made by the Braconid inside the skin of the Aphids;

pupation lasts from 14 to 16 days, and the adult escapes by gnawing a hole on the upper side of the cocoon. At least two generations occur in a season, the adult life generally lasting 5 or 6 days and sometimes as long as 10 days. In captivity the adults fed on the sap oozing from cut leaves and on honey-dew, but they seemed to live as long and remain as vigorous without food.

Dickerson (E. L.) & Weiss (H. B.). **The Life-history and Early Stages of *Platymetopius hyalinus*, Osb., a Japanese Leaf-hopper in New Jersey.**—*Ann. Entom. Soc. America, Columbus, Ohio,* xii, no. 4, December 1919, pp. 369–372. [Received 9th February 1920.]

Platymetopius hyalinus, Osb., has been observed to be more or less abundant in New Jersey during the last few years on Japanese maple (*Acer palmatum*). From observations made during the summer of 1918, when the species was abundant on the Norway maple, *A. platanoides* var. *globosum*, it was found that hibernation occurs in the egg-stage, each egg being deposited singly just under the bark close to a bud on the recent growth of the twig. Groups of two to five eggs occasionally occurred, though they were always separated from each other. Hatching began about 1st June and continued for nearly a month, first-stage nymphs being found as late as July. From eggs hatching in early June, adults appeared early in July, so that the five nymphal stages require about one month, probably less in very warm weather. All nymphal stages and adults may be found during the first half of July, but adults are most plentiful during late July and early August. The eggs that remain through the winter are then deposited. The nymphs feed on the lower leaf-surfaces and seem to prefer the shaded portions of the tree. All stages of the insect are described. In view of the wide distribution of Japanese maple as an ornamental tree, *P. hyalinus* has probably been introduced into many other eastern localities.

Treherne (R. C.). **Notes on the Aeolothripidae.**—*Proc. Entom. Soc. Brit. Columbia, Victoria,* Systematic Series, no. 12, February 1918, 1919, pp. 27–33, 20 figs. [Received 10th February 1920.]

This paper includes keys to the sub-families and genera of Aeolothripidae as well as to the species of *Aeolothrips*, Hal.

Tothill (J. D.). **Natural Control Investigations in British Columbia.** —*Proc. Entom. Soc. Brit. Columbia, Victoria,* Systematic Series, no. 12, February 1918, 1919, pp. 37–39. [Received 10th February 1920.]

It is probable that barriers within the limits of the Dominion of Canada are affecting the distribution of parasitic and predaceous enemies of insects; thus a Tachinid which for years was responsible for the destruction of over 60 per cent. of the fall webworm (*Hyphantria cunea*) became exterminated as another parasite which was able to oviposit in wet weather monopolised its host. In a similar manner the principal parasites of the forest tent caterpillar (*Malacosoma disstria*) were indirectly killed off by a light frost in June.

The liberation of parasites of *M. pluvialis* is suggested as a means of combating *M. disstria* in districts where the parasites of the latter are absent.

Hyphantria cunea (fall webworm) is parasitised in British Columbia by an undescribed Tachinid, unknown in Eastern Canada, whereas the mite, *Hemisarcoptes malus*, which is predaceous on the oyster-shell scale [*Lepidosaphes ulmi*] in Eastern Canada and the eastern United States, is apparently absent in British Columbia. Experimental colonies of this mite have been liberated at several points and will be kept under observation during the next few years.

Dille (A.). **How Teachers may use Publications on the Control of Diseases and Insect enemies of the Home Garden.**—*U.S. Dept. Agric., Washington, D.C.*, Dept. Circ., no. 68, September 1919, 4 pp. [Received 10th February 1920.]

The contents of this paper are indicated by its title.

Worsham (E. L.). **Control of Insects attacking stored Products.**—*Georgia State Bd. Entom., Atlanta*, Circ. no. 22, [n.d.] 1 p. [Received 10th February 1920.]

The insects commonly found attacking stored grain are dealt with and the usual remedial measures advocated.

Briggs (G.). **Report of the Agronomist and Horticulturist.**—*Rept. Guam Agric. Expt. Sta.* 1918, *Washington*, 14th October 1919, pp. 29–59, 7 plates. [Received 10th February 1920.]

Serious damage was caused by *Pyrausta nubilalis* (European corn borer) and *Leptocorisa varicornis* (rice bug) to sorghum. The latter also caused serious injury to rice.

Other pests of rice include two Pyralids, one of which folds the leaves on which it feeds and can as yet only be controlled by hand-picking, the other bores upwards in the stems, especially near the joints. The suspension of irrigation may prove an effective remedial measure against this pest.

Tobacco is attacked by a Gryllid, and the moths, *Heliothis assulta* and *H. obsoleta*, which were successfully checked by the use of a spray consisting of 4 lb. of lead arsenate paste, 4 lb. of lime and 100 U.S. gals. of water, applied as often as twice a week during the rainy season.

Considerable damage was caused to coconut trees by a scale which had been identified as *Aspidiotus oceanica*, but is now believed to be *A. destructor*. This scale was also abundant on fruit and foliage of bananas, papaws and bread-fruit.

Houser (J. S.). **Destructive Insects affecting Ohio Shade and Forest Trees.**—*Ohio Agric. Expt. Sta., Wooster*, Bull. 332, November 1918, pp. 161–487, 70 plates. [Received 10th February 1920.]

This bulletin supplements one published more than ten years previously. Since that time much information has been accumulated pertaining to the control of insects affecting shade-trees in Ohio, and the public are far more interested than formerly in the preservation of their shade and ornamental trees. The factors associated with insect control in cities are discussed. Spraying machinery and accessories are described, with spraying formulae and the usual control measures such as banding, etc. Some account is given of the chief insects attacking foliage, scale and other sucking insects and borers. A useful and comprehensive index is appended.

DE ONG (E. R.). **The Red Spider.**—*Mthly. Bull. Cal. Dept. Agric., Sacramento*, viii, no. 11–12, November-December 1919, pp. 679–680. [Received 11th February 1920.]

The method of feeding of the mites known as red spiders and the role of chlorophyll in the life of trees is discussed. As the food of red spiders consists chiefly of chlorophyll the plants attacked are very much weakened and rendered more susceptible to injury by frost. Remedial measures such as sulphur should be applied in the early summer before the damage done becomes noticeable.

WELD (L. H.). U.S. Bur. Entom. **A New Parasitic Cynipid reared from a Clover Aphid. (Hym.)**—*Entom. News, Philadelphia, Pa.*, xxxi, no. 1, January 1920, pp. 14–16.

Charips leguminosa, sp. n., is described. It is possibly a parasite of the clover aphis, *Anuraphis* (*Aphis*) *bakeri*, Cow., but as it was reared in cages with *Aphelinus lapsiligni*, How., the most important parasite of this Aphid, it is suggested that it may be a hyperparasite. A key to the species of the genus *Charips*, Hal., is given.

BAERG (W. J.). **An unusual Case of Parasitism on** *Clastoptera obtusa*, **Say. (Hemip., Cercopidae; Dip., Drosophilidae.)**—*Entom. News, Philadelphia*, xxxi, no. 1, January 1920, pp. 20–21, 1 fig.

The author records finding spittle masses of *Clastoptera obtusa* on alder (*Alnus americana*) inhabited by small Dipterous larvae which were identified as being those of *Drosophila inversa*, Wlk. [see also *R.A.E.*, A, vii, 139]. Many of the larvae were found on nymphs of the spittle insect, but apparently they do no damage beyond bruising and irritating the sides of the abdomen to which they are attached, and are parasitic only in as much as they use the excess of sap drawn from the plant by *C. obtusa* and utilise the spittle insect as a means of transportation. Apparently these larvae are exclusively parasitic upon *C. obtusa*, as nymphs of *C. proteus* which were abundant on *Viburnum* close to the alders showed no signs of infestation. From pupae of *D. inversa*, adults were reared and also a few Hymenopterous parasites identified as Cynipids of the subfamily EUCOILINAE.

BALLOU (H. A.). **A Weevil attacking** *Agave*.—*Agric. News, Barbados*, xix, no. 462, 10th January 1920, p. 10.

A weevil, *Scyphophorus acupunctatus*, Gyl., has recently been reported as attacking *Agave* in Curaçao. This insect is apparently a native of Mexico, where it is very abundant, and has also been recorded in Java, East Africa, Haiti and Cuba. Both larvae and adults are found in large numbers in the stem and leaf-bases of plants of *Agave frankeera* that have not yet formed a pole. The insect has also been found attacking *A. vivipara*, where it occurs only in the "bull-end" of the flower-pole; *A. sisalana* does not appear to be attacked. The weevil has distinct potentiality for harm in localities where henequen cultivation is being started, and if, as is surmised, the insect is introduced with planting material, such material should only be obtained from localities where the species does not occur. The weevil, if once established, would be extremely difficult to control and almost impossible to exterminate except by eradication of its food-plants. It is possible that some parasite may be found in Mexico or Central America that could be transported with advantage to the localities where it has recently been introduced.

Ballou (H. A.). **An Observation on Ants.**—*Agric. News, Barbados*, xix, no. 462, 10th January 1920, pp. 10–11.

A case is recorded of a house in Barbados that was seriously infested with a small red ant, and although remedial measures were tried for several months and the numbers were slightly reduced, eradication seemed impossible. A small colony of the crazy ant, *Prenolepis longicornis*, subsequently became established in the house and at the present time it is found all over the house, while the red ant has entirely disappeared.

Sanders (G. E.) & Kelsall (A.). **The Use of White Arsenic as an Insecticide in Bordeaux Mixture.**—*Agric. Gaz. Canada, Ottawa*, vii, no. 1, January 1920, pp. 10–12.

As a result of three years' investigation on the various methods of using white arsenic, a method of preparation is described which is safe and simple and results in a product that compares favourably with other more complicated and expensive forms of arsenicals. The advantages of using white arsenic are its low cost, varying from one-fifth to one-tenth per unit of arsenic over that of other arsenicals, and its concentrated form. The disadvantages generally alleged against it are the difficulty with which it mixes with water, its poor physical condition, the low killing value sometimes reported for it and its caustic action on foliage. These disadvantages can all be overcome if the following method is carefully adhered to. The arsenic used must be superfine, that is, guaranteed to pass a screen of 250 meshes to the inch. It is immaterial whether high calcium or dolomite lime is used, though the former is preferred. To make 10 gals. of copper sulphate stock solution the vessel should be filled with 10 gals. water into which is sifted a mixture of 1 lb. white arsenic and 1 lb. hydrated lime. This should be thoroughly stirred and in it should be suspended a sack containing 10 lb. crystal copper sulphate. The mixture should be stirred occasionally while the copper sulphate is dissolving. The solution should be made at least 24 hours before it is used, and when made, it will keep indefinitely. It should be stirred thoroughly before it is diluted. The poisoned Bordeaux mixture made in this way will have the desirable physical characteristics of ordinary Bordeaux mixture, while its fungicidal value is unimpaired.

Strickland (E. H.). **The Cottonwood Leaf-mining Beetles in Southern Alberta.**—*Canad. Entom., London, Ont.*, lii, no. 1, January 1920, pp. 1–5, 4 figs.

Zeugophora scutellaris, Suffr., and *Z. abnormis*, Lec. (cottonwood and poplar leaf-mining beetles) are responsible for much damage in Alberta and Saskatchewan to cottonwoods and other poplars that have proved to be the best species for shade and ornamental purposes in those regions. *Z. scutellaris* appears in the adult stage feeding on the leaves about 15th June, and from that date until the end of the month its numbers increase rapidly. The beetles are generally most abundant on the smaller-leaved varieties of cottonwood and are always more numerous on the sheltered side of the tree and on trees in sheltered situations. Towards the end of the month mating occurs, and within a few days eggs are deposited within half an inch of the leaf margin where the veins are very fine, several being laid in one leaf but many failing to hatch. Soon after oviposition, the tissues above the egg-cavity turn brown. The larvae, immediately upon hatching, begin to enlarge the cavity in which they have hatched, feeding on the leaf cells just under the upper epidermis. This causes the lower tissues of the leaf to turn black, the discoloration showing through the transparent upper epidermis. A large blister made by the tunnels of various larvae may contain many individuals, though only one usually survives. By mid-September most of the larvae are mature, and break through the thin upper surface of the leaf to fall to the ground. After burrowing some inches below the surface they construct a cavity in which they hibernate.

Z. abnormis is rarely seen on cottonwood but is abundant on balm of Gilead (*Populus balsamifera*). The life-history is similar in both species, but as many as 50 eggs of *Z. abnormis* may be laid in a single leaf; about 28 per cent. of these fail to hatch. The larvae are more gregarious and as many as seven healthy individuals have been found in one blister. The greatest damage is to foliage 6 to 10 feet from the ground and is always worst on sheltered trees; leaves towards the centre of the tree are seldom attacked. *Z. abnormis* does not occur annually in such large numbers as *Z. scutellaris*, but in some years is very abundant on the comparatively small numbers of its food-plant.

Egg-parasites of both species are numerous, particularly a Mymarid reared from *Z. abnormis*. Over 40 per cent. of the eggs contained various stages of this parasite. Sprays of 1 oz. Paris green and 4 oz. slaked lime to 10 gals. water gave better results than lead arsenate; the spray must be directed to the underside of the leaves with an angle nozzle, and should be applied as soon as the beetles appear in any numbers. Spraying operations must be general, owing to the powers of flight of the beetles.

Takahashi (R.). **A new Genus and Species of Aphid from Japan. (Hem.).**—*Canad. Entom., London, Ont.*, lii, no. 1, January 1920, pp. 19–20, 1 fig.

For a new Aphid that has been found in the leaves of *Podocarpus macrophylla*, the genus *Neophyllaphis* has been erected; it is compared with *Phyllaphis*, Koch, to which it is closely related. The type species, to which the name *N. podocarpi* is given, is here described in its various forms from Tokyo, Japan. The species is rather inactive in habit. Both winged and wingless forms appear in May and later, in the second and subsequent generations. The sexuparae are wingless but the oviparous female as well as the male is winged, these forms appearing during September. As is frequently the case among Siphonophorina, wingless viviparous females may give birth to both winged and wingless progeny, but winged females produce only wingless forms.

Greenidea kuwanae, Perg., *Trichosiphum tenuicorpus*, Okag., and *Cervaphis quercus*, Tak., resemble *N. podocarpi* in that the oviparous females are winged.

KING (J. L.). **The Angoumois Grain Moth** (*Sitotroga cerealella*, **Oliv.**).—*Penn. Dept. Agric., Bur. Plant Indust., Harrisburg*, Circ. 1, January 1920, 14 pp., 1 plate, 2 figs.

This popular bulletin has been written to replace one published several years ago, since when the damage done to wheat by the Angoumois grain moth, *Sitotroga cerealella*, has become more serious and has spread to new areas [*R.A.E.*, A, vii, 543]. The life-history and habits of the moth are described and recommendations given for its control [*loc. cit.*. vi, 202].

THORNE (C. E.). **Entomology.**—*37th Ann. Rept.* 1917–1918, *Ohio Agric. Expt. Sta., Wooster*, Bull. 325, June 1918, pp. x-xi. [Received 17th February 1920.]

An outline of the work of the entomological division during 1917–1918 is given, with a list of the publications issued during that period.

VEITCH (R.). **The Cane Beetle Borer in Fiji** (*Rhabdocnemis obscura*, **Boisd.**).—*Colonial Sugar Refining Co., Ltd.* [*Fiji*], *Agric. Rept., no. 4, Sydney*, October 1919, 23 pp., 1 plate. [Received 20th February 1920.]

The information contained in this paper has already been noticed [*R.A.E.*, A, v, 52–54 ; viii, 25].

SMITH (T. A. J.). **Tobacco Culture.**—*Jl. Dept. Agric. Victoria, Melbourne*, xvii, no. 12, 15th December 1919, pp. 755–756.

Cutworms are very troublesome pests of tobacco in Victoria. The poison-bait recommended for them consists of 1 lb. Paris green or arsenic to 50 lb. bran, with sufficient water and molasses to moisten it. Another pest of the growing crop is the caterpillar of a Sphingid moth, which may attack the plants at all times from transplantation up to harvest. The remedies suggested are hand-collection and the use of a spray consisting of 1 lb. Paris green to 200 gals. of water, applied as a fine mist. The young, tender leaves in the centre of the plant should be thoroughly sprayed as soon as the caterpillars appear.

NICHOLLS (H. M.). **The Woolly Aphis** (*Eriosoma lanigera*).—*Tasmania Agric. & Stock Dept., Hobart,* Bull. 83, 1919, 8 pp. [Received 20th February 1920.]

The origin and early records of *Eriosoma lanigerum* (woolly aphis) are discussed, and the life-history is given. This differs very little from that in other countries outside America, though the winged form is not seen abundantly in Tasmania but appears to be recognised in New South Wales, where it is observed about mid-summer. As the wingless forms are found on the trees all the year round they evidently do not rely on the winged forms for carrying on the generations, as is the case in severer climates. The winged females produce living young and these continue reproducing until late in autumn and sometimes throughout the winter. At the beginning of autumn males and oviparous females begin to appear. In Australia, there is no evidence that *E. lanigerum* ever migrates from the apple to any other food-plant.

Apple-trees in Tasmania may have every appearance of heavy infestation by this Aphid, and have been in that condition for many years, without apparently suffering in any way, but in some of the drier parts of the State the pest causes a good deal of damage, especially to young trees. Experiments in Tasmania with resistant varieties of apple-stock have been disappointing, but further tests are required and the discovery of resistant roots that would grow freely in somewhat poor soils would be very desirable.

The usual remedial measures against *E. lanigerum* are recommended. Young trees should be dipped or fumigated previous to planting. For slightly infested trees, Blackleaf 40 can safely be used at all times of the year. Sprays of red oil or crude petroleum have given satisfaction in some of the drier parts of Australia but are of doubtful value under the moist conditions frequently prevailing in Tasmania. These sprays can only be used during the dormant season. Against Aphids on the roots the usual remedies practised in other countries are described. A treatment recommended by the New Zealand Government consists of 4 lb. sublimed sulphur boiled with water in an iron pot, to which is added 1 lb. caustic potash previously dissolved in water. When the sulphur has dissolved and the mixture is hot, as much colza or other vegetable oil as will make a thick paste is added. The mixture is painted, while warm, round the butt of the tree. Rain washes it down to the roots and the oil will tend to preserve its strength for years.

THOMAS (P. H.). **Small-Fruit Culture.**—*Tasmania Agric. & Stock Dept., Hobart,* Bull. 87, 1919, 16 pp., 12 figs. [Received 20th February 1920.]

Black and red currants in Tasmania are very liable to attack by *Aegeria tipuliformis*, Clerck (currant borer). The larvae penetrate the pithy centres of the various parts of the bush and burrow downwards, eventually killing the parts attacked. Control is somewhat difficult and must be by concerted effort in any district if it is to be successful. All affected parts of the bushes should be removed and burnt during early spring.

Several species of scale-insects also attack currant bushes. These may be controlled by an application of lime and sulphur, about 1 part of concentrate (33° Bé.) to 10 or 12 parts of water, applied during the dormant period.

Froggatt (W. W.). **Poison Baits for White Ants.**—*Agric. Gaz. N.S.W., Sydney*, xxxi, no. 1, 2nd January 1920, p. 46.

The resistant properties of various Australian timbers in relation to termites are not yet sufficiently known. A poison bait is recommended consisting of 1 oz. arsenic to 1 lb. treacle, or sodium arsenite might advantageously be substituted for the arsenic. This should be dissolved in hot water and then mixed with the treacle. The bait should be poured into the woodwork of floors or joists and percolates through any damaged wood. A mixture of 1 oz. Paris green and 1 lb. pollards, brought to the consistency of putty by the addition of a little sweetened water, has also been found useful. This should be forced into any wood that it is not desired to remove.

Froggatt (W. W.). **Notes on the Apple Root Weevil** (*Leptops hopei*).—*Agric. Gaz. N.S.W., Sydney*, xxxi, no. 1, 2nd January 1920, pp. 56–60, 7 figs.

Observations are recorded on *Leptops hopei* (apple-root weevil), which was studied in an infested orchard where the larvae were eating away the bark from the main roots of apple trees and causing the roots to rot. From the irregular development of larvae and pupae it seems probable that there is an emergence of beetles towards the end of summer as well as the main emergence in September and October. Eggs were found early in November, when the beetles were collecting on the tips of the highest branches of apple trees and eating the foliage, and are deposited between the two gummed surfaces of a folded leaf. Weevils enclosed on apple branches in mosquito-net bags were found to deposit from 33 to 97 eggs in each patch. These hatched in about a week. The young larvae, though legless, are very active, and descend the trunk to the roots. When mature they leave the apple roots and have been found pupating in an earthern cell several inches away from the roots and over two feet below the ground surface, whence the adults emerge and crawl up the tree-trunk to the foliage.

As the beetles are found to ascend the trunk from early September until the end of November, it is suggested that an inverted funnel or a frill of tin or stiff oiled paper over which they could not crawl should be placed round the tree-trunk and examined every week during this period for adults sheltering there. To capture the small larvae as they descend the trunk a band of sticky paper could be tied round it, well above the ground. If the beetles reach the leaves the highest foliage should be sprayed with lead arsenate.

Report on the Occurrence of Insect and Fungus Pests on Plants in England and Wales, in the Year 1918.—*Bd. Agric. & Fisheries Intelligence Dept., Plant Disease Branch, London,* Miscellaneous Publications, no. 23, 1920, pp. 5–15 & 29–42.

The pests damaging cereals include: A thrips, probably *Limothrips denticornis*, Hal., or *L. cerealium*, Hal., which caused sterile spikelets in oats; *Tipula paludosa*, Meig., which attacked spring-sown cereals, especially oats, as well as autumn-sown wheat and rye; *T. vernalis*, Meig.; *Hylemyia coarctata*, Fall., which was apparently less destructive than in 1917; *Chlorops taeniopus*, Meig.; *Oscinella* (*Oscinis*) *frit*, L., which was less abundant than usual; wireworms, which were very abundant; *Phyllotreta vittula*, Redt., which caused severe damage to barley in May and June and was also found on oats, young maize and *Agrostis alba*; and *Tylenchus scandens*, Schneid., which was unusually abundant.

Potatoes were attacked by *Calocoris norvegicus*, Gmel. (*bipunctatus*, L.), Capsid bugs, *Lygus* spp., and *Hydroecia micacea*, Esp. Swedes were injured by *Agrotis* spp. Other pests of root crops include: *Chaetocnema* (*Plectroscelis*) *concinna*, Marsh., on young mangel plants; *Phyllotreta nemorum*, L., and *P. undulata*, Kutsch.

Pests of pulse crops include: *Bruchus rufimanus*, Boh., which was found attacking 30 per cent. of the bean crop in Cambridgeshire and 90 per cent. in Bedfordshire; *B. pisorum*, L. (*pisi*, L.); *B. affinis*, Fröl., on broad beans; *B. obtectus*, Say, on Canadian wonder beans; *Sitones lineatus*, L., which chiefly attacked late-sown peas and against which a wash consisting of 2 oz. washing soda, 1 oz. carbolic soft soap and 1 gal. water applied to the ground round the plants proved successful.

Anthonomus pomorum, L. (apple-blossom weevil) was particularly abundant, but was checked in several cases by the application of a lime and salt spray when the buds were bursting. Black currant buds were seriously infested by a mite, *Eriophyes ribis*, Nal.

Owing to the apparent shortage of lead arsenate, alternative poisons for mandibulate insects were tested, including barium chloride, calcium arsenate and pyridine, but according to F. V. Theobald these substitutes are useless. Barium chloride, 2 lb. to 10 gals. of water, was only effective against the larvae of the ermine moths, *Hyponomeuta* spp. Tests with calcium arsenate by F. R. Petherbridge and with barium chloride by F. J. Chittenden show that both these insecticides give rise to a considerable degree of scorching.

A general list of all insects and fungi reported for the year is given arranged under the various crops attacked.

TRYON (H.). **Report of the Entomologist and Vegetable Pathologist.** —*Queensland Ann. Rept. Dept. Agric. & Stock for the Year 1916–1917, Brisbane*, 1917, pp. 49–63. [Received 11th February 1920.]

The chief pests recorded for the year under review include: *Heterodera radicicola* which caused root-gall on sugar-cane, potatoes, tomatoes, passion vine and grape-vine. Maize was attacked by *Cirphis* (*Leucania*) *unipuncta* (army worm), *Dichocrocis punctiferalis* (smaller maize borer), *Calandra oryzae*, Scarabaeids, Elaterids, *Gryllotalpa africana* and Forficulids. Wheat was injured by Elaterids, *Calandra oryzae* and *Sitotroga cereallela*. *Aulacophora olivieri* occurred in several instances on pumpkins. *Haltica solani* (potato flea-beetle) and *Phthorimaea operculella* caused injury to potatoes.

Cotton pests include: *Agrotis* sp.; *Dichocrocis punctiferalis* (Queensland bollworm no. 1); *Earias insulana* (Queensland bollworm no. 2); grasshoppers; *Tectocoris banksi* (shield bug); *Dysdercus* sp.; and *Oxycarenus luctuosus* (small black cotton bug). *Epilachna vigintioctopunctata* and *Heliothis obsoleta* (*armigera*) infested tomatos. Cabbages were attacked by *Plutella maculipennis* (*cruciferarum*) (diamond-back caterpillar), *Hellula undalis* and *Brevicoryne* (*Aphis*) *brassicae*. *Thrips tabaci*? was abundant on onions; cucumbers were injured by *Leptoglossus membranaceus*, a bug that also caused great damage to *Citrus*. *Agromyza phaseoli* seriously injured beans.

Orchard pests include: *Dacus ferrugineus* (*Bactrocera tryoni*), *Aphis persicae-niger*, *Dichocrocis punctiferalis* and *Gryllus* sp. on peaches; *Aphis* sp. on plums; a Pyralid, *Aphytoceros lucusalis* (shoot-boring caterpillar) and an undetermined scale-insect on figs; *Eriosoma lanigerum* (woolly aphis) and *Aspidiotus perniciosus* (San José scale) on apples; *Bryobia* sp. and *Protaetia mandarinea* (fruit-eating Cetoniid) on pears.

Citrus was attacked by *Oncoscelis sulciventris* (bronze sucking bug), *Siphanta galeata* (torpedo bug), *Chrysomphalus aurantii* (red scale), *C. aonidum* (circular black scale), *Ceroplastes rubens* (pink wax scale), *Icerya purchasi* (cottony cushion scale), *Lepidosaphes beckii* (*Mytilaspis fulva*) (mussel scale), *Pseudococcus adonidum* (*Dactylopius longispinus*) (mealy bug), *Saissetia* (*Lecanium*) *nigra*, *Coccus* (*L.*) *hesperidum*, the mites *Eriophyes* (*Typhlodromus*) *oleivorus* and *Tenuipalpus* sp., *Uracanthus cryptophagus* (stem-girdling beetle borer), Curculionids and fruit-sucking moths (*Ophideres*).

Cosmopolites sordidus (weevil borer), *Thrips* sp., and a Noctuid, *Tirocala plagiata*, attacked bananas; *Pseudococcus* (*Dactylopius*) *bromeliae* infested pine-apples and *Achaea janata* (*Ophiusa melicerta*) castor-oil plants.

Roses were attacked by *Icerya purchasi*, *Coccus longulus*, *Chrysomphalus aurantii* and *C. aonidum*. Laburnum trees (*Cassia brewsteri*) were injured by a wood-boring caterpillar and a Cetoniid beetle, *Protaetia mandarinea*.

Other miscellaneous insects include: the lucerne webworm, *Tortrix divulsana* (*glaphyrana*), which did enormous damage, a Jassid, grasshoppers and *Prodenia litura* (*testaceoides*) on lucerne (*Medicago sativa*); a Pyralid, *Hypsipyla robusta* (cedar twig borer) and *Aspidiotus* (*Euaspidiotus*) *lataniae* (white cedar scale) on red cedar (*Cedrela toona*); *Papilio aegeus* on crows ash (*Flindersia*); a gall-producing caterpillar destroying the foliage of tallowwood (*Eucalyptus microcorys*); an undetermined Tortricid, *Anobium* sp., *Platypus solidus*, the Curculionids, *Orthorrhinus cylindrirostris* and *Euthirrhinus meditabundus*, and the Oedemerid, *Selenopsclaphus* (*Selenopalpus*) *cyaneus*, on *Araucaria bidwilli*; the Scolytids, *Crossotarsus armipennis* and *Hylesinus pseudomori*, on waddywood (*Pseudomorus brunnoniana*); the Cossids, *Xyleutes boisduvali* on grey gum (*Eucalyptus tereticornis*) and *Endoxyla eucalypti* on *Acacia* sp.; a Gelechiid moth, *Cryptophaga irrorata*, on forest oak (*Casuarina inophloia*) and river oak (*C. cunninghami*); *Epicoma* (*Teara*) *tephrosia*? on white cedar (*Melia composita*); a Pierid butterfly, *Terias hecabe*, on locust trees (*Robinia* spp.); and a mite, *Phyllocoptes lycopersici*, which caused rosette disease and fruit sterility of tomatos.

The lantana seed-fly, *Agromyza* sp., has been imported from Honolulu for the purpose of destroying lantana, and has become established in certain districts, as has also the wild cochineal insect, *Dactylopius (Coccus) confusus indicus*, Green, which was introduced for the suppression of the prickly pear, *Opuntia monocantha*. The work of this insect however is greatly impaired by a predatory Coccinellid beetle, *Cryptolaemus montrouzieri*.

The pests intercepted in quarantine during the year include: *Pectinophora (Gelechia) gossypiella* (pink bollworm) on cotton from Egypt; a cotton stainer, *Dysdercus* sp., on cotton seed from Papua; *Diatraea* sp. and *Chionaspis* sp. on sugar-cane from Java; *Ephestia* sp. and *Tenebroides mauritanica* in dried fruit from Portugal; *Alphitobius piceus* in bags of rice from the East; *Bruchus ? ramicornis* and *Bruchus* sp. in algaroba (*Prosopis juliflora*) from Argentina; *Rhizoglyphus* sp. in avocado (*Persea*) seeds from Fiji and in bulbs from England; *Heterobostrychus pileatus* and *Dinoderus* sp. in wood of tea chests from India; and *Asterolecanium* sp. on the bark of a stake received with plants from New Zealand.

Tryon (H.). **Report of the Entomologist and Vegetable Pathologist.** —*Queensland Ann. Rept. Dept. Agric. and Stock for the Year 1918–1919, Brisbane*, 1919, pp. 37–49. [Received 11th February 1920.]

The chief pests dealt with during the year under review in addition to those recorded in the preceding paper include: *Epilachna vigintioctopunctata* infesting potatoes; *Herse (Chaerocampa) convolvuli* on sweet potato; a Pyralid caterpillar, *Endotricha puncticostalis*, on pea-nuts (*Arachis*). Cotton was infested by a Noctuid, *Anomis erosa* (*Cosmophila xanthindyma*), *Earias huegeli*, *Oxycarenus luctuosus*, *Dysdercus sidae*, and a defoliating beetle, *? Monolepta rosea*. Cucurbitaceae were attacked by *Aulacophora hilaris* and *Epilachna vigintioctopunctata*, though the latter did not attack water-melons. Other pests included *Phytometra chalcites* and *Agrotis ypsilon* on cabbages and turnips; *Isodon puncticolle* on tomatoes; the Oniscid, *Armadillidium* sp. on vegetables generally; *Cydia (Carpocapsa) pomonella* and *Oecanthus* sp., on apples; *Orgyia postica* on plums; *Nysius vinitor* (false chinch bug), termites and a scale-insect on peaches; *Bostrychus jesuita*, an undetermined Cerambycid, *Morganella (Hemiberlesea) longispina*, a Jassid, *Kybos* sp., and a beetle, *Galerucella semipullata*, on figs; *Chionaspis dilatata* on mango; *Pseudococcus* sp., *Coccus (Lecanium) longulus* and *Saissetia (L.) nigra* on custard apples; an undetermined white scale and *S. (Lecanium) oleae* on persimmon; *Aspidiotus perniciosus* on loquat; *Monolepta rosea*, *Coccus longulus* and termites on grape-vine; an undetermined root-destroying Scarabaeid on pine-apple; *Papilio anactus*, *P. ormenus*, *Biprorulus bibax* (green horn bug), termites, *Chrysomphalus aurantii*, *Aspidiotus hederae*, *Ceroplastes ceriferus*, *Chionaspis citri* on *Citrus*; *Notarcha clytalis*, a Pyralid, on flame tree (*Sterculia acerifolia*); a Tortricid, *Cryptophlebia illepida* ("*Arctiophora*" *ombrodelta*) on Queensland nut (*Macadamia ternifolia*); *Psylla fici* on fig (*Ficus macrophylla*); *Brithys crini* and *Calogramma festiva* on *Crinum* and *Amaryllis*; and an unidentified Cerambycid on *Acacia harpophylla*.

Pseudomonas campestris, a bacterial disease of cabbages and turnips etc., is thought to be disseminated by biting insects. Many diseases of *Citrus* plants are caused by mites; thus russeting is attributed to *Eriophyes* (*Phyllocoptes*) *oleivorus*; brown spot to *Tenuipalpus* sp.; melanose of fruit and wood to *Tydeus* sp.; and bud suppression to a mite, *Tarsonemus* sp. Stool decay in bananas is primarily induced by injury caused by Scarabaeid grubs.

Enemies of honey bees include: the Asilid flies, *Asilus rufiventris*, Macq., and *Blepharotes flavus*, Ric.; the Reduviid bug, *Pristhesanchus papuensis*; the foraging ant, *Iridomyrmex purpurascens*, and the green tree ant, *Oecophylla smaragdina*.

Larvae of *Anthrenus scrophulariae* are recorded as attacking woollen clothing.

The lantana fly, *Agromyza* sp., imported for the control of the lantana plant is now established throughout the area occupied by *Lantana camara*, extending from the Mosseman river in the north to the Tweed river in the south and apparently through coastal New South Wales to Sydney.

PIERCE (W. D.). i. **A Program for the Eradication of the Mexican Cotton Boll Weevil.—ii. The Need of immediately Eradicating the imported European Corn Borer, and a Definite Proposal therefor.**—*Gage-Pierce Res. Lab., Denver, Colo.*, Bull. 1, December 1919, pp. 3–14. [Received 11th February 1920.]

In view of the extensive annual loss incurred by the ravages of the Mexican cotton boll weevil [*Anthonomus grandis*] a definite working basis is proposed with the Gage-Pierce Research Laboratories as the initial unit for organising the campaign. The plan suggested involves ten years work of preparation and one year of absolute cessation of cotton growing in the Southern States from New Mexico to Virginia.

Funds subscribed for this purpose are to be kept as a trust, and only used in connection with activities legitimately lying within the scope of the project.

As soon as the approval of Congress is obtained the support of organisations of growers, business and scientific men is to be sought. The officials of the American Association of Economic Entomologists are in sympathy with the movement and it is hoped that the Association will actively support the project when the plans have been definitely laid before it. Various committees are to be appointed, including those for direction, finance, legislation, demonstration, inspection, etc., and the first duty of these will be to devise the requisite methods of attack.

A definite plan has been drawn up on which the preliminary committees may build their discussions; this suggestion is given in detail.

The need for the immediate eradication of the European corn borer [*Pyrausta nubilalis*] is emphasised and may be carried out on the same lines.

PIERCE (W. D.). i. **A Second Statement regarding the Plan to eradicate the Mexican Cotton Boll Weevil from the United States. ii. A Catechism on Boll Weevil Eradication.**—*Gage-Pierce Res. Lab., Denver, Colo.*, Bull. 2, January 1920, pp. 3–15.

Owing to the ravages of the Mexican cotton boll weevil [*Anthonomus grandis*] the annual loss in lint alone amounts to about £35,764,400 with a corresponding loss of about £5,000,000 worth of seed.

The eradication of this pest is therefore one of the greatest economic entomological problems and involves among others the cattle tick problem and malaria suppression, as these are indirectly connected with it.

For the proposed project to be a success it is essential to have the co-operation of the population of the Southern United States. In view of the objects and purposes of the American Cotton Association, which are given in detail, the elaborate plans suggested in the preceding paper may not be necessary, and the author therefore now outlines his scheme, which is to be considered as a business proposition and would involve an appropriation of at least £5,000,000 to be granted by Congress.

Zanon (V.). **L'Orticoltura a Bengasi.** [Horticulture at Benghasi, Tripoli.]—*Agric. Colon., Florence*, xiii, no. 3–6, 30th June 1919, pp. 154–176. [Received 12th February 1920.]

Among the injurious insects recorded are the following:—Lepidoptera: *Feltia* (*Agrotis*) *exclamationis* on tomato and various salads; *Agrotis pronuba* on peas and salads; *Agrotis* sp. on *Capsicum annuum*; *Acherontia atropos* on *Solanum melongena*; *Calocampa exoleta* on peas; *Hellula undalis* on cauliflower and cabbage; *Papilio machaon* on *Foeniculum officinale* and *F. piperitum*; *Pieris brassicae* on cauliflower; and *Phytometra* (*Plusia*) *gamma* on tomato, *Capsicum annuum* and various salads.

Coleoptera: *Epicometis squalida* on *Vicia faba*; *Lixus anguinus* on cauliflower and cabbage; *L. junci* on beet; and a Meloid beetle on *Vicia faba*.

Rhynchota: Aphidae, *Aphis maidis* on *Sorghum vulgare*, and *Aphis* sp. on *Eleusine coracana*.

Diptera: *Pegomyia hyoscyami* (*Anthomyia conformis*) on spinach.

Del Guercio (G.). **Cecidomyid Enemies of Aphids.**—*L'Agric. Colon., Florence*, xiii, no. 1, 28th February 1919, pp. 31–62, 31 figs. [Received 12th February 1920.]

The following species are dealt with: *Rondaniella phorodontis*, sp. n., attacking *Phorodon humuli*: *R. macrosiphonis*, sp. n., attacking *Macrosiphum* sp. on artichoke; *R. macrosiphoniellae*, sp. n., attacking *Macrosiphoniella*, sp. on chrysanthemum; *R. ornata*, sp. n., attacking an Aphid on ornamental quince; *R. cucullata*, sp. n., attacking *Toxoptera* sp. on privet; *Trilobia aphidisuga*, gen. et sp. n., attacking *Aphis rumicis*; *Uncinulella criosomiperda*, gen. et sp. n., attacking woolly aphis (*Eriosoma lanigerum*); *Adelgimyza strobilobii*, gen. et sp. n., attacking *Chermes* (*Adelges*) [*strobilobius*] on larch; and *Adelgimyza dactylopii*, sp. n., attacking mealy-bugs.

Each of these Cecidomyids is dealt with separately and in each case descriptive, systematic and biological notes are given. *Toxoptera* sp. on privet, which is attacked by *Rondaniella cucullata*, is also infested by a species of *Aphidius*, and these two enemies sometimes reduce its numbers to such an extent that no injury results to the plant. The genus *Trilobia* is provisionally erected on the larval characters only, no adults having been found when the Aphid host was examined on *Vicia faba*. *Uncinulella eriosomiperda* may destroy as many as 15 per cent. of the woolly aphis. *Adelgimyza*, gen. n., closely resembles *Silvestrina*, Kieff.

Del Guercio (G.). **Il Moscerino del Fleotripide dell'Olivo** (*Adelgimyza tripidiperda*, **sp. n.). Il Moscerino della** *Sipha* **del Granturco** (*Trilobiella siphae*, **gen. et sp. n.). Il Moscerino della Diaspide della Rosa** (*Cecidomyella aulacaspidis*, **gen. et sp. n.).**—*Agric. Colon., Florence*, xiii, no. 3–6, 30th June 1919, pp. 177–190, 11 figs. [Received 12th February 1920.]

Adelgimyza tripidiperda, sp. n., was taken on olive branches infested with *Phloeothrips oleae* and another species of the same genus that may be undescribed. The larva of *Trilobiella siphae*, gen. et sp. n., feeds on *Sipha maidis* infesting maize. *Aulacaspis rosae* infesting *Rosa* spp. and *Rubus* spp. is attacked by *Cecidomyella aulacaspidis*, gen. et sp. n. The characters distinguishing this new genus from *Cecidomyia*, Meig., and *Hyperdiplosis*, Felt, are given.

Paoli (G.). **Un Apparecchio per la Preparazione della Crusca avvelenata per la Lotta contro le Cavalette.** [An Apparatus for preparing the Poison-Bran used against Locusts.]—*Agric. Colon., Florence*, xiii, no. 12, 31st December 1919, pp. 547–553, 3 figs. [Received 12th February 1920.]

This article fully describes the construction and advantages of the apparatus for preparing poison-bran mentioned in a previous paper [*R.A.E.*, A, vii, p. 535].

Hubenthal (W.). **Ueber einige in Deutschland eingeschleppte exotische Käfer (Col.).** [Some exotic Beetles introduced into Germany.]—*Entom. Mitt., Berlin*, iv, no. 4–6, 20th May 1915, pp. 128–130. [Received 12th February 1920.]

The Elaterid, *Cardiophorus gärtneri*, Schwarz (1901), captured in Thuringia in 1899, is stated to be identical with *C. raffrayi*, Schwarz (1896), from East Africa; it seems certain that this specimen was imported in a shipment of plants. The weevil, *Sternochetus mangiferae*, F., was found in 1914 in the nuts occasionally occurring in bales of clove stems from Zanzibar.

A large Bruchid of the genus *Caryoborus* was taken with its larvae from Brazil nuts at Sättelstädt. A smaller species, provisionally identified as *Pachymerus* (*C.*) *gonagra* was imported from the East Indies into Thuringia in a shipment of acacia pods. *Bruchus* (*Pachymerus*) *chinensis* and *B.* (*P.*) *quadrimaculatus* did much damage to Indian forage peas in bags imported into Holzminden. Beans imported into Erfurt from the south of France were infested with *Bruchus* (*Acanthoscelides*) *obtectus*, Say. In the same city a smaller species, believed to be *B. tetrichus*, Schh., and two other undetermined Bruchids were found in acacia seed from the East Indies.

WOLFF (M.). **Ueber die Chalcidiergattung *Chrysocharis*, Förster 1856 (1861) (Hym.) und die erste aus Deutschland bekannt gewordene Art *Chr. kraussei*, n. sp., sowie über die Gattungen der *Derostenus*-Gruppe Thomsons.** [Notes on the Chalcid Genus *Chrysocharis*, Förster, and the first Species known from Germany, *C. kraussei*, sp. n., and on the Genera of the *Derostenus* Group of Thomson.]—*Entom. Mitt., Berlin*, v. no. 9–12, pp. 258–282, 9 figs., 1 plate. [Received 12th February 1920.]

In 1915 a number of Chalcid pupae were received on a plane leaf, grouped round a spot where their host, probably some Lepidopterous larva, had died. The adults proved to be a new species here described as *Chrysocharis kraussei*. In view of the lack of information available on the genus *Chrysocharis*, Förster, this paper gives a key to the various species and also to the genera of the *Derostemus* group.

ROSENFELD (W.). **Schlupwespen und Borkenkäfer.** [Hymenopterous Parasites and Bark-beetles.]—*Entom. Mitt., Berlin*, viii, no. 1–3, 8th February 1919, pp. 29–37, 9 figs. [Received 12th February 1920].

Very little information exists regarding the occurrence of Hymenopterous parasites of bark-beetles. In 1916 damage by snow and wind to the forests in Austrian Silesia was followed by an abundance of bark-beetles that provided an opportunity for studying their enemies.

Most of the parasites observed in 1917 and 1918 were CHALCIDIDAE, the majority belonging to the subfamily PTEROMALINAE. The larger beetles, such as *Ips typographus*, L., and *I. amitinus*, Eich., were attacked by the larger species, while the smaller ones, such as *I. chalcographus*, were infested by the smaller parasites. The following were identified: Braconids, *Cosmophorus klugi*, Ratz.; Chalcidids, *Rhopalicus suspensus*, Ratz., *R. demulus*, Ratz., *Rhophocerus eccoptogastri*, Ratz. The presence of Hymenopterous parasites is betrayed by their pupae in the mines of the beetles. From the end of April to the beginning of May the adults emerge by cutting a hole in the bark. Mating immediately follows and the females deposit their eggs close to the beetle larvae or pupae beneath the bark. The beetle-infested stumps in sunny, sheltered places in damaged spruce woods are preferred for oviposition. On hatching the parasitic larvae attack the adjacent larvae of the host which gradually decrease in size. This process lasts 2 or 3 weeks and the parasitic larvae then pupate. A larva that had finished feeding on 14th June 1918 pupated on 20th June and the adult emerged on 7th July. In captivity the entire life-cycle from oviposition to emergence lasted 38–45 days. There are therefore several annual generations. The number of parasites is considerable. Two spruce stems, each 16 inches long by 5 inches thick and strongly infested with *I. typographus* and *I. amitinus*, yielded 80 Chalcidids from 20th August to 11th September.

The conclusions reached are that an outbreak of bark-beetles is always accompanied by a large increase of Hymenopterous parasites. Dry weather not only favours the parasites but restricts the number of breeding-places of the beetles by causing the desiccation of a number of sites that otherwise would be used. The Hymenoptera are capable of destroying the beetles unaided, but the time required would be so long that much damage would be done. To shorten the period it is necessary to clear up the broken timber. When doing this the preferred breeding-places of the parasites must be left untouched until the end of the operations. This method appears to provide a sure means of checking even serious outbreaks of bark-beetles.

ENSLIN (E.). **Beiträge zur Kenntnis der Tenthredinoidea, iv, v, vi (Hym.).** [Contributions to the Knowledge of the Tenthredinoidea, iv, v, vi.]—*Entom. Mitt., Berlin*, vi, no. 7–9, 29th September 1917, pp. 238–243, 2 figs.; vii, no. 4–6, 1st June 1918, pp. 77–80, 3 figs.; viii, no. 4–6, 14th June 1919, pp. 78–83, 3 figs. [Received 12th February 1920].

The first of these papers deals with parthenogenesis in *Lophyrus* and with oviposition in saw-flies generally; the second with abnormal saw-fly galls, with the various galls of *Euura atra*, Jur., and with the larva of *Megalodontes klugi*, Leach (*spissicornis*, Kl.); and the third with the larvae of *Phyllotoma vagans*, Fall., *Fenusa dohrni*, Tischb., and *Pristiphora viridana*, Knw.

ENSLIN (E.). **Blattwespengallen.** [Saw-fly Galls.]—*Internat. Entom. Zeitschr., Guben*, x, no. 3, 6th May 1916, pp. 13–15, no. 4, 20th May 1916, pp. 17–19, no. 5, 3rd June 1916, pp. 21–2, no. 6, 17th June 1916, p. 29, no. 7, 1st July 1916, p. 33, 18 figs.

The European saw-flies dealt with are those of the genera, *Euura* and *Pontania*. The galls made by these insects on various plants are figured, as well as the saw-like effect produced on the leaves by their attack.

ZUKOWSKY (B.). **Aphoristische Skizze uber die bisher bekannt gewordenen Futterpflanzen der paläarktischen Aegeriidae.** [A concise Outline of the known Food-plants of the Palearctic Aegeriids.]—*Internat. Entom. Zeitschr., Guben*, ix, no. 15, 23rd Oct. 1915, pp. 77-99.

The article is arranged in tabular form according to the plant family, with indications as to which part of the plant is attacked.

BERTRAND (G.), BROCQ-ROUSSEU & DASSONVILLE. **Action comparée de la Chloropicrine sur le Charançon et sur le** *Tribolium*.—*C. R. Hebdom. Acad. Sci., Paris*, clxix, no. 26, 29th December 1919, pp. 1428–1430.

The Tenebrionid beetle, *Tribolium navale*, F., attacks a variety of cereals, but only those grains that have been already infested by weevils [*Calandra*]. To destroy it *T. navale* must be exposed for a longer time to the action of chloropicrin than is necessary for the weevils.

CHOPARD (L.). **Observations sur la Mante religieuse et ses Parasites.**—*C. R. Hebdom. Acad. Sci., Paris*, clxx, no. 2, 12th January 1920, pp. 140–143.

Besides a number of Sphegids that feed their larvae on young individuals of *Mantis religiosa*, there are certain Hymenoptera that oviposit in the oothecae and destroy its eggs. One of the most interesting of these is a Scelionid, *Rielia manticida*, Kieff., which hatches about the middle of September in France just as the mantis has completed its final ecdysis. The female attaches herself to the mantis, sometimes as many as five parasites attacking a single individual, on which they live for several months, only leaving their host to oviposit and returning immediately afterwards. The host oviposits during October and November in frothy masses that harden on exposure to the air, the parasite passing to the ootheca in process of formation and probably then laying its own eggs in those of the mantis.

METALNIKOFF (S.). **Immunité de la Chenille contre divers Microbes.**—*C. R. Soc. Biol., Paris*, lxxxiii, no. 5, 7th February 1920, pp. 119–121.

Many experiments have been made to determine the immunity of insect larvae against various organisms that are highly pathogenic to man and other animals. The species used was *Galleria melonella* (bee moth), which breeds freely under laboratory conditions, is active and resistant and can withstand high temperatures. Upon analysing the results of these experiments, the microbes may be divided into three groups according to their effects upon the larvae. The first group, including the various agents of tuberculosis, diphtheria, tetanus, trypanosomiasis, etc., were found to have no effect at all upon the larvae, even when administered in a quantity almost equal to the whole blood content of the body. The destruction of the organisms is generally complete within 24 hours, and is due to an active phagocytosis. The second group contains microbes against which the larvae possess an incomplete immunity, and do not resist very strong doses for as long as 24 hours; with smaller doses however, they recover rapidly. This group includes the organisms of virulent plague, *Staphylococcus*, fowl cholera, anthrax, Asiatic cholera, typhus abdominalis, etc. To the third group of bacilli the larvae offer no resistance and die from even the smallest doses, generally within a day. These organisms include *Bacillus coli communis*, *B. pyocyaneus*, *B. prodigiosus*, *B. subtilis*, *B. proteus*, etc.

In comparing these three groups of microbes it is at once evident that the Lepidopterous larvae possess an immunity to those organisms that are most pathogenic to higher animals, while they are very susceptible to the saprophytic or slightly pathogenic organisms that have been tested. It is hoped to elucidate the reason for this in the near future.

FIESSINGER (N.). **L'Immunisation antituberculeuse de la Mite d'Abeille.**—*C. R. Soc. Biol., Paris*, lxxxiii, no. 6, 14th February 1920, pp. 147–148.

The author's investigations into the immunity of *Galleria melonella* (bee-moth) have confirmed the experiments recently recorded by Metalnikoff [see preceding paper], and he has also recovered from inoculated larvae a ferment that probably plays some part in their anti-bacillary immunity. Experiments have been conducted to determine whether the disappearance of the bacilli injected into the larvae is the result of their complete destruction. Subcutaneous injections of an extract of inoculated larvae, from which *Bacillus kochi* had disappeared, were given to guinea-pigs and it was found that when an extract was used after an inoculation lasting 5 minutes within the larvae, the guinea-pig died three months later of general visceral tuberculosis. When an extract after 2 to 8 hours' inoculation was used, death occurred after a similar interval, though in 5 to 8 hours after inoculation of the bacillus into the body of the larva it is exceptional to find any trace of it there.

Further research on this subject is necessary, but it is evident that the larva of the bee-moth does not possess any substance capable of breaking down the action of the bacillus. The tubercle bacillus is rendered inoffensive, it encysts and loses its affinity for acid, but it is not destroyed, at least for some hours.

Illingworth (J. F.) & Jarvis (E.). **Cane Grub Investigation.**—*Queensland Agric. Jl., Brisbane*, xiii, January 1920, pp. 33–36.

The mode of oviposition of the digger wasp, *Dielis formosa*, parasitic on *Lepidiota frenchi* is described. The larvae emerge after about 3 days and pupate after feeding for seven or eight days. The adults emerge in about five weeks, the total life-cycle thus occupying less than two months. There are probably four generations a year.

Breeding experiments show that unfertilised females of another wasp *Campsomeris radula* begin ovipositing about 4 days after emergence and that the ova hatch in a normal manner and produce individuals of both sexes.

In addition to the grubs of *Lepidiota* spp., *Isodon* spp. and *Haplonycha* spp., a cockchafer is recorded as damaging sugar-cane, as well as an unidentified Psychid.

Experiments with manures show that meat-works manure has the disadvantage of having a distinct attraction for sugar-cane grubs. Of the various forms of arsenic used, common white arsenic (arsenious acid) proved most effective.

Lyon (A. V.). **The Viticultural Industry.**—*Science & Industry, Melbourne*, i, no. 8, December 1919, pp. 490–494.

Insects affecting grapes in Australia include the Indian meal moth [*Plodia interpunctella*], which is a serious pest of dried fruits; the elephant beetle, which is best kept in check by the destruction of tamarisk hedges in the winter between April and October before the adults emerge; and the light brown apple moth [*Tortrix ashworthana*], which is particularly destructive to sultanas and against which a spray of 2 lb. lead arsenate to 30 gals. of water has proved successful.

Beeson (C. F. C.). **The Life History of the Toon Shoot and Fruit Borer, *Hypsipyla robusta*, Moore (Lepidoptera, Pyralidae, Phycitinae) with Suggestions for its Control.**—*Indian Forest Records, Calcutta*, vii, no. 7, 1919, 71 pp., 13 plates, 2 figs. [Received 23rd February 1920.]

This detailed account of *Hypsipyla robusta*, Moore (toon shoot and fruit borer) is the result of investigations carried out during 1914–1916, which were finally abandoned owing to military duty. Its publication was delayed in the hope of including an account of the parasites, but the War has also been the cause of postponing their determination. Various records of damage to toon in India by this species have appeared since 1876, and are briefly reviewed.

H. pagodella, Rag., is a synonym of this moth, which occurs in India, Burma, Ceylon, Perak, British New Guinea and Australia. The food-plants include *Cedrela toona*, *C. australis* (in Queensland and N.S. Wales), *C. multijuga*, *Swietenia mahagoni*, *S. macrophylla*, *Chickrassia tabularis*, *Soymida febrifuga*, *Rosa* sp. and *Citrus medica*. All stages of the insect are described.

There are normally five generations in a year. The eggs of the first generation are laid in early March when the toon is in flower, and the larvae feed on the flowers until the first week in April. While feeding, they bind together individual flowers or adjacent groups of flowers in a loose network of silk threads, and this frequently remains as a ragged mass of débris after the colony of larvae have deserted it. Moulting occurs within a more densely woven silk cell inside the network. The life-cycle from egg to moth requires generally from 24 to 29 days and the whole generation is complete within 8 or 9 weeks. The second generation is equally short, the larvae emerging early in April. By this time the fruits are set and the entire larval development is passed in the growing fruits, which are bound together much as the flowers have been. Larvae of the 1st and 2nd generation, when mature, hang from the trees by silken threads in the early morning and may thus be dispersed along thoroughfares by vehicles and pedestrians. Pupation occurs generally under flakes of bark on the trunk and main branches of the tree on which they have fed. The cocoons are frequently closely packed in masses two and three layers deep, so that moths of the lowest layer are seldom able to emerge, but die in the cocoons. Pupation frequently occurs near the food-tree on houses, walls, fences, etc. The larvae of the 3rd generation, which are found at work during July, and those of the fourth (August-October) and fifth (February-April) feed only in the shoots of the current year. Saplings and young trees which, owing to absence of flowers and fruit, are not attacked by the first two generations, are preferred by the later generations owing to the greater abundance of new growth. The eggs are laid on the new unexpanded leaves and the larvae, descending to the thicker portions of the growing shoot, feed by removing the epidermis in irregular patches and test the shoot for suitable spots for boring into the interior. Sometimes boring is started in vigorously growing tissue and in this case the attack is unsuccessful and causes a flow of sap or gum that may entrap and drown the larvae. Eventually the larva gains an entrance and excavates a central gallery in the pith which is gradually increased during the feeding period, sometimes to a length of two feet. One shoot only is usually attacked, but among rapidly killed shoots one may be abandoned for another. The shoot above the entrance hole dries up and withers, eventually breaking off at the weak spot. Within the shoot partitions of silk are constructed at intervals to secure protection from enemies. The combined attacks of the third and fourth generations kill off the current shoot growth, and the fifth generation attack any new shoots that the tree may have put out after the rains. The emergence holes left by the moths are frequently entered by ants, bees, wasps, etc. The larvae of the 3rd, 4th and 6th generations pupate towards the base of the hollowed shoot after constructing at least one silk partition in addition to the cocoon. Larvae of the fifth generation generally pass the winter without pupation in silken hibernacula. The adult moths are rarely seen in flight and have not been observed to feed. They live in captivity up to 10 days. The average number of eggs found in dissected females was 472, and these are laid singly, attached to flowers, young fruits, and on developing leaves and leaf-buds.

The seasonal history of the insect as observed at Dehra Dun in 1914, 1915 and 1916 is given in detail. The life-cycles of the 3rd and 4th generations occupy from 17 to 19 weeks each and that of the 5th, or overwintering, generation from 28 to 31 weeks.

Trees infested with *Hypsipyla robusta* suffer in two ways; the consumption of the flowers and fruits by the first two generations amounts sometimes to complete destruction of the seed crop. In the Punjab and Bengal it has occasionally been difficult to collect sufficient sound toon seeds for sowings, and in Australia heavy seed crops of *Cedrela australis* have been almost entirely ruined by this borer. The injury to the growth of the tree, described above, is the more obvious form of injury. It has been found impossible in India to establish young toon in plantations in the proximity of old toon trees, and the same difficulty arises with mahogany and, in other parts of the world, with various species of cedar.

The pruning and burning of infested shoots on saplings has been found useless as a remedy. It is suggested that the simplest method of establishing a sound plantation lies in the previous removal of all old trees in the vicinity. Young trees are liable to attack from their second or third year and the following measures are recommended for their protection. As the flowers appear, the trees should be banded with a strip of sacking about 12 in. wide and long enough to overlap by 6 in. This should be tied with a cord at breast-height and folded double over the binding-cord. These bands should be inspected at intervals of not less than ten days during the flowering and fruiting season and all larvae and cocoons destroyed. The removal of large flakes of bark within reach and the cutting away of undergrowth at the base of the tree will add to the value of the bands. About one month after the fruits are ripe all infested shoots should be cut out and burnt. In the case of bad infestations, a second pruning should be done in the cold weather or three months before the normal flowering date. Gaps in roadside avenues of toon should be filled up with some other species. The extension of avenues, shade-trees, etc., should be preceded and accompanied by sack-banding of the flowering trees.

The number of flowering trees it may be necessary to band in order to protect a plantation varies. The width of the protective zone is roughly estimated at 1,000 to 500 yards, but no experiments have been carried out on the flight of moths or the distance travelled by migrating larvae. As many as 500 larvae may be found on one examination of a banded tree. At the period of maximum abundance, a cloth bag with draw-string and funnel-shaped mouth-piece is useful. The contents of the bag should be emptied into a hole and buried.

The cost of sack-banding and collection is reckoned at less than one penny per tree.

The effect of various grease-bands, as an alternative to sack-banding, has been tried ; of these only tanglefoot had any effect on the larvae and this can be considered a poor deterrent.

Parasites of *H. robusta*, about which it is hoped to obtain some information, are not very extensive, but include several Chalcidids, Ichneumonids and Braconids.

CAMPBELL (R. E.). **The Broad-bean Weevil.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 807, 27th January 1920, 22 pp., 1 plate, 6 figs.

The growing of broad or horse beans in California has been seriously handicapped during the last few years owing to infestation by *Bruchus rufimanus*, Boh. The practical impossibility of growing uninfested beans has caused many acres to be abandoned, especially since under the Federal Food and Drugs Act infested beans are classed as adulterated food. It is now permissible to export beans containing not more than 15 per cent. of infestation. Besides being used as food for stock the horse bean is used as a green vegetable and also to a considerable extent as a winter cover crop. The stages of *B. rufimanus* are described and are compared with those of *B. pisorum*. There is only one generation of *B. rufimanus* in a year and the beetle does not breed in dry beans ; seed held over until a second year is therefore free from infestation. The eggs are laid on the green bean pods in the field from the middle of March to mid-May, the incubation period lasting from 9 to 18 days. The young larva eats its way into the bean pod and continues feeding until it is mature, when it eats a round hole in the cotyledon directly under the epidermis, leaving a half-transparent skin which is easily broken by the adult weevil when ready to emerge. Death frequently occurs among the larvae after entering the beans. From 5 to 16 larvae may enter a single bean, but seldom more than two adults emerge. The larva is mature after 10 to 15 weeks and pupates within the bean, the pupal stage lasting from 7 to 16 days. The adult may emerge at once through the broken skin or it may remain in the bean for several months, and many individuals never emerge at all. The beetles frequently emerge after the beans have been planted, the adult life lasting from 1 to 8 months.

Germination of infested beans is found to be from 20 to 40 per cent. less than that of uninfested ones, though the germination of seed a year or more old is only slightly less than that of new seed.

There are no natural enemies of any importance affecting *B. rufimanus* in America. The predaceous mite, *Pediculoides ventricosus*, Newp., has been observed attacking a few of the beetles.

Experiments in remedial measures showed that a temperature of 170° to 180° F. for half an hour is necessary to kill all the beetles in beans. Sulphur proved to be unsatisfactory as a fumigant. Fumigation with carbon bisulphide at the rate of 7 lb. per 1,000 cub. ft. in an air-tight box for 24 hours kills all the beetles. Late planting is advisable ; beans from crops planted after 1st March are much less infested than those planted from November to March.

Cole (F. R.). **Notes on the Lunate Onion Fly,** *Eumerus strigatus* **(Dip., Syrphidae).**—*Entom. News, Philadelphia,* xxxi, no. 2, February 1920, pp. 31–35, 1 fig.

Notes and observations on *Eumerus strigatus*, Fall., are given, additional to those of Metcalf [*R.A.E.*, A, vii, 356]. This fly was first observed infesting onions in the United States in July 1917, when the females were found crawling into crevices in the ground and ovipositing in the leaf-sheaths just above the bulb. Onions taken from the ground at this time contained larvae of several sizes that pupated in the laboratory in March and April, and emerged as adults in late April and early May, a little later than individuals of *Hylemyia antiqua* from the same bulb. The onion bed was almost entirely destroyed. The insect has also been recorded from British Columbia, where it has been collected near large onion farms, and all along the Pacific Coast from British Columbia to California. There may be biological races of this fly, as in the case of the apple maggot [*Rhagoletis pomonella*]. The adult is described and figured.

LEGISLATION.

Jardine (N. K.). **Legislation regarding Shot-hole Borer** (*Xyleborus fornicatus*, **Eichoff.**).—*Trop. Agriculturist, Peradeniya,* liv, no. 1, January 1920, pp. 31–34.

The legislation that has been passed in Ceylon regarding *Xyleborus fornicatus*, Eich., since 1903 is here reviewed.

The position from 1st January 1920 is as follows:—Infested areas, that is estates or parts of estates declared infested, cannot have permits granted to them, and no tea plants or parts of tea plants other than tea seed or leaf for manufacture may be removed from them. Tea plants may be removed from estates that are not infested areas, provided that a permit is obtained from the Director of Agriculture; the permit must state the number of plants, their source and their destination.

It follows that infested estates should not establish tea nurseries for the sale of plants, but non-infested estates may do so if they are willing to take the risk of infestation.

Hewitt (C. G.). **The European Apple Sucker Quarantine.**—*Agric. Gaz. Canada, Ottawa,* vii, no. 1, January 1920, p. 12.

Following upon the discovery of *Psylla mali*, Schmidb., in Nova Scotia during the summer of 1919 [*R.A.E.*, A, vii, 506] a quarantine regulation has been added, under date 28th November 1919, to the Destructive Insect and Pest Act, which forbids the removal of any apple stock from within a radius of five miles of the town of Wolfville, where the pest was found, without a certificate of inspection guaranteeing that such stock has been duly treated in accordance with the instructions of the Department of Agriculture and that it is free from infestation with *P. mali*.

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CONTENTS.

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Holloway (T. E.). **Establishing the Cane Borer Parasite from Cuba on Louisiana Plantations.**—*Louisiana Planter & Sugar Manufacturer, New Orleans,* lxiv, no. 1, 3rd January 1920, p. 11.

Euzenilliopsis diatraeae, Towns., a Tachinid parasite of the sugar-cane borer, *Diatraea saccharalis crambidoides,* Grote, has been imported from Cuba and liberated in certain fields of Louisiana, where it has apparently become established. With the aid of additional importations it is hoped ultimately to supply every plantation with parasites. As living parasites in the pupal stage were found in the field on 13th December after being exposed to a temperature of 35° F., there is every reason to believe that this fly will withstand the climate of Louisiana.

Metcalf (Z. P.). **A Suggestion for a better Popular Name for the Fulgoridae (Hemip.).**—*Entom. News., Philadelphia,* xxxi, no. 2, February 1920, pp. 57–58.

The only popular name apparently hitherto used for members of the family Fulgoridae is "lantern flies," based upon the supposition that a large South American species emits light. As this is not a general characteristic of the family, the term is evidently a misnomer. The author suggests "plant-hopper" as being the most suggestive name available, thus bringing the family into line with the closely related families known as tree-hoppers (Membracidae), frog-hoppers (Cercopidae), and leaf-hoppers (Cicadellidae).

Speare (A. T.). U.S. Bur. Entom. **Further Studies of *Sorosporella uvella*, a Fungous Parasite of Noctuid Larvae.**—*Jl. Agric. Research, Washington, D.C.,* xviii, no. 8, 15th January 1920, pp. 399–438, 6 plates.

A further account is here given of the entomogenous fungus, *Sorosporella uvella,* infesting cutworms [*R.A.E.*, A, v, 484]. It is shown that the yeast-like vegetable cells existing within the blood of infected insects are ontogenetically related to other phases in the development of the organism. These cells are ingested by certain of the blood corpuscles, the process of phagocytosis apparently being followed by the destruction of the phagocytes. The organism is readily cultivated on artificial media, and tests were made on cutworms infected with *S. uvella* and on *Bombyx mori* (silkworms) and *Lachnosterna* spp. (white grubs) inoculated with the conidia. A hypodermic needle was used, for when the usual methods of infection were employed the insects in question did not succumb. To determine whether there is immediate active phagocytosis of infected susceptible hosts, the conidia were injected into *Xylomyges* (*Prodenia*) *eridania,* Cram. (semitropical army worm). Phagocytosis was not observed within two days after inoculation, but smears made three days after injection showed blastocysts incorporated in the phagocytes, though no sign of disintegration of the former could be detected, while the fungus cells were reproducing rapidly.

Other insects inoculated, either by direct contact, by spraying or by feeding, include larvae of *Musca domestica* and of Elaterids, nymphs and adults of grasshoppers, workers of the termite, *Reticuli-*

(673) P1921/141. 1,500. 5.20. B.&F.,Ltd. Gp.11/14. A

termes sp., and Lepidopterous larvae such as *Feltia jaculifera*, Guen., *F. subgothica*, Haw., *Lycophotia margaritosa* (*Peridroma saucia*, Hb.), *Agrotis ypsilon*, Rott., *Agrotis* (*Noctua*) *c-nigrum*, L., *Heliothis* (*Chloridea*) *obsoleta*, F., *Hyphantria textor*, Harr., *Cirphis* (*Leucania*) *unipuncta*, Haw., *Protoparce* (*Phlegethontius*) *sexta*, Joh., *Bombyx mori* L., and several other Noctuids. The larvae of *F. jaculifera* were the only ones that died of the disease in control dishes during the course of the experiments. House-fly larvae were covered with the conidia when removed from the cultures, but after burrowing in dung in the rearing boxes for a few hours no conidia could be detected. The fungus was not recovered from any of these inoculated insects, though several, including larvae of *M. domestica* and *H. textor*, died from unknown causes. It is evident from the experiments, however, that under laboratory conditions a high percentage of mortality may be realised, and that the death rate is not appreciably higher when larvae are kept in contact with the fungus for a long time than when they are subjected to infection for a minute or two. The spray method, which gave a mortality of somewhat below 30 per cent. for all the tests, proved of less value in artificial inoculation than the direct contact method. The feeding method, in which a conidial agar paste was smeared over clover leaves on which cutworms, chiefly *Xylomyges eridania*, were fed, gave a mortality as high as the direct method.

In the case of army worms inoculated by direct contact it was found that the organism of disease, though unable to kill the larvae and pupae, passed through the various metamorphic changes of the host and finally caused the death of the adult after emergence. The presence of the fungus in the winged adults indicates the possibility of dissemination of the organism. The adults from which the fungus was recovered were, however, in all cases imperfectly formed individuals, indicating that during metamorphosis certain of the imaginal tissues were destroyed.

It is definitely proved by these experiments that the organism is readily transmitted to healthy insects, and in laboratory experiments a mortality of from 60 to 90 per cent. may be obtained without difficulty.

WILLARD (H. F.). U.S. Bur. Entom. **Work and Parasitism of the Mediterranean Fruit Fly in Hawaii during 1918.**—*Jl. Agric. Research, Washington, D.C.*, xviii, no. 8, 15th January 1920, pp. 441–446.

This paper is a continuation of previous records [*R.A.E.*, A, vi, 185, etc.] and gives the extent of parasitism during 1918 by the introduced parasites, *Opius humilis*, Silv., *Diachasma tryoni*, Cam., *D. fullawayi*, Silv., and *Tetrastichus giffardianus*, Silv., the amount of infestation by *C. capitata* for the same period and, for purposes of comparison, general summaries of parasitism and infestation during 1916 and 1917.

The infestation in 1918 of a number of food-plants was as great as during 1917, and in a few cases considerably greater. Generally speaking, the increase has occurred among the preferred food-plants, with the exception of the mango (*Mangifera indica*) and this is accounted for by the fact that some varieties of this fruit are much more susceptible to fruit-fly attack than others. While the infestation of host-fruits in general was as great as in 1917, the parasitism of the larvae developing in the majority of the abundant fruits infested, such as Indian almond (*Terminalia catappa*), coffee (*Coffea arabica*), strawberry guava (*Psidium cattleyanum*), and French cherry (*Eugenia uniflora*), was higher than in previous years. The most important of the abundant fruits producing a low percentage of parasitism are the mango, kamani (*Calophyllum inophyllum*), Chinese orange (*Citrus* sp.) and guava (*Psidium guayava*). The low parasitism of the larvae developing in these, especially in guava, which is cultivated in large areas in all parts of the Islands, indicates that these fruits are the source of supply of the large number of fruit-flies that cause the continual high infestation of favoured food-plants.

Previous records [*R.A.E.*, A, iii, 412; iv, 289; vi, 167 & 185; vii, 43] show the consistent ascendancy of the parasite *Diachasma tryoni* over *Opius humilis* during the warmer months of the year and the predominance of *O. humilis* in the cooler months. This is due to the ability of *D. tryoni* to destroy *O. humilis* when both occur in the same host-larva, and the increased activity of the former during the cooler months. While in 1916 and 1917 *O. humilis* gained this predominance for 5 and 3 months respectively, during 1918 the period was two months only. This yearly decrease in the effectiveness of *O. humilis* is due to the increasing abundance of *D. tryoni*. The average parasitism by the latter has increased from 13·3 larvae to each fruit in 1916 to 20·3 in 1917 and to 34·6 in 1918. Although the parasitism by both *D. fullawayi* and *T. giffardianus* was less in 1918 than in 1917, the total percentage of parasitism for the last year, on account of the increased effectiveness of *D. tryoni*, had increased by 8·3, making the total parasitism for 1918, 55·8 per cent. of all the fruit-fly larvae under observation. Thus the value of the parasites of *C. capitata* has consistently increased each year since their introduction, conferring benefit upon the people of Hawaii by greatly decreasing the infestation of those fruits which are less susceptible to fruit-fly attack and which include the majority of fruits of commercial value, and upon the fruit-growers of the United States by greatly decreasing the danger of introducing fruit-flies into that country.

Beeson (C. F. C.). **Insects attacking Yemané.**—*Indian Forester, Allahabad*, xlvi, no. 2, February 1920, pp. 85-86.

As it has been recorded that plantations of yemané (*Gmelina arborea*) are not materially damaged by insects, the author points out that the tree is by no means immune from insect attack. The Cassidid, *Calopepla leayana*, Latr., regularly defoliates the trees during the rains; a weevil which may be *Alcides ludificator*, Fst. (known as the pith borer of teak in Burma) bores the shoots; the Longicorns, *Haplohammus cervinus*, Hope (teak canker grub) and *Glenea galathea*, Thoms. (also a breeder in teak), bore the stem near the ground-level; and the Hepialid, *Phassus signifer*, Wlk. (ghost moth), an important borer of sapling teak, makes beeholes when in the larval stage.

In view of the proposal to establish pure blocks of yemané in conjunction with pure blocks of teak, it is thought probable that the insects feeding on both species, while they may hitherto have been merely of secondary importance, may rapidly rise to the position of serious pests. *H. cervinus* and *P. signifer* in particular are likely to be troublesome.

KING (H. H.). **Clean Cultivation and its Relation to the Control of Insect Pests.**—*Wellcome Trop. Res. Lab., Khartoum*, Entom. Bull. 8, 17th March 1918, 4 pp. [Received 28th February 1920.]

It is suggested that the importance of the suppression of weeds and clean cultivation generally in the control of insect pests is usually underestimated or not realised at all. In this connection it should be remembered that, while some insects in the Sudan have only one food-plant, such as *Diparopsis castanea* (red cotton bollworm) and *Aphis sorghi* (dura aphis) and others, such as locusts, grasshoppers, crickets and cutworms, are practically omnivorous, the majority of species have two or several food-plants. *Earias insulana* (spiny cotton bollworm) and *Nisotra uniformis* (cotton flea-beetle), for example, can feed on *Hibiscus esculentus*, *H. sabdariffa* and *Abutilon* spp., all of which are allied to cotton. The dura stem-borer [*Sesamia cretica*] attacks both maize and wheat, and a bug, *Agonoscelis puberula*, which sometimes greatly damages dura, feeds also on wild grasses. The cotton aphis [*Aphis gossypii*] has for alternative food-plants members of the melon family (Cucurbitaceae) which are in no way related to cotton. Cotton should not occupy the land for more than ten months in the year; dura, the staple crop of sakia land, is not generally grown in the winter, while barley, wheat, beans, *Hibiscus*, etc., rarely take more than four months from seed time to harvest.

General recommendations are that the entire farm and uncultivated land immediately adjoining it should be kept as far as possible free from weeds. Canal banks, waste land near buildings and land under bare fallow, should receive particular attention. Plants growing in these situations are almost always useless and inedible for stock. On farms plants should be rigidly restricted to the areas on which they have been sown. All diseased plants and fruits should be destroyed. Melons infested with *Dacus brevistylus* (melon fruit-fly) should not be left on the ground, where the maggots can complete development, but should be thrown into water. The refuse of a crop that has been harvested should be at once collected and burned. In this way, in the case of melon plants, numbers of *Aspongopus viduatus* (black melon bug) will be killed. Refuse of cotton and dura should never be used for building shelters or windscreens, as it frequently harbours numbers of stem-borers or other pests. Ploughing should take place as soon as possible after harvest.

KING (H. H.). **The Control of Insect Pests of Cotton.**—*Wellcome Trop. Res. Lab., Khartoum*, Entom. Bull. 9, 13th August 1918, 4 pp. [Received 28th February 1920.]

The principal pests of cotton in the Anglo-Egyptian Sudan include: *Pectinophora gossypiella* (pink bollworm), *Earias insulana* (spiny bollworm), *Diparopsis castanea* (Sudan or red bollworm), *Aphis gossypii* (cotton aphis or asal fly), *Oxycarenus hyalinipennis* (cotton stainer) and a flea-beetle, *Nisotra uniformis*. The food-plants of these pests and the measures for their control are discussed (see preceding paper). During the period in which no cotton is grown, a clearing up and clean cultivation of the land should be practised so that there will be no food-plants in which the insects can either shelter or feed. All cotton seed for sowing should be sunned at the ginneries to kill any pink bollworms contained in the seed. Cotton seed required for feeding purposes should either be treated in the same way or crushed before being returned to the farm.

From the time when cotton sowing is started, *Abutilon* spp. may be grown as a trap-crop for *E. insulana*, but care must be taken that it is not left too long. The seed-pods should be examined frequently, and when any are found to contain half-grown bollworms the plant should immediately be cut and burned all over the farm and uncultivated land adjoining.

King (H. H.). **The Pink Bollworm,** *Pectinophora* (*Gelechia*) *gossypiella*, **Saunders, at Tokar, Anglo-Egyptian Sudan, during the Season 1917–1918.**—*Wellcome Trop. Res. Lab., Khartoum*, Entom. Bull. 10, 9th September 1918, 3 pp. [Received 28th February 1920.]

The status of *Pectinophora gossypiella* (pink bollworm) in Tokar, Anglo-Egyptian Sudan, where it was first discovered in 1914–1915, and the conditions peculiar to that locality, are discussed. After its first appearance in the Sudan the pest spread rapidly and by April 1917 infestation of the bolls had risen in some areas to 10 per cent. Energetic control measures, on the lines suggested in the preceding papers, were undertaken, with the result that in the 1917–18 season the infestation was less than 0·05 per cent. and the damage done was negligible.

The Clothes Beetle (*Anthrenus vorax*).—*Wellcome Trop. Res. Lab., Khartoum*, Entom. Circ. 6, 28th March 1918, 2 pp. [Received 28th February 1920.]

The beetle, *Anthrenus vorax*, in its larval stage often causes considerable damage to clothes in the Sudan. The beetles will oviposit on almost any substance of animal origin, such as woollen and silken fabrics, feathers, horns, etc., but never on anything of vegetable origin such as cotton and linen. The eggs are pearly white and, although small, are easily visible on dark cloth. The larvae are black and hairy and the pupa is encased in the old larval skin. The duration of the life-cycle and the number of generations occurring in the year depend upon the temperature; probably six weeks is about the average time required for development.

In protecting clothes from damage it should be remembered that the beetles frequently fly to clothes from flower gardens, that the eggs are soft-shelled and easily broken, both larvae and pupae are easily crushed, and none but the egg-stage can survive in an atmosphere heavily charged with naphthaline. Clothes that have been exposed to possible infection should be brushed with a stiff brush before being put away; this will crush eggs, larvae or pupae and dislodge the adults. Articles that cannot be treated in this way should be enclosed in an airtight receptacle with a quantity of naphthaline and left for a fortnight or more. Uninfested articles may be protected by enclosing them in a cotton or linen sheet.

Allen (A. A.). **Birds and Trees in Winter.**—*Amer. Forestry, Washington, D.C.*, xxvi, no. 313, January 1920, pp. 45–47, 7 figs.

Attention is drawn to the importance of protection and shelter, especially during the winter, for the insectivorous birds that are so beneficial to fruit and forest trees in America. It is pointed out that sprays against such pests as the codling moth [*Cydia pomonella*] are only efficacious if applied on just the right spot at the right time, and that during the entire life-cycle of the pest there are only a few hours when the spray can be effective and, since all the eggs do not hatch at once, the chances of killing all larvae are slight. Birds, however, can act as the destroying agents during two periods, first when the moths transform in the spring and warblers, vireos and other migrating birds pass through the orchards, and again during the entire winter when nuthatches, woodpeckers and creepers are hunting over the bark for insects. Young tent caterpillars [*Malacosoma*] are similarly attacked by warblers, vireos and wrens on their northward migrations; the half-grown caterpillars are seized in their nests by orioles, while full-grown ones are eaten by cuckoos. Nuthatches, chickadees and crows all devour the eggs in winter. The downy woodpecker and the hairy woodpecker dig out boring insects from the trunks of pines, elms, and other shade trees. It is suggested that small refuges and feeding-stations should be placed in every forest reserve and a little suet should be attached to some of the trees to attract the winter birds.

Urban (C.). **Beiträge zur Lebensgeschichte der Käfer. III.** [Contributions to the Life-history of the Coleoptera, III.]—*Entom. Blätter, Berlin*, x, no. 9–12, 31st October 1914, pp. 225–231, 4 figs.

A number of Cruciferae have been recorded as food-plants of *Baris laticollis*, Mrsh. The author has observed this weevil in the roots of *Erysimum hieraciifolium* and *E. cheiranthoides*, the former being preferred. According to Kaltenbach, *Tychius picirostris*, F., develops in the flower-heads of *Trifolium pratense*. The author has found only *T. tomentosus*, Hbst., there, but *T. picirostris* was found in *Trifolium hybridum*.

The food-plants of *Apion hookeri*, Krby., belong to the genera *Anthemis* and *Matricaria*. From *M. inodora*, *A. hookeri* was bred together with its parasites *Bracon satanas*, Wsm., *Aphidius chrysanthemi*, Wsm., *Encyrtus morio*, Dlm., as well as a large number of the leaf-miner, *Phytomyza affinis*, Mg.

Kleine (R.). *Chrysomela fastuosa*, **L., und ihre Nahrungspflanzen. Ein weiterer Beitrag zur Kenntnis ihrer Biologie.**—[*C. fastuosa* and its Food-plants; a further Contribution to a Knowledge of its Biology.]—*Entom. Blätter, Berlin*, x, no. 9–12, 31st October 1914, pp. 241–249, 10 figs.; xi, nos. 1–3 & 4–6, 6th February & 10th May 1915, pp. 56–63 & 72–82, 6 figs.

This is a series of notes dealing with the food-plants of *Chrysomela fastuosa*, those of the genus *Stachys* being preferred.

EGGERS (H.). *Ips fallax* **nov. spec.**—*Entom. Blätter, Berlin*, xi, no. 4–6, 10th May 1915, pp. 96–97.

In a collection containing *Ips sexdentatus*, Boerner, and *I. subelongatus*, Mot., received from Siberia, four examples were found from Irkutsk belonging to a new species, *Ips fallax*, which is intermediate in character between them.

KLEINE (R.). **Erster Nachtrag zur Gesamt-Literatur der Borkenkäfer.** [First Supplement to the Complete Literature of the Bark-beetles.]—*Entom. Blätter, Berlin*, xi, no. 4–6, 10th May 1915, pp. 123–126.

The contents of this paper are indicated by its title.

LANGHOFFER (A.). **Scolytidae Croatiae.**—*Entom. Blätter, Berlin*, xi, no. 7–9, 25th July 1915, pp. 154–159.

In this list of Scolytids, the area included embraces Croatia proper, Slavonia and Dalmatia.

KLEINE (R.). **Die Gattung** *Chrysomela* **und ihre Standpflanzen.** [The genus *Chrysomela* and its Food-plants.]—*Entom. Blätter, Berlin*, xi, no. 10–12, 30th December 1915, pp. 203–213.

The subject matter of this paper is indicated by its title.

WICHMANN (H.). **Zur Kenntnis der Ipiden. iv.** [A Contribution to a Knowledge of the Scolytidae. iv.]—*Entom. Blätter, Berlin*, xi, no. 10–12, 30th December 1915, pp. 213–217.

The following species are described: *Scolytus* (*Eccoptogaster*) *platystylus*, sp. n., from East Siberia; *S.* (*E.*) *frankei*, sp. n., from Turkestan; *S.* (*E.*) *emarginatus*, sp. n., from Turkestan; *S.* (*E.*) *nodicornis*, sp. n., from Brazil; and *Polygraphus primus*, sp. n., from Kamerun.

SIMMEL (R.). *Juniperus communis* **als Sterbequartier verschiedener Borkenkäfermännchen?** [*J. communis* apparently used as Death-quarters by Male Bark-beetles.]—*Entom. Blätter, Berlin*, xiv, no. 10–12, 18th November 1918, pp. 288–291.

Observations are recorded of the infestation of *Juniperus communis* by males of *Cryphalus abietis*, *Pityophthorus micrographus*, *Pityogenes chalcographus*, and *P. bistridentatus*. The individuals in question fed only for a short time and then died; no females were found.

FRIEDRICHS (K.). **Einiges über die Käfer des toten Holzes im Kiefernwald der Insel St. Marguérite (Sudfrankreich).** [Some Notes on the Beetles infesting dead wood in the Pine Forest of the Isle of Ste. Marguérite in the South of France.]—*Entom. Blätter, Berlin*, xv, no. 1–3, 31st March 1919, pp. 20–27.

Among the beetles dealt with are *Rhagium inquisitor*, L., the larvae of which were killed by the fungus, *Metarrhizium anisopliae*. The latter also killed all stages of *Ergates faber*, L., and appears able to penetrate into the larval mines, some larvae, probably those of *Monochamus*

(*Monohammus*) *galloprovincialis*, Ol., being also killed by it. A Lamellicorn. *Oryctes laevigatus*, Heer, was found in the stumps of dead pines, whereas *O. nasicornis* in Germany occurs in rotten oak. The larvae of an Elaterid, *Adelocera punctata*, Hbst., prey actively on other insects.

A list of all the species found on the island is given.

SIMMEL (R.). **Befall von entrindetem Nutzholz durch Borkenkäfer. Borkenkäferparasiten und ihre Feinde.** [Bark-beetle Infestation of barked Timber. Bark-beetle Parasites and their Enemies.]—*Entom. Blätter, Berlin*, xv, no. 1–3, 31st March 1919, pp. 34–36.

The first of these notes records the infestation of barked oak logs in Carniola by the following bark-beetles: *Xyloterus domesticus*, L., *X. signatus*, F., *Xyleborus* (*Anisandrus*) *dispar*, F., and *X. xylographus*, Say (*Xyleborinus saxeseni*, Ratz.). The logs had been recently barked and this may account for the infestation. An editorial note points out that the damp atmosphere in Croatia from February to April delays the drying of logs, so that even conifers that have been felled and barked in spring are attacked by *Xyloterus lineatus*, L.

The second paper deals with bark-beetles and their parasites in Carniola. In the mountains there *Ulmus montana* is much attacked by *Scolytus laevis*, Chap. Hymenopterous parasites destroy a large percentage of the larvae and the infested individuals are unable to bore deep into the sapwood.

SIMMEL (R.). **Zur Lebensweise des Haselborkenkäfers** (*Lymantor coryli*, **Perris**). [Notes on the Life-history of the Hazel Bark-beetle, *Lymantor coryli*, Perris.]—*Entom. Blätter, Berlin*, xv, no. 4–6, 5th July 1919, pp. 103–110, 1 fig.

Dryocoetes (*Lymantor coryli*, Perris, appears to have only one generation a year in the cold climate of Carniola. As hazel (*Corylus avellana*) is an unimportant plant in the region in question this beetle is of little economic importance there.

KLEINE (R.). *Ceuthorrhynchus sulcicollis*, **Paykull**; *Galerucella tenella*, **L.**; *Sitones lineatus*, **L.**—*Entom. Blätter, Berlin*, xv, no. 10–12, 7th January 1920, pp. 250–251.

The larva of *Ceuthorrhynchus sulcicollis*, Payk., is recorded from winter rape. The eggs of *Galeruca tenella* are laid in small groups of from two to five on the leaves of *Alchemilla* and *Spiraea* in damp situations. Injury to Leguminosae by *Sitones lineatus* is chiefly to the edges of the leaves, though in late summer the inner portions of the leaves of *Trifolium pratense* and *Pisum arvense* may also suffer.

POUILLAUDE (I.). **La Teigne du Poireau** (*Aerolepia assectella*, **Zeller**).—*Bull. Soc. Sci. Med. de l'Ouest, Rennes*, xxvi, 7th December 1917, pp. 57–61, 2 figs. [Received 6th March 1920.]

The chief insect pest of leeks is the moth, *Aerolepia assectella*, Z., the caterpillars of which make irregular channels downward in the closely pressed leaves of the leek, killing the plant when they reach the base. Pupation takes place on the plant itself and the adult appears a fortnight later. There are two annual generations, the first ravaging the crop in June to July, the second in September to October. This moth probably hibernates as an imago.

A remedial measure that is often effective is to cut off the leaves level with the soil before the caterpillars penetrate to this point, the operation being carried out as late as possible to avoid the danger of a fresh batch of eggs being deposited on the new growth. The leaves thus cut off should be burned or buried together with any useless plants that may shelter the caterpillars in the neighbourhood of the crop.

Pouillaude (I.). **Méthodes de Lutte contre un Ravageur du Caféier à La Réunion** (*Coccus viridis*, **Green**).—*Bull. Soc. Sci. Med. de l'Ouest, Rennes.* xxv, 8th Dec. 1916, pp. 33–40. [Received 6th March 1920.]

The scale, *Coccus viridis*, Green, which has a wide distribution in the tropics, threatens the abandonment of coffee cultivation in Réunion. A useful natural check on it is a fungus, *Cephalosporium lecanii*, which under sufficiently humid conditions may destroy as many as 90 per cent. of the Coccids.

Remedial measures include spraying with a resinous soap solution made of 2 lb. each of resin, sodium carbonate and soap in 8 gals. of water. The powdered resin and soda are boiled in a little water and kept stirred. When the liquid is clear the flaked soap is added. The whole is then dissolved and cooled, and the rest of the water added.

Lime-sulphur mixture (Savastano's formula) [*R.A.E.*, A, ii, 412] may also be used, or petroleum emulsion consisting of 30 lb. soft soap, 3 gals. petroleum and 100 gals. water.

Fumigation with hydrocyanic acid gas is also recommended.

Wesenberg-Lund (C.). **Insektlivet i ferske Vande.** [Insect Life in Fresh Waters.]—Gyldendalske Boghandel, Nordisk Forlag, *Copenhagen*, 1915, 528 pp., 377 figs. Price 11.25 Kr.

In this voluminous book the author has collected together his many valuable notes on aquatic insects (including Culicids and other Nematocera). The literature on the subject has been consulted with great thoroughness and the whole forms a very valuable compendium of the known facts on the biology of aquatic insects up to the year of publication (1915).

Bergsoe (Vilh.). **Fra Mark og Skov. Billeder af Insekternes Liv.** [Pictures of Insect Life from Field and Wood.]—New Edition by C. Wesenberg-Lund, Gyldendalske Boghandel, Nordisk Forlag, *Copenhagen*, 1915, 2 vols., 1172 pp., 917 figs., 29 pls. Price 10 Kr.

This new and much enlarged edition of Bergsoe's old popular book has been issued by the editor as a pendant to the work above mentioned on freshwater insects. Numerous details are given, of the bionomics of insects noxious to agriculture and forestry as well as to household insects, house-flies, etc., and the work is full of excellent illustrations.

Dendy (A.). & Elkington (H. D.). **Report on the Effect of Air-tight Storage upon Grain Insects. Part III.**—*Rept. Grain Pests (War) Committee, Royal Society, London*, no. 6, January 1920, 51 pp. [Received 2nd March 1920.]

The chemical and physiological problems connected with the destruction of insect life in hermetically sealed vessels is discussed, the efficacy of this method having already been demonstrated [*R.A.E.*, A, vii, 94].

The results of experiments to determine as accurately as possible what are the factors concerned in the death of insects in sealed vessels, are summarised as follows:—Grain insects sealed up in air-tight vessels, with or without wheat, succumb as soon as the oxygen has been used up, a corresponding amount of carbon dioxide being produced. The only gases present in such sealed vessels, under normal conditions, are oxygen, nitrogen and carbon dioxide. The amount of carbon dioxide given off by live wheat in air-tight vessels varies directly with the moisture content and the temperature. As regards moisture content there is a critical point, above which the production of carbon dioxide by wheat suddenly increases very greatly. This critical point varies slightly with the temperature. For the temperature and wheats investigated it lies between 13·25 and 16·95 per cent. Above the critical point of moisture content wheat stored in air-tight receptacles very soon renders itself immune to the attacks of grain insects, but below this point it takes a comparatively long time to do so. Data are given in the appropriate places. The amount of oxygen absorbed by live wheat of low moisture content is greater than the amount of carbon dioxide given off. At about 30° C., 100 *Calandra oryzae* give off about 29·5 mg. (nearly a fifth of their own weight) of carbon dioxide in 24 hours, and at 20–21° C. only about 9·38 mg. Weight for weight, *C. granaria* gives off rather less carbon dioxide than *C. oryzae*, which is to be accounted for by its less active habits. The respiratory quotient for *C. oryzae* is about 0·773 and for *C. granaria* about 0·815, indicating that the respiratory processes of these insects are perfectly normal.

The complete absence of oxygen is alone sufficient to kill weevils, without taking into account the presence of carbon dioxide, though they are able to remain alive for a considerable time when only small percentages of oxygen are present. The extent to which weevils are able to make use of oxygen in sealed vessels depends upon the percentage of that gas initially present. Carbon dioxide exerts a poisonous effect upon weevils apart altogether from the question of diminished oxygen pressure. Thus at 30–31° C. *Calandra oryzae* was killed in less than 12 days in an atmosphere containing from 14·08 to 22·56 per cent. of CO_2, though 13·88 per cent. of O_2 still remained. Pure (moist) carbon dioxide is less fatal in its effects than carbon dioxide with a small admixture of oxygen. Pure (moist) carbon dioxide acts almost instantaneously as a narcotic, under the influence of which weevils may remain motionless for a long time without losing their power of recovery.

It has not yet been found possible to devise a method by which the time may be accurately estimated that is required to render wheat in an air-tight silo of given dimensions and under given conditions immune from the attacks of insects by the normal consumption of oxygen and production of CO_2. The rate of oxygen consumption and CO_2 production varies greatly with conditions of temperature and moisture, and it is difficult to determine even approximately the number of insects that may be present in the wheat. While no definite statement can be made, it is considered that infested grain put into air-tight storage cannot be seriously damaged by insects ; for if only a few were present, they could not do much damage in the time before they died, and if many were present, they would all be killed in a very short time by oxygen consumption and CO_2 production.

A series of experiments to determine the effect of sealing 100 grains of weevil-infested wheat in varying amounts of air-space demonstrates clearly the efficiency of hermetical sealing even when a relatively large air-space is present. The tests also indicated that sealing wheat for a short period would be a useful means of testing concealed weevil-infestation. The general advantages of air-tight storage are briefly summarised, and in conclusion, the importance of this method is urged as a means of maintaining a reserve of cereals in case of war or failure of crops.

Dendy (A.) & Elkington (H. D.). **Report on the Vitality and Rate of Multiplication of certain Grain Insects under various Conditions of Temperature and Moisture.**—*Rept. Grain Pests (War) Committee, Royal Society, London*, no. 7, January 1920. 52 pp. [Received 2nd March 1920.]

The following summary is given of the results of experiments on the vitality of the most important weevils attacking stored grain :—Under suitable conditions of temperature and moisture and with an abundant supply of wheat, *Calandra oryzae* and *C. granaria* show a very high rate of increase and breed all the year round. The optimum temperature for the breeding of *Calandra oryzae* and *C. granaria* is about 82° F., for *Rhizopertha dominica* somewhat higher. At all temperatures and under all conditions, when breeding takes place at all, *Calandra oryzae* increases much more rapidly than *C. granaria*, the maximum observed for the former species being a 700-fold increase in 16 weeks, at an average temperature of 82·5 ° F. For this reason *C. oryzae* is a more serious danger than *C. granaria*, unless indeed in the British Isles the higher rate of increase is counter-balanced by the higher death-rate of the adults in winter. At ordinary room temperature in the British Isles both *Calandra oryzae* and *C. granaria* multiply only during the warmer months of the year, the lower temperature limit for multiplication being probably about 65° F., while for *Rhizopertha* it is probably about 70° F. At ordinary room temperatures nearly all adults of *Calandra oryzae* are killed off during the winter, but large numbers of larvae survive in the interior of the grains.

The adults of *Calandra granaria*, on the other hand, survive the winter in large numbers, the death-rate being little, if any, higher than at other times of the year. The adults of the three species show remarkable differences in their susceptibility to cold. After being kept at a temperature of 33–36° F. for 11 days, 91 out of 100 *C. granaria* recovered, only 3 out of 100 *C. oryzae* showed very feeble signs of life, and none out of 100 *Rhizopertha dominica* recovered. *Rhizopertha dominica* is less susceptible to high temperatures than the two weevils, the lethal temperature for an exposure of three minutes being about 146° F. for the former and between 120° and 131° F. for the latter (in the adult condition). An exposure to a temperature of 145·5° F. for five minutes is sufficient to kill the larvae of *Calandra oryzae* and probably to sterilize the wheat completely as regards all insect life. Although a moist atmosphere is undoubtedly more favourable than a dry one for the two weevils, both species can live and multiply in a dry incubator, *Calandra oryzae* increasing much more rapidly than *C. granaria*, provided the initial moisture content of the grain is sufficiently high. Very dry wheat is less liable to attack by weevils than wheat with a moderate or high moisture content, but wheat readily absorbs moisture in a damp atmosphere, and thereby becomes much more susceptible to weevilling. *Rhizopertha* can withstand dry conditions better than either of the two weevils. *Calandra oryzae* and *C. granaria* are both likely to be serious pests in the British Isles, but little is to be feared from *Rhizopertha dominica* under ordinary temperature conditions. In addition to the damage done by actual consumption of the grain the presence of weevils results in extensive fouling with faecal matter, encouraging the absorption of moisture and the ultimate rotting of the whole mass. In large quantities of wheat the process of decay is doubtless accelerated by rise of temperature due partly to the presence of insects and partly to " heating of the wheat."

RATHBONE (H. R.). **Wheat and its Pests.**—*Grain Pests* (*War*) *Committee, Royal Society, London*, Memorandum no. 6, December 1919, 4 pp. [Received 2nd March 1920.]

Before the War the problem of wheat storage was of but little interest in Great Britain, as wheat was practically never stored in large quantities for any length of time. During the War, when storage became a necessity, considerable trouble was experienced from mites. W th regard to weevil infestation, the author expresses the opinion that the loss of wheat from weevils all over the world would probably be overstated at 0·001 per cent. per annum. It has been stated that severe losses were incurred by the Government in purchasing during the War a larger amount of wheat in Australia than they were likely to be able to ship; in the author's opinion the loss to the British Government will be small (certainly less than 2 per cent.), the smallness of the loss being largely due to the measures initiated to combat insect infestation [*R.A.E.*, A, vii, 167]. The standard plant finally erected for sterilising and screening the wheat is described. This is capable of treating 1,000 bushels per hour. All weevi s, eggs and larvae are killed in passing through the steriliser; from 200 to 300 lb. of dead weevils are secured from the amount of wheat (2,500 bags) treated in eight hours, about 442,000 weevils being estimated to the lb. While heavy losses have occurred in Australia, it is pointed out that the conditions under which an enormous bulk of wheat was obliged to remain stored for some years were quite exceptional and are very unlikely ever to recur.

Hecke (G. H.). **California—A future Cotton State.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, ix, no. 1–2, January–February 1920, pp. 3–4.

To ensure the future success of cotton growing in California the necessity of carrying out the inspection and quarantine service on a more adequate scale is emphasised. So far the cotton boll weevil, *Anthonomus grandis*, and the pink bollworm, *Pectinophora gossypiella*, have not gained entry into the State.

Snyder (T. E.). **"White Ants" as Pests in the United States and Methods of preventing Damage.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, ix, no. 1–2, January–February 1920, pp. 7–20, 11 figs.

The bulk of the information contained in this paper on termites has been noticed elsewhere [*R.A.E.*, A, v, 147].

Essig (E. O.). **The Grape Scale in California.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, ix, no. 1–2, January–February 1920, pp. 37–39, 2 figs.

The grape scale, *Aspidiotus uvae*, Comst., which was found attacking American vines in California in November 1919, is redescribed. The scales were abundant upon the old canes as well as upon one-year-old wood and were usually hidden under the rough and peeling bark. A list of twelve other scale-insects known to attack grapes in the State is given; none of these, however, is of any importance in commercial viticulture.

Wilson (G. R.). **Insects found in Banana Cars.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, ix, no. 1–2, January–February 1920, pp. 40–41, 1 plate.

There is always great danger of insects being introduced into fresh localities by railway cars passing through infested territory. Apparently banana cars are a greater source of danger than those carrying other commodities. Between 1st June 1918 and 31st July 1919 a collection was made in these cars of 124 insects belonging to 92 species representing 45 families. Of these 46 were injurious, but as some of these were not banana pests, they must have entered the car during transit. On two occasions small colonies of the Argentine ant [*Iridomyrmex humilis*] comprising workers and pupae were found in bunches of banana fruit.

Maskew (F.). **Reports for the Months of November and December 1919.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, ix, no. 1–2, January–February 1920, pp. 49–52.

The pests intercepted during November and December include:—From Arizona, *Cydia* (*Laspeyresia*) *pomonella* in apples. From Florida, *Lepidosaphes beckii*, *Parlatoria pergandei* and *Phomopsis citri* on oranges and grape-fruit. From New York, a Dipterous larva in Japanese iris; *Coccus hesperidum* and *Aspidiotus britannicus* on bay trees. From Oregon, *Cydia pomonella* and *Aspidiotus perniciosus* in apples. From Washington, *C. pomonella*, *Lepidosaphes ulmi* and *Aspidiotus perniciosus* on apples; *Parlatoria pergandei* and *Lepidosaphes beckii* on grape-fruit. From Alabama, *Parlatoria pergandei* on grape-fruit and oranges. From Pennsylvania, Idaho, Texas and Utah, *Cydia pomonella* on apples. From Colorado, *Lepidosaphes ulmi* and *C. pomonella* on apples. From Ohio, *Balaninus caryatrypes* in chestnuts. From Connecticut, *Pseudococcus citri* on *Gardenia*. From Arkansas, *Aspidiotus perniciosus* and *C. pomonella* on apples. From Illinois, *Aspidiotus perniciosus* on apples; *Pseudococcus* sp. on bulbs of *Calla*. From Massachusetts, *Lepidosaphes ulmi* and *C. pomonella* on apples. From Missouri, *Lepidosaphes beckii* and *Parlatoria pergandei* on grape-fruit. From Wyoming, *Lepidosaphes beckii* on grape-fruit. From Central America, *Pseudococcus* sp., *Aspidiotus* sp., *A. cyanophylli*, *Palacococcus rosae*, *Chrysomphalus scutiformis* and *Icerya purchasi* on bananas; *Aspidiotus* sp. on palm seed. From Nevada, *Heterodera radicicola* in potatoes and *Cydia pomonella* on apples. From Mexico, *Chrysomphalus* sp., *C. aurantii* and *Aspidiotus scutiformis* on oranges; *Lepidosaphes beckii* and *L. gloveri* on limes; *Aspidiotus* sp. on sweet limes; *Acritochaeta pulvinata* and *Drosophila buscki* in gourds. From New Mexico, *Lepidosaphes beckii* on lemons. From Papeete, an undetermined ant in tamarinds and *Pseudococcus* sp. on pineapples. From Guam, *Ischnaspis longirostris* (*filiformis*) on coconuts. From Hawaii, *Diaspis bromeliae* and *Pseudococcus bromeliae* on pineapples; *Coccus elongatus*, *Pseudococcus* sp. and *Aphis* sp. on betel leaves; *Pseudococcus virgatus* on leaves used as packing; larvae of *Dacus* (*Bactrocera*) *cucurbitae* in cucumbers; *Pseudaonidia clavigera*, *Saissetia nigra*, *Lepidosaphes* sp. and a Tetranychid mite on *Hibiscus* cuttings; *Chrysomphalus aonidum*, *Hemichionaspis minor* and a Lepidopterous larva on coconuts; *Pseudococcus* sp. on green coconuts, and *Aspidiotus lataniae* on shrubs. From China, Lepidopterous larvae in walnuts; an undetermined weevil and Lepidopterous larvae in roots; *Parlatoria pergandei*, *Chionaspis citri* and *Lepidosaphes beckii* on grape-fruit. From Japan, an undetermined weevil in chestnuts. From Australia, an ant and *Saissetia hemisphaerica* on staghorn fern.

SEVERIN (H. H. P.). **The Beet Leafhopper. A Report on Investigations into its Occurrence in California.**—*Facts about Sugar, New York*, viii, nos. 7–13, 15th February–29th March 1919, pp. 130–131, 134, 150–151, 170–171, 173, 190–191, 210–211, 230–231, 250, 255, 6 figs. [Received 2nd March 1920.]

Detailed records are given of the finding of individuals of *Eutettix tenella* (beet leaf-hopper) at different seasons on various food-plants in California, which are chiefly of the saltbush family (*Atriplex* spp.), the investigation having been undertaken with a view to determining the habits of the insects after leaving the cultivated area. The bulk of the information given has already been noticed [*R.A.E*, A, vii, 474].

ALDRICH (J. M.). U.S. Bur. Entom. **European Frit Fly in North America.**—*Jl. Agric. Research, Washington, D.C.*, xviii, no. 9, 2nd February 1920, pp. 451–473, 1 plate, 7 figs.

The investigations recorded in this paper were carried out in 1914–1916. A history of the early records of the frit fly is given.

Linnaeus described the insect in 1758 as *Musca frit*; Fabricius included it in the genus *Oscinis*. Since that date frit flies have been recorded as various species of *Oscinis* in North America, but the author's studies of these forms have led him to the conclusion that *O. pusilla*, Meig., *O. nitidissima*, Meig., *O. carbonaria*, Lw., *O. variabilis*, Lw., *O. nigra*, Tucker, and *O. soror*, Macq., are all synonyms of *Oscinella* (*Oscinis*) *frit*, the multiplicity of names having arisen from the variability and wide distribution of the species.

This fly is most abundant in the region where winter wheat is grown, *i.e.*, from the Great Lakes to the Ohio River and westward to the Missouri. Outside this area it has been found in abundance locally from the Atlantic to the Pacific and from Ottawa to the Gulf of Mexico, its northern limit being 58° in Alaska. It is general wherever grass is abundant and green for a considerable part of the year. In the arid West it occurs along streams, in irrigated pastures, or at high altitudes where the humidity is greater. The various stages of the insect are described.

In Indiana, where these investigations were made, *O. frit* winters in the larval stage in winter wheat. Following the emergence of this brood in spring, there are four summer generations. The method of rearing these generations in the laboratory is described. The first emergence extended in 1916 from about the middle of April to mid-May; adults of the first summer generation emerged from about 12th June to 13th July, those of the second generation from 16th to 26th July, those of the third, from 10th to 28th August. Only two flies of the fourth summer generation were reared; these emerged on 24th and 25th September. While the record covers too few individuals to exclude the possibility of variation in the number of generations, it indicates that four summer generations are the normal number.

The flies oviposit on the young and tender shoots of grains and grasses, the larvae entering the shoot and feeding downward in the middle; occasionally eggs are laid on or within the glumes just after heading, in which case the larvae eat out the soft kernel. The flies seem to be attracted by an exudation from the fresh epidermis of grass that is producing new shoots. Bluegrass lawns that are kept watered and mown yield large numbers of *O. frit*, practically throughout the season. The relation of *O. frit* to grasses requires much further study. A list is given of the known food-plants of the species; timothy grass, which is included in the list, has proved unattractive. In experiments, wheat, rye, emmer, barley and oats were infested in the order given. While in England, *O. frit* is frequently referred to as "the oat fly," in America it seems not to feed upon the oat at all, unless compelled to do so, when it sometimes accepts oats and sometimes prefers starvation. Wheat, on the other hand, is preferred for oviposition; eggs are laid on the autumn wheat soon after it appears, and spring wheat is attacked by the first summer generation. A characteristic symptom of infestation in young shoots of all kinds is the dying of the central leaf, while the others around it remain green. While in cool and moist weather the injured leaf may remain green for some time, in hot dry weather it is killed at once. The insect has rather a wide range of habits and may concentrate on any one of several food-plants; it sometimes severely attacks young, unripe grains, though ordinarily it does not affect them.

Owing to the great difficulty of rearing parasites it has been impossible to determine any species, but it appears evident that *O. frit* is freely parasitised by minute Hymenoptera.

The attack of *O. frit* upon wheat is very similar to that of the Hessian fly [*Mayetiola destructor*], and therefore it is thought that the remedy for one trouble may dispose of the other. As early as 1777, a change in the methods of tillage was recommended for the control of *O. frit* and this is still the only practicable remedy. In wheat sown at weekly intervals from 12th September to 17th October, it was noticed that infestation was heaviest in the earliest sowing and decreased regularly to the latest sowings, in which infestation was nil. It therefore seems that the recommendation of late sowing to escape the Hessian fly will equally apply to *O. frit*, though with the former the possibility of infestation entirely ceases at a certain date, while with the latter the chances decrease regularly until the cold weather. Wheat sown in late spring is more infested than that sown early. Continuous cropping in wheat appears to make no difference, for the fly migrates freely for considerable distances.

TURNER (W. B.). U.S. Bur. Entom. **Lepidoptera at Light Traps.**—*Jl. Agric. Research, Washington, D.C.*, xviii, no. 9, 2nd February, 1920, pp. 475–481, 1 fig.

Further observations have been made in Maryland with regard to Lepidoptera at light-traps, the species caught including many of those previously taken and a number of others [*R.A.E.*, A, vi, 487]. The work was carried on in 1918 from 14th May to 13th September and includes 28 observations. The trap used is described and figured. The total number of moths taken was 3,152, including more than 60 species; of these, 2,200, or 69·8 per cent. were males and 952 or 30·2 per cent. females. In the case of *Agrotis* (*Noctua*) *c-nigrum* and *Euparthenos nubilis* the sexes were in equal numbers, in three others there was a preponderance of females. Of the 952 females, 77·3 per cent. were gravid, these constituting 23·35 per cent. of all moths captured. Of the 11 genera of Arctiids, all the females of 9 genera were gravid; among 8 genera of Noctuids 100 per cent. of the females were gravid.

Temperature and humidity seem to have but little influence on night-flying moths, but strong winds, rain or fog materially restrict their flight. A large percentage of the total number of gravid females were captured during the early hours of the night (before 10 p.m.); this confirms the findings of another observer [*R.A.E.*, A, v, 211].

Of the species collected in Maryland, at least 20 are of economic importance and several others are likely to prove serious pests if circumstances favour them.

COLLINS (C. W.) & HOOD (C. E.). U.S. Bur. Entom. **Life History of *Eubiomyia calosomae*, a Tachinid Parasite of *Calosoma* Beetles.**—*Jl. Agric. Research, Washington, D.C.*, xviii, no. 9, 2nd February 1920, pp. 483–497, 2 plates.

During 1912, adults of the predaceous beetle, *Calosoma sycophanta*, L., successfully introduced into Massachusetts in 1906, were collected for breeding experiments. Many of these were killed by a Tachinid parasite since determined as *Eubiomyia calosomae*, Coq. Townsend's description of this fly is quoted and an account is given of each instar. It has been bred from *C. sycophanta* in many parts of eastern Massachusetts and in parts of Maine, New Hampshire and Rhode Island. It is probably native to New England, having been first bred from *C. calidum*, which it has infested to the extent of 4·4 per cent. for a period of years, the figure for *C. sycophanta* being only 3·4 per cent. or less during 1915–1918.

The eggs of *E. calosomae* are laid on the exterior surface of the adults of *Calosoma* (the larvae not being attacked) singly, or in groups of 2, 3 or 4. The period of oviposition during three years' observations was from 19th July to 16th August. Several experiments in longevity gave an average of 18 days. *E. calosomae* hibernates in the second larval instar within the body cavity of the beetles. The young larva upon hatching enters the body, probably through the spiracles, and reaches the second instar about the time that the beetles enter the earth for hibernation. In spring the parasitised beetles, weakened by the presence of the parasite, begin to work their way upward through the ground in search of food. They die after two or three days on, or near, the ground surface, and the parasites emerge shortly before the normal field emergence of *C. sycophanta*. There are two full generations of *E. calosomae* in a year and a partial third under favourable conditions. The egg-stage lasts from 3 to 24 hours, the larval stage from 9 to 12 days, pupation from 9 to 18 days. If beetles infested by flies of the summer generation immediately become inactive and dormant, the parasite apparently does likewise; but if the host continues to feed actively, the parasite reaches the adult stage and gives rise to a partial second summer generation.

This parasite has been bred from *C. sycophanta*, *C. frigidum* and *C. calidum* collected in the field in New England, and from one individual of *Carabus nemoralis*, and it is probable that other beetles belonging to these genera are attacked. The only instance of secondary parasitism has been the discovery of one puparium of *E. calosomae* containing a larva of *Chalcis* sp. There is an abundance of *E. calosomae* issuing in late July and August, after the beetles have begun to enter the ground for hibernation, and many must perish unless they attack some other host than *Calosoma* or *Carabus*. This may account for the present limits to the increase of the parasite. Should *C. calidum* become very abundant in eastern Massachusetts and New Hampshire, where *C. sycophanta* is already numerous, the abundance of the parasite may also increase materially, and constitute a serious handicap to the usefulness of *C. sycophanta* in New England.

WADE (O.). **The Four-Spotted Cowpea Weevil** (*Bruchus quadrimaculatus*, **Fabricius**).—*Oklahoma Agric. Expt. Sta., Stillwater*, Bull. 129, November 1919, 14 pp., 6 figs. [Received 2nd March 1920.]

Bruchus quadrimaculatus, F., its life-history, natural enemies, and methods of control are described. About seven generations of the insect take place in a year, and though depredations start in the field, the greatest damage is done to the stored seed.

Methods of control that have proved effective include:—(1) The mixing of 1 part lime to 8 parts stored peas by weight; (2) three successive fumigations in a week with carbon bisulphide (5 lb. to 1,000 cu. ft. of space), followed by stacking the peas in well secured bags of closely woven material with tight seams.

The most important natural enemy is a Hymenopterous parasite, *Bruchobius laticeps*, Ashm. Though this parasite probably destroys many immature Bruchids, the damage to cowpeas is already done before it can materially reduce their numbers.

Department of Entomology.—*Montana Univ. Agric. Expt. Sta., 25th Ann. Rept. for Year ended 30th June 1918, Bozeman*, February 1919, pp. 159–164. [Received 2nd March 1920.]

The growth of the entomological department in Montana since its inception in 1896 is outlined, and a list is given of the publications that have been issued. The life-histories of many well-known pests have been worked out under Montana conditions and published. Cutworms are a serious pest in fields and gardens; in 1915 it was estimated that about 100,000 acres of winter wheat were destroyed by the army cutworm [*Euxoa auxiliaris*]. Grasshoppers have appeared in destructive numbers in several localities and much work has been done in investigating this problem, about 160 species having been collected in the State.

Special studies have been made of the sugar-beet root aphis [*Pemphigus betae*] and it is found that by increasing the number of irrigations and so maintaining moisture content in the soil, these insects are prevented from becoming numerous and the sugar-content of the beets is considerably increased. The lucerne weevil [*Hypera variabilis*] has not yet been recorded in Montana, but is prevalent in the States to the south, and farmers are requested to be on the watch against its appearance.

Haywood (J. K.). **Report of the Insecticide and Fungicide Board.**—*U.S. Dept. Agric. Washington, D.C.*, 22nd August 1919, 5 pp. [Received 3rd March 1920.]

The Insecticide and Fungicide Board was inaugurated to assist the Secretary of Agriculture in the enforcement of the Insecticide Act, the purpose of which is to prevent the manufacture, sale, or transportation of adulterated or misbranded Paris green, lead arsenate and other insecticides and fungicides and for regulating traffic therein. The work of the year ended 30th June 1919 is reviewed. The great increase in the use of these substances has necessitated constant vigilance and has resulted in a material increase in the amount of work which the Board has been called upon to perform. Owing to the enlarged market and the increased tendency toward adulteration the work of the Board requires considerable expansion, which however is not possible with the present appropriation.

Marlatt (C. L.). **Report of the Federal Horticultural Board.**—*U.S. Dept. Agric., Washington, D.C.*, 1st October 1919, 32 pp. [Received 3rd March 1920.]

This report, which covers the administration of the Plant Quarantine Act for the fiscal year ended 30th June 1919, includes a list of the current quarantine and other restrictive orders. The chief insect pests dealt with include the Japanese beetle [*Popillia japonica*] and the European corn borer [*Pyrausta nubilalis*], in connection with which the present position is reviewed.

The pink bollworm [*Pectinophora gossypiella*] was not found in any area previously infested, and this was probably owing to the active control measures undertaken in connection with the 1918 crop. Clearing-up operations were begun as soon as possible in the newly infested districts, and although the planting of cotton for 1919 under adequate safeguards was permitted owing to the remoteness of the infested zone from other cotton areas, the district in question is to remain a strictly non-cotton zone for as long a period as necessary.

FERRIS (G. F.). **The California Species of Mealy Bugs.**—*Leland Stanford Junior Univ. Publications, Cal.*, 1918, 78 pp., 3 plates, 16 figs. [Received 3rd March 1920.]

The author emphasises all the points in a previous paper made [*R.A.E.*, A, v, 407] in connection with methods of identifying mealy-bugs. He disregards biological in favour of morphological evidence for taxonomic purposes, because the former, not being fully understood, is often misleading. Under the term "mealy bugs" the following genera are included: *Antonina*, *Cryptoripersia*, *Erium*, *Geococcus*, *Lachnodius*, *Natalensia*, *Phenacoccus*, *Pseudococcus*, *Rhizoecus*, *Ripersia*, *Ripersiella*, *Trabutina*, *Trionymus* and *Tylococcus*.

One new genus, *Heterococcus*, is erected, and the following new species are described:—*Pseudococcus cupressicolus* on *Cupressus guadelupensis* and *C. arizonicus*; *P. longisetosus* on underground stems of *Castilleja foliolosa* and *Orobanche tuberosa*, and roots of *Armeria vulgaris*; *P. quercicolus* on *Quercus chrysolepis*, *Q. agrifolia* and *Pasania densiflora*; *Phenacoccus eriogoni* on *Eriogonum nudum*; *P. solani* on roots of *Hemizonia rudis*, potato, tomato, and a variety of wild plants; *Heterococcus arenae* on *Poa douglasi*; *Trionymus bromi* on *Bromus* spp., *Ammophila arenaria* and *Ericameria fasciculata*; *T. distichlii* on *Distichlis spicata*; and *T. grindeliae* on roots of *Grindelia robusta*.

Keys are given to the Californian genera and species.

FERRIS (G. F.). **A Contribution to the Knowledge of the Coccidae of Southwestern United States.**—*Leland Stanford Junior Univ. Publications, Cal.*, 1919, 68 pp., 38 figs. [Received 3rd March 1920.]

This paper consists chiefly of redescriptions of named forms.

The following new species are described:—*Orthezia nuda* on *Quercus emoryi*; *Fonscolombia yuccae* on a broad-leaved *Yucca*; *Lachnodius salicis* on *Salix* sp.; *Pseudococcus lycii* on *Lycium* sp.; *Ripersia hilariae* on a perennial grass, probably *Hilaria cenchroides*; *Aclerda ariditatis* on a perennial grass, probably *H. cenchroides*; *Protodiaspis tridentata* on *Prosopis velutina*; *P. edentata* on *Acacia greggii*; *Pseudodiaspis atriplicis* on *Atriplex* spp.; *P. condaliae* on *Condalia spathulata*;

Lepidosaphes ceanothi on *Ceanothus* spp.; *Aspidiotus covilleae* on *Covillea glutinosa*; and *Targionia covilleae* (described as *Chrysomphalus covilleae*, but referred to the genus *Targionia* in the supplement) on *Covillea glutinosa*.

PETTIT (R. H.). **Report of the Entomologist.**—*57th Ann. Rept. (1st July 1917 to 30th June 1918) Michigan State Bd. Agric., Lansing*, 1919, pp. 278–280. [Received 3rd March 1920.]

The potato aphis [*Macrosiphum solanifolii*] caused considerable trouble during the year, the insect being difficult to reach with a spray owing to its habit of resting on the underside of the leaves. Against the onion maggot [*Hylemyia antiqua*] poisoned syrup baits have been used with much success. Weather conditions were very favourable in 1917 to the bean maggot [*Phorbia fusciceps*], and smaller numbers were present in 1918, but undoubtedly the shallow seeding of beans and the proper preparation of the seed-bed resulted in saving a large proportion of the crop. The stalk borer, *Papaipema nebris* (*nitela*), has done considerable damage to maize, tomatoes, potatoes and some other crops. Cutworms, wireworms and white grubs were all rather abundant and a species of *Sitones* is increasing as a clover pest in various parts of the State. In some countries grasshoppers are causing considerable trouble and the high prices of poison-bran materials render control an expensive matter; it is hoped that the numbers of blister beetles [*Epicauta*] reported from the infested regions may be a distinct help in destroying the grasshopper eggs. A Lepidopterous borer in maize that appeared in 1917 has now been determined as *Oligia* (*Noctua*) *fractilinea*, which is a serious pest in the more southern States.

The greatest menace however is that of the wheat jointworm [*Harmolita tritici*] which is now well established in the State. Much is hoped from the parasites of this insect which are appearing in large numbers. The pest producing blemishes on elbertas has now been identified as the flower thrips, *Frankliniella* (*Euthrips*) *tritici*, while that deforming gooseberries is an Aphid, *Macrosiphum cynosbati*. Further information will be published about these pests. The breeding of parasites of scale-insects is progressing.

An investigation is being made into possible means of controlling the cockroach, *Periplaneta americana*, which does not respond to the ordinary methods of cockroach control. The tamarack saw-fly [*Lygaeonematus erichsoni*] is apparently being held in check by at least one Hymenopterous parasite and by the fungus, *Isaria farinosa*, introduced for that purpose some years ago.

HALLIGAN (C. P.) & PETTIT (R. H.). **Spray and Practice Outline for Fruit Growers.**—*Michigan Agric. Expt. Sta., East Lansing*, Spec. Bull. 86, 1918, 22 pp., 6 figs. [Received 3rd March 1920.]

The purpose of this bulletin is to specify the correct times for the application of sprays and the proper materials to use for the insects and diseases that may be expected on fruits in Michigan. Directions for making the sprays and instructions for general treatment of the principal crops are included.

Blakeslee (E. B.). **Use of Toxic Gases as a possible Means of Control of the Peach-Tree Borer.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 796, 21st October 1919, 23 pp., 1 plate. [Received 3rd March 1920.]

Investigations were begun in 1915 with the object of developing a possible method of controlling the peach tree borer, *Aegeria* (*Sanninoidea*) *exitiosa*, Say, by the use of local applications of volatile toxic compounds to the soil at the base of the tree.

The substances experimented with include carbon bisulphide, carbon tetrachloride, hydrocyanic acid gas, naphthaline and paradichlorobenzene. With the exception of the last-named all the tests gave negative results.

Some account of para-dichlorobenzene is given and its previous uses are reviewed. The action of the gas generated is quite local and an even distribution about the tree is desirable; in the present experiments it was found most convenient to pulverise the material to about the fineness of coarse salt. The soil around the tree was broken up to a depth of 1 or 2 inches but not scraped away from the collar of the tree unless there was a decided mound. Para-dichlorobenzene was then sprinkled in a band 1 or 2 inches wide round the collar of the tree as nearly as possible at the level of the uppermost galleries. It is probably best to keep the material from actual contact with the bark to the extent of about half an inch, but the practical importance of this precaution is not known. The material is finally covered to a depth of about 2 inches with soil and the mound slightly compressed. No lumps or stones should be left against the trunk above the surface as they furnish shelters for the newly hatched larvae out of reach of the vapour.

A total of 126 eight-year-old trees were treated with various doses ranging from ½ oz. to 10 oz. per tree. It was found that less than ½ oz. would probably not give consistent control, but there is no advantage in giving a larger dose than 1 oz. The best time for application is 3 weeks before the end of the hatching period, when all larvae will be killed except a few that have already entered the tree. The seasonal fluctuations in the period of oviposition prevent the determination of the time of application to any very great degree of exactness, but during these observations applications made between the end of August and end of September proved most satisfactory, the larvae being killed in about a fortnight. There is apparently no advantage in making a second application, which only increases the risk of injury to the tree. Although it has been found that, with all gases, trees recover more readily from injury in the spring at the beginning of the growing season, applications made at that time are not efficacious, as the majority of the larvae have penetrated the tree and their galleries provide a chance of escape from the gas.

Trees of six years standing or older do not appear to show any ill effects from fumigation, but the injury to younger trees was too great to warrant the use of this substance. It has so far been used with almost uniform results on a variety of soils.

This method of fumigation has also been tried on apple trees against *Saperda candida*, but the trees were severely injured, there being apparently a wide difference in susceptibility between apple and peach trees in this respect. On the latter the gas was also observed to destroy the fungus gnat, *Mycetobia* sp., which feeds on the gum.

Quaintance (A. L.). **The San José Scale and its Control.**—*U.S. Dept. Agric., Washington, D.C.,* Farmers' Bull. 650, October 1919, 31 pp., 18 figs. [Received 3rd March 1920.]

This is a revision of a bulletin on *Aspidiotus perniciosus* that has been previously noticed [*R.A.E.*, A, iii, 417]. It includes a list of food-plants compiled by W. E. Britton. The remedial measures advocated include Scott's formulae for home-made lime-sulphur concentrate [*loc. cit.*, 418].

Brooks (F. E.). **The Round-headed Apple-Tree Borer.**—*U.S. Dept. Agric., Washington, D.C.,* Farmers' Bull. 675, September 1919, 20 pp., 19 figs. [Received 3rd March 1920.]

This bulletin on *Saperda candida*, F., is a revision of a former one, the contents of which have already been noticed [*R.A.E.*, A, iii, 586].

Brooks (F. E.). **The Flat-headed Apple-Tree Borer.**—*U.S. Dept. Agric., Washington, D.C.,* Farmers' Bull. 1065, October 1919, 12 pp., 13 figs. [Received 3rd March 1920.]

The flat-headed apple-tree borer, *Chrysobothris femorata*, F., occurs over almost all the United States and in Southern Canada. It injures a great variety of fruit, shade, and forest trees. Damage is only done by the larva, and only to trees that are weakened in some way, such as by transplanting or injury. The larva cannot thrive in a perfectly healthy tree, though it may continue for months in a half-starved condition, and finally complete its development if the tree is weakened in any way. The normal life-cycle takes a year.

The natural enemies of this beetle are woodpeckers and other birds, ants and some Hymenopterous parasites including :—*Bracon charus*, Riley, *B. pectinatus*, Say, *Spathius pallidus*, Ashm., *Labena apicalis*, Cr., *L. grallator*, Say, and *Phasgonophora sulcata*, Westw.

The most important feature of control is a good condition of the trees. Low-formed branches on the south side of trees, and boards set in the ground to throw a shadow on the trunks of newly-planted trees cause the beetles to lay their eggs elsewhere, in sunnier places. Traps consisting of logs of any kind laid in the sun and covered with a sticky material may be used. Injuries on a tree may be protected with paint, and during the season of oviposition the whole trunk may be covered with paper or other wrapping. Dying or cut wood of any kind should never be left in an orchard from one season to another, in case beetles may emerge from it.

The European Corn Borer (*Pyrausta nubilalis*).—*Amer. Plant Pest Committee, Boston, Mass.,* Bull. 1, 30th November 1918, 2 pp., 1 fig. [Received 8th March 1920.]

This is an appeal to the public, emphasising the importance of the actual and possible damage by *Pyrausta nubilalis,* including the danger of its spread to the Southern States. Many of the recommendations contained in it have since been dealt with [*R.A.E.*, A, vii, 224, 411; viii, 91, 97–99].

The Sweet Potato Weevil (*Cylas formicarius*).—*Amer. Plant Pest Committee, Boston, Mass.*, Bull. 1, 12th May 1919, 2 pp., 1 fig. [Received 8th March 1920.]

The sweet potato is now the second most important vegetable crop in the United States, and the loss due to *Cylas formicarius* is estimated at over 6 per cent. of its total value. This weevil is well established in Texas, Louisiana and part of Florida, has a foothold in Mississippi, Alabama and Georgia, and is liable to spread wherever sweet potatoes are grown and stored.

From its life-history it seems that direct remedies cannot entirely exterminate it or prevent its spread. The best results come from community application of repressive measures carried to the point of eradication, consisting chiefly of practical, clean culture, and the use of weevil-free planting stock. These measures should be applied in special districts under the close supervision of inspectors, and supplemented by rigid quarantine laws. The Federal Government is being asked to provide £15,000 (about 1 per cent. of the value of the damage) to be used in conjunction with the contributions of the various States where the weevil is established.

FULLAWAY (D. T.). **The Fern Weevil Menace.**—*Hawaiian Forester & Agriculturist, Honolulu*, xvii, no. 1, January 1920, pp. 3–4, 1 plate.

A serious infestation of ferns of the genus *Sadleria* by the Australian fern weevil, *Syagrius fulvitarsis*, Pasc., was noticed in September in the neighbourhood of Kilanea and has now spread on the fish-tail fern to such an extent that eradication does not appear to be feasible. Isolation is apparently the only possible remedial measure. In the mountains behind Honolulu, this beetle has been present for 15 years.

CRAWFORD (D. L.). **The Jumping Plant Lice of the Palaeotropics and the South Pacific Islands. Family Psyllidae, or Chermidae, Homoptera.**—*Philippine Jl. Sci., Manila*, xv, no. 2, August 1919, pp. 139–208, 3 plates, 3 figs. [Received 5th March 1920.]

The Psyllids of the Palaeotropics are not of much economic importance, though a few species do considerable damage, and no doubt when the habits of certain others are known the number of those of economic interest will be augmented.

Euphalerus vittatus, Crawf., has been recorded from Bombay on *Cassia fistula*, and *E. citri*, Knw., is a pest of *Citrus*. *Arytaina punctipennis*, Crawf., injures indigo (*Indigofera*) in Bengal and Ceylon, and *A. obscura*, Crawf., attacks mangos (*Mangifera*) in Bengal.

Several new species are described.

Report of the Canadian Arctic Expedition 1913–18. III: Insects, Part E: Coleoptera, *Ottawa*, 12th December 1919, pp. 1–27E., 3 plates. [Received 8th March 1920.]

The beetles here dealt with include SCOLYTIDAE (IPIDAE), CERAMBYCIDAE, and BUPRESTIDAE by J. M. Swaine; CARABIDAE and SILPHIDAE by H. C. Fall; Coccinellidae, Elateridae, Chrysomelidae, and Rhynchophora by C. W. Leng; and Dytiscidae by J. D. Sherman, Jr.

The forest insects were collected chiefly on the east side of the Copper Mine River, North-west Territories. The trees were stunted white spruce [*Picea alba*], examined in February at a temperature of 50 degrees below zero. Forest insects including bark-beetles and Cerambycid larvae had caused extensive injury. Mr. Johansen in his field notes considered that they had killed the majority of the numerous dead trees in that locality, and he suggests that the injuries to the most northern trees, ascribed to fires and climatic conditions, may have been really caused by similar insect outbreaks. The following Scolytids are described:—*Dendroctonus johanseni*, sp. n., *Carphoborus andersoni*, sp. n., *Polygraphus rufipennis*, Ky., which is usually rare in pine but is commonly found in larch in Canada, and *Pityophthorus nitidus*, Sw.

The only Cerambycids obtained in the extreme north were:—*Criocephalus agrestis*, Kirby, *Merium proteus*, Kirby, *Neoclytus muricatulus*, Kirby, and *Xylotrechus undulatus*, Say. A new species, *Callidium subopacum*, is described from Yukon territory.

Gibson (A.). **The Lepidoptera collected by the Canadian Arctic Expedition 1913–18,**—*Rept. Canad. Arctic Exped. 1913-18, Ottawa*, 10th January 1920, iii,: Insects Pt. I: pp. 1–58, 5 plates. [Received 8th March 1920.]

The greater part of the collection here described was made by the Southern Party from 1913 to 1916, and consists chiefly of butterflies. A small collection was made by the Northern Party and in addition a record is given of species that have been collected in Arctic regions by officials of the Geological Survey of Canada.

Strickland (E. H.). **The Date on which it is safe to re-seed Fields in the Prairie Provinces after they have been devastated by Cutworms.**—*Canada Dept. Agric., Entom. Branch, Ottawa*, Crop Protection Leaflet 11, [n. d.], 2 pp. [Received 8th March 1920.]

A chart and directions are given for measuring cutworms in order to ascertain how long it will take for them to become full grown. The importance of this lies in the fact that if they have destroyed one crop, they will do an equal amount of damage to another unless they have ceased to feed. If they average $\frac{3}{4}$ inch long, fields should not be sown in less than 5 weeks, if $\frac{7}{8}$ inch 4, if 1 inch 3, if $1\frac{1}{4}$ inch 2, and if $1\frac{1}{2}$ inch (full grown) 1 week.

The pale western cutworm [*Porosagrotis orthogonia*] does not leave destroyed fields, but the red-backed and army cutworms [*Euxoa ochrogaster* and *E. agrestis*] may sometimes do so. If it is certain they have left, it is safe to re-seed at any time.

Early sown crops suffer less than those sown late, and cutworms are almost always worst on summer-fallowed land. Flax suffers as much as grain from cutworms. Rain does not kill them, but reduces the extent of their feeding.

STRICKLAND (E. H.) & CRIDDLE (N.). **The Beet Webworm** (*Loxostege sticticalis*, **L.**).—*Canada Dept. Agric., Entom. Branch, Ottawa*, Crop. Protection Leaflet 12, [n.d.], 3 pp., 4 figs. [Received 8th March 1920.]

The beet webworm (*Loxostege sticticalis*, L.) frequently appears in enormous numbers in the prairie provinces. When its food-plants are destroyed it migrates in the manner of the army cutworm [*Euxoa agrestis*], but is not destructive to grain crops. There are two generations in the year, the moths appearing in May and late July.

The larvae are rather beneficial than otherwise to field crops, as they destroy all sorts of weeds, and only attack flax and lucerne after all the weeds are gone, while grain crops are left alone. On the other hand beet and garden plants are quickly and entirely destroyed. If the larvae are about to invade some susceptible crop, a deep furrow should be ploughed in their path and treated with a poison bait consisting of 50 lb. of fresh weeds moistened and thoroughly dusted with 1 lb. Paris green; two furrows, a rod apart, may be advisable if the webworms are very numerous.

A spray applied at the rate of 100 gals., per acre and consisting of Paris green 3 lb., lime 3 lb., water 100 gals., is very effective on infested areas.

MATHIEU (E.). **Tuba-Root** (*Derris elliptica*) **as an Insecticide.**—*The Gardens Bull., Straits Settlements, Singapore*, ii, no. 6, 31st January 1920, pp. 192–197.

This paper consists of a recapitulation of some of the tests and conclusions on derris in one already noticed [*R.A.E.*, A, vii, 496].

In the control of the fly, *Agromyza phaseoli*, which has caused a complete destruction of the bean crop, none of the ordinary remedial measures had any success. An extract was then tried, made of 10 oz. of tuba-root well pounded, the juice expressed, and the fibre exhausted in 20 gals. of water. This was applied to the young plants, a cigarette tin full to four plants, morning and evening for 15 days by which time the plants were sufficiently established to be safe. This treatment was completely successful.

JACK (R. W.). **Tobacco Pests of Rhodesia, Part II.**—*Rhodesia Agric. Jl., Salisbury*, xvii, no. 1, February 1920, pp. 28–33. 5 plates.

This is a continuation of a paper recently noticed [*R.A.E.*, A, viii, 134].

There are three species of Tenebrionid beetles that attack tobacco after the manner of cutworms, but only newly planted crops suffer appreciably. One of these, a species of *Gonocephalum*, is easily destroyed by poisoned bait, like that used for cutworms with the optional substitution of sodium arsenite for Paris green. No practical method of destroying the others (*Zophosis* spp.) has yet been found.

Tenebrionid larvae of the genera *Psammodes* and *Trachynotus*, called wireworms in Rhodesia, cause considerable damage underground. Their attacks usually, but not invariably, occur on newly broken soil, though as *Psammodes scrobicollis* and *P. similis* live in the larval state for two or three years, attacks may continue for two years after breaking up the soil. The damage done is so severe that it is frequently impossible to obtain a stand of plants on infested ground.

The only known remedial measures apply to the adult beetles, and must be taken against these before they have laid their eggs. *Trachynotus* spp. should be destroyed by poisoned bait before May, while *Psammodes* spp. can be easily seen and destroyed in early morning and evening after the first wetting rains of the season. Details of the life-history of these beetles are given [see also *R.A.E.*, A, vi, 337].

Grasshoppers are frequently troublesome to new crops. The burning of a broad belt of grass round land before planting is beneficial. Crickets are usually dug out of their holes by hand. The following poison-bait may be used—3 lb. bran, green grass or lucerne, ½lb. sugar or treacle, and one dessert spoonful of sodium arsenite or Paris green.

The root gallworm (*Heterodera radicicola*) may become a very serious pest, though it seems to prefer wetter soil than the tobacco lands of Rhodesia. The heavy rainfall of the last two seasons has favoured its increase. It is probably introduced in seed potatoes, and low-lying land is most liable to infestation. No measures of control are applicable once the pest is established in a crop, though seed beds may be sterilised by heavy firing.

A general summary of measures for avoiding loss to tobacco crops is given, regarding as a whole the various pests that have been dealt with in detail.

OKADA (T.). **Kansho Hakui-mushi ni tsuite.** [On the Leaf Pest of the Sweet Potato].—*Byochugai Zasshi* [*Journal of Plant Protection*], *Tokyo*, vii, no. 2, 5th February 1920, pp. 74–79, 1 plate.

The sweet potato army worm *Scotogramma trifolii*, Rott. (*Catephia inquieta*, Wlk.) is as yet known only in southern Japan. It is a serious pest and may defoliate the plants. It has three generations a year, the winter being passed in the pupal stage.

As regards remedial measures, though the use of trap-lanterns and hand-picking are the methods commonly adopted, the author recommends a contact poison such as kerosene emulsion with insect powder; this is very effective, especially in the case of the first and second instars.

KURISAKI (M.). **On the Life-history of the Citrus Leaf Miner, *Phyllocnistis saligna*, Zell., and the Relation between this Miner and Citrus Canker, *Pseudomonas citri*, Hasse.**—*Konchu Sekai* [*Insect World*], *Gifu*, xxiv, no. 2, 15th February 1920, pp. 39–44.

In this report the author only deals with the life-history of the moth, of which there probably are seven generations a year. A Hymenopterous parasite has been bred from both larva and pupa.

Shakutori-mushi no Higai-Kiji no Zemmetsu shitaru kekkwa. [Outbreak of Looper Caterpillars due to Extinction of the Pheasant.]—*Ryokai Jiho* [*Shooting News*], *Tokyo*, ii, no. 1, 28th January 1920, pp. 33–34.

The pheasant is a bird generally considered to be very injurious to crops in Japan. In the Kodama District, Saitama Prefecture, however, where formerly pheasants were numerous but have now entirely disappeared, looper caterpillars have occurred in abundance in mulberry plantations and have done considerable damage.

Kitajima (Y.). **Fusanranga oyobi Shosusanranga ni Kwansuru Kenkyu.** [Studies in Sterility and reduced Oviposition in Silkworms.]—*Sangyo Shimpo* [*Journal of the Silk Industry*], *Tokyo*, xxviii, no. 321, 1st December 1919, pp. 1165–1176, 6 figs.; no. 323, 1st February 1920, pp. 112–119.

Absolutely sterile moths occur very rarely among silkworms, and the author only found 5 such individuals out of 2389 moths. Such examples usually occur among hybrids between the Japanese and European races. They contain as many eggs as normal ones, but their genital system is usually deformed, the principal cause being mostly due to mechanical injuries in the pupal stage. Another type of sterile moth is one that does not oviposit after pairing on the day of emergence; but such an individual may do so if pairing is repeated with a sound male on the following day. Individuals of this type are common in hybrids and less so in the native races. A third type is one that produces but few eggs, and examples of this occur in both native and European races. Many individuals of this type lay unfertilised eggs, and the phenomenon is therefore probably due mainly to sterility in the male.

Silkworm diseases seem to have no relation at all to abnormal oviposition. Methods of rearing may have some influence, since abnormalities are not uncommon amongst individuals fed on soft mulberry leaves. The compelling of silkworms into spinning cocoons of a definite shape which may deform the abdomen of the pupa may also be a factor in causing sterility.

Kitajima (Y.). **Sanran ni Kwansuru Kenkyu.** [Studies on the Silkworm Egg.]—*Dainihon Sanshikwaiho.* [*Report of the Japan Sericultural Society*], *Tokyo*, xxix, no. 337, 1st February 1920, pp. 98–103.

In investigations on the relation between the condition of silkworm eggs and the situation of the pupa, 55 out of 222 moths from erect pupae, 56 of 447 from obliquely situated pupae, and 19 out of 197 from horizontal pupae laid their eggs badly, *i.e.*, the eggs are placed obliquely, erect or in a heap. From this result pupae in erect positions seem to give rise to bad oviposition. The same phenomenon is observable in moths that emerge from pupae the abdominal end of which is compressed or deformed. When the deformation is very marked the eggs are also usually fewer in number. This is especially the case in moths of the summer brood. No relation seems to exist between the weight of pupae and bad oviposition. The author has found a few similar deformations in *Saturnia pernyi*, Guér., but not in *Dictyoploca japonica*, Moore. This investigat on is to be continued.

MITANI (K.), WATARAI (M.) & KONO (D.). **Kennai Yotai ni Zoshokushitaru wakaki** *Pediculoides*-**Dani Seichu no Sonogono Ummei.** [The Fate of Young Adults of *Pediculoides*-Mites after Development within the Silk Cocoon.]—*Dainihon Sanshikwaiho* [*Report of the Japan Sericultural Society*], *Tokyo*, xxix, no. 337, 1st February 1920, pp. 103–107.

It is a known fact that when a young female *Pediculoides* clings to the surface of the silkworm cocoon, it penetrates it and reaches the pupa on which it develops. The authors have made an investigation as to whether the mites in this stage can again emerge from the cocoon and infest other silkworms. After many experiments they have come to the conclusion that they not only may attack silkworms and moths near the original cocoon, but also are capable of infesting the pupa in another one. They only do so however when the original host-pupa has shrivelled up. The thickness of the cocoon seems to afford no protection. Earlier heating of infested cocoons is therefore strongly recommended against these parasites.

MITANI (K.), WATARAI (M.) & KONO (D.). *Pediculoides*-**Dani no Shiyu-Seichu no Wariai oyobi Yu-Seichu no tasaiteki Seishitsu ni tsuite.** [On the Proportion of Male and Female Individuals of Adult *Pediculoides* Mites and the Polygamous Character of the Male.]—*Sangyo Shimpo* [*Journal of the Silk Industry*], *Tokyo*, xxviii, 1st February 1920, pp. 145–146.

Out of 3,883 individuals of adult *Pediculoides* 276 were male and 3,607 female, the percentage of males being thus only 7 per cent. Evidence of polygamy in this mite corresponding with these data was actually obtained.

NAKAI (G.). **Kuwa no Daiyo Shokubutsu ni kwansuru Shiken.** [Experiments in Food-plants substituted for the Mulberry.]—*Sangyo Shimpo* [*Journal of the Silk Industry*], *Tokyo*, xxviii, no. 323, 1st February 1920, pp. 131–140.

Though it is certain that the mulberry is indispensable as food for silkworms, *Cudrania triloba*, *Lactuca brevirostris*, *Broussonetia kasinoki* and other plants may be utilised to some extent. Silkworms can be fed on *Cudrania triloba* throughout the larval stage, though individuals fed only on this plant produce far inferior silk. *B. kasinoki* is almost valueless as food for the younger instars, but at the fifth stage, especially toward the end of it, is as readily eaten as mulberry. *L. brevirostris* can be substituted in the first stage, especially during the first three days, but for the later stages, especially the fifth, it is almost valueless.

MIYAKE (T.). **Shokuyo oyobi Yakuyo ni kwansuru Kenkyu.** [Investigations on Insects used for Food and in Medicine.]—*Nojishikenjo Tokubetsu-Hokoku* [*Special Report*], *Imperial Agricultural Experiment Station*, *Tokyo*, no. 31, 18th December 1919, 204 pp., 1 plate.

In this report on insects used for food and in medicine in Japan, in the first category only such insects are described as are deliberately eaten for food. Under the insects used in medicine, all the species are included that are believed to have any efficacy in respect of disease, a great majority of them being merely edible species to which curative virtues are attributed. Both groups are arranged systematically; in the former, the method of cooking, and in the latter, the preparation, and the diseases against which they are used, are recorded.

In the case of supposed medicinal insects, it is recommended that each one should be scientifically tested as to its value, without rejecting it outright as an instance of superstition.

The food insects include :—Ephemerids, such as may-fly larvae; dragon-flies, both larva and imago; various Orthoptera, including Mantids, locusts, and crickets; Rhynchota, including the egg-masses of *Belostoma*; numerous Lepidoptera, including the larvae of the rice-borers (*Chilo simplex*, Butl., and *Schoenobius incertellus*, Wlk.), and the pupae of the silkworm, *Bombyx mori*, L.; among Coleoptera, various Cerambycid, Curculionid, and Hydrophilid larvae and the imagines of the Dytiscid, *Cybister japonicus*, Sharp; among Hymenoptera, the larvae and pupae of Vespid, Scoliid and Sphegid wasps and the larvae of *Bombus*.

The long list of insects used in medicine includes representatives of all the natural orders.

MAKI (M.) & RIN (G.). **Mokumao no Tengyu Kujo Shiken (Dai ichi Hokoku).** [Experiments in preventing Cerambycid Attacks on *Casuarina stricta*.] **Report I.**—*Ringyo-Shikenjo Hokoku* [*Report Forest Expt. Station*], *Taipe, Formosa*, no. 6, pp. 109–113.

Casuarina stricta, which is a very useful tree in Formosa, is much attacked by various injurious insects, of which a scale, *Icerya purchasi*, Mask., and a Cerambycid, *Melanauster chinensis*, Forst., are the most formidable. Experiments were made by the authors for controlling the latter. As the beetles oviposit from April to July, the eggs can be crushed and destroyed by inspecting the forest at least once a month. This method is also very useful when the larvae are first hatched, as they usually remain for more than three weeks under the bark without entering deeper into the wood. In order to kill the larvae the infested area must first be detected by the presence of excrement, and stripping off a piece of the bark suffices and does no harm to the tree. One man can treat 250 trees a day in this manner. Covering the trunk with the leaves of the fan palm, *Livistona chinensis*, also gave good results, 70 or 80 trees a day being treated in this way by one man.

MAKI (M.). **Taiwan Mamehanmyo ni kwansuru Chiken.** [Note on the Formosan Blister-beetle.]—*Ringyo-Shikenjo Hokoku* [*Report Forest Expt. Station*], *Taipe, Formosa*, no. 6, pp. 115–128, 1 plate.

The Formosan blister-beetle, *Epicauta hirticornis*, Haag (?), attacks cultivated plants such as *Glycine hispida*, *Solanum melongena*, *Amarantus gangeticus* and *Corchorus capsularis*; and wild plants such as *Clerodendron paniculatum*, *C. cyrtophyllum*. *Sambucus javanica*, *Ehretia macrophylla*, *Canavalia lineata*, *Amarantus mangostanus* and

A. spinosus. From bred insects it was found that eggs laid in June hatched in August and the winter was passed in the larval stage, during which time four moults occurred. Pupation took place in the middle of May of the following year and the adult appeared at the end of the same month. The eggs of the locust, *Oxya intricata*, Stål, were used as baits for the larvae.

GREEN (E. E.). **On a New Species of *Antonina* (Coccidae) from Ceylon.**—*Entom. Mthly. Mag., London*, (3) v, no. 56, August 1919, pp. 175–176, 2 figs.

Antonina zonata, sp. n., here described, was found on bamboo (*Teino tachyum attenuatum*) in Ceylon. The adult females are clustered in the axils of the smaller branches and are almost enclosed by shelters constructed over them by ants, *Cremastogaster dohrni*. The male puparia are usually concealed beneath the stipules of the bamboo.

KING (H. H.). **The Dura Asal Fly (*Aphis sorghi*, Theob.) in Dongola Province, Anglo-Egyptian Sudan.**—*Wellcome Trop. Res. Lab., Khartoum*, Entom. Bull. 2, [n. d.] 14 pp. [Received 28th February 1920.]

In the northern provinces of the Sudan *Aphis sorghi*, Theo., is almost exclusively found on dura (*Sorghum* spp.) and garowi (*Andropogon halepensis*) grown near the river banks. Although it will attack *Eragrostis major* and *Panicum isachne*, it cannot thrive on these grasses for very long.

In the district under consideration reproduction is entirely parthenogenetic, but in cooler and damper regions sexual forms probably occur. Immediately after birth the larva pierces the tissue of the leaf and begins feeding on the sap. After four moults in the course of 5½ to 7 days, the mature females, either alate or apterous, appear. The apterous individuals start reproducing a few hours after the last moult, but the alate forms migrate to fresh positions, giving birth to from 6 to 12 young wherever they settle. The reproductive period of wingless forms varied from 13 to 20 days under laboratory conditions with a progeny of from 65 to 103, and that of the winged forms from 15 to 25 days with a progeny of from 39 to 72. The proportion of winged and wingless individuals depends largely on the condition of the food-plant. Should the plant become sickly or begin to dry up, the proportion of apterous females becomes larger. The Aphids are probably carried to a very small extent by the running water of the irrigation channels and also to a certain extent by ants.

The natural enemies include Coccinellids, a lacewing fly, a Dipteron and at least one species of Hymenopterous parasite.

The starving out of *Aphis sorghi* is advocated as a remedial measure. This may be effected by uprooting and burning all dura stumps immediately after the demeira crop (*i.e.*, that started after the Nile flood is established) has been harvested, and keeping the land entirely free from dura and garowi until the next demeira crop or at least until the summer crop is sown. To be effective these measures would have to extend over the entire Province.

GRANATO (L.). **Cultura do Algodoeiro.** [Cotton Cultivation.]—*São Paulo*, 1918, 29 pp. [Received 2nd March 1920.]

This booklet gives practical instructions for the use of Brazilian cotton growers. Among the insect pests mentioned are *Anthonomus* sp. and the pink bollworm [*Pectinophora gossypiella*].

SCHENK (P. J.). **Cursus in Plantenziektenleer, 1919–1920.** [A Course on Plant diseases, 1919–1920.]—Drukkerij Floralia, *Assen*, 32 pp. [Received 4th March 1920.]

This course of instruction, which originally appeared as a series of articles in the journal *Floralia* in 1919, is intended for fruit and vegetable growers and includes notes on the various insect pests that are met with in Holland. Among the species dealt with are :—Elaterid beetles, the larvae of which may be collected by means of baits ; *Agrilus sinuatus*, a Hymenopte ous parasite of which has been recently discovered ; *Anthonomus pomorum*, an attempt to combat which is being made with a Hymenopterous parasite that also attacks *Pontania proxima*, a sawfly infesting *Salix amygdalina* ; *Cheimatobia brumata*, infestation by which is checked by banding ; *Cydia pomonella* (codling moth) and the sawfly, *Hoplocampa testudinea*, which are combated by stomach poisons and banding ; *Cydia* (*Grapholitha*) *nigricana* and *C.* (*G.*) *dorsana* infesting peas—the remedy advised being early sowing and the avoidance of fresh stable manure ; *Incurvaria capitella*, which attacks red, white and black currants and is combated with an 8 per cent. solution of carbolineum ; *Pteronus ribesii* (*Nematus ventricosus*), which attacks gooseberries and is usually combated with a stomach poison ; the larvae of *Eriocampoides* spp., which are best killed by means of a poison in dust form ; *Phorbia* (*Chortophila*) *brassicae*, causing serious injury to cabbages and cauliflowers that may be prevented by fitting the plants with collars.

The Aphids dealt with include *Eriosoma* (*Schizoneura*) *ulmi*, the winged generation of which migrates in July and August to currant and gooseberry and is known as *E. grossulariae* ; *Aphis rumicis* (bean aphis) ; *A. pomi* (*mali*) (green apple aphis) ; *A. sorbi* ; *A. pruni* ; *Rhopalosiphum ribis* ; *Myzus ribis* ; and *Eriosoma* (*Schizoneura*) *lanigerum*.

Lepidosaphes ulmi is the chief injurious Coccid ; spraying with 7·5 per cent. carbolineum is advised against it. *Kakothrips pisivora* (*Thrips robustus*) injures the leaves and pods of beans and peas ; early sowing and a double application of a contact poison are advised. Both the mites, *Bryobia pretiosa* (*ribis*), infesting gooseberry bushes, and *Paratetranychus* (*Tetranychus*) *althaeae*, attacking apple, may be checked by spraying with 7·5 per cent. of carbolineum. *Eriophyes ribis* attacks black currant and *E. avellanae* hazel. Against *Tylenchus devastatrix* and other Nematodes the only known remedy consists in destroying infested plants and in practising crop rotation.

STRAND (E.). **Eine neue Tortricide aus Kiautschou** (**Lep.**). [A new Tortricid from Kiaochow.].—*Entom. Mitt., Berlin*, ix, no. 1–3, 19th February 1920, pp. 30–32, 1 fig.

A description is given of *Rhyacionia* (*Evetria*) *vorana*, sp. n., a Tortricid pest of pines.

HOLLRUNG (M.). **Der Gattungsname** *Lachnus* **(Hem.).** [The generic Name *Lachnus*.]—*Entom. Mitt., Berlin,* ix, no. 1–3, 19th February 1920, p. 42.

The erection of the genus *Lachnus* has been ascribed by some authorities to Illiger, by others to Burmeister. Del Guercio (*Redia*, v, p. 176) states that Burmeister recognised the genus, ascribing it to Illiger, as also did Buckton (*Monograph*, iii, p. 43). The author cannot however find any record of this genus in the works of Illiger.

LIZER (C.). **Expedition al Chaco Boliviano, con Objeto de hacer Investigaciones acerca de la Zona permanente ó de Refugio invernal de la** *Schistocerca paranensis* **(Langosta voladora).** [Expedition to the Bolivian "Chaco," for the purpose of investigating the Permanent Zone or Hibernation Quarters of *Schistocerca paranensis* (the Winged Locust)].—*Bol. Minist. Agric. Nación, Buenos Aires,* xxiv, no. 1, January–December 1919, pp. 26–70, 4 maps. [Received 8th March 1920.]

A detailed description is given of a six months' journey through the Bolivian Republic undertaken by order of the Argentine Commission for Agricultural Defence for the purpose of investigating the permanently occupied area and hibernation quarters of the migratory locusts of that region.

Schistocerca paranensis undoubtedly concentrates each year in autumn and winter in a zone following the River Pilcomayo, and situated approximately between the parallels 20° 30′ and 24° 30′ south latitude and between 58° 30′ west of Greenwich and the first slopes of the Andes. From this area the winged locusts migrate in the spring in all directions, though there are also isolated groups that winter beyond these parallels and have not for some reason followed the bulk of the swarm into the principal winter concentration zone. The migrations of *S. paranensis* extend into Argentina as far as Rawson and the River Chubut and in Bolivia as far as latitude 15° S. The damage done in Bolivia is not to be compared with the devastations that occur in Argentina in the cultivated area. Against those isolated swarms that have not returned to their principal winter quarters, the Commission of Agricultural Defence carries out a winter campaign each year, with very good results, but the same results cannot be expected if such campaigns were attempted in the main hibernation regions of limitless woods and deserts with the means that are at present available for control. It is important to discover the complete life-history of this locust, and this is a question of time and constant and careful study.

MAUGINI (A.). **Probabile prossima Invasione di Cavalette in Cirenaica. Preparare in Tempo i Mezzi di Difesa.** [A probable impending Invasion of Cyrenaica by Locusts and the Need to prepare Defensive Measures in Time.]—*L'Agric. Colon., Florence,* xiv, no. 1, 31st January 1920, pp. 38–49. [Received 8th March 1920.]

In 1918 large numbers of adult locusts, mostly *Tettigonia* (*Decticus*) *albifrons*, were carried by violent winds into the region around Benghasi, Cyrenaica, and caused serious loss. The eggs that were laid hatched in 1919, the hinterland of Benghasi being particularly infested. Wheat was severely injured, barley less so, as the drought in 1919 had accelerated ripening. In Cyrenaica the eggs of this locust hatch about the end of March on the coast and up to May in high-lying districts.

Natural enemies include many reptiles and birds. An Acarid belonging to the genus *Eutrombidium* parasitises the locusts on the plateau, but was not found at the coast.

A further outbreak may be expected in 1920 and flame-throwers and poisoned bran are recommended as providing the methods best suited to the country. Fire must be used early in spring against the masses of hoppers and nymphs, while poisons are adapted for use in gardens against all stages. These measures against the native generations of *Tettigonia albifrons* will not dispel all danger, as swarms of locusts of other species may invade the country. Cyrenaica is, however, one of the north African regions that are rarely subject to this danger, probably because it is outside the usual lines of migration. An agreement between Great Britain, France and Italy, as has been suggested before, provides the only way of dealing with the locust problem throughout northern Africa.

Guerreiro Beatriz (M.). **Rhynchota damaging Cotton in Angola, Portuguese West Africa.**—*Bol. Agric., Pecuária e Fomento. Loanda*, 1919, 3rd Series, pp. 64–66. (Abstract in *L'Agric. Colon., Florence*, xiv, no. 1, 31st January 1920, p. 57.) [Received 8th March 1920.]

In October 1918 the cotton plantations at Katete, Angola, were invaded by the stainer, *Oxycarenus hyalinipennis*, Costa. This bug feeds on the seeds and oviposits in the open bolls. To limit the injury it is necessary to harvest the cotton without delay and to burn all the old bolls left in the fields together with the grasses growing near them.

A Thysanopteron injurious to Cacao in the Island of San Thomé, Gulf of Guinea.—*Bol. Centro Colonial, Lisbon*, xi, 1919, pp. 7–8. (Abstract in *L'Agric. Colon., Florence*, xiv, no. 1, 31st January 1920, p. 57–58.) [Received 8th March 1920.]

The occurrence of *Heliothrips rubrocinctus* in San Thomé has been known for many years, but the infestation has hitherto been so slight as to be unimportant. Recently, however, a violent outbreak took place near the city of S. Thomé and many cacao plantations suffered severe losses; the northern part of the island appears to be less affected. A spray, that has given good results consists of:—Tar 14 lb., palm oil 23 lb., wood ashes 23 lb., water 50 gals.

Pictet (A.) **Recherches expérimentales sur l'Adaptation de** *Lymantria dispar* **aux Conifères et à d'autres Essences.**—*Mitt. Schweiz. Entom. Gesell., Berne*, xiii, no. 1, November 1919. pp. 20–54, 1 plate. [Received 11th March 1920.]

The larvae of most Lepidoptera are usually limited to a few food-plants or even to one only. *Porthetria* (*Lymantria*) *dispar* (gipsy moth) is one of the exceptions, and in this paper an attempt is made to elucidate the following points:—The adaptation of the caterpillars of this moth to conifers, to the climate of the High Alps, to fruit trees such as walnut and *Mespilus*, to forest trees such as chestnut, to willow, poplar, rose, or to low-growing plants such as sainfoin and dandelion; the modification of the colour of the wings owing to the difference in food and climate; and finally to ascertain whether such adaptations may become established.

Some notes on the life-history are given, the results of which are summarised. The adaptation of *P. dispar* to conifers can only be temporary and when individuals have migrated to resinous plants their progeny will die out after a few generations. For this reason the injury to these trees can never be of primary importance. The low temperature in the High Alps kills most of the mature caterpillars, and the pupal stage is so prolonged that the adults emerge at a season the inclemency of which prevents reproduction. Adaptation to walnut and plane is likewise temporary only. On the contrary, adaptation of a definitive character to rose, *Mespilus*, chestnut (*Aesculus*), poplar, sainfoin and dandelion is quite possible. Degeneration due to food obtained from unsuitable plants is shown by a lack of pigmentation in the adult moth.

GAUMONT (L.). **Sur un Lachnide du Rosier peu étudié appartenant à un Genre nouveau,** *Maculolachnus rosae*, **Cholodk. [Hem. Aphididae.]**—*Bull. Soc. Entom. France, Paris*, no. 2, 28th January 1920, pp. 26–31, 4 figs. [Received 11th March 1920.]

Attention is drawn to the necessity of erecting a new genus *Maculolachnus*, for *Lachnus rosae*, Choldk. (*maculatus*, Licht.). The author's observations on this Aphid and the points of difference between it and allied genera are given. A modification of Del Guercio's key to these Aphids to include this new genus is appended.

BLANCHARD (E.). **Dégats causés aux Arbres Fruitiers par la Cheimatobie dans la Vallée du Rhône.**—*La Vie Agric. et Rur., Paris*, xvi, no. 10, 6th March 1920, p. 169.

Cheimatobia brumata is increasing in the Rhône Valley. Cherry orchards are chiefly attacked, and the crop is sometimes considerably reduced. The ordinary method of control is by banding with an adhesive [*R.A.E.*, A, vi, 470]. To supplement this, experiments were made with injections of carbon bisulphide into the ground round isolated trees for a distance of 20 inches, the dose being about 5 cwt. to the acre.

Considerably fewer females were caught in the sticky bands on the trees that had been thus treated, but they were still attacked, and consequently there is a need for further measures, or a denser series of injections might be tried.

DEL GUERCIO (G.). *Pectinophora gossypiella*, **a Microlepidopteron injurious to Cotton in Italian Somaliland.**—*L'Agric. Colon., Florence*, xii, no. 5, 1918, pp. 298–311. (Abstract in *Mthly. Bull. Agric. Intell. & Pl. Dis., Rome*, x, no. 3, March 1919, pp. 362–363.) [Received 15th March 1920.]

Pectinophora gossypiella (pink bollworm) has become firmly established in the cotton-fields of Italian Somaliland, where almost 100 per cent. of the cotton capsules are infested. The parasites of this moth mostly attack the larvae, and include a Braconid, three Chalcidids, one of which attacks the eggs and the other two the larvae, and a Proctotrupid of which only one female has been observed. It is suggested that immediately after the cotton harvest all bolls remaining on the plants should be collected into large boxes with openings in the sides covered with wire gauze, thus permitting the parasites to escape while retaining the bollworm moths. The boxes should be placed in the plantations at intervals of 150 feet and raised above the soil on stones to prevent the contents becoming damp.

FABIANI (C.). *Agriotes lineatus*, a **Coleopteron injurious to the Vine in Italy.**—*Giornale Vinicolo Italiano, Casale Monferrato*, xlv, no. 8, 1919, pp. 71–72, 2 figs. (Abstract in *Mthly. Bull. Agric. Intell. & Pl. Dis., Rome*, x, no. 3, March 1919, pp. 363–364.) [Received 15th March 1920.]

The Elaterid beetle, *Agriotes lineatus*, L., has recently caused frequent and serious damage in nurseries of grafted American vines. The larvae appear towards mid-June, when the tender shoots begin to grow, and attack them close to the point of insertion of the graft, ringing them and pressing and piercing them until they dry up. The damage is gradually reduced as the shoots become stronger. Remedial measures as applied on cereals against this beetle have as yet been unsuccessful in the case of vines.

DEL GUERCIO (G.). *Eumarchalia gennadiosi*, a **Dipteron injurious to Carob Beans in Italy.**—*L'Agricoltura Colon., Florence*, xii, no. 5, 1918, pp. 287–297, 5 figs. (Abstract in *Mthly. Bull. Agric. Intell. & Pl. Dis., Rome*, x, no. 3, March 1919, p. 366.) [Received 15th March 1920.]

Eumarchalia gennadiosi, March., the stages of which are described, oviposits on very young carob fruits in Italy, and the young larvae feed on the fruit tissues, greatly retarding their growth. Sometimes the fruits dry up and fall after the emergence of the adult fly. There are several generations in a year and both early and late fruits are therefore attacked, the percentage of infestation sometimes rising to 50 or 60 per cent. As a remedial measure, all incompletely developed or deformed fruit should be collected. and after storage, can be used as food for cattle. When the tree is attacked by both *E. gennadiosi* and by the fungus, *Oidium ceratoniae*, suitable strengths of calcium polysulphide or sulphur washes should be used.

DEL GUERCIO (G.). *Moreschiella moricola*, **n. subgen. & n. sp., a D.pteron injurious to the Mulberry in Italy.**—*L'Agric. Colon. Florence*, xii, no. 6, 1918, pp. 345–354, 9 figs. (Abstract in *Mthly. Bull. Agric. Intell. & Pl. Dis., Rome*, x, no. 4, April, 1919, p. 503.)

Moreschiella moricola, subgen. et sp. n., is described, having been found injuring mulberries (*Morus alba*) in the Province of Teramo, Italy. Eggs are laid in the axils of young branches and the larvae bore into them and feed and transform into adults within them. The bark on attacked portions of the tree shows dead patches that are particularly evident in May; the leaves wither and finally die. All infested branches should be removed in May and June.

Del Guercio (G.). *Moreschiella roburella*, **n. sp., and** *M. ilicicola*, **n. sp., Diptera injurious to the Oak and Holly Oak respectively, in Italy.**—*L'Agric. Colon. Florence*, xii, no. 6, 1918, pp. 358–369, 14 figs. (Abstract in *Mthly. Bull. Agric. Intell. & Pl. Dis., Rome*, x, no. 4, April 1919, p. 503.) [Received 15th March 1920.]

Two new Cecidomyids are described from Tuscany, namely, *Moreschiella roburella*, the larvae of which live in the cupules of *Quercus robur*, and *M. ilicicola*, the larvae of which occur in the acorns of *Quercus ilex*.

Crop Pest Campaigns.—*Cyprus Agric. Jl., Nicosia*, xiv, part 3–4, xv, part 1, January 1920, pp. 149–152, & 166. [Received 10th March 1920.]

In 1918 40,000 orange and lemon trees were sprayed with lime-sulphur against scale-insects, with such success that only 21,345 had to be sprayed in 1919.

Phthorimaea operculella (*Lita solanella*) (potato moth) was first recorded in Cyprus in 1918. It was only about a third as severe in 1919, the campaign against it being on the same lines as in the previous year [*R.A.E.*, A, vii, 70, 88]. This moth does not attack the winter crop, which is lifted in November. It only attacks exposed tubers, and all infested ones should be destroyed. Stored potatoes should be protected with a layer of straw covered with earth, and the pile ventilated and well drained.

Drastic measures a few years ago have greatly lessened the attacks of the cotton bollworm (*Earias insulana*). If bolls are attacked they should be burned, as also the roots after the crop has been gathered. Paris green sprayed twice with an interval of fourteen days is an effectual preventive.

In 1919 a small Trypetid fly attacked celery. The larva feeds inside the leaves. Affected leaves should be burned to prevent a second generation of the insect.

Andrews (E. A.). **A Preliminary Note on the Present State of the Mosquito-Blight Enquiry.**—*Qtrly. Jl. Scient. Dept. Ind. Tea Assoc., Calcutta*, 1919, part iv, pp. 119–129. [Received 15th March 1920.]

This paper is a summary of the results that will shortly be published of investigations on the relation between the tea mosquito (*Helopeltis theivora*, Waterh.) and the soil. The soil affects the tea bush, and this being the source of the insect's food-supply, controls its rate of development. The effect of climate on soil is considered, and it is shown that excessive drought may increase liability to attack as much as excessive moisture, though moderate dryness lessens the liability to infestation; hence the importance of drainage.

The nature of the soil itself also affects the question. Its chemical composition may be a controlling factor, as the character of the nutriment afforded to the insect by the tea-plant depends on the potash-phosphoric acid ratio.

Manuring experiments showed that potash is beneficial, but the results obtained were very irregular. Evidently factors preventing the bush from utilising the potash present in the soil also prevent it, to some extent, from deriving benefit from the potash manures added to it.

To eliminate this, direct injection of the bushes with potash was tried and was convincingly successful. Bushes that were heavily infested with *Helopeltis* quickly became free from the pest and gave splendid flushes. Insects alighted on the treated bushes, but did no damage, gave up their attempts to feed and migrated to untreated bushes.

The author considers that it will therefore be possible in the near future to control this pest, though all the factors that affect the question have not yet been discovered. Proper attention to subsoil drainage is especially recommended.

Green (E. E.). **Notes on Indian Coccidae of the Subfamily Diaspidinae, with Descriptions of new Species.**—*Records Indian Mus., Calcutta*, xvi, pt. vii, December 1919, pp. 433–449, 6 plates. [Received 17th March 1920.]

To the Indian list of scale-insects fifty species are added, the following being described as new:—*Chionaspis annandalei* on *Dendrocalamus strictus*; *C. caroli* on tea plants; *C. chir* on chir pine (*Pinus* sp.); *C.* (*Phenacaspis*) *gudalura* and *C. spiculata* on bamboo (*Bambusa*); *Aspidiotus* (*Hemiberlesia*) *pseudocamelliae* on *Capparis stylosa*; *A. tamarindi* on *Tamarindus*; *Aonidia indica* on an undetermined plant; *A. tentaculata* on *Vateria indica*; *Gymnaspis ficus* on *Ficus retusa*; *G. ramakrishnae* on *Hemigyrosa*; *Parlatoria artocarpi* on jak (*Artocarpus integrifolia*); *P.* (*Websteriella*) *papillosa* on jak; *P. vateriae* on *Vateria indica*; *Lepidosaphes meliae* on *Melia azedarach*; *L. retrusus* on *Litsea whiteana*; *Fiorinia frontecontracta* on *Garcinia indica*; *F. plana* on *Elaeodendron glaucum*; *F. sapindi* on *Sapindus trifoliatus*.

Green (E. E.). **On a New Genus and Species of Coccidae from North Western India and Eastern Persia.**—*Records Indian Mus., Calcutta*, xviii, Pt. 2, December 1919, pp. 117–119, 2 plates. [Received 17th March 1920.]

Naiacoccus serpentinus, gen. et sp. n., on *Tamarix articulata* in India and *N. serpentinus* var. *minor* on *T. stricta* in Eastern Persia are described.

Special Entomological and Mycological Investigation and Work Connected with Insect and Fungus Pests and their Control. *Rept. Dept. Agric. St. Vincent*, 1918–1919; *Barbados*, 1920, pp. 13–18. [Received 15th March 1920.]

A study of infestation of cotton fields by the cotton-stainer, *Dysdercus delauneyi*, Leth., indicates that the insects come, not from the forests as has been suggested, but chiefly from the vicinity of buildings on lands near to which cotton has been grown and in which it has been stored, although a few may have survived on cotton trees and bushes in sheltered places. This bug has been found in several instances on the cork-wood tree (*Ochroma lagopus*), which is widely distributed in the island, and it may be necessary to deal with this tree during the coming months. It was not found possible in all cases to enforce the close season for cotton and in many places stalks remained undestroyed until the end of April, while planting began early in May. It is clear that the cotton-stainer takes advantage of any opportunity to survive during the close season. The wisdom of attempting to eradicate the mountain John Bull tree (*Sterculia caribaea*) is considered doubtful, though it is known to be a food-plant of the stainer; it is considered that this tree acts as a trap rather than a food for the insect. It is hoped that the fungus, *Sporotrichum globuliferum*, which has been discovered among the stainers, will cause heavy mortality.

Observations made to determine the length of time that adults of *D. delauneyi* can survive under natural conditions in the absence of regular Malvaceous food-plants, indicate that they can exist without feeding for at least three months by sipping the nectar of flowers, honey-dew and water and by remaining in cool, shady places. It is this fact that renders control so difficult, and indicates that the close season for cotton should be made as prolonged as possible, and that the destruction of native food-plants should be continued systematically. A small trap-crop of cotton might advantageously be planted in April; to these the surviving insects would be attracted in June, when the cotton starts to flower. Daily collections of the stainers would then have to be made, and the main cotton crop should not be started until June or later. The experience of two seasons has shown that cotton planted in May always attracted stainers to begin breeding in it, while when plantings were later, the insects did not become numerous until the bulk of the cotton had been reaped. In one district a group of Tobago bread-nut trees (*Pachira aquatica*) were left as a trap for the insects, and on 26th April, when in full fruit, they were invaded by many stainers from the cotton fields. Cotton-seed traps were placed in heaps at the bases of the trees, and the insects, as expected, left the bread-nut for the cotton-seed. These traps were burnt over twice a day from 26th April to 15th June with a kerosene torch and on each occasion thousands of adults were destroyed. In this way the pest in that district was practically exterminated.

Other pests on the principal crops were not particularly harmful. *Edessa meditabunda* (pea chink) was fairly prevalent on pigeon peas and ground-nuts in parts of the Windward district. *Diatraea saccharalis* (moth borer of sugar-cane), which had caused much damage in the last three years, declined considerably in numbers, its natural enemies apparently keeping it in check. *Calpodes ethlius* (arrowroot worm) did little damage, and no outbreak of *Alabama argillacea* was recorded.

"**Lucerne Flea.**"—*Jl. Dept. Agric. S. Australia, Adelaide,* xxiii, no. 6, January 1920, p. 502.

The lucerne flea (*Smynthurus viridis*), an insect of the order Collembola, is troublesome in some years in South Australia. It attacks lucerne, clover, Cape dandelion, beans, potatoes and other plants. As it is a gnawing insect, it may be destroyed with arsenical sprays, but contact sprays are of little use owing to its highly polished body.

SANDERS (G. E.). **Spraying vs. Dusting in Annapolis Valley.**—*Canad. Horticulturist & Beekeeper, Toronto, Ont.*, xxviii, no. 2, February 1920, pp. 27–28, 1 fig.

It is not often recognised that spraying results in the production of larger fruit, as the leaves, being kept free from fungus, are able to take in more carbon dioxide from the air. The use of lime-sulphur, however, tends to injure the chlorophyll, and so may lessen the food-gathering power of the leaf, while it undoubtedly sometimes causes a serious dropping of the fruit.

Dusting with sulphur has beeen tried during 1919 with remarkably good results, the dust being composed of 90 per cent. sulphur and 10 per cent. lead arsenate. Copper-lime-arsenate dust has as yet hardly been tested, but in 1920 tests are to be made on apple-trees with 10 lb. dehydrated copper sulphate, 5 lb. calcium arsenate and 85 lb. hydrated lime. It is estimated that spraying with this material will cost from 24*s.* to 32*s.* per acre less than liquid spraying or dusting with sulphur only. As the dust is less adhesive than liquids, five applications would probably be preferable to four. It is probable that changes will still be made in the dusting formula and it is hoped to improve upon the present mixture and make it cheaper.

JACK (R. W.). **Tobacco Pests of Rhodesia.**—*Dept. Agric. Salisbury, Rhodesia*, Bull. 347. February 1920, 15 pp., 10 plates.

The information contained in this bulletin has been noticed elsewhere [*R.A.E.*, A, viii, 134, 193.]

PHILLIPS (W. J.). **Studies on the Life History and Habits of the Jointworm Flies of the Genus *Harmolita* (*Isosoma*) with Recommendations for Control.**—*U.S. Dept. Agric. Washington D.C.*, Bull. no. 808. 24th February 1920, 27 pp., 6 plates, 8 figs.

The Chalcids of the genus *Harmolita* are dealt with in this bulletin in three groups, viz :—Species infesting grain crops, cultivated grasses and wild grasses. Under the first heading the life-histories are given of *H. tritici*, *H. grandis* and *H. vaginicola*, infesting wheat, *H. hordei* infesting barley, and *H. secalis* and *H. websteri*, infesting rye (this being the order of their economic importance) ; under the second heading of *H. albomaculata*, *H. dactylicola*, *H. captiva*, *H. poae* and *H. festucae* ; while there are ten species that come under the third heading. Of six more species the biology is unknown. [See also *R.A.E.*, A, vii, 470.]

These insects are largely controlled by parasites, and for this reason those of them that feed on wild grasses must be regarded as beneficial in that they act as hosts for the parasites at times when the numbers of the harmful species are low.

The economic damage chiefly occurs in wheat, which pays a regular toll every year in all the wheat producing States east of the Mississippi River and in a large part of Missouri.

Ploughing the wheat stubble under is an effective remedy [see also *R.A.E.*, A, v, 213]. This would necessitate a change in the existing rotation of crops where wheat is used as a nurse crop for clover, but it would seem advisable to adopt it if large sums could be saved annually by this means. It would also control Hessian fly (*Mayetiola destructor*), and all the grain joint-worms could be controlled in this way if necessary. The wheat-straw worm (*H. grandis*) may be controlled by leaving 40 yards clear between new wheat and infested stubble, as the wingless generation cannot cross the interval [*R.A.E.*, A. viii, 76].

If necessary, the insects attacking cultivated grasses could be controlled by clipping the fields in spring in order to delay the appearance of seed stalks so that the insects would have nowhere to deposit their eggs.

Frank (A.). **Disease and Insect Troubles of Raspberries and their Control.**—*Mthly. Bull. Washington Agric. Expt. Sta., Pullman*, vii, no. 11, February 1920, pp. 188–192, 6 figs.

Some of the common insect pests of raspberries have become established in western Washington, and growers are asked to do everything possible to prevent their spread. They include the raspberry-cane maggot [*Phorbia rubivora*], which oviposits near the tips of the new shoots, and the grubs of which enter the pith of the cane, bore down a few inches and then turn outwards to just beneath the bark and girdle the twig. This causes wilting and the formation of a bluish ring where the girdling occurs. When mature, the maggot bores down through the pith and enters the ground, where it pupates, emerging as an adult fly the following spring. All wilted shoots should be cut off several inches below the girdling and burnt.

The raspberry and blackberry root or crown borer, *Pennisetia* (*Bembecia*) *marginata*, tunnels in the canes, crowns and roots of raspberries and blackberries. The eggs are laid on the underside of the leaves from late July until early September. The young larvae crawl down a cane to the ground surface and enter the cane where they hibernate. The next summer they again bore in the crown and cane, becoming inactive in the autumn, and in the following spring they bore upward through the cane, make a hole to the outside, pupate, and the moths emerge leaving the pupal case wedged in the emergence hole. The only practical remedy is to dig out and burn affected plants. Birds and chickens will eat many of the moths.

The red spider, *Bryobia pretiosa* (*pratensis*), lays masses of dark red eggs on canes in the winter. During summer the mites feed on the underside of the leaves and spin small webs there, the leaves becoming spotted with yellow or turning reddish-brown. A spray of powdered sulphur or of sulphur in water will kill many of them. The strawberry root weevil, *Otiorrhynchus ovatus*, frequently attacks the small roots of raspberry canes, but does not constitute a serious pest. The raspberry cane borer, *Oberea bimaculata*, girdles new shoots by making two rings of punctures and laying eggs in the cane between them. The tip of the shoot withers. The grub of this Longicorn bores its way down the cane, taking until the autumn of the second season to reach the ground, and forming a gall or swollen ring on the cane. The wilted tips and the ringed canes should be cut out and burned, and old canes should be cut and destroyed immediately after harvest.

Minor pests of raspberry canes include leaf and cane miners, flea-beetles, twelve-spotted cucumber beetle [*Diabrotica duodecimpunctata*], tarnished plant bug [*Lygus pratensis*], leaf-hoppers, and oyster-shell scale [*Lepidosaphes ulmi*].

BANKS (C. S.). **Two Philippine Leaf-mining Buprestids, one being New.**—*Philippine Jl. Science Manila*, xv, no. 3, September 1919, pp. 289–300, 3 plates. [Received 24th March 1920.]

A description is given of all the stages of *Endelus bakeri*, Kerrem., feeding on bird's-nest fern (*Asplenium nidus*, L.). The larva is parasitised by at least one Chalcid, and may be destroyed by squeezing it in its mine in the leaf.

Endelus calligraphus, sp. n., here described, was bred from larvae mining in a fern that is perhaps a variety of *A. nidus*.

LATHROP (F. H.). **The Cicadellidae or Leaf-Hoppers of South Carolina.**—*S. C. Agric. Exp. Sta., Clemson College, S. C.*, Bull. 199, June 1919, 119 pp., 44 figs. [Received 25th March 1920.]

This paper is almost entirely systematic in scope. Keys are given to the sub-families of CICADELLIDAE, and to genera and species that occur in South Carolina.

JARVIS (E.). **Some Lepidopterous Pests New to Sugar Cane in Queensland.**—*Queensland Bur. Sugar Expt. Sta. Div. Entom., Brisbane*, Bull. 9, 1920, 16 pp., 1 plate.

This paper is intended as an amplification of one already noticed [*R.A.E.*, A, iv, 344]. The species dealt with include the Noctuids, *Cirphis loreyi*, Dup., the larva of which causes similar injury to the foliage of sugar-cane as does *C. unipuncta*, Haw.: *Mocis rugalis*, F.; *Melanitis leda*, L.; *Padraona hypometoma*, Lower: *Anthela acuta* Wlk.; and *Achaea janata* (*Ophiusa melicerta*, Drury), which is also destructive to castor-oil plants (*Ricinus communis*).

SPEYER (E. R.). **The Distribution of** *Xyleborus fornicatus*, **Eich. (Shot-hole Borer of Tea).**—*Ceylon Dept. Agric., Peradeniya*, Bull. 39, August 1918, 34 pp. [Received 27th March 1920.]

The history of *Xyleborus fornicatus*, Eich. (shot-hole borer of tea) in Ceylon is reviewed and its distribution outside Ceylon described. It has been recorded from castor-oil plants in India (Bangalore) and from nutmeg in Penang, though the latter is open to doubt. This borer is found most abundantly at about 2,000 feet above sea-level, and seems to spread gradually upwards, attaining an altitude of 5,000 feet, but it becomes less numerous when 4,000 feet is reached, and above 4,500 is no longer a serious pest. Above 4,000 feet development is longer by some three weeks.

A list of estates infested up to 7th June 1918 is appended.

SPEYER (E. R.). **Shot-hole Borer (*Xyleborus fornicatus*, Eich.). Treatment of Prunings on Infected Estates.**—*Ceylon Dept. Agric. Peradeniya*, Bull. 43, March 1919, 16 pp. [Received 27th March 1920.]

Details are given of experiments in dealing with the prunings from tea bushes infested with *Xyleborus fornicatus*, Eich. From branches left on the ground after pruning, all pupae in the galleries that are within four days of maturity will become adults and emerge with those insects that are already adult within the galleries, whether the season is wet or dry. In wet seasons, all mature beetles, pupae and late larval stages will complete development and emerge. When prunings are buried from 4 to 18 inches below ground level, development in the woody stems proceeds normally for at least 30 days, and adult females may continue to emerge from the soil for a period of 56 days in dry weather and for a shorter period in heavy rains. In effect a full generation can develop beneath the soil, and adults can emerge from the greatest depth to which it is profitable to bury prunings. Destroying the insects in buried prunings by fumigation or insecticidal solutions is not practicable owing to the heavy expense and the danger involved.

While burning the prunings destroys all insects, the loss of manurial constitutents to the soil precludes the adoption of this method. The best plan therefore is to cut the leaves and smaller wood up to the thickness of a pencil from the branches immediately after pruning, and to bury them in holes of suitable size. The maximum amount of borer infestation in these will be 4 per cent. of the total in the prunings. The larger wood should then be carried to the roadside and burnt, the ashes being used as manure. The cost involved is not much greater than that of burying prunings wholesale.

SPEYER (E. R.) **Shot-hole Borer (*Xyleborus fornicatus*, Eich.). A Control Pruning Scheme, and its Practical Modification.**—*Ceylon Dept. Agric., Peradeniya*, Bull. 44, June 1919, 8 pp. [Received 27th March 1920.]

This bulletin describes in detail the pruning operations for tea bushes infested with *Xyleborus fornicatus* (shot-hole borer) recommended elsewhere [*R.A.E.*, A, viii, 110].

ROBINSON (E. N.). **The Prickly Pear; Enemy Pests to be tried.**—*Science & Industry, Melbourne*, ii, no. 1, January 1920, pp. 45–51, 4 figs.

The bulk of the information contained in this paper has been noticed elsewhere [*R.A.E.*, A., vii, 481].

WILLIAMS (F. X.). **A Note on the Habits of *Epactiothynnus opaciventris*, Turner, an Australian Thynnid Wasp.**—*Psyche, Boston, Mass.*, xxvi, no. 6, December 1919, pp. 160–162, 2 figs. [Received 25th March 1920.]

Epactiothynnus opaciventris is apparently the most abundant Thynnid in North Queensland. The plant that is most attractive to the adults is a weed, *Crotalaria* sp. The female wasps have been found experimentally to oviposit on Lamellicorn larvae, as also does another Thynnid, *Tachynomyia* sp.

GREEN (E. C.). **A Lagarta rosada dos Capulhos no Brasil.** [The Pink Bollworm in Brazil.]—*Bol. Minist. Agric., Ind. e Comm., Rio de Janeiro*, vii, January-April 1918, pp. 101–114, 2 plates. [Received 15th March 1920.]

The pink bollworm, *Pectinophora gossypiella*, was noticed in Brazil in 1914. This paper reviews its life-history and the methods needed to combat it.

A Lagarta verde dos Cafesaes, *Eacles magnifica*, **Walk.** [The green Coffee Caterpillar.]—*Chacaras e Quintaes, S. Paulo*, xxi, no. 2, 15th February 1920, pp. 101–102, 2 figs.

The green coffee caterpillar, *Citheronia* (*Eacles*) *magnifica*, Wlk., feeds on the leaves of coffee plants. A caterpillar taken early in May entered the pupal stage on 7th May and the adult moth emerged on 9th October. This pest is known from many parts of Brazil, Paraguay and various parts of North America. It is not confined to coffee, being also found on mango (*Mangifera indica*) and other plants. Hand collection is the remedial measure advised for it.

BONDAR (G.). **Como combater a Lagarta dos Galhos da Figueira.**—[Measures against the Fig Shoot Caterpillar.]—*Chacaras e Quintaes, S. Paulo*, xxi, no. 2, 15th February 1920, pp. 108–109, 1 fig.

The caterpillar of the Pyralid, *Azochis gripusalis*, Wlk., causes serious injury to the cultivated fig (*Ficus carica*) and some wild figs of the genus *Urustigma* in Brazil. From November to June in many of the shoots holes are found covered with excreta bound together with a silken substance. The caterpillar occurs within the shoot, the terminal leaves and soft parts of which wither and the fruits become atrophied. All infested parts must be cut off and burned.

RAVAZ (L.). **Les Traitements arsenicaux contre la Pyrale.**—*Progrès Agric. Vitic., Montpellier*, lxxiv, no. 3, 18th January 1920, pp. 53–55.

Owing to the difficulty of obtaining sufficient fuel for hot water treatments against *Sparganothis pilleriana*, and because fumigation is only possible on light soils, more reliance than ever will have to be placed in the use of arsenicals either in the known commercial forms or in home-made solutions. A formula recommended for the latter is 30 lb. sodium carbonate dissolved in 13 gals. hot water, to which 30 lb. powdered arsenious acid is added while stirring, and then 30 lb. soap. The soap is not indispensable, and instead of arsenious acid or sodium arsenite, sodium arsenate can be used. Before use, this solution is diluted with 10 or 12 times its volume of water, and should be applied towards the end of the winter.

DEGRULLY (L.). **Cochenilles et Fumagine de la Vigne.**—*Progrès Agric. Vitic., Montpellier*, lxxii, no. 49, 7th December 1919, pp. 530–532. [Received 6th April 1920.]

Many French vineyards, especially those of the south-west, have been greatly injured by scale-infestation. The scales chiefly concerned are *Targionia* (*Aspidiotus*) *vitis* (grey scale), which occurs very rarely except in Provence; *Eulecanium persicae* (*Lecanium cymbiforme*) (oblong scale), abundant throughout the south and especially in the Gironde region; *Pulvinaria vitis* (red scale) and *Pseudococcus* (*Dactylopius*) *vitis* (white scale) found throughout the Mediterranean basin; *Eulecanium* (*Lecanium*) *corni*, found only in the north; *Aulacaspis* (*Diaspis*) *pentagona*; and the falciferous scale [*Rhizoecus falcifer*, Künck.], which lives on the roots. All these species may be controlled by practically the same treatment, which is carried out in the winter. With the exception of *Pseudococcus vitis*, which hibernates under the shelter of the bark, they may all be found, often in large colonies, on the stocks and branches, and sometimes on the largest roots, in which case the base of the vine should be exposed before the treatment is begun. The most heavily infested shoots should then be cut out and burnt. If there are scales under the bark, complete decortication may be necessary, the pieces of bark being collected and burnt, or, if decortication is not done, the scales on the trunk and branches should be crushed with a hard brush. An insecticide treatment is then given such as the one recommended for destroying the winter eggs of *Phylloxera*, which consists of 5 lb. heavy coal-oil, thoroughly mixed with 20 lb. unslaked lime and added to 10 gals. water. Another formula recommended is an emulsion of 7 oz. black soap, 7 oz. seed oil, 3½ oz. paraffin in 56 oz. water. Lime-sulphur solution can also be used.

LICHTENSTEIN (J. L.). **Le Parasitisme** d'*Aphiochaeta* (*Phora*) *fasciata*, **Fallen.**—*C. R. Hebdom. Acad. Sci., Paris*, clxx, no. 9, 1st March 1920, pp. 531–534, 3 figs.

The female of *Aphiochaeta fasciata* oviposits on the nymphs of the Coccinellids, *Thea vigintiduopunctata*, L., and *Vibidia duodecimguttata*, Poda, after the final ecdysis, the eggs being deposited on the ventral surface. In 1½–2 days the larva hatches and makes its way at once into the host, and 2 days later emerges through a hole on the ventral surface between the head and thorax. Pupation occurs twelve hours later, the fly appearing after two to three weeks.

BUGNION (E.). **Le Termite lucifuge dans les Basses-Pyrénées.**—*Rev. Hist. Nat. App., Paris*, 1ère partie. no. 2, February 1920, pp. 49–51.

Numerous nests of the termite, *Leucotermes lucifugus*, Rossi, were found in the lower Pyrenees at an altitude of from about 650 ft., to 980 ft. Although this species usually inhabits pine trees (*Pinus maritima*) five of the nests under consideration were found in decaying stumps of chestnut trees that had previously been attacked by a fungus disease.

LAURENT (L.). **La Chenille mineuse de l'Artichaut.**—*Rev. Hortic. de l'Algérie, Algiers*, xxiii, no. 11–12, November–December 1919, pp. 337–339, 2 figs. [Received 29th March 1920.]

Gortyna (*Hydroecia*) *xanthenes* is causing serious and increasing damage to artichokes (*Cynara*) in Algeria and the South of France, where it has been a pest for the last ten years. The adult moths are on the wing from the end of September and during October, when they fly at night, ovipositing on the shoots of artichokes. The larvae enter the shoot and descend slowly to the junction of the stem and root, passing the spring and summer in this way. In July or August pupation occurs, the adults emerging in October. The plants grow gradually weaker while the insects feed within them, and die in July or August without having flowered.

Former recommendations have been to dig up infested plants at the end of May and burn them. While the efficacy of this method cannot be disputed, it is suggested that as some of the stalks probably remain sound it is a pity to dig up the whole plant, while the burning of a quantity of pulpy matter of this kind is not easy, and if not thoroughly done, may be an encouragement to the insect rather than a deterrent. As an alternative, summer treatments are advised. At the beginning of summer the parts of the plant above ground die and the stems remaining below give rise to a number of buds that form shoots for the next year. In early July the ground around the plants should be lightly cultivated and the shoots cut down to the surface of the soil or even a little lower. Some of these will be healthy, firm and full of sap, others will show a central cavity ; the latter are the infested shoots and should be cut off from the main stem as low down as possible until healthy tissue is found. The shoots should then be cut longitudinally and the larvae of *G. xanthenes* removed and destroyed. The main stems should all be inspected and if the removal of an unsound portion would damage the stem too badly they should be sounded with a pointed stick. All refuse should be immediately burnt. This treatment destroys almost all the miners. If irrigation is possible, the plants should be well watered about a month later, when they are showing signs of growth, and if any infested plants still remain they can then be detected by their sickly appearance.

As the red artichoke is a little earlier than the white, a second cultivation should be given during September. Any superfluous shoots should be removed and the best of them put in a nursery for planting out in the following spring. It is obvious that co-operation is necessary, for if any plantation is left untended until autumn, the adults of *G. xanthenes* emerging from it will disperse and lay their eggs in neighbouring plantations.

CHATEAU (C.). **Le Pou Rouge et le Sel Marin.** *Rev. Hortic. de l'Algérie, Algiers*, xxiii, no. 11–12, November–December 1919, p. 343. [Received 29th March 1920.]

For orange trees infested with *Chrysomphalus dictyospermi pinnulifera* (*minor*) the author has used a spray consisting of three parts sea-water to one part fresh water, making four applications in a year, two at the end of May at four day's interval, and two at the end of September, these two periods being the time when reproduction is active. This treatment was entirely effective; the scale disappeared and the plants, which were yellowish, recovered their green colour. With this proportion of sea-water, and making the applications in the evening, there is no danger of scorching even the tenderest leaves. The same treatment applied to *Saissetia* (*Lecanium*) *oleae* has proved ineffective.

Puig y Nattino (J.). **Los Parásitos vegetales y animales de las Plantas cultivadas y espontáneas, observados en la Republica Oriental del Uruguay.**—*Repub. Orient. Uruguay, Minist. Indust., Montevideo*, Bol. 36, 1919, 94 pp., 52 figs. [Received 26th March 1920.]

A list is given of the fungus and insect pests observed in Uruguay on both cultivated and wild plants: these include Aphids, red spiders (*Tetranychus telarius*), and many Coccids, among which are *Aulacaspis* (*Diaspis*) *pentagona*, *Ceroplastes* sp., *Aspidiotus* sp. and *Lepidosaphes* sp. The food-plants of each is given. The injury caused by these pests is discussed and the usual remedies for their control are advocated, formulae being given for the requisite insecticides. The control of *Aulacaspis pentagona* by *Prospaltella berlesei* is described.

Insects that attack vegetable or fruit crops, and for which special instructions in control are given, include the blister beetle, *Epicauta adspersa*, on potatoes and tomatos, for which arsenical sprays should be used in the morning after the dew has evaporated, as soon as the insect appears, or even before this if it occurs regularly each year, and the sawfly, *Eriocampoides limacina* (*Tenthredo adumbrata*), the larvae of which attack cherries, pears and quinces, and for which in addition to arsenical sprays, dusting with slaked lime, ashes or even fine, dry earth is recommended. For *Cydia* (*Carpocapsa*) *pomonella* on apples, pears, peaches and quinces, the correct times for spraying are after the majority of the petals have fallen, and again one month and two months later. The bagworm, *Oeceticus platensis*, can also be checked by the use of arsenical sprays. Caterpillars of *Papilio thoantides*, Burm., which attack oranges and lemons, should be crushed by hand or sprayed with iron, lead or copper arsenate. The larva of *Diloboderus abderus* (white grub) sometimes causes important injuries both in pasture and cultivated land. The methods advocated by Carriquiri for keeping down these beetles are quoted. He considers that the most efficient method, under Uruguayan conditions, is to plough up strips of land about 2 yards wide at distances some 700 yards apart, in rich, humid soil. If this is done in spring, these strips will be chosen for oviposition in January and February. In March or April the land is ploughed over and the eggs are turned under to a depth of about 10 inches, where the conditions prevent their incubation. The land may be used for sowing oats or for a green crop in the winter. Lighted torches for use against the adults of *D. abderus* are suggested on smaller estates. In gardens, orchards, and other small but valuable areas, naphthaline should be used as a repellent. Against the larvae, benzine or carbon-bisulphide should be injected at a depth of about 1 foot, and spraying should be done with ammonia solutions. These measures should be applied during the dormant season.

TALBERT (T. J.). **Combining Dormant and First Summer Spray in Apple Orchards infested by San José Scale.**—*Missouri Univ. Agric. Expt. Sta., Columbia*, Bull. 161. January 1919, 15 pp., 3 figs.

Details are given of experiments made over several years for the control of the San José scale [*Aspidiotus perniciosus*] in apple orchards. The results show that the dormant spray consisting of commercial lime-sulphur. 33° Bé., in dilution of 1 to 7 or 1 to 8 may be safely applied to the trees until the first blooms appear, and thus takes the place of the first summer spray. The spray should be applied at 200 pounds pressure or less, as heavier pressure increases the risk of injury by scorching. This treatment also proved successful in controlling Aphids, oyster-shell scale [*Lepidosaphes ulmi*], scurfy scale [*Chionaspis furfura*] and many other noxious insects.

LATHROP (F. H.). **Insect Pests of Stored Grains and Mill Products.**—*Oregon Agric. Coll. Extension Service, Corvallis*, Exten. Bull. 228, May 1919, 4 pp., 5 figs. [Received 25th March 1920.]

A brief account is given of the injury caused to stored grain by the bean weevil, *Bruchus* (*Acanthoscelides*) *obtectus*, Say, the pea weevil, *B.* (*Laria*) *pisorum*, Lec., the Mediterranean flour moth [*Ephestia kühniella*], the Indian meal moth [*Plodia interpunctella*] and granary beetles [*Calandra*]. Fumigation with carbon bisulphide, sulphur or hydrocyanic acid gas, is advocated and the method of application described.

HAYES (W. P.). **The Maize Billbug or Elephant Bug (*Sphenophorus maidis*, Chittn.)**—*Kansas Agric. Expt. Sta., Manhattan*, Technical Bull. 6, January 1920, 27 pp., 12 figs.

The different stages and life-history of *Sphenophorus maidis*, Chitt., are described, and the nature of injury as well as the remedial measures for this pest are discussed [*R.A.E.*, A, iv, 193 : vii, 378].

WEISS (H. B.). **Notes on *Corythuca bulbosa*, O. & D.**—*Ohio Jl. Sci., Columbus*, xx, no. 1, November 1919, pp. 17–20. [Received 24th March 1920.]

Corythuca bulbosa, O. & D., occurs on American bladder nut, *Staphylea trifolia*, from Maryland and Virginia westwards to Ohio. There are five nymphal stages, and these as well as the egg and adult are described. During observations made in Philadelphia the eggs and adults were found on 11th June. The eggs are usually inserted in the tissue of the lower leaf-surface near the edges. They are found in groups of from 10 to 250. By 24th of June fewer adults were noticed, but in addition to eggs, 2nd and 3rd stage nymphs were noticed feeding in colonies on the undersurface of the leaves. By the 8th July all adults had disappeared, but all other stages were present, the 4th and 5th nymphal stages being most plentiful. The first adults of the new generation were seen about 12th July. There is probably only one generation a year.

BRIGANTI (G.). **Olive-Growing in Apulia, Italy.**—*Agricoltura italiana illustrata, Milan*, 1, no. 1, January 1919, pp. 32–57, 13 figs. (Abstract in *Mthly. Bull. Agric. Intell. & Pl. Dis., Rome*, x, no. 5, May 1919, pp. 563–564. [Received 31st March 1920.]

Among the many causes of the decline of olive growing in Italy is the damage caused by the olive fly, *Dacus oleae*, the olive moth, *Prays oleellus*, and a weevil, *Rhynchites cribripennis*.

COTTA (A.). **The Stone Pine (*Pinus pinea*) in Italy.**—*L' Italia agricola, Piacenza*, v, nos. 1 & 3, 15th January & 15th March 1919, pp. 10–16 & 70–80, 14 figs., 1 plate. (Abstract in *Mthly. Bull. Agric. Intell. & Pl. Dis., Rome,* x, no. 5, May 1919, pp. 570–573. [Received 31st March 1920.]

An insect injurious to stone pine (*Pinus pinea*) is *Cnethocampa pityocampa*, which destroys the needles and lessens the resistance of the trees to beetles such as *Myelophilus* (*Hylesinus*) *piniperda* and *Hylastes ater*.

LEGISLATION.

Plant Legislation. *Rept. Dept. Agric. St. Vincent, 1918–1919; Barbados*, 1920, pp. 18–19. [Received 15th March 1920.]

An amendment was passed on 24th February 1919 to the Importation of Plants Diseases Prevention Ordinance of 1906 under which the necessary authority is given for the examination of plants, seeds, etc., for pests and diseases on board a vessel in port, and to prohibit the landing of these if infested, together with any goods forming part of the cargo likely to be the means of introducing any fungoid disease or insect pest injurious to plant life. The text of the amendment is quoted verbatim, and fines up to £100 may be levied for any contravention of the Ordinance.

BROOKS (A. J.). **Efforts made to prevent the Introduction of serious Plant Pests and Diseases into Saint Lucia and the Spreading therein.** *Agric. Dept. St. Lucia*, Leaflet no. 17, December 1919. 12 pp. [Received 25th March 1920.]

The provisions of the Plant Protection Ordinance of 1916 are quoted and the regulations are given prohibiting the importation of certain plants from infested countries [*R.A.E.*, A, v, 46]. In addition to those noticed in the above reference, cotton seed or seed cotton from any country or place except Grenada or St. Vincent is prohibited and also any Graminaceous plants, such as sugar-cane, rice, bamboo, rye, barley, oats, maize, millet, guinea corn, etc., from Trinidad or Grenada, where froghoppers occur.

Some sections of the regulations dealing with the eradication and prevention of the spread of insect pests and diseases within the Colony are also quoted.

CONTENTS.

CONTENTS—*cont.*

Registered at the G.P.O. for Transmission to Canada and Newfoundland by Magazine Post.

VOL. VIII. Ser. A. Part 6.—pp. 217-256. JUNE, 1920.

THE REVIEW OF APPLIED ENTOMOLOGY

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SEVERIN (H. C.). **Tenth Annual Report of the State Entomologist of South Dakota for the Period ending 30th June 1919.**—*South Dakota State Coll., Brookings*, 15th September 1919, pp. 1–36, 1 plate, 11 figs. [Received 26th March 1920.]

An account is given of the inspection of South Dakota nurseries with a list of the pests found. Much information has been collected with regard to the web-spinning sawfly of the plum, *Neurotoma inconspicua*, Nort., and the common field cricket, *Gryllus abbreviatus*, full details of which are to be published.

Experiments show that there is practically no difference in the efficacy of crude or refined powdered white arsenic when used in poison-baits for grasshoppers. The time of application is apparently also immaterial.

Special investigations have been made with regard to pests and diseases of currants and gooseberries. Those dealt with include a Longicorn beetle, *Psenocerus supernotatus*, Say (American currant borer), which attacks chiefly the old dead branches, but occasionally injures healthy stems. The grubs tunnel lengthwise and several may be found in one stem. They remain in the stem until the following spring, when pupation occurs in the tunnel. The beetle emerges in 2 to 4 weeks. There is one generation a year. The moth, *Aegeria* (*Sesia*) *tipuliformis*, Clerck, is similar both as to life-cycle and habits. The best remedial measures for both pests is to cut out all dead wood as well as all stems 4 years old and over, close to the crown of the plant, and burn before June. The same treatment should be carried out with canes and foliage that are wilting or becoming weak and sickly.

The scale, *Eulecanium* (*Lecanium*) *corni*, Bch., has but one generation a year. The remedial measures advocated are spraying before the buds open with dormant strength lime-sulphur or kerosene emulsion consisting of 1 part of stock to 4 or 5 parts of water. The usual remedial measures are advocated for the oyster-shell scale, *Lepidosaphes ulmi*, L., and *Aspidiotus ancylus*, Putn. *Myzus ribis* L. (currant aphis) infests the undersurface of the leaves, causing deformity and discolouration. Hibernation occurs in the egg-stage on the canes: these give rise in the spring to the stem-mothers which migrate to the leaves and give rise to several generations of parthenogenetic females. The first spray should be applied when the buds are breaking, followed by a second in about 10 days and a third 14 days later. The sprays advocated are:—1 part Black-leaf 40, 1,000 parts of water, with soap at the rate of 1 lb. to 25 U.S. gals. of spray; 1 lb. laundry soap to 5 U.S. gals. of water; or 1 part of stock kerosene emulsion to 7 parts of water.

The sawfly, *Pteronus ribesii*, Scop., is the most destructive enemy of the foliage of currants and gooseberries in South Dakota. The eggs are laid in the spring on the undersurface of the leaves and hatch in about 10 days. The larvae feed in colonies and eat small holes in the leaves, eventually devouring the leaf-tissue. A bush may be defoliated in a few days. After about three weeks the larvae hide under trash or burrow into the ground ready for pupation. There are two generations a year, the second brood appearing about the time the currants are ripening. The larvae hibernate in a cocoon. Lead arsenate paste or powder, 1 lb. and $\frac{1}{2}$ lb. respectively, to 25 U.S. gals. of water, or $\frac{1}{4}$lb of Paris green, $\frac{1}{2}$ lb. of freshly slaked lime and 25 U.S. gals. of water, have been used with success against this pest. The spray should be applied as soon as the leaves begin to unfold. Should the second generation become destructive, hellebore should be used either as a spray—1 oz. to 1 U.S. gal. of water, or as a dust—1 oz. to 5 oz. of air-slaked lime or flour.

There are two generations of *Tortrix* (*Archips*) *rosaceana*, Harr., during the year. The caterpillars of the first brood appear during June and July and the second from July to September. Eggs are laid in a mass on the canes or leaves of the plant. Hibernation occurs in this stage. The caterpillars form nests by rolling up the leaves. Remedial measures include handpicking and spraying with lead arsenate at the rate of $1\frac{1}{2}$ lb. of paste to 25 U.S. gals. of water. The spray should be applied as soon as the leaves expand and be repeated at the end of a week.

Several generations of *Tetranychus telarius*, L., occur on currants and gooseberries during the year. The eggs hatch in from 3 to 10 days, development being retarded in cool and rainy weather. The larvae give rise in about 3 days to the adult mites. They may be controlled by spraying with flour paste or dusting with powdered sulphur either alone or mixed with air-slaked lime. Other effective sprays are 1 lb. powdered sulphur, 2 oz. soap and 3 U.S. gals. of water, or Black-leaf 40 1 part to 1,000 parts of water with the addition of soap at the rate of $\frac{1}{4}$ lb. to 5 U.S. gals. of Black-leaf 40.

The caterpillars of *Cymatophora ribearia*, Fitch (currant span-worm) hatch in late May or early June and feed for about 3 weeks on the leaves. They enter the ground for pupation, which lasts 2 or 3 weeks. Hibernation occurs in the egg-stage. This moth may be controlled by spraying with lead arsenate or Paris green as for *Pteronus ribesii*.

The paper concludes with a summary of treatment for pests and diseases attacking currant and gooseberry plants.

Moznette (G. F.). **Annotated List of the Injurious and Beneficial Insects of the Avocado in Florida.**—*Florida Buggist, Gainesville*, iii, no. 3, December 1919. pp. 45–48. [Received 27th March 1920.]

In addition to the insect pests of avocado recently recorded [*R.A.E.*, A, vii, 198, 240] the author gives notes on the following: *Trialeurodes floridensis*, Quaint. (avocado whitefly), which is particularly abundant about the coast, and multiplies rapidly during the summer months, causing sooty mould; *Tetranychus yothersi*, McG. (avocado red spider), which also attacks camphor in the northern part of Florida, and lives on the upper surface of the foliage of avocado, causing yellowing and browning of the leaves; the scales, *Chrysomphalus dictyospermi*, Morg., *Saissetia oleae*, Bern., *Pseudococcus nipae*, Mask. (coconut mealy-bug), and *Pulvinaria pyriformis*, Ckll. A thrips, *Frankliniella cephalica* var. *masoni*, Wats., oviposits on the pedicel of the flower-clusters, causing the cluster to drop. *Empoasca minuenda*, Ball (avocado leaf-hopper) attacks the lower leaf surface during the growing season, causing white spots to appear on the foliage. A species of *Gracilaria* near *G. violacella*, Clem., is a small moth found wherever avocados are grown. Eggs are deposited on the new growth and the larvae curl the leaves on which they feed. A Tingid, *Acysta perseae*, Heid., sucks the juices of the leaves, causing them to turn yellow and drop. *Anomala undulata*, Mels. (leaf-chafer) emerges from the soil at night and devours the flowers, the depredations lasting only about a week, when the beetles return to their breeding grounds. A weevil, *Caulophilus latinasus*, attacks the seed of avocado in the orchard and in storage, tunnelling the seeds and rendering them worthless for planting. A moth, *Sparganothis* sp., oviposits in the flower-clusters, the larvae webbing them together to form a nest and feeding on the flowers. Two Cerambycid beetles, *Lypsimena fuscata*, Lec., and *Elaphidion inerme*, Newm., attack dying or unhealthy branches of avocado, and if the infested branches are allowed to remain, the burrows are often extended into healthy tissue.

Beneficial insects that are either predatory or parasitic upon the above pests include *Sympiesis dolichogaster*, Ashm., a Hymenopterous parasite of *Gracilaria*; a lacewing, *Chrysopa lateralis*, Guér., which devours red spider; the predatory thrips, *Scolothrips sexmaculatus*, Perg., *Leptothrips mali*, Hinds, and *Franklinothrips vespiformis*, Crawf.; the Coccinellids, *Scymnus utilis*, Horn, and *S. kinzeli*, Casey; *Prospaltella* sp., frequently bred from *Trialeurodes floridensis*; *Cryptognatha* (*Delphastus*) *pallida*, Lec., which is predatory upon the same insect; and *Aspidiotiphagus citrinus*, Craw, parasitic on *Chrysomphalus dictyospermi*.

Dudley (F. H.). **Report of State Horticulturist.**—*17th Ann. Rept. Maine Commiss. Agric.*, *Waterville*, 1918, pp. 23–50, 6 figs. [Received 29th March 1920.]

Inspections of localities formerly infested with San José scale [*Aspidiotus perniciosus*] have shown that the practices of cutting out and burning infested trees or thoroughly spraying them have brought the pest almost entirely under control. The nests of the cherry-tree Tortricid [*Tortrix cerasivorana*], which was reported as very destructive in 1917 [*R.A.E.*, A, vii, 175], have been eradicated in many towns in the State.

The importance of bee-keeping in orchards is pointed out, especially among those apples that require cross-fertilisation; an instance is given of an orchard that produced 600 barrels of apples a year, while after bees were placed in the orchard the crop increased to 1,800 barrels.

Dusting with sulphur and lead arsenate is being taken up as a substitute for liquid spraying and three dusting machines are now being used in the State. A short account is given of *Palaeacrita vernata* (spring canker-worm) which defoliated 150 trees in one orchard. Ploughing in late autumn will bring the pupae to the surface, where the severe winter will destroy them. Banding trees with a sticky substance in early spring will prevent the wingless moths from crawling up the tree-trunks to oviposit. Spraying will kill the caterpillars, using 2 to 3 lb. lead arsenate in lime-sulphur solution (1 : 35), when the buds begin to open and show pink. A general spray calendar is also given

As maize is one of the important crops of Maine, an account is given of the chief maize pests, namely, *Pyrausta nubilalis* (which has not yet been definitely recorded in the State, though infestation is feared), *Papaipema nebris* (*nitela*), *Heliothis obsoleta*, and *Estigmene acraea* [*R.A.E.*, A, vii, 277].

PHILBROOK (E. E.). **Report of Special Field Agent, Gypsy Moth Work.**—*17th Ann. Rept. Maine Commiss. Agric., Waterville*, 1918, pp. 51–56. [Received 29th March 1920.]

There are now ten or more species of parasites of the gipsy moth [*Porthetria dispar*] established in the infested area in Maine. The Carabid, *Calosoma sycophanta*, which devours both pupae and caterpillars, has also been established in the western part of the State, where "flacherie" or wilt disease has also spread in the moth-infested areas. In consequence of these factors, a higher degree of mortality has been secured in 1918 than in any other year. Scouting began on 1st January and continued until the eggs hatched ; during this time 1,235,954 egg-clusters were found and destroyed and 567 gallons of creosote were used to paint them. Spraying of caterpillars began with the hatching of the eggs and continued until mid-August, 8 tons of lead arsenate being used. In July trees were banded with burlap as in the previous year ; 67,000 trees were thus treated and 876,258 caterpillars collected from them. The benefit to be derived from birds in gipsy moth suppression, and the importance of protecting them, is emphasised. While the actual area infested has not been reduced to any extent since 1917 [*R.A.E.*, A, vii, 176], the colonies of the moth within that area have been greatly lessened.

DUPORT (L.). **Rapport à Monsieur le Président de la Chambre d'Agriculture sur les Recherches poursuivies à la Station Entomologique de Cho-Ganh.**—*Supplements to Bulls. 123 & 124, Chambre d'Agric. Tonkin & Nord-Annam, Hanoi*, nos. 5 & 6, June-September & October-December 1919, 18 pp. [Received 29th March 1920.]

Further investigations have been made regarding the insect parasites of *Xylotrechus quadripes* (coffee borer) [*R.A.E.*, A, viii, 111], both on coffee and on some of its other food-plants, of which a list is given. Two species of insect parasites have up to the present been successfully reared in the laboratory and it is hoped that others may be found. The most important, at first thought to be an Ichneumonid, has since been identified as a Braconid, and is so minute that it can pass the smallest wire mesh obtainable. The female is provided with a long ovipositor to reach the larval host within the wood. One female lays as many as 25 eggs on one larva, and chooses for preference the mature larvae of *X. quadripes* that are about to pupate and are close under the bark. The young parasitic larvae feed upon the host larva for 7 or 8 days. They then pupate in the cell prepared by the borer, this stage apparently lasting about 15 days, after which the adults emerge through a hole about 1 mm. wide. Multiplication is rapid, the whole life-cycle requiring only about 25 days, and breeding might be continuous in the laboratory throughout the year if the rearing-boxes are sheltered from severe cold. This parasite can breed also on the larvae of *Chlorophorus annularis*, Fairm. (bamboo borer), and on *X. quadripes* in fresh, dead, or diseased coffee. It seems almost certain, therefore, that it should be an important factor in control in the plantations. Some 200 insects are now ready for distribution each day and liberations have already been made in some plantations. The author is prepared to provide at a small cost a model cage with the necessary plant stems for rearing, to any planter that applies to him. Such cages with wire mesh screening should be placed at intervals in the plantations. The emergence of this insect is much retarded by the first cold weather and stops completely after about 8 days. The parasite is, however, less susceptible to cold than the borer.

Another Braconid parasite of *X. quadripes* has been found less abundantly in cages and in the field. Breeding of this species has not been possible as the sexes have not emerged at the same time. Several eggs are laid on each host, but the ovipositor is much shorter than that of the other species described. Other Braconid parasites of minor importance also occur. An Ichneumonid parasite that was reared in 1914 was observed in the plantations in 1919, but its numbers were too few for rearing in the laboratory.

Some small black ants have been found preying upon the larvae, pupae and adults of *X. quadripes*. They live entirely within the trunks where the borers are to be found, their life-cycle apparently requiring 30 days in warm weather. Reproduction practically ceases in the cold weather. Unfortunately they also attack the larvae of the Braconid parasites.

A scale-insect found on the roots of coffee plants closely resembles *Pseudococcus citri*. It is suggested that fumigation of the roots by pouring potassium sulpho-carbonate into a trench should be efficacious against it.

The attacks of *Schoenobius incertellus*, Wlk., on rice have only caused an infestation of 5 per cent. at the maximum in Cho-Ganh; it is thought that its Hymenopterous and Dipterous parasites account for this.

The Anobiid beetle, *Lasioderma serricorne*, does serious damage to stored tobacco and to cigars and cigarettes prepared from infested tobacco. Fumigation with carbon bisulphide has been suggested as a remedy, but this does not destroy the eggs and therefore at least two treatments are necessary. Dry heat is probably a more efficacious and safer process.

TAIT (J.). **Some Diseases of Fruit-trees.**—*Agric. Jl., Victoria, B.C.*, v, no. 1, March 1920, pp. 6 & 13.

This paper deals in a popular manner with the usual pests found on fruit trees, including the pear-leaf blister mite [*Eriophyes pyri*], the woolly apple aphis [*Eriosoma lanigerum*] and the peach-tree borer [*Aegeria exitiosa*]. The usual remedial measures are discussed.

CAESAR (L.). **To Control the San José Scale.**—*Canadian Horticulturist & Beekeeper, Toronto, Ont.*, xxviii, no. 3, March 1920, pp. 59–60.

The first essential for keeping an orchard free from San José scale [*Aspidiotus perniciosus*] is clean cultivation. Good pruning is of the greatest importance and all rough, loose bark should be scraped off the main branches and trunk so that the scale will not be protected by it. The scraping, however, should only be necessary once in about five years and only on old and fairly large apple trees. A lime-sulphur spray should be applied with a spray gun on peaches before the buds begin to swell and on apples and most other fruits when they are ready to burst. The strength used should be of 1·035 specific gravity, which is the same as one gal. of ordinary commercial lime-sulphur to 7 gals. water. The whole of the tree should be thoroughly covered with this spray.

BALLOU (H. A.). **The Pink Boll Worm** (*Gelechia gossypiella*, **Saunders) in Egypt in 1916–1917.**—*Minist. Agric. Egypt, Cairo*, 1920, 120 pp., 16 plates. [Received 31st March 1920.]

This important report records the author's investigations in Egypt during 1916–1918 into the possibilities of control of the pink bollworm *Pectinophora* (*Gelechia*) *gossypiella*. Owing to the delay in issuing it, much of the matter it contains has been already noticed at length [*R.A.E.*, A, viii, 67].

Under the section discussing the control of this pest, the legislation passed in Egypt against it is reviewed, and the campaigns of 1916 and 1917 are described. It is not considered likely that the pink bollworm will be eradicated in Egypt for many years, but the prospects are that sufficiently good work will be done to reduce infestation to a minimum, so that as long as combative measures are maintained at the highest possible pitch of efficiency, the amount of damage done each year will be small, and cotton growing will be a profitable industry.

MORRIS (H. M.). **The Hypopus of** *Carpoglyphus anonymus*, **Haller.**—*Ann. Trop. Med. Parasit., Liverpool*, xiii, no. 4, 15th March 1920, pp. 339–342, 1 fig.

A description is given of the hypopial nymph of a mite, *Carpoglyphus anonymus*, which in company with some beetles (*Carpophilus hemipterus* L.), were found heavily infesting a quantity of dried figs received from the Port Sanitary Authority, Liverpool.

MCLAINE (L.S.). **Memorandum to Importers. No. 2.**—*Dept. Agric. Entom. Branch, Ottawa*, 27th February 1920, [1p. MS.]

The Japanese beetle [*Popillia japonica*] has been accidentally imported into the United States where it is causing serious and extensive damage [*R.A.E.*, A, vii, 101, etc.]. To prevent a similar occurrence in Canada all importers are requested to notify the Dominion Entomologist when placing orders for shipments of perennials, herbaceous stock, etc., from Japan and the Far East and to advise the same officer upon their arrival so that arrangements may be made for their inspection.

FERRIS (G. F.). **Notes on Coccidae.—v. (Hemiptera).**—*Canad. Entom., London, Ont.*, lii, no. 2, February 1920, pp. 29–32, 5 figs.

The species dealt with in this continued list [*R.A.E.* A, viii, 63] include: *Protodiaspis parvula*, Ckll., on oak in Mexico; *P. agrifoliae*, Essig; *P. lobata*, sp. n., on *Quercus gambelii* in New Mexico; and *P. pulchra*, sp. n., on *Quercus toumeyi* in Arizona.

The genus *Protodiaspis* is discussed and a new genus, *Ancepaspis*, is erected to which is referred *Protodiaspis tridentata*, Ferris (the type), *P. anomala*, Green, *P. edentata*, Green, and an undescribed species to be discussed in another paper.

COCKERELL (T. D. A.). **A Parasite of Dermestid Beetles in Entomological Collections.** —*Canad. Entom., London, Ont.*, lii, no. 2, February 1920, p. 34.

Laelius utilis, sp. n., is described. This Bethylid was found parasitising Dermestids infesting dried insects in a museum collection in Virginia.

The genus *Laelius* is well known to be parasitic on Dermestid larvae and the following species have been recorded: —From U.S.A., *L. trogodermatis*, Ashm., *L. tricarinatus*, Ashm., *L. rufipes*, Ashm., *L. nigripilosus*, Ashm., and *L. fumipennis*, Brues; from France, *L. bipartitus*, Kieff., *L. tibialis*, Kieff., and *L. perrisi*, Kieff.; from Italy, *L. fulvipes*, Kieff., and *L. anthrenivorus*, Tran.

ROCKWOOD (L. P.). U.S. Bur. Entom. *Hypera nigrirostris*, **Fab., in the Pacific North-west.**—*Canad. Entom., London, Ont.*, lii, no. 2, February 1920, pp. 38–39.

Hypera nigrirostris is closely allied to *H. variabilis* (*postica*), both being pests of clover, and the discovery of its parasites in North-western America is thought worthy of record.

This weevil, which has occurred in the east of Canada and U.S.A. for many years, had not been known west of Minnesota before 1914. Since that date it has been found widely distributed in the Pacific North-west. Two Hymenopterous parasites also appeared in considerable numbers, both being highly specialised for attacking *Hypera* spp., viz:—*Blathyplectes exigua*, Grav., and *Dibrachoides dynaster*, Forst. These parasites are not found in the east, and it is unusual for highly specialised parasites to become common so soon after the appearance of the host.

As *H. nigrirostris* is spreading from north to south in the Pacific North-west, this seems to indicate that the weevil did not come from the east, but rather that it is circumpolar in its range, or that it has come from eastern Siberia by natural dissemination or accidental introduction, probably by easy stages, such as would not eliminate its parasites.

Bekämpfung des Heu- und Sauerwurms. [Combating Vine Moths, *Clysia ambiguella* and *Polychrosis botrana*.]—*Luxemburger Weinztg., Grevenmacher*, vii, no. 8, 19th April 1919, pp. 133–134. [Received 12th March 1920.]

Experiments were made in the Rhine Province during 1917 to ascertain the relative efficacy of the ordinary spray-nozzle and the revolver sprayer in combating the second generation of the vine moths (*Clysia ambiguella* and *Polychrosis botrana*). A spray consisting of a 1 per cent. Bordeaux mixture with the addition of 3 lb. of tobacco extract to every 20 gals. of spray was used, and the results distinctly show the greater value of the spray-nozzle, with which a given area was treated in $2\frac{1}{4}$ hours, as against the $7\frac{1}{2}$ hours required when using the revolver sprayer. With the spray-nozzle there is also less expenditure of material, which, in the given circumstances, was in the proportion of 60 to 73.

Zur Wurmbekämpfung. [Combating Vine Moths.]—*Luxemburger Weinztg., Grevenmacher*, vii, no. 16, 16th August 1919, pp. 227–229. [Received 12th March 1920.]

In consequence of the appearance of the first generation of the vine moths (*Clysia ambiguella* and *Polychrosis botrana*) in 1919 a strong infestation by the second generation was anticipated. The remedial measures advocated include the addition of one of the following substances to the third application of the usual lime-copper solution: from 1 to $1\frac{1}{2}$ lb. of soft soap to every 20 gals. of solution; about $3\frac{1}{2}$ oz. of urania green to every 22 gals. of solution or the same quantity of "Zabulon"; or 1 lb. of tobacco extract and $\frac{1}{2}$ lb. of soft-soap to 10 gals. of solution.

A nicotine soap solution that has proved efficacious, provided it is freshly prepared, consists of 10 lb. copper sulphate to 100 gals. of water to which lime is added until the solution is alkaline. To every 22 gals. of this mixture $5\frac{1}{2}$ oz. of 85–95 per cent. crude nicotine or $3\frac{1}{3}$ lb. of 8–10 per cent. tobacco extract and about 9 oz. of soft-soap should be added.

The spraying should be begun when the flight period is at its maximum; this, under normal conditions, would be about the end of May for the first generation and the middle of July for the second. This spray is also of value as a fungicide.

Zum Reblausgesetz. [The Law against *Phylloxera*.]—*Luxemburger Weinztg., Grevenmacher*, vii, no. 18, 6th September 1919, pp. 261–263. [Received 12th March 1920.]

The advisability of substituting American vines for the native ones with the object of obtaining a stock that is resistant to *Phylloxera* is discussed.

Fixmer (—). **Zur Reblausfrage.** [The *Phylloxera* Question.]—*Luxemburger Weinztg., Grevenmacher*, vii, no. 22, 1st November 1919, pp. 315–317. [Received 12th March 1920.]

In spite of precautions hitherto adopted *Phylloxera* is apparently spreading in Luxemburg. As complete eradication is impossible, the necessity for adopting cultural methods is emphasised. The remedial measures advocated include spraying with carbon bisulphide and the grafting of indigenous vines on suitable American stocks, the possible varities of which are discussed.

Zum Reblausgesetz. [The Law against *Phylloxera*.]—*Luxemburger Weinztg., Grevenmacher*, vii, nos. 25 & 26, 20th & 31st December 1919, pp. 369–371, 383–387. [Received 12th March 1920.]

The laws dealing with viticulture that have been in force since 12th May 1905 and 27th July 1909 in Germany demand the entire destruction of any plots infested with *Phylloxera*. Subsequent experience has shown that the results obtained do not warrant such drastic treatment and the necessity of the revision of these laws is therefore emphasised.

Intensive cultural methods such as have been successfully adopted in France and Hungary are advocated as an alternative.

Ritzema Bos (J.). **De gestreepte Dennenrups** (*Trachea piniperda*, **Panz.** = *Panolis griseovariegata*, **Goeze**). [The Pine Moth, *Panolis flammea*.]—*Tijdschr. Plantenziekten, Wageningen*, xxvi, nos. 1, 2, 4, January, February, April 1920. pp. 28–60, 71–104 & 113–115, 2 plates.

The abnormal increase of *Panolis flammea*, Schiff. (*piniperda*, Panz.) in Holland in 1919, doubtless due to the warm, dry weather early in 1918 and 1919, has led to the publication of this paper, which contains an account of the observations made by the author and others and a review of previous knowledge of this pest in Holland.

All stages are described and notes on the life-history are given from many sources. It is certain that in years during which the weather has been normal very few individuals are found on pines because *P. flammea* is readily affected by unfavourable weather conditions. The moths do not oviposit indiscriminately on all examples of *Pinus sylvestris* but choose the larger trees that are at least 20 years old; in stands of 15-year-old trees injury is unusual. Though *P. flammea* is a pest of *Pinus sylvestris* the caterpillars also feed on *Chamaecyparis lawsoniana* and *Picea menziesii* (*sitchensis*). It is probable that the caterpillars attack these trees only if the supply of food on *Pinus sylvestris* proves insufficient. In view of the conflicting records as to the direction of the compass in which the spread of the caterpillars takes place, it is suggested that it tends to be towards trees that have not been defoliated. It has also been suggested that the mating flight is against the wind, and as the mating usually occurs at a period when east winds are blowing, this accounts for a second outbreak being eastwards of that of the preceding year. The first signs of defoliation become visible at the end of May or early in June. Pupation begins in July and nearly all caterpillars have pupated by August. The adults emerge in March and April.

As a rule the young caterpillars begin by feeding on the young needles of the May shoots; if these are not out at the time the larvae hatch, they attack older needles. In serious infestations when the amount of food material is insufficient everything is eaten without distinction.

It is generally assumed that pines that have been stripped bare must die and should be felled. This is certainly not always the case, and precipitate felling should be avoided. Conifers suffer more than broad-leaved trees, but not all conifers are affected to an equal extent. *Picea excelsa* dies if defoliated because it is unable to produce new needles in the same year, but *Pinus sylvestris* does not necessarily succumb, especially if defoliation has taken place early in the year.

The infestation in the various parts of Holland in 1919 is recorded in some detail.

Though each female is the potential ancestor of 6,750,000 individuals in 4 years, only two caterpillars are found on the average on each tree. Cold weather early in the year destroys many moths before they have oviposited or renders them incapable of doing so; heavy rain may also prove fatal. The young caterpillars are very sensitive to cold and heavy rain, and the latter may wash older caterpillars from the trees. Prolonged rain may either drown the pupae sheltering under leaves and other débris on the ground, or may lead to their death through the heat evolved when the soaked material is afterwards subjected to the influence of warm, dry weather, or again may favour the growth of fungi injurious to them. Lack of food leads to the death of many caterpillars. Natural enemies of the adults include bats and many birds, the latter also feeding on the caterpillars. Among the mammals that destroy the pupae wild pigs are the most important and they are so effective that the use of domestic pigs has been recommended for this purpose. Stoats, weasels and *Mus sylvaticus* are other destroyers of the pupae. These mammalian enemies however also destroy the parasites of the pupae. Both caterpillars and pupae of *P. flammea* are preyed upon by several beetles and their larvae. A wasp, *Ammophila sabulosa*, paralyses the caterpillars prior to ovipositing in them. Parasitic insect enemies play a decisive part in checking an outbreak, but may take 2 or even 3 years to do so.

Smits van Bürgst believes that there is no insect with more parasitic enemies belonging to its class than *P. flammea* and has submitted a list of 33 Hymenopterous species to which the author adds a further 3. These are:—*Ichneumon comitator*, L., *I. trilineatus*, Gmel., *I. scutellator*, Grv., *I. nigritarius*, Grv., *I. fabricator*, F., *I. annulator*, F., *I. pallidifrons*, Grv., *I. dumeticola*, Grv., *I. derogator*, Wesm., *I. bilunulatus*, Grv., *I. molitorius*, Grv., *I. gradarius*, Wesm., *I. equitatorius*, Panz., *I. tristis*, Grv., *I. nigrocyaneus*, Grv., *I. pachymerus*, Ratz., *Microcryptus perspicillator*, Grv., *M. arrogans*, Grv., *Cryptus cyanator*, Grv., *C. tarsoleucus*, Schr., *C. sponsor*, F., *C. dianae*, Grv., *Pimpla instigator*, F., *Euceros crassicornis*, Grv., *Henicospilus ramidulus*, L., *H. merdarius*, Grv., *Exochilum circumflexum*, L., *Heteropelma calcarator*, Wesm., *Anomalon biguttatum*, Grv., *Banchus compressus*, F., *B. pictus*, F., *B. femoralis*, Ths., *B. monileatus*, Grv., *Mesochorus brevipetiolatus*, Ratz., *Meteorus scutellator*, Nees, and *M. albiditarsis*, Curtis. It is probable that there are still other Hymenopterous parasites. Of these the Braconid, *Meteorus albiditarsis*, and *Ichneumon pachymerus* appear to have been very effective in 1919. With regard to these two parasites Smits van Burgst states that the latter has two generations a year and must have another host besides *P. flammea*, which has one brood only, while *M. albiditarsis* has one generation and therefore needs no other host. Next to the Hymenopterous parasites in importance come Diptera such as Tachinids, Dexiids, and Sarcophagids. It is recorded that an outbreak of *P. flammea* in 1845 was checked by a parasitic fly, probably *Tachina* (*Nemoraea*) *glabrata*. Bacteria and fungi also aid in checking the pine moth, and epidemics due to these sometimes cause a rapid reduction in infestation. The author observed one instance where *Empusa aulicae* stamped out a local infestation in about a fortnight. This fungus and *Botrytis bassiana* were active in 1919. Polyhedral disease, formerly confused with flacherie, is another factor in checking *P. flammea*.

As regards the consequences of the outbreak of 1919 the author believed that many stands of *Pinus sylvestris* that seemed to have been hopelessly defoliated might recover. Where all appearances tend to show that recovery is impossible, felling should be quickly carried out in the winter. A few trees that have kept some needles should not be felled before the end of February or the beginning of March, as they are needed as trap-trees for pine beetles [*Myelophilus*]. These trap-trees must be removed about the end of May and the bark must be burnt, as it contains the larvae and pupae of the beetles.

It has been stated that an outbreak may last from 2 to 3 years. As 1919 was the first year, in the case of many woods, it is likely that infestation will be considerable in many places in 1920. Examination of the soil covering will show if pupae are present and if they are parasitised or not. Wherever from 5 to 10 healthy pupae per 11 square feet are found it is advised that the soil covering be removed and used as stable litter; or if it is placed in heaps, the heat that is generated will destroy the pupae. It is certain that in a locality where infestation has occurred in the preceding year the number of healthy pupae will be less than that of parasitised ones. In South Germany the soil covering and moss is removed and piled up. After being left thus during autumn and winter—during which period the pupae are destroyed—the material is taken back to the wood and again spread over the ground. A trial of this method was made in one district in Holland in 1919, and it was noticed that many birds cleared off the pupae on the uncovered ground. The driving of pigs into woods should begin in July and the animals may remain there until the frosts set in. The caterpillars and the moths may be jarred from the trees by hitting the trunks with a club. Insecticides are of practical value on a large scale.

Much may be done to prevent outbreaks if a pine wood, when laid out, is encircled by a girdle of deciduous trees and if the plantation is of considerable extent it should be divided into sections by rows of trees, which act as a barrier to the spread of infestation. Pines in such mixed stands also suffer less from *P. flammea*, and mixed stands have the further advantage of favouring insectivorous birds.

La Plaga "Salivita" en la "Yerba Parana." [The Spittle-Insect, *Monecphora bicincta*, Say, on Paraná Grass (*Panicum numidianum*).]—*Cuba: Comisión de Sanidad Vegetal, Havana*, Circ. 4, [n.d.] 31 pp., 8 plates. [Received 1st April 1920.]

Paraná grass (*Panicum numidianum*) forms the principal pasturage in Cuba, and has lately been severely attacked by a Cercopid, *Monecphora bicincta*. This insect is of wide distribution in Cuba, where it has been known since 1910, but its numbers are not very serious except in unusually wet seasons. The life-cycle has not been worked out in Cuba, but probably resembles that of *Tomaspsis saccharina* (*varia*) in Trinidad, where the eggs hatch in a minimum of 12 days in wet weather and during dry periods may remain unhatched for as long as 4 months. The nymphal stage lasts from 32 to 40 days. In Cuba, the maximum numbers occur in September, October and November. The winged females oviposit on the ground near the plant or on the plant itself, in moist places sheltered from the sun. The nymphs, upon emerging from the egg, immediately attach themselves to exposed roots or other tender parts of the plant and begin to extract the juices, enveloping themselves with a protective covering of superfluous sap, in the characteristic manner of spittle-insects. At first the nymphs are found only near the base of the plant, but in the third or fourth instar they ascend it and are sometimes found in the axils of the leaves. Besides Paraná grass, Guinea grass (*Panicum maximum*) is attacked when growing with it, and also *Andropogon muricatus* and other undetermined grasses. In the Experiment Station of Santiago de las Vegas, *Sorghum halepense* and sugar-cane (*Saccharum officinarum*) have also been attacked; if infestation on sugar-cane develops, it probably will be sufficient to clear away all grasses from the plantation. The insect is evidently, however, a potential pest of sugar-cane and watch should be kept for it.

When a pasture is so badly infested that there is little chance of saving it, it is best to burn it over, with sufficient intensity to reach the roots where there may be eggs, and to include a certain area around the infested parts. Light-traps for the adults have been found useful in Trinidad. Drags, such as those used in the United States against locusts or crickets, should be of the greatest use in control, but as many of the pastures are on hillsides and interspersed with tree stumps, etc., certain modifications would be necessary; for example, the front of the drag should be provided at the base with one or several arched rods of cane or bamboo which would enable it to pass over stumps and other obstacles.

No insect enemies of *M. bicincta* are as yet known in Cuba that would control the pest without damaging the plants, but the green muscadine fungus (*Metarrhizium anisopliae*), which has been successfully disseminated in Trinidad, exists in Cuba, and may prove a valuable help in control if cultivated abundantly in the laboratory and dessiminated in the field.

Arango (R.). **Algunas Plagas de nuestros Cultivos.**—*Cuba: Oficina de Sanidad Vegetal, Havana*, Bol. 2, 1919, pp. 47–80, 3 plates, 19 figs. [Received 1st April 1920.]

The black fly of citrus, *Aleurocanthus woglumi*, has been known as a pest of citrus trees, and of certain species of mango and sapota trees, in Cuba since 1915. A list of 44 food-plants occurring in the Island is given.

When the first attempts were made in Cuba to combat the pest in August 1916, the plants were sprayed with 2 gals. paraffin to 2 lb. whale-oil soap, mixed in 1 gal. of water and diluted with 10 parts of water before use. This solution killed the eggs, larvae and pupae and also a good number of adults, but it proved very expensive and in later treatment kerosene was substituted for the paraffin and common yellow soap for the whale-oil soap, almost the same results being obtained. When infestation is very heavy and the plants are beyond saving in good condition, the mixture may be used much stronger, the water being reduced to three parts. Some plants have been almost completely defoliated in this way. But a few months later they put out fresh foliage that was quite free from infestation. A cheaper and equally efficacious mixture can be made with crude petroleum, but in this case 7 or 8 parts of water at least must be used for safety. Another successful mixture consists of 10 lb. powdered commercial sulphur to 5 lb. quicklime placed in a kerosene tin and heated, with water gradually added until the tin is nearly full, and the whole allowed to simmer for 40 minutes. This should be bottled, and 1½ parts should be diluted with 20 parts water. This mixture has the disadvantage of not always killing the pupae.

The Bostrychid borer, *Apate francisca*, caused great devastation in 1918 in a large plantation of sour-sop [*Anona muricata*] the trunks of which were full of galleries of the borers. Other food-plants include the alligator-pear [*Persea gratissima*], orange and custard apple [*Anona reticulata*]. Although the infestation was so heavy the adults were never found to fly. The remedy advocated is to inject a little carbon bisulphide with a fine syringe into the galleries and plug the entrance immediately. The borers in the galleries are killed at once in this way.

The commonest and most injurious scale-insects in Cuba are *Pseudococcus* spp. on various fruits; *Lepidosaphes beckii* on oranges, limes, lemons, etc.; *Saissetia hemisphaerica*, on several ornamental plants and various fruit trees; *Chrysomphalus aonidum*, frequently found on ornamental palms and on the commoner fruit-trees; *Lecanium* sp. (tortoise-shell scale), which is particularly injurious to young orange trees and occurs on other fruits and on coffee; *Selenaspidus articulatus*, on oranges, mangos and many ornamental plants; *Ceroplastes floridensis*, which is not abundant in Cuba, but does some damage to citrus and mango trees; *Ischnaspis longirostris*, which infests the leaves of mangos, palms, etc.; *Howardia biclavis*, on various fruit and ornamental trees, and scales of minor importance. The usual insecticidal treatments are recommended. Many of these scales are attacked by fungous diseases that serve to keep them in check. Whiteflies, of which the commonest is *Aleurothrixus howardi*, attack oranges, alligator-pears and other fruits, but are less destructive than the black flies.

Descriptions are given of various implements and apparatus for applying insecticidal treatments.

RAYMUNDO (B.). **Noticia sobre alguns Lepidopteros serígenos do Brasil.** [Some Silk-producing Lepidoptera of Brazil.] *Annuario Collegio Pedro II*, iii (1916–1918), *Rio de Janeiro*, 1919, pp. 25–95, 27 figs. [Received 6th April 1920.]

This paper does not confine itself to species of commercial importance but includes moths that pass the pupal state in webs or cocoons of any kind.

MAHDIHASSAN (S.). **The Cultivation of Lac from a Physiological Standpoint.** Phatak & Co., *Hyderabad*, [n.d.], 26 pp.

This paper was written for the first Provincial Forest Conference held at Hyderabad, Deccan, on 10th September 1919. It sets out the chain of conditions that should be maintained if the lac insect (*Tachardia lacca*) is to be successfully and economically cultivated.

The chemical investigation of a number of trees shows that gum production is the forerunner of lac production, and probably that tannins are the precursors of gums. Gum production is not exactly a healthy condition and semi-dryness in the trees stimulates the growth of gum bacteria. Consequently semi-dry trees are those that ultimately produce food for the insect. This condition of the trees may be induced in various ways, by the chemical composition of the soil, and by ground fires and various methods of spacing, both of which affect the tree directly and also affect the chemical composition of the soil.

It is emphasised that systematic cultivation of lac should replace the casual collection of it in the more or less wild state.

Woglum (R. S.). U.S. Bur. Entom. **Practical Fumigation with Liquid Hydrocyanic Acid.**—*The California Citrograph*, [*sine loco*], iv, no. 10, August 1919, p. 284. [Received 1st April 1920.]

New dosage schedules producing a greater uniformity of results are given to take the place of those originally prepared [*R.A.E.*, A, viii, 29], together with a method of calculating the amount of material used in practical work.

Woglum (R. S.). U.S. Bur. Entom. **The Value of Weather Records in Fumigation.**—*The California Citrograph*, [*sine loco*], v, no. 4, February 1920, p. 110, 2 figs.

The effects of atmospheric conditions on the results of citrus fumigation are many and complex. The temperature desirable depends on the locality. Humidity tightens the tent cloth, causing a greater concentration of gas over a longer period ; but the dragging of heavy wet tents over wet fruit tends to skin abrasion with subsequent pitting and scorching from the gas. Certain injury seems due to low barometric pressure, but sufficient data have not yet been collected on this point. A slight wind produces uneven gas concentration, a strong wind clears it from the tent. Hot sunshine is injurious. A series of instruments suitable for use in field work is mentioned.

Metcalf (Z. P.). **Report of Entomologist.**—*41st Ann. Rept. North Carolina Agric. Expt. Sta. Year ended 30th June 1918, Raleigh*, 30th June 1918, pp. 45–49. [Received 1st April 1920.]

The gloomy scale (*Chrysomphalus tenebricosus*) is the most destructive pest of maples in Carolina. A Hymenopterous parasite infests it, killing as many as 98 per cent., but, unfortunately, its appearance is very sporadic. Spraying must therefore be the chief measure in control, soluble oils being the most suitable for this purpose. One application of a strong mixture during the winter is often efficacious.

Bean and pea weevils (*Bruchus* spp.) should be treated by storing the seed in air-slaked lime, or the weevils can be killed by heat. The amount of lime varies ; for less than a gallon of seed, four times as much lime as seed should be used and thoroughly mixed in. For amounts up to two or three bushels the same quantities of lime and seed should be mixed ; up to 25 bushels one-half as much lime is required; for still larger amounts the beans or peas should be placed in a bin to a depth of two or three feet and mixed with a small quantity of lime and the whole covered with a layer of lime ½ to 1 in. thick. This will not injure the beans or peas for food or seed purposes, provided they are sifted and then washed before use for any other purpose than seed. For dry heating storage should be in a fairly air-tight room or building, and the temperature raised to 120° or 140° F. Higher temperatures will not injure them except for seed purposes, and the temperature should be maintained from three to four hours. Another method is to dip the beans or peas in hot water at about 140° F. for 15 to 20 minutes, after which they should be dried and stored in tight sacks.

METCALF (Z. P.) & UNDERHILL (G. W.). **The Tobacco Flea Beetle.**—*North Carolina Agric. Expt. Sta., W. Raleigh*, Bull. 239, April 1919, 47 pp., 34 figs. [Received 1st April 1920.]

The tobacco flea-beetle [*Epitrix parvula*] is one of the worst pests of tobacco in North Carolina. The adults hibernate near the tobacco fields under leaves or grass or in other suitable places, emerging in the spring as soon as any food-plant is available. There are four generations a year, but the stages overlap so much that they cannot be readily distinguished. The eggs, which hatch in about a week, are laid from April to September near the surface of the ground under the tobacco plant. The larvae feed on the roots of the plant from May to October, and pupate in small cells just beneath the surface of the ground.

The greater part of the damage is done by the adult beetles, which eat holes in the leaves both in the seed-beds, where it is sometimes impossible to obtain a stand of plants, and after transplanting, when the plants are sometimes killed. The indirect loss due to the consequent weakening of the plant is still greater, but the direct loss, which alone can be accurately measured, is more than 100 lb. an acre.

The most important methods of control are directed to the plants in the seed-bed, which ensures a vigorous crop and prevents later damage by the beetle, precautions at transplanting time, and destruction of suckers after harvest. The seed-beds should be located as far as possible from good hibernating quarters, and if necessary an area round the beds should be burnt in early winter. The plants should be shielded by a beetle-proof canvas cover over a broad frame. A trap-bed should be provided near by, and this should be dusted or sprayed weekly. If in spite of these precautions the beetles obtain a footing, dusting or spraying should be carried out weekly. After transplanting, all tobacco and any Solanaceous plants (on which, in the absence of tobacco, the beetles will feed) should be destroyed, and the bed treated with a heavy application of poison.

The spray recommended is made of 1 lb. lead paste to 10 gals. water, but dusting, with lead arsenate or lime, 1 lb. of the poison to 4 lb. of fine sifted wood ashes, is simpler and cheaper. When transplanting, all plants should be dipped in a solution of lead arsenate (1 lb. paste or ½ lb. powder in 5 gals. water). Only the leaves should be dipped, and the excess poison gently shaken off. After the crop is housed, all suckers should be destroyed, together with all other possible food-plants.

If all these methods are carried out carefully there should be no need of dusting or spraying in the fields. If this becomes necessary, the same poisons at half the strength should be used.

A full description of the beetle in all its stages is also given, with a list of food-plants other than tobacco on which it is known to feed.

Busck (A.). **Descriptions of New Central American Microlepidoptera.** —*Insecutor Inscitiae Menstruus, Washington, D.C.*, viii, no. 4–6, April–June 1920, pp. 83–95.

Among the twenty new species of moths here described is *Zetesima theobromae* from Paramaribo, Dutch Guiana, infesting cacao. The larvae spin two cacao leaves together, and eat the soft parts, leaving the veins, many of the older leaves being skeletonised in this manner.

Ackerman (A. J.). **Two Leafhoppers injurious to Apple Nursery Stock.** —*U.S. Dept. Agric., Washington D.C.*, Bull., 805, 15th December 1919, 35 pp., 5 plates, 2 figs. [Received 1st April 1920.]

A description is given of the characters, life-history and habits of *Empoasca mali*, Le B., and *Empoa rosae*, L., from data obtained in Pennsylvania and Maryland. These two leaf-hoppers have often been confused hitherto.

The apple leaf-hopper, *Empoasca mali*, causes much the more serious injury, attacking and curling the terminal leaves, and stunting the growth of apple trees, young or slow-growing varieties being particularly injured. It suffers but little from parasites, but spiders, mites, Coccinellid larvae, and a bug, *Triphleps insidiosus*, are predaceous on it to a small extent.

The rose leaf-hopper, *Empoa rosae*, feeds on the lower leaves, producing white or yellow spots on them. Its numbers are greatly reduced by parasites. Hymenoptera such as *Anagrus epos*, Gir., and *A. armatus*, Ashm., var. *nigriventris*, Gir., attack the eggs, while the adults are parasitised by a species of Dryinid.

A single spraying with 40 per cent. nicotine sulphate at the rate of 1–1,500 combined with soap will check an infestation by the apple leaf-hopper so materially that the injury caused by those individuals that escape will be of little consequence; the spray must, however, be applied against the first brood of nymphs, as, later, the leaves will be so curled as to shelter the insects from the spray and render it ineffective.

The same treatment, three or four weeks earlier, is effective against the rose leaf-hopper, though this species is seldom injurious enough to justify a special application.

Borg (P.). **The Scale-Insects of the Maltese Islands.**—*Malta Herald Office, Malta*, 1919, 67 pp., 12 figs. [Received 6th April 1920.]

These notes on the Coccids of Malta have been compiled from the publications of various specialists, local observations on habits, etc., having been added by the author. While all the known species of economic importance existing in the Islands are included, fresh additions are constantly being introduced. A short account is given of each scale, many of them being illustrated, and special chapters are devoted to the natural enemies of the Coccids of Malta and to various treatments against the scales, including fumigation and spraying.

Insects affecting the Strawberry.—*Canada Dept. Agric. Div. Hortic., Ottawa, Ont.*, Bull. 92, 10th February 1919, pp. 31–35. [Received 6th April 1920.]

Insect pests that do serious damage to strawberries in Canada almost every year include white grubs (*Lachnosterna* spp.), which readily attack strawberries when grass land is ploughed up and they are deprived of their usual food. Land intended for strawberry culture should be previously planted with such a crop as lucerne, clover or buckwheat, that will not attract the grubs. The practice of taking only one crop of fruit from a plantation and then ploughing it up is recommended. *Anthonomus signatus*, Say (strawberry weevil) is frequently injurious [*R.A.E.*, A. iv, 189; v, 461], especially to early varieties; those varieties with imperfect or pistillate flowers are practically immune. Clean conditions and dusting every bud with one part lead arsenate to five parts finely ground sulphur, when the weevils begin to feed, and again seven days later, are considered the best remedies for this pest.

Otiorrhynchus ovatus, L. (strawberry root-weevil) is the most important pest of strawberries in British Columbia [*R.A.E.*, A, v, 469, 579]. Root-infesting insects are always difficult to control, and in the present case any insecticide that is strong enough to destroy the weevil larvae in the soil will cause some injury to the plant. The remedy, therefore, lies almost entirely in cultural practices, which include rotation of crops, the growing of strawberries on the one-year or two-year cropping plan, autumn ploughing and keeping the ground free from weeds in order to starve the young larvae, and the use of domestic birds for clearing up the soil. When the growing of strawberries on a commercial scale is contemplated, these measures should be adopted before the necessity arises, and fruit trees should be eliminated from land used for strawberry culture.

The caterpillars of a small moth, probably *Aristotelia* sp., are rather frequently found in the crowns of the plants. *Ancylis comptana*, Froel. (strawberry leaf-roller) occasionally does important damage [*R.A.E.*, A. v., 446]. A spray of 2 lb. dry lead arsenate to 40 gals. Bordeaux mixture before the leaves become folded should be effective, and in cases of serious infestation the foliage should be burned, or raked off and burned immediately after the crop is harvested. Cutworms are often troublesome to young strawberry plants. The usual poison-bran mixtures are advocated.

Work connected with Insect and Fungus Pests and their Control.—*Rept. Agric. Dept. St. Lucia, 1918-1919*; *Barbados*, 1920, pp. 7–8.

The mole-cricket, *Scapteriscus vicinus* (*didactylus*), is commonly found throughout St. Lucia, causing a good deal of damage in vegetable gardens and in grass lawns. It is chiefly active in the wet season, and whenever a small patch of grass lawn or road becomes unusually moist it quickly becomes the starting point of an attack that may spread over 600 feet in a few weeks. The cricket seems to be incapable of destroying really hard turf that is top-dressed with a heavy layer of "tiff." Where the pest occurs in small patches on lawns, it is easily checked by watering with whale-oil soap solution (1 lb. to 5 gals. of water). Large numbers of the crickets may be brought to the surface in this way and collected. The advantage of this remedy is that it is not necessary to fork the lawn before applying the solution.

Information for Orchardists in Arkansas.—*Arkansas State Plant Bd. Little Rock, Ark.*, Circs. 2–8, June 1917 to August 1918, 19 pp. [Received 6th April 1920.]

The Arkansas Plant Act of 1917 provided for nursery inspection and the control of the movement of nursery stock. For the information of growers in the State, these circulars quote some of the rules and regulations adopted by the Plant Board, and give particulars of the orchard inspection service, with a list of insect pests and diseases that are dangerous and require to be destroyed.

Spray Calender.—*Univ. Arkansas Agric. Expt. Sta., Fayetteville*, Circ. 48, February 1920, 4 pp.

This spray calendar has been prepared for Arkansas fruit growers by the Departments of Plant Pathology and Entomology and includes spray schedules for apples, pears, peaches, plums, cherries and grapes, giving the materials necessary for each spray and notes on the preparation of some of the commonest insecticides.

Cresson (E. T., Jr.). **Descriptions of New North American Acalyptrate Diptera.—ii. (Trypetidae, Sapromyzidae).**—*Entom. News, Philadelphia*, xxxi, no. 3, March 1920, pp. 65–67.

Among the new flies described is *Rhagoletis juglandis*, from Arizona, where it was found mining the exocarp of *Juglans regia*. It appears towards the end of June and oviposits in the green husk of a variety of the English walnut, which is mined by the larvae, with the result that the nut turns black. The earlier larvae descend by a silk thread to the ground for pupation, but most of them stay in the husk till the nut falls, and pupate in it.

Service and Regulatory Announcements: August, September, October, 1919.—*U.S. Dept. Agric., Fed. Hortic. Bd., Washington, D.C.* no. 65, 12th December 1919, pp. 93–115. [Received 1st April 1920.]

The present situation with regard to the pink bollworm [*Platyedra gossypiella*] in the Southern United States is reviewed. A feature of the work has been the tracing of all possible means of dissemination of the pest throughout the cotton-growing area, and repeated inspections of the cotton-fields. No new infestation, and only one re-infestation of old territory, was discovered, and energetic measures were at once taken to suppress this outbreak. The survey work on the Mexican border has been continued as well as research work at

Laguna Station. The instructions that have been issued relative to the disposition of cotton and cotton seed produced in regulated cotton zones in the State of Texas are quoted verbatim.

With regard to the European corn borer [*Pyrausta nubilalis*] the extension of the quarantine area is being discussed. In spite of the fact that the food-plants of this moth now number nearly 80, and that the present surveys are daily revealing new areas of infestation, in the majority of cases the damage done has been negligible and further quarantine action is not practicable. The present purpose is to determine as accurately as possible the distribution of the pest, and to carry on control experiments on a large scale with the object of determining the possibilities in that direction.

BERGER (E. W.). **The Semitropical Army Worm.**—*Qrtrly. Bull. Florida State Plant Bd., Gainesville.* iv. no. 2. January 1920, pp. 17–33. 1 fig.

Xylomyges eridania, Cram. (semi-tropical army worm) was the cause of serious destruction among castor beans in Florida in 1918. There are probably four principal generations, with a possible fifth, in the year, the infestation described assuming serious dimensions about mid-July. The life-cycle of each generation occupies an average of about 35 days; 4–6 days for the egg, 17 days for the larva, and 9 days for the pupa, the egg-laying period of the moths lasting about 4 days. All parts of castor plants are eaten by the caterpillars; the leaves are preferred, then the young fruit-spikes, the leaf-petioles and the tips of the shoots. The more mature caterpillars that are chiefly found near the base of the plants in the daytime generally eat the bark off the plant. Nearly mature spikes are not injured severely, only the outer green covering being eaten off. Other food-plants include cotton, of which the immature bolls are attacked and the blooms and squares, as well as the bark of the plants, sweet potato, sunflower, potato, velvet bean, okra, egg-plant, pepper, oleander, beggarweed, avocado, peanuts, watermelon, cowpeas and citrus, as well a number of broad, fleshy-leaved weeds such as careless-weed (*Amarantus*), *Sonchus* and *Rumex*.

Methods of control vary according to the stage of development of the caterpillars in the field. When they are young and before they have started to migrate from the parent leaf, and also in the egg-stage, hand-picking is a very efficient method, but if practised against the larger caterpillars would result in serious defoliation of the plants. Dusting and spraying with arsenicals are applicable under almost any conditions, and should cover not only the infested plants but also the weeds and grass between the rows. For dusting, a machine should be used when the plants are wet with dew, 1 part of powdered lead arsenate being used to 4 parts of hydrated or air-slaked lime; for spraying, $1\frac{1}{2}$ lb. powdered lead arsenate is required to 50 U.S. gals. of water, 125 to 175 gallons being necessary for each acre. The caterpillars of *X. eridania* do not migrate to such an extent as most army worms, but the larger individuals wander about a great deal over the ground and up and down the plants. A poisoned bait is very effective against this stage. $12\frac{1}{2}$ lb. each of rice bran and cotton-seed meal being mixed with 1 lb. Paris green and sweetened with syrup. The migrating instinct is not sufficiently strong to render ditching, as applied to other army worms, very successful. The use of light-traps against the adults has proved of little practical value.

Natural enemies appeared scarce at the beginning of the outbreaks, but became more useful later, in fact the author believes that it was predaceous insects and parasites that checked the numbers of the August generation, which was expected to be abundant. The larva of a ground beetle, probably a species of *Calosoma*, has been observed to devour larvae and pupae of *X. eridania*; Tachinids sometimes parasitise as many as 75 per cent. of the caterpillars; a cocoon of the genus *Ophion* was collected among some pupae, and the spined soldier bug (*Alcaeorrhynchus grandis*, Dall.) and a large brown wasp are said to destroy both eggs and larvae. Many pupae are parasitised by Sarcophagids. Birds are undoubtedly a factor in control of the caterpillars, the most important being the jackdaw, quail, meadow lark (*Saturnella neglecta*), rice-bird, and a shrike (*Lanius ludovicianus*).

Other insects observed on castor bean plants include *Heliothis* (*Chloridea*) *obsoleta*, F., which cuts round holes in the bean pods; *Pyroderces rileyi*, Wals. (pink corn worm), which probably feeds upon dying and dead material only; *Prodenia ornithogalli*, Guen. (sweet potato caterpillar); and *Laphygma frugiperda*, S. & A. (fall army worm), for which a dust composed of 1 part zinc arsenite and calcium arsenate to 4 parts of hydrated or air-slaked lime was used.

In an appended note by Mr. J. R. Watson, the opinion is expressed that Kansas bait is fully as efficient against *X. eridania* as dusting and much easier and quicker to apply, but where plants are tall it is difficult to distribute the bait over them. Whether the bait would be as efficacious if thrown on the ground at their base is not known.

MERRILL (G. B.). **The Yam Weevil (*Palaeopus dioscoreae*, Pierce).**—*Qrtrly. Bull. Florida, State Plant Bd. Gainesville*, iv, no. 2, January 1920, pp. 34–35.

A yam imported into Florida from Jamaica has been found to be heavily infested with young larvae of the weevil, *Palaeopus costicollis*, Mshl. (*dioscoreae*, Pierce). As the food-plant of this weevil in Jamaica is the yam (*Dioscorea batatas*) [and sweet potato], it might occasion much damage to this crop and possibly also to sweet potatoes if introduced into Florida, where the conditions are more or less tropical. The original description of *P. dioscoreae* is quoted [*R.A.E.*, A, vi, 209, 254].

Quarantine Department. Report on Inspections and Interceptions, all Ports and Stations, for the Quarter ending December 31, 1919.—*Qrtrly. Bull. Florida, State Plant Bd. Gainesville*, iv, no. 2, January 1920, pp. 36–37.

During the quarter ended 31st December 1919, a scale, *Aspidiotus destructor*, Sign., was intercepted on palms and castor beans from Cuba; *Pseudischnaspis alienus*, Newst., on *Caladium* and jasmine from Cuba; *Palaeopus costicollis*, Mshl. (*dioscoreae*, Pierce) (yam weevil) in yams from Jamaica; a scale, *Lepidosaphes alba*, Ckll., on cassava from the Bahamas; and *Pseudococcus sacchari*, Ckll. (sugar-cane mealy-bug) on sugar-cane from Cuba.

GREEN (F. J.). **The Larch Shoot-boring Moth.**—*Qrtrly. Jl. Forestry, London*, xiv, no. 2, April 1920, pp. 119–122.

The insect enemies of larch in England are of great economic importance, as this is one of the staple trees for timber production. *Lygaeonematus* (*Nematus*) *erichsoni* (large larch sawfly) can be checked to some extent by hand-picking the larvae and by encouraging insectivorous birds in the woods and nurseries. The most injurious pest is *Argyresthia laevigatella* (larch shoot-boring moth). The moths appear from about the second week in May in warm countries and in June in northern or colder localities. Pairing and oviposition occur soon afterwards, the eggs being laid on the young shoots. The larva hatches in June or July and, boring its way into the shoot, begins to tunnel and feed. It hibernates in the shoot and in early spring resumes feeding until May, when it pupates after boring a small exit hole through which the adult escapes. Damage done by this insect is frequently attributed to frost, especially when there is also an infestation of *Coleophora laricella* (larch mining moth) which bores into and kills the needles. Young larch trees, ten or twelve years old, are the most severely attacked. Japanese larch is objected to in some localities owing to its habit of growing multiple leaders, but the author attributes this in many instances to an endeavour to replace a leader destroyed by *A. laevigatella*, whereas in native and European larches only one shoot is sent out to replace an injured leader.

Control measures are difficult to carry out, but much can be gained by restricting the planting of larch to soil and localities suited to it, and by planting only strong plants with an abundance of fibrous roots. Insectivorous birds should be encouraged. In early spring, before the moths appear, affected shoots, distinguishable by their lack of foliage, should be cut out and burnt. The soil surface should be kept free from dead poles and branches. Initial thinning should be practised soon after the surface vegetation is suppressed, and this thinning should be consistent with a close overhead canopy so as to conserve the soil moisture and preserve the soil fertility.

MARSHALL (R. C.). **The Pine Beetle in the New Forest.**—*Qrtrly. Jl. Forestry, London*, xiv, no. 2, April 1920, p. 142.

Scots pines (*Pinus sylvestris*) in the New Forest have been extensively attacked by the pine beetle, *Hylurgus piniperda*. The beetles hibernate in the rootstock and occasionally in the hollowed-out shoots. Breeding occurs in dying or felled timber, especially pine logs that are lying about unbarked, and the larvae hatch in two or three weeks, the beetles appearing in June and July. There may be two generations in a year. Scots pine and occasionally larch are the only food-plants. The remedies are the eradication of breeding places and the provision of suitable breeding traps in which the beetles may be destroyed.

Hecke (G. H.). **The Grasshopper Outlook for 1920.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento,* ix. no. 3. March 1920, pp. 53–54.

Severe infestations of grasshoppers are expected in California in 1920 owing to the exceptional numbers of adults that were known to deposit eggs in the late summer of 1919; the mild and dry winter encouraged their development, and the shortage of spring rains will probably force them to migrate to irrigated lands and seek food in the green fields and orchards. A State-wide grasshopper campaign is being undertaken.

Quayle (H. J.). **The Codling Moth in Walnuts. A Partial Report of Investigations for 1919.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento,* ix. no. 3. March 1920. pp. 64–69, 2 figs.

The codling moth, *Cydia* (*Laspeyresia*) *pomonella,* has been known in California as a pest of walnuts, as well as of apples, since 1909. Recent experiments have proved that the insect can be transferred from one food-plant to another without affecting its development. Under field conditions, however, when walnut and apple foliage are interwoven, 90 per cent. of the apples may be infested and not more than 1 per cent. of the walnuts, while outside the area of walnut infestation, the nuts will remain immune though apples growing in contact with them are infested. Until recently it was thought that the later broods only attacked walnuts, but it is now known that the life-history of the moth is practically identical on both food-plants within the same locality.

Most of the larvae appearing in early spring enter the nuts at the calyx end, causing them to fall to the ground without attaining maturity. When the nuts have grown large enough to come more or less in contact, the larvae frequently enter at the point where two nuts touch each other. From mid-July onwards the nuts are harder and the larvae can only enter at the suture at the base, or, if they fail to find this, they may complete development in the husk of the nut.

The control of *C. pomonella* in walnuts should follow, in general outline, the methods adopted in the case of apples, but the large size of walnut trees presents a difficulty in reaching all parts; it is also difficult to get the poison to where two nuts are in contact, and there is no calyx cup to fill. An average-sized walnut tree requires 25 U.S. gals. of spray to cover it thoroughly, a larger one, 35 U.S. gals., while an apple tree requires 8 or 10 U.S. gals., but reckoned on acreage there is not much difference, there being fewer walnut-trees than apple-trees to the acre. Burlap bands round the trunk are a valuable accessory measure. Dusting with lead arsenate powder was tried extensively in 1919, and gave considerable success both with walnuts and apples. To avoid injury to the tree, basic or neutral lead arsenate should be used rather than the standard or acid variety. Applications should be made just previous to the time when the maximum number of larvae of the two important generations enter the nuts, the dates differing with different counties. It has been found that where the percentage of infestation is sufficiently high, dusting has reduced it considerably; while in cases of low infestation, such as 2 or 3 per cent., it is doubtful whether the treatment pays for itself.

SHEAR (W. V.). **The Eelworm and Potatoes.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento,* ix, no. 3, March 1920, pp. 69–71, 1 fig.

Potatoes in California are heavily infested with eelworms, which attack the outer layer of the potatoes to a depth of about $\frac{1}{4}$ in. One tuber may contain many thousands of these Nematodes, which will cause it to shrivel prematurely and decay. Infestation is largely spread by the sowing of infested tubers, especially when table potatoes are used for seed purposes, and also by throwing the parings from infested potatoes on to the land either as rubbish or to serve as manure. It is highly important that the distribution of infested potatoes should be rigidly prevented, and this can be done by planting only disease-free seed on disease-free land.

NOUGARET (R. L.). **Sulphur Fumigation for the Control of Mealybug (*Pseudococcus bakeri,* Essig) on Grape Vines in the Vineyard.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento,* ix, nos. 1–2 & 3, January, February and March 1920, pp. 26–31 & 83–85, 2 figs.

Fumigation by means of sulphur burned under a tent has been found very effective against the mealy-bug, *Pseudococcus bakeri,* Essig, on grape-vines. The life-history of the insect is different on grapes from that on any other food-plant. On grape there are two distinct generations, which do not overlap, as is the case on citrus or pear; the first hatches in June and is the progeny of the overwintering larvae, the second hatches during September and October. Hibernation occurs in the larval stage, within the ovisac. Fumigation, therefore, is directed against the larvae only, as there are no eggs to be taken into consideration. Full instructions for the process of fumigation are given, advice as to materials, and the cost of fumigation per vine has been worked out.

The mealy-bug, being wingless and very slow in locomotion, seldom spreads by its own efforts to neighbouring vines, unless these overlap or touch, but is largely disseminated by wind, on the clothes of grape-pickers and in the grape-picking boxes. These boxes should always be fumigated after use by burning $\frac{1}{2}$ lb. sulphur per 100 cu. ft. of space in a fruit-fumigating shed or under canvas, the process lasting at least half an hour. Honeydew on grapes is a positive sign of the presence of the mealy-bug, and all bunches of grapes marked with it should be refused at the packing shed.

WOODWORTH (H. E.). **Damage to Nursery Plants by the Fire Ant (*Solenopsis geminata,* subsp. *maniosa,* Wheeler).**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento,* ix, no. 3, March 1920, pp. 87–88, 1 fig.

The ant, *Solenopsis geminata* subsp. *maniosa,* Wheeler, commonly known as the fire ant, has been very injurious in California to passion vines (*Passiflora edulis*). The ants build their nests in a mound from two to four inches high around the stems of the vines, using the hollowed stems as entrances and exits to their nests and frequently causing the death of the plant, probably by girdling. Fumigation by pouring one or two ounces of carbon bisulphide into holes made in the nest would prevent the spread of the ants and the ultimate destruction of other plants, but would be very injurious to the plants that received treatment. Other investigators have recommended a solution of 1 oz. potassium cyanide to one gallon water used in the same way; this would probably be more effective in dry ground and sandy soil. A solution of Black-leaf 40 is also very effective.

CURRIER (D. L.). **Damage to Tomatoes by the Potato-tuber Moth** (*Phthorimaea operculella*, **Zeller**).—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, ix, no. 3, March 1920, pp. 91–93, 2 figs.

Tomatos in Santa Clara County, California, were in 1919 infested with the potato-tuber moth, *Phthorimaea operculella*. While the number of fields in which serious loss was caused by the larvae was small, the possibilities of damage are considerable, the moth being an active flier and capable of rapid spread. The larvae infest very small, green tomatos as well as ripe ones. They generally enter at the stem end of the fruit and work just under the skin; later they burrow deeper into the fleshy part of the tomato, sometimes lightly webbing the entrance to the tunnel. There are frequently 7 or 8 larvae in one fruit, sometimes as many as 15 or 16. It has not yet been discovered where oviposition occurs.

If all the plants and fruits are piled up and burned shortly after they have been killed by the autumn frosts most of the larvae will be killed. Burning the plants and ploughing the fruit under to a good depth might be as effectual and would be cheaper. Clean cultivation, including the destruction of such weeds as would serve as breeding-places or hibernation quarters for the insect, is advocated, and sheep and pigs might with advantage be turned into the fields to clean up refuse.

MASKEW (F.). **Quarantine Division. Report for the Month of January, 1920.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, ix, no. 3, March 1920, pp. 98–99.

The pests intercepted during January included: From Hawaii, *Hemichionaspis minor* and *Chrysomphalus aonidum* on coconuts; *Diaspis bromeliae* and *Pseudococcus bromeliae* on pineapples; *Coccus elongatus* on betel leaves; *Parlatoria ziziphus*, *Chrysomphalus aonidum* and *Lepidosaphes beckii* on oranges. From Japan, *Hemichionaspis aspidistrae* on tangerines. From Central America, *Pseudococcus* sp., *Aspidiotus cyanophylli* and *Icerya purchasi* on bananas. From Mexico, *Heliothis* (*Chloridea*) *obsoleta* on tomatos; *Lepidosaphes gloveri* and *Parlatoria pergandei* on limes. From Colorado, *Cydia* (*Laspeyresia*) *pomonella* on apples. From Florida, *Lepidosaphes beckii* on oranges. From Oregon, *Chionaspis pinifoliae* on Douglas fir and *C. pomonella* on apples. From New Jersey, *Chionaspis furfura* on undetermined plants. From South Dakota, *C. pomonella* on apples. From Washington, *C. pomonella* on apples and larvae of *Balaninus* sp. in chestnuts.

Essig (E. O.). **Important Dried Fruit Insects in California.** *Mthly. Bull. Cal. State Dept. Agric., Sacramento*, ix, no. 3 (Supplement), March 1920, pp. 119–125, 5 figs.

There are not many insect pests of dried fruits in California, but the few that occur are responsible for a great deal of damage and loss. The larvae of the moths attacking dried fruit are easily detected by their habit of webbing the fruit and the container, and by the presence of the thick white cocoon that they spin for pupation. The moths, attracted by the scent of the fruit, oviposit directly upon it whenever possible, and the young larvae generally manage to gain access to it. Each generation requires from one to two months, so that reproduction is rapid. The commonest species is *Plodia interpunctella* (Indian meal moth), which breeds in all cereal products, nuts, seeds, and many kinds of dried foods. Owing to its general feeding habits this insect is very troublesome in public warehouses and stores. Pupation frequently occurs in corners and crevices of the packing houses and the moths can survive from crop to crop, so that a house once infested will remain so unless thoroughly treated. *Ephestia cautella*, Wlk. (fig moth) has been repeatedly introduced into America in Smyrna figs, and has become established in many localities, but has not yet become a pest in California. Watch should be kept for its appearance.

The larvae of beetles infesting dried fruits may be distinguished *inter alia* by their inability to spin webs. They work in the fruit, in which they pupate, the adults being very active and strong fliers. The most injurious beetle is *Carpophilus hemipterus*, L., the larvae of which reduce the fruit to a mass of fine powder. Fruit frequently becomes infested while still on the trays in the drying yards, and the pest is thus carried to the packing houses. It is particularly abundant in the central valleys and southern parts of the State. [*R.A.E.*, A, iii., 681]. *Silvanus surinamensis*, L. (saw-toothed grain beetle) is also very injurious at times, particularly to figs, destroying not only the fruit, but also boring holes in the packages.

The most important factor in control of all these insects is cleanliness. With the exception of *C. hemipterus*, infestation almost always occurs in the packing house or in a storehouse after packing. All packing houses should therefore be thoroughly cleaned prior to harvest time. Fruit that has been kept since the previous season should be carefully inspected, and if any infestation is found, the entire house should be thoroughly treated.

General directions for fumigating packing-sheds, storehouses, or piles of fruit-boxes under canvas, with either carbon bisulphide or hydrocyanic acid gas are given. Much success has been obtained with a vacuum fumigator in which materials are placed for fumigation after the air has been drawn off. The advantages of this method include thorough penetration of the gas into the densest materials, quickness of killing and operation, and ease and safety in handling. Carbon bisulphide, hydrocyanic acid and dry steam can be used in this way. The equipment is expensive, but is lasting and efficient.

A very general treatment of insects in mills, packing houses, etc., is by heat, a temperature of 140° to 180° F. being maintained for several hours. This is sufficient to kill larvae, adults, and generally all eggs, though repeated treatments may be necessary to ensure complete eradication. Hot water may effectively be used as a dip preparatory to packing. If sealed and insect-proof packages are used, fruit may pass through a lengthy period of storage without danger of infestation. Attention has already been drawn to the value of machinery for sealing [*R.A.E.*, A, iii., 575]. This process has been adopted by many cereal food manufacturers, and might advantageously be used in the dried fruit industry.

McDaniel (E.). **Termites in Buildings** (*Leucotermes flavipes*).—*Qrtly. Bull. Michigan Agric. Expt. Sta., East Lansing*, ii, no. 3, February 1920, p. 124.

Termites, *Reticulitermes* (*Leucotermes*) *flavipes*, have been doing considerable damage to wooden structures of all kinds in Michigan. They are difficult to eradicate from a building, as the parent nests may be several rods away in the soil, or in rotting stumps. Badly infested timbers should be burned. If this is impossible, kerosene or ammonia injected into the cavities is beneficial, as also are light, dryness and ventilation. All termite nests and rotten timber in the neighbourhood of them should be destroyed. Timbers treated with coal-tar creosote, or with zinc chloride by the pressure process, are very resistant to attack. It is not safe to sink untreated timbers in concrete foundations since, if the concrete cracks, it leaves an ideal entrance for termites.

Sturtevant (A. P.). **A Study of the Behaviour of Bees in Colonies affected by European Foulbrood.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 804, 16th March 1920, 28 pp., 6 figs.

European foulbrood is known to be an infectious disease due to *Bacillus pluton*, the incubation period being from 36 to 48 hours. During the first 5 to 7 days after the colony becomes infected the spread of the disease is slow; after this interval the disease increases rapidly under favourable conditions. The critical time to detect the disease and begin treatment is therefore early in its course. Evidence tends to confirm the theory that one of the ways by which the disease is spread in the colony is by the house-cleaning bees, and from colony to colony by their drifting. Infection is probably carried on the mouth-parts and feet; the question of infection from the intestinal contents or from the source of larval food at various stages needs further substantiation. Italian bees offer the greatest resistance to the disease, perhaps owing to their vigorous house-cleaning habits rather than to any natural immunity. Infection does not seem to be always removed by a period of queenlessness. Re-queening is generally necessary, except possibly in the strongest Italian colonies. A heavy honey flow tends to prevent infection from gaining a foothold, and also tends to eliminate the disease if present when the the heavy flow begins. European foulbrood is a disease of weak colonies; it is difficult to infect any but very weak colonies during a heavy honey flow; therefore, colonies kept strong up to the time of the honey flow run very little danger of contracting the disease.

ANSTEAD (R. D.). *Xyleborus* **Beetles.** *Planters' Chron., Coimbatore,* xv, no. 11, 13th March 1920, p. 179.

The most important beetle of the genus *Xyleborus*, namely, *X. fornicatus* (shot-hole borer of tea) does not appear to occur in South India. Two other species have however been discovered on South Indian estates; *X. compactus* attacks the stems of *Coffea robusta*, which is apparently its only food-plant. It is not certain that this is really a primary pest; it may be merely a borer in dead wood. The remedy appears to be to cut out all attacked shoots well back to the healthy wood and burn them, any wounds made being coated with tar. *X. biporus* is a small borer that attacks *Hevea*, but is a secondary pest infesting only wood or bark already killed by other causes. The remedy is to treat such wounds as quickly as possible after they are made. Logs of *Hevea* are rapidly attacked by these borers after thinning-out operations.

GOWDEY (C. C.). **Report of the Government Entomologist.** *Uganda Dept. Agric. Ann. Rept. Year ended 31st March 1919, Entebbe,* 1920, pp. 36—40. [Received 8th April 1920.]

Insect pests of coffee that have not been dealt with in previous reports include *Anthores leuconotus*, Pasc. (white coffee stem-borer), which has been very destructive in Tanganyika Territory, and was discovered in Uganda in 1900. *Diarthrothrips coffeae*, Will., was reported from two districts as causing considerable loss to coffee [*R.A.E.*, A, vii, 260]. *Antestia lineaticollis*, Stål (*orbitalis*, Westw., var. *faceta*, Germ.), has not apparently been so abundant or so injurious as in the preceding year [*loc. cit.*], and this was particularly noticeable on an estate where the rearing of its egg-parasites was systematically carried out. The scale, *Asterolecanium coffeae*, Newst., was reported from some districts; on one estate where the predaceous Coccinellid, *Chilocorus discoideus*, Crotch, had been destroyed owing to ignorance of its utility, the pest appeared in large numbers.

Among cacao pests mentioned in the previous year's report a species of *Nygmia* (pod-moth) was wrongly recorded as *Euproctis mediosquamosa*, B.-Bak. [*loc. cit.*]. Another pod-moth, *Phthoropora carpella*, Wlsm., apparently only attacks pods previously infected with pod-rot. The scale, *Stictococcus diversiseta*, Silv., has been found to be parasitised by a Chalcidid, *Aethognathus afer* var. *cavilabris*, Wtrst., [*R.A.E.*, A, v., 456]. A previously unrecorded cotton pest is a phytophagous beetle, *Chlorita facialis*, Jac., which feeds on the underside of the leaves and within the bracts.

Sugar-cane at Kampala was found to be attacked by *Pseudococcus* sp. and *Chionaspis madiunensis*, Zehnt. The latter scale is new to Uganda and has probably been imported from Java. On bananas, *Aspidiotus destructor*, Sign. (Bourbon scale) is widely distributed, but shows a preference for the red variety.

Cosmopolites sordidus, Germ. (banana borer) has lately become rather important as a banana pest. This weevil, besides occurring on the mainland, has been collected on Bakassa Island, Sesse Group, which has been uninhabited for years, and it is probably not therefore a recent introduction. It is always found on old banana plots where very little cultivation is practised. As breeding is continous throughout the year and as bananas are grown for several years on the same plot, all plants in an infested plot soon become affected. The best methods of controlling the pest are good cultivation and sanitary measures, and the rearing of certain Histerid beetles that are predaceous on it. Three swarms of the locust, *Cyrtacanthris septemfasciata*, Serv., var. *fascifera*, Wlk., were reported during the year.

Tinea pellionella (case-bearing clothes moth) has been recorded for the first time in Uganda, destroying the felt on piano keys.

SCHOLL (E. E.). **Method of Procedure in Pink Bollworm Eradication Work in Texas.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 1, February 1920, pp. 38–44, 1 map. [Received 13th April 1920.]

This paper is an account of the Texas Pink Bollworm Act of 1919 as amended from the similar Act of 1917 [*R.A.E.*, A, vi, 543]. Its aim is firstly to prevent the introduction of the moth [*Platyedra gossypiella*] from Mexico and secondly to eradicate outbreaks that have become established in the State.

The danger of importation is safeguarded by frontier safety zones in which non-cotton zones can be made if need arises; this is supplemented by fumigation of imported cotton. If an outbreak occurs outside this safety zone, a non-cotton zone may be declared in which all cotton is destroyed; or, if the infestation is light, a regulated zone under quarantine rules may be set up; in any case provision is made for compensation of the growers for the loss involved.

FELT (E. P.). **The European Corn Borer Problem.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 1, February 1920, pp. 59–91. [Received 13th April 1920.]

In this paper and the discussion that followed it the importance of the European corn borer, *Pyrausta nubilalis*, was considered, and suggestions made as to the grants that would be desirable to combat it.

The methods of control recommended are chiefly adaptations to local conditions of methods already noticed [*R.A.E.*, A., viii, pp. 97–99].

SAFRO (V. I.). **The Work of the Railroad Entomologist.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 1, February 1920, pp. 112–117. [Received 13th April 1920.]

The benefits of railway agricultural departments suggest that there is a great opening for the entomologist in the same direction. Greatly increased tonnage would result from co-ordinated entomological work in the districts served by railways, and examples of loss from the lack of it show this over and over again. In addition to the direct profit, the increased wealth of the population along railways would be an asset, and more use of railways would be made.

Railway economics are greatly affected by crop diversification. Greater variety means less risk, better distribution of rolling stock and labour. Crops that might be grown commercially are often neglected because of insect pests, when organised remedial measures would render them profitable. Railroad co-operation with government or other agencies would often be beneficial, while in matters of quarantine and inspection an entomologist would eliminate a great deal of loss and friction.

PIERCE (W. D.). **Commercial and Professional Entomology—the Future of our Profession.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 1, February 1920, pp. 117–123. [Received 13th April 1920.]

The sphere of activity of an entomologist working independently as a professional and consulting specialist is discussed. Of late years business men recognise the possibilities of scientific processes, and brains, foresight and initiative can name their price. A combination of investigation, consultation, demonstration, practice and possibly manufacture offers the widest scope. Results must be produced quickly. An entomologist must know how to present estimates of the cost of his work, and how to keep the cost at a competitive level.

NEWELL (W.) & BYNUM (E. K.). **Notes on Poisoning the Boll Weevil. Results of an Investigation to Determine whether the Presence of Dew or Rain Water on Cotton Plants is necessary to the effective use of Arsenates.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 1, February 1920, pp. 123–136, 1 plate. [Received 13th April 1920.]

The experiments here described were made in field-cages, the cotton plants being treated with either calcium arsenate or lead arsenate or left untreated as a control, some cages in each class being protected from all rain and dew. Further experiments were made to find the amount of poison in the dew on treated plants, and the effect of this dew on the weevils [*Anthonomus grandis*] when deprived of other food, and also when supplied with unpoisoned food and poisoned dew.

These showed that the mortality among boll-weevils on cotton plants treated with lead and calcium arsenates and kept protected from all rain and dew was appreciably higher than the mortality on plants similarly treated but exposed to dew and normal precipitation. As the presence of dew or rain-water on the cotton plants does not increase the effectiveness of either lead or calcium arsenate as a boll-weevil poison, it is evident that mortality from the use of either of these is brought about by ingestion of the poison with the weevil's food and not by drinking the so-called "poisoned dew."

Dew collected from cotton plants treated with lead arsenate at the rate of approximately 8 lb. per acre was found, upon analysis, to contain 6·7 parts of arsenic per million. Dew from plants treated with calcium arsenate at the same rate was found to contain from 10 to 43·5 parts of arsenic per million. The dew was collected only from cotton leaves that showed a distinct, thorough white coating of the arsenates.

Boll-weevils deprived of all food and having dew from treated plants as the only source of moisture suffered a greater mortality than boll-weevils confined with clear water, showing that the dew contained sufficient arsenic to produce death when the weevils were compelled to take the dew and no other food or water over a period of several days. Such a condition, however, does not occur in cotton fields. When boll-weevils had access to food in the form of non-poisoned cotton squares and, at the same time, to dew from treated plants, no mortality resulted, showing that the weevil can be poisoned under normal conditions only by poisoning its food. Consequently it would seem that as the boll-weevil is poisoned largely or entirely through taking poison with its food, machinery for applying poison to the cotton plants should be so designed as to apply the poison primarily to the squares, bolls and terminal buds, rather than to the foliage.

The greatest mortality among the boll-weevils occurred on the third day following application of the arsenates and fell off rapidly after the seventh day, indicating that, other things being equal, applications should be at intervals of a week, or less, apart.

Kelly (E. G.). **Outline of Project Work in Extension Entomology.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 1, February 1920, pp. 137–140. [Received 13th April 1920.]

Extension work in entomology means the carrying to the producer of information as to the control of his insect pests. The organisation of this work in Kansas is described. County agents, under the direction of the Extension Entomologist, exist at each County Farm Bureau. The Entomologist sees the agents at conferences, and they hand on his recommendations to the farmers at "insect committees." This programme is elastic, and can be intensified in emergency, while the Entomologist may devote two or three days to helping the agent in a particular area.

The agent's campaign is helped by publicity methods, and at the same time there is an educational side to the work, short lessons being sent to every farmer in the county to follow up the campaign. There are extension schools for farm workers when opportunity offers, and advantage is taken of local opportunities such as the county fairs for reaching as many people as possible.

Harned (R. W.) & Snapp (O. I.). **Two "Spray your Orchard Week" Campaigns in Mississipi.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 1, February 1920, pp. 140–142. [Received 13th April 1920.]

In 1917 from 85 to 90 per cent. of all deciduous fruit trees in Mississippi were more or less infested with San José scale (*Aspidiotus perniciosus*). A campaign was organised during the summer of 1917, to be carried out in December, for the purpose of urging upon every farmer possessing an orchard to spray it for this pest. Prizes were given for the best outfits for spraying suited to various orchards. Publicity work was undertaken, and, under the direction of the county agent, the aid of every possible local authority and association was called in. The campaign achieved very good results. Infestation by this scale materially decreased, and the use of insecticides was realised as a practical factor in the State. A further campaign on the same lines took place in February 1919, in which Louisiana joined.

HOLLISTER (W. O.). **Distribution of Shade Tree Insects in 1919.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 1, February 1920, pp. 143–146. [Received 13th April 1920.]

The country east of the Mississippi and north of the Mason-Dixon line is dealt with, but more especially that around the larger cities from Chicago eastwards towards Boston and Washington.

Aphids were abundant, especially *Phyllaphis fagi* and *Phenacoccus acericola.* Of scale-insects the oyster scale (*Lepidosaphes ulmi*) was numerous, others being *Chionaspis pinifoliae, Toumeyella liriodendri, Chionaspis americana, Gossyparia ulmi, Pulvinaria vitis, Asterolecanium variolosum,* and occasionally the San José scale [*Aspidiotus perniciosus*].

Leaf-eating insects were not particularly destructive, except canker-worms locally in the spring. Those reported include: *Melasoma scripta* (cottonwood leaf beetle), *Vanessa antiopa, Thyridopteryx ephemeraeformis, Datana integerrima,* the elm leaf beetle [*Galerucella luteola*], the elm leaf-miner [*Kaliosysphinga ulmi*], the elm case-bearer (*Coleophora limosipennella*), *Hyphantria cunea,* which seems on the increase, *Chalepus dorsalis* (locust leaf-miner) and *Hemerocampa leucostigma* (tussock moth).

The most destructive insects are the borers, their presence frequently escaping notice till serious damage has been done, though they seem to prefer trees of a lowered vitality. The bronze birch borer (*Agrilus anxius*) is gradually killing white birches, and the hickory bark borer, *Scolytus* (*Eccoptogaster*) *quadrispinosus,* is also very destructive. Others are *S.* (*E.*) *multistriatus, Prionoxystus robiniae, Cyllene robiniae, Ecdytolopha insiticiana,* the leopard moth (*Zeuzera pyrina*), the sugar maple borer (*Plagionotus speciosus*), *Aegeria* (*Sesia*) *acerni, Agrilus bilineatus,* and twig pruners, especially *Elaphidion villosum.* The black carpenter ant (*Camponotus*) tunnels into and weakens a tree if it finds an opening, while red spiders (*Tetranychus*) are causing increasing injury.

WALTON (W. R.). **European Corn Borer in Broom Corn.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 1, February 1920, p. 147. [Received 13th April 1920.]

Early in February 1920, considerable numbers of both larvae and pupae of *Pyrausta nubilalis* were intercepted in broom corn (*Andropogon sorghum*) by the Federal Horticultural Board. The broom corn in question came from Venice, and consisted of 97 bales of 200 lb. each, an occurrence that strengthens the belief that this moth first gained access to America in this grain.

WADLEY (F. M.) **Note on *Eriopyga incincta*, Morr.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 1, February 1920, p. 148. [Received 13th April 1920.]

The cutworm-like caterpillar of *Eriopyga incincta* is recorded as abundant but local in Kansas. Lucerne, and probably beans, were attacked. The larvae were not observed actually feeding, but were hidden on the surface of the ground, at the same time that *Feltia subgothica,* usually the commonest cutworm, was scarce.

The larvae pupate early in June or late in May. The adults emerge about September. Hibernation probably takes place in the larval stage, but the length of the egg, larval, and hibernation stages is not yet known.

Rosewell (O. W.). **Two Rhynchophora found feeding in Sweet Potatoes.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 1, February 1920, p. 148. [Received 13th April 1920.]

In Louisiana considerable damage caused to sweet potato was attributed to the sweet potato weevil (*Cylas formicarius*), but was also due to some extent to the Scolytids, *Xyleborinus pecanis* and *Platypus compositus.* The burrows of the former are clean cut, those of the latter filled with some material. Trees or newly cleared land were always present near the infested fields.

Rosewell (O. W.). *Anasa tristis*, **De G. (Hemiptera) feeding on Leaves and Fruit of the Fig Tree.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 1, February 1920, p. 148. [Received 13th April 1920.]

Adults and nymphs of the bug, *Anasa tristis*, were observed in considerable numbers in August on fig trees in Louisiana, no cucurbit vines being within one hundred yards.

Smyth (E. G.). **To keep out Cane Butterfly.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 1, February 1920, p. 149. [Received 13th April 1920.]

Attempts have been made in Porto Rico to secure permission to introduce seed sugar-cane from San Domingo, in the hope of overcoming the mosaic disease of sugar-cane. There would however, have been great risk of introducing also the butterfly, *Calisto archebates*, which would have been an irreparable calamity in Porto Rico, where already May beetles [*Lachnosterna*] and *Diaprepes spengleri* cause great loss to sugar-cane.

There are no regulations, Federal or Insular, that could be utilised to keep out this cane; but the idea was given up under pressure from the quarantine experts of the Insular Experiment Station in favour of the cultural methods of combating the disease that they advised.

Chittenden (F. H.). U.S. Bur. Entom. **The Porto Rico Mole-Cricket in South Carolina and Florida.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 1, February 1920, pp. 149-150. [Received 13th April 1920.]

The Porto Rico mole-cricket (*Scapteriscus vicinus*, Scud.), for a number of years a troublesome pest in Georgia, has recently reappeared in South Carolina and Florida, where it had been noticed in 1915 and 1917.

In August 1919 it damaged the fairways and greens of the Florida County Golf Club. Carbon bisulphide and lead arsenate were unsuccessful against it, but poisoned baits, like those used for cutworms, were very effective.

In and around Charlestown, South Carolina, an infestation was reported to cover an area of 12 square miles and to be spreading annually.

In some cases, some of the chief root and vegetable crops have had to be abandoned, and the cabbage industry is threatened. Poisoned baits were not successful, probably because of the lateness of the season, as they were not applied till October.

HEINRICH (C.). U.S. Bur. Entom. **A New Genus and Species of Oecophorid Moths from Japan.**—*Proc. Entom. Soc. Washington, D.C.*, xxii, no. 3, March 1920, pp. 43–50, 2 plates.

Santuzza kuwanii, gen. et sp. n., is described from five individuals of both sexes reared from stored grain at Yokohama. Descriptions of the larva and pupa are also given.

MANN (W. M.). **A Proctotrypid Inquiline with** *Formica exsectoides*, **Forel. (Hym.)**—*Proc. Entom. Soc. Washington, D.C.*, xxii, no. 3. March 1920, pp. 59–60.

The Proctotrupid, *Megaspilus crawfordi*, sp. n., is described from a nest of *Formica exsectoides*, Forel. This is the first species of its genus to be recorded from ants' nests in America, but a number of European species have been noted as myrmecophilous in habit.

Insect Investigations.—*32nd Ann. Rept. Maryland Agric. Expt. Sta., College Park, Md.*, 1918–1919, pp. ii–vii. [Received 13th April 1920.]

Much of the work recorded for the year under review has already been noticed in the Bulletins published by the Station. Experiments against the woolly apple aphis [*Eriosoma lanigerum*] show that an 8 per cent. pine-tar creosote emulsion applied twice a year is efficient in controlling this Aphid and is not injurious to the trees, except where the ground is such that the soil holds the creosote and natural water around the trunk practically throughout the year. A number of new insecticides have been and are being tried in the field, and the results secured will form the basis of recommendations made to farmers applying for insecticide material. Further experiments in the control of *Cydia* (*Laspeyresia*) *molesta*, Busck (Oriental peach-moth) [*R.A.E.*, A, vii, 254] indicate that orchards can be protected by thorough spraying with a combination of self-boiled lime-sulphur, nicotine sulphate and a satisfactory spreader, such as lime caseinate. In the vicinity of the Experiment Station, 46 species of flea-beetles have been collected and an annotated list of them will be published.

Experiments in dusting peach and apple trees indicate that insects are controlled to about an equal extent as in liquid spraying, but that diseases are not so easily checked.

CHITTENDEN (F. H.). **Harlequin Cabbage Bug and its Control.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 1061, February 1920, 16 pp., 5 figs.

Murgantia histrionica, Hahn (harlequin cabbage bug) is a serious pest of cabbages in the Southern United States, the injured fields looking as though they had been swept by fire; hence the name "fire-bug." The life-history and habits of this pest, its food-plants and methods of control are discussed. [*R.A.E.*, A, vi, 300; vii, 243.] It is urged that every effort should be made to prevent it from spreading further northward, and the importance of destroying the first generation of bugs, *i.e.*, those that have hibernated through the winter, and their progeny is emphasised. The co-operation of growers is absolutely essential if success is to be attained.

Back (E. A.). **Book Lice or Psocids.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 1104, February 1920, 4 pp., 1 fig.

The habits of Psocids (book lice) and the conditions favourable to their increase are described. They are most numerous in houses during late summer and early autumn, and are most abundant in damp, shaded rooms not in general use, and in houses that have been shut up for long periods. When a few individuals are present, which is frequently the case, as they easily enter a house from outside, thoroughly airing a room after heating to 120° to 140° F. for several hours and moving the furniture into the sunshine should be sufficient to rid it of them. When the numbers become alarming in any room the breeding-place should be at once located. If the source is a mattress, as is often the case, this should be burnt and the room fumigated with sulphur, using 1 lb. for every 1,000 cubic feet of space. Chests, boxes, trunks, etc., can be fumigated satisfactorily with carbon bisulphide.

Kalkus (J. W.). **Orchard Horse Disease.**—*Amer. Jl. Vet. Med., Chicago*, xv, no. 4, April 1920, pp. 139–143, 8 figs.

Present knowledge of this disease indicates that it is confined to the irrigated apple orchard districts where lead arsenate sprays are commonly used. The disease may possibly be due to poisoning of the lucerne or hay crop under the fruit trees owing to excess of the spray. Doubt is thrown on this theory by the fact that the symptoms of the disease do not resemble arsenic or lead poisoning in every particular. If the theory is correct, the chronic form of the disease may be due to the lead, and the acute form to arsenical poisoning. It is hoped that a definite conclusion may be reached as a result of the experiments now being conducted at the Washington Agricultural Experiment Station.

Paillot (A.). **La Phagocytose chez les Insectes.**—*C. R. Soc. Biol., Paris*, lxxxiii, no. 12, 27th March 1920, pp. 425–426.

Referring to Metalnikoff's recent paper on immunity in insects [*R.A.E.*, A, viii, 163], the author points out that it is in general the saprophytic microbes that are pathogenic to the larvae of *Galleria mellonella*, while those that are highly pathogenic to man or the larger vertebrates are less pathogenic to them, and sometimes incapable of causing their death. In many previous papers, the author has expressed the opinion that phagocytosis is not the only method of defence of larvae inoculated with entomophytous microbes;

it may even be said that that this is not the most efficacious defence. Further proof of this point will be published in a subsequent paper.

A typical case is that of *Bacillus liparis.* The micronucleocytes in the blood of larvae of any species show a remarkable affinity for this bacillus; the envelopment begins soon after inoculation; the microbes are not seized by the pseudopodia of the cells; at first they attach themselves to the surface of the micronucleocyte, the protoplasm degenerates by their contact and the microbes then penetrate into the cell and become directly incorporated with the protoplasm. The influence of the protoplasm on the incorporated bacillus is nil; its vitality is not even impaired after a prolonged sojourn in the cell. When the accumulation of bacilli is large enough the cell becomes disorganised; this is frequently the cause of death in larvae, even those that are most resistant to microbe infection.

Larvae that do not generally show any resistance to infection, such as those of *Pieris brassicae* and *Vanessa urticae*, are very susceptible to the action of the bacillus and yet the micronucleocytes and also the other elements of the blood actively phagocytose it. If the temperature is low the larvae resist indefinitely, but if the temperature rises the microbes immediately multiply in the blood and cause the death of the larvae. A number of entomophytous microbes act in a similar manner to *B. liparis;* enveloped in large numbers by the micronucleocytes they become parasitic on the cells and are thus pathogenic to their host. If the number of microbes injected is small the micronucleocytes tolerate their presence, and if the temperature is low, the infection does not become generalised. In any case, it is difficult to consider the envelopment of the microbes as a defensive reaction on the part of the insect.

The most typical cases of immunity, those in which the insect is resistant to the inoculation of a large mass of microbes, does not seem to be in any way due to phagocytosis. The case of *B. melolonthae non-liquefaciens* β has already been studied; a certain number of other bacilli seem to behave in the same way, *e.g.*, *B. melolonthae non-liquefaciens* γ, *B. pieris non-liquefaciens* α and *B. hoplosternus;* it is hoped that experiments will decide this point in the near future.

It is noticeable that the larvae that demonstrate the most remarkable cases of immunity are precisely those in which the reaction of karyokinesis appears most regularly and most strongly. This seems a strong indication, if not a proof, that the most active immunity is not due to phagocytosis alone, but to humoral or cellular reactions, the nature of which has not yet been definitely determined.

L'Utilisation industrielle des Sauterelles comme Engrais dans l'Uruguay. —*Bull. Agric. Algér. Tun. Maroc, Algiers*, xxvi, no. 1–2, January-February 1920, pp. 25–26. [Received 6th April 1920.]

In Uruguay experiments with locusts dried in ovens or by the sun show that a product can be obtained which may be employed in several ways.

As a fattening food for domestic animals it has a higher value than oil-cake. As a fertiliser, particularly in extensive cultivation, it is richer in nitrogen and phosphoric acid than dried blood or powdered meat guano. The grease it contains can be used as a lubricant.

Some modifications in drying methods have ensured the practical utility of this product; its economic value, as a set-off to the damage done by locusts and the cost of their control in regions subject to periodic invasion, is obvious.

Vogelschutz. [Bird Protection.]—*Schweiz. Zeitschr. Obst.- u. Weinbau, Frauenfeld*, xxix, no. 7, 3rd April 1920, pp. 106–108.

In view of the increasing losses due to insects the necessity for providing nesting facilities for birds is urged, especially since natural ones are becoming rare in Switzerland owing to progress in agriculture and forestry. Many useful birds destroy three or four thousand insects a day during their breeding period, a result that is not obtained by artificial methods.

BERLESE (A.). **Tornerà la *Diaspis* sui nostri Gelsi?** [Will *Aulacaspis pentagona* re-infest our Mulberry Trees?]—*Boll. Agricoltura*, no. 11, (Reprint in *La Campagna, Como*, xix, no. 318, 31st March 1920, p. 1, 1 fig.)

Alarm has been expressed in various districts of north Italy regarding an apparent re-infestation by *Aulacaspis pentagona*, and the aim of this article is to point out that the increase of the scale is only temporary and is due to its momentary preponderance in the ever-varying balance between it and its parasite, *Prospaltella berlesei*, which latter is bound to regain the upper hand after a short interval.

LOTRIONTE (G.). **La Cocciniglia grigia della Vite.** [*Targionia vitis.*] —*La Nuova Agricoltura del Lazio, Rome*, viii, no. 174, 1st April 1920, p. 42.

In Italy two scales, *Pseudococcus* (*Dactylopius*) *vitis* and *Targionia vitis*, usually attack the grape-vine, the latter being the more common. In 1920 it is proving rather serious in some parts of the province of Rome. Tar-oil or lime-sulphur sprays are recommended, or the stocks may be painted with an acid solution of iron sulphate after the dead bark has been scraped off.

BERLINER (E.). **Uber die Schlaffsucht der Mehlmottenraupe (*Ephestia kühniella*, Zell.) und ihren Erreger, *Bacillus thuringiensis*, n. sp.** [Wilt Disease of the Meal-moth Caterpillar (*Ephestia kühniella*, Zell.), and its Causal Agent, *Bacillus thuringiensis*, sp. n.]—*Zeitschr. f. angew. Entom., Berlin*, ii, no. 1, April 1915, pp. 29-56, 7 figs. [Received 19th April 1920.]

Extensive observations have been made with regard to wilt disease affecting the larva of the meal moth, *Ephestia kühniella*, Z. The disease can only be definitely diagnosed under the microscope and is apparently due to infection with *Bacillus thuringiensis*, sp. n., the morphology, cytology and cultural features of which are described.

Experiments show that infection occurs through ingestion and the organism develops in the intestinal tract. The disease thus acquired always proved fatal, whether the organism had been obtained from dead infected larvae or from pure cultures. Recovery was only noticed in certain cases where infection was produced only a short time prior to moulting or about 2 days before pupation.

Adult stages fed with infected water were found to contain the organism after death, but the actual cause of death was not proved. *Bacillus thuringiensis* is apparently specifically pathogenic to *Ephestia kühniella*, as various other grain-infesting insects, including *Calandra granaria*, *C. oryzae*, *Gnathocerus cornutus*, *Tribolium castaneum* (*ferrugineum*), *Dermestes lardarius*, and *Tenebrio molitor*, which were experimentally tested, did not show any sign of disease.

The value of this disease as a means of controlling *Ephestia kühniella* by artificial infection is discussed. Spraying the walls and appliances with water containing the virus was not entirely effective, but the use of such a spray directly on the grain is suggested. Grain thus treated is safe for human consumption, as the organism is killed in the process of baking and even in the raw state is not pathogenic to man. Whether such grain may be fed to cattle has still to be proved, but it is harmless to mice.

NEUMEISTER (—). **Mitteilungen über das Auftreten der Kieferneule im Forstbezirk Dresden.** [The Appearance of the Pine Moth in the Dresden Forest District.]—*Zeitschr. f. angew. Entom., Berlin*, ii, no. 1, April 1915, pp. 164–167, 1 fig. [Received 19th April 1920.]

During the spring of 1913 the pine moth [*Panolis flammea*] occurred in exceptional abundance in the forests near Dresden. Remedial measures, including the use of sticky bands and the shaking of trees, effectively reduced their numbers in certain districts. The pupae were destroyed by turning pigs loose in the forest. During 1914 such extensive remedial measures were not necessary owing to the abundance of natural enemies.

KLEINE (R.). **Die Getreideblumenfliege, *Hylemyia coarctata*, Fall. Ein Beitrag zur Kenntnis ihrer Biologie und ihrer Bedeutung für die Landwirtschaft.** [A Contribution to the Knowledge of the Biology and Significance of *Hylemyia coarctata* in Agriculture.]—*Zeitschr. f. angew. Entom., Berlin*, ii, no. 2, August 1915, pp. 360–389, 4 figs; iii, no. 1, 1916, p. 179. [Received 19th April 1920.]

The wheat bulb fly, *Hylemyia coarctata*, Fall., causes serious damage in Germany to wheat and rye. Although it is widely distributed, greater destruction of crops occurs in the north of Germany than any other region; this is probably due to the methods of cultivation employed there. It is apparently useless to attempt to grow wheat or rye on ground which has not been under cultivation for some time. Wheat should be preceded by root crops. Autumn ploughing is also suggested as a possible means of preventing infestation. There is only one generation a year. Oviposition generally occurs from August to September, in certain localities as early as July. The larva is fully developed prior to hibernation, but does not emerge from the egg until the following spring. It immediately bores into the young shoot from the outside and begins feeding on the juices of the plant. The first larvae were noticed during the beginning of March. By the beginning of May they are fully fed and after making an emergence-hole in the stalk near the ground they leave it and enter the soil to a depth of about 4 inches for pupation, which lasts from 20 to 24 days. The first adults appear early in June and are usually on the wing until the end of August, though a few individuals may still be found in September. The author has not been able to rear any parasites of this pest.

The author does not consider that *H. coarctata* is a pest of summer crops, but as a result of observations by Zimmermann the possibility of isolated cases of such infestation is admitted.

ZACHER (F.). **Neue und wenig bekannte Pflanzenschädlinge aus unseren Kolonien.** [New and little known Plant Pests from our Colonies.]—*Zeitschr. f. angew Entom., Berlin*, ii, no. 2, August 1915, p. 422–426, 3 figs. [Received 19th April 1920.]

Coconut-palm pests received from the Caroline Islands included a leaf beetle which is here described as *Bronthispa (?) chalybeipennis*, sp. n., though its generic position is doubtful, and it should possibly be placed in *Oxycephala* or *Xiphispa*. A key is also given to the Hispid pests of coconuts, including *Botryonopa sanguinea*, Guér., *Bronthispa froggatti*, Sharp, *B. chalybeipennis*, *Promecotheca cumingi*, Baly, *P. callosa*, Baly, *P. varipes*, Baly, *P. antiqua*, Wse., *P. opacicollis*, Gestro, *P. reichei*, Baly, *P. coeruleipennis*, Blanch., and *P. lindingeri*, Aulm.

ZWEIGELT (F.). **Der gegenwärtige Stand der Maikäferforschung.** [The present Position of Cockchafer Investigation.]—*Flugschr. d. Deutschen Gesellsch. f. angew. Entom., Berlin*, no. 8, 1918, 40 pp., 1 map. [Received 19th April 1920.]

The bulk of the information contained in this paper has been noticed elsewhere [*R.A.E.*, A, ii, p. 670]. The chief species dealt with are *Melolontha melolontha* (*vulgaris*) and *M. hippocastani*. Both species require at least three years for the completion of one generation in Austria, South West Germany, Holland, France and Switzerland, but in other parts of Germany and the mountain regions of Central Europe *M. melolontha* may require four years, whilst *M. hippocastani* may extend over five years, depending chiefly on climatic conditions. The comparison of climatic charts of various districts shows that the increase of the yearly rainfall on the one hand and the decrease of the yearly mean temperature on the other results in a reduction of cockchafer infestation. There is also a close relation between the yearly isotherm and the distribution of cockchafers, their presence being negligible where the isotherm is below 7° C. [44° F.]. The intensity of their development depends greatly on the depth to which they are able to burrow into the soil for protection against the cold; this is regulated by soil character and the level of the subsoil water.

The appearance of the adults in the spring depends more on the temperature at the time of emergence than on the average temperature of the preceding winter.

Many questions still remain unsolved with regard to these beetles; these include the development "en masse" in North Germany in spite of a mean temperature below 7° C. [44° F.], and the reason for the appearance of broods of the chief races in adjoining localities.

de Vin (T. J.). **Een Waarneming betreffende de Pimpelmees** (*Parus coeruleus*). [An Observation regarding the Titmouse.]—*Tijdschr. Plantenziekten, Wageningen*, xxvi, no. 3, March 1920, p. 109.

An observation of the destruction by *Parus coeruleus* of the larvae of the prune beetle, *Magdalis* (*Magdalinus*) *pruni*, L. (*ruficornis*, L.), infesting dead branches of damson is recorded.

Kieffer (J. J.). **Cécidomyies habitant les Fruits des Conifères.**—*Broteria, Braga*, Ser. Zool., xviii, no. 1, 1st February 1920, pp. 14–22. [Received 20th April 1920.]

Up to the present 5 species of Cecidomyiids have been recorded in Europe from pine cones, *Perrisia strobi*, Winn., being the earliest known and the most widely distributed.

In this paper *P. strobi* is re-described. It has been recorded from France, Germany and Hungary. Descriptions are given of the following new species, all from cones of *Picea excelsa* near Munich:—*Coprodiplosis coni*; *Lestodiplosis holstei*, allied to *L. septemguttata*, Kieff., and the larvae of which probably parasitise those of *Perrisia strobi*; *Clinodiplosis piceae*; *Camptomyia strobi*; and *Winnertzia conorum*.

Kimura (K.) & Takakura (Y.). **Hidara Chugai Yobo ni Kwansuru Kenkyu.** [Researches on controlling Insects injurious to Dried Cod.] *Suisankoshujo Shiken Hokoku.* [*Experiment Report of the Fishery Institute*], *Tokyo*, xv, no. 1, 8th July 1919, pp. 1–32, 3 plates.

Dried cod-fish is seriously attacked in Japan by injurious insects, especially from July to September. The flesh is attacked in preference to the skin. The chief insects concerned are the beetles, *Dermestes vulpinus*, F., and *D. cadaverinus*, Oliv. The former species prefers lightly salted material and dark places. The winter is passed in all stages. Oviposition occurs at intervals of from 1 to 5 days and in each case 3–20 eggs are laid; after five or more ovipositions the adult dies. The larval stage lasts about 50 days, there being 6 moults, and the pupal stage from 5–12 days. The eggs hatch in 3–12 days according to the temperature. They are laid in the fish or in the cracks, etc., in store-houses.

The larvae and adults are easily detected, and even eggs, if carefully looked for, may be found with the naked eye. Fumigation of the dried fish with carbon bisulphide and with hydrocyanic-acid gas in the store-houses is also very effective. Heating however seems to be the best method at present. One hour at 60° C. [140° F.] is sufficient to exterminate all stages. Measures against the entry of the insect into the store-houses should also be carefully considered. The dried fish has hitherto been conveyed simply tied in bundles with rope, but when enveloped in a suitable material, such as paper, it is completely protected from infestation. Further investigations as to the best method of effecting this are in progress.

LEGISLATION.

Disposiciones vigentes sobre el Servicio de Sanidad Vegetal. [Regulations in Force under the Plant Welfare Service.]—*Cuba, Sec. Sanidad Vegetal, Havana*, Circ. 5, 1919, 32 pp. [Received 1st April 1920.]

The legislation that is enforced under the Plant Welfare Board, created by a decree of 3rd July 1916, is given verbatim. This board is empowered by a decree dated January 1919 to enforce the following regulations:—No living plants are to be transported from any part of Cuba without a certificate from the Plant Welfare Board. In the case of plants destined for Florida, these must be defoliated before consignment, as a safeguard against the dissemination of the black-fly, *Aleurocanthus woglumi*, as well as being accompanied by a certificate. An exception is made in the case of tobacco, which is not subject to infestation by this pest. The re-export of potatoes not grown in Cuba, or imported from countries under quarantine decree of the United States government, is forbidden. The importation of plantains, unless accompanied by a certificate declaring their freedom from pests, is prohibited. Other prohibitions include the introduction into Cuba of the fruits and seeds of aguacate or alligator-pear [*Persea gratissima*] from Mexico or Central America, on account of the presence there of *Heilipus lauri* (avocado weevil); the introduction of cotton plants or any part of them, as a safeguard against *Platyedra* (*Gelechia*) *gossypiella* (pink bollworm); of any leaves or shoots of bananas, owing to infestation with *Cosmopolites sordidus*; of any fruits indicated by the Board as being likely to be infested with *Ceratitis capitata* (Mediterranean fruit-fly) from a number of countries, unless accompanied by a certificate of fumigation or, failing that, of inspection by the Board. Parcels or packets of plants must be labelled with the number and date of their certificate. Commercial growers of vegetables and fruit whose fields are free from pests may obtain a general certificate from the Board authorising them to transport their produce for a limited time, to be fixed by the Board, which shall keep a register of all such growers. The Board, or its deputies, are to be allowed facilities for inspection. The fines to be imposed for any infringement of these regulations are fixed by the penal code.

All decrees and regulations that were in force when this legislation was promulgated are to remain in observance unless expressly modified or repealed. These include the prohibition against importing *Citrus* plants from Mexico, and their admittance from other countries only after preliminary fumigation, and the prohibition against importing any food-plant of *Aleurocanthus woglumi* (black-fly) from India, the Bahamas or Jamaica. Infestations of this pest are notifiable to the Board.

In an appendix is given the text of various laws passed in the United States as a safeguard against the introduction from Cuba of *A. woglumi* and other pests occurring in the Island.

NOTICES.

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CONTENTS.

CONTENTS—*cont.*

Registered at the G.P.O. for Transmission to Canada and Newfoundland by Magazine Post.

VOL. VIII. Ser. A. Part 7.—pp. 257-320. JULY, 1920.

THE REVIEW OF APPLIED ENTOMOLOGY

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Grandori (R.). **Studi sulla Flaccidezza del Bombice del Gelso. Nota preliminare.** [Studies on the Wilt Disease of *Bombyx mori.*]—*Boll. Soc. Zool. Italiana, Rome,* (4) i, no. 1–2, 31st March 1920, pp. 17–28.

The findings recorded in this preliminary note are not claimed to provide a sure means of diagnosing the presence of wilt disease in the egg of *Bombyx mori,* but it is hoped that they justify further work on these lines.

Admitting, as a working hypothesis, the presence in certain eggs of *B. mori* (healthy and uninfected with any germ) of a hereditary predisposition to wilt disease, the author questioned whether careful microscopical examination of the immature egg, the fecundated egg, the yolk and the developing embryo, would not yield a constant morphological character peculiar to the egg hereditarily predisposed to wilt and visible on comparison with a healthy one. Such a differentiation would be of practical value, even if the specific disease germ remained undiscovered.

It was found that in healthy moths the yolk of the immature egg consists, at its periphery, of minute granules that increase in size towards the centre, where they are large. These granules are homogeneous. In diseased examples the largest granules (about equal in size to the central ones in healthy specimens) are at the periphery, and the size diminishes towards the centre, where it is much smaller than that of the minute peripheral granules in healthy specimens. These large peripheral granules of diseased individuals are not homogeneous, and the very minute central ones are almost unstainable with any of the usual plasmatic stains.

The choriogenous cells of the ovarian tubes of a diseased moth are in an advanced stage of histolysis, and the structure of one cell is not distinctly defined from those of contiguous ones. In healthy ovarian tubes these cells are defined and recognisable; and there are other differences also.

In the case of eggs already deposited, the differences in the yolk are so marked as to be recognisable by a non-expert using a low magnification (125 diameters). In the healthy yolk there is a very thin layer of ectoplasm and a central sphere of cytoplasm surrounding the nucleus or nuclei. In the yolk of an egg from a diseased moth the layer of ectoplasm is present in part only and is sometimes indistinguishable, and the two spheres (yolk and cytoplasm) are confused. The serous membrane of a healthy egg envelops the entire yolk, but in a diseased one the serous membrane sinks into the yolk and is at a certain depth on the third day after oviposition.

Nomaguchi (G). **Taisho 7-Nen Mikanbai Kenkyu-Jiseki.** [Results of Orange Fly Investigation, 1918.] *Oita-Ken Naimubu* [*Interior Division Oita Prefectural Government*], August 1919, 16 pp., 1 plate.

The investigation here described has been carried out by the author under the supervision of Dr. Miyake at the Orange Fly Research Laboratory at Tsugumi in the Ōita Prefecture. The results are, therefore, mainly supplementary to the information given by the latter

(684) Wt. P1850/163. 1,500. 7.20. B.&F.Ltd. Gp.11/14. A

author [*R.A.E.*, A, vii, 238, 350]. The egg-stage of *Dacus tsuneonis* seems to be more than 10–14 days. The larval stage last from one to six days. The pupae generally penetrate into the soil to a depth of under ½ an inch, some under 1 inch, a few under 1½ inches, and none deeper than this.

Insect Pests in Ceylon, 1919.—*Planter's Chron., Coimbatore*, xv, no. 12, 20th March 1920, pp. 206–208.

In addition to the insect pests of Ceylon in 1919 previously dealt with [*R.A.E.*, A, vii, 374, viii, 110], the following have been recorded during the year:—*Spatulicraspida castaneiceps* (nettle grub), infesting tea foliage; *Orgyia postica* (tussock caterpillar) is a common pest of dadap, from which it often spreads to tea; *Gracilaria theivora* (tea leaf-roller) which starts as a leaf-miner and then rolls a portion of the leaf from the tip inwards, inside which it feeds. Both the older leaves and the flush are attacked by these caterpillars. During rains many of them are drowned in their shelters. The infested leaves should be plucked off and burned. The larvae of *Oscinis theae* make irregular, silvery-white tracings on the upper surface of the leaf. Termites (probably *Calotermes militaris*) work within the bushes until the main stem may be a mere shell; their presence may be undetected until pruning-time. In the case of seed-bearing bushes they probably enter the bush fairly high up, usually at some injured spot, and then work down the main stem and perhaps into the roots. Badly infested seed-bearers usually die back at the top. The removal of all dead wood, the trimming of broken branches and the tarring of all cut ends are suggested as remedial measures. Experiments are being made with carbon bisulphide, but no definite information can as yet be given as to this treatment. Eelworms (*Heterodera radicicola*) caused the death of a number of bushes, working chiefly in the older roots. The remedial measures suggested are the isolation of the worst infested area by trenching, the removal of dead and dying bushes and heavy liming of the soil.

Rubber has been injured to some extent by the larvae of a Longicorn beetle, *Batocera rubus*; these can be killed in their galleries by probing with stiff wire or by injecting carbon bisulphide and plugging the holes. Coconuts were damaged by *Nephantis serinopa* (black-headed coconut caterpillar). Suggested remedies are the cutting off and burning of infested leaves, the lighting of tar and sulphur smoke fires under the younger trees and the use of top-lights against the moths. Infested areas should receive special cultivation and manuring. The distribution of parasites, which exercise a fair amount of control, would also be beneficial.

Curran (C. H.). **Observations on the more common Aphidophagous Syrphid Flies (Dipt.).**—*Canad. Entom., London, Ont.*, lii, no. 3, March 1920, pp. 53–55.

This paper deals with the more important species of Aphid-destroying Syrphid flies, and is the result of studies carried on during 1913–1919. The larvae of these flies are always more or less heavily parasitised. The eggs are laid singly on the leaves or stems of plants either in or near an Aphid colony. *Allograpta obliqua*, Say, is one of the commonest species, and is found from May to October. The larvae are very general feeders, having been found in one season on *Brevicoryne* (*Aphis*) *brassicae*, *Aphis rumicis*, *A. cardui*, *A. pomi*, *A. gossypii*, *Myzus cerasi*, and *Macrosiphum* sp., on wild lettuce and wild asters. They were very abundant on all hosts except *A. pomi*, which generally lives too much exposed to sunlight to afford the shelter required by Syrphid larvae. *Sphaerophoria cylindrica*, Say, is also abundant from May to November, especially on Aphids on low-growing plants. *Syrphus americanus*, Wied., is of considerable importance in reducing the number of Aphids attacking cultivated plants and fruits. *S. ribesii*, L., is probably the best-known species, and is very common in orchards and gardens from May to November, attacking many of the Aphids listed above and also *Eriosoma lanigerum* and *Aphis viburnicola*. It is particularly useful in checking currant Aphids. *S. torvus*, Z., is a most important species. Eggs are laid in early spring on the first colonies of Aphids appearing on the shoots of various plants. The young larvae develop on clusters of stem-mothers and frequently destroy whole colonies. Again, in autumn, they prey upon the return migrants and sexuales. *Paragus tibialis*, Fall., is predaceous on *Acyrthosiphon* (*Macrosiphum*) *pisi* and also on *A. cardui* on thistles; *P. bicolor*, F., is similar in habit, but is much less numerous.

Observations on the immature stages of these species and the number of Aphids they destroy show that when food is plentiful the larvae frequently kill two or three Aphids in succession without sucking them dry, and, in these circumstances, the larval and pupal stages appear to be of shorter duration, the abundance of food evidently producing rapid maturity. Growth is also more rapid in warm weather. Further extensive investigations on the immature stages of Syrphids would be advantageous.

FERRIS (G. F.). **Notes on Coccidae. vi. (Hemiptera).**—*Canad. Entom. London, Ont.*, lii, no. 3, March 1920, pp. 61–65, 1 fig.

The species dealt with in this continued list include *Porococcus tinctorius*, Ckll., of which the habits and morphological characteristics are described: *Targionia yuccarum*, Ckll., of which *T. covilleae*, Ferr., is a synonym; *Aspidiotus herculeanus*, Doane & Hadden; *Pseudodiaspis yuccae*, Ckll.; and *Lepidosaphes hawaiiensis*, Mask. (*moorsi*, D. & F.)

WARREN (E.). **Zoology, Physiology, Hygiene and Sanitary Science. Section D., Presidential Address. Termites and Termitophiles.**—*S. African Jl. Sci., Kingwilliamstown*, xvi, no. 2, September 1919, pp. 93–112, 3 plates.

This paper offers a comparative study of the modifications of structure and habit occurring in the termitophile faunas of the southern Continental land-masses, and discusses the possibility of deducing therefrom some evidence regarding the occurrence of land connections between the continents in past geological periods.

Blackman (M. W.). **Notes on Forest Insects. iii. Two New Species of *Pityophthorus* from Colorado.**—*Psyche, Boston, Mass.*, xxvii, no. 1, February 1920, pp. 1–5, 1 plate, 1 fig.

This paper describes *Pityophthorus occidentalis*, sp. n., and *P. bassetti*, sp. n., from *Picea engelmanni* in Colorado. The latter bark-beetle will also breed in *Abies balsamea*, and from laboratory observations there is apparently only one generation in a year. In the Engelman spruce the larvae work almost entirely in the inner and middle bark, usually not even grooving the sap-wood, while in *A. balsamea* the mines are partly excavated from the sap-wood. The nuptial chamber generally occurs at the junction of bark and sap-wood, and from this a number of egg-galleries, generally from four to nine, branch off on all sides, taking a longitudinal direction. Egg-niches occur on both sides of the gallery, and are not closely arranged, indicating that the number of eggs laid by each female is not great.

Lallemand (V.). **Un Membracide (Hem.) nouveau pour la Faune française.**—*Bull. Soc. Entom. France, Paris*, 1920, no. 3, 11th February 1920, p. 53.

The capture is recorded of individuals of *Ceresa bubalus*, F., in Hérault in September 1918, on *Equisetum*, among which were young vine stems. This Membracid is widely distributed in the United States, especially in the east, and it is possible that it was imported into Europe with young vine plants, though it has not previously been recorded in this continent.

Lichtenstein (J. L.) & Picard (F.). **Note sur les Proctotrypides (Hym.).**—*Bull. Soc. Entom. France*, Paris, 1920, 11th February 1920, pp. 54–55.

Among the Proctotrupids dealt with are *Trichopria* (*Cephalonomia*) *hypobori*, Kieff., known as a parasite of *Hypoborus ficus*, Er. At Montpellier this insect commonly infests several Scolytids, such as *Scolytus rugulosus*, Ratz., in plums, *S. amygdali*, Guér., in cherry-laurel, and *Phloeosinus thuyae*, Perris, in cypress.

Piutti (A.). **Sur l'Action de la Chloropicrine sur les Parasites du Blé et sur les Rats.**—*C. R. Hebdom. Acad. Sci. Paris*, clxx, no. 14, 6th April 1920, pp. 854–856.

The author summarises the results of his experiments with chloropicrin. As regards the action of this substance on insects infesting grain, such as the beetles, *Calandra granaria*, *Tenebroides mauritanicus*, *Tribolium castaneum* (*Laemophloeus ferrugineus*), and Lepidopterous larvae such as *Sitotroga cerealella*, *Tinea granella* and *Plodia americana*, if the chloropicrin acts on the grain for about a week (20 cc. per cubic metre at a temperature of about 15°–20° [59°–68° F.] being used) excellent results are obtained. Neither the flour nor the bread made from such grain deteriorates in any degree so far as its nutritive value is concerned, although the grain loses about 30 per cent. of its germinating power. As regards the extermination of rats on ships, all the rats experimented with were destroyed after $2\frac{1}{2}$ hours exposure, the fleas infesting them being killed in even less time.

THOMPSON (W. R.). **Sur les Diptères Parasites des Isopodes terrestres.**—*C. R. Soc. Biol., Paris,* lxxxiii. no. 13, 17th April 1920, pp. 450–451.

In a previous paper [*R.A.E.*, A, vi, 35] the author described the larval forms of *Phyto melanocephala*, a Dipterous parasite of woodlice. Later investigations have disclosed the fact that the larval stages in question belonged to two distinct species, *P. melanocephala* and *Melanophora roralis.* All the larval stages of both flies have been studied and their characteristics are described and compared. A third species has also been discovered, having the same habits as the above. The larva resembles that of *M. roralis*, from which, however, it is easily distinguishable. Unfortunately, only one larva has as yet been obtained, and the adult has not been reared.

WAHL (B.). **Die wichtigeren tierischen Schädlinge unserer gebräuchlichsten Gemüsearten.** [The more important animal Pests of our most common Vegetables.]—*Mitt. landw.-bakter. u. Pflanzenschutzstation, Vienna* [n.d.], 70 pp., 20 figs. [Received 27th April 1920.]

The insects dealt with include a thrips, *Physapus vulgatissima*, Hal. Orthoptera:—*Gryllotalpa gryllotalpa*, L. (*vulgaris*, Latr.); and *Forficula auricularia*, L.; Coleoptera:—*Melolontha melolontha*, L.; *M. hippocastani*, F.; *Amphimallus solstitialis*, L.; various Chrysomelids: *Meligethes aeneus*, F.; *Sitones lineatus*, L.; *Ceuthorrhynchus sulcicollis*, Gyll.; *C. assimilis*, Payk.; *C. terminatus*, Hbst.; *Bruchus pisorum*, L.; *Agriotes lineatus*, L. Lepidoptera:—*Polia* (*Mamestra*) *oleracea*, L.; *Barathra* (*M.*) *brassicae*, L.; *Polia* (*M.*) *pisi*, L.; *P.* (*M.*) *persicariae*, L.; *Phytometra* (*Plusia*) *gamma*, L.; *Pieris brassicae*, L.; *P. rapae* L.; *P. napi*, L.; *Evergestis extimalis*, Scop.; *Depressaria apicella* (*nervosa*). Diptera:—*Bibio hortulanus*, L.; *B. marci*, L.; *Phorbia* (*Chortophila*) *brassicae*, Bch.; *Hylemyia antiqua*, Meig.; *Eumerus strigatus*, F.; *Psila rosae*, F.; *Athomyia radicum*, Meig.; *A.* (*Chortophila*) *floralis*, Fall.; *Aphis rumicis*, L. (*papaveris*, F.); *Eurydema oleraceum*, L.; *E. ornatum*, L.; *E. festivum*, L.; *Halticus saltator*, Geoffr. The Nematodes, *Heterodera schachtii*, Schmidt, *H. radicicola*, Greef, and *Tylenchus devastatrix*, Kühn; and a mite, *Tetranychus telarius*, L.

The various crops attacked and the damage done by these pests is described and the usual remedial measures are advocated.

FULMEK (L.). **Die Kirschblattwespe** (*Caliroa cerasi*, **L.**)—*Mitt. Pflanzenschutzstation, Vienna* [n.d.]. 4 pp., 2 figs. [Received 27th April 1920.]

Eriocampoides limacina, L. (*Caliroa cerasi*, L.) caused severe damage to pear and cherry trees in 1915. It is described and illustrated and the usual remedial measures are advocated [*R.A.E.*, vi, A, 367, 385, etc.]; a spray that proved effective consists of 10 lb. tobacco extract, ½ gal. of petroleum, ¼ gal. demilysol and 100 gals. of water. During the infestation in 1915 isolated larvae were found as late as October, suggesting that two generations occur during the year. A proportion of the larvae apparently pupate in the summer, giving rise to adults in July and August, whilst others hibernate and thus produce only one generation during the year.

FULMEK (L.). **Die Lärchenminiermotte.** [The Larch-mining Moth.]—Separate from *Natur, Leipzig*, 15th July 1917, no. 20, 2 pp., 2 figs. [Received 27th April 1920.]

Coleophora laricella, Hb., is one of the most serious pests of the larch in Austria and Germany. Oviposition occurs at the end of May and the larvae on hatching begin to bore at once in the needles, though the damage is not visible until about the middle of September. The hollowed-out tip of the needle is broken off and used as a case in which the larva hibernates. The following spring the buds and new needles are attacked. Pupation occurs from the end of April to the beginning of May in the case attached to one of the needles. The remedial measures advocated are those already recommended by other authors [*R.A.E.* A, iii, 191].

FULMEK (L.). **Die Feldmässige Bekämpfung der Blattläuse.** [Field Control of Aphids.]—*Mitt. landwl.-bakteriol. u. Pflanzenschutz-station, Vienna* [n.d.]. (Separate from *Wiener landw. Zeitung*, no. 68, 24th August 1918), 12 pp., 15 figs.

This paper deals with Aphids in general. Their natural enemies and measures for dealing with them are discusssed.

WAHL (R.). **Bekämpfung der Spinnmilben.** [Control of *Tetranychus* spp.]—*Mitt. landw.-bakteriol. u. Pflanzenschutzstation, Vienna* [n.d.], 12 pp., 1 fig. (Separate from *Wiener landw. Zeitung*, no. 51, 24th June 1916.) [Received 27th April 1920.]

The measures advocated for red spider [*Tetranychus*] include the destruction of the winter eggs and hibernating individuals by means of clean cultivation and the application of quassia, nicotine and lime-sulphur sprays. The formulae given include several for the preparation of the latter, which is considered to be the most efficacious.

WAHL (B.) **Die Bekämpfung der Graseule** (*Charaeas graminis*, **L.**) [The Control of the Antler Moth.]—*Mitt. landw.-bakteriol. u Pflanzenschutzstation, Vienna* [n.d.], 3 pp., 1 fig. (Separate from *Wiener landw. Zeitung*, no. 47, 12th June 1915.) [Received 27th April 1920.]

Charaeas graminis, L., is very destructive to grassland in the north of Europe, and has also been noticed in Bukovina. The different stages are described. About 200 eggs are laid by each female round the grass roots. The larvae emerge after about three weeks and feed on the grass. They hibernate in the ground, and begin feeding again in the spring, and continue until June, when pupation occurs in the soil. The adults emerge in July, and are still on the wing in August. Remedial measures should be carried out in the autumn and spring, and should consist of removing all moss from the grass by means of sharp harrows or rakes and the burning over of infested meadows. Repeated grazing should reduce the number of caterpillars.

Miestinger (K.). **Der Getreidelaufkäfer und seine Bekämpfung.** [The Control of *Zabrus tenebrioides*, Goeze.]—*Mitt. landw.-bakteriol. u. Pflanzenschutzstation, Vienna* [n.d.], 6 pp., 3 figs. [Received 27th April 1920.]

An account is given of the corn ground beetle, *Zabrus tenebrioides*, Goeze, and its control. [*R.A.E.*, A, ii, 309.]

Miestinger (K.). **Die Blattsauger, ihre Lebensweise und Bekämpfung.** [Bionomics and Control of Psyllids].—*Mitt. Pflanzenschutzstation, Vienna* [n.d.], 4 pp., 4 figs. [Received 27th April 1920.]

The Psyllids that are most destructive in Austria are *Psylla mali*, Schmidb., on apples, and *P. pyrisuga*, Först., on pears. Although *P. pyricola*, Först., occurs, as does also *P. pyri*, L., the damage done by them is of minor importance. The remedial measures advocated include a dormant spray of 10 per cent. carbolineum, nicotine sprays and kerosene emulsion, for which formulae are given.

Fulmek (L.). **Himbeerschabe** [*Lampronia rubiella*, Bjk.]—*Mitt. Pflanzenschutzstation, Vienna* [n.d.], 2 pp., 1 fig. [Received 27th April 1920.]

This bulletin deals in a popular form with the life-history and remedial measures for *Incurraria* (*Lampronia*) *rubiella*, Bjk.

Fulmek (L.). **Schildläuse (Coccidae.).**—*Pflanzenschutzstation, Vienna*, [n.d.], 8 pp., 6 figs. [Received 27th April 1920.]

The Coccids dealt with include *Lepidosaphes ulmi*, L., *L. pinnaeformis*, Bch., *Aspidiotus ostreaeformis*, Curt. (*Epidiaspis betulae*, Bär.), and *Aulacaspis pentagona*, Targ. Remedial measures include sprays of lime-sulphur, petroleum emulsion or carbolineum.

The artificial distribution of *Prospaltella berlesei*, How., has greatly reduced the numbers of *Aulacaspis pentagona* in various districts of Austria, and the Coccinellid, *Novius cardinalis*, has proved to be a useful natural enemy of *Icerya purchasi*, Mask. A key is given to the indigenous species of Coccids.

Bezzi (M.). **Notes on the Ethiopian Fruit-flies of the Family Trypaneidae, other than** *Dacus*.—iii.—*Bull. Entom. Research, London*, x, no. 3, April 1920, pp. 211–272, 2 plates.

The Trypetid flies at present known from the Ethiopian Region, with the addition of the new forms here described for the first time, are enumerated in a systematic catalogue, numbering 216 species.

The new genera and species include *Sosiopsila trisetosa*, gen. et sp. nov., from Portuguese East Africa and Nyasaland; *Coelopacidia strigata*, *C. melanostigma*, and *Leucotaeniella guttipennis*, from N. Nigeria; *Clinotaenia anastrephina*, gen. et sp. nov., from Nyasaland: *Pterandrus rosa*, Karsch, var. *fasciventris*, nov., from Uganda; *Pardalaspis melanaspis*, from Cape Colony; *P. aliena* from Cape Colony; *Capparimyia*, gen. nov., erected for *Ceratitis savastani*, Mart., a gall-making insect, found only as yet in Sicily and Southern Italy; *Perilampsis*, gen. nov., an Ethiopian genus with *Carpophthoromyia pulchella*, Aust., as the type; *Hoplolopha cristata*, gen. et sp. n., from British East Africa; *Trirhithrum validum*, from Uganda; *Rhacochlaena pulchella*, from the Gold Coast; *Taomyia marshalli*, gen. et sp. nov., from Natal; *Notomma bioculatum*, gen. et sp. nov., from the Gold Coast; *Acidia fossataeformis*, *A. homogenea*, and *Ocneros undatus*, from Nyasaland; *O. bigemmatus*, from British East Africa; *Ocnerioxa discreta*, from N. Nigeria; *Allotrypes brevicornis*, gen. et sp. nov., from Natal; *Acïura perpicillaris*, from British East Africa; *Spheniscomyia neavei*, from Nyasaland; *Spathulina bioculata*, from N. Nigeria; *Euaresta amplifrons* and *Ensina gladiatrix*, from Natal; *E. magnipalpis*, from Durban; *Trypanea subcompleta*, from British East Africa; *T. hemimelaena*, from the Gold Coast; *Perirhithrum marshalli*, gen. et sp. nov., from Natal; and *Rhabdochaeta neavei*, from Nyasaland.

Marshall (G. A. K.). **Some Injurious South African Weevils.**—*Bull. Entom. Research, London*, x, no. 3, April 1920, pp. 273–276. 1 plate.

The following new Curculionids from South Africa are described:—*Protostrophus planatus* and *P. instabilis* injuring the foliage of young orange trees in the Transvaal; *P. noxius*, feeding on young wheat in the Orange Free State; *Eremnus horticola*, feeding on dahlias and chrysanthemums in the Orange Free State.

Wolff (M.). **Uber die Pteromalinengattung** *Platyterma* **Walker 1834 und über eine deutsche, von C. Eckstein aus** *Lophyrus pini* **erzogene, neue Art.** [Notes on the Pteromalid Genus *Platyterma*, Walker, and a new German Species bred by C. Eckstein from *Lophyrus pini*.]—*Zeitschr. f. angew. Entom., Berlin*, iii, no. 1, 1916, pp. 157–171, 19 figs. [Received 19th April 1920.]

The genus *Platyterma*, Wlk., is redescribed and a key is given to the species contained in it. A new species reared from the sawfly, *Diprion* (*Lophyrus*) *pini*, L., is described as *Platyterma ecksteini*, all descriptions as well as the key being given in Latin.

Bolle (J.). **Uber die Bekämpfung des Holzbohrwurmes** (*Anobium*) **in einem alten Kunstwerke.** [The Control of the Woodborer *Anobium* in an old Work of Art.]—*Zeitschr. f. angew. Entom., Berlin*, iii, no. 1, 1916, pp. 172–178, 2 figs. [Received 19th April 1920.]

The extensive damage caused by *Anobium striatum* (*domesticum*) in the carved lime-wood of the altar in a church in Upper Austria is described. The remedial measures advocated are fumigation with carbon bisulphide, after which the wood should be impregnated with an alcoholic solution of 3 per cent. corrosive sublimate followed by petroleum to prevent reinfestation.

Maas (O.). **Bemerkungen zur Einführung der Seidenzucht in Deutschland nach eigenen Erfahrungen über die Biologie des Seidenspinners.** [Remarks on the Introduction of Sericulture into Germany as a result of personal Experiences with regard to the Biology of the Silkworm.]—*Zeitschr. f. angew. Entom., Berlin*, iii, no. 1, 1916, pp. 180–194. [Received 19th April 1920.]

This is one of a series of papers by various authors dealing with the prospects of sericulture as an industrial proposition in Germany. The question is dealt with from the economic as well as the bionomic point of view. Owing to various circumstances, such as climatic conditions and the necessity of finding substitutes for the normal silkworm diet, the ultimate success of the project under present conditions is considered doubtful, though not impossible.

Puster (—). **Maikäfer-Ökonomie und Waldwirtschaft.** [Cockchafer Control and Forestry.]—*Zeitschr. f. angew. Entomologie, Berlin*, iii, no. 2, 1916, pp. 196–203. [Received 19th April 1920.]

Observations made in the Upper Palatinate show that cultivation should be carried out during the flight period of cockchafers [*Melolontha*] so that the roots are stronger and more able to resist attack by the time the larvae commence their work of destruction.

The author does not consider that the formation or condition of the soil has any influence on the choice of place for oviposition, as eggs may be laid in ground where larval development is quite impossible. Permanently shaded forests impede the development of the larva by depriving them of the required warmth. For this reason clearing should always have a northern or north-western aspect in preference to a southern one. The best means of preventing infestation is to lay out nurseries as far as possible from the danger zone.

Wolff (M.). **Uber das neue (zweite) zoologische Laboratorium der Kgl. Forstakademie in Eberswalde.** [The new (second) Zoological Laboratory of the Royal Academy of Forestry at Eberswalde.]—*Zeitschr. f. angew. Entom., Berlin*, iii, no. 2, 1916, pp. 289–298, 4 figs. [Received 19th April 1920.]

The plan and arrangements of a new laboratory in connection with the Academy of Forestry at Eberswalde are described and illustrated. It is intended for scientific research in economic zoology.

The comparatively low cost of erection of such local experiment stations, as well as their many advantages both to students and Science, is emphasised and the hope is expressed that such laboratories will become more numerous.

Escherich (K.). **Hopfenschädlinge.** [Hop Pests.]—*Zeitschr. f. angew. Entom., Berlin*, iii, no. 2, 1916, pp. 311–313, 2 figs. [Received 19th April 1920.]

Considerable damage was caused during 1916 to hops in the Hollerdau district by the hop aphis, *Phorodon humuli*, Schrk., as well as by flea-beetles. The latter were most abundant in fields where cultivation had been retarded. Sprays consisting of a 1 or 2 per cent. soft-soap solution with the addition of a little petroleum, tobacco extract or barium chloride, are advocated against *Phorodon humuli.* The necessity for further study of hop pests is emphasised.

Escherich (K.). **Eine *Clytus*-Kalamität in der Pfalz. *Clytus* (*Plagionotus*) *arcuatus*, L. (Coleopt., Cerambycidae) als Eichenschädling.** [An outbreak of *Clytus* in the Palatinate. *Clytus* (*Plagionotus*) *arcuatus*, L., as a Pest of Oak.]—*Zeitschr. f. angew. Entom., Berlin*, iii, no. 3, 1916, pp. 388–397, 4 figs. [Received 19th April 1920.]

The observations made with regard to the damage to oaks by the Cerambycid beetle, *Clytus arcuatus*, during 1916 are described [*R.A.E.*, A, iv, 441]. The maximum damage is caused to felled timber, though unhealthy growing trees may also be attacked. The length of the life-cycle has not yet been determined in the district under consideration.

It is most important to clear the logs as early as possible to prevent infestation; they should all be removed by the end of April at the latest; where this is impossible they should be placed in the shade. The application of luminous paints may prevent oviposition. The chief natural enemies are woodpeckers and Ichneumonid parasites.

Loos (K.). **Der Kampf gegen Maikäfer und Engerling mit besonderer Berücksichtigung der Vogelwelt.** [The Campaign against Cockchafers and Grubs with special Consideration of Birds.]—*Zeitschr. f. angew. Entom., Berlin*, iv, no. 1, 1918, pp. 1–15. [Received 19th April 1920.]

It is recognised that collection of the adults and grubs of *Melolontha* is at present the only possible means of reducing cockchafer infestation, and therefore the necessity for organising campaigns to carry out this work is emphasised. Once the infestation is reduced to the normal, *i.e.*, about 280 individuals to the acre, birds may be relied upon to keep the pest under further control, provided that any abnormal increase in numbers is immediately reduced by systematic hand-collection. The birds referred to include gulls and starlings, and their value in destroying this pest is discussed.

Kleine (R.). **Die Getreideblumenfliege, *Hylemyia coarctata*, Fall. Diesjährige Beobachtungen in Pommern.** [*Hylemyia coarctata*, Fall. This Year's Observations in Pomerania.]—*Zeitschr. f. angew. Entom., Berlin*, iv, no. 1, 1918, pp. 16–24, 1 fig. [Received 19th April 1920.]

Further observations on *Hylemyia coarctata*, Fall. [*R.A.E.*, A, viii, 253] show that infestation does not so much depend on the preceding crop as on the condition of the ground. Crops grown on heavy soils are usually more free from attack than those grown on light ones.

This is not due to the soil composition, but rather to the greater humidity and coolness of heavier ground. It is advisable to begin preparing the ground for seed as soon as possible after the harvest, and early sowing is also advocated so that the plants may outgrow infestation.

POPOFF (M.) & JOAKIMOFF (D.). **Uber die Züchtung phylloxerafester Reben.** [On the Training of *Phylloxera*-resistant Vines.]—*Zeitschr. f. angew. Entom., Berlin*, iv, no. 1, 1918, pp. 31–33.

POPOFF (M.). **Die Lösung der Phylloxerafrage durch Reformierung der Rebenkultur.** [The Solving of the *Phylloxera* Question by new Methods of cultivating the Vine.]—*Ibid*, v, no. 2, 1919, pp. 217–225. [Received 19th April 1920.]

The advisability of growing vines on trees, etc. [*R.A.E.*, A, v, 533], as a measure against *Phylloxera*, in countries with less favourable climatic conditions than those existing in Bulgaria is discussed, and suggestions are made for the training of vines so that they may benefit by the heat reflected from the ground.

STITZ (H.). **Die Beziehungen der Ameisen zum Menschen und ihre wirtschaftliche Bedeutung.** [The Relation of Ants to Man and their Economic Importance.]—*Zeitschr. f. angew. Entom., Berlin*, iv, no. 1, 1918, pp. 71–128. [Received 19th April 1920.]

Ants in general are here discussed from the point of view of their economic importance. The beneficial species are dealt with under the headings of those used for food, as improvers of soil, as destroyers of noxious insects and as distributors of seeds. In certain districts where the bark of *Acacia* spp. does not crack as a result of weather influences the valuable gum exudes from incisions made by ants.

The damage caused by ants includes the inconvenience caused by biting species, the transmission of pathogenic micro-organisms, and injury to plants, especially in connexion with the fostering of Aphids and Coccids. The natural enemies of ants and the various artificial remedial measures are reviewed. The paper includes an extensive bibliography of the literature of the subject.

FRICKHINGER (H. W.). **Blausäure im Kampf gegen die Mehlmotte** (*Ephestia kühniella*, **Zeller**). [Hydrocyanic Acid in the Control of the Flour Moth.]—*Zeitschr. f. angew. Entom., Berlin*, iv, no. 1, 1918, pp. 129–140, 4 figs. [Received 19th April 1920.]

In view of the efficacy of hydrocyanic acid gas fumigation in the control of the Mediterranean flour moth, *Ephestia kühniella*, Z., in America, it has been tried in Germany with equal success. The experimental fumigation of a mill and the method employed are described.

ANDRES (A.). **Starke Beschädigung von gelagertem Reis durch die Mehlmotte** (*Ephestia kühniella*, **Z.**) [Great Damage to stored Rice by the Meal Moth.]—*Zeitschr. f. angew. Entom., Berlin*, iv, no. 1, 1918, pp. 150–151. [Received 19th April 1920.]

The infestation is recorded of large quantities of rice with *Ephestia kühniella* when stored in buildings that had contained infested flour the remnants of which had not been properly cleaned out.

Reh (L.). **Uber Einfuhr-Beschränkungen als Schutz gegen die Einschleppung pflanzenschädlicher Insekten.** [Import Restrictions as a Protection against the Entry of Insect Pests of Plants.]—*Zeitschr. f. angew. Entom., Berlin*, iv, no. 2, 1918, pp. 189–237. [Received 19th April 1920.]

The advantages and disadvantages of importation restrictions and quarantine measures are discussed and many existing laws, including those of the United States, are reviewed. It is almost impossible entirely to eliminate the danger of introducing a foreign pest into a country by this means in cases where the conditions for its entry and establishment are favourable ; its distribution may however be greatly limited by the timely application of quarantine regulations. The importance of field inspection is emphasised.

Jordan (K. H. C.). **Uber die Gallmilbe, *Oxypleurites carinatus*, Nal., ihren Schaden und ihre Bekämpfung.** [The Gall Mite, *Oxypleurites carinatus*, its Damage and its Control.]—*Zeitschr f. angew. Entom., Berlin*, iv, no. 2, 1918, pp. 238–266, 17 figs. [Received 19th April 1920.]

The sickly appearance of horse-chestnut trees (*Aesculus hippocastanum*) and the early fall of their leaves has been found to be due to a mite, *Oxypleurites carinatus*, Nal., the various stages of which are here described. The eggs are usually deposited on the leaves, and these hatch in from 8 to 10 days. The larvae moult twice at intervals of from 6 to 8 days, making the total life-cycle from egg to adult about 22 to 26 days. The number of generations occurring during the year could not be definitely ascertained as it varies according to the fall of the leaves. Hibernation occurs under scales of the bark in the vicinity of buds and lasts from early autumn to late spring. The damage caused by this pest has been greatly reduced in certain cases by the activities of Gamasids.

Nicotine sprays have proved effective against the mites. The time of application depends on the development of the trees. The first spray should be applied about the middle of May as soon as the bud-scales have fallen off. This should be repeated in about a fortnight. The jet must be directed against the lower surface of the leaves.

Stellwaag (F.). **Das Massenauftreten des Rebstechers (*Byctiscus betulae*, L.) in der Rheinpfalz.** [An outbreak of *Byctiscus betulae* in the Rhine Palatinate.]—*Zeitschr. f. angew. Entom., Berlin*, iv, no. 2, 1918, pp. 274–277. [Received 19th April 1920.]

Byctiscus betulae was very abundant during 1917 in the Rhine Palatinate. In addition to vines, willows, poplar, beech and even apple and cherry trees were attacked by this weevil. The necessity for the enforcement of compulsory remedial measures is emphasised.

Stellwaag (F.). **Cyanwasserstoff gegen die Traubenwickler.** [Hydrocyanic Acid against Vine Moths.]—*Zeitschr. f. angew. Entom., Berlin*, iv, no. 2, 1918, pp. 278–286, 2 figs. [Received 19th April 1920.]

Experiments have been made with hydrocyanic gas as a fumigant against vine pests. The advantages and disadvantages of this method are discussed. Although the results were apparently successful, further and more extensive observations are required to prove the efficacy of this treatment in combating the first and second generations of the vine moths [*Clysia ambiguella* and *Polychrosis botrana*].

Teichmann (E.). **Die Bekämpfung der Wachsmotte** (*Galleria mellonella*) **durch Blausäure.** [The Control of *Galleria mellonella* with Hydrocyanic Acid.]—*Zeitschr. f. angew. Entom., Berlin*, iv, no. 2, 1918, pp. 287–289. [Received 19th April 1920.]

A method of treating beehives with hydrocyanic acid gas for the extermination of the wax moth, *Galleria mellonella*, is described.

Frickhinger (H. W.). **Blausäureräucherung im Dienste der Mehlschädlingsbekämpfung. ii. Bericht über eine vereinfachte Methode der Mühlenräucherung.** [Hydrocyanic Acid Fumigation for controlling Meal Moth. ii. Report on a simplified Method of Mill Fumigation.]—*Zeitschr. f. angew. Entom., Berlin*, iv, no. 2, 1918, pp. 310–324, 3 figs. [Received 19th April 1920.]

Further experiments have been made with hydrocyanic acid gas fumigation [*R.A.E.*, A, viii, 267] as a means of disinfecting flour mills. The mills treated and the fumigator used are described.

Molz (E.). **Zur Biologie der Getreideblumenfliege** (*Hylemyia coarctata*, **Fall.**)—*Zeitschr. f. angew. Entom., Berlin*, iv, no. 2, 1918, pp. 325–326. [Received 19th April 1920.]

The author expresses his pleasure at finding that Kleine's observations [*R.A.E.*, A, viii, 266] on the unimportance of the preceding crop and the condition of the soil as factors influencing infestation by *Hylemyia coarctata*, confirm those made by himself during 1914 in Saxony.

Hess (A.). **Die Kohlweisslingplage in der Schweiz im Sommer 1917.** [The White Cabbage Butterfly Pest in Switzerland in the Summer of 1917.]—*Zeitschr f. angew. Entom., Berlin*, iv, no. 2, 1918, pp. 332–334. [Received 19th April 1920.]

The bulk of the information contained in this paper on *Pieris brassicae* has been noticed elsewhere [*R.A.E.* A, vii, 235]. Hand-collection is advocated as the most satisfactory remedial measure.

Rhumbler (L.). **Vorschlag zu einer zweckmässigen Formeldarstellung der Biologien von Insekten.** [Suggestion for a useful Representation of the Life-histories of Insects by means of Symbols.]—*Zeitschr. f. angew. Entom., Berlin*, iv, no. 3, 1918, pp. 335–346. [Received 19th April 1920.]

The contents of this paper are indicated by its title.

Andres (A.). **Bekämpfung der Kleidermotte** (*Tineola bisselliella*) **durch Blausäure.** [Control of *Tineola bisselliella* with Hydrocyanic Acid.]—*Zeitschr. f. angew. Entom., Berlin*, iv, no. 3, 1918, pp. 366–368. [Received 19th April 1920.]

Experiments with hydrocyanic acid gas in the control of *Tineola bisselliella* have shown that an exposure of 4 hours with 1 volume per cent. of the space to be fumigated is required to kill all stages of this moth. The eggs are much more susceptible to the gas than the larvae.

Tineola pellionella, *Trichophaga tapetzella* (*tapetiella*) and *Endrosis lacteella* may be controlled in the same way.

Kleine (—). *Therera nobilitata* **Fabr. (ein neuer Roggenschädling)** [A new Pest of Rye.] *Zeitschr. f. angew. Entom., Berlin*, iv, no. 3, 1918, p. 373. [Received 19th April 1920.]

As similarly recorded from Silesia [*R.A.E.*, A, v, 231], a Therevid fly has now been found infesting rye in Pomerania, and as the result of breeding has been identified as *Therera nobilitata*, F. The infestation apparently depends on the type of soil, damp ground being preferred. Pupation occurs in the ground at a depth of from 2–2½ in. Very little is known of the biology of this fly.

Teichmann (E.). **Zur Biologie des Kabinettkäfers** (*Anthrenus museorum*.)—*Zeitschr. f. angew. Entom., Berlin*, iv, no. 3, 1918, pp. 375–376. [Received 19th April 1920.]

Anthrenus museorum is recorded as damaging the linen lining of a trunk and a woollen suit which was in it. The larvae were killed by exposure for six hours to two volumes of hydrocyanic acid per cent. of the space to be fumigated. A smaller amount would probably be sufficient, but further observations are necessary to determine the minimum effective dosage.

Haenel (K.). **Maikäferplage und Vogelschutz.** [The Cockchafer Pest and Bird Protection.]—*Zeitschr. f. angew. Entom., Berlin*, v, no. 1, 1919, pp. 34–42. [Received 19th April 1920.]

A list of 68 birds is given which are commonly found in the Bienwald in the Rhine Palatinate. Of these 17 have been proved to feed on cockchafers [*Melolontha*]. Although they are energetic destroyers of this pest, their value in controlling its numbers should not be overrated, the most satisfactory means of eradication being those previously described [*R.A.E.*, A, v, 33].

Müller (H. C.) & Molz (E.). **Beobachtungen über das Auftreten der Erdraupen der Saateule** (*Agrotis segetum*, **Schiff.**) **im Jahre 1917.** [Observations on the Appearance of Caterpillars of *Agrotis segetum*, Schiff., in 1917.]—*Zeitschr. f. angew. Entom., Berlin*, v, no. 1, 1919, pp. 43–46. [Received 19th April 1920.]

During 1917 *Euxoa* (*Agrotis*) *segetum* was one of the chief pests in the vicinity of Halle. The crops attacked included grain, potatoes, cabbages, turnips, beet, spinach, tobacco, sugar, onions, parsnips and carrots, the latter two being those most severely damaged.

The caterpillars appeared particularly early during the year under discussion, damage being noticed at the beginning of June. Their abundance is attributed to the dry weather experienced during May and June of that year. Natural enemies include birds and a Carabid beetle, *Broscus cephalotes*, L. The remedial measures advocated include the careful selection of rotation crops, the use of artificial manure and as early cultivation as possible.

HEROLD (W.). **Zur Kenntnis von *Agrotis segetum*, Schiff. (Saateule).** [A Contribution to the Knowledge of *Agrotis segetum*, Schiff.]—*Zeitschr. f. angew. Entom., Berlin*, v, no. 1, 1919, pp. 47–59, 9 figs. [Received 19th April 1920.]

The egg and various stages of the larva of *Euxoa* (*Agrotis*) *segetum*, Schiff., are described. The present observations were made in consequence of the abundance of this pest in Germany in 1917. The eggs were laid in May, July, and from September to October, giving rise to two generations in the year. In the majority of cases they are laid on plants above ground in batches of about 500, making a total of about 1,600 for each female. During October and the beginning of November the eggs in the field as well as under laboratory conditions required from 15 to 17 days to hatch. The newly emerged larva is very active until suitable food is found, and this it attacks immediately. The first moult takes places after about 10 days, but the total number of moults was not ascertained. After from 30 to 45 days the larvae begin burrowing in the earth and only occasionally appear above ground in search of food.

Experimentally they will feed on many weeds; of those tried the order of preference observed was *Leontodon*, couch grass, *Geranium*, *Viola*, *Erodium*, *Sisymbrium*, *Plantago*, clover and *Achillea*. *Senecio vulgaris* was not touched. A great number of larvae were found to be infected with a fungus, *Tarichium megaspermum*.

LENGERKEN (H.). **Lebensweise und Entwicklung des Fliederschädlings *Otiorrhynchus rotundatus*, Siebold.** [The Life-history and Development of the Lilac Pest, *Otiorrhynchus rotundatus*, Siebold.]—*Zeitschr. f angew. Entom., Berlin*, v, no. 1, 1919, pp. 67–83, 21 figs; no. 2, pp. 319–321, 5 figs. [Received 19th April 1920.]

The observations here described with regard to *Otiorrhynchus rotundatus*, Sieb., were made partly under natural and partly under laboratory conditions. The eggs are laid in the ground, probably near the roots of the food-plant. In Germany this weevil has only been recorded from the neighbourhood of Dantzig, where it attacks Turkish lilac (*Syringa*). The larvae feed on the root-ends and pupate about the end of July or beginning of August in the ground. The adults emerge in the middle of August and soon begin feeding on the leaves. The damage caused to the foliage is described and illustrated. By the end of October all the adult weevils have disappeared into the ground for hibernation; they emerge the following April and attack the buds of the food-plant.

Since writing this paper the author has received further examples of this weevil from Bucharest and from Tapiau in East Prussia.

The food-plants include *Ligustrum vulgare*, *Lonicera tatarica*, *Philadelphus coronarius*, *Spiraea salicifolia* and *Cornus stolonifera*.

SZYMANSKI (J. S.). **Zur Methodik der Entomologischen Untersuchungen.** [On the Technique of Entomological Investigations.]—*Zeitschr. f. angew. Entom., Berlin*, v, no. 1, 1919, pp. 93–97, 3 figs. [Received 19th April 1920.]

By means of an apparatus on the principle of a chemical balance and called an "aktograph," the mechanism of which is described, it is possible to ascertain the period of activity and rest in insects. It is also suggested that observations made on the behaviour of anaesthetised insects should prove of value in investigations on their sense organs.

TRÄGÅRDH (I.). **Untersuchungen über einige schädliche Forstinsekten in Schweden.** [Observations on some injurious Forest Insects in Sweden.]—*Zeitschr. f. angew. Entom., Berlin*, v, no. 1, 1919, pp. 98–104, 8 figs. [Received 19th April 1920.]

The bulk of the information contained in this paper has been previously noticed [*R.A.E.*, A, vi, 287; vii, 422.]

BOLLE (J.). **Die Ermittlung der Wirksamkeit von insektentotenden Mitteln gegen die Nagekäfer des verarbeiteten Werkholzes.** [Tests of the Efficacy of Insecticides on Boring Beetles of worked Timber.]—*Zeitschr. f. angew. Entom., Berlin*, v, no. 1, 1919, pp. 105–117, 5 figs. [Received 19th April 1920.]

Details of various experiments on *Anobium paniceum*, L., *Tenebrio molitor*, L., and *Tineola bisselliella*, Z., are given. The results of these show that, of the gases so far tried, carbon bisulphide is the most effective fumigant against these pests. These insects were used for the experiments, as wood borers could not always be obtained. Against the latter the proportions advocated are about $4\frac{1}{2}$ oz. to 35 cu. feet with an exposure of 4 days at a temperature over 15° C. [59° F.] The time of exposure must be doubled for lower temperatures, but treatment should not be undertaken if the temperature is below 10° C. [50° F.]. Experiments are now in progress to test the efficacy of hydrocyanic acid gas for such purposes.

ZANDER (E.). **Die Bekämpfung der Wachsmotten mit Blausäure (Cyanwasserstoff).** [Control of Wax Moths by means of Hydrocyanic Acid.]—*Zeitschr. f. angew. Entom., Berlin*, v, no. 1, 1919, pp. 127–128. [Received 19th April 1920.]

Galleria mellonella, L., and *Achroia grisella*, L., caused great damage to honeycombs during 1917, but all stages of these moths were successfully controlled by fumigation with hydrocyanic acid gas. The advantages of this method over sulphur fumigation are emphasised.

STELLWAAG (F.). **Zunahme der Acarinose am Wein in der bayer. Rheinpfalz.** [Increase of Mite-infestation on Vines in the Bavarian Rhine Palatinate.]—*Zeitschr. f. angew. Entom., Berlin*, v, no. 1, 1919, p. 128. [Received 19th April 1920.]

Attacks on vines due to the mite, *Phyllocoptes vitis*, have spread considerably during the past few years in the Rhine Palatinate. The remedial measures advocated include spraying with a nicotine and soap solution mixed with a copper-lime spray such as is used against *Peronospora*.

Stellwaag (F.). **Rebstichler** (*Byctiscus betulae*, **L.**) **in der bayer. Rheinpfalz.** [*Byctiscus betulae*, L., in the Bavarian Rhine Palatinate.] *Zeitschr. f. angew. Entom., Berlin*, v, no. 1, 1919. p. 129. [Received 19th April 1920.]

During 1918, as in the previous year [*R.A.E.*, A. viii, 268], *Byctiscus betulae*, L., was very abundant in the Rhine Palatinate. At the time of maximum infestation an order was passed to close all schools for a few days so that the children might assist in collecting the weevils. It is hoped that this pest will be less abundant in 1920 owing to these measures.

Krausse (A.). **Uber** *Aradus cinnamomeus*, **Panz., die Kiefernrindenwanze.** [Pine Bark Bug.]—*Zeitschr. f. angew. Entom., Berlin*, v, no. 1, 1919, pp. 134–136, 5 figs. [Received 19th April 1920.]

During 1917 a bug, *Aradus cinnamomeus*, Panz., caused great damage to pines in the neighbourhood of Eberswalde. Various stages, including eggs, were found to be present on 18th August. The first larva from these eggs emerged 5th September. Various characteristics of this pest are described. The natural enemies of the bugs include larvae of *Rhaphidia* sp., which were only present in small numbers.

The trees were also infested with a bark-beetle, *Pityogenes bidentatus*, Hbst., in the galleries of which *Hypophloeus linearis*, F., was also found. Other pests on the trees included a weevil, *Brachonyx pineti*, Payk., and the Aphids, *Lachnus pineus*, Mordv. (*pineti*, Koch, nec F.) and *L. pini*, Kalt. The latter were largely attended by *Formica fusca cinerea*. Only a few larvae of *Bupalus piniarius*, L., were found in the locality.

Lakon (G.). **Die Insektenfeinde aus der Familie der Entomophthoreen. Beitrag zu einer Monographie der Insektentötenden Pilze.** [The Enemies of Insects belonging to the Family of *Entomophthora*. A Contribution to a Monograph of Insect-killing Fungi.]—*Zeitschr. f. angew. Entom., Berlin*, v, no. 2, 1919, pp. 161–216, 18 figs. [Received 19th April 1920.]

The genera *Empusa*, *Lamia*, *Entomophthora* and *Tarichium* are described and a key for the identification of these fungi is given. The insect hosts are dealt with under their respective orders. The paper concludes with an extensive bibliography of 216 works, 47 of which are especially referred to as dealing with the culture and practical utility of these fungi.

Friederichs (K.). *Plocaederus obesus*, **Gah., ein gefährlicher Feind des Kapokbaumes.** [*Plocaederus obesus*, Gah., a serious Enemy of the Silk-cotton Tree.]—*Zeitschr. f. angew. Entom., Berlin*, v, no. 2, 1919, pp. 226–230, 7 figs. [Received 19th April 1920.]

A Longicorn beetle, *Plocaederus obesus*, Gah., is recorded as a serious pest of kapok trees (*Eriodendron anfractuosum*) in Cochin China. The larvae bore in the wood and cause the ultimate death of the trees.

The formation and position of the pupa in the trunk are described.

Reh (L.). *Homoeosoma nebulella*, **Hb., als Sonnenblumen-Schädling in Rumänien.** [*Homoeosoma nebulella*, Hb., as a pest of Sunflowers in Rumania.]—*Zeitschr. f. angew. Entom., Berlin*, v, no. 2, 1919, pp. 267–277, 3 figs. [Received 19th April 1920.]

During the German occupation of Rumania the author was requested to make special investigations on *Homoeosoma nebulella*, a Lepidopterous pest of sunflower seeds, and the possibility of its future control. For political reasons however the methods suggested as a result of this expedition could not be carried out. The eggs are laid in the sunflower heads when in bloom and the emerging larvae feed on the blossoms and soft seeds. In Rumania there are probably three generations a year, hibernation occurring in the larval stage usually in or on the ground and only in isolated cases on the plant. Pupation does not occur in the hollowed-out seed. It probably lasts about 4 weeks. The remedial measures advocated include clean cultivation and especially the removal of all thistles, as these form the breeding place of the first generation. The emergence of the adult moths might be prevented by deep ploughing in the spring prior to sowing. The adults of the first generation appear at the end of April and beginning of May in Wallachia; the second generation from the end of June to the beginning of July; and the third some time in August.

Early sowing, so that the chief blossoming takes place before the flight of the second generation, reduces the amount of infestation.

As sunflowers with a large oil content suffer more from this pest than other varieties, it is suggested that experiments should be carried out with a view to producing an immune variety of sunflower by cross-breeding and selection.

Kleine (R.). **Welche Aaskäfer-Imagines (Silphiden) verfressen die Rübenblätter?** [Which Silphids attack Turnip leaves in the Adult State?]—*Zeitschr. f. angew. Entom., Berlin*, v, no. 2, 1919, pp. 278–285, 5 figs. [Received 19th April 1920.]

The author's observations with regard to Silphids damaging turnip foliage confirm those of previous writers. In no case was *Phosphuga* sp. induced to feed on these plants, whereas *Blitophaga opaca*, L., and *B. undata*, Müll., will attack the leaves both in the larval and adult stages. As the beetles only feed on leaves of more or less mature plants, the crop itself is not much affected. The chief damage is caused by the larvae as the plants begin to develop. Baits consisting of carrion proved ineffective. The remedial measures advocated are the pulling up of destroyed plants after the maximum feeding is over and improving the vigour of the crop by manuring, etc.: the thinning out of diseased plants before the end of the feeding period of the larvae will only induce them to attack the remaining plants in greater numbers and thus reduce the ultimate crop.

Burkhardt (F.). **Zur Verbreitung und Lebensweise von** *Otiorrhynchus rotundatus*, **Siebold.** [The Distribution and Life-habits of *Otiorrhynchus rotundatus*, Siebold.] *Zeitschr. f. angew. Entom., Berlin*, v, no. 2, 1919, pp. 295–300, 4 figs. [Received 19th April 1920.]

Otiorrhynchus rotundatus, Sieb., is recorded as being found at Bromberg and Küstrin, as well as Dantzig [*R.A.E.*, A, viii, 271].

Additional food-plants include snowberries and *Prunus padus*. The characteristic results of feeding were also seen on *Cornus sanguinea*, *C. alba*, *Ribes aureum*, *Prunus serotina*, *Rosa canina* and *Spiraea* sp., though no examples were taken on these plants. One female was noticed to lay about 48 eggs from the beginning of August to the 18th August; these hatched under laboratory conditions in about 17 days. During the present observations the first damage was noticed early in June, but this apparently depends on climatic conditions.

SCHUMACHER (F.). *Leucopis nigricornis* **Egg. (Dipt.) als Parasit bei** *Pulvinaria betulae*, **L. (Coccid.)**—*Zeitschr. f. angew. Entom., Berlin*, v, no. 2, 1919, p. 314. [Received 19th April 1920.]

The Agromyzid fly, *Leucopis nigricornis*, Egg., is recorded as a parasite of *Pulvinaria betulae*, L., infesting *Prunus cerasiferus* near Berlin. About 90 per cent. of the scales were thus infested.

ANDRES (—). **Etwas über die Kupferrote Dörrobstmotte,** *Plodia interpunctella*, **Hb.** [Notes on the Dried Fruit Moth, *Plodia interpunctella*, Hb.] *Zeitschr. f. angew. Entom., Berlin*, v, no. 2, 1919, pp. 316–317. [Received 19th April 1920.]

Plodia interpunctella, Hb., is recorded as infesting various stored products. There are apparently two generations a year. The moths of the first generation are on the wing until September, and hibernation occurs in the larval stage of the second generation. Fumigation with hydrocyanic acid as for *Ephestia kühniella*, Z., is recommended.

FRIEDERICHS (K.). **Studien über Nashornkäfer als Schädlinge der Kokospalme.** [Studies on Rhinoceros Beetles as Pests of the Coconut Palm.]—*Monographien zur angew. Entomologie*, no. 4, Supplement no. 1 to *Zeitschr. f. angew. Entomologie, Berlin*, vi, 1919, 116 pp., 53 figs., 20 plates, 1 map. [Received 19th April 1920.]

Owing to the extensive damage caused by rhinoceros beetles in the coconut plantations of Samoa during 1912–13 an extensive journey was undertaken by the author to ascertain why these beetles are apparently more dangerous to coconut cultivation in these islands than in other palm-growing countries. Observations were also to be made with a view to the possibility of introducing natural enemies to Samoa, but this part of the project had to be abandoned owing to the outbreak of war. The places visited included: the Philippine Islands, Cochin China, Cambodia, Siam, Singapore, the Malay States, Ceylon and Madagascar.

The morphology and ecology of various species are described, including *Oryctes rhinoceros*, *O. monoceros*, *O. boas*, and *O. radama*. The prevalence of these beetles and the respective damage caused by them in the various places visited is discussed at length. In Indo-China *Xylotrupes gideon*, L., and *X. lorquini*, Deyr., were also abundant.

Although *Oryctes* spp. were found in great numbers in Ceylon and comparatively very little is done to combat them there, their presence does not apparently interfere seriously with coconut cultivation. The Ceylon palms evidently possess certain properties that enable them to resist the ravages of these beetles, and it is possible that they would still prove resistant if cultivated in Samoa.

All observations show that clean cultivation and the destruction of breeding places are the essential remedial measures in combating these pests; where this work is neglected even the natural enemies, which include birds, rodents, Scoliid wasps and the fungus, *Metarrhizium anisopliae*, are not of much use in keeping down the numbers.

The author calls attention to the fact that in a previous notice [*R.A.E.*, A, v, 291] *Scolia erratica*, which is a parasite of *Rhynchophorus ferrugineus* in the Straits Settlements, was erroneously stated to be also a parasite of *Oryctes*.

Köck (K.). **Die Wirkung nikotinhältiger Dämpfe auf den Heuwurm.** [The Action of Nicotine Vapours on the First Generation of Vine Moths.]—*Zeitschr. landw. Versuchswesen in Oesterreich, Vienna*, xvii, no. 6–7, June-July 1914, pp. 638–641, 1 fig. [Received 23rd April 1920.]

Nicotine sprays are in general use against vine moths [*Clysia ambiguella* and *Polychrosis botrana*] and a dust containing ·45 per cent. of nicotine has also given good results. Nicotine vapour provides a third method of checking these pests and a knapsack generator for producing it has been placed on the market, but this model is dangerous to the operator as the steam employed as a carrier for the nicotine is raised by means of a spirit lamp. Another type, here described, consists of a 5-gallon boiler mounted on two wheels, and the nicotine-impregnated steam is led through hose pipes to the spray nozzles. In the course of a trial steam was raised in 40 minutes and in 45 minutes 3 workers dealt with 380 stocks. It was not possible to gauge the action of the nicotine as too few moths were present, but the weight of this apparatus and its cost [£12 in 1914] are against it. Other experiments showed that nicotine vapour has bad effects on the workers and does not appear to kill more than half of the moths.

Chase (W. W.). **Experimental Dusting and Spraying of Peaches for 1919.**—*Georgia State Bd. Entom., Atlanta*, Circ. 30, March 1920, 13 pp.

The dusting of peaches, as a substitute for spraying, obtained a wide usage by the summer of 1919. The season was an unprecedented one as regards rainfall and lack of sunshine, and consequent infestation by brown rot, while the abnormal abundance of curculio [*Conotrachelus nenuphar*] rendered it an unusual opportunity for tests of dusting and spraying, emphasising the deficiencies of each and indicating what is needed to correct them. The tests carried out by the State Board of Entomology were a continuation of a series begun some years previously [*R.A.E.*, A, v, 264.]

For the dust sprays, sulphur, lead arsenate and hydrated lime were used in four different proportions, namely, 80–10–10; 60–10–30; 60–5–35 and 10–10–80. For the liquid sprays, $\frac{3}{4}$ lb. powdered lead arsenate was used to 50 U.S. gals. water with the addition of 2 lb. lime. For the second and third applications 4 lb. atomic sulphur, $\frac{1}{2}$ lb. lead arsenate and 2 lb. lime were used to 50 U.S. gals. water. Each substance was applied with a regulation power outfit. Detailed results obtained in the various test plots are tabulated.

The results indicate that the above dust mixtures effect approximately as good control of brown rot as spraying with a combined insecticide and fungicide in water and that they are far superior in scab prevention. Dust mixtures are, however, less effective than sprays in controlling *C. nenuphar* on varieties that ripen as late as Elbertas; both spray and dust were unsatisfactory in this respect. The comparative inefficacy of dust against the weevil is the principal weakness of the method. It is thought that a fourth application of dust to Elbertas, perhaps about two weeks before maturity, might in years of normal abundance effect control of the pest; future experiments will decide this. It was found that 5 per cent. lead arsenate gave as good results in control of the weevil as formulae containing more lead, and with less lead there is of course less liability to injury of foliage. No recommendations can be made with regard to dust formulae until more work has been done on these lines.

Tryon (H.). **Root-Bark Channeller of Citrus.** *Decilaus citriperda*, **H. T. (Coleoptera, Fam. Curculionidae, Sub-Fam. Cryptorrhynchidae).**—*Queensland Agric. Jl., Brisbane*, xiii, February 1920, pp. 71–82, 3 plates. [Received 20th April 1920.]

The larva of the weevil, *Decilaus citriperda*, sp. n., which is described in all its stages, attacks citrus roots. It was hardly noticed before 1917, and experiments against it were not started till the autumn of 1919. There are probably two generations in a year. The larvae gnaw channels in the inner bark (cortex) but do not give rise to a ring-barking effect, so that a strong tree will probably overcome the direct injury. Young trees never suffered appreciably, and Seville orange trees were not attacked. The trees chiefly infested were ordinary oranges, lemons and mandarins. Grafted or worked trees suffered more than seedling trees, but most damage took place where the trees were already unhealthy. The attacks are very local, and as the adult weevils cannot fly, they probably oviposit for the most part on the roots they have themselves infested.

No reliable remedial measure has yet been discovered. Salt and sulphur treatment of the soil did not produce successful results. Further experiments should perhaps be on the following lines: the insects might be prevented from reaching the root by some repellent substance (*e.g.*, one containing crude naphthaline) placed at the base of the tree-trunk; or some gaseous insecticide may prove effective against insects already occurring in the roots; or it may be possible to reach them in the burrows in dry weather with some fluid that is not itself destructive to plant-tissue (*e.g.*, kyanit). Strengthening the roots by correct soil treatment, measures against drought, and fertilisers, prevent insect attack and also benefit the tree.

Burke (H. E.). **California Oak Worm.**—*U.S. Dept. Agric., Washington, D. C.*, Farmers' Bull., 1076, February 1920, 14 pp., 9 figs. [Received 21st April 1920.]

The food-plants and natural enemies of this moth [*Phryganidia californica*] have already been noticed [*R.A.E.*, A, vii, 381]. In addition to native and introduced oaks, it attacks the American chestnut (*Castanea dentata*) and blue gum (*Eucalyptus globulus*). Its occasional appearance in such large numbers as to defoliate the oak trees, and become a general nuisance by crawling everywhere, is due to the reduction of its natural enemies during the periods when its own numbers are few. There are two generations a year, the caterpillars being most noticeable in April and May and again in August and September. The best method of control is to spray the trees while the larvae are young with a mixture of 3 to 5 lb. of lead arsenate paste, or half that amount of powder, dissolved in 50 gallons of water.

The Outbreak of Locusts in Western Canada in 1919.—*Agric. Gaz. Canada, Ottawa*, vii, no. 3, March 1920, pp. 218–220, 2 figs.

An outbreak of locusts that occurred in certain sections of Manitoba, Saskatchewan, Alberta and British Columbia in 1919 was the most important from an economic view point since the West was developed as an agricultural region. As soon as it was realised that the emergence of young hoppers was unusually large, farmers were warned and control measures were advocated. The infested areas were determined, demonstrations of the action of poison-baits were given and later in the season the new areas in which oviposition had occurred were ascertained. The difficulties were enhanced by the fact that the outbreaks were most severe in districts affected by the extreme drought. As a result of the wide-spread application of poisoned bait and the use of hopperdozers, however, thousands of acres were saved. Investigations of the areas infested indicate that, unless unfavourable weather supervenes, the infestation of 1920 will cover about twice the area of that of 1919. In Saskatchewan it is estimated that wheat worth upwards of £400,000 was saved by the measures practised. Some 226 tons of poisoned bait were used, costing approximately £5,000.

Hopkins (A. D.). **The Bioclimatic Law.**—*Jl. Washington Acad. Sci., Washington, D. C.*, x, no. 2, 19th January 1920, pp. 34–40. [Received 26th April 1920.]

The greater part of the contents of this paper has already been noticed [*R.A.E.*, A, viii, 87]. The measurement of the intensity of the factors controlling this law can best be effected by observing the response of any given plant or other organism to a given environmental influence, since all organisms that are adapted to it respond to such influence in like manner. The organism not only records the influence of all factors that are recorded by artificial instruments but also all the other forces that affect life activity, which no instruments yet invented can do.

Reports on the State of the Crops in each Province of Spain on the 20th March 1920. *Boletín Agric. Técnica Económica, Madrid*, xii, no. 135, 31st March 1920, pp. 216–233.

For the first time it has been considered advisable to arrange for the technical staff to undertake the study of *Tortrix viridana*, which has caused such serious losses to the acorn crops in the Province of Badajoz, amounting to many millions of pesetas in this Province alone. It is feared that the problem will present some difficulty and that, in view of the little time and the paucity of funds available for this research, control will not be attained as quickly as the public hopes. Investigations and experiments will probably be necessary for some years, with adequate funds for disposal, before the pest can be controlled.

The anti-locust campaign has been more successful than in former years, but it is regretted that some agriculturists still refuse to practice rotation of crops, with the result that this pest must still remain endemic. In the province of Madrid also, the negligence of some of the local municipal councils and ranch owners has unfortunately resulted in a heavy infestation causing considerable loss, which might easily have been prevented if the proper measures had been taken in the infested territory.

SMITH (R. H.). **A Preliminary Report on the Clover Aphis and Methods for its Control.**—*Univ. Idaho Agric. Expt. Sta., Moscow, Id.*, Bull. 112, December 1918, 15 pp., 5 figs. [Received 28th April 1920.]

Some account of *Anuraphis* (*Aphis*) *bakeri*, Cowen (clover aphis) in Idaho has already been published [*R.A.E.*, A, vi, 399]. Red, alsike and to some extent white clovers are attacked in Idaho. When present in small numbers the Aphids usually occur under the stipules of the clover leaves. The injury to the clover plants consists of a stunting of their growth, causing them to ripen prematurely, killing flowering branches, blighting seeds and covering the seed with honey-dew, thus lowering the market value.

Weather conditions are probably the greatest factor in the natural control of *A. bakeri*. During severe winters the Aphids are largely destroyed; unusually rainy periods encourage the fungus, *Empusa* (*Entomophthora*) *aphidis*, Hoff., which causes the death of large numbers. Other natural enemies include two Hymenopterous parasites, the larvae of Syrphid flies, a number of bugs and a small red mite, and (probably the most important) several species of Coccinellids.

Close pasturing of red clover and alsike fields during autumn, winter and early spring, is the most effective check on the clover aphis as yet known. Grazing during spring and early summer, or close grazing after the hay crop has been removed, will greatly help in preventing injury to the red clover seed crop. The Aphids can be destroyed completely by submerging the clover fields for from 6 to 10 hours just after the hay crop has been removed. Present evidence indicates that no injury to the clover results from flooding in early spring. Clover cover-crops in apple and pear orchards should be close grazed in early September to prevent the Aphids from ovipositing on the fruit trees. Patches of self-sown clover should be close grazed or destroyed.

Spraying gives promising results on alsike clover fields, but is not recommended for red clover. The most satisfactory spray used consisted of 1 part Blackleaf 40 to 1,400 parts of water or $\frac{7}{8}$ pint to 150 U. S. gallons, 4 lb. of dissolved laundry soap being added to each 100 gals. of solution. This was applied with a power sprayer.

Marcovitch (S.). **The Strawberry Weevil in Tennessee.**—*Tennessee State Bd. Entom., Knoxville*, viii, no. 3, Bull. 30, September 1919, 17 pp., 4 plates, 8 figs. [Received 4th May 1920.]

The author's experiences in controlling the strawberry weevil [*Anthonomus signatus*] in Tennessee during 1915 and 1916 are recorded. An account is given of the life-history and habits of the weevil. The method of control by means of sulphur-lead arsenate dust is discussed [*R.A.E.*, A, v, 287]. While working on this insect in Minnesota, it was discovered that the weevils are unable to emerge when covered over with soil; apparently therefore by ploughing under old, infested patches the weevils can be successfully buried. On badly infested fields the one-crop system should be followed to avoid severe injury, or, if the weevils are not too numerous on the buds, the two-crop system may be practised. Soon after picking the beds should be mowed and the leaves and weeds should be burned over quickly, as a creeping fire injures the plants. The rows should then be narrowed to strips 4 to 8 inches wide. Where the beds are burned over and cultivated, it is seldom that any weevils are left. More than two crops should never be taken from the same field and old, neglected patches should not be tolerated as they serve as a breeding-ground for the weevils.

Smith (L. B.) & Zimmerley (H. H.). **Booms for Spraying Truck Crops.**—*Virginia Truck. Expt. Sta., Norfolk, Va.*, Bull. 28, 1st July 1919, pp. 83–98, 6 figs. [Received 4th May 1920.]

This paper describes the various equipments necessary for the effective application of sprays for different vegetable crops. The particular kind of "boom," *i.e.*, the structure that conducts the spray material to, and supports, the nozzles, that is adaptable to a special crop such as tomato, potato, spinach or kale, is discussed, and the construction of suitable ones is described and illustrated. The connecting of these booms to existing machinery is explained and their cost has been approximately worked out.

Cook (W. C.). **Cut Worms and Army Worms.**—*Office State Entomologist, Univ. Farm, St. Paul, Minnesota*. Circ., 52, 1st April 1920, 8 pp., 13 figs.

Cutworms are among the worst pests that the farmers and gardeners in Minnesota have to contend with: some instances are given of serious losses in the State due to them. The usual methods of protection against these pests are discussed, the best means of prevention of attack being by general clean cultivation. Other methods include autumn ploughing, stiff paper collars round the young plants, and the use of poisoned bran mashes. Hand-picking and digging out the caterpillars are also advocated.

A key is given for the determination of the commoner cutworms of Minnesota, with an account of their life-histories and habits. The species dealt with include *Agrotis fennica*, Tausch., *A. c-nigrum*, L., *A. unicolor*, Wlk., *A. ypsilon*, Rott., *Lycophotia margaritosa*, Haw., *Cirphis unipuncta*, Haw., *Euxoa tessellata*, Harr., *E. messoria*, Harr., *Feltia ducens*, Wlk., *Septis arctica*, Boisd., and *Sidemia devastatrix*, Brace.

FAES (H.). **Le Pyrèthre et sa Culture.**—*Rev. Hortic. de l'Algérie, Algiers*, xxiv, no. 1–2, January-February 1920, pp. 19–23. [Received 5th May 1920.]

Pyrethrum, bought on the market, must be taken very much on trust. The efficacy of the powder depends on details in its collection and preparation, and it is often adulterated. Consequently the advantages of growing it as required for use are obvious. At the same time it is difficult to obtain seed of good quality. The seed should be sown in April-May or July-August, covered with a very thin layer of earth ($\frac{1}{8}$ inch) and watered. Afterwards fresh plants can be obtained by self-sowing. When bedded out the plants should be about 20 inches apart. The plants flower after two years. Flowers should be gathered in dry weather, when the majority are beginning to open, and dried in the shade [*R.A.E.*, A. v, 538]. This will probably be about the middle of June. The formula for use against *Clysia ambiguella* is 3 lb. of pyrethrum powder stirred into 20 gals. of water in which has been dissolved 4 lb. of black soap.

CAESAR (L.). **The Oyster-Shell Scale.**—*Canad. Horticulturalist and Beekeeper, Toronto, Ont.*, xxviii, no. 4, April 1920, pp. 95–96.

The oyster-shell scale [*Lepidosaphes ulmi*] is very widely distributed in Ontario, though some localities are specially favourable to it. It is however considerably checked by parasites [*R.A.E.*, A. vii, 242], while an infestation of several hundred individuals is necessary to destroy a moderate-sized tree. The simplest method of control is the use of lime-sulphur wash (one part to seven of water). Spraying should take place just as the buds are bursting, as it aims at killing the young scales just after they hatch. The dead scales may remain on the tree for two or three years.

McLENNAN (A. H.). **Spraying Vegetables.**—*Canad. Horticulturist and Beekeeper, Toronto, Ont.*, xxviii, no. 4, April 1920, pp. 107–108.

Insect injury in 1919 was severe in Ontario. Against the cabbage maggot [*Phorbia brassicae*] corrosive sublimate (one oz. to 10 gal. of water) gave perfect results; three applications were made, beginning four days after the plants were set out. Black heart in celery, due to tarnished plant bugs [*Lygus pratensis*], presents a serious problem. A concentration as high as one pint of Blackleaf 40 to four gallons of water had to be used for successful results in severe infestations, one pint to 50 gals. with 2 lb. soap being the normal concentration. Onion thrips [*Thrips tabaci*] caused a loss of over 50 per cent. of the crop. Sodium nitrate (50 to 100 lb. per acre) helped to bring the crop through, but Blackleaf 40 and kerosene emulsion were tried too late to produce satisfactory results.

ABOT (A.). **Note sur la présence en Anjou de** *Cassida inquinata*, **Brullé.**—*Bull. Soc. d'Et. Sci., Angers*, xlix. 1919 (1920), pp. 100–101.

The Chrysomelid, *Cassida inquinata*, Brullé, is reported for the first time in Anjou, where it attacks camomile cultivated for medicinal purposes. It lives on the underside of the leaves, which it riddles with holes. Unless the beetle is numerous the damage it does is not great and the only remedy is to destroy the larvae and adults by hand.

BALLOU (H. A.). **Notes on the Cotton Crop in Egypt.**—*Agric. Jl. Egypt, Cairo*, ix (1919), 1920, pp. 14–48. [Received 10th May 1920.]

This paper is a consideration of the factors that have caused the steady falling off in the yield of the Egyptian cotton crop during the past twenty years. The influence of insect pests on this phenomenon is discussed, the principal ones being the cotton worm (*Prodenia litura*), the spiny bollworm (*Earias insulana*), the cotton stainer (*Oxycarenus hyalinipennis*) and the pink bollworm (*Platyedra* (*Gelechia*) *gossypiella*). *P. gossypiella* only affects the figures for the last five years, and though *P. litura* and *E. insulana* cause great damage in certain years and *O. hyalinipennis* is responsible for some loss, they were not less harmful during the thirty or forty years from 1860 onwards, when there was a steady increase in the yield. Insect pests do not therefore affect the subject under consideration.

CARTWRIGHT (W.). **Treatment of Cotton in the Field as a Combative Measure against** *Gelechia* **attacks.**—*Agric. Jl. Egypt, Cairo*, ix (1919), 1920, pp. 126–128. [Received 10th May 1920.]

Tables are given showing the results of experiments carried out in 1918 to demonstrate the value of special watering of cotton to minimise attack by *Platyedra* (*Gelechia*) *gossypiella*. As had been found before [*R.A.E.*, A, vi, 70], the reduction of the amount of water per watering in July, and stopping of all water supply after, approximately, the first week in August, increase the yield and make the crop ripen earlier.

Quince.—*Agric. Jl. Egypt, Cairo*, ix (1919), 1920, pp. 129–130, 1 plate. [Received 10th May 1920.]

Experiments in growing quince trees in Egypt are described. The chief insect pest is the leopard moth [*Zeuzera pyrina*], the caterpillars of which bore galleries in the shoots and branches. The trees should be inspected weekly, and when any holes are noticed a wire should be pushed in to kill the larvae inside. If the hole is too long or crooked for this to be done, they may be killed by injecting carbon bisulphide and stopping the hole with grafting wax immediately afterwards.

CHIPP (T. F.). **A pest of Lima Beans and a Remedy for the Bean Fly.**—*Gardens' Bull., Straits Settlements, Singapore*, ii, no. 6, 31st January 1920, p. 205, and no. 7, 12th April 1920, p. 263, 264.

A beetle that is a troublesome pest of lima beans in Singapore has been identified by the Imperial Bureau of Entomology as *Pagria* *flavopustulata*, Baly; and an Agromyzid fly as *Agromyza phaseoli*, Coq. Against the latter an appliance for catching the adults [*R.A.E.*, A, v, 36], trap-crops and an application of saw-dust and kerosene emulsion [*R.A.E.*, A, vi, 526], are recommended. In every case it is advisable that the refuse of bean fields should be burned after the crops have been gathered.

MATHIEU (E.). **Some Trials of Food Plants in the Economic Gardens. II.**—*Gardens' Bull., Straits Settlements, Singapore*, ii, no. 7, 12th April 1920, pp. 238–245, 3 plates, 1 fig.

In the experimental cultivation of lima beans (*Phaseolus lunatus*), the fight against pests is said to be almost hopeless; Nematodes, *Agromyza* sp., *Bruchus rufimanus*, an unidentified black bug, and various fungi all seem to concentrate on the bean plots. Disinfection of seeds, dusting with sulphur, sprayings with Bordeaux mixture, petroleum emulsion, etc., have all been used with only very partial effect.

The roselle plant (*Hibiscus sabdariffa*), on the other hand, except for the attacks of Nematodes, is singularly free from disease. It is however a food-plant of the red cotton bug (*Dysdercus cingulatus*), which increases rapidly unless kept in check by frequent sprayings and dusting with sulphur.

FLIPPANCE (F.). **A Guide to the Palm Collection in the Botanic Gardens. II.**—*Gardens' Bull. Straits Settlements, Singapore*, 12th April 1920, pp. 246–258, 1 plate.

Among the insect pests of palms here recorded are the large larvae of *Rhynchophorus ferrugineus* (red palm weevil) which burrow in the growing bud, a vital part of all palms. Usually only large plants are attacked, and the single-stemmed species are often killed. The plant may be saved, if the growing point has not been destroyed, by cutting down to it and removing the grubs. A larger species of *Rhynchophorus* acts in the same manner, and may be dealt with in the same way.

Oryctes rhinoceros burrows into the stem of the palm near the growing point, the apertures being marked by the exudation of a gummy liquid from the tree. The beetles should be speared with a sharp pointed object, and salt sprinkled in the hole to deter others.

There are also various small beetles and their larvae which attack the leaf-sheaths. They are generally inaccessible to insecticides; affected leaves should therefore be removed and an insecticide sprayed on the remainder, derris or soft-soap being recommended.

The larva of a Cetoniid beetle, *Protaetia fusca* (*Cetonia mandarinea*) attacks the roots of tub and pot plants. The caterpillars of two butterflies, *Amathusia phidippus* and *Erionota thrax*, should be picked off and the palms sprayed with derris to prevent further depredations. Grasshoppers, which are sometimes troublesome, should be caught with a net, or with a stick dipped in bird lime. Coccids should be sponged off with soft-soap and paraffin solution, and thrips should be similarly treated or else sprayed.

PETTEY (F. W.). **The Fruit-shed in relation to the Control of the Codling Moth.**—*S. African Jl. Sci., Johannesburg*, xvi, no. 3, October–December 1919, pp. 193–195. [Received 11th May 1920.]

Large numbers of the larvae of *Cydia pomonella* are brought into fruit-sheds with the pears and apples that are stored there and are able to leave the infested fruit and seek shelter in the cracks and crevices, where they make their cocoons, hibernate, and develop into moths which emerge in the spring. Fumigation with hydrocyanic acid or sulphur is not likely to give satisfactory results: in the cold weather the gas will not penetrate small openings, and the respiration of the hibernating insect is very slight, while the construction of the sheds often makes fumigation impossible.

If the sheds are so constructed that they can be kept perfectly closed against the exit of moths till the end of the fruit season this affords the best method of control; but if they are not so constructed, they should be left as open as possible, so that the moths may emerge at the same time as those outside. If on the other hand the sheds are kept partly closed, the majority of moths will emerge about six weeks later than those outside and the larvae hatching from their eggs will be difficult to control: firstly, because the spray applications will not have been timed to destroy them, and, secondly, because the later the eggs hatch the greater will be the number of larvae that attempt to enter the sides of the fruit, where they are harder to poison than in the calyx cup.

The sorting and temporary placing of the infested fruit of the packing house in shallow pens with no cracks in the floor or sides, and surrounded by strips of hessian or loose boards full of crevices so arranged as to attract the larvae to make cocoons where they may be collected and destroyed, might be of advantage. During the winter all cracks and corners in open houses should be examined thoroughly, and all cocoons found should be crushed or destroyed.

PETTEY (F. W.). **Insect Enemies of the Codling Moth in South Africa and their Relation to its Control.**—*S. African Jl. Sci., Johannesburg*, xvi, no. 3, October–December 1919, pp. 239–257, 8 tables.

A full account is given of the Chalcid, *Trichogrammatoidea lutea*, Gir., which is considered to prevent the hatching of 50 per cent. of eggs of the later broods of *Cydia pomonella* [*R.A.E.*, A, vi, 324]. Other Hymenopterous parasites attacking the larvae are the Ichneumonids, *Pimpla heliophila*, Cam., and *Trichomona cariniventris*, Cam.

Of predaceous insects the Argentine ant, *Iridomyrmex humilis*, is of considerable importance in localities where it is numerous, but it is inadvisable to encourage its increase as in many respects it is harmful, directly or indirectly, to the fruit grower. Other predators are a cricket, *Liogryllus bimaculatus*, DeG., the Reduviids, *Coranus papillosus* and *Pirates* sp.; a Pentatomid, *Diploxys hastata*, F.; a Carabid, *Chlaenius dichrous*, Wied., and the ant, *Dorylus helvolus*, L.

These enemies of the codling moth however cannot be relied upon to control it, chiefly because they begin to be active too late in the season. In addition there are always years in which the host dominates the parasite and losses among fruit-growers will therefore increase if spraying operations are not continued.

Experiments with Green Bolls of Sea Island Cotton.—*Agric. News, Barbados*, xix, no. 468, 3rd April 1920, p. 101.

The Spence-Harvey system of treating green cotton bolls is said to lessen materially the damage caused by the boll weevil [*Anthonomus grandis*] in the United States. Under this system the bolls are gathered while green and mechanically matured by a special process; they are then treated by special machinery so as to extract the cotton. Only two machines are at present in operation, though it is expected that upwards of a 100 will be made during 1920.

Barber (E. R.). **The Argentine Ant as a Household Pest.**—*U. S. Dept. Agric., Washington, D. C.*, Farmers' Bull. 1101, March 1920, 11 pp., 3 figs. [Received 17th May 1920.]

Much of the information on *Iridomyrmex humilis* given here has already been noticed [*R.A.E.*, A, i, 325; v, 422; vi, 313].

The following poison is recommended:—9 lb. granulated sugar, 9 pints water, 6 grams tartaric acid (crystallized), sodium benzoate 8·4 grams; these should be boiled for 30 minutes and allowed to cool. At the same time 15 grams sodium arsenite (C. P.) should be dissolved in hot water and cooled. The poison should then be thoroughly stirred into the syrup and the whole carefully mixed with 1¼ lb. of honey. Accuracy in the details of this mixture is important. It is weak in action, with the result that it is continually attended, the workers carrying it to the nest and feeding it to the queen and the larvae, until eventually the entire colony is exterminated. A strong poison, on the other hand, may kill a few workers, but the others will quickly recognise and avoid it. Weakly poisoned syrup should be placed outside an infested house to attract the ants away from it. The best container is a can so dented that the ants can get in under the lid, while the lid still keeps out rain. A sponge should be floated in the syrup, or a sponge, dipped in it, may be placed in a paraffined paper bag pierced with holes to admit the ants, and another paper bag, similarly waterproofed, used to cover the whole from the weather.

Edmundson (W. C.) & Welch (J. S.). **The Home Garden in Idaho.**—*Univ. Idaho Agric. Expt. Sta. (Dept. Hortic.) Moscow, Id.*, Bull. 106, February 1918, 30 pp., 12 figs. [Received 17th May 1920.]

A short description of the bionomics and control of the following garden pests is given:—the Colorado potato beetle, *Leptinotarsa decemlineata*, controlled by sprays of lead arsenate or Paris green; the potato flea-beetle, *Epitrix cucumeris*, by the same sprays, used with Bordeaux mixture; cabbage worms, *Pieris (Pontia) rapae*, by lead arsenate dust or in a spray with soap added; cabbage aphis, *Brevicoryne (Aphis) brassicae*, and melon aphis (*A. gossypii*), by Black-leaf 40 or kerosene emulsion sprayed at high pressure; the tomato worm, *Protoparce (Phlegethontius) sexta*, by hand-picking or lead arsenate sprays; the pea Bruchid [*Bruchus pisorum*] by fumigation of the seed peas with carbon bisulphide, by heating them to 140° F., or by holding the peas over for a season; the corn-ear worm, *Heliothis obsoleta*, by deep ploughing to expose and kill the pupae; and the onion thrips, *Thrips tabaci*, by sprays of kerosene emulsion or Black-leaf 40.

Formulae are given for all the sprays and poisons mentioned.

Banks (N.) & Snyder (T. E.). **A Revision of the Nearctic Termites, with Notes on Biology and Geographic Distribution.**—*U. S. Nat. Mus., Washington, D.C.*, Bull. 108, 1920, 228 pp., 35 plates, 70 figs.

The first part of this volume is a systematic monograph of the Nearctic termites. One new genus is erected and, of the thirty-six species described, seventeen species and one variety are new. Keys are given to the families, sub-families, genera and species, and the insects' structure, classification and distribution are discussed.

The second part deals with the biology of the Nearctic termites. They are divided into groups according to their habits, and their life-history is described, with the damage they do and the methods of preventing this. An account is given of their parasites and other natural enemies, as well as of the insects found associated with them. Biological notes are also given on the individual species.

Bezzi (M.). **Fruit Flies of the Genus** *Dacus* (*sens. lat.*) **(Diptera) from the Philippine Islands.**—*Philippine Jl. Science, Manila*, xv, no. 5, November 1919, pp. 411–444, 2 plates. [Received 18th May 1919.]

This systematic paper describes 23 species of Dacinae from the Philippines, ten species and four varieties being new. Keys are given to the genera and to the Philippine species contained in them. Among the species mentioned is *Monacrostichus citricola*, Bezzi, reared from fruits of *Citrus*.

Gossard (H. A.). **Insects resembling European Corn Borer.**—*Mthly. Bull. Ohio Agric. Expt. Sta., Wooster*, iv, no. 12, December 1919, pp. 372–379, 8 figs. [Received 20th April 1920.]

Careful watch is being kept in Ohio for the European corn borer [*Pyrausta nubilalis*]. A brief description is given of the habits and character of damage caused by insects that have been mistaken for this moth including:—*Heliothis obsoleta* (corn-ear worm), *Hadena fractilinea* (lined stalk borer), *Crambus* spp. (sod webworms), *Pyrausta ainslici*, *Depressaria heracleana* (parsnip webworm), and a Dipteron, *Chaetopsis aenea* (corn-stalk maggot). The best remedial measures for these pests are discussed.

Naumann (A.). **Ein neuer Schädling des Kartoffel-Krautes.** [A new Pest of Potatoes.]—*Sächs. landw. Zeitschr.*, 1917, no. 41, pp. 571–572. (Abstract in separate from *Zeitschr. landw. Versuchswesen in Oesterreich, Vienna*, xxi, 1918, p. 7 (143).)

In Saxony potatoes have been injured by a Psyllid, *Aphalura nervosa*, Först. Though the outbreak in question was of no economic importance, it was thought advisable to recommend the burning of infested plants as a precaution against the spread of the insect.

SCHUHMACHER (F.). **Ist *Pentatoma rufipes* nützlich oder schädlich?** [Is *P. rufipes* beneficial or injurious?]—*Naturwiss. Zeitschr. f. Forst- u. Landw.*, 1918, no. 3–8, pp. 244–246. (Abstract in separate from *Zeitschr. landw. Versuchswesen in Oesterreich, Vienna*, xxi, 1918, p. 7 (630).)

This paper traverses the general opinion that *Pentatoma rufipes*, L., is predaceous on caterpillars, etc. It certainly feeds on dead insects, but never kills living individuals. As this bug also feeds on the young branches, leaves and fruit of apple and sour cherry, it must be classed as injurious.

BURKHARDT (F.). **Die der Landwirtschaft und dem Gartenbau schädlichen Erdflöhe.** [Flea-beetles injurious to Agriculture and Gardening.]—*Abt. f. Pfl.-Krankh. des Kaiser Wilhelms Inst. f. Landw., Bromberg*, Flugblatt no. 26, March 1917. (Abstract in *Zeitschr. landw. Versuchswesen in Deutschösterreich, Vienna*, xxii, no. 1–2, January-February 1919, pp. 37–38.)

The flea-beetles infesting peas, vetches, and Cruciferae [in Prussia] include *Phyllotreta nigripes*, F., *P. atra*, F., *P. cruciferae*, Goeze, *P. undulata*, Kutsch., *P. nemorum*, L., *Psylliodes chrysocephala*, L., and *P. napi*, F. They are favoured by warm, dry weather. Measures against the first generation are of the greatest practical value. In dry weather repeated harrowing between the rows with light harrows and the spreading of basic slag in sunshine, are recommended. Instead of slag, soot or lime (with a little tobacco dust or sulphur added) may be used. In gardens, spraying with a solution of carbolic acid, frequent watering and shading the beds, are advised. In the case of *Psylliodes chrysocephala* the above measures may be supplemented by capture, the apparatus consisting of frames cover.d with gauze that is sticky on the lower surface. The biology of *Phyllotreta nemorum* is fully described and the life-histories of *Psylliodes attenuata*, Koch, and *P. affinis*, Payk., are also dealt with. When taking measures against the last-named, it is necessary to eradicate night-shade plants.

VOSS (G.). **Rapsglanzkäfer und Rapsverborgenrüssler.** [*Meligethes aeneus*, *M. viridescens*, *Ceuthorrhynchus assimilis* and *C. napi*.]—*Schaffnits Flugblattsammlung über Pflanzenschutz, Bonn-Poppelsdorf*, Flugblatt no. 14, April 1919. (Abstract in *Zeitschr. landw. Versuchswesen in Deutschösterreich, Vienna*, xxii, no. 7–8, July-August 1919, p. 193.)

As the damage done to rape by *Meligethes aeneus*, F., *M. viridescens*, F., *Ceuthorrhynchus assimilis*, Payk., and *C. napi*, Koch, is greatly reduced if the plants are vigorous, the soil should be broken up small and the seed should be well distributed by repeated harrowing, followed by rolling. Direct remedial measures include collection and deep ploughing after the crop has been harvested.

von WAHL (C.). **Die Gespinstmotten.** [*Hyponomeuta malinellus* and *H. variabilis*.]—*Hauptstelle fur Pflanzenschutz in Baden an der Grossh. landw. Versuchsanstalt Augustenberg*, Flugblatt no. 5, April 1916. (Abstract in *Zeitschr. landw. Versuchswesen in Deutschösterreich, Vienna*, xxii, no. 9–10, September-October 1919, p. 235.)

In the Grand Duchy of Baden *Hyponomeuta malinellus* infests the apple and *H. variabilis* the prune, plum and sloe. The flight period lasts from mid-June to the end of July. The eggs, numbering from 15 to 80, are laid on the buds of the shoots and are covered with a slime that hardens. Four weeks later the larvae hatch and they hibernate beneath the shield. In the spring they begin to feed and then spin their webs. Natural enemies include a Dipteron, *Meigenia bisignata*, Meig., and the Hymenoptera, *Angitia chrysosticta*, Gmel., *Pimpla alternata*, Grav., and *Agrypon variitarsum*, Wesm. Remedial measures are spraying with soft-soap solutions containing nicotine or quassia. The spray must be applied at high pressure on dry days as soon as the caterpillars begin spinning their nests. The latter may be collected and burned.

ZACHER (F.). **Zur Biologie der Vorratsschädlinge.** [The Biology of Pests of stored Products.]—*Mitt. Biol. Anstalt f. Land- u. Forstwirtschaft*, 1919, no. 17. (Abstract in *Zeitschr. landw. Versuchswesen in Deutschösterreich, Vienna*, xxii, no. 9–10, September-October 1919, p. 236.)

Ephestia kühniella lays 200 eggs on an average; the egg-stage lasts about 7 days. *Calandra granaria* requires 7-12 weeks for development; the life of the adult may extend to 5 months. *Gnathocerus cornutus* lives over 10 months in the adult stage, after a developmental period of 4 months. The larvae of *Anthrenus verbasci* have been found in rye meal.

Primary pests of rotting potatoes include *Tylenchus devastatrix*, *Rhizoglyphus echinopus*, *Eumerus strigatus*, *Sciara* sp., *Reichertella* sp., *Phorbia* (*Chortophila*) *trichodactyla*, *P.* (*Hylemyia*) *brassicae*, *Phaonia trimaculata* and *Drosophila funebris*. Both house and stable flies have also been reared from rotting potatoes.

ZACHER (F.). **Beobachtungen über einige schädliche und nützliche Insekten.** [Observations on some injurious and useful Insects.]—*Mitt. Biol. Anstalt f. Land- u. Forstwirtschaft*, 1919, no. 17. (Abstract in *Zeitschr. landw. Versuchswesen in Deutschösterreich, Vienna*, xxii, no. 9–10, September-October 1919, p. 236.)

Particulars are given regarding the infestation of barley by a Trypetid fly, *Zonosema alternata*, and a Chloropid, *Lasiosina cinctipes*; of bean seedlings by maggots of *Chortophila* sp.; of potatoes by *Phorbia* (*Chortophila*) *trichodactyla* and *Eumerus strigatus*; of cauliflower by *Phytomyza flavicornis*; and of *Atriplex* by *Phthorimaea* (*Gelechia*) *atriplicella*, *Aphis rumicis* (*euonymi*) and *Lygus pratensis*.

Other insects dealt with are the oak mining moth, *Tischeria complanella*; *Eulecanium* (*Lecanium*) *corni*, which is preyed upon by a

Coccinellid beetle, *Exochomus quadripustulatus*: *Phylloxera coccinea* on oaks, which is preyed upon by another Coccinellid, *Pullus auritus*; and the alder leaf-beetle, *Agelastica alni*, the egg-stage of which lasts 7–15 days.

Börner (—) & Blunck (—). **Larven der Flohkäfergattung** *Phyllotreta*. [The Larvae of Flea-beetles of the genus *Phyllotreta*.]—*Illustrierte landw. Ztg.*, no. 75–76, 1919, pp. 382–383. (Abstract in *Zeitschr. landw. Versuchswesen in Deutschösterreich, Vienna*, xxii, no. 11–12, November-December 1919, p. 294.)

The larvae of the following species of *Phyllotreta* and their life-history are described: *Phyllotreta vittula*, Redt., *P. nemorum*, L., *P. armoraciae*, Koch, *P. ochripes*, Curt., *P. tetrastigma*, Com., *P. undulata*, Kutsch., *P. nigripes*, F., *P. atra*, F., and *P. nodicornis*, Marsh. The authors consider *P. atra*, F., and *P. cruciferae*, Goeze, to be varieties of the same species, the former name having priority. Destruction of the beetles in mid-summer, autumn and early spring is the remedial measure advised.

Wahl (B.). **Ueber das Auftreten des Kartoffelblattflohes in Oesterreich** (*Aphalara nervosa*, **Först.**) [The Occurrence of the Potato Psyllid, *A. nervosa*, in Austria.]—*Wiener landw. Ztg.*, 1919, pp. 565–566. (Abstract in *Zeitschr. landw. Versuchswesen in Deutschösterreich, Vienna*, xxii, no. 11–12, November-December 1919, p. 294.)

This is a brief résumé of existing data concerning the distribution, injury and appearance of the Psyllid, *Aphalara nervosa*, Först. The collection and burning of the foliage infested with the larvae is advised.

Zacher (F.). **Ein neuer Schädling des Blumenkohls** (*Phytomyza flavicornis*, **Fall.**) **und andere wenig bekannte Gartenschädlinge.** [A new Pest of Cauliflowers, *P. flavicornis*, and other little-known Garden Pests.]—*Gartenflora*, lxviii, no. 13–14, 1919. (Abstract in *Zeitschr. landw. Versuchswesen in Deutschösterreich, Vienna*, xxii, no. 11–12, November-December 1919, pp. 294–295.)

The larvae of *Phytomyza flavicornis*, Fall., feed on the stalks of cauliflowers, and those of *Phorbia* (*Chortophila*) *trichodactyla* on the cotyledons of young bean plants; beans sown early near Berlin are severely affected, whereas late-sown plants remain quite uninfested, contrary to what is reported to have occurred in Holland. Some species of *Lygus* perforate the leaves of sunflowers; these bugs may be captured on boards smeared with an adhesive, or spraying with Dufour's solution may be resorted to.

Kleine Mitteilungen zur Biologie der pflanzenfressenden Käfer. [Short Communications on the Biology of Plant-eating Beetles.]—*Koleopterolog. Rundschau, Vienna*, vii, no. 1–2, 30th April 1918, pp. 11–18, 2 figs.

These notes initiate a number of series, each series being devoted to some special subject concerning Coleoptera. Only original observations of scientific interest are included and copious references to existing literature are given.

F. Heikertinger deals with the leaf-mines of the flea-beetle, *Phyllotreta nemorum*, L., infesting cruciferous plants. Other authors have described them as serpentine in shape whereas actually they are roundish, irregular spots or flat blisters.

J. Bachinger points out that hitherto only rosaceous plants have been recorded as food-plants of *Anthonomus rubi*, but the Compositae must now be included, as he has found this weevil in the flowers of *Tragopogon pratensis* and *Buphthalmum salicifolium*, and these flowers were accepted as food by captive specimens. The same author has found *Ceuthorrhynchus puncticollis* feeding on the leaves of *Erysimum canescens*. In a footnote, H. Scheuch points out that a similar record was made by Ganglbauer in 1882 and that he himself has found it on *E. canescens* and *E. hieracifolium*.

With reference to the food-plants of *Ceuthorrhynchus pulvinatus*, Gyll., H. Scheuch gives the following list: *Sisymbrium* sp., *S. sophia*, *Erysimum cuspidatum*, *Rapistrum perenne*, *Bertoroa incana* and *Camelina sativa*. Both *Cirsium arvense* and *Matricaria chamomilla* appear to have been recorded in error in the literature. *C. pulvinatus* is a typical feeder on Cruciferae, to which plants the closely-allied species, *C. pyrrhorhynchus*, Marsh., is also exclusively confined.

F. Heikertinger records *Baris gudenusi* from the Cruciferae, *Rapistrum perenne* and *Sisymbrium strictissimum*; on the latter plant it occurred together with *Phyllotreta austriaca*.

Combate a Lagarta rosea no Brasil. [Work against the Pink Bollworm in Brazil.]—*Bol. Minist. Agric., Ind. e Comm., Rio de Janeiro*, viii, no. 2, July-September 1919 (1920), pp. 93–102. [Received 6th May 1920.]

This is a résumé of the reports for the first quarter of 1919 sent in by the agents of the Anti-Bollworm Service in Brazil. In one locality in the State of Maranhão a loss of 70 per cent. was caused by *Platyedra* (*Gelechia*) *gossypiella*. Carbon bisulphide and hot water are mentioned in the report from the State of Piauhy as being used for seed disinfection. In this State *Alabama argillacea* and a weevil, *Gasterocercodes gossypii*, Pierce [*R.A.E.*, A. iii 273], also injure cotton.

Moreira (C.). **Os Besouros da Canna de Assucar.** [Sugar-Cane Beetles.]—*Bol. Minist. Agric., Ind. e Comm., Rio de Janeiro*, viii, no. 2, July-September 1919, pp. 103–119, 12 plates, 1 map.

The State of Pernambuco, which produces most of the Brazilian sugar, has suffered more losses from sugar-cane beetles than the adjoining ones of Alagôas and Parahyba, where they also occur. In view of the need for methodical application of remedial measures the author was commissioned to study these pests.

The species concerned are two Scarabaeids native to Brazil, *Ligyrus fossator*, Dej., and *Podalgus humilis*, Burm. The former also occurs in French Guiana and the latter, in French Guiana, Colombia, Panama and Mexico. They are subterranean species and when, as the result of bringing virgin land under cultivation, the soil moisture conditions are modified, both the beetles and their larvae seek out the damper places. For this reason they are most abundant in flat districts where there are wide valleys well watered by numerous streams. *L. fossator* and its larva are of large size and thus require more moisture than *P. humilis*; they are therefore found in the lowest parts of valleys and other very damp situations. Both species fly in the evening and at night, and at dawn they burrow into the ground; if the latter be too hard, the beetles are killed by the heat of the mid-day sun. They can live for 3 months. The females lay about 20 eggs. While these species constitute the chief pests of sugar-cane, others of the same family, such as *Stenocrates laborator*, F., also occur and do some injury.

The larvae of *L. fossator* and *P. humilis* appear to be able to live for about 20 months. They remain underground at a depth of 6–8 inches, moult several times and then enter the nymphal stage, which lasts about 12 days. Owing to the warmth of the Brazilian climate the generations follow one another without a break.

The larvae of *L. fossator* are more harmful than the adults; both stages attack the newly-planted cane-slips and kill old cane by feeding on the roots. The adults of *P. humilis* are more injurious than the larvae, the latter scarcely attacking the slips or shoots. The adults either bore into the slips from end to end or into the new shoots, and the former injury makes re-planting necessary. As a rule neither the adults nor the larvae of *P. humilis* are able to bore through the hard bark of sugar-cane. In large plantations infestation with *L. fossator* and *P. humilis* is not general, certain areas being foci of infestation; small plantations may be entirely destroyed.

It is not possible to eradicate these pests, but proper measures, based on the fact that infestation is limited to given points, should prevent much economic loss. When the ground is being ploughed, careful inspection will show the infested spots and these may be marked with stakes. After an interval of about 30 days carbon bisulphide may be applied by means of the Vermorel injector or Vernette plough [*R.A.E.*, A, ii, 256], or the ground may be flooded and re-ploughed after draining. This second method will interfere with the cultural practices now used, so that disinfection with carbon bisulphide is advised. The injector or special plough must be adjusted to deliver 6 grams of carbon bisulphide. The plough is supplied by the maker with a capacity up to 10 grams but that of the injector does not normally exceed 6 grams, so that it should be ordered with a graduation of 8 grams or over. The best plan would be to drill the holes in straight lines so that the ground would be divided into squares with 19-inch sides, and to inject 8 grams into each hole, but this is not usually possible if the slips have already been planted. In this case it is necessary to drill the holes in lines along the middle of the furrows between the lines of slips, which are about 24 inches apart. The dose of carbon bisulphide must be 6 grams in this case. Where circumstances allow it and the ground is of a permeable character flooding for 48 hours may be resorted to. The adults of *P. humilis* that succeed in escaping destruction by soil treatment may be captured by means of light-traps and a suitable model is described. It is provided with a shade so that only those beetles that emerge from the surrounding ground will be attracted. Lights that attract beetles from the neighbouring woods are a danger. There is one fact relating to the larvae of *L. fossator* and *P. humilis* that is very favourable to the sugar-cane grower. During the heavy rains low-lying points become flooded and if the ground is permeable the larvae there are suffocated. During the dry weather the pools diminish in size and the larvae near them gather near the edges until finally the water is completely dried up, when the dampest point swarms with them beneath the dead and dry plant débris. It is an easy matter to throw some straw on this débris and set it on fire, thus killing enormous numbers. Those that are too deep to be reached in this way may be killed by flooding or by injecting carbon bisulphide.

A very full description is given of various forms of apparatus for injecting carbon bisulphide.

Other insect pests of sugar-cane in Brazil include the Pyralid, *Diatraea saccharalis*, F., and the scale, *Pseudococcus citri*, Risso, which is combated with kerosene-soap emulsion.

Uma Praga dos Laranjaes. [A Pest of Oranges.]—*Bol. Minist. Agric., Ind. e Comm., Rio de Janeiro*, viii, October-December 1919 (1920), pp. 104-108. [Received 6th May 1920.]

Attention is drawn to the establishment of the scale, *Icerya purchasi*, in the State of S. Paulo where it promises to become a serious danger to fruit growing. The necessity for a proper quarantine service is emphasised, if the introduction of other pests is to be prevented.

Ramsay (A. A.). **The Compositions of various Lead Arsenates.**—*Agric. Gaz. N.S.W., Sydney*, xxxi, Part 3, March 1920, pp. 208-212.

The lead arsenate that remains in suspension longest is the most efficacious for spraying purposes. The results of tests made with various commercial brands are discussed and illustrated by a graph.

Ramsay (A. A.). **A Dry Form of Lime-Sulphur.**—*Agric. Gaz. N.S.W., Sydney*, xxxi, Part 3, March 1920, p. 216.

The preparation sold under the name of B. T. S., for use in all cases where lime-sulphur spraying is desired, has been analysed in solution. It is recommended by the manufacturers for use at the rate of 12 to 14 lb. per 50 gals. water for dormant trees and at 1 to 4 lb. in the same quantity of water for trees in foliage. It appears to be a preparation of barium tetrasulphide of about 88 per cent. purity.

Tests in the laboratory showed that there is greater decomposition in the more dilute solutions, and it is also probable that the length of time the solutions are left standing might also affect the results obtained in spraying in the field.

Favor (E. H.). **Spraying Machinery for the Citrus Grove.**—*Florida State Hortic. Soc. Qtrly., De Land*, Proceedings 32nd Ann. Meeting, 1919, pp. 53-57. [Received 8th May 1920.]

This paper emphasises the importance of spraying in Florida, showing how Florida oranges are at a disavantage on the market, owing to their poor external appearance. Types of sprayers are considered, with the relation between the cost of the machine and its earning power, the power and fineness of the spray being the important points for efficiency.

Warner (L. R.). **Some Troubles to Quarantine against and their Nature.**—*Florida State Hortic. Soc. Qtrly., De Land*, Proceedings 32nd Ann. Meeting, 1919, pp. 113–121. [Received 8th May 1920.]

This paper points out the enormous losses that have been caused in Florida by the introduction of injurious insect pests and plant diseases while no quarantine measures were in force, and the great importance of such measures in the future by the Quarantine Department set up by the Florida Plant Act of 1915. The examples of the gipsy and brown-tail moths [*Porthetria dispar* and *Nygmia phaeorrhoea*] show how much more serious a pest becomes in a new environment than it was in its original country.

Of insect pests in the United States, which Florida has so far escaped, the most important are the moths mentioned above, and various plant diseases. Outside the United States there are many undesirable insects of which perhaps the fruit-flies are the principal. The life-histories of *Ceratitis capitata* (Mediterranean fruit-fly), *Anastrepha ludens* (Mexican orange maggot), *Dacus cucurbitae* (melon fly) and *Anastrepha fraterculus* (West Indian fruit-fly) are given to illustrate this. The most probable avenue of introduction is the West Indies. The whiteflies, of which *Aleurocanthus woglumi* is the most feared, are possible pests of *Citrus* in Florida, together with the purple scale [*Lepidosaphes beckii*] and sooty mould which follow it.

Geiger (H. L.). **Community Spraying and Compulsory Control.**—*Florida State Hortic. Soc. Qtrly., De Land*, Proceedings 32nd Ann. Meeting, 1919, pp. 122–125. [Received 8th May 1920.]

It is almost impossible to obtain really successful results from community spraying for several reasons. The chief of these is that there is no means of preventing unprogressive individuals from undermining the good work of others, and the inspector who supervises the spraying has no legal force to back him. The only feasible method is through State legislation, compelling a community to control by concerted action and under the direction of competent inspectors all insects and diseases that cannot be dealt with by individual endeavour. A list is given of insects and diseases of *Citrus* and other plants against which such legislation might advantageously be directed. The author considers that it is only a question of time for the benefits of such compulsory control to be recognised.

Sloan (G. D.). **Does it pay to spray Citrus Trees?**—*Florida State Hortic. Soc. Qtrly., De Land*, Proceedings 32nd Ann. Meeting, 1919, pp. 129–133. [Received 8th May 1920.]

Spraying is the only possible way of obtaining *Citrus* fruit of the first quality. Whitefly and scale-insects may be controlled to a certain extent by beneficial fungi, but in that case thrips and rust mite must be left undisturbed as lime-sulphur and nicotine solutions, which easily control them, are also fungicides, and in addition the necessity of a fungicide for the numerous fungus diseases of citrus makes impracticable the use of fungi as the sole preventative of whitefly and scales. Spraying is an expensive operation as regards first cost, and to be of value its application demands skill and thoroughness.

But considering the damage that various insects do and the cost of spraying taken from accurate figures for different groves of ages varying from one to five years, it is clear that spraying pays directly, apart from the indirect benefit of preventing the establishment of a number of fungus diseases in the trees themselves.

Newell (W.) & O'Byrne (F. M.). **Should Cottony Cushion Scale be allowed to spread unrestricted in the State of Florida?**—*Florida State Hortic. Soc. Qtrly., De Land*, Proceedings 32nd Ann. Meeting, 1919, pp. 152–159. [Received 8th May 1920.]

The Florida Plant Board, which was created in 1915, attempted to make a regulation which would keep the cottony cushion scale (*Icerya purchasi*) confined to the parts of Florida it then occupied, chiefly the central portion of the State. The regulation requires every nurseryman in this territory to scrub any food-plant of this scale that he sends out with an insecticide under the personal supervision of an inspector, for whose time the nurseryman pays. This results in a very heavy tax on the industry and some of the nurserymen are in favour of the repeal of the rule, considering that *Icerya purchasi* is quite sufficiently controlled by the Australian Coccinellid [*Novius cardinalis*]. But if this were done, apart from the fact that in certain years the scale outstrips the Coccinellid, individuals outside would not be willing to buy stock from the infested territory, while other States might very well set up a quarantine against Florida, and this would be a greater handicap to the industry than the present regulation.

In the discussion that followed this paper attempts were made to suggest an alternative regulation, but no conclusion was arrived at.

Berger (E. W.). **Work of the Entomological Department, State Plant Board.**—*Florida State Hortic. Soc. Qtrly., De Land*, Proceedings 32nd Ann. Meeting, 1919, pp. 160–170. [Received 8th May 1920.]

Some account is given of the method of introducing *Aschersonia aleurodis* (red fungus) and *A. flavocitrina* (yellow fungus) against the common and cloudy-winged whiteflies of citrus [*Dialeurodes citri* and *Aleurodes nubifera*] [*R.A.E.*, A, vii, 215]. The spores are produced in enormous numbers in the cultures furnished by the State Plant Board, and it is only necessary to spray a mixture of them with water on to the whitefly larvae in the infested trees. The storing, mixing and application of the fungus, together with the best spraying machines to use are described in detail.

The Entomological Department is almost always able to supply colonies of the Australian Coccinellid [*Novius cardinalis*] for use against the cottony cushion scale [*Icerya purchasi*]. In the control of camphor thrips [*Cryptothrips floridensis*] the results of cutting back the trees to 10-inch stumps and dipping them in double strength oil emulsion was so successful that a ruling in the Nursery Department was made that camphor trees so treated, provided they did not show thrips lesions, might be sold from thrips infested nurseries.

Other work has included the placing out of colonies of *Cryptochaetum*, an Agromyzid fly parasitic on the cottony cushion scale in its immature stages, which had been sent from California [*R.A.E.*, A, vii, 20].

Fouts (R. M.). **Some New Parasites, with Remarks on the Genus** *Platygaster* **(Hymenoptera).**—*Proc. Entom. Soc. Washington, D. C.*, xxii, no. 4, April 1920, pp. 61–72.

The new species of Hymenoptera here described from the United States include the Scelionids, *Trissolcus edessae*, reared from the eggs of *Edessa bifida*, Say; *Paridris brevipennis* from the eggs of *Gryllus abbreviatus* Serv.; *Platygaster leguminicolae* from the clover seed midge *Perrisia* (*Dasyneura*) *leguminicola*; *P. feltii* from the gall of *Walshomyia texana* on cedar; and a Bethylid, *Cephalonomia kiefferi*, from *Calandra oryzae*.

Burke (H. E.). **Collecting some little known Buprestidae (Coleopt.).**—*Proc. Entom. Soc. Washington, D.C.*, xxii, no. 4, April 1920, pp. 72–76.

Many of the species here mentioned are considered the rarest of the American Buprestidae, but some of them are quite numerous in certain localities, though their habits make them difficult to find. Among those noticed are:—*Trachykele lecontei*, Gory, taken in bald cypress (*Taxodium distichum*); *T. blondeli*, Mars., in western juniper (*Juniperus occidentalis*), Monterey cypress (*Cupressus macrocarpa*), Sargent cypress (*C. sargenti*) and western red cedar (*Thuja plicata*); *T. opulenta*, Fall, in incense cedar (*Libocedrus decurrens*) and *Sequoia washingtoniana*; *T. nimbosa*, Fall, in scars on red fir (*Abies magnifica*), white fir (*A. concolor*) and mountain hemlock (*Tsuga mertensiana*); *Buprestris gibbsi*, Lec., in black oak (*Quercus californica*); *B. viridisuturalis*, Nic. & Weiss, in various species of cottonwood (*Populus*) and in white alder (*Alnus rhombifolia*); *B. confluenta*, Say, in aspen (*Populus tremuloides*) and in *P. deltoides*; and *Chrysophana placida*, Lec., in cones of *Pinus attenuata* and in *Abies concolor*.

Bordas (L.). **Considerations générales sur la Biologie du** *Rhynchites conicus* **et Anatomie de sa Larve.**—*Insecta, Rennes*, no. 106–108, October-December 1919, pp. 196–201, 3 figs. [Received 10th May 1920.]

The greater part of the information contained in this paper has already been noticed [*R.A.E.*, A, v, p. 569]. Another outbreak of this weevil occurred in 1919 in gardens in Rennes, pears and peach trees suffering more than apples in some cases. Usually in the case of apple trees the puncture in which the egg is laid is immediately below the base of the leaf or shoot, but in peach trees it is placed several millimetres lower.

Cockerell (T. D. A.). *Furcaspis biformis* **(Homop., Coccidae.)**—*Entom. News, Lancaster, Pa.*, xxxi, no. 4, April 1920, p. 109.

The occurrence of *Furcaspis biformis*, Ckll., in abundance on leaves of *Cattleya percivaliana* in a greenhouse in Colorado is recorded.

Report of the Agricultural Department, Antigua, 1918-19.—*Imp. Dept. Agric. West Indies, Barbados*, 1920, pp. 15–18. [Received 12th May 1920.]

Lachnosterna sp. was present in the majority of sugar-cane fields in Antigua during the year under review. It is suggested that white arsenic at the rate of 14 lb. to 1 cwt. of meatworks manure should be tried against these beetles. Very little damage was caused by *Metamasius (Sphenophorus) sericeus* or *Diatraea saccharalis.*

Cotton crops were seriously injured by *Alabama argillacea.* Other cotton pests included *Dysdercus* spp., which appeared earlier than usual, *Nezara viridula*, which also caused serious damage to tomatos, *Contarinia gossypii*, which increased during November and subsided in December. *Heliothis obsoleta (armigera)* and *Laphygma frugiperda.*

The most common scales on limes were *Coccus viridis, Lepidosaphes beckii, Chrysomphalus aurantii* and *Chionaspis citri. Euscepes (Cryptorrhynchus) batatae* was abundant on sweet potatoes.

As a result of the work carried out in view of the Cotton Stainer Ordinance of 1919, by which the Government was empowered to destroy any trees or plants which acted as hosts for this pest, about one-twentieth of the total area of the Island may now be considered clear. This involved the destruction of 13,237 trees.

JHAVERI (T. N.). **Swarming Caterpillars of Northern Gujarat.**—*Agric. Jl. India, Calcutta*, xv, Part 2, March 1920, pp. 181–184.

Great damage was caused to early-sown crops of maize, *Pennisetum typhoideum, Paspalum scrobiculatum*, chillies and rice seedlings during 1919 by the appearance of *Prodenia litura* and *Cirphis loreyi.* The exceptional abundance of these caterpillars was probably due to the absence of rain for a very long period.

Pupation occurs in the higher land at a depth of from 2 to 3 inches. Under normal circumstances it lasts from 1 to 6 weeks, but may be longer under very dry conditions. Each female lays about 500 eggs which hatch in about four days. The numbers of the second brood, which should have appeared early in August, were greatly reduced by the presence of a Tachinid parasite and on account of the heavy rain. To prevent infestation the land should be ploughed up before the rains come or as soon as the previous crop is harvested, so as to destroy the pupae by exposure to the sun and birds. The moths may be destroyed by light-traps. Other measures include late sowing of crops and hand collection of leaves on which eggs have been deposited.

KNOWLES (C. H.). **Inspection of Plantations.**—*Fiji Dept. Agric., Ann. Rept. for* 1918, *Suva*, Council Paper no. 32, 14th May 1919, pp. 11–12. [Received 14th May 1920.]

In view of the losses occasioned by the banana borer [*Cosmopolites sordidus*] an important addition has been made to the regulations under the Diseases of Plants Ordinance of 1913, whereby cultivators of plants attacked by, or liable to be attacked by, a declared disease must maintain a proper condition of cultivation. In consequence, owners of old, exhausted banana plantations, which form excellent breeding-grounds for the borer, are obliged to destroy them. Scale-insects have undoubtedly diminished in numbers since the regulations requiring growers to spray for them were brought into force, but to what extent this may be also due to natural causes is not known.

KNOWLES (C. H.). **Division of Entomology.**—*Fiji Dept. Agric., Ann. Rept. for* 1918. *Suva*, Council Paper no. 32, 14th May 1919, pp. 12–15. [Received 14th May 1920.]

Levuana iridescens (coconut leaf moth) continues to infest the leaves of coconut palms [*R.A.E.*, A, vii, p. 311]. The bug, *Canthecona cyanocantha*, which has been found to be predaceous upon the caterpillars, cannot be regarded as an efficient check, but it is thought that their numbers are considerably reduced by the wasp, *Polistes hebraeus*, which is extremely common in the infested localities. An unrecognised bird also destroys them and may be a considerable check. Scales (*Aspidiotus* sp.) have been prevalent in some localities, especially on unhealthy palms: in one district coconut leaves and fruits were covered with these scales. As the spraying of tall coconut palms is almost impossible, badly attacked trees should have the infested leaves removed or the plants should be cut down and burnt. *Promecotheca reichii* (Hispid leaf-miner) continues to be a coconut pest, but is held in check by a Chalcid parasite. An unidentified spathe borer is a minor pest and mealy-bugs are occasionally injurious.

Cacao leaves are attacked by *Adoretus tenuimaculatus* (Japanese rose beetle), which sometimes causes the death of young plants. It is hoped that the Scoliid wasp introduced against this pest will materially reduce its numbers. There are signs that the fungus *Metarrhizium*, introduced some years previously, is acting as a check on the beetle. Mealy-bugs (*Pseudococcus*), when troublesome, can be controlled by spraying with lime-sulphur or kerosene emulsion, and as the bugs appear to be carried about by the red, long-legged ant, the nests of the latter at the roots of the trees should be dealt with.

Bananas have been seriously injured during the year by *Cosmopolites sordidus*, Germ. (banana borer), and it is thought that unhealthy conditions in many trees attributed to fungus diseases are primarily due to the attacks of the borer. This weevil is distributed throughout the Colony and is abundant in all districts. Traps consisting of pieces of banana bulbs laid on the ground among the plants have proved effective in attracting the beetles, but unless removed and destroyed at least once in every 21 days they become breeding-places and increase instead of diminishing the numbers. While thorough cultivation does not render the plants free from the pest, it is a great help in maintaining a healthy condition, and it is essential that neglected plants should not be allowed and old worn-out plantations should be ploughed over, as they form breeding-places for the beetles. The Histerid beetle, *Plaesius javanus*, has been introduced from Java, where it is a good check on the borer, and distributed among the infested plantations.

The branches of *Citrus* plants are sometimes killed by scale-insects, chiefly *Chionaspis citri*; spraying should be practised every few days. The stems of *Piper methysticum* are frequently badly attacked by scales, chiefly *Aspidiotus* sp., the shelter provided by the leaves creating excellent conditions for them. Minor insect pests of little economic importance are also recorded.

Dash (J. S.). **Maladies des Plantes et les Pestes d'Insectes.**—*Premier Rapport Sta. Agronom. Guadeloupe*, 1918–1919; *Pointe-a-Pitre*, 1920, pp. 29–32.

Pests of sugar-cane include *Diatraea saccharalis*, F., which also attacks sorghum and is distributed over the whole island. Great damage is caused to the lower parts of the stem by the larvae of *Diaprepes abbreviatus*, L., var. *distinguendus*, Ol., *D. famelicus*, Ol., *D. marginatus*, Ol., and another species of *Diaprepes* not yet identified. During the pupal stage these weevils remain for over 300 days in the soil. The eggs are laid on the leaves. Another beetle, *Cyclocephala tridentata*, F., attacks the young roots of sugar-cane.

Cotton pests include the stainers, *Dysdercus discolor* and *D. andreae*, and the cotton moth, *Alabama argillacea*.

Anticarsia gemmatalis was found attacking late-sown velvet beans. The larvae of this moth are parasitised by *Coelichneumon serricorne*, Cress. Cowpeas have been attacked by *Bruchus quadrimaculatus*. Other miscellaneous insects include: a Reduviid, *Zelus rubidus*, found in cotton lint and probably predaceous on other insects, and an unidentified Psychid attacking flamboyant (*Poinciana regia*).

Brèthes (J.). **El Bicho de Cesto** [The Bagworm.] **Cómo vive, se multiplica y se difunde. Su Destrucción por Medio de los Parásitos naturales.**—*Anales Soc. Rural Argentina, Buenos Aires*, liv, no. 6, 1st April 1920, pp. 235–247, 20 figs.

An account is given of *Oeceticus platensis* (Argentine bagworm), which is one of the insects most injurious to trees in that country. Its food-plants are so numerous that there are only a few, such as *Eucalyptus*, paradise tree, etc., that are not attacked by it.

Much of the information here given has already been noticed [*R.A.E.*, A, vi, 315, 517]. A full list of the parasites of *O. platensis* is given, and includes, in addition to those dealt with in previous papers, a number of Ichneumonids, the Chalcidids, *Spilochalcis bergi*, Kirby, and *Tetrastichus oeceticola*, and a Braconid, *Ipobracon oeceticola*, Brèthes. These are, however, only incidental parasites, the most important being *Tetrastichus platensis* and *Parexorista caridei*. An account is given of these two parasites. *T. platensis* oviposits in the larva of *O. platensis* and completes its development within the bag, causing the death of a large proportion of the bagworms. *P. caridei* apparently oviposits on the larva of the bagworm when the latter protrudes its head from the bag to feed, the young larvae making their way into the body-cavity of the host. When mature, the larva abandons its host and either pupates within the bag, or, more frequently, drops to the ground for pupation a little below the soil surface. There are two or three and sometimes more generations in a year.

The campaign of 1919–1920 against the bagworm was continued on the lines of previous years [*loc. cit.*], and distributions of the parasites have been more extensively made, particularly in the Province of Buenos Aires and in Uruguay. In localities where the parasites are established, it is still advisable to destroy bagworms during the winter. *T. platensis* and *P. caridei* are rarely found within the bags at this time, while the females of *O. platensis*, being incapable of flight and living entirely within the bags, may be destroyed with advantage. Investigations will be made as to the establishment of the parasites in the various localities to which they are sent.

Brèthes (J.). **Insectos útiles y dañinos de Rio Grande do Sul y de La Plata.**—*Anales Soc. Rural Argentina, Buenos Aires*, liv, no. 7, 15th April 1920, pp. 281–290.

A number of insects are enumerated that were sent for identification from Rio Grande do Sul (Brazil) and La Plata (Argentina). Among these are the Diptera: *Lasiopa atrata*, F., which has been reared on peaches and is therefore presumably an injurious species; a Syrphid, *Baccha clavata*, F., the larvae of which feed on Aphids: *Sarcophaga blandita*, sp. n., which is parasitic on a Mantid; *S. libera*, sp. n., and *S. clotho*, sp. n., which are parasitic on the locust *Schistocerca* sp. in Rio Grande do Sul; *Anastrepha fraterculus*, Wied., which has been reared on Aracá [*Psidium araca*]; *Euxesta eluta*, Lw., the larva of which destroys the pulp of oranges: *Agromyza guaranitica*, sp. n., the larvae of which mine the leaves of cultivated *Chrysanthemum*; *Agromyza marellii*, sp. n., on which further data will be published.

Lepidoptera: *Melittia riograndensis*, sp. n., breeding on the shoots of pumpkins; *Neopyralis ronnai*, gen. et sp. n., breeding on prickly pear; *Ammalo helops*, Cram., injurious to fig-trees; and *Tinea pellionella*, L., the common clothes moth.

Hymenoptera include *Camponotus mus*, Rog., a scavenger ant: *Ipobracon oeceticola*, sp. n., which is parasitic on the bagworm, *Oeceticus platensis*; *Apanteles riograndensis*, sp. n., which is parasitic on *Tinea pellionella*; *A. ayerza*, sp. n., a parasite of *Colias lesbia*; *Cecidopimpla ronnai*, gen. et sp. n., parasitic on the Lepidopteron, *Ceciloses eremita*; *Trichomalus hesperocharidis*, sp. n., parasitic on larvae and pupae of a Lepidopteron, *Hesperocharis* sp.: *Prionomitus brasiliensis*, sp. n., found parasitic on the larva of a moth injurious to albahaca [*Ocymum basilicum*]; *Habrocytus platensis*, sp. n.; *Perissopterus caridei*, Brèthes, and *Tetrastichus zemani*, sp. n., parasitising *Ceroplastes rusci*, L., on orange-trees in La Plata; *Tetrastichus oeceticola*, sp. n., a parasite of *Oeceticus platensis*; and *Cirrospilus melleus*, sp. n., a parasite of a Lepidopterous larva.

Grimaud (L. E.). **El Gorrión** [The Sparrow.]—*Anales Soc. Rural Argentina, Buenos Aires*, liv, no. 7, 15th April 1920, pp. 291–294.

An appeal is made for co-operation in the destruction of sparrows, which have established themselves in Argentina at the expense of the native beneficial birds, many of which are of considerable value in destroying insects.

Duncan (F. M.). **Insect Pests and Plant Diseases in the Vegetable and Fruit Garden.**—*London*, Constable and Co., Ltd., 1919, 95 pp., 12 plates. Price 3*s*. 6*d*. [Received 16th June 1920.]

This book gives a short and popular account of those insect pests and plant diseases that are most likely to be met with in allotment or vegetable gardens together with such methods of control as could be easily applied by the owner of a small garden. Only the commoner British insects and fungi are included.

Hulbert (H. W.). **Field Pea Production in North Idaho.**—*Univ. Idaho Agric. Expt. Sta., Moscow*, Bull. 115, March 1919, 26 pp., 3 figs.

The pests mentioned as attacking field peas are *Bruchus pisorum* (pea weevil), *Acyrthosiphon* (*Nectarophora*) *pisi destructor* (pea aphis) and *Cydia* (*Semasia*) *nigricana* (pea moth). The damage caused by these pests and the remedial measures for them are discussed.

Webb (J. L.). **How Insects affect the Rice Crop.**—*U. S. Dept. Agric., Washington, D. C.*, Farmers' Bull. 1086, March 1920, 11 pp., 4 figs.

The rice water weevil, *Lissorhoptrus simplex*, Say, occurs annually in the rice-fields, attacking the roots. In extreme cases the plants are killed. The adults hibernate in dead grass, the dates of their first appearance in the spring varying from 25th March to 26th June. The eggs are inserted into one of the principal roots. The larvae hatch in a few days and commence feeding on the inner root tissues. One larva may attack several roots. The duration of the pupal stage is probably from 1 to 2 weeks, the total life-cycle occupying about 38 days. For the control of this pest the fields should be drained while the larvae are still young about 2½ to 3 weeks after the first flooding. The drainage should continue for 2 weeks. A longer period will injure the rice, but a shorter period will not kill the larvae. Other pests of rice include the stink bug, *Solubea* (*Oebalus*) *pugnax*, F.; *Laphygma frugiperda*, S. & A.; *Chilo plejadellus*, Zinck.; *Diabrotica duodecimpunctata*, Ol., and *Ligyrus rugiceps*, Lec.

The methods advocated for controlling insect pests of rice include the ploughing of fields in the autumn previous to planting time. If this is not done, all vegetation should be burned off during the winter. Fields should be drained after first flooding. In case of attacks by caterpillars they should be flooded at once, and no weeds should be permitted in their neighbourhood.

Weiss (H. B.). **Miscellaneous Nursery Insects.**—*New Jersey State Dept. Agric., Trenton*, Circ. no. 31, March 1920, 21 pp., 17 figs.

This circular deals briefly with the life-history of, and remedial measures for the following insects pests:—*Gryllotalpa gryllotalpa*, L., (European mole-cricket), *Idiocerus scurra*, Ger. (poplar leaf-hopper), *Macropsis virescens* var. *graminea*, F. (poplar stem leaf-hopper), *Platymetopius hyalinus*, Osb. (Japanese maple leaf-hopper), *Brachys ovatus*, Web., and *B. aerosus*, Mels. (oak leaf-miners), *Vespa crabro*, L., *Rhynchites bicolor*, F. (red rose beetle), *Pyrausta penitalis*, Grote (lotus borer), *Olethreutes hebesana*, Wlk. (verbena bud-moth), *Lygus pratensis*, L. (tarnished plant bug), and *Macronoctua onusta*, Grote (iris root borer).

OSHIMA (M.). **Formosan Termites and Methods of preventing their Damage.**—*Philippine Jl. Sci., Manila*, xv, no. 4, October 1919, pp. 319–383, 13 plates, 5 figs. [Received 18th May 1920.]

Of the 14 species of termites occurring in Formosa and Japan those described as injurious to wooden structures are *Coptotermes formosanus*, Shir., *C. flaviceps*, Osh., and *Odontotermes formosanus*, Shir. *Leucotermes flaviceps* is closely related to *L. spiratus*, Osh., from Japan. *Coptotermes formosanus* is most formidable to buildings and its habits are here dealt with in detail. The swarming of this species takes place in May or early in June in Formosa, and a little later in Japan. This termite is essentially a destroyer of wood, but has also been found penetrating brick walls, in which it destroys the mortar. The attack on wood is insidious, an outer layer being left intact as a protection from sunlight and natural enemies.

It has been proved that if the upper parts of buildings are disconnected from the soil by a concrete layer that has neither cracks nor joints infestation by *C. formosanus* is prevented from the ground but the building is not proof against attacks by the winged forms.

Tests have been made with 45 species of native and exotic woods, a list of which is given, to ascertain their relative resistance to termite attack. These tests are described and the relationship between the resistance and the chemical as well as physical properties of timber is discussed. The observations show that teak (*Tectona grandis*) and cypress pine (*Calletris glauca*) are absolutely immune to the attacks of Formosan termites, their resistance being due to organic compounds that may be extracted with benzine or alcohol. This compound is a sesquiterpene alcohol.

The experiments were further extended in order to discover some home product that would replace the resistant properties existing in teak and cypress pine so that non-resistant timber might be made immune. For this purpose a mixture of neutral petroleum oil from Niizu, Japan, and camphor green oil (10 per cent. solution), which contains 25 per cent. sesquiterpene alcohol, proved most effective, the fluid being injected into the wood. Of ten common preservatives tested, only carbolin, carbolineum Avenarius, Stop-rot and carbolineum Atlas prevented the attack of *Odontotermes formosanus*. As the efficacy of these chemicals depends on their anthracene oil content they may be successfully applied to railway sleepers or telegraph poles, but are not recommended for use in houses on account of the staining properties of this substance.

COCKERELL (T. D. A.). **A new Scale Insect on** ***Rhizophora***.—*Philippine Jl. Sci., Manila*, xv, no. 4, October 1919, pp. 385–387, 1 fig. [Received 18th May 1920.]

Targionia merrilli, sp. n., occurring on *Rhizophora mucronata* (mangrove) in the Philippines is described.

Other scales that have been recorded on mangroves are *Ctenochiton rhizophorae*, Mask., in Australia, *Mesolecanium rhizophorae*, Ckll., in Brazil, and *Chrysomphalus rhizophorae*, Ckll., in Mexico.

JOHNSON (E.) & COAD (B. R.). **Dusting Machinery for Cotton Boll Weevil Control.**—*U.S. Dept. Agric., Washington, D. C.*, Farmers' Bull. 1098, January 1920, 31 pp., 5 figs. [Received 18th May 1920.]

Recent tests with poison-dusts against the cotton boll weevil [*Anthonomus grandis*] have given satisfactory results, and it is considered that this practice is likely to spread rapidly. Suitable machinery is an essential factor in success and much attention has been given to the development of various types, as cotton dusting involves the treatment of much more extensive areas than have formerly been treated by this method. The present bulletin is considered only as a progress report and is issued solely for the purpose of recording the information on dusting machinery that has been secured up to the present time. The special factors governing the construction of the cotton-dusting machine which are discussed include the type of labour available, the areas to be treated in plantations and in the field, field conditions, the necessity for night operation, the characteristics of poison utilised and the type of dust cloud required. The recommendations given in this paper are not, however, considered in any way final, and it is expected that improvements will be developed from time to time for years to come.

WARREN (D. C.). **Dusting Cotton for the Control of the Boll Weevil.** —*Georgia State Bd. Entom., Atlanta*, Bull. 56, February 1920, 15 pp., 2 figs. [Received 20th May 1920.]

While a considerable amount of experimental work has been done in various parts of the United States in dusting cotton for the control of the cotton boll weevil [*Anthonomus grandis*], it has been found essential that special tests should be made under Georgia conditions. Particulars are given of the experiments that have been carried out, and the results show that the method was successful in practically every case. Directions are given for applying poison, the various materials that may be used, of which calcium arsenate has given the best results, the dosage and number of applications, and suitable machinery.

CHASE (W. W.). **The Principal Parasites of the Peach.**—*Georgia State Bd. Entom., Atlanta*, Bull. 57, Revised Ed. of Bull. 43, March 1920, 45 pp. 11 plates.

Much of the information contained in this bulletin has been noticed elsewhere [*R. A. E.*, iv, 261]. The mounds suggested for the control of *Aegeria* (*Sanninoidea*) *exitiosa*, Say, should be formed between the 15th July and 1st August.

HAYES (W. P.) & McCOLLOCH (J. W.). **Some Observations on the Genitalia of** *Lachnosterna*.—*Ann. Entom. Soc. America, Columbus, Ohio*, xiii, no. 1, pp. 75–80, 2 plates.

This paper is the result of the examinations of about 50,000 individuals of *Lachnosterna* from Kansas. The genitalia of nine species are discussed, as well as specific and sexual determination in the pupal stage.

HERRICK (G. W.). **The Winter of 1918–19 and the Activities of Insects with special reference to the Clover Leaf-Weevil** (*Hypera punctata*, Fab.)—*Ann. Entom. Soc. America, Columbus, Ohio*, xiii, no. 1, pp. 101–107.

Many insect pests were abundant during the summer of 1918 in New York State, including *Melanoplus femur-rubrum*, a blister beetle, *Pomphopoea sayi*, a bug, *Cosmopepla carnifex*, the wheat midge, *Contarinia tritici*, the green clover worm, *Plathypena scabra*, *Lema trilineata* and *Empoasca mali* on potatoes, *Eriocampoides limacina* on cherry trees, the lined corn borer, *Hadena fractilinea*, and *Hypera punctata*.

The fact that the weather was below normal in precipitation, while the temperature was above normal, may be responsible for the early increase of insects during the year. *Hypera punctata* occurred in great abundance, but was successfully kept in check by the fungus, *Empusa sphaerosperma*. Observations and breeding experiments show that this weevil may survive favourable winters in the adult stage and become active enough in the spring to oviposit, thus giving rise to a second generation.

SMYTH (E. G.). **Cotton Insects in Porto Rico.**—*Entom. News, Lancaster, Pa.*, xxxi, no. 5, May 1920, pp. 121–125.

Although *Heliothis* (*Chloridea*) *obsoleta*, F., infests maize in Porto Rico, it has not yet been found to attack cotton.

The cotton pests so far noticed include *Alabama argillacea*, Hb., which is controlled by the destruction of the alternative food-plants, *Urena lobata* and *Malachra rotundifolia*, on which it also hibernates. The stainer, *Dysdercus andreae*, L., is most frequently found in the drier northwest and south coast regions, but cannot be considered a serious pest of the cotton crops. The isolated attacks of *Xylomyges sunia*, Gn., on cotton are considered accidental. *Heliothrips haemorrhoidalis*, Burm., caused severe injury to the outside of cotton bolls and seems immediately concerned in the attacks of a disease that somewhat discolours the bolls and prevents them from bursting properly by cementing them to the calyx. This is apparently the first record of this pest attacking cotton. About 30 per cent. of the cotton bolls were infested with *Pseudococcus virgatus*, Ckll., which also attacked lima beans and pepper during the summer. This mealy bug was heavily parasitised by a Cecidomyiid, probably *Karschomyia cocci*, Felt. Other pests found on cotton during the year include: *Pseudococcus citri*, Risso; *P. longispinus*, Targ.; an undetermined scale closely allied to *Coccus mangiferae*, Green; *Corythuca gossypii*, F.; and *Aphis gossypii*, Glov. The enemies of the latter include *Cycloneda sanguinea*, L., *Scymnus roseicollis*, Muls., *Hyperaspis* sp., a Braconid, a Chalcidid, a Chrysopid, and the fungus, *Agrostalagmus albus*. *C. sanguinea* is itself parasitised by an Encyrtid, *Homalotylus* sp.

Diabrotica graminea, Baly, *Empoasca* sp., a Membracid, *Antianthe expansa*, Germ., and *Nezara viridula*, L., have also been found on cotton in Porto Rico.

Shot-hole Borer Investigations.—*Trop. Agriculturist, Peradeniya*, liv, no. 4, April 1920, p. 226.

In the course of a meeting of the Committee of Agricultural Experiments held at Peradeniya in March, 1920, it was reported that the paint recommended for the destruction of *Xyleborus fornicatus* (shot-hole borer of tea) [*R.A.E.*, A, viii, p. 110] has proved considerably more expensive than was anticipated, and that, while it generally destroyed the adult beetles, the young and eggs in the galleries were more or less unaffected. It is hoped, however, that the cost of application may be reduced under careful supervision and that further experiments with the paint will be made.

Isely (D.) & Ackerman (A. J.). **Some Features of the Codling Moth Problem in the Ozarks.**—*Jl. Econ. Entom., Concord, N. H.*, xiii, no. 2, April 1920, pp. 159–166.

Loss to the apple crop in the Ozarks due to codling moth [*Cydia pomonella*] has quite recently become very serious, and experiments in its control in 1918 and 1919 are described. The climatic conditions of the Ozarks and the parts of Southern Illinois and Kansas that resemble them give rise to a more severe infestation than is the rule in most fruit regions. There are numerous broods, and the second and following ones occurring in the heat of summer overlap so much as to be, for practical purposes, one brood. At the same time, also for climatic reasons, there is considerable variation in the date of hatching of the larvae of the first brood. Consequently all spray applications, with the exception of the calyx spray, are based on the dates of hatching of the first and second broods. It may be anything between three to six weeks after the falling of the petals before the larvae of the first brood begin hatching in appreciable numbers. With such a variation, no fixed date for the application of the first spray following the calyx application can be given, the time must be determined by life-history studies each season of the hatching of the larvae, the time of emergence of the earliest moths not being a reliable index. An additional first-brood spray is applied at a fixed interval (usually two weeks) following the first application to give continuous protection. The earliest second brood larvae hatch about eight or ten days after the emergence of the earliest first brood moths. Applications of sprays for the second and following broods are spaced at intervals (usually of about three weeks) to give protection until near harvest. In the experiments in 1918 this series of spraying was stopped on 5th August, and was effective till the end of August. The long spell of hot weather, however, produced a late brood, which after that date caused two-thirds of the damage sustained in sprayed orchards. In the cooler summer of 1919 there was no fourth brood, and the last spray on 12th August was sufficient protection.

The experiments showed that spraying machinery which produces a very fine mist is much more efficient than a coarse spray, and with the former, using the system described, *Cydia pomonella* can be efficiently controlled in the Ozarks.

HEADLEE (T. J.). **Some Experiences with the Codling Moth.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 2, April 1920, pp. 166–173.

Observations in New Jersey seem to show that the habits of the codling moth [*Cydia pomonella*], like those of other insects, differ materially from those exhibited in other parts of the United States where careful studies have been made. There seem to be only two broods of the moth in New Jersey. Though the blossom fall [calyx] spray is essential, it will not alone produce any satisfactory control, sprays directed against the larvae which enter the apples being absolutely essential also. In cases where the time of spraying was determined by the entrance of the larvae such a degree of control was obtained that less than 1 per cent. of the picked fruit was damaged. There is a fairly close relationship between the time the blossoms fall and the time the larvae enter the fruit, because the temperature factor, which is of considerable delaying or accelerating effect, probably operates on the insect in much the same way, and to about the same extent, as it does on the tree. Experiments showed that from the falling of the petals to the beginning of entrance by the first brood larvae there was a period of about four weeks. In the case of the second brood larvae the interval from the falling of the petals was nearly twelve weeks.

As a consequence of the mistakes that arise in applying the results of experiments in one locality in the differing conditions of another, the suggestion is made that studies of country-wide economic species should be carried out on a regional basis under a plan that includes extensive and thorough co-operation between States and with the Government agencies.

In the discussion that followed this paper it was observed that in Indiana there was no break between the broods, the moths emerging continuously from the middle of May till September. Consequently an unbroken series of sprays has to be kept up all through the summer.

GLENN (P. A.). **Forms of the Oyster-Shell Scale in Illinois.**—*Jl. Econ. Entom., Concord, N. H.*, xiii, no. 2, April 1920, pp. 173–178.

The author is of opinion that the oyster-shell scales that infest various species of deciduous trees in Illinois do not belong to the European species, *Lepidosaphes ulmi*, or at any rate are distinct varieties of that species. They are designated the brown form, the greyish-brown or banded form, and the yellowish-brown form. The brown form appears identical with *L. ulmi* and infests apple. The greyish-brown form cannot live on apple and certain other fruit trees. The yellowish-brown form probably does not infest apple. The average number of circumgenital pores varies in these forms, but there is such variation among individuals in the same group that identification by this means would be difficult.

It is on the economic side that the difference in form is at present most marked. The greyish-brown form is of no importance as a fruit pest, but in cities it is more numerous than either of the others, and unless some method of control is adopted, it seems probable that it will eliminate the poplar and ash, and possibly all its favourite food-plants, since, unlike the other forms, it is not subject to any parasite known at present. Spraying with lime-sulphur wash is an effective remedial measure, but it frequently cannot be applied to large shade-trees and it will also damage paint on neighbouring buildings, so that its use is often impracticable. The only other satisfactory method of procedure is to cut down infested trees and replace them with others not susceptible to the pest. Poplars are especially objectionable because the scale multiplies rapidly upon them; they are too high to spray, and too hardy to die, so that they serve as disseminating centres for the scale for many years.

MARLATT (C. L.). **Report on Federal Plant Quarantine Work and Co-operation with State Officials.**—*Jl. Econ. Entom., Concord, N. H.*, xiii, no. 2, April 1920, pp. 179–180.

A brief résumé is given of this report, many of the facts in which have chiefly been taken from one already noticed [*R.A.E.*, A, viii, 234]. The enormous growth of the scope of the Federal Horticultural Board is emphasised, together with the need of support from every State official and worker against reactionary propaganda such as that which has been spread broadcast respecting quarantine no. 37. [*R.A.E.*, A, vii, 184.]

SASSCER (E. R.). **Important Foreign Insect Pests collected on imported Nursery Stock in 1919.**—*Jl. Econ. Entom., Concord, N. H.*, xiii, no. 2, April 1920, pp. 181–184.

The amount of stock exported from the principal countries to the United States was less in 1919 than in any year since 1912, but, in spite of this, the number of insects arriving on imported stock has been as large as ever, if not larger. Even if stock had been examined by recognised experts on the other side, there was seldom if ever a shipment of any size that did not show insects of some description when examined in the United States, and an insect of no importance in its own country may easily change its habits in a new environment.

The insects intercepted in 1919 included :—*Platyedra* (*Pectinophora*) *gossypiella*, Saund. (pink bollworm), in cotton seed from China, Africa (Angola) and Mexico; *Palaeopus costicollis*, Mshl. (*dioscoreae*, Pierce), in yams from Jamaica; *Euscepes batatae*, Waterh., in sweet potatoes from British West Indies; *E. porcellus*, Boh., on sweet potato cuttings from Hawaii; larvae of presumably *Anastrepha fraterculus*, Wied., in grape-fruit and mangos from Cuba, Guatemala and Jamaica; *Arctornis chrysorrhoea*, L. (*Porthesia similis*, Fuessl.) (gold-tail moth) on *Acer atropurpureum* and *Azalea amoena* from Holland; *Acronycta rumicis*, L. (sorrel cutworm) on pear and quince from France; nests of *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*) (brown-tail moth) on *Cotoneaster*, apple and manetti stock from France; egg-masses of *Porthetria dispar*, L. (gipsy moth) on quince, apple and manetti stocks from France, and on boxwood from Holland; *Agonopteryx ocellana*, F., on rhododendrons and boxwood from Holland; *Gracilaria zachrysa*, Meyr., on azaleas from Holland and Belgium; a species of *Reticulitermes* in packing-moss round roots of litchi and citrus from the Philippines; a species of *Melanotus* in ship's ballast from Spain; *Athous niger*, L., in soil round rhododendrons from Holland; a species of *Crambus* in rice-straw packing from Japan;

a mite. *Stigmaeodes cinctus*, Ewing, in pineapple shoots from the Straits Settlements ; *Agromyza shineri*, Gir., and a species of *Xyleborus* on wistaria from Japan ; *Calandra linearis*, Hrbst., in tamarind seed pods from Guatemala and Cape Verde Islands ; *Gryllotalpa gryllotalpa*, L. (European mole-cricket) in soil round azaleas from Holland ; *Melanaster chinensis*, For., on Japanese figs ; and *Emphytus cinctus*, L., on various plants from Britain, France and Holland.

On flower bulbs were taken *Otiorrhynchus sulcatus*, F., from Holland ; *Pyralis farinalis*, L., from France ; *Eumerus strigatus*, Fall., *Merodon equestris*, F., *Rhizoglyphus rhizophagus*, Banks, and *R. hyacinthi*, Boisd., from France and Holland. *Anuraphis tulipae*, Boyer, infested *Iris tingitana* from France, and a species of the same genus was found on *Iris alberti* from England. A new species of *Liothrips* was found on a lily from France, and an undescribed species of *Tarsonemus* on narcissus from Holland. Unidentified Chironomids, Cecidomyiids and Agromyzids were also intercepted.

As in former years, Coccids were frequently met with, the more important being :—*Aspidiotus transparens*, Green, on cycads from South Africa : *Selenaspidus pumilus*, Brain, from South Africa ; *Targionia bromeliae* Newst., on pineapple shoots from Straits Settlements ; *T. hartii*, Ckll., on yams and sweet potatoes from Africa ; *T. sacchari*, Ckll., on sugar-cane from Porto Rico ; *Chionaspis exalbida*, Ckll., on aloe and *Pandanus* from Port Elizabeth, South Africa ; *C. niger*, Ckll., on litchi from Hawaii ; *Lepidosaphes alba*, Ckll., on *Manihot* sp. from St. Kitts, British West Indies, Bahama Islands, and the Belgian Congo, and on *Manihot esculenta* from Jamaica ; *Parlatoria calianthina*, B. & L., on *Pyrus communis* from Algeria ; *P. pseudaspidiotus*, Lindg., on orchids from the Philippines ; *Eulecanium* (*Lecanium*) *cerasorum*, Ckll., on wistaria from Japan ; *L. kunoensis*, Kuwana, on plums from Japan ; *E.* (*L.*) *persicae*, F., on *Berberis verruculosa* from France ; *Pulvinaria floccifera*, Westw., on *Renanthera imschootiana* from England ; *Pseudococcus boninensis*, Kuwana, on sugar-cane from Argentina ; *P. comstocki*, Kuw., on persimmon from Japan ; *P. crotonis*, Green, on orchid from Porto Rico ; *P. sacchari*, Ckll., on cow cane and Indian cane from Rhodesia, and on sugar-cane from Cuba and the Virgin Islands ; *P. virgatus*, Ckll., on litchi from the Philippine Islands.

Davis (J. J.). **The Green Japanese Beetle Problem.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 2, April 1920, pp. 185–194.

The green Japanese beetle (*Popillia japonica*, Newm.) has increased very rapidly in New Jersey, and was at least ten times as numerous in 1919 as in the previous year, infesting an area of 15,000 acres. Grants had been made in previous years by the State and Federal Governments for its extermination or control, but in 1919 it was decided that the policy of eradication must be abandoned and the cost of control was estimated at a minimum of about £14,000. Congress appropriated £7,000 ; this will enable valuable work to be done, but is insufficient for success, since in spite of the measures of the past two seasons, the insect has increased enormously and spread rather rapidly.

The life-history and habits of this beetle have been already noticed [*R.A.E.*, A, vi. 440 ; vii. 224, 411], but in the present paper pupation was not recorded before June. The insect is not injurious in the larval stage, but the adult is a serious menace to small fruits, orchards, cereal and forage crops and other plants. It is practically omnivorous, skeletonising the leaves of the food-plant. In Japan it is of small importance, being controlled by natural conditions, natural enemies or both; but without this control it may easily become a pest of prime importance in almost any community. It is hard to control artificially as it is a strong flier and is easily carried in vehicles, on the person and on marketable foodstuffs, plants, etc. It feeds on almost any plant, and the weeds by the road-side form a network of food-plants that assist its spread all over the country. It multiplies rapidly and the greater part of its life is spent under ground where it is difficult to reach.

The present limits of its infestation in New Jersey are as accurately known as careful work can make them. Scouting has been undertaken, the beetle has been well advertised, and all reports of its occurrence outside the known area carefully followed up. The project at present is to prevent the further spread of the insect and at the same time to discover practical control measures. The conditions in Japan are to be studied in the hope of finding parasites, and the introduction of a colony of English pheasants, which are very fond of the beetle, is planned. Various measures have been designed to prevent the spread of the insect. Quarantine covering green maize, in which the beetle is often carried, has already proved effective, and will be strictly enforced. The roadside clean-up [*R.A.E.*, vii, 511] will be reinforced by the use of salt to prevent re-growth; and the half-mile barrier [*loc. cit.*] will be maintained, lime-sulphur being now used as a repellent so as to avoid poisoning cattle. Aeroplane photographs of the ground are to be used to assist in planning out the work. As the full estimated cost of all this work has not been granted by the Government, it will be necessary to enlist the co-operation of individual farmers in carrying it out.

To reduce the numbers of the beetles, hand collection, which accounted for a million and a half in 1919, will be encouraged, and soil insecticide operations with sodium cyanide, which are too expensive for general use, will be applied where grub infestation is heavy.

Observations of the life-history indicate that most poisons do not kill the beetle, but act as repellents. Certain odours are very attractive to it: most of them disappear too soon to be effective in combination with poison-sprays, but one of them, iron arsenate, which is too feebly poisonous to be effective itself, may well form an efficient combination with another poison.

Infested ground should be ploughed in the autumn and again ploughed or cultivated as deeply as possible in late May and in June when the metamorphoses are taking place. This, like all the other points in the control measures, depends for its success on the faithful co-operation of all the residents in and around the infested area.

HADLEY (C. H.). **The Green Japanese Beetle Quarantine.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 2, April 1920, pp. 198–201.

In this paper the quarantine restrictions mentioned in the preceding paper are described in detail. It was found that there is great danger of *Popillia japonica* being carried from infested territory on farm produce especially green or sweet maize. Accordingly Quarantine Order number 35 was published prohibiting inter-State movements of green, sweet or sugar maize from the infested districts, to take effect from 1st June 1919, and it was shortly after supplemented by a similar measure for movements in the State of New Jersey itself. The representative of the Federal Horticultural Board was responsible for both quarantines, the details of which were the same. Information was obtained from every farmer in the quarantined area as to the maize being grown, and its intended disposal. Farms within the quarantined area, but well outside the known limits of infestation, received certificates allowing unrestricted shipment, until revoked, or up to 15th August, by which time the spread of the beetle would be known. Farms within the probable limits of infestation, but not yet infested, received similar certificates up to 25th July. In each case these certificates were extended as the circumstances warranted. The third group included all infested farms. No general certificates were issued, but actual inspection and certification of every package of maize was required before it could be moved from the farm.

The experience of inspection showed that the ears that concealed the beetle were only those that had a loose husk or one that had been damaged or deformed. Normal ears do not afford any concealment. In 23,000 baskets of maize only seventy-seven beetles were found but if the rapid increase of the insect is considered, this abundantly justifies the quarantine. The examination of other farm products, however, showed that they all favour the dispersal of the beetles, and a revised quarantine measure is now being drawn up, designed adequately to cover all phases of the situation.

PETERSON (A.). **A Preliminary Report on the Use of Sodium Cyanide for the Control of the Peach-Tree Borer** (*Sanninoidea exitiosa*, **Say**).—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 2, April 1920, pp. 201–207.

The results are given of two years study of the response of the peach tree borer, *Aegeria* (*Sanninoidea*) *exitiosa*, Say, and of peach trees to sodium cyanide. The problem is complicated by the close relation of such factors as the size and position of the larvae, the age and condition of the tree, the time and method of application, the penetrative and lasting quality of the poison in the soil, and the physical and chemical properties of the soil, particularly its temperature and water holding capacity.

The granulated or liquid sodium cyanide is placed two or three inches deep in the soil and covered with a mound six to ten inches high. One ounce treatments of sodium cyanide will kill 75 to 90 per cent. of the larvae in five- to ten-year-old trees. The granulated poison is as efficient as the liquid, and easier to apply. An application of less than one ounce does not produce a practical control, and trees are liable to injury with a larger quantity. The time of application is important. Strong trees of five to ten years of age are not injured by one ounce treatments when the applications were made in May, June, September or October. Healthy trees two to four years of age were not injured by half-ounce treatments.

Sodium cyanide is probably too poisonous for general use, but the results obtained may give some guidance for the use of other substances, such as paradichlorobenzene.

SANDERS (J. G.) & DE LONG (D. M.). **Dust versus Spray for Control of Sour Cherry Pests in Pennsylvania.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 2, April 1920, pp. 208–210.

The usual pests of sour cherry in Pennsylvania, curculio [*Conotrachelus nenuphar*], slug [*Eriocampoides limacina*] and leaf spot disease, were unusually destructive in 1918, and as a consequence a series of experiments were carried out in 1919 to determine the relative value of dust and spray mixtures.

The following were the materials used and the proportions of the ingredients :—Sulphur-lead-arsenate dust 90–10 ; lime-sulphur spray 1–40 ; lime-sulphur-lead-arsenate dust 50-45–5 ; and Bordeaux spray 3–3–50 to 1 lb. lead arsenate. In application the dust had several advantages over the spray. It could be applied in less than half the time with less labour, and the only disadvantage is that undesirable wind conditions cause delay. All the four applications produced excellent results as compared with the control plot, but the sulphur-lead-arsenate dust seemed the best in results as well as in the ease of application. These experiments are to be continued in 1920.

FERNALD (H. T.). **Ten Years of the Oriental Moth.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 2, April 1920, pp. 210–212.

In 1907 the area in Massachusetts occupied by the Oriental moth [*Cnidocampa flavescens*] was two miles by a mile and a half at the most, extending furthest from the centre towards the south-west. By the end of 1916 the area occupied was four miles long by three wide at the widest point and with an average width of two miles. The insect had reached the ocean on the east, and had extended furthest to the south and south-east, hardly at all to the west. In 1917 and 1918 shipments of a Chrysid parasite of this moth were made from China, and in March 1919 about six per cent. of the cocoons were found to be parasitised.

This parasite, *Chrysis shanghaiensis*, infests the pupa, and unfortunately tends to emerge too soon, when the larva of its host is only half-grown, and by the time that pupation occurs the weather is often so cold that the parasite becomes sluggish. Attempts are to be made to hold back the emergence of the parasite by cold storage. Though this seems to be the only example of a Chrysid parasitic on a Lepidopteron, there is no evidence to support the theory that it is merely a hyperparasite.

CROSBY (C. R.) & PALMER (R. G.). **The Organisation of a Special Spray Service in New York State.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 2, April 1920, pp. 212–218.

Control demonstrations are most effective when based on a seasonal programme of treatment rather than on the use of any particular spray or the destruction of any particular pest. The value of such a programme is shown as adapted to local conditions and the prevalent weather. From an educational and financial standpoint this system has a greater value both to the individual and, particularly, to the country as a whole. Efficiency requires that the work be done with an organised group of growers rather than with individuals, and to achieve this result it is necessary that sound expert advice be available and that the necessary information be placed in the hands of the growers at the exact time when it will be of most use to them. A full account is given of the co-operation devised in New York State between the College of Agriculture and the Country Farm Bureau Associations whereby a special field assistant is stationed during the growing season in the country and conducts the work, mostly on specimen demonstration plots, sending his information to the growers chiefly by letter or telephone and keeping in close touch with a specialist of the United States Weather Bureau, since weather is often a vital factor. In all his work he is under the supervision of the Departments of Entomology and Plant Pathology.

BALL (E. D.) & FENTON (F. A.). **What Per Cent. of Tipburn is caused by the Potato Leafhopper ?**—*Jl. Econ. Entom., Concord, N.H.* xiii, no. 2, April 1920, pp. 218–221.

An account is given of experiments following on the discovery that a considerable amount of tipburn is caused by the potato leaf-hopper [*Empoasca mali*] [*R.A.E.*, A, vii, 278]. Tests were carried out with potato plants enclosed in cages which showed that hopperburn can be produced at will by the use of leaf-hoppers, and prevented as effectively by their elimination. Both nymphs and adults give rise to the scorching, but the males do little or no damage. If the numbers are small, the damage done by the nymphs is more noticeable as they remain on one leaf till it is used up.

Tipburn has never been produced artificially in any other way (the effects of damp and shade were tried in these experiments) and all the evidence points to the fact that its appearance in the field is strictly correlated with the attacks of the leaf-hopper. If these conclusions are warranted, then "hopperburn" as a name for the leaf-hopper effect on potatoes covers practically all that has formerly been designated as "tipburn" on this plant. Tipburn has however been used for scorching effects of all kinds on various plants, and the substitution of the name "hopperburn" for the specific damage to the leaves caused by the potato leaf-hopper is justified in the interests of accuracy.

BRITTON (W. E.). **A Connecticut Cornfield injured by** *Crambus praefectellus*, **Zinck.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 2, April 1920, pp. 222–223.

A field of over an acre in Connecticut was cultivated with maize for the first time in 1919, and the resulting crop was almost a total failure owing to the stalk of nearly every plant being attacked by the larva of a Pyralid moth. The injury took the form of a hole eaten into the side of the stem at, or just above ground level. The larva was greyish, covered by a case formed of soil particles webbed together by silk threads.

At first the larva was supposed to be that of the corn web-worm (*Crambus caliginosellus*, Clem.), but four adults that emerged were identified as *C. praefectellus*, Zinck., a species that has not hitherto been recorded as injuring maize, though it has sometimes been observed on maize and wheat in other States, causing no damage of any importance. The larva and adult are described.

PARROTT (P. J.) & OLMSTEAD (R. D.). **The Work of *Empoasca mali* on Potato Foliage.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 2, April 1920, pp. 224–226.

The results are given of a series of experiments to determine the effects of attacks of *Empoasca mali*, Le B., on potato foliage. Feeding by the insects produced small brownish or burned areas at the tips and margins of the leaves. These areas spread inwards, the tissues dried, and the margins rolled up, leaving a narrow strip of green tissue in the centre of the leaflet. In cases of severe injury the drying extended to the petioles, so that any slight disturbance produced defoliation.

In the field, to compare the repellent effects of ordinary sprays with those of heavier consistency, the following preparations were applied :—Bordeaux mixture (10–10–100) ; Bordeaux mixture (10–10–100) with six pounds of lead arsenate paste ; china clay, 60 pounds to 100 U. S. gals. of water to which were added 10 pounds of soap ; and Bordeaux mixture (8–8–100) with 60 pounds of lump lime. Three sprayings were applied in July owing to heavy rains, and a fourth on 25th August ; later developments indicated that two sprayings in August would have been better. The control plants showed injury in August, and declined rapidly in September, the injury being indistinguishable from the disease known as tipburn. The sprayed plants presented hardly any traces of injury.

The heavy washes, composed of china clay or lime, were a little more effective in repelling the insects ; they caused very little trouble in clogging the nozzles in spite of their consistency, and produced a thick coating on the foliage. On the other hand the china clay was more easily washed off by rain than any of the other mixtures, and the heavy limewash was unsatisfactory as, after the first three applications, it injured the foliage. Although not quite so effective, the two lighter Bordeaux mixtures, if thoroughly sprayed, prevent serious damage by leaf-hoppers. They withstand rain bettter than china clay or lime, the combination with lead proving somewhat superior to the Bordeaux mixture alone.

In the discussion that followed, the senior author said that the injury caused by the leaf-hopper was not merely due to the extraction of the juices of the plant, but also to something in the salivary secretions of the insect that is toxic to plant tissues.

WEIGEL (C. A.) & CHAMBERS (E. L.). **The Strawberry Root-Worm injuring Roses in Greenhouses.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 2, April 1920, pp. 226–232.

Infestations are described of roses in greenhouses by a Chrysomelid beetle, *Typophorus* (*Paria*) *canellus*, F. (strawberry root worm), which usually infests strawberries. It occurred in Virginia and Indiana, Possibly the insects had been introduced into the greenhouses in the soil. The larvae feed on the roots, but the greater part of the damage is done by the adult beetles, which eat the young shoots and leaves of the rose trees, growing quickly under the forcing conditions of the greenhouse. They feed at night, feigning death if disturbed. The infested greenhouses were visited in July, but before this serious damage had been experienced from the beginning of May, and various attempts had been made to control it. A mixture of lead arsenate and Paris green in water did not adhere well, and was ineffective. One part of kerosene emulsion to sixteen of water killed the beetles, but caused serious scorching of the plants. Nicofume liquid (36 teaspoonfuls to 4 U.S. gals. of water) stupefies, but does not kill the insects.

In the tests here described, the plants were thoroughly sprayed with lead arsenate at the rate of two to two and half pounds to fifty U.S. gals. water and twenty-five ounces of soap. This did not injure the plants, but, contrary to experience with strawberries, was not effective. This was due to the insects choosing the fresh, tender growth that was being forced during the hot sultry nights and avoiding the sprayed foliage. Fumigation with hydrocyanic-acid gas was then tried. Half an ounce to a thousand cubic feet of space produced no result, and the maximum dose that roses can withstand, using two ounces to a thousand cubic feet of space, was therefore tried. As a result 97 per cent. of the beetles were killed. Almost all the tender growth was more or less scorched, but recovered in three weeks, while this deprived the few remaining beetles of their favourite place of feeding. In this way a large percentage of females are killed many months before normal egg-laying time.

In the discussion that followed this paper Mr. A. Peterson described the results of three years' study of this insect in a rose-house in New Jersey. In that State there are two generations a year, the adults appearing in June and July and again in September. The winter is passed in the adult stage in the soil. No satisfactory control had been found. Hydrocyanic acid gas ($1\frac{1}{2}$ oz.) applied in August, scorched the foliage so seriously that it did not recover that season without killing more than a small percentage of the beetles. Dusting with a lead, sulphur and lime mixture in June and July gave promise of control, but the only method in use consists in beating the bushes and catching the beetles as they fall.

FLINT (W. P.). **Poison Baits for Grasshoppers.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 2, April 1920, pp. 232–237.

The preference that grasshoppers show for leguminous plants, 75 per cent. of the damage done by them in Illinois being to clover, lucerne, soy beans, cowpeas, and similar plants, suggested that a bait with a strong leguminous odour might possibly prove more attractive than the standard bran-molasses-lemons bait [*R.A.E.*, A, vii, 206, etc.]. Lucerne meal has been tried, but has not the necessary fresh odour. During 1918 and 1919 a series of experiments were made using the standard bait, and, for comparison, a bait made of twenty-five pounds of bran and one pound of Paris green mixed dry, and a stiff mash made by adding water in which had been stirred three pounds of finely ground, green beans. In six tests out of seven the new bait worked considerably better than the standard one, so that it can be considered at least quite as good and is about one shilling per acre cheaper. A similar bait with three pounds of freshly ground clover substituted for the beans acted almost as well. No work was done to compare the relative attractiveness or cost of the new bait with a bait made of bran and poison only such as was used in Dr. Morrill's experiments [*R.A.E.*, A, vi, 304] with almost as much success as was obtained with the molasses and lemons. Baits made with paper instead of bran are more suitable in certain situations, where weeds are tall, or where poisoning of poultry or other birds is feared, although there is little evidence of birds ever having been poisoned by the mixture. Paper soaked in soluble poisons did not give good results, but newspaper soaked for half-an-hour in a mixture of one U.S. gal. of water, a quarter of a cup of molasses, two ounces of Paris green and one ounce of salt, torn into pieces four inches square and sown over a clover field at six inch intervals, killed four times as many grasshoppers in two days as were killed by the standard bait at ten pounds per acre. The paper also retains its attractiveness for a much longer period though it is particularly attractive when damp.

DEAN (G. A.) & KELLY (E. G.). **Organization for Grasshopper Control.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 2, April 1920. pp. 237–242.

The campaign against the infestation of grasshoppers in 1919 in Kansas is described. After the measures in 1918 [*R.A.E.*, A, vii, 284] large numbers of eggs of *Melanoplus atlantis* survived in undisked road-sides and hedgerows, and by 1st June the grasshoppers were swarming everywhere. The farmers had been warned, but did not recognise the danger till the insects had entered the wheat fields and after eating the leaves crawled up the stalk and attacked the stem just below the head. Hot sun and wind did the rest and by 29th June one and a half million bushels of wheat were lost. The grasshoppers then attacked green oats and barley and caused more loss while the maize, lucerne, and sorghum crops were threatened. An urgent call for assistance was sent to the State Agricultural College, and measures were set on foot at once. Under the Kansas grasshopper law, supplies of poison were at once located and obtained, and the forces in each county organised for work under the county agents or representatives of the College. The amount of material for each township was estimated and distributed, and the township trustees made responsible for its application.

The results were excellent throughout. Poisoning the grasshoppers at this time also protected the autumn wheat and no reports of injury to this crop were received.

MCCOLLOCH (J. W.). **A Study of the Oviposition of the Corn Earworm with relation to Certain Phases of the Life Economy and Measures of Control.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 2, April 1920, pp. 242–255.

The following summary of this paper on the corn earworm, *Heliothis* (*Chloridea*) *obsoleta*, F., is given by the author :—A study of the oviposition of the corn earworm on different varieties of maize plants, with relation to the date of planting and period of silking, has been made during the past six years. This work represents the daily number of eggs deposited on 128 individual plants and the silking period of 128 rows of maize. Three distinct broods of the corn earworm occur each year, the first brood of moths emerging early in June, the second brood about 10th July, and the third brood about 10th August. The maximum emergence occurs about two weeks after the first emergence. The first two broods are of little importance in comparison with the third. The date of silking is dependent on the variety rather than on the date of planting. While the plantings were made at intervals of two weeks the dates of silking show a difference of less than a week for maize planted 15th April, 1st May and 15th May.

The moths show a decided preference for the silks for oviposition. When these are not available, the upper surface of the leaves and the stalks are selected. Relatively few eggs are deposited on the lower surface of the leaves, the husk, or the tassel. There is a distinct relation between the date of planting and the number and location of the eggs. From the data presented, the 15th April is too early to plant maize from the standpoint of oviposition, and the 1st June is too late. The variety of maize, however, is to be considered in developing variations which will have an influence on the number of eggs deposited on it. An analysis of the data indicates that from the standpoint of the number of eggs deposited, Boone County White can be planted from 15th April to 1st May, Commercial White about 1st May, and Kansas Sunflower and Hildreth from 1st May to 15th May. Considering the results for the four varieties, 1st May, under favourable conditions, is the optimum time to plant maize to escape the corn earworm.

Considerable variation has been noted in the number of eggs deposited on the four varieties of maize. In 43·7 per cent. of the plots grown in the six years, Boone County White had the lowest number of eggs. Kansas Sunflower had the fewest eggs in 28·3 per cent. of the plots, Commercial White in 15·6 per cent., and Hildreth in 12·5 per cent. A similar variation was noted in the location of the eggs on the different varieties. There are a number of factors to be considered with relation to oviposition on varieties of maize, the principal ones being the time and period of silking, the time of maturing, and certain morphological characters of the plant.

Resolutions adopted by the Cotton States' Entomologists at Vicksburg, Miss., March 1, 2 and 3, 1920.—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 2, April 1920, p. 257.

Among the resolutions adopted were the following :—That it is the conviction of the members of this Association that the European corn borer [*Pyrausta nubilalis*], Japanese beetle [*Popillia japonica*], Oriental peach moth [*Cydia molesta*] and gipsy moth [*Porthetria dispar*], foreign pests established in the north-eastern United States, constitute a potential menace to the agricultural prosperity of the Southern States, and we urge upon the National Government such steps and appropriations as are necessary to prevent the further spread of these destructive pests in the United States, and that earnest efforts should be made to eradicate them.

That the experience of Texas and Louisiana with the pink bollworm [*Platyedra gossypiella*] emphasises the importance of each State doing systematic scouting work for such dangerous insect pests as the pink bollworm, European corn borer, Oriental peach moth, sweet potato weevil [*Cylas formicarius*], etc.

That it is apparent that there is need for crop pest control laws, with the necessary funds to enforce them, in every State to enable responsible authorities to deal promptly and effectively with dangerous pests wherever they may become established.

That while, in our opinion, a wide diversity in climatic conditions, horticultural products and insect fauna makes impracticable the application of uniform nursery inspection laws and regulations in all the States of the United States, it is nevertheless desirable, in the interests of increased horticultural development and the economical administration of inspection measures, that such laws and regulations be standardised in the Southern States, and uniformity therein secured as far as may be possible.

Woglum (R. S.) & Borden (A. D.). **Control of the Citrophilus Mealybug.**—Separate from *California Citrograph, Los Angeles*, May 1920, 1 p., 1fig.

The history of the spread of the citrophilus mealy-bug [*Pseudococcus gahani*] in California is reviewed. The remedial measures tried in 1918, and repeated in 1919 [*R.A.E.*, A, vii, 103] are described. In addition to those already mentioned these include banding with burlap, the destruction of the massed insects on the trunks by means of a power spray and the use of an insecticide containing 40 lb. of soap, 10 U.S. gals. of distillate crude oil (28° to 30° Bé.) and water to make 200 U.S. gals. If a lighter oil is used, the amount should be increased to 15 U.S. gals. Bands should be removed before spraying and dipped in pure distillate oil and replaced 2 or 3 days after the treatment. In cases of very severe infestation the spray may have to be repeated, but during the operations in 1919 a single application proved adequate. Spraying should be done before the larvae migrate to the branches. The liberation of natural enemies such as *Cryptolaemus*, *Leucopis*, *Chrysopa* and *Scymnus* is advocated.

Criddle (N.). **Locust Control in the Prairie Provinces.**—*Canada Dept. Agric., Ottawa*, Circ. no. 13, 13th April 1920, 20 pp., 6 figs.

Melanoplus atlantis, Riley, and *Camnula pellucida*, Scudd., were the most troublesome locusts during the recent infestation in Western Canada [*R.A.E.*, A, viii, 278]. The habits of the young and adults and the breeding grounds selected by the different species are discussed. The remedial measures advocated include burning weedy patches and dead grass, etc., where the young hoppers shelter for the night, ploughing and the use of poisoned baits. The natural enemies of locusts include the locust flesh fly, *Sarcophaga kellyi*, Ald., the locust bee fly, *Anastoechus* (*Systoechus*) *oreas*, O. S., the larvae of which feed on the eggs, *Trombidium* sp., which destroys the eggs, and a fungus, *Empusa* sp.

Details are given of local infestations during 1919. Years that are favourable for locusts generally show an increase of *Melanoplus femur-rubrum*, de G. (red-legged locust) and *M. bivittatus*, Say (two-striped locust). The campaign against locusts in 1919 was seriously handicapped owing to lack of authority in compelling farmers to undertake the necessary remedial measures. In view of these difficulties the provincial legislature is now engaged in amending the existing act so as to cover these exigencies during future outbreaks.

STRICKLAND (L. F.) & ACHILLES (J. B.). **The Quince Curculio and Methods of Control in Western New York.**—*N. Y. State Dept. Farms & Mkts., Div. Agric., Albany*, Bull. 116. February 1919. 45 pp., 13 figs. [Received 25th May 1920.]

Conotrachelus crataegi, Walsh (quince curculio) is probably a native of America, where its natural food-plant was the common haw [*Crataegus*] prior to the introduction of the quince, of which it is now the principal pest, destroying sometimes 80 to 90 per cent. of the fruit. The adults appear between 6th and 15th July in Western New York, oviposition lasting for about 22 days. After an incubation period of about 3 days the eggs, which are laid in excavations on the fruit of the quince, hatch and the larvae feed in the fruit for about 95 days. They are then mature and drop to the ground and, burrowing into the top layer of soil, prepare an earthen cell in which they live fo: about $8\frac{1}{2}$ months. In the spring the pupal stage lasts for about 10 days. The adults feed on the leaf-petioles, on the necks of small quinces and on the body of young fruit ; this feeding extends for several days before oviposition takes place to any extent and important damage is done during this period. One female may deposit about 30 eggs.

Early literature dealing with control methods for *C. crataegi* recommends cultivation, spraying, the use of pigs in the orchard and jarring [*R.A.E.*, A, i. 283]. Recent experimental work in spraying is described in detail, and this practice has been found the most efficacious against the pest. The best method proved to be two applications of Bordeaux mixture 3:3:50 or of lime-sulphur 1:40, to either of which was added 3 lb. lead arsenate to 50 U.S. gals. of spray, the spray being directed both upward and downward so that both upper and lower surfaces of fruit and foliage were covered. Four years of experimental work have shown that a rapid reduction of the numbers of the insect can be effected by this method, supplemented by the removal from the orchard of all fallen and picked quinces before the larvae leave the fruit. These applications also control the common fruit-spot disease of the quince.

The time of application of the spray is a most important point. The first application should be made when the adults begin to feed, and the second when oviposition takes place. The time of appearance of the adults varies considerably ; it is always earliest where the orchard stands on light soil. During the four years' demonstration, the adults have appeared between 6th and 17th July, and generally during a period of clear, dry weather. Watch should be kept for the first feeding punctures and the first spraying should then be done. About five days later oviposition begins, and when several egg-pits are found the second application should be made.

Smith (H. S.) & Armitage (H. M.). **Biological Control of Mealybugs in California.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, ix, no. 4. April 1920, pp. 104–158, 1 plate, 28 figs.

Mealy-bug control in California is a problem that has been extensively studied. As the remedial measures used against other citrus pests, such as spraying and fumigation, are useless against mealy-bugs, a great deal of experimental work in the biological or parasite method has been done, with the result that a solution of the problem has been found, resulting in the saving of several thousands of pounds annually to the citrus industry. This paper gives a résumé of the work and of the principles underlying it.

The mealy-bugs occurring in California include some 35 species, of which the most important, economically, are *Pseudococcus citri*, Risso (citrus or common mealy-bug), *P. gahani*, Green (citrophilus mealy-bug) and *P. maritimus*, Ehrhorn (Baker's mealy-bug). [See also *R.A.E.*, A, ii, 434.] The general characteristics and life-history of these species are discussed. During 1918 a species new to California, *P. krauhniae*, Kuw. (Japanese mealy-bug) was added to the list. It is not at present of economic importance, but might become so in the future if allowed to spread.

For some years tentative efforts have been made to introduce natural parasites of these species with a view to their control. The Encyrtid, *Tanaomastix abnormis*, Gir., was introduced from Sicily, and has become well established, occurring in almost every locality where the citrus mealy-bug is found. It was not, however, able to keep the mealy-bug in subjection, and the same might be said of the Coccinellid, *Cryptolaemus montrouzieri*, Muls., introduced from Australia but not well established. In 1916, it was found that potato sprouts were excellently adapted for the rearing of the latter beetle in large numbers, and this work has been undertaken with most successful results in control of the Coccids. It is an effective check on all the three principal species of mealy-bug. *T. abnormis* prefers *P. citri* and *P. krauhniae* as its hosts, particularly the younger stages of the former, and will occasionally oviposit in *P. maritimus*. The life-cycle of this parasite occupies from 25 to 45 days, and from 1 to 100 eggs may be laid in a single mealy-bug, though one is the normal number. The Coccinellid, *Hyperaspis lateralis*, is apparently a native of California and is widely distributed in the State. Its chief host is *P. citri*, but it has the disadvantage of being hyperparasitised, and is less easily reared than *C. montrouzieri*. The same may be said of the lacewings, of which several species are predaceous, *Sympherobius californicus* being a natural enemy of *P. citri*, *P. maritimus* and *P. krauhniae*, and *S. barberi* of *P. citri* and *P. maritimus*. The Dipteron, *Leucopis bella*, destroys many eggs, particularly of *P. gahani* and *P. maritimus*. Other insect enemies of less importance include *Rhizobius ventralis*, several species of *Scymnus*, the Syrphid, *Baccha lemur*, *Chrysopa* spp. (green lacewings), but none of these has been reared on a large scale.

The method of rearing and distributing *C. montrouzieri* is described in detail, and also the buildings and equipment constructed for the purpose.

Maskew (F.). **Quarantine Division. Report for the Month of February, 1920.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento,* ix, no. 4, April 1920, pp. 162–163.

The pests intercepted during February included: From Central America, *Aspidiotus cydoniae*, *A. cyanophylli*, *Pseudococcus* sp. and *Chrysomphalus scutiformis* on bananas. From Hawaii, *Coccus elongatus* and *Aphis* sp. on betel leaves; *Parlatoria proteus* var. *crotonis* and *Lepidosaphes auriculata* on croton; *Hemichionaspis minor* on coconuts; *Diaspis bromeliae* and *Pseudococcus bromeliae* on pine-apples. From Florida, *Lepidosaphes beckii* on grape-fruit and oranges; *Parlatoria pergandei* on oranges. From Georgia, *Parlatoria pergandei* and *Lepidosaphes beckii* on grape-fruit. From Idaho, *Cydia* (*Laspeyresia*) *pomonella* in apples. From Kansas, *Lepidosaphes ulmi* and *C. pomonella* in apples. From Louisiana, *Lepidosaphes* sp. on lemons and *Chrysomphalus aonidum* on oranges. From Mexico, *Heliothis* (*Chloridea*) *obsoleta* in tomatos, *Chrysomphalus dictyospermi* on coconuts and *C. aurantii* on oranges. From Missouri and Nebraska, peach-tree borers in peach stock. From Oregon, *Lepidosaphes ulmi* on cascara bark; *Aphis* sp. on privet; *Chionaspis pinifoliae* on Douglas fir; *Aspidiotus perniciosus* on apples; Lepidopterous larvae in willow twigs. From Texas, *Heterodera radicicola* in peach stock and peach-tree borers in peach and plum stock. From Washington, *Eriosoma lanigerum* on apple trees.

Matsumoto (S.) **Watano Gaichu Akamimushi oyobi Akadani.**—[The Red Worm and Red Mite infesting Cotton.]—*Kwangyo Mohanjo Kenkyuhokoku.* [*Science Report of the Industry Model Station*], *Cotton Plantation Branch Station, Moppo, Korea*, 1st March 1920, 25 pp., 4 plates.

This report deals with two pests of cotton, viz. :—a moth, *Platyedra* (*Gelechia*) *gossypiella*, Saund., and a mite, *Tetranychus bimaculatus*, Harv., both of which are known to be very injurious in Korea. *P. gossypiella*, Saund., appears twice a year: larvae that have hibernated pupate from the latter part of June to the beginning of July, and moths emerge in the middle of the same month and lay eggs. The egg hatches within a week and the larval period lasts about 16 days, so that pupation occurs from the end of July to the beginning of August. The pupal period lasts about 10 days, so that adults appear in the middle of August and lay eggs that hatch in about a week. The larvae are mature from the beginning to the middle of September and pass the winter in that stage.

The moths prefer shady places and oviposit at night, laying 10–30 or rarely 50 eggs per diem, continuing to do so for about 10 days. The adults seem to be but little attracted to light. The larvae of the first brood attack the flower-buds of cotton, each insect infesting a single bud. Those of the second brood infest the bolls, 3 or 4 individuals being found in each. The larva has a marked dislike for sunshine. The winter is passed underground at a depth of 2 or 3 inches or within crevices, etc., in the store-houses in an earthen cocoon. Individuals that pass the winter within the cotton-boll usually do not spin a cocoon.

P. gossypiella is one of the most formidable cotton pests of Korea, the first brood destroying the flowers and the second the seeds. As regards remedial measures, advantage may be taken of the dislike of the larvae for sunshine by collecting the bolls and exposing them to it. Ploughing in the winter also destroys some of them. Burning infested buds or bolls and submerging the seed in water so as to detect infested examples may sometimes be employed.

Tetranychus bimaculatus, Harv., appears at the end of June in the cotton field, and attacks the plants which are then five or six inches high ; 12 or 13 generations occur in a year. Females that have hibernated oviposit at the end of February on weeds, and the resulting adults, after passing through three nymphal stages, attack the cotton. Reproduction is both sexual and parthenogenetic. Parthenogenesis is most marked in summer, though it also occurs in spring and autumn, while sexual reproduction is continous throughout the year. There is no difference in the morphology and habits of individuals produced in the two manners, though those produced by parthenogenesis are exclusively males. Males are however usually less numerous than females. Oviposition begins, 3 or 4 days after pairing in spring, on the same or the next day in summer, and after 2 or 3 days in autumn. A female lays from 50–180 eggs and dies two or three days after oviposition. In hot, dry seasons oviposition is very vigorous ; in cool, wet seasons the opposite occurs, so that in rainy years the outbreak is much reduced. For hibernation, the mite leaves the cotton, shelters among weeds near by and becomes inactive. Males are readily killed by cold, so that those that survive the winter seem to be nearly all females.

This mite may attack the leaves of cotton to such an extent as to cause defoliation and the ultimate death of the plant. It also attacks beans. Burning of weeds near the cotton fields in winter, and of infested stalks before this, is very effective. A 45 X solution of lime-sulphur (35° Bé.) is sufficient to kill this pest in half-an-hour.

LEGISLATION.

New Plant Inspection Rule.—*Hawaiian Forester and Agriculturalist, Honolulu*, xvii, no. 3, March 1920, pp. 56–57, 70. [Received 10th May 1920.]

The text is given of "Rule XXI—Division of Plant Inspection," prohibiting, with penalties, the carrying of any white ginger plant, fern plant or Spanish moss (*Tillandsia usneoides*) from one locality to another throughout the Territory. In the case of the first two the rule is directed against a recently discovered pest of the white ginger plant [*Pteroporus subtruncatus*, Frm.] and against the Australian fern weevil [*Syagrius fulvitarsis*] [*R.A.E.*, A, viii, 191.]

NOTICES.

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CONTENTS

CONTENTS—*cont.*

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VOL. VIII. Ser. A. Part 8.—pp. 321-360. AUGUST, 1920.

THE REVIEW OF APPLIED ENTOMOLOGY

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TAKAGI (S.). **Kansho no Gaichu, Imohamushi, ni kwansuru Kenkyu.** [Investigation on the Leaf Beetle attacking the Sweet Potato.]—*Byokingaichu-Iho.* [*Report of Plant Disease and Injurious Insect Research*], *Imperial Agricultural Bureau, Tokyo*, no. 7, 30th March 1920, pp. 1–7, 1 plate.

The Chrysomelid beetle, *Chrysochus* sp. (*C. chinensis*, Baly ?), that attacks the sweet potato has hitherto only occurred in the Miye, Tokushima and Tochiki Prefectures. The adults appear from the end of June to the middle of July, and the eggs hatch about a week after deposition. The larvae pupate from the middle of September to the beginning of June of the next year. The pupal stage usually lasts about two weeks. The egg is usually laid singly just beneath the earth. The beetles are less active at early morning and night, and shelter at the roots of the sweet potato or among wheat. They are active by day and feed on the leaves and stalks. The larvae are very active and bore into the sweet potato tuber and devour the flesh. When mature they pupate in earthen cocoons. Infested sweet potatoes are of a dark green colour along the puncture and the tunnel is filled with excrement. The skin is also superficially attacked. Such tubers are bitter to the taste and smell. By deep ploughing hatching of the eggs may be prevented to some extent. While the larvae are still in the tubers, the latter may be examined for them and the insects killed. The adults may also be captured by putting hay or straw on the fields. Rotation of crops, clean cultivation, trapping the insects etc., are also recommended.

HARUKAWA (T.). **Nashihimeshinkui (Momoshinorimushi) ni Kwansuru Kenkyu.** [Investigation on the Small Pear Borer (Peach Moth).] —*Byokingaichu-Iho.* [*Report of Plant Disease and Injurious Insect Research*], *Imperial Agricultural Bureau, Tokyo*, No. 7, March 30th 1920, pp. 9–74, 2 plates.

This report on *Cydia molesta*, Busck, forms a supplement to a former one [*R.A.E.*, A, vii, 108]. As regards the life-history many new experiments were made, but it was found to be essentially the same as already described. Regarding remedial measures, capture of the moths may be effected by making the store-houses dark and collecting the emerging individuals at the windows. Removal of infested peach shoots should be effected in early spring, and newly infested ones only should be cut off; these can be detected by the withering of the single top leaf of the shoot. Conspicuously withered shoots as a rule do not contain the borer. In cleaning the orchard, rubbish on the ground as well as loose and rough bark of the fruit trees should be carefully removed. Each fruit should be covered with paper. Kerosene emulsion with insect powder should be sprayed three times, from the middle of July to the end of August.

ISHIYAMA (Z.). **Rakkwasei no Gaichu, Tobiiro-Zomushi ni kwansuru Chosa.** [Investigations on the Weevil, *Scepticus insularis*, Roelofs, attacking the Peanut].—*Chibaken Naimubu* [*Home Division, Chiba Prefectural Government*], April 1920, 8 pp., 1 plate, 1 map.

The weevil, *Scepticus insularis*, Roelofs, that attacks peanuts is spreading to such an extent in the Prefecture of Chiba that at present

(602) Wt.P1850/163. 1,500. 8.20. B. & F.,Ltd. Gp.11. A

the damaged portion amounts to 17 per cent. of the whole area cultivated with this crop. The insect has probably only one brood a year; the adult appears in April or May, and devours the buds or young shoots of the peanut, interfering with the growth of the plant. It may remain in this stage till July or August, or even September. It also attacks beans, melons and sweet potatoes. The complete life-history is still under investigation. No effectual remedies have been discovered. At present powdered tobacco, and sprays of lead arsenate, zinc arsenate, Paris green etc., are in use.

Takahashi (R.). **Two new Species of Aphididae from Japan.**—*Canad. Entom., London, Ont.*, lii, no. 4, April 1920, pp. 77–78, 2 figs.

Stomaphis pini, sp. n., on *Pinus densiflora*, and *Brachycolus gramini*, sp. n., are described from Japan. The latter was found on a plant belonging to the Gramineae and is very common from August onwards.

Timberlake (P. H.). **Correction of two Generic Names in Coleoptera and Hymenoptera.**—*Canad. Entom., London, Ont.*, lii, no. 4, April 1920, p. 96.

As the recently proposed name, *Brethesia*, [*R.A.E.*, A, vii, 524] proves to be preoccupied, *Brethesiella* is proposed in place of it.

Jack (R. W.). **Further Experiments with Poisoned Bait on Maize Lands.**—*Rhodesia Agric Jl., Salisbury*, xvii, no. 2, April 1920, pp. 130–136.

Further experiments have been made with poisoned baits [*R.A.E.*, A, vii, 315] for the Tenebrionids, *Gonocephalum* and *Emyon*, and the Curculionids, *Tanymecus* and *Systates*. The experiments were most successful and the bait seems particularly valuable against *Tanymecus*, though further tests are necessary to prove the value of distributing the bait on chopped grass etc. The value of distributed bait on bare lands is unquestionable, as is also that of spraying the bait on self-sown maize and weeds before these are hoed out previous to planting. In suitable seasons trap-rows of maize might be planted for this purpose, but the poison must not be used on the growing crop. The planting of the main crop should be delayed till after 1st December.

Treherne (R. C.). **Insects for the Year 1919.**—*Agric. Jl., Victoria, B. C.*, v, nos. 1–2, March-April 1920, pp. 25–26, 52–56.

The studies on the life-history, habits and control of the peach twig borer, *Anarsia lineatella*, have been continued [*R.A.E.*, A, vii, 170]. Larvae were first found to be infesting terminal buds of peaches on 27th April in 1919. Pupation occurred on 28th May and the moths emerged 16th June. Under laboratory conditions this moth has at least a partial second generation. Lime-sulphur as well as lead arsenate sprays have again proved successful. The first spray against the adults of the pear thrips, *Taeniothrips inconsequens*, was applied on 31st March as the opening of the buds was retarded by the cold weather.

Further observations have been made in connection with Lepidopterous pests of fruit and the following insects have been identified : *Eucosma ocellana*, *Argyroploce consanguinana*, *Tortrix* (*Cacoecia*) *rosaceana*, *Mineola tricolorella* and *Enarmonia* (*Laspeyresia*) *prunivora*. An apple-tree bark-beetle, *Magdalis* sp., caused conspicuous injury to foliage. Females were observed excavating egg-chambers at the base of buds of the previous year's growth after mating in June.

In connection with observations on fire blight [*Bacillus amylovorus*] distributors the majority of the trials proved negative, but *Empoasca mali*, *Aphis pomi* (*mali*) and *Lygus pratensis* have been proved to distribute the disease. Ants, honey bees, apple Aphids, bark-beetles and Elaterids are responsible for the early spring distribution of the disease. Of the Elaterids, *Cardiophorus fenestratus* was observed feeding on blight exudate on stumps of pear trees, and *Corymbites fallax* and *C. inflatus* were both found on apple trees and the latter also on lupins. The rose leaf-hopper, *Empoa rosae*, appeared in abundance, but has not been proved a carrier of blight. If this pest is not properly controlled on rose bushes, nicotine sulphate and soap should be applied to the lower surface of apple leaves in July when the nymphs appear. Observations on the life-history of the strawberry root weevil, *Otiorrhynchus ovatus*, show that the adults are parthenogenetic and that hibernating individuals deposit eggs in the spring. The raspberry crown borer, *Pennisetia* (*Bembecia*) *marginata*, is recorded on raspberries and loganberries. Experiments for its control are being made. Other fruit pests include the loganberry leaf-hopper, *Empoasca* sp., which was successfully controlled by a nicotine and soap spray ; the raspberry maggot, *Phorbia rubivora* ; the strawberry crown borer, *Aristotelia fragariae* ; and *Aegeria* (*Synanthedon*) *rutilans*. Experiments are still in progress to prove the efficacy of poison-baits for the currant fruit fly, *Epochra canadensis*.

Further experiments with poison-baits for the onion maggot, *Hylemyia antiqua*, show that they do not apparently check oviposition. Probably three generations occur during the year, but accurate notes have not yet been obtained as regards the third generation.

Against *Phorbia brassicae* attacking cauliflowers, mercury bichloride in three treatments at 1 to 1,000 proved superior to the use of tarred paper disks, although the latter method successfully reduced the infestation of cabbages to 5 per cent.

Noctuid larvae associated with a common plant, *Chrysothamnus* sp., have been found to be attacked by a fungus, *Entomophthora megaspermum*, and this may prove of economic importance in the control of cutworms.

The locusts reported from various localities include : *Camnula pellucida*, *Melanoplus atlantis* and *M. femur-rubrum*. Parasites and predaceous enemies of locusts include Asilids, Bombyliids, Tachinids, Sarcophagids, *Epicauta maculata* and a mite, *Trombidium locustarum*.

Miscellaneous insects of economic interest include the western tussock moth, *Hemerocampa vetusta gulosa*, which defoliated Douglas fir and western yellow pine ; the Pentatomid bug, *Apateticus crocatus*, which destroyed tent caterpillars and the oak looper, *Ellopia somniaria* ; the tent-caterpillars, *Malacosoma pluvialis* and *M. erosa* ; the Syrphid fly, *Eumerus strigatus*, which proved injurious to onions ; the apple fruit miner, *Marmara pomonella*, Busck.

The Colorado potato beetle [*Leptinotarsa decemlineata*] is recorded for the first time in the Province. Earwigs, probably *Forficula auricularia*, were reported from Vancouver as household pests.

Stratford (G.). **Control of Red Mite on Apple-Trees.**—*New Zealand Jl. Agric., Wellington,* xx, no. 3, 20th March 1920, pp. 176–178.

In a series of experiments for the control of red mite [*Tetranychus* sp.] tests were made with various brands of red oil and lime-sulphur. All brands of red oil were almost equally effective, and no injury to the plants was noticed. When used at a strength of 1 to 8 and applied as late as possible, they are useful in controlling the mite in the egg-stage.

Lime-sulphur sprays should be used at the time of fruit formation at strengths varying from 1 : 80 to 1 : 100.

Contra el Barrenillo del Olivo. [Measures against *Phloeotribus scarabaeiodes.*]—*Rev. Inst. Agric. Catalan de San Isidro, Barcelona,* lxix, no. 4, 20th February 1920, pp. 60–61. [Received 10th May 1920.]

In view of the losses caused by the olive beetle, *Phloeotribus scarabaeoides* (*oleae*), and the olive fly, *Dacus oleae*, the Provincial Council of Agriculture in Barcelona has circulated the local authorities requiring the burning of all olive prunings or their storage in tightly closed rooms. A reminder is given that the best means of combating *D. oleae* consist in scraping the trunks and in keeping the store-rooms clean after crushing the olives, all débris being burned.

Loos (K.). **Die Generationsverhältnisse unserer Borkenkäfer.** [The Generations of our Bark-beetles.]—*Vereinsschrift f. Forst-, Jagd- u. Naturkunde, Prague,* 1918–1919, no. 7–9, pp. 283–288. [Received 17th May 1920.]

An accurate knowledge of the conditions governing the number of generations of bark-beetles is of the greatest importance to forestry, but requires a very great deal of careful research. Eichhoff believed that there are 2 or even 3 annual generations in the case of the chief species represented in Bohemia, but the author points out that this would result in so numerous a progeny that natural enemies could scarcely exercise a valid check. Eichhoff stated that it is the *second* generation of *Dendroctonus micans*, Kug., that hibernates. Without definitely rejecting this the author records the presence of young adults at the end of March and in April, June. July, September, October and November; they also may remain for a longer period at their place of origin where they enlarge the larval mines. Larvae were found early in July and early in September; they were half-grown in mid-September and early October. Pupae were met with on 5th July, 9th September, 14th September and 7th November. *Polygraphus poligraphus*, L., is another species said by Eichhoff to be two-brooded, but a table here given shows that hibernation begins in mid-November and that a period of 348 days elapses from then to the development of the egg. In the case of *Hylesinus fraxini*, F., infested ash billets placed indoors in April yielded some young beetles on 2nd August, others having previously emerged and escaped. A second generation may occur, but only exceptionally. With regard to *Ips* (*Tomicus*) *typographus*, L., and *I.* (*T.*) *amitinus*, Eichh., it is known that eggs, larvae and pupae occur together (as a result of slow oviposition and rapid embryonic development) and it is possible that the first eggs laid may produce a second generation, which is not the case with eggs found in August. Under exceptional conditions a third generation may occur.

KURTZ (C.). **Wirksame Bekämpfung des Apfelblütenstechers.** [An efficacious Measure against *Anthonomus pomorum.*]—*Landw. Mitt. f. Steiermark*, 1919, p. 212. (Abstract in *Zeitschr. landw. Versuchswesen in Deutschösterreich, Vienna*, xxiii, no. 1–4, January-April 1920, p. 37.)

Many years' experience have shown the following method to be satisfactory against *Anthonomus pomorum.* The tree-trunks must be cleaned with lime wash and the ground beneath the branches strewn in February with half a wheelbarrowful of gallnut meal, a waste product from tanneries. The strong odour, the tannic acid and tannin content of this substance prevents any insect from reaching the trunk. Mice also are repelled and moss and weeds disappear, making way for grass and clover.

RAYMUNDO (B.). **Outro Inimigo dos Cafezaes.** [Another Enemy of Coffee Plantations.]—*Chacaras e Quintaes, S. Paulo*, xxi, no. 4, 15th April 1920, p. 286.

A caterpillar found in coffee plantations in the Brazilian State of S. Paulo has been identified as that of a moth, *Megalopyge lanata*, Stoll. It is not peculiar to coffee, but injury may result in cases of severe infestation.

VON BASSEWITZ (E.). **O Casulo de uma nossa Borboleta prejudicial ás Laranjeiras transformado em optimo Piteira para Cigarros.** [The Cocoon of one of our Lepidopterous Pests of Oranges transformed into an excellent Cigar Holder.]—*Chacaras e Quintaes, S. Paulo*, xxi, no. 4, 15th April 1920, pp. 293, 294, 1 fig.

By cutting off the ends of the cocoon of a moth, *Perophora packardi*, and removing the larva, the cocoon, after being washed in soapy water, dried and soaked in aromatic alcohol for a few days, is said to provide an excellent cigar holder, very resistant to the action of the teeth. It is stated that a German cigar factory has offered to purchase large quantities.

HEMPEL (A.). **Como destruir as "Vaquinhas" da Batata ingleza.** [The Method of destroying Beetles, known as "Vaquinhas," infesting the Potato.]—*Chacaras e Quintaes, S. Paulo*, xxi, no. 4, 15th April 1920, p. 300.

Against the beetles, *Lytta* (*Cantharis*) *excavata*, Klug, and an unidentified species of the same genus, which attack potatoes in Brazil, collection is advised, especially in the early morning when the insects are torpid.

The Pink Boll Worm in Texas.—*Agric. News, Barbados*, xix, no. 469, 17th April 1920, p. 122.

It is reported that the difficulties in dealing with the pink boll-worm [*Platyedra gossypiella*] in Texas continue, and experience has demonstrated that a one-year non-cotton zone is not effective. Although a non-cotton zone was proclaimed for 1918 and thousands of Malvaceous plants other than cotton were examined without result during 1918 and 1919, infestation re-appeared in 1919, evidently from cotton seed that had fallen to the ground in the fields and had escaped removal. In another locality in Texas where an infestation was found in 1917, a non-cotton zone was maintained for two years, apparently with perfect success, as no recurrence of the pest has been discovered. Only the most persistent application of thorough methods of cleaning up and constant vigilance over a period of several years, even when there are no signs of recurrence of the pest, can be expected to give satisfactory results.

The Cowpea Weevil.—*Agric. News, Barbados*, xix, no. 469, 17th April 1920, p. 122.

Chalcodermus aeneus (cowpea weevil) is responsible for a good deal of damage in St. Vincent, and apparently has not previously been recorded there. Examples from St. Vincent are smaller than those occurring in the United States and may prove to be a distinct but closely related species. The larvae feed inside the growing peas, on which the eggs have been laid. It was found that by planting a variety of cowpea that continuously blooms and fruits over a considerable period, the weevil can be trapped and effectually controlled by collecting all the pods on these cowpeas at intervals of three days for a period of 5 or 6 weeks.

Marchal (—) & Poutiers (—). **La Fourmi d'Argentine.**—*La Vie Agric. et Rur., Paris*, xvi, no. 20, 15th May 1920, p. 351.

Attention is drawn to the appearance of the Argentine ant, *Iridomyrmex humilis*, in the vicinity of Toulon and Cannes, and the danger of further spread is emphasised. It was probably imported with plants from South America.

Faes (H.). **Essais et Traitements effectués dans le Vignoble vaudois contre le Ver de la Vigne (Cochylis) en 1918.**—*Station Viticole, Lausanne*, 1919, 12 pp. [Received 26th May 1920.]

During 1918 the vine moth [*Clysia ambiguella*] caused less damage in the vineyards of the Swiss canton of Vaud than during the preceding years.

Details are given of the various localities inspected. The larvae of the first generation appeared towards the end of May, those of the second about the end of July. A 9 per cent. solution of locally grown pyrethrum and soap again proved the most effective [*R.A.E.*, A, v, 389] measure. General recommendations are given for dealing with the first and second generations with titrated nicotine.

IMMS (A. D.) & HUSAIN (M. A.). **Field Experiments in the Chemotropic Responses of Insects.**—*Ann. App. Biol., Cambridge*, vi. no. 4, April 1920, pp. 269–292.

The results of preliminary studies on the subject of chemotropism in insects are described. A summary of the literature already published on this question shows that previous observations have been directed to finding out the responses of some particular species. The work here discussed on the other hand is quantitive in aim with a view to obtaining the data on the attractiveness of various substances in various conditions, their optimum attractive strength and relative powers of attraction in relation to other substances, the species attracted, their numbers and the proportion of the sexes, and meteorological data.

The experiments were conducted during July and August 1918, and for the most part during wet and apparently unfavourable climatic conditions. The most noteworthy features of the investigation may be summarised as follows.

The insects attracted consisted almost exclusively of Diptera. With the exception of one or two examples of *Vespa vulgaris*, no Hymenoptera responded. Rhynchota, Coleoptera and Neuroptera (*sens. lat.*) were unrepresented. A small number of Noctuid moths entered the traps, but for the purpose of conducting experiments with such relatively large insects, as are many Lepidoptera, it would be necessary to alter slightly the construction of the traps used in order to allow of greater facilities for ingress.

Beer, sugar-cane molasses, and mixtures of these two substances are powerful chemotropic agents for various Diptera. Ethyl alcohol, in various concentrations, exhibited little or no chemotropic properties, but with the addition of small amounts of butyric, valerianic or acetic acids it exercised a powerful stimulus. Aqueous solutions of the above acids were not attractive, the respective esters probably being the attractive agents in each case. The remaining substances utilised in these experiments were found to exhibit little or no positive chemotropic properties.

Out of considerably over 3,000 Diptera attracted during the course of these observations, by far the greater number pertained to one or other of the five families RHYPHIDAE, MYCETOPHILIDAE, SEPSIDAE, MUSCIDAE and ANTHOMYIDAE.

As a general rule members of both sexes of a species were attracted irrespective of the chemotropic agent employed. In the majority of instances males predominated over females, but in no case where the number of individuals of a species attracted exceeded 20 was the disproportion greater than 2·9 males to 1 female.

Rhyphus punctatus, *Hylemyia strigosa* and *Calliphora erythrocephala* were the dominant species attracted.

HAVILAND (M. D.). **On the Sexual Forms of *Aphis saliceti*. Kaltenbach.**—*Ann. App. Biol., Cambridge*, vi. no. 4, April 1920, pp. 311–313.

Of a number of *Aphis saliceti*, Kalt., collected on sallow (*Salix caprea*) in June 1919 the majority were found to be sexual males and females, and not parthenogenetic individuals as might have been expected. This has been observed before with regard to this species in America and on the Continent, but not, apparently, in Britain. Parallel instances of the appearance of sexuales in summer are rare, but further study may prove it to be more frequent than has been supposed, and the disappearance of some forms from a food-plant, which has been attributed to migration to a different one, may be simply the normal cycle after production of fertilised ova. Descriptions of the male and oviparous female forms of *A. saliceti* are given.

PAILLOT (A.). **Sur une Réaction des Micronucléocytes des Chenilles d'*Euproctis chrysorrhea*, contaminées par le *Bacillus melolonthae liquefaciens* λ.**—*C.R. Soc. Biol., Paris*, lxxxiii, no. 15, 1st May 1920, pp. 615–617.

If a fresh culture of *Bacillus melolonthae liquefaciens* λ is inoculated into the body cavity of larvae of *Nygmia phaeorrhoea* (*Euproctis chrysorrhoea*), the micronucleocytes in the blood exhibit a marked protoplasmic reaction, which most frequently begins within an hour of the inoculation.

The direct cause of the reaction is a toxin secreted by the *Bacillus*. If a drop of a concentrated emulsion of microbe culture is inoculated into the body cavity of the caterpillars the reaction occurs, but is neither so intense nor so complete as when living bacilli are used; the majority of the micronucleocytes resist the action of the toxin and more or less quickly regain their normal aspect. It would seem therefore that the toxin developed within the blood of the larva is more active than that formed in cultures on artificial media. This toxin is susceptible to the action of heat; prolonged heating at 127°–131°F. (53°–55°C.) destroys it almost entirely.

METALNIKOW (S.). **B. dysénterique et bactériophage de d'Hérelle chez les Chenilles de *Galleria mellonella*.**—*C. R. Soc. Biol., Paris*, lxxxiii, no. 16, 8th May 1920, pp. 667–668.

It has previously been shown [*R.A.E.*, A, viii, 163] that the larvae of *Galleria melonella* are very susceptible, not only to saprophytes but also to the microbes of intestinal organisms such as *Bacillus coli*, and the *Bacillus* of Shiga. The latter always produces a fatal infection, 1/80 c.c. of emulsion killing a larva in 15 to 25 hours. Phagocytosis is almost entirely absent, and the bacilli reproduce with great rapidity, so that in two to three hours after inoculation the whole body cavity of the insect is full of microbes.

The author has conducted a series of experiments to test whether injections of d'Hérelle's bacteria-destroying organism would confer any immunity on the larvae. Five larvae inoculated with 1/50 c.c. of a fairly strong emulsion of de Shiga's dysenteric bacillus were all killed in 24 hours. Five others similarly treated, but receiving ten minutes before an injection of a small dose of d'Hérelle's organism, were all living after 24 hours. This immunity however does not last long. It appears that d'Hérelle's organism has no influence on the development of the disease for the first two or three hours. After that the number of microbes diminishes rapidly. Most of the bacilli swell up and become transformed into small spheres, and it is then that intensively active phagocytosis begins. The bacteria enveloped by the phagocytes are digested with great rapidity.

The injection of a weak dose of an old culture of dysenteric bacilli also confers immunity on a larva against otherwise fatal doses.

van Hall (C. J. J.). **Ziekten en Plagen der Cultuurgewassen in Nederlandsch-Indië in 1919.** [Diseases and Pests of Cultivated Plants in the Dutch East Indies in 1919.]—*Meded. Inst. Plantenziekten, Buitenzorg*, no. 39, 1920, 50 pp.

The pests recorded include a Coccinellid, *Epilachna* sp., attacking potatoes; the larvae of *Heliothis* sp., infesting *Arachis* [*hypogaea*] (ground nut); and the sweet potato weevil, *Cylas formicarius* (*turcipennis*).

The forest pests, *Duomitus* [*ceramicus*], *Calotermes* [*tectonae*], *Zeuzera* [*coffeae*], *Hypsipyla* sp., and the ring borer, *Phassus damor*, occurred as usual. The unidentified species of *Xyleborus* infesting teak, mentioned in the previous report [*R.A.E.*, A, vii, 388] proves to be *X. destruens* [*R.A.E.*, A, vii, 536]; this beetle attacks growing teak and there are indications that this infestation must have been of long standing. Leaf caterpillars, including *Achaea* (*Ophiusa*) *serva* and *A.* (*O.*) *melicerta*, defoliated guttapercha trees (*Palaquium*). Larvae, probably those of a beetle, *Dichodontus croesus*, destroyed a group of *Vernonia arborea* trees.

Cacao suffered little injury from the cacao moth [*Acrocercops cramerella*], contrary to what occurred in the previous year.

Cassava was attacked by mites [*Tetranychus bimaculatus*] and termites. Green vegetables were infested by various caterpillars, *Agromyza phaseoli* and *Aphis medicaginis*.

Hevea was infested by *Coptotermes gestroi*, Lymantrid caterpillars, *Acanthopsyche snelleni*, *Pseudococcus citri*, *Holotrichia leucophthalma* and *Lepidiota stigma*.

Cotton was almost free from attack by *Earias fabia*.

Kedelé [*Glycine soja*] suffered considerable injury from the pod borer (*Etiella zinckenella*), the stem borer (*Agromyza sojae*) and the catjang borer (*A. phaseoli*). The last-named fly seems more injurious at certain times; on one estate where planting was done on five separate dates with 15-day intervals, it was only the fifth lot that was badly attacked. A Coccinellid *Epilachna* sp., another beetle *Araecerus* sp., and caterpillars—including those of *Heliothis*—also infested *G. soja*.

Cinchona pests included *Helopeltis antonii* var. *bradyi*, the caterpillars of *Euproctis flexuosa* and *Attacus atlas*, a scale *Coccus* (*Lecanium*) *hesperidum*, and the mites, *Tetranychus bimaculatus* and *Brevipalpus obovatus*. In spite of the prolonged dry weather many seed-beds in the government cinchona plantations were free from mites.

Coconuts continued to be infested by *Brachartona catoxantha*. *Hidari irava* was a serious pest on one estate. Limacodid caterpillars and those of *Amathusia phidippus* did little injury. *Oryctes rhinoceros* and *Rhynchophorus ferrugineus* occurred everywhere, but on the east coast of Sumatra they did little damage owing to the measures systematically adopted. A caterpillar, thought to be that of *Setora nitens*, occurred in a number of localities, but not much damage was done. The Hispid beetle, *Bronthispa longissima*, Gestro, and *Mellissoblaptes rufovenalis* occurred in Celebes.

Coffee pests included the scales, *Pseudococcus virgatus* and *Coccus* (*Lecanium*) *viridis*, Limacodid caterpillars, *Stephanoderes hampei*, *Zeuzera coffeae*, *Araecerus fasciculatus*, and *Xyleborus coffeae*.

Maize was infested by many caterpillars, including those of *Marasmia*, *Cirphis* and *Heliothis obsoleta* (*armigera*). Infestation by the last-named moth was reduced by the advent of the rains.

Oil palms suffered some injury from Psychid and Limacodid caterpillars. The pepper bug, *Elasmognathus hewitti*, increased as compared with the previous year.

Rice pests included *Nymphula depunctalis*, *Schoenobius incertellus* (*bipunctifer*), *Scirpophaga sericea*, *Sesamia* sp., *Cirphis* (*Leucania*) *unipuncta*, *Spodoptera mauritia* and *Tetraneura oryzae*.

Aleurodes bergi, *A. longicornis*, *Oregma lanigera* and *Chionaspis tegalensis* occurred on sugar-cane, but did no very serious damage.

Tobacco was infested by the caterpillars of *Heliothis* (*Chloridea*), *Prodenia* and *Phthorimaea* (*Gnorimoschema*) *heliopa*. The beetles. *Gonocephalum* and *Eutochia* (*Holaniara*), occurred again, but not seriously. The pests of stored tobacco, *Lasioderma* [*serricorne*] and the tobacco moth [*Setomorpha margalaestriata*], caused little loss, as a large portion of the tobacco stored in the Dutch East Indies was exported, and the remainder was easily disinfected with carbon bisulphide.

Tea pests included *Helopeltis*, *Zeuzera coffeae*, *Xyleborus fornicatus*, *Stauropus alternus*, a Bombycid caterpillar, various Limacodid caterpillars including *Setora nitens* and *Thosea cervina*, the bugs, *Hyalopeplus smaragdinus* and *Poecilocoris hardwicki*, and the mites, *Eriophyes* (*Phytoptus*) *carinatus*, *E.* (*P.*) *theae* and *Brevipalpus obovatus*.

DAMMERMAN (K. W.). **Rapport over Planten-quarantaine in Japan, Hawaii en de Vereenigde Staten.**—*Meded. Inst. Plantenziekten, Buitenzorg*, no. 40, 1920, 37 pp.

A brief report is given on the plant quarantines in force in Japan, Hawaii and United States, including the Hawaiian order for fruit and plant inspection. Appendix I gives (in Dutch) the Japanese Law no. 11 of 25th March 1914 with the regulations pertaining to it. Appendix II gives the U.S. Plant Quarantine Act, 20th August 1912, as amended 4th March 1913 and 4th March 1917, together with the rules and regulations issued under it.

JOHNSON (W. F.). ***Necrobia rufipes* in Belfast.**—*Irish Naturalist, Dublin*, xxix, no. 3, March 1920, p. 25.

Attention is drawn to an infestation of dried figs by *Necrobia rufipes*, DeG., in Belfast.

LYLE (G. T.). **Contributions to our Knowledge of the British Braconidae. No. 4, Rhogadidae and No. 5, Sigalphidae.**—*Entomologist, London*, lii, nos. 673–675 & liii, no. 682, June, July & August 1919 & March 1920, pp. 134–136, 149–155, 178–181, 56–60.

In this paper, which is a continuation of one previously noticed [*R.A.E.*, A, vi, 381] the species dealt with include: *Rhogas grandis*, Giraud, reared from *Amphipyra pyramidea*; *R. rugulosus*, Nees, reared from *Arsilonche albovenosa* in England and from *Acronycta euphorbiae* and *A. abscondita* on the Continent; *R. praetor*, Rein, bred from *Smerinthus populi* in Suffolk; *R. geniculator*, Nees, bred from larva of *Arctia villica* and *Odonestis potatoria* in Devon and *Arctia caja* and *Arctornis chrysorrhoea* (*Porthesia similis*) on the Continent; *R. cantherius*, sp. n., a fairly abundant parasite of *Semiothisa liturata* in the New Forest; *R. circumscriptus*, Nees, reared in the New Forest from larvae of *Triphaena fimbria*, *T. pronuba*, *Calymnia trapezina*, *Taeniocampa stabilis*, etc.; and *Sigalphus pallidipes*, Nees, a parasite of *Orchestes fagi* and *O. quercus* in the New Forest, a hyperparasite being frequently reared from its cocoons.

DITMARS (R. L.). **The Seventeen-Year Locust.**—*Zool. Soc. Bull., New York*, xxiii, no. 1, January 1920, pp. 18–23, 14 figs.

The life-history of the seventeen-year cicada [*Tibicen septemdecim*] is reviewed. During the appearance of this pest in 1919 very little damage was caused to fruit trees in Georgia and Long Island. Brood xi is due to appear in 1920 in Connecticut and Rhode Island. Whereever the pest is expected young and natural tree growth should be cultivated so as to attract the females away from neighbouring fruit trees. Bush fires should especially be guarded against the year before the cicadas are due to appear.

TEICHMANN (E.) & ANDRES (A.). *Calandra granaria*, **L., und** *Calandra oryzae*, **L., als Getreideschädlinge.**—[*Calandra granaria*, L., and *C. oryzae*, L., as Grain Pests.]—*Zeitschr. f. angew. Entom., Berlin*, vi, no. 1, September 1919, pp. 1–24, 1 plate. [Received 19th April 1920.]

The distribution and life-histories of *Calandra granaria*, L., and *C. oryzae*, L., are discussed. *C. oryzae* has apparently not become established in Germany, although numerous infestations by this weevil have been recorded.

The parasites of *C. oryzae* include the Chalcids, *Pteromalus* (*Meraporus*) *calandrae* and *Meraporus graminicola*. *C. granaria* is parasitised by *Cerocephala formiciformis*, *C. elegans*, *Meraporus* sp., a Chalcid belonging to the genus *Dibrachys* and a Braconid *Chremylus* (*Penecerus*) *rubiginosus*, Nees. A mite, *Tyroglyphus* (*Aleurobius*) *farinae*, has been found in the breeding jars containing *C. granaria*.

The various remedial measures suggested by previous authors are reviewed and the use of hydrocyanic acid gas is advocated.

BURKHARDT (F.). **Zur Biologie der Mehlmotte** (*Ephestia kuehniella*, **Zeller**).—*Zeitschr. f. angew. Entom., Berlin*, vi, no. 1, September 1919, pp. 25–60, 13 figs. [Received 19th April 1920.]

The work of various authors with regard to the biology and control of the Mediterranean flour moth, *Ephestia kühniella*, Z., is discussed and the value of hydrocyanic acid gas fumigation as a remedial measure is emphasised.

Über das "Tannensterben." [Causes of Death of Fir Trees.]—*Zeitschr. f. angew. Entom., Berlin*, vi, no. 1, September 1919, pp. 168–170. [Received 19th April 1920.]

The continued dying back of silver fir [*Abies pectinata*] in the Frankenwald in North Bavaria, previously attributed to the fungus *Agaricus melleus*, is now thought to be the result of insect attack. Several beetles have proved to be abundant, including *Pissodes piceae*, which attacks stems of any age between 30 and 200 years though 40 to 80-year old wood is preferred. One tunnel-system is sufficient to kill the tree. The chief enemies of this beetle are woodpeckers.

Ips curvidens is most abundant in old trees and seldom occurs in young ones. It is often found in company with *Cryphalus piceae*, which attacks the tops and strong branches of old trees, but which is most frequently found in young trees.

Other pests of less importance are *Chermes* (*Dreyfusia*) *piceae* and *Sirex* spp.

Müller (G. W.). **Ist *Thereva nobilitata*, Fabr., ein Roggenschädling?** [Is *Thereva nobilitata*, F., a Pest of Rye?].—*Zeitschr. f. angew. Entom., Berlin*, vi, no. 1, September, 1919, pp. 172–173. [Received 19th April 1920.]

The author considers that the damage to rye attributed to *Thereva nobilitata*, F. [*R.A.E.*, A, viii, 270] is due to some other pest, as this fly is probably predaceous on other insects.

Angewandte Entomologie und Schule. [Applied Entomology and Schools].—*Zeitschr. f. angew. Entom., Berlin*, vi, no. 1, September 1919, pp. 180–183. [Received 19th April 1920.]

The importance of intensive pest control can only be disseminated in Germany if the foundation for it is laid in the State elementary schools. Suggestions in furtherance of this idea are made by K. Escherich and A. Haase.

Collin (J. E.). ***Eumerus strigatus*, Fallen, and *tuberculatus*, Rondani, (Diptera, Syrphidae).**—*Entom. Mthly. Mag., London*, no. 672, Third Ser., no. 65, May 1920, pp. 102–106, 1 plate.

Narcissus bulbs are damaged by two species of *Eumerus* in Britain. *E. strigatus*, Fall., which has also been recently found infesting parsnips, and *E. tuberculatus*, Rond., which is here described.

Jack (R. W.). **Further Experiments with Poisoned Bait on Maize Lands.**—*Rhodesia Dept. Agric., Salisbury*, Bull. 353, April 1920, 8 pp. [Received 1st June 1920.]

The information contained in this bulletin has been noticed already [*R.A.E.*, A, viii, 322].

FROGGATT (W. W.). **The Powder-post Beetle and its Parasite.**—*Agric. Gaz. N. S. W., Sydney*, xxxi, no. 4, April 1920, pp. 273–276, 2 figs.

The most destructive powder-post beetle in New South Wales is *Lyctus brunneus*, the female of which oviposits in the outer surface or sapwood of trees that have been cut down and the bark of which is drying. The eggs or young larvae remain in the timber when it is sawn up and used for building, and many generations of grubs may be hatched, develop and emerge as adults after the furniture or building is completed [*R.A.E.*, A, vi, 390]. Rattan and cane chairs from the East are particularly liable to infestation. In 1919 *L. brunneus* emerged from a badly-infested board of "blue fig" from Queensland, accompanied by a Braconid parasite that is briefly described. This is apparently the first record of any parasite of this beetle.

ALLEN (W. J.) & HOGG (S. A.). **Cherry Growing in New South Wales.**—*Agric. Gaz. N. S. W., Sydney*, xxxi, no. 4, April 1920, pp. 277–279.

Insects recorded as pests of cherry trees in New South Wales include *Maroga* (*Cryptophaga*) *unipunctana*, Don. (cherry tree borer), the webs of which should be removed, and the holes prodded with copper-wire or treated with kerosene and then plugged up; San José scale [*Aspidiotus perniciosus*], for which sprays of resin, soda and fish-oil should be given in the summer and lime-sulphur solution in the winter; Rutherglen bug [*Nysius vinitor*], for which no satisfactory remedy is known that will not injure the fruit; and pear slug [*Eriocampoides limacina*], for which the remedy is a spray of 2 lb. lead arsenate to 50 gals. water; when infestation is severe the soil round the trunks of the trees should be disturbed or lime applied so as to destroy the pupae in the ground.

GALLARD (L.). **Notes on the Dicky Rice Weevil** (*Prosayleus phytolymus*, **Olliff).**—*Agric. Gaz. N. S. W., Sydney*, xxxi, no. 4, April 1920, pp. 280–284, 11 figs.

Prosayleus phytolymus, Oll. (dicky rice weevil) has been a serious pest of orchards and nurseries in New South Wales for the last fifteen years, but it is only recently that the habits of the larvae have been discovered. There are two generations in a year, the first emerging in October and November and the second in February and March, that is, in conjunction with the starting of the two main periods of growth. The adults attack the young shoots and in many cases eat the crown right out or so damage the young shoot that its growth is stunted and deformed. The tender leaves are eaten away in patches, the older ones being scalloped at the edges, and the outer surface of the young fruit is nibbled off in irregular blotches. Adults confined in a glass tube with some soil oviposited under the surface, where the larvae hatched. This indicated that the larvae may live in the soil, and examination revealed them working on the roots of apple trees about 9 to 12 inches deep, where pupae also were found. The bark of the roots is corrugated and nibbled away by the larger larvae.

Where a large area is available, the nursery beds can be shifted as soon as the weevils appear in any quantity, and poultry should be turned into the orchards, many pupae and larvae being devoured by them. Some nurserymen claim to have obtained good results with lead arsenate sprays; if used judiciously, they should prove a good remedy. The numbers of *P. phytolymus* have been diminishing in recent years, probably owing to predaceous enemies, which include a number of small Carabid beetles and Therevid fly larvae. Now that more is known of the life-history and habits of this weevil further studies will be made of remedial treatments.

Passerini (N.). **Sul Potere insetticida del *Pyrethrum cinerariaefolium*, Trev., coltivato a Firenze in confronto con quello di alcune altre Asteracee.** [The insecticidal Power of *P. cinerariaefolium*, Trev., cultivated in Florence compared with that of some other Asteraceae].—*Nuovo Giornale Botanico Italiano. Florence*, xxvi, no. 1, January 1919, pp. 30–45. [Received 2nd June 1920.]

After carrying out many experiments with *Pyrethrum cinerariaefolium*, the results of which are given in detail, the conclusion is reached that no other plant of this family has properties so powerful or so swift in their action against *Musca domestica*, L., *Ctenocephalus canis*, Curt., or ants such as *Crematogaster scutellaris*, Ol. All parts of the plant, when reduced to powder, are effective, the leaves, stalks and roots in a somewhat lesser degree than the flower-heads.

Piutti (A.) & Bernardini (R.). **Sopra l'Azione della Cloropicrina (Tricloronitrometano) sui Parassiti del Grano.** [The Action of Chloropicrin on the Pests of Grain.]—*Rend. Acad. Sci. Fis. Mat., Naples*, xxiii, ser. 3ª, nos. 4–6, April–June 1917, pp. 51–53. [Received 22nd June 1920.]

Chloropicrin is found to be more effective against such grain pests as the beetles, *Calandra granaria*, *Tenebroides mauritanicus*, *Laemophloeus ferrugineus*, and the larvae of the moths, *Sitotroga cerealella*, *Tinea granella* and *Plodia americana* than carbon bisulphide, carbon tetrachloride, sulphurous anhydride or hydrocyanic acid, etc.

Piutti (A.) & Mango (A.). **Sull' Impiego della Cloropicrina (Tricloronitrometano) nella Disinfezione dei Cereali.** [Chloropicrin as a Disinfectant for Cereals.]—*Rend. Acad. Sci. Fis. Mat., Naples*, xxvi, ser, 3ª, nos. 1–3, January-March 1920, pp. 77–88.

Experiments with chloropicrin against insects infesting cereals lead to the conclusion that this substance is an efficacious insecticide which has no ill effects on the grain beyond reducing its germinating power to a certain extent.

Quarantine on Account of European Corn Borer.—*N.Y. State Dept. Farms and Mkts., Div. Agric., Albany*, Circ. 193, April 1920, 14 pp.

A State and Federal quarantine has been placed on certain cities in New York State to prevent the spread of the European corn borer, *Pyrausta nubilalis*, within and out of the State. Particular areas are declared to be infested; these may be extended or reduced as found necessary. A list is given of various plants and flowers that may harbour this pest, and inspection and certification by the Department of Agriculture is made a condition of their movement, while the conveyance used must not move from the areas without thorough cleaning. Permits may be issued to allow re-export of plants that have been imported into the areas. In all cases the expenses of inspection, other than the services of the inspector, are paid by the shipper. But a general, revocable permit to allow shipment of quarantined articles may be issued in cases where districts or individual premises are free from corn borer and where freedom from weeds and other vegetable growths is maintained.

Suggestions for methods of control of *P. nubilalis* include :—Cutting maize close to the ground to reduce the number of borers left in the stubble; deep ploughing, preferably in the autumn; putting maize fodder in silo, or shredding and salting the stalks to promote their consumption by cattle; keeping maize fields and adjacent areas free from weeds; and planting small early plots of maize as a trap, the crop being fed to cattle if badly infested. Where other treatment is impossible the stalks should be composted or burned. Partly consumed stalks should not be mixed with manure unless the latter is composted or made to heat. Garden crops liable to be infested and commonly transported by commercial agencies should not be grown nearer than fifty feet to infested maize. Prompt reporting of any infestation is very desirable.

VOSLER (E. J.). **Insect Enemies.**—*Science and Industry, Melbourne*, ii, no. 3, March 1920, pp 184–189.

The greater part of this paper deals with an attempt to introduce parasites of *Eutettix tenella* (beet leaf-hopper) from Australia into the United States. The importance of this pest and its life-history and association with the curly-leaf disease of beets have already been noticed [*R.A.E.*, A, vi, p. 480, etc.]. The work was carried on in 1917 and 1918, attention being chiefly directed to two egg-parasites—*Ptergogramma acuminata* and a Mymarid infesting a leaf-hopper that has the same food-plant as *E. tenella*.

The difficulty of keeping any individuals of two such delicate species alive over the journey from Australia to America was very great, but after a number of failures it was overcome, and the two species were reared in sufficient numbers to give them a fair trial, but there was no evidence of parasitism and it must be considered that they do not find *E. tenella* a suitable host.

At the same time some of the insects injurious to citrus culture were investigated. The black scale (*Saissetia oleae*) is not a pest of prime importance in Australia, being attacked by the predaceous moth *Eublemma* (*Thalpochares*) *cocciphaga*, the internal parasites *Coccophagus* sp. and *Aphycus lounsburyi*, the egg-parasite *Scutellista cyanea*, and various Coccinellids. The first three of these have been sent to California and are now being reared to produce sufficient numbers to permit of their introduction into the orchards. *E. cocciphaga* in particular is the most promising of any of the material brought from Australia.

Only three species of mealy-bugs were taken on *Citrus* trees. From one, which resembled *Pseudococcus citri*, *Paraleptomastix abnormis* was reared. From the other two, two species of primary parasites, *Leptomastix* sp., and *Anagrus* sp., were brought to California and liberated on *Pseudococcus citri*, *P. gahani* and *P. maritimus*. No parasites however were reared, though *Leptomastix* sp. oviposited on *P. gahani*. *Pseudococcus aurilanatus*, the golden mealy-bug, is becoming a pest of Norfolk Island pines [*Araucaria excelsa*] in California. In South Australia the chief factor in its control is the Coccinellid, *Cryptolaemus montrouzieri*, which is already of assistance in controlling California mealy-bugs. The internal parasites *Pachyneuron* sp., *Tetracnemus* sp. and a small Encyrtid were introduced, but it is too early for results to be judged. A moth closely resembling *Eublemma cocciphaga*, predaceous on *Pseudococcus acaciae*, did not attack *Pseudococcus citri*. A small Encyrtid from *Pseudococcus albizziae* has also not found a suitable host among the Californian mealy-bugs. The Coccinellid, *Rhizobius plebeius*, predaceous on *P. acaciae*, was not successfully reared; but another species, *Midas pygmaeus*, which was introduced from the same material, breeds readily on *Pseudococcus citri* and seems a promising addition to the imported enemies of mealy-bugs.

Nicholls (H. M.). **The Codlin Moth and the Powdery Mildew.**—*Tasmania Dept. Agric. & Stock, Hobart*, Bull. 77, 1918, 9 pp., 4 figs. [Received 2nd June 1920.]

The codling moth, *Cydia* (*Carpocapsa*) *pomonella*, which was introduced from California, has usually only one, or at most two, generations a year in Tasmania. The second generation only occurs in very hot seasons, but a look-out should be kept for it, for if it is neglected, the number of moths will greatly increase in the following year. There are no other unusual features of the life-history, which is described at length. The insect should be easily controlled with lead arsenate sprays (1 lb. of the powder or 2 lb. of the paste to 50 gallons of water). The first spray, applied just before the calyx closes, is the most important. It should be followed by a second three weeks later, and a third a month after that. A fourth spray about the end of January should be applied if there is any danger of a second brood. All these sprays may be combined with fungicides. The fact that in Tasmania the moths do not lay their eggs for several weeks after the calyx spray is applied does not prevent its efficacy, as the poison is retained in the calyx almost indefinitely, if properly driven into the cavity. Bandaging the tree-trunks with sacking to trap the caterpillars is a useful supplementary measure, but worse than useless unless the bandages are carefully attended to in the autumn. Infested trees should be kept clear of loose bark and other shelter where the insects can hide. The further the caterpillars have to travel for shelter the more they are exposed to natural enemies which, in Tasmania, include beetles, Ichneumonids, Tachinids and birds. Poultry in an orchard will pick up many caterpillars. The spread of the codling moth is greatly aided by the use of cases that have held infested fruit, and this should be avoided. The moth occurs on various fruit trees, but the treatment in all cases is the same.

NICHOLLS (H. M.). **Scale Insects.**—*Tasmania Dept. Agric. & Stock, Hobart,* Bull. 78, 1918, 12 pp., 8 figs. [Received 2nd June 1920.]

This bulletin gives an account of the various scale-insects that are of economic importance in Tasmania, including *Aspidiotus perniciosus* (San José scale), *A. ostreaeformis* (oyster-shell scale), *A. rapax* (greedy scale), *A. rossi*, *A. hederae* (white scale), *Lepidosaphes ulmi* (*Mytilaspis pomorum*) (mussel scale), *Aulacaspis rosae* (rose scale), *Asterolecanium quercicola* (oak scale), *Eulecanium* (*Lecanium*) *persicae* and *Coccus* (*L.*) *hesperidum*, while a few others, not of economic importance, are also mentioned.

Dormant spraying with lime-sulphur is recommended against *A. perniciosus* and *L. ulmi*, a weaker spray being used if the leaves are out. *Lecanium* spp. are more resistant to lime-sulphur, but on deciduous fruit trees they can be kept in check by the use of oil sprays such as red oil, crude petroleum or kerosene emulsion. All the insecticides mentioned have been described in a bulletin already noticed [*R.A.E.*, A, vii, 48]. Every effort should be made to prevent the spread of scale-insects. It is an offence under the San José Scale Act for anyone to remove any part of an infested tree from the enclosure wherein it is growing without the consent of the Acting-Director of Agriculture.

TRYON (H.) & BENSON (A. H.). **The Banana Weevil** (*Cosmopolites sordida*, **Chevr.**).—*Queensland Agric. Jl., Brisbane,* xiii, no. 4, April 1920, pp. 165–168, 5 figs.

Cosmopolites sordidus (banana weevil) has been present in Queensland for at least 25 years, in spite of stringent regulations passed under the Diseases of Plants Act. Another banana weevil, *Metamasius hemipterus*, L., has also been imported on banana plants from Jamaica. The life-history and habits of *C. sordidus* are given, with a description of the various stages. Growers are warned against mistaking any of the several species of Sphenophorid beetles that occur in Queensland for *C. sordidus*. Every precaution should be taken to ensure that only sound suckers are planted and the usual recommendations are given for the treatment of infested plantations [*R.A.E.*, A, vii, 86, etc.]. The method of destroying infested plants by digging them out and making them into a compost heap with fresh horse manure or chopped green vegetation so that the mass will ferment and generate enough heat to kill the beetles is recommended.

BRITTON (W. E.). **Nineteenth Report of the State Entomologist of Connecticut for 1919.**—*Conn. Agric. Expt. Sta., New Haven,* Bull. 218, 1920, pp. 112–208, 24 plates, 5 figs. [Received 2nd June 1920.]

A detailed account is given of the inspection of nurseries carried out during the year. The pests intercepted on imported nursery stock during 1918–1919 include *Agelastica alni*, L., *Amara communis*, Panz., *Anisodactylus binotatus*, F., *Carabus nemoralis*, Mull., and *Clivina fossor*, L., on trees from Holland; *Barypeithes pellucidus*, Boh., and *Aphodius granarius*, L., on *Taxus* trees from Holland; *Coccinella septempunctata*, L., on azaleas from Holland; *Coccus hesperidum*, L., on laurel from Belgium; *Emphytus cinctus*, L., on Manetti rose from

England, France and Holland; *Nygmia phaeorrhoea* Don. (*Euproctis chrysorrhoea*, L.) on fruit-trees from France; *Forficula auricularia*, L., and *Lathrobium brunnipes*, F., on trees from Holland; *Malacosoma neustria*, L., on shrubs, and *Otiorrhynchus sulcatus*, F., on *Taxus* from Holland; *Triaena plebeja*, Gyll., on trees, and oyster-shell scale [*Lepidosaphes ulmi*] on boxwood from Holland.

On imported bulbs, which were inspected for the first time during the year under review, the pests intercepted from Holland included *Cathartus advena*, Wal., *Merodon equestris*, F., *Pyralis farinalis*, L., in buckwheat chaff. *Rhizoglyphus echinopus*, F. & R. (from Holland, France. Japan, etc.), *Sitodrepa panicea*, L., *Tenebrio molitor*, L., in chaff packing, and *Typhoea fumata*, L.

Apiaries were inspected as in previous years [*R.A.E.*, A, vii, 339, etc.]. During 1919 an Act was passed requiring all beekeepers to register, in order to facilitate inspection. European foulbrood continues to decrease, but American foulbrood is increasing and will receive special attention.

White pines (*Pinus strobus*) were severely damaged by *Pissodes strobi*, Peck (white pine weevil), the leaders and higher shoots of young trees being chiefly attacked and becoming crooked and deformed. Only wood of the previous season's growth is normally attacked. *P. affinis* and *P. approximatus* also occur in Connecticut, but *P. strobi* is the only really injurious species and it also attacks *Pinus sylvestris* (Scots pine), *P. divaricata* (jack pine), *P. rigida* (pitch pine), *Picea excelsa* (Norway spruce) and *P. rubens* (red spruce). Weevil-infested trees prove more susceptible to attacks of *Pinipestis zimmermani*, Grote (pine-tip moth). The life-history of *P. strobi* in Connecticut is very similar to that described for Canada [*R.A.E.*, A, vi, 62]. Natural enemies occurring in Connecticut include an Ichneumonid, *Coeloides pissodis*, Ashm., and a closely allied species, *Habrobraconidea bicoloripes*, Vier., *Microbracon nanus*, Prov., *Eurytoma pissodis*, Gir., *Rhopalicus suspensus*, Ratz., and *Spathius brachyrus*, Ashm. Methods of control for *P. strobi* include the removal and destruction of infested leaders and the prevention of infestation by spraying. Commercial lime-sulphur (1 part in 8 parts water) proved to be one of the best repellants, and should be applied about 1st May when only the old leaves are present; no injury to foliage occurs in this way. Experiments with creosote and carbolineum are also described [*R.A.E.*, A, v, 114], but some injury to the trees resulted from their use. Jarring the trees and collecting the weevils is a useful accessory measure.

Chermes pinicorticis, Fitch (pine bark aphis) appears as white cottony tufts at the base of the needles on the twigs, and as white flocculent patches on the bark of trunks and branches. It is generally found on the shaded side of the bark and does not thrive well in a strong light. Though chiefly a pest of white pine, it is also recorded as damaging Scots pine in Canada. The life-history is not fully known, but the eggs begin to hatch about 1st May, and the young larvae suck the sap from the twigs. Winged females appear about mid-May but disappear about two weeks later. There are probably several generations during the summer, and the winter is probably passed by wingless females on the bark. It is not known whether there is any alternate food-plant. Natural enemies of this Aphid include the Coccinellids, *Anatis quindecimpunctata*, Ol., *Adalia bipunctata*, L., and

Megilla fuscilabris, Muls., larvae of a Syrphid and of the lacewings, *Chrysopa* and *Hemerobius*. The application of a driving spray composed of 2 U.S. gals. kerosene, 1 lb. common laundry soap to 1 U.S. gal. water and diluted to one-ninth its strength before use is advised.

Plathypena scabra, F. (green clover worm) was responsible for much damage to bean plants in 1919. Clover is the usual food-plant of this moth, but occasionally it attacks beans, peas, vetch, soy beans, tick-weed (*Meibomia* sp.), strawberry and blackberry. During the infestation of 1919 both common and Lima beans were attacked, irregular holes being eaten in the leaves and sometimes in the pods by the caterpillars. The moths appear in the spring after hibernation in the adult stage; eggs hatch in 4 to 6 days; the larval stage requires about 25 days and the pupal stage 10 to 14 days. There are apparently two or three generations in a year; adults have been found in Connecticut from June to November. A spray consisting of 1 oz. lead arsenate paste or ½ oz. powder to one U.S. gallon of water proves an effective remedy against the larvae, or one teaspoonful of Blackleaf 40 with one oz. laundry soap in one U.S. gallon of water.

Much interest has been aroused by the discovery of a borer in maize that was at first thought to be *Pyrausta nubilalis* (European corn borer) but was subsequently identified as a new species and described as *P. ainsliei*, Heinr. [*R.A.E.*, A, viii, 116]. Meantime an Act was passed in Connecticut making provision for the suppression of *P. nubilalis* should its presence be proved, and a brief review is given of the situation in regard to this pest in other States. *P. ainsliei* was found in the larval stage in the stalks of maize and of smartweed (*Polygonum*) and particularly in *Polygonum persicaria*, and probably occurs also in other weeds such as pigweed (*Chenopodium album*) and beggar's ticks (*Bidens frondosa*). The adults appear in Connecticut in the first half of July; the eggs laid by these hatch before the end of the month and the larvae begin to tunnel in the stems of plants, passing from smartweed to maize and *vice versa*. No injury occurs to the tassels or ears of maize; the holes are found on the main stalks, usually two or three feet from the ground; the plants are not very much injured and their growth and vitality are not impaired. Hibernation occurs in the stalks, and the larvae resume feeding in the following spring and pupate in June. The injury to maize in Connecticut has not been sufficiently severe to necessitate remedial measures. Probably it is only during seasons of unusual numbers that maize is attacked, the insect surviving unnoticed in weeds during ordinary years. If it should again become unusually prevalent and attack maize, the stalks should be cut into short pieces about ½ inch in length, and either used as food for stock or put into a silo. Stalks left in the field through the winter should be burnt before 1st May, and the fields should be kept free from any large growth of smartweed.

Papaipema nebris, Gn. (*nitela*, Gn.), the common native stalk borer, is present every year in Connecticut, and infests maize, beans, potatoes, eggplant, tomato, rhubarb, spinach and many other common vegetables and weeds. There is only one generation in a year, hibernation probably occurring in the egg-stage on the stalks of weeds. Larvae appear early in June, and when attacking maize usually feed on the new leaves before they unroll. Later they are found in the developing tassel or boring in the stalk, which they may tunnel down to the base.

Many of the larvae examined were parasitised by Diptera and many individuals of *Masicera myoidea*, R.D., were bred from them. Dry lead arsenate should be sifted into the whorl when the young larvae are feeding; later, when they are in the stalks, they can only be controlled by destroying infested stalks. The destruction of all the larger weeds that serve as food-plants for the larvae will help in reducing the numbers.

Maize plants in New Haven were found to be seriously damaged by larvae that bored into the side of the stalks near the base. These were identified as a Pyralid, *Crambus praefectellus*, Zinck., a native species that has not previously been recorded as injuring maize. Other pests of maize present in 1919 include *Cirphis unipuncta*, Haw. (army worm), which in one locality was found infesting a field of oats, and *Acronycta* (*Apatela*) *oblinita*, S. & A. (smeared dagger-moth), the caterpillars of which devour the leaves of maize and are usually near the base of the highest leaves at the time the tassel first begins to show. Later they feed anywhere on the upper part of the plant. This moth has a long list of food-plants, but is not sufficiently abundant in Connecticut to require remedial measures. *Hadena fractilinea*, Grote (lined corn borer) was reported from New York State; similar individuals were taken in Connecticut, but seemed to resemble *H. semicana*, Wlk., rather than *H. fractilinea*. *Heliothis obsoleta*, F. (corn ear worm) occurs nearly every year in Connecticut on different varieties of maize, eggs being laid on the silk and the larvae feeding first on the silk and later on the unripe kernels at the tip of the ear. Apparently there is only one brood annually, the winter being passed in the pupal stage; in the southern States several generations occur and pupation lasts only two or three weeks. There is no good method of controlling this insect on field maize, but on sweet maize it is held in check in New Jersey by dusting the silk soon after it appears with powdered lead arsenate and fine sulphur in equal parts. Early planted fields and early maturing varieties usually escape injury. Badly infested fields should be ploughed in the autumn. Minor pests of maize in 1919 include *Anaphothrips striatus*, Osb. (grass thrips), wireworms, and the Noctuids, *Autographa falcigera*, Kirby, var. *simplex*, Guen., *Mamestra subjuncta*, Gr. & Rob., and *Ceramica* (*M.*) *picta*, Harr.

Depressaria heracleana, L. (parsnip web-worm) hibernates as an adult under loose bark or other sheltered places, and eggs are laid in May or June on the leaves. The young larvae web the leaves and devour the unfolding blossom buds of young parsnips and carrots. When nearly mature the larva leaves the web and enters the stalks, usually through the axil of a leaf, and tunnels in the stem. Pupation occurs within the stalks, and lasts about three weeks. There is only one generation in a year. The native food-plants are wild carrot, wild parsnip, cow parsnip and other Umbelliferae. Remedial measures are the removal and destruction of infested plants or the latter may be sprayed after blossoming with lead arsenate.

Miscellaneous pests include *Enchenopa binotata*, Say, taken on garden beans, though its usual food-plants are *Celastrus scandens* (bitter-sweet) and sometimes black locust (*Robinia pseudacacia*); the weevil, *Baris scolopacea*, Germ., from stems of *Amarantus retroflexus* (red-root pigweed) and *Ambrosia artemisiaefolia* (ragweed); *Mompha eloisella*, Clem., in the stems of *Oenothera biennis* (evening primrose): *Conotrachelus nenuphar*, Hbst. (plum curculio) in unripe peaches; *Zeuzera pyrina*, L. (leopard moth) in branches of elm; *Macrosiphum solanifolii*, Ashm. (potato aphis) on potatoes and tomatos; *Aphis gladioli*, Felt, on corms of gladiolus; *Acyrthosiphon* (*Macrosiphum*) *pisi*, Kalt. (pea aphis) on pea plants; the Geometrid, *Cingilia catenaria*, which was numerous and feeds in the larval stage on sweet fern and bayberry; *Coleophora laricella*, Hb. (larch case-bearer) on larch twigs, which should be controlled by lead arsenate sprays; *Eulia pinatubana* (pine tube-builder) on white pines in nurseries; and *Bruchophagus funebris*, How. (clover-seed Chalcid), for which the early cutting of clover is advocated.

Large numbers of the cotton moth, *Alabama* (*Aletia*) *argillacea*, Hb., appeared in various localities, evidently migrating northwards from the southern States. *Galerucella luteola* (elm leaf beetle), which was reported as increasing during 1918, was again abundant during 1919, and trees should be sprayed during 1920 in localities where it is likely to be numerous. *Uranotes melinus*, Hb. (grey hair-streak butterfly) infested Lima beans; there are two generations in a year in the Northern States and three in the Southern; the plants should be sprayed with lead arsenate. *Phyllorycter* (*Lithocolletis*) *hamadryadella*, Clem. (white blotch oak leaf-miner) discolours the upper surface of the leaves of various kinds of oak. Pupation occurs within the mines in the leaf and there are five or six generations each year in Washington, D.C. The only effective remedial measure known is to gather and destroy infested leaves. An Aphid, *Calaphis betulaecolens*, Fitch, was present in great swarms in the winged form in the city of New Haven [*R.A.E.*, A, vii, 479], where it had evidently dispersed from an area covered with grey birches (*Betula populifolia*), perhaps on account of scarcity of food. *Disonycha xanthomelaena*, Dalm. (spinach flea-beetle) caused considerable injury to Swiss chard and also feeds upon spinach, beets and pigweed. As poison cannot be applied to foliage that is used for food, the under-surface of the leaves should be sprayed with strong soap and water or brushed. The adults can be caught like flea-beetles by passing a box lined with tanglefoot over the rows.

A case is recorded of a house infested with *Atropos pulsatoria*, L., a species of book-louse. The wood-work, furniture, pictures etc. were washed with hot water and soap, and after some time the insects disappeared. If they re-appear in the spring, fumigation with hydrocyanic acid gas will be resorted to.

Lasioderma serricorne, F. (cigarette beetle) caused a serious infestation of tobacco stored in a warehouse. After unsatisfactory attempts with carbon bisulphide the infested tobacco was placed in one room and was heated by steam to 130° F., at which temperature it was left for five hours. This treatment was apparently quite successful.

Davis (I. W.). **Gipsy and Brown-tail Moth Work in 1919.**—*Conn. Agric. Expt. Sta., New Haven*, Bull. 218, 1920, pp. 135–144, 1 map.

The brown-tail moth [*Nygmia phaeorrhoea*] and the gipsy moth [*Porthetria dispar*] have been scarce in Connecticut for the last three or four years, probably owing to natural causes. The number of towns under quarantine has been reduced since the previous year's report by ten [*R.A.E.*, A, vii, 341.]. Throughout the winter watch was kept for nests. The details of the suppression work in various towns are given and are summarised in a table.

ZAPPE (M. P.). **Experiments to Control the Chrysanthemum Gall Midge,** *Diarthronomyia hypogaea*, **Loew.**—*Conn. Agric. Expt. Sta., New Haven*, Bull. 218, 1920, pp. 161–165.

Owing to increasing damage to chrysanthemums by *Diarthronomyia hypogaea*, Lw. (chrysanthemum gall-midge) in the greenhouses of Connecticut, experiments were undertaken in January 1919 to find some simple method of controlling the insect. The eggs are laid on the top of the plant where the new leaves are unfolding and as the leaves grow larger the larvae make their way into them. Shortly before the flowers open, the larvae enter the stem, which they enlarge and weaken, causing the blossom to droop. Some varieties are far more liable to attack than others, and in one greenhouse some may be badly infested and some quite healthy. Fumigation with hydrocyanic acid gas has been recommended, but is costly and requires repetition every few days as it is effective against the adults only. There is also danger of injury to the foliage with its use. The experiments described include treatment with carbolic acid emulsion, 40 per cent. nicotine-sulphate, lead arsenate, fish-oil emulsion, powdered tobacco and scalecide. The results showed that the best time to deal with this pest is while it is still in the egg-stage or before the young larvae have disappeared within the leaf. Scalecide killed all eggs and young larvae but injured the foliage. Nicotine sulphate (40 per cent.) with soap, applied every three or four days, is a satisfactory remedy and is probably the easiest and best spray for commercial florists to use.

BRITTON (W. E.). **Insects attacking Squash, Cucumber and Allied Plants in Connecticut.**—*Connecticut Agric. Expt. Sta., New Haven*, Bull. 216, December 1919, 51 pp., 8 plates, 9 figs. [Received 2nd June 1920.]

An account is given of the chief insect pests of such crops as squash, pumpkin, cucumber and melon in Connecticut. They include *Diabrotica vittata*, F. (striped cucumber beetle), *D. duodecimpunctata*, Ol. (twelve-spotted cucumber beetle or southern corn root worm), *Sminthurus hortensis*, Fitch (springtail), *Epitrix cucumeris*, Harris (cucumber or potato flea-beetle), *Melittia satyriniformis*, Hb. (squash vine borer), *Epilachna borealis*, F. (squash lady-beetle), *Anasa tristis*, DeG. (squash bug), *Papaipema nebris*, Gn. (*nitela*, Gn.) (stalk borer), *Aphis gossypii*, Glov. (melon aphis), *Macrosiphum cucurbitae*, Midd. (squash aphis) and the whitefly, *Aleurodes* (*Asterochiton*) *vaporariorum*, Westw.

Service and Regulatory Announcements: November-December 1919.—*U.S. Dept. Agric., Fed. Hortic. Bd., Washington, D.C.*, no. 66, 19th February 1920, pp. 117–128. [Received 3rd June 1920.]

Field surveys to determine the situation with regard to the pink bollworm [*Platyedra gossypiella*] have been continued since the last Announcements were issued [*R.A.E.*, A, viii, 234]. In some districts in Texas the infestation remains almost as widespread as before, but much less in amount. Claims arising in Texas for cotton condemned and destroyed as being within five miles of infestation amount to something like £8,000, which, under the terms of the Pink Bollworm Act, will probably be paid by the State. It is pointed out that eradication of the pest is impossible in one year and that a longer non-cotton period is required. The larvae of *P. gossypiella* have been found to be very resistent to water and it is thought that probably in a district like that of the Great Bend of the Rio Grande they may be largely spread by water carriage in bolls or parts of the cotton plant caught up by flood waters. While in Texas the insect has confined itself strictly to cotton, it can, in the absence of its natural host, subsist on many related plants.

The quarantine action taken by various States and Canada with regard to the European corn borer [*Pyrausta nubilalis*] is quoted in a statement giving the effective date of the quarantines, the plants covered and the States or areas concerned.

A list of current quarantine and other restrictive orders relating to various plants and insects is given.

Service and Regulatory Announcements.—*U. S. Dept. Agric., Insect. and Fung. Bd., Washington, D.C.*, no. 27, 20th February 1920, pp. 609–640. [Received 3rd June 1920.]

These Announcements include a notice to manufacturers relative to the labelling of calcium arsenate for use against the cotton boll weevil [*Anthonomus grandis*] and notices of judgments given under the Insecticide Act of 1910.

Green (E. E.). **Observations on British Coccidae.**—*Entom. Mthly. Mag., London*, nos. 672 and 673, Third Ser. nos. 65 and 66, May–June 1920, pp. 114–130, 8 figs.

The species dealt with include: *Steingelia gorodetskia*, Nass., on birches; *Eriococcus greeni*, Newst.; *E. insignis*, Newst.; *E. inermis*, Green; *E. devoniensis*, Green; *Gossyparia ulmi*, Geoff., on various species of elm; *Kermes quercus*, L., on oak; *Pseudococcus sphagni*, Green, from nests of *Formica picea* in the New Forest; *P. hibernicus*, Newst., under loose bark of dead oak; *P. gahani*, Green; *P. maritimus*, Ehrh., infesting ivy-leaved geranium; *P. walkeri*, Newst., in August on grasses; *Ripersia tomlini*, Newst.; *R. subterranea*, Newst.; *Lecanium aequale*, Newst., hitherto only recorded from British Guiana, found on orchid foliage; *Lecanium zebrinum*, Green, on *Salix*, heavily parasitised by the Chalcids *Comys scutellata*, Swed., and a species of *Prionomitus* that is probably new; *Coccus* (*Lecanium*) *hesperidum*, L., on *Acalypha*; *Eulecanium* (*L.*) *capreae*, L., on hazel and elm; *E.* (*L.*) *persicae*, Geoff., var. *robiniarium*, Dougl., on *Robinia*; *Pulvinaria vitis*, L., on birch and alder; *Lichtensia viburni*, Sign., on ivy; *Parafairmairia gracilis*, Green; *Lecanopsis formicarium*, Newst., from a nest of *Lasius niger* in Guernsey; *Diaspis rosae*, Sandb., on plants of *Cycas revoluta* at Kew; *D. zamiae*, Morg., on *Cycas revoluta*, *Encephalartos* spp. and other plants; *Poliaspis gaultheriae*, sp. n., on *Gaultheria depressa* and *G. rupestris* at Edinburgh; *Chionaspis salicis*, L., on stems of *Jasminum* and young lime trees; *Aspidiotus palmae*, Ckll., recorded for the first time from the British Isles, occurring freely on the Bromeliad *Keratas*; and *Ortheziola vejdovskyi*, Seele, found in moss.

RICE (W. H.). **Red Mite and Woolly Aphis on Nursery Fruit-Trees.**—*New Zealand Jl. Agric., Wellington*, xx, no. 4, 20th April, 1920, pp. 250–251.

Control tests against *Tetranychus* and *Eriosoma lanigerum* on orchard nursery stock confirmed the results of those already noticed [*R.A.E.*, A, vii, 357]; but red mite control cannot be assured with red oil weaker than 1 : 6. Root immersion in oil of apples and pears is not injurious, but in the case of plums it retards bud-movement fully a week, though there is no other damage.

CAESAR (L.) & GARLICK (G.). **The Imported Currant Worm,** *Pteronus ribesii*, **Scop.**—*Canad. Entom., London, Ont.*, lii, no. 5, pp. 106–108.

Attention is drawn to some points of interest observed during a study of the imported currant sawfly, *Pteronus ribesii*, Scop. The food-plants of this insect are generally referred to as "currants and gooseberries," but as a matter of fact, red and white currant foliage is attacked but never that of black currant. Oviposition was observed when the leaves were very young, in fact when the majority of the buds had just burst. Parthenogenesis is common in this species, the adults derived from unfertilised eggs being invariably males. The eggs are laid in a chain-like arrangement along the main ribs or veins on the under-surface of the leaves in the central and lower part of the bush, and the younger larvae frequently strip that portion of leaves before their presence is detected. The later generations oviposit rather indiscriminately over the leaves. The second generation larvae begin to hatch about a week before red currants are ripe and hatching continues for about a month. The third generation begins to hatch about two weeks after the fruit has ripened. The adults producing this generation emerged in cages up to September. Fully half the larvae of the two earlier generations remained in cocoons throughout the year without pupating. Many larvae of the second and third generations die soon after hatching and do little damage, so that if the first generation can be destroyed little harm will result.

Natural factors in control include two parasites, one a Braconid and the other a Cynipid; many eggs are destroyed by Chrysopids and Coccinellid larvae. Another cause of mortality is the heat of the soil, which kills many larvae that fall upon it accidentally or when seeking pupation quarters. Artificial control is easy. Against the young larvae, ½ lb. lead arsenate paste in 40 gals. water is efficacious. If the bushes are thoroughly sprayed as soon as the leaves are well-developed, especially in the central and lower part of the bush, with 1–2 lb. lead arsenate paste or ½ to 1 lb. powder in 40 gals. water, no damage should result. If Bordeaux mixture is used, calcium arsenate, a little weaker than the lead arsenate, may be used, or not more than ¼ oz. of Paris green may be substituted, in 40 gals. Bordeaux. If a second spraying is necessary it should be given eight or ten days after the first, or soon after red currants are well set.

STOOKEY (E. B.). **Why does Red Clover fail?**—*Mthly Bull. Western Washington Expt. Sta., Puyallup*, viii, no. 2, May 1920, pp. 18–20.

The chief insect pest of clover in Western Washington is the root borer [*Hylastinus obscurus*]. Damage by this beetle is done largely during the second season of growth, reducing the crop and resulting in a very poor stand in the following year. The eggs are laid in the spring in and along the stem of the one year old plants. The larvae tunnel into the roots, often entirely separating the root and the crown. They pupate in July and August, reaching the adult stage in early autumn, in which condition they pass the winter. The only method of control is ploughing the infested fields. This is best done immediately after harvesting the first crop, as the larvae are then killed. Clover is thereby limited to one year in the crop rotation system, but this has been found necessary in many parts of the United States.

FRANK (A.). **Diseases and Insect Pests of Currants and Gooseberries.**—*Mthly. Bull. Western Washington Expt. Sta.. Puyallup*, viii, no. 2. May 1920, pp. 29–31, 4 figs.

The same insects attack both currants and gooseberries. An Aphid, *Myzus ribis*, raises blistered red areas on the leaves. Black-leaf 40, a third of a pint to 50 U.S. gallons of water, should be sprayed on the under-side of the foliage. The sawfly, *Pteronus ribesii*, may be controlled by spraying the leaves with lead arsenate, one pound of the powder to 50 U.S. gallons of water, or if the fruit is about to be picked, with fresh hellebore, one ounce to three gallons of water. Remedies for the currant fruit maggot (*Epochra canadensis*) have already been noticed [*R.A.E.*, A, vi, 242]. Other common pests are flea-beetles and Elaterids.

LAKON (G.). **Zur Systematik der Entomophthoreengattung** *Tarichium*. [The Systematics of the Entomophthoran Genus *Tarichium*.]—*Zeitschr. f. Pflanzenkrankheiten, Stuttgart*, xxv, no. 5, 28th August 1915, pp. 257–272, 10 figs. [Received 10th June 1920.]

The systematic position of the fungi of the genus *Tarichium* is discussed with the object of establishing a foundation for future studies with reference to the artificial dissemination of fungi for the purpose of insect control.

SORAUER (—). **Die Wiederaufnahme der Seidenraupenzucht in Deutschland.** [The Resumption of Sericulture in Germany.]—*Zeitschr f. Pflanzenkrankheiten, Stuttgart*, xxv, nos. 5 & 8, 28th August 1915 & 21st March 1916, pp. 296–311 & 473–478, 14 figs. [Received 10th June 1920.]

The advisability of re-establishing sericulture in Germany is discussed, and attention is also called to the danger of introducing *Aulacaspis* (*Diaspis*) *pentagona* owing to the consequent cultivation of mulberries.

Kutin (A.). **Die gelbbeinige Schlupfwespe** (*Microgaster glomeratus*, **L.**), **der Verderber der Kohlraupe, als indirekter Schädling des Weizens.** [*Microgaster glomeratus*, L., the Destroyer of the Cabbage Caterpillars, indirectly injuring Wheat.]—*Zeitschr. f. Pflanzenkrankheiten, Stuttgart*, xxvi, no. 8, 15th January 1917, pp. 452–454, 1 fig. [Received 10th June 1920.]

In the vicinity of Prague wheat has been found to be damaged owing to the presence of cocoons of *Apanteles* (*Microgaster*) *glomeratus*, which deprived the ears of the plants of light and air, and thus prevented the proper development of grain. As this Braconid is a well-known parasite of *Pieris brassicae*, L., the host caterpillars had probably crawled up the wheat ears, but what the original food-plant was has not yet been ascertained.

Molz (E.). **Blattlausbekämpfung mittels des "Landauretts."** [Control of Aphids by means of the "Landaurett."]—*Zeitschr. f. Pflanzenkrankheiten, Stuttgart*, xxvii, nos. 2–3, 25th April 1917, pp. 107–110, 1 fig. [Received 10th June 1920.]

The apparatus already described [*R.A.E.*, A, viii, 276] for the application of nicotine vapour has been successfully used against Aphids. Enemies of Aphids, such as *Coccinella septempunctata* and *Chilocorus* sp., are not injured by this treatment.

Molz (E.). **Die Wiesenwanze,** *Lygus pratensis*, **L., ein gefährlicher Kartoffelschädling.** [*Lygus pratensis*, L., a serious Pest of Potatoes.]—*Zeitschr. f. Pflanzenkrankheiten, Stuttgart*, xxvii, nos. 7–8, 31st January 1918, pp. 337–339, 2 figs. [Received 10th June 1920.]

Lygus pratensis, L., is recorded as causing serious injury to potatoes at Mehmke. Both adults and nymphs were found on the plants. Jarring the plants so that the insects fall on planks covered with an adhesive substance is suggested as a remedy. The efficacy of arsenical sprays has not yet been tried, but a 3 to 4 per cent. tobacco solution proved useless.

Bredemann (G.). **Beobachtungen über Weinschädlinge in Obermesopotamien.** [Observations on Vine Pests in Upper Mesopotamia.]—*Zeitschr. f. Pflanzenkrankheiten, Stuttgart*, xxix, nos. 5–6, 1919, pp. 166–171, 2 figs. [Received 10th June 1920.]

Owing to climatic conditions there are very few serious vine pests in upper Mesopotamia. The noxious insects recorded include the larvae of a Sphingid, *Deilephila livornica*, Esp., which appear from the middle of May to the middle of June and attack the leaves and unripe fruit. An autumn generation probably occurs in certain districts. Under laboratory conditions pupation occurred about 11th June on or just under the surface of the ground. The adult moths appeared between 28th June and 10th July. Handpicking is relied upon for the destruction of this pest.

FULLAWAY (D. T.). **The Melon Fly—Its Control in Hawaii by a Parasite introduced from India.**—*Hawaiian Forester & Agriculturist, Honolulu,* xvii, no. 4, April 1920, pp. 101–105.

The bulk of the information contained in this paper has already been noticed [*R.A.E.*, A, v, 2, etc.]. *Opius fletcheri* now accounts for the destruction of 50 per cent. of the melon-fly, *Dacus* (*Bactrocera*) *cucurbitae*, infesting fruit in Hawaii, and in some localities it is again possible to grow melons successfully.

GAHAN (A. B.). **Black Grain-stem Sawfly of Europe in the United States.**—*U.S. Dept. Agric., Washington, D.C.,* Bull. 834, 19th May 1920, 18 pp., 2 plates, 1 fig.

Trachelus tabidus, F. (black grain-stem sawfly of Europe) has evidently been established in America for some years, though how it was introduced there is unknown. Its present distribution is confined to some half-dozen of the eastern and central States, but the species, judging from its expansion in Russia, may eventually spread from coast to coast in America. The only known food-plants in America are wheat and, very occasionally, rye. A description is given of the various stages of *T. tabidus,* with a key for separating the grain-infesting sawflies, *T. tabidus, Cephus pygmaeus,* L., and *C. cinctus,* Nort. The life-histories of *T. tabidus* and *C. cinctus* are probably similar. Oviposition of the former species occurs from 15th May to 10th June, the eggs being inserted in a slit in the stem made by the female at some distance above the ground. The young larvae burrow downward through the pith of the stem, hollowing it out to the base. The larvae become mature about the time that the grain is ripe ; by 22nd July during the season investigated all were full-grown and had evidently gone into hibernation at the extreme base of the stem, where they were encased in a silken tube or lining in a burrow entirely filling the hollow straw and closed above by a wad of frass. Before closing the burrow the larva almost completely severs the stem from the inside, the cut being at or near the surface of the ground and usually a little above the first node on the stem where the surface roots put out. Just enough of the epidermis is left to prevent severing the straw and to allow it to stand erect, so that the first slight bending of the stem, as by a strong wind, causes it to snap off and fall. Both the end of the stalk remaining in the ground and the fallen straw are distinctly concave or funnel-shaped, clearly defining the work of the pest. The hibernating larva remains in the stub of the wheat stalk left in the ground, where it lives from about the time the wheat is ripe until some time in the following spring when it pupates, probably in late April or early May. Under some conditions the life-cycle may be extended over two years ; this is probably unusual, but shows a high degree of adaptability on the part of the species for overcoming unfavourable conditions. Some of the infested stems are able to develop at least partially filled heads and the extent of loss will probably depend in some degree upon weather conditions during the period of ripening of the grain.

Neither of the parasites of this species occurring in Russia [*R.A.E.*, A, iv, 21] has been found in America, but an evidently important parasite is an apparently undescribed species of the Chalcidoid genus *Pleurotropis.* This parasite emerges from the prepupal larva of *T. tabidus* at about the time of emergence of the host adults, and is believed to be a primary parasite.

In the present state of knowledge of this species only suggestions of possible means of control can be given. Neither egg nor larval stage can be attacked, as both occur in the growing grain. Disking the stubble thoroughly as soon as possible after cutting the grain might destroy the larvae by exposing them, but they are very hardy and only experiment will prove the efficacy of this method. Deep ploughing of the stubble is recommended in Russia and should prove effective in America, but it must be remembered that adults can escape if only covered with two or three inches of soil. The ploughing should be done any time between the cutting of the grain and the following spring prior to emergence of the adults in April or May. As the insect apparently confines its attacks to the small-grain crops in America, wheat, barley or rye should be followed by some crop that will not serve as a food-plant, such as maize or vegetables. Any system of crop rotation should be preceded by thorough ploughing of the wheat stubble.

Faes (H.). **La Lutte contre le Ver de la Vigne (Cochylis) en 1919.**—*La Terre Vaudoise, Lausanne,* xii, no. 24, 12th June 1920, pp. 230–231.

While nicotine or concentrated tobacco juice with the addition of some copper solution is the insecticide most frequently used for the control of *Clysia ambiguella* in the vineyards of Vaud, Switzerland, a pyrethrum-soap solution has also given excellent results against the young larvae of the first generation. Although the local cultivation of pyrethrum is greatly increasing, the quantity of flowers produced is still far short of the demand.

Gray (R. A. H.) & Wheldon (R. W.). **Field Trials for the Prevention of Damage to Crops by Wireworms and Leather Jackets.**—Reprint from *Newcastle Farmers' Club Jl.*, 1919, 10 pp. [Received 16th June 1920.]

As wireworms and the larvae of Tipulids (leather-jackets) were responsible for much damage on grassland newly ploughed in 1917, and as further land was to be ploughed for 1918, it was thought desirable to carry out trials combining the application of various substances, cultural methods and the suitability of different varieties and kinds of crops, with a view to controlling these pests. These experiments, carried out in various localities, are described in detail, the infestations being so bad in some cases that the crops were entirely destroyed. The damage is greatest before the end of May or beginning of June, when the insects pupate. It was found that when oats were sown under good conditions on well cultivated land, they grew quickly enough to withstand the attack of wireworms until the danger was passed, while where land had been badly ploughed and the furrows had not been broken up the damage done was severe. Land liable to infestation should be ploughed early so that a good tilth and seed-bed may be obtained for the oats, which should not be sown too early.

Close grazing during summer is advisable before ploughing old land as crane-flies are attracted to tufts of coarse grass for oviposition. Birds should not be discouraged during cultivation, rooks being particularly useful in removing numbers of both pests. To ensure quick development, 1 cwt. of sulphate of ammonia to the acre might be harrowed in with the seed. If damage is observed when the crop is a few inches high, a good harrowing with seed harrows, followed by heavy rolling has sometimes proved advantageous. In this way the movements of the grubs are checked and the crop has an opportunity to recover. When oats have been too severely damaged by the end of May to yield a crop, the land should be prepared for turnips, or other root crops. After a severe attack by wireworms the land should be ploughed immediately after harvesting, cultivated if possible and again ploughed during the winter. Beans or white mustard are apparently safe crops for wireworm-infested land. Wireworms may give trouble on newly ploughed land for two or three years and are persistent on some types of soil; leather-jackets are generally troublesome only for one year on newly ploughed land. The methods outlined above have proved of greater value than any application to the soil; napthaline applied in quantities up to 5 cwt. per acre did not even appreciably reduce the numbers of either pest.

WILTSHIRE (S. P.). **The Apple Canker Fungus.**—*Univ. Bristol: Ann. Rept. Agric. & Hortic. Research Sta., Long Ashton, Bristol*, 1919, pp. 23–29. [Received 17th June 1920.]

Investigations during 1919 to determine the relation of the apple canker fungus, *Nectria ditissima*, to attacks of the woolly apple aphis [*Eriosoma lanigerum*] showed that the cankered areas were always found surrounding injury by the Aphid. It was evident that the canker attacked only Aphid galls that had burst and exposed the wood, which became heavily infested with spores of *N. ditissima*. While, therefore, the Aphid injury, resulting in the formation of galls, is not directly very injurious to the trees, indirectly considerable damage may be done, as canker frequently results in the death of the branch.

LEES (A. H.). **Woolly Aphis of Apple.**—*Univ. Bristol: Ann. Rept. Agric. & Hortic. Research Sta., Long Ashton, Bristol*, 1919, pp. 46–47. [Received 17th June 1920.]

Experiments made in 1919 showed that the best way to control woolly apple aphis [*Eriosoma lanigerum*] with the least possible number of operations is to use a spray consisting of 15 to 20 lb. soft soap, 2 gals. paraffin and $\frac{1}{2}$ lb. nicotine to 100 gals. water. This is capable of killing the stem form of the Aphid even with no very high pressure, and should be used when the majority of the flower trusses have separated but before the flowers open, that is, about the end of the first week in May in an average season, and, if any insects are still present, a second spraying should be done when the flowers have set. As soon as the spraying has been done, grease bands should be placed on the trees to catch the migrants from the roots that usually ascend the tree from the end of May onwards, and those that descend the tree to the roots in the autumn. These treatments should control all the commoner pests of apple, including Aphids, Capsids, caterpillars and apple-sucker [*Psylla mali*].

LEES (A. H.). **The Control of Logan Beetle by Cultivation.**—*Univ. Bristol: Ann. Rept. Agric. & Hortic. Research Sta., Long Ashton, Bristol*, 1919, pp. 48–49. [Received 17th June 1920.]

The loganberry beetle [*Byturus tomentosus*] is probably the worst pest of loganberries and is very difficult to deal with, as most of its adult life is passed within the ground, while the larval stage is spent within the berry. The adults emerge from the soil over a long period, so that in attempting to control by spraying several operations are necessary. A successful spraying method has been evolved [*R.A.E.*, A, vi, 424], but is too expensive to be thoroughly satisfactory. It has been observed, however, that berries growing in well cultivated soil suffer far less than others, and experiments have therefore been conducted in which cultivation was practised in spring only, in autumn only, and in both spring and autumn. The results showed a marked decrease of infestation where any cultivation was done, but the difference between the variously treated rows was not sufficient to draw any definite conclusion, and the experiments must be continued for a further period.

LEES (A. H.). **Big Bud.**—*Univ. Bristol: Ann. Rept. Agric. & Hortic. Research Sta., Long Ashton, Bristol*, 1919, pp 50–56. [Received 17th June 1920.]

The big bud mite [*Eriophyes ribis*] passes the greater part of its life, roughly from June to March, in the interior of the buds of black currant bushes. During the rest of the year it is migrating from the previous year's buds and is seeking entrance to the buds of the current year. Consequently though spraying operations have met with some success [*R.A.E.*, A, vi, 425], they cannot be considered a practicable method of control. Several varieties have been introduced as resistant to big bud but all have eventually been more or less attacked [*R.A.E.*, A, vi. 480]. It is probable that climate has a good deal to do with the possibility of formation of big bud; a moist season, by prolonging the growing season of the bush, increases the food-supply of the growing points and thus allows the mite to form a big bud instead of a killed bud. While increase on any one bush may be quick or slow according to external conditions, increase from bush to bush is governed by chance and is generally slow. Experiments in control have given largely negative results. The difficulty in spraying during the migrating season is that it is impossible to destroy the source of infection in the big buds of the previous year, and that spraying must be very frequent if it is to prevent any mites reaching the buds of the current year.

Investigations to test the action of lime-sulphur are described. The conclusion is drawn that in the locality of Long Ashton lime-sulphur at the rate of 1 in 16 or 1 in 12, applied as soon as the first leaves are as big as a sixpence, results in a considerable decrease in the number of big buds the following winter. A second spraying at summer strength (1 in 30) did not produce any increased efficiency. The success of this treatment can only be assured by repeating it for some years.

PETHERBRIDGE (F. R.). **Potato Spraying Trials in the Cambridgeshire Fens, 1919.**—*Jl. Ministry Agric., London*, xxvii, no. 3, June 1920, pp. 282–286.

In the course of this paper on spraying for potato blight with Bordeaux and Burgundy mixtures, it is remarked that, after a period of hot dry weather, the leaves of potatoes may be attacked by Aphids, and are then liable to become scorched when sprayed. It is suggested that this scorching is due to the entrance of the spray into the punctures caused by the Aphids. Until this question is settled by experiment, growers are warned that by spraying in hot dry weather, when the foliage is attacked by Aphids, they risk damage to the crop through scorching.

WARBURTON (C.). **Annual Report for 1919 of the Zoologist.**—*Jl. R. Agric. Soc. England, London*, lxxx, 1919, pp. 411–417. [Received 28th June 1920.]

No new pests of great importance were recorded, but an outstanding feature of 1919 was the great abundance of caterpillars, especially on fruit trees, in early summer, and the numerous complaints of attack by Aphids on every kind of farm crop late in the season. Of cereals, barley was attacked by gout-fly [*Chlorops taeniopus*], wheat, in a less degree than in 1918 [*R.A.E.*, A, vii, 442], by wheat bulb-fly [*Hylemyia coarctata*], and oats and winter wheat by frit-fly [*Oscinella frit*], while wireworms and leather-jackets also caused damage. Grass was badly damaged by cockchafer grubs [*Melolontha*] in one locality. Potatoes suffered to a small extent from Aphids, the eelworm (*Heterodera schachtii*), and in Wales and the Midlands from the stem-boring surface caterpillar, *Gortyna* (*Hydroecia*) *micacea*. Winter and spring sown beans suffered equally from the black aphis [*Aphis rumicis*], which caused considerable damage, but was very erratic in incidence. Peas and beans were considerably infested with pea thrips [*Kakothrips pisivora*] and to a small extent by *Sitones* weevils, pea midge [*Contarinia pisi*] and pea moth [*Cydia nigricana*], while in stored beans there were a few cases of Bruchid beetles. Mangels were attacked by Aphids (*Aphis rumicis*), the pigmy beetle [*Atomaria linearis*] and millipedes ; turnips by surface caterpillars, wireworms, the turnip fly [*Phyllotreta nemorum*] and the turnip seed beetle [*Ceuthorrhynchus assimilis*]. The chief cabbage pests were the usual caterpillars, together with root-fly maggot [*Phorbia brassicae*] and gall weevil [*Ceuthorrhynchus pleurostigma*]. Carrot-fly [*Psila rosae*] and onion-fly [*Hylemyia antiqua*] were destructive, though onions sown with parsley escape the latter. Asparagus beetle [*Crioceris asparagi*] and celery-fly [*Acidia heraclei*] were also noticed.

Fruit trees were attacked by an unusually large number of insects. Unbanded orchards suffered severely from winter moth (*Cheimatobia brumata*) ; but it is pointed out that banding in the autumn is ineffective except against moths with wingless females, and spraying with arsenic in the spring should be adopted where the proportion of the caterpillars of such moths is small. There were severe infestations by caterpillars of the lackey moth [*Malacosoma neustria*] in various localities on fruit and other trees. Banding was useful to intercept caterpillars migrating from defoliated trees to fresh ones. Aphid attack on fruit trees was almost universal and at times very destructive. Of the various insects mentioned as attacking forest trees the oak tortrix [*Tortrix viridana*] was the most noticeable.

Bücher (H.). **Die Heuschreckenplage und ihre Bekämpfung.** [The Locust Plague and its Control.]—*Monogr. no. 3 zur angew. Entom., Beiheft zur Zeitschr. f. angew Entom., Berlin*, v, no. 1, 1918, 274 pp., 11 maps, 20 plates, 33 figs. [Received 19th April 1920.]

The campaign against locusts undertaken by a number of German and Turkish scientists during the war is described; the work was carried out under the direction of the Turkish Ministry of Agriculture and with the aid of the military authorities [*R.A.E.*, A, vi, 341; vii, 161]. The organisation of the campaign in various districts during 1916–1917 is described. The remedial measures are divided into physical, chemical and biological, all of which must be based on a careful study of the life-history of the pest. Natural enemies such as insects and fungus diseases are also dealt with, but are not considered of much importance in the destruction of locusts. Owing to their natural avoidance of shaded, cool places such as forests, it is suggested that a belt of trees round cultivated areas might be worth consideration as a protection against invasion by travelling swarms. The biology of *Dociostaurus* (*Stauronotus*) *maroccanus*, Thunb., is dealt with at length by Dr. W. La Baume.

Although the remedial measures here discussed were applied primarily against *D. maroccanus* in Anatolia and Syria, they may be equally well used against *Schistocerca peregrina*.

Zweigelt (F.). **Beiträge zur Kenntnis des Saugphänomens der Blattläuse und der Reaktionen der Pflanzenzellen.** [Contributions to a Knowledge of the Suction Phenomena in Aphids and the Reactions of Plant Cells.]—*Centralbl. Bakt., Parasit. u. Infektionskr., Jena*, IIte Abt., xlii, no. 10–14, 12th October 1914, pp. 265–335, 2 plates, 7 figs. [Received 7th May 1920.]

The contents of this paper are indicated by its title.

Krausse (A.). **Ein automatischer, quantitativ arbeitender Fangapparat zum Studium der Insekten- und Milben-fauna des Bodens, speziell für pflanzenpathologische und bodenkundliche Untersuchungen.** [An Automatic Collector of large Capacity for the Study of Underground Insects and Mites with special Reference to Soils and Plant Pathology.]—*Centralbl. Bakt., Parasit. u. Infektionskr., Jena*, IIte Abt., xliv, no. 17–23, 10th December 1915, pp. 663–665, 2 figs. [Received 7th May 1920.]

An apparatus for separating insects and other living organisms from large quantities of earth or débris for scientific purposes is described. The mechanism is very simple, the main principle being that the insects etc. are driven by means of heat towards the centre where they fall through a sieve into a collecting jar.

Zweigelt (F.). **Blattlausgallen, unter besonderer Berücksichtigung der Anatomie und Aetiologie.** [Aphid Galls with special Consideration of their Anatomy and Aetiology.]—*Centralbl. Bakt., Parasit., u. Infektionskr., Jena,* IIte. Abt., xlvii, no. 16–22, 8th October 1917, pp. 408–535, 32 figs. [Received 7th May 1920.]

The Aphid-produced galls occurring on plants are dealt with, and the pathological changes occurring in the plant owing to Aphid injury are discussed. The type of gall formation is determined by the reaction of the plant-cells to certain gall-producing irritants irrespective of the number of parasites.

Schwangart (F.). **Ueber Rebenschädlinge und -nützlinge. V. Die Schlupfwespen der Traubenwickler. Zuchtergebnisse.** [Insects injurious and beneficial to the Vine. V. The Hymenopterous Parasites of the Vine Moths. Breeding Results.]—*Centralbl. Bakt., Parasit. u. Infektionskr.,* IIte Abt., *Jena,* xlviii, no. 24–25, 28th November 1918, pp. 543–558. [Received 7th May 1920.]

This paper contains evidence in support of, and additions to the author's previous results relating to the Hymenopterous parasites of *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff. It includes the following list of such parasites as were bred by the author himself :— Ichneumoninae. *Ichneumon deceptor* ; *Platylabus dimidiatus* ; *Dicaelotus pusillator* ; *Cinxaelotus erythrogaster.* Cryptinae. *Habrocryptus alternator* ; *Gambrus infernus* ; *Hemiteles areator* ; *H. dubius* ; *H. hemipterus* ; *H. nigriventris* ; *H. pulchellus* ; *H. taschenbergi.* Pimplinae. *Lissonota carbonaria* ; *Pimpla alternans* ; *P. calobata* ; *P. examinator* ; *P. sagax* ; *P. strigipleuris* ; *P. terebrans* ; *P. turionellae.* Ophioninae. *Agrypon flaveolatum* ; *Eulimneria crassifemur* ; *Omorgus abbreviatus* ; *O. difformis* ; *Mesochorus semirufus.* Tryphoninae. *Exochus tibialis* ; *E. notatus.* Braconidae. *Rhogas tristis* ; *Ascogaster quadridentatus* ; *Microplitis tuberculifera.* Chalcididae. *Eurytoma rosae* ; *Habrocytus acutigona* ; *Dibrachys boucheanus.*

Most of these have a first generation with an early flight period that does not coincide with the stages of the vine moths. The majority, including those most common in the southern vineyards (such as in South Tyrol), are also found in the northern regions (such as the Palatinate), but the number of individuals is less. It is therefore desirable that plants suitable for non-injurious intermediate hosts should be grown in the north. *Exochus tibialis* and *E. notatus* do not appear to need an intermediate host, and as they are excellent parasites in the south it may be worth while importing them into northern districts with a mild climate where the vine moths occur. *Agrypon flaveolatum*, which is common in the north and scarce in the south, is a species that emerges decidedly late. Some species vary in abundance in different years, so that the figures given in this paper cannot be taken as typical; only one generation and winter pupae were examined, and such important enemies as the species infesting the eggs were not represented.

Friederichs (K.). **Ueber die Pleophagie des Insektenpilzes *Metarrhizium anisopliae* (Metsch.) Sor.** [Notes on the Pleophagy of the Insect Fungus *Metarrhizium anisopliae*.]—*Centralbl. Bakt. Parasit. u. Infektionskr., Jena,* IIte Abt., l, no. 13–19, 26th March 1920, pp. 335–356, 1 plate.

The fungus *Metarrhizium anisopliae*, which attacks *Oryctes rhinoceros*, L., in Samoa, was also found attacking larvae of *Rhagium inquisitor*, and larvae and pupae of *Ergates faber*, on the island of St. Marguérite. Personal observations as well as those of other authors with regard to the artificial transmission of the fungus are discussed. Under laboratory conditions it is possible to infect many varied species with the disease owing to the unnatural conditions which tend to predispose the host to attack, but under natural surroundings the same hosts prove to be more or less immune to the disease unless a particularly virulent form of it is produced.

Fulmek (L.) & Stift (A.). **Ueber im Jahre 1916 erschienene bemerkenswerte Mitteilungen auf dem Gebiete der tierischen und pflanzlichen Feinde der Kartoffel-pflanze.** [Communications of Value published in 1916 concerning the Animal and Vegetable Enemies of the Potato.]—*Centralbl. Bakt., Parasit. u. Infektionskr., Jena,* IIte Abt., li, no 5–11, 10th June 1920, pp 97–129.

The title of this paper indicates its contents, which form a comprehensive review of the literature on the subject for the year in question.

Schumacher (F.). **Der Autor der Aphidengattung *Lachnus* (Hem.).** [The Author of the Aphid Genus *Lachnus*.]—*Entom. Mitt., Berlin,* ix, no 4–6, 19th May 1920, pp 87–88.

In reply to a recent note on the authorship of the genus *Lachnus* [*R.A.E.*, A, viii, 200] it is stated that this name has been incorrectly ascribed to Illiger. The first description of the genus was given in 1835 by Burmeister, and he is therefore the author.

Stearns (L. A.). **Experiments on the Control of the Oriental Fruit Moth (*Laspeyresia molesta*, Busck).**—*Qtrly. Bull. Virginia State Crop Pest Commis., Blacksburg,* ii, no. 1, April 1920, 16 pp., 3 figs.

In Virginia there are four, or under favourable circumstances five, broods of *Cydia* (*Laspeyresia*) *molesta* and, though at present this pest has not yet appeared in the main orchard districts, the fact that it feeds upon most fruit trees in a similar manner to the codling moth, *C. pomonella*, suggests that it may come to have a destructive status equal to, and perhaps greater than, the latter insect.

No satisfactory method for its control has been devised as yet. Orchard spraying tests show that arsenical sprays are but slightly effective, since the larvae feed largely within twigs and fruit. Limited experiments, suggested by the terminal-feeding habit of the larvae, were conducted to determine the benefits derived from the clipping and the destruction of infested twigs. Although economy would seem to forbid the application of such a measure on an orchard scale, the results have been sufficiently encouraging to emphasise the advisability of further investigation along this line, especially with small blocks of trees. In detailed laboratory tests and as applied to single trees in the orchard, nicotine sulphate (40 per cent.), "Black-leaf 40" as an ovicide, and nicotine-arsenical combinations in applications near hatching time, have proved most effective, a three-fourths control having been secured. Sea-moss stock at the rate of 5 lb. to 50 U.S. gals. of water, and a calcium-casein preparation at the rate of 1 lb. to 50 U.S. gals. of water, when combined with this insecticide, were found to increase considerably its spreading and sticking possibilities.

These experiments have suggested the removal and the destruction by burning or otherwise of all infested twigs of nursery stock and young orchard trees. This measure would be of most value in the spring. At that time the terminals are infested by small numbers of overwintering and first brood larvae, whose destruction will decrease considerably the size of the summer broods which cause widespread injury. By cutting-back severely each year a few trees in a single section of an infested orchard, the resulting fresh growth on these "trap trees" should attract the moth, and the succulent shoots would serve as a feeding ground during the spring and early summer for the caterpillars. These trees may be examined frequently, and the infested twigs removed and destroyed. In bearing orchards fruit infestation might be decreased materially in this way. Applications of nicotine sulphate (40 per cent.), "Black-leaf 40" diluted 1 part to 800 parts of water, may be made about 17th May, 2nd June, 26th July and 28th August. Life-history studies in 1918 and 1919 have shown that the heaviest deposits of eggs are present on the foliage at these dates. Clean culture, which would include the removal and destruction by ploughing under or burning of all refuse (leaves, grass, weeds and especially decaying and dried-up fruit) about the tree-trunks in which the larvae find suitable quarters to cocoon for hibernation, is also advisable.

Some Insect Pests of the Castor Oil Plant.—*Agric. News, Barbados,* xix, no. 470, 1st May 1920, p. 138.

Unlike Florida [*R.A.E.*, A, viii, 235] Brazil is apparently free from pests of the castor oil plant and contains districts eminently suited to its cultivation.

Moll (F.). **Holzzerstörende Krebse.** [Crustacea destructive to Timber.]—*Naturwiss. Zeitschr. f. Forst- u. Landwirtsch., Stuttgart,* xiii, no. 4–5, April-May 1915, pp. 178–207, 12 figs. [Received 10th June 1920.]

This paper reviews the existing knowledge of timber-destroying Crustacea, of which the most important species are *Limnoria lignorum* and *Chelura terebrans.* Most of the damage is done along the coasts of Europe and North America. Greenheart and turpentine logs, especially in the bark, are immune from attack. Sheathing and other similar coverings are too expensive, paints are not lasting, and impregnation with metal salts has not yielded good results up to the present. The best protection available, especially for pine wood, is impregnation with creosote. At least 160 litres of creosote must be used for 1 cu. metre of timber, and the creosote must contain 6–10 per cent. of tar acid. A large number of references to the literature of this subject, dating from 1723, are appended.

Dewitz (J.). **Ueber die Einwirkung der Pflanzenschmarotzer auf die Wirtpflanze.** [The Action of Plant Parasites on their Host-plant.]—*Naturwiss. Zeitschr. f. Forst- u. Landwirtsch., Stuttgart,* xiii, no. 6–7, June-July 1915, pp. 288–294. [Received 10th June 1920.]

Most work relating to parasites of plants deals with the outward changes caused to the host. Very little has been done concerning the effect on the internal organism.

As a result of experiments with an Aphid infesting *Pelargonium* it has been ascertained that an extract obtained from the bodies of this insect exercises a haemolytic action on the red corpuscles in the blood of cattle, so that it is evident that this Aphid contains a toxin.

Schwangart (F.). **Ueber Rebenschädlinge und –nützlinge. iv. Vorstudien zur biologischen Bekämpfung des "Springwurms" der Rebe (*Oenophthira pilleriana,* Schiff.).** [Insects injurious and beneficial to the Grape Vine. iv. Preliminary Studies on the Biological Control of *O. pilleriana.*]—*Naturwiss. Zeitschr. f. Forst- u. Landwirtsch., Stuttgart,* xiii, nos. 8–9 & 11–12, August-September & November-December 1915, pp. 380–408 & 522–541. [Received 10th June 1920.]

An account is given of a careful study of *Sparganothis* (*Oenophthira*) *pilleriana,* Schiff., a pest of the grape-vine, the work having been begun in 1911. A list of the parasites of this moth is given, and two methods of planting are advised against it and allied Lepidopterous pests. One aims at utilising against each other the following :—*Hyponomeuta malinellus,* found on apple ; *H. padellus* on *Prunus* ; and the vine moths, *S. pilleriana, Clysia ambiguella* and *Polychrosis botrana.* The other makes use of *Hyponomeuta padellus,* found on *Euonymus.* All these insects, according to the date on which they appear and the parasites they harbour, form links in a "host-cycle." To promote this and thus favour the natural enemies and adversely affect the plant pests, resort to such planting methods as follow is advised. If it is intended to use the five pests mentioned, *Prunus* and apple must be planted in vine-growing districts and grape-vines must be planted beneath the fruit trees in an orchard district. It is always advisable to mingle stone-fruit with apples and pears, as the different species of *Hyponomeuta* occurring on these plants are not always likely to appear in equal numbers in a given year. This method of interplanting has a number of limitations, and recourse must also be had to a wild plant, *Euonymus,* which harbours *Hyponomeuta cognatellus. Euonymus* needs no attention, does not impoverish the soil, does not throw a shade injurious to the vine, and may be planted in situations unsuitable for fruit trees. Furthermore *H. cognatellus* may be allowed to develop in numbers that cannot be permitted to *H. malinellus* or *H. padellus,* which are injurious to fruit-trees.

Scheidter (F.). **Ueber die Eiablage von *Saperda populnea,* L.** [The Oviposition of *S. populnea.*]—*Naturwiss. Zeitschr. f. Forst- u. Landwirtsch., Stuttgart,* xv, no. 4–6, April-June 1917, pp. 113–128. [Received 10th June 1920.]

The oviposition of *Saperda populnea,* L., on poplar in Bavaria is described in detail. The female makes a curved furrow in the bark shaped like a horse-shoe, with the horns upwards; between these there are horizontal cross-furrows. The bore-hole is on the lower edge, and an egg is laid in it. Thin twigs of the previous year's growth are chosen, and the eggs are often less than an inch apart. The female appears to oviposit on the same tree from which she emerged, unless lack of space compels her to migrate to another. If the bark is removed after the egg has been laid, only the bore-hole is visible with the egg attached to the inner surface of the bark. On hatching, the larva begins to feed on the swellings surrounding the point of attachment of the egg. It then makes a horizontal, peripheral mine, and then one traversing the centre of the twig. Hibernation usually takes place there. There are two annual generations, and about 10 per cent. of the eggs yield adult beetles. This is due to natural checks, including an excess or a lack of swelling in the twigs. Willows also are infested.

The most important Dipterous parasite is *Sarcophaga albiceps*, Meig., though it not clear how the host larvae become infested; possibly the parent fly deposits a larva near the entrance of the tunnel. A list, supplied by Dr. Ruscka of Vienna, is given of 20 primary and 3 secondary Hymenopterous parasites of this beetle.

Remedial measures consist in cutting off infested twigs or even the entire plant near the ground, collection of the beetles at the time of oviposition (May-June), and the destruction of the eggs beneath the bark by pressing the latter; and oviposition on some of the more valuable plants may, it is suggested, be prevented by protecting them with an adhesive.

SCHUMACHER (F.). **Die Insekten der Mistel und verwandter Loranthaceen.** [Insects of the Mistletoe and allied Loranthaceae.]—*Naturwiss. Zeitschr. f. Forst- u. Landwirtsch., Stuttgart*, xvi, no. 3–8, March-August 1918, pp. 195–238. [Received 10th June 1920.]

The existing literature on insects of the mistletoe is reviewed. The present paper deals with 8 Coleoptera, 1 Lepidopteron, 11 Rhynchota and 1 Psocid. No Diptera or Hymenoptera have been found. The Rhynchota include a large proportion of COCCIDAE. Of the 21 species only 6 are peculiar to the mistletoe, these being :—Coleoptera : *Apion variegatum*, Wenck., and *Liparthrum bartschti*, Mühl.; and Rhynchota: *Lygus viscicola*, Put., *Hypseloecus visci*, Put., *Anthocoris visci*, Dgl., and *Psylla visci*, Curt.

The scale, *Diaspis visci*, Schr., was formerly believed to be peculiar to mistletoe, but it is now considered to be identical with *D. juniperi*, Bch., found on conifers.

SEEGER (—). **Ein Massenauftreten von** *Lophyrus rufus*. [An Outbreak of *L. rufus*.]—*Naturwiss. Zeitschr. f. Forst- u. Landwirtsch., Stuttgart*, xviii, no. 1–2, January-February 1920, pp. 41–42.

In June 1919 an outbreak of *Lophyrus rufus* occurred near Heidelberg. An area of about 87 acres was affected, the trees most attacked being *Pinus banksiana* and the common pine; Weymouth pine suffered less. The damage did not appear to be serious.

Müller (H. C.). **Bericht über die Tätigkeit der Agrikulturchemischen Kontrollstation und der Versuchsstation für Pfanzenkrankheiten der Landwirtschaftskammer für die Provinz Sachsen für die Jahre 1916 und 1917.** [Report for 1916 and 1917 of the Agro-Chemical Research Station and of the Experiment Station for Plant Diseases of the Agricultural Chamber for the Province of Sachsen.]—Abstract in *Zeitschr. f. Pflanzenkrankheiten, Stuttgart*, xxx, no. 1, 1920, p. 22. [Received 10th June 1920.]

Potatoes were damaged by the meadow bug, *Lygus pratensis*, L., oats by the oat mite, *Tarsonemus spirifex*, March., and wheat by the gall midge, *Sitodiplosis* (*Clinodiplosis*) *mosellana*, Géh.

Schumacher (—). **Ueber die Schildlaus,** *Pulvinaria mesembrianthemi*. **Vallot.**—*Deutsche Entom. Zeitschr.*, 1918, pp. 421–422. (Abstract in *Zeitschr. f. Pflanzenkrankheiten, Stuttgart*, xxx, no. 1, 1920, p. 38.) [Received 10th June 1920.]

The discovery of the scale, *Pulvinaria mesembrianthemi*, Vall., in the plant houses of the Botanical Gardens at Dahlem (Berlin) is recorded. It had evidently been imported from S. Africa and throve in the temperate houses containing the succulents.

Baer (W.). **Der Fichtenrindenwickler und Fichtenknospenmotten.** [The Spruce Bark Moth and the Spruce Bud Moths.]—*Tharandter Forstl. Jahrb.*, lxviii, 1917, pp. 38–47. (Abstract in *Zeitschr. f. Pflanzenkrankheiten, Stuttgart*, xxx, no. 1, 1920, p. 39.) [Received 10th June 1920.]

In the Tharandt forest (Saxony) the habits of *Cydia* (*Grapholitha*) *duplicana*, Zett., are different from those usually recorded. Instead of feeding on the swellings on the branches of fir due to *Aecidium elatinum*, it regularly visits, together with *Dioryctria spendidella*, the resinous edges of the wounds caused by red-deer to the trunks of spruce.

The author found the caterpillars of *C.* (*G.*) *duplicana* to be indistinguishable from those of *C.* (*G.*) *pactolana*, Zett.; the former species is less abundant.

C. (*G.*) *coniferana*, Rtzb., was found on resinous, fungus-infested parts of pines, especially on the swellings due to *Peridermium*, and on the tops of diseased Weymouth pines or common pines. *C.* (*G.*) *cosmophorana*, Tr., was bred with *Rhyacionia* (*Evetria*) *resinella* from the galls of the latter.

Morphologically, *Cydia* (*Tortrix*) *grunertiana*, Rtzb., is identical with *C. pactolana* and must be considered a biological variety of it that has adapted itself to the larch, where it is found on the swellings of old wounds on dead branches of 30-year-old trees.

In late summer the caterpillar of *Argyresthia illuminatella*, Z., begins feeding on the terminal buds of fir branches and then bores a mine $1\frac{1}{4}''$–$1\frac{1}{2}''$ long, down the shoots. This internal injury is already visible in winter through the discolouration of the needles at the tips of the shoots.

Argyresthia certella is usually obtained from infested spruce buds, the injury being confined to the bud; where this extends $\frac{2}{5}$–$\frac{4}{5}$ of an inch along the shoot *A. glabratella* is the species concerned.

Schaffnit & Lustner. **Bericht über das Auftreten von Feinden und Krankheiten der Kulturpflanzen in der Rheinprovinz in den Jahren 1915 und 1917.** [Report on the Occurrence of Enemies and Diseases of Cultivated Plants in the Rhine Province in 1916 and 1917.]—*Bonn*, 1919, 97 pp. (Abstract in *Zeitschr. f. Pflanzenkrankheiten, Stuttgart*, xxx, no. 2–3, 1920, pp. 80–81.) [Received 10th June 1920.]

Limothrips cerealium caused white-ear disease in cereals to a serious extent. Kainit was successfully used against *Otiorrhynchus sulcatus* infesting vines, about 7 oz. being placed during the dead season in hollows around each stock.

Linsbauer. (L.). **Programm und Jahresbericht der höheren Staatslehranstalt für Wein-und Obstau über das Schuljahr 1918–1919.** [Programme and Annual Report of the Higher State Institute for Vine and Fruit Culture for the Scholastic Year 1918–1919.]—*Vienna*, 1919, 107 pp. (Abstract in *Zeitschr. f. Pflanzenkrankheiten, Stuttgart*, xxx, no. 2–3, 1920, pp. 82–83.) [Received 10th June 1920.]

Scale-insects were abundant on plum trees, which were also attacked by *Otiorrhynchus ligustici* and *Coleophora* sp.

No success attended an attempt to transfer *Tetraneura ulmi* from *Ulmus montana major dampieri wedrei* to *U. atropurpurea*, though at the same time the *Tetraneura* galls typical to *U. atropurpurea* developed in some numbers. In the case of the transfer of *T. ulmi* to *U. pendula* there occur galls which differ in shape from those on *U. dampieri wedrei* and which do not develop fully. Failure met every attempt to transfer the stem-mothers of *Eriosoma* (*Schizoneura*), which are much more mobile than those of *Tetraneura*.

Zimmermann (H.). **Schädlinge der Oelfrüchte.** [Pests of Rape and Turnip.]—*Illust. Landw. Ztg.*, xxxix, 1919, pp. 153-154, 166–167. (Abstract in *Zeitschr f. Pflanzenkrankheiten, Stuttgart*, xxx, no. 2–3, 1920, pp. 88–89.) [Received 10th June 1920.]

The most important pest of rape in Mecklenburg is *Meligethes aëneus*. After hibernating it appears at the end of April or early in May. The larvae appear 8–10 days after the eggs are laid; after one month they pupate in the ground, and 12–16 days later the adult emerges. Other Coleopterous pests discussed in this paper are *Ceuthorrhynchus* spp., *Baris chlorizans*, and *Psylliodes chrysocephalus*. Lepidopterous pests of rape in Mecklenburg are *Agrotis segetum*, *Pieris napi*, *Evergestis extimalis* and *Phalonia* (*Conchylis*) *epilinana*. *Athalia colibri* (*spinarum*) is not yet abundant in Mecklenburg. The cabbage gall-midge, *Perrisia* (*Dasyneura*) *brassicae*, also occurred.

Dammerman (K. W.). **Landbouwdierkunde van Oost-Indië. De schadelijke en nuttige Dieren voor Land-, Tuin- en Boschbouw in Oost-Indië.** [The Agricultural Zoology of the [Dutch] East Indies. The Animals injurious and beneficial to Agriculture, Gardening and Forestry in the [Dutch] East Indies.]—*Amsterdam*, J. H. de Bussy, 1919, x + 368 pp., 135 figs., 39 plates. Price 16 florins.

This book should satisfy a real want in view of agricultural development in the Malay Archipelago. It is chiefly intended for agricultural instructors and for the staffs of experiment stations who are required to give information regarding animal pests, but it is arranged so as to assist agriculturists also.

The pests are arranged according to the injury they cause, and this facilitates the record of remedial measures. Their structure, systematic position, etc., are only briefly discussed. The vernacular name is given, together with the scientific and Dutch names.

At the end of the volume there is a convenient list of references. This is followed by a list of cultivated plants, the pests of each plant being noted with the respective page reference. A name index including scientific, Dutch and vernacular terms is also appended.

The numerous illustrations, including many coloured plates, are a useful feature. The whole work appears to have been carefully prepared from the point of view of those for whom it is intended, and should prove exceedingly valuable and helpful to readers with a knowledge of Dutch.

Making Lime-sulphur at Home.—*British Columbia Dept. Agric., Victoria*, New Hortic. Ser. Circ. 61, May 1920, 5 pp.

In view of the high cost of commercial lime-sulphur solutions, and of the probable shortage of this article in the near future, users are advised to make their own. The best materials for the purpose, the method of preparation and the cost of concentrated lime-sulphur wash are discussed. Directions are given for testing and diluting lime-sulphur solutions.

Patrol River to keep Pests out of State.—*Pennsylvania Dept. Agric., Wkly. Press Bull., Harrisburg, Pa.*, v, no. 23, 3rd June 1920, 1 p.

In an effort to keep the Japanese beetle [*Popillia japonica*], which is already present in New Jersey as far as the brink of the Delaware River, out of Pennsylvania, the west bank of the Delaware, opposite the infested area in New Jersey, is being patrolled for a distance of ten miles. All food-plants in this zone are carefully examined every day or two, and an effort will be made to destroy any insects that may fly across the river. The beetle has not yet appeared in Pennsylvania.

Caesar (L.). **Spraying Currants and Gooseberries.**—*Canad. Horticulturist, Toronto, Ont.*, xliii, no. 6, June 1920, pp. 159–160, 1 fig.

The greater part of the information about insects contained in this paper has already been noticed [*R.A.E.*, A, viii, 345]. The removal of the older canes and burning them before the end of May is recommended against the currant borer [*Aegeria tipuliformis*], the importance of which as a pest is uncertain.

NOTICES.

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CONTENTS.

CONTENTS—*cont.*

Registered at the G.P.O. for Transmission to Canada and Newfoundland by Magazine Post.

VOL. VIII. Ser. A. Part 9.—pp. 361-416. SEPTEMBER, 1920.

THE REVIEW OF APPLIED ENTOMOLOGY

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URBAHNS (T. D.). **The Clover and Alfafa Seed Chalcis Fly.**—*U.S. Dept. Agric., Washington, D. C.*, Bull. 812, 31st May 1920, 20 pp., 8 plates, 2 figs.

The life-history of the Chalcid, *Bruchophagus funebris*, has already been noticed [*R.A.E.*, A, iii, 185; vi, 139, etc.], but in Southern California the development begins earlier in the year and the transformations tend to be more rapid; adults may even be active in small numbers throughout the winter. This pest occurs in practically every locality in the United States where either red clover or lucerne seed is grown to any extent. It is easily carried from place to place in infested seed, and spreads along the wild lucerne plants that grow on the edges of fields, while infested seeds may be washed down streams and carried, with the water in irrigation canals, all over the country. The adults are often carried some distance by wind. This insect is often responsible for a loss of from 50 to 400 lb. of seed per acre.

Control is chiefly attained by cultural methods; and, owing to the rapid dispersal of the adults, community action is the most effective. All lucerne growing in waste areas should be burnt over in late autumn to destroy hibernating larvae. Seed fields should be harrowed in winter, for if the infested seeds are covered with damp soil, they will mould and prevent the development of the pupal or adult stages. Irrigation in early spring produces a rapid growth of lucerne which is cut as early fodder, leaving a stronger growth to take its place for seed; while at the same time the humid atmosphere over an irrigated field accelerates the emergence of the pest from seeds of the newly forming crop, which would otherwise become sufficiently dry to force many of the larvae into a resting period. All self-sown lucerne on waste ground should be cut at the same time, that is before the actual seed crop begins. The fodder crop should be cut closely, and clusters which have escaped the mower may be disposed of by turning live stock into the field. The seed crop should not be allowed to stand too long, or the insect may pass a complete generation in the earlier pods and infest the later ones in much greater numbers. In the south-west, where it is possible to grow two seed crops a year, the results of the second are usually very disappointing and unremunerative on account of severe infestation by this pest.

Bruchophagus funebris is attacked by several Hymenopterous parasites, including *Tetrastichus bruchophagi* [*R.A.E.*, A, v, 189], *Liodontomerus secundus*, *L. perplexus*, *Eutelus bruchophagi*, *Habrocytus medicaginis* [*R.A.E.*, A, v, 18], *Trimeromicrus maculatus*, *Tetrastichus venustus*, *Liodontomerus insuetus* and *Eupelmus* sp., though the economic importance of the last three is not established. The larva of a midge, *Lestodiplosis* sp., also apparently destroys the larva of *B. funebris*.

MACLENNAN (A. H.). **Report of the Vegetable Specialist for 1919.**—*15th Ann. Rept. Ontario Veg. Growers' Assoc., 1919*; *Toronto*, 1920, pp. 14–16, 1 fig.

Black heart in celery was exceptionally serious owing to the very large numbers of tarnished plant bugs [*Lygus pratensis*]. Black-leaf 40 (1 pint to 50 U.S. gals. of water with 2 lb. of soap, or up to as much as 1 pint to 10 gals. in severe attacks) checked the injury considerably.

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This bug also lives on red root and pig weed, and these weeds should not be permitted near celery beds. Onion thrips (*Thrips tabaci*) caused a loss of over 50 per cent. of the crop. Sodium nitrate, 50–100 lb. to the acre, was beneficial in some cases. Black-leaf 40 and kerosene emulsion were applied too late for satisfactory results, though the former (at 1–500 with 3 lb. soap) sprayed with a fine nozzle held close to the plant gave good results elsewhere. This spraying should be repeated a second time, to destroy insects hatching from eggs already laid.

Corrosive sublimate gave promising results in preliminary experiments in the control of radish and onion maggots [*Phorbia brassicae* and *Hylemyia antiqua*].

GIBSON (A.). **Some recent work on the Control of the Cabbage Root Maggot.**—*15th Ann. Rept. Ontario Veg. Growers' Assoc., 1919*; *Toronto*, 1920, pp. 67–70.

Experiments to test the efficacy of applications of corrosive sublimate in controlling the cabbage root maggot [*Phorbia brassicae*] are described. Solutions of various strengths were used, but the weakest, 1 oz. in 10 gals. water, applied three times proved as effective as stronger solutions and more frequent applications. The first application was made four, the next ten, and the third twenty days after the plants were put out in the field. Of the plants thus treated those destroyed by maggots ranged from nil to four per cent., while in untreated plots the damaged plants varied between 52 and 80 per cent. The cost of the treatment, including labour and material, was about half as much again as that of the usual procedure with tarred felt paper disks. Corrosive sublimate had no harmful influence on the plants or on soil organisms; under field conditions the growth of the plants seemed to be stimulated.

McDONNELL (C. C.), ROARK (R. C.) & KEENAN (G. L.). **Insect Powder.**—*U.S. Dept. Agric., Washington, D. C.*, Bull. no. 824, 3rd June 1920, 100 pp., 4 plates.

Experiments undertaken to discover the active principle of pyrethrum powder made from the flowers of *Chrysanthemum cinerariaefolium* showed that all the common organic solvents completely remove the insecticidal principle. It is not removed by steam distillation, either in neutral, acid, or alkaline solution. It is insoluble in water and dilute acids, but dilute potassium hydroxide solution removes nearly all the active principle, which contains no nitrogen and is not an alkaloid. A considerable amount of resin is present in pyrethrum, but this is inert when tested upon cockroaches. Alcoholic potash saponification completely destroys the insecticidal activity of the petroleum-ether extract, the ester being split up into acids and resinous materials. The results of the work indicate that the insecticidal activity of pyrethrum is due to a mixture of acids and esters which first benumb and subsequently kill the insects brought into contact with it. While it is generally considered to be harmless to the higher animals, a number of cases where it has produced symptoms of a more or less serious nature are recorded.

The flowers are cultivated commercially and the powder made in Dalmatia, Japan, Australia, Algeria and California. It is sometimes adulterated with colouring matter, other species of flowers or any convenient powder, but particularly with the ground stems of the pyrethrum plant itself. A formula is given for determining the approximate amount of added pyrethrum stems in insect powder.

Although *Chrysanthemum* (*Pyrethrum*) *cinerariaefolium* is the plant from which it is usually made, pyrethrum made from *C.* (*P.*) *roseum* and *C. marshalli* is recognised by the Insecticide Board of the United States Department of Agriculture.

Morrill (A. W.). **Entomology.**—*28th Ann. Rept. Arizona Agric. Expt. Sta., for Year ended 30th June 1917, Tucson,* 31st December 1917, pp. 472–473. [Received 23rd June 1920.]

This report gives the results of experiments with poison baits for the grasshopper, *Melanoplus differentialis*, the most destructive species in Arizona. Attempts to reduce the cost of the standard formula have already been noticed [*R.A.E.*, A, vii, 206]. The new formulae have not been tested against other species of grasshoppers, or the immature stages of *M. differentialis*. It is of little importance at what time of day the baits are spread. Grasshoppers rarely travel 70 yards and usually not more than 25 yards from where the poison is eaten. The calculations of loss per square yard due to these insects have already been noticed [*R.A.E.*, A, vi, 305].

Fromme (F. D.). & Ralston (G. S.). **Dusting Experiments in Peach and Apple Orchards.**—*Virginia Agric. Expt. Sta., Blacksburg,* Bull. 223, November 1919, 16 pp., 2 figs. [Received 23rd June 1920.]

Dusting, as compared with spraying, saves time and labour, especially where rough ground hampers the use of the heavier liquid outfits, but it has several limitations in practice in the case of both peaches and apples. The following formulae were used in dusting experiments (the parts being by weight) :—for peaches, sulphur and lead arsenate 90–10, and sulphur, filler and lead arsenate 50–40–10 ; for apples, a Bordeaux dusting mixture and an 80–10–10 mixture of sulphur, filler and lead arsenate. In peach orchards both the dusting mixtures produced a satisfactory control of scab (*Cladosporium carpophilum*) and probably curculio [*Conotrachelus nenuphar*], but were of only slight value in the control of brown rot (*Sclerotinia cinerea*) ; consequently though they may be used for the first two summer applications, they cannot be relied on for the third or subsequent ones. In apple orchards both mixtures produced a satisfactory control of the codling moth [*Cydia pomonella*], and the Bordeaux dust gave excellent results against blotch (*Phyllosticta solitaria*) and frog-eye (*Sphaeropsis malorum*) ; but they were little better than no treatment at all against bitter rot (*Glomerella cingulata*). As a result it would seem that neither in the case of apples nor peaches can dusting be regarded as giving a satisfactory general control ; and as its use must therefore necessitate duplications of equipment, the best results will probably come from the methods and materials the value of which has already been proved.

Pierson (H. B.). **An infestation of the White Pine Aphid.**—*Psyche, Boston, Mass.*, xxvii, nos. 2-3, April-June 1920, pp. 62-63.

This paper records an attack of white pine trees by *Lachnus strobi*, Fitch (white pine aphis). Mature trees in a somewhat isolated clump were all dying as a result, while the infestation was spreading to young plantations on the sides. The Aphids were ovipositing on the needles on 10th October, and their survival in spite of low temperatures and heavy rains was remarkable, subsequent examinations showing that they were feeding until about the first of November. Very few winged individuals were found.

Garman (H.) & Jewett (H. H.). **The Broods of the Tobacco Worms.**—*Univ. Kentucky Agric. Expt. Sta., Lexington*, Bull. 225, March 1920, 24 pp., 4 figs. [Received 29th June 1920.]

Of the two moths, *Protoparce* (*Phlegethontius*) *sexta* (southern tobacco worm) and *P. celeus* (northern tobacco worm), the former is constantly injurious to tobacco, while the latter only occurs in certain seasons and is local, though both fluctuate widely in numbers in different years. Their life-histories are identical in Kentucky within a week or two. Larvae of the first brood appear about the time the tobacco plants are transplanted. The second brood appears early in August, but there is considerable overlapping and all stages may appear at any time between late June and the end of August. Whether individuals observed late in the year belong to a third brood or are belated members of the second is uncertain.

For control to be effective arsenites should be applied when the larvae are young—as soon as possible after hatching. There are thus two periods of importance, from the middle to the end of June and early in August.

Fungi, insect parasites and diseases cause wide fluctuations in the number of caterpillars from season to season. The more important are a fungus, apparently *Cordyceps militaris*, which attacks the pupae, a disease of uncertain origin which attacks all larvae in tobacco fields, a Hymenopterous parasite, *Apanteles congregatus*, and a fly, *Winthemia quadripustulata*.

Weigel (C. A.). & Sanford (H. L.). **Chrysanthemum Midge.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 833, 31st May 1920, 25 pp., 2 plates, 2 figs.

Diarthronomyia hypogaea, Lw. (chrysanthemum midge), although of comparatively recent introduction into the United States, is now one of the most important pests of chrysanthemums, attacking both greenhouse and outdoor plants. The average life-cycle requires about 35 days and there are several generations in greenhouses, occurring during the spring (February to June) and during the autumn (September to November). Natural enemies that have been recorded include *Amblymerus* sp., the larvae of which live within the galls occupied by the maggots of the midge, which they consume. They remain within the galls until mature, adults appearing from August to October, during which time as many as 80 to 90 per cent. of the maggots may be destroyed. Another enemy is *Tetrastichus* sp. Many experiments have been made with a view to controlling the insect, and certain points in the life-history bear upon these. The egg-stage may be controlled by spraying or dipping the cuttings or plants [*R.A.E.*, A, viii, 342]. The adults can be controlled at the time of emergence by consistent spraying and afterwards by fumigation. In cases of very slight infestation daily picking of gall-infested leaves will hold the pest in check; when infestation is very heavy the most severely damaged plants should be removed and burned. Fumigation should be done every night for at least six weeks, in order to kill all the adults that emerge during this period and to prevent further oviposition. If nicotine papers are used one sheet to 1,000 cubic feet of space will suffice; if hydrocyanic acid gas is employed $\frac{1}{8}$ to $\frac{1}{4}$ oz. per 1,000 cubic feet will kill all adults. Fumigation must be started between 12.30 a.m. and 2 a.m., as the adults do not emerge until after midnight and after 2 a.m. oviposition will have begun. If fumigation is impracticable, spraying with 40 per cent. nicotine sulphate diluted to 1 : 800 with the addition of $\frac{1}{2}$ to 1 oz. per gallon of solution, should be practised every afternoon for a period of 4 to 6 weeks.

In California the growing of the bulk of the chrysanthemum crop under cloth is recommended as an efficient preventive against the attacks of *D. hypogaea*. Another method is to plant the stocks in benches or cold frames directly after the season's crop has been removed. This should be followed by thorough treatment with equal parts of dry or air-slaked lime and tobacco dust. All new growth should be kept covered with the mixture until further operations in the spring.

Baker (A. C.) & Moles (M. L.). U. S. Bur. Entom. **A New Species of Aleyrodidae found on Azalea (Hom.).**—*Proc. Ent. Soc. Washington, D.C.*, xxii, no. 5, May 1920, pp. 81–83, 1 plate.

Aleurodes azaleae, sp. n., is described. This insect has been intercepted by plant quarantine inspectors on shipments of azalea from Belgium, Holland and Japan. It occurs frequently, but is not abundant on the food-plant, only four or five pupa cases being found to a leaf, and it does not seem, so far, to be injurious.

Craighead (F. C.). **Direct Sunlight as a Factor in Forest Insect Control.**—*Proc. Ent. Soc., Washington, D.C.*, xxii, no. 5, May 1920, pp. 81–83, 1 plate.

Direct sunlight may be used as a highly efficient method of prevention or control of certain destructive tree-killing or wood-boring insects. An assortment of infested mesquite sticks containing several species of Bostrychids in all stages, and larvae of *Chrysobothris* spp. and *Cyllene antennatus*, was placed in direct sunlight. In two days 40 per cent. of all the insects to a depth of half an inch were killed; in a week 75 per cent. to a depth of three-quarters of an inch; and in two weeks 90 per cent. to the same depth.

From June to September uninfested green mesquite sticks were laid out in the sun and turned weekly for four to ten weeks. A few *Chrysobothris* spp., and Bostrychids attacked the under-side of the logs at first, but all were killed during turning, and no subsequent attack resulted. Similar results in controlling and in preventing infestation were achieved with ash, pine, oak and hickory against ambrosia beetles and *Neoclytus erythrocephalus*, with pine against various Scolytids and *Monochamus* (*Monohammus*) *titillator*, and with hickory against *Cyllene pictus*.

It was found that on some occasions the inner bark on logs exposed to direct sunlight may reach a temperature higher than the surrounding air by as much as 60°.

Raymundo (B.). **A Lagarta amarella das Cucurbitaceas (Aboboras, Pepinos, Melancias, etc.)** *Glyphodes nitidalis*, **Stoll.** [*G. nitidalis*, the Yellow Caterpillar of Cucurbitaceae (Pumpkins, Cucumbers, Water-melons, etc.).]—*Chacaras e Quintaes, S. Paulo*, xxi, no. 5, 15th May 1920, pp. 371–372, 3 figs.

The Pyralid, *Diaphania* (*Glyphodes*) *nitidalis*, Stoll, is a common pest of Cucurbitaceae in Brazil. It is found in most parts of South America and in North America. At Rio de Janeiro it occurs throughout the year and is attracted by lights, both indoors and in the streets, together with *Diaphania* (*G.*) *hyalinata*, L., *Desmia funeralis*, Hb., etc.

After gathering the crop the plants should be destroyed. The leaves and injured fruit should be burned. If an infested field is promptly ploughed this will destroy a large number of caterpillars and pupae. Trap-plants may be grown in the field ; in the United States pumpkins are used to protect cantaloups in this way.

Hempel (A.). **Um Inimigo importante da Figueira cultivada,** *Ituna ilione*, **Cramer.** [*I. ilione*, an important Enemy of the cultivated Fig.]—*Chacaras e Quintaes, S. Paulo*, xxi, no. 5, 15th May 1920, pp. 373–374, 1 fig.

As new areas are brought under cultivation insects that formerly fed on wild plants often begin to attack the cultivated species. This has occurred in the case of the Nymphalid butterfly, *Ituna ilione*, Cram., which occurs in South America from the Guianas to the southernmost State in Brazil. In districts that are becoming populated *I. ilione* has become a pest of the foliage of the cultivated fig.

The caterpillars are easily collected by hand, or spraying may be carried out with a solution of Paris green 3 oz., either in water 25 gals., or in Bordeaux mixture.

Bertoni (M. S.). **La Temperatura minima secular de 1918.**—*Anales Cient. Paraguayos, Puerto Bertoni*, Ser. ii, no. 5, July 1919, pp. 345–391. [Received 22nd June 1920.]

The years 1916–1918 were so remarkable and unusual in the south of Brazil and the basin of the Rio de la Plata that they seem to mark a new epoch in the climate of those regions. The year 1917 had already broken several records, particularly as regards cold, while in 1918 the lowest temperature since 1789 was recorded. As one consequence of the unusual conditions, the balance of insect life was unsettled. The extreme cold obliged both insects and spiders to remain in hibernation and to delay their development for two or three months, and as a result the insectivorous birds that had not already died of cold, then died of starvation. Certain insects, upon emergence, therefore found themselves almost free from enemies, and many occurred in most unusual abundance throughout the winter. Ants, particularly of the genus *Atta*, were a veritable plague; cutworms were responsible for very serious damage to agriculture and horticulture; *Diabrotica speciosa* was so abundant that in some localities garden produce was almost entirely destroyed, while *D. vittata* almost completely devoured the winter sowings of Cucurbits; Lepidoptera were so numerous that heavy infestation by the larvae is expected during the following summer season; Noctuids, Tabanids, *Haltica* spp., Chrysomelids, Curculionids, Aphids, *Pulex*, *Rhynchoprion* sp. and grasshoppers were all unusually abundant. Those insects that are largely controlled by insect enemies were no more numerous than in normal years.

I Gas velenosi nella Distruzione degli Insetti dannosi alle Piante. [Poisonous Gases for the Destruction of Insects injurious to Plants.] *La Campagna, Como,* xix, no. 319, 15th April 1920, p. 2.

A new company, Società Italiana Fumigazioni Gas Tossici, has been formed in Rome with the object of destroying noxious insects by the fumigation of buildings, ships, goods and plants with poisonous gases.

METALNIKOW (S.). **Immunité naturelle et acquise des Chenilles de** *Galleria mellonella.*—*C. R. Soc. Biol., Paris,* lxxxiii, no. 18, 29th May 1920, pp. 817–820.

It has been shown in a previous paper that the larvae of *G. mellonella* possess a remarkable immunity to those organisms that are most pathogenic to man, while thay are very susceptible to saprophytic or slightly pathogenic organisms [*R.A.E.*, A, viii, 163]. In the present paper the reasons for this apparently paradoxical statement are discussed. It is considered that in all cases of acquired immunity that have been studied, the essential factor is the alteration in the activity and the susceptibility of the phagocytes. It may be said that the reactions of the cell change in consequence of adaptation to new conditions, and negative reactions are replaced by positive reactions. In these changes in the reactions of the cell lies the principal cause of acquired immunity.

Reports on the State of the Crops in each Province of Spain on the 20th May 1920.—*Bol. Agric. Téc. Econ., Madrid,* xii, no. 137, 31st May 1920, pp. 378–393.

The insect pests recorded during May 1920 include *Malacosoma* (*Bombyx*) *neustria* on almond trees in Alicante and larvae of the gipsy moth, *Porthetria* (*Liparis*) *dispar*, on oaks in Avila, which are causing such injury that the trees will be unproductive for some years. Measures are to be taken to destroy the eggs. Fruit trees, particularly plums, are being largely destroyed by the attacks of *Hyponomeuta padellus*; instructions have been given for arsenical treatment. In Cordoba, the oaks have been infested with larvae of *P. dispar* and of

Tortrix viridana, and the crop of acorns is expected to be poor. Vines in Guadalajara are in excellent condition but are rather heavily infested with *Haltica ampelophaga*, which is also present in the vineyards of Toledo; arsenical mixtures are being applied under the direction of the Agronomical Department. *Aelia rostrata* is being similarly dealt with in certain parts of Toledo where it has appeared. In the Province of Madrid locusts have appeared in numbers in many localities where the ground was left unbroken during the winter campaign. The usual methods are now being followed for their extermination.

Les Parasites de la Cochylis-Eudémis.—*Le Progrès Agric. et Vitic., Montpellier*, lxxiv, no. 24, 13th June 1920, pp. 565–566.

Much discussion was raised some years ago as to the efficacy of the artificial dissemination of fungus diseases among the vine moths [*Clysia ambiguella* and *Polychrosis botrana*]. It was finally held that the conditions necessary for this method of control, namely, moisture, heat and prolonged contact of the insect with the spores, occurred too rarely for the method to be of much practical value. The author of the present paper has discovered that the larvae of these moths are particularly susceptible, under favourable conditions, to the muscardine disease of silkworms, *Botrytis bassiana*. Since the life-cycle of the vine moths are similar to that of the silkworm, he suggests that other infectious diseases attacking the latter insect, *e.g.*, pebrine, flacherie, etc., might be useful against the larvae of the vine moths.

Picard (F.). **A propos de la Lutte contre la Cochylis et l'Eudémis au moyen des Parasites.**—*Le Progrès Agric. et Vitic., Montpellier*, lxxiv, no. 25, 20th June 1920, pp. 589-593.

In answer to the suggestion contained in the preceding paper, a concise review is given of the position of natural enemies in the control of insect pests, much of which has been written previously. It is pointed out that the whole question is one of natural balance, and that while much advantage may be gained by the introduction from the country of its origin of the natural parasites of an imported species, the artificial distribution of natural enemies against an indigenous pest is a very different matter. In the former case the natural balance has been upset by the establishment of a pest in new surroundings where it is free from its natural enemies; in the latter case the mere fact of the balance being upset proves that conditions are for the moment not favourable to the multiplication of the controlling factor, and therefore an attempt to introduce fresh individuals, carefully reared in the laboratory, would be simply like adding drops to the ocean and would do nothing to remedy the existing unfavourable conditions. Instances are given to illustrate these principles.

In the case in question, there is nothing to gain by attempting to propagate pebrine among vineyards infested with *C. ambiguella* and *P. botrana*, as this disease already occurs in the locality among wild bees and therefore, if it does not attack the vine pests, the reason obviously is that the conditions are not favourable for its development on them.

Chauvigné (A.). Action de la Chaleur pour la Destruction de la Cochylis et de l'Eudémis, en 1919.—*Le Progrès Agric. et Vitic., Montpellier*, lxxiv, no. 25, 20th June 1920, pp. 595–597.

The author's observation have led to the conclusion that the destruction of *Clysia ambiguella* and *Polychrosis botrana* by the sun's heat is certain when the temperature registers 122° to 132° F. during the period of incubation of the eggs. This confirms the results of previous investigations on this point.

Dr. Marchal, commenting upon this statement, remarks that the intense heat must coincide with the moment of oviposition and with the hatching of the eggs, otherwise it has no action on the development of the insects. This explains the differences in the action of heat in various countries and seasons.

Sicard (H.). La Destruction des Eudémis par les Pulvérisations de Savon Pyrèthre.—*Le Progrès Agric. et Vitic., Montpellier*, lxxiv, no. 25, 20th June 1920, pp. 593–595.

Following the method practised by Dr. Faes [*R.A.E.*, A., viii, 348] of using a pyrethrum-soap solution against *Clysia ambiguella*, the author records the results he has obtained with this mixture against *Polychrosis botrana* in the south of France. Contact with the insecticide produced instantaneous death among the larvae, and a few hours after treatment there were 7 or 8 times more individuals of *P. botrana* on the untreated vines than on those sprayed with the mixture.

Feytaud (J.). Le Procès d'un Myriapode : le Blaniule moucheté.—*Bull. Soc. Etude Vulg. Zool. Agric. Bordeaux*, xix, no. 5, May 1920, pp. 33–35.

Although the millipede, *Blaniulus guttulatus*, Bosc., is generally considered harmless to vegetation, it may, in seasons of unusual abundance, cause considerable damage, especially to the germinating seeds of vegetable crops, and by wounding the tissue of various fruits may cause them to decay. Its numbers can be checked by sprinkling the soil before sowing with strong salt-water, or with a solution of sodium nitrate, iron sulphate, potassium sulpho-carbonate, tobacco extract, etc., or by injecting carbon bisulphide into the ground, and by the laying down of bait-traps consisting of pieces of beetroot, or potato, which should be taken up and plunged into hot water to destroy the millipedes collected.

Lesne (P.). L'Utilisation de la Chloropicrine pour la Destruction des Insectes Nuisibles et des Rats.—*Jl. d'Agric. Pratique, Paris*, xxxiii, no. 25, 17th June 1920, pp. 462–464.

The discoveries of various investigators regarding the uses that can be made of chloropicrin in the destruction of noxious insects and of rats are reviewed. One of the latest applications of this poison is to destroy pests infesting the foliage of plants without injuring the growth. The value of this discovery should be proved by its practical application.

La Lutte contre les Insectes.—*Le Progrès Agric. et Vitic., Montpellier*, lxxiv, no. 26, 27th June 1920, pp. 614–615.

The case is recorded of a severe infestation of Aphids on plum trees in the vicinity of Paris, which was completely controlled towards the middle of May by Coccinellids that were reproducing with great rapidity. In the region of La Crau the Moroccan locust, *Dociostaurus maroccanus*, has been exceedingly numerous, and a vigorous campaign was undertaken to prevent its spread to other regions. About 1,250 acres were heavily infested with eggs and these hatched over a period of two months, beginning in April. The military authorities were called upon to help in the campaign. The use of chloropicrin emulsion was abandoned after a trial owing to the difficulty of application. Flame jets gave good results when the insects were driven towards the apparatus, which operated over a surface roughly 20 yards long and 1 yard wide. Poisoned baits of bran and molasses mixed with arsenicals proved efficacious, especially in irrigated crops. Collection of the insects in sheets is an economical method but requires many beaters. The insects should be driven during hours of low temperature, when their movements are slow, but not numbed by cold. They can then be driven in compact masses towards the flame-jets. In the canals the locusts can float for a long time without being drowned; dams have therefore been constructed at which large numbers have been collected. The locusts killed by poison are left on the ground as a fertiliser; those caught in sheets are made into compost or used in the manufacture of nitrogen superphosphates.

Diffloth (P.). **Culture des Groseilliers.**—*La Vie Agric. et Rurale, Paris*, xvi, no. 26, 26th June 1920, pp. 424–428, 4 figs.

The insects recorded as injurious to gooseberry culture in France include *Pteronus ribesii* (gooseberry sawfly), which makes its appearance soon after the young leaves, which it completely devours. There are two, and often three generations in a year. A spray composed of 2 lb. lead arsenate in 100 gals. water should be used on the foliage; powdered hellebore mixed with slaked lime can be used against the second generation, which appears with the fruit. *Myzus ribis* (gooseberry aphis) deforms the leaves of the bushes and gives them a red tinge. Nicotine solution should be used on the young shoots at the beginning of the season and later on the leaves. The larvae of *Aegeria* (*Sesia*) *tipuliformis* make tunnels in the branches during the summer, hibernating in them and emerging in May or June as adults. The only remedy is to destroy all infested branches. The larvae of *Epochra canadensis* (yellow gooseberry fly) develop in the fruit, causing it to drop before it is ripe. They then descend into the ground and emerge as adults in the following season. There is no known remedy for this pest.

Brandes (E. W.). **Artificial and Insect Transmission of Sugar-Cane Mosaic.**—*Jl. Agric. Research, Washington, D.C.*, xix, no. 3, 1st May 1920, pp. 131–138.

A series of experiments showed that mosaic disease of sugar-cane can be transmitted by insects. The species tested did not come from a country where the disease occurs, as the experiments and to be carried out in a locality where the disease does not exist to ensure freedom from infection of the plants used. However, *Aphis maidis*, which was shown to carry the disease, has been reported on sugar-cane from practically wherever this crop is grown. It is not considered probable that the transmission of the disease is limited to this insect, or to other Aphids. The sharp-headed grain leaf-hopper [*Draeculacephala mollipes*], which had been under suspicion as a carrier, did not transmit the disease in the experiments, but other leaf-hoppers are being tested. Just what insects are responsible in the sugar-cane regions remains to be proved.

MOZNETTE (G. F.). **Banana Root-Borer.**—*Jl. Agric. Research, Washington, D.C.*, xix, no. 1, 1st April 1920, pp. 39–46, 4 plates. [Received 1st July 1920.]

The banana root-borer, *Cosmopolites sordidus*, was introduced into Florida about four years before 1917, when it was first definitely noticed. A national quarantine was placed on it in 1918, and every effort is being made to exterminate it, particularly as it has been reported as attacking sugar-cane, besides all forms of banana (*Musa* spp.). A full description is given of the various stages. The eggs are laid in a cavity which the weevil makes between the leaf-sheath and the stem of the banana plant. The grubs hatch in about a week and work their way into the body of the bulb or trunk. They are very destructive, as they girdle the plant in the immediate vicinity of the lateral roots put out by the bulb, thus cutting off the passage of sap. After from 15 to 20 days the larvae pupate in their burrows. The pupal stage probably lasts about a week. The adult weevils are nocturnal.

The best method of control in Florida consists in the immediate destruction of infested banana plants, followed by the use of traps consisting of strips of healthy banana stems. As the beetles congregate under and about these strips they should be burned, and the process repeated until the pest is eradicated. It is very important that the traps should be renewed, as the weevils can live a considerable time without food.

SNYDER (T. E.). U.S. Bur. Entom. **The Colonizing Reproductive Adults of Termites.**—*Proc. Ent. Soc., Washington, D.C.*, xxii, no. 6, June 1920, pp. 109–150.

This paper gives a description of the three types of colonising reproductive termites, and the nymphs from which they develop, together with their intermediate forms. An account is given of their habits and methods of establishing new colonies, and the results of experiments in breeding and cross-breeding are also discussed.

BARBER (H. S.). **A New Tropical Weevil from Florida and Cuba.**—*Proc. Ent. Soc., Washington, D.C.*, xxii, no. 6, June 1920, pp. 150–152, 1 plate.

A description is given of the adult of *Metamasius mosieri*, sp. n. Its food-plant is unknown, but it is possible that it may become a pest of some economic crop in view of its close relationship to other weevils, such as *Metamasius sericeus* or *Cosmopolites sordidus*, infesting sugar-cane, banana, pine-apple, and palms.

Lovett (A. L.). **Insecticide Investigations.**—*Oregon Agric. Expt. Sta., Corvallis*, Bull. 169, April 1920, 55 pp., 2 plates. [Received 1st July 1920.]

This bulletin is a report on the progress of an investigation on insecticides of which some of the earlier work has already been noticed [*R.A.E.*, A, iii, 264, 655, 759; v, 477]. The investigations show that acid lead arsenate is more effective than the basic salt, the proportion assimilated by the larvae being greater. One pound of the acid lead arsenate in 400 U.S. gallons of water was effective against very small tent caterpillars [*Malacosoma*], and would probably be equally so against newly hatched codling moth larvae [*Cydia pomonella*]. The ordinary commercial lead arsenates are nearly pure acid lead arsenate. The powdered form is superior to the paste and keeps better. Substances known as spreaders, which increase the covering power and adhesiveness of the spray, add greatly to its efficiency. The most practical in order of merit are: caseinate, glue, soap bark, and oil emulsion. They are not improved by the addition of phosphates or sulphates.

The three factors, method of application, the spray solution and the spray material, all affect the efficiency of the spray, and the improvement of any one of them decreases the relative importance of defects in the other two.

In the calyx application for codling moth a fine misty spray is as effective as a driving spray. But undue importance should not be attached to the calyx spray. In Oregon usually less than half of the infestation is due to calyx entry; it is the last brood of larvae, which infects the fruit in late August and early September, that causes the heavy losses and is hardest to control, owing to the difficulty in timing the spray.

The calcium arsenates have a high killing efficiency, but are not so stable as the lead salts, and an excess of lime is advisable in solutions of them. There is probably no adequate reason for the abandonment of lead in favour of calcium arsenate for orchard work.

Nicotine sulphate is a powerful repellent for tent caterpillars, and if feeding does take place, even weak solutions kill almost instantly. It is an effective ovicide for codling moth, especially with the addition of soap, but is not to be recommended as a substitute for the standard arsenate sprays in codling moth control; though it may prove highly efficient as a substitute for the arsenate spray in the July application where a serious summer reinfestation of Aphids is present or again in combination with the last summer application of arsenate with a spreader, as a further insurance against the damage caused by the last brood of larvae.

Wimshurst (C. R.). **A Note on the Wheats and Barleys of Mesopotamia, together with Observations on Local Conditions.**—*Agric. Directorate, Mesopotamia, Basrah*, 1920, 19 pp., 7 plates. [Received 5th July 1920.]

Among the common pests of wheat and barley in Mesopotamia are wireworms, which, however, do not cause a great deal of damage. Grasshoppers cause very variable and sometimes extremely serious losses. *Decticus albifrons* waits until the ears of wheat and barley are turning yellow before beginning to feed on them, and can then be found in enormous numbers infesting wheat and barley stacks awaiting threshing. When the attack is too bad for the crop to be saved, barley especially is often cut just before the ear hardens, and stacked in small heaps with the ears inwards to complete ripening; grain so treated is, however, of bad colour and shrivelled. *D. albifrons* is not migratory and is rather local in occurrence, breeding over scattered areas among the crops attacked. It is not a gregarious species, and therefore poison baits are the most promising remedial measure. *Schistocerca peregrina* (yellow migratory locust) probably originates in the Nejd desert, which would make preventive treatment very difficult, but it also breeds to a large extent in the vicinity of cultivated areas. The migratory swarms appear before the insects are quite mature and while the corn is still green, and frequently devastate whole fields in one night. In the thinly populated districts there is not much hope of combating migratory swarms, and remedial measures must be directed to the destruction of the original hatching swarms in the spring, while they are still in the hopper stage.

Eelworms are distributed throughout the wheat-growing areas, and the minute red wheat thrips causes slight damage. Stem maggots and leaf-miners occur in both barley and wheat without causing serious losses.

GIBSON (A.). **Boring Caterpillars affecting Corn and other Crops and which are liable to be mistaken for the European Corn Borer.** —*Canada Dept. Agric., Entom. Branch, Ottawa,* Circular 14, 9th April 1920, 14 pp., 6 figs. [Received 5th July 1920.]

As a result of the efforts made to prevent the introduction and establishment in Canada of the European corn borer, *Pyrausta nubilalis,* and the publicity given to it, numerous caterpillars have been received that have been mistaken for it. This circular has been prepared in view of the fact that a number of these are also of economic importance and to enable the various species that may be found to be distinguished. As *P. nubilalis* closely resembles its nearest allies and also other borers in the younger stages, it is urged that the presence of any borer found in plants, particularly maize, should be at once reported and specimens sent to the nearest official entomologist. Besides *P. nubilalis,* which has not yet been found in Canada, and the American *P. ainslei* and *P. penitalis,* a number of Canadian caterpillars are described. The burdock borer, *Papaipema cataphracta,* occurs commonly on burdock in Eastern Canada, and also attacks a number of garden plants. The stalk borer, *Papaipema nebris* (*nitela*), in some years seriously abundant in the northern States, has not been responsible for important losses in Canada; it attacks maize and garden plants. The potato-stem borer, *Gortyna micacea,* is a pest of some importance, particularly in New Brunswick and Nova Scotia, though so far its attacks are practically confined to gardens. A western corn borer, *Helotropha reniformis atra,* has been reported in considerable numbers attacking maize in Manitoba; and two larvae of a new eastern corn borer, *Apamea nictitans americana,* have been taken in maize in Nova Scotia. The corn earworm, *Heliothis obsoleta,* was more than usually abundant in Manitoba, Ontario and Quebec in 1919, but has not as yet caused severe losses in Canada, except perhaps locally. The spindle worm, *Achatodes zeae,* occurs in Canada, but has not yet been reported as boring in maize, as it does in the United States. The glassy cutworm, *Sidemia devastatrix,* though not a borer, often attacks maize, and its work may therefore be mistaken for that of *P. nubilalis.* The parsnip webworm, *Depressaria heracleana,* does not attack maize, but is a well known pest of parsnips and similar plants.

Insects such as borers cannot be reached by spray applications, and clean culture is the main preventive measure. Valuable thick-stemmed plants have frequently been saved by slitting the side of the stem and removing the borer, afterwards binding the stem with thread. Usually, however, it is best to remove all weakened stems that indicate the presence of the insect.

Telephone Cables damaged by Wood Borers.—*Agric. Gaz. N.S.W., Sydney,* xxxi, no. 5, May 1920, p. 344.

A suspension of the telephone service was caused by water reaching the wire through small holes bored by a beetle, *Bostrychus cylindricus.* Cables have frequently been similarly attacked, and an instance of identical injury due to another Bostrychid has already been noticed [*R.A.E.*, A, vi, 141]. *B. cylindricus* is one of the commonest Australian wood-boring beetles, attacking all kinds of timber; but the larvae usually feed and pupate in the sapwood. The beetle has been recorded as damaging empty wine-casks. The boring in lead seems to be casual, and no practical method of dealing with it has presented itself, except to destroy any poles, etc., in which the larvae were found to be breeding in any numbers.

Davis (J. J.). **The Green Japanese Beetle.**—*New Jersey Dept. Agric., Trenton,* Circular 30, February 1920, 33 pp., 19 figs. [Received 5th July 1920.]

The greater part of the matter contained in this paper has already been noticed [*R.A.E.*, A, viii, 307]. The importance of individual co-operation in the work of preventing the spread of the green Japanese beetle, *Popillia japonica,* is emphasised. To limit the damage in infested districts the use of arsenical sprays as repellents is recommended, with soil insecticide operations where suitable, and ploughing in the autumn to destroy the larvae [*loc. cit.*]. Clean cultivation and weed destruction are important. Poultry and pigs are both useful in destroying the grubs, and the former should follow the plough where possible. Hand collecting on a large scale by boys also produces good results. The most important natural enemies of these beetles in the United States are birds, but a Pentatomid bug (*Podisus maculiventris*), and the wheel bug (*Arilus cristatus*) have been observed feeding on them. No true parasites have been reared.

Degrully (L.). **La Pyrèthre contre la Cochylis et l'Eudémis.**—*Le Progrès Agric. & Vitic., Montpellier,* lxxv, no. 27, 4th July 1920, p. 5.

In response to many enquiries as to where to obtain the pyrethrum-soap solution advocated for use against the vine moths, *Clysia ambiguella* and *Polychrosis botrana* [*R.A.E.*, A, viii, p. 348], the following formulae are given: 5 lb. soft-soap dissolved in 5 gals. hot water, mixed with 6 lb. pyrethrum powder and diluted with 45 gals. of cold water; or, 50 gals. water containing 1 lb. olein soap and 5 lb. pyrethrum powder. Good quality pyrethrum powder is, however, very scarce at the present time, and it is doubtful whether it could be obtained in sufficient quantities for large applications. The author has recommended the culture of pyrethrum in France, which should be successful, as it has been in Switzerland; but none has as yet been gathered. Meanwhile, nicotine at 10 per cent. strength is recommended at the rate of $1\frac{1}{2}$ gals. per 100 gals. of water.

OGUMA (K.). **A New Scale-Insect, *Xylococcus alni*, on Alder, with special reference to its Metamorphosis and Anatomy.**—*Jl. Coll. Agric. Hokkaido Imp. Univ., Sapporo, Japan*, viii, pt. 3, March 1919, pp. 77–109, 4 plates. [Received 7th July 1920.]

Xylococcus alni, sp. n., here described, seems to be restricted to *Alnus japonica*. It takes three years to reach maturity; and all the specimens that have been examined are in the same stage of development, no case having been found in which examples of different stages occur in one and the same year.

FULLAWAY (D. T.). **Division of Entomology.**—*Hawaiian Forester and Agriculturist, Honolulu*, xvii, no. 5, May 1920, pp. 133–135.

During 1919 no new field work was undertaken owing to the unsettled conditions, but a pupal parasite of *Pieris rapae* (the imported cabbage worm) obtained from California was propagated in the insectary, and large colonies were liberated in the cabbage fields in Oahu and Hawaii. Its establishment has not yet been determined.

Considerable time has been given to the study of termites, which are becoming severely destructive with the increase and spread of two lately immigrant species.

In September an infestation of forest ferns by the Australian fern weevil, *Syagrius fulvitarsis*, was discovered [*R.A.E.*, A, viii, 191]. The ferns are important as part of the ground cover of the Hamakua forest reserve, and it was decided to attempt to control the outbreak and prevent its spread beyond the small area affected. This necessitated the destruction of all ferns in the area as far as possible, which were cut and burned; thereafter, the ground cover was either fired or poisoned to destroy crawling weevils, which might have escaped the initial treatment, and every vestige of fern plant; and an artificial barrier of crude oil was laid to contain the insect. At the same time a study was made of the weevil's life-history.

The following beneficial insects have been liberated:—*Galesus silvestrii* 7,710, *Diachasma tryoni* 12,465, *D. fullawayi* 2,325, *Tetrastichus giffardianus* 28,675, *Dirhinus giffardi* 3,640 and *Opius humilis* 6,900, all being parasites of the fruit-fly [*Ceratitis capitata*]; *Opius fletcheri* 45,695, a parasite of the melon fly [*Dacus cucurbitae*]; *Paranagrus osborni* 154,200, a parasite of the corn leaf-hopper [*Peregrinus maidis*]; and *Spalangia cameroni* 7,300, and *Pachycrepoideus dubius* 150, parasites of the horn-fly [*Lyperosia exigua*].

Walton (W. R.). **The Hessian Fly and how to prevent Losses from it.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 1083, March 1920, 16 pp., 13 figs. [Received 7th July 1920.]

Much of the matter contained in this bulletin has already been noticed [*R.A.E.*, A, iii, 416]. In the chief winter-wheat growing regions of the United States the Hessian fly, *Mayetiola* (*Phytophaga*) *destructor*, is the most injurious enemy of the wheat crop. Damage by this pest amounting to £20,000,000 in a single year has been known to occur. Barley and rye are injured to a less extent, and oats are not attacked. The larvae feed on the stems under the sheath. In severe infestations much of the young wheat may be killed outright, particularly in the case of the autumn brood larvae; otherwise as the wheat head grows heavy with grain the stem bends, or even breaks off at the weakened spot, and the head falls to the ground out of reach of the harvesting machinery. Infested plants are usually of a darker colour, with shorter, ranker leaves.

The insect has adapted its life to varying climatic conditions in that the summer pupal stage is short in the north and long in the south. The effect of cold on the fly seems to have been overestimated. Eggs are laid in quite cold weather, and frosts seem only to delay their hatching. The immunity of late-sown wheat is not due to frost, but to the fact that most of the flies have disappeared by the time that severe frosts occur. Larvae in the puparia have been known to survive for more than two years. By application of the bioclimatic law [*R.A.E.*, A, viii, 87, 278] it is indicated that the first general colouring of the foliage is as a rule coincident with the safest and best time to begin sowing wheat on any farm within the range of winter wheat culture.

Parasites play a very important part in the control of the Hessian fly. Often one species will almost exterminate the pest in a particular locality. They cannot however be depended upon for control. *Polygnotus hiemalis* is perhaps the most useful, and *Eupelmus allyni* is known to be of considerable importance, though it sometimes functions as a hyperparasite. More than twenty species of insect parasites of the Hessian fly are now known, but many of them are apparently of little importance under most conditions.

Once established the Hessian fly cannot be reached by any control measure, though the application of a quickly acting fertiliser to increase the vigour of the plants may be beneficial. Preventives however have an important effect; crop rotation lessens the activity of all wheat pests and should be carried out where practicable; stubble should be ploughed deeply, and the surface rolled or harrowed, to prevent the flies emerging; but this should not be practised, under existing systems of rotation, wherever it seriously interferes with the growing of clover or the forage grasses necessary for maintaining the proper tilth of the soil. Self-sown wheat, which acts as a breeding place, should be destroyed. Everything possible should be done to ensure a strong crop by care in preparing the seed-bed and conserving moisture, and the use of the best seed and of fertilisers. Owing to the fact that the majority of the flies of the autumn brood survives for about a week only, it is possible so to time the seeding of winter wheat as to avoid the pest, and this is one of the most effective measures that can be applied. Remedial measures should be continued even when the fly is scarce to prevent its becoming abundant. Community co-operation is essential, as one infested field may furnish enough flies to damage the wheat for several miles round.

PHILLIPS (E. F.). **Control of American Foulbrood.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 1084, March 1920, 15 pp., 5 figs. [Received 7th July 1920.]

This bulletin describes American foulbrood in bees and its symptoms, emphasising the importance of distinguishing this disease, caused by *Bacillus larvae*, a spore-bearing organism, from European foulbrood. Preventive measures, which will greatly minimise the danger of infection though they will not give complete security, are described together with remedial measures which all involve different methods of removing the bees from the infected hives, and establishing them in fresh ones away from the infected combs, honey and other materials. The drugs that have been recommended for this disease are described as useless.

HAVILAND (M. D.). **Preliminary Note on Antennal Variation in an Aphis** (*Myzus ribis*, **Linn.**).—*Proc. Camb. Philosoph. Soc., Cambridge*, xx, Pt. 1, June 1920, pp. 35–44.

Experiments as to the effects on the position of the sensoria on the antennae of the winged parthenogenetic females of *Myzus ribis*, produced by different foods, *e.g.*—green currant leaves, or currant leaves covered with red blisters from Aphid attack—suggest that the antennae of *Myzus ribis* are modified according to the food taken, and that the effect in one generation is discernible in the succeeding three or four.

DODD (A. P.). **Notes on the Exotic Proctotrupoidea in the British and Oxford University Museums.**—*Trans. Ent. Soc., London*, 1919, Pts. 3, 4, 15th January 1920, pp. 321–382. [Received 12th July 1920.]

Among the sixty-three new species described are *Hadronotus antestiae* and *Telenomus truncativentris*, bred from the eggs of the coffee-bug, *Antestia lineaticollis*, in East Africa.

MUNRO (J. W.). **Survey of the Forest Insect Conditions in the British Isles 1919.**—*Forestry Commission, London*, Bull. 2, May 1920, 35 pp., 18 figs., 3 plates 1 map. [Received 10th July 1920.]

The war conditions were particularly favourable to the spread of various forest insect pests [*R.A.E.*, A, vi, 258] in Great Britain and Ireland, and a preliminary survey of conditions shows that coniferous woods generally are in a most unhealthy condition. In a summary of the results of this survey it is stated that Scots pine woods, and young coniferous plantations on the site of or near felled areas of Scots pine are suffering most. Pure larch, spruce, Douglas fir and

Corsican pine woods are comparatively free from injurious insects and do not form centres of dispersal. The most injurious species are *Hylobius abietis*, *Myelophilus piniperda*, *Pityogenes bidentatus*, *Hylastes ater* and *H. opacus*. Some secondary enemies (*e.g.*, *Ips* (*Tomicus*) *acuminatus*) have in certain localities become of primary importance.

Attention should be given in the first place to *Hylobius abietis* and *Myelophilus piniperda*. The survey indicates that the former can best be controlled by trapping the adults, and that the latter can be controlled by means of trap-trees. Further information with regard to the best means of trapping *Hylobius*, and to the most suitable time for setting and barking trap stems for *Myelophilus*, in different localities is desirable. It is also a question whether Scots pine is not planted too extensively, both pure and in mixture with other coniferous trees. From the entomological point of view this is undoubtedly the case, and statistics as to the rate of growth of timber support the contention.

With the exception of the Douglas fir seed-fly, *Megastigmus spermotrophus*, there is no evidence of imported insects causing serious loss to foresters in this country.

A description of the more important forest insects is given in an appendix. Of those found in felled areas, the life-history of *Hylobius abietis* is not very well known. All the early stages are spent underground in the stumps and roots of Scots pine, and, as a result, the only sure remedial measure is to trap and collect the adult weevils. *Pissodes notatus* and *P. pini* have a similar life-history, though their habitats are usually different, *P. pini* preferring pole-woods and *P. notatus* young plantations of two to ten years standing. Like *Hylobius*, the weevils of this genus have a long adult life, and are to be found throughout all the warm months of the year. The life-cycle commonly occupies a year. The female lays her eggs in punctures made in the bark, and the grubs tunnel between the bark and the wood, often causing radiating galleries that end in the pupal chamber.

Both species are easily trapped during the warmer months with logs which should be removed and barked every three months, the bark being burned. *P. pini* attacks Scots pine or occasionally spruce, and any part of the tree may be injured. *P. notatus* attacks Scots pine, and sometimes Austrian and Weymouth pine. The larva mines the bark of the stem and roots, girdling them and killing the plant. The adult gnaws the young shoots. Trees weakened or injured from any cause are more liable to attack.

Myelophilus piniperda (pine-shoot beetle) has normally two broods and one generation a year. The eggs are laid and the larvae burrow in Scots pine stems. The beetles bore in the last year's shoots, and severe attacks involving repeated loss of the leading shoot, kill the tree. This beetle will become more serious if it is compelled to attack green standing timber, when the felling, which is still going on everywhere, ceases. The best means of controlling it are by careful thinning and cleaning of all pine woods. Stems felled during the winter should be barked in May and the slash burned up before that date. Where attacks are severe, trap-stems should be felled in September, and barked in May or June to catch the first brood, and felled in July, and barked in December for the autumn brood. The lesser pine-shoot beetle, *M. minor*, causes similar damage, but its egg-galleries, being horizontal, are more injurious. It has only been observed in Scotland.

The black pine beetle, *Hylastes ater*, and the brown pine beetle, *Hylastes* (*Hylurgops*) *palliatus*, have already been noticed [*R.A.E.*, A, vi, 116]. The former can only be controlled by uprooting and burning all attacked plants and trapping the beetles by means of thin logs partly buried in the soil on the slant. Other beetles of the genus *Hylastes* cause injury to a minor degree. *H. palliatus* causes damage by boring under the bark of sickly trees, and by the borings of the larva. Control depends almost entirely on clean forestry methods, as trap-trees do not always prove attractive.

The two-toothed pine beetles, *Pityogenes bidentatus*, and in the north of Scotland *P. quadridens*, destroy the cambium in cutting their egg-tunnels under the bark. As they are very prolific where they occur, they rapidly encircle young stems, causing cessation of the sap flow and death. The eggs of the first brood are laid in May, and of the second in August and September, and in the extreme north even in October in mild weather. The best remedial measures consist in burning all slash and the destruction of attacked plants. Where the infested stems may be saleable as stakes, the bark should be removed and burnt. Owing to the usual density of the plantations attacked, the use of trap-trees is not always practicable. Plants from five to twenty-five years of age are attacked, and occasionally nursery plants.

The large-toothed pine beetles, *Ips* (*Tomicus*) *laricis* and *I.* (*T.*) *acuminatus*, have greatly increased in numbers of recent years. Their life-history under British conditions is not known; clean forestry methods and the burning of all slash are the best means of dealing with them. The pith pine beetles, *Pityophthorus lichtensteini* and *P. pubescens*, are of little importance except locally in Perthshire. They tunnel in the bark and pith of the smaller pine twigs.

Insects associated with felled spruce areas are not in general of such great importance. They include *Hylastes cunicularius* (black spruce bark-beetle), which in parts of Scotland causes damage in young plantations similar to that caused by *H. ater*; *Trypodendron lineatum*, breeding in fallen spruce and stumps, and sometimes in Scots pine and larch, which is injurious only when occurring in large numbers; *Pityogenes chalcographus*, which has not previously been observed in Britain, breeding in fallen spruce stems and suppressed trees in Perthshire (this beetle probably resembling *P. bidentatus* in biology and control), and *Dryocoetes autographus*.

Of insects found in standing woods, the large larch saw-fly, *Lygaeonematus* (*Nematus*) *erichsoni*, was observed in parts of Scotland. Very severe sporadic outbreaks of this pest have been recorded in the past, and it is desirable that any instance of it should be reported. In young plantations hand-picking of the larvae is very effective. Pine sawflies of two species, *Lophyrus pini* and *L. rufus*, were observed in small numbers.

The pine tortrix moths attack Scots pine trees of five to twelve years of age in various districts. *Rhyacionia* (*Tortrix*) *buoliana* (pine-shoot moth) is the most injurious; its larva destroys both buds and shoots. *R.* (*T.*) *turionana* (pine-bud moth) destroys the leading bud. *R.* (*T.*) *resinella* (resin-gall moth) forms a resinous gall around the shoot, and causes death of the shoot or twigs above the gall by gnawing into the shoot. It is doubtful whether any practical measures can be devised against these moths, and it is probable that in many cases their presence is an indication of poor soil. The larch mining moth, *Coleophora laricella*, has been observed throughout the country, having caused considerable injury locally in Surrey and Wales. The encouragement of insectivorous birds, especially tomtits, and the removal of weakly branches in young plantations are the best means of controlling this moth. The larch shoot moth, *Argyresthia atmoriella*, occurred frequently in company with *C. laricella*, and in young plantations proved more injurious than the latter.

Of Aphids, *Chermes pini* may be controlled in nurseries by fumigation with hydrocyanic acid gas or by a nicotine spray. Two spruce Aphids, *Chermes abietis*, Kalt. (*viridis*, Rtzb.) and *C.* (*Cnaphalodes*) *strobilobius*, form galls of different kinds [see also *R.A.E.*, A, vi, 154]. The injury these insects do is two-fold. The gall-formation they cause undoubtedly reduces growth, and in some localities spruce is often badly dwarfed and even killed by the continual destruction of the young shoots. All these injuries, small individually, are collectively of importance, and these Aphids must rank as considerable pests of spruce in Britain. Unfortunately satisfactory and practicable remedial measures for them have still to be devised.

Pine Weevils.—*Forestry Commission, London*, Leaflet no. 1, February 1920, 12 pp., 5 figs. [Received 10th July 1920.]

This leaflet deals at greater length with three of the weevils mentioned above, viz., *Hylobius abietis*, *Pissodes pini* and *P. notatus*. The life-history and the characteristics of the attack of *H. abietis* are described in detail. So far as is known no conifers common in Britain are immune from attack, though some are preferred to others. Attack should be anticipated if larvae can be found in the winter under the bark of stumps or their roots. There are no known preventive measures. Remedial measures are of various kinds. Destruction of the breeding grounds by uprooting the stumps is very costly, and attempts to render them unsuitable to the weevil with creosote, or by barking or charring are unsatisfactory. Insecticides are practically untried in Britain. Carbolineum painted on the stems of the young plants gives protection, but is liable to scorch the bark. An emulsion of 5 galls. milk of lime to 3 qts. linseed oil is probably better.

Various types of traps are used:—Pine billets sticking up out of pits that have been filled with layers of branches and earth, so that the ends of the branches also protrude from the pit to attract the weevils, which oviposit on the billets, the whole trap being dug up and burned in the winter; partly buried pine or spruce billets, on which the weevils lay their eggs; twigs placed on the ground and covered with fresh bark to attract the weevils, which gather under them, the traps being frequently renewed; and a new type of trap in which the bark of recently felled pine stumps is prised off in large slabs and replaced, when the weevils gather under the slabs in large numbers. Hand-picking in the young plantations is very effective.

Delay in planting a felled area until dessication and decay has made the stumps unsuitable as a breeding ground is only effective in an area isolated from other plantations. Vigorous plants withstand attack better than unhealthy ones, which are also more liable to infestation.

Woodpeckers are among the enemies of *H. abietis*. The larvae are parasitised by a Braconid and an Ichneumonid, *Ephialtes tuberculatus*, and the pupae by an unidentified Ichneumonid. An eelworm (*Tylenchomorphus* sp.) is parasitic on the larva, and in some districts a bacterial disease destroys numbers of larvae. Most of the information given on *Pissodes pini* and *P. notatus* has been noticed above.

HEINRICH (C.). U.S. Bur. Entom. **On some Forest Lepidoptera with Descriptions of New Species, Larvae and Pupae.**—*Proc. U.S. Nat. Mus., Washington, D.C.*, lvii (no. 2305) 1920, pp. 53–96, 13 plates.

This paper deals with moths that have been reared in connection with the forest insect investigations of the U.S. Bureau of Entomology. A new genus, *Tosca*, is erected and sixteen new species and two new varieties are described.

Among the new species are: *Rhyacionia* (*Evetria*) *ulteriorana* reared from cones of *Pseudotsuga taxifolia*; *R. luculentana* from *Pinus scopulorum*, the larvae inhabiting pitch nodules and feeding on terminals of branches; *Eucosma rescissoriana* from cones of *Pinus murrayana*; *E. monitorana* from cones of *Pinus*; *E. tocullionana* from cones of *Picea*; *Cydia* (*Laspeyresia*) *pallidibasalis* from cones of *Abies concolor*; *Gelechia negundella* from *Acer negundo*; *Recurvaria moreonella* from *Pinus scopulorum*; *Tosca plutonella*, a leaf-miner on *Prunus*; and *Holcocera augusti* from cones of *Pseudotsuga taxifolia*.

ROHWER (S. A.). U.S. Bur. Entom. **Descriptions of Twenty-Six New Species of North American Hymenoptera.**—*Proc. U.S. Nat. Mus., Washington, D.C.*, lvii (no. 2312), 1920, pp. 209–231.

The twenty-five new species of Hymenoptera here described include: MEGALODONTIDAE: *Itycorsia zappei*, on pine; TENTHREDINIDAE: *Periclista plesia*, on white pine; *P. pecanivora*, on pecan; *Pteronidea alnivora*, on alder; *P. mendicana*, on *Salix*; *P. amelanchieridis*, on *Amelanchier canadensis*; *P. plesia*, on *Populus tremuloides*; *Pristiphora betulavora*, on white birch (*Betula alba*); ICHNEUMONIDAE: *Lissonota evetriae*, parasitic on *Rhyacionia* (*Evetria*) *taxifoliella*; *L. dioryctriae*, parasitic on *Dioryctria xanthaenobares*; *Exochus evetriae*, a pupal parasite of *R.* (*E.*) *taxifoliella* and *R.* (*E.*) *siskiyouana*; *Mesoleius gymnonychi*, a parasite of *Gymnonychus californicus*; *Exenterus affinis* parasitic on cocoons of *Neodiprion* sp. feeding on *Pinus resinosa*; BRACONIDAE: *Microtypus dioryctriae*, parasitic on *Dioryctria xanthaenobares*.

A key is given to the North American species of the genus *Exenterus*, in which the author includes the species formerly placed in *Picroscopus*.

DRAKE (C. J.). **The Southern Green Stink-Bug in Florida.**—*Qtrly. Bull. Florida State Plant Bd., Gainesville*, iv, no. 3, April 1920, pp. 41–94, 38 figs. [Received 10th July 1920.]

The following is a part of the author's summary of this paper:—The large green stink-bug, *Nezara viridula*, L., often becomes a serious pest upon cultivated plants in Florida. All parts of plants are attacked but tender young shoots and maturing fruit are greatly preferred. Among the crops injured are tomato, potato, sweet potato, beans, cowpeas, radish, cabbage, turnip, mustard, okra, etc. In autumn and early winter the insect sometimes becomes a serious pest in *Citrus* groves, feeding especially upon the fruit, young seedlings and young shoots of older trees. Similar infestations have been reported in pecan groves.

Notes on its habits and life-history studies have been made at Gainesville, Florida. Hibernation is imperfect, about one-half of the individuals remaining upon succulent plants in the field throughout the winter months. No breeding takes place during the winter. Eggs have been found outdoors during the second week of April and as late as 12th December. The eggs are deposited in clusters, mostly on the under-side of the leaves.

The minimum period for incubation was 4 days. The minimum time for the five nymphal instars, based on individual records, was 24 days. This gives a total of only 28 days from the time the eggs are laid until the adult state is reached. Field records indicate that there are four generations annually at Gainesville, and probably five in the southern portion of the State. Development is more rapid during the summer, temperature having an important bearing upon the period of development of both eggs and nymphs.

Of six predaceous enemies recorded in the field, the bug, *Euthyrhynchus floridanus*, is the most important; three parasites of the adult and two egg-parasites have been reared. Of 800 adults of *Nezara viridula* collected in the field during the latter part of May and the beginning of June, 38 per cent. were killed by two Dipterous parasites, 31 per cent. by a Tachinid, *Trichopoda pennipes*, and the rest by a Sarcophagid, *Sarcophaga sternodontis*. Both of these flies were also bred from a number of other plant-feeding insects in Florida. The egg-parasites were not common at Gainesville and are represented by undescribed species.

When valuable garden and truck crops are heavily infested, hand-collecting seems to be the best control method. The proper management and cutting of the cover or soiling crop will usually keep the insects under control in *Citrus* and pecan groves. In case of severe infestation of *Citrus* it has been demonstrated that hand-collection with large nets can be done successfully and profitably. In using large nets the work should be done in early morning or on cool days when the temperature is below 70° F. At a higher temperature many of the adult bugs will save themselves by taking flight before they drop into the nets.

Of both wild and cultivated vegetation the insects generally show a decided preference for leguminous and cruciferous plants. During late autumn, winter and early spring the bugs often congregate upon cruciferous plants such as radish, collard, rape, mustard, turnip, etc. Some of these might serve as a valuable trap-crop at these seasons. Experiments during the summer show that radish and collard, both growing in the same row, will serve as a trap-crop to protect tomatos. The seed should be planted about 1st November so that the radish will be forming pods while the fruit of the tomato is developing and ripening during the following spring. The insects should be gathered by hand.

Leguminous plants such as cowpeas, beans, etc., are much preferred to other plants during the summer and early autumn, especially during the pod-formation period. Rattle-box (*Crotalaria urasamoensis*) probably offers one of the greatest possibilities as a trap and propagating crop during the summer. The plant itself is probably not more or perhaps as attractive to the bugs as cowpeas and beggarweed, but the blossoms are very alluring to the parasites, the principal one, *Trichopoda pennipes*, being a honey-loving insect and a constant visitor to the flowers of rattle-box. From 10 to 80 per cent. of the examples of *Nezara viridula* collected on this plant bore eggs of *Trichopoda pennipes*. On this account it seems that rattle-box should be grown as a propagating plant during summer and thus increase the number of parasites. The long blooming and pod-formation period adds much to the value of the plant as a trap and propagating plant.

Moznette (G. F.) U.S. Bur. Entom. **A Blossom Destroying Beetle on the Mango.**—*Qtrly. Bull. Florida State Plant Bd., Gainesville*, iv, no 3, April 1920, pp. 95–98. [Received 10th July 1920.]

A beetle, *Anomala undulata*, causes at times great damage by destroying the whole, or parts, of the floral spikes of the mango. Different groves seem to be attacked in different seasons, while others, previously attacked, escape. The beetles are active at night, and burrow in the soil at the foot of the tree by day. The species is closely related to the May-beetles [*Lachnosterna*]. but smaller, and the larval habits are probably similar. The trees are heavily attacked, as many as thirteen hundred beetles having been taken on a tarpaulin from a single jarring of a tree. The beetle has also been recorded as attacking the flowers of other fruit trees and crops in various parts of the United States. The best method of control is the addition of a poison to the spray normally used when the mango is sprayed for *Colletotrichum*; two pounds of powdered lead arsenate or zinc arsenite to 50 gals. Bordeaux mixture (3–4–50) is added after the admixture of two pounds of soap. A good agitator is necessary in the spraying outfit. The spray should be particularly directed at the flowers, as the beetle does not attack the dormant foliage, and very little if any new growth is present at the time of blossoming.

Quarantine Department Report on Inspections and Interceptions, all Ports and Stations, for the Quarter ending March 31, 1920.—*Qtrly. Bull. Florida State Plant Bd., Gainesville*, iv, no. 3, April 1920, pp. 102–103. [Received 10th July 1920.]

The insects intercepted included:—The black fly, *Aleurocanthus woglumi* from Cuba twice on *Citrus*, once on mango, and once in a mail package in connection with the parcel post inspection; *Aspidiotus destructor*, 29 times on shipments from Cuba, Porto Rico and the Isle of Pines; *Aspidiotus* (*Targionia*) *hartii* on yam from Georgetown [S.C.?]; and San José scale [*Aspidiotus perniciosus*] on 36 shipments from other States, chiefly the south-eastern ones, but including points as far west as Louisiana and as far north as North Carolina.

Berger (E. W.). **Whitefly Fungus.**—*Qtrly. Bull. Florida State Plant Bd., Gainesville,* iv, no. 3, April 1920, p. 104. [Received 10th July 1920.]

The Entomological Department of the State Plant Board has ready for distribution about 3,000 pure cultures of the red fungus, *Aschersonia aleurodis,* and yellow fungus, *A. flavocitrina,* which infest the common and cloudy-winged whiteflies of citrus [*Dialeurodes citri* and *D. citrifolii*]. A culture is sufficient for starting the fungus in an acre of grove. The method of ordering the cultures is detailed, growers being requested to send a few dozen leaves for examination so that, if necessary, *A. flavocitrina,* regarded by some as being more effective against *D. citrifolii,* may be included.

Smith (L. B.). **The Green Clover Worm a Pest of Soy Beans** (*Plathypena scabra,* **Fab.**).—*Qtrly. Bull. Virginia State Crop Pest Commiss., Blacksburg,* i, no. 3, October 1919, 8 pp., 4 figs. [Received 10th July 1920.]

Soy beans suffered severe injuries throughout Eastern Virginia in 1919 from the attacks of the green clover worm (*Plathypena scabra,* F.), while other leguminous plants, including lima and snap beans, lucerne and clovers were also injured to some extent. A similar outbreak of this moth was reported over most of the Atlantic coastal plain region from Maine to Florida. The leaves and occasionally the blossoms of the plants are eaten. It is seldom that the plants are killed, new growth coming again after the outbreak subsides, but the quantity of seed is much less owing to the extra foliage produced.

The life-history of *P. scabra* has been already noticed [*R.A.E.,* A, vii, 201]. There are probably four generations in Virginia, but they overlap considerably. It appears that the caterpillars of the first generation feed chiefly on clover and lucerne, as beans are not available before the middle of May.

A spray recommended to control the caterpillars on beans is made of lead arsenate (powder), $1\frac{1}{4}$ lb. in 50 U.S. gals. of water. As an alternative a dust made of 5 lb. lead arsenate and 50 lb. gypsum or air-slaked lime may be used. Snap beans should be treated just before the blossoms open; with later treatment the blossoms will be destroyed, and after the pods are set, there is a danger of poisoning the beans as food. Lima beans should be sprayed just before the second crop of blossoms comes into bloom. Soy beans grown for seed may be treated with the same spray with the addition of 2 lb. of lime. It is unnecessary for the spray to reach the under-side of the leaves, and it may be applied at any time. If the caterpillars have disappeared before any measures are taken, a furrow thrown towards the base of the plants from each side of the row will kill the pupae, or prevent the moths emerging. Soy beans sown broadcast for forage should not be treated unless the infestation is very severe, since, as far as foliage is concerned, they will probably recover. In very severe infestations they should be cut and raked to destroy the larvae by exposure to the sun and lack of food.

Clover and lucerne should be cut immediately if the caterpillars are abundant. Lucerne develops new growth after cutting, and in the case of clover, the loss from early harvesting is less in the end than it would be if the caterpillars were permitted to feed uninterruptedly.

SCHOENE (W. J.). **Twelfth Report of the State Entomologist and Plant Pathologist 1918-19.**—*Qtrly. Bull. Virginia State Crop Pest Commiss., Blacksburg*, i, no. 4, January 1920, 28 pp., 4 figs. [Received 10th July 1920.]

In this report are given the paragraphs of the Acts of 1918 authorising quarantines against pests which might in the future be found to exist within or outside Virginia, and providing for the inspection and certification of florists' stock. The danger of introduction of the sweet potato weevil (*Cylas formicarius*, F.) is emphasised and the quarantine measures adopted against it in 1919 are detailed, prohibiting movement of its food-plants from infested States without an inspection certificate from the State of origin. The work done and proposed in connection with the Oriental moth, *Cydia* (*Laspeyresia*) *molesta*, is described [*R.A.E.*, A, viii, 354].

Serious insect damage during 1918 and 1919 was caused by a number of insects, including the codling moth [*Cydia pomonella*]; the green clover worm (*Plathypena scabra*, F.); broods ix and x of the seventeen-year cicada [*Tibicen septemdecim*], against which trees were protected in some cases by wrapping in cloth; and potato aphis (*Macrosiphum solanifolii*), which occurred in large numbers on potatoes and spinach. Spraying, which is a general practice on potatoes, seems advisable on spinach also. The spray must hit the insect and should be stronger than for other Aphids. On the spinach that had been attacked an unusual outbreak of blight occurred four weeks later.

The spring army worm, *Cirphis* (*Heliophila*) *unipuncta*, was abundant in 1919. It was controlled on young grass and millet by rolling the crop with a heavy roller. It was also confined to certain fields by deep furrows; when these became filled with caterpillars they were destroyed by dragging a heavy chain or small log through them.

An unprecedented outbreak of the false cabbage aphis [*Aphis pseudobrassicae*] occurred in the autumn of 1919 in a long-continued drought. A spray of one pint nicotine sulphate to 100 gals. water and five bars of laundry soap was applied, a special adaptation of a two-wheel spraying outfit being devised to spray six rows at once. Over 75 per cent. of the insects were destroyed. The locust leaf-miner (*Chalepus dorsalis*), which has for several years damaged leaves of the black locust tree, has been observed on apple, but is not believed to cause important damage.

In the investigation work of the department the control of the woolly aphis, *Eriosoma* (*Schizoneura*) *lanigerum*, Haus., is still being studied. Work on the life-history of the pink and green potato aphis (*Macrosiphum solanifolii*) has proved that this insect is instrumental in transmitting several serious mosaic diseases of vegetable crops. The spray formula recommended against it is: $\frac{3}{4}$ pint of nicotine sulphate (40 per cent.), 4 lb. fish-oil soap and 50 U.S. gals. water. Experiments have also shown that the tarnished plant-bug, *Lygus pratensis*, carries the virus of spinach blight.

Flea-beetles (*Epitrix fuscula*, Crotch, and other species) damage egg-plants and render them liable to infection from several diseases. The most satisfactory method of control is to spray the plants weekly with 3 lb. of calcium arsenate (powder) and 50 gals 4–6–50 Bordeaux mixture. They should also be dipped in a solution of 2–4–50 Bordeaux mixture with the addition of the poison when they are planted out.

Severin (H. C.). **Cabbage Worms. The Imported Cabbage Worm, the Cabbage Looper and the Diamond-back Moth.**—*South Dakota State Entomologist, Brookings*, Circ. 9, November 1919, 10 pp., 2 figs.

A popular account is given of the life-histories and habits of and methods of control for *Pieris* (*Pontia*) *rapae*, L. (cabbage worm), *Phytometra* (*Autographa*) *brassicae*, Riley (cabbage looper) and *Plutella maculipennis*, Curt. (diamond-back moth), all of which are serious pests of vegetable crops in South Dakota.

Severin (H. C.). **Currant and Gooseberry Worms. The Imported Currant Worm and the Currant Span-Worm.**—*South Dakota State Entomologist, Brookings*, Circ. 10, November 1919, 6 pp., 3 figs.

Pteronus ribesii, Scop. (imported currant worm) is found in South Dakota wherever currant and gooseberry plants are grown. The sprays recommended for it are 1 lb. lead arsenate paste or $\frac{1}{2}$ lb. powder to 25 U.S. gals. of water, or $\frac{1}{4}$ lb. Paris green and $\frac{1}{2}$ lb. freshly slaked lime to the same quantity of water. This should be applied as soon as the leaves unfold, or when larvae are first noticed. If the second generation is destructive, fresh hellebore should be used in the proportion of 1 oz. to 1 U.S. gal. of water, or 1 oz. to 5 oz. air-slaked lime or cheap waste flour if used as a dust.

Cymatophora ribearia, Fitch (currant and gooseberry span-worm) also attacks the foliage of both plants and may entirely strip a bush of its leaves and then attack the soft growing stem and devour it also. There is one generation in a year. The eggs are glued upon the canes, and do not hatch until the warm weather in the following spring, generally in late May or early June. The larvae feed for 3 or 4 weeks before becoming full-grown, when they enter the ground and pupate at the depth of a few inches. The adult emerges 2 or 3 weeks later. Spraying as directed for *P. ribesii* will kill these caterpillars, but hellebore is not effective. They may be caught by jarring the bushes, when they drop and hang on a thread ; they can then be thrown into kerosene.

Mackie (D. B.). **A Prepared Grasshopper Poison.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, ix, no. 5–6, May–June 1920, pp. 194–197.

The season of 1919 was a particularly bad one in respect to grasshopper infestation in California, and a serious invasion is again expected in 1920. The importance of being prepared with poison-baits before infestation begins cannot be over-estimated. Unfortunately the necessary supplies are extremely difficult to obtain and very costly, and many people were prevented from taking action for these reasons. Experiments were therefore undertaken with a view to devising a formula that could be put in cans and kept without deterioration until needed. The compound that proved most successful and economical consisted of 5 lb. of orange and grapefruit pulp, finely ground, with 1 lb. white arsenic. When needed for use, this concentrate is diluted with 4 U.S. gals. of water and mixed with 25 lb. bran. This mixture was found to give as good results as freshly-mixed standard bran mash, and has been kept exposed to the air for several months without any sign of decomposition. It will be made up in 6 lb. cans, each of which is sufficient to treat 5 acres of ground, and it is believed that both in efficiency and price it will meet the requirements of ranchers.

BAKER (A. C.). U.S. Bur. Entom. **Note on the Indian Peach Aphis (*Anuraphis helichrysi*, Kalt.)**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento,* ix, no. 5–6, May-June 1920, p. 203.

Attention is called to the fact that *Anuraphis helichrysi*, Kalt. (Indian peach aphis) has been recorded from Washington State south to California and into Colorado. It has generally been found on some composite weed, but recently collections have been received from plum trees in the north Pacific region. While this Aphid is very destructive to peaches in northern India, it is not known whether it will become injurious under Californian conditions, but it is well to remember that it is distinct from the common local species and might, under suitable conditions, become an important pest.

MASKEW (F.). **Fruit-Fly Larvae from South Africa intercepted.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento,* ix, no. 5–6 May–June, 1920, p. 207.

Special attention is drawn to the interception of three Trypetid larvae in a shipment of nectarines from Cape Colony.

MASKEW (F.). **Quarantine Division. Report for the Month of March, 1920.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento,* ix, no. 5–6, May–June 1920, pp. 208–210.

The pests intercepted during March included :—From Africa, Trypetid larvae in nectarines. From Barbados, *Parlatoria pergandei* and *Pseudococcus* sp. on grapefruit. From Central America, *Paratetranychus tumidus* on croton ; *Aspidiotus cyanophylli, Pseudococcus maritimus* and *Chrysomphalus scutiformis* on bananas. From Colorado, *Cydia* (*Laspeyresia*) *pomonella* in apples ; *Lepidosaphes ulmi* on apples ; *Parlatoria pergandei* and *L. beckii* on Florida grapefruit. From Hawaii, larvae of *Dacus* (*Bactrocera*) *cucurbitae* in cucumbers ; *Hemichionaspis minor, Ripersia palmarum* and *Chrysomphalus aonidum* on coconuts ; a Dipterous leaf-miner and *Saissetia nigra* on Transvaal daisies ; Trypetid larvae in coffee berries ; *Phenacaspis eugeniae* in kukui nuts ; *Saissetia nigra* and *Pseudaonidia clavigera* on *Hibiscus* cuttings ; *Diaspis bromeliae* and *Pseudococcus bromeliae* on pineapples ; *Coccus elongatus* and *Aphis* sp. on betel leaves. From Japan, *Hemichionaspis aspidistrae* and *Chrysomphalus aonidum* on *Aspidistra* ; Lepidopterous larvae and an undetermined mite on *Rhodea japonica.* From Florida, *Lepidosaphes beckii* and *Parlatoria pergandei* on grapefruit and oranges. From Illinois, *Aphis* sp. on rose plants. From Kansas, *Cydia pomonella, Aspidiotus perniciosus* and *Eriosoma lanigerum* on apples. From Louisiana, *Bruchus pisorum* in cowpeas; *Coccus* sp. on *Magnolia* ; *Tetranychus mytilaspidis* and *Aleurodes* sp.

on *Gardenia*. From Mexico, *Heliothis* (*Chloridea*) *obsoleta* on tomatos; *Chrysomphalus dictyospermi* and *Hemichionaspis* sp. on coconuts; larvae of *Tachardia* on dry twigs. From Minnesota, *Lepidosaphes beckii* on grapefruit. From Nevada and Oregon, *Heterodera radicicola* in potatoes. From Ohio, *Tetranychus mytilaspidis*, *Myzus rosarum* and other Aphids on rose plants. From Pennsylvania, *Tetranychus mytilaspidis* on violets. From Tahiti, *Parlatoria pergandei* on limes and an undetermined Coccid on coconuts. From Utah, *Hypera variabilis* (*postica*) in lucerne hay. From Washington, *Cydia pomonella* in apples.

AINSLIE (G. G.). U.S. Bur. Entom. **The Cornpith Weevil** (*Centrinus penicellus*, **Hbst.**)—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 3, June 1920, pp. 271–280, 3 figs.

The larvae of the Curculionid, *Centrinus penicellus*, Hbst., were first observed in 1911, boring in the nodes of maize stalks. The injury is but slight, though the species is well distributed through the southern States, its northern limit being probably determined by the depth to which the ground freezes during the winter. In Maryland it is abundant at an elevation of 500 ft., but entirely absent at 2,100 ft. Maize is apparently the principal food-plant, though larvae that may prove identical have been found in *Panicum crusgalli* and *P. dichotomiflorum*, and it is probable that other large grasses are attacked. There is one generation in a year. The beetles begin to emerge from the ground about 1st July and increase gradually in numbers until early August. Oviposition is generally on the main stem of maize, either in or immediately below the tassel, no eggs being laid until the tassel is pushed out beyond the sheath, exposing the culm. The punctures that then begin to appear on the stem are not all for oviposition purposes, some being merely for feeding. The eggs are soft and jelly-like, and are always placed a little to one side of the puncture. The incubation period is probably about a week, and after hatching the minute larva begins to feed on the delicate pith cells around it, turning downwards. The number of instars has not been accurately worked out, but after the first or second moult the larva constantly moves up and down in the burrow. At each node there is a distinct pause, and the cavity is always enlarged there. Sometimes growth is completed at the top node; it is very rarely that a fourth node is reached. It is seldom that more than one larva in a plant reaches maturity. The exit-hole is usually just above a node. Practically all larvae become mature about 1st October and leave the stalks almost simultaneously. The larvae when free fall to the ground and enter the soil to a depth of 3 or 4 inches if it is firm, or from 8 to 10 inches in soft or cultivated ground. They then form a spherical cell where they lie until the time for pupation in the following summer. Neither the exact time of pupation nor the length of the stage is known. The beetles are difficult to capture, as they remain hidden during the day and are very alert and quick to fly. The degree of infestation in adjoining fields may vary greatly, and may reach practically 100 per cent. It does not seem possible to plant early enough to avoid the attacks of this beetle, as the earliest tassels to appear are always attacked immediately.

Probably the adults emerge earlier and feed sparingly on various plants while awaiting their favourite food.

The only enemy of *C. penicellus* at present known is a minute Cecidomyiid, which enters the punctures and devours the eggs and perhaps also the small larvae.

A description of the last instar larva of *C. penicellus* by Mr. A. G. Böving is appended, and a description of the adult by Blatchley and Leng is quoted.

SATTERTHWAIT (A. F.). U.S. Bur. Entom. **Notes on the Habits of** *Calandra pertinax*, **Oliv.**—*Jl. Econ. Entom., Concord., N.H.*, xiii, no. 3, June 1920, pp. 280–295, 2 plates.

Sphenophorus (*Calandra*) *pertinax*, Oliv., is one of the commonest and most widely distributed billbugs in the United States, breeding normally in swamps in the cat-tail weed (*Typha latifolia*) and in sweet flag (*Acorus calamus*), its economic importance lying in the fact that it sometimes causes considerable destruction among maize plants [*R.A.E.*, A, vii, 379]. The States in which it has been found at various times are enumerated and cover a wide range. Special studies of infestations at Flushing, New York, and in Indiana, Maryland and Missouri, are described in detail. In New York State, pupation invariably occurred in cat-tail stalks, at or near the top of the larval excavation. Adults developed in the swamp as early as 6th September, and in cages as early as 19th August. Many eggs were observed on 10th August, when pupae also were present, indicating that some might not mature before winter, and explaining the fact that in March 1919, larvae, pupae and adults were all present. This long period of oviposition avoids the obliteration of a whole colony by any single rise of the water-level. Eggs laid from mid-June to mid-August will probably be placed at every normal water-level, and, if the water should rise only after the last of the eggs have been deposited, those first laid at low water-levels will have had time to mature and the adults escape. Many findings and rearings from the swamps of Indiana, Maryland and Missouri are recorded in detail. The observations show that *Typha latifolia* is a widely-distributed swamp plant and that all cat-tail beds are probably more or less infested with *S. pertinax*. Consequently, they must be regarded as dangerous to maize wherever cat-tail areas are broken for maize planting. Maize so grown frequently reaches 3 or 4 inches in height and then turns yellow. Some stalks die ; others grow up tardily, too late to make an ear.

The many observations and reports studied indicate that during the last two years about 95 per cent. of the insect damage to growing maize plants on or in the vicinity of cat-tail areas is due to *S. pertinax*, and in some localities about 90 per cent. of the total damage is due to insects and 10 per cent. to direct water damage. The close proximity of water to the surface of the soil is undoubtedly a disadvantage to maize, delaying the growth during high water-level or during unfavourably cool weather, especially when the maize is only 3 or 4 inches high. Incidental to this check in the growth of the plant, the work of any insect will have an intensified deleterious effect.

In many areas improved drainage would help the maize to grow steadily and assist the growers to destroy the food-plants of the billbug. It is an advantage to break up the land the year before the first crop is planted, as if the food-plants are completely destroyed before the winter, any surviving billbugs will leave and maize can safely be planted the following spring. When the food-plants have only been partly destroyed, it would be advisable to plant such crops as pumpkins, turnips, melons, flax, cotton or beets, that are not susceptible to billbug injury. Usually, injury by billbugs ceases to be serious after the second crop has been produced on new land where the wild food-plants have been abundant, but it may extend over several years, according to the time taken in completely destroying them.

SHERMAN (F.). **The Green Clover Worm** (*Plathypena scabra*, **F.) as a Pest on Soy Beans.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 3, June 1920, pp. 295–303.

An account is given of a bad infestation of soy beans by the larvae of the Noctuid, *Plathypena scabra*, F., that occurred in the east of North Carolina in July 1919. Within a week from the first report of the outbreak, a preliminary survey had been made and two temporary field stations were in operation. Life-history studies were made from 1st August to 10th September. Eggs were found in late August on either surface of the leaves of soy beans, and hatched in about 5 days. The larvae are very active, and when small often hang suspended from a thread. They begin feeding on the under-side of the leaf, but within a few days have eaten a hole through to the upper surface and are found equally frequently there. Even when present in great numbers the damage is not conspicuous for the first 15 days of larval life, but after that it is very pronounced. In the outbreak described, the beans were so defoliated that the lace-work of dried leaf-veins gave a cobweb-like appearance to whole fields. In the majority of cases, however, the growing bud and the older, lower leaves were left, and enabled the plants to make a quick recovery when the caterpillars were killed or had matured. The larvae become mature after 25 days, and then drop from the plant and seek shelter for pupation in crevices in the soil, under rubbish, etc. They remain 2 days in their silken cocoon before pupating, the latter stage lasting 11 days; emergence, mating and oviposition require another 8 days. Winter is passed in the adult and perhaps also in the pupal stage.

When the present investigations were begun, the larval infestation was nearing its height and immediate remedial measures were necessary, and it was obvious that nothing less than a prompt application of arsenicals would save the situation. Dusting was therefore advocated with 1 lb. dry powdered lead arsenate to 8 lb. lime dust, or spraying with 1 lb. to 25 U.S. gals. water. This remedy was found effective, and neither prohibitive in cost nor in labour of application, but prompt treatment was essential to success. Collection of larvae and of adults with nets, attraction to lanterns and bonfires, and bait-traps, were all tried with very poor results. Apparently no injury attached to the hay crop by the use of arsenicals; the dust quickly disappears from the plants and no bad results were recorded. It was found that greater strengths might safely be used with a dusting machine, but they were not necessary.

During the studies the following parasites of *P. scabra* were recovered, none of which seems to have been previously recorded from this host:—*Trichogramma pretiosa*, Riley, a very important egg-parasite, attacking about 50 per cent. of the eggs examined; the Tachinids, *Phorocera claripennis*, Macq., which is moderately important, *Exorista boarmiae*, Coq., *Frontina aletiae*, Riley, and *Euphorocera floridensis*, Tns. One each of *Anthrax lateralis*, Say, and *Sarcophaga cimbicis*, Tns., were reared; also a Hymenopteron, apparently a new species and new genus of Campopleginae.

Hayes (W. P.). **The Life Histories of some Kansas** *Lachnosterna*. *Jl. Econ. Entom., Concord, N.H.*, xiii, no. 3, June 1920, pp. 303–318, 2 figs.

These notes are the results of studies of the *Lachnosterna* of Kansas begun in 1916, and amplify the observations made by Davis [*R.A.E.*, A, iv, 284; vi, 568, and vii, 256]; they deal in particular with two species not discussed by him, namely, *L. rubiginosa*, Lec., which is second in abundance among the night-flying species in Manhattan district, and *L. submucida*, Lec., which is one of the rarer species. Other species dealt with, in the order of their abundance, are *L. crassissima*, Blanch., *L. futilis*, Lec., *L. rugosa*, Mels., *L. implicata*, Horn, and *L. vehemens*, Horn. The relative abundance of these beetles is discussed. The flight season begins about 18th April and may last until mid-August. The maximum flight occurs in May and June, except in the case of *L. submucida*, which pupates in June and July and requires a two-year life-cycle. *L. futilis*, *L. rubiginosa* and *L. vehemens* usually appear first, followed by *L. crassissima* and *L. rugosa*. Although *L. crassissima* is the most abundant species, its comparative absence on its known food-plants indicates a preference for some food that has not yet been found. It has been stated that it probably feeds on grass or low herbage. A list of the known food-plants of each species has been compiled, and the life-histories of the different species are discussed, and summarised in a series of tables. The egg-stages were found to average from 14 to nearly 30 days. The larval periods vary, both two and three-year life-cycles occurring. *L. vehemens* apparently always requires three years, and a three-year cycle for *L. submucida* is indicated in some cases besides the two-year cycle referred to above. The pre-pupal stage averages from 6½ to 9 days for the different species, the pupal stage averaging from 22 to 30½ days. The averages of the two and three-year life-cycles for the different species were 478 and 808 days for *L. crassissima*, 476 and 805 days for *L. rubiginosa*, 462 and 827 days for *L. futilis*, 461 and 814 days for *L. rugosa*, 412 and 751 days for *L. implicata*, and 845 days for *L. vehemens*. The average period for *L. submucida* was slightly over 711 days.

The natural enemies of *Lachnosterna* encountered in the course of these studies are enumerated and have almost all been previously recorded by Davis [*loc. cit.* vii, 256]. Mermethids (hairworms) have frequently been reared from the grubs. Nematodes, probably *Diplogaster aerivora*, Cobb, killed many grubs in the rearing cages in 1919, especially those of *L. lanceolata*. The Carabids, *Scarites substriatus*, Hald., and *Pasimachus* sp. (probably *punctulatus*, Hald.) were observed to attack the adults.

PARKER (J. R.). **The Chinch Bug in Montana.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 3, June 1920, pp. 318–322.

Blissus leucopterus, Say (chinch bug) was first recorded from Montana in 1911, and is of considerable interest on account of its economic importance, and also because its life-history in Montana differs remarkably from that recorded in other States. Previous records from other States have described hibernation as occurring in the adult stage; and even in the southern States, where there are two generations, the majority of the first generation do not reach maturity until July. In Montana, fourth-instar nymphs were found at their maximum abundance as early as 23rd May, and newly-transformed adults have been found on 12th June. It does not seem possible that the seasonal history of *B. leucopterus* could be a month earlier than in Kansas and Missouri, which are 10° further south, and the only reasonable explanation is that the insects hibernate in Montana in the fourth nymphal stage. This cannot, however, be definitely determined until the insect has actually been observed in its winter quarters.

The infestation in Montana was first noticed in May in a field of oats, and in June the bugs were also found on wheat and maize, but apparently no serious damage was done. The bugs evidently occur most abundantly on native grasses. Both long and short-winged forms were present in about equal numbers. It is probable that the infestation has slowly spread up the valley of the Missouri River to Montana.

In the discussion following this paper, it was mentioned that there is some variation in the hibernation and emergence in Kansas, the bugs sometimes leaving hibernation in March and appearing in early spring, and sometimes hibernating until May.

LARSON (A. O.). **A Predaceous Enemy of Bean Weevils.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 3, June 1920, pp. 322–323.

Females of *Bruchus quadrimaculatus*, F. (bean bruchus) that were under observation during oviposition, were observed to be behaving in an abnormal manner, and this was found to be due to the presence of numerous mites attached to their bodies. Although many eggs were laid in the container, very few Bruchids emerged, and examination showed many dead larvae and pupae in the beans, together with many gravid female mites. Many dead adults were also found in the jar with gravid female mites protruding from under their wings. The mites multiplied rapidly, killing off the whole of the next generation of *B. quadrimaculatus*. *B. obtectus*, Say, when put into the same jar, were able to rid themselves to some extent of the mites by using their mouth-parts as a comb for legs and antennae and then using the latter to brush their bodies, but they eventually succumbed. The mites were probably *Pediculoides ventricosus*, Newp., and were found to produce an intensely irrigating rash upon any person handling the infested Bruchids [see also *R.A.E.*, B, vii, 161, etc.].

Zetek (J.). **Hawaiian Sugar Cane Borer in Costa Rica: A Correction.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 3, June 1920, p. 323.

The author corrects a statement made in a previous paper [*R.A.E.*, A, vii, 395] reporting the occurrence of *Rhabdocnemis obscura* in Costa Rica. This should have been the banana root borer, *Cosmopolites sordidus*, Germ.

Pettit (R. H.). **Tree Hoppers and Alfalfa.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 3, June 1920, p. 323.

A tree-hopper, presumably *Ceresa bubalus*, has been found to cause considerable damage in young orchards in Michigan, the injury occurring in the autumn when eggs are laid on young apple-trees in their first or second year. This damage has been found to occur in practically all cases in orchards planted with lucerne, while adjoining orchards free from lucerne have shown little or no injury.

Herbert (F. B.). **Cypress Bark Scale, *Ehrhornia cupressi*, Ehrh.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 838, 5th June 1920, 22 pp., 6 plates, 5 figs.

Ehrhornia cupressi, Ehrh. (cypress bark scale) infests a large proportion of the Monterey cypress trees (*Cupressus macrocarpa*, Hartw.), which are among the most popular shade and ornamental trees in California. Originally a pest of incense cedar (*Libocedrus decurrens*), it has spread through large areas by the usual agencies of wind, birds, etc., and by the transportation of infested nursery stock. A map shows its present distribution on both plants. The presence of the scale is indicated by a secretion of white cottony wax protruding from the bark crevices, and covering the twigs, and under each scale may be found a small brown ring in the cambium showing where the tissue has been killed. On one or two limbs of an infested tree the foliage turns yellow, then red or brown, and this spreads until the entire tree is killed. Other food-plants include Arizona cypress (*C. arizonica*), Guadalupe cypress (*C. guadalupensis*) and occasionally deodar (*Cedrus deodara*).

A description of the various stages is given. There is only one generation in a year, the limits of which are not very well defined. The males appear in autumn, and are most abundant in October and November, when most of the females have moulted for the last time and are about half grown. After mating, the males rapidly die off. The adult females hibernate, their eggs developing during the winter and early spring. Oviposition begins on the first warm spring days and continues throughout the summer; in the autumn the females shrivel and die, but by that time the females of the next generation are well developed. The eggs hatch in from 30 to 40 minutes after deposition, and the larvae wander about until they find a suitable crevice in the bark where they remain and feed. First-instar larvae are found from April to mid-October, those of the second instar from mid-May to mid-November, and adult females all the year round.

The male larva begins to pupate earlier than the female, passing through a pre-pupal and a pupal stage, the latter lasting from 10 to 15 days, before emergence.

Predaceous insects that exercise some measure of control over *E. cupressi*, without however affecting its abundance very materially, include the Coccinellids, *Nipus biplagiatus*, Casey, *Chilocorus bivulnerus*, Muls., and *Hippodamia convergens*, Guér., the Nitidulid, *Cybocephalus californicus*, Horn, and larvae of the brown lacewing, *Sympherobius angustus*, Banks. A few examples of a small Hymenopterous parasite have been reared from caged material of the scale-insect, but this parasite is evidently very scarce. The scarcity of the scale in the Sierras would indicate that a parasite may be attacking it, but none has as yet been recorded.

A number of experiments in control, with the use of various materials, are described. A $12\frac{1}{2}$ per cent. solution of a very high gravity miscible oil (such as 33° Bé.) is recommended for spraying. This should be applied twice, once in August and once in the latter part of September, and the spray must be made to penetrate well into the cavities of the bark. Other recommendations for control are the cutting out and destruction of all dying trees or limbs and the purchase for planting of clean stock only. When the trees are not intended to form hedges or windbreaks, a wide space should be left between each in planting, cypresses being placed fully 40-50 feet apart.

Insects frequently found in association with *E. cupressi* on cypress include the cypress bark-beetles, *Phloeosinus cupressi*, Hopk., and *P. cristatus*, Lec., which cause the death of many trees. Besides being primary pests these beetles readily attack trees weakened by the cypress scale. The mealy-bugs, *Pseudococcus ryani*, Coq., *P. sequoiae*, Colem., and *P. cupressicolus*, Ferris, also do some damage, as well as the scales, *Xylococcus macrocarpae*, Colem., *Eulecanium* (*Lecanium*) *corni*, Bch., *Diaspis carueli*, Targ., *Aspidiotus hederae*, Vall., and *A. ehrhorni*, Colem. Various other cypress pests are *Phymatodes nitidus*, Lec., *Atimia confusa*, Say, *Trachykele blondeli*, Mars., *Argyresthia cupressella*, Wals. (cypress moth), *Cydia cupressana*, Kear. (cypress cone-borer), *Sirex californicus*, Ashm. (horn-tail wasp), *Lachniella tujafilina*, del Guer. (arborvitae aphis) and an undetermined tussock moth.

Tryon (H.). **The Banana Weevil** (*Cosmopolites sordida*, **Chevr.**). **Considerations influencing Methods of Repression.**—*Queensland Agric. Jl., Brisbane,* xiii, no. 5, May 1920, pp. 222-223.

In furtherance of the suggestions for the control of *Cosmopolites sordidus* (banana weevil) in a recent paper [*R.A.E.*, A, viii, p. 337] a warning is issued regarding the kind of traps used for the adults. It is pointed out that if sections of the banana stem are used as traps, the weevils will approach them for feeding purposes, but for oviposition will turn to some available banana plant in the vicinity. If on the other hand a portion of the corm or root-stock is used as a trap, the beetles will breed in it, and may thus infest neighbouring plants that have previously been healthy. Collecting weevils from the traps every morning will reduce this migration to some extent.

To obviate these dangers it is suggested that the baits should not be used generally outside the area of infestation in any plantation. They should not be placed among apparently uninfested stools growing adjacent to a known infested area. It is preferable to place the baits on the soil between the banana rows or on tracks traversing the plantation. Weevils have been observed to visit baits on hard, bare roads and on the tops of standing tree-stumps. The corm or root stock should be used for bait, and every trap should be examined once a day, preferably in the early morning, the soil on which it has rested also receiving close attention. The cut surfaces of the baits, if found to be dry, should be pared, and should never be used for more than three weeks at the most.

Suckers that are to be used in establishing a new plantation should be removed before nightfall on the same day on which they are separated and dried at some distance from the source, in order to prevent infestation before they are planted.

During mid-winter the adults emerge from the pupae in far fewer numbers than at any other time. This, therefore, is the season when old and infested stools should be eradicated and the ground cleared. Even after this has been done traps should be laid on the cleared ground, as it has been proved that weevils covered up in the soil, whether enclosed in fragments of the stool or not, may for many days following the clearing of the land emerge and fly off to banana stools in the neighbourhood.

PICARD (F.). **La Lutte contre la Cochylis par le Choix des Cépages et par la Culture de Plantes attractives.**—*Le Progrès Agric. et Vitic., Montpellier*, lxxv, no. 28, 11th July 1920, pp. 36–39.

In response to an enquiry regarding the value of resistant varieties of vines as a measure for guarding against the attacks of the vine moths, *Clysia ambiguella* and *Polychrosis botrana*, it is suggested that the best method of preventing attack is not only to plant the varieties that are least attractive to these pests, but also to surround these plants with some food-plant that is extremely attractive to them. It is considered a great mistake to destroy all the preferred food-plants of a pest in an infested region as a means of exterminating it, as this merely has the contrary result of driving the pest on to the cultivated crop.

An analogy is drawn between the possibility of thus protecting a cultivated crop by some more attractive food-plant, and the suggested method of protecting man from the attacks of mosquitos by surrounding him with those species of animals that are preferred hosts [*R.A.E.*, B, viii, 141], or from ticks by the keeping of pigs. It is suggested that the common flax-leaved daphne, *Daphne gnidium*, plays in vineyards the same rôle that the pig fills towards man. It is stated as certain that a vine of some resistant variety, surrounded by a hedge of *D. gnidium* would remain free from attack by *P. botrana* even in an infested locality, all the moths being attracted to the preferred food-plant. In this way, *P. botrana*, which is so difficult to destroy, would be reduced to an inoffensive rôle.

RAND (F. V.) & PIERCE (W. D.). **A Coördination of our Knowledge of Insect Transmission in Plant and Animal Diseases.**—*Phytopathology, Baltimore,* x, no. 4, April 1920, pp. 189–231. [Received 14th July 1920.]

This paper reviews the present knowledge with regard to insect transmission of plant and animal diseases, and the importance in future studies of collaboration between pathologist and entomologist is emphasised.

PIERCE (W. D.). **An Offer to the Sugar Planters to conduct the Introduction of Cuban Parasites of the Sugar Cane Borer.**—*Mineral, Metal & By-Products Co., Dept. Biol., Denver, Colo.,* Spec. Bull. 1, March 1920, 6 pp. [Received 14th July 1920.]

It is known that many growers of sugar-cane in the United States are losing thousands of dollars' worth of sugar annually owing to the depredations of the sugar-cane borer [*Diatraea saccharalis*], and that, while parasites have been introduced from Cuba with great success in certain plantations in Louisiana, it is left to the planters themselves to provide the funds and arrange for the introduction of the necessary numbers of parasites into their plantations.

The suggestion is made that if planters will subscribe funds with the author as trustee, these funds will immediately be used to secure the best methods of parasite introduction under a competent agent. Laboratories will be established at New Orleans, as distributing centres, and in Cuba. It is the intention of the Biological Department of the Mineral, Metal & By-Products Co. to expand until it has the best force of expert technical men in the commercial field, and eventually to manufacture many of the chemicals required for agricultural projects and to supply at reasonable figures fertilisers of standardised quality and designed for particular soils.

PIERCE (W. D.). **A Proposition for the Reorganisation of Railroad Agricultural Work in the Interests of Efficiency and Increased Tonnage.**—*Mineral, Metal & By-Products Co., Dept. Biol., Denver, Colo.,* Spec. Bull. 2, March 1920, 7 pp. [Received 14th July 1920.]

In furtherance of his schemes for the eradication of the Mexican cotton boll weevil [*Anthonomus grandis*] and other pests [*R.A.E.*, A, viii, 158] the author appeals to the railway companies of the United States to give active support to a service that is designed to report constantly upon insect pest conditions and enable experts to prepare for probable insect infestations and check them at the start. It is suggested that this should preferably be a joint railroad undertaking, and it is pointed out how greatly the railroads would benefit by the increased tonnage that would result from a decrease in insect depredations. A suggested method of financing the operations is described.

WAKELAND (C.). **Alfalfa Weevil and Control Methods.**—*Univ. Idaho, Boise,* Exten. Circ. 23, May 1920, 4 pp.

This circular gathers together in a concise form the known facts that are valuable to the farmer in combating the alfalfa weevil [*Hypera variabilis*] and the losses caused by it. [*R.A.E.*, A, vi, 339, etc.]

SCHULTZ (E. S.) & FOLSOM (D.). **Transmission of the Mosaic Disease of Irish Potatoes.**—*Jl. Agric. Res., Washington, D.C.*, xix, no. 7, 1st July 1920, pp. 315–337, 8 plates.

The following is a portion of the author's summary of this paper :— Transmission of potato mosaic by means of tubers, grafting, plant juice, and Aphids (*Myzus persicae*, Sulz.) was effected under various conditions, including those essentially of the field with insects controlled. Infection was obtained with intervarietal transfer of juice.

Transmission was attempted, but without success so far as could be ascertained in the same season, by means of flea-beetles (*Epitrix cucumeris*, Harris), and Colorado potato beetles (*Leptinotarsa decemlineata*, Say). Preliminary observations indicate that infection does not result from growth in soil that produced mosaic potato plants the previous season.

It appears impossible either for infected plants to recover or, so long as diseased stock is not far off and insect carriers exist, to assure the maintenance of health of susceptible varieties by roguing plots or by selecting hills, tubers, or seed pieces.

Isolation of plants by means of insect cages, as well as elimination of insects in the greenhouse, have maintained stocks disease-free, indicating that control of Aphids and possibly of some other kinds of insects as well, is the most important means of checking the spread of potato mosaic among susceptible varieties.

MATSUMOTO (S.). **Budogaichu ni kwansuru Kenkyu.** [Studies on Injurious Insects of the Vine.]—*Rinji-Hokoku* [Supplementary Report], *Prefectural Agric. Expt. Sta., Okayama*, no. 21, 30th April, 1920, 28 pp., 3 plates.

This deals with three insect pests of the grape vine. The Aleurodid, *Aleurodes taonabae*, Kuw., was originally described as attacking *Taonaba japonica.* It infests the upper surface of the vine leaf, which becomes rolled up and sooner or later falls. It also attacks the grapes. As observed in confinement, there are three generations a year ; the winter is passed on *Taonaba* leaves as larvae, which become adult in May or June ; these enter the vineyard and lay eggs, giving rise to another generation in August that again oviposits on the vine foliage ; the next brood becomes adult from the middle of September to the beginning of October and oviposits on *Taonaba* leaves near the vineyard. In the field, though a great many of the insects infest the vineyard, few seem to remain and breed on *Taonaba* throughout the year. The burning of infested foliage of *Taonaba* near the vineyards is therefore the surest method of preserving vines from attack. Kerosene emulsion with or without insect powder is also efficacious.

A leaf-hopper, *Zygina apicalis*, Mats., does considerable damage to both foliage and fruit. In breeding experiments it has been found to have three generations a year and to hibernate in the adult stage. Vineyards become infested in the middle of April, and the eggs are laid singly in the tissue of the leaf-veins ; they hatch at the beginning of June and become adult at the end of that month. The adults of the second generation appear in the middle of August and of the third in the middle of September. In the field, however, both nymphs and adults are always present after July. In general, the insect increases in numbers toward autumn, so that applications of kerosene emulsion with insect powder at the beginning of the outbreak effectually reduce this pest. In spraying, the vines should be surrounded by a tent so as to prevent the adults from escaping by flight.

The vine-infesting Cerambycid, *Xylotrechus pyrrhoderus*, Bates, appears once a year, passing the winter within the vine stems in the larval stage. In May or June the larva attacks the wood beneath the bark so that the upper portion of the vine withers. Pupation takes place within the stem and the adult appears in August or in September. It usually lives a week and lays eggs in the bud, and the resulting larvae bore into the stem. Unlike most Cerambycids, this species does not eject its excrement through the aperture of the burrow, so that detection of its presence is rather difficult, though late in the season the infested area may be distinguished by the dark colour of the bark and should be removed with a knife.

AOYAMA (T.). **Kansai no Gaichu ni kwamsuru Chosa.** [Investigation on Injurious Insects of the Sugar-Beet.]—*Tokubetsuhokoku*, [Special Report], *Korea: Heian-Nando Seedling Plantation Sta.*, no. 1, June 1920, 31 pp., 4 plates, 1 map.

The weevil, *Scepticus insularis*, Roel., is a one-brooded insect which passes the winter in the larval stage, pupates at the end of March and appears as an adult at the beginning of April. Serious damage is done by the adults to the buds of sugar-beet from the end of April to the beginning or middle of May. The insect also feeds on grasses, *Rumex japonicus*, *Anthriscus silvestris*, *Chelidonium majus*, *Medicago sativa*, *Capsella bursa-pastoris* and *Draba nemorosa*, and these plants may be utilised as trap-crops.

As regards other Coleopterous pests, *Serica* sp. has one annual generation, overwintering in the larval stage, pupating in March and the adult appearing at the beginning of April. The adults devour the buds, and the larvae, which live underground two inches below the surface, eat the young roots. *Opatrum reticulatum*, Motsch., is a one-brooded beetle. It passes the winter as a larva and pupates at the end of March, the adult appearing at the beginning of April. The adults injure young buds, and the larvae which live just beneath the ground (half an inch deep) attack the young roots. *Epicauta megalocephala*, Gebl., is also one-brooded, over-winters in the larval stage and pupates in April, the adult emerging at the end of May. It occurs in large numbers and destroys the foliage.

Lepidopterous pests include *Zinckenia fascialis*, Cram., which has three generations, the adult moths appearing in June, July, and at the end of August or in September: it hibernates in the soil as a pupa. The caterpillars of the third brood do the most serious damage to the foliage. *Barathra brassicae*, L., has two generations and winters in the pupal state. The caterpillars devour the foliage. *Laphygma exigua*, Hb., appears in June and in July, and passes the winter as a pupa. The caterpillars are nocturnal feeders on the foliage.

Pegomyia vicina, Lint., has three generations, in June, July and August, and passes the winter as a pupa. The larvae mine the leaves.

Atractomorpha bedeli, Boliv., appears once a year, in July, and the winter is passed in the egg-stage. The adults and nymphs attack the leaves where beets are grown near weeds. *Lachnosterna diomphalia*, Bates, appears as an adult in June, passing the winter as a larva. The beetles live just beneath the earth and eat the foliage at night. The larvae attack the young roots. Eggs are laid half an inch deep and pupation takes place 1–2 inches below the surface. *Dolycoris baccarum*, L., appears twice a year, in May and in June, and the winter is passed as an adult. The nymphs suck the leaf and flower-buds.

A beneficial Carabid beetle, *Calosoma chinense*, Kirby, is also described, several cases having been observed of its preying on Noctuid larvae attacking beet. It has probably one annual generation, and hibernates in the larval stage.

MITANI (K.), WATARAI (M.) & KONO (D.). ***Pediculoides*-Dani no Yadonushi to shiteno Sangyo ni tsuite.** [On the Silkworm Pupa as the Host of the *Pediculoides* Mite].—*Sangyo-Shimpo* (Journal of the Silk Industry), *Tokyo*, xxviii, no. 327, 1st June 1920, pp. 520–522.

Although it is recognised that the silkworm pupa is the most favoured host of the parasitic mite, *Pediculoides*, this is dependent upon the maturity of the pupa. The authors' experiments showed that parasitism by the mite is only readily effected up to the fourth day after pupation by the silkworm. This may chiefly be due to the fact that the silkworm pupa is by this time far more strongly chitinized, and the mites are incapable of finding their way into the host's body.

NALEPA (A.). **Eriophyiden aus Java. (Zweiter Beitrag.)** [Eriophyidae from Java. Second Contribution.]—*Verhand. k.k. zool.-bot. Gesellsch., Vienna*, lxviii, nos. 1 & 2–5, 15th March & 10th June 1918, pp. 40–48, 49–92. [Received 7th June 1920.]

In all, 38 new species are described, belonging to 8 genera, 3 of which are new. The majority (25) belong to the genus *Eriophyes*; 4 to *Phyllocoptes*; 2 each to *Epitrimerus*, *Tegonotus*, and *Oxypleurites*. For the remaining 3 species the genera *Phytoptochetus* and *Cecidodectes* of the subfamily ERIOPHYINAE and *Diptilomiopus* (PHYLLOCOPTINAE) have been erected. *Eriophyes gastrotrichus*, sp. n., is recorded from sweet potato (*Ipomoea batatas*). Keys to the species of *Eriophyes* and *Phyllocoptes* are given. There are also two lists, one of the galls and their producers, arranged according to plant orders, and another of the mites concerned.

NALEPA (A.). **Revision der auf den Betulaceen Mitteleuropas Gallen erzeugenden *Eriophyes*-Arten.** [A Revision of the Species of *Eriophyes* producing Galls on the Betulaceae of Central Europe.]—*Verhand. zool.-bot. Gesellsch., Vienna*, lxix nos. 1–2 & 3–5, 25th April & 30th June 1919, pp. 25–48, 49–51. [Received 7th June 1920.]

The title indicates the subject-matter of this paper which concludes with a key to the species dealt with.

Nalepa (A.). **Revision der auf Fagaceen und Ulmaceen Gallen erzeugenden Eriophyinen.** [A Revision of the Eriophyinae producing Galls on Fagaceae and Ulmaceae.]—*Verhand. zool.-bot. Gesellsch., Vienna*, lxix, no. 10, 31st March 1920, pp. 386–401. [Received 7th June 1920.]

The species of *Eriophyes* infesting the beech, oak and elm are dealt with.

Faes (H.). **La Lutte contre le Ver de la Vigne (Cochylis) en 1919.**—*La Terre Vaudoise, Lausanne*, xii, no. 25, 19th June 1920, pp. 240–242.

In continuation of a previous paper [*R.A.E.*, A, viii, 348] the conclusion reached is that the best means of combating *Clysia ambiguella* in the Canton of Vaud consists in spraying the first generation caterpillars, measuring about $\frac{1}{12}$–$\frac{1}{5}$ of an inch, with pyrethrum-soap and then spraying the eggs laid by the second-generation adults with nicotine.

Martinet (G.). **Un Piège à Courtilière.** [A Trap for Mole-Crickets.]—*La Terre Vaudoise, Lausanne*, xii, no. 28, 10th July 1920, p. 272.

Traps in every way similar to those used for moles, but only half the size and of thinner wire, are recommended against mole-crickets [*Gryllotalpa gryllotalpa*]. They are also placed in position in a similar manner.

Bernard (C.). *Suana* **sp.**—*De Thee, Buitenzorg*, i, no. 1, March 1920, p. 22, 1 plate.

Attention is drawn to the exceedingly large number of eggs laid by some Lepidoptera. The illustration shows a tea twig bearing a female of *Suana* sp. and about 2,000 eggs laid by it in the course of a day.

Blin (H.). **Succédanés des Jus de Nicotine comme Insecticides.** [Substitutes for Nicotine Juice as Insecticides.]—*Jl. d'Agric. Pratique, Paris*, xxxiv, no. 27, 1st July 1920, pp. 17–18.

The present high cost of nicotine is an inducement to investigate other substances having at least the same insecticidal value.

A decoction of the stems and leaves of the tomato plant, especially if prepared with the household washing lye made with wood ash, is a very potent insecticide that may be diluted with water and used for spraying in the same way as nicotine. The active principle in the tomato stem is more injurious than that in tobacco leaf. The leaves of *Digitalis grandiflora* yield digitalin, which is as powerful as nicotine and serves admirably against the beet aphis [*Aphis rumicis*], the hop aphis [*Phorodon humuli*], fruit tree Aphids, *Haltica ampelophaga*, etc. It is in June and July, when the plant is in flower, that the leaves are richest in alkaloid. To prepare the decoction 30 lb. of stems with the leaves are boiled for 30 minutes in 20 gals. water. The solution must be stored in labelled containers, as it is a violent poison, and it is diluted for use with an equal part of water. It is less liable to scorch than nicotine.

Petroleum, at the rate of 1 part by weight per 100 parts of spray solution, is another substitute for nicotine. The following is a tested formula: Petroleum 5 lb., Panama bark 1 lb., water 3 gals. The bark is crushed and boiled in the water until about $2\frac{1}{2}$ gals. of liquid is obtained; this is strained through a fine cloth and the petroleum is added by degrees with constant beating until a perfect emulsion results. This is diluted with 50 gals. water.

Macrum (C. A.). **Combined Bordeaux Oil Emulsion Spray.**—*15th Bienn. Rept. Oregon State Bd. Hortic., Salem*, 1919, p. 82. [Received 5th July 1920.]

A spray has been designed that, applied as the buds are opening, will control scab, San José scale [*Aspidiotus perniciosus*], Aphids, leaf-roller, red spider [*Tetranychus*] and curl leaf of the peach, and if it dries thoroughly it will stay on the bark all through the season.

To make it a 200 U.S. gal. tank is filled three-quarters full of water, and 24 U.S. gals. of copper sulphate solution (1 lb. to 1 U.S. gal. water) are added. Milk of lime, made with 12 lb. slaked lime, is then poured in until litmus paper shows that the solution is neutral, and $1\frac{1}{2}$ gals. of glue solution ($1\frac{1}{2}$ lb. glue in water) are then added; twelve U.S. gals. of the General Chemical Company's No. 1 oil emulsion, or a corresponding one, are stirred with a little water until emulsion is started, and poured into the tank with enough water to make the whole up to 200 U.S. gals.

Lovett (A. L.). **The Potato Eelworm.**—*15th Bienn. Rept. Oregon State Bd. Hortic., Salem*, 1919, pp. 101–104, 3 figs. [Received 5th July 1920.]

The potato eelworm (*Heterodera radicicola*] has been found infesting potatoes in Oregon. It attacks a very large number of different kinds of plants, forming the galls on the rootlets known as root knots, but on potatoes the injury is different. The worms form cysts in the tissue of the tuber at a depth of a quarter of an inch or more which appear as brownish rings with a pearly centre. The skin of infested potatoes is usually wrinkled, and there are irregular sunken greyish areas with a raised centre here and there over the surface. Occasionally seed potatoes in the earlier stages will show no outward indication of injury.

H. radicicola has practically ruined the potato industry in the irrigated sections of Nevada, and also occurs in Southern California, in Oregon, where it seems to be confined at present to one locality in Coos County, and probably in Colorado and parts of Utah as a pest of potatoes, and all over the United States on other plants. Once it is established in a field total eradication is probably impossible, the young worms working out of the root in which they have hatched into the soil and infesting other plants. Seed potatoes should only be obtained from uninfested districts, and should be carefully examined for any suspicious roughness or galls; even if they seem clean, a number of representative tubers should be broken (not cut) into small pieces and carefully examined for the small brown spots in the tissue caused by the cysts.

If the soil should become infested, planting must be limited to the few crops, such as cereals and leguminous plants, that are not seriously attacked, a list of which is given. If plants of this class are used in a carefully planned rotation for a three-year period, the pest will be very decidedly reduced, so much so that potatoes may probably be grown for a year.

Chittenden (F. H.). U.S. Bur. Entom. **The Potato Tuber Moth.**—*15th Bienn. Rept. Oregon State Bd. Hortic., Salem*, 1919, pp. 105–110, 4 figs. [Received 5th July 1920.]

The greater part of the contents of this paper on *Phthorimaea operculella*, Zell., has already been noticed [*R.A.E.*, A, i, 102]. In addition it is advised that potatoes for seed should be sorted two weeks after digging, and again two weeks later, and the uninfested tubers placed in a moth-proof bin. The latter should be fumigated with carbon bisulphide and inspected frequently. If any sign of infestation appears they should be fumigated again.

Duport (L.). **Note sur les Chenilles perforantes du Riz.**—Extract from *Bull. Econ. Indochine* [*sine loco*], no. 134, January-February 1919, 3 pp. MS. [Received 10th July 1920.]

There are four principal species of moths the larvae of which tunnel in the stems of rice plants in Indo-China and in fact throughout the Far East. By far the worst of these is *Schoenobius incertellus*, Wlk. (*bipunctifer*, Wlk.), which causes serious losses each year; *Cnaphalocrocis medinalis*, Gn., has become sufficiently numerous at times to cause severe damage in various parts of Tonkin; *Chilo simplex*, Butl., is mainly a pest of maize, but occasionally attacks rice also; *Sesamia inferens*, Wlk., is very seldom a pest of any importance. Observations at Cho-ganh indicate that other moth borers also occur, but only occasionally appear in sufficient numbers to cause much trouble.

S. incertellus has been dealt with in a previous paper [*R.A.E.*, A, vii, 519]. At Tonkin, the damage done by this species alone amounts in normal years to 10 to 15 per cent. of the crop, and may sometimes reach 40 to 50 per cent., the loss frequently being attributed to atmospheric conditions. The only method of control that has been tried with any success is hand-picking the infested stalks a short while after blossoming. This is a tedious operation, and must be carried on over large areas to prevent re-infestation from neighbouring fields. The same method will be tried next year on the same fields on the two yearly crops, and will be followed by the removal and destruction of the stubble in which those larvae that have escaped hand-picking occur.

All the four moths mentioned also infest maize. The larvae are parasitised to some extent by Hymenoptera, but these do not seem to exercise much control.

Zimmerley (H. H.) & Smith (L. B.). **A Study of the Cost of Spraying Kale.**—*Virginia Truck Expt. Sta., Norfolk*, Bull. 30, 1st January 1920, pp. 121–131, 1 fig. [Received 14th July 1920.]

Kale, which is one of the most important crops produced in Eastern Virginia, is attacked with increasing severity by various insect pests, among the more important of which are the imported cabbage worm [*Pieris rapae*], cabbage looper [*Phytometra brassicae*] and several species of Aphids. The first two can be controlled by $1\frac{1}{2}$ lb. lead arsenate powder to 50 U.S. gals. of water, and for the Aphids $8\frac{3}{4}$ oz. nicotine sulphate, 5 lb. fish-oil soap and 50 U.S. gals. of water is recommended. Most of the spraying is done in the autumn, when the outbreaks generally occur. Statistics are given regarding the time requisite for preparing and applying the sprays, the amount of solution necessary to spray one acre with a machine drawn at $3\frac{1}{2}$ miles an hour, and the total cost of so spraying one acre with either lead arsenate or nicotine sulphate, each being calculated for use on rows planted 20, 24, 30 and 36 inches apart. It was found that the saving in the cost of labour and materials by increasing the speed of the team from 3 to 4 miles an hour was over 4*s*. per acre when the rows were planted 20 inches apart; that is, a saving of nearly 25 per cent. of the entire cost of application.

INGERSON (H. G.) & RUNNER (G. A.). **Control of the Grape-berry Moth in Northern Ohio.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 837, 3rd June 1920, 26 pp., 4 plates, 1 fig.

This bulletin records the results of studies during 1916-1918 on *Polychrosis viteana* Clem. (grape-berry moth) in northern Ohio. The life and seasonal history are briefly described [*R.A.E.*, A, iv, 190, 386, etc.], but the bulk of the information deals with control experiments, which are described in detail and summarised in a series of tables.

Under northern Ohio conditions, vineyards should be prepared for winter at the end of the cultivation season in July and left without further cultivation until the spring, in order to increase the winter mortality of the pupae. Of the many sprays tried, the one that has given the greatest success consists of $1\frac{1}{2}$ lb. lead arsenate powder or 3 lb. paste to 50 U.S. gals. liquid, with the addition of 1 lb. resin fish-oil soap to act as a spreader and adhesive, used either in Bordeaux mixture or, if in water, with 2 lb. freshly slaked lime to each 50 U.S. gals. Bordeaux mixture should not be used on the Ives variety of grapes as it injures the foliage. Sufficient spray should be used to cover all clusters with a thin, smooth film of spray material. The first application of spray should be made 3 to 5 days after the grapes have set and the second should begin when the grapes touch in the clusters, that is, usually 3 to 4 weeks after the first. In cases of severe infestation the trailer method of spraying should be used.

Experiments with a dusting mixture composed of 10 per cent. lead arsenate powder to 90 per cent. hydrated lime gave somewhat inconclusive results ; this method might be satisfactory for treating small areas, but would need much more frequent application than the liquid to be effective.

CHITTENDEN (F. H.) & MARSH (H. O.). **The Bean Ladybird.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 843, 7th June 1920, 24 pp. 5 figs., 6 plates.

A detailed account is given of *Epilachna corrupta*, Muls., as occurring in the semi-arid regions of the south-western States, where it is very destructive to the important bean crops raised there [*R.A.E.*, A, vi 299].

The most important natural check to this beetle in Colorado is cold weather. It has not yet become fully adapted to northern climates, and many eggs, larvae and pupae occur so late in the autumn that they are killed by frost. Predaceous enemies include other Coccinellids, such as *Hippodamia convergens*, DeG., *H. quinquesignata*, Kby., and *Coccinella transversoguttata*, F., which destroy the eggs.

The latest experiments in controlling *E. corrupta* indicate that preventive measures are the most efficient, consisting of hand-picking and brushing from the plants, clean culture and early and late planting. Arsenicals have some toxic properties, but act chiefly as repellents. Spraying with 1 or 2 lb. lead arsenate powder or 1 to $1\frac{1}{2}$ lb. dry zinc arsenite to 50 U.S. gals. of water is recommended, and Bordeaux mixture (4 : 4 : 50) should be used either alone or in combination with these arsenicals. Further tests are required to ascertain the most effective and economical mixture, that will not injure foliage.

A report on the occurrence of *E. corrupta* in Colorado in 1919, by A. E. Mallory, is appended.

Fryer (P. J.). **Insect Pests and Fungus Diseases of Fruit and Hops.**—*Cambridge*, University Press, 1920, xv + 728 pp., 305 figs., 24 plates. Price 45*s.* net.

This is a book of reference suited to the requirements of the fruit and hop grower. The chief characteristics of the structure and life of insects and plants are given, and the insect pests that attack fruit and hops are described in detail, the information being given concisely, and tabulated where possible. Beneficial insects are noticed, and a full description of practical insecticide materials is given. Fungi and the diseases they cause are dealt with on the same lines.

An account is given of spraying and spraying machinery of all kinds, with a calendar of work to be done throughout the year. Owing to the method of tabulating information, with references to other parts of the book where necessary, any particular detail required on a subject is readily ascertained, and a large amount of matter is contained in the space available. An adequate index is appended.

Smith (K. M.). **The Injurious Apple Capsid (*Plesiocoris rugicollis*, Fall.)**—*Jl. Ministry Agric., London*, xxvii, no. 4, July 1920, pp. 379–381.

Some of the information contained in this paper has already been noticed [*R.A.E.*, A, vi, 278]. *Plesiocoris rugicollis* seems to have increased greatly of late years, and has caused serious loss to apple growers.

It produces stunting of the leaves and shoots, serious malformation of the fruit and, after a consecutive attack for several years, stunting of the tree itself. The damage is caused by the action of some substance in the salivary juices peculiar to this species among those bugs normally feeding on apple. It is pointed out that there is a possibility that other Capsids causing similar injury, such as *Lygus pabulinus*, which normally feeds upon herbaceous plants, may suddenly adopt a taste for fruit trees.

Spraying is useful as a remedial measure, but it is necessary to wet each individual with the fluid, as if only a few escape, they are capable of doing great injury. The best time to spray varies with the season, usually just before the blossoms burst. A watch should be kept for the first sign of spotting of the leaves—then, after an interval of ten days to allow the majority of the bugs to hatch, the spray should be applied. A second spraying immediately after the petals have fallen is beneficial. A formula that has proved satisfactory is:—nicotine (98–99 per cent.) 3 oz., soft-soap 4 lb., water 40 gals. This wash is expensive, but less efficient sprays are a waste of labour against Capsids, while nicotine and soap will kill Aphids, apple-sucker [*Psylla mali*] and a good proportion of any winter moth [*Cheimatobia brumata*] caterpillars that may be present.

LIZER (C.). **Nota acerca de la Presencia de la** *Sitotroga cerealella*, **Oliv., en la República Argentina.** [A Note on the Occurrence of *S. cerealella* in Argentina.]—*Physis, Buenos Aires*, iv, no. 18, 31st December 1919, pp. 530–531. [Received 19th July 1920.]

The author corrects the statement contained in a paper by Brèthes in which the grain pest, *Sitotroga cerealella*, is said to be recorded for the first time in South America [*R.A.E.*, A, vii, 126], and points out that this moth was recorded as a serious pest of maize in Buenos Aires by Dr. C. Berg in 1875.

JOAN (T.). **Nota sobre la Presencia en la República Argentina de un Enemigo natural de los Gorgojos y Palometas del Trigo y del Maiz.** [A Note on the Occurrence in Argentina of a Natural Enemy of Pests of Wheat and Maize.]—*Physis, Buenos Aires*, iv, no. 18, 31st December 1919, pp. 573–574. [Received 19th July 1920.]

The presence is recorded in Argentina of the Acarid, *Pediculoides ventricosus*, as an important enemy of the two chief grain pests, *Sitotroga cerealella*, Ol., and *Calandra* (*Sitophilus*) *oryzae*, L. This mite is so prolific that it would seem easy to propagate it artificially as a check to these pests of cereals, but as it is known to attack the stems of wheat and maize it would be necessary to make a thorough study of its habits in order to determine the advantageousness or otherwise of this proceeding.

LAHILLE (F.). **Nota sobre un nuevo Genero de Diaspinae.** [A Note on a new Genus of DIASPINAE.]—*Physis, Buenos Aires*, iv, no. 18, 31st December, 1919, pp. 595–599. [Received 19th July 1920.]

The Coccid, *Paradiaspis lizerianus*, gen. et sp. n., is described from the Chubut region, where it was taken on leaves of *Chuquiragua avellanedae* and was at first thought to be *Aulacaspis* (*Diaspis*) *pentagona*. A Chalcid parasite emerged from some of the female scales.

Contra o "Pulgão" branco das Laranjeiras. [Against *Icerya purchasi*.]—*Chacaras e Quintaes, S. Paulo*, xxi, no. 6, 15th June 1920, p. 463.

The Ministry of Agriculture of S. Paulo, Brazil, is importing from Uruguay the Coccinellid, *Novius cardinalis*, in order to check the infestation of orange trees with the scale, *Icerya purchasi*.

Os Insectos damninhos. iv. A Lagarta dos Tomateiros (*Mechanites nessaea lysimnia*, **Fabr.**). [Injurious Insects. iv. The Tomato Caterpillar, *M. nessaea lysimnia*.]—*Chacaras e Quintaes, S. Paulo*, xxi, no. 6, 15th June 1920, pp. 479–480, 1 fig.

Os Insectos damninhos. v. A Cigarrinha dos Cannaviaes, *Tomaspis perniciosa*. [Injurious Insects. v. The Sugar-cane Frog-hopper, *T. perniciosa*.]—*Ibidem*, p. 480.

Caterpillars reported as defoliating tomato plants in the State of S. Paulo have been identified as those of the Danaid butterfly, *Mechanites nessaea lysimnia*, F., which are known pests of Solanaceae. Spraying with Paris green or lead arsenate is advised, the latter being preferable as it is less liable to scorch the foliage. From $\frac{3}{4}$ to 1lb. of lead arsenate per 18 gals. water is a suitable strength. The first application should be made when the caterpillars are quite small, but if the infestation is not severe, the cheapest and best remedy is hand-collection.

A Cercopid, *Tomaspis parana*, has been causing serious injury to sugar-cane in the State of Minas Geraes. The infested canes should be cut down and burned in the field, a hot, sunny day being chosen so as to ensure the destruction of the larvae in the ground.

Reports on the State of the Crops in each Province of Spain on the 20th of June 1920.—*Bol. Agric. Téc. Econ., Madrid*, xii, no. 138, 30th June 1920, pp. 447–464.

In the province of Castellón *Phloeothrips oleae* has done some damage to olives, and in some localities of Toledo *Aelia rostrata* has appeared in large numbers.

Eckstein (F.). **Eine Syrphidenlarve aus Larvengängen von** *Hylobius abietis*, **L.** [A Syrphid Larva from the Larval Mines of *H. abietis*.]—*Naturwiss. Zeitschr. f. Forst- u. Landwirtsch., Stuttgart*, xviii, no. 7, July 1920, pp. 178–182, 1 fig.

There does not appear to be any previous mention of the occurrence of Syrphid larvae in conifers, especially in the mines of *Hylobius* larvae. From larval mines in trap-billets infested with *Hylobius abietis* a number of Syrphid maggots were taken in the Upper Palatinate. They closely resemble those of *Brachyopa*, Meig., *Baccha*, F., and *Neoascia*, Willist., but a complete identification was not possible. An illustrated description of these larvae is given.

Wurth (T.). **Verslag omtrent de Werkzaamheden van het Proefstation Malang over 1919.** [The Malang Experiment Station Report for 1919.]—*Malang*, 1920, 21 pp.

An infestation of coffee berry clusters with the scales, *Coccus* (*Lecanium*) *viridis* and *Pseudococcus* sp., caused the green berries to fall. Although spraying the clusters with a 5 per cent. soap solution proved effective the cost is so high as to be unjustified by the limited injury done. Infestation by *Xyleborus coffeae* resulted in a withering of coffee twigs. An increased spread of *Stephanoderes hampei* was noted ; some coffee samples, believed to be attacked by this beetle, were found to harbour the Anthribid, *Araecerus fasciculatus*. Extended observations showed that in dry weather living adults and brood of *S. hampei* occurred, even after a period of 2 months, in infested berries lying on the ground. This is of great importance in connection with the question whether the removal, at one and the same time, of all infested material should be advised against this pest. From one estate, lamtoro [*Leucaena glauca*] injured by bark-beetles was received, the infestation being believed to be primary.

SMITS VAN BURGST (C. A. L.). *Bracon discoideus*, **Wesm. (Hym.), een Parasiet van de Appelbloesemkever** (*Anthonomus pomorum*, **L.**). [*Bracon discoideus* a Parasite of *Anthonomus pomorum*.]—*Entom. Ber. Nederlandsche Entom. Vereen., The Hague*, v, no. 97, 1st September 1917, pp. 1–3. [Received 23rd July 1920.]

Nearly all the Hymenopterous parasites reared from *Anthomonus pomorum* infesting the apple in various parts of Holland appear to be *Bracon discoideus*, Wesm. It is not improbable that *B. discoideus* had *Byctiscus betulae* as its original host, from which it later adapted itself to *A. pomorum*. As *B. discoideus* is known to have been bred from the saw-fly, *Pontania proxima*, Lep., the introduction of the latter's food-plant, *Salix amygdalina*, into districts infested with *A. pomorum* might be worth trying.

SMITS VAN BURGST (C. A. L.). *Bracon variator*, **Nees, en** *Bracon scutellaris*, **Wesm. (Hym.).**—*Entom. Ber. Nederlandsche Entom. Vereen., The Hague*, v, no. 108, 1st July 1919, pp. 159–160. [Received 23rd July 1920.]

Bracon variator, Nees, has been bred from cocoons found in pear infested with larvae of *Hoplocampa* sp., probably *H. brevis*, Htg. *Bracon scutellaris*, Wesm., which is new to the Dutch fauna, is recorded from fir-cones.

OUDEMANS (J. T.). *Pristiphora fausta*, **Htg., eene nieuwe Bladwesp voor de Nederlandsche Fauna.** [*P. fausta*, a Saw-fly new to the Fauna of Holland.]—*Entom. Ber. Nederlandsche Entom. Vereen., The Hague*, v, no. 108, 1st July 1919, pp. 155–158. [Received 23rd July 1920.]

Pristiphora fausta, Htg., is recorded on oak leaves.

OUDEMANS (J. T.). *Lophyrus nemorum*, **F.**—*Entom. Ber. Nederlandsche Entom. Vereen., The Hague*, v, no. 109, 1st September 1919, pp. 169–172. [Received 23rd July 1920.]

From a cocoon collected in the winter of 1918–19 a female example of *Diprion* (*Lophyrus*) *nemorum*, F., emerged on 2nd August 1919. This seems to show that there is only one generation of this saw-fly a year in Holland.

SMITS VAN BURGST (C. A. L.). **De Houtwesp,** *Xiphydria camelus*, **L., en haar Parasiet,** *Aulacus striatus*, **Jur.** [The Woodwasp, *X. camelus*, and its Parasite, *A. striatus*.]—*Entom. Ber. Nederlandsche Entom. Vereen., The Hague* v, no. 112, 1st March 1920, pp. 222–223. [Received 23rd July 1920.]

The Evaniid, *Aulacus striatus*, Jur., has been bred from the larvae of *Xiphydria camelus*, L., infesting a birch badly damaged by fire.

SMITS VAN BURGST (C. A. L.). **Uit Duitsche Vlinderpoppen gekweekte Sluipwespen, behoorende tot de Groep der Lissonotini** ; *Meniscus nonagriae* **n. sp.** [Hymenopterous Parasites of the Group Lissonotini bred from Lepidopterous Pupae from Germany. *Meniscus nonagriae*, sp. n.]—*Entom. Ber. Nederlandsche Entom. Vereen., The Hague*, v, no. 113, 1st May 1920, pp. 239–240. [Received 23rd July 1920.]

From pupae of *Gortyna ochracea*, Hb., and *Acronycta abscondita*, Tr., collected near Berlin, the parasite, *Echthrodoca conflagrata*, Grv., was bred. *G. ochracea* was also parasitised by the rare *Anarthronota thuringiaca*, Schmied. Both parasites occur in Holland. Pupae of *Nonagria geminipuncta*, Hatchett, from Anhalt yielded a new species described here as *Meniscus nonagriae.* From an undetermined species of *Nonagria* living on *Typha latifolia* in Anhalt *Meniscus scapularis* was bred ; this species appears to have been recorded hitherto from South Hungary only.

MAYNÉ (R.). **Un Insecte nuisible aux Noix palmistes,** *Elaeïs guineensis*, **contre lequel il faut se protéger en Afrique.**—*Ann. Gembloux, Brussels*, xxvi, no. 4, April 1920, pp. 166–168.

The chief pests of the oil palm, *Elaeïs guineensis*, in the Belgian Congo are the larvae of the Curculionid, *Rhynchophorus phoenicis*, and the adults of the Dynastids, *Oryctes monoceros* and *O. boas.* These beetles attack the palm itself. Although the Bruchid, *Pachymerus* (*Caryoborus*) *nucleorum*, F., is known to attack the nuts of this palm in British Guiana no beetles of this genus have yet been found destructive to them in the Belgian Congo, and the necessity for careful inspection and quarantine to prevent their introduction is emphasised.

Phylloxera vastatrix. **Notice to Viticulturists.**—*New Zealand Jl. Agric., Wellington*, xx, no. 5, 20th May 1920, p. 335.

Owing to *Phylloxera vastatrix* having been found in a number of districts round Auckland this circular is issued to warn all vine-growers once more of the danger to successful viticulture of growing any vines from cuttings—the *Phylloxera*-resistant stocks excepted. The method of obtaining vines grafted on resistant stocks from the Department of Agriculture is described. Orders must be received in the winter months and the plants will be ready the following winter.

With vines of this kind it is very necessary to see that after the season's growth the scion is not sending down roots, which it may do where the plant is put in deep enough for the union of scion and stock to come in contact with the soil. This may occur at any time should the soil be brought up to the scion. In the winter when pruning, and in the spring when disbudding, are the times to note whether this is taking place. If it occurs the roots should be cut clean away and the soil removed from where they have started.

Although *Phylloxera* is general in many districts, it has been decided, in the interests of the vine-growers, to allow them to retain vines now bearing fruit till the planting season of July 1922. After that date all *Phylloxera*-affected vines must be rooted out and burned.

FLETCHER (T. B.). & INGLIS (C. M.). **Some Common Indian Birds. No. 3. The Spotted Owlet** (*Athene brama*). -*Agric. Jl. India, Calcutta*, xv, no. 3, May 1920, pp. 235–238, 1 plate. [Received 21st July 1920.]

The spotted owlet (*Athene brama*) is one of the commonest owls in the Plains of India and Burma, and is constantly found about houses and cultivated gardens. Its prey consists of termites, beetles, crickets and other insects and, to a less extent, mice, shrews and lizards. In 8 birds examined, 69 insects were taken, one of which was beneficial, 26 neutral and 42 injurious. At Pusa the chief food seems to be the large crickets, *Brachytrypes* and *Gryllotalpa*, and dung-beetles. It is therefore a most useful bird, especially in the control of crickets which are also nocturnal in habit.

MANN (H. H.), NAGPURKAR (S. D.) & KULKARNI (G. S.). **The Tambera Disease of Potato.**—*Agric. Jl. India, Calcutta*, xv, no. 3, May 1920, pp. 282-288, 2 plates. [Received 21st July 1920.]

In the Poona district of Western India the potato crop is a very important one and, in the case of plants grown during the rainy season, much damage is caused by the presence of large numbers of a very small mite that may be a Tetranychid. This pest sucks the juices from the epidermal cells of the leaves so that they are unable to stand the heavy drain on them and wither prematurely. The mites crawl from plant to plant where these are in contact, and they may possibly be carried also by insects and other agencies. The affected plants acquire a reddish colour, almost as though they had been burnt, this condition being known as tambera. The disease may appear at any stage in the growth of the plant, but is more general after it is a month old. A very similar disease occurs in potatoes in Hawaii and is caused by a mite that is apparently identical [*R.A.E.*, A, vi, 552; vii, 196]. In order to determine the cause of the disease inoculation experiments were undertaken, which proved the causal connection of the mites.

Spraying with sulphur wash and dusting with sulphur were tried and proved very effective; three applications were given; the first when the plants were three weeks old, the second about three weeks later, and the third two or three months after planting. The yield of an unsprayed plot in 1919 was only 1,000 lb. per acre, that of a plot sprayed after the attack commenced being 5,000 lb. per acre, and of a plot sprayed from the beginning 8,720 lb. per acre. Spraying, though the more effective method, is a new process to the cultivators, and dusting with sulphur from muslin bags will probably be more general for some time.

It is not known how the mites survive from year to year. They may possibly be carried over on the potato plant itself. There are two distinct seasonal crops grown; one is sown in June or July and is harvested in September and October or even in November; the other is sown in November and gathered in March. Stray plants arising from the old tubers of the previous crop are always found in the fields, and although the November-sown crop is not seriously attacked, it is by no means free from the mites, which become active again as soon as the hot weather begins in April and May. It is also possible that the mite may have other food-plants. An apparently identical species has been found on *Cyamopsis psoralioides* (guvar), and cross inoculations have proved that potato plants infected with the mite taken from this plant readily took the disease. Chillies and tomatos have proved immune, but more observations and experiments are required on this point.

FROGGATT (W. W.). **Three Native Beetles attacking Orchard Trees.**—*Agric. Gaz. N.S.W., Sydney*, xxxi, no. 6, June 1920, pp. 421–426, 5 figs.

The Lamellicorn, *Anoplognathus chloropyrus*, Drapiez, often appears in the early summer in immense numbers on native vegetation, frequently denuding the tops of young gum and other trees and defoliating shrubs. They recently swarmed into an orchard and defoliated many plum trees. Both adults and larvae are destructive. The larva of an allied species, *A. analis*, has also been recorded as eating off the roots of strawberry plants.

Perperus insularis, Boh. (white-striped weevil) is a well-known orchard pest. The adults emerge in early summer from the ground where they have pupated and, crawling up the tree-trunks just as the leaf-buds are bursting, eat the centre out of each bud. Recently, the young branches of small *Citrus* trees have been stripped of their leaves and bark. Hand-picking and shaking into canvas sheets at night would have greatly reduced this pest if practised as soon as it was noticed. An inverted funnel-shaped bandage of stiff oiled paper, fixed tightly round the tree stem just clear of the ground, would also trap large numbers. Spraying with lead arsenate has been recommended, but though the beetles eventually die of the poison they are generally able to do considerable damage first. A second species, *P. innocuus*, also caused serious injuries to fruit trees, and attacked and punctured many grapes just as they were ripening, as well as damaging the leaf-buds.

Geloptera porosa, Lea (pitted apple beetle) is a Chrysomelid usually associated with foliage injury, but has lately appeared in apple orchards, gnawing off patches of the skin of young fruit. The life-history is unknown, but pupation probably occurs in the soil. The damage to apples is very similar to that caused in Victoria and Tasmania by the Lamellicorn, *Diphucephala colaspidoides*, which feeds normally on black wattle and migrates into adjoining orchards. Lead arsenate sprays would kill the adults of *G. porosa*, or they may be jarred on to sheets placed under the trees early in the morning when they are in a semi-torpid condition.

Report on the Prevalence of some Pests and Diseases in the West Indies during 1918. [Compiled from the Reports of the principal local Agricultural Officers.]—*West Indian Bull., Barbados*, xviii, no. 1–2, 1920, pp. 34–60. [Received 22nd July 1920.]

This is a résumé of various local reports, much of the information from which has already been noticed [*R.A.E.*, A, vi, 514 ; vii, 204, 261, 366, 481, 512].

NOWELL (W.). **The Red Ring Disease of Coconut Palms. Infection Experiments.**—*West Indian Bull., Barbados.* xviii, no. 1–2, 1920, pp. 73–76. [Received 22nd July 1920.]

In a paper previously noticed [*R.A.E.*, A, viii, 66] artificial infection experiments with the red ring disease of coconut palms were recorded, and a fuller account of them is given here. Pieces of tissue infested with *Aphelenchus cocophilus*, Cobb, the Nematode causing red ring disease, were inoculated into the stems or petioles, or dropped into the axils of healthy trees. Of eight trees thus treated, six were found infested after sixty to seventy-four days. The two failures were trees in which infection was attempted in a basal leaf. During the period of the experiments, February-August 1919, one tree among the forty-two remaining trees in the plot was infected naturally. The next case of natural infection occurred in November of the same year.

The rapidity of infestation shown in the experiments renders untenable the hypothesis that infection takes place at an early age without its effects becoming manifest until the tree matures.

The results support the idea that infection occurs in the leaf-bases, and more recent observations in Trinidad suggest that this may frequently take place by way of the small cracks that develop in the fold made on the outside of the leaf-base by the bending outwards of the leaf as it matures. In many leaves examined there was a narrow streak of infested tissue connecting this point with well-developed infestations in the softer tissue further along the petiole.

HUTSON (J. C.). **The Paddy Bug** (*Leptocorisa varicornis*, **F.**).—*Trop. Agriculturist, Peradeniya,* liv, no. 6, June 1920, pp. 363–366, 1 fig.

Leptocorisa varicornis, F., is one of the chief pests of rice in Ceylon [*R.A.E.*, A, vii, 349]. The "maha" [chief] crop, which reaches its critical stage in February and March, is usually more seriously damaged than the later crops which flower in July and August. The remedial measures advocated include the use of the bag net, which is illustrated.

JARVIS (E.). **Notes on a little known Leaf-eating and Stem-boring Beetle.**—*Queensland Agric. Jl., Brisbane,* xiii, no. 6, June 1920, pp. 274–276, 1 plate.

The Chrysomelid, *Rhyparida morosa*, Jac., of which the larva and pupa are here described, has been recorded as seriously injuring sugar-cane in Queensland. The chief damage is caused by the larva. The beetles feed on the leaves of sugar-cane and of their native food-plant "bladygrass" (*Imperata arundinacea*). They may also be found on young twigs of *Ficus opposita*. The larvae pupate nine days after entering the soil and the adults appear nine days later. The adult beetles are preyed upon by a Reduviid bug and an undetermined Tachinid fly has been bred from the larva.

Division of Entomology.—*Jl. Dept. Agric., Pretoria,* i, no. 2, May 1920, pp. 168–171, 1 fig.

Icerya purchasi continues to be a pest of *Citrus* and roses in parts of the Cape Province, but its ravages are greatly checked by the Coccinellid, *Novius cardinalis*.

Tobacco growers are asked to be on the watch for *Lema bilineata*, which it is thought was originally imported from South America with forage. This beetle feeds readily on *Stramonium* and several weeds such as *Physalis* and *Nicandra* that are closely related to the Cape gooseberry. Fortunately it feeds very little on potato plants, but its increase in tobacco plantations may necessitate the application of arsenical sprays several times every season, thus greatly increasing the cost of tobacco production. The eggs are laid in clusters of 15 to 40 on the leaves of food-plants. The period of oviposition stretches over several months, and the total number of eggs deposited varies from 1,000 to 2,000. During the summer the grubs mature in about 2 weeks from the laying of the eggs. They enter the ground for pupation, the adult emerging about a fortnight later. During the winter the beetles hide and may thus be easily carried in bales of tobacco from one place to another.

The Melyrid beetle, *Astylus atromaculatus*, which has become very abundant in lucerne fields near Pretoria during the last few years, was probably also imported from South America. The larvae are apparently carnivorous, and the beetles are thought to live on insect eggs and soft-bodied insects. *Psammodes illotus* occurred in great numbers during December. The adult beetles are apparently harmless, but the larvae are supposed to feed on roots of plants. Although maize and wheat have been attacked, this pest is far more abundant at the roots of veld grasses than on cultivated land.

The butterfly, *Belenois mesentina*, appeared in swarms during December in northern Natal and in the southern part of the Transvaal. It is not known to be a pest of cultivated plants, but has been reared from *Rhus* sp., probably *R. viminalis*, and it is suspected that the larvae sometimes defoliate *Capparis albitrunca*.

The San José scale [*Aspidiotus perniciosus*] is apparently spreading into many fresh districts in spite of the precautionary measures in force.

Army Mystery Worm. Action in Case of Recurrence.—*Jl. Dept. Agric., Pretoria*, i, no. 4, July 1920, pp. 391–393.

During April 1920 extensive damage was caused to potato, barley and maize fields in the Uitenhage district by the army worm, *Laphygma exempta*. In several instances the crop was entirely destroyed.

Should this pest appear in teff and other sown grasses, they should be at once mown down in order to expose the caterpillars to their many natural enemies and thus prevent their spread. In cultivated fields sweetened poison-bait is the most effective remedial measure. The preparation advocated consists of 1 lb. of sodium arsenite, 2 lb. of sugar or 2 qts. of molasses, 16 gals. of water and as much bran or finely cut grass as the liquid will moisten. About 100 lb. of bait should be spread to the acre.

Severin (H. C.). **The Colorado Potato Beetle.**—*South Dakota State Entom. Office, Brookings*, Circ. 13, November 1919, 8 pp., 1 fig. [Received 20th July 1920.]

This circular describes the life-history [*R.A.E.*, A, iv, 172] and control of *Leptinotarsa decemlineata*, Say, in South Dakota. The spray materials recommended are :—1 lb. calcium arsenate and 2 lb. freshly slaked lime ; 1 lb. lead arsenate or zinc arsenite ; or ½ lb. Paris Green and 1 lb. freshly slaked lime (the poisons being in dust form and diluted in 25 U.S. gals. water in each case). The first application should be made when the potato plants are six inches high, and repeated at intervals of from 10 to 14 days; two applications usually suffice; 50 gals. of spray cover an acre when the plants are small, but when they are larger 80–100 gals. will be required. Hand-picking and jarring for small plots are also described.

Le Soeuf (W. H. D.). **The Value of the Ibis.**—*American Forestry, Washington, D.C.*, xxvi, no. 319, July 1920, pp. 410–411.

The ibis is very useful to agriculture in Australia. It has been calculated that a colony of these birds that nests in a swamp in New South Wales, numbering 200,000 individuals, accounts for as many as 482 millions of grasshoppers a day as well as other insects. Many of the slower flying hawks feed largely on insects, and cockatoos also prey upon grasshoppers by digging up and devouring their egg-clusters.

Caesar (L.). **Insects and Diseases in Cherry Orchards.**—*Canadian Horticulturist, Toronto*, xliii, no. 7, July 1920, pp. 191–192.

The chief insects attacking cherries are: black Aphids [*Myzus cerasi*], which as a rule only attack sweet cherries; plum curculio [*Conotrachelus nenuphar*], responsible for the so called "stinging" of cherries; and cherry fruit-flies [*Rhagoletis cingulata* and *R. fausta*], which are very destructive in some orchards, though others are unharmed [*R.A.E.*, A, iii, 293].

Three sprayings are usually enough to control both insects and diseases. The first should be applied just before the buds break and should consist of 1 gal. lime-sulphur to 7 or 8 gals. water, with the addition of Black-leaf 40 according to the directions for black Aphids. For sour cherries the Black-leaf 40 is omitted, and the spray should be only about a quarter as strong, or Bordeaux mixture (4 : 6 : 40) may be used. The second spray, applied as soon as the fruit is formed and nearly free from the remnants of the blossom, should consist of Bordeaux mixture of the above strength or a little weaker, with the addition of 1 lb. calcium arsenate, or $1\frac{1}{4}$ lb. lead arsenate (powder). Lime-sulphur is not quite equal to Bordeaux mixture as an alternative. For the third spray, applied as the earliest varieties are beginning to colour, the same mixture should be used as for the second. It is hoped to find a liquid spray that will have the same effect as the sulphur dust, which has been shown to be beneficial just before the cherries are picked to prevent brown rot without staining the fruit as liquid sprays usually do.

Fisher (D. F.). **Apple Powdery Mildew and its Control in the Arid Regions of the Pacific North-west.**—*U.S. Dept. Agric., Washington, D. C.*, Bull., 712, 29th October 1918, 28 pp., 3 plates, 2 figs. [Received 27th July 1920.]

The powdery mildew disease of apples is caused by the fungus, *Podosphaera leucotricha*, which passes the winter in mycelial form in dormant buds. It is disseminated by the wind and possibly to some extent by insects.

The beetles, *Psyllobora borealis*, Casey, *Pentaria nubilia*, Lec., and *Anthicus nitidulus*, Lec., have been found feeding on this mildew.

White (G. F.). **European Foulbrood.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 810, 26th February 1920, 39 pp., 8 plates, 6 figs. [Received 27th July 1920.]

European foulbrood, which is an infectious disease of the brood of bees caused by *Bacillus pluton*, is characterised by the death of brood during its uncapped stage and by the absence of any marked odour. The disorder has a wide distribution, while the losses sustained by the infected apiary vary from a slight weakening of the colonies in some instances to the destruction of all of them in others.

This paper deals with some of the results that have been obtained from a study of the disease from a laboratory point of view. Among the problems considered are the resistance of *B. pluton* to heat, drying, sunlight, fermentation, and disinfectants ; the effect of the disease on the colony and on the apiary; and the aetiology, transmission, diagnosis, and prognosis of the disease. Work directly on the treatment of the disease has not been attempted ; but any treatment that is devised, if it is to be efficient and economical, must be based upon the results obtained from the solution of such problems as have been mentioned.

Brandes (E. W.). **The Mosaic Disease of Sugar Cane and other Grasses.**—*U.S. Dept. Agric., Washington, D. C.*, Bull. 829, 29th October 1919, 26 pp., 5 figs., 1 plate. [Received 27th July 1920.]

Field observations of plants suffering from mosaic disease indicate that acceleration in the spread of the disease is accompanied with or preceded by severe insect infestation. The cane leaf-hopper (*Tettigonia* sp.) in particular has been noticed to accompany the rapid spread of the disease. The evidence in favour of insect transmission is borne out by the fact that ten healthy plants in insect-proof cages in a greenhouse did not contract the disease, while five plants kept outside the cages, but otherwise under identical conditions, all became infected. Aphids were abundant on the diseased cane in the greenhouse and a few leaf-hoppers were present. A great deal of experimental work remains to be done, however, before the theory of transmission by any particular insect can be established.

Shaw (H. B.). **Control of the Sugar-Beet Nematode.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 772, December 1916, 19 pp., 6 figs. [Received 27th July 1920.]

The sugar-beet Nematode, *Heterodera schachtii*, Schmidt, is found in practically every European country where beets are grown. It has been introduced into the United States and has become well established in the older beet districts in the West, causing the same amount of damage as in Europe. This species is closely related to the root-knot Nematode, *H. radicicola*, the points in which it differs being here described. As soon as the larvae emerge they search for food, entering the tissues of the rootlet and feeding on the plant juices. They moult twice before transforming into the adult, after which the males at once escape from the rootlet in search of the females. The latter protrude from the rootlet and, when fully mature, drop to the ground and die, after which the eggs hatch. Each female is capable of producing from

350 to 400 eggs. On the approach of cold weather or other unfavourable conditions, the females transform into a brown cyst that forms a protective covering for the eggs. These may hatch a few at a time during a period that may extend over several years. This probably accounts for the fact that eelworms have been known to persist in ground that has been kept free from all food plants for some years. Although cold does not apparently injure the eggs in the cyst, they are destroyed when exposed to a dry heat of 145° F. All other stages succumb to 95° F. This Nematode in all forms may be easily carried from place to place by boots, farm implements, etc. It has also been spread by using, as fertilisers, waste water from the beet washers and mud from the settling pond. Infested plants may be safely given to sheep as fodder, as the Nematodes do not pass through the intestines of sheep alive, but it is not yet known if this is true of other domestic animals.

In addition to feeding on plant juices, this pest causes irritation of the plant cells, giving rise to abnormalities of the roots and spots, etc., on the leaves. These appear about the end of July or in August. The food-plants of *H. schachtii* include various crops of economic importance as well as weeds, a list of which is given.

Crop rotation has proved the best means of eradicating this pest. A list of non-susceptible plants is given, and beets and other susceptible plants should only be included once in a rotation of about 6 years. If the infested area is small the Nematodes may be destroyed by a liberal application of unslaked lime, which should be well mixed with the infested soil to a depth of about one foot and frequently turned over during the summer. The method of surveying suspected fields is described. Only the females and the brown cysts are visible to the naked eye.

FISHER (D. F.) & NEWCOMER (E. J.). **Controlling important Fungous and Insect Enemies of the Pear in the Humid Sections of the Pacific North-west.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 1056, September 1919, 34 pp., 18 figs. [Received 27th July 1920.]

The portion of this paper dealing with the insect enemies of pears includes *Syneta albida*, Lec.; San José Scale (*Aspidiotus perniciosus*, Comst.); pear leaf blister mite (*Eriophyes pyri*, Pag.); the bud moth (*Eucosma* (*Tmetocera*) *ocellana*, Schiff.); the pear slug (*Eriocampoides limacina*, Retz.); and the pear leaf worm (*Gymnonychus californicus*, Marl.).

The methods of preparing and applying the various sprays advocated against these pests are discussed, and a spraying schedule is included.

FERRIS (G. F.). **Scale Insects of the Santa Cruz Peninsula.**—*Stanford Univ. California Public., Biol. Sci.*, i, no. 1, 1920, 57 pp., 35 figs.

This list of Coccids found at Santa Cruz does not include greenhouse species. Of the 92 species dealt with, 60 are presumably native and the rest imported.

The new species described include *Eriococcus paenulatus* on the smaller stems of *Artemisia californica*; *E. stanfordianus*; *E. villosus* on *Eriogonum latifolium*; *Lecanium excrescens* on cultivated English walnut, almond and maple; *Toumeyella pinicola* on *Pinus radiata.*

A synonymical list of the species is given.

Ainslie (C. N.). U.S. Bur. Entom. **Notes on *Gonatopus ombrodes*, a Parasite of Jassids (Hymen., Homop.)**—*Entom. News, Philadelphia*, xxxi, nos. 6 & 7, June and July, 1920, pp. 169–173 & 187–190.

The Jassid, *Cicadula sexnotata*, has been found to be parasitised by a Dryinid, *Gonatopus ombrodes.* The method of parasitism is discussed and the various stages of the parasite are described. A period of 10 to 12 days elapses from the emergence of the larvae to that of the adult. The cocoon is usually attached to grasses among vegetable rubbish near the ground.

Although distinctly beneficial, this parasite is not of great economic importance, as it occurs in very limited numbers.

LEGISLATION.

Destructive Insect and Pest Act Amendment.—*Agric. Gaz. Canada, Ottawa*, vii, no. 6, June 1920, p. 479.

An amendment to the Destructive Insect and Pest Act, passed on 14th April 1920, forbids the importation of lucerne hay from Idaho, Utah, and certain counties of Wyoming and Colorado, excepting shipments of lucerne hay transported through the districts mentioned on a through bill of lading. At the same time *Hypera variabilis* (*Phytonomus posticus*) (alfalfa weevil) is added to the list of destructive insects, pests and diseases.

Amendment to the Regulations under the Destructive Insect and Pest Act. Amendment no. 10 (No. 2 of 1920).—*Canada Dept. Agric., Ottawa.* MS. [Received 13th July 1920.]

The amendment to this Act, dealing with the European corn borer [*Pyrausta nubilalis*], passed on 19th May 1919 [*R.A.E.*, A, vii, 312], is rescinded by an Order-in-Council dated 24th May 1920. In substitution, it is enacted that maize, broom maize, including all parts of the stalk, celery, green beans in the pod, beets with tops, spinach, rhubarb, oat and rye straw as such or when used as packing, cut flowers or entire plants of chrysanthemums, aster, *Cosmos*, *Zinnia*, hollyhock, and cut flowers or entire plants of *Gladiolus* and *Dahlia*, except the bulbs thereof without stems, are prohibited entry into Canada from a list of districts enumerated in the four States of Massachusetts, New Hampshire, New York and Pennsylvania, unless they are accompanied by a certificate of Inspection issued by the U.S. Federal Horticultural Board stating that they are free from infestation by *P. nubilalis.*

CONTENTS.

CONTENTS—*cont.*

Registered at the G.P.O. for Transmission to Canada and Newfoundland by Magazine Post.

VOL. VIII. Ser. A. Part 10.—pp. 417-464. OCTOBER, 1920

THE REVIEW OF APPLIED ENTOMOLOGY

SERIES A: AGRICULTURAL.

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Bequaert (J.). **A New Host of *Laboulbenia formicarum*, Thaxter, with Remarks on the fungous Parasites of Ants.**—*Bull. Brooklyn Entom. Soc., Brooklyn, N.Y.*, xv, no. 2, April-June 1920, pp. 71–79.

The fungus, *Laboulbenia formicarum*, is recorded as infesting the ant, *Formica pallidefulva*, Latr., subsp. *schaufussi*, Mayr, near Boston. This and other species of fungi known to attack ants are discussed.

Rohwer (S. A.). U.S. Bur. Entom. **The North American Ichneumon-Flies of the Tribes Labenini, Rhyssini, Xoridini, Odontomerini, and Phytodietini.**—*Proc. U.S. Nat. Mus., Washington, D.C.*, lvii, no. 2317, 1920, pp. 405–474, 13 figs.

This list comprises 8 new species and one new variety, including *Labena confusa* var. *minor* n., bred from *Chrysobothris femorata*, F., and *Aplomerus buprestivorus*, sp. n., found in the cocoon stage in the larval galleries of a Buprestid in mountain mahogany (*Cercocarpus parvifolius*).

Keys to the genera of the above tribes are given and also to the species of the genera *Phytodictus*, *Odontomerus*, *Aplomerus*, *Poemenia*, *Deuteroxorides*, *Xorides*, *Megarhyssa*, *Rhyssella* gen. n., *Epirhyssa*, *Rhyssa*, *Grotea*, and *Labena*.

Cushman (R. A.) & Rohwer (S. A.). U.S. Bur. Entom. **Holarctic Tribes of the Ichneumon-Flies of the Subfamily Ichneumoninae (Pimplinae).**—*Proc. U.S. Nat. Mus., Washington, D.C.*, lvii, no. 2315, 1920, pp. 379–396, 13 figs.

As a result of several years' study the authors' opinion regarding the relationship and number of tribes of the Ichneumoninae (Pimplinae) as represented in the Holarctic region is discussed. It is considered that the sub-family name Pimplinae must be suppressed in favour of Ichneumoninae and the sub-family Ichneumoninae of authors will be Joppinae, after the name of the oldest included genus.

Cushman (R. A.) & Rohwer (S. A.). U.S. Bur. Entom. **The North American Ichneumon Flies of the Tribe Acoenitini.**—*Proc. U.S. Nat. Mus., Washington, D.C.*, lvii, no. 2320, 1920, pp. 503–523, 3 figs.

A key is given to the five genera included in this tribe, though only two, namely, *Coleocentrus*, Grav., and *Arotes*, Grav., are known to occur in North America. The members of this tribe are mostly parasitic on wood-boring Coleopterous, Hymenopterous and Lepidopterous larvae. Keys are given to the species of the genera dealt with.

Patch (E. M.). **Three Pink and Green Aphids of the Rose.**—*Maine Agric. Expt. Sta., Orono*, Bull. 282, December 1919, 44 pp. [Received 28th July 1920.]

Besides *Macrosiphum rosae* and *M. solanifolii*, there is at least one other species of rose Aphid with distinct pink and green colour varieties, viz., *M. pseudorosae*, sp. n., here described. This species was first found on golden ragwort (*Senecio aureus*) in company with

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M. solanifolii, and then on wild rose. There seems no reason to question the conclusion that the ragwort material, first taken in July, had had its origin in migrants from the rose. Stragglers of both species remained on the rose during the summer. Experiments showed *M. pseudorosae* to be able to live and produce young on ragwort, and the young matured on the secondary food-plant. It is possible that it may prove to be synonymous with *M. rosaeformis*, Das, from India.

M. solanifolii, on migrating from the rose, commonly causes heavy infestation of the potato, and perhaps transmits the mosaic disease of that plant. *M. rosae* is not known to migrate.

A key to the New England species of *Macrosiphum* is given, and the following new species described: *Macrosiphum carpinicolens*, on blue beech (*Carpinus caroliniana*); *M. ptericolens* from fronds of bracken (*Pteris aquilina*) and lady fern (*Athyrium filix-foemina*); *M. diervillae* from wild bush honey-suckle (*Diervilla lonicera*); *M. impatiensicolens* from stem of terminal shoots of *Impatiens biflora*; *M. amelanchiericolens* from *Amelanchier spicata*; *M. onagrae* on evening primrose (*Oenothera biennis*); *M. pseudocoryli* from ironwood (*Ostrya virginiana*) and hazel bush (*Corylus rostrata*); *M. pseudodirhodum* on greenhouse and wild roses; *M. gravicornis* on *Solidago*; *M. eupatoricolens* on *Eupatorium purpureum*; and *M. lanceolatum* on *Solidago lanceolata*.

This bulletin also contains a further instalment (Part VI) of the author's food-plant catalogue of the Aphids of the world. [*Cf. R.A.E.*, A, vii, 243.]

Patch (E. M.). **The Life-Cycle of Aphids and Coccids.**—*Ann. Entom. Soc. America, Columbus, Ohio*, xiii, no. 2, June 1920, pp. 156–167.

This paper, forming part of a Symposium on "The Life Cycle in Insects," discusses the difficult problems of the life-cycles of Aphids, which, although governed by certain rules, are very confusing owing to the unusual phenomena that occur in the course of the life-history of any species. The overwintering egg is true to the rules governing Hexapods, but between each sequence of such eggs there is a succession of remarkable phenomena, including parthenogenetic viviparous generations, extreme examples of polymorphism, alternation of generations in a series where a duplication may not occur for seven or more generations, parallel series in which certain females give birth to true sexes, while others of the same generation give rise to normal young that hibernate in the first instar without feeding, and a system of seasonal migration that is unsurpassed by any in the animal kingdom. All these divergences from the normal may be exhibited in a single species. Typical life-cycles of *Eriosoma lanigerum*, *Hormaphis hamamelidis*, *Chermes* and *Phylloxera* are given in illustration. The relations of the Aphid to its environment and the manner in which it controls and selects that environment are discussed. The instinct that prompts the autumn migration is not understood, but whatever the cause, it is always once and once only in seven generations that the autumn migration takes place from secondary to primary host and the reverse migration in spring. It is obvious that environment is influential in the production of winged forms, and that migration is correlated with exhaustion of the infested food-plant in the spring and with either that or a normal ripening of the food-plant in autumn. Parthenogenetic reproduction may in many species be indefinitely continued in a warm climate or in hot-house conditions. Whether temperature is the direct control is doubtful, for many species produce both alate and apterous forms throughout the summer; and it is quite possible that continuous vegetable growth in a warm climate is the direct encouragement to parthenogenetic viviparous reproduction. Even in tropical climates with a wet and dry season gamogenetic eggs are produced to tide over the period of famine; and in the north some non-migrating species produce sexuales in August, July or even June on exhausted vegetation. Certain species, such as *E. lanigerum* and *Prociphilus tessellatus*, even when they occur in the north, attempt to provide for a continuation of the apterous viviparous parthogenetic part of their cycle by producing annually nymphs to hibernate about the base of the secondary host at the same time that the migrants are producing the sex forms on the primary host.

In the case of Coccids, the specialisation of their structural characters and the modified metamorphosis of both sexes is discussed, and typical life-cycles of COCCIDAE in general, and of *Xylococcus betulae* and *Aspidiotus perniciosus* in particular, are sketched.

SEAMANS (H. L.). **The External Anatomy of *Anthomyia radicum*, L. (Diptera Anthomyidae).**—*Ann. Entom. Soc. America, Columbus, Ohio*, xiii, no. 2, June 1920, pp. 201–223, 6 plates.

The contents of this paper are indicated by its title.

HICKERNELL (L. M.). **The Digestive System of the Periodical Cicada, *Tibicen septemdecim*, L.**—*Ann. Entom. Soc. America, Columbus, Ohio*, xiii, no. 2, June 1920, pp. 223–242, 6 plates.

In discussing the structure of the digestive system of *Tibicen septemdecim*, it is remarked that nothing in the course of the present study has thrown any light upon the reasons for the peculiar life-history of this species.

JOULIAN (C.). **A Coleopteron injurious to grafted Vines in Algeria.**—*La Petite Revue Agric. et Hortic., Antibes*, xxvi, 1920, p. 10. (Abstract in *L'Agric. Colon., Florence*, xiv, no. 6, June 1920, p. 272.)

In Algeria grafted vines have a dangerous enemy in the beetle, *Pentodon punctatus*, the underground grub of which attacks the scar at the point where the grafting meets the American stock. The nurseries are usually placed in ground rich in humus as a result of continued applications of stable manure, and an essential preliminary to establishing a nursery is the collection of all the grubs present, any adults found being also destroyed.

ESCHERICH (K.). **Forstentomologische Streifzüge im Urwald von Bialowies.** [Forest Entomological Excursions in the Virgin Forest of Bialowies.]—*Bialowies in deutscher Verwaltung, Berlin*, no. 2, 1917, pp. 97–115, 19 figs. [Received 28th July 1920.]

The observations recorded here were made in August 1916, during a month's visit to the forest of Bialowies in Lithuania. Some portions of this forest are virgin, but the greater part shows traces of human action of slight importance, such as the removal of dead wood. The chief differences between normal German forests and this area are its enormous extent—about 320,000 acres, the mixture of many varieties of trees, the absence of clearings and plantations, the untouched soil-covering and the marshy character of extensive tracts.

As regards insect infestation it was found that primary pests were not common. Injury to leaves and needles was rare ; for instance very few spruce showed traces of [*Eucosma*] *tedella* or other Tortricids. Still rarer were such Hymenoptera as *Lyda*, *Lophyrus* and *Nematus*, and the Coleoptera, *Brachyderes*, *Strophosomus*, *Phyllobius*, etc. Only a few oaks were badly infested by the oak miner, *Tinea complanella*. Galls were not numerous ; in one case galls of *Chermes* were abundant on a spruce covered with *Physokermes piceae*. In spite of the number of oaks, oak-galls were very rare, only one type, those of the Cynipid, *Neuroterus numismalis*, being noticed. Willows and poplars also were almost free from galls ; in one instance those of *Pontania salicis* were seen on *Salix purpurea*. The leaf-galls of *Eriosoma* (*Schizoneura*) *ulmi* occurred on elms in the grounds of Bialowies castle. The absence of injury by *Hylobius* to the root-crowns of spruce and pine was remarkable. Of the more harmful Lepidoptera the nun moth [*Liparis monacha*] alone seems to find conditions favourable to an occasional outbreak.

In striking contrast was the remarkable abundance of secondary pests. The chief of these are Scolytid, Buprestid and Cerambycid beetles, which predominate over all others. Among the CERAMBYCIDAE were *Prionus coriarius*, *Leptura rubra*, *L. dubia*, *Monochamus sartor*, *M. galloprovincialis*, *Necydales ulmi*, *Saperda perforata*, *Clytanthus varius*, *Acanthoderes clavipes*, *Acanthocinus griseus*, *Liopus nebulosus*, etc. The Buprestids included *Buprestis rustica*, *B. maculata*, *B. haemorrhoidalis* and *Phaenops cyanea*, all four of which were seen together in large numbers on one occasion. The number of Scolytid beetles, however, greatly exceeded those of the above two families. One pine trunk harboured *Myelophilus piniperda*, *M. minor*, *Ips* (*Tomicus*) *sexdentatus* and *I.* (*T.*) *laricis*, besides Buprestids and Cerambycids, and this appeared to be the general rule. Of the bark-beetles of conifers *I.* (*T.*) *laricis* was the most frequently met with, other species found in abundance being *I.* (*T.*) *typographus*, *I.* (*T.*) *amitinus*, *M. piniperda*, *M. minor*, *Pityogenes bidentatus*, *P. quadridens*, *P. chalcographus* and *Polygraphus poligraphus*. *Hylastes ater*, *H. opacus*, *H. palliatus* and *Dryocoetes autographus* were fairly common and a few specimens of *Ips* (*Tomicus*) *suturalis*, *I.* (*T.*) *duplicatus*, *I.* (*T.*) *longicollis* and *Polygraphus subopacus* were found. Compared with species breeding in the bark the timber-infesting beetles were few in number, only a few specimens of *Xyloterus lineatus* being observed in fallen or standing dead conifers. The bark-breeding genus *Pissodes* was almost completely absent, and no adult individuals were seen, though a few mines of *P. piniphilus* and some pupae of *P. notatus* were observed.

Secondary pests were of common occurrence in the case of deciduous trees also. *Scolytus ratzeburgi* was particularly abundant in birch and in many situations it appeared to be a primary pest. *Xyloterus signatus* was also often noticed in birch. Poplars and aspens were sometimes severely infested with secondary enemies ; in one case a freshly uprooted poplar harboured 3 species:—a Cossid, a Buprestid and the bark-beetle, *Cryphalus asperatus*. Bark-beetles, chiefly *Hylesinus crenatus* and *H. fraxini*, also occasionally infested ash to a serious extent.

The differences in insect infestation in a virgin forest and in a cultivated one are discussed, the conclusion reached being that in the Bialowies forest injurious insects are of very little importance. Their increase is checked by the mixture of plant species, by the vigour of the trees due to growth in naturally suitable situations and to natural re-afforestation, and by the abundance of natural enemies. These findings point to the need for bringing cultural methods as much as possible into line with the conditions found in nature.

ESCHERICH (K.). **Die Bekämpfung schädlicher Insekten.**—*Frankfort on Main*, Werner u. Winter G. m. b. H., 1919. pp. 5–15, 3 plates [Received 28th July 1920.]

In this article the economic and hygienic necessity for combating injurious insects is explained in simple language.

COELHO DE SOUZA (W. W.). **Combate á Lagarta rosea.** [Work against the Pink Bollworm.]—*Brasil Agricola, Rio de Janeiro*, v, no. 1, January 1920, pp. 12–14, 1 fig. [Received 30th July 1920.]

It is recommended that each of the more important townships in the Brazilian cotton zone should be provided with a cotton-seed disinfecting apparatus, one made in Rio de Janeiro being said to be suitable. A further measure against the pink bollworm [*Platyedra gossypiella*] is crop rotation, and French beans should be planted in land where cotton has been grown.

FEYTAUD (J.). **Sur les jeunes Colonies du Termite lucifuge.**—*C. R. hebdom. Acad. Sci., Paris*, clxxi, no. 3, 19th July 1920, pp. 203–206.

The founding of new colonies by the swarming of kings and queens is an established fact in the case of *Leucotermes lucifugus*, Rossi, and they can form colonies likely to live on freshly cut pine stumps. Two years later most of these colonies still possess the royal pair in the midst of a large population, in which the soldiers are relatively more numerous than in the old colonies. Swarming takes place for the first time at the end of the second year and is probably not repeated each spring. The replacement of the royal pair begins before the end of the second year.

HOLLANDE (A. C.) & VERNIER (P.). *Coccobacillus insectorum*, **n. sp., Variété** *malacosomae*, **Bacille pathogène du Sang de la Chenille** *Malacosoma castrensis*, **L.**—*C. R. hebdom. Acad. Sci., Paris*, clxxi, no. 3, 19th July 1920, pp. 206–208.

The blood of 50 per cent. of the caterpillars of *Malacosoma castrensis*, L., feeding on the leaves of *Poterium sanguisorba* in the neighbourhood of Nancy was found to be infected with a new organism, *Coccobacillus insectorum* var. *malacosomae*. Experiments showed that the caterpillars of *M. castrensis* and of *Vanessa urticae* are killed in 24 hours by an inject on of the *Coccobacillus* into the blood or by merely pouring the culture on the leaves, while those of *M. neustria* die 12 hours after the injection of the organism, although only 30–60 per cent. are killed through the medium of the leaves.

Reyne (A.). **A Cocoonspinning Thrips.** *Tijdschr. Entomologie, The Hague*, lxiii, no. 1–2, 15th July 1920, pp. 40–45, 1 plate.

Franklinothrips tenuicornis, Hood, which has been recorded from Moro Island, Trinidad and Panama [*R.A.E.*, A, iii, 566 ; vii, 185], also occurs in Dutch Guiana. Its most peculiar habit is the spinning of a cocoon before pupation. Reference is made to a similar observation by Kurdjumov in the case of *Aeolothrips fasciatus* [*R.A.E.*, A, iv, 166].

Insectenpoeder-productie in Japan. [The Production of Insect Powder in Japan.]—*Teysmannia, Batavia*, xxxi, no. 2, 1920, p. 91.

In 1910, pyrethrum was grown on 1,122 acres and produced 865,316 lb. of powder. By 1918 the acreage had risen to 10,474 and the amount of powder to 6,720,000 lb. In 1919, these figures fell considerably, being 3,809 acres and 2,479,680 lb. This reduction is due to cultivators having turned their attention to peppermint and grasses suitable for strawplaiting.

Byars (L. P.). **A Nematode Disease of Red Clover and Strawberry in the Pacific North-west.**—*Phytopathology, Baltimore*, x, no. 2, February 1920, pp. 91–95, 2 plates.

During the summer of 1919 red clover (*Trifolium pratense*) and strawberry plants (*Fragaria* sp.) were greatly injured by a disease due to the presence of a Nematode, *Tylenchus dipsaci*, Kühn (*devastatrix*) [*R.A.E.*, A, viii, 79]. The disease is only found in the Pacific North-west and then only in the irrigated sections. Whether it is confined to clover grown under irrigation has, however, not yet been decided Apparently only those parts of the plant that are above ground are attacked. The Nematode is no doubt largely spread by water, and in the case of strawberries it is probably disseminated by means of the young infected plants used for propagating purposes. This Nematode has also been found attacking a wild plant, *Physalis* sp.

Rand (F. V.) & Cash (L. C.). **Some Insect Relations of *Bacillus tracheiphilus*, Erw. Sm.**—*Phytopathology, Baltimore*, x, no. 3, March 1920, pp.133–140, 1 fig.

Experiments with *Diabrotica vittata* (striped cucumber beetle) and *D. duodecimpuncta* (twelve-spotted cucumber beetle) in connection with studies on insect transmission of bacterial wilt of cucurbits are described. It is evident that the former beetles harbour the organism internally when they enter the fields in the spring, and apparently their only source of infection is the cucurbit crop of the preceding autumn. Infection may take place from the mouth-parts or faeces of the insects when these come in contact with fresh lesions on the leaves, provided that the injury involves the vascular system. Beetles of the genus *Diabrotica* are the only known carriers of the disease in nature.

Howitt (J. E.). **Some Observations made in inspecting for Leaf Roll and Mosaic.**—*Phytopathology, Baltimore*, x, no. 5, May 1920, p. 316.

In northern Ontario the mosaic disease of potatoes appears year after year in infected stock and is evidently spread from diseased to healthy plants. The chief transmitting agent is apparently the leaf-hopper, *Empoasca mali*, Le Baron.

HENRY (A.). *Chermes* **attacking Douglas Fir.**—*Gardeners' Chronicle, London*, lxvii, no. 1748, 26th June 1920, p. 318, 1 fig.

In view of the increased tendency to use Douglas fir and Sitka spruce in afforestation schemes in England, attention is drawn to the presence of *Chermes cooleyi* in this country. This Aphid causes great damage to these trees, and in the United States is known to attack Colorado and Oregon Douglas fir. It is more common in the Rocky Mountains, where it also occurs on *Picea engelmanni* and *P. pungens*. In the Pacific coast region it has been found on Sitka spruce. In England it has not yet been recorded from Colorado Douglas fir, even when it is grown alongside infested Oregon Douglas fir.

In Montana this pest has been successfully checked in nurseries by spraying with kerosene emulsion. The importance of planting absolutely clean seed is emphasised.

SPEYER (E. R.). *Chermes* **attacking Trees of the Douglas Fir.**—*Gardeners' Chronicle, London*, lxviii, no. 1751, 17th July 1920, p. 36, 2 figs.

Attention is drawn to the damage caused by *Chermes cooleyi*, Gill., in Bagley Wood near Oxford, especially during 1919, in which year it also affected a number of plants in the nursery. The "sistens" stage develops in the spring from hibernating larvae. These adults are situated on the old needles, on which they feed by sucking the juice. Numerous eggs are laid by them and the larvae from these migrate to the new shoots and cause them to have an unhealthy appearance. By the end of May they have developed wings and disappeared, probably to Sitka spruce.

A few of the larvae remain wingless and are known as "progredientes"; these lay eggs which give rise to "progredientes" or "sistentes." The latter hibernate in the larval form until the following spring.

The winged form or sexupara on Sitka spruce produces a sexual generation, all other generations being asexual. From this stage onwards details of the life-cycle are not accurately known, and the life-cycle of the closely-allied *Chermes strobilobius*, Kalt., is therefore briefly described. [*R.A.E.*, A, viii, 138.]

Fumigation with hydrocyanic acid before planting out in the forest is advocated for the destruction of this pest. Damage by *Chermes* is apparently most serious where the trees are planted on unsuitable soil.

VOGEL (J. F.). **Over het Bestrijden van den Nonvlinder** (*Liparis monacha.*) [Measures against the Nun Moth, *Liparis monacha.*]—*Tijdschr. Plantenziekten, Wageningen*, xxvi, no. 5, May 1920, pp. 146–148.

Early in August 1919 some adults and masses of pupae of the nun moth, *Liparis monacha*, were observed near Loo in a forest of about 150 acres of *Pinus sylvestris* aged 40–80 years. Collection was carried out from 11th to 20th August, 100 children in squads of 10–15 being employed at a total cost of about £65. From a batch of

200 pupae there were obtained 54 males, 109 females, 16 Hymenopterous parasites (*Ichneumon flavatorius*, Grv., and *Pimpla instigator*, F.) and 7 cocoons of Dipterous parasites, while 14 pupae were either shrivelled or attacked by fungi. The percentages of males and females were thus 27 per cent. and 55 per cent., an exceptional result as the males usually predominate. About 84,000 female moths and pupae were collected : the males and the few caterpillars were not counted. The pupae represented about half the catch or about 40,000 specimens. Assuming 55 per cent. to be females this would yield 22,000, or a total of 66,000. As each female should average 100 eggs (the maximum and minimum numbers observed being 184 and 62), the total number would have been 6½ millions, for there is no reason for assuming the non-fertilisation of many females owing to their numerical excess. Up to the date of writing (May 1920) the pines were free from infestation.

ZACHER (F.). **Notizen über Schädlinge tropischer Kulturen. 10. Aufsatz : Afrikanische Tabakschädlinge.** [Notes on Pests of tropical cultivated Plants. No. 10. African Tobacco Pests.]—*Tropenpflanzer, Berlin*, xx, nos. 4–6, 1917, pp. 159–175, 207–222, 259–265, 37 figs. [Received 1st July 1920.]

This paper was prepared in view of the expected development of tobacco cultivation in Kamerun and other colonies, as it is a matter of paramount importance to recognise a local infestation before it has time to spread.

Among the chief tobacco pests in Africa are locusts and other Orthoptera. The use of poison-baits, such as the Criddle mixture, is advised against *Schistocerca peregrina*, Ol. *Gyna capucina*, Gerst., has been found in Kamerun, but does not appear to be dangerous. Other Orthoptera include : *Acrida* (*Tryxalis*) *turrita*, L. ; *Gastrimargus marmoratus*, Thunb. ; *Heteropternis coloniana*, Sauss. ; *Morphacris fasciatus*, Thunb. ; *Acrotylus patruelis*, H.-S. ; *Locusta* (*Pachytylus*) *migratorioides*, Reiche ; *L. pardalina*, Wlk. (*P. sulcicollis*, Stål) ; *Atractomorpha aberrans*, Karsch; *Chrotogonus hemipterus*, Schaum ; *C. lameeri*, Bol. ; *Zonocerus elegans*, Thunb. (one of the worst plant pests in East Africa) ; *Oxyrrhepes procera*, Stål ; *Catantops opulentus*, Karsch ; *C. solitarius*, Karsch ; *C. vittipes*, Sauss. ; *C. melanostictus*, Schaum ; *Acridium lineatum*, Stål ; *Orthacanthacris* (*A.*) *aegyptius*, L. (common in Africa, where it has not, so far, attacked tobacco as it does in Italy and Dalmatia); *Euprepocnemis* sp. (from Kamerun) ; *Brachytrypes membranaceus*, Dru. ; *Scapsipedus marginatus*, Afz. ; *Acheta bimaculata*, DeG. (common in Africa, where it has not, so far, attacked tobacco) : and *Gryllotalpa africana*, P. de B. (a very serious pest of many cultivated plants).

In the Transvaal a bug, *Nezara viridula*, L., is common in tobacco fields, but does little harm.

Aphids may cause serious loss, and this may occasionally be the case with Tipulid larvae.

Lepidopterous pests include the Noctuids, *Euxoa* (*Agrotis*) *segetum*, *E. spinifera*, Hb., *Agrotis ypsilon*, Rott., *A. c-nigrum*, the cotton worm, *Prodenia litura*, F. (one of the worst tobacco pests, for which the remedial measures adopted in Egypt are enumerated together with notes on its natural enemies), *Laphygma exigua*, Hb. (the life-history of which resembles that of *P. litura* so that the same measures are applicable) and *Heliothis* (*Chloridea*) *obsoleta* (an account of natural and artificial control for which is given); *Phthorimaea* (*Gnorimoschema*) *heliopa*, Lwr.; and *P. operculella*, Zell. (which appears to prefer the subtropical regions of Africa to the tropical ones).

Among the Coleopterous pests of tobacco the TENEBRIONIDAE are remarkable for the number of species that are injurious both as larvae and adults. *Gonocephalum simplex*, Gerst., is a widely distributed African species that has been recorded from Kamerun. It is closely related to *Opatrum intermedium*, Fisch., from Bessarabia, and to a species believed to be *O. depressum*, F., in Sumatra. In South Rhodesia beetles of the genera *Zophosis*, *Psammodes*, *Dichtha* and *Anomalipus* have been recorded as occasional pests of tobacco. *Trachynotus griseus*, Fhs., is also a Rhodesian pest. Occasional injury to the leaves has been done in the Transvaal by *Strophosomus* sp. and *Peritelus* sp. The pests of stored tobacco include *Lasioderma serricorne*, F., *Tribolium confusum*, Duv., *Calandra oryzae*, L., *Anobium paniceum*, L., *Dermestes vulpinus*, F., *Tinea pellionella*, L., and the cheese mite, *Tyroglyphus siro*, Latr. Except in the case of the first two it is not quite clear whether these pests occur in Africa.

ZACHER (F.). **Vorratsschädlinge und ihre Bekämpfung.** [The Pests of Stored Products and their Control.]—*Kaiserl. Biol. Anstalt Land- u. Forstwirtsch., Berlin, Flubglatt* 63, June 1918, 8 pp., 13 figs. [Received 1st July 1920.]

The pests of stored wheat here enumerated are :—*Calandra granaria*, L., *C. oryzae*, L., *Sylvanus surinamensis*, L., *Tribolium navale*, F., *Tinea granella*, L., and *Sitotroga cerealella*, Cl.

Pests of flour, etc., are :—*T. navale*, *Tenebrio molitor*, L., *Ephestia kühniella*, Z., *Plodia interpunctella*, Hb., and *Tyroglyphus siro*, L. Pests of dough and bakery products include *C. granaria*, *C. oryzae*, *T. molitor*, *P. interpunctella*, *E. kühniella*, *Sitodrepa panicea*, F., *Blatta orientalis*, L., and *Gryllus domesticus*, L. A brief note is given in each case.

Remedial measures, which are briefly described, include the use of such chemicals as hydrocyanic acid, sulphurous acid, carbon bisulphide, etc., the action of high and low temperatures and mechanical methods (sieves, etc.).

ZACHER (F.). **Untersuchungen über Schädlingsbekämpfung mit Blausaüre.** [Investigations on combating Insect Pests with Hydrocyanic Acid Gas.]—*Mitt. Biol. Reichsanst. Land- u. Forstwirtsch., Berlin*, no. 17, June 1919, pp. 31–37. [Received 1st July 1920.]

The conclusions reached in this paper are in substantial agreement with those of Burckhardt [*R.A.E.*, A, vii, 353]. At the present time hydrocyanic acid cannot be advised against *Calandra granaria*, but on the whole this substance is useful against most of the pests that occur indoors.

In a series of experiments the following were killed by a 4-hours exposure to 1 per 1,000 (= 1220 mg. per cu. m.) :—*Tribolium navale* (beetles), *Gnathocerus cornutus* (larvae and beetles), *Sitodrepa panicea* (beetles), *Crioceris lilii* (beetles), *Sitones* (*Sitona*) sp. (beetles), *Coccinella* sp. (larvae), Syrphid larvae, ants, *Porthetria* (*Lymantria*) *dispar* (caterpillars), and *Ephestia kühniella* (caterpillars). A mortality of 90 per cent. was attained with *Laemophloeus ferrugineus* and of 95 per cent. with *Nygmia phaeorrhoea* (*Euproctis chrysorrhoea*).

ZACHER (F.). **Die Schädlinge der Kärtoffeln. 2. Schädlinge an der unterirdischen Teilen der Kartoffelpflanze.** [Potato Pests. 2. Pests of the Underground Portions of the Potato Plant.]—Separate from *Der Kartoffelbau*, [*sine loco*], iii, nos. 16 & 18, 16th October & 16th November 1919, 4 pp., 5 figs. [Received 1st July 1920.]

The potato pests dealt with include millipedes, the mites, *Rhizoglyphus echinopus*, C. & F., and *Histiostoma rostroserratum*, Megn., and mole-crickets, *Gryllotalpa gryllotalpa* (*vulgaris*). In the case of the latter the author found animal food in 2 individuals, vegetable in 8 and mixed animal and vegetable débris in 38. The measures advised against mole-crickets are traps, flooding the galleries and poison-baits.

ZACHER (F.). **Schädlingsplagen im Werderschen Obstbaubezirk.** [Insect Pests in the Werder Fruit-growing District.]—Separate, issued by the *Biol. Reichsanst. Land- u. Forstwirtsch., Berlin*, from *Mitt. Deutschen Landwirtsch.-Gesell.*, 1920, no. 24, 2 pp.

Fruit-growers in the Werder district of Brandenburg suffered considerable losses in 1920 from insect and fungus enemies.

The caterpillars of *Cheimatobia* (*Operophthera*) *brumata*, L., were abundant and injured cherries and gooseberries. Apples were attacked by this moth and by *Anthonomus pomorum* and *Eriosoma* (*Tmetocera*) *ocellana*. Other injurious insects were *Argyroploce* (*Olethreutes*) *variegana*, Hb., *Blastodacna hellerella*, Dup., *Aporia crataegi*, L., *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*), *Malacosoma neustria*, L., *Diloba coeruleocephala*, L., *Psylla mali*, Schm., and the woolly aphis [*Eriosoma lanigerum*]. The two last-named did much damage in many places. Apples, pears and cherries were severely infested by *Otiorrhynchus raucus*, and cherries and strawberries by *Cneorrhinus plagiatus* (*geminatus*). The gooseberry sawfly, *Nematus* sp., and the gooseberry mite, *Bryobia praetiosa*, Koch, were in evidence. *Hyponomeuta malinellus*, Z., appears to be increasing. Around Berlin severe infestations by *Hoplocampa fulvicornis*, Htg., occurred.

ZACHER (F.). **Vorläufige Diagnosen einiger neuer Spinnmilbearten.** [Preliminary Descriptions of some new Spinning Mites.]—*Berlin*. Typed leaflet issued 17th May 1920 by the author.

The following new species are described:—*Paratetranychus gossypii* from cotton in Togo, West Africa; *Tetranychus salicicola* from willow and poplar in Berlin and the Island of Rügen; *Tetranychus* (*Epitetranychus*) *viennensis* from apple, pear and heart-cherry in Vienna and Berlin

Börner (—). **Aufzucht der Reblausfliegen und ihrer Brut.** [The Breeding of *Phylloxera* Adults and their Progeny.]—*Mitt. Biol. Reichsanst. Land- u. Forstwirtsch., Berlin*, no. 17, June 1919, pp. 23–24. [Received 1st July 1920.]

The best method of collecting adult *Phylloxera* required for breeding purposes is described. Some difficulty was experienced with regard to the enclosure of the necessary vines, but a cover of finest parchment paper proved satisfactory; this cover was attached to the upper end of a cardboard tube which surrounded the stem and the other end of which was pressed into the earth. This had to be undertaken owing to the death in the winter of 1916, through unavoidable neglect, of the 67th generation of a stock that the author had kept under observation since 1910.

Escherich (K.). **Das Forschungsinstitut zur Bekämpfung tierischer Schädlinge in München.** [The Munich Research Institute for combating Animal Pests.]—*Verh. Deutschen Ges. angew. Entom., II. Mitgliederversammlung, Munich, 24–26 September 1918: Berlin*, 1919, pp. 13–23. [Received 28th July 1920.]

This new Research Institute will include departments for forest and agricultural pests; later on a department dealing with enemies of man and domestic animals will be added. Besides these main divisions there will be a smaller section dealing with industrial and commercial pests. There will be an independent division for chemistry and another for bacteriological and mycological research. The central institute will be supplemented by field stations established in foci of infestation. Opportunity will thus be afforded for training competent economic entomologists, a matter that has hitherto been neglected in Germany.

It is absolutely necessary that the results obtained by such an institute should be available and applied universally throughout the country. This pre-supposes a popular appreciation of economic entomology, and the elementary schools must undertake this work.

Stellwaag (F.). **Die Verwendung von Blausäure zur Bekämpfung der Traubenwickler.** [The Use of Hydrocyanic Acid Gas against Vine Moths.]—*Verh. Deutschen Ges. angew. Entom., II. Mitgliederversammlung, Munich, 24–26 September 1918: Berlin*, 1919, pp. 24–31. [Received 28th July 1920.]

Tent fumigation with hydrocyanic acid gas in vineyards [*R.A.E.*, A, viii, 268] has been found to give such uncertain results as not to warrant further work to develop this method.

Treatment with solutions of hydrocyanic acid in water is however very promising. Even with a weak solution of ½ per cent. the escaping gas was able to kill the pupae. No other method has yielded a result of 100 per cent., as was obtained at strengths varying from ½ to 3 per cent. The cost of spraying the stocks is smaller than that of any other winter measure. Spraying with a solution of hydrocyanic acid will probably prove useful also in orchards, in combating insects that hibernate on the bark, and it should also be successful against those in living or dead wood. Further experiments are being made in this connection.

HEYMONS (R.). **Die Bekämpfung der Mühlenschädlinge.** [The Control of Flour Mill Pests.]—*Verh. Deutschen Ges. angew. Entom., II. Mitgliederversammlung, Munich. 24–26 September 1918*; *Berlin*, 1919, pp. 34–51. [Received 28th July 1920.]

The method of combating *Ephestia kühniella*, Z., by fumigation with hydrocyanic acid gas is here dealt with. This moth was introduced from America sometime about 1870, and the losses it causes in Germany annually are said to amount to £25,000–£50,000. Fumigation has proved quite efficacious, but the cost of this process is against it at present in the case of most mills. The cost for a mill of 2,000 cu. metres is at least £32 10*s*., and for 6,000 cu. metres, over £60.

FRICKHINGER (H. W.). **Organisation der Bekämpfung der Mühlenschädlinge.** [The Organisation of Measures against Flour Mill Pests.]—*Verh. Deutschen Ges. angew. Entom., II. Mitgliederversammlung, Munich, 24–26 September 1918*; *Berlin*, 1919, pp. 52–61. [Received 28th July 1920.]

The technical organisation for combating pests that was founded in 1917 and attached to the Prussian Ministry of War is described. The Staff has been enlarged as the demand for its services increased in northern and central German States. A similar body has also been formed in Bavaria, the scientific part of the work being entrusted to the Zoological Department of the Bavarian Forest Research Institute.

This work of combating flour-mill pests has proved one of the first great successes of applied entomology in Germany, and has materially contributed to the recognition of its value to the country.

FLURY (F.). **Die Tätigkeit des Kaiser Wilhelm Instituts für physikalische Chemie und Elektrochemie in Berlin-Dahlem in Dienste der Schädlingsbekämpfung.** [The Work done in the Service of Insect Pest Control by the Kaiser William Institute for Physical Chemistry and Electro-chemistry.]—*Verh. Deutschen Ges. angew. Entom., II. Mitgliederversammlung, Munich, 24–26 September 1918*; *Berlin*, 1919, pp. 61–75. [Received 28th July 1920.]

During the War this institute was attached to the Prussian War Ministry and worked out problems connected with insect pest control, including analytical work relating to fumigation with hydrocyanic acid. An instrument constructed by Prof. Wieland enables the exact strength of gas used to be determined. It also proved of value in experiments made with sulphurous acid in the treatment of horse mange, an effective method of treatment being arrived at.

FULMEK (L.). **Zur Arsenfrage im Pflanzenschutzdienst.** [The Use of Arsenic in Plant Protection Work.]—*Verh. Deutschen Ges. angew. Entom., II. Mitgliederversammlung, Munich. 24–26 September 1918*; *Berlin*, 1919, pp. 75–88. [Received 28th July 1920.]

This paper reviews the properties and applications of the arsenic compounds most widely used against insect pests of plants. It was prepared in the view of their increasing popularity in spite of restrictive legislation and because the War had reduced the supplies of carbolineum, nicotine, soap, petroleum and other insecticides.

SCHLÜTER (—.). **Die Schädlingstafeln der Deutschen Gesellschaft für angewandte Entomologie.** [The Insect Pest Posters of the German Society for Applied Entomology.]—*Verh. Deutschen Ges. angew. Entom., II. Mitgliederversammlung, Munich, 24–26 September 1918; Berlin*, 1919, pp. 130–133. [Received 28th July 1920.]

The German Society for Applied Entomology is publishing six series of large-sized plates of pests dealing with injurious insects of all kinds. Each series is placed under the supervision of an entomologist of repute with special qualifications for the particular work. Explanatory circulars are issued in conjunction with the plates. The Society has distributed 12,000 prospectuses to schools, magistrates, museums, factories, etc.

FULMEK (L.) & STIFT (A.). **Ueber im Jahre 1917 erschienene bemerkenswerte Mitteilungen auf dem Gebiete der tierischen und pflanzlichen Feinde der Kartoffelpflanze.** [Communications of Value published in 1917 concerning the Animal and Vegetable Enemies of the Potato.]—*Centralbl. Bakt. Parasit. u. Infektionskr., Jena*, IIte Abt., li, nos. 12–15, 12th July 1920, pp. 315–336.

This is a comprehensive review of the literature on the subject for the year 1917.

KORNAUTH (K.). **Bericht über die Landwirtschaftlich-bakteriologische und Pflanzenschutzstation in Wien im Jahre 1919.** [Report of the Agricultural, Bacteriological and Plant Protection Station in Vienna in 1919.]—*Zeitschr. landw. Versuchswesen in Deutschösterreich, Vienna*, xxiii, 1920, Sonderheft, pp. 26–41.

The results of a number of analyses of insecticides are given. Various proprietary brands of insecticides were also tested. Further experiments are being made with tomato decoction against Aphids; dry tomato leaves give a less favourable result than fresh ones.

LYLE (G. T.). **Contributions to our Knowledge of the British Braconidae.**—*Entomologist, London*, viii, no. 687, August 1920, pp. 177–186.

This paper deals with the sub-family AGATHINAE and a key to the genera is given. Keys are also given to the species of *Agathis* and *Microdus*.

The species dealt with include *Agathis anglica*, Marsh., reared from *Coleophora* sp. and *Depressaria nervosa*; *A. brevisetis*, Nees, from *Coleophora troglodytella*; *Microdus clausthalianus*, Ratzb., bred from *Semasia rufillana* and *Depressaria atomella*; and *M. cingulipes*, Nees, reared from *Coleophora* sp.

WALLIS (T. E.). **Mexican Insects in Poultry Food; Mexican Cantharides, *Notonecta*, *Corixa* and *Berosus*.**—*Analyst*, xliv, 1919, no. 521, pp. 284–287. (Abstract in *Expt. Sta. Record, Washington, D.C.*, xliii, no. 1, July 1920, p. 53.)

The author finds that there is a regular commerce in dried insects from Mexico for use in poultry feeds, the chief genera present being *Notonecta* and *Corixa*. Poultry eat such insects with avidity, as they form an excellent relish to poultry food, no vesicant principle being present.

PEMBERTON (C. E.). **Insecticide Sprays: Their Relation to the Control of Leafhoppers by Parasites.**—*Hawaiian Planters' Record, Honolulu*, xxii, no. 6, June 1920, pp. 293–295.

In connection with spraying operations against the cane leaf-hopper [*Perkinsiella saccharicida*] fears have been expressed as to the result in view of the fact that some parasites are actually being destroyed and that *Paranagrus optabilis* is the chief agent in keeping the leaf-hopper in check. A consideration of the life-cycle of the leaf-hopper and its parasite and the comparative vulnerability of each to the spray may however serve to allay these fears.

During the winter and spring it was found that, on an average, it required about 35 days for the leaf-hopper egg to hatch, 62 days for the young insect to develop to an adult, and at least 15 days more before the adult began laying eggs, this process continuing for at least 20 days. The parasite completes its development within the leaf-hopper egg in about 42 days. As soon as it emerges it begins laying eggs in those of its host, and has laid all its eggs and died in about 5 days. Thus about 73 per cent. of the leaf-hopper's life is spent on the surface of the sugar-cane, while only about 10 per cent. of that of the parasite is passed under these exposed conditions. Consequently a much greater proportion of all leaf-hoppers than parasites present will be destroyed by spraying, and a change in balance is quickly effected. Besides this the parasite begins ovipositing as soon as it hatches, whereas the leaf-hopper does not begin to do so for about 77 days. Consequently many more of the parasites that are killed will have laid a proportion of their eggs. A second spraying before 77 days have elapsed is still more effective. It should be noted that the parasite attacks even eggs that are ready to hatch, and develops successfully.

In practice no detrimental effect of the spray on the parasite has arisen, and the parasitism has increased from a very low point when the spraying commenced to a much higher percentage in a short period. Further a decided response in the growth of the cane has accompanied this increase in parasitism and the decrease of a host of leaf-hoppers through the action of sprays and hopper-catchers operated over the entire area at the same time.

FULLAWAY (D. T.). **The Fern Weevil Menace.**—*Hawaiian Planters' Record, Honolulu*, xxii, no. 6, June 1920, p. 299, 1 plate.

The contents of this paper have already been noticed [*R.A.E.*, A, viii, 191].

BRIDWELL (J. C.). U.S. Bur. Entom. **Insects Injurious to the Algaroba Feed Industry.**—*Hawaiian Planters' Record, Honolulu*, xxii, no. 6, June 1920, pp. 337–343.

There are four insects effecting perceptible injury to the algaroba [*Prosopis juliflora*] crop. These are three beetles, which begin to infest the beans in the field, viz. :—*Bruchus prosopis* (algaroba or mesquite Bruchid), *B. sallaei* (glue bush Bruchid) and *Pachymerus* (*Caryoborus*) *gonagra* (tamarind Bruchid), and a moth, *Plodia interpunctella* (Indian-meal moth), which feeds in the pods during storage. Some of the information given concerning these Bruchids has been already noticed

[*R.A.E.*, A, vi, 352–356; vii, 434–435]. The first two are usually in the pupal state in the pods when the beans are harvested, while in the case of *P. gonagra* the eggs usually hatch about the time the beans are stored, almost all the damage being done in the warehouse, while the larva rarely finds enough food in a single bean, as do the others, but devours two or three before it reaches full growth. All these Bruchids are attacked by an egg-parasite, *Uscana semifumipennis*. In the case of *P. gonagra* 70–90 per cent. of the eggs are parasitised, infestation of the other species being rather less, probably because they often oviposit in clumps in which some eggs are protected from attack. A larval parasite, *Heterospilus prosopidis*, infests the two species of *Bruchus*, but is irregular in its attacks.

Remedial measures in the warehouse may prevent the damage done by *P. gonagra*, and the spread of the other Bruchids. Heating is not possible in practice owing to the cost; but fumigation, either in the public fumigating rooms at Honolulu or in others similarly constructed, is suggested.

In the field, where most of the damage by *B. prosopis* and *B. sallaei* is done, there seems no means of reaching the injury except by the introduction of natural enemies. Both the Bruchids in question occur in the south-western United States, and larval parasites may be found there, while some species of fossorial wasps of the genus *Cerceris* may be found to serve as an enemy of the adults.

Plodia interpunctella attacks many kinds of stored food, and breeds in considerable numbers in algaroba warehouses. The eggs are laid on the bags, and the caterpillars feed on the sugary pith inside the pods. Cocoons are made in crevices on the surface of the bag or elsewhere. While the caterpillars are crawling about in search of hiding places for making their cocoons they are attacked by red fire ants, a small predaceous bug, and a Hymenopterous parasite which deposits its eggs on them.

The best remedial measure is to heat or fumigate the bags after use, as infestation of new beans sometimes takes place because the caterpillars or pupae have been sent out with the bags, and escaped destruction in handling.

EHRHORN (E. M.). **Division of Plant Inspection.**—*Hawaiian Forester and Agriculturist, Honolulu*, xxii, no. 6, June 1920, pp. 174–175.

The pests intercepted during April included weevils in a package of chestnuts from Japan; mites in tree seeds from Java; moth larvae in herbs from China; Aphids on an undetermined plant, and mealy-bugs [*Pseudococcus*] on orchids, from California; pineapple mite [*Stigmaeus floridanus*] from Guatemala, and pineapple weevil [*Metamasius ritchiei*] and mealy-bug from Mexico, on pineapple suckers.

RODDA (T. E.). **Woolly-Aphis Control.**—*New Zealand Jl. Agric., Wellington*, xx, no. 6, 21st June 1920, pp. 372–374.

Experiments to control woolly aphis [*Eriosoma lanigerum*] show that the best results are obtained by spraying with oil (1 : 10) heated to 120° [F.] during the dormant period; this also proved most effective against red mite [*Tetranychus*]. Oil (1 : 1) heated to 120° [F.] and painted on the trees proved fairly effective. Crude vaseline was very effective when applied to old knots. Heavy sprayings of oil, *i.e.*, 1 : 6 & 1 : 8, during the dormant period proved more effective up to a certain time than the weaker strengths applied during growth. During the later period Black-leaf 40, applied either alone or with soap or lime-sulphur, proved the most satisfactory remedy, although its effect was very temporary, the Aphids increasing rapidly three weeks after treatment.

DRY (F. W.). **Flax Caterpillars.**—Separate from *Daily Leader* [*Nairobi*], 29th June 1920, 3 pp.

Observations show that roping is an adequate means for destroying flax caterpillars, of which *Phytometra* (*Plusia*) *orichalcea*, F., is the most common species in the Nakuru District of Kenya. The ropes, about an inch in diameter, should be dragged through the flax about six times a day. This operation should be done early in the day, as the injured caterpillars, provided that they are not too large, are then attacked by ants.

BRINDLEY (H. H.). **Further Notes on the Food Plants of the Common Earwig** (*Forficula auricularia*).—*Proc. Cambridge Philos. Soc., Cambridge*, xx, part 1, July 1920, pp. 50-55.

Forficula auricularia prefers to feed on plants with succulent leaves. A list is given of plants on which earwigs were fed during these observations, the relative preference shown towards different species being indicated. A knowledge of the preferred hiding places of these insects facilitates their destruction should they become a pest, although the actual damage done seems to be generally exaggerated.

THOMPSON (W. R.). **Sur un nouveau Parasite de la Galéruque de l'Orme**, *Degeeria collaris*, **Fall. (Dipt. Tachinidae)**.—*Bull. Soc. Entom. France, Paris*, no. 10, 26th May, 1920, pp. 180–184, 1 plate 4 figs.

A Tachinid, *Degeeria collaris*, Fall., of which the various stages are here described, is recorded as parasitising *Galerucella luteola* (elm leaf beetle) in Italy in the spring.

THOMPSON (W. R.). **Note sur** *Rhacodineura antiqua*, **Fall., Tachinaire Parasite des Forficules (Dipt.)**.—*Bull. Soc. Entom. France, Paris*, no. 12, 23rd June 1920, pp. 199–201, 5 figs.

The egg and first-stage larva of *Rhacodineura antiqua*, Fall., a Tachinid parasite of earwigs, are described. The first stage of the larva was found to be completely developed inside the egg. In the second stage the larva lies in the body-cavity of its host [*R.A.E.*, A, iv, 324]. The eggs are deposited on the food of the host.

PICARD (F.). **Sur quelques Insectes nuisibles à la Vigne.**—*Bull. Soc. Entom. France, Paris*, no. 12, 23rd June 1920, pp. 201–202.

The insects recorded as injurious to vines include a weevil, *Tanymecus palliatus*, F., which appeared in the valley of the Hérault in the spring of 1919, and is generally found in marshes near the coast. A Noctuid, *Calocampa exoleta*, L., damages the foliage in May in damp districts. A Sphingid, *Deilephila lineata* var. *livornica*, Esp., appeared in unusual numbers in one neighbourhood. *Scobicia chevrieri*, Villa, hatched towards the end of May and in June from vine shoots in which it develops under the same conditions as *Sinoxylon sexdentatum*, Oliv. This beetle hibernates in the larval stage. *Lyctus* (*Trogoxylon*) *impressus*, Com., was also abundant in vine shoots; it is attacked by a Clerid beetle, *Tarsostenus univittatus*, Rossi, and a Braconid, *Monolexis lavagnei*, Picard. *Clytus arietis*, L., hatched at the beginning of April.

Callidium fasciatum, Vill., and *Agrilus derasofasciatus*, Lac., are able to develop on living branches, but are seldom found except on wild vines.

LORENZETI (J. B.). **La Isoca en los Alfalfares.** [The Larvae of *Colias lesbia* in Lucerne Fields.]—*Gaceta Rural, Buenos Aires*, xiii, no. 155, June 1920, pp. 1243–1245.

The larvae of the butterfly, *Colias lesbia*, occur abundantly in lucerne fields throughout Argentina, especially in the drier regions. The first generation hatches in the spring from eggs laid in the previous autumn; the life-cycle of this generation occupies about 40 days, and successive generations follow until the autumn. If the infestation dies out after the first or second generation, as is sometimes the case in humid soils or during a wet season, the crop may be very little injured; in cases of continued infestation control measures are essential. In Argentina the cultivated areas are too vast, and labour too scarce and too scattered to render practicable the ordinary methods of collection of adults and larvae, the use of smoke or sulphur fumes, etc. It is therefore suggested that the crop should be cut somewhat before the normal time and that it should be dried and prepared for threshing, the stubble which is left being burned over. As the crop dries, the larvae infesting it will leave it and take refuge in crevices in the ground, under loose bits of soil, etc. To destroy these, as soon as the crop is removed and the stubble burnt, the ground should be disked to break it up and then rolled several times. This should destroy the majority of the surviving larvae. Another method is to cut down the lucerne in rows, about 20 to 25 yards wide, leaving strips of 5 to 8 yards uncut. The crop should be left on the ground to dry for a time and then be removed for threshing. The larvae will leave the cut grass for that still standing; on the following day the remainder should be cut down and as soon as it is sufficiently dry it should be burnt, and this should be followed by the disking and rolling described above. In cases of persistent infestation, the lucerne should be cut repeatedly, even before flowering, and the ground raked and rolled after each cutting, other food-plants in the vicinity being cut down and burnt at the same time as a complementary measure. Wherever possible, lucerne fields can be cleared of the pest by repeated flooding, but this should always be done in the evening as the sun is liable to injure the crop when under water. In very small areas, poultry allowed to run in lucerne fields will keep them free from the caterpillars.

Parodi (—.). **Naranjos atacados.** [Infested Oranges.]—*Gaceta Rural, Buenos Aires*, xiii, no. 155, June 1920, p. 1321.

In reply to an enquiry from Corrientes, Argentina, regarding certain caterpillars attacking orange plants so severely that in four days complete defoliation occurred, the author identifies the larvae as those of a moth, *Streblota bonariensis* and recommends spraying the plants with Paris green for the destruction of larvae and pupae.

Feytaud (J.). **Les Parasites de la Vigne. Insectes des Souches et des Sarments.**—*Bull. Soc. Vulg. Zool. Agric., Bordeaux*, xix, nos. 1–2, 3–4 & 6, January–April & June 1920, pp. 8–11, 22–26 & 56–61, 4 figs.

This paper indicates the insects injurious to the shoots and stocks of vines. The species dealt with include *Cossus cossus*, L., the caterpillars of which may be destroyed by piercing them in their galleries with wire or by fumigation. Termites may cause the death of the plant vines, but are usually only secondary pests. The most important are *Calotermes flavicollis*, F., and *Leucotermes lucifugus*, Rossi.

Other pests include: *Sinoxylon sexdentatum*, Ol., *S. perforans* (*muricatum*, F.), *Xylopertha sinuata*, F., *Apate bimaculata*, Ol., *A. capucina*, L., and *A. monacha*, L. These beetles are preyed upon by *Denops albofasciata*, Charp., *Tillus unifasciatus*, F., and *Opilo mollis*, Latr. The larvae of *S. sexdentatum* are especially parasitised by a Chalcid, *Pteromalus bimaculatus*, Nees, the Proctotrupids, *Laelius perrisi*, Kief., *L. tibialis*, Kief., *Cephalonomia formiciformis*, Westw., and a Braconid, *Monolexis lavagnei*, Picard.

A Buprestid, *Agrilus derasofasciatus*, Lac., and the Longicorns, *Clytanthus verbasci*, L., *Cerambyx miles*, Bon., *Phymatodes fasciatus*, Vill. *Rhopalopus clavipes*, F., and *R. femoratus*, L., have also been recorded as injurious to vines, as well as the sawfly, *Macrophya rufipes*, L. (*Tenthredo strigosa*). The majority of these pests do not however attack healthy vigorous wood.

Fullaway (D. T.). **Natural Control of Scale Insects in Hawaii.**—*Proc. Hawaiian Entom Soc., Honolulu*, iv, no. 2, June 1920, pp. 237–246.

Many of the Hymenopterous parasites now found in Hawaii were probably unintentionally introduced together with their hosts before the plant inspection and quarantine rules came into force [*R.A.E.*, A, vii, 437]. The majority of the beneficial Coccinellids as well as other natural enemies of scale-insects have since been imported.

A list is given of the scale-insects and their natural enemies; this includes 44 hosts, 37 parasites and 11 predators.

Bridwell (J. C.). **Notes on *Nesotocus giffardi*, Perkins (Coleoptera).**—*Proc. Hawaiian Entom. Soc., Honolulu*, iv, no. 2, June 1920, pp. 250–256, 1 plate, 6 figs.

The weevil, *Nesotocus giffardi*, has been considered one of the rarer endemic insects in Hawaii. The larvae, to the number of at least 300 or 400, were found in a fallen tree. *Cheirodendron gaudichaudii*. The eggs had evidently been laid soon after the tree had fallen. All stages of larvae were present, and a few had already pupated on 17th November 1918. During the feeding period the larvae work in the cambium of the bark, and occasionally complete their transformation in this portion of the tree, but more frequently, when fully grown, penetrate into the wood for 10 or 15 millimetres nearly vertically and then direct the burrow along the grain of the wood. When the larval chamber is complete the entrance is plugged with shredded wood.

This weevil attacks living trees of *Cheirodendron platyphyllum*, *C. gaudichaudii*, *Pterotropia*, *Tetraplasandra oahuensis* and *T. meiandra*. Efforts to breed from the collected larvae and pupae were not successful. Adults were kept alive for a month on branches of *Nothopanax guilfoylei* but oviposition did not take place. The larvae will construct pupal chambers in sugar-cane, but owing to the warmer temperature of the lowlands they become susceptible to moulds. The weevil is generally found at elevations of 1,200 feet or over. As the adults feed on living as well as dead bark they may occasionally be instrumental in causing the death of the food-plant by inoculating into it decay-producing organisms, but as the trees are among the most vigorous on the island, very little damage actually occurs.

FULLAWAY (D. T.). **A New Species of Fruitfly Parasite from Java (Hymenoptera).**—*Proc. Hawaiian Entom. Soc., Honolulu*, iv, no. 2, June 1920, pp. 260–261.

Biosteres javanus, sp. n., here described, was reared from pupae of *Dacus ferrugineus* in fruits of *Capsicum* at Buitenzorg, Java.

OSHIMA (M.). **A New Species of Immigrant Termite from the Hawaiian Islands.**—*Proc. Hawaiian Entom. Soc., Honolulu*, iv, no 2, June 1920, pp. 261–264, 1 plate.

Coptotermes intrudens, sp. n., which is closely related to *C. formosanus* Shir., is described from Honolulu. This termite was probably introduced into Hawaii from South America or the Orient, and causes considerable damage to wood products. Large colonies are formed, but it does not build mounds, the nests being made in or near the ground.

TIMBERLAKE (P. H.). **Notes on the Immigrant Hawaiian Species of Ichneumonini or Pimplini of Authors (Hymenoptera).**—*Proc. Hawaiian Entom. Soc., Honolulu*, iv, no. 2, June 1920, pp. 266–275.

Ephialtes (*Pimpla*) *hawaiiensis*, Cam., is redescribed and its numerous Lepidopterous hosts are recorded. A description is also given of *Itoplectis immigrans*, sp. n.

BRIDWELL (J. C.). **Some Notes on Hawaiian and other Bethylidae (Hymenoptera) with the Description of a New Genus and Species. 2nd Paper.**—*Proc. Hawaiian Entom. Soc., Honolulu*, iv, no. 2, June 1920, pp. 291–314.

The general biology and the method of attacking their prey of the species of *Sclerodermus* are described. The species dealt with include *S. immigrans* [*R.A.E.*, A, vii, 535], which was originally taken from cocoons of the Bruchid *Pachymerus* (*Caryborus*) *gonagra* in the pods of *Acacia farnesiana*. It is probably an immigrant from the Philippines.

Under natural conditions it generally attacks the Bostrychids, *Sinoxylon conigerum*, Gerst., and *Schistoceros cornutus*, Pall., and the larvae of the Cerambycids, *Neoclytarlus euphorbiae*, Bridwell, *Lagocheirus obsoletus*, Thoms., and *Coptops aedificator*, F., besides the Bruchid already mentioned. It has also been bred experimentally from several Anobiids, *Tenebroides mauritanicus* or a related species, the Tenebrionids *Tribolium ferrugineum*, F., and *Gnathocerus cornutus*, F., a Cerambycid, *Xystrocera globosa*, Ol., and a termite, *Calotermes cantaneus* Burm.

The only prey rejected during these experiments were *Pseudococcus* sp., *Sarcophaga* sp. and paralysed spiders from the nests of *Sceliphron*.

The endemic species of *Sclerodermus* have generally been associated with wood-boring larvae of the moths related to *Hyposmochoma*, *Semnoprepia* and *Hyperdasys*. In August 1919 *S. muiri*, Bridw., was taken from borings of an Anobiid beetle in wood of *Straussia*. The endemic species do not apparently attack Coleopterous larvae, but *S. poecilodes*, Perk., may under certain circumstances make use of those of Rhynchophora.

By the use of larvae of *Neoclytarlus euphorbiae* it was found possible to breed the endemic mountain species, *S. chilonellae*, Bridw., *S. polynesialis*, Saund., and *S. poecilodes*, Perk., in the warmer climate of the lowlands.

From observations made it is considered that *Cephalonomia* resembles *Sclerodermus* in its biology.

Nesepyris ewa, gen. et sp. n., which is predaceous on small Lepidopterous larvae, is described.

Bridwell (J. C.). **New Food Plant of Pink Boll Worm.**—*Proc. Hawaiian Entom. Soc., Honolulu*, iv, no. 2, June 1920, p. 328.

A pupal skin of *Platyedra* (*Pectinophora*) *gossypiella* is recorded as having been found in a dry pod of *Hibiscus youngianus*.

Swezey (O. H.). **The Tahiti Coconut Weevil,** *Calandra taitensis*, **Guerin, in Hawaii.**—*Proc. Hawaiian Entom. Soc., Honolulu*, iv, no 2, June 1920, pp. 333–335.

Attention is drawn to the finding of the coconut weevil, *Diocalandra* (*Calandra*) *taitensis*, Guér., in Hawaii. The presence of holes made by the larvae on old dried up leaves near the base of young trees seem to indicate that this weevil made its appearance some years previously. It is apparently not very injurious.

Bridwell (J. C.). **Notes on the Bruchidae (Coleoptera) and their Parasites in the Hawaiian Islands, 3rd Paper.**—*Proc. Hawaiian Entom. Soc., Honolulu*, iv, no. 2, June 1920, pp. 403–409.

The species dealt with include: *Bruchus prosopis*, Lec., *B. sallaei* Sharp, *B. limbatus*, Horn, and *Pachymerus* (*Caryoborus*) *gonagra*, F. [see also *R.A.E.*, A, vi, 352; vii, 434].

Bruchus limbatus has been found breeding in seeds of *Samanea saman*, *Pithecolobium dulce* and *Albizzia lebbek*, and experimentally it has been bred from seeds of *Acacia farnesiana* and pods of *Prosopis juliflora*.

All these species are parasitised by a Chalcid, *Uscana semifumipennis* Gir.

TIMBERLAKE (P. H.). **Descriptions of New Genera and Species of Hawaiian Encyrtidae (Hymenoptera), ii.**—*Proc. Hawaiian Entom. Soc., Honolulu*, iv, no. 2, June 1920, pp. 409–437, 23 figs.

The new species described include *Anagyrus antoninae* reared from *Antonina indica*, Green, on Bermuda grass, and *Xanthoencyrtus apterus*, Timb., many individuals of which were reared from a mealy bug, *Trionymus insularis*, Ehrh. Keys are given to both sexes of the latter genus.

Other species dealt with include *Coelopencyrtus orbi*, sp. n., reared from larvae of *Odynerus orbus*, Perk.; *Xesmatia flavipes*, gen. et sp. n., which may prove to be an egg-parasite; and *Plagiomerus hospes*, sp. n., the host of which is probably a Diaspine scale.

CORY (E. N.) & TRAVERS (W. C.). **The Control of the Strawberry Leaf Beetle.**—*Maryland Agric. Expt. Sta., College Park, Md.*, Bull. 236, May 1920, pp. 133–136, 1 fig. [Received 4th Aug. 1920.]

A series of dusting experiments for the control of *Typophorus canellus* (strawberry leaf beetle) is described. Effective mixtures were: 85 per cent. hydrated lime and 15 per cent. calcium arsenate; and 65 per cent. hydrated lime, 20 per cent. ground Bordeaux and 15 per cent. lead arsenate. The second mixture seemed also to give some control of leaf spot. Mowing before dusting gave a little advantage, but hardly enough to make it an economical practice.

The first application should be made about 1st July, and be followed by a second in three weeks. Applications should be repeated if followed in the course of several days by heavy rain, or if the injury to the plants is seen to have continued on subsequent examination.

CRIDDLE (N.). **Fragments in the Life-Habits of Manitoba Insects—II.**—*Canad. Entom., Toronto*, lii, no. 6–7, June-July 1920, pp. 121–125.

The brome-grass cutworm, *Trachea finitima cerivana*, Smith, feeds by night on brome-grass (*Bromus inermis*), hiding in the sheaves by day. The larvae first attract attention about the middle of September, when they gather into the grass sheaves that have been cut for seed purposes. They hibernate, and pupate in May, the adults emerging in June. This moth occurs over a wide area in Manitoba, Saskatchewan and Alberta. In Manitoba the caterpillars are usually so abundant in the sheaves at threshing time as to cause considerable annoyance, but the actual damage done to the plants seems to be very small considering the number present. This is probably due to the vigorous growth of the grass after harvest, which thus largely overcomes the insects' attack. It is not, therefore, a serious menance at the present time; but should it increase to still greater numbers, the loss would have an important bearing on the pasture situation, brome-grass being one of the most valuable fodder-plants of the west.

Remedial measures may include ploughing in July and cultivating later to prevent further growth, thus starving the caterpillars, destroying the insects shaken into the racks when threshing, using brome-grass straw for fodder and burning the refuse round the threshing place.

Proteopteryx oregonana (early aspen-leaf curler) was one of the three Microlepidoptera that infested aspen poplar (*Populus tremuloides*) in 1917–18 [*R.A.E.*, A, vii, 73]. The moths are on the wing in swarms in March. The larvae usually hatch towards the end of April, and drop from the trees to pupate about the end of May. The pupal stage lasts from early June till the following spring.

Parasites of *P. oregonana* are numerous, but have not been studied. Of predaceous enemies there are a number, particularly a Carabid beetle, *Calosoma frigidum*, the adults of which devour the caterpillars on the trees, while the larvae seek out and destroy the pupae buried under dead leaves. Several birds also feed on the caterpillars, species that are passing during migration being the more useful, as the caterpillars have pupated before many of the native birds commence to nest.

Hopping (R.). **A New Species of the Genus *Pissodes* (Coleoptera).**—*Canad. Entom., Toronto,* lii, no. 6–7, June-July 1920, pp. 132–134.

Pissodes terminalis, sp. n., here described, seems to be the only Californian species of this genus to breed on lodge-pole pine (*Pinus contorta*), and the only one to attack the terminals. In certain districts large areas of lodge-pole pine stands have suffered seriously from its attacks, the general infestation being on the terminal of the stem.

Many of the trees that had been attacked for three years had a squat appearance, caused by curtailing height and stimulating lateral growth. Healthy trees were attacked, while trees infected by the fungus, *Peridermium harknessi*, were avoided. The terminal is generally killed down to, and sometimes including, the first whorl of branches. The larvae mine the centre of pith of the terminal, each terminal producing from one to six weevils. Transformation takes place in the autumn, the adult apparently hibernating through the winter in the larval gallery. In many places the larvae were heavily parasitised by a small Dipteron.

Wickham (H. F.). **An Interesting Otiorhynchide Weevil from Vancouver Island (Coleoptera).**—*Canad. Entom., Toronto,* lii, no. 6–7, June-July 1920, pp. 134–135.

Panscopus (*Phymatinus*) *sulcirostris*, Pierce, is here recorded from Vancouver Island. Large numbers of this weevil were found in early May 1916 feeding upon the leaves of *Lilium pardalinum* ; and quantities of the larvae, and a few pupae were disclosed by digging about the roots of the lilies. There is every likelihood that this weevil may reappear as a pest of some importance in flower gardens along the north Pacific coast.

Glendenning (R.). **Some Notes on the Eriophyidae (Acarina) in British Columbia.**—*Canad. Entom., Toronto,* lii, no. 6–7, June-July 1920, pp. 136–137.

This paper records an infection of " Big-bud " on *Ribes bracteosum*, a wild black currant, by mites from infested black currant bushes imported from England to Vancouver Island. On the mainland the native hazel (*Corylus californica*) is frequently attacked by a similar mite, which also attacks *Ribes lacustre* and *R. bracteosum*.

The question of the specific identity of the mites on these plants is considered, and it is suggested that three of the four English mites, *Eriophyes avellana*, *E. ribis* and *E. grossulariae* are not good species and would be transferable from one food-plant to another. Proof of this has however not been obtained. The fact that the mite on the mainland, which is strongly established in the lower Fraser Valley, apparently lives on both hazel and currant, will have a retarding influence on the planting of these districts with small fruits, especially black currants; and it would be inadvisable to let any large area be planted until the fact that this mite will not affect the cultivated varieties of black currant and gooseberry has been proved beyond all doubt.

VAN HALL (C. J. J.). **Carbolineum ter Bestrijding van Ziekten en Plagen in onze Gewassen.** [The Use of Carbolineum against Diseases and Pests of our Crops.]—*Teysmannia, Batavia*, xxxi, no. 3, 1920, pp. 119–126.

Some of the advantages and disadvantages of carbolineum as an insecticide are discussed. This substance is largely used on the trunks and larger branches, but only rarely on the leaves and twigs, and it is of no importance as a soil disinfectant. A weak point is its irregular quality: even if each batch is chemically tested, the result will not show whether the material is efficient against the pests and non-injurious to the plants. Another disadvantage is the irregular behaviour of different samples as regards emulsification. In Dutch Guiana an 8 per cent. solution has proved effective against the scale, *Coccus* (*Lecanium*) *viridis*, on Liberian coffee, and it is worthy of note that the foliage did not suffer. Against scales in the Dutch East Indies a trial with an 8 per cent. solution should be made and if the foliage is injured it is best to prune the leaves and twigs prior to spraying, when a stronger solution—of 10 or even 20 per cent. strength—may be used with impunity.

It is important that only such carbolineum be used as yields a milk-white or dirty white solution in water: a light brown or light violet-brown colour denotes a quality unsuitable for spraying plants.

VAN HALL (C. J. J.). **Derris als Insecticide.** [Derris as an Insecticide.]—*Teysmannia, Batavia*, xxxi, no. 4, 1920, pp. 159–166.

The chief part of this paper is taken from one recently noticed [*R.A.E.* A, vii, 496]. There is also a reference to a short article, issued by Wood in 1912 (*Agricultural Bulletin Fed. Malay States*, i, p. 164), which recorded the successful application of derris against ants and cabbage caterpillars. About 2 lb. of the root were crushed by beating, 1 gal. of boiling water was added and 1 part of the decoction thus obtained after a few hour's soaking was diluted with 8 parts of water for use.

REYNE (A.). **Bestrijding van den Cacaothrips.** [Measures against the Cacao Thrips.]—*Meded. Dept. Landbouw Suriname, Paramaribo*, no. 15, 12th December 1919, 3 pp. [Received 10th August 1920.]

Owing to the lack of a practical method nothing has been done hitherto to combat *Heliothrips rubrocinctus*, Giard, which is the most serious insect pest of cacao in Dutch Guiana. It is a primary pest there, and infests trees in good condition, in which case spraying is the only remedy. As a general rule it is well to have a uniform, and not too light a shade over the cacao, for the thrips increases rapidly in open situations. Laboratory tests have shown that contact insecticides are unable to kill more than 60 per cent. of the larvae and probably do not affect the eggs. If Bordeaux mixture, Paris green, and lead arsenate are used, the thrips are quickly poisoned; milk of lime is not so rapid in its action. In the field a spray containing 2 parts by weight of unslaked lime in 100 of water remained on the foliage for several months and infestation was prevented. It is probable therefore that the good results obtained in Trinidad with a combination of Bordeaux mixture and nicotine sulphate are due to the Bordeaux mixture, and that the latter may be replaced by the very cheap milk of lime. The advantages as compared with contact insecticides are that the protection lasts for months (as long as the covering is present), even single trees may be treated, and there is no danger of re-infestation from adjacent plants. The shade-producing properties of the covering probably promote the vital processes of the plant.

In a test described, 5 plots were sprayed with a 2 per cent. solution of Bordeaux mixture containing 1 per 1,000 of Black-leaf 40 (nicotine sulphate), 3 plots were sprayed with Bordeaux mixture alone, and 2 were left untreated. The difference between the untreated and treated plots was very marked, but no difference was seen between the two lots of treated plots. The action was purely protective, and when much new leaf is formed spraying must be repeated. The under-sides only of the leaves were sprayed, so that angle-nozzles are suitable. It is better to spray a few trees thoroughly than to treat a large number carelessly. Milk of lime must be well stirred.

Reyne (A.). **Bestrijding van den Cacaothrips door Bespuiting mit Kalkmelk.** [Combating the Cacao Thrips by Spraying with Milk of Lime.]—*Meded. Dept. Landbouw Suriname, Paramaribo*, no. 16, 1st July 1920, 3 pp.

A count was taken in May 1920 of the pods in the test plots referred to in the preceding paper and it was found that the treated trees averaged $5\frac{1}{4}$ pods more than the others. The cost per tree was about 3*d*. It is desirable that spraying should be energetically prosecuted in the current year, and if it proves a success economically, cacao cultivation will flourish anew.

It is advisable to spray the plots where thrips appeared the previous year. Furthermore, if after the chief rainy season one ordinary full-grown leaf be taken from each of 100 trees and the thrips counted, spraying will be justified if an average of one thrips per leaf is obtained. In examining trees the presence of thrips or of fresh punctures should be sought for; rusty leaves and defoliated trees only prove that infestation has already taken place. Spraying should be done immediately after the rains, in July and the first half of August in the case of a normal year. The formation of new leaf renders a repetition of the spraying needful; spraying must certainly be done when the amount of new leaf equals that of the old. As a general rule two applications should be sufficient for old cacao and three for new. The good condition of the spraying apparatus, and the careful application of the spray to the under-side of the leaves are important factors in success.

van Slogteren (E.). **De Nematoden-Bestrijding in de Bloembollenstreek.** [The Combating of Nematodes in the Dutch Bulb-growing Districts.]—*Tijdschr. Plantenziekten, Wageningen*, xxvi, nos. 5, 7, 8, May, July, August 1920, pp. 118–138, 161–171, 177–188, 4 figs., 3 plates.

A detailed account of the infestation of flower bulbs by Nematodes and of the measures advised against them is given. When the bulbs are still in the ground and both ground and bulbs are infested, the removal of affected bulbs with the earth surrounding them is the measure advocated. If the ground is not planted, it should be turned over so that the upper layer is buried; an alternative method consists in carefully removing the top layer to a depth of 7 inches, and putting down clean sand before planting uninfested bulbs.

Infested bulbs may be freed from Nematodes by immersion in hot water or exposure to hot air. Care must be taken to do this at the most favourable time and with the method best suited to the particular bulb. Up to the present, for instance, hot water has not given good results with hyacinths.

Allwood (M. C.). **Carnations—their Pests and Diseases.**—*Jl. R. Hortic. Soc., London*, xlv, no. 2–3, July 1920, pp. 233–236, 4 figs.

The chief insect pest of carnations is *Tetranychus telarius* (red spider) which usually appears in June, July and August, and may be eradicated by syringing at very high pressure the under-sides of the leaves with clear cold water and once every fourteen days with nicotine extract. One application of nicotine preparation will destroy Aphids, and this is also the most effective remedy against *Heliothrips tabaci*.

Agriotes spp., *Tylenchus dipsaci* (*devastatrix*) (eelworm), *Tipula oleracea* (leather-jacket grub), etc., may be reduced by treating the soil in the spring. This includes ploughing from 4 to 5 inches and allowing chickens to pick over the soil. For special seedlings the soil is sterilised with steam.

Russell (E. J.). **The Partial Sterilization of Soils.**—*Jl. R. Hortic. Soc., London*, xlv, no. 2–3, July 1920, pp. 237–246, 7 figs.

Partial sterilisation of the soil has been found to be an effective and in some cases the only means of eradicating organisms noxious to plants. Of the various methods tested, steam is decidedly the most efficacious and reliable, as it kills all organisms and animal pests and also facilitates the work of beneficial organisms by bringing about a certain amount of decomposition. Owing to the expense involved with this method experiments have been carried out to find an efficient chemical steriliser. The use of chemicals for this purpose is not only cheaper, but also more convenient. It is most essential that the substance should disappear from the soil after its work is done. This may occur by evaporation, oxidation or decomposition. The various substances tested include carbon bisulphide, toluene, cresylic acid (liquid carbolic acid) and chloropicrin. The latter is one of the best, and proved fatal to eelworms and wireworms besides being harmless to plants, but it is unfortunately very awkward and dangerous to handle.

Toluene and carbon bisulphide are unreliable. Although liquid carbolic acid was not nearly so effective as steam, it has proved the most convenient of all the chemical substances for use on a large scale. In laboratory experiments its effectiveness against eelworms and fungi is improved by introducing chlorine atoms.

The method of using cresylic acid is to add 1 gal. of the acid to 40 gals. of water and apply the mixture to 9 to 18 sq. yds., followed by heavy watering. In the case of heavy soil the acid is applied in two doses at an interval of 14 days, the land having been previously dug over to a depth of 1 spit. Planting can begin at the end of one month. Good results can be obtained with half the dose.

Morrill (A. W.). **Entomology.**—*Arizona Univ. Agric. Expt. Sta., 29th Ann. Rept. Year ended 30th June 1918, Tucson.* 31st December 1918. pp. 335–338. [Received 10th August 1920.]

The bulk of the information given in this report, which deals largely with grasshoppers, has been noticed elsewhere [*R.A.E.*, A. vi, 304; vii, 204].

Work Connected with Insect and Fungus Pests and their Control.—*Rept. Agric. Dept., St. Kitts-Nevis, 1918–19; Barbados,* 1920, pp. 13–14 & 27–28.

Considerable damage was done to cotton by the cotton worm, *Alabama argillacea*, during the year under review. Cotton-stainers [*Dysdercus*] were also very abundant, especially during November and December 1918. On 28th September 1918 an ordinance was passed making provision for the eradication of this pest. Two inspectors have been appointed to assist in carrying on the campaign, which includes destruction of the cotton-stainers wherever found, destruction of the native food-plants, and thorough cleaning up of old cotton seed around ginneries and other places.

Leaf blister mite [*Eriophyes gossypii*] was not very prevalent during the year.

Moth borers were in evidence on sugar-cane, but their abundance was probably due to drought.

Froggatt (W. W.). **Notes on Australian Sawflies. (Tenthredinidae).**—*Proc. Linn. Soc. N.S.W., Sydney*, xliii, pt. 3, 18th December 1918, pp. 668–672.

The species dealt with include: *Perga dorsalis*, Leach (steel-blue sawfly), the larvae of which feed at night on the leaves of gum trees (*Eucalyptus*). Pupation generally occurs in the soft soil against the tree-trunk about April. From pupae taken in April, adults emerged in the insectarium in the early part of October. The adults of *Pterygophorus bifasciatus*, Brullé, emerged in September from pupae found embedded in soft wood of the stem of an undetermined tree. *Philomastix macleayi*, Westw., was found on wild raspberry plants on the Tweed River, New South Wales. A number of cases are recorded of cattle dying as a result of feeding on the larvae of *Pterygophorus analis*, G. Costa. The eggs are laid in the early summer on the foliage of the ironbark tree. The larvae completely strip the foliage of the tree and when fully grown fall to the ground and pupate. The adults emerge and are active in April. The only method of protecting cattle from the larvae is to ringbark the trees.

FROGGATT (W. W.). **Notes and Exhibits.**—*Proc. Linn. Soc. N.S.W., Sydney*, xlv, pt. 1, 25th June 1920, p. 180.

Anaphothrips obscurus (*Thrips striatus*), the grass thrips of the United States, is recorded for the first time from Australia, where it has been found damaging tobacco in the Tamworth district.

GAHAN (C. J.). **Furniture Beetles.**—*Brit. Mus. Nat. Hist., London*, Economic Ser. no. 11, 1920, 23 pp., 1 plate, 5 figs.

The life-histories of the following species are described: *Anobium punctatum*, DeG. (common furniture beetle); *Ptilinus pectinicornis*, L.; *Xestobium rufovillosum*, DeG. (death-watch beetle); *Lyctus brunneus*, Steph., and *L. linearis*, Goeze (powder-post beetles).

Uninfested furniture may be protected from a first attack by the application of paraffin oil or turpentine to the joints and all rough places, thus preventing oviposition. This treatment if continued over a sufficiently long period might prove successful in destroying the grubs in infested wood. Other methods advocated include treatment by dry heat, fumigation with a gas vapour, or the application of a liquid such as benzine, carbon tetrachloride or terebene. Mercuric chloride, carbolic acid, creosote and various other tar-oil derivatives will afford protection against these beetles as well as other sources of decay. The relative danger and utility of the various gases suitable for fumigation are discussed; these include hydrocyanic acid gas, carbon bisulphide, sulphur dioxide, vapour of benzine and carbon tetrachloride.

The best time to apply treatment is just before pupation or after the young larvae are hatched. In the case of *Anobium punctatum* this would be about the middle of May and the end of July or beginning of August. With the other species it would be a little earlier. The best method is to treat the material in May and again in July or August each year. If carried out for a few years in succession, any of the above mentioned methods should prove successful in completely eradicating the pest. If heat sufficient to raise the temperature in the interior of the wood to 130° F. is obtainable, this will kill all stages of the insect at any time.

SEVERIN (H. C.). **The Bean Weevil.**—*South Dakota State Entomologist, Brookings*, Circ. 15, November 1919, 7 pp., 2 figs. [Received 11th August 1920.]

The life-history of the bean Bruchid, *Bruchus obtectus*, Say, and the damage caused by it are dealt with. Remedial measures advocated include cold storage, heat, lime treatment, and fumigation with carbon bisulphide or carbon tetrachloride.

SEVERIN (H. C.). **The Potato Flea Beetle.**—*South Dakota State Entomologist, Brookings*, Circ. 16, November 1919, 6 pp., 5 figs. [Received 11th August 1920.]

The life-history of and remedial measure against the potato flea-beetle, *Epitrix cucumeris*, Harris, are briefly described.

SEVERIN (H. C.). **Currant and Gooseberry Lice.**—*South Dakota State Entomologist, Brookings*, Circ. 11, November 1919, 5 pp., 1 fig. [Received 18th August 1920.]

A popular account is given of the general life-history of and remedial measures for the currant and gooseberry Aphids, *Myzus ribis*, L., *Aphis samborni*, Patch, *Rhopalosiphum lactucae*, Kalt., and *Myzus varians*, Patch.

SEVERIN (H. C.). **The Striped Cucumber Beetle.**—*South Dakota State Entomologist, Brookings*, Circ. 12, November 1919, 6 pp., 2 figs. [Received 18th August 1920.]

The methods of controlling the striped cucumber beetle, *Diabrotica vittata*, F., and its life-history are described in a popular form.

SEVERIN (H. C.). **The Melon Aphis.**—*South Dakota State Entomologist, Brookings*, Circ. 14, November 1919, 8 pp., 1 fig. [Received 18th August 1920.]

The remedial measures advocated against the melon aphis, *Aphis gossypii*, Glov., include fumigation and spraying. The injury caused by it and its life-history are described.

GILBERTSON (G. T.). **Common Insecticides and Fungicides.**—*South Dakota State Entomologist, Brookings*, Circ. 18, November 1919, 21 pp. [Received 18th August 1920.]

The various insecticides and fungicides here dealt with include Bordeaux mixture, ammoniacal copper carbonate, potassium sulphide, mercuric bichloride, and stomach-poisons such as Paris green, lead arsenate, zinc arsenate, calcium arsenate and hellebore. Methods of preparing poison bran mash, baits for ants and the different contact insecticides are also discussed. Fumigants and repellents are also dealt with, and formulae are given for all the preparations. A table is given showing the advantageous combination of certain sprays.

SEVERIN (H. C.). **The Common Stalk-Borer.**—*South Dakota State Entomologist, Brookings*, Circ. 17, November 1919, 4 pp., 1 fig. [Received 18th August 1920.]

A brief account is given of the life-history of the common stalk-borer, *Papaipema nebris*, Gn. (*nitela*, Gn.), and various remedial measures are advocated.

Entomology.—*Rept. Agric. Dept. Bengal 1917–18, Calcutta*, 1918, pp. 5–6. [Received 11th August 1920.]

The eggs of the mango weevil are laid when the fruit has attained half its natural size. They are deposited singly in depressions on the surface of the fruit. The oviposition period is confined to one or two weeks.

SEN (P. C.). **Annual Report of the Entomological Collector, Bengal, for the Year 1918–19.**—*Rept. Dept. Agric. Bengal 1918–19, Calcutta*, 1919, pp. 101–106. [Received 11th August 1920.]

The pests recorded include :—*Apion* sp. (jute stem weevil) ; *Tetranychus* sp. on jute ; *Anomis* (*Cosmophila*) *sabulifera* (jute semilooper) ;

Oryctes rhinoceros (palm beetle); *Leptocorisa varicornis* (rice bug); *Cirphis* (*Leucania*) *unipuncta* (rice army worm); *Crocidolomia binotalis* on mustard for which the crop was sprayed with lead chromate; *Brachytrypes achatinus* (large brown cricket); *Idiocerus atkinsoni* (mango hopper); *Batocera rubus* (mango tree borer); *Cryptorrhynchus gravis* (mango weevil); *Heterographis bengalella* (bullock's heart fruit borer); *Diacrisia obliqua* (jute hairy caterpillar), which was controlled by handpicking the eggs; *Termes* sp.; *Cryptophlebia* (*Argyroploce*) *illepida* (lichi fruit borer); *Diatraea* sp.; *Scirpophaga xanthogastrella* (*auriflua*) (white moth borer); *Earias fabia* (cotton bollworm); *Dysdercus cingulatus* (cotton-stainer); and *Argina cribraria* (orange sann moth).

Owing to the careful selection of cane sets the sugar-cane crop was very free from insect pests.

VOGLINO (P.). **In Difesa delle nostre Piante.** [The Protection of our Plants.]—*Riv. Agric., Parma*, xxv, no. 32, 6th August 1920, pp. 401–402.

In view of the appearance of the Argentine ant, *Iridomyrmex humilis*, on the French Riviera the Phytopathological Observatory at Turin draws the attention of Italian agriculturists to the urgent necessity for reporting without delay any abnormal increase of ants in order that an immediate investigation may be made.

DA COSTA LIMA (A. M.). **Sobre a Origem da *Pectinophora gossypiella* (Saunders) no Brasil.** [The Origin of *Platyedra gossypiella* in Brazil.]—*Arch. Escola Sup. Agric. e Med. Vet., Nictheroy* (*Rio de Janeiro*), iii, no. 1–2, December 1919, pp. 41–55. [Received 10th August 1920.]

The origin of *Platyedra* (*Gelechia*) *gossypiella* in Brazil is a matter of doubt. Some consider that it was imported in Egyptian cotton seed in 1911, 1912 and 1913, while others think that Brazil itself is one of its original habitats. A number of circumstances are enumerated, including the occurrence in Brazil of other food-plants such as *Hibiscus* and *Abutilon*, which point to its previous existence there; a fact that was not noticed until the extension of cotton cultivation. It is quite possible that infested cotton seed may have been imported from Egypt in addition. In any case cotton cannot be grown on a large scale unless combative measures are immediately adopted throughout the cotton districts.

DA COSTA LIMA (A. M.). **Contribução as Conhecimento dos Microhymenópteros Parasitos de Lagarta rosea de *Pectinophora gossypiella* (Saunders) no Brasil.** [A Contribution to the Knowledge of the Microhymenopterous Parasites of the Pink Bollworm, *Platyedra gossypiella*, in Brasil.]—*Arch. Escola Sup. Agric. e Med. Vet., Nictheroy* (*Rio de Janeiro*), iii, no. 1–2, December 1919, pp. 57–63. [Received 10th August 1920.]

The following parasites were obtained from material received from the Brazilian cotton districts:—a Chalcid, *Trigonura annulipes*, sp. n., from a pupa of *Platyedra gossypiella*; a Eupelmid, *Encyrtarpis* *proximus*, sp. n., from cotton seed infested by *P. gossypiella*; *Bracon* sp., from ginning machines; an Ichneumonid, *Scambus* (*Epiurus*) sp., from cotton in the seed; *Apanteles* (*Urogaster*) *balthazari*, Ashm., from infested green bolls and seed; and a Bethylid, *Parasierola nigrifemur*, Ashm., in unginned cotton stored in ginneries.

Colón (E. D.). **El Sulfato de Amoníaco como Insecticida.** [Sulphate of Ammonia as an Insecticide.]—*Puerto Rico Estación Expt. Insular, Rio Piedras*, Circ. 15, April 1919, 6 pp. [Received 12th August, 1920.]

Ammonium sulphate is the chemical most commonly used in Porto Rico as a nitrogen fertiliser in the cultivation of sugar-cane, and its value as an insecticide at the same time is worthy of consideration. In France it has already been largely used against *Phylloxera* on vines, both as a spray and, mixed with lime, in injections into the soil.

The experiments with this substance in the control of grubs of *Lachnosterna* [*R.A.E.*, A, vi, 377] are referred to, the conclusion drawn from them being that ammonium sulphate applied to a sowing of sugar-cane at the beginning of the season does not prevent the deposition of eggs of *Lachnosterna* on the plants, but it kills a great number of the grubs while its action in the soil lasts. Records of the use of this substance in Queensland are also quoted. Trials are being made with it in Porto Rico, the results of which will be published, and meantime sugar-cane growers are asked to experiment with regard to the quantities to be used, number and times of application, etc., and to communicate their experiences to the Experiment Station.

Smyth (E. G.). **Report of the Division of Entomology.**—*Ann. Rept., Porto Rico Insular Expt. Sta., 1918–19, Rio Piedras*, 1919, pp. 27–31. [Received 12th August 1920.]

During the year further investigations were made with regard to the transmission of sugar-cane mottling disease by insects, but no definite conclusions have so far been reached. Experiments with the paraffin oil emulsion recommended in a previous report [*R.A.E.*, A, vi, 487] show that for the control of scale-insects on *Citrus* the spray should be applied twice at an interval of from 1 to 2 weeks.

This spray has proved useless against *Pseudococcus nipae*, Mask., on guava trees.

Hayes (W. P.). *Solenopsis molesta*, **Say. (Hym.): A Biological Study.**—*Kansas Agric. Expt. Sta., Manhattan*, Tech. Bull. 7, June 1920, 55 pp., 11 figs.

Much of the information contained in this bulletin concerning the damage caused by *Solenopsis molesta*, Say, and the remedial measures advocated, has been noticed elsewhere [*R.A.E.*, A, iv, 184].

In addition to the species mentioned as being attacked by this ant, it is known to feed also on *Craponius inaequalis* (grape curculio), *Conotrachelus juglandis* (walnut curculio), *Anthonomus grandis* (cotton boll weevil), the eggs of *Blissus leucopterus* (chinch bug), *Cydia* (*Carpocapsa*) *pomonella* (codling moth), *Papaipema nebris* (*nitela*) (corn-stalk borer), eggs of various grasshoppers, *Megilla* *maculata* (ladybird beetle) and *Ligyrus relictus*. The ant does not however appear to be of material value as an enemy of these pests, as it probably only attacks injured individuals.

The synonymy and systematic position as well as the ecological relations of this species are discussed.

BRAIN (C. K.). **The Coccidae of South Africa.—V.**—*Bull. Entom. Res., London*, xi, no. 1, August 1920, pp. 1–42, 4 plates.

The genera dealt with in this paper, which is the fifth of the series [*R.A.E.*, A, iv, 134; vii, 138, 242; viii, 117], are *Lecanium, Saissetia, Hemilecanium, Aclerda, Protopulvinaria. Pulvinaria, Ceronema, Lichtensia, Filippia, Ceroplastes, Inglisia, Cryptinglisia, Parafairmairea, Ceroplastodes*, and four new ones—*Allopulvinaria, Conofilippia, Idiosaissetia* and *Membranaria*, all of the sub-family LECANIINAE. A key to these genera is given.

The new species described are:—*Lecanium ehretiae*, on *Ehretia hottentottica*; *L. pumilum*, on a native shrub, covered by a shelter made by ants; *L. pseudelongatum*, on *Acacia caffra* (?): *L. proteae*, on *Protea*; *L. wistariae*, on wistaria; *L. durbanense*, on an undetermined plant; *Saissetia perseae*, on avocado pear (*Persea gratissima*); *S. kellyi*, on *Acacia melanoxylon*; *S. oculata*, on grape-vine; *Allopulvinaria subterranea* on "quick" grass; *Pulvinaria lepida*, on veld grass; *Ceronema mobilis*, on *Celastrus cordata*; *Lichtensia asparagi*, on *Asparagus capensis*; *Filippia chilianthi*, on *Chilianthus oleaceus*; *F. carissae*, on *Carissa grandiflora*; *Conofilippia subterranea*, on roots of a native shrub; *Ceroplastes combreti*, on *Combretum* sp.; *C. eucleae*, on *Euclea* sp.; *C. longicauda*, on a native shrub; *C. pallidus*, on fig; *C. quadrilineatus*, Newst., var. *simplex*, n., on *Rhus* sp.; *C. tachardiaformis*, on *Elytropappus rhinocerotis*; *Inglisia elytropappi*, on *Elytropappus rhinocerotis*; *I. geranii*, on geranium; *I. zizyphi*, on *Zizyphus* sp.; *Parafairmairea patellaeformis*, on *Acacia karroo*; *Ceroplastodes bituberculatus*, on a native shrub; *Idiosaissetia peringueyi*, on grasses or reeds: and *Membranaria pretoriae*, on crowns of grass.

THEOBALD (F. V.). **African Aphididae.—Part IV.**—*Bull. Entom. Res., London*, xi, no. 1, August 1920 pp. 65–72.

In this paper, which is a continuation of one already noticed [*R.A.E.*, A, vi, 209], the following new species are described:—*Macrosiphum cissi* on *Cissus* sp. and *Rhopalosiphum carduellinum* on thistles (*Carduus*) from Pretoria; *Phorodon violae* on pansy from Durban; *Capitophorus chrysanthemi* on chrysanthemum from Bloemfontein; *Cerciaphis bougainvilleae* on *Bougainvillea* from Uganda; and *Forda natalensis* on roots of a weed and in an ant's nest from Natal.

Macrosiphum dahliafolii, Theo., and *M. sonchi*, L., are also noticed, both on thistles (*Carduus*) from Uganda.

ROEPKE (W.). **Gegevens omtrent de Koffiebessenboeboek** (*Stephanoderes hampei*, **Ferr.**=*coffeae*). [Information on the Coffee-Berry Borer, *S. hampei*.]—*Meded. Inst. Plantenziekten, Buitenzorg*, no. 38, 1919, 33 pp., 3 plates. [Received 4th August 1920.]

First noticed in West Java in 1909, the infestation of coffee by *Stephanoderes hampei*, Ferr., had spread throughout that region by

1918 and caused serious alarm. It appeared early in 1919 on the east coast of Sumatra, but has not been recorded from other parts of the Malay Archipelago. Its distribution includes Central Africa, the West Indies and Europe (France and Transylvania).

It is considered that *S. coffeae*, Hgd., and *Xyleborus coffeïvorus*, van der Weele, originally described from Africa, are synonyms of this species.

It is doubtful whether this pest occurred in Java prior to 1909. According to Dammerman living beetles have been found in coffee seed imported from the Congo.

Descriptions of all stages are given. The eggs are laid in heaps; in green coffee berries it is rare to find more than 4–6 eggs together. At Buitenzorg the entire life-cycle appears to require about 1 [illegible] a shorter period than in Central Africa. As is the case [illegible] Scolytids, the females predominate. The author has nev[illegible]d males in green berries; they occur in small numbers in [illegible] berries and seed-coffee. There is therefore a possibility that the boring females are not all fertilised. The mother-beetle does not appear to leave the infested berry until the larvae are full-grown; it then leaves with them, probably through the entrance-hole. In the case of green berries it is not usual for the young beetles to re-infest a berry before leaving it; re-infestation occurs in berries that have turned black or in seed-coffee. It is not established whether there is a flight period prior to infestation, but at sunset the author has seen beetles issue from coffee berries and make attempts to fly.

As regards the food of the larvae, van der Weele definitely states that they feed on the soft mycelium of an *Ambrosia* fungus, but it should be noted that no Cryphaline beetles are known to do this, and furthermore no *Ambrosia* fungus has been found in the mines of *S. hampei*. The author believes that they feed on the débris produced by the boring of the attendant mother and states that her removal has always been followed by the death of all immature larvae and eggs, and that if eggs and larvae are removed to an uninfested berry development ceases; the eggs hatch, but the young larvae are unable to bore. It therefore appears that all the boring in an infested berry is done by the mother.

Coffea liberica and the species allied to it are chiefly attacked. With an increase of infestation the varieties of *C. robusta* suffer. Java coffee (*C. arabica*) is the last to be severely infested. In a mixed coffee estate the first signs of infestation will therefore be seen on *C. liberica*. At the beginning of an outbreak the beetle prefers berries that are withered and black. Not only are such berries early attacked, but they are more abundantly infested than green ones. Repeatedly from 50 to 75 living beetles have been taken from a blackened berry, and it is quite possible that several individuals had already left. Such a berry usually has several holes, and its infestation by several females is probable. Withered berries that have dropped are likewise infested and seem quite suitable for breeding purposes, and this also holds good for "glondongan" coffee. The latter is prepared by sun-drying the entire berry, from which the bean is afterwards obtained by stamping and husking. As a rule only berries that are withered and black are treated in this manner. In seed-coffee, which is simply wind-dried and therefore contains more moisture than beans intended for consumption, the development of *S. hampei* is in no way interfered with. In the case of coffee intended for consumption the processes of fermentation and artificial drying seem to be fatal to the insect, which has been, however, recorded from this commodity in Europe and the Belgian Congo, so that watchfulness is necessary.

If it be assumed that *S. hampei* is native to Java, the question of its other food-plants arises. Mayné has reported it in the Belgian Congo from *Hibiscus* and various Leguminous seeds, and Morstatt has taken it from wild blackberry in East Africa. In spite of careful search, however, no wild food-plant has as yet been discovered in Java. During a number of experiments *S. hampei* bored into plants other than coffee, but did not breed in them.

[illegible] vell [illegible] vn variations in the intensity of infestation appear to [illegible] to a decrease in the infesting power of the females. This may be ow[illegible] inbreeding and parthenogenesis. The spread of infestation is probab[illegible] due more to a passive spread of the pest than to an active one.

Up to the present, even in cases of severe infestation, the existence of coffee cultivation has not been threatened by *S. hampei*, but it is possible that conditions may become less favourable. The author thinks that estimated crop-losses of 25-40 per cent. are exaggerated; in any case the yield of berries depends on too many factors to allow of a definite allocation to any one of them. The loss of weight in the beans may however average 10 per cent. where infestation has been very severe. Infested beans are, of course, of inferior quality, and in some cases half the crop may be thus depreciated in value. This deterioration in quality is the chief loss due to *S. hampei*.

Among the remedial measures that have been advised are spraying [*R.A.E.*, A, iii, 751], the removal and destruction of infested berries and all débris in the plantations and buildings, and the removal and destruction of infested berries only.

The author recommends the collection of as many infested berries as possible, especially in mixed plantations where *C. liberica* and the hybrid varieties act as trap-plants. Blackened berries should be carefully removed in the early stages of an outbreak. The ground beneath the bushes must be kept clean. Spraying provides the sole means for protecting uninfested bushes, and stomach-poisons, especially lead arsenate, are the most suitable: at present, however, no exact data exist. Attempts to interrupt the life-cycle by removing as much infectible material as possible do not seem very hopeful. The author's conclusion is that suppression involves many practical difficulties, so that prevention is emphatically better than cure.

At the end of 1918 the Government coffee-seed garden at Bandelan appeared to be infested with *S. hampei*, and this led to disinfection being attempted. It was found that fumigation for 24 hours with 150 c.c. of carbon bisulphide (CS_2) per cu. metre killed all stages of the beetle, but that the germination power of the seed suffered. The trials were made with *Coffea dybowskii*—a variety allied to *C. liberica*—which was the only kind available. It is possible that others may prove more resistant, and perhaps a shorter period of fumigation and a lesser strength of carbon bisulphide may suffice.

Flint (W. P.) & Malloch (J. R.). **The European Corn Borer and some similar Native Insects.**—*Illinois State Nat. Hist. Survey Bull., Urbana*, xiii, article x, June 1920, pp. 287–305, 44 figs.

This article gives an account of the life-history of *Pyrausta nubilalis* (European corn-borer), and of the damage it does, followed by an account of allied and other insects that resemble it, including *Pyrausta ainslei* (*obumbratilis*), *P. penitalis*, *P. caffreii*, sp. n., the corn ear worm [*Heliothis obsoleta*], the fall army worm [*Laphygma frugiperda*], the common stalk borer [*Papaipema nebris*], *Depressaria heracleana*, and another Tineid. The distinguishing characters of the species of *Pyrausta* are given in detail.

Minangoin (N.). **La Culture de la Betterave dans l'Afrique du Nord.**—*Rev. Agric. de l'Afrique du Nord, Algiers*, xviii, no. 24, 9th January 1920, pp. 25–28. [Received 18th August 1920.]

In the portion of this paper dealing with the diseases and insects affecting beet in Northern Africa it is stated that the chief damage is caused by the larvae of *Rhizotrogus* sp. In France this beetle is largely destroyed by fowls, and the portable fowlhouses used for transferring the birds to the fields are described. An alternative, but costly, measure is the injection of carbon bisulphide into infested areas. In France this crop is also attacked by Nematodes, *Haltica* sp., and *Atomaria linearis*.

Minangoin (N.). **Le Vignoble Tunisien.**—*Rev. Agric. de l'Afrique du Nord, Algiers*, xviii, no. 26, 30th January 1920, pp. 71–72. [Received 18th August 1920.]

The usual insect pests of vines do not attack these plants in Tunisia, the vine moths, etc., being absent; crickets are the only important pests.

An infestation of *Phylloxera* occurred in 1906, but owing to the energetic steps taken, its presence has been confined to a limited area.

Vermeil (P.). **Les Cochenilles et leur Destruction.**—*Rev. Agric. de l'Afrique du Nord, Algiers*, xviii, nos. 32, 50 & 53, 12th March, 16th July & 6th August 1920, pp. 186–188, 47–50 & 113–115, 5 figs. [Received 18th August 1920.]

The scale-insects described as occurring in the north of Africa and the south of France include: *Pseudococcus* (*Dactylopius*) *citri*; *Coccus* (*Lecanium*) *hesperidum*; *Saissetia* (*Lecanium*) *oleae*; *Ceroplastes rusci*, the natural enemies of which include a Chalcid, *Scutellista cyanea*, and a Noctuid moth, *Eublemma* (*Thalpochares*) *scitula*: this scale may be destroyed by wiping the branches in the winter with a rag soaked in a solution containing 10 lb. of carbonate of soda and 3 gals. of cresyl, or 2 gals. of lysol, to 100 gals. of water; *Parlatoria zizyphi*; *Lepidosaphes ulmi* (*Mytilaspis pomorum*); *Aspidiotus hederae* (*limonii*); *A. perniciosus*; and *Chrysomphalus dictyospermi pinnulifera* (*minor*).

In dealing with these pests treatment must be directed against the emerging young, and spraying should therefore be begun about 15th May and continued to about 15th or 20th August for the control of scales attacking orange trees. Spraying against the scales attacking olive and carob trees should be begun about 10th June and continued until about 10th or 15th September.

A solution that has proved efficacious against *C. dictyospermi pinnulifera* is composed of 40 parts by weight of seal-oil, 20 of fish-oil, 5 of caustic soda, 30 of tar-oil and 19 of water. Good results have also been obtained with hydrocyanic acid gas. A measure that has proved successful in Spain and Algeria comprises a winter spray consisting of 50 lb. lime, 33 lb. sulphur, 25 lb. common salt, and 100 gals. water, followed by spring treatment with a mixture containing 50 lb. lime, 33 lb. sulphur and 150 gals. of water.

LALANDE (E.). **Le Charançon Coupe-Bourgeons des jeunes Greffes.**—*Rev. Agric. de l'Afrique du Nord, Algiers*, xviii, no. 54, 13th August 1920, pp. 131–132.

Attention is called to the occurrence of a small bud-cutting beetle, probably a species of *Opatrum*, amongst newly grafted vine shoots.

As a means of protecting the plants it is suggested that they should be cut sufficiently high up so that the buds are beyond the reach of this pest, which generally works at the ground surface.

VINCENS (F.). **Microlepidotteri nocivi al Riso nella Cocincina.** [Microlepidoptera injurious to Rice in Cochin-China.]—*Bull. Agric. Inst. Scient., Saigon*, ii, 1920, pp. 97–105, 2 plates. (Abstract in *L'Agric. Colon., Florence*, xiv, no. 7, July 1920, p. 314.)

Among the insect pests of growing rice are the caterpillars of *Schoenobius incertellus*, Wlk., and *Chilo suppressalis*, Wlk., which bore inside the stems, and those of *Cnapholocroeis medinalis*, Gn., which feed on the leaves. The last-named moth is the most abundant, but does little injury, so that combative measures are not needed; it has many natural enemies and many individuals are destroyed by the fires lit against *S. incertellus*. The latter does damage throughout the rice field, while *C. suppressalis* is concentrated in circular patches that gradually spread. The former hibernates in the rice stubble and the latter lives on the wild plants that grow in the field after the harvest.

To reduce the losses these moths cause, it is necessary to cut and burn the wild plants in and around the rice-fields before sowing or transplanting. When the rice is growing, large fires should be lighted on dark nights as soon as the adults of *S. incertellus* are noticed. When large yellow patches are seen in the fields the affected rice-plants must be pulled up and burned. After the harvest the straw left in the fields must be burned and the ground must be lightly ploughed so as to expose those parts of the stalks that have escaped the fire.

CRESPO (M. A.). **Un Insetto molto dannoso al Cocco in Portorico.** [An Insect very injurious to the Coconut in Porto Rico.]—*Rev. Agric. Puerto Rico, San Juan*, iv, 1920, pp. 47–48. (Abstract in *L'Agric. Colon., Florence*, xiv, no. 7, July 1920, pp. 314–315.)

In the island of Porto Rico young coconuts are seriously injured by a stem-boring beetle, *Strategus quadrifoveatus*, which is also a pest of sugar-cane. Infestation results in a yellowing of the leaves followed by the arrest of growth and the ultimate death of the palm. Trap-heaps collect large numbers of the larvae, and if a plant is thought to be infested the ground around it must be dug up and all individuals found destroyed. Clean cultivation to eliminate all possible breeding places is also recommended.

KIEN (E.). **Nemici della Vite in Tunisia.** [Vine Pests in Tunisia.]—*Rev. Viticulture, Paris*, 27th year (1920), ii, pp 129–131. (Abstract in *L'Agric. Colon., Florence*, xiv, no. 7, p. 315.)

There are but few insect enemies of the vine in Tunisia. The principal ones are a scale, *Pseudococcus vitis*; a mite, *Eriophyes vitis*; *Anomala vitis*; *Agrotis pronuba*; and *Rhizotrogus* sp. Up to the present the Pyralid, *Sparganothis pilleriana*, and the vine-moths, *Clysia ambiguella* and *Polychrosis botrana*, have not been recorded. *Phylloxera* was first observed in 1906. Most of the vines attacked no longer exist, having been destroyed by the authorities. At present only one vineyard is known to be infested, and as it happens to be in an isolated situation there is little danger of the spread of this pest.

Os Insectos damninhos. vi. O Pulgão da Couve, *Aphis brassicae*, **Linn.** [Injurious Insects. vi. The Cabbage Aphis, *A. brassicae.*]—*Chacaras e Quintaes, S. Paulo,* xxii, no. 1, 15th July 1920, pp. 17–18, 3 figs.

The remedies advised against *Brevicoryne* (*Aphis*) *brassicae* are those in use in the United States [*R.A.E.*, A, vi, 164].

RONNA (E.). **Os Insectos damninhos. vii. Uma Broca da Tuna,** *Neopyralis ronnai*, **Brèthes.** [Injurious Insects. vii. A Cactus Caterpillar, *N. ronnai*, Brèthes.]—*Chacaras e Quintaes, S. Paulo,* xxii, no. 1, 15th July 1920, pp. 18–20, 2 figs.

A brief account is given of a Lepidopterous pest of spineless cactus, described by Brèthes as *Neopyralis ronnai*, gen. et sp. n. The author noticed the infestation in an imported cactus and succeeded in breeding the adult moths. The female lays several eggs on each cactus stem, and the larvae feed voraciously and easily pass from one stem to another, causing severe injury. They are polyphagous—at least as regards the various species of cactus.

KÜNNEMANN (—.). **Die mitteleuropäischen** *Ceuthorrhynchus*–**Arten aus der Gruppe des** *chalybaeus* **Germar (Col.).** [The Central European Species of *Ceuthorrhynchus* of the Group *chalybaeus*, Germar.]—*Entom. Mitt., Berlin*, ix, nos. 4–6 & 7–9, 19th May & 20th August 1920, pp. 70–77 & 124–130.

This systematic paper includes a key to the species dealt with and a list of their synonyms.

ROEPKE (W.). **De Bloemknop-Wants van de Theeheesters,** *Hyalopeplus smaragdinus*, **Rpk.** [*H. smaragdinus*, Rpk., the Flower-bud Bug of the Tea Shrub.]—*Meded. Proefstation voor Thee, Buitenzorg*, no. 67, 1919, pp. 1–10, 7 figs. [Received 24th August 1920.]

One of the less known pests of tea is the Capsid bug, *Hyalopeplus smaragdinus*, Rpk., which is closely allied to *Helopeltis*, though very far from being as dangerous.

The imago, larva and egg are described. Little is known of the life-history. In the laboratory at Buitenzorg the larvae moulted six times before attaining full-growth in 9–10 days. The young larvae remain motionless on the tea buds. The imago is restless and flies readily, so that it soon injures itself when caged. For this reason no eggs were obtained in captivity. Both larvae and adults confine their feeding to the flower-buds and do not attack any other part of the tea-plant. The infested buds do not appear to suffer.

H. smaragdinus is of no economic importance in crop tea-gardens, but it may prove injurious in seed-gardens if the buds there are severely attacked.

It is worthy of note that *Lopus sulcatus*, a bug very similar to *H. smaragdinus*, attacks the flower-buds of the vine and causes serious harm.

The non-identity of *H. smaragdinus*, Rpk., with *Callicratides* (*Hyalopeplus*) *rama*, Kirby, from Ceylon is held to be proved by Distant's description of the latter (*Fauna of British India, Rhynchota*, ii, 1904).

BERNARD (C.). **De Zaad-Wants van de Theeheesters,** *Poecilocoris hardwickii*. [*P. hardwicki*, the Seed-Bug of the Tea Shrub.]—*Meded. Proefstation voor Thee, Buitenzorg*, no. 67, 1919, pp. 11–20, 12 figs. [Received 24th August 1920.]

A Pentatomid bug attacks the tea berries in Java and is of much greater importance in seed-gardens than the Capsid described in the preceding paper, for both the quantity and quality of the seed may be affected.

In a note published in 1911 (*Qrtly. Jl. Indian Tea Assoc.*, i, pt. iv, p. 14) Antram records two species, *Poecilocoris hardwicki* and *P. latus*, as attacking tea-seed in British India and states that they are but slightly differentiated. The variations in the colouring of the adults are discussed here, and as the description of *P. hardwicki* best agrees with the Javanese species, the latter has been accordingly attributed to it.

Two other Pentatomids, *Cantas ocellatus* and (probably) *Lamprocoris lateralis*, have also been observed, but little is known of them.

The eggs of *P. hardwicki* are laid on the upper and lower surfaces of the leaves; they are not very numerous, usually 14. They are globular in shape and measure less than 2 millimetres in diameter. The egg-stage lasts about 6 days. There appear to be not more than 4 moults. The larvae and adults usually live in groups on the leaves and dislike movement. Even the winged adults are not active, so that capture is easy.

Observations on captive specimens confirm that feeding takes place at the expense of the seed or, rather, of the berry. The leaves are not touched; according to Roepke ripe seeds are not attacked, the large but still green berries containing unripe seed being chosen. The skins of these unripe seeds are still partly white and not very hard, and the endosperm is still fluid. Roepke states that the bug pierces the hard skin of the green berry with a sawing motion of the rostrum, which is about $\frac{2}{5}$ of an inch long (nearly as long as the body) and can penetrate three-quarters of that distance into the fruit. Keuchenius has found that the soft endosperm is sucked out. The author's own observations show that the larvae, nymphs and imagines prefer the young tea berries and that they are unable to pierce the very hard skin of the seed in older berries. Captive individuals also puncture the young twigs and the leaves (mostly near the chief veins), but whether the insects do this in nature is not known.

According to Antram, Butler is convinced that there is a relation between the holes in the skin of the berry and the fungus-infection of the seed-lobes in apparently sound kernels. Up to the present the author has not noticed any such connection, but the subject requires further investigation, as it is quite possible that the failure of the crop in many seed-gardens may be due either directly to the bug or to a fungus entering through the punctures.

The habits of *P. hardwicki* facilitate remedial measures. By shaking the bushes the larvae and most of the adult bugs will be thrown to the ground, where collection is easy. The winged adults may be collected by hand at the same time as the eggs. Spraying is too costly.

A Proctotrupid parasitises the eggs of *P. hardwicki*. In one observation the first parasite that emerged ran over the unhatched eggs and when a parasitised one opened it assisted the occupant to emerge. The latter appeared to be a female, and mating immediately took place. After this the male sought another egg and the same thing occurred again. As this parasite is beneficial, egg-collectors should leave the parasitised eggs on the bushes.

BERNARD (C.) & KERBOSCH (M.). **Mijten-Aanteekeningen.** [Notes on Mites.]—*Meded. Proefstation voor Thee, Buitenzorg*, no. 68, 1919, pp. 1–9, 3 plates. [Received 24th August 1920.]

This paper supplements a previous publication [*R.A.E.*, A, vii, 41], and draws attention to a cheap and convenient means of combating mites.

The polyphagous habits of *Tetranychus telarius*, L. (cinchona or cassava mite), *Brevipalpus obovatus*, Don. (orange mite) and some other species account for their rapid spread. Most mites, including *B. obovatus*, *Tarsonemus translucens*, Green, and *Eriophyes* (*Phytoptus*) *theae*, increase during the dry season. Rain washes them off, so that the infestation of cultivated plants decreases with the advent of the wet season. A short spell of dry weather, however, results in re-infestation, and therefore it must be assumed that the mites shelter during the wet season in neighbouring weeds from which some unknown factors cause their return to cultivated plants. These facts must be remembered when remedial measures are undertaken.

Besides the food-plants of *T. telarius* previously mentioned [*loc. cit.*] the following have been noted by Leefmans: *Ageratum conyzoides*, *Tridax procumbens*, *Synedrella nodiflora*, *Sida rhombifolia*, *Vernonia cinerea*, *Amarantus spinosus*, *Commelina nudiflora*, *Lantana camara*, *Hyptis suaveolens*, *Portulaca oleracea*, various grasses and *Jatropha curcas*. The authors have found it on other plants, including *Polygala paniculata*, *Fuchsia* sp., and *Hydrocotyle* sp., at altitudes ranging from 1,500 to 6,000 feet. They have also observed it on *Albizzia moluccana* in a tea plantation.

B. obovatus is another very polyphagous species. The plants listed here include *P. paniculata*, *Rubus* sp., *Bidens pilosa*, *Commelina* sp., *A. conyzoides*, *Hydrocotyle asiatica*, *Eleutheranthera ovata* and *Bauhinia* sp.

Dusting with finely powdered sulphur has proved to be the best remedial measure hitherto tried.

On estates where infestation has often occurred its recurrence in future years is very probable. In such cases preventive treatment is advisable. One method that has proved satisfactory with cinchona is dusting the seed-beds with sulphur about 3 months after the seed has been planted. As cinchona does not germinate in the dark, as much light as possible should fall on the beds, and dusting with sulphur permits this, while providing the protection that is totally lacking in such open beds.

Bernard (C.). **Verschillende Rupsen-Plagen in Theetuinen.** [Various Caterpillar Pests in Tea Estates.]—*Meded. Proefstation voor Thee, Buitenzorg*, no. 68, 1919, pp. 11–27, 10 plates. [Received 24th August 1920.]

Lepidopterous caterpillars do not as a rule seriously injure tea bushes, leaf-rollers doing the most harm. Such cases of severe infestation as do occur are quite temporary in character, as the pests tend to disappear owing to a number of natural causes. In tea the injury means a more or less temporary reduction of the yield.

One curious instance is recorded in which tea severely infested by *Helopeltis* was completely defoliated by *Stauropus alternus*, the new leaves not being re-infested by the Capsid.

Andraca bipunctata, Wlk. (bunch caterpillar) attacks tea in Java and Sumatra, especially in the latter island. It occurs in seed-gardens and nurseries of older plants, in which the damage warrants remedial measures such as collection by special gangs and spraying or burning off with blow-lamps. Energetic action is advisable in order to forestall severe outbreaks such as have occurred in British India. The eggs are deposited on the under-side of the leaves, and the egg-stage lasts about a week, the caterpillars becoming full grown in a month.

An instance of severe infestation by the Limacodid, *Thosea cervina*, is described. About 120 acres were involved, some portions being entirely defoliated. The prunings should have been burned on this occasion, for it is important that the pest should be destroyed before or during pruning ; after this the plants need all their strength, and the infestation of young plants may have serious consequences, which may be further aggravated by Curculionid attack. On this estate a weevil, *Myllocerus* sp., injured both *Erythrina* [dadap] and the tea shaded by it. The outbreak was worst during the dry season and diminished at the beginning of the rains. Collection was actively prosecuted, and on one day 220,000 individuals of *T. cervina* were taken. The cocoons also were gathered. They are the chief factor in spreading infestation for they roll about on the ground and are carried to a distance by water. In all 7,500,000 caterpillars and cocoons were destroyed. A fungus or bacterial disease destroys many caterpillars. An attempt was made to spread the disease by crushing infected caterpillars and distributing the material in the estate, but neither this measure nor insecticides and trap-lamps proved of practical value. The outbreak lasted 8 months, at the end of which period masses of shrivelled caterpillars were found, a fact for which no satisfactory explanation was forthcoming. The same remedies as for *T. cervina* are advised against another Limacodid, *Setora nitens*.

Psychid caterpillars are common pests of tea. They include *Clania crameri* (faggot-worm), *C. variegata* (bag-worm), *Amatissa contorta* (basket-worm) and a large species, probably belonging to the genus *Acanthopsyche*. The latter resembles in shape *A. snelleni*, common on tea in Java, but is much bigger. *A. subteralbata* is of very little importance; it has been noticed on *Albizzia moluccana* and on the tea beneath. A caterpillar found on *Lantana* is very similar to *Clania holmesi* (spiral faggot-worm). On one occasion a number of caterpillars resembling those of *Pagodia hekmeyeri* were found on tea near Buitenzorg. Dr. van Leeuwen has recorded this moth from cacao.

BERNARD (C.). **Termieten-Bestrijding.** [Measures against Termites.]—*Meded. Proefstation voor Thee, Buitenzorg*, no. 68, 1919, pp. 28–30. [Received 24th August 1920.]

The following method of checking termites is not new, but the success achieved justifies its mention. A tea estate in Java has been freed from these pests by scraping all stems that show signs of infestation. They are then painted with an emulsion of petroleum residue. As a matter of fact the scraping appears to be the effective part of the process, but the coolies are convinced of the virtue of the emulsion, and to enable it to act to the best advantage they scrape the stems with scrupulous care, this being the secret of success. It goes without saying that, when pruning, all infested twigs are removed or treated with tar.

Telephone posts are protected from rotting and from insect attack by winding "indjoek" string round the lower portions. Dr. Maurenbrecher has adapted this to the protection of young tea (1–4 years old) against termites, "indjoek" rag being used. The upper roots are laid bare and the rag is laid over them and spread out; it is then wrapped round the stem and tied in two places—at the root-collar and about 8 inches higher up. The cost of the material is about 10/- per acre, while labour costs about 15/-. This works out at about 1 farthing for 5 plants. Infestation was reduced from 25 per cent. to less than 2 per cent. It only occurred very sporadically when the outside of the covering was painted with an emulsion of petroleum-residue.

BERNARD (C.). ***Xyleborus*-Aantasting.** [*Xyleborus* Attack.]—*Meded. Proefstation voor Thee, Buitenzorg*, no. 68, 1919, pp. 31–33. [Received 24th August 1920.]

A case of infestation by boring beetles is recorded from a tea estate in nurseries that had not been properly cleared and prepared owing to lack of time. The plants lost their leaves, their stems remained slender, and the roots became abnormally enlarged.

The cause of the injury was a beetle of the genus *Xyleborus*, which does not appear to be either *X. fornicatus* or the small twig borer, known in Java as "tocco," "koppo" or "boeboek" which—according to Green— is not identical with *X. fornicatus*.

The mines of this very small brown *Xyleborus* are a little more than ½ millimetre in diameter and contain white eggs, larvae and females. The latter are somewhat longer than 1 millimetre, the males being rather less. On the interior walls there is a white fungus which the beetles cultivate for food.

Direct remedial measures did not appear feasible, but in time the infestation proved to be less serious than at first thought, only the weakest and backward plants dying. The healthy plants recovered, and the openings of the mines closed up. In sections of such stems the discoloured mines were visible and here and there the dead insects were enclosed. Preventive measures are advocated, the immediate destruction of prunings by burning being one of these. When pruning, some of the twigs should be spared so as to regulate the sap-flow and promote the speedy growth of the tissues, in order that the mines may become closed.

BERNARD (C.). **Verslag van het Proefstation voor Thee over het Jaar 1919.** [Report of the (Buitenzorg) Tea Experiment Station for 1919.]—*Meded. Proefstation voor Thee, Buitenzorg*, no. 69, 1919, 23 pp. [Received 24th August 1920.]

The section on diseases and insect pests in this report is embodied in one already noticed [*R.A.E.*, A, viii, 329]. Among the papers issued were some on *Helopeltis* [*R.A.E.*, A, vii, 499, 500]. Work is now in progress on the tea leaf-rollers, *Gracilaria theivora*, Wals., *Cydia* (*Laspeyresia*) *leucostoma*, Meyr., and *Homona coffearia*, Nietn. Experiments in the control of *Helopeltis* are being conducted.

SENIOR-WHITE (R.). **A Note on *Suana concolor*, Walker.**—*Spolia Zeylanica, Colombo*, xi, no. 42, 22nd July 1920, pp. 299–302, 1 plate.

The Lasiocampid, *Suana concolor*, Wlk., occurs in India, Ceylon, Java and the Philippines. Its food-plants include *Psidium guayava*, *Cajanus indicus*, *Hibiscus rosa-sinensis*, *Grewia tiliaefolia* and *Shorea robusta*. It is said occasionally to attack tea in Ceylon.

In the [Matale] district the author has observed two broods a year, maturing in February-March and September, respectively. The egg, larva, pupa and adult are described.

All stages of the larva are attacked by a fungus, *Verticillium* sp.; a species of *Penicillium* found on dead larvae is believed to be a secondary parasite. A Phorid fly has been seen to emerge from dead larvae, in which it appears to oviposit before they die from some other cause.

COAD (B. R.) & CASSIDY (T. P.). **Cotton Boll Weevil Control by the Use of Poison.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 875, July 1920, 31 pp.

The system of poisoning described in this bulletin does not aim at the extermination of the boll-weevil [*Anthonomus grandis*], but only at a sufficient reduction of infestation to permit the maturing of a full crop of cotton. This depends on the habit of the cotton plant of producing much more fruit than it is able to mature. About 60 per cent. of the squares fail to reach maturity as bolls, and are shed at some time during their development. This shedding is comparatively slight early in the season, and increases rapidly as the plants develop, until it reaches the point when all the new fruit that appears is shed. Up to a certain point the fruit shedding due to boll-weevil attack merely takes the place of the normal shedding which would occur even if the weevils were absent.

Generally speaking, then, the weevils are permitted to multiply unmolested until they have become sufficiently abundant to puncture more squares than would be shed normally. Poisoning is then started, and every effort directed to holding the infestation below this point until the plants have had time to develop beyond weevil injury as many bolls as they will be able to mature. Poisoning is then stopped, and the weevils are allowed to resume multiplication. Remarkably large increases of yield frequently result from a comparatively slight degree of control for a short time during this critical period. But a satisfactory effect can only be secured by starting applications at the right time, and repeating them at the correct interval.

The time of starting depends on the percentage of squares in the field that are weevil-punctured. As a general rule operations should start when from 15 to 20 per cent. of the squares are punctured, and be repeated often enough to prevent the infestation rising above 25 per cent. until the crop is set and the bolls safe from weevil attack. In certain cases in large plantations it may be possible to confine the weevils to the fields in which they first appear, near their hibernation quarters, as they will not migrate to the adjoining cotton if their numbers are kept down. In such cases it is hardly ever necessary to poison the entire acreage, but it is well to start operations at a somewhat lower percentage and continue later than usual.

A four or five day interval is best. The effect of the poison does not last long, and this interval results in the successful control of the progeny of the first weevil attack if three applications in all are made under average conditions, while more applications are necessary if a longer interval is allowed. At the same time, if anything happens to interfere with the schedule for a day or so, it can still be continued, whereas with a longer interval all control is lost.

The poison advised is calcium arsenate used as a dust, with the following specifications :—Not less than 40 per cent. arsenic pentoxide ; not more than 0·75 per cent. water-soluble arsenic pentoxide ; density not less than 80 nor more than 100 cubic inches per pound. Without the first specification the poison will not be sufficiently insecticidal ; without the second, it may scorch the plants ; without the third, it will not produce a suitable dust cloud.

The danger of the poison to man and animals is slight if proper precautions are taken, but the risk of inhaling the poison or of absorption through the skin. as well as that of swallowing it, must be borne in mind. The poison is best applied at night when the humidity is high and the air calm. Rain washes it off much more readily if it has been applied in very dry weather.

Dusting machinery is of three kinds, hand guns, cart dusters, and power dusters. Hand guns are only suitable for very small areas, or to supplement the cart duster, while as the expense of the latter is hardly justified for less than 75 acres the problem of a smaller area is difficult. Power dusters are not very satisfactory.

The expense of poisoning varies in different circumstances, but speaking generally it is hardly justified unless the land is fertile enough for the plants to take full advantage of the treatment ; in fact, unless the land would produce at least half a bale of cotton an acre if there were no weevils.

Calcium arsenate can also be used in the control of cotton leaf-worm [*Alabama argillacea*], fall army-worm [*Laphygma frugiperda*], etc. But if it is desired to use the weevil equipment solely for leaf-worm control, the expense may be considerably reduced by mixing lime in equal parts with the calcium arsenate and applying the mixture at the rate of four or five pounds an acre.

FRANK (A.). **Diseases and Insects Pests of Blackberries, Loganberries and Strawberries.**—*Mthly. Bull. Western Washington Expt. Sta., Puyallup*, viii, no. 1, April 1920, pp. 14–16, 2 figs. [Received 24th August 1920.]

Blackberries and loganberries are attacked by the cane maggot [*Phorbia rubivora*], the crown borer [*Pennisetia marginata*] and the cane borer [*Oberea bimaculata*], all of which also infest raspberries [*R.A.E.*, A, viii. 208].

Leaf-hoppers, *Empoasca mali*, cause a great deal of damage to these plants but may be destroyed by spraying with "Black-leaf 40" at the rate of $\frac{1}{3}$ of a pint to 50 U.S. gals. of water and 1 lb. of soap. This should be applied before the insects develop wings.

Strawberry pests include :—*Aristotelia* sp., *Philaenus spumarius*, *Lachnosterna* sp., Nematodes and the root weevils, *Otiorrhynchus ovatus* and *O. sulcatus*. The grubs of these weevils may be killed by covering the plants with canvas painted with linseed oil or oilcloth. Under this, saucers should be placed at intervals of about 5 feet and containing about $\frac{2}{3}$ of an ounce of carbon bisulphide. The edges of the canvas should be covered with soil and the treatment carried out for about 6 hours.

COBB (N. A.). **A newly discovered Parasitic Nematode (*Tylenchus mahogani*, n.sp.) connected with a Disease of the Mahogany Tree.**—*Jl. Parasit., Urbana*, vi, no. 4, June 1920, pp. 188–191, 3 figs.

Tylenchus mahogani, sp. n., here described from Barbados, lives in the tissues of the mahogany tree and causes a disease the seriousness of which is still uncertain. This Nematode greatly resembles *T. musicola*, Cobb, and *T. coffeae*, Zimm., and the distinguishing characters of these three species are discussed.

BRUES (C. T.). **The Selection of Food Plants by Insects, with Special Reference to Lepidopterous Larvae.**—*American Naturalist, Lancaster, Pa.*, liv, no. 633, July–August 1920, pp. 313–332.

The various theories accounting for the association of insects with definite plants are discussed.

LEIBY (R. W.). **The Spraying of Irish Potatoes.**—*Bull. North Carolina Dept. Agric., Raleigh*, xl, no. 3 (Bull. 254), March 1919. 38 pp., 10 figs. [Received 30th August 1920.]

The results of five years' (1913–1918) experimental treatment to control insects and diseases of the autumn or late potato crop are described in detail. The insects dealt with include the Colorado potato beetle (*Leptinotarsa decemlineata*, Say), flea-beetles (*Epitrix* spp.), and the leaf-hopper (*Empoasca mali*, Le B).

By spraying four times during the growing season with lead arsenate and Bordeaux mixture [*R.A.E.*, A, v, 364] the average yield was increased by about 50 bushels per acre.

The first application should be made when the plants are from 4 to 7 inches high, or earlier if the beetles appear sooner. A constant film of spray should be noticeable on the foliage if the best results are to be obtained.

LEIBY (R. W.). **Spraying Irish Potatoes.**—*North Carolina Agric. Extens. Service, Raleigh*, Extens. Circ. 103, March 1920, 14 pp., 6 figs. [Received 24th August 1920.]

The results of two years' experiments with sprays for the protection of the early crop of potatoes show that the best treatment is the same as advocated for the autumn crop. The early crop should be sprayed at least three times, and it is advisable to make the first application when the first eggs hatch. The chief pest of this crop is the Colorado potato beetle [*Leptinotarsa decemlineata*]. Dusting with lead arsenate and powdered lime at the rate of 1 lb. to 6 lb., or calcium arsenate and lime at the rate of 1 to 8, will destroy this beetle on the early crops, but will not protect them from blight.

SHERMAN (F.). **The Cotton Boll Weevil.**—*North Carolina Agric. Extens. Service, Raleigh*, Extens. Circ. 104, March 1920, 20 pp., 8 figs. [Received 24th August 1920.]

In view of the fact that *Anthonomus grandis* (cotton boll weevil) has now reached North Carolina, this circular gives an account of the insect's history in the United States, the manner in which it may be expected to spread, and the damage it is likely to do in North Carolina. The usual course of disturbance and recovery in an attack over a number of years is described, with the measures that should be taken to offset losses from it. The life-history of the weevil is given together with direct measures against it, including the destruction of the stalks in the autumn earlier than they would die naturally, to lessen the number of weevils that live through the winter by taking away some of their shelter, clean cultivation for the same reason, and poisoning, etc., [cf. *R.A.E.*, A, vi, 17 ; vii, 74].

SHERMAN (F.) & LEIBY (R. W.). **Green Clover Worm as a Pest of Soybeans with special reference to the Outbreak of 1919.**—*North Carolina Agric. Extens. Service, Raleigh*, Extens. Circ. 105, July 1920, 14 pp., 4 figs.

The bulk of the information on *Plathypena scabra* here given has been dealt with elsewhere [*R.A.E.*, A, viii, 384, 390].

EHRHORN (E. M.). **Division of Plant Inspection.**—*Hawaiian Forester and Agriculturist, Honolulu*, xvii, no. 7, July 1920, pp. 204–206.

The pests intercepted during May 1920 included ants (*Monomorium* sp.) in packing from the United States, weevils in vegetable seeds from Manila, and ants (*Prenolepis* sp.) in yams from China.

Swezey (O. H.). **Wireworms as Cane Pests in Hawaii.**—*Hawaiian Planters' Rec., Honolulu*, xxiii, no. 1, July 1920, pp. 1–5, 1 fig.

Recent investigations show that under certain circumstances wireworms may become serious sugar-cane pests. At Honokaa, Hawaii, *Simodactylus cinnamomeus*, Boisd., was not sufficiently abundant to produce noticeable injury, but large numbers of *Monocrepidius exul*, Sharp, were found burrowing into and eating the eyes of seed cane. Under normal conditions this species is probably predaceous on the larvae of another beetle, *Pantomorus fulleri*.

The wireworm injury to seed cane in other countries is reviewed, and the experiments with sodium cyanide in New Jersey are quoted [*R.A.E.*, A, viii, 45]. Tests are being made with poisons and repellents for this pest.

McSwiney (J.). **Report of the Agricultural Department, Assam, for the Year ending 31st March 1920,** *Shillong*, 1920, pp. 6–7. [Received 26th August 1920.]

The pests recorded for the year under review include:—*Hispa armigera* (rice Hispid), *Leptocorisa varicornis* (rice bug) and *Schoenobius incertellus* (*bipunctifer*) (rice stem borer) on rice. The mustard Aphid and mustard sawfly, *Athalia proxima*, were again reported and were dealt with as in the previous year [*R.A.E.*, A, vii, 492]; *Diacrisia obliqua* and *Achaea* (*Ophiusa*) *melicerta* occurred on castor-oil plants. Handpicking was practised to reduce the numbers of *Agrotis ypsilon* attacking tobacco. Plantains were damaged by a weevil, *Odoiporus longicollis*. A Pentatomid bug, *Rhynchocoris* sp., is reported as a general pest of orange fruits. At present it can only be destroyed by trapping with a stick coated with gum. Litchi trees were seriously infested by a mite, *Eriophyes* sp.

Florent (P.). **La Fourmi d'Argentine.**—*Jl. d'Agric. Pratique, Paris*, xxxiv, no. 35, 26th August 1920, p. 172.

Owing to the spread of the Argentine ant [*Iridomyrmex humilis*] in the south of France it was resolved at a meeting held by the Central Society of Agriculture of Nice and the Department of the Maritime Alps that the Ministry of Agriculture should send a specialist to make careful investigations along the whole of the coast with a view to defining precisely the infested areas; that the agriculturists, horticulturists and proprietors of structures affected by the ravages of the ant should form a syndicate of defence with the object of applying intensive and continued remedial measures; and that they should be supported in this task by the Ministry of Agriculture, the Department, and the municipalities.

Inspection centres should be established in the infested areas to prevent further dissemination of the pest.

Menegaux (A.). **Oiseaux utiles.**—*Jl. d'Agric. Pratique, Paris*, xxxiv, no. 35, 26th August 1920, pp. 174–176, 1 plate.

The necessity for protecting useful insectivorous birds such as *Saxicola oenanthe*, *Ruticilla titys* and *Pratincola rubetra* is emphasised. The insects devoured by the latter include *Pieris brassicae*, *P. rapae* and *P. napi*.

Wildermuth (V. L.). **The Alfalfa Caterpillar.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 1094, April 1920, 16 pp., 14 figs. [Received 30th August 1920.]

Much of the information contained in this bulletin on *Colias* (*Eurymus*) *eurytheme* has been noticed elsewhere [*R.A.E.*, A, iii, 153], additional information being given with relation to control of this butterfly by the management of irrigation water.

Childs (L.). **Dust and Spray Gun in Calyx Worm Control.**—*Jl. Econ. Entom. Concord, N.H.*, xiii, no. 4, August 1920, pp. 331–338.

During the past four years, experiments have been carried out with dusts and sprays against the codling moth [*Cydia pomonella*] in the calyx. The percentage of calyx entrants is a very variable factor during different seasons in different sections. Observations show that the general utility of the dusting method is very limited, and it cannot be recommended as a general means of control. Over-estimation of the efficacy of this method is likely to depreciate the value of cover sprays, and great infestation of the fruit is the result. The dust must be applied during a calm atmosphere, the best time being usually very early in the morning.

Owing to the many handicaps and difficulties connected with this method it is only advocated for use on steep hillsides and in sections where it is difficult to obtain sufficient water for spraying. The spray gun gave better results than the rods. As the moths are inclined to deposit more eggs on the tops of the trees than near the ground, spraying should be carried out to at least a height of 25 feet. If the trees are not sprayed above this, fruit should not be grown at that height in order to reduce infestation to the minimum. In order to throw a spray of the proper quality, the machine must maintain a pressure of at least 275 lb. With a low-pressure machine a tree can only be covered by drenching, a large amount of material being thereby wasted. The spray must reach the calyx ends in the proper condition and in sufficient amounts to effect a coating as it falls.

Gibson (E. H.). **Professional Entomology : The Call and the Answer.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 4, August 1920, pp. 355–357.

Professional entomology is defined as the study and application of economic entomology for the means of livelihood. There is no reason why entomology should not be put on a similar basis as law, medicine or engineering, professions that are the outcome of necessity. The present need for consulting entomologists is emphasised, and the possibilities of this science as a profession are discussed.

Herbert (F. B.). U.S. Bur. Entom. **Western Twig Pruners.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 4, August 1920, pp. 360–363.

The beetles that prune twigs and small branches in the West are apparently all native species, although exotic plants are not immune to their attack. They include a Bostrychid, *Polycaon confertus*, Lec., which usually bores at the forks of small branches of almond, apple, apricot, avocado, birch, cherry, currant, English elm, *Eugenia* *myrtifolia*, fig, grape, live oak, olive, orange, peach, pear, prune and strawberry tree (*Arbutus unedo*). Its eggs are generally laid in the dead wood of acacia, almond, apple, Oregon and silver maple, manzanita, live oak, tan bark oak and rose. The larvae mine in the heart and sap-wood of these trees for a year or more and emerge as adults in the early summer. The breeding places should be destroyed, where possible, in the winter or early spring by burning all dead logs and stumps of the food-plants.

P. stoutii, Lec., breeds in California laurel, coast live oak, madrone and mazanita and attacks the branches of almond and *Eucalyptus globulus*. It occurs throughout California.

The western twig-borer, *Apate punctipennis*, occurs throughout the Pacific southwest where its native food-plant appears to be mesquit [*Prosopis*], but it has also been bred from wood of apricot, fig, grape, pear and orange.

The Scolytids, *Phloeosinus cupressi*, Hopk., and *P. cristatus*, Lec., are both native to California, and occur in many species of cypress. Galleries are excavated under the bark parallel to the grain of the wood. The eggs are laid in niches along the sides of the gallery. The larvae mine in the cambium and thus girdle the trees. Under certain conditions they will attack small branches about $\frac{1}{8}$ inch in diameter. Most of the injury is done in the spring and autumn. Remedial measures include burning up the infested trees, posts or poles in which they are breeding, and killing them by removing the bark. Injured twigs may be trimmed from the trees.

A Scolytid found in broken twigs of ash (*Fraxinus* spp.) and old brood galleries of which were found in the dead tops of neighbouring ash trees, is probably an undescribed species of *Leperisinus* near *L. aculeatus*, Say. An allied species, *L. fraxini*, has been reported from Europe.

Other twig-pruners include *Agrilus angelicus* (flat-headed oak twig-girdler) and two unidentified Cerambycid larvae which were found upon the larger twigs of oak.

STEARNS (L. A.). **Some Results with Nicotine and Nicotine Combinations in Experiments on the Control of *Laspeyresia molesta*, Busck.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 4, August 1920, pp. 364–367.

The investigation on *Cydia molesta* of which these results are a part, has been previously noticed [*R.A.E.*, A, viii, 354].

BARBER (G. W.). U.S. Bur. Entom. **The Occurrence of the Chinch-bug (*Blissus leucopterus*) in Eastern Massachusetts.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 4, August 1920, pp. 369–370.

A lawn composed chiefly of blue grass having been completely destroyed by the chinch-bug, *Blissus leucopterus*, all stages of the insect were found in Massachusetts during August 1919. This pest was probably introduced with sheep manure, which had been extensively used for the lawn. In January 1920 the lawn was burned and ploughed and made ready for spring planting. Although adults were hibernating in considerable numbers in the roots of certain grasses it is doubtful if sufficient will survive to become injurious next season.

Burgess (A. F.). **A European Pest found in Massachusetts.**—*Jl. Econ. Entom., Concord, N.H.*, xiii, no. 4, August 1920, p. 370.

Attention is drawn to the occurrence of the satin moth, *Stilpnotia salicis*, L., in Massachusetts. The larvae feed on poplar, willow and other trees. As the pest was not discovered until it was too late for spraying, large numbers of larvae and pupae have been crushed, and egg-masses treated with creosote. Observations are now being made on the life-history of this moth.

Sanders (J. G.) & De Long (D. M.). **Descriptions and Figures of eleven confused Species of *Deltocephalus* infesting Grasses.**—*Pennsylvania Dept. Agric.*, iii, no. 15 (no. 346), *Bur. Plant Indust.*, Tech. Ser. no. 1, *Harrisburg*, June 1920, pp. 3–14, 5 plates.

Methods of collecting and mounting leaf-hoppers are discussed, and a key to the species belonging to the genus *Deltocephalus* is given, with notes on each.

Sanders (J. G.) & De Long (D. M.). **New American Records and Notes of Cicadellidae.**—*Ibid.*, pp. 19–20.

The species dealt with include :—*Idiocerus scurra*, Germ., found in New York, New Jersey, Connecticut, Pennsylvania and Ohio, and probably imported with poplar trees ; *I. cognatus*, Fieb., infesting white poplars (*Populus alba*) in New York and New Jersey ; and *Platymetopius hyalinus*, Osb., occurring on various species of maple in Philadelphia, New York City, New Jersey, etc.

Ainslie (C. N.). **The Western Grass Stem Sawfly.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 841, 7th May 1920, 27 pp., 16 figs. [Received 30th August 1920.]

The life-history of *Cephus cinctus*, Nort., is reviewed and the various stages described. A key is also given to the North American species of *Cephus*. The food-plants of *C. cinctus* include :—*Elymus* spp., *Agropyron* spp. *Hordeum jubatum*, *Bromus inermis*, *Phleum pratense*, *Deschapsia* sp., *Calamagrostis* spp., *Festuca* sp., wheat, durum, spelt and rye. It is also probable that the larvae attack barley. The eggs hatch in about 6 to 7 days. The emerging larva begins feeding almost at once and excavates the stem of the plant. The number of instars has not been determined, but there are probably four moults, and the larval stage may last 11 months. Hibernation occurs in the larval stage, and pupation takes place in the spring and probably only lasts about a week.

The most common parasite of *Cephus cinctus* in grasses is a Chalcid, *Pleurotropis utahensis*, Cwfd., which attacks the hibernating larvae. They are also parasitised by a Braconid, *Microbracon cephi*, Gah. [*R.A.E*, A, vii, 23].

Deep ploughing to at least 5 or 6 inches is the only measure suggested at present for the control of this pest, but even this will be useless unless the resulting surface be compacted by harrowing or rolling, and the stubble thus thoroughly buried. Under laboratory conditions the adults emerged through loose soil when buried at a depth of 6 inches.

Cephus cinctus is often confused with *C. pygmaeus*, L., which it also greatly resembles in its life-history.

CONTENTS.

CONTENTS—*cont.*

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Froggatt (W. W.). **Thrips damaging Tobacco** (*Anaphothrips striatus*, **Osbourne**).—*Agric. Gaz. N.S.W., Sydney*, xxxi, no. 7, July 1920, pp. 502–506, 8 figs.

The grass thrips, *Anaphothrips striatus*, Osb., here redescribed, is recorded as causing serious damage to tobacco in Australia. On 25th April 1919 all stages were found on the upper and lower surfaces of tobacco leaves.

The remedial measures advocated include spraying with a soda soap wash during the earlier growth of the plants, and destruction by ploughing or burning of all plants and waste material in the paddock after the tobacco has been cut and removed. Burning sulphur to the windward side of the tobacco plants was of no use and caused scorching of the foliage.

Froggatt (W. W.). **To destroy the Mole Cricket.**—*Agric. Gaz., N.S.W., Sydney*, xxxi, no. 7, July 1920, p. 518.

A bait consisting of 1 oz. Paris green, 16 oz. bran, one tablespoonful salt and sufficient water to bring the whole to the consistency of bran mash, is advocated for the destruction of mole-crickets, *Gryllotalpa* sp., in such places as garden lawns and putting-greens. They may also be drowned by flooding.

Caesar (L.). **Grasshoppers and their Control.**—*Canad. Horticulturist, Toronto*, xliii, no. 8, August 1920, p. 220.

Grasshoppers were unusually abundant in Ontario in 1920. In most cases they spread from old pastures and waste land to cultivated fields, causing serious injury to the crops. The remedial measures suggested are autumn or early spring ploughing, and the use of a poison bran bait consisting of 20 lb. bran, ½ to 1 lb. Paris green, 2 qts. molasses, 2 or 3 oranges or lemons and 2 gals. water. A cheaper substitute may be made with 20 lb. sawdust, ½ to 1 lb. Paris green, ½ lb. salt and 2 gals. water. This mixture will only be sufficient for about 3 acres, whereas the bran bait will cover 4 acres.

Illingworth (J. F.). **Cane Grub Investigations.**—*Queensland Agric. Jl., Brisbane*, xiv, no. 1, July 1920, pp. 35–36.

Since the cessation of delayed but heavy rains in North Queensland, which prevented the sugar-cane from making much advance, the activities of the cane-grubs (*Lepidiota albohirta*) have been very noticeable. Within four days the whole infested area yellowed, and, in places, the leaves turned brown as if scorched. To make matters worse the grubs will continue feeding several weeks later than usual before hibernating, owing to their having hatched so late. A small area, formerly free from them, is now infested, apparently because the fowls, which used to occupy it and destroyed great numbers of the egg-laden beetles, were disposed of before the flight of the beetles. In all, several hundred acres of fertile soil have been consequently thrown out of cultivation.

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Fields that have been left uncultivated for a time sometimes produce well when first planted again. This may be due to the wild flowers in the uncultivated fields attracting the parasitic wasps (*Campsomeris* and *Scolia*), which normally must go far from the cane area in search of nectar-bearing flowers, few probably returning. The planting of nectar-producing shrubs is therefore recommended. A satisfactory method of using arsenic for cane-grub control has yet to be discovered; placed in furrows on either side of the stools, it has proved useless. The destruction of feeding trees, which has recently been tried [*R.A.E.*, A, vii, 110], seems likely to prove beneficial.

In the Babinda area, which is a very humid one, white grubs have not appeared, but a weevil, *Rhabdocnemis obscura*, is a serious pest and is spreading rapidly. A more extensive effort to introduce colonies of its Tachinid parasite [*Ceromasia sphenophori*] is being made.

JARVIS (E.). *Doticus* **sp.** (*D. pestilens*) **attacking Granadillas in Queensland.**—*Queensland Agric. Jl., Brisbane*, xiv, no. 1, July 1920, pp. 36–37.

A Coleopterous larva, probably *Doticus pestilens*, was found in a hole in green granadilla fruit, and when transferred to a sound fruit burrowed into it [*cf. R.A.E.*, A, ii, 511], and successfully completed its development.

HIRST (S.). **Revision of the English Species of Red Spider (Genera** *Tetranychus* **and** *Oligonychus*.)—*Proc. Zool. Soc. London*, 1920, part 1–2, July 1920, pp. 49–60, 5 figs.

The distinguishing characters of the genera *Tetranychus* and *Oligonychus* are described, and a key to the species of *Tetranychus* occurring in England is given. The species dealt with include *Tetranychus crataegi*, sp. n., described from hawthorn hedges in Wiltshire, and *T. talisiae*, sp. n., from a South American tree (*Talisia princeps*) in Kew Gardens.

MOLZ (E.). **Die** *Typhula*-**Fäule der Zuckerrüben auf den Azoren und ihre Bekämpfung.** [*Typhula* Rot of Sugar-Beet in the Azores and its Control.]—*Zeitschr. Pflanzenkr. Stuttgart*, xxx, no. 4–5, 1920, pp. 121–139, 7 figs.

In the Azores the spread of *Typhula* and its capacity for infecting sugar-beet are much aided in dry soils by injuries to the plant by the caterpillars of *Euxoa* (*Agrotis*) *segetum*, the wounds made by which readily give access to infection by this fungus. The immunity of young sugar-beets to infection by *Typhula* is due both to their lesser sugar-content and to the absence or comparative absence of the caterpillars at that time.

ZIMMERMANN (H.). **Nematodenbefall** (*Heterodera*) **an Kartoffeln.** [Nematode (*Heterodera*) Infestation of Potatoes.]—*Zeitschr. Pflanzenkr, Stuttgart*. xxx, no. 4–5, 1920, pp. 139–145, 4 figs.

In 1913 potatoes in Mecklenburg were found to be attacked by a species of *Heterodera*, as yet undetermined, the spread of which was slow until recently, when the damage done became marked, though confined to potatoes. The condition of the affected plants is described. Infestation by this Nematode was accompanied by that of a mite, *Rhizoglyphus echinopus.*

Crop rotation is advised, potatoes not being planted oftener than once in three years. Deep trenches will prevent a spread of the pest. All débris from potato fields must be burned, and potatoes from infested plots must not be used for seed.

Gegen die Geheimmittel im Pflanzenschutz. [Against Secret Remedies in Plant Protection.]—*Zeitschr. Pflanzenkr. Stuttgart,* xxx, no. 4–5, 1920. pp. 146–147.

The German Society for Applied Entomology has submitted to the Imperial Chancellor a memorandum pointing out the evils accruing through the sale of secret remedies for plant diseases and pests. Animal pests alone of agriculture and forestry cause an annual loss of £25,000,000 in Germany, and this loss is increased by the use of worthless specifics. The memorandum, which was signed by Prof. Escherich and Dr. Stellwaag on behalf of the Society, calls for the prohibition of any compound not duly authorised by a competent authority.

WILHELMI (J.). **Die angewandte Zoologie als wirtschaftlicher, medizinisch-hygienischer und kultureller Faktor.** [Applied Zoology as an economic, medico-hygienic and cultural Factor.] —*Berlin,* J. Springer, 1919. 88 pp. Price 5 Marks. (Review in *Zeitschr. Pflanzenkr. Stuttgart,* xxx, no. 4–5, 1920, p. 172.)

The necessity for basing measures against injurious insects on their biology is emphasised in this booklet. Control by means of natural enemies is not always the best. The enormous importance of applied zoology is referred to in the last chapter, and a claim is made for its inclusion among the university courses. Dr. Reh, the German reviewer, points out that one man cannot properly deal with so wide a subject as applied zoology. The zoology of plant pests, excluding parasites of animals, is a sufficiently wide subject for a single individual to cope with.

WOHLBOLD (H.). **Forstschädlinge.** [Forest Pests.]—*Leipzic,* Hachmeister & Thal. (Review in *Zeitschr. Pflanzenkr. Stuttgart,* xxx, no. 4–5, 1920, p. 173.)

WOHLBOLD (H.). **Landwirtschaftliche Schädlinge.** [Agricultural Pests.] —*Idem.*

The first part of the booklet on forest pests deals with general considerations concerning the interrelation of plant and animal life in forests, and the dependence of the latter on the former. The subject of mammalian, avian and insect pests and their control is then briefly dealt with. Combative measures should only be taken against persistent enemies, not against animals responsible only for occasional injury.

The booklet on agricultural pests is also intended for lay readers, especially those who are practical agriculturists.

STELLWAAG (F.). **Frühjahrbekämpfung einiger wichtiger tierischer Schädlinge der Obstbäume und Beerensträucher.** [Spring Treatment of some of the more important Animal Pests of Fruit Trees and Berry Bushes.]—*Flugschrift Staatl. Lehr- u. Versuchstation Wein- u. Obstbau, Neustadt a.Hdt.* (Abstract in *Zeitschr. Pflanzenkr. Stuttgart,* xxx, no. 4–5, 1920, pp. 174–175.)

Instructions are given for combating Aphids with nicotine, *Nygmia phaeorrhoea* (*Euproctis chrysorrhoea*) and *Malacosoma neustria* with Urania green. *Cheimatobia brumata* with the usual remedies, and the gooseberry sawfly [*Pteronus ribesii*] either with nicotine-soap or Urania green.

DUYSEN (F.). **Einwirkung des strengen Winters und der sommerlichen Dürre auf Schädlinge der Pflanzen.** [The Effects on Plant Pests of the severe Winter and of the Summer Drought.]—*Verh. Botan. Vereins d. Provinz Brandenburg,* lx, 1918, pp. 140–141. (Abstract in *Zeitschr. Pflanzenkr. Stuttgart,* xxx, no. 4–5, 1920, p. 177.)

Contrary to expectation the two factors mentioned in the title resulted in a serious increase of infestation and injury by various pests, such as *Euxoa* (*Agrotis*) *segetum* on potatoes, *Bruchus pisorum* (*pisi*) on peas and *Apion fuscirostris* on the pods of *Sarothamnus.*

WAHL (B.). **Die Erscheinungen von mangelhafter Ährenbildung und von Weissährigkeit bei unserem Getreide.** [Defective Ear Formation and White Ear Disease of our Wheat.]—*Nachrichten Deutsch. Landwirtschaftsgesell. Oesterreich, Vienna,* N.S., iii, 1919, p. 291. (Abstract in *Zeitschr. Pflanzenkr. Stuttgart,* xxx, no. 4–5, 1920, p.179.)

Defective ear formation and the white ear disease of wheat are due to a number of causes including attack by insects such as *Anisoplia* spp., *Zabrus tenebrioides, Cephus pygmaeus,* frit-fly [*Oscinella frit*] (only in Scandinavia), *Mayetiola destructor,* mites, Aphids, various caterpillars, and thrips.

VITZTHUM (H.). **Gäste unserer Schildläuse.** [Guests of our Scales.] —*Mikrokosmos,* xii, 1918–19, pp. 123–126. (Abstract in *Zeitschr. Pflanzenkr. Stuttgart,* xxx, no. 4–5, 1920, p. 180.)

This reviews the various mites that are found, especially in winter, under the shield of scale-insects. *Hemisarcoptes coccisugus,* Lign., attacks the eggs of *Lepidosaphes ulmi* (*Mytilaspis pomicorticis*) and those only. Most other mites are harmless to the scales they are associated with.

SCHUMACHER (—). **Wanzen als Bewohner von Koniferenzapfen.** [Bugs as Inhabitants of the Cones of Conifers.]—*Deutsche Entom. Zeitschr.,* 1918, pp. 406–407. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart,* xxx, no. 4–5, 1920, p. 184.)

The Lygaeid bugs, *Gastrodes abietis,* L., and *G. ferrugineus,* L., are recorded from fallen fir-cones from Bialowies, Lithuania. The former chiefly feeds on *Pinus excelsa*; it also occurs on *Abies alba* and, more rarely, on *Pseudotsuga douglasi*. *G. ferrugineus* prefers *Pinus sylvestris*, but also occurs on *P. nigra*, *P. montana*, *Picea excelsa*, *Abies alba*, and *Larix*.

BAYER (E.). **Bejlomorky hålkotvorné na stredoevropských ost ̌icich.**—[Gall-forming Cecidomyids on Central European Sedges.]—*Acta Soc. Entom. Bohemiae, Prague*, xiv, 1918, pp. 75–92. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 4–5, 1920, pp. 185–187.)

Much existing information on Cecidomyid galls is uncertain or incorrect, as the authors concerned have not bred the insects forming the galls nor observed them over a period of several years. It is not possible to determine a species from the larvae in a gall. A key to the galls formed by Diptera on *Carex* spp. in Central Europe is given.

BERTOG (—). **Raupenfrass in Brandenburg.** [Caterpillar Injury in Brandenburg.]—*Deutsche Forstzeitung*, xxxiii, 1918, p. 614. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 4–5, 1920, p. 190.)

In the last few years there has been an increase of *Dendrolimus pini* and *Bupalus piniarius* in Brandenburg. *Anomalon circumflexum* is the only parasite of the former caterpillars known at present.

KRAUSSE (A.). **Entomologische Mitteilungen. 6. Ueber den Frass der Raupe von *Aglia tau*, L., an Roteiche.** [Injury to *Quercus rubra* by the Caterpillar of *A. tau*.]—*Zeitschr. f. Forst- u. Jagdwesen*, l, 1918, pp. 490–493, 4 figs. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 4-5, 1920, p. 190.)

During 1918, *Quercus rubra*, usually free from insect attack, was infested by the caterpillars of *Aglia tau*, L., near Eberswalde.

SCHULZE (P.). **Drei für die Rose typische mazedonische Käfer.** [Three Macedonian beetles common on the Rose.]—*Deutsche Entom. Zeitschr.*, 1918, pp. 381–382, 2 figs. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 4–5, 1920, p. 193.)

Of three beetles that are abundant in May at Uskub, two, *Homaloplia marginata*, Füssl., and *Rhynchites hungaricus*, Hbst., are pests of roses. The former damages the leaves and the latter the blossoms.

SCHULZ (U. K. T.). **Beiträge zur Biologie des Apfelblütenstechers (*Anthonomus pomorum*).** [Contributions to the Biology of *A. pomorum*.]—*Sitz.-Ber. Ges. nat. Frde., Berlin*, 1918, pp. 363–371. (Abstract in *Zeitschr, Pflanzenkr., Stuttgart*, xxx, no. 4–5, 1920, p. 193–194.)

The apple blossom weevil, *Anthonomus pomorum*, hibernates in the bark of various fruit trees. At the end of March the adults migrate to the top of the trees, where for about 14 days they feed on the buds until ready to pair. Oviposition takes place 2 or 3 weeks afterwards, the eggs being laid in the buds. The larvae hatch in 8-10 days and begin to feed on the pollen cells; they next attack the bud leaves and then the androecia and styles. Pupation takes place 3 weeks later and lasts 8 days. The young adults feed on the surface of the leaves and then aestivate, this being usually followed by hibernation, without a break. The author does not agree with those who think that *A. pomorum* is not necessarily harmful, and considers it to be a dangerous pest, to be combated whenever noticed.

WRADATSCH (G.). **Biologisches von** *Lixus algirus*, **L. (Sumpfrüsselkäfer.)** [Biological Notes on *L. algirus*.]—*Oesterr. Monatsschr. f. d. grundlegenden naturwiss. Unterricht*, xiv, 1918, pp. 99–103. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 4–5, 1920, p. 195.)

Though *Lixus algirus*, L., usually occurs on *Carduus* spp., in Styria the leaves of *Vicia faba* are readily attacked, so that attention must be paid to this new pest.

BADOUX (H.). **Die durch die kleine Fichtenblattwespe verursachten Beschädigungen der schweizerischen Waldungen in letzter Zeit.** [Recent Injuries caused by *Nematus abietinum* to Swiss Forests.] —*Vierteljahrschr. Naturforsch. Ges. Zürich*. lxiii, no. 3–4, 1918, pp. 38–40. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 4–5, 1920, p. 195.)

It is only since 1900 that *Lygaeonematus pini*, Retz. (*Nematus abietinum*, Htg.), has done serious injury in Switzerland. In about 250 acres of fir forest the loss amounted to £1,600–£2,000 from 1911 to 1916. The areas must be well thinned, and silver fir and deciduous trees must be planted in the gaps. Stands of fir only should not be planted in low situations to which fir is not native. Both the developmental and feeding periods of this sawfly are typically short. It swarms at the end of April or early in May, the flight period lasting only 10 days. The needles of the May shoots are split open, and an egg is laid in them. Only the May shoot needles are attacked, and these turn red. The buds that will develop shoots in the following year are not attacked. Repeated attacks result in destruction of the crowns. Near Zürich *L. pini* also attacks larch, but never infests silver fir. Up to the present, banding and spraying have been unsuccessful. Nothing is known of natural enemies that might be utilised against this sawfly. Many adults are caught in webs, ants kill the larvae, and starlings also are useful in this capacity.

THOBIAS, (J.) Junr. **Der Distelfink als Vertilger von** *Siphonophora rosae*.—*Aquila, Budapest*, xxiv, 1918, p. 294. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 4–5, 1920, p. 198.)

Roses in Hungary that were seriously infested by the Aphid, *Macrosiphum* (*Siphonophora*) *rosae*, were thoroughly cleared of this pest by goldfinches. This is remarkable in that these birds are not usually insectivorous.

GESCHWIND (—). **Die Nützlichkeit der Alpendohle.** [The Usefulness of the Alpine Crow.]—*Oesterr. Forst- u. Jagdzeitung, Vienna*, xxxvii, 1919, p. 111. (Abstract in *Zeitschr. Pflanzenkr., Stuttgart*, xxx, no. 4–5, 1920, p. 199.)

In winter the Alpine or mountain crow migrates to the valleys, where it tears open the larval nests of *Cnethocampa pityocampa*, Schffn., and feeds on the half-grown caterpillars. *C. pityocampa* is found up to an altitude of about 4,000 feet, occurring on *Pinus leucodermis*. Its importance in forestry lies in the fact that it precedes bark-beetles that infest the crowns of the trees, such as *Pityogenes bidentatus*, Hbst., *P. bistridentatus*, Eich., *P. quadridens*, Htg., and *Ips acuminatus*, Gyll. These are, in their turn, followed by *Myelophilus minor*, Htg., infesting the trunks.

Report on the Department of Agriculture, 1917–18. *Barbados*, 1920. 35 pp. [Received 2nd September 1920.]

The manurial experiments with sugar-cane [*R.A.E.*, A, vi, 393] still fail to show any definite results owing to the infestation of the canes by the root-borer, *Diaprepes abbreviatus*, L., and the brown hardback *Phytalus smithi*, Arr. The loss consequent upon this infestation is estimated at 4·42 tons of cane, or about £6 15*s.* 0*d.* per acre; the numbers of these beetles are still increasing, and digging out the old cane holes and destroying the larvae seem to have but little effect on the severity of the infestation. Very little effort is made by the majority of planters to collect either pest during the oviposition period or to dig up the stumps and destroy the grubs within them.

Cotton seed imported for the extraction of oil and for the manufacture of cotton seed meal is fumigated with sulphur dioxide, but the process is evidently not effective, as living moths and beetles have been found on the seed after fumigation has been carried out. Dying sugar-canes were found to be badly attacked by the moth-borer, *Diatraea saccharalis*. On one estate caterpillars, identified as *Cirphis microgonia*, Hmp., attacked the foliage on about three acres of young canes. Some of these caterpillars were parasitised by a Tachinid, *Peleteria robusta*, Wied. These parasites, assisted by dusting the canes with Paris green, proved an efficient control.

Trees infested with the green scale, *Coccus viridis*, were sprayed with spores of *Cephalosporium lecanii* suspended in water, and subsequent examination proved that many of the scales were attacked by the fungus.

CLEARE (L. D.). **Annual Loss caused through Insects in British Guiana.**—*Jl. Bd. Agric. Brit. Guiana, Demerara*, xiii, no. 3, July 1920, pp. 115–126.

The annual loss due to insect attack in British Guiana is estimated at over £1,000,000, without reckoning the injury caused to livestock and man, or to forest products.

The pests responsible for these enormous losses include: *Castnia licus*, Drury (giant moth borer), *Diatraea saccharalis*, F., *D. canella*, Hmpsn., *Dyscinetus bidentatus*, Burm., *Metamasius hemipterus*, F., termites, and the mealy-bug, *Pseudococcus sacchari*, Ckll., all of which attack sugar-cane.

Insects damaging rice include: *Laphygma frugiperda*, S. & A. (rice worm), *Remigia repanda*, F. (grass moth), *Diatraea* sp., a bug *Mormidea ypsilon*, L., ants such as *Solenopsis pylades*, For., and a grasshopper, *Conocephaloides maxillosus*.

Coconuts are injured by the larvae of *Brassolis sophorae*, L., *Castnia daedalus*, Cram., and *Sibine fusca*, Stoll, the beetles *Strategus aloeus*, L., and *Rhynchophorus palmarum*, L., *Aspidiotus destructor*, Sign., and Aleurodids.

de Gaulle (J.). **Parasites de *Lophyrus pini*, L.**—*Bull. Soc. d'Etude Sci. Nat., Elbeuf*, xxxvii, 1918 (1919), pp. 55–58.

In this list of parasites of the sawfly, *Diprion* (*Lophyrus*) *pini*, L., the Diptera include 11 species, and the Hymenoptera 58 species of Ichneumonids and 7 of Chalcids.

Coulon (L.). **Les Insectes du Chêne.**—*Bull. Soc. d'Etude Sci. Nat. Elbeuf*, xxxii, 1913 (1914), pp. 159–179, xxxiii–xxxiv, 1914–1915 (1916), pp. 61–80, xxxv, 1916 (1917), pp. 53–80.

The extensive lists here given of insects found on oaks include some indication of the life-history, method of attack and parasites of over 1,400 species.

Feytaud (J.). **Sur la Destruction des Termites par la Chloropicrine.**—*C.R. hebdom. Acad. Sci., Paris*, clxxi, no. 8, 23rd August 1920, pp. 440–442.

Details are given of successful experiments in the destruction of termites with various doses of chloropicrin. There is ground for hope that this substance may be used with excellent results in disinfecting houses infested by these pests.

Rostand (J.). **Sur la Biologie de *Sarcophaga filia*, Pandellé [Dipt.]**—*Bull. Soc. Entom. France, Paris*, no. 13, 1920, pp. 215–216.

Sarcophaga filia, Pand., is recorded as parasitising a snail, *Helix* sp. The larva is apparently deposited on the shell, and gradually devours the host. Pupation lasts about a fortnight, and takes place either in the shell or in the ground. There is only one generation a year. Certain Hymenopterous parasites attack the larvae of this fly, including an undetermined Braconid and a Cynipid.

Misra (C. S.). **The Rice Leaf-Hoppers (*Nephotettix bipunctatus*, Fabr., and *Nephotettix apicalis*, Motsch.)**—*Mem. Dept. Agric. India, Calcutta*, Entom. Ser. v, no. 5, May 1920, pp. 207–237, 4 plates, 9 figs. [Received 6th September 1920.]

The rice leaf-hoppers, *Nephotettix bipunctatus*, F., and *N. apicalis*, Mot., have not been reported from the Chattisgarh Division, Central Provinces, since 1916 [*R.A.E.*, A, iv, 439]. The adoption of remedial measures in 1915 [*R.A.E.*, A, iii, 528] probably prevented the pest from becoming established in the infested area. The life-histories of these species are very similar. The complete cycle in September and October occupies from 17 to 25 days. The eggs hatch in from 4 to 6 days, and the nymphal stage lasts from 13 to 21 days, during which time 5 moults occur. The number of broods during the year has not been definitely ascertained, but there are probably not more than four or five. The chief damage is generally done by the third generation.

Insects that are frequently found in association with these hoppers are: *Hieroglyphus banian*, F., and the Delphacids, *Sogata pusana*, Dist., *S. distincta*, Dist., and *S. pallescens*, Dist.

Other rice pests include two species of *Oliarus*, *Athysanus indicus* Dist., *A. fusconervosus*, Motsch., *Thomsoniella albomaculata*, Dist., *Tettigoniella spectra*, Dist., *Kolla* sp., *Selenocephalus virescens*, Dist., *Paramesus lineaticollis*, Dist., *Cloria puncta*, Wlk.: *Pachidiplosis oryzalis*, W. Mason (rice stem fly); the moths *Schoenobius incertellus* (*bipunctifer*) and *Cnaphalocrocis medinalis*, and a butterfly *Chapra mathias*.

RAMACHANDRA RAO (Y.). *Lantana* **Insects in India. Report on an Inquiry into the Efficiency of indigenous Insect Pests as a Check on the Spread of** *Lantana* **in India.**—*Mem. Dept. Agric. India, Pusa*, Entom. Ser. v, no. 6, June 1920, pp. 239–314, 14 plates, 3 figs.

The results of these investigations indicate that in India no insect exists that will effectively keep *Lantana* in check.

A list is given of 148 species that have been found feeding on this plant. The most efficient of these is the plume moth *Platyptilia pusillidactyla*, which occurs practically throughout India and breeds in *Lantana indica* and *Lippia geminata*, though its increase is checked by natural enemies. The scale *Orthezia insignis* will successfully destroy this plant, but cannot be made use of owing to its polyphagous habits.

The advisability of introducing the Agromyzid fly that keeps down this plant in Hawaii is discussed, and the necessity for careful investigations into the habits of this fly with regard to the possibility of its attacking plants of economic importance in India is emphasised.

FELT (E. P.). **New Indian Gall Midges (Diptera).**—*Mem. Dept. Agric. India, Pusa. Entom. Ser.* vii, no. 1–2, June 1920, pp. 1–11.

The new Cecidomyiids here described, include: *Asphondylia lantanae* from galls in flowers of *Lantana indica* and *L. camara*; *Diadiplosis indica* reared from larvae preying upon *Phenacoccus hirsutus* on mulberry and cotton and *Pseudococcus corymbatus* on cotton; *Raodiplosis orientalis*, gen. et sp. n., taken on mango stems; *Itonida penniseti* from ear-heads of *Pennisetum cenchroides*; *Horidiplosis fici*, gen. et sp. n., from pustules on *Ficus infectoria*; and *Cecidomyia penniseti* from ear-heads of *Pennisetum typhoideum*.

LLOYD (Ll.). **Greenhouse White Fly on Tomatoes.**—*Expt. Sta., Cheshunt*, 1920, 2 pp.

The life-cycle of *Aleurodes vaporariorum* from egg to adult occupies from 21 to 27 days in the greenhouse in warm weather, but in the spring and autumn it may last from 33 to 42 days. The adult will apparently feed and oviposit on any plant, including weeds, but a marked preference is shown for cucumbers. French beans, tomatos, potatoes, *Salvia* and *Calceolaria*. Nurseries with mixed crops are generally most heavily infested, as the houses are never free from foliage. If only one crop is grown and the houses are kept well cleared from weeds in the winter, the insect will not as a rule be noticed until May, and does not become a serious pest until the end of the summer.

Fumigation with hydrocyanic acid gas is advocated as the most efficacious remedial measure. Details of its application are discussed. The normal dose for a house in good condition is $\frac{1}{5}$ oz. sodium cyanide to each 1,000 cubic feet. The treatment should be repeated in from 10 to 21 days time in the summer; in the spring and autumn the second application should not be given before the 30th day. It is advisable to fumigate the night before the weekly watering is due, and the house should be as cold as it can be got before fumigation, which should be begun at dusk and completed by dawn. The house should be opened at dawn to allow thorough evaporation of gases before the sun rises.

PENZER (N. M.). **Cotton in British West Africa.**—*Federation of British Industries, London*, 1920. 53 pp., 2 maps. Price 2*s*. 6*d*.

This paper traces the history of the cotton industry of the whole of West Africa from the earliest records to 1860, and reviews the work of the British Cotton Growing Association in British West Africa since its foundation in 1902.

The insect pests recorded include: *Tetranychus* sp., Aphids, the leaf-rolling Pyralid *Sylepta derogata* and a grasshopper *Catantops vittipes*, all of which attack the leaves. An undetermined stem-borer and the larva of an Aegeriid moth attack the stalks and the larvae of a Lamellicorn beetle the roots.

The bolls are attacked by *Diparopsis castanea*, the eggs of which are laid at the base of the bract or on young leaves, *Earias biplaga*, and *Pyroderces simplex*. The cotton stainer *Dysdercus superstitiosus* attacks developing bolls early in the season.

WATSON (J. R.). **An apparently new *Haplothrips* from Cuba.**—*Florida Entom., Gainesville*, iv, no. 1, July 1920, pp. 7 & 12.

Haplothrips merrilli, sp. n., is here described from under cap scales of coconuts from Cuba taken in quarantine in Florida during March and April 1920.

BRÈTHES (J.). **Descripción de un Género nuevo y una nueva Especea de Tisanóptero de la República Argentina.** [Description of a new Genus and Species of Thysanoptera from the Argentine Republic.] —*Anales Mus. Nac. Hist. Nat., Buenos Aires*, xxvii, 1915, pp. 89–92, 4 figs.

Austrothrips verae, gen. et sp. n., taken on *Trametes pulchra* is described.

BRÈTHES (J.). **Hymenoptères Parasites de l'Amérique Méridionale.** [Hymenopterous Parasites of South America].—*Anales Mus. Nac. Hist. Nat., Buenos Aires*, xxvii, 1915, pp. 402–430, 19 figs.

Among the new Hymenopterous parasites here described from South America are *Doryctes ridiaschinae*, a parasite of the moth

Ridiaschina congregatella; *Allapanteles cecidiptae*, gen. et sp. n., parasitic upon *Cecidipta excaecariae*, Berg.; *Microgaster ducanae*, parasitic upon a Tineid in the parenchyma of leaves of *Schinus longifolia*: *Telenomus schrottkyi* and *T. edessae*, parasitic upon eggs of *Edessa rufomarginata*, Germ.; *Dissolcus paraguayensis*, a parasite of *E. rufomarginata*: *Eurytoma ridiaschinae*, parasitic on *Ridiaschina congregatella*: *Psilomirinus flavidulus*, gen. et sp. n., a parasite of *Aulacaspis* (*Diaspis*) *pentagona*; and *Aphelinus argentinus*, parasitic on *Parlatoria pergandei*.

LAHILLE (F.). **La Langosta en la República Argentina.** [The Locust in the Argentine Republic.]—*Minist. Agric. Lab. Zool., Buenos Aires*, 1920. 172 pp., 1 map, 11 plates, 16 figs.

The various forms of the locusts occurring in Argentina and their synonymy are discussed. They include *Schistocerca flavofasciata* de G., *S. paranensis*, Burm., *S. rustica*, F. (*pallens*, Scud.) and *S. cancellata*, Serv. The biology of these forms is very little known, and the necessity of studying them is urged. The stages and life-history of *S. paranensis* in Argentina are described, and particulars of its external morphology are given.

Plans are drawn up outlining the campaigns that should be followed in attempting to control this locust, and a detailed account is given of the campaign in Villa Nueva in 1918. In that year, locust control was much facilitated by natural conditions: the insects appeared late, there was a prolonged drought, and the fly, *Sarcophaga acridiorum*, Wey., destroyed large numbers of them. They were also unusually heavily infested with a mite, *Podapolipus berlesei*, Lah.

The artificial control measures used during the campaign in Córdoba were limited almost exclusively to physical methods, and evidence points to the barrier method, when properly managed, as being the simplest and most efficacious against the larval and nymphal stages. The various methods of collection and disposal of the locusts after they are caught by the barriers are discussed. The plan for studying the various data necessary for a campaign is outlined and includes the localities and dates of the first hatchings, the area of distribution of the eggs, first appearances of the early stages, the numbers of eggs and immature locusts destroyed, natural enemies observed, climatic conditions, etc.

A study has been made of the general direction of the main swarms coming from the north, and a chart illustrates these lines of flight. If it is true, as is generally believed, that the locust passes the winter in a warmer climate further north than that of the most destructive invasions, and if this hibernation occurs in the south-west of Bolivia, there must of necessity be a return migration towards the north. Apparently, such a migration has never been observed: it seems probable therefore that the insects develop nocturnal habits and fly towards Bolivia on calm nights. As they can easily rise to a height of 3,000 ft. or more, it is obvious that they may readily pass unperceived.

The author, however, is inclined to agree with the view that *S. paranensis* has no natural and permanent breeding-ground and no fixed hibernation quarters. He considers that the general opinion to the contrary is based upon theory without any well founded basis and upon an artificial classification of the areas infested more or less permanently or simply temporarily. It seems useless to attempt to trace the cause of locust invasions to meteorological changes or other conditions; migration is apparently instinctive, and if conditions are favourable, there is no limit to it. In 1919 the presence of locusts in the flying stage was recorded on 28th July in five provinces and many districts; these swarms, though decimated by natural enemies, had evidently passed the entire winter in the Central Argentine zone, simply passing from one locality to another, taking short flights in irregular directions when conditions were favourable. If there were a definite migratory instinct towards Bolivia or the Chaco region in the winter season, there would not be so many of these isolated and stationary swarms in such scattered districts and so far from the Bolivian frontier. On the other hand, had Bolivia contained an extraordinary number of locusts, it is remarkable that three naturalists should have searched the region during the autumn and winter months of 1917 without finding more than ten individuals. It should be remembered that *S. paranensis,* contrary to the habits of almost all the other Argentine locusts, passes the winter in the adult stage. The zone within which it is possible for the species to hibernate cannot in all probability be definitely determined, but in the author's opinion it can be roughly defined as lying between parallels 25° north and 32° south. This does not imply that there are no locusts in Bolivia during the winter; on the contrary there undoubtedly are considerable numbers, and it is not denied that large invading swarms sometimes migrate from that country, but it is not admitted that the main focus from which all swarms appear is always to be found there. The foci are variable and numerous, and the winter is passed wherever the insect happens to be located, provided that the temperature is suitable and there is sufficient sustenance in the neighbourhood. The very obvious differences of opinion of authors who have discussed the question of the migrations and permanent zones of the Argentine locusts indicate the necessity for further investigations on the subject.

Certain recommendations are suggested for future investigations. Observers should be stationed at intervals along the Bolivian frontier to note any flights or settlement of swarms in that region. The exact areas in which locusts hibernate throughout the country should be determined over a number of years, so that control measures may be concentrated on those areas. It would be of interest to determine, if possible, the reason why the swarms cross certain regions of the country only, e.g., the Misiones territory, and never visit, for example, the south-east of the Province of Buenos Aires or the Puna region. Similar plans of investigation should be followed in the neighbouring republics of Paraguay and Bolivia. It is suggested that a special technical office should be established, with full authority, to study the biology of the locust, its migrations, parasites, and the most modern methods of dealing with it.

This monograph concludes with a list of the species of *Schistocerca* commonly accepted in 1910.

JOHANSEN (H.). **Los Insecticidas y Fungicidas más Importantes.** [The chief Insecticide and Fungicide Mixtures.]—*Rev. Agric. Santo Domingo, R.D.*, xvi, no. 4, 31st July 1920, pp. 106–109.

Instructions are given for preparing some of the more usual insecticide and fungicide mixtures, which should be kept at hand on every estate in readiness for the appearance of any insect or disease.

NAGORNY (P. I.) & UVAROV (B. P.). **Таблицы для Опредѣленія важнѣйщихъ Вредителей и Болѣзней культурныхъ Растеній Грузій.** [Tables for the Identification of the chief Pests and Diseases of cultivated Plants of Georgia.]—**Министерство Земледѣлія, Бюро Борьбы съ Вредителями Сельскаго Хозяйства.** [*Ministry of Agriculture, Bureau for the Control of Agricultural Pests.*] *Tiflis*, 1920, 103 pp, 16 plates.

These tables enumerate the chief pests and diseases of fruit trees and garden plants under the name of the plant attacked. Field crops, etc., will be dealt with in a subsequent paper. A special table is given showing the best time to apply the remedial measures advocated.

ANDERSON (E.). **The South African Locust Poison.**—*Union of South Africa Dept. Agric., Pretoria*, Science Bull. 15, 1920, 18 pp.

The chief method of combating locusts in South Africa is the use of a poison made by mixing sodium arsenite solution with a sweetening agent such as treacle or a solution of cane sugar.

In view of the discovery of a sludge in the drums of concentrated poison as well as the occasional difference in appearance of two lots of poison, a chemical investigation of the materials used was undertaken. As a result of this it is suggested that cold sodium arsenite solution be placed in the containers first, and the treacle added afterwards. The poison should be stored in this form and not mixed until required for use. An arsenite in which the ratio of sodium oxide to arsenic trioxide is approximately 1 to 4·5 is apparently the most suitable for preparing the poison.

SMITH (L. B.). **Potato Spraying Experiments on the Control of the Pink and Green Aphid** (*Macrosiphum solanifolii*, **Ashmead**). I.—*Virginia Truck Expt. Sta., Norfolk*, Bull. 29, 1st October 1919, 1 fig. [Received 8th September 1920.]

Details are given of experiments carried out in 1917 for the control of *Macrosiphum solanifolii* on potatoes [*R.A.E.*, A, vii, 492]. Nicotine sulphate and fish-oil soap at the rate of $8\frac{3}{4}$ oz. and 5 lb. respectively to 50 U.S. gals. of water are advocated as a spray. If a combination spray is required, 8 to 10 oz. of nicotine sulphate may be added to 50 U.S. gals. of Bordeaux containing 2 lb. powdered lead arsenate—the mixture used for the Colorado potato beetle [*Leptinotarsa decemlineata*]. Nicotine must not be mixed in the same spray as Paris green.

Feytaud (J.). **Sur l'Extension de l'Eudémis en France.**—*Bull. Soc. Vulg. Zool. Agric., Bordeaux*, xix, no. 7, July 1920, pp. 70–75.

The gradual spread of *Polychrosis botrana* in France is discussed. From being originally a negligible factor this moth has become a serious menace to vine cultivation, and occurs practically in all vineyards throughout the country.

Picard (F.). **Quelques Insectes nuisibles à la Vigne.**—*Bull. Soc. Vulg. Zool. Agric., Bordeaux*, xix, no. 7, July 1920, pp. 75–76.

Insect pests of vines include *Deilephila livornica*; *Hippotion (D.) celerio*; *Pergesa (D.) elpenor*; *D. porcellus*; a locust *Barbitistes berenguieri*; *Lyctus impressus*, which is parasitised by a Braconid *Monolexis lavagnei*; a Bostrychid *Scobicia chevrieri*, and a Longicorn *Clytus arietis*.

The Cultivation and Preparation of Cocoa.—*Bull. Imp. Inst., London*, xviii, no. 1, January–March 1920, pp. 36–73.

A short chapter of this paper is devoted to the general remedial measures that have proved successful in combating pests of cacao. A list of the insects noxious to this crop is given in the form of a table showing their usual habitat, the portion of plant attacked and the respective specific remedial measures.

Wimshurst (C. R.). **Entomological Section.**—*Administration Rept. Agric. Directorate [Mesopotamia] for* 1919, *Baghdad*, 1920, pp. 39–41.

The noxious insects reported during the year include the following date pests: *Oryctes rhinoceros*, the larvae of which bore into the palm trunks, *Parlatoria blanchardi*, *Tetranychus* sp., and a small Lepidopterous larva, possibly that of *Ephestia cautella*.

Insects attacking cotton include: *Earias insulana* (spotted bollworm); a termite *Microtermes* sp.; *Agrotis* sp.; *Oxycarenus laetus*, found in the opening cotton bolls in August; *Nezara viridula*; Capsid bugs; and red spider *Tetranychus* sp.

Wheat was attacked by *Tylenchus scandens*, a Pentatomid bug and Thysanoptera.

Larvae of a Buprestid beetle and a larva, probably of *Dichocrocis punctiferalis*, were found on peaches and nectarines. Other miscellaneous pests include *Prodenia littoralis* on *Phaseolus mungo*; *Lygaeus pandarus* on *Sesamum*; *Chilo simplex* on *Sorghum vulgare*; *Sesamia* sp. in cobs of dwarf maize; *Bagrada picta* on leaves of radishes; *Stephanitis* sp. on quince and apple leaves; *Ocnerogyia amanda* on figs; *Nezara viridula* on tomatos, chillies and sweet limes, the eggs of this bug being also found on apple in July; *Carpophilus dimidiatus* on pears and poplar; *Utetheisa pulchella* on sunn hemp (*Crotalaria juncea*); a Pentatomid bug on grapes; *Tylenchus* sp. and a bulb mite *Rhizoglyphus* sp. in potatoes; *Epilachna* sp. on egg-plants and cucurbits; *Aulacophora abdominalis* on young cucurbits; an unidentified larva, probably of a Pyralid, on *Castor*; *Dacus* sp. on sweet melons; and *Anomala varians* infesting young pumpkin and melon plants.

The grasshopper *Decticus albifrons* caused severe damage to various crops, and *Schistocerca peregrina* appeared in large swarms in May and also caused damage in April.

The pests of stored products include *Calandra oryzae* and *Rhizopertha dominica* in wheat; *Ephestia cautella*, *Silvanus surinamensis* and *Laemophloeus* sp. in dates; and Bruchid beetles in kidney beans.

DAVIDSON (W. M.). U.S. Bur. Entom. **A new *Myzocallis* (Aphididae: Homoptera).**—*Canad. Entom., London, Ont.*, ii. no. 8, August 1920, pp. 176–177, 1 fig.

Myzocallis alhambra, sp. n., here described, is recorded from the leaves of *Quercus englemanni* and *Quercus* sp. in California.

WALTON (W. R.). **Cutworms and their Control in Corn and other Cereal Crops.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 739, May 1920, 7 pp., 3 figs.

This is a revision of an earlier bulletin dealing with the life-histories of the cutworms, *Hadena devastatrix*, Brace, *Agrotis ypsilon*, Rott., *Lycophotia* (*Peridroma*) *margaritosa*, Haw., and *Agrotis* (*Noctua*) *c-nigrum*, L. [*R.A.E.*, A, iv, 511.]

Western Plant Quarantine Board.—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, ix, no. 7, July 1920, pp. 215–287, 5 figs.

The second convention of the Western Plant Quarantine Board was held at Salt Lake City, Utah, on 11th to 14th May, 1920. The papers read include reports on the quarantine conditions in various States, and in British Columbia. A number of problems affecting the work of the Board were discussed, and several resolutions intended to aid the work in the future were passed.

MASKEW (F.). **Quarantine Division. Report for the Months of April and May, 1920.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, ix, no. 7, July 1920, pp. 298–302.

The pests intercepted during April and May included:—From Australia, *Aspidiotus rapax* (*camelliae*) on lemons. From China, *Ephestia elutella* in shelled walnuts, and *Chionaspis citri* on oranges. From Japan, *Hemichionaspis aspidistrae* and *Parlatoria pergandei* on *Citrus* fruit; weevils in chestnuts; *Pseudococcus* sp. on tuberoses; Lepidopterous larvae, pupae and adults, and Coccids on *Aspidistra*; a Coleopterous larva, *Pseudococcus* sp. and a Formicid on *Aralia*; a Lepidopterous cocoon on *Daphne*, and *Lepidosaphes ficus* on pears. From Vladivostok, Siberia, *Aulacaspis rosae* on *Rosa multiflora*. From Borneo, *Lecanium* sp. on elm; and *Pulvinaria* sp. on maple. From Hawaii, *Diaspis bromeliae* and *Pseudococcus bromeliae* on pineapples; larvae of a Trypetid in tomatos; *Coccus elongatus* and *Aphis* sp. on betel leaves; *Pseudaonidia clavigera*, *Saissetia nigra*, *Parlatoria proteus*, *Lepidosaphes auriculata*, *Pseudococcus* sp., *Coccus elongatus* and a Tetranychid on croton and *Hibiscus* cuttings; *Araecerus fasciculatus* in seed; larvae of *Dacus cucurbitae* in cucumbers; *Monomorium* sp. and *Pseudococcus* sp. on *Dracaena* sp. From Balboa, *Chrysomphalus dictyospermi* on coconuts. From Pago Pago, Samoa, *Chrysomphalus aonidum* on coconuts. From Tahiti, *Lepidosaphes beckii* on oranges and limes and *L. gloveri* on limes. From Cuba, *L. beckii* on grapefruit. From Central America, *Aspidiotus cyanophylli*, *Pseudococcus* sp., and *Aspidiotus cydoniae* on bananas. From Ecuador, unidentified Lepidopterous pupae in sacks of cacao beans. From Mexico, *Chrysomphalus aonidum* and *Lepidosaphes beckii* on oranges; *Calandra oryzae* and an unidentified weevil in tamarind nuts; *Heliothis* (*Chloridea*) *obsoleta* on tomatos; *Saissetia oleae* on *Ficus* sp.; *Coccus elongatus* and *Lepidosaphes* sp. on croton; undetermined Lepidopterous larvae, *Calandra oryzae*, *Tribolium confusum* and *Carpophilus* sp. on acorns; *Hemichionaspis* sp. on coconuts. From Oregon, *Lepidosaphes* sp. on cascara bark. From Utah and Washington, *Lepidosaphes beckii* on Florida-grown grapefruit. From New York, *Aleurodes* sp. and *Pseudococcus* sp. on nursery stock; *Aulacaspis boisduvali* on orchids; *Aphis* sp. on *Hydrangea*; and *Aegeria exitiosa* on peach trees. From Arkansas, a Coccid on a rubber tree. From New Jersey, *Aspidiotus britannicus* and *Coccus hesperidum* on bay trees. From Connecticut, *Pseudococcus* sp. on *Gardenia*. From Florida, *Lepidosaphes beckii* and *Parlatoria pergandei* on grapefruit. From Mississipi, *Chrysomphalus ficus* on *Pandanus*. From Ohio, *Aphis* on roses.

SARSFIELD (J.). **Insect Pests and How to Beat Them.**—*London*, C. A. Pearson Ltd., 1919, 202 pp., 44 plates. Price 3*s*. 6*d*. [Received 14th Sept. 1920.]

This book gives a popular account of the insect pests that are most likely to be met with in Britain, in the farm—including those that attack farm animals—garden, orchard or greenhouse, and of the remedial measures that may be used against them. Special attention is given to methods of treatment that are practicable for a small holder. Fungus pests are also noticed, and there are chapters on soil composition and manures. There is an adequate index, and also a chart showing the insect pests that may be expected, and the work that may be necessary, from month to month.

ASHBY (S. F.). **Black Fly on Citrus Trees.**—*Jl. Jamaica Agric. Soc.*, *Kingston*, xxiv, nos. 3 & 6–7, March & June–July 1920, pp. 72–74 & 182–184.

In this report on black fly [*Aleurocanthus woglumi*] on orange, grapefruit and tangerine trees in various districts of Jamaica, the conditions of the various districts are considered in detail. The spread of the fly is slowly followed by the red and brown fungi [*Aschersonia aleurodis* and *Aegerita webberi*] that attack this pest; early infestations of the fly are liable to be heavy, but are reduced when the fungi become established. The fly is controlled at the lower elevations by an ant [*Cremastogaster*], which also keeps the trees free from scale insects. This ant and a small black stinging species seem to be mutually exclusive, and colonies of the latter in trees should be destroyed with oil emulsion, before any attempt is made to introduce a colony of the beneficial species.

Usually it takes about a year after the appearance of the fly for the red or brown fungi to become established naturally, but this may be much accelerated artificially. A good time for such measures as pinning up infected leaves is when the fly has become abundant, as the insects will then help to spread the spores mechanically. Spraying with a solution containing the spores is more effective about two weeks later, when many eggs have hatched and while the insect is in the susceptible larval stage. This should not be done with an apparatus that has been used for fungicides, and any apparatus must be well washed out before use. Brown fungus should be rubbed off the leaves into the water with the aid of sand to break up the mycelium.

The sooty film or blight on leaves and fruit is not necessarily due to the fly. Heavily sooted trees have been observed quite free from fly, but infested by a scale which also gives rise to cases of sooty blight on mango. On this account fly infestation cannot be certainly inferred from sooty fruit seen at the packing houses, though most of the fruit thus affected is due to it.

Blackmore (E. H.). **Entomology.**—*Rept. Brit. Columbia Prov. Mus. Nat. His., 1919*; *Victoria*, 1920, pp. P16–P23, 2 plates.

The caterpillars of *Malacosoma pluvialis*, Dyar (forest tent caterpiller) were particularly numerous in the early spring, but before becoming fully fed were killed in large numbers by a disease of fungous or bacterial origin. Several species of locusts caused great damage in the south-eastern part of the Province. *Hemerocampa vetusta gulosa* has apparently only one brood and not two as was previously thought [*R.A.E.*, A, vii, 479].

This report also includes a list of the less common insects taken in British Columbia during the year.

Komp (W. H. W.). **The Use of Carbon Bisulphide against the White Grub.**—*Soil Science, New Brunswick, N.J.*, x, no. 1, July 1920, pp. 15–28.

The damage done to lawns, strawberry beds, etc., by subterranean insects, and the difficulties of controlling the grubs concerned are discussed. Experiments described indicate that carbon bisulphide may be an effective soil fumigant in situations where the grubs cannot be reached by cultural methods. The maximum dose that can be used without injury to grass is slightly less than 5 oz. per square foot, while the minimum dose for white grubs [*Lachnosterna*] is about 1 oz. Temperature greatly influences the effectiveness of fumigation, less than 1 oz. at 85° F. or above being as effective as 1 oz. at 65° F., while the maximum dosage for plants is probably affected also. Injections should be made about 6 inches apart. The soil moisture should be medium (10 per cent.) to wet (20 per cent.) to get good results. Wetting the surface of soil that is too dry seems to increase the effectiveness of the treatment. The charge should be placed several inches below the point where the grubs are working. These small dosages seem to have a stimulating effect upon lawn grasses, but the high cost of carbon bisulphide will considerably restrict its use.

Davis (J. J.). **Miscellaneous Soil Insecticide Tests.**—*Soil Science, New Brunswick, N.J.*, x, no. 1, July 1920, pp. 61–72, 2 plates.

The results of various experiments and observations with soil insecticides are described. Experience with carbon bisulphide indicates that its use against most species of *Lachnosterna* (white grubs) and similar insects is impracticable, but that it is useful in destroying ant colonies and in killing those grubs that live in an open burrow, such as those of *Allorrhina* (*Cotinus*) *nitida* (southern green June beetle).

The effect of kerosene emulsion on various grubs is recorded; this did not prove as satisfactory an insecticide as cyanide, being less effective, more expensive and more difficult to make up and apply. The same may be said of commercial preparations of coal-tar or creosote. Corrosive sublimate proved ineffective in repeated tests. Sulphuric acid was tried in various strengths against grubs of *Popillia japonica* (Japanese beetle), but no application gave more than 10 per cent. mortality. Acetaldehyde was wholly ineffective in many tests with the same species, and never gave a higher rate of mortality than 12 per cent. Kopper's solution (a by-product containing approximately 25 per cent. carbon bisulphide and 75 per cent. benzine) in a number of tests gave no higher mortality than 9 per cent.

Important consideration was given to tests with sodium cyanide. A brief review of previous work with this insecticide is given. In the present experiments, for small areas such as lawns and gardens, an ordinary sprinkling can was used, granular sodium cyanide at the rate of 165 lb. in 12,000 U.S. gals. of water being used per acre. For larger areas a 600-gallon tank mounted on heavy wagon frames and drawn by a caterpillar-type tractor was used. The results of these treatments against *P. japonica* in various kinds of stubble and grass-lands are recorded in a series of tables, and the methods of application and the labour and expense involved are described. The degree of mortality shows great variation, averaging about 78½ per cent. over 65 different tests with various dosages. Ground covered with timothy grass, weeds, or similar vegetation allowed better penetration of the insecticide if the crop was closely mown, consequently a higher mortality was obtained than where the vegetation was tall and matted. When the cyanide was applied dry and the treated area afterwards watered, the results were uniformly poorer than when the cyanide was applied in liquid form. Where comparisons were possible it was observed that cyanide was more effective against the grubs of *Cyclocephala*, *Lachnosterna*, and *Macrodactylus* than against those of *P. japonica*, the latter having apparently burrowed deeper than the other species of beetles at the first approach of cold weather.

Little is known of the effect of cyanide treatment on soil. In the present experiments it was found that grass might be scorched by the cyanide solution, but the injury was not permanent except where the liquid stood in low places for a considerable time. Cultivated crops, such as maize, were appreciably injured by the treatment. The chemical effect on the soil, and on different kinds of greenhouse plants when treated soil is used for potting and seed-beds, requires further study, and the whole question of cyanide treatment has as yet been so little investigated that only fragmentary results and temporary conclusions have been attained.

Smyth (E. G.). **Insects and Mottling Disease.**—*Jl. Dept. Agric. Porto Rico, Rio Piedras,* iii, no. 4, October 1919, pp. 83–116. [Received 14th September 1920.]

Failure of other ordinary means of dispersion of the cane mottling disease has led to the belief that insects may transmit it, and there seems better reason to suspect sucking than chewing insects of doing so. The only insect yet observed in the field that would satisfy all the conditions is the yellow cane thrips (*Frankliniella* sp.). On the other hand from a large number of experimental tests made in insect transmission, successful inoculations resulted from only four different species of sucking insect. These were the West Indian cane-fly (*Stenocranus saccharivorus*), the cane-leaf scale (*Pulvinaria iceryi*), the yellow cane aphis (*Sipha flava*) and a mealy-bug (*Pseudococcus calceolariae* or *P. sacchari*).

In view of the fact that the number of successful inoculations was very small, compared with the large number of tests made under apparently favourable conditions, the question of insect transmission cannot be regarded as settled. Other factors may have escaped notice.

It is possible that inoculation requires that the plant be in a condition of rapid growth—a condition that does not occur in the potted test plants. The possibility of the infective principle being carried by the insect for a length of time, and undergoing a cyclic change in its body, or of its being transmitted to the young through the egg before it becomes pathogenic, has yet to be investigated.

A bibliography of insect-borne diseases of plants is appended to this paper.

Smyth (E. G.). **An Annotated Bibliography of Porto Rican Cane Insects.**—*Jl. Dept. Agric., Porto Rico, Rio Piedras,* iii, no. 4, October 1919, pp. 117–134. [Received 14th September 1920.]

This bibliography includes 136 works published between 1880 and 1919, with an indication of the scope of each.

Smyth (E. G.). **List of the Insect and Mite Pests of Sugar Cane in Porto Rico.**—*Jl. Dept. Agric., Porto Rico, Rio Piedras,* iii, no. 4, October 1919, pp. 135–150. [Received 14th September 1920.]

This list includes all the insects and mites that have been commonly found feeding on sugar-cane (*Saccharum officinarum*), with particulars, in tabular form, of the common name, damage, distribution, food-plants, enemies, and control of each.

Smyth (E. G.). **Nuestro Amigo el** *Anolis.* [Our Friend *Anolis.*] —*Rev. Agric. Puerto Rico, San Juan,* iv, no. 5, 31st May 1920, pp. 11–21.

Over 75 per cent. of the lizards of Porto Rico belong to the genus *Anolis,* and they are very numerous and ubiquitous, some hundred or so being found to the acre of average land. Corresponding to this abundance of lizards is the obvious scarcity of insect life compared with conditions on the mainland. It is estimated that from 30,000 to 150,000 insects are probably consumed on each acre of land in one week by the lizards present, the species including grasshoppers and katydids, the West Indian cane-fly *Delphax saccharivora*, the southern grass-worm *Laphygma frugiperda*, and the chinch bug *Blissus leucopterus*, all of which would probably cause heavy losses if they were not kept in check by these enemies. Unfortunately, many of the most destructive pests of the Island are too well protected to be captured in this way, especially when they are nocturnal in habit; these include the changa *Scapteriscus vicinus*, the May beetle *Lachnosterna* (*Phyllophaga*) *portoricensis*, the moth stalk-borer of sugar-cane *Diatraea saccharalis*, the sugar-cane mealy-bug *Pseudococcus sacchari*, the fire-ant *Solenopsis geminata*, Coccids, Aleurodids, Aphids, Psyllids, Tingitids and termites, as well as the Pyralids and Hesperids that fold or roll the leaves, and insects that are particularly large or active, such as *Pachyzancla periusalis*, injurious to tobacco, *Nacoleia indicata*, a pest of beans, and *Pilocrocis tripunctata*, which damages sweet potatoes, *Eudamus proteus* (bean leaf-roller) and *Eantis thraso* (citrus leaf-roller).

The commonest and most valuable insectivorous lizards of the Island are *Anolis pulchellus*, *A. cristatellus*, *A. stratulus*, *A. evermanni*, *A. cuvieri* and *Ameiva exul*.

Many of the nocturnal insects that escape these lizards are devoured at night-time by tree-toads, *Eleutherodactylus* spp., which are thus very valuable checks on the increase of pests.

PAOLI (G.). **La Lotta contro le Cavalette in Capitanata nel 1917-1918.** [Anti-Locust Work in Capitanata in 1917–1918.]—*Boll. Minist. Agric., Ind., Comm. e Lavoro, Rome,* Year xviii, vol. 1, Ser. B, no. 3–4, March-April 1919, 11 pp. [Received 13th September 1920.]

In spite of the destruction of the eggs of *Dociostaurus maroccanus*, as recommended in the preceding report [*R.A.E.*, A, vi, 500], a large number of hoppers hatched in May 1918. Measures against these and the resulting adults therefore followed those taken against the eggs. The work was done in two separate zones in the Province of Foggia. In the zone around Foggia itself, *D. maroccanus* was the predominant species. In the second zone, around Torremaggiore, *D. maroccanus* was absent, but numerous small swarms of *Calliptamus italicus*, mixed with other species, occur.

The measures adopted in the Torremaggiore zone were confined to the use of a poison-bait of bran treated with 3 per cent. of sodium arsenite.

In the Foggia zone the work was more comprehensive. In dealing with the egg-masses, infested ground was lightly dug and then raked over, the broken soil being thrown on metal screens so as to separate the eggs. The latter were used to fill up existing pits, as it was found that a covering of 4 inches of earth prevents emergence. The surplus eggs were gathered in heaps measuring about 16 feet in diameter and from 3 to 5 feet in height. To prevent those on the surface from hatching, these heaps were sprayed with a 10 per cent. solution of cresosol, or with a mixture of cresosol 5 parts, carbon bisulphide 1, and petroleum 1. It is estimated that about 1,200 million locusts were prevented from hatching at a cost of about 16*s.* per million. This figure is double the amount estimated by Lunardoni in 1911, a difference that is accounted for by the higher costs at the present time. As the eggs destroyed only represented a portion of those laid in 1917, work against the hoppers was also necessary. Hatching began on 17th April and continued until 4th May, owing to the alternating sunny and dull weather. The hoppers were sprayed with sodium arsenite, the strength of which was at first just under 1 per cent. and was then gradually increased to 2 per cent., as they grew older. The best result was obtained by spraying the insects themselves instead of the grass, Spraying is not a suitable method where the work is on a small scale, owing to the expense of moving the plant, and in such circumstances a poison-bait was used. It was made either of damaged grain, maize cobs (after the maize had been removed) or bran. Full details are given of the quantities and costs. Against the full-grown locusts a poison-bait was the means used, and it was found to possess a great advantage in that the mortality among the females was much greater than among the males. Whereas the females only numbered from 15 to 30 per cent. of the total in a swarm, some 50 per cent. of the individuals killed by poisoning were females, which are constantly feeding in order to mature the eggs. It is estimated that the cost of dealing with the adults was sufficiently low to be economically practicable. Two parasites, *Tephromyia lineata*, Fall., and *T. grisea*, Meig., attacked many females and rendered them incapable of depositing eggs. The egg-masses were attacked by a Coleopteron, *Mylabris variabilis*, Pall., and by two Diptera, *Cytherea* (*Mulio*) *obscura*, F., and *Systoechus ctenopterus*, Mikn., which were jointly responsible for the destruction of 15–20 per cent. of the eggs. Another fly, *Anastoechus nitidulus*, F., was also found, but was very rare and therefore of little importance. This was the first time it has been noticed in Italy, the previous records being from Astrakan [*R.A.E.*, A, ii, 718 ; iii, 636].

Details are given regarding the various baits. It was found that crushed grain absorbs 30 per cent. of its weight of liquid, bran 70–90, ground maize cobs 125, slices of dried beet up to 300, white sawdust nearly 100, brown sawdust 70, crushed olive stones 35. To ensure that the bait contained 4 per cent. of its dry weight of sodium arsenite, the solutions had to contain varying strengths of the poison, approximately 13 per cent. for grain, 5 for bran, 3·2 for cobs, 1·3 for beet, 4 for white sawdust, 5 for brown sawdust, and 11·4 for crushed olive stones. It was found that neither grain nor maize cobs alone were suitable for strewing, and therefore use was made of a mixture of grain 7 parts by weight, bran $1\frac{1}{2}$, and maize cobs 1 ; the sodium arsenite solution was diluted accordingly. Bran requires the liquid to be added and stirred in with great uniformity, otherwise lumps are formed, and waste occurs in spreading it. Of the other baits employed, maize cobs, slices of dried beet, and sawdust proved satisfactory. As regards cost, white sawdust was the cheapest ; next came brown sawdust, followed by cobs, beet, bran, crushed olive stones, and crushed grain, There are however other important factors—the capacity for absorption, and the capacity for swelling, the latter determining the quantity of dry substance needed for a wet bait to cover a given area. An equation is given to assist in comparing various baits with due regard to the different factors involved. The addition of molasses, oranges, or lemons did not seem to increase the attractiveness of the baits for the young larvae of *D. maroccanus*.

It is known that locusts do not oviposit in cultivated ground, and the suggestion was made that the ground should be tilled in areas known to be prone to infestation. The Province of Foggia does not, however, lend itself to this method, as the uncultivated tracts are larger in extent than the cultivated ones.

FRICKHINGER (H. W.). **Die Mehlmotte. Schilderung ihrer Lebensweise und ihrer Bekämpfung mit besonderer Berücksichtigung der Cyanwasserstoffdurchgasung.** [The Meal Moth. An Account of its Life-History and Control with special Reference to Fumigation with Hydrocyanic Acid Gas.]—*Munich*, Verlag Natur und Kultur. Dr. Frz. Jos. Völler, 1918, 63 pp., 16 figs. Price 2 Marks.

The life-history of *Ephestia kühniella*, Z., and the injury done by its larva are described. Infestation is spread from mill to mill by means of the sacks. The various methods employed against this pest are reviewed. The main portion of the paper deals with the theory and practice of fumigation with hydrocyanic acid gas, and gives a detailed account of the methods successfully adopted in Germany [*R.A.E.*, A, viii, 428]. The illustrations are a feature of this useful monograph.

SCHULZ (U. K. T.). **Ergebmisse meiner Zuchtversuche an** *Anthonomus pomorum*. [The Results of my Breeding Experiments with *A. pomorum*.]—*Entom. Blätter, Berlin*, xvi, no. 1–3, 24th April 1920, pp. 16–20. [Received 14th September 1920.]

The author's observations under natural conditions of the apple blossom weevil, *Anthonomus pomorum*, have recently been noticed [*R.A.E.*, A, viii, 469]. These breeding experiments were begun in 1919.

It was found that the feeding in spring prior to mating [*loc. cit.*] is necessary for full sexual development. Females from which food was withheld at the termination of hibernation were unable to oviposit: in some of the males maturity was sufficiently advanced at the end of hibernation to make mating possible. These captive specimens appeared to suffer from hunger; their reserve of fat had been consumed during hibernation and they fed on bark.

An attempt to determine the maximum number of eggs a female can lay showed figures varying from 20 to 46.

As regards the effect of temperature on the eggs it was found that whereas in the open air the egg-stage usually lasts 8–10 days, this period was reduced to 6–6½ days indoors at 17°–19° C [63°–66° F.], Eggs in the shade out of doors and exposed to the temperatures of April 1919, which sometimes sank to 2° C. [35° F.], required 14–15 days. Tests with temperatures higher than those normally obtaining indoors could not be made, as gas rationing interfered with the regular working of the thermostats.

Great difficulties attended the breeding of the young larvae. The least unsatisfactory results were obtained with pear buds placed in glass dishes with absorbent paper that was daily wetted. The supply of buds was repeatedly renewed, the larvae being moved to the new buds as soon as the old ones showed signs of drying.

In nature the larvae not only feed on the anthers, but also on the corolla. The injury to the petals causes the bud to remain closed and this provides a shelter during the entire period of development, including the pupal period. Unusually warm spring weather or delayed oviposition interferes with the above normal course, and larvae may be found in open apple and pear buds, especially the latter. Under these altered conditions the larvae kept the filaments together by feeding at their bases, and crept upwards between the anthers in order to defecate, the droppings being used to bind the anthers, so as to form a shelter. The need for a shelter therefore appears to be established.

To investigate the resistance of the larvae many individuals of varying ages were placed on open buds. All the young and helpless ones were gradually shaken out. Cold rain proved very injurious to the larvae, either washing them away or killing them *in situ*.

The preferred food of the young adults was apple leaves, pear leaves coming next. The leaves of *Pyrus baccata* were also eaten ; those of sweet cherry, sour cherry, rose, hawthorn, linden, etc., were rejected.

SCHOLZ (M. F. R.). **Die Aufzucht von *Ptinus tectus*, Boield.** [The Breeding of *P. tectus*.]—*Entom. Blätter, Berlin*, xvi, no. 1–3, 24th April 1920, pp. 23–24. [Received 14th September 1920.]

Adult beetles and pupae of *Ptinus tectus*, Boield., were found in July 1918 in a tin of fish food apparently composed of dried meat. At the end of August a number of larvae appeared. By mid-February 1919 these larvae were pupating, and the first new adult appeared on the 25th February.

EGGERS (H.). **60 neue Borkenkäfer (Ipidae) aus Afrika, nebst zehn neuen Gattungen, zwei Abarten.** [Sixty new Bark Beetles from Africa, with ten new Genera and two Subspecies.]—*Entom. Blätter*, Berlin, xvi, nos. 1–3 & 4–9, 24th April & 31st August 1920, pp. 33–45 & 115–126.

This is the concluding portion of a paper on new African Scolytids. *Cryphalus acaciae* is recorded from Abyssinia from *Acacia catechu* and *C. balanopselaphus* from East Africa from a wild species of *Rubus*.

HEIKERTINGER (F.). **Untersuchungen über die Standpflanzen der Blütenkäfergattungen *Meligethes, Brachypterus* und *Brachypterolus* (*Heterostomus*).** [Investigations on the Host-plants of the Blossom Beetles of the Genera *Meligethes, Brachypterus* and *Brachypterolus* (*Heterostomus*).]—*Entom. Blätter, Berlin*, xvi, nos. 4–9, 31st August 1920, pp. 126–143.

When engaged in the preliminary studies for a work on the phytophagous beetles of Europe, the author's attention was drawn to the problem of food-preference. It appeared necessary to obtain a comprehensive view of the extent and constancy of the food-preference of the adults of pollen-eating beetles, and to ascertain to what degree the enumeration of food-plants would be of real scientific value. This matter is of interest both as regards pollination and applied entomology.

The final result of these investigations on the pollen-eating MELIGETHINAE has not the simplicity obtaining in the case of the leaf-eating HALTICINAE, and it is necessary to consider pre-imaginal development, as the Meligethine larvae have a more marked dependence on certain plants than the adults.

The results are given in two tables, one arranged according to the species of beetles, and the other according to the plants.

The character of the MELIGETHINAE as pollen-eating insects postulates that the hibernated adults are seldom able in early spring to find food on the plants that have served, and will again serve, the larvae. The adult is compelled to resort to other plants, and this polyphagy has somewhat reduced the strictness of its food-preference. This compulsion does not exist in the case of the larva, as mating and oviposition occur at a time when blossoms are present; the larva may be oligophagous or even monophagous.

It is therefore clear that whereas in the case of the HALTICINAE the recording of a definitely observed food-plant of the adult is valuable, such a record is usually undesirable for MELIGETHINAE. It is a record of the observed food-plants of the larvae of the latter that merits attention, and then only if a marked regularity in attack is unmistakably shown.

Meligethes aeneus, *M. viridescens*, *M. coracinus* and *M. lepidii* were all bred from larvae from Crucifers, but in all the author's experiments the adults confined themselves to slitting open the anthers and eating the pollen therein, the female organs never being touched.

DE STEFANI (T.). **Informazioni sull' *Icerya purchasi*, Mask., agli Agrumicoltori della Provincia di Trapani.** [Information on *Icerya purchasi* for the Citrus Growers of the Province of Trapani.] —*Il Rinnovamento Econ.-Agrar., Trapani*, xiv, no. 7, July 1920, pp. 97–102, 3 figs. [Received 14th September 1920.]

This popular article was prepared as a result of the appearance of the scale, *Icerya purchasi*, Mask., on *Citrus* in the Province of Trapani, Sicily. The usual remedial measures are mentioned for use as auxiliaries to natural control by the Coccinellid, *Novius cardinalis*.

MOREIRA (C.). **Praga da Mangueira.** [A Mango Pest.]—*Chacaras e Quintaes, S. Paulo*, xxii, no. 2, 15th August 1920, p. 123.

Against the Homopteron, *Aethalion reticulatum*, L., infesting mangos, spraying with either nicotine or kerosene-soap is advised.

SANTSCHI (F.). **Cinq nouvelles Notes sur les Fourmis.**—*Bull. Soc. Vaud. Sci. Nat., Lausanne*, liii, no. 198, 15th September 1920, pp. 163–186, 18 figs.

The new ants here described include *Plagiolepis foreli*, found on orchids in the Botanical Gardens at Zurich.

Marié (P.). **Section d'Entomologie.**—*Bull. Soc. Agric. France, Paris,* September 1920, pp. 211–212.

In view of the danger of extending the ravages of the potato moth, *Phthorimaea operculella* [*R.A.E.*, A, viii, 121], it is suggested that the prohibition of the transportation of potatoes from the infested areas of the Department of Var should be re-established.

The urgent necessity for adopting systematic control measures against *Nygmia phaeorrhoea* (*Liparis chrysorrhoea*) (brown-tail moth) is insisted upon [*R.A.E.*, A, viii, 6].

Dufrénoy (J.). **Observations biologiques sur les Xylophages du Pin Maritime et leurs Parasites.** [Biological Observations on Borers of *Pinus maritima* and their Parasites.]—*Bull. Soc. Vulg. Zool. Agric., Bordeaux,* xix, nos. 7 & 8, July & August 1920, pp. 65–70 & 81–87, 6 figs.

The natural enemies of the Scolytid *Ips* (*Tomicus*) *sexdentatus* are discussed; these include a fungus, *Beauveria globulifera*, and a Nematode. Predaceous or parasitic insect enemies of this beetle have not been noticed.

La Fourmi d'Argentine en France.—*Bull. Soc. Vulg. Zool. Agric., Bordeaux,* xix, no. 8, August 1920, pp. 91–93.

Attention is drawn to the occurrence of the Argentine ant, *Iridomyrmex humilis*, in the south-east of France [*R.A.E.*, A, viii, 326]. The remedial measures advocated have been noticed elsewhere [*loc. cit.*, 285].

Ursat (J.) & Gaumont (L.). **La Lutte contre le Bombyx cul-brun** (*Liparis chrysorrhoea*).—*Bull. Soc. Vulg. Zool. Agric., Bordeaux,* xix, no. 8, August 1920, pp. 93–94.

Owing to the increase of *Nygmia phaeorrhoea* (*Liparis chrysorrhoea*) during 1919 in Loiret in the vicinity of Orleans, destruction of the nests by the 15th March was made obligatory. A total of 2,183,179 nests were collected under the auspices of the Department of Agriculture at a cost of about £1,300. Many additional nests were destroyed by individual enterprise.

Swaine (J. M.). **Forest Insect Control Work in British Columbia.**—*Agric. Gaz. Canada, Ottawa,* vii, no. 8, August 1920, pp. 642–644.

Yellow pine (*Pinus ponderosa*) and lodge-pole pine (*P. contorta murrayana*) in southern British Columbia have suffered heavy losses during the past twelve years from extensive outbreaks of two destructive pine bark-beetles, *Dendroctonus brevicomis* (western pine bark-beetle) and *D. monticolae* (mountain pine bark-beetle). In British Columbia, *D. brevicomis* attacks yellow pine only, but *D. monticolae* also attacks western white pine (*Pinus monticola*) and lodge-pole pine.

The beetles appear in July, and bore into the trees in enormous numbers. The grubs that hatch from their eggs excavate numerous galleries, so that the inner bark is girdled rapidly in thousands of places, and the sap flow effectively checked. The foliage turns yellow, and by the following June is dead and red. During July, the beetles leave the dead trees to attack other healthy pines in the neighbourhood. In some districts the destruction has been almost as thorough as a forest fire, while the distribution of the insects is wide.

Although so destructive, the beetles can be effectively controlled by destroying the broods in the infested area. This may be done by modified logging operations, and often without great expense, since in many valleys the trees that are cut may be utilised as lumber. The general principle is to destroy 75 per cent. of the infested bark, selecting the most heavily infested trees so that approximately 75 per cent. of the broods of beetles will be destroyed. If the infested district is being logged, the logs are immersed in water in the spring long enough to kill the broods; or else they are sawn during winter, and the slabs burned; or they are removed entirely from the neighbourhood.

If logging is not profitable, the trees should be barked, either standing or felled, and the bark burned.

The progress is described of control work in the Coldwater and adjacent valleys—the first extensive work on these lines ever undertaken in British Columbia, from which hopes are entertained of a great saving of timber.

Brittain (W. H.). **General Results in Spraying and Dusting.**—*56th Ann. Rept. Nova Scotia Fruit Growers' Assoc., Kingston,* 1920, pp. 68–82.

This paper summarises the advances in methods of orchard pest control that have been made since 1914.

The discovery of the apple-sucker, *Psylla mali*, in Nova Scotia is noticed [*R.A.E.*, A, vii, 506], and investigations on lime sprays against it, either in late autumn or in the spring, are proposed. It is not however regarded as a very serious pest at present. Poison sprays against the apple maggot [*Rhagoletis pomonella*] should consist of lead arsenate (2lb. to 40 gals. water) without the addition of sweetening materials, which do not greatly attract the flies, and which often injure the foliage. The trees should be covered thoroughly so as to compel the flies to feed on the poison during the egg-laying period [*loc. cit.*, vii, 302]. Two applications, one in the middle of July and one about the first of August, were very effective.

Much of the information on the development of spraying and dusting has already been noticed [*loc. cit.*, vi, 559; vii, 304, etc.]. With regard to the danger of the apples falling owing to the application of lime-sulphur with high capacity machinery, it is advised that lime-sulphur should not be used in a drenching spray, but should be applied in the form of a mist. It should not be used for the fourth spray, *i.e.*, that applied ten days or a fortnight after the apple blossoms fall, but modified Bordeaux mixture made on the formula 3–10–40 or 2–10–40 should be substituted. In fact the latter mixture may be used for all the spraying operations, though it will probably cause a slight russetting if used for the third spray.

SANDERS (G. E.). **Spraying and Dusting.**—*56th Ann. Rept. Nova Scotia Fruit Growers' Assoc., Kingston*, 1920, pp. 114–127.

This paper emphasises the economic importance of spraying, the profits from which are even greater now that higher prices are being paid for fruit. Spraying materials and dusts and a spray-calendar, all as adapted to conditions in Nova Scotia, are noticed, the question of lime-sulphur injury and the comparative merits of spraying and dusting being considered in detail.

DE SEABRA (A. F.). **Etudes sur les Maladies et les Parasites du Cacaoyer et d'autres Plantes cultivées à S. Thomé. vii. Quelques Observations sur le "Thrips" du Cacaoyer.**—*Lisbon*, Compagnie "Agrícola Ultramarina," 1919, 23 pp., 7 figs. [Received 21st September 1920.]

Heliothrips rubrocinctus, Giard, attacks both cacao and avocado in the island of S. Thomé. The various stages are described. As the climatic conditions and the vegetation of the island are very favourable to this pest, the necessity for preventing its spread by the application of artificial remedial measures is emphasised. These include thoroughness in cultivation and the burning of infested leaves and branches. The resistance of the plant may be increased by watering during the dry season.

A Coccinellid, *Exochomus flavipes*, Thunb., has been found associated with *H. rubrocinctus*, and is probably predaceous on it.

DE SEABRA (A. F.). **Etudes sur les Maladies et les Parasites du Cacaoyer et d'autres Plantes cultivées à S. Thomé. viii. Sur une nouvelle Espèce du Genre *Mirotermes* appartenant à la Faune de S. Thomé.**—*Lisbon*, Compagnie "Agrícola Ultramarina," 1919, 6 pp., 8 figs. [Received 21st September 1920.]

Mirotermes amaralii, sp. n., here described from San Thomé, is apparently the first representative of this genus of termites recorded from the island.

DE SEABRA (A. F.). **Etudes sur les Maladies et les Parasites du Cacaoyer et d'autres Plantes cultivées à S. Thomé. ix. Les Cochenilles du Caféier.**—*Lisbon*, Compagnie "Agrícola Ultramarina," 1919, 8 pp., 9 figs. [Received 21st September 1920.]

The Coccids here recorded as occurring on coffee plants on the Island have been noticed elsewhere [*R.A.E.*, A, vi, 383]. The species there referred to as *Ceroplastes* sp. is probably *C. ceriferus*, Anders.

SANTSCHI (F.). **Etudes sur les Maladies et les Parasites du Cacoyer et d'autres Plantes cultivées à S. Thomé. x. Fourmis de S. Thomé.**—*Lisbon*, Compagnie "Agrícola Ultramarina," 1919, 4 pp. [Received 21st September 1920.]

The ants recorded as occurring on the Island include *Pheidole megacephala*, F., *Monomorium pharaonis*, L., *Prenolepis longicornis*, Latr., and *Camponotus maculatus*, F., var. *thomensis*, n.

DE SEABRA (A.). **Estudos sôbre as Doenças e Parasitas do Cacaueiro e de outras Plantas cultivadas em S. Thomé. xviii. A Moléstia nova dos Cacaueiros na Ilha de S. Thomé.** [Studies of the Diseases and Parasites of Cacao and other Plants cultivated in the Island of San Thomé. XVIII. The new Disease of Cacao in S. Thomé.]—*Lisbon*, Companhia Agrícola Ultramarina, 1919, 43 pp. [Received 21st September 1920.]

In 1916 an apparently new disease of cacao appeared in the Island of San Thomé and the danger to the plantations increased to such an extent as to render necessary an investigation, of which the results are given here.

The disease is an aggravated form of injury due to two enemies previously known in the island, a fungus, *Lasiodiplodia theobromae*, and a thrips, *Heliothrips rubrocinctus*, Giard.

The investigation covered 61·5 per cent. of the estimated area under cacao, 35 per cent. of the plantations being affected. Among young cacao (under 5 years old) the mortality sometimes amounted to 50 per cent. ; the old trees suffered much less.

Bordeaux mixture containing at least 1 per cent. of copper sulphate, and enough lime to neutralise the solution, is recommended against the fungus. Measures against *H. rubrocinctus* are more difficult to apply owing to the disadvantages attaching to a contact poison. The formulae given by Russell for nicotine are advised [*R.A.E.*, A, i, 99]. Both enemies may be combated simultaneously by combining nicotine with Bordeaux mixture. Natural enemies such as the Coccinellid, *Exochomus flavipes*, and three others still unidentified, should be protected. Against the thrips, tobacco should be planted experimentally, as it has been stated that the thrips is attracted to the stems and leaves of green tobacco and dies before injuring that plant.

The paper concludes with a list of 51 insect pests of cacao in San Thomé : of these the following either contribute to or precede the development of the fungus :—Rhynchota : *Aleurodes* sp., *Selenaspidus* (*Aspidiotus*) *articulatus*, Morg., *Morganella* (*A.*) *maskelli*, Ckll., *A. palmae*, Mask. & Ckll., *Aulacaspis pentagona*, Targ., *Dysdercus superstitiosus*, F., *Helopeltis* sp., *Coccus* (*Lecanium*) *viridis*, Green, *Lepidosaphes* (*Mytilaspis*) *beckii*, Newm., *Orthezia insignis*, Dougl., *Pseudaonidia trilobitiformis*, Green, *Pseudococcus citri*, Risso, *Psylla* sp., *Toxoptera coffeae thomensis*, Sbr. Coleoptera : *Haltica* sp., *Apate* sp. Isoptera : *Cephalotermes rectangularis*, Sjöst., *Microcerotermes dolichognathus*, F. Silv., *Neotermes gestroi*, F. Silv. Thysanoptera : *Heliothrips rubrocinctus*, Giard, *Heliothrips* sp. Corrodentia : *Psocus* sp.

DE SEABRA (A.). **Estudos sôbre as Doenças e Parasitas do Cacaueiro e de outras Plantas cultivadas em S. Tomé. xix. A Seca dos Ramos dos Cacaueiros.** [Studies of the Diseases and Parasites of Cacao and other Plants cultivated in the Island of San Thomé. XIX. The Withering of the Branches of Cacao.]—*Lisbon*, Companhia Agrícola Ultramarina, 1919, pp. 5–40. [Received 21st September 1920.]

Insect pests of cacao additional to those recorded in the preceding paper, include the termites, *Neotermes pallidicollis*, Sjöst., *Microcerotermes parvus theobromae*, Desn., *Termes ostentans*, F. Silv., and *Schedorhinotermes putorius*, Sjöst. ; and a borer, thought to be a caterpillar of the genus *Zeuzera*.

Considerable injury has been done by *Pseudaonidia trilobitiformis*, the biology of which is briefly described. It attacks the leaves, but a fungus, *Microcera coccophila*, first noticed in 1916, had effectively checked it by 1918. The diffusion of this fungus by means of leaves of *Castilloa* and small cacao plants was attempted. Insufficient investigation does not permit of any opinion being advanced on the value of another fungus, *Myriangium duriaei*, or of Ichneumonid parasites. *Neotermes gestroi* lives within the living stems of cacao ; it is the most dangerous of the termites and causes serious loss. Infestation may be rapidly reduced by cutting off and immediately burning the infested wood, the upper parts being the first attacked. A black ant is a natural enemy of this pest. *Microcerotermes parvus theobromae* and *Mirotermes amaralii* build their nests near the cacao stems. *Cephalotermes rectangularis* makes a semi-subterranean nest near a root or stem. *Microcerotermes dolichognathus* nests in the upper branches. *Termes ostentatus* lives either underground or in hills ; it cultivates a fungus that has not yet been identified.

The caterpillar attacking the green branches, stated above perhaps to belong to the genus *Zeuzera*, makes a mine with a diameter of 6 millimetres and a length of 16–39 inches. As a rule two-year-old branches are infested, sometimes the trunks also. Only a few centres of infestation have been noticed in the Island, and it is probable that natural enemies keep this pest in check. Infested branches and stems should be cut off and burned.

DE SEABRA (A. F.). **Estudos sôbre as Doenças e Parasitas do Cacaueiro e de outras Plantas cultivadas em S. Thomé. xxix. Notas sôbre as principais Formas de Animais e Plantas interessando a Agricultura de S. Thomé e particularmente a Cultura do Cacau.** [Studies on the Diseases and Parasites of Cacao and other cultivated Plants in San Thomé. XXIX. Notes on the chief Animals and Plants relating to Agriculture in San Thomé, especially as regards the cultivation of Cacao.]—*Lisbon*, Companhia Agrícola Ultramarina, 1919, 13 pp. [Received 21st September 1920.]

Further insects recorded include :—Coleoptera. *Cicindela melancholica*, F., *C. purpurea*, Ol., *Scarites fatuus*, Karsch, the Elaterid, *Alaus chalcolepidium*, Fairm., the Scarabaeids, *Tephraea ancilla*, Karsch, and *Oryctes latecavatus*, Fairm., *Cladognathus antilope*, Swed., a Curculionid, *Sphenophorus quadrimaculatus*, Gylh. (very injurious to bananas), the Anthribid, *Araecerus fasciculatus*, deG. (a most dangerous pest of coffee), the Cerambycids, *Chlorida festiva*, L., *Macrotoma edulis*, Karsch, *Mallodon downesi*, Hope, *Ancylonotus tribulus*, F., and *Monochamus ruspator*, F. [probably *M. thomensis*, Jord.], and the Chrysomelids, *Nisotra theobromae*, Lab., and *Limidus variicolor*, Berl. (both of which do serious injury to cacao).

Lepidoptera. *Corcyra cephalonica*, Staint. ?, *Papilio bromius*, Dbd., *P. demodocus*, L., *Argina leonina*, Ar., *Deilephila nerii*, L., *Euchlora megaera*, L., *Hypolimnas misippus*, L., *Phytometra* (*Plusia*) *chalcites*, Esp.

Rhynchota. *Dysdercus superstitiosus*, F., *Icerya purchasi*, Mask., *Vinsonia stellifera*, Green (rare on *Citrus*, but abundant on coconut), *Saissetia* (*Lecanium*) *nigra*, Niet., *S.* (*L.*) *hemisphaerica*, Targ., and *Aulacaspis pentagona*, Targ. (which would be exceedingly dangerous were it not checked by fungi), *Aspidiotus palmae* (very common on coconut), and *Ischnaspis longirostris*, Sign. (*filiformis*, Dougl.) (rare on coffee, but very abundant on coconut).

Orthoptera. The most injurious species are *Gryllotalpa africana*, Pal., and *Liagryllus capensis*, F., but they are uncommon. *Polyspilota pustulata*, Stål., is a useful insectivorous Mantid.

Hymenoptera play an important part in the destruction of scale-insects on the Island.

The Myriapods, *Spirostreptus integer*, Karsch, and *S. marginescaber*, Karsch, sometimes cause rapid rotting of bananas injured by *Cosmopolites sordidus* (*Sphenophorus striatus*).

Fungi of great value are *Microcera coccophila*, Desm., which has almost entirely eradicated *Pseudaonidia trilobitiformis*; *Cephalosporium lecanii*, which has been equally effective against the coffee scale, *Coccus viridis*; and *Myriangium duriaei*, which is another enemy of *P. trilobitiformis*. Two other entomophagous fungi are *Ophionectria* and *Aschersonia*.

de Seabra (A. F.). **Note sur l'Existence en Portugal de la Tortrix de la Vigne, *Œnophthira pilleriana*, Schiff.**—*Bull. Soc. Portug. Sci. Nat., Lisbon*, viii, no. 2, 1920, pp. 148–150.

The only species of vine Tortricid that is of any serious economic importance in Portugal is *Sparganothis* (*Oenophthira*) *pilleriana*, of which there have been heavy infestations for many years in various districts, and especially in the magnificent plantations and old established vineyards beside the Tagus. A study has been made of the biology of this moth in Portugal, which is very similar to that of the species in France. The life-history is shown in a chart. In the present studies, a proportion of 64 per cent. of males was observed. Of 4,648 caterpillars collected from the vines, 1,836 were found to be parasitised by Hymenoptera or Diptera. As these parasites always emerge from the pupal stage of *S. pilleriana*, it is a simple matter to collect the adult caterpillars and rear the parasites from them.

Rutgers (A. A. L.). **Verslag van den Directeur 1 Juli 1919–30 Juni 1920.**—*Meded. Algem. Proefst. A.V.R.O.S., Medan*, Algem. Ser. no. 9, 1920, 43 pp.

The report of the entomologist, Mr. J. B. Corporaal, states that caterpillars did little damage to rubber. *Hevea* was infested with a termite, *Microtermes pallidus*, Havil., but no real injury was done. A dangerous species of *Coptotermes* occurred sporadically, and fumigation with sulphur-arsenic by means of the "Universal white ant destroyer" was advised. *Xyleborus perforans*, Woll. (*kraatzi*, Eich.) must be added to the rubber borers mentioned in the preceding report [*R.A.E.*, A, vii, 64]. The presence of a scale encouraged nest-building by an ant, *Cremastogaster* sp.

Tea pests did not include *Helopeltis*; this is surprising as *H. sumatranus*, Rpke., *H. antonii*, Sign., and *H. theivora*, Wlk., occur among the wild vegetation. *Colobathristes saccharicida*, Kirk, was sent in as *Helopeltis*, which it resembles, but may be distinguished by the presence of a pointed, instead of a rounded spine on the scutellum. A Pentatomid bug, *Dalpada* sp., requires attention as it appears able to breed on tea. *Megachile* sp. attacks the older leaves of tea, but the injury is insignificant. Some tea twigs were infested by a Fulgorid. A beetle, provisionally identified as a species of *Phyllobius* [*Corigetus scapularis*, Roel.], did some damage to the young shoots. Of various injurious caterpillars, one belonged to the genus *Attacus*.

Coffee pests included *Stephanoderes hampei*, which has extended its infestation since the previous year, when it was first observed. Up to the present, no real injury has been done, because only the fleshy part of the berry is attacked, and because, by keeping the ground clear of withered berries, an effective check seems to result. The coffee beetle, *Araecerus fasciculatus*, is of general occurrence. In the plantations it confines its attacks to withered berries only. *Zeuzera coffeae*, Nietn., was received from coffee and tea. Branches killed by this moth must be cut off and burned. A good poison-bait for grasshoppers attacking coffee consisted of 35–40 parts of fresh horse manure, 1 part Paris green, and 2 parts salt. A bait suitable for Tettigoniids as well, contained $4\frac{1}{2}$ lb. sodium arsenite, 18 lb. sugar or molasses, and $22\frac{1}{2}$ gals. water with enough fresh maize leaves (chopped into pieces about 1 inch long) added to produce a wet bait, which is left standing overnight before it is strewn in the morning.

Brachartona catoxantha re-appeared on the same coconut estate as in the previous year [*loc. cit.*], but its natural enemies seemed more abundant.

Oil-palm pests included Limacodid and Psychid caterpillars, *Rhynchophorus ferrugineus*, Dipterous maggots and Tenebrionid larvae.

A Pyralid caterpillar of the genus *Pyrausta* injured maize. Rice was attacked by the Pyralid borer, *Schoenobius bipunctifer*, Wlk., and by the bugs, *Nezara viridula*, L. *Leptocorisa* sp., and *Podops vermiculata*, Voll. Much injury to maize and rice may be prevented by cultural methods. Care must be taken to sow a given area within a short period (2–3 weeks.) An interval of about 6 weeks must occur between harvesting a crop, and planting a new one. The sowing time should be uniform with that on other plantations, and with the time of planting practised in the native villages.

Dry maïze and rice were infested by *Tribolium ferrugineum*, F., *Carpophilus* sp., and *Dinoderus minutus*, F., which last also occurs in dry bamboo, and is attacked by a Clerid, *Tillus notatus*, Klug.

Phaseolus lunatus was infested by a small fly, probably *Agromyza phaseoli*, Coq. The leaves of *Dioscorea sativa* were eaten by the caterpillars of *Herse* (*Protoparce*) *convolvuli*, and ornamental palms, *Corypha* sp., were infested by caterpillars of *Amathusia phidippus*, a pest of coconut.

Rhinotermes translucens, Hav., penetrated a teak chest kept indoors and destroyed papers within it, the teak-wood being left untouched. A species of *Coptotermes*, probably *C. curvignathus*, Holmgr., was observed on living mango trees and destroyed by fumigation with sulphur-arsenic

Feytaud (J.). **Sur l'Extension de l'Eudémis en France.**—*Le Progrès Agric. et Vitic., Montpellier,* lxxv, no. 38, 19th September 1920, pp. 281–284.

The extended distribution of *Polychrosis botrana* in France during the past thirty years is reviewed. Although originally the local outbreaks were of minor importance, it has become one of the most serious pests of the vineyards. Wherever this moth becomes established, *Clysia* (*Conchylis*) *ambiguella*, Hb., apparently disappears.

Passy (P.). **Le Cèphe du Poirier.** [*Cephus compressus* on Pear Trees.] —*La Vie Agric. Rurale, Paris,* xvii, no. 38, 18th September 1920, pp. 180–182, 4 figs.

The sawfly, *Janus* (*Cephus*) *compressus*, F., oviposits on pear trees from about 15th May to the end of June. The young shoots frequently show many punctures made by the female, in one of which the egg, which is very difficult to locate, is deposited. Shoots so attacked wilt and die. The eggs hatch in 8 or 10 days, and the young larva begins to feed on the medullary tissue; later it begins to descend the shoot, leaving the latter empty and dying. The larval tunnel is generally 3 or 4 inches long. Pupation occurs in the autumn, the pupa being usually located a little below the dead part of the shoot, though by the time the adult emerges, towards the end of the following April, the whole shoot has died. The adult lives on flower juices and does not damage the trees, except by oviposition. As the old shoot dies, a new one frequently arises from one of the eyes just below the point attacked, but its growth is retarded by the old shoot still absorbing part of the sap, even if it is not actually killed by the larva descending beyond the point of its origin.

It is almost impossible to capture the adults of *J. compressus* owing to their agility; in fact they can seldom be observed except at the moment of oviposition. Remedial measures must therefore be directed against the earlier stages. During the oviposition period (May and June) all buds that show signs of wilting should be cut off an inch or two below the punctures. In this way the egg or young larva will be removed and the next healthy shoot will be encouraged in its growth. After the leaves have fallen, during the winter pruning, all the dried shoots should be cut sufficiently low to ensure that the pupae are enclosed in them, and they should then be burnt. Certain birds, in particular the tomtit and the goldfinch, are useful in extracting the larvae from the shoots. An Ichneumonid parasite, *Pimpla* sp., is able to oviposit through the shoot on to the larva within, and is evidently very beneficial in reducing the numbers. In fact collections of the larvae of this sawfly almost always yielded as many parasites as hosts.

Billaudelle (L.). **Un Ravageur du Chou. La Baridie Verdatre.** [A Cabbage Pest, *Baris chlorizans*, Germ.]—*Jl. d'Agric. Pratique, Paris,* xxxiv, no. 39, 23rd September 1920, pp. 252–253, 1 fig.

The Curculionid, *Baris chlorizans*, Germ., causes serious damage among cabbages in the Seine-et-Oise region, the leaves at the base of the plants drying away and falling to the ground about June or July.

Such plants show the stems riddled with galleries made by the larvae. Adults may be observed in early June among the larger leaves, the females ovipositing in the tissues of the stem or at the base of the petioles. After two months of feeding by the larvae, first on the leaves and then on the stalk, a pupal cell is formed in the stalk, where transformation takes place. In favourable weather the adults emerge from September onwards, but during bad weather they may remain in the stalks until the following March. The insects are too well protected to be reached by poison sprays, and it would be difficult to reach the parts of the plants on which they feed with any insecticide. The most practical method of control consists of collecting débris, withered leaves and old stalks and burning them. During July the larvae will be destroyed by this method, and later on the adults.

ZETEK (J.). **Enemigos de la Agricultura y Modos de combatirlos.** [Enemies of Agriculture and Methods of controlling them.]—*Revista la Salle, Panama*, iv, nos. 39–45, December 1919–June 1920, pp. 75–83, 107–112, 140–144, 180–186, 216–221, 245–251, [Received 24th September 1920.]

This paper deals largely with the diseases and hygiene of plants, and also describes the preparation of insecticides suitable for contact sprays and stomach-poisons. The value of the various insecticides is discussed, and the compatibility of many of the usual insecticides and fungicides is shown in a table. Suitable machinery for spraying and pulverising is described and illustrated.

CORBETT (G. H.). **Observations on Cotton Thrips in the Gezira, Blue Nile Province, Sudan, in 1918–19.**—*Bull. Entom. Res. London*, xi, no. 2, September 1920, pp. 95–100.

Heliothrips indicus, Bagn., has been known on cotton in the Gezira for about three years, and towards the end of October 1918 attracted serious attention. It is thought that the damage done would be much less if the cotton were not so scattered, and the crop for 1919–20 is to be grown in larger areas. This thrips has apparently reached the cotton from weeds growing on fallow land near by or has been brought on the wind. A study of its bionomics was begun in February 1919, when the cotton was recovering from the attack. While the losses caused are considerable, it is hoped that the attacks may prove to be local and to occur only spasmodically. At present, however, this is the most important cotton pest in the Gezira. Observations made from November to August indicate that there is probably no aestivating period and no resting stage. The differences in the lengths of each stage of the life-cycle are remarkable, but under field conditions the whole cycle is a short one averaging about 18 days, and the insect quickly reproduces in large numbers. The egg-stage averages 8·2 days. The larva feeds by piercing and sucking the juices of the plant, generally on the lower surface of the leaves, and remains on the plant from 3 to 6 days. When full-grown the larvae drop from the leaf and crawl into a crevice in the soil, where they change to the pre-pupa and then to the pupa. The insect remains from 4 to 14 days in the soil before the emergence of the adults. Oviposition begins two days after emergence, the adult having crawled up the stem to the leaves, and depositing eggs at the rate of about 6 per diem on the lower and middle leaves of the plant.

The list of both cultivated and wild foodplants is a long one and includes potatoes, beans, ground-nuts, wheat, barley, many vegetable crops, and both American and Egyptian cotton. American cotton suffers much more than Egyptian, and does not make such good recovery.

It is not precisely known how the thrips subsists after the old cotton crop is removed and until the new one is well advanced. Suggestions for control include the ploughing of old cotton land as soon as possible if it is found that any stage aestivates, or the removal of all plants on the land if the insect spends the dead season on vegetation. If watering of the cotton were stopped somewhat early and the cotton cut and burnt sooner than is normally done, the number of thrips that could attack the succeeding cotton crop would be greatly diminished. Heavy watering appears to have a detrimental effect on the number of thrips emerging from the soil. probably because the ground is prevented from cracking. Further investigations on this line are required; it is suggested that one or two heavy waterings about the beginning of November might have a beneficial effect. Owing to the wide range of food-plants, experiments with trap-crops might be tried. Cultural methods include the destruction of all weeds and vegetation growing among the cotton or in its vicinity. Spraying is considered impracticable and uneconomical when the cotton is four or five months old, but if the thrips appear when the plant is small, two or more applications of spray should be given in the late afternoon or evening in order to kill the larvae. Pyridine sulphate and quinoline sulphate were both found unsuitable as insecticides. One part of nicotine sulphate (32 per cent.) to 1,200 parts of soap solution obtained by dissolving 1 lb. of soap in 21 gals. of water was the most successful spray used, or 1 lb. of soap to 10 gals. of water will kill a large percentage of both larvae and adults if nicotine sulphate is unobtainable.

THEOBALD (F. V.). **Aphididae of Persia.**—*Bull. Entom. Res., London,* xi, no. 2, September 1920, pp. 153–157, 4 figs.

The species dealt with include *Aphis buxtoni*, sp. n., of which the alate and apterous viviparous females are described from Umbelliferae on the Caspian coast. This species was found in association with an ant, *Lasius emarginatus*, Latr., var. *nigro-emarginatus*, Forel. The same forms are described of *Myzus mespiliella*, sp. n., taken on the young twigs of medlars in north-west Persia. *Aphis punicae*, Pass., taken on wild pomegranate on the south-west Caspian coast, is re-described, as apparently only the apterae were known to Passerini. Certain characters of *Lachnus pyri*, Buckt., which was originally recorded from pears in Ceylon, are described from individuals taken on pears in western Persia.

TEMPANY (H. A.) & D'EMMEREZ DE CHARMOY (D.). **The Campaign against *Phytalus smithi* in the Colony of Mauritius.**—*Bull. Entom. Res., London*, xi, no. 2, September 1920, pp. 159–169, 1 plate.

This paper gathers together and summarises a good deal of information from various sources, much of which has previously been noticed [*R.A.E.*, A, iii, 730, 756; v, 502; vi, 141; vii, 4, 8; viii, 73, etc.]. The history of the appearance of *Phytalus smithi* as a sugar-cane pest in Mauritius is reviewed, and an account is given of its habits, the damage done by it, and the remedial measures that have been employed against it, including the collection and destruction of the beetles. The introduction and establishment of a Scoliid parasite, *Tiphia parallela*, from Barbados is described.

The regulations under the Ordinance of 1911 regarding the notification and treatment of areas infested with *P. smithi* are given, as well as the proclamation of 1918 regarding the movement of infested earth or cane-tops, the inspection of growing sugar-cane or other crops, and the growing of trap-crops.

The cost of the campaign against *P. smithi* is worked out. It has recently been decided that the entire cost of control of the pest should be borne by the planters, and an export tax on sugar is suggested to meet the cost of future campaigns. The measures taken and the expenditure incurred are regarded as abundantly justifying the results. It is probable that if no remedial measures had been undertaken, sugar-cane growing would have been rendered impracticable over large areas.

D'EMMEREZ DE CHARMOY (D.). **Notes on Insects accidentally introduced into the Island of Mauritius.**—*Bull. Entom. Res., London*, xi, no. 2, September 1920, pp. 171–177.

Mauritius is remarkable for the number of insect pests that have been introduced into the Island, chiefly on exotic plants. The sugar-cane industry was threatened with ruin owing to the introduction of a borer, *Proceras sacchariphaga*, Boj., from Ceylon, and again was largely damaged by the introduction of *Pulvinaria gasteralpha*, Icery. The cultivation of coffee and vanilla has been in large part abandoned owing to introduced pests and diseases. Legislation against these indiscriminate importations began in 1882; more recent legislative measures are briefly reviewed, and at the present time a regular and efficient control is established over plant importations. The text of the Ordinance of 1910, and the regulations made under it, are given as an appendix to this paper.

The introduction and history of the following pests in the Island are discussed:—*Phytalus smithi*; a Cecidomyiid fly that forms galls on the leaves of mango trees; *Dacus d'emmerezi*, which is a pest of marrows and pumpkins; the fowl flea *Echnidnophaga gallinacea*; the jigger, *Dermatoph lus* (*Sarcopsylla*) *penetrans*; a red ant, *Solenopsis* sp., which is a household pest and attacks seeds and young seedlings; the Coccids, *Asterolecanium spectabile*, *Aspidiotus mauritianus*, *A. destructor*, *Chionaspis simplex*, *Coccus* (*Lecanium*) *mangiferae*, *C.* (*L.*) *hesperidum*, and *Pulvinaria antigoni*; a Phalangid, *Gagrella feae*, which is numerous in towns and forests and is sometimes so abundant in houses as to constitute a domestic pest; and a millipede, *Anoplodesmus saussurei*.

WILLIAMS (C. B.). **A Pannier Hopper-Dozer.**—*Bull. Entom. Res., London*, xi, no. 2, September 1920, pp. 179–180, 1 plate, 1 fig.

A hopper-dozer that has proved very satisfactory in the control of the froghopper, *Tomaspis saccharina*, Dist., damaging sugar-cane in Trinidad, is described and illustrated. Two wire mosquito nets were used in the form of panniers on a mule, being wide enough to sweep two rows of cane planted five feet apart, while the animal walks between the rows. Each net is hinged behind and supported in front by a stout cord or wire attached to the front supporting bar. This is loose in its bearings, and by rotating it, the front of the net can be raised or lowered by the person in the saddle, as the height of the canes changes. The panniers can be rapidly removed by taking out the stop on the rear bar, and unhooking the front supporting cord. The nets are open in front and may be smeared inside with some sticky substance. The advantage of using net is that it allows air to pass through and does not create a back-draught. The framework of nets and saddle is constructed of light wooden bars, while the main supporting bars, rear and front, are of one inch iron tubing. Provided that the nets are not too close to the ground no difficulty is found in taking them over rough ground, open field-drains, or even small gullies.

Buxton (P. A.). **A Liparid Moth (*Ocneroqyia amanda*, Staud.) destructive to Figs in Mesopotamia.**—*Bull. Entom. Res., London*, xi, no. 2, September 1920, pp. 181–186, 1 fig.

Figs, though apparently not a major crop, are widely grown in Mesopotamia, and are severely damaged by the larvae of a Liparid moth, *Ocneroqyia amanda*, Staud., the leaves being sometimes completely devoured and the fruit shrivelling and dropping before it is ripe. Its eggs are found in patches of from 20 to 100 on the lower parts of the trunks, and more rarely on the underside of the lower leaves or on rubbish on the ground. The larvae feed at night, sheltering among dead leaves or soil beneath the fig trees, or in mud walls, etc. Pupation occurs in cracks in soil or mud walls. The generations are continuous throughout August and September, all stages being found together at this time. This is unusual among Mesopotamian Lepidoptera, which generally aestivate throughout the summer.

The pest should be fairly easy to keep in check. Arab growers burn the dead leaves and other rubbish in heaps beneath the trees. This destroys all stages of the insect as well as its hiding-places. Collections of larvae and eggs from beneath the leaves might be made shortly after dawn.

As only the male of *O. amanda* has been previously described, a re-description by Sir George Hampson is appended.

Garman (H.). **Observations on the Structure and Coloration of the Larval Corn-Ear Worm (*Chloridea obsoleta*), the Bud Worm (*C. virescens*) and a few other Lepidopterous Larvae.**—*Kentucky Agric. Expt. Sta., Lexington*, Bull. 227, May 1920, 84 pp., 16 figs. [Received 24th September 1920.]

A detailed study is given of the anatomy of the larvae of *Heliothis* (*Chloridea*) *obsoleta* and *H.* (*C.*) *virescens*, comparisons being made with those of *Protoparce* (*Phlegethontius*) *sexta*, *H.* (*Chloridea*) *phloxiphaga*, and a number of other Lepidopterous larvae of various genera.

PADDOCK (F. B.). **The Cotton or Melon Louse—Life History Studies.** —*Texas Agric. Expt. Sta., College Station.* Bull. 257, December 1919. 54 pp., 4 plates, 3 figs. [Received 24th September 1920.]

The synonyms of *Aphis gossypii*, Glover (cotton or melon Aphid), as now understood, include *Aphis citri*, Ashm., *A. citrulli*, Ashm., *A. cucumeris*, Forbes, and *A. cooki*, Essig. It is widely distributed over the world, and common throughout the United States where any of its food-plants are grown. In Texas it is a serious pest of cotton, melons, cucumbers and similar plants. The confusion in the identity of this species has arisen from the very numerous food-plants that have been attributed to it, but not all of these have been proved to be food-plants by migration tests.

In Texas, the normal form of reproduction is asexual throughout the entire year. The alternative food-plants in that State have not been determined. Fifty-one generations completed their life-cycle in a period of exactly twelve months. The average reproduction period was 21·4 days, and the average number of young produced was 84·4. The migration tests indicated that the Aphids do not migrate from cotton to plants of the melon family or the reverse. Ants were found associated with the Aphids at all times, but no definite relation was established.

A. gossypii is reduced by natural enemies, being parasitised by *Lysiphlebus testaceipes*, Cress., and preyed upon by three species of Coccinellids—*Megilla maculata*, deG., *Hippodamia convergens*, Guér., and *Coccinella munda*, Say—and two species of Syrphid flies, *Syrphus americanus*, Wied., and *Allograpta obliqua*, Say.

PADDOCK (F. B.) & REINHARD (H. J.). **The Cowpea Weevil.**—*Texas Agric. Expt. Sta., College Station.* Bull. 256, December 1919. 92 pp., 6 plates, 3 figs. [Received 24th September 1920.]

The commonest Bruchid infesting cowpeas in Texas is *Bruchus quadrimaculatus*, F. All varieties of cowpeas grown in the State are equally subject to attack, and the annual loss caused is very great.

This Bruchid is very prolific, and under favourable conditions, of which temperature is one of the most important, the life-cycle may be completed in less than three weeks. In stored seed, breeding is practically continuous throughout the year, and most of the insects undoubtedly hibernate in such seed. About nine generations occur in a year in Texas.

The natural enemies of the immature stages are a predaceous mite, a Chalcid (*Bruchobius laticeps*, Ashm.) and an egg-parasite (*Uscana semifumipennis*, Gir.). It is not, however, sufficiently checked by its natural enemies, and artificial remedial measures must be employed. Proper harvesting (carried out just before the seeds are exposed by the opening pod) will greatly reduce the initial infestation in the field, while to prevent reinfestation, seed should be stored in tightly closed containers. The insect can be destroyed in any stage by heating the infested seed to a temperature of 145° F. for fifteen minutes, which does not affect the germination of the seed, or by fumigation with carbon bisulphide at the rate of 4 lb. per thousand cu. ft. of space.

Baker (A. C.). **Generic Classification of the Hemipterous Family Aphididae.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 826, 10th August 1920, 109 pp., 16 plates.

This systematic paper gives descriptions of, and keys to, the super-family Aphidoidea, the family Aphididae, and the sub-families, tribes, subtribes and genera of that family.

Hurd (W. E.). **Influence of the Wind on the Movements of Insects.**—*Mthly. Weather Rev., Washington, D.C.*, xlviii, no. 2, February 1920, pp. 94–98. [Received 28th September 1920.]

Weather has perhaps more effect on the control of insect life than all other factors combined. The influences of temperature and wind pressure on the life and, more particularly, the movements of insects are discussed in this paper. The distribution of insects by wind is brought about either by involuntary flight, when the insects are carried from their local haunts, as in the case of Simuliids, scales, gipsy moth [*Porthetria dispar*] larvae and mosquitos, or are diverted in the course of their migration, or, in the case of more helpless types, such as Aphids, the insects may instinctively place themselves in the path of an air current, by crawling to the tops of plants just before a storm so that, when the first onrush of wind occurs, they can drop into it and are carried to new areas. The wind is also an important factor in carrying scent from food-plant to insect, or from one insect to another, and this is frequently followed by flight against the wind.

The importance of wind to migratory swarms of locusts is well known ; swarms flying from Montana to Missouri have been known to travel as far as 200 or 300 miles a day over the prairie during favourable winds. Two of the most sharply defined extensions of the Mexican cotton boll weevil [*Anthonomus grandis*] in Texas occurred in 1915 and 1916, and were largely due to the sweeping winds experienced in those years. Many other instances are quoted from existing literature of remarkable dispersion of insects by wind agency.

Froggatt (W. W.). **Orchard and Garden Mites. No. 1. Blister Mites (Family Eriophyidae).**—*Agric. Gaz. N.S.W., Sydney*, xxxi, no. 8, August 1920, pp. 577–580.

Short notes are given on the Acarina generally, the family Eriophyidae, and three species of this family that have been introduced into Australia, viz. :—*Eriophyes pyri* (pear-leaf blister mite), *E. vitis* (vine-leaf blister mite) and *E.* (*Phyllocoptes*) *oleivorus* (silver or orange rust mite).

Growing Wheat damaged by Cut-worms.—*Jl. Dept. Agric. S. Australia, Adelaide*, xxiii, no. 3, October 1919, p. 282. [Received 27th September 1920.]

An outbreak of cut-worms that destroyed young wheat and all other plants, except the so-called Cape dandelion, on an area of about twelve acres is recorded. The species concerned, in the order of importance were *Persectania* (*Mamestra*) *ewingi*, *Euxoa* (*Agrotis*) *infusa*, and two other species belonging to *Agrotis* or an allied genus. The outbreak was not investigated till the end of September, when the caterpillars were just beginning to pupate, so that it was too late to attempt any remedial measures.

The small numbers of the larvae observed, in view of the damage done, was astonishing. This may be accounted for in two ways—cannibalism, a common habit of such larvae when their food-plants are used up, and disease, which sometimes sweeps off cut-worms wholesale, and of which many larvae in this instance had apparently died. Birds probably had no effect on them, as the caterpillars are nocturnal when healthy.

Should sufficient of the present brood survive to render a second generation of importance, the damage will probably be done in November, when the wheat in the ear is well forward.

COCKAYNE (A. H.). **The New Zealand Grass-Grub. Some Notes on its Control.**—*New Zealand Jl. Agric.*; *Wellington*, xxi, no. 1, 20th July 1920, pp. 1–5.

The life-history of the grass-grub, *Odontria zealandica*, has not been completely worked out, but enough is known to indicate the general course of it. Most of the eggs are laid early in the summer (November). The adult beetles have been found during most of the year, but except for the great brood that emerges in November they are not of any importance. The young grubs feed on the roots of plants, especially fibrous roots such as those of grasses, though in the seedling stage any type of plant, including trees, is likely to be killed. They feed till the following spring, though they are in a more or less quiescent state in the winter, pupating in October.

On practically no grass-land in New Zealand are they ever absent, but their ravages are more or less periodic, which is due to two factors—an increase in the number of grubs in any particular area, and extremely dry weather conditions causing lessened root-production. When numerous, grass-grubs thoroughly pulverise and loosen the ground below the first two inches or so from the surface, and lessen the capillary rise of water. Thus in dry weather the grasses that have been eaten through cannot form new roots quickly, as the surface layer of the soil becomes too dry.

In grass-lands the main damage is caused either in the grasses' first year of development, mainly in the autumn following spring sowing, or after some years, when the plants have passed their most vigorous root-development stage. Grass sown with rape in October and November generally escapes damage, probably because the ground is bare at the time of egg-laying, and is therefore not selected by the beetle for the purpose. The main reasons why grass sown with cereals—especially spring-sown oats—is seriously damaged are the readiness with which the beetles lay their eggs in cereal crops, and the weak rooting and poor establishment of the grass.

There is no practical method for the control of grass-grub on farm land by trapping, poisoning, burning, or by chemical treatment, though quite small areas may be treated by fumigation with carbon bisulphide. Nothing of any practical nature can be done except re-seeding or rotation cropping. Measures on these lines are discussed in detail—the principles being those indicated above. The benefits supposed to be derived from rolling, or from the presence of lime in the soil are probably due, not to any effect on the grubs, but to the increased vigour of the grass itself. Clover or weeds with strong tap-roots seem to be the most resistant of the pasture plants to attack.

Regulations for the Control of Fire-Blight.—*New Zealand Jl. Agric., Wellington*, xxi, no. 1, 20th July 1920, p. 56.

These regulations for the control of fire-blight (*Bacillus amylovorus*) prohibit the removal of bees, and plants and parts of plants of apple, pear, quince, or *Crataegus* from the North Auckland and Auckland Land Districts, or from any nursery or orchard in which the disease may be found by an inspector.

Cockayne (A. H.). **Report of the Biologist.**—*New Zealand Dept. Agric., Indust., & Commerce, Ann. Rept. 1918–19, Wellington*, 1919, pp. 40–42. [Received 27th September 1920.]

The pear bud mite *Perrisia* (*Contarinia*) *pyri* and a leaf-hopper, *Empoasca* sp., which have hitherto been more or less unknown in New Zealand, proved extremely destructive during the year under review.

Gossard (H. A.). **Dust Spraying. Tests comparing Dusting with Liquid Applications and Costs.**—*Mthly. Bull. Ohio Agric. Expt. Sta., Wooster*, v, no. 5, May 1920, pp. 147–153. [Received 28th September 1920.]

Particulars are given of tests with dusting applications carried out in apple orchards at Wooster in the springs of 1916, 1917, and 1918. The results indicate that dusting can take the place of one or two of the sprays for codling moth [*Cydia pomonella*], and under some circumstances it is recommended. Dusting mixtures containing sulphur and lead arsenate have given good control of Curculionids in the peach orchards of Virginia.

Gossard (H. A.). **Watch for Chinch Bugs. Method of Constructing Dust and Tar Barriers in Farm Fields.**—*Mthly. Bull. Ohio Agric. Expt. Sta., Wooster*, v, no. 6, June 1920, pp. 178–179. [Received 27th September 1920.]

The chinch bug [*Blissus leucopterus*] was abundant in some Ohio districts in 1919, and, though a wet spring has been unfavourable to it, precautions against it are advised.

Barriers should be constructed to prevent the bugs migrating from wheat stubble to maize fields immediately after harvest. These may be either a line of creosote on a ploughed ridge with post-holes to trap the insects as they turn back from the creosote on the top of the slope [cf. *R.A.E.*, A, v, 65], or a dust barrier, made by ploughing several furrows round the wheat, and then dragging a log over the ploughed area till a dusty trench is formed. Such a barrier is only effective in dry weather.

If the bugs have already entered a maize field, the infested portion should be enclosed by a barrier, and the insects sprayed with kerosene emulsion diluted with 8–10 parts of water, or nicotine sulphate diluted with 500 parts of water and 4 lb. of soap added to each 100 U.S. gals. of the spray. Pure kerosene kills the maize, but is very efficient, and may be useful if a large number of bugs are concentrated in a small area.

When chinch bugs are very abundant, it may be advisable to give up wheat for a year or two and sow immune crops such as soybeans, potatoes, vegetables, etc.

Davis (J. J.). **New Species and Varieties of** *Phyllophaga*.—*Bull. Illinois Nat. Hist. Survey, Urbana*, xiii, article xii, August 1920, pp. 329–338, 6 plates, 8 figs.

From collections of May-beetles from various parts of the United States the following new species and varieties are described :—*Lachnosterna* (*Phyllophaga*) *perlonga*, on pecan, elm, hicory, and honey locust ; *L. fraterna*, Harr., var. *mississippiensis*, on pecan, poplar, elm, hickory, black oak, plum, and apple ; *L. pearliae*, on honey locust, elm, winged elm, buttonwood, willow, and walnut ; *L. soror* ; *L. foxii* on blackberry (*Rubus nigrobaccus*), blueberry (*Vaccinium* sp.), wild rose (*Rosa* sp.), persimmon (*Diospyros virginiana*), red oak (*Quercus rubra*), Spanish oak (*Quercus falcata*), locust (*Robinia hispida*), elder bush, black gum, hackberry, birch, and sour gum ; *L. impar* ; *L. parvidens*, Lec., var. *hysteropyga* ; and *L. hirticula*, Knoch, var. *comosa*.

Though he has not had an opportunity to study the actual types, the author considers *L. quadrata*, Sm., to be identical with *L. postrema*, Horn. The latter is known only from the male, and the former from the female.

Brooks (F. E.). **Round-headed Apple-Tree Borer : Its Life History and Control.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. 847, 9th August 1920, 42 pp., 9 plates, 5 figs.

Saperda candida, F. [*R.A.E.*, A., iii, 586 : vi, 447] is a serious pest of apple, pear, and quince, and occurs in the United States and Canada over most of the apple-growing regions east of the Rocky Mountains. It also breeds in wild crab, hawthorn, mountain ash, and service tree. Infestation is often confined to rather definite areas, and its not uncommon spread to new ground is probably due to the presence of an abundance of wild trees near the freshly planted orchard.

Much of the life-history has already been noticed [*loc. cit.*], but it varies with the locality. The larva may spend from one to four years in the tree, this stage being of longer duration in the north than in the south. The pupal stage approximately coincides with the blossoming time of apple, the beetles appearing in the south earlier than in the north.

During oviposition the females are capable of flying to a considerable distance, but prefer to place their eggs in trees near the place where they themselves have developed. By preventing the development of adults in the orchard trees and in other trees growing within 300–600 feet of the orchard, subsequent infestation has been reduced 73·6 per cent.

The borers have few insect enemies, but woodpeckers play an important part in holding them in check.

No easier and cheaper method of control has been found than the old one of worming the trees. This should be done as soon as possible after the last eggs of the season have hatched, and should be repeated in the spring following the blossoming time of apple trees. Paints and other kinds of tree protectors were used to prevent oviposition on the bark. Nothing of this nature has been found that surpasses common white-lead paint in cheapness, ease of application, and effectiveness. Young apple trees painted once annually for from four to six years showed no injury, and the treatment gave a control efficiency of 74·3 per cent.

Various attempts to kill borers were made by applying penetrating liquids of a poisonous or irritating nature to the bark of infested trees. Nicotine sulphate, kerosene, kerosene emulsion, sodium arsenate in a miscible-oil carrier, and linseed oil, were among the materials tested. None of these was effective on large borers that had penetrated deep into the tree, but most of them killed a considerable percentage of young individuals that were still feeding in shallow burrows. Some of the liquids, particularly kerosene, injured the trees. Carbon bisulphide can be injected with good results into deep burrows, though it injures the bark.

The beetles feed rather freely on the leaves and the bark of twigs, and it is possible to kill them by spraying with arsenicals. Sprays for this purpose should be applied to young orchards within ten days after the apple blossoms have disappeared. In bearing orchards what is known as the first codling-moth spray will be effective also against the adults of *S. candida*.

SMITH (H. S.) & COMPERE (H.). **The Life-History and successful Introduction into California of the Black Scale Parasite, *Aphycus lounsburyi*, How.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento*, ix, no. 8, August 1920, pp. 310–320, 5 figs., 1 plate.

Aphycus lounsburyi has become firmly established in the citrus orchards of California. The various stages of this Chalcid and its method of oviposition are described. This parasite of the black scale, *Saissetia oleae*, Bern., was first liberated in September, and further liberations were made throughout the winter. Colonies of the Coccinellids *Scutellista cyanea* and *Rhizobius ventralis* were also liberated in order to form a combination that would insure a natural control. So far, 30,000 individuals of *A. lounsburyi* have been liberated in various plots.

As this experiment proved successful, a new area, comprising 10,000 trees, has been set aside to form a propagating ground for *A. lounsburyi* on a commercial scale. This parasite does not spread very rapidly, but if present in sufficient numbers it will attack practically every scale in the area of its abundance. The life-cycle from egg to adult varies according to climatic conditions from 28 days to 3 months.

Mackie (D. B.). **The Application of Vacuum Fumigation to Fresh and Packed Dates.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento,* ix, no. 8, August 1920, pp. 321–324, 2 figs.

The advantages of vacuum fumigation as compared with the ordinary process are discussed. The apparatus here described was successfully used for the destruction of *Plodia interpunctella* (Indian meal moth) and *Silvanus surinamensis* (saw-toothed grain beetle) in packed dates. The fruit thus treated may be eaten immediately upon removal from the fumigator as all traces of the gas are removed by freely circulating air through the mass for five minutes after mechanically withdrawing the gas.

Nougaret (R. L.). **A Termite Pest of Vineyards.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento.* ix. no. 8. August 1920, pp. 327–330, 3 figs.

Reticulitermes hesperus is recorded as injuring vines. The insects apparently breed in *Arundo donax*, a plant that is grown along ditches to serve as a windbreak. Infested vines should be pulled up, and a good-sized hole dug on the spot, the earth from which should be scattered so as to expose the termites to the sun. Vines with healthy roots may be planted in the same place in the following spring. The windbreaks should be cleaned up, and all dead or infested material should be burned.

Swain (A. F.). **Argentine Ant Control from an Economic Standpoint.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento.* ix, no. 8, August 1920, pp. 333–338, 1 fig.

In operations undertaken against the Argentine ant, *Iridomyrmex humilis*, in Southern California, the poison used consisted of 12½ U.S. gals. water, 2 oz. tartaric acid, 100 lb. sugar, 6 oz. sodium arsenite dissolved in a few pints of lukewarm distilled water, 20 lb. strained honey and 4 oz. sodium benzoate dissolved in water.

Experiments show that a cheap grade of honey is quite satisfactory, provided that it is boiled for several minutes before straining to prevent crystallisation. Boiling for an hour prevents souring of the product. No ants were found two weeks after the poison was placed on infested trees, and no individuals were seen even on very warm days in the next winter. One treatment is apparently sufficient for at least two seasons, and the cost is little more than 1*d.* per tree per year.

Wilkansky (T.). **The Danger of Indiscriminate Introduction of Foreign Plant Varieties.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento,* ix, no. 8, August 1920, pp. 339–340.

The danger of increasing insect infestation in Palestine by grafting on to imported olive stock is emphasised. The pests recorded as infesting imported French varieties of olive include the beetles, *Himatismus villosus, Phlocotribus scarabaeoides* and *Hylesinus oleiperda*, and the olive fly, *Dacus oleae*, though these have not been noticed on indigenous olives.

Woglum (R. S.). U. S. Bur. Entom. **A recently discovered *Citrus* Pest, *Platynota tinctana* (Walk.) in California.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento,* ix, no. 8, August 1920, pp. 341–343.

Platynota tinctana is recorded as injuring oranges in southern California. This moth has been found in company with *Tortrix citrana* (orange tortrix), but is less injurious. The various stages are described. The larva is usually found webbed within old dry leaves or fallen flower petals close to the fruit. The damage to the fruit is caused by puncturing the rind. *P. tinctana* is generally kept in check by parasites, of which at least three distinct species of Hymenoptera have been reared.

Larson (A. O.). U. S. Bur. Entom. **Bean Weevils in California.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento,* ix, no. 8, August 1920, pp. 344–349.

The loss caused by the bean Bruchids, *Bruchus obtectus*, Say, and *B. quadrimaculatus*, F., for 1918 is estimated at about £824,000. Details are given of the bionomics of these beetles as observed in California.

Successful results were obtained by fumigation with carbon bisulphide for 48 hours at the rate of 6 lb. to 900 cubic feet. A mite, probably *Pediculoides ventricosus*, Newp., effectively checked *B. quadrimaculatus* under laboratory conditions, but owing to the discomfort it causes to man, its use is not advocated.

Maskew (F.). **Quarantine Division. Report for the Month of June, 1920.**—*Mthly. Bull. Cal. State Dept. Agric., Sacramento,* ix, no. 8, August 1920, pp. 350–351.

The pests intercepted during June included :—From Central America, *Pseudococcus* sp., *Aspidiotus cyanophylli*, and *A. cydoniae* on bananas. From Mexico, *Calandra* sp. and *Silvanus surinamensis* in squash seed ; *Lepidosaphes gloveri* and *Chrysomphalus aurantii* on limes ; *Anastrepha ludens* in mangos ; *Heliothis* (*Chloridea*) *obsoleta* in tomatos ; unidentified weevils in tamarinds, and *Diatraea saccharalis* in sugar-cane. From Oregon, *Epochra canadensis* in gooseberries. From Pennsylvania, *Pseudococcus* sp. on *Gardenia*. From Alabama, *Lepidosaphes beckii* on grapefruit. From Illinois, *Eulecanium* (*Lecanium*) *corni* on black currant bushes. From New York, green aphis and *Tetranychus* sp. on *Chrysanthemum* ; *Lepidosaphes beckii* on Cuban and Florida grapefruit. From Ohio, green aphis on *Chrysanthemum*. From Texas, *Schizotetranychus* (*Tetranychus*) *mytilaspidis*, *Aleurodes* sp. and *Ceroplastes floridensis* on Cape jasmine. From San Salvador, *Lepidosaphes gloveri* and *L. beckii* on limes. From the Philippine Islands, weevil larvae in sweet potatoes. From Cuba, *Diaspis bromeliae* on pineapples. From Hawaii, *Diaspis bromeliae* and *Pseudococcus bromeliae* on pineapples ; an undetermined Trypetid larva in tomatos; *Coccus elongatus* and *Aphis* sp. on betel leaves; *Hemichionaspis minor* on red pepper; *Saissetia nigra* and *Pseudaonidia duplex* on *Hibiscus* cuttings. From New Zealand, undetermined Dipterous larvae in decayed potatoes. From China, an undetermined Formicid in water chestnuts; Lepidopterous larvae in dry herbs, and undetermined larvae of borers in twigs. From Japan, undetermined Lepidopterous larvae in dried chestnuts and dried fruits.

ANDERSON (G. M.). **The Slender Wireworm: Its Relation to Soils.**—*South Carolina Agric. Expt. Sta., Clemson College*, Bull. 204, September 1920, 14 pp., 4 figs.

Some of the matter in this paper on *Horistonotus uhleri*, Horn, has been previously noticed [*R.A.E.*, A, iii, 693]. The type of soil seems to be the determining factor in the distribution of this wireworm. The infestations in South Carolina are always confined to the loose, thin, barren upland, sandy soils which form a belt parallel to the sea coast, about sixty miles inland. The soil is of such a texture that saturation with water is almost impossible, the larvae being unable to live in saturated soils even for a short time.

Wireworms as a whole present a most complicated problem in economic entomology because of their varied habits, and their generic idiosyncrasies. Given control measures cannot as a rule be applied to more than one genus. Being soil infestors they are difficult to observe, while their life-cycles vary greatly. Closely associated with these factors are those of soil and air temperature, soil moisture and heredity. Studies on these heads are being prosecuted, and reports of progress on other phases of the problem will be issued.

WILCOX (A. M.). U.S. Bur. Entom. **Notes and Descriptions of Species of *Telenomus* having ten-jointed Antennae (Hymenoptera; Scelionidae).**—*Psyche, Boston, Mass.*, xxvii, no. 4, August 1920, pp. 78–81.

The Proctotrupids dealt with include *Telenomus hemerocampae*, sp. n., reared from eggs of *Hemerocampa leucostigma* in U.S.A.; *T. euproctidis*, sp. n., from eggs of *Euproctis conspersa*, Butl., from Japan; *T. dalmani*, Ratz., from eggs of *Notolophus antiquus* and *Hemerocampa leucostigma* in the United States, and also recorded from the former moth in England, Holland and Canada.

A table is given by which the females of this group may be separated.

CUSHMAN (R. A.). U.S. Bur. Entom. **The North American Ichneumon-Flies of the Tribes Lycorini, Polysphinctini, and Theroniini.**—*Proc. U.S. Nat. Mus., Washington, D.C.*, lviii, no. 2326, 1920, pp. 7–48, 5 figs.

Revisions are given of the North American species of the above three tribes of the subfamily ICHNEUMONINAE, with keys to the genera sub-genera, species, and varieties concerned. Two new genera are erected, and eight new species described.

Böving (A. G.) & Champlain (A. B.). U.S. Bur. Entom. **Larvae of North American Beetles of the Family Cleridae.**—*Proc. U.S. Nat. Mus., Washington, D. C.*, lvii, no. 2323, 1920, pp. 575–649, 12 plates.

The first part of this paper deals in detail with the morphology and taxonomy of the larvae of North American Cleridae; the second with the general habits and seasonal history of these beetles.

The Cleridae are among the principal predators of wood and bark boring beetles, the adults attacking the adults of the destructive species, while the larvae feed upon the eggs and broods in the bark and wood. Under natural conditions they are not of great importance, but these conditions may be upset in their favour by properly conducted control work. Their dissemination in infested regions, in addition to control work, would therefore be of great value.

The adults are very active, especially on sunny days, though some are nocturnal. They consume numbers of Scolytids, and other small insects, though in some genera there are instances where the adults are apparently not predaceous, but feed on pollen.

Certain species of Clerid larvae in all stages are found in the galleries and mines of bark and wood borers. They feed voraciously on the eggs, larvae, and sometimes the dead (?) parent adults of the host. The pupal cell may be made in the earth, the bark, or in the cell of the host. The time of transformation to adults varies, but is generally in the spring. Some species may have more than one generation in a season, especially if there are several generations of the host. Others appear to pass several years in the larval stage

Among the more important of the species noticed with details of their life-history in many cases are *Monophylla terminata*, *Cymatodera bicolor*, *Thanasimus dubius*, *T. nigriventris*, *Enoclerus quadriguttatus*, *E. sphegeus*, *E. ichneumoneus*, *E. quadrisignatus*. *Xenodosus sanguineus*, *Phyllobaenus dislocatus*. *Neichnea laticornis*, *Chariessa pilosa*, *Galerucella oculatus*, and *Orthopleura damicornis*. These are all destroyers of bark-beetles.

Bernard (C.). **Bestrijding van Rupsenplagen.** [Measures against Caterpillar Pests.]—*De Thee, Buitenzorg*, i, no. 2, June 1920, pp. 41–42. [Received 28th September 1920.]

The attention of tea planters is drawn to the necessity for combating the caterpillars of *Thosea* spp., *Setora nitens* (and other species with urticating hairs), *Stauropus alternus*, *Belippa bohor*, various Psychids, Geometrids, and *Andraca bipunctata*. In special circumstances, when the usual natural checks are not operating, serious loss may be caused by them. Collection is generally sufficient to check infestation, but it is essential that this be done immediately the first examples are observed.

The serious injury done to nurseries by bunch caterpillars, *A. bipunctata*, on the east coast of Sumatra, was stopped by an epidemic that entirely wiped them out. A similar epidemic has been observed in the case of *Thosea cervina* [*R.A.E.*, A, viii, 455 .

LEGISLATION.

Service & Regulatory Announcements. January, February, March, April, 1920.—*U.S. Dept. Agric., Washington, D.C.*, Fed. Hortic. Bd., 67, 11th June 1920, 50 pp. [Received 28th September 1920.]

In consequence of the discovery that the pink bollworm [*Platyedra gossypiella*] has invaded certain localities of south-western Louisiana, a resolution was adopted at the Interstate Cotton Conference held at New Orleans on 5th March 1920, declaring that for the protection of the cotton industry of the State, the planting of cotton should be prohibited in the infested regions, within such non-cotton zone limits and for such period of time as may be named by the Departments of Agriculture and Horticulture of the State, the producers to be compensated for any loss sustained. A quarantine resolution has also been formulated to prevent the movement from Texas and Louisiana into other States of any materials likely to carry and distribute infestation. The Federal Horticultural Board is requested to act on this resolution without delay. A review of the present situation with regard to the pink bollworm, issued by the Secretary of Agriculture, is given verbatim. It is considered that the extermination of the insect in Texas and Louisiana is absolutely contingent on the prohibition of the growth of cotton in infested areas. The quarantine action proposed by the U.S. Department of Agriculture in agreement with the Federal Horticultural Board is discussed in detail. It is thought that this arrangement will make it possible to limit the quarantine to the non-cotton and the regulated zones described in these two States. As maize has been freely imported into the United States from Mexico, and as much of it has contained more or less cotton seed, coming in some instances from infested areas, a quarantine order has been issued prohibiting the importation of maize (*Zea mays*) from any of the States of Mexico into the United States. The regulations supplementary to this order are given, including those relating to the grinding and sterilisation of maize as a condit on of its entry from Mexico.

The situation with regard to the European corn borer (*Pyrausta nubilalis*) has necessitated the passing of a quarantine order prohibiting the movement from infested areas in the States of Massachusetts, New Hampshire, New York and Pennsylvania of any maize and broom corn including all parts of the stalk, celery, green beans in the pod, beets with tops, spinach, rhubarb, oat and rye straw, as such or when used as packing, cut flowers or entire plants of *Chrysanthemum*, *Aster*, *Cosmos*, *Zinnia*, hollyhock, and of *Gladiolus* and *Dahlia* (except the bulbs thereof without stems), except in such manner and under the conditions prescribed in the regulations and amendments that are given as supplementary to the order. The penalties for conviction under this order are stated. A later measure, directed against other pests and diseases besides *P. nubilalis*, forbids, except as provided in supplemental rules and regulations, the importation into the United States from all foreign countries and localities, of stalks and all other parts, whether used for packing or other purposes, in the raw or unmanufactured state, of maize (*Zea mays*), broom maize (*Andropogon sorghum* var. *technicus*), sweet sorghums and grain sorghums (*A. sorghum*), Sudan grass (*A. sorghum sudanensis*), Johnson grass (*A. halepensis*), sugar-cane (*Saccharum officinarum*) including Japanese varieties, pearl millet (*Pennisetum glaucum*), Napier grass (*P. purpureum*), teosinte (*Euchlaena luxurians*) and Job's tears (*Coix lachrymajobi*).

In consequence of the presence of the Japanese beetle (*Popillia japonica*) in New Jersey, an order has been passed quarantining certain enumerated localities within that State and ordering that (1) farm, garden and orchard products of all kinds, including fresh and perishable crops, such as green maize, tomatos, beans, peas, cantaloups, watermelons, grapes, raspberries, blackberries, cherries, peaches, apples and all other fresh fruits and vegetables; (2) grain and forage crops of all kinds: (3) nursery, ornamental and greenhouse stock, and all other plants including bulbs and cut flowers; and (4) soil, compost and manure other than fresh manure, shall not be moved except under the conditions laid down in the supplementary regulations.

In order to prevent the entrance of a number of plant diseases and injurious insects from the Orient, such as the oriental fruit moth (*Cydia* (*Laspeyresia*) *molesta*), the pear fruit borer (*Nephopteryx rubrizonella*), the apple moth (*Argyresthia conjugella*), *Psylla pyrisuga*, *Lecanium glandi* and *L. kunoensis*, which are new to and hitherto not widely prevalent or distributed in the United States, but occur in Asia, Japan, the Philippine Islands and Oceania, including Australia and New Zealand, the entry into the United States is forbidden of stocks, cuttings, scions and buds of fruits for propagation. Exceptions are made in the case of plants destined for experimental or scientific purposes by the Department of Agriculture, and those imported under special permits for the purpose of keeping the country supplied with new varieties and necessary propagating stock, and those permitted in accordance with the regulations governing entry for immediate export.

The regulations governing the use of sterile packing material for bulbs, and the substitutes allowed for sterilised soil are discussed. A list of the current quarantine and other restrictive orders is given.

Destruction des Parasites nuisibles à l'Agriculture.—*Rev. Agric. Afr. Nord, Algiers*, xviii, no. 59, 17th September 1920, p. 223.

By a decision of the Ministry of Agriculture, given 26th January 1920, the decree of 14th September 1916 concerning the importation, sale and use of poisonous substances is modified to permit of the winter treatment of vines and fruit-trees by means of preparations containing soluble arsenicals up to 1st May 1921. By a further decision, given 16th June 1920, manufacturers and dealers are allowed to pack and send in wooden boxes poisonous preparations destined for the destruction of agricultural pests. The use of these soluble compounds for vines and fruit trees otherwise than in the dormant season, and their addition to sprays used during the season of growth, remain strictly prohibited.

CONTENTS.

CONTENTS—*cont.*

Registered at the G.P.O. for Transmission to Canada and Newfoundland by Magazine Post.

VOL. VIII. Ser. A. Part 12.—pp. 513-544. DECEMBER, 1920.

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HINDS (W. E.). **Report of the Entomologist.**—*Thirty-second Ann. Rept. Alabama Agric. Expt. Sta., Auburn,* January 1920, pp. 26–27. [Received 28th September 1920.]

The rice weevil [*Calandra oryzae*] was unusually abundant in 1919. Simple and effective methods of control have been developed as a result of investigations, and have been demonstrated to farmers, who have in many instances put them into practice with good results. The first important factor is the selection of a type of seed-ear resistant to weevil attack, that is, ears that have an exceptionally tight-fitting shuck, the tip being well covered and protected against the first entrance of the insect. Much success has been gained with the trap-plot method, by which the first generation of weevils is concentrated and can be controlled economically on the small crop of maize that is grown on the trap-area.

Work in soil fumigation has been continued, and the value of sodium cyanide as a fumigant, particularly in greenhouse soils, has been tested, but the results have been so conflicting that further study will have to be made before any conclusions can be reached. Investigations are also being made to determine the possibility of destroying Nematodes that have become embedded in the roots of growing plants, without injuring the plants themselves.

BERNARD (C.). **Over Psychiden (Zakrupsen).** [Bagworms.]—*De Thee, Buitenzorg,* i, no. 2, June 1920, pp. 43–44, 2 plates. [Received 28th September 1920.]

These notes on bagworms supplement some previously published [*R.A.E.*, A, viii, 455]. The caterpillars, which have not yet been identified, have done no serious injury so far, chiefly because the youngest leaves are not attacked.

A severe infestation by *Clania crameri* is recorded from the east coast of Sumatra. The caterpillars appeared in newly-pruned plots, and the lack of leaves caused them to feed on the bark of the stems and twigs. The bushes recovered very slowly. Intensive collection prevented a further increase of the pest.

BERNARD (C.). **Djamoer oepas op** *Sesbania.* [The Fungus, *Corticium javanicum,* on *Sesbania.*]—*De Thee, Buitenzorg,* i, no. 2, June 1920, pp. 44–45. [Received 28th September 1920.]

Sesbania, which is used for green manure, has been severely attacked by *Corticium javanicum*. It is known that many plants, including Leguminosae, may be attacked by this fungus under special conditions. In this case the fungus appeared after infestation by a cicada, *Lawana* sp., which has a waxy secretion and sweetish excrement. The trees were covered first with the whitish wax, then with the black crust of *Capnodium*, and, as a result of the dampness beneath the epiphytic mycelium, with *C. javanicum*.

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Aguiló (I.). **La Cochinilla de los Olivos y sus Enemigos.** [The Olive Scale and its Enemies.]—*Rev. Inst. Agric. Catalán S. Isidro, Barcelona*, lxix, no. 18, 20th September 1920, pp. 296–299.

Some observations on the life-history of *Saissetia* (*Lecanium*) *oleae* in Spain are recorded. In 1920, no eggs hatched before 25th June. From then till mid-September both eggs and scales were seen.

The injury done by *S. oleae* and the various combative measures employed against it are described. Two natural enemies were observed: a Noctuid moth, *Eublemma* (*Thalpochares*) *scitula*, and a Chalcid, *Scutellista cyanea*. The latter occurs in abundance, but as the early scales escape its attack its action is limited to reducing the amount of infestation.

Brèthes (J.). **La *Diatraea saccharalis* en la Provincia de Buenos Aires.**—*Anales Soc. Rural Argentina, Buenos Aires*, liv, no. 16, 1st September 1920. pp. 943–948, 6 figs.

The presence is recorded of larvae of the Pyralid, *Diatraea saccharalis*, in maize stems from the Province of Buenos Aires, where it has not hitherto been observed, although it has been known in the more northern provinces of Argentina. The life-history and habits and the usual remedial measures against this moth are discussed.

Gemmill (J. F.). **Wheat-Bulb Disease.**—*Nature, London*, cvi, no. 2657, 30th September 1920, p. 148.

It is pointed out that Kleine's conclusions in reference to *Hylemyia coarctata* [*R.A.E.*, A, viii, 253] are misleading. Observations show that the eggs are chiefly laid on fallow land and among root crops, especially potatoes [see however *loc. cit.* 266, 269].

This fly has caused much damage in the east of Scotland, and is apparently spreading.

Subramaniam (P. V.). **Life History of the Buprestid Leafminer (*Trachys bicolor*, Kerremans), a Pest on *Butea frondosa* in Mysore.**—*Jl. Bombay Nat. Hist. Soc., Bombay*, xxvii, no. 1, 1st July 1920, pp. 178–179, 1 plate.

Trachys bicolor is a serious pest of *Butea frondosa* in Mysore. The adults feed on the leaf-tissue and may be seen from April to about February or March. About four to five broods occur during the year. The eggs are laid singly or in groups of 2 or 3 on the upper surface of the leaves at the junction of the veins with the midrib. The larvae hatch in about 19 days, and at once begin to eat into the leaf-tissue and continue feeding for about a month. Pupation occurs in the cavity thus formed and lasts about nine days.

The natural enemies of this beetle include a small black ant, *Camponotus* sp., that feeds on the eggs, and a Chalcid that parasitises the larva.

Brèthes (J.). **Description de una nueva Mosca langosticida.** [Description of a new Locust-destroying Fly.]—*Anales Mus. Nac. Hist. Nat., Buenos Aires*, xxviii, 1916, pp. 142–144, 1 fig.

Sarcophaga argentina, sp. n., is described as a parasite of the Argentine locust, *Schistocerca paranensis*, Burm. As this fly has also been recorded as causing myiasis, its artificial propagation is not desirable.

Marelli (C. A.). **Las diferentes Larvas de Langostas que acompañan á las grandes Mangas de la Saltona de *Schistocerca paranensis*, Burm.** [Various Species of Locust Larvae that accompany the main Swarms of the Hoppers of *Schistocerca paranensis*, Burm.]—*Anales Mus. Nac. Hist. Nat., Buenos Aires*, xxviii, 1916, pp. 345–390.

While the bulk of the swarms of locusts invading Argentina consists of individuals of *Schistocerca paranensis*, Burm., there are always a number of individuals belonging to other species that accompany the main swarm. A detailed investigation of the appearance and measurements of these has been made: they are found to include *S. peregrina*, Ol., *S. exsul*, Scudd., *S. pallens*, Thunb., *S. cancellata*, Serv., *S. americana*, Brun., *S. damnifica*, Sauss., and *S. peruviana*, Lynch Arribálzaga. In addition to these, representatives of other genera, including *Tropidacris cristata*, L., and *Elaeochlora viridicata*, Serv., also occur in the swarms.

Laboissière (M. V.). **Description d'une Espèce nouvelle de *Nisotra* (Halticini) de l'île de San Thomé (Col. Chrysomelidae).**—*Bull. Mus. National Hist. Nat., Paris*, 1920, no. 1, pp. 31–32.

Nisotra theobromae, sp. n., is described from San Thomé on cacao.

Priesner (H.). **Beitrag zur Kenntnis der Thysanopteren Oberösterreichs.** [Contribution to the Knowledge of the Thysanoptera of Upper Austria.]—*78. Jahres-Ber. Mus. Francisco Carolinum vom Oberösterreichischer Musealverein, Linz*, 1 July 1920, pp. 50–63.

This list comprises the 98 species of Thysanoptera so far known to exist in Upper Austria. Brief notes are given on the abundance, habitat and food-plants of each species.

Schmitt (C.). **Die Zucht von *Tachyptilia populella* aus Espenblatt-Wickeln.** [The Rearing of *Tachyptilia populella* from rolled-up Aspen Leaves.]—*Entom. Zeitschr., Frankfurt a. M.*, xxxiv, no. 13, 25th September 1920, pp. 50–51.

Attention is drawn to the finding of *Tachyptilia populella* in rolled eaves of *Populus tremula*.

Lyle (G. T.). **Contributions to our Knowledge of the British Braconidae.**—*Entomologist, London*, liii, no. 689, October 1920, pp. 227–230.

The species dealt with include *Microdus rufipes*, Nees, bred from *Argyroploce* (*Tortrix*) *variegana* and *Coleophora gryphipennella*. A key is given to the species of the genus *Earinus*, Wesm.

ROSEWALL (O. W.). **Wood-boring Beetles of Black Locust.**—*Canad. Entom., London, Ont.*, lii, no. 9, September 1920, p. 203.

The boring beetles reared from young black locust (*Robinia pseudacacia*) in Louisiana include: the Bostrychid, *Sinoxylon basilare*, Say; the Buprestid, *Agrilus egenus*, Gory; and the Cerambycids, *Ecyrus dasycerus*, Say, *Liopus alpha*, Say, *L. fascicularis*, Harr., *L. variegatus*, Hald., *Neoclytus erythrocephalus*, F., and *Phyton pallidum*, Say.

FROST (C. A.) & WEISS (H. B.). **A Bibliography of the Literature on the described Transformations and Food Plants of North American Species of *Agrilus* (Col.).**—*Canad. Entom., London, Ont.*, lii, no. 9, September 1920, pp. 204–210.

This first instalment includes references to the literature on the life-histories, habits and food-plants of thirty North American species of *Agrilus*, those of special economic importance including *A. ruficollis*, F. (red-necked cane-borer), *A. armatus*, Say (oak twig-girdler), *A. vittaticollis*, Rand (apple root borer), *A. bilineatus*, Web. (two-lined chestnut borer), and *A. anxius*, Gory (bronze birch borer).

WATERSTON (J.). **On a New Polyembryonic Encyrtid (Chalcidoidea) *Copidosoma tortricis*, sp. n., bred from the Strawberry Tortrix Moth.**—*Ann. App. Biol., Cambridge*, vii, no. 1, September 1920, pp. 1–5, 5 figs.

Copidosoma tortricis, sp. n., here described, was reared in large numbers from larvae of *Oxygrapha comariana*. The remarkable appearance of the irregularly swollen, dried skins of the hosts suggests a polyembryonic method of reproduction on the part of the parasite. It was noted that as many as 35 of the parasites might emerge from one larva. A practically identical form of *Copidosoma* has been reared from a species of *Tortrix* in Italy, and found to be polyembryonic.

PETHERBRIDGE (F. R.). **The Life History of the Strawberry Tortrix, *Oxygrapha comariana* (Zeller).**—*Ann. App. Biol., Cambridge*, vii, no. 1, September 1920, pp. 6–10, 1 plate.

The strawberry tortrix, *Oxygrapha comariana*, caused serious damage to strawberries from 1913–1917 in certain localities in England. The caterpillars bind the leaflets with threads, so that their attack is easily recognised; the flowers are also attacked, with the result that the fruit does not form or is distorted. There are two generations a year. In a normal season the caterpillars are found from the beginning of May to the middle of June, and again from mid-July to the beginning of September. The pupal stage lasts from two to three weeks, and the adult stage about four weeks in the first generation, and as late as the third week in November in the second. The winter is passed in the egg-stage.

In 1918 both broods of caterpillars were severely parasitised by a small Chalcid [*Copidosoma tortricis*, described above]; a single pupa was found containing a large Hymenopterous parasite, but this did not mature.

Apart from parasites, the best means of reducing this pest seems to be to run a mowing machine over the crop so as to cut off the tops as close to the crown as possible when the second generation is in the pupal stage, *i.e.* in the beginning of September. The tops must be burnt or buried before the middle of September, when the moths emerge. The eggs are laid too low to be reached in this manner, but may be destroyed by ploughing. Old beds should not be ploughed up until after the eggs are laid in November, for if this is done earlier, the moths will probably lay their eggs on neighbouring crops of strawberries, or on wild plants of *Fragaria* and *Comarum*.

Smith (K. M.). **Investigation of the Nature and Cause of the Damage to Plant Tissue resulting from the Feeding of Capsid Bugs.**—*Ann. App. Biol., Cambridge,* vii, no. 1, September 1920, pp. 40–55, 1 plate, 5 figs.

The author's summary is as follows:—There are several species of Capsid bugs that normally feed on the leaves and fruit of apple trees, but only one causes any damage, *i.e. Plesiocoris rugicollis*. This species produces the death of the tissue surrounding each puncture in the leaves made in feeding, and on the fruit produces great distortion and "russeting."

There are three possible explanations of this damage: (1) a purely mechanical injury produced by the insect's stylets in the process of sucking; (2) the possibility of the bug acting as a "carrier" of bacteria and by injecting these into the plant along with the saliva setting up a pathological state; (3) the injection of some secretion from the salivary glands which has a violently toxic effect on the plant tissue.

It was found impossible to reproduce by mechanical means the injury resulting from the feeding of *P. rugicollis*; also the fact that the other species of Capsids feed in a similar manner and produce no injury militates strongly against the theory of mechanical injury only.

As regards the second theory, no bacteria could be discovered in microtome sections of either damaged plant tissue or the salivary glands of the bug, and all attempts to reproduce the damage by means of bacteria failed.

The third explanation proved to be the correct one from several experiments and observations.

Experiments were made to reproduce the bug injury with various dilute poisons; in most cases a very similar appearance was produced in the foliage, but the attempts were unsuccessful in the fruit itself with the exception of the very great retarding effect in the growth of the fruit, which is one of the results of the bug injury.

By feeding the bugs on slices of potato instead of apple the same effect was produced, but on a magnified scale. The salivary glands of *P. rugicollis* and of *Lygus pabulinus*, a bug harmful to potato foliage, when placed on a freshly cut slice of potato in a petri dish, produced a violent reaction which killed much of the surrounding tissue. The same experiment was carried out with the glands of one of the harmless apple-feeding bugs, *Psallus ambiguus*; these had no effect whatever on the potato. When the salivary glands of *P. rugicollis* were pricked into apple buds, the shoots were killed within 24 hours. The salivary glands of *P. ambiguus* when similarly treated had no effect. Observations were made showing the rate of exudation of sap from the bug's puncture in the potato, and these are given for *P. rugicollis* and *Lygus pabulinus*. A list of common plants and fruit trees with their various reactions to the feeding of harmful bugs is also given.

LLOYD (Ll.). **The Habits of the Glasshouse Tomato Moth,** *Hadena* (*Polia*) *oleracea*, **and its Control.**—*Ann. App. Biol., Cambridge,* vii, no. 1, September 1920, pp. 66–102. 3 plates.

The author's summary of this paper on *Polia* (*Hadena*) *oleracea* is as follows:—*P. oleracea* is not a normal pest of tomatos grown under glass, and where it has become established as such it is still in some respects ill-adapted to a greenhouse life on a tomato diet. The larvae eat the fruit because many of them are unable to survive on the foliage alone. In spite of this, it has become a serious pest because the moth is a prolific one and, once having entered a greenhouse, it usually becomes a prisoner there. In a normal year there are two complete generations and a partial third, and the moths are present in the houses continuously from February to October. Spraying the young plants with lead arsenate largely controls the first brood of larvae, but not entirely, because moths of the first flight of the year are still emerging when it is not practicable to use a poisonous spray on the plants.

The plants should be sprayed three times when the larvae appear early: (1) when the seedlings are in pots; (2) just after planting out; (3) about a month before picking begins. The last operation is the most important and the two previous ones may be omitted if there are no signs of larvae feeding.

Systematic moth trapping must be done throughout the growing season, because it will reduce the numbers of moths which pass out of the houses, and these, or their offspring blunder into the same or neighbouring greenhouses; and also because it is the most effective form of control when spraying is not practicable, and will reduce the infestation to a very great extent. Sixty jars baited with ale, treacle and 1 per cent. sodium fluoride should be used to each acre of glass. The dead moths should be removed frequently and the jars should be rebaited every third week. Broken fruit must not be allowed to lie about in the houses as the moths feed on this and become more prolific. Many full grown larvae may be trapped in sacks placed about the houses. The sacks should be collected and dipped in boiling water every third week. Pupae should be destroyed in the winter. Special baskets should be kept for fruit picking, and those from the markets should never be allowed in the houses.

The pest spreads rapidly through areas where the nurseries are congested owing to the escape of moths from the infested houses. It may be introduced into isolated localities by means of market baskets, or by plants purchased from infested nurseries. On its first appearance every method of control should be applied at once, as attempts to check it by picking off the larvae by hand in trade nurseries have almost invariably ended in failure.

BALLARD (E.). **A Note on** *Heliothis* (*Chloridea*) *obsoleta*, **Fb., as a Pest of Cotton.**—*Agric. Jl. India, Calcutta*, xv, no. 4, July 1920, pp. 462–464.

Attention is drawn to the infestation of cotton in India by *Heliothis obsoleta*, F. Apparently Cambodia cotton suffers more than the Uppam or Kurangunni varieties, although the latter were grown next to a field of gram. Tobacco plants in an adjoining field were untouched.

The attack was first noticed in January, and by February all the caterpillars had disappeared. They feed externally on young green bolls, but occasionally enter the boll and destroy the entire contents. The usual food-plants in India are red gram (*Cajanus indicus*), Bengal gram (*Cicer arietinum*), ground nut (*Arachis hypogaea*), tomato, maize, cholam (*Andropogon sorghum*), tobacco, hemp (*Cannabis sativa*), linseed, safflower and *Dolichos lablab*. Should the present change of habit persist in India, this moth would become more dangerous than *Earias* or *Platyedra* (*Pectinophora*) *gossypiella*.

HUTSON (J. C.). **The Fluted Scale and the Vedalia Beetle.**—*Trop. Agric., Peradeniya*, lv, no. 2, August 1920, pp. 95–97, 1 fig. [Received 4th October 1920.]

The spread of *Icerya purchasi* (fluted scale), which first came into prominence in Ceylon in December 1915 on *Acacia*, caused considerable apprehension in 1916 and 1917, as it was feared that it might attack tea and other crops of economic importance. Investigations led to the discovery that a fungus periodically controls the scale in most districts during the wet weather. No trace of the Coccinellid beetle, *Novius cardinalis*, was found, but a related species, *N. roseipennis*, was fairly numerous in some localities. This species has, however, nothing like the voracious appetite and powers of reproduction possessed by *N. cardinalis*, and consequently arrangements were made for consignments of the latter to be sent periodically from South Africa. A number of difficulties were encountered. All the beetles in four consignments in 1919 died, probably owing to the length of the journey. Some living beetles were received in January 1920, and after food had been obtained they bred rapidly, and colonies were sent out to various localities. When these places were inspected recently very little scale was found, and that little was being rapidly devoured by the Coccinellid larvae.

The larvae of *N. cardinalis* that were kept for breeding suffered severely from disease, due probably to overcrowding, but in the event of any abnormal local increase of *I. purchasi* in the future, it will be comparatively easy to obtain further consignments of *N. cardinalis* from South Africa, since better facilities for shipping the beetles will then be available.

HUTSON (J. C.). **Report of the Entomologist.**—*Ceylon Dept. Agric. Administr. Repts. for 1919, Peradeniya*, 1920, pp. C8–C10. [Received 7th October 1920.]

The chief pests recorded include:—*Xyleborus fornicatus*, Eich., which is distributed throughout the greater portion of the area under tea; *Homona coffearia* (tea tortrix), a fresh outbreak of which occurred during the year; and *Icerya purchasi* (fluted scale) on *Acacia*, which is generally controlled during the wet season by fungi, especially *Cephalosporium* and *Melanospora*. *Agrotis* spp. are found in abundance amongst vegetable crops. Towards the end of the year outbreaks of the swarming paddy cutworm, *Spodoptera mauritia*, occurred in several localities. Remedial measures include clean cultivation, flooding the fields and collection of caterpillars by means of winnows. Towards the end of the outbreak numerous cocoons of a Braconid parasite were in evidence. Termites, probably *Calotermes militaris*, have been prevalent on several tea estates at different elevations. Remedial measures include the pruning of all dead wood, the trimming of all broken ends and the tarring of all cut ends. Field experiments with carbon bisulphide show promising results, but further trials are needed to prove the efficacy of this treatment.

Nephantis serinopa (coconut caterpillar) is still abundant in the Eastern Province, and outbreaks have also been noticed in the North-Western Province, where a Hymenopterous parasite is an important factor in its control. On young palms the outbreak may be checked by collecting and destroying the larvae on the leaves. In the Eastern Province tar and sulphur "smudge" fires are used and trap-lights to catch the egg-laying females. On old palms the infested material should be removed and burnt; to prevent attack the trees should be kept in vigorous health.

Minor pests on tea included:—*Zeuzera coffeae* (red borer); *Spatulifimbria castaneiceps* (nettle grub); *Saissetia hemisphaerica*; *Oscinis theae* (tea leaf-miner); *Gracilaria theivora* (tea leaf-roller) controlled by plucking and by the heavy rains; *Heterodera radicicola* (eelworm); *Coccus viridis*; *Helopeltis antonii*; *Ricania fenestrata*; *Ricanoptera opaca*; *Orgyia postica*; *Heterusia cingala*; and *Lepidiota pinguis*.

Saissetia nigra and the Cerambycid *Batocera rubus* occurred on *Hevea*, and *Caprinia conchylalis* infested *Funtumia elastica*.

Arbela quadrinotata (brown bark-borer), *Helopeltis* sp. and an Aphid, *Toxoptera aurantiae*, infested cacao. The latter is preyed upon by Chrysopid and Syrphid larvae.

Coconut was attacked by *Rhynchophorus ferrugineus* (red weevil), *Oryctes rhinoceros*, *Aspidiotus destructor* and *Ischnaspis longirostris*.

Schoenobius incertellus (*bipunctifer*) (rice stem-borer), *Cnaphalocrocis medinalis*, *Marasmia bilinealis*, *Nymphula depunctalis*, and *Leptocorisa acuta* (paddy bug) occurred on rice.

Sylepta multilinealis and *Dysdercus cingulatus* are reported on cotton; *Orgyia postica*, the Lasiocampid *Taragama dorsalis*, *Terastia meticulosalis* and the Coreid bug *Anoplocnemis phasiana* on dadap (*Erythrina lithosperma*): and *Icerya purchasi*, *Myllocerus curvicornis*, *Astycus immunis*, *Popillia complanata*, *Lepidiota pinguis*, and *Homona coffearia* on *Acacia* spp. *Araecerus fasciculatus* attacks the pods of *Tephrosia candida*, *Crotalaria*, *Indigofera*, *Bauhinia* and *Cajanus indicus*. *T. candida* is also attacked by *Euproctis scintillans*. *Maruca testulalis* (which also attacks *Cajanus indicus*) and the Coreid bugs *Riptortus pedestris* and *R. fuscus*. *Cajanus indicus* is attacked by the Membracids *Leptocentrus* sp. and *Gargara* sp., the Pentatomids *Nezara viridula*, *Cyclopelta siccifolia*, *Brachyplatys cingalensis*, *Coptosoma cribrarium* and *C. siamicum*, the Lycaenid *Lampides baetica*, *Agromyza* sp. and the Meloid beetle *Mylabris pustulatus*.

Most of these bugs also attack *Indigofera arrecta*, as do the Pentatomids *Halyomorpha picus, Piezodorus rubrofasciatus, Eusarcocoris guttiger* and *Tolumnia immaculata*.

Sweet potatoes (*Ipomoea batatas*) were attacked by the weevil *Cylas formicarius*, the Cassids *Aspidomorpha miliaris* and *A. micans*, and the Pyralid *Tabidia aculealis*.

Other miscellaneous pests include: *Plutella maculipennis* on varieties of *Brassica oleracea*; *Crocidolomia binotalis* on Chinese cabbage; the Pentatomid bug *Bagrada picta* on knol-khol; *Dacus cucurbitae* on *Sechium edule*; *Dorylus orientalis* on potato (*Solanum tuberosum*); and a Cerambycid beetle, probably *Batocera rubus*, on the jak tree (*Artocarpus integrifolia*).

JEPSON (F. P.). **The Tea Shot-hole Borer Investigation.**—*Ceylon Dept. Agric. Administ. Repts. for 1919, Peradeniya*, 1920, p. C11. [Received 7th October 1920.]

Soap-resin-fish-oil emulsion has been applied to bushes, immediately after pruning, over an experimental area of 161½ acres, but has not proved as efficacious in the control of *Xyleborus fornicatus*, Eich. (shot-hole borer of tea) as was originally anticipated.

An area of 24 acres has been interplanted with castor-oil plants to test their value as trap-trees. The periodical removal of infested branches is apparently an effective method of control, provided that it is systematically carried out. The number of fresh estates declared infested is 22.

GIRAULT (A. A.). U.S. Bur. Entom. **New Serphidoid, Cynipoid, and Chalcidoid Hymenoptera.**—*Proc. U.S. Nat. Mus., Washington, D.C.*, lviii, no. 2332, 1920, pp. 177–216.

The following species of economic interest are described:— *Hadronotus ajax*, sp.n., reared from eggs of *Anasa tristis* in the United States; *Paraceraptrocerus africanus*, sp. n., reared from *Ceroplastes* sp. on *Elytropappus rhinocerotis* in South Africa; *Achrysopophagus io*, sp. n., and *A. rex*, sp. n., reared from *Pseudococcus citri* on bamboo in Manila; *Tetrastichus fasciatus*, Ashm., reared from *Cecidomyia manihot*; and *Paratrigonogastra stella*, sp. n., reared from larvae of *Agromyza* on bean roots in the Philippines.

HARNED (R. W.). **Biennial Report Mississippi State Plant Board for the Years 1918–1919.**—*Jackson, Miss.*, 1920, pp. 5–24.

The sweet potato weevil [*Cylas formicarius*] has only been found in the four southernmost counties of Mississippi, and regulations have been adopted to prevent its further spread. Remedial measures so far carried out have been very successful, and if they continue under similar conditions the State should be free from the weevil within from one to two years. The Argentine ant [*Iridomyrmex humilis*] is spreading rapidly, but funds have not been sufficient for the undertaking of systematic remedial measures.

The cottony cushion scale [*Icerya purchasi*] attacks a great variety of plants, and is established in about five counties.

Lüstner (G.). **Ueber die bisher in den preussischen Weinbaugebieten angestellten wissenschaftlichen und praktischen Versuche zur Bekämpfung des Heu- und Sauerwurms.** [The scientific and practical Experiments hitherto made in the Prussian Vine-growing Districts for the Purpose of checking the first and second Generations of the Vine Moths.]—*Centralbl. Bakt., Parasit., u. Infektionskr., Jena,* IIte Abt., l, no. 1–4, 10th February 1920, pp. 88–175.

This is a comprehensive review of experiments conducted in Prussia since 1898 with a view to checking the first and second generations of the vine-moths [*Clysia ambiguella* and *Polychrosis botrana*]. The measures tested are divided into three groups :—Those that are useless ; those that are effective, but are not available for a number of reasons including—as in the case of arsenicals—legislative restrictions ; and those that are of practical value, even on a large scale. This last class includes the use of nicotine and soft-soap solutions. The former is used in strengths of 1–1½ per cent. and the latter in strengths of ¼–½ per cent. Tobacco dust was less effective than the liquid extract. Nicotine-soap is more effective against the second generation than against the first. Its use does not give any unpleasant taste or smell to the grapes.

Jegen (G.). **Die Blausäure und ihre Bedeutung im Kampfe gegen tierische Schädlinge.** [Hydrocyanic Acid and its Importance in Work against Animal Pests.]—*Schweiz. Zeitschr. Obst- u. Weinbau, Frauenfeld,* xxix, nos. 18 & 19, 4th & 18th September 1920, pp. 289–294, 322–326, 2 figs.

Very successful experiments in fumigating fruit trees with hydrocyanic acid gas against *Anthonomus pomorum* and in fumigating store-rooms where stocks of dried fruit were infested by the larvae of *Ephestia elutella*, Hb., are described. This method of fumigation is both highly efficacious and cheap. It is also easy to apply, provided that the same operators are employed in a given district. The establishment of an organisation for carrying on this work in Switzerland is therefore suggested.

Stift (A.). **Ueber im Jahre 1918 veröffentlichte bemerkenswerte Arbeiten und Mitteilungen auf dem Gebiete der tierischen und pflanzlichen Feinde der Zuckerrübe.** [Communications of Value published in 1918 concerning the Animal and Vegetable Enemies of the Sugar-beet.]—*Centralbl. Bakt., Parasit., u. Infektionskr., Jena,* IIte Abt., lii, no. 1–3, 15th September 1920, pp. 65–78.

A full review of the literature on the subject for the year 1918 is given.

Ultée (A. J.). **Verslag over het Jaar 1919.** [Report of the Besoekisch Experiment Station for 1919.]—*Meded. Besoekisch Proefst., Djember,* no. 29, 1920. 25 pp.

Amongst the material sent in for inspection were leaves of young coconut attacked by a beetle, *Brontispa longissima* ; leaves of young *Hevea* attacked by mites ; and coffee berries infested with *Stephanoderes* (*Cryphalus*) *hampei*, Ferr. (*Xyleborus coffeivorus*, Weele).

ECKSTEIN (K.). **Zur Bekämpfung der Kohlweisslinge.** [Measures against *Pieris* spp.].—*Naturwiss. Zeitschr. f. Forst- u. Landw., Stuttgart,* xviii, no. 8–9, August–September 1920, pp. 234–235.

Experiments made with the object of testing the value of elderberry (*Sambucus nigra*) in protecting cabbages against *Pieris* [*R.A.E.*, A, viii, 141] proved the uselessness of this method.

Work connected with Insect and Fungus Pests and their Control.—*Rept. Agric. Dept. Montserrat, 1918–19, Barbados,* 1920, pp. 38–40.

An ordinance similar to that existing in St. Vincent providing for the destruction of the known food-plants of cotton-stainers [*Dysdercus*] was enacted in August 1918 in Montserrat. The destruction of these trees was begun in December 1918, and by April 1919, 1,506 silk-cotton trees were felled. *Sida acuminata* and *S. carpinifolia* are also probably alternative food-plants, but it still remains to be proved whether they are capable of carrying the stainer over from one season to another. The larvae of *Prodenia* sp. are reported as attacking ajowan [*Carum copticum*]. A poison-bait containing Paris green and laid down in the vicinity of the seed at sowing time is suggested as a remedial measure.

RENNIE (J.) & SUTHERLAND (C. H.). **On the Life History of** *Bucentes* (*Siphona*) *geniculata* (**Diptera: Tachinidae**), **Parasite of** *Tipula paludosa* (**Diptera**) **and other Species.**—*Parasitology, Cambridge,* xii, no. 3, September 1920, pp. 199–211, 1 plate.

The Tachinid, *Bucentes* (*Siphona*) *geniculata*, is considered to be a normal parasite of *Tipula* spp. It has been found in *T. oleracea*, but more frequently in *T. paludosa*. Other observers have recorded it from the Noctuid *Barathra* (*Mamestra*) *brassicae*, and a related species, *Siphona cristata*, from *Tipula gigantea*. During the winter the larvae remain within their host, but generally leave the latter for pupation; this occurs in April in the soil, and lasts about three weeks. A second generation appears about June, the larval period of which lasts about three weeks, and the pupal stage about 17 days. The adult flies of this generation appear towards the end of July. Parasitism of the *Tipula* larvae probably takes place in the autumn.

The larva and its structural relations to its host are described. The structure and habits of the adult fly will be dealt with in a subsequent paper.

CHAMBERLIN (W. J.). **The Western Pine Bark-Beetle. A serious Pest of Western Yellow Pine in Oregon.**—*Oregon Agric. Expt. Sta., Corvallis,* Bull. 172, June 1920, 30 pp., 4 plates, 4 figs. [Received 9th October 1920.]

Oregon is one of the most important forest regions of America, containing about one-fifth of the standing timber of the United States. The principal trees in this vast forest are Douglas fir (*Pseudotsuga taxifolia*) and western yellow pine (*Pinus ponderosa*), and one of the most important insect pests is *Dendroctonus brevicomis* (western pine bark-beetle). Although the effects of this insect are slow in appearing, it is probably the cause of more dead yellow pine than any other single factor.

Hibernation occurs in the adult and larval stages; and in the early spring (generally April or May) the adults that have lived through the winter become active and begin extending their galleries or construct new ones through the bark of healthy, injured, fallen or standing timber, in which their eggs are deposited. These hatch in a week or ten days. The young larvae bore winding galleries through the inner bark. The length of the larval stage varies considerably; in the case of the summer brood 9 to 12 weeks are spent in the larval stage, while hibernating larvae remain in that stage for over six months, being inactive during cold winter weather. The pupal stage lasts 3 to 4 weeks. From May onwards there is an almost constant emergence of adult beetles until September. The chief period of attack by the adults is during July and early August, but all stages are found throughout the year except the pupae, which do not seem to be present from October until late May. After emergence the beetle may again attack the parent tree, but usually migrates to a neighbouring one. When trees show large numbers of exit holes and the foliage has a yellowish or reddish appearance, it is useless to attempt to save them, and careful examination should be made of all timber in the vicinity to ascertain if the recently emerged beetles have attacked it. The foliage of infested trees may remain green until the majority of beetles have left it, but it usually turns yellow in autumn and forms what is known as a "red top" in the following spring. Occasionally swarms of the beetles fly a considerable distance and attack isolated trees or clumps of trees, establishing a new centre of infestation from which succeeding generations will extend in all directions. For the first year or two of infestation but little damage is done to standing trees, but trees left standing are subsequently attacked by other boring insects, fungi, etc., and small trees are soon rendered useless, though large trees may be merchantable for 15 or 20 years. Regions containing large areas of mature or over-mature yellow pine timber are particularly favourable to rapid multiplication and spread of the beetles, especially where heavy storms have broken down some of the trees.

Natural control of *D. brevicomis* is exercised to a certain extent by Ichneumonid and Chalcid parasites. Predaceous enemies include Clerid, Trogositid and other beetles and Asilids (robber flies). Certain species of parasitic fungi thrive in the damp galleries of the borers, and though little is known of the species that attack *D. brevicomis*, it is evident that fungi are capable of destroying whole broods of closely related beetles. It is suggested that methods of artificial propagation and dissemination of such a fungus might be worked out with advantage. Birds destroy large numbers of wood-boring grubs, and Acarids, such as *Seius safroi*, Ewing, also kill many of them, but whether the propagation and dissemination of these mites would be possible remains to be determined.

It is admitted that the present artificial methods of controlling bark-beetles are crude, expensive and not altogether satisfactory, but they have given some success in reducing epidemic infestations to normal, or even below normal. Wherever possible, logging operations should be directed to infested areas so as to ensure the cutting of all infested trees after 1st September and to have them through the mill and the slabs destroyed before 15th April. Infested trees growing near lakes or streams should be cut into lengths and put under water; this will kill the borers in the tree and prevent others from entering, and is a cheap method. Piling the logs and scorching the bark sufficiently to destroy the broods is efficacious in the case of small thin-barked trees such as lodge-pole pine [*Pinus murrayana*], but is not applicable to large, thick-barked species such as yellow and sugar pine [*Pinus lambertiana*]. A good method of maintaining an uninfested area in healthy condition is to injure a tree by girdling it during the time of flight of the beetles so as to attract them to this one tree rather than to the green timber. The number of such trap-trees required would however be too great to render their use possible over very large areas. As the beetles normally prefer dying bark it is suggested that all prunings and refuse should be piled over the stumps and fallen logs and burnt at the proper season. In the case of insects having two generations in a year, these burnings should be carried out in July and August and again between October and April. How far the beetles will be attracted to this refuse has not yet been determined, but it is evidently a distance of some miles. It is suggested that saw-mills might be used to advantage in heavily infested areas, the infested trees being cut and converted into lumber on the spot. An example is given of successful control of bark-beetles in the Ochoco National Forest, all the operations being described, with the labour necessary for each. A set of rules and regulations found useful for employés in insect control work is appended.

MUIR (F.). **Report of Entomological Work in Australia, 1919–1920.**—*Hawaiian Planters' Record, Honolulu*, xxiii, no. 3, September 1920, pp. 125–130, 1 fig.

An account is given of the author's journey to Australia for the purpose of collecting a colony of *Drypta* for introduction into Hawaii as a control of the sugar-cane leafhopper, *Perkinsiella saccharicida*. Owing to unfavourable climatic conditions, difficulties of transport, etc., this object was not accomplished ; but the investigation led to the discovery of a small bug, *Cyrtorhinus mundulus*, that will probably prove of greater value than *Drypta* in the control of the leafhopper. This bug apparently does not attack sugar-cane but lives entirely on the eggs of leafhoppers, of which it sucks out the contents, leaving the eggshell unbroken, the puncture being so minute that it is unrecognised.

The eggs of *C. mundulus* are laid in crevices in the cane leaf, often in the slit made by the leafhopper. These eggs are parasitised by a Mymarid parasite very similar to *Paranagrus* sp. infesting *Perkinsiella*, but specifically distinct. The young bugs are bright scarlet and very active, and hide at the base of the cane leaf. The heavy rains experienced in Hawaii are too severe for the minute egg-parasites that might otherwise control the leafhopper, and in North Queensland both *Paranagrus* and *Drypta* were very scarce after the rains. *C. mundulus*, on the other hand, seems to be unaffected by storms, and in the author's opinion this insect is the chief cause in Queensland of keeping *P. saccharicida* in check, being evidently responsible for reducing the numbers by about 80 per cent.

The possibility of *C. mundulus* destroying *Paranagrus*, and so doing more harm than good, has been considered, but even if it entirely supplanted the latter parasite it would still be a gain, as it is the more valuable of the two. This, however, has not occurred in Australia or Fiji. In spite of delays on the voyage, a number of *C. mundulus* were brought back to Hawaii in good condition, and it is hoped to start a colony with them, and eventually to establish the bug in the sugar-cane fields. As the rate of increase is slow and the supply of food for large numbers will not be easy to maintain, it is suggested that a colony should be brought from Fiji, which is only eight days distant. It is proposed to cease work on *Drypta* until *C. mundulus* has become established and its effect on the leafhopper is known.

Nut-grass, which is abundant throughout Queensland, chiefly in cultivated land, is frequently infested with *Antonina* sp. The work of this scale is being investigated, and if it is considered of sufficient importance, more will be procured from Australia [see, however, *R.A.E.*, A. iii, 364]. Sugar-cane is apparently not attacked by it.

Search was made in likely localities for *Syagrius fulvitarsis*, Pasc. (fern-weevil), but without success. It is apparently scarce under natural conditions though abundant at times in greenhouses. A good deal of investigation is necessary before control of this weevil can be hoped for.

PEMBERTON (C. E.). **An Entomological Inspection of the Kohala District.**—*Hawaiian Planters' Record, Honolulu*, xxiii, no. 3, September 1920, pp. 138–141.

Owing to the numbers of wireworms present in the Kohala district and the damage caused by them, an inspection of the region has been made. The two most injurious species are *Monocrepidius exul* and *Simodactylus cinnamomeus*, but both were rare when the inspection was made. The adults of the latter beetle were frequently seen at lights. One larva was found in a cane-stool in the ground, but was not feeding upon the cane and apparently does no injury to it. It was thought that wireworms were attracted to some localities by the presence of *Pantomorus fulleri*, but this is evidently not the case, for in some districts where *P. fulleri* was abundant wireworms were exceedingly scarce. The grubs of *P. fulleri* apparently do no important damage to sugar-cane, though they no doubt feed upon the tender roots. The adult beetle eats conspicuous notches in the cane leaves, but *Verbena* is apparently preferred.

The parasite, *Scolia* [*manilae*], introduced to combat the beetle, *Anomala* [*orientalis*], was found to be established in Kohala. This wasp has also been observed attacking the Japanese beetle [*Adoretus umbrosus*], and it is hoped that some benefit may result in the future. Leafhoppers [*Perkinsiella saccharicida*] are found everywhere in Kohala, and are heavily parasitised by *Paranagrus optabilis* and *Ootetrastichus formosanus*. A few were also found parasitised by Dryinids, and an adult of *Pseudogonatopus hospes* was taken. *Gonocephalum seriatum*, which normally feeds on trash, is a very prevalent beetle in the cane fields of Kohala, and its feeding habits should be further studied. It probably feeds only on decaying cane, roots of weeds and other decomposed vegetable matter, but there is a possibility that it may attack living cane roots to some extent. Its numbers are checked in Oahu by a parasite, though none has been observed in Kohala.

Amargos (J. L.). **El Gusano Verde** (*Protoparce carolina*, **L.**).—*Rev. Agric., Santo Domingo, R.D.*, xvi, nos. 4 & 5, July & August 1920, pp. 110–114, & 138–143, 8 figs.

Tobacco in Dominica is severely damaged by the caterpillars of *Protoparce carolina*, L., a well-known pest in almost all tobacco-growing countries. A great number of eggs are laid, two or three being placed on each of the upper leaves of tobacco plants. The larvae hatch in 4 days, and pass through several instars, being most injurious in the third and following stages, in which 2 or 3 caterpillars entirely strip a plant in one day. Pupation in the soil lasts 21 days. The greatest emergence of the moths takes place after heavy rain or a period of moist weather, and it is probable that in dry seasons many adults perish when the ground is too hard for emergence. The average life-cycle occupies 48 days, and the generations are continuous.

Natural enemies of *P. carolina* include wild birds and poultry, the latter devouring the caterpillars or pupae with avidity, and certain spiders. The wasp, *Sphex flavipennis*, attacks the larvae, as well as a small Hymenopteron. *Ichneumon magnus* might be introduced with advantage. The larval stage is frequently attacked by a bacterial disease that often proves fatal.

Artificial methods of control include clean cultivation, particularly the destruction of tomato and other Solanaceous plants. A few days after the tobacco crop is gathered, the ground should be dug to the depth of 3 to 5 inches in order to expose the pupae: poultry should then be turned in to devour these. Many adults can be caught at light-traps, of which a practical model is described. As the moths usually fly in large numbers, many Dominican growers burn débris in their fields as they arrive, surrounding the fires with a screen of cloth smeared with some sticky substance; the moths are then attracted by the light and fly against the screens, on which they are caught. As tomato is a preferred food-plant of *P. carolina*, it is suggested that rows of tomatos should be sown between each 10 or 12 rows of tobacco as a trap-crop.

The best treatment for infested plants is a poison-spray of Paris green or lead arsenate, either in the form of dust or in solution. When used as a dust, 1 part of Paris green to 60 parts of fine soil or 50 parts of fine maize flour has proved successful. This should be applied while the dew is on the plants, and if possible after rain. These treatments do not in any way depreciate the value of the tobacco.

Gillette (C. P.) & List (G. M.). **Some Data on Codling Moth Control in the Grand Junction District in Colorado.**—*Proc. Soc. Prom. Agr. Sci.*, xxxix, 1919, pp. 113–123, 4 figs. (Abstract in *Expt. Sta. Record, Washington, D.C.*, xliii, no. 2, August 1920, p. 161.)

Orchardists in Colorado have not been satisfied with the results of spraying for codling moth [*Cydia pomonella*], for while 5, 6 or 7 applications have given 70 to 80 per cent. of sound apples, other States have obtained as many as 90 to 95 per cent. after only 2 or 3 applications of arsenical poison. It must be remembered that climatic conditions in Colorado are very favourable to the continuous development of the moth, but there is obvious need for a reliable chart to show the seasonal incidence of the larvae throughout the summer, and consequently to fix the best dates for spraying; this could only be accomplished by a competent entomologist working in the field throughout the summer. The insect cannot be satisfactorily controlled in Colorado by means of a calyx spray and one or two cover sprays. Burlap bands properly applied and attended to are a very important aid, and should lessen the numbers of the late generation by 30 or 40 per cent.

Maheux (G.). **Report of the Provincial Entomologist.**—*Rep. Minist. Agric., Quebec*, 1919, pp. 109–114. [Received 11th October 1920.]

With the exception of *Aphis pomi* (apple aphis) the number of insect pests during the year was limited, and the majority of these have been already noticed [*R.A.E.*, A, viii, 2]. Although generally well represented, *Leptinotarsa decemlineata* (potato beetle) showed a decrease from 1917, while *Cydia* (*Carpocapsa*) *pomonella* (codling moth) also did less damage than in the past. *Agrilus anxius* (bronze birch borer) continued to do damage. Attacked trees die within one or two years, and on the north side of the Ottawa River an entire stand of white birch (*Betula alba*) was found to have been invaded by the beetle, which had so far confined itself to cities and inhabited centres.

Quebec is now a port of entry for the importation of plants subject to the Federal Act respecting insects and pests, and consequently several parcels from France, England and Holland have been inspected.

Plum Aphides.—*Ministry Agric. & Fish., London*, Leaflet 308, April 1918, 6 pp., 2 figs. [Received 12th October 1920.]

The contents of this revised leaflet on *Aphis pruni*, Réaum., *Hyalopterus pruni*, F., and *Phorodon humuli*, Schr., are almost identical with those of a paper already noticed [*R.A.E.*, A, iv, 532]; but in the spray formulae it is recommended that lime wash should be made of 10–15 lb. quick lime to 10 gal. water, instead of 10–20 lb. to the same quantity of water.

Roberts (J. A.). **Annual Report of the Commissioner of Agriculture.**—*18th Ann. Rept. Maine Commiss. Agric., Augusta* 1919, pp. 7–24. [Received 12th October 1920.]

To protect the State of Maine from the introduction and dissemination of the European corn borer (*Pyrausta nubilalis*), regulations have been issued by the Crop Pest Commission of Maine requiring that every person or corporation receiving any maize or other vegetation from any area in the United States outside the State of Maine which now is or hereafter may be quarantined, shall return it to its place of origin or destroy it, unless in the judgment of the Commissioner of Agriculture it may be disinfected in such a manner and under such supervision as he may direct. Inspectors are to be appointed to watch for the appearance of the moth and to notify and warn all persons or corporations receiving material from quarantined areas to comply with the above regulations.

DUDLEY (F. H.). **Report of State Horticulturist.**—*18th Ann. Rept. Maine Commiss. Agric., Augusta,* 1919, pp. 31–69, 10 figs. [Received 12th October 1920.]

The following pests are briefly described, and suitable remedial measures are advocated:—*Rhagoletis pomonella* (apple maggot); *Aphis pomi* (apple aphis); *Ancylis nubeculana* (leaf sewer); *Tortrix (Archips) argyrospila* (fruit-tree leaf-roller); *Coleophora fletcherella* (cigar case-bearer); *C. malivorella* (pistol case-bearer); *Bucculatrix pomifoliella*; *Heterocordylus malinus* (apple red bug); *Canarsia hammondi* (apple-leaf skeletoniser); *Heterocampa guttivitta*, which has only one generation a year in Maine; *Graptolitha (Xylina) antennata* (green fruit worm); *Lygus pratensis* (tarnished plant-bug); *Macrodactylus subspinosus* (rose chafer); *Eriocampoides (Eriocampa) cerasi* (pear slug); *Galerucella luteola (Galeruca xanthomelaena)* (elm leaf beetle).

Beneficial insects include:—the Coccinellid, *Adalia bipunctata*; *Calosoma* spp., predaceous on gipsy moth (*Porthetria dispar*) and other Lepidopterous larvae; *Podisus modestus*; *Lebia grandis*, predaceous on cutworms, etc.; *Thalessa lunata*, a parasite of borers; *Pimpla conquisitor*, a parasite of tent caterpillars (*Malacosoma*); and *P. inquisitor*, a parasite of tussock caterpillars (*Hemerocampa*).

Formulae are given for the preparation of poison-baits for grasshoppers and cutworms, and sticky bands for trees, and a spray calendar is included.

MCINTIRE (M. H.). **Report of the Field Agent, Gypsy Moth Work.**—*18th Ann. Rept. Maine Commiss. Agric., Augusta,* 1919, pp. 70–72. [Received 12th October 1920.]

Work on the gipsy moth [*Porthetria dispar*] was continued during the year [*R.A.E.*, A, viii, 220]. Banding with burlap and spraying were begun on 1st June, and 12,500 trees were treated. During June, July and the beginning of August, lead arsenate was used for spraying. Owing to the action of the liberated parasites there is an apparent decrease in the number of caterpillars in the infested section, and the large sums of money necessarily expended on this work have been fully warranted by the results.

SANDERS (G. E.). **Apple Spraying.**—*18th Ann. Rept. Maine Commiss. Agric., Augusta,* 1919, pp. 199–209. [Received 12th October 1920.]

Experiments show that russeting of apple fruit due to the application of Bordeaux mixture may be avoided by the addition of three parts of lime to every one part of Bordeaux mixture. In Nova Scotia russeting is prevented by substituting some other spray for Bordeaux mixture in the third, or after-blossom, spray. One pound of soluble sulphur, ½ lb. calcium arsenate and 5 lb. hydrated lime to 50 U.S. gals. water may be safely used as a calyx spray. Magnesium arsenate may replace calcium arsenate, as it is apparently safer. Sucking insects may be controlled by the application of 3 lb. soluble sulphur and 1 pt. Black-leaf 40 to 120 U.S. gals. of water. This is also effective against canker-worms if applied before the larvae are half grown. *Rhagoletis pomonella* (railroad worm) may be controlled by the application of two sprays, the first consisting of 10 lb. of lead arsenate paste to 120 U.S. gals. of water and 4 lb. only of dry lead arsenate for the second spray. The first spray must be applied just before the emergence of the first flies, which is about 12th July in New Brunswick and Maine. The second application should be made about twelve days later. The spray should cover every part of the tree.

Three pounds of soluble sulphur and 1 pt. Black-leaf 40 to 120 U.S. gals. water applied after the emergence of young oyster-shell scales [*Lepidosaphes ulmi*] proved more efficacious than the dormant spray against this pest. High pressure spraying or drenching with soluble sulphur and Black-leaf 40 immediately before and after blooming is advocated for the control of the green apple bug [*Lygus communis*].

ANDREWS (E. A.). **Insect Pests of Tea in North-East India during the Season 1919.**—*Qrtly. Jl. Sci. Dept. Indian Tea Assoc., Calcutta,* 1920, pt. 2, pp. 27–36.

The insects recorded include *Andraca bipunctata,* Wlk. (bunch-caterpillar), which was in evidence from February to May and again in October, but was less numerous than during 1918. Collection of the clusters of the caterpillars is considered an efficient means of control. *Agriophora rhombota,* Meyr. (sandwich caterpillar) has only been reported from one district of Assam. *Zeuzera coffeae,* Nietn. (red borer) has apparently two broods in the year, one appearing from March to April and the other from August to September. *Arbela dea,* Swinh. (bark-eating borer) is gradually becoming less numerous, probably owing to more careful pruning. *Diapromorpha melanopus,* Lac. (orange beetle) was chiefly in evidence from April to June and again in September, and was more numerous than usual. *Helopeltis theivora,* Waterh. (tea mosquito) was particularly injurious. *Empoasca flavescens,* Dist. (tea green-fly) was more abundant in certain localities.

Other pests recorded are *Biston suppressaria,* Gn. (looper caterpillar); *Heterusia magnifica,* Butl. (red slug), found in small numbers in July and October; *Clania* spp. (faggot and bagworms); *Acanthopsyche reidi,* Watt (limpet caterpillar); *Belippa* spp. (gelatine grubs), most conspicuous in July and from mid-October to November; *Thosea cervina,* Moore (nettle grub); and *Physothrips setiventris,* Bagn., seen in June, July and September. The cricket, *Brachytrypes achatinus,* Stoll, was very injurious in nurseries. *Tetranychus bioculatus,* W.-M. (red spider) proved more serious in the early part of the year than in 1918. Lime-sulphur, lime and fresh cowdung, sulphur and cowdung, sulphur and mud, were all reported to have been used successfully against it. *Eriophyes* (*Phytoptus*) *theae,* Watt (pink mite) was more numerous.

MOZNETTE (G. F.). **Dusting v. Spraying for the Control of Avocado Insect Pests.**—*Florida Grower,* xxi, no. 14, 1920, pp. 8 & 17, 2 figs. (Abstract in *Expt. Sta. Record, Washington, D.C.,* xliii, no. 3, 31st August 1920, p. 255.)

The most important pests of avocado in southern Florida are *Tetranychus yothersi,* McGreg. (avocado red spider), greenhouse thrips and the leafhopper, *Empoasca minuenda,* Ball. Fine dry sulphur dust was found to be effective against *T. yothersi*, but for controlling leaf-hoppers and leaf thrips as well, liquid lime-sulphur solution with Black-leaf 40 proved the more effective and the cheaper treatment.

BRANDES (E. W.). **Mosaic Disease of Corn.**—*Jl. Agric. Research, Washington, D.C.*, xix, no. 10, 16th August 1920, pp. 517–521, 2 plates.

It has been proved experimentally that mosaic disease of maize may be transmitted by *Aphis maidis*, but under natural conditions this is probably not the only means of dissemination [*R.A.E.*, A, viii, 370]. The virus of the disease is identical with that of sugar-cane and sorghum mosaic. Its existence on perennial grasses may explain its appearance on maize in the spring. The only effective method of eliminating the disease is to destroy all plants affected by it.

PARKS (T. H.). **Wheat-Sowing Dates to avoid Hessian Fly.**—*Mthly. Bull. Ohio Agric. Expt. Sta., Wooster*, v, no. 9, September 1920, pp. 243–246.

Ohio has just experienced one of the worst outbreaks of Hessian fly [*Mayetiola destructor*]. The spring brood in 1920 killed or damaged an average of 44 per cent. of all wheat straw in the State. The northern counties suffered most, apparently because wheat became infested there during the autumn of 1919, even when sown a week later than dates that are usually fly-free. By 15th July 1920, 31 per cent. of all puparia were parasitised. Parasites usually control a serious outbreak eventually, but not soon enough to prevent severe damage for two or three years. The present outbreak will call for united effort on the part of the growers to prevent early sowing of wheat this autumn. A map is given showing safe dates to sow wheat in different parts of Ohio. They are somewhat later in northern Ohio than those previously recommended, for the reason indicated above, but are consistent with maximum yields.

Wheat joint-worm [*Harmolita tritici*] was not present in serious numbers, except on the western edge of the State. It had been becoming steadily less numerous for the past three years, and no trouble is expected from it in 1921.

NOWELL (W.) & WILLIAMS (C. B.). **Sugar-Cane Blight in Trinidad: A Summary of Conclusions.**—*Bull. Dept. Agric. Trinidad & Tobago, Port-of-Spain*, xix, part 1, 1920, pp. 8–10.

As a result of investigations made during 1919 it was found that froghoppers [*Tomaspis saccharina*] can produce a definite form of blight on sugar-cane without other insect or fungus agencies. The condition thus produced is different in character from that caused by any form of root disease, and is apparently mainly the result of injury to the leaves. The chief damage is caused by the presence of large numbers of insects where the local conditions of a field especially favour it. In certain cases the infested patches are sharply defined from the rest of the field. A merely backward or stunted condition of the crop is not in itself sufficient to induce infestation by froghoppers, the prevalence of which is apparently governed by relations between soil and moisture that are not yet understood. The prevalence of root disease over wide areas in Trinidad is largely due to the weakening of the plants' resistance as a result of froghopper attack.

No direct method for controlling this pest has yet been found. [*R.A.E.*, A. vii, 336.]

NOWELL (W.). **Report on a Visit to Trinidad in connexion with Froghopper Blight of Sugar Cane.**—*Bull. Dept. Agric. Trinidad & Tobago, Port-of-Spain*, xix, part 1, 1920, pp. 11–18.

The observations made during 1919 do not at any point conflict with the opinions expressed in the previous report [*R.A.E.*, A, vii, 335], the results being summarised in the preceding paper.

WILSON (H. F.), PICKETT (R. C.) & GENTNER (L. G.). **The Common Cabbage Worm in Wisconsin** (*Pontia rapae*, **Linn.**)—*Wisconsin Agric. Expt. Sta., Madison*, Research Bull. 45, August 1919, 35 pp., 11 figs. [Received 19th October 1920.]

As a result of extensive investigations made during 1916 & 1917, the various stages and life-history of *Pieris* (*Pontia*) *rapae* are described. Lead arsenate and calcium arsenate have proved to be the most effective remedial measures and are not injurious to plants [*R.A.E.*, A, vi, 201]. *Pteromalus puparum*, L., and *Apanteles glomeratus*, L., are parasites of this butterfly in Wisconsin.

FLUKE (C. L.), Junr. **The Pea Moth : How to Control it.**—*Wisconsin Agric. Expt. Sta., Madison*, Bull. 310, April 1920, 12 pp., 9 figs. [Received 19th October 1920.]

The pea moth, *Cydia* (*Laspeyresia*) *nigricana*, Steph., is recorded from Michigan and the north-eastern counties of Wisconsin. The various stages are described. The moths appear shortly after the pea vines begin to bloom. The eggs are generally laid singly on pods, leaves and stems of the plants, and even on weeds and grasses in their vicinity. The first eggs were noticed on 17th July ; these hatch in from 7 to 10 days. The larvae eat their way through the pods and feed on the peas. They mature in from 16 to 26 days, and when full grown, enter the ground or hide in any suitable place such as cracks or crevices in the barn. Hibernation occurs in this stage, followed by pupation in the spring.

The remedial measures advocated include deep autumn ploughing and thorough disking of the soil after the peas are harvested. The peas should be thrashed within a day or two after harvesting. Unless the remaining straw is used as fodder it should be destroyed by burning. Infestation may be avoided to a certain extent by planting early maturing varieties of peas as early in the spring as possible.

A footnote by C. Heinrich states that the insect here referred to as *C.* (*L.*) *nigricana*, Steph., is distinct from the European species. The possibility of a native as well as the European species infesting peas in the United States is therefore suggested.

VERCIER (J.). **Une Invasion de Chenilles.**—*Le Progrès Agric. & Vitic., Montpellier,* lxxv, no. 42, 17th October 1920. pp. 370–371.

Attention is drawn to the exceptional abundance of caterpillars, especially *Nygmia phaeorrhoea* (*Liparis chrysorrhoea*), in Côte d'Or during 1920, and the necessity for repeated measures such as the collection of larval nests is emphasised.

NEIFERT (I. E.) & GARRISON (G. L.). **Experiments on the Toxic Action of certain Gases on Insects, Seeds, and Fungi.**—*U.S. Dept. Agric., Washington, D.C.,* Bull. 893, 8th September 1920, 16 pp., 9 tables.

About fifteen different species of insects were used for these experiments, in which the value of various gases as insecticides was tested. These included various species of ants, bed-bugs, potato beetles (*Leptinotarsa decemlineata* and *Epitrix cucumeris*), grain beetles, house-flies and blow-flies, cockroaches, grain weevils, mites, an Aphid (*Myzus persicae*) and a whitefly (*Aleurodes vaporariorum*).

The gases tested included phosgene, arsine, carbon monoxide, cyanogen chloride, and chloropicrin. Only the last two gave satisfactory results, but they can only be used for stored products. For greenhouse fumigation they are useless owing to their injurious action on plants.

MALLOCH (J. R.). **Descriptions of Diptera of the Families Anthomyidae and Scatophagidae.**—*Ohio Jl. Sci., Columbus,* xx, no. 7, May 1920, pp. 267–288, 3 plates. [Received 21st October 1920.]

Descriptions are given of 29 new species of Diptera. A key is given to the male species of *Hylemyia*, R.-D., in which *H. uniseriata*, Stein, *H. fusciceps*, Zett., and *H. sepia*, Zett., are included, and are recorded for the first time for North America. According to Stein the species previously recorded by authors as *H. fusciceps*, Zett., is *H. cilicrura*, Zett.

BODKIN (G. E.). **Report of the Economic Biologist.**—*Brit. Guiana Dept. Sci. & Agric., Rept. for 1918, Georgetown,* 1919, Appendix iii, 9 pp. [Received 2nd October 1920.]

Sugar-cane pests recorded during 1918 include *Diatraea* spp. and *Tomaspis flavilatera*, Urich, the destruction of canes and thorough flooding of the affected area being advocated against the latter; trap-lights also proved successful. The usual outbreak of *Brassolis sophorae*, L. (coconut caterpillar) occurred. No fresh pests were observed on *Citrus*. An ant, *Solenopsis pylades*, Forel, was noticed in several instances to bore into stems of fully grown rice plants. The nests may be destroyed by carbon bisulphide.

New scale-insects found during the period under review include *Lecanium decemplex*, Newst., on leaves of a tree (*Lecythis* sp.); *Aspidiotus umboniferus*, Newst., on the same plant, and *Lichtensia litoralis*, Newst., on an undetermined wild plant.

A shipment of beans from Venezuela was found to be infested with a Bruchid, *Spermophagus semifasciatus*, Boh.

MEYRICK (E.). **Exotic Microlepidoptera.** ii, pt. 2, October 1920, pp. 321–352. [Published by the author, *Marlborough, Wilts.* Price 3*s.*]

The new species described include the Xyloryctid, *Ptochoryctis chalazopa*, bred from a larva feeding on bark of *Hevea* in Java; and the Tortricids, *Tortrix* (*Cacoecia*) *isocyrta*, bred from larvae in shoots of lucerne (*Medicago*) in Bengal; *T.* (*C.*). *pomivora*, bred from larvae that bore into fruits of apple in the Himalayas in the same way as *Cydia* (*Laspeyresia*) *pomonella*, and are serious local pests; and *Peronea agrioma*, bred from a larva on apple in Assam.

CHILDS (L.). **Spray Gun versus Rod and Dust in Apple Orchard Pest Control.**—*Oregon Agric. Expt. Sta., Corvallis*, Bull. 171, July 1920, 46 pp., 17 figs. [Received 26th October 1920.]

Much of the information contained in this bulletin has been recently noticed [*R.A.E.*, A, viii, 462]. Useful tables of the cost of spraying typical orchards with various insecticides are given.

GRANDI (G.). **Studio morphologico e biologico della** *Blastophaga psenes*, **L.** [A morphological and biological Study of *Blastophaga psenes.*]—*Boll. Lab. Zool. Gen. Agrar., R. Scuola Sup. Agric., Portici*, xiv, 15th August 1920, pp. 63–204, 31 figs. [Received 1st October 1920.]

Blastophaga psenes, L., is the type of a genus including some 30 species distributed throughout the world. It lives in the receptacles of *Ficus carica*, which is said to occur in a zone extending from Afghanistan to the Canary Islands between the 25th and 42nd degrees of north latitude.

A brief description of the adults is followed by a study of their morphology and of that of the egg, larva, and pupa. The life-history of this species has been much discussed, but Mayer in 1882 and Howard in 1900 are the only zoologists who have dealt with it. Most of the literature is therefore unreliable. Among the exceptions is the work of Longo (1905–1918).

The section on the biology of *B. psenes* is prefaced by notes on the inflorescences and flowering of the "Caprifico," the form of *Ficus carica* in which the insects develop and in which the male flowers are formed. During the year three kinds of receptacles appear. The first develops in spring and matures at the end of spring or in summer; the second develops in summer and matures at the end of summer or in autumn: and the third develops in autumn, remains on the tree in winter, and matures in the following spring.

At Portici (Naples) the adults of the third generation of *B. psenes* may appear at the end of March, but April—or even the first half of May—is more usual. It should, however, be noted that in the case of this and all other generations the emergence of the adults from the receptacles on a given tree does not always correspond with the maturing of the receptacles of the succeeding flowering of the same tree or adjacent trees. In such cases the first inflorescences of a given flowering are not visited by the insect, though ready matured for it, and they fall unless the cultivator provides the tree with receptacles in which *B. psenes* is ready to emerge. On the other hand, insects from the first fruit-formations often lack the mature receptacles of the following flowering. The perpetuation of the species is ensured by the females that emerge from the later fruit-formations.

The males are the first to emerge and they begin to seek galls containing females. A hole is cut in such a gall and mating takes place. Several females are visited in succession. The usual proportion of males to females is 10–15 per cent. After exhausting its fecundatory power the male dies, usually without having ever emerged from the receptacle, though a few specimens emerge through the ostiole of the fruit as the females do. The females enlarge the hole made by the male in the gall and then emerge from the receptacle. They live for 4–5 days only. They always turn towards the light, and during the author's experiments it was necessary to keep them in semi-darkness or to illuminate the distal ends of the figs in order to induce them to enter the receptacle. In her efforts to penetrate through the ostiole the female may lose her antennae and wings, the débris of which are a positive sign of penetration. The author has never observed more than 4 females in a given inflorescence, but the number may very well depend on the size of the receptacle and on the number of inflorescences on a given tree or in a given locality. On reaching the cavity the female lays a number of eggs, believed not to exceed 400, and then dies. In some receptacles there is no trace of the body or bodies, though wing débris are seen, and in others the number of eggs greatly exceeds those attributable to the one individual found dead. Apparently some females are able to leave the receptacle after oviposition, but this important point requires study. The egg-stage lasts 4–6 days. The resulting first-generation females oviposit in the second series of receptacles (those that develop in summer and mature at the end of summer or in autumn), thus producing the second generation. These females are used by cultivators for the edible figs that require pollination: on emerging from the Caprifico they are covered with pollen from which they are unable completely to cleanse themselves. The larvae of the second generation attain maturity in mid-August, and by mid-September the adults are ovipositing in the third series of receptacles. The eggs begin to hatch at the end of September. Hibernation takes place in the larval stage, the first pupae—and occasionally some adult males—appearing in mid-February. The hibernating third generation of *B. psenes* thus requires about 7 months for development. A fourth generation has not hitherto been observed in Italy, but its occurrence may be possible, provided exceptionally favourable conditions are present. A list of 307 references is appended to this paper.

DA COSTA LIMA (A.). **Nota sobre o Microlepidóptero,** *Pyroderces rileyi*, **Wlsm.** [A Note on the Microlepidopteron, *P. rileyi*, Wlsm.]—*Arch. Escola Sup. Agric. e Med. Vet., Nictheroy (Rio de Janeiro)*, ii, no. 1–2, 1918, pp. 75–77. [Received 19th October 1920.]

The author expresses the opinion that *Pyroderces simplex*, Wlsm., is not a distinct species from *P. rileyi*, Wlsm., and gives his reasons. The latter name has priority.

REYNE (A.). **Verslag van den Entomoloog.** [Entomologists' Report.] —*Verslag Dept. Landbouw in Suriname, 1918, Paramaribo,* 1919, p. 21. [Received 19th October 1920.]

In the course of a study of the cacao thrips [*Heliothrips rubrocinctus*] only one natural enemy of any importance, a Chrysopid larva, has been found in Surinam. *Lasioderma* occurred in stored coffee. A Pentatomid bug severely injured rice by sucking the young grain.

REYNE (A.). **Verslag van den Entomoloog.** [Entomologist's Report.] —*Verslag Dept. Landbouw in Suriname, 1919, Paramaribo,* 1920, pp. 20–24. [Received 19th October 1920.]

The study of the cacao thrips [*Heliothrips rubrocinctus*] was continued. Its natural enemies, larvae of *Chrysopa* sp. and *Franklinothrips* sp., were noticed, but their numbers were too small to have any effect. In one instance *Xyleborus perforans*, Woll., attacked old cacao plants, though it is usually a secondary pest that occurs on cacao attacked by canker. Caterpillars noticed on cacao in the preceding year have been identified as *Boccharis plenetinealis*, Dyar, which rolls and binds up the young leaves, *Catephiodes zuleana*, Schaus, which eats holes in the young leaves, and *Zetesima theobromae*, Busck, which binds two old leaves together face to face before feeding.

Coffee pests included *Coptotermes marabitanos*, Silv. *Coccus* (*Lecanium*) *viridis* occurred on *Eugenia chrysophylloides*, a tree peculiar to Guiana, and on *Phitirusa* sp. If the latter is infested, any coffee bushes among which it is planted are certain also to be attacked.

The rice bug referred to in the previous report has been determined as *Mormidea* sp. It did little damage during 1919. A large quantity of paddy swarmed with a moth, *Sitotroga cerealella*, which, however, did no damage.

Some coconut palms were severely attacked by caterpillars belonging to the genus *Castnia*, probably *C. daedalus*, and bananas were injured by *C. licus*.

The parasol ant, *Atta* sp., caused much annoyance to small cultivators, and attempts to replace carbon bisulphide, which was unobtainable, by other insecticides proved unsatisfactory against it.

REYNE (A.). **Eenige Opmerkingen over de Bestrijding van Insekten, schadelijk voor Liberiakoffie.** [Some Remarks on combating Insects injurious to Liberian Coffee.]—*Dept. Landbouw in Suriname, Paramaribo,* Bull. 37, October 1919, 18 pp. [Received 19th October 1920.]

Liberian coffee has not suffered much from insects in Surinam. The green scale, *Coccus* (*Lecanium*) *viridis*, Green, has been disregarded hitherto: its excreta attract a small black ant, *Cremastogaster* sp., and —on sandy soils—a red ant, *Solenopsis saevissima*, F. Smith, both of which nest either in the ground or in the bushes. Especially during the rainy season these tree-nests are full of scales. *Dolichoderus bidens*, Latr., interferes with the harvesting of the berries, but cannot be said to be specially attracted by the scale. The latter also infests *Citrus* and *Artocarpus integrifolia*. It may be held in check by natural enemies in the Colony, but the application of remedies is urged and measures attempted in the Dutch East Indies are mentioned. Experiments made with an 8 per cent. solution of carbolineum, which does not injure Liberian coffee if carefully applied, proved satisfactory. This can also be used on *Citrus* with a better result than petroleum emulsion. Thorough remedial measures include the destruction of the ants; nests in the ground may be treated with carbon bisulphide.

Dolichoderus bidens causes such inconvenience to workers among the coffee that picking is done hastily and unsatisfactorily. Experiments were made with poisons, including calomel and the California ant-poison, and with various sprays, including nicotine sulphate, carbolineum, carbolic acid and phytophiline. The last two gave the best results. The high cost of phytophiline precludes its use, and carbolic emulsion is advised. To prepare this, 5 lb. of soap is dissolved in $4\frac{1}{2}$ gals. of water at boiling point, and then $\frac{1}{2}$ gal. of crude carbolic is very thoroughly stirred in. Stirring may be avoided by keeping the mixture boiling for 20 minutes. The emulsion is diluted with 10 parts of water for use.

The coffee thrips, *Heliothrips haemorrhoidalis*, Bch., also occurs on cacao, *Citrus*, and other cultivated plants, and on the wild plants, *Coccoloba latifolia*, *Triplaris surinamensis*, and *Hura crepitans*. It does no injury to coffee, though quite as abundant on it as the cacao thrips, *H. rubrocinctus*, Giard, is on cacao, because the coffee leaves do not drop as a result of the infestation. It should be noted that *H. rubrocinctus* is harmless on its other food-plants, *Bixa orellana*, *Terminalia catappa*, and *Jambosa vulgaris*. Though *H. rubrocinctus* also infests coffee, it does not feed on it, and cannot be reckoned as a coffee pest.

VAN HEURN (F. C.). **Verslag van den Directeur 1 Juli 1918–30 Juni 1919.** *Meded. Algem. Proefst. A.V.R.O.S., Medan*, Algem. Ser. no. 7, 1919, 66 pp., 1 plate. [Received 22nd October 1920.]

This report is issued by the acting director in Dr. Rutger's absence. A number of notes are given from the report of the Entomologist, Mr. J. B. Corporaal.

Hevea borers included a Bostrychid, three species belonging to the genus *Praonetha*, and an Anthribid, as well as those mentioned in the previous report [*R.A.E.*, A, vii, 64]. Mites still occur, but no serious complaint was made. A similar report of Psychid infestation was received as in the preceding year, and *Psyche* (*Acanthopsyche*) *snelleni*, Heyl., was probably again the cause. *Coptotermes gestroi*, Wasm., and an ant, probably *Solenopsis geminata*, F., also injured *Hevea*; the last causing damage similar to that of *P. snelleni*.

Tea remained unattacked by *Helopeltis*. The Lygaeid bug reported in the previous year is closely allied to *Colobathristes sacchariciila*, Karsch. *C. sacchariciila* itself was sent in on one occasion. Other tea pests were *Lepidiota* sp.; the borers, *Zeuzera coffeae*, Nietn., and *Xyleborus fornicatus*, Eich.; a Notodontid, *Stauropus alternus*; and Limacodid caterpillars. The latter are sometimes covered with urticating hairs that inconvenience the workpeople. On one estate *Abizzia*, used as a shade for tea, was very severely infested by *Psyche snelleni*, and the tea was involved to some extent.

About one-third of the coffee estates on the east coast of Sumatra is infested by the coffee-berry borer, *Stephanoderes hampei*. Up to the present this beetle confines its feeding to the flesh of withered berries [*R.A.E.*, A, viii, 447]. *Araecerus fasciculatus*, de G., also infested withered berries. Other injury to the berries has been noticed, and is believed to be due to a bug, a fly, or a weevil such as *Balaninus*. Other pests included Limacodid caterpillars, *Coccus* (*Lecanium*) *viridis*, Green. *Zeuzera coffeae*, Nietn., and *Lawana* sp.

On coconuts, *Brachartona catoxantha*, Hmps., again appeared on the same estate as in the previous year, but was effectually checked by natural enemies. *Hidari irava*, Moore, proved injurious in a few localities. Neither Limacodids nor *Amathusia phidippus*, L., caused much damage. *Melissoblaptes rufovenalis*, Snell., is perhaps the cause of bad bearing. No serious attempt to check it has been made hitherto. The coconut beetles include *Oryctes*, *Xylotrupes*, *Rhynchophorus*, *Sphenophorus*, *Diocalandra*, *Aegus*, and *Plesispa*. Details regarding the last-named and *H. irava* have been published by Leefmans [*R.A.E.*, A, vii, 389, 390].

Oil-palm pests include Psychid, Limacodid and Satyrid caterpillars and those of *Hypolimnas misippus*, L. An oil-palm nut was received bearing marks of feeding similar to those of *Pachymerus* found in a parcel of imported oil-palm seed [*R.A.E.*, A, vii, 488], and the need for great care in connection with plant imports is emphasised.

Among miscellaneous pests, a Psychid caterpillar, *Pagoda hekmeyeri*, Heyl., feeds on the leaves of cacao. *Xylothrips flavipes*, Ill., was noticed boring in the beams of a house. This beetle was successfully combated by injecting a solution containing 25 per cent. of thymol in alcohol. *Adoretus* sp. and *Apogonia destructor* were found on kedele [*Glycine soja*]. *Tribolium navale*, F., was found in pressed cake of *Vigna catjang*. The infested cake should be dug into the fields, thus killing the beetles and restoring the nitrogen to the soil. Among the caterpillars found on maize were *Marasmia trapezalis*, Gn., *Cirphis unipuncta*, Haw. (?), and *Chilo simplex*, Butl.; against these collection is advised. Trap-lamps may be tried against the last named.

PALM (B. T.). **Verslag van het Deli Proefstation over 1 Juli 1919–30 Juni 1920.** [Report of the Deli Experiment Station from 1st July 1919 to 30th June 1920.]—*Meded. Deli Proefstation, Medan*, 2nd Series, no. 12, 1920, pp. 1–21.

Light-traps proved useless against tobacco moths, but a number of minor tobacco pests, *Gryllotalpa*, *Opatrum*, *Anomala*, *Nezara*, grasshoppers, etc., were taken. They should be very useful in the case of local outbreaks of these pests. Trials with Andres-Maire traps gave absolutely negative results. The most important result of experiments with a number of insectides was a new method of spraying against insects infesting tobacco seed-beds. The latter are sprayed every 4–5 days with a solution containing 2 per cent. of lead arsenate with the addition of 3 per thousand of soap, previously dissolved in water. This renders superfluous both the collection of the pests and the covering of the beds.

LAMBERTON (C.). **A Coleopteron injurious to Coffee in Madagascar.**—*Rev. Agric. Vét. de Madagascar et Dépendances, Antananarivo*, iv, 1919, pp. 326–328. (Abstract in *L'Agric. Colon., Florence*, xiv, no. 9, September 1920, p. 386.)

An unidentified boring beetle occurs on *Coffea robusta* and *C. canephora* in Madagascar. *C. liberica* does not appear to be infested. In any case young bushes under two years old are nearly always immune. The most vigorous bushes harbour the largest number of beetles. Some planters cut off all the infested twigs, and others cut down the bushes at ground level, but before adopting such drastic measures, it is necessary to investigate the economic effect of the infestation. The beetles live in the pith of the young branches, entering through a hole perpendicular to the axis. On horizontal branches the holes are always on the underside, so that they easily escape notice. A small chamber, rarely more than $\frac{4}{5}$ of an inch in length, is made in the pith, and in a given chamber eggs, larvae, pupae, and adults may sometimes be found together.

AGUILÓ (J.). **El** *Rhizotrogus aestivus* **Parásito del Olivo.** [*Rhizotrogus aestivus*, a Pest of Olive-trees.]—*Bol. Agric. Técnica Econ., Madrid*, xii, no. 141, 30th September 1920, pp. 680–682.

The adults of the beetle, *Rhizotrogus aestivus*, spend the daytime hidden under clumps of earth, in grass or the crevices of the bark of trees, and emerge after sunset to settle on olive trees, where they feed on the tender leaves and flowers, and are sometimes so numerous in Spain as to ruin the crop. Eggs are laid in the ground among decomposing leaves or delicate roots, on which the young larvae feed. The winter is passed in the ground, whence the adults emerge in April. The larvae do considerable damage to the roots and leaves of various plants, while the adults, as well as attacking olive-trees, feed on the young leaves of almonds and oaks.

As the adult beetles are most frequently in the trees between 4 and 5 in the morning, they can easily be shaken at this time into cloths laid beneath the trees. Lead arsenate sprays are also efficacious, but less economical.

ANDRES (A.). **Die Durchgasung von Gewächshäusern mit Bläusaure zur Vernichtung von Blättlausen und anderen Schädlingen.** [The Fumigation of Plant-houses with Hydrocyanic Acid Gas for destroying Aphids and other Pests.]—*Die Gartenwelt*, xviii, no. 18, 1919, pp. 139–140. (Abstract in *Zeitschr. landw. Versuchswesen in Deutschösterreich, Vienna*, xxiii, no. 5–8, May–August 1920, p. 100.)

Experiments are described in fumigating *Begonia*, *Pelargonium*, *Cactus* and other plants with hydrocyanic acid gas against Aphids and *Pseudococcus citri*. Half an hour is sufficient to kill these pests with a strength of 0·2–0·3 volume per cent., which does not injure the plants. Against *Eriosoma* (*Schizoneura*) *lanigerum* 0·5 volume per cent. must be used for a period between 30 minutes and an hour.

SEDLACZEK (W.). **Das Auftreten der Nonne in Böhmen im Jahre 1918.** [The Occurrence of the Nun Moth in Bohemia in 1918.]—*Centralbl. f. ges. Forstwesen*, 1918, pp. 219–227. (Abstract in *Zeitschr. landw. Versuchswesen in Deutschösterreich. Vienna*, xxiii. no. 5–8. May–August 1920, p. 102.)

As a result of observations extending from 1904 to 1918, the author believes that there exists a relation between the increase of *Lymantria monacha* on the one hand, and the temperature in the months of May, June, and July and the occurrence of evenings favourable to the flight of the moths, on the other. A low temperature during the feeding period is unfavourable to this pest.

ZIMMERMANN (H.). **Ueber die Erdraupe der Wintersaateule (*Agrotis segetum*, Schiff). Erdraupenschäden in Mecklenburg 1912–1917.** [The Caterpillar of *Euxoa segetum*. Damage done in Mecklenburg in 1912–1917.]—*Arch. Ver. Freunde der Naturgeschichte in Mecklenburg*, lxxiii, 1919, pp. 25–54.

——. **Ueber die Erdraupe der Wintersaateule. Ein weiterer Beitrag zu der Lebensweise und Bekämpfung.** [The Caterpillar of *Euxoa segetum*. A further Contribution on its Life-history and Control.]—*Mecklenburg. landw. Wochenschr.*, iv. no. 10, 1920, pp. 184–188. (Abstracts in *Zeitschr. landw. Versuchswesen in Deutschösterreich, Vienna*, xxiii, no. 5–8, May–August 1920, p. 100.) [Received 25th October 1920.]

The outbreaks of *Euxoa segetum* were most severe in 1917, rape and sugar-beet being chiefly attacked. The enormous losses were due to the fact that the young stages of the moth and of the food-plants occurred at the same period. Other favourable factors were the heavy, dry, clay soil, the lasting dry weather and the use of stable manure. Protective trenches may be dug, and domestic animals may be allowed to feed on the caterpillars. Crows are very useful in this connection. In August the caterpillars are killed by a bacterial disease. In 1918 no caterpillars or moths were seen after the month of August.

JENSEN (H.). **The Exact Determination of some Pests of Tobacco in Java.**—*Proefstation voor Vorstenlandsche Tabak, Semarang*, xxxv, 1918. (Abstract in *Mthly. Bull. Agric. Intell. & Pl. Dis., Rome*, x. no. 7–8–9, July-August-September 1919, pp. 1040–1041.) [Received 25th October 1920.]

The moth originally identified in Java as *Phthorimaea operculella*, Z. (*Lita solanella*, Boisd.) is now recognised to be *P.* (*Gnorimoschema*) *heliopa*, Lw. The true *P. operculella*, Z., is a mining caterpillar living in the leaves of certain Solanaceae and frequently infesting tobacco, though it has never been observed to do so in the East Indies. Its life-history differs considerably from that of *P. heliopa*: its eggs are laid on the leaves, and the caterpillars mine the leaves and pupate on the surface of the ground. The species of *Heliothis* that is very injurious to tobacco in Java has been identified as *H. assulta*, Gn.

The larva of a beetle that is also injurious and has hitherto passed as *Opatrum depressum*, F., has been sent to Washington for identification, and although no definite decision has been arrived at, it is certain that the Dutch East Indian species is neither *O. depressum* nor the allied species, *O. acutangulum*. It should be known provisionally as *Gonocephalum* (*Opatrum*) sp.

Mutyca grandis, **a Bug preying on the Macrolepidopteron,** *Papilio thoantiades*, **in Argentina.**—*La Prensa, Buenos Aires*, 7th April 1919. (Abstract in *Mthly. Bull. Agric. Intell. & Pl. Dis., Rome*, x, no. 7–8–9, July-August-September 1919, p. 1042. [Received 25th October 1920.]

The caterpillars of *Papilio thoantiades* (orange worm) have been observed in Buenos Aires to be preyed upon by a Pentatomid bug, *Mutyca grandis*. It is believed that this bug attacks other Lepidoptera injurious to agriculture, and a study of its life-history and habits is to be made.

Kryger (J. P.). **Further Investigations upon the European Trichogramminae.**—*Entomologiske Meddelelser, Copenhagen*, xiii, no. 4, 1920, pp. 183–188.

Further notes on the hosts of *Trichogramma evanescens* are given [*R.A.E.*, A, vii, 231].

The author had not seen Silvestri's paper on *Centrobia* [*R.A.E.*, A, vi, 504] when writing in 1918. He does not agree with Silvestri that the species found by the latter on oak is *Centrobia walkeri*, Förster, considering it a new species for which he proposes the name *C. silvestrii*. A key is given to the four European species of this genus, viz:—*C. försteri*, Kryger, *C. silvestrii*, sp. n., *C. silvestrii* var. *minor*, Silv., *C. similis*, Silv., and *C. walkeri*, Först. These are briefly described.

Rostrup (S.). **Jordloppeangrebet i 1918. Jordloppernes Levevis og Forsøg med deres Bekaempelse.** [Flea-beetle Attack in 1918. The Habits and Control of Flea-beetles.]—*142 Beretning Statens Forsøgsvirks. i. Plantekultur; Tidsskr. Planteavl., Copenhagen*, xxvii, 1920, pp. 216–286, 11 figs. With an English Summary.

Flea-beetles were particularly abundant in Denmark during the summer of 1918 [*R.A.E.*, A, vii, 541], the species concerned being *Psylliodes chrysocephala* on turnips and swedes grown for seed; *Chaetocnema concinna* on beets; and *Phyllotreta nemorum*, *P. undulata*, *P. sinuata*, *P. atra*, *P. nigripes*, and *P. vittula* on cruciferous crops.

The severity of the attack is probably chiefly due to weather conditions, a hot and dry summer being particularly favourable. Infestation was found to be most severe in areas that had been ploughed and manured in the spring.

The remedial agricultural measures advocated have already been noticed [*loc. cit.*]. For garden and experimental plots, spraying with tobacco extract diluted to a nicotine percentage of 0·1 (100–120 gals. an acre) is advocated. The spray should be applied as soon as the flea-beetles appear, and repeated in the event of new attacks.

FREDERICHS (K.). **Untersuchungen über Rapsglanzkäfer in Mecklenburg.** [Investigations on *Meligethes* spp. in Mecklenburg.]—*Zeitschr. f. angew. Entom., Berlin*, vii. no. 1, September 1920, pp. 1–36, 13 figs., 2 plates.

Investigations carried out in 1919 and further observations during the first half of 1920 in Mecklenburg, where rape is grown on a large scale, are recorded. The ordinary rape beetle, *Meligethes aeneus*, of which the early stages are briefly described, and the less common *M. viridescens*, together with *Ceuthorrhynchus assimilis*, gall-midges, etc., sometimes cause severe crop losses. It is difficult to say whether *Meligethes* or *Ceuthorrhynchus* is the worse pest, but the presence of the former is more apparent.

The feeding habits of *Meligethes* are dealt with in detail. After rape has flowered, the beetles have at their disposal *Raphanistrum*, *Sinapis arvensis*, *Raphanus sativus*, etc., and in July, *Sinapis alba*. During August they begin to migrate to the ground, where they hibernate. It is doubtful whether any larvae hibernate. The egg-stage lasts 4 days, the larval feeding period 8–12, the larval rest period 8, and the pupal stage 11–12. To this total of 31–36 days must be added the rest period of the adult 9–14 days, the total life-cycle above ground thus requiring 40–50 days. As regards the number of generations, the author was at first of opinion that in Mecklenburg there are two generations, the first swarming in the second half of June, and the second hibernating and mating in the following year; but in a supplementary note he inclines to the view that only one generation occurs annually, as neither he nor others have succeeded in breeding a second.

The injury done by the adult becomes noticeable when the cruciferous plants begin to flower. If the beetle appears when the plants are in full bloom, it often eats the nectaries when feeding on the pollen and sucking the nectar, but no further injury is done. If it appears early it makes its way through the buds in search of the pollen and destroys them.

Larval injury is of less importance, and is worthy of note only when the adults have been particularly harmful. In such cases of severe infestation, when food becomes scarce at the close of the flowering period, the young flowers are injured or even destroyed by the larva, though usually a pollen-feeder. It may even attack the shoots and the stems.

The few natural enemies of *Meligethes* include *Coccinella septempunctata*, *Malachius bipustulatus* and an Ophionine parasite, *Isurgus heteroceras*, Thoms. The latter plays an important part in checking infestation, and is probably the parasite found by Oberstein in 1919 and recorded by him as *Thersilochus morionellus*, Holmgr. [*R.A.E.*, A, vii, 354]. The beetle larvae are protected so long as they are in closed buds. Details of this parasitism are given.

FALCK (R.). **Die Resinolbrühe als Spritzmittel zur Bekämpfung tierischer Schädlinge.** [Resinol Solution as a Spray against Insect Pests.]—*Zeitschr. f. angew. Entom., Berlin*, vii, no. 1, September 1920, pp. 37–47.

The alkali and alkaline-earth salts of the phenol-aldehyde resins are easily soluble in water, and if concentrated to contain 33 per cent. of resin, which solution is commercially obtainable in Germany, serve to produce the sodium-resinol spray if diluted with water, and the lime-resinol spray if diluted with a solution of calcium chloride. These sprays have the same wetting power as soap solutions, and in the presence of atmospheric carbonic acid they soon decompose and liberate the resin. Decomposition may take place prior to use, and the resin then appears in the liquid in the form of a flocculent, emulsion-like precipitate. After the spray-fluid has evaporated, the resin remains, adhering with such tenacity as to afford a certain degree of protection for some considerable time.

A number of experiments with the caterpillars of *Pieris brassicae* are described in detail. It was found that the soluble resinol salts have a three-fold action. They first increase the adhesive power of water, thus enabling the surface of an insect's body to be wetted, and they make penetration into the stigmata possible. They then clog or seal the tracheae and their approaches by precipitating a thick solution of resin. Thirdly they dissolve or emulsify substances insoluble in water, such as carbon bisulphide; this may increase their activity.

A review of the substances acting in a similar manner at once directs attention to lime-sulphur, which in fact is the best spray for the San José scale [*Aspidiotus perniciosus*]. Resinol can therefore prove successful only if the above three actions are most marked in the presence of the material it is desired to affect and if it can be produced at a suitable cost. In most cases chemical remedial methods will be permissible only if treatment acts on fungus and insect pests simultaneously, and resinol may prove specially adapted for this purpose. The author's previous work with resinol was directed against fungi, and it was in the course of those experiments that its insecticidal action was first noticed.

In an addendum dated June 1920 it is stated that caterpillars of the first generation of *Clysia* (*Conchylis*) [*ambiguella*] are even more susceptible than those of *Pieris*. A sodium-resinol solution of 0·4–0·6 per cent. strength proves rapidly fatal. With the addition of carbon bisulphide, solutions containing 0·1 per cent. or less of resinol proved fatal. Tobacco extract also increases the effect.

Potash soap being available, it was found that strengths of 1·6–2 per cent. are fatal. In this case the penetration of the fluid seems sufficient to cause death; the clogging of the stigmata does not seem necessary. Soap, however, can be washed off after application, whereas resinol solutions are decomposed and remain adherent.

KLEINE (R.). **Sind manche *Phyllotreta*-Arten wirklich Getreideschädlinge.** [Are some species of *Phyllotreta* really Pests of Grain.]—*Zeitschr. f. angew. Entom., Berlin*, vii, no. 1, September 1920, pp. 48–57, 4 figs.

Several observers have recorded the infestation of grain by *Phyllotreta*, the two species mentioned being *P. vittula*, Redt., and *P. atra*, F., but their status as pests has remained doubtful.

Observations on *P. vittula* in a field of grain in Pomerania, showed that rye suffered most, barley less and oats least, even when the plants were intermingled. The surface of the ground was uneven, and in the wet, lower portions the attack was slight. The appearance of the injury was quite typical and comparable only with that of *Lema* (*Crioceris*) *cyanella*, L. Feeding started at the centre of the leaf and extended upwards. Young plants only seemed to be attacked.

The injury is not of a lasting character, growth being only delayed. Remedial measures are of doubtful value. Frequent harrowing seems to reduce attack.

It was only during the mating period that these beetles were seen on grain, and this may confirm Heikertinger's view that for mating the HALTICINAE seek plants other than their normal food-plants.

KRÜGER (P.). **Beobachtungen am Mehlmottenparasiten** *Nemeritis canescens*, **Gravenhorst; zugleich ein Beitrag zur Kenntnis der äusseren Anatomie der Ichneumoniden.** [Observations on the Meal Moth Parasite, *Nemeritis canescens*, Gravenhorst, being also a Contribution to the Knowledge of the external Anatomy of the Ichneumonids.]—*Zeitschr. f. angew. Entom., Berlin*, vii, no. 1, September 1920, pp. 58–67, 19 figs.

A Campoplegine, *Nemeritis canescens*, Grav., occurs in German flour mills, where it parasitises *Ephestia kühniella*, Z. In all probability it was introduced into Central Europe with the moth. Its food in the mills is not known. It has never been seen eating flour, and it does not appear to be long-lived, 16 days being the longest period that any of a large number of females found on 25th October 1918 survived. From a subsequent breeding experiment reproduction would appear to be parthenogenetic. The author points out that *N. canescens* provides favourable opportunities for studying the life-history of Ichneumonids. Its method of oviposition is remarkable. A female placed near meal-moth webs runs about on the flour, digging its ovipositor in repeatedly and apparently haphazard. It is possible that meal-moth larvae had previously occupied these spots. The victims are quite conscious of attack and endeavour to avoid their enemy. The latter carries eggs at the end of its ovipositor ready for instant deposition in the host.

After quoting Schmiedeknecht's description of *N. canescens* the author briefly describes its external anatomy.

LEGISLATION.

Rules and Regulations of the State Plant Board effective July 1, 1920.—*Arkansas State Plant Board, Little Rock*, Circ. 10, July 1920, 28 pp. [Received 18th October 1920.]

All the regulations here detailed were passed or amended on or since 24th April 1917.

The insects declared to be pests under these regulations are:—*Platyedra* (*Pectinophora*) *gossypiella*, *Cylas formicarius*, *Aspidiotus perniciosus*, *A. uvae* (grape scale), *Chrysomphalus tenebricosus* (gloomy scale), *C. obscurus*, *Aulacaspis pentagona*, *Eriosoma lanigerum*, *Dialeurodes citri* and *D. nubifera*.

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CONTENTS.

CONTENTS—*cont.*

VOL. VIII. Ser. A. Title-page and Index. [Issued July, 1921.]

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A reference in heavy type indicates that a paper by the author has been abstracted.

(3202) Wt.P3 184 1500 8 21 Harrow G.75 B

GENERAL INDEX.

In the case of scientific names the page reference is cited only under the heading of the generic name.

When a generic name is printed in brackets it signifies that the name is not adopted.

A.

C.

D.

E.

F.

G.

H.

I.

J.

K.

M.

N.

O.

P.

Q.

R.

S.

T.

U.

V.

W.

X.

Y.

Z.

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