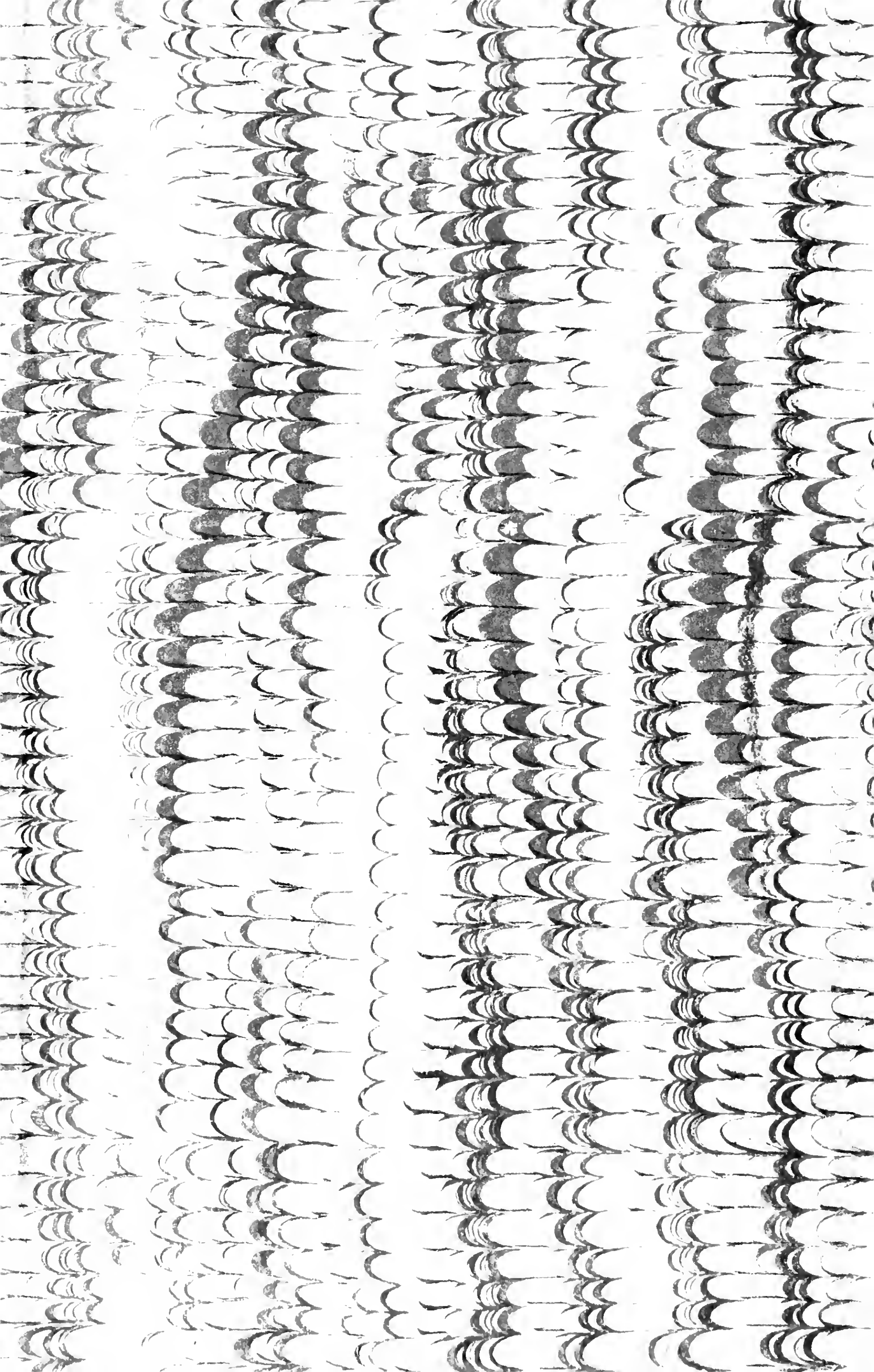

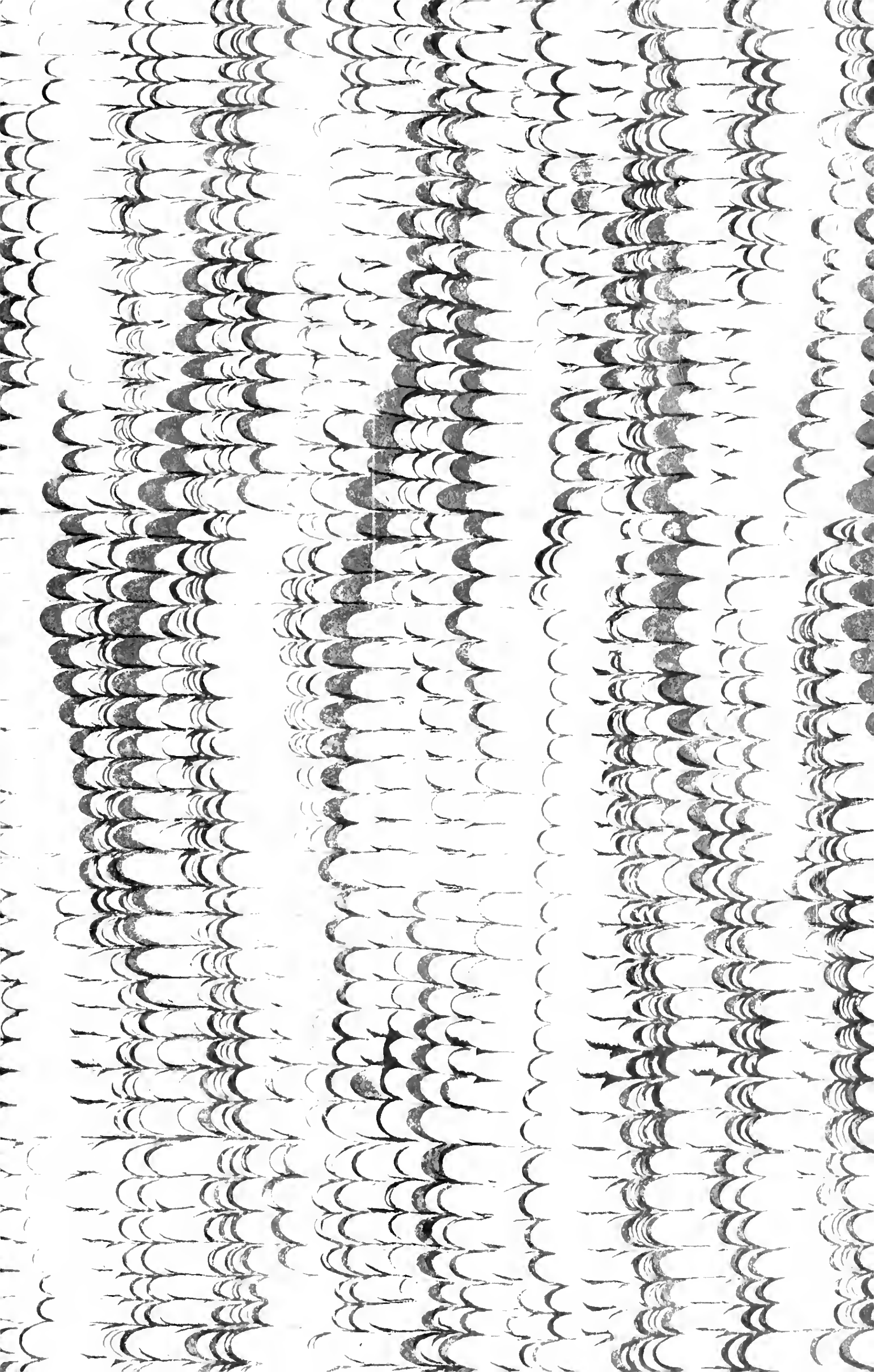

REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

VOL. II.

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ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

LONDON:
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DULAU & CO., Ltd., 37, SOHO SQUARE, W.
1914.

IMPERIAL BUREAU OF ENTOMOLOGY.

Honorary Committee of Management.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.

Publication Office.—27, Elvaston Place, London, S.W.

ERRATA.

Page 19	line 23	for " *vomitoria* "	read " *C. vomitoria.*"
,, 20	last line	,, " *vestilipennis* "	,, " *vestitipennis.*"
,, 21	line 45	,, " kerosine "	,, " kerosene."
,, 21	,, 47	,, ,,	,, ,,
,, 27	,, 39	,, " *Monstruus* "	,, " *Menstruus.*"
,, 46	,, 36	,, " drainiage "	,, " drainage."
,, 54	,, 23	,, " *H. ctenocephalis* "	,, " *H. ctenocephali.*"
,, 60	last line	,, " *X. cheopsis* "	,, " *X. cheopis.*"
,, 78	line 28	,, " *Uranstaenia* "	,, " *Uranotaenia.*"
,, 116	,, 25	,, " *Argus* "	,, " *Argas.*"
,, 121	,, 43	,, "DA COSTA (B. G. B.)"	,, "DA COSTA (B.F.B.)."
,, 150	,, 35	,, " Nicole "	,, " Nicolle."
,, 176	,, 38	,, " oi "	,, " oil."
,, 187	,, 11	,, " *augustipennis* "	,, " *angustipennis.*"
,, 187	,, 20	,, " CHALMERS (A. T.)"	,, " CHALMERS (A. J.)."

VOL. II. Ser. B. Part 1.—1-16. JANUARY, 1914.

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Report of the Tasmania Agricultural and Stock Department, *Hobart,* 1st July, 1913, p. 14.

The Chief Inspector of Stock states that under existing legislation and administration, the endeavour of the Department of Agriculture to deal with the eradication of ticks and lice has been fairly successful, though much difficulty has been experienced in trying to induce owners and others trading in sheep to carry out the provisions of "The Stock Act, 1905."

ENGELAND (O.). **Meine Erfahrungen bezüglich der Malaria-prophylaxie an Bord eines Kriegschiffes.** [My experiences of Malaria prophylaxis on board a warship.]—*Archiv. für Schiffs- und Tropen-Hygiene, Leipzig,* xvii, no. 15, Aug. 1913, pp. 523-531.

After dealing at length with quinine, the author remarks that in the tropics doctors have found that a thorough quinine prophylaxis is not always sufficient to prevent cases of malaria. He thinks that a ship's surgeon should guard the crew from mosquito bites as completely as possible. If the vessel is anchored less than a mile from the coast, and particularly if a land wind is blowing, Anophelines may be found on board in large numbers. Boats and lighters often bring them, and the author has found them in fresh vegetables. In the case under report, the following measures were adopted:—(1) An anchorage $1\frac{1}{2}$–2 miles from the shore was chosen wherever possible. (2) Shore-leave was only granted by day; visits to native huts were forbidden; on any particular case of night leave the man concerned received a dose of one gramme of quinine on his return. (3) All vegetables brought on board were washed at the gangway. (4) Covered native boats were not allowed to come alongside. (5) When coal-lighters and water-boats came alongside all doors and windows on that side of the vessel were shut and that side was washed down afterwards. (6) The men were trained to destroy all mosquitos on board. (7) When less than a mile from land, all openings were protected by wire or cotton netting, excepting those of the cook's galley, where they were found to cause unbearable heat. The mesh of European-made netting was too wide for the small African mosquitos, but the difficulty was met by greasing the meshes; this also was a protection against rust. The cotton gauze was found to last longer, being easily replaced and much cheaper. A cloth-covered wood or metal frame is best, the netting being lightly stitched to the cloth. The mesh must not be wider than 2 mm. These gauze screens were placed in position at 5.30 p.m. and taken down at 6 a.m. The men were not allowed to sleep on deck in those places where it was necessary to use the screens. (8) In order not to attract mosquitos only the lights absolutely necessary were allowed to burn. (9) The deck watch wore high boots at night and were allowed to smoke. (10) Those men who were landed for survey work were provided with mosquito nets.

Few mosquitos were seen on board as a result of these measures. One man only was attacked by malaria, and he was a cook working in a brightly-lit galley unprovided with screens. The usual dose of quinine had been administered to him regularly.

The author concludes by insisting on the need of combining the quinine treatment with mechanical protection against mosquito bites. A bibliography is given.

Malloch (J. R.). **A new species of *Simulium* from Texas.**—*Proc. Entom. Soc., Washington,* xv, no. 3, Sept. 1913, pp. 133-134.

Simulium distinctum, sp. nov., is described; it was taken at Devil's River, Texas, on 5th May 1907, at light.

Eysell (A.). **Verbesserte feuchte Kammer zur Stechmückenzucht.** [An improved damp chamber for breeding Mosquitos.]—*Archiv. fur Schiffs- und Tropen-Hygiene, Leipzig,* xvii, no. 20, Oct. 1913, pp. 712–714, 1 fig.

The apparatus consists of a saucer half full of water, in which a glass is placed containing a little water and fine white sand, the surface of which slants about 30 degrees, so that its lower half only is under water. Over this glass a bigger one is placed upside-down to serve as a cover. The whiteness of the sand shows up the eggs clearly. It is first washed many times and then poured into the glass with water. By tipping the glass the required slant is obtained. Then the water is poured off and the glass placed upright. The water saturating the sand drains out and forms the pool referred to above. The dead female is removed and the eggs transferred on a sterilized platinum palette knife to breeding chambers. To ensure an accurate count of the eggs only one female is introduced at a time.

Wood (H. P.). **Experiments in the use of sheep in the eradication of the Rocky Mountain Spotted Fever Tick.**—*U.S. Dept. Agric., Bull. no.* 45, 22nd Nov. 1913, 11 pp.

In order to test the possibility of trapping the spotted fever tick by means of sheep, some experiments were performed by the Bureau of

Entomology in the Bitter Root Valley in Montana in June and July, 1913. The first experiment, with twenty sheep, was carried out in country known to be well infested with ticks. On the morning of 4th June and thereafter until the evening of 14th June, the sheep were put out to graze twice a day for about two hours at each feeding. For the remainder of the time they were kept in corral. About three-fourths of the time the sheep were grazing, they were allowed to run at will, and during the other one-fourth they were made to feed in certain places known to be well infested with ticks. During the whole period the development of the ticks was watched, and when it was found that some of them were nearly engorged, the sheep were driven to the camp laboratory and examined, usually twice a day, and any engorged females removed. Two examinations were made of each sheep to locate the living ticks and to remove the dead ones. The first began on 10th June and was completed on 15th June. The second began on 23rd June and was completed on 27th June. Other less thorough examinations were also made. A table shows the distribution of the ticks recovered from the sheep to be as follows:—Head: 31 dead, 45 alive; neck: 28 dead, 29 alive; upper part: 30 dead, 15 alive; sides: 23 dead, none alive; underneath: 3 dead, 23 alive.

In certain cases a known number of ticks was placed on a sheep and their subsequent distribution and behaviour were noted. In one of these experiments thirty-three female ticks were placed on one sheep, but only one of them fed sufficiently to lay eggs, though there were six females which stood a fair chance of engorging; so that it is difficult to estimate what percentage of females that get on to sheep in nature will engorge to repletion. Lambs or sheared sheep would require to be dipped, for the results of the experiments tend to show that such animals present conditions that are favourable for the development of the ticks, and kill but few; therefore if sheep are to be used in the work of tick eradication they must carry heavy wool.

There are practical difficulties in the use of sheep for this purpose. In the first place, it would be necessary to eliminate temporarily all live stock except sheep on which ticks could be destroyed at weekly intervals by dipping or otherwise; and, indeed, it is impossible to stock a given area heavily with sheep, and at the same time carry the usual number of other live stock. It would also be necessary to drive the sheep to places in which the ticks are known to be located, for, if left to themselves, the animals would only go where they could find the best grazing. Finally the possibility that sheep might serve as a reservoir for the virus of spotted fever is a point that should be tested before they are used at all in the destruction of ticks

It appears, nevertheless, that these animals are good collectors of ticks. Six sheep with heavy wool picked up 72 females and 47 males in 11 days, and the author is of opinion that under the same conditions a similar number of horses or cattle would not have picked up and retained nearly so many. Therefore in tick country, which is favourable for grazing sheep, it would be advantageous to use them as collectors of ticks. By dipping the sheep once in seven days it would seem that much good could be accomplished. But the author is of opinion that the general dipping of all domestic animals remains the most reliable measure for eradicating ticks.

Mansion (J.). **Les Phlebotomes en Corse.** [*Phlebotomus* in Corsica.] —*Bull. Soc. Path. Exot., Paris,* vi, no. 9, 12th Nov. 1913, pp. 637-641, 1 fig.

The author says that Leger and Séguinaud identified one or two cases of Pappataci fever, in Corsica, in the summer of 1912, and attributed it to *Phlebotomus pappatasii,* Scop., on the strength of two specimens captured near Bastia. The author is inclined to doubt the diagnosis of the insect, and on the advice of Leger, studied the question on the spot during the autumn of 1912, the spring, and the greater part of the summer of 1913, but up to that time without result. No *Phlebotomus* were captured until the beginning of September. The summer had been very dry and the appearance of these insects coincided with the first rains. The author says that he is not sure whether it is possible to establish a relation between the appearance of *Phlebotomus* and the moisture of the air, or whether the individuals captured in September were part of a second summer generation, the first part of which had escaped his observation. He gives the result of his captures, with the weather conditions day by day from the 11th September to the 23rd October, during which time he caught 56 males and 19 females. The largest numbers were obtained in his house, which was situated on a hill to the west of Toga, 700 metres from the sea, and about 80 metres above sea-level. The *Phlebotomus* never entered the house until after sunset. The time during which they might be captured rarely exceeded 50 or 60 minutes, between 5.30 and 8.30 in the evening, and they usually rested on the windows. The general result of the author's captures tends to show that the insects are more numerous in warm and damp weather, with a cloudy sky, that is to say, the condition known as sirocco. The strong westerly wind (libeccio), prevents all movements of Diptera, and after 23rd October no more were seen. Only the females, and those in only a few cases, were found to be engorged with blood. The author gives details of the structure of the species captured and points out that the genital forceps of the male, which is very important for determination of the species, has a distinctive structure, sufficient in his opinion to justify its erection into a new species, which he proposes to call *P. legeri*. He was able to make certain observations on the life of *Phlebotomus* in captivity, and found that the insects lived about 48 hours in dry air and 88 hours in moist air. Attempts to cause either males or females to bite the author, either immediately after capture or after several days of captivity, failed. He was unable to observe copulation, nor did he succeed in causing females carrying ripe eggs to oviposit, and he was also unable to incubate eggs taken from the abdomen. The number of eggs found on dissection averaged 46, with a maximum of 55. All attempts to discover larvae of this species failed. Four members of the author's family presented slight symptoms of Pappataci fever between 9th and 16th October, and although the author does not feel sure of the diagnosis, he thinks it at least possible that the febrile condition was caused by the bite of some of the flies which he caught and found gorged with blood. Under the conditions observed he regards it as quite easy to avoid the bite of *Phlebotomus* by shutting all doors and windows just before sunset.

Sorel (F.). **L'Hygiène á Bassam en 1912.** [Hygiene in Bassam in 1912.]—*Bull. Soc. Path. Exot., Paris*, vi, no. 9, 12th Nov. 1913, pp. 645-653, 3 sketch maps.

The author mentions amongst matters dealt with by the laboratory at Bassam, Ivory Coast, in the course of the year 1912, that with regard to yellow fever and malaria all the well-known prophylactic measures were adopted. Throughout the year five mosquito-catchers were continuously employed. In addition to oiling pools, and other water not intended for drinking purposes, the author reports that he used cresyl with great success, laboratory experiments having shown that pure cresyl is a poison to the larvae of *Stegomyia* and *Anopheles* in five minutes when diluted in the proportion of three drops to 500 c.c. of water, and in 8-10 minutes when diluted to two drops per 500 c.c. The pupae resist longer but are killed by three drops in 500 c.c. after about one-half to three-quarters of an hour's exposure. The work of the mosquito-catchers has been greatly diminished in consequence of the spread of knowledge amongst the inhabitants, and most of the heads of factories now employ a man for this special purpose. The free use of pumps for emptying gutters and other water receptacles has greatly diminished the number of breeding places of the larvae. The reservoirs of rain water received special attention, and the author devised the following arrangement for preventing the entry of insects or larvae. The rain-water pipes were made to empty themselves into a funnel fitted at the top with a galvanized iron grid, and below with a piece of fine wire gauze, the lower part of the pipe being so arranged that in case of storms the first portion of the water could be directed away from the reservoir, and thus avoid the carriage into it of dust and dirt from the roofs. In spite of the suggestion of this device and the promise that it would be put in operation, the author complains that in practice he found it much more useful to send one of his employées to warn the occupants of the house or factory and to see that the necessary precautions were taken. Marshy places and pools round the village were filled up, and the general result of the operations has been the practical disappearance of *Anopheles* and *Stegomyia*. He remarks, however, that at certain seasons northerly winds carry into the town mosquitos which are bred in the marshes situated on the other side of the lagoon. These mosquitos are generally either *Culex* or species of the genus *Mansonioides*. The drainage of these marshes will, he says, require the intervention of the engineer, but he hopes that the dredging of the port and deepening of the navigable channel will greatly assist in carrying off the water; meanwhile it is intended next year to plant a larger number of *Eucalyptus* and *Taxodium distichum* (Black Cypress). The author further gives certain regulations with regard to natives, which were found desirable in order to secure the segregation of the possible virus carriers, and three maps of the town are given showing the progress of the work from 1910 to 1912.

Quinine is now regularly distributed to the children in the schools, and the malarial index had fallen from 40% in 1910 to 12% in November 1912. In this way the adult natives have become educated to the desirability of taking quinine as a prophylactic.

Ewing (H. E.). **A new parasite of the House-Fly** (*Acarina, Gamasoidea*).—*Entom. News, Philadelphia*, xxiv, no. 10, Dec. 1913, pp. 452-456, 1 pl.

For several years the author noticed that house-flies are occasionally found flying about with rather large Gamasid mites hanging to them. Never more than a single mite has been observed on one fly. It is well known that flies, as well as many other insects, carry non-parasitic mites, especially of this family, whereby the distribution of the latter is effected, and for this reason the author at first paid little attention to these mites. Upon later investigation, however, he found mites that had their chelicerae inserted into the ventral body-wall of the fly, and in one case the mite remained so attached after being killed, along with its host. When these mites feed upon the house-fly they attach themselves always at the base of the abdomen on its ventral surface, the anterior end of the mite being directed toward the head of the fly. Thus far, only the females of the mite have been found. A systematic description of the species is given, under the name of *Macrocheles muscae*, sp.n.; the specimens described were taken from *Musca domestica* at Ithaca, New York, and at Corvallis, Oregon.

Grünberg (K.). **Ein neuer Fall des Vorkommens der Larve der Rinderdasselfliege im menschlichen Auge.** [A further case of the presence of the bot-fly larva in the human eye.]—*Sitz. Gesell. Naturf. Freunde, Berlin*, nos. 5 & 6, May-June 1913, pp. 298-304.

Up to the present there are only three cases recorded in medical journals of the presence of a larval insect in the human eye. The insect was probably in all cases the cattle bot-fly. It was always found in the anterior chamber of the eye, and in children of 5 to 9 years of age. In the present case, the patient was again a child; the larva was found in the retina and caused acute chorioretinitis, leading to the loss of the eye. Upon examination of the larva, it was found that it agreed in all its characters with the form described by Kennel in 1904. The author states that it undoubtedly belongs to the genus *Hypoderma*. The question of the species is more difficult to settle, as it is not unlikely that the larva, in consequence of its unusual surroundings has become slightly modified.

Alcock (Col. A.). **Synopsis of the Anopheline Mosquitos of Africa and of the Oriental Region,**—*Jl. London School Trop. Med.* ii, pt. 3, November 1913, pp. 153-166, 1 pl.

This is a detailed synopsis intended for the convenience of medical men. The author says that his experience has taught him that the method of identifying *Anopheles* species by the exact form and distribution of the scales of the body is confusing, and sometimes misleading, although he does not ignore the fact that the nature of the scales and the general scheme of colouring of the wings provide the means of partition of the old genus *Anopheles* into four natural and fairly convenient subgenera, viz. *Anopheles* (s.r.), *Myzorhynchus*, *Myzomyia* and *Nyssorhynchus*.

DRAKE-BROCKMAN (R. E.). **Some Notes on *Stegomyia fasciata* in the Coast Towns of British Somaliland.**—*Jl. London School Trop. Med.*, ii, pt. 3, Nov. 1913, pp. 166-169.

The author describes the egg, larvae, pupae and imago of *Stegomyia fasciata*. The eggs are always laid singly and never adherent together in rafts, usually along the water-line, and always within an inch of it. Evaporation of the water and the drying of the eggs does not interfere with the life of the majority of them, except perhaps in the hot summer when the maximum shade temperature rises as high as 109° F. He thinks it probable that in Somaliland all eggs deposited in tins, broken bottles and the like, after rains and just previous to the hot summer, are destroyed by the rapid evaporation of the water and the heating of the receptacles, the species being continued by the individuals which aestivate. The larvae emerge two to three days after oviposition and pupate in four or five days, but if food is scarce the larval stage may last for three weeks or more. They will survive in the smallest quantity of water, a thimbleful being sufficient for half a dozen of them. When water is plentiful the author says it is surprising how many larvae will exist together and thrive without devouring each other, a not uncommon occurrence when the food supply is getting scarce. *Stegomyia* larvae will coexist in the same water with those of *Culex sitiens*, Wied. (*salus*, Theo.), and probably other larvae. They prefer rain water, although brackish well water is also acceptable. The pupal stage lasts about twenty-four hours, and there is no doubt, in the author's opinion, that large numbers of pupae die in nature, just as they do when artificially bred, for in the last fortnight of June the heat on the Somali coast was so great that he was unable to continue breeding experiments after that date under natural conditions.

The insects do not feed until about twelve hours after emergence. It is in this stage that some of their non-aquatic enemies attack them, and the commonest of these is the little red ant (*Pheidole*) so ubiquitous in the Tropics. It is probable that these ants, together with spiders, destroy large numbers of the aestivating mosquitos as well. The author gives tables of experiments on the length of life of *Stegomyia fasciata* when unfed and when fed on dates and on human blood. The results are not summarised, and the life period is exceedingly variable. Unfed mosquitos did not live longer than four days. Those fed on blood lived from five to thirty days, and those fed on dates for about the same period, but the range of life was very great.

WENYON (C. M.). **The Length of Life of *Phlebotomus* in Captivity; a Note on a Method of keeping the Flies alive for Experimental Work.**—*Jl. London School Trop. Med.* ii, pt. 3, November 1913, pp. 170-171.

The difficulty which has been experienced in keeping these flies alive in captivity has often led to the assumption that the length of their life in nature is very short, but the author has succeeded in keeping them for several weeks by placing them in porous earthenware pots covered with muslin and standing in water, the insects being thus able to enjoy a cool and moist atmosphere with plenty of fresh air.

The finest muslin had to be used for the sand-flies, as they were found to force their way through mosquito netting of the smallest mesh obtainable. The flies were liberated every second, third or fourth day into a large net from which they were easily caught separately in small glass tubes for feeding. The observations began with seven females and two males on 20th June, and on 8th August, the last fly was dead. During the whole of this time no eggs were laid, though on dissection the females were found to be full of well-developed eggs. It is probable that a suitable medium for their egg-laying was not present. One fly was kept alive for over forty-six days, and as this fly had not been raised from the egg its age must have been still greater.

Brues (C. T.). **The Geographical Distribution of the Stable-Fly,** *Stomoxys calcitrans.—Jl. Econ. Entom., Concord,* vi, no. 6, Dec. 1913, pp. 459-477.

On account of its economic importance, the author publishes a detailed account of the distribution of *Stomoxys calcitrans,* the geographical range of which is very wide, rivalling that of the house-fly. It occurs commonly in parts of every zoological region, and practically throughout most of them. He considers that it is probably native to the Palaearctic region, whence it has followed man in his migrations to all parts of the world. In the United States it was common in the vicinity of Philadelphia as early as 1776. It is not equally abundant everywhere that it occurs, but it is much more common in temperate regions such as the United States and Argentina. In the Tropics it occurs very generally, but almost always in lesser numbers than in cooler climates.

Drake-Brockman (R. E.). **On the Occurrence of an Epidemic of Relapsing Fever in Bulhar, British Somaliland.**—*Jl. London School Trop. Med.* ii., pt. 3, Nov., 1913, pp. 195-199.

The author says that as there is apparently no record of the occurrence of relapsing fever in Somaliland, a few remarks on an outbreak occurring during the months of February, March, and April, 1913, may be of interest. This took place at Bulhar, a town on the coast not more than forty years old. The larger part of it consists of many hundreds of huts arranged together in irregular blocks, each block belonging to a distinct tribe, and called locally a "haffa." The haffa in which the outbreak occurred was inhabited by a race of outcasts called Midgans, who are chiefly engaged in sweeping the town or skinning the animals slaughtered daily for the consumption of the inhabitants. The Midgan haffa is set somewhat apart from the other haffas and near to the slaughter-houses on the outskirts of the town. Being outcasts the Midgans are dirtier in their habits than the other Somalis, but, notwithstanding this, there is one haffa, the Dulbahanta, mostly composed of destitute people, adjoining the Midgan haffa, while several other haffas are within a short distance. Out of 108 inhabitants in the Midgan haffa on 17th April, thirty-eight persons had recovered and seventeen were suffering. In the Dulbahanta haffa with seventy-five huts and one hundred and fifty-two inhabitants, six had recovered, while eight still had the disease. The following species of ticks were collected either in the huts or close by: *Hyalomma aegyptium*, *Rhipicephalus pulchellus*, *R. simus*, *R. sanguineus*, *Boophilus* sp., *Ornithodorus savignyi*, and *Argas persicus*. *Ornithodorus savignyi* was found almost entirely in the soft soil or sand covering the floor of the huts or immediately outside them. According to the inhabitants of the haffa it is very well known to them and is very common in all the coast towns; the Somalis have a special name for it, "Kudkudeh," or "Kudkuda," all other ticks being called "Shillin." The bite is said to set up great irritation, and with subsequent scratching abrasions result which not infrequently become infected and ulcerate.

Argas persicus was found to be very common in the huts of those who kept fowls, and every fowl examined showed dozens of the minute larvae fixed on to the skin around the neck and on the back. The Somalis say that it never attacks them, and they have no name for it.

The author says that everything points to the disease having been recently imported from British East Africa, and to the parasite being *S. duttoni*. During the last few years a very large colony of Somali traders has been formed in Nairobi, and a week rarely passes without numbers arriving at or departing from the Somali coast. The author thinks that the Somalis are probably correct when they say that although *Ornithodorus savignyi* has been known to them from their childhood, relapsing fever is quite new to them and could only have been imported this year.

Darling (S. T.). **The part played by flies and other insects in the spread of infectious diseases in the tropics, with special reference to ants and to the transmission of *Tr. hippicum* by *Musca domestica*.**—Reprint from *Trans. XVth Internat. Congress Hyg. & Demog. Sect.* v., *Washington*, 1913, 4 pp.

In order to ascertain if ants acted as carriers of infectious diseases of bacterial origin, several species were trapped and fed with typhoid bacilli. After dissection it was not possible to cultivate *B. typhosus* or any other micro-organism from their intestinal tract. In the large yellow ant, *Camponotus landolti zonatus*, Emery, formic acid was absent in the head and thorax, but was present in the abdomen to the amount of 3·51 per cent., or 1·43 per cent. of the entire body weight. Another species, *Tetramorium guineense*, contained 2·1 per cent. by weight; 76 ants of another lot contained 1·3 per cent. free acid and 7·5 per cent. combined acid. Common ants then contain from 1 to 4 per cent. of formic acid, and it would appear that they may effectually sterilize bacteria in their food. Further experiments showed that ants are capable of acting as mechanical carriers of *B. typhosus* on their legs.

Recently the author has been interested in the question of the transmission of trypanosomiasis of horses by *Musca domestica*, this disease (murrina) having visited the corral mules and draught horses on the Panama Canal Zone in 1909. As it was chiefly among the mules, it could not be ascribed to copulation. Careful consideration resulted in testimony tending to incriminate no other insect but the common fly. After further observation it seemed reasonable that the fly transported the trypanosome from the sores of infected animals to the fresh cuts of clean animals. In pursuance of a rational mode of prophylaxis based on this hypothesis, the following recommendations were made in order to detect and isolate all infected animals :—The isolation of all suspects in screened stables ; the diagnosis of infected animals in the laboratory, by microscopic examination and animal inoculation ; the sacrifice of all infected animals ; and the protection of all non-infected animals by suitable dressings for their wounds. Thirty-five infected animals were detected, and the precautionary measures were at once carried out. The results were eminently successful, for the disease has been stamped out in the corrals, and has not reappeared in 2 years, although rife in nearly all the outlying districts of the Republic of Panama. The author suggests that more attention be paid to the possibility of the transmission of trypanosome diseases by means of *Musca domestica*.

JARVIS (E.). **Trapping sheep-maggot flies.**—*Queensland Agric. Jl., Brisbane,* Aug. 1913, pp. 105–107.

One of the many remedies suggested for this notorious sheep pes is that of trapping the adult fly. American entomologists have found the plan very successful in controlling the Stable Fly (*Stomoxys calcitrans*) and in view of the fact that a single female specimen of the common Sheep-Maggot Fly (*Lucilia sericata*) is credited with laying 500 eggs, and probably " strikes " several sheep, a method of this kind which might result in the capture of thousands of these flies appears worth a thorough trial. A simple trap can be manufactured with little trouble out of a kerosene case and a piece of wire gauze, the latter being fixed to a movable light framework of wood, so that dead flies can be easily emptied out. Its efficiency will mainly depend on the attractiveness of the bait, for which decaying animal or vegetable matter is suitable. The best mode of applying this method of trapping would be that at least ten traps be used in paddocks of 100 acres, each being placed on a slab fixed to a stout pole, the latter being sufficiently high to prevent sheep from reaching the trap, and to give the breeze a chance to become charged with the odour of the decaying bait. Any decaying animal matter lying about must be burnt or otherwise destroyed.

Eine neue Art der Mückenbekämpfung. [A new means of combating gnats.]—*Frankfurter Zeitung, Frankfurt,* 25th Nov. 1913.

This article refers to the plan proposed by Dr. Gebbing, Director of the Zoological Garden at Leipzig, to employ the wild duck (*Anas boschas*) as a destroyer of mosquito larvae. Several absolutely successful instances are recorded, and the need of measures for the protection of this bird is emphasised.

ECKARD (B.). **Uebertragung des** *Trypanosoma rhodesiense* **durch die** *Glossina palpalis.* [The transmission of *Trypanosoma rhodesiense* by *Glossina palpalis.*]—*Centralbl. für Bakt. Jena,* xxii, nos. 1 & 2, 26th Nov. 1913, pp. 73–76.

The results of recent work go to support Kleine's supposition that in Africa, under suitable climatic conditions, any known pathogenic trypanosome can develop in any species of *Glossina,* but to ascertain if there is a special selection of any particular species of *Glossina* further research is necessary.

The author has now transmitted *T. rhodesiense* through *G. palpalis.* This experiment was made on Tanganyika, with trypanosomes taken from a man in Nyasaland; 476 laboratory-bred *G. palpalis* were fed for four days on infected guinea-pigs, and after a two days' fast were fed on healthy goats and monkeys. The first trypanosomes were detected on the 32nd day. By separating the *Glossina* and feeding them singly, twelve flies were ascertained to be infective. Besides these, nine that died after the 10th day showed developing trypanosomes. Three of the infective flies were used to test the infectiousness of their several organs. After sucking blood from healthy animals for two days, they were anæsthetised with chloroform, the salivary glands, proventriculus, and intestine were removed and subcutaneously injected into nine different healthy monkeys. On the fifth day trypanosomes were apparent in all of these. This corresponds with the results obtained by Kinghorn and Yorke in similar tests with *G. morsitans,* but is contrary to those of Kleine, Eckard, and M. Robertson, who were unable to convey trypanosomes to monkeys when using the intestine or proventriculus of *G. palpalis,* the salivary glands alone proving infectious. (In a footnote the author adds that Kleine and Eckard have continued their work, and subsequently only the salivary glands were found infectious in the case of eleven out of thirteen flies). As it is probable that *T. rhodesiense* and *T. gambiense* develop similarly in *Glossina,* the reasons for the different results required investigation. A technical error could not alone account for it. Among other things, the possibility of the results being influenced by the age of the flies was considered. In Kleine and Eckard's experiments the average age of the infectious *Glossina* was fifty to sixty days, whereas in the author's case it was only forty. To decide this point a fly was kept alive for fifty-four days. In this instance only the monkey injected with the salivary glands fell ill on the fifth day as usual. A microscopic examination showed numerous trypanosomes in the intestines of the fly, and therefore the author supposes that the development of trypanosomes in the intestine ceases gradually, and that the virulent parasites migrate to the salivary glands.

TAYLOR (F. H.). **Report of Entomologist.**—Reprinted from the *Report for the Year* 1911 *of the Australian Institute of Tropical Medicine, Townsville,* May 1913, 24 pp., 3 pls.

The report is practically an annotated list of North Australian blood-sucking flies and ticks, principally from the vicinity of Townsville, Queensland. Of mosquitos, 17 species are recorded, of which four are described as new, namely, *Culex* (*Culicelsa*) *abdominalis*, *C.* (*Culicelsa*) *consimilis*, *C.* (*Culicelsa*) *paludis*) and *Ochlerotatus* (*Pseudohowardina*) *linealis*. *Stegomyia fasciata*, F., is stated to occur throughout the whole year, all along the Queensland coast, and *Culex fatigans* is equally ubiquitous, being the common house mosquito. Only two *Anopheles* are mentioned: *A.* (*Myzorhynchus*) *bancrofti* and *A.* (*Nyssorhynchus*) *annulipes*, Walk. The former is noted as being a vicious biter and prevalent throughout Northern Australia, while the latter is relatively scarce.

Of the TABANIDAE, or " March Flies " as they are called in Australia, nine species of *Tabanus* only are listed, all being fully described. Six species are considered to be new, viz., *fuscipes*, *lineatus*, *pseudoardens*, *nigritarsis*, *tetralineatus* and *parvus*.* A new species of *Culicoides* is also described, from Townsville.

Ten species of ticks are recorded, of which *Argas persicus*, Fisch., *Haemaphysalis australis*, Neum., *Hyalomma aegyptium*, L., *Boophilus australis*, Full., and *Ixodes holocyclus*, Neum., the common scrub tick, are of economic importance.

LOUGHNAN (W. F. M.). **Phlebotomus Fever and Papataci Flies in Aden.**—*Jl. R. Army Med. Corps, London*, xxi, no. 4, Oct. 1913, pp. 402-405.

Though Phlebotomus fever was first described as occurring in Aden in 1910, an examination of the annual reports from 1907–1909 shows a large number of admissions under " Pyrexia of uncertain origin." The hospital records of the 18th Indian Infantry, stationed at the Crater, Aden, for 1912 were examined, and from these it appeared that 108 cases of pyrexia of uncertain origin were admitted. The blood from all these cases was examined for malarial parasites, but none were found. The clinical symptoms were typical of Phlebotomus fever. The monthly incidence of the fever in the years 1907–1909 shows that it was epidemic in June and July, as was also the case for the fever in 1912, and this suggests that all these cases were really sand-fly fever. At Aden the symptoms vary considerably in severity. The mortality is nil, and the disease appears specially to affect newcomers. The distribution of the fever varies from year to year; in some years it is most prevalent at the Crater, in others at Steamer Point which is somewhat higher. Malaria is not endemic at Steamer Point nor at the Crater. The troops are practically free from enteric fever, and it is uncommon amongst the civil population. The eight-day continued fever of Crombie is frequently met with; dengue appears sporadically, but no serious epidemic has been noted since 1872–3. The fever seems to be most prevalent from the beginning of May to the end of October; there is a definite relationship between the climatic conditions and the fever; the season of high temperatures and greatest humidity produces the highest admission rates.

Four specimens of sand-flies captured in the beginning of June were found to be *Phlebotomus minutus*. The adults have been found in dark places in houses and in the caves frequented by camel men and

[* Two of these names, *fuscipes* and *lineatus*, have already been used in the genus, and therefore cannot stand. Mr. E. E. AUSTEN is publishing a note, in which he is revising some other points in the nomenclature in this paper.—ED.]

sweepers. They are found sparsely distributed during the colder months, but increase in numbers with the onset of the monsoon from the end of May, when the temperature averages 95° F. and the humidity of the atmosphere is greater than during the colder months.

Although the conditions might be considered favourable, the author has not been able to discover the breeding places of the flies.

King (A.). **Report of the Medical Officer of the Second Division for the Year 1912-13.**—*Ann. Rept. on the Hospitals and Dispensaries, St. Lucia, Castries,* July 1913.

Malaria and pellagra are mentioned among the diseases prevailing in the district during the past year. Malaria seems to have been more prevalent and severe than during the previous year, although preventive measures were still carried out in a small way by distributing "Millions" fish in pools, cleaning edges of streams where vegetation might harbour *Anopheles* larvae, distributing quinine in schools, etc. The conditions during most of the year were not favourable for the "Millions," as there were many spells of dry weather, during which they all died except in large collections of water, and the smaller pools required constant re-stocking.

Pellagra seems to be gaining a firm foothold in the Colony, and has advanced beyond the limits of the vagrant and aged pauper classes, to which it has hitherto seemed to be entirely confined. Its incidence is very erratic and difficult to fit in with any of the theories so far propounded as to its causation.

Regarding the sanitary conditions, the district has improved in several respects. *Stegomyia fasciata* was not very prevalent, except in the neighbourhood of the stacks of logwood on the wharves, but unless inspection was kept up, people grew lax in the disposal of water. During the months December to March, 34 cases of infringement of the Board of Health anti-mosquito bye-laws were dealt with by the police in Castries, resulting in 28 convictions, 1 dismissal, and 5 withdrawals.

In view of the possible disease-carrying powers of rat fleas, measures were taken for the reduction of the numbers of rats in the town and neighbourhood. The laboratory work in this connection consisted in dissection and examination for gross lesions, microscopical examination of smears, and the making of cultures when thought necessary. Notes were made of species, sex, size, place caught, number of fleas, etc. Fleas vary with the habitat of the rat, the season and the rainfall. Rats caught in stores and houses have numerous fleas, country rats few. In cooler months the flea population decreases. On rats caught in wet weather, hardly any are found. With very few exceptions one single species of flea has been noted (*Xenopsylla cheopis.*)

Da Costa (B. F. B.). **Sleeping Sickness in the Island of Principe.**—90 pp., 8vo., 3 pls., 4 tables. (London, Baillière, Tindall & Cox, *Price,* 2*s.* 6*d.* net.)

Sleeping sickness has been known for more than a century on the West Coast of Africa, but it seems to have occurred in the island of

Principe only during the last twenty to thirty years. There appears reason to suppose that *Glossina palpalis*, or the "Gaboon fly" as it is called locally, must have been introduced with the cattle from the African coast, and probably from the Gaboon, somewhere about 1820. Up to 1890 the bite of the fly was regarded as harmless, and cases of sleeping sickness were very rare. So long as the labourers drawn from Angola were not numerous the number of cases was insignificant, but when, in 1893 and 1894, labourers imported from Angola came chiefly from the vicinity of Casengo, where the disease had attained an enormous development, the malady began to spread with alarming rapidity throughout the island. In 1907 the disease had assumed such grave proportions that the Government appointed a Commission, which spent a year in carrying out experiments, and suggested remedies, but they were not legally enforced until April 1911. The author says that up to August 1912, little or nothing had been done to carry these measures into effect, and that when he arrived with others on a special mission at that time great obstacles had to be contended with. It required eight months' exertion before the prophylactic measures suggested were at all properly carried out, and these have given results beyond expectation. The author then proceeds to give an account of the work done by the Medical Mission, of which he was the head, in the ten months between August 1912 and the end of May 1913. The island was divided into three zones, and one doctor appointed to each, with the object of carefully studying each individual estate, examining the blood of men and animals, and segregating those found to be affected. It may here be remarked that the gravest defect in the report is the absence of sketch maps, which renders it difficult to follow the very interesting details given. During these ten months, out of a total population of about 5,000, the blood of nearly 4,000 persons was examined; trypanosomes were found in 125 cases, filaria in 454, and malarial parasites in 286. The percentage of all cases of sleeping sickness found by the Mission in the island is given at 7·2 per cent., of fresh cases 3·1 per cent.; this shows a marked reduction as compared with 1908, when the percentage was 23·5. The total number of persons now affected is 361, of whom 50 present every appearance of being cured. Of the persons examined, the percentages affected by filariasis and malaria were 11·3 and 7·1 respectively, which figures indicate a marked reduction in these diseases also. Of 198 animals examined, 39 were found to be infected with trypanosomes and two with filaria. The author states that in 1908, when a member of the original Commission, he was of opinion that the native population was inclined to disappear. It was calculated that the approximate number of indigenous natives in 1900 was 800, whereas in 1908 it was reduced to about 300, but the number has now increased, as 550 persons were examined by the Commission. Fourteen pages of the report are devoted to the question of the value of atoxyl as a remedy for animals, and the author concludes from the observations made that the drug has no value for this purpose, but that it merely acts as a tonic, and so prolongs the life of the animal, and strongly recommends that all infected animals should be killed as soon as the existence of the parasite is verified. Thirty-two pages are devoted to observations upon the work of prophylaxis carried out by the planters against the spread of sleeping sickness. The author says that he is in a position to state definitely that the work carried out has yielded the best of results, in spite of the expectations of many who thought it impossible to eliminate the scourge from the island. This is especially the case on estates owned by Europeans. The disease diminished as if by magic, and *Glossina palpalis* no longer appeared on the roads and cultivated portions of the island, except in very reduced numbers, and even then very seldom. The general mortality on some properties fell by 50 per cent., and in others by 70 and 80 per cent. The methods adopted by the planters, under the instruction of the Commission, were briefly as follows: Swamps were drained and timber felled in all places where *Glossina* took shelter; wild pigs were killed, scrub jungle was cleared, flies were caught by means of tanglefoot traps, and the like, and all affected domestic animals were slaughtered. Human beings attacked were segregated until the trypanosomes had disappeared from the circulation, and injections of atoxyl were given immediately after the bite of the fly. In some cases the drainage of the swamps involved the sacrifice of the plantations. At first some of the planters showed great unwillingness to comply with the law, but now all are carrying out the measures prescribed more thoroughly, and some even with great vigour. If these operations are efficiently and continuously carried on, the author believes that the total eradication of sleeping sickness would be quite possible within a short period. Special complaint is made with regard to the properties owned by natives, for though there is a Native League, it has done nothing to assist the Commission by impressing its less intelligent members with the necessity for stamping out sleeping sickness, and the natives are for the most part afflicted with "sickly fatalism." They do not maintain cleanliness, and let their properties go to ruin, except for little patches used for growing manioc and millet. Every native hut sheltered a dozen dogs, running wild, as if for the feeding of the *Glossina*, and the natives attacked with sleeping sickness could with difficulty be got to submit to segregation and treatment. The author complains that the expenses of the Brigade are borne by Europeans, some of whom are not in any better financial position than many natives. The fly is known to take refuge in damp shady places, frequented by animals, chiefly pigs, which are insensible to the bite of the insect, and allow it to settle on them in large numbers. They carry the fly about from place to place, thus not only acting as vehicles, but also providing it with a liberal food supply. The author says that he has seen as many as thirty *Glossina* gorged with blood hanging on the dead body of one pig. It has been noticed that in places forming foci for the fly, when the land is cleared, the wild pigs killed and the swamps drained, *Glossina* disappears in a wonderfully short space of time and never re-appears so long as cleanliness is maintained. The Commission has, therefore, insisted upon keeping the borders of the marshes and brooks free from all vegetation. Whilst the brigade was engaged in this work it took with it a number of labourers dressed in black clothes smeared with bird-lime, so as to catch the flies. In order to protect these men, they were given injections of atoxyl as soon as bitten, but in four cases out of 120 examined, trypanosomes were found. These men were bitten several hours' journey away from the camp, and hence the injection was delayed, but the author considers that on the whole, the Commission was exceedingly fortunate in maintaining the health of its men, seeing that they were obliged to work precisely in the places most infested by *Glossina*. The total number of flies caught by the brigade in the ten months was 110,691. The total number of pigs killed was 235, "*lagaias*" 251, stray dogs 272, to which must be added 300 killed in the town area. The total area of lands cleaned up by the brigade, including fellings, eradication of secondary scrub, cleansing of swamps and streams, was approximately 65 square kilometres (2,600 acres). The author then goes on to remark upon the insanitary condition of the town of Sant'Antonio in Principe, the filthiness of which he denounces in unsparing terms.

Cowflies and Disease.—*Jl. Board Agric. Brit. Guiana*, vii, no. 2, Oct. 1913, p. 75.

A list of TABANIDAE captured while actually attacking mules is given in an editorial note, and includes *T. impressus*, Wied., *T. semisordidus*, Walk., *T. trilineatus*, Latr., *T. caiennensis*, F., *T. desertus*, Walk., *Chrysops tristis*, F., and *Chrysops costata*, F. Among plantation mules at Berbice there has recently been an outbreak of *mal de caderas*, which is supposed to be transmitted by means of biting flies from wild to domestic animals.

FELT (E. P.). *Phormia regina*, **Meig. (Queen Blow-Fly).**—*Twenty-eighth Report of the State Entomologist* (1912), *New York State Museum, Albany, New York, Bull.* 165, 15th July 1913, pp. 75-79.

The study of this fly was undertaken in order to obtain data for estimating the period a human body had lain exposed to the elements in midsummer. This was rendered necessary in consequence of the want of facts on the biology of this fly in existing literature. It was supposed at first that the common blow-fly (*Calliphora erythrocephala*, Mg.), was the more prevalent species at Nassau, the place where these investigations were conducted, but the experiments resulted in rearing only the above-named species, and a flesh-fly. Hough reports this species as being very common everywhere in the United States, though it appears to be rare in Europe. Aldrich lists it from localities as widely separated as New Jersey, Montreal and New Mexico. It was reared by Mr. J. H. Paine from city garbage, in Boston, Mass., in larger numbers than either the common house-fly or the blue-bottle (*Lucilia sericata*), though it should be noted that *Phormia* was present in fewer lots, and that by far the largest number came from one lot, concerning which there was no special record, except that no house-flies were obtained from it, and the material was collected in August.

The duration of the various stages was found to be approximately as follows:—Eggs, 12–24 hours, depending on temperature; the first larval stage lasted about three days; the second stage two or three days; third stage, that of active feeding, about three days, although pupation did not occur till three days later. The egg, larva and pupa are described in detail, and a bibliography from 1826 is given.

NOTICES.

The Editor will be glad to receive prompt information of the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion, the adoption of which would increase the usefulness of the Review.

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Shilston (A. D). **The Preparation of Caustic Soda and Sulphur Dip.**—*Agric. Journ., U. of S. Africa, Pretoria*, vi, no. 5, Nov. 1913, pp. 746-749.

During the course of a series of experiments which were carried out to ascertain whether the caustic soda and sulphur dip exerted any injurious effect on the health of sheep, departures from the correct method of preparation, such as might easily occur on the farm, were adopted, and the composition of the resulting mixtures tested. Although solutions of caustic soda have a solvent action on wool, compounds formed by the union of caustic soda and sulphur have no such effect, and though after dipping the sulphur compounds in the fleece may undergo oxidation, it is impossible for caustic soda to be set free by scouring. In the formula recommended for preparing 100 gallons of this dip, 5 lb. of caustic soda should unite with $7\frac{3}{4}$ lb. of sulphur, leaving $12\frac{2}{5}$ lb. of sulphur undissolved, and if the given directions are followed, little free caustic soda remains. Boiling water should be used. If too much water is used, or if the water is considerably below boiling point, little chemical action occurs, and not only is such fluid dangerous to use, but it is also ineffective. The fusion of the undissolved sulphur into lumps can be avoided by adding the caustic soda slowly, or by pouring in a little more water when the reaction is very energetic. Experiments were made to ascertain whether a more uniform result could not be obtained by boiling the ingredients, instead of relying on the activity of the chemical reaction for the production of the necessary heat. The degree of reaction of the caustic soda and sulphur can be determined by ascertaining the amount of undissolved sulphur by testing the specific gravity of the fluid or its alkalinity. It was found that boiling the correctly mixed fluid for ten minutes is sufficient to complete the chemical reaction. If the mixing has been improperly carried out, boiling is the surest means of producing a fluid of uniform composition. Boiling water for mixing the sulphur paste is not necessary if the mixture is to be boiled afterwards.

Mosquitos and "Millions."—*Agric. Journ., U. of S. Africa, Pretoria*, vi, no. 5, Nov. 1913, p. 829.

The Anti-Malarial Association was instrumental in importing a consignment of the West Indian fish, known as "Millions," with a view to acclimatising them in South Africa. The two lots of fish consigned to the Transvaal Trout Acclimatisation's Hatcheries at Potchefstroom, and to the Pongola Rubber Estate Company in Zululand, ultimately disappeared. The fish consigned to the Stellenbosch Hatcheries have made excellent progress, and the Curator is hoping to be able to distribute small lots of fish to suitable places during the coming season.

Russell (H.). **The Flea.**—*Camb. Manuals of Science and Literature, Camb. Univ. Press*, 1913, 125 pp., 9 figs.

The author says in his preface that this book is intended to give in plain language some account of a small but noteworthy group of

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insects. Technical terms have been avoided as far as possible, and whenever used are explained.

In the introductory chapter the general distribution of fleas on animals is set out, with a brief statement of their life-history, and in this a large amount of information is put together of considerable interest to the uninitiated, who will perhaps be surprised to learn that monkeys have no fleas. The importance of the study of fleas as the undoubted carriers of plague and possible carriers of other diseases, is emphasised. Three chapters are devoted to descriptions of the external structure, the mouth-parts, sense-organs and internal organs of the flea. The human flea (*Pulex irritans*) and others, which occasionally attack man, including the Chigoe, are described. Another chapter is devoted to the consideration of the relation of fleas to plague. The habits of the rats which specially serve as hosts, and the fleas which particularly affect rats and bats are discussed at some length. In an appendix a list is given of the British fleas with their hosts, revised to March 1913, which includes 46 species, while another appendix contains simple instructions for capturing and preserving fleas. A general bibliography is given, followed by a list of seven works dealing chiefly with fleas in their relation to plague.

COUSINS (H. H.). **Annual Report of the Department of Agriculture for the year ended 31st March 1913.**—*Jamaica, Kingston*, 1913, p. 4.

Among his general observations, the Director of Agriculture of Jamaica reports on the efficiency of the Trypan Blue treatment for tick fever. He states that of the 14 pedigree Red Poll cows imported in April last from England, only one died during the year, while 13 calves from these cows have been reared to date. Trypan Blue has also been used with marked effect on cattle which were suffering severely from tick fever. The best preventive of this disease with native cattle is systematic spraying for ticks.

In the Departmental wash of "Paranaph" and Cooper's Dip, arsenite of soda (80 per cent. strength) has been substituted for the Cooper's Dip. This tick remedy has proved a success. An improved form of the "Abol" syringe has been found to be a very efficient implement for the spraying of cattle. At Hope, the imported cattle are stabled permanently, since the farm is invaded by millions of ticks from surrounding lands where nothing is done to check them. Ticks in Jamaica can only be dealt with by general and compulsory measures, and the eradication of ticks is a *sine qua non* for the improvement of beef and dairy cattle in the island.

It is also reported that owing to the serious risks of plague-rats effecting an entry into the island in consequence of ship communication with Havana, just before plague was announced in that city last summer, an energetic campaign of rat destruction was carried out. The original attempts at eradicating rats by engendering a plague of "rat typhoid" were a failure. The inoculated rats developed the disease and died, but it did not spread to any extent among the rat community. Simple chemical poisons have been found the most effective, and the standard mixture used was arsenious oxide and barium carbonate

GRAHAM-SMITH (G. S.). **Flies in Relation to Disease (Non-blood-sucking flies).**—*Cambridge University Press*, 1913. 292 pp., 24 pls., 32 figs. (10*s*. 6*d*.)

The author claims that a very strong case has already been made out for the thorough investigation of the relationship of non-biting flies to disease, but he says that in order to determine with any degree of certainty the part really played by flies, there is great need of a large amount of epidemiological evidence, of which, at present, very little is available. In order to meet the requirements of various classes of readers, the author has printed those portions of this book which relate to matters of general interest and importance, in large type, and in them, as far as practicable, has avoided the use of technical terms. Those portions which concern the expert have been printed in smaller type. The author devotes 35 pages to the species of non-blood-sucking flies found in houses, giving a description of each, together with the essential characters by which they may be distinguished. A table is given which shows, from observations made in the United States and in London, Manchester and Birmingham, that *Musca domestica* forms 82 per cent., *Fannia canicularis* 14 per cent., and other species, 4 per cent. of the flies found in houses and places where food is exposed. The species described and figured are—*Musca domestica*, L., *M. entaeniata*, Big., *M. corvina*, F., *Calliphora erythrocephala*, Mg., *vomitoria*, L., *Lucilia caesar*, L., *Pollenia rudis*, F., *Muscina stabulans*, Fall., *Fannia canicularis*, L., *F. scalaris*, F., *Anthomyia radicum*, L., *Sarcophaga carnaria*, L., *Sepsis punctum*, Mg., *Piophila casei*, L., *Scatophaga stercoraria*, L., *Drosophila fenestrarum*, Fall., and *Scenopinus fenestralis*, L., and in each case an account is given of the distribution and habits.

A chapter is devoted to the life-history of the house-fly (*Musca domestica*), and then follow chapters on the internal anatomy of this species and the habits of adult flies, with special reference to range of flight, outdoor habits, indoor habits, hibernation, etc. Another short chapter is devoted to methods of observing flies in captivity, and a fly cage used by the author is figured. Previous observers have used large cages and have succeeded in keeping flies alive in them for several days; the advantage of the author's pattern of cage is that it is small and easily handled, and by daily transfer to similar fresh cages, he has been able to keep flies alive for more than three weeks. He then discusses the ways in which flies carry and distribute bacteria, with special reference to *Bacillus prodigiosus*, from which it appears that this bacterium may be cultivated from the legs and wings of infected flies for 18 hours (sometimes longer) after infection. They can be cultivated from the contents of the crop and intestine in large numbers up to four or five days, and have been found surviving in the intestine up to 18 days. Flies allowed to walk over plates covered with agar-agar are capable of infecting them (probably by means of material regurgitated through the proboscis) for at least seven days; they are capable of infecting sugar for at least two days; flies fed on milk deposited infected faeces during seven days, on syrup during four days, and on sputum for two days. Milk is frequently contaminated by infected flies, whether they merely drink it or fall into it. Conclusions arrived at in New York and Liverpool, from investigations made on city flies, show that these insects carry both on and in their bodies, very large numbers of bacteria, many of which are derived from faecal material.

The author gives at some length such evidence as exists as to the period of survival of micro-organisms ingested by the larvae in the adult fly. The evidence as to pathogenic bacilli in this respect is not very conclusive, but it must not be forgotten that under natural conditions, flies which emerge from infected larvae may be able to re-infect themselves if the contaminating organism still survives in material surrounding the pupae.

The question of the carriage of typhoid fever by flies is discussed at some length. The author is satisfied that flies, if suitable opportunities of visiting infected material occur, may carry and distribute organisms of this type for several days. A lengthy chapter is devoted to summer diarrhoea in relation to flies, and the author says that both the entomological and bacteriological evidence is so suggestive and the disease is of such importance, that an attempt to settle definitely the connection between flies and summer diarrhoea, by experimental preventive measures against flies in a selected area, seems now justifiable. Cholera, tuberculosis, anthrax, diphtheria and ophthalmia are dealt with, and the author then proceeds to discuss certain non-bacterial diseases in this connection, poliomyelitis, small-pox, tropical sore, trypanosomiasis and yaws.

Another chapter is devoted to the consideration of the part played by flies in the dispersal of the eggs of parasitic worms. The author considers the evidence up to the present as unsatisfactory, but, provided the ova are not too large, flies can ingest them and deposit them uninjured in their faeces in some cases up to the third day at least. The ova may also be carried on their legs or bodies, and thus food and fluids may be contaminated. The question of myiasis is also discussed at some length.

The concluding chapters of the book deal with the diseases of flies, their parasites and their enemies, and Howard's list of flies frequenting human faeces is quoted. Measures of control are then discussed, and the final chapter consists of a summary and conclusions. A very complete bibliography, extending over 17 pages, closes the book, which contains a great mass of well-arranged information, and constitutes a valuable summary of the whole subject.

NEISH (W. D.). **The Tabanidae and Anophelines of Jamaica.**—*Report of the District Medical Officer, Spanish Town, Jamaica,* August 1913, 3 pp.

In a letter from Dr. W. D. Neish, District Medical Officer, Spanish Town, to the Superintending Medical Officer, the following list of *Tabanidae*, so far known to occur in the island is given:—*Chrysops costatus*, F., *Lepidoselaga lepidota*, Wied., *Tabanus alene*, Towns., *T. angustifrons*, Towns., *T. lucidulus*, Walker, *T. obliquus*, Walker, *T. rufiventris*, Walker, *T. trilineatus*, Latr., *T. parallelus*, Walker. With the exception of *Chrysops costatus*, all the TABANIDAE are exceedingly rare in Jamaica. So far as is known, none transmits any disease. Reference is also made to two species of *Anopheles*. Nothing is known as to the habits of *Anopheles vestitipennis*, Dyar and Knab, and it is not known to carry malaria; it occurs in Guatemala, Mexico, Cuba and Jamaica. *A. crucians*, Wied., has a southerly and easterly distribution in the United States, ranging as far north as Long Island. It is called the "daylight anopheles" in America, and is a great nuisance to travellers on the Mississippi. It occurs in Cuba, and specimens have been found in Jamaica, at Montego Bay, Black River, and Annotto Bay. This mosquito is known to carry malaria. Since the antimalarial crusade there has been a marked improvement in conditions generally over the island.

LAURIE (D. F.). **Parasites of Poultry.**—*Dept. Agric., S. Australia, Adelaide, Bull.* no. 80, 1913, 24 pp., 34 pls.

In this paper the author follows up his researches into the life-history of the poultry tick [see this *Review*, i, Ser. B, p. 23], with descriptions and illustrations of other ecto-parasites affecting poultry, which often cause serious losses. Poultry infected by parasites are prone to disease, because they become weak through loss of blood in some cases, and through the effects of irritation in others. Ecto-parasites may act as carriers and distributors of disease organisms, as is known to be the case with the poultry tick.

Dermanyssus gallinae, Redi, a Gamasid mite, has the rostrum arranged for pricking or sucking. This species is commonly known as the red poultry mite, and is essentially nocturnal, living in the day-time in cracks, under the perches, etc. It seems to be a cosmopolitan parasite, and is troublesome wherever poultry are kept. These mites have not yet proved to be carriers of harmful organisms, but the extraordinary numbers in which they congregate, and their rapacity as blood-suckers, soon lead to an anaemic condition of the infested birds. To eradicate red mites from a poultry house, various insecticides, which kill them at once, can be used, and like the tick, they succumb to kerosene. Sitting hens require to be periodically examined for these pests. The use of wooden nest-boxes is to be deprecated, for if infested, they will need saturating with kerosene emulsion or some other insecticide. It is a common practice on farms to allow poultry to roost in sheds where cattle and horses are fed. Neumann quotes a case where the inner ear of a cow was found to be invaded by *Dermanyssus*, which had tunnelled through and were the indirect cause of death. Formalin in 10 per cent. solution is a very effective remedy, and may be freely used for farm sheds, bird-cages, poultry-yards, etc., to eradicate this parasite.

The poultry lice are not blood-suckers, but feed either on the feathers or on portions of the epidermis; however, when present in numbers, they undoubtedly irritate the skin, and may cause serious loss of condition, and even death. Ordinary good insect powders shaken freely among the feathers will destroy these parasites. The application of kerosine (one part) and olive oil (three parts) is effective, but subsequent contact with dust gives the oiled feathers a dirty appearance. Any good dip—kerosine emulsion, 10 per cent.; formalin 2 per cent.; or coal-tar by-products, 2 per cent. to 5 per cent.—will destroy both parasites and eggs. *Menopon pallidum* and *M. biseriatum* are mentioned, the latter occurring also on the turkey, pheasant and pigeon. *Goniocotes gigas*, Tasch., has also been found in South

Australia on fowls, but is stated to be uncommon. All poultry runs should be provided with dust-baths, consisting of fine road dust, to which may be added a little wood ashes and sulphur. In these the fowls rid themselves of the parasites, which are smothered by the fine dust.

Strickland (C.). **The Philosophy of Piping as a Preventive of Paludism.**—*Agric. Bull. Fed. Malay States*, ii, no. 2, Sept. 1913, pp. 36-42.

The author regards subsoil drainage by means of pipes as the only effective anti-malarial measure in dealing with water-logged land, for though more expensive in first cost than open drains, it is much more effective. In three cases in which it is reported to have failed, the failure was due to insufficient extension of the system, whilst when it had been properly carried out, the general local health has improved and malaria diminished. He regards the provision of pipe drainage sufficient to carry off all surface water as unnecessary and as a needless expense.

Pinkus (H.). **The Life-History and Habits of *Spalangia muscidarum*, Richardson: a parasite of the Stable-Fly.**—*Pysche. Boston.* xx, no. 5, Oct. 1913, pp. 148-158, 1 pl., 1 fig.

During the course of some experiments on the life-history of the stable-fly, *Stomoxys calcitrans*, L., two parasites belonging to the family Pteromalidae were found breeding in large numbers in the puparia of the fly. One was undetermined: the other was described by Mr. C. H. Richardson as *Spalangia muscidarum*. The latter species appears to have a wide distribution: it has been bred from the house-fly (*Musca domestica*) near Boston and at Washington, and from *Stomoxys* in Texas, Kansas and Louisiana.

The adult parasite is a scavenger in habit, preferring to feed on the remains of the host than on food, such as honey, which may be given to it. The female does not usually deposit more than a single egg in the same host, but will readily oviposit in many species of dipterous pupae, apparently having no preference. In addition to *Stomoxys*, the following species have been parasitised experimentally:—*Musca domestica*, L., *Lyperosia irritans*, L., *Helicobia quadrisetosa*, Coq., and *Pseudopyrellia cornicina*, F. In nature, the stable-fly is undoubtedly the principal host.

The period of development varies with the host and also with the temperature. In *S. calcitrans*, at a temperature of 56°-58° F., the period was 84 days: in *M. domestica*, 106 days. Parasites developed from the egg to the adult in 100 days in *L. irritans*, at the same temperature as above, but in the same host and at a temperature considerably higher, the period was only 88 days. Examination of puparia kept out of doors during the winter of 1912-13, showed that a few adults emerged during warm weather, but the majority of the immature stages appeared to continue developing very slowly, and it was thought that they would not emerge until the spring.

The author suggests that these Chalcids would be an asset in combating the stable-fly, if it were possible to obtain mature adults early in the spring, and he describes a method for the artificial propagation of the parasite, which results in the early production of the adults. Since *Spalangia* does not discriminate between various species of fly puparia, the work of artificial propagation is greatly facilitated. For the breeding of the parasites, the author devised a cage made from an empty honey box, measuring 8 x 14 x 9½ inches; glass is closely fitted in the front and top, and a hole 4 inches in diameter is cut in either end. Around the inside edge of each hole is tacked one end of a cuff of soft muslin cloth: these should be about 9 inches in length, the outer end being gathered with an elastic, so as to fit the wrist of the operator closely when the hands are inserted into the box; when not in use, the cuffs are tied up. A hole 1 inch in diameter is cut in the bottom of the cage, which with the exception of this hole, is covered with oil cloth, above which a layer of white blotting paper completely covers the bottom of the cage; a narrow strip of blotting paper is sewn to the large piece in such a position as to extend through the hole in the bottom of the cage into a vessel containing water beneath: this keeps the blotting paper layer always moist. The cage is mounted on four legs 3½ in. long. A small amount of damp straw is then placed in the cage on the blotting paper. When the cage is ready, the parasites, either in the adult or larval stage, are introduced; if adult parasites be put into the cage, the pupae from which they emerged should accompany them in order to furnish food and protection. Unparasitised pupae should then be introduced from time to time. The cage must be kept in direct sunlight and in a warm room, at a temperature of 75–80° F. A week or two after the first pupae have been exposed to the parasites, they should be put in a separate place, and fresh pupae added: the parasitised pupae may be recognised by their dark colour. As the parasites emerge, they should be transferred into breeding boxes as described. When a sufficient number of *Spalangia* has emerged to proceed with breeding, the other puparia parasitised in the cages should be examined. When it is found that most of the parasites are in the pupal stage, the entire lot should be removed to a refrigerator or cold storage room in which the temperature is kept uniformly between 50° and 55° F. These temperatures check development, and retard emergence until a few weeks before it is planned to liberate the insects in the field. Parasites should always be liberated near barns or straw stacks, where flies are known to be breeding.

RICHARDSON (C. H.). **Studies on the Habits and Development of a Hymenopterous Parasite, *Spalangia muscidarum*, Richardson.**—*Jl. Morph., Philadelphia*, xxiv, no. 4, 29th Dec. 1913, pp. 513-549, 4 pl.

The genus *Spalangia* is widely distributed throughout North America and Europe; a number have also been recorded from Central and South America and the Hawaiian Islands. They appear to be absent from Australia, Asia and Africa, but this may be due to the lack of a thorough search for them. A list of the 28 recognised species is given, with the particular region in which each occurs. Although a decided preference is shown for Diptera as hosts, their parasitism is not restricted to this order, and some attack Lepidoptera, while others are myrmecophilous. The following is a list of insects with the name of the species by which they are parasitised :—DIPTERA : *Drosophila* sp. by *S. drosophilae*, Ashm. : *Lyperosia irritans*, L., by *S. haematobiae*, Ashm. : *Musca domestica*, L., *Stomoxys calcitrans*, L., and *L. irritans* by *S. muscidarum*, Richardson : *M. domestica*, L., by *S. nigra*, Latr.; *Lasioptera eryngii*, Giraud, by *S. fuscipes*, Ness ; and *M. domestica*, L., by *S. hirta*, Hal. LEPIDOPTERA : *Coleophora giraudi*, Giraud, by *S. nigra*. The myrmecophilous species are :—*S. erythromera*, Förster, and *S. formicaria*, Kieffer, both associated with *Lasius fuliginosus*.

A full description is given of the development and life-history of *S. muscidarum*, with a brief account of hypermetamorphosis in the order Hymenoptera. The effect of the parasite upon the host is slowly to consume the blood plasma of the latter, reducing the puparium to a flattened mass of cuticle.

Regarding the economic importance of *S. muscidarum*, the author says that the investigation was undertaken too late in the autumn to obtain definite results. The highest proportion of parasitised house-fly puparia was noted on 5th October 1912, when nine *Spalangia* larvae and pupae were removed from 22 puparia. On another occasion, five larvae and pupae were taken from 101 fly puparia. Bishopp found *S. muscidarum* to be a parasite of *Stomoxys calcitrans*, *Lyperosia irritans* (*Haematobia serrata*) and *M. domestica* in Texas. In an examination of 2,500 puparia of *Stomoxys*, 40 per cent. were found to be parasitised by this and another undetermined Pteromalid. Reference is made to the foregoing paper by H. Pinkus, and a full bibliography is added.

URICH (F. W.). **Mosquitos of Trinidad.**—*Proc. Agric. Soc. Trinidad and Tobago*, xiii. no. 10, Oct. 1913. pp. 525-530.

Attention is called by the author to the great loss planters sustain through preventible diseases. Besides loss of work through malaria, stock, especially horses, mules, and donkeys are affected by mosquitos, and the blood lost may account at times for that weakened state of some of the animals, which goes by the general name of "falling off." Seventy-three species of mosquitos are listed for Trinidad, but so far as known only three are closely associated with man. They are: *Stegomyia fasciata* (*Aedes calopus*), commonly called "The Stegomyia," *Culex quinquefasciatus* and *Anopheles tarsimaculatus*. *A. tarsimaculatus* is the commonest of the seven species of *Anopheles* in the island, and is there the principal carrier of the malaria parasite. Closely allied to *A. tarsimaculatus* is *A. argyritis*, a comparatively rare insect. The other species are forest and cacao-dwellers. *A. bellator* breeds in the water which accumulates in the leaf-axils of wild pine-apple, and *A. eiseni* frequents the Northern Range, where its larvae live in pot-holes of rocks and in the dry beds of streams ; it has also been found in tree-holes in Panama by A. H. Jennings. The *Megarhini* are large and showy mosquitos, but in spite of their size they are harmless, subsisting on the nectar of flowers, especially those of Christmas-bush and black sage. The larvae are very voracious and devour other mosquito larvae found near them. *M. trinidadensis* is semi-domesticated, being found in Port-of-Spain in water containing the larvae of *Stegomyia* and *Culex quinquefasciatus*. Out of the town, *M. trinidadensis* occurs in tree-holes, *M. superbus* and *M. iris* being confined to wild pine-apple. *Taeniorhynchus* (*Mansonia*) *titillans* is at times very troublesome on the large rivers and near the coast. The species of the genus *Janthinosoma* are essentially field mosquitos, and at times occur in large swarms in the cacao estates and in the woods. They are voracious blood-suckers, and lately *J. lutzii* has been found by Dr. Nunez Tova to be the carrier of the eggs of *Dermatobia* (mosquito worm) to man and animals. *Aedes scapularis* and *A. serratus* are common in the woods and cacao plantations; the former can be recognised by the white silvery spot on the thorax, and the latter by the single silvery line on the back of the thorax. *A. taeniorhynchus* is a black mosquito, which is often very numerous and troublesome. *Aedes sexlineata* is common in the cacao plantations and in woods, but its larvae have never been found, being probably tree-hole dwellers. The genus *Haemagogus* is represented by the metallic green and blue mosquitos that attack man in the woods and among cacao. *Deinocerites troglodytus* is a crab-hole mosquito, living near the crab-holes in the water of which its larvae dwell. The author's experience is that it is a timid blood-sucker, biting in the field. The SABETHINAE are all bromelia or tree-hole dwellers. The species of *Wyeomyia* bite in the field, and in flight carry their legs all curled up. Also a biter in the field is *Sabethinus*, a genus of metallic blue colour. *Joblotia digitatus* is a fairly large mosquito with white tarsi seen around cacao heaps, in the broken shells of which it breeds when they contain water. The list of mosquitos is followed by a summary of the remedial measures that should be taken against them.

MACFIE (Dr. J. W. S.). **Preliminary Note on the Development of a Human Trypanosome in the Gut of** *Stomoxys nigra*.—*Ann. Trop. Med. Parasit., Liverpool*, Series T.M., vii, no. 33, 7th Nov. 1913, pp. 359-362, 1 fig.

The rôle of *Stomoxys* in the transmission of trypanosomiasis has been much discussed. In May 1913, the author made some experiments on the subject at the Medical Research Institute, Lagos. At the end of May and at the beginning of June a number of *S. nigra* caught in the laboratory were fed on a guinea-pig infected with the trypanosome from a case of sleeping sickness from Eket in Southern Nigeria. This trypanosome differed in several respects from *T. gambiense*. Thirteen flies were dissected from one to six days after the first infecting feed. In six, flagellates (*Herpetomonas*) were found in the mid-gut. As a control, twelve flies not fed on the infected animal were dissected and found to have no flagellates. To exclude the possibility of previous infection, experiments were begun with flies bred in the laboratory. On 14th June one *S. nigra*, which had emerged the previous day, was fed on the infected guinea-pig. On 17th June, the fly was dissected and *Herpetomonas* was found in the mid-gut only. On 28th June, another bred fly was fed on the infected guinea-pig. It was dissected on 2nd July, and *Herpetomonas* found in its mid-gut. Two flies also bred out in the laboratory, but not fed on the infected guinea-pig, were dissected and found to contain no flagellates. These experiments would seem to prove that the trypanosome, with which the guinea-pig was infected, was capable of development in the gut of *Stomoxys nigra*, and thus this fly is probably capable of serving as the intermediary host of human trypanosomiasis. At this stage the experiments had to be abandoned.

Roth (P. B.). **Report and Remarks on a Small Epidemic of Poliomyelitis.**—*The Lancet, London*, 15th Nov. 1913; Reprint 8 pp., 3 figs.

This epidemic consisted of six cases, which occurred in five small villages around Deddington, Oxfordshire, between 9th August and 15th September 1911. There was no death. The nature of the onset, the parts affected and the recovery of each case is described. The question of how the infection could have been conveyed in this epidemic is of interest. The impossibilty of direct infection is clear, owing to the distances between the cases, which arose one after the other in a circular course. The author states that the only point in their environment which was the same in all the cases, was the close proximity of stables. It has been demonstrated conclusively that poliomyelitis can be transmitted from monkey to monkey through the agency of the stable fly (*Stomoxys calcitrans*). This fly is also found in large numbers in this country and is sometimes mistaken for *Musca domestica* (the house-fly). It breeds in decaying vegetable matter, and is found about stables and cowsheds. It is most prevalent in August and September, and attacks human beings, horses and cattle. A disease in horses, which seems closely allied to poliomyelitis, has been recently discovered at Borna, near Leipzig, and named the "Bornasche Krankheit." The infective material (in the laboratory) is very resistant to cold, and the disease much more common in warm weather, and yet the epidemics stop as soon as the cooler weather comes, seeming to suggest that the infection is carried by some insect that is killed or disappears as soon as summer ends. From a consideration of the cases, it would seem that this epidemic was originated by infected *Stomoxys* biting Case I, in the cattle-yard at Fritwell; that the infected patient was bitten by other *Stomoxys*, which in turn became infected, and were carried by horses or cattle or on carts and waggons through other villages, biting in turn the other children. If this theory should prove to be correct, viz., the transmission of poliomyelitis by *Stomoxys*, then it should be possible, by a wholesale crusade against this fly, to banish the disease from large regions of the globe.

Edwards (F. W.). **New Synonymy in Oriental Culicidae.**—*Bull. Entom. Research, London*, iv, pt. 3, Nov. 1913, pp. 221-242.

In connection with the preparation of a tabular synopsis of the Oriental mosquitos, the author has found it necessary to make many corrections in the nomenclature, which are here set forth. In all, 63 species are dealt with, and no less than 80 specific names are sunk, while the probable synonymy of eight or ten others is suggested: two new names are proposed.

Simpson (J. J.). **Entomological Research in British West Africa. IV. Sierra Leone.**—*Bull. Entom. Research, London*, iv, pt. 3, Nov. 1913, pp. 151-190, 5 pl., 1 map.

The present paper is the fourth of the series by the same author upon his entomological investigations in West Africa [Bull. Entom. Research. ii, pp. 187–239; ii, pp. 301–356; iii, pp. 137–193]. These investigations took the form of tours in the various Colonies for the purpose of studying the mode of occurrence and the distribution of all blood-sucking insects, in view of their potential power to transmit diseases, and with the further object of stimulating medical officers and others to interest themselves in this direction. From March to November 1912, the author journeyed continuously in Sierra Leone. An account is given of the general physical features of the country, its vegetation, rainfall, etc., while the accompanying map shows the areas in which the different species of *Glossina* occurred. After describing the tour in general, the author goes on to enumerate the species of blood-sucking insects and other Arthropods which occur in Sierra Leone. The Diptera include 17 species of CULICIDAE, 30 species of TABANIDAE, five species of MUSCIDAE, one *Culicoides* and one *Simulium*; in addition to these there are three species of fleas and ten of ticks. The native names for the more familiar insects are given.

Regarding the insect-borne diseases, the author says that the most prevalent of these is malaria; very little is known as to the actual species of mosquitos responsible for its transmission, but probably *Anopheles funestus* and *A. costalis* are involved. The disease is on the decrease, owing to the use of mosquito nets, and mosquito-proof rooms, the use of quinine, the segregation of European from native quarters, and the sanitary measures adopted for the diminution of the number of mosquitos. Yellow fever has recently occurred in Freetown, where the species *Stegomyia fasciata* is ubiquitous, but stringent measures are being adopted for its diminution. Only one case of sleeping sickness has been recorded from Sierra Leone; other suspicious cases examined showed no trypanosomes. Trypanosomiasis is very prevalent among stock, but does not cause a heavy mortality.

The genus *Glossina* is represented in Sierra Leone by five species, namely:—*G. palpalis*, *G. fusca*, *G. longipalpis*, *G. pallicera*, and *G. nigrofusca*. The genus *Stegomyia* is represented by three species, namely: *S. fasciata*, *S. sugens*, and *S. apicoargentea*. The distribution of these species is given. A list is given of the various ecto- and endo-parasites from mammals, birds and reptiles examined.

KNAB (F.). **A Note on some American** SIMULIIDAE.—*Insecutor Inscitiae Menstruus*, *Washington*, i, no. 12, Dec. 1913, pp. 154-156.

The nomenclature of certain species of *Simulium* is discussed. A new *Simulium* from Venezuela was described by Roubaud in 1906 under the name *S. exiguum*; in 1909 a different species from Brazil was described by Dr. A. Lutz, under the same name; in 1911, Surcouf and Gonzalez Rincores proposed the name *S. minutum* for the *S. exiguum* of Lutz; this name is also preoccupied, having been given to a North American species by Lugger in 1896. The author, therefore, proposes the new name *Simulium lutzi* for the species of Lutz. He also indicates that *S. bipunctatum*, Malloch, is a synonym of *S. dinellii*, Joan.

PATTON (W. S.). *Culicoides Kiefferi*, **sp. n., a new Indian Blood-Sucking Midge.**—*Indian Jl. of Med. Research, Calcutta*, i, no. 2, Oct. 1913, pp. 336-338, 1 pl.

This midge was first caught by Captain Cragg, I.M.S., in the cold weather of 1912, biting the calves used for purposes of vaccination at the King Institute, Madras. At present no species of *Culicoides* is suspected of being the host of any pathogenic parasite. The females bite in the early morning and occur in large numbers on the shaved abdomens of the calves from November to April. This midge bites man, but its chief host appears to be cattle.

JAMES (S. P.). **The Protection of India from Yellow Fever.**—*Indian Jl. of Med. Research, Calcutta*, i, no. 2, Oct. 1913, pp. 213-257, 1 map, 3 plans.

Yellow fever has not yet reached India, although the conditions there are favourable to the disease. By many it has been feared that the opening of the Panama Canal will increase this danger by providing a direct route to Asia and India from Europe, but a table giving the length of the various routes shows that those *viâ* Panama are, on the whole, longer than those *viâ* the Suez Canal, and hence these long direct routes will probably not be used. It is pointed out that the spread of yellow fever to India may result as a secondary event consequent upon the infection of ports further east. This is also very unlikely, since every precaution is taken in dealing with traffic from the endemic area. As a guard against the spread of the disease, Major James recommends that "intelligence officers" might be appointed to hold stations in, and on the routes from, the endemic areas in America. These officers would supply continuous first-hand information concerning the disease to India. A more complete knowledge of the destruction of *Stegomyia scutellaris* and *S. fasciata* and of matters in connection with the etiology and prevention of the disease is desirable. The author would also urge India to take every possible step to reduce the breeding places of *Stegomyia* mosquitos. An account is given of the many ports visited by Major James in connection with this problem. It is especially noted that the arrangements for the prevention of the entry of infectious diseases into Japan are far from satisfactory. *Anopheles sinensis*, *Culex fatigans*, *Armigeres ventralis* and *Stegomyia scutellaris* are said to occur at Shanghai. It is doubtful whether *S. fasciata* exists here or in Hong Kong.* Both *S. fasciata* and *S. scutellaris* occur in Singapore. The sanitary and quarantine arrangements of these places are also described.

JAMES (S. P.). **Note on the Practicability of Stegomyia Reduction in Indian Seaports.**—*Indian Jl. of Med. Research, Calcutta*, i, no. 2, Oct. 1913, pp. 258-262.

Owing to the social and political difficulties connected with the institution of sanitary reforms in India, the plan of campaign for

* [Six specimens of *S. fasciata* have recently been received by the Imperial Bureau of Entomology from Hong Kong, together with several thousands of *S. scutellaris*.—ED.]

accomplishing *Stegomyia* reduction in that country must be quite different from that usually recommended elsewhere. In most seaports the low-pressure water-supply necessitates the use of water-storing receptacles, which form the chief breeding places of *Stegomyia fasciata*. The introduction of a constant high pressure water-supply would justify a campaign against these receptacles, and would lead to their automatic disuse, a course which would be more effective than a campaign against the water in which mosquitos breed, especially as the latter would necessitate throwing open the houses to inspectors. Persuasive measures should be used at present, though few objections (religious or otherwise) have been raised by the householders against the provision of a sufficient and constantly available water-supply. By this plan the main position would be carried and the completion of the task of reducing *Stegomyia* would become a question of tactics, differing in different places. As regards measures in the interior of houses, any attempt to deal with them at present is not advocated. Outside the houses breeding places such as discarded tins, bottles, etc., can be effectively dealt with and roof gutters should never be permitted in the tropics. The provision of a constant water-supply is a costly measure, but for international reasons it is advisable to raise the standard of sanitation in the large Indian sea-ports. The harbour of Madras and an area in Georgetown would be most suitable for a first experiment, owing to its favourable conditions for the breeding of *Stegomyia*. A scheme for a constant water-supply is at present being carried out in Georgetown.

TOWNSEND (C. H. T.). **El Vector de la Verruga.** [The carrier of Verruga.]—*Noticias, Lima*, no. 22, 15th Nov. 1913, p. 7.

The author has communicated to the Latin American Medical Congress what he considers to be scientific proof that the *Phlebotomus* discovered by him in the area of Matucana, Peru, is the carrier of verruga, which he has succeeded in transmitting in the laboratory to two more animals, a dog (*Canis caraibicus*) and a monkey (*Cebus capucinus*). The former animal was injected with an extract of *Phlebotomus* caught at Quebrada de Verruga; the other was exposed in a place next to a wall from which *Phlebotomus* emerged in great numbers every night. It was kept in this place from 10th October to 6th November, and on 11th and 12th November the blood of this monkey was found to contain true Barton bodies, and on the 13th the characteristic eruption broke out on the monkey's orbits.

The author points out that this is the first time that Barton bodies have been found in the blood of animals other than man.

GUÉNAUX (G.). **Traitement des Maladies Parasitaires des Oiseaux de Basse-Cour.** [Treatment of Parasitic Diseases of Poultry.]—*La Vie Agricole et Rurale, Paris*, 8th November, 1913, ii, no. 49, p. 603.

In this article the author gives several remedies for different diseases of birds including the treatment for the attacks of the fowl mite (*Dermanyssus gallinae*). The fowl-houses, etc., should be cleaned and washed with boiling water, the walls and perches being washed over with quick-lime and carbolic acid. The nests should be renewed or disinfected with essence of eucalyptus, with turpentine or with petrol. A good method of disinfecting a nest is to place in it an empty egg into which has been introduced a sponge soaked with a disinfecting essence, the aperture in the shell being stopped up with wax ; the fumes escape through the pores of the shell and so protect the sitting hen. Disinfection of the birds is less easy. Insecticide powders can be used, or the Lagrange method of sulphur fumigation may be employed. In this method the body of the animal is enclosed in a box, leaving the head outside. A stick of sulphur is burned in the box and the animal taken out six or seven minutes afterwards. This operation should be carried out at night before the parasites leave their hosts. The larvae of TROMBIDIIDAE cause serious trouble among birds. They attach themselves at the base of the feathers and pierce the skin with their rostra. The birds can be dusted with flowers of sulphur, treated with pomade of oxide of zinc or sulphurous pomades, or rubbed with carbolic acid or vaseline treated with benzine or petroleum. When fowls are affected by *Sarcopterinus nidulans*, the swellings are cut, the contents pressed out and the inside washed with a mixture of balsam of Peru and alcohol. Another mite disease, caused by *Epidermoptes bilobatus* and *E. bifurcatus*, is rather common, the pests living on the skin and producing whitish areas. This may also be treated with a mixture of balsam of Peru and alcohol, or with a solution of cresol.

CARPENTER (G. D. H.). **Second Report on the Bionomics of** *Glossina fuscipes* (*palpalis*) **of Uganda.**—*Repts. Sleeping Sickness Commiss. Roy. Soc., London*, xiv, 1913, pp. 1-37, 1 sketch map, 36 figs., 4 charts.

The author conducted the studies which are described in this paper on the Island of Bugalla in the north-west corner of Lake Victoria. He describes the locality carefully and notes that where the coast-line was rocky the forest came to the water, where sandy there was a bit of foreshore, on which flies were more numerous than elsewhere. In one such locality pupae were to be found, although none could be found on another piece of sandy foreshore on the northern side of the island. The species of *Glossina* which forms the subject of this report is the Eastern race of *G. palpalis*.

Over 9,000 flies were caught and marked in various ways between 18th March and 26th April, 1912, and the longest interval before recapture was 247–253 days in the case of two male flies (still in good condition) and 126–131 days in the case of one female fly. This may be compared with the results of experiments made at Jinja (mainland) which gave 182 days for the female and 149 days for the male. The author thinks that on the mainland it is probable that the fly will not live beyond the first dry season which it encounters a few months after it has hatched out ; whilst on the lake margin flies may be found all the year through, and probably those which have emerged shortly before the onset of the dry season are better able to resist adverse influences. He then goes on to discuss climatic conditions at length and shows that they have a marked effect upon the total numbers of flies, the proportions of the sexes and the rate of larviposition. The number of flies captured per hour was found to vary more or less directly with the relative humidity of the atmosphere, and the author says that he constantly found, on days when there had been a little rain early, followed by the sun shining through the clouds, that the flies were terribly persistent in their attacks; but on a brilliantly fine windy day they were not nearly so desirous of feeding. There appears to be an inverse relation between the number of flies and the temperature, but this will be influenced by local conditions affecting relative humidity. He also is of opinion that there is an inverse relation between the proportion of females and the temperature, and suggests that the females are more susceptible to heat, which may account for the much smaller proportion of females on the islands where the temperature is higher. From figures representing the number of pupae captured in the same localities by the same fly boys it seems that there is an intimate relationship between the number of larvae deposited and the relative humidity.

Seeing that the rate of reproduction of *Glossina* is abnormally low for an insect, in that it brings forth only one offspring at a time and only a total of a dozen or so, there is, the author thinks, strong *a priori* evidence against any great destruction of *Glossina* taking place by the attacks of enemies; and during 2½ years in which he had been studying the subject he did not succeed in finding any enemies of importance. No parasites were reared from the many thousands of pupae which were kept in closely shut boxes with glass lids; and although pupae were destroyed by an Acarid, it was also found that the same Acarid attacked pinned insects, and it is possible that the pupae attacked were already dead. Neither had the author, except on one occasion, found any insect attacking the newly emerged fly. He also regards it as improbable that this *Glossina* is attacked by birds, inasmuch as it frequents bush or forest with thick undergrowth, thus keeping out of the way of the larger insectivorous birds of powerful flight which would alone be capable of catching such an active insect. Results of the examination of the stomachs of 64 insectivorous birds shot while feeding on the fly-areas of Damba and Bugalla Islands tended to show that no *Glossina* had been consumed. A very abundant species of dragon fly (*Cacergates leucosticta*) has been seen to catch and devour *Glossina*. Flies of the family ASILIDAE have been carefully watched and on only one occasion was *Glossina* seen to be captured by one. Nematodes have been found in the abdominal cavity of 4 out of 1,000 flies.

The next question the author considers is the food supply of *Glossina*: the sources from which it derives blood, and the question as to whether it feeds on vegetable juices or no, and whether it sucks up water. In answer to the first question a table is given showing the proportion of mammalian (M) and non-mammalian blood (N) found in the flies in three different localities: Jinja (mainland), M. 31·5 per cent., N. 68·5 per cent.; Damba Is., M. 15·2 per cent., N. 84·8 per cent.; Bugalla Is., M. 68·7 per cent., N. 31·3 per cent.; but these proportions varied greatly from day to day. It was found that 4 per cent. of the non-mammalian blood in a large number of flies examined could be described as avian, and 95·7 per cent. as reptilian, the latter being probably derived chiefly from monitor lizards. Amphibian or ophidian blood was never found. The question whether *Glossina* feeds on vegetable juices is a difficult one to answer definitely, though numerous bodies of a vegetable nature have been found in several cases in the gut contents. Definite microscopical evidence has been obtained that occasionally flies do imbibe water.

The proportion of flies infected with trypanosomes varied greatly in different localities; thus on Damba Island 885 flies were required to infect a monkey, whereas on Bugalla Island over 7,000 were required. Microscopical examinations showed that trypanosomes were twice as frequent in the wild flies on Damba Island as on Bugalla. On Bugalla *T. vivax* was present in 2·2 per cent. of wild flies, thus exceeding *T. gambiense* in frequency of occurrence.

The proportion of the sexes is given for three localities: At Jinja (mainland) 12,773 flies yielded 55·7 per cent females; on Damba Island over 6,000 flies yielded 21·6 per cent.; and on Bugalla Island in 56,775 flies, 20·6 per cent. were females. In bred flies the sexes are produced in approximately equal numbers. The author thinks that it is possible that female pupae die under natural conditions as a result of variations in temperature, humidity, etc., which do not occur in the laboratory, and that this may account for the high percentage of bred females.

The prospects of getting rid of *Glossina* by limiting attention to localised breeding grounds are not good, and the author instances the fact that on Bugalla Island only one locality yielded pupae in any numbers, and then only as many hundreds as the Island of Damba yielded thousands, though flies were, if anything, more numerous on Bugalla than on Damba. Photographs are given of typical sites for the deposition of pupae under fallen trunks and at roots of trees a few yards from the edge of the water and a few feet above it.

DUKE (H. L.). **Some Trypanosomes recovered from Wild Game in Western Uganda.**—*Repts. Sleeping Sickness Commiss. Roy. Soc. London.* xiv, 1913, pp. 37-59, 1 map, 4 plates.

These investigations were carried out with a view to obtaining information as to the part played by wild game in the spread of trypansomiasis of human beings and domestic animals. The district traversed, the Western Province of the Uganda Protectorate, is a great game country with a relatively small population. The character of the country is described in detail, and four species of *Glossina* were met with, viz., *palpalis*, *pallidipes*, *morsitans*, and *fusca*. As regards the distribution of different species, *G. fusca* is mainly confined to the forest; as also is *G. palpalis*, which is more less restricted to the neighbourhood of water: man probably furnished a large proportion of its food supply. The other species are found in the short grass plains running up to the elephant-grass country around the Hoima River, which country abounds with buffalo. The author says that the hippopotamus where it occurs, is an important source of food for *Glossina fusca*. *G. pallidipes* was found over the grass-lands frequented by buffalo and also in isolated patches of wood at a considerable distance from the scrub which forms the boundary of the open country: it is chiefly associated with reedbuck, buffalo, cob and waterbuck. A species of *Hippobosca* was found on almost every antelope that was shot in this part of the country. Fifteen specimens of this fly were dissected in the belief that it might possibly prove to be a trypanosome carrier and that it might account for the presence of trypanosomiasis amongst cattle in districts free from tsetse ; but no trypanosomes were found.

The author's conclusions were as follows:—(1) A considerable portion of the wild game in the fly districts of the Western Province of the Uganda Protectorate is infected with trypanosomes. (2) Certain of these trypanosomes have a suspicious resemblance to the human trypanosomes, *T. gambiense* and *T. rhodesiense* ; others are known to be exceedingly pathogenic to domestic animals. (3) The tsetse of these parts also contain flagellates which it is highly probable are derived from wild animals. (4) The population of the fly districts is scanty, and the greater part has recently been removed to fly-free areas. (5) It is reasonable to hope, that, as regards the spread of human trypanosomiasis, the removal of the people from the infected districts will suffice, and this measure will simultaneously prevent native cattle being exposed to the fly bite ; the majority of the fly area is practically uninhabited country. (6) The alternative of destroying the game, and so of abolishing what is doubtless a permanent trypanosome reservoir, would be a gigantic and almost impossible undertaking in this region. In considering such a proposal, elephant must, of course, be included, as must also hippopotamus, sitatunga, bush-pig and hyaena, all of which are difficult to eradicate. The scarcity of people is a serious objection to such a course, as is the difficult nature of the country. It would be well to await the trial of this expedient under more favourable conditions before undertaking so drastic a measure under severe natural handicaps. (7) It would appear inadvisable to take any measures to protect the existing game and thereby encourage an increase in their numbers. On the other hand it is inadvisable to permit natives to hunt in the fly districts. The ideal arrangement would be to make the fly districts prohibited areas, and in the region under consideration this is feasible to a far greater extent than would be the case in other parts of the Protectorate.

Mongalla Province Sleeping Sickness Regulations, 1913.—*Soudan Govt. Gazette, Khartoum*, 7th March 1913.

These regulations, of the 6th Feb. 1913, cancel the Sleeping Sickness Proclamation of 1909. Camps may be established for the reception of persons suffering from sleeping sickness and the Medical Officer may also detain a suspected person there. Clauses 9 to 14 deal with water traffic, and the Medical Officer and every Magistrate has power to stop and detain any vessel which appears to have infringed the regulations. Clause 15 requires all persons who enter the Sudan by land from Uganda to proceed forthwith to Mongalla and submit themselves for medical examination there. Clauses 16 to 21 impose a number of restrictions on trade. For instance trading in Western Mongalla may only be carried on in such stations as may from time to time be specified in the Sudan Government Gazette. Clause 18 only allows Government transport to be used in Western Mongalla. Trade may only be carried on by licensed persons. Offences against the regulations may be tried before any Magistrate and punished by a fine, or imprisonment, or both.

Sleeping Sickness in Nyasaland.—*Sleeping Sickness Diary, Zomba*, pt. xxi, 31st August 1913 (date of Report). 11 pp.

The districts of Marimba, Dedza, South Nyasa and Upper Shire, are being reinvestigated (three months' time being allotted to each) with the idea of demonstrating that sleeping sickness occurs wherever *Glossina morsitans* is found, and to collect facts in proof, but more especially to spread amongst the natives a lively belief in the danger arising from tsetse. It is reported by Dr. Conran that the natives are gradually altering their attitude towards the fly, missionaries having informed him that when travelling in the sleeping sickness area they have overheard natives discussing intelligently the best way of avoiding bites, and that the use of fly-whisks of various kinds is becoming more prevalent.

The preventive measures suggested are briefly summarised as follows: (1) Impressing upon the natives the necessity of avoiding being bitten by flies; (2) clearing for a distance of 300 yards or more round villages situated in close proximity to fly, and extending these clearings in many instances so as to embrace their cultivated lands also; (3) making clearings on each side of roads and main paths leading from one village to another; (4) instructing the natives to use this felled timber for firewood, and to avoid visiting the adjacent fly-infested woods for this purpose; (5) instituting public latrines in all the villages to prevent natives from visiting the adjoining woods for the purpose of defaecation; (6) prohibition as to the firing of grass till the month of October, when only it is fit for burning, so as to ensure as large and as effectively cleared areas as possible; (7) removal to fly-free areas whenever feasible, of villages situated in danger zones.

To expedite clearing operations axes and heavy knives have been supplied to natives in the sleeping sickness area, and during a recent inspection there was reason to be satisfied that some measures of protection at all events will be secured from the bites of tsetse-flies, and it is anticipated that the danger of man-to-man infection may be considerably reduced.

The supervision of these clearing operations has been placed in the hands of Medical Officer's patrols and of the police. The work is being done by the villagers themselves without payment and Dr. Conran is satisfied that the various headmen did not regard this labour as an imposition, but appeared to take an intelligent interest in the work.

Theobald (F. V.). Culicidae **from New Caledonia and the Loyalty Islands.** [*Forschungen in Neu-Caledonien und auf den Loyalty Inseln.*]—*A. Zoologie, Wiesbaden*, i, pt. 3, 1913, pp. 163-164.

Only two species of mosquitos were taken by the Expedition in New Caledonia and the Loyalty Islands, namely *Culex jepsoni*, Theo., *C. nocturnus*, Theo., and *C. nocturnus niger*, var. nov.

Hindle (E.). **A Chinese Flea-trap.**—*Proc. Cambridge Phil. Soc., Cambridge*, xvii, pt. 3, 8th Sept. 1913, p. 284, 1 fig.

A flea-trap which is much used by the natives in Sze-Chwan has been obtained, through Mr. S. A. Stericker, from Cheng-tu the capital of that province of China. It consists of two pieces of bamboo, one inside the other. The outer bamboo is about 1 foot in length and 2½ inches in diameter and is fenestrated by long slits running parallel to its length. The inner bamboo is of equal length but only about 1 inch in diameter, and is kept in position within the former by means of a short wooden plug, which has previously been coated with bird lime. The function of the outer bamboo is to prevent the sticky substance from coming in contact with surrounding objects. The trap is placed under bed-clothes, or amongst rugs, etc., and any fleas that get on to the surface of the inner bamboo at once stick to the bird-lime. The apparatus is very simple and might be used with advantage during plague epidemics, in order to catch fleas, rat or human, within houses. Considering the importance of the rat-flea in the transmission of plague, the employment of a simple and effective flea-trap, such as this, would probably have a decided effect on the spread of the disease.

Disease of Horses in Berbice. *Agric. News, Barbados.*—25th Oct. 1913, p. 345.

Attention is drawn to the fatal disease of horses which appears to be spreading at Berbice. The Demerara "Daily Argosy," 1st Oct. 1913, states that Dr. Minett has diagnosed it as "mal de caderas," a very deadly and well known South American disease caused by *Trypanosoma equina* and sometimes fatal in three or four weeks. There is some indication of its being carried by the stable fly (*Stomoxys calcitrans*) which has been observed in Barbados and occurs in St. Vincent, Antigua, Montserrat, and Jamaica. The Veterinary Officer of the Imp. Dept. of Agriculture in Barbados points out the risk involved by the introduction of Venezuelan horses into Trinidad, Barbados and elsewhere. Surra disease has been said to occur in Barbados, but owing to the similarity of the symptoms it is possible that the cases were really "mal de caderas." Only indefinite knowledge seems to exist in regard to the transmission of this disease, so that further investigation is very necessary. The Demerara "Daily Argosy" (12th Oct. 1913) reports that a resolution was passed at a meeting of the Town Council directing a special inspection of every stable by the Health Department, with the object of advising owners regarding immediate precautionary measures.

Stannus (Hugh S.). **Pellagra in Nyasaland.** Second Paper. *Trans. Soc. Trop. Med. & Hyg.* vii, no. 1, Nov. 1913, pp. 32-56.

The author read a paper before the Society in December 1911 on pellagra in Nyasaland, and pointed out that with the exception of Egypt and Robben Island the disease had not been before described as occurring in Africa. The present paper consists of a series of detailed observations on cases occurring in the Zomba district and especially in the prison at Zomba. The author says that in his first paper he was only able to state that Simuliidae were present in Zomba. In January 1913, with the assistance of Mr. E. Ballard, Entomologist to the Agricultural Department, the streams of the Zomba township were investigated and every stream was found to harbour *Simulium* larvae and pupae. The numbers were roughly proportional to the swiftness of the stream, the maximum being found in the months of January and February.

Simulium larvae were also found in practically every stream in the neighbourhood, and the author believes that larvae would be found in all streams in Nyasaland which, for a sufficiently long period in the year, carried enough water and fulfilled the other well-known conditions necessary for the development of these flies. He thinks that there is some possible support for the theory that *Simulium* may be the carrier of the pellagra virus; at all events there are no facts in Nyasaland militating against that theory, though at the same time all the data collected equally support the theory of defective nutrition as the cause of the disease.

[The species of *Simulium* obtained by Dr. Stannus and Mr. Ballard have recently been identified by M. Roubaud as *S. latipes*, Mg., *S. pusillum*, Fries, and *S. nanum*, Fries, all of which occur also in Europe.—Ed.]

SURCOUF (M. J.). **Note sur les Tabanidae d'Algérie and de Tunisie.** [Note on the Tabanidae of Algeria and Tunis.]—*Archives de l'Institut Pasteur de Tunis*, iii-iv, 1913, pp. 183-186, 1 pl.

The author says that in the course of three journeys made in recent years in Algeria and Tunis he has studied biting Diptera and especially the TABANIDAE. In the group of large blackish *Tabanus* with a bluish sheen on the first segment of the abdomen there are several species which are frequently confused, and for these the distinctive characters are given. *Tabanus algirus*, Macq., is very common on grasslands in Algiers in May and June, and at Tunis the author found a new species, very closely related to it, which he proposes to call *Tabanus tunisiensis*.

LAVERAN (A.) & NICOLLE (C.). **Le Kala Azar Méditerranéen ou Infantile.** [Mediterranean or Infantile Kala Azar.]—*Archives de l'Institut Pasteur de Tunis*, iii-iv, 1913, pp. 204-242.

This is the author's report presented to the section of Tropical Medicine and Hygiene at the 17th International Medical Congress, London, 1913. The history, medical geography, symptoms, mode of cultivation of *Leishmania infantum*, the distribution of the disease amongst animals and the relation of Mediterranean to Indian Kala Azar, are all discussed. The author regards the propagation of the disease amongst dogs by fleas as proved and that *Pulex irritans* as well as *Ct. serraticeps* is capable of propagating *Leishmania infantum*.

ROSS (P. H.). **Report of the Bacteriological Section for the latter half of the Year 1912.**—*Nairobi Laboratory Reports, July-December* 1912, iii, 1913, pp. 1-36.

On page 3 the author notes some cases reported to him which were suspected to be pappataci fever. *Phlebotomus* had not yet been found in the Protectorate, but Manteufel on the coast of German East Africa has met with similar cases of fever and has caught *Phlebotomus* which have not yet been identified. Experiments made with *Glossina* *longipennis*, though at first unsuccessful, eventually resulted in the infection of a monkey; trypanosomes resembling *T. cazalboui* were found in the blood.

ANDERSON (T. J.). **Ticks and biting Insects of Nairobi.**—*Nairobi Laboratory Reports. January-June* 1912, iii, 1913. pp. 19-22.

A list, prepared by the author, of the biting insects and ticks found in the country to date, with their localities, is embodied in the report.

WOOSNAM (R. B.). **The Question of the Relation of Game Animals to Disease in Africa.**—*Jl. E. Africa and Uganda Nat. Hist. Soc., Nairobi*, iv, no. 7, Dec. 1913, pp. 3-4.

The author sets forth the chief points at issue in the question of the relation of game animals to disease in Africa, summarising the conclusions arrived at in connection with sleeping sickness by many authorities upon the subject, and recorded in the "Sleeping Sickness Bulletin" during the past years. Referring to one of the most recent controversies upon the subject, namely, as to whether the big game act as a reservoir for the virus of the disease and should in consequence be destroyed, the author says that from the point of view of game preservation there are six questions which need answers, and that until they are answered, it is impossible to decide upon a definite plan of campaign. Briefly these questions are:—(1) Are game animals the only wild animals which are acting as reservoirs for trypanosomes? (2) Are the trypanosomes found in the blood of game animals pathogenic for man and domestic animals? And if so, are not the trypanosomes found in the blood of other animals also pathogenic? (3) Are tsetse-flies (*Glossina*) the only transmitting agents of these trypanosomes in the infected areas? (4) Are game animals the only source from which the tsetse-flies or other transmitting agents draw their blood supply? And if not what are the other source of supply? (5) Can tsetse-flies live and breed upon food other than blood, such as plant juices? (6) Are the distribution, increase, and spread of tsetse-flies, if this latter occurs, dependent upon game alone? And if not, what are the governing factors?

Experiments which might yield answers to these questions are then indicated.

KING (H. H.). **Observations on the breeding places of Sand-flies (*Phlebotomus* spp.) in the Anglo-Egyptian Sudan.**—*Jl. Trop. Med. and Hyg., London*, xvii, no. 1, 1st Jan. 1914, pp. 2-3.

Up to the present, observers have, on the whole, been of the opinion that the breeding places of sand-flies (*Phlebotomus* spp.) are in crevices in rocks or cement or stone walls, or among bricks and refuse. The author believes, however, that soil and sand are also favourite breeding places. On one occasion he unearthed a single larva from soil in a cotton-field at Tokar, in the Anglo-Egyptian Sudan; he now records the taking of a number of larvae in soil at Khartoum, and the emergence of the adults under abnormal conditions. In May 1913, soil was taken from between rows of orange and lime trees in the grounds of Gordon College, and placed in glass jars. The soil was soaked with water and cotton seeds planted. Thirteen days after the taking of the soil an adult *P. papatasii* was noticed in one of the jars; it had newly emerged and the empty pupal case was close to it. Examination revealed the presence of several pupae in similar situations in both jars, and for the next few days fresh pupae and adults were continually being observed. The pupal period in two cases was nine days. It is obvious that immature larvae must have been present in the soil when it was first placed in the jars, as it was thirteen days before the first adult was seen.

The author has taken adult sand-flies in crevices in rocks in the beds of streams, and in holes in trees, etc., but in the northern desert provinces they are sometimes met with in myriads, sufficiently far from any building or rock to preclude the possibility of their having come from it. Tokar, the centre of a cotton-growing area of 30,000–40,000 acres, is an example of this: in the cotton-fields as many as fifteen adults may be found under a single clod of earth. The writer has endeavoured to sleep in the desert, outside the town of Berber, and found that sleep was rendered almost impossible by sand-flies. By observations made in these and in other localities in the Anglo-Egyptian Sudan, the author is led to believe that in devising any scheme for the destruction of the breeding places of sand-flies one will have to take into consideration all tracts of soil containing cracks and a certain amount of moisture. [Cf. this *Review*, Ser. B, i, pp. 27, 132, 221.]

HIRST (L. F.). **Identification of Rat-Fleas in Colombo.**—*Brit. Med. Jl.*, 10th Jan. 1914, p. 85.

The author says that in February 1912 he began a systematic examination of the rats, principally *Mus rattus*, caught by the principal rat-catchers in the city of Colombo; collections of Siphonaptera and also of small acarine rat parasites were also made from live rats. The fleas have been identified by the Hon. N. C. Rothschild as *Xenopsylla astia* (Roths.), a species first described by him from specimens caught in Rangoon. The author also obtained collections of rat fleas from Madras and they have also been identified as *X. astia* (Roths.), and he draws attention to the fact that in the 7th report on plague investigations in India (Dec. 1912) it is stated that the only rat flea found in Madras is *X. cheopis*. According to the author *X. astia* rarely bites man at temperatures above 80° F., but will do so readily between 70° and 80° F., as also the control rats.

Plague is endemic in Rangoon, but not in S. India or Ceylon, and no epidemic has yet occurred in Colombo, nor, despite the susceptibility of the Madras rats to infection, has there been one of any importance in that city in recent times. The author suggests that an investigation into the relative distribution of *X. cheopis* and *X. astia* in S. India and Burma and also into their relative infectivity as plague-carriers, would throw light on the epidemiology of plague.

HINDLE (E.). **The Flight of the House Fly.**—*Proc. Cambridge Phil. Soc., Cambridge*, xvii, pt. 4, 30th Jan. 1914, pp. 310-313.

During the months of July, August and September 1912, the author in conjunction with Mr. Gordon Merriman, conducted an extensive series of experiments on the range of flight of *Musca domestica*, L., in the town of Cambridge. In the course of these experiments over 25,000 flies were liberated under various meteorological conditions, and about 50 observation stations were employed for their recovery. The results of these experiments point towards the following conclusions: (1) that house-flies tend to travel either against or across the wind; this direction may be directly determined by the action of the wind, or indirectly, owing to the flies being attracted by any odours it may convey from a source of food; (2) that the chief conditions favouring the dispersal of flies are fine weather and a warm temperature: the nature of the locality is another considerable factor, as in towns flies do not travel so far as in the open country, this being probably due to the food and shelter afforded by the houses; (3) that under experimental conditions, the height at which the flies are liberated, and also the time of day, influence the dispersal of the insects; when set free in the afternoon they do not scatter so well as when liberated in the morning; and (4) that, in the experiments made, the usual maximum flight in localities where houses are numerous seems to be about a quarter of a mile, but in one case a single fly was recovered at a distance of 770 yards; it should be noted, however, that part of this distance was across fen land.

LEBOEUF (A.). **Notes sur l'épidémiologie de la Lèpre dans l'Archipel Calédonien.** [Notes on the epidemiology of Leprosy in the New Caledonian Archipelago.]—*Bull. Soc. Path. Exot., Paris*, vi, no. 8, 8th Oct. 1913, pp. 551–556.

The author has for the past $2\frac{1}{2}$ years made a series of enquiries in the islands of the Archipelago with a view to determining to what extent insects or acarids are responsible for the transmission of Hansen's disease. Many Diptera which have been at one time or another incriminated, may, he says, be eliminated *en bloc*. With respect to the SIMULIIDAE, on the Island of Maré, in the Loyalty group, in 1912, the number of lepers formed 4 per cent. or 5 per cent. of the population, and *Simulium* was unknown in the island: neither are there any blood-sucking Chironomids.

As regards the CULICIDAE, the author states that what he has to say applies only to the sub-family CULICINAE, as Anophelines are probably unknown throughout the whole New Caledonian Archipelago, and certainly at Belep in New Caledonia and in the Isle of Pines, Lifu and Maré. He gives a brief description of the character of these islands, which are practically of coral, and no stream, lake or pond is to be found in them. The distribution of Culicines in the three Loyalty Islands (Maré, Lifu and Uvea), with a total population of 11,000 and situated at distance of about 50 nautical miles from New Caledonia, is as follows:—In Maré mosquitos are excessively rare; in Lifu they are also very rare, except at certain periods of the year at Djoj-Luengani. In Uvea on the contrary they are extremely abundant during the rainy season throughout the whole extent of the island, lasting a little longer into the dry season in the northern parts. Now it is a fact that it is precisely in the Island of Maré, where Culicines are not to be found, that the proportion of lepers is highest. On the other hand, in the Island of Lifu, with 1·65 per cent. of its population lepers, the most contaminated villages are those of Wuiwatoul and H'Melek, with a leprous population of 3·96 per cent. and 4·9 per cent. respectively; these villages are more than 25 kilometres from the marsh of Djoj-Luengani and there is no marsh whatever in their neighbourhood, whilst at Djoj-Luengani there are no lepers, in spite of the relatively large number of mosquitos to be found in the place and its neighbourhood during 7 months of year. The author says that the first case of Hansen's disease occurred at Uvea in 1894, and in 1912 Dr. Javelly gave the percentages of leprosy in the three districts, north, centre and south of the island, as 5·34, 0·08 and 2·84 thus showing the extent to which the disease had spread. At Muli the cases rose between 1907 and 1908 from 3 per cent. to 8 per cent., whilst at Fayawé, it had barely risen 0·9 per cent., and yet there are fewer mosquitos at Muli than at Fayawé. It would thus appear that the relation of CULICINAE to the disease is at least doubtful.

Laboratory researches on lice as a means of conveyance have given negative results. In the Loyalty Islands very few of the men are lousy, but the women of the Catholic tribes are obliged to cut their hair very short in order to struggle successfully against vermin. The women of the Protestant tribes do not cut their hair, and it is a curious fact that whether the native women cut their hair or no, the result so far as the number of lepers is concerned, is exactly the same. The women of the Loyalty Islands, who are generally much more lousy than the men, are rarely attacked by leprosy.

With regard to fleas and bugs, as they are found everywhere, it is very difficult to attach any epidemiological significance to them and laboratory experiments have yielded practically negative results. The author considers also that the itch acarus has no connection with the disease. With regard to *Demodex folliculorum*, which was accused by Borrel (*Ann. Inst. Pasteur*, March 1909), not without reason, of being the carrier of Hansen's bacillus, the author says that he has not sufficient laboratory experience to be able to draw a sound conclusion. As regards flies, he refers to a previous paper of his (*Bull. Soc. Path. Exot.* No. 19, page 860, 1912) and says that he has no reason to change the opinions therein expressed. From the epidemiological point of view he is inclined to incriminate only *Demodex folliculorum* and Diptera of the genus *Musca*, especially *Musca domestica*; but in any case he is of opinion that it is rather a question of method of carriage than of a method of transmission, properly speaking. In New Caledonia everything appears to point to the fact that the contagion is spreading directly from one person to another, or indirectly, but under exceedingly limited conditions, through the medium of certain objects fouled by the patient. The radius of dissemination appears to be exceedingly small, but he contends that this does not conflict with the possible rôle of the domestic fly as a carrier and urges in support the family incidence of the disease which is very frequent in New Caledonia. He says in conclusion, without wishing to push the idea too far, that in his opinion one of the best methods of individual prophylaxis against leprosy is the daily use of soap and water without stint.

NOTICES.

The Editor will be glad to receive prompt information of the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion, the adoption of which would increase the usefulness of the Review.

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Moreau (L.). **Prophylaxie du Paludisme dans l'Afrique Orientale Allemande.** [Malaria Prophylaxis in German East Africa.]—*Bull. Soc. Path. Exot., Paris,* vi, no. 8, 8th Oct. 1913, pp. 569–571.

The author says that the German colonists have from the outset done what they could to improve the sanitary conditions of their new country, and in this short paper he deals with what has been done especially against endemic malaria. He says that, even in the good season, the climate is particularly exhausting and depressing, and that though during the construction of the railway from Dar-es-Salaam to Tabora a large number of natives fell victims to malaria, on the other hand the drainage and other works have effected the greatest improvement. The use of petroleum, he was told during his visit, had not yielded very satisfactory results, and the colonists are now busy raising fish as destroyers of mosquito larvae. Attention, however, is being more especially paid to individual prophylaxis. Quinine for this purpose is not in great favour with the colonists and officials, but on the other hand metallic gauze is used in all buildings and some of them, especially the fine Colonial Hospital, are so thoroughly protected in this way that the author says that it must be practically impossible for a single mosquito to enter. In the private houses it is common to find a portion of the verandah elaborately protected with wire gauze in such a way that the occupants may sit there in the evening and drink their beer in peace. Every bed is provided with a mosquito curtain.

The authorities realise that the natives are the principal source from which the mosquitos, against which they seek to protect themselves, derive the malarial poison, and that so long as they are surrounded by infective natives, so long will they, if bitten, be liable to malaria. In order to reduce this to a minimum the native quarters are regularly investigated every week and samples of blood taken, and in those cases in which the organism is found, the individual is at once subjected to an intensive quinine treatment and everything is done to prevent the mingling of infective natives with the uninfected. The regular inspection is most rigorously carried out. The caravans present the greatest difficulty because the natives composing them penetrate into the most gravely infected areas. These caravans are inspected by medical police throughout the whole route.

The result of these vigorous and careful measures has been to reduce the mortality amongst the natives very considerably and the cases of fever amongst Europeans have fallen from 40 per cent. to 10 or 15 per cent. The pernicious type has become rare, and the author says that though the results are perhaps not all that might have been hoped for, the energy and persistence of the colonists in combating the disease are worthy of all admiration.

Bauche (J.), & Bernard (N.). **Notes sur le Surra d'Indo-Chine à Hué.** [Notes on Indo-Chinese Surra at Hué.]—*Bull. Soc. Path. Exot., Paris,* vi, no. 10, 10th Dec. 1913, pp. 690–693.

The authors point out that Laveran and Mesnil have differentiated the trypanosomiasis of horses in Annam from Indian surra and have given the specific organism the name of *Trypanosoma annamense.* The disease appears every year at various times at Hué (Annam)

(C22) Wt.P.11/12—26.3.13. 1,500. 3.14. B.& F. Ltd. G.11/3. A where it rages amongst horses, oxen, buffalos and dogs. H. Schein has insisted that ruminants are the carriers of the poison. The authors say that out of 500 oxen taken to the abattoir in good health they only found six carrying the organism, and out of 89 buffalos examined they failed to find a single case. Out of 300 dogs infected with *Dirofilaria repens* in the proportion of 30 per cent., only one showed trypanosomes. Two or three dogs suffering from trypanosomiasis are brought every year to the veterinary surgeon, and these generally die in a month. The authors say that they have observed that horses suffering from trypanosomiasis have invariably lived at the time of their infection in partially cleared areas covered with bush. In the course of two epidemics, in the first of which nine out of 48 horses died and in the second 100 out of 200, all the horses were treated with equal care in stables alongside the cattle stables. The groups of horses sent to pasture in areas covered with brushwood provided all the cases of sickness, whilst those which were pastured on clearings and were only allowed out during the night or during cool sunless days and were kept in a stable during the hot periods of the day, remained absolutely healthy. The temperature of all the horses was taken, suspected cases isolated, and the moment trypanosomiasis was detected the animal was killed, and these measures were sufficient to stop the spread of the disease in a maximum period of 11 days, this being the mean period of incubation. These facts permit the supposition that the agent of transmission is a fly living in open stretches in wooded areas, such as the *Tabanus*, rather than *Stomoxys* or some other sedentary domestic fly.

The authors' experiments on the transmission of the disease to guinea-pigs by means of *Tabanus annamiticus*, Surcouf, by *Stomoxys*, *Chrysops* or mosquitos, have failed. The Tabanids only lived two or three days after capture, and they would not bite the experimental animals spontaneously.

The authors have examined the blood of about 2,000 pigs, invariably with negative results, but inoculation experiments conducted upon them with 1 cc. of the blood of horses, mules, guineapigs or dogs affected with the disease, were invariably successful. Of 19 animals six were inoculated under the skin and 13 in the peritoneum. Two monkeys (*Macacus rhesus*), 12 guineapigs and two pigs inoculated with the blood of a dog suffering from the disease, all died.

SHANNON (R. C.). **Feeding Habits of *Phlebotomus vexator*, Coq.**—*Proc. Entom. Soc., Washington*, xv, no. 4, Dec. 1913, pp. 165-167.

Recent observations made by the author and by Dr. Paul Bartsch tend to show that *Phlebotomus vexator* feeds normally upon reptiles. On the evening of 19th July 1913 a large copperhead snake was shot and badly crippled at Plummer's Island, Maryland. It still showed life the following morning, when it was found to have numbers of this *Phlebotomus* feeding upon it. The flies had their beaks inserted between the scales of the snake and some of them were so heavily engorged that they were unable to fly; both males and females were present. In Paris, Virginia, on the same day a black snake was caught which had, in addition to numerous ticks, a few of the same flies feeding upon it in a similar way. Specimens of *P. vexator* are recorded as feeding on man; in India a species of *Phlebotomus* has been observed sucking the blood of a toad.

Discussing this paper Mr. Knab draws attention to the marked difference in the feeding habits of species of *Phlebotomus*, which the observations made in the present paper accentuate. It is recognised that *P. papatasii*, of the Mediterranean region, the vector of the so-called pappataci fever, is associated with man, frequenting houses, and the females sucking his blood. Mr. Howlett shows that another species common in the Orient, *P. minutus*, has a marked preference for the blood of geckos, and states that the distribution of *P. minutus* and of the GECKONIDAE correspond very closely, and that the biology and life-history of this species is closely associated with these lizards. (Howlett, *Ind. Jl. Med. Research*, i, pp. 34–38, July 1913; see this *Review* Ser. B, i, p. 211).

GUENTHER (K.). **Die lebenden Bewohner der Kannen der insektenfressenden Pflanze** *Nepenthes destillatoria* **auf Ceylon**. [Living inhabitants of the pitchers of the insect-eating plant, *Nepenthes destillatoria*, in Ceylon.]—*Zeitschrift für wissenschaftliche Insektenbiologie, Berlin*, ix, nos. 6, 7, 8, July-Sept. 1913, pp. 198-207 and 259-270, 14 figs.

Among the living insects found in the pitchers of *Nepenthes destillatoria* in Ceylon were numerous mosquito larvae, which the author describes under the name of *Ficalbia* [*Rachionotomyia*] *dofleini*.

LUTZ (A.). **Forest Malaria.**—*Proc. Entom. Soc., Washington*, xv, no. 4, Dec. 1913, pp. 169-170.

In answer to the objections raised by Mr. Knab and Dr. Dyar to his theory that isolated epidemics of malaria in forests are due to bush mosquitos, [see this *Review*. Ser. B, i, p. 230,] the author makes the following reply. Another Anopheline had not been mistaken for *Anopheles lutzi*, as had been suggested; that other Anophelines had not been overlooked, a special look-out having been kept for them; that the men attacked with malaria could not, as stated, have returned to towns during the night, all towns being too far distant from the forest camps to make the journey possible within the course of a night*; and that the contention that mosquitos, which have never been in contact with men before, cannot transmit disease, is erroneous and contrary to observed facts.

MORSTATT (H.). **Liste der blutsaugenden Fliegen und Zecken**. [A list of blood-sucking flies and ticks.]—*Der Pflanzer, Dar-Es-Salaam*, ix, no. 10, Oct. 1913, pp. 507-510, 1 pl.

A full list is given of the bloodsucking flies and ticks recorded from German East Africa, which is chiefly based on the list published by S. A. Neave (*Bull. Ent. Res.* iii, p. 316). Of mosquitos 19 species are recorded, including 5 Anophelines; while there are 58 TABANIDAE, 5 *Glossina*, 11 *Stomoxys* and 10 HIPPOBOSCIDAE. The ticks are represented by 1 Argasid and 32 IXODIDAE.

*[There does not appear to have been any suggestion on the part of Dr. Dyar that the towns had been visited in the course of a single night. —ED.]

Ewing (H. E.). Some External Parasites of Poultry.—*Oregon Agric. College, Corvallis*, 1913, *Bull.* 92 (Exten. Ser. ii, no. 5), 16 pp., 12 figs. [Received 18th Feb. 1914.]

The universally distributed parasites of poultry, *Argas persicus* and *Dermanyssus gallinae*, are dealt with, and the usual remedies are recommended [cf. this *Review*, Ser. B. i, p. 23, ii, p. 21]. The disease known as scabies or scaly leg of chickens is caused by the itch mite, *Cnemidocoptes mutans*, Robin, which attacks especially the combs and legs. Upon the combs the injury shows as small white specks and folds covered with scales. The injury to the legs begins in the form of small blisters between the scales, which enlarge and rupture, causing the serum to dry and producing a chaffy scale. As a remedy it is suggested that the affected parts should be soaked first with hot soap-suds and much of the scabby material removed, and these parts then treated with any good ointment containing sulphur, a strong kerosene solution, or commercial lime-sulphur diluted at the rate of one part of the solution to 9 or 10 parts of water. *Menopon pallidum*, Nitzsch, the common hen louse, produces irritation by its movements over the skin, and may prove a very serious pest when it becomes abundant on small chickens. It attacks especially the head region. The eggs are laid among the feathers and the young as well as the adults feed chiefly on the barbules of the feathers. As a remedy, dress the chickens with either kerosene, or a mixture of plaster of Paris and carbolic acid, or slaked lime and sulphur. The following mixture is also a good one: Crude carbolic acid, $\frac{1}{2}$ pint; gasoline, $1\frac{1}{2}$ pts.; plaster of Paris, 5 lb. It may also be necessary to spray the nests and buildings with kerosene or gasoline. These control measures will also serve for the large hen louse, *Menopon biseriatum*, Piaget. *Trinoton ludium*, Nitzsch, occurs on a great many species of ducks, but on no other birds; and many species of wild ducks found in the United States, as well as the domesticated ones, are infested with another biting louse, *Lipeurus squalidus*, Nitzsch; both species may be treated in the same way as *T. ludium*. *T. lituratum*, Nitzsch, occurs on the goose, and *Goniodes stylifer*, Nitzsch, is commonly found wherever turkeys are raised. As control measures against the fowl flea, *Echidnophaga gallinacea*, Westw., the infested quarters should be cleared of all loose trash and rubbish, which should be burned. The houses, crates and coops should be sprayed with kerosene, gasoline or distillate oil, the walls of the houses being drenched so that the oil will penetrate the cracks. In some parts of the country, especially in the Western States, the common flea in poultry houses is the bird flea, *Ceratophyllus lusavium*, Tasch.

Fantham (H. B.), & Porter (A.). The pathogenicity of *Nosema apis* to insects other than hive-bees.—*Ann. Trop. Med. & Parasit., Liverpool*, Series T. M., vii, no. 4, 30th Dec. 1913, pp. 569-579.

Some experiments made with insects other than *Apis mellifera* tend to show that the pathogenicity of *Nosema apis* is far from being restricted to the hive-bee. The authors have reached the following conclusions: (1) *Nosema apis* has been proved pathogenic to Hymenoptera other than bees; it can multiply in the alimentary canals of humble bees, mason bees and wasps, and can bring about the death of the hosts. (2) Contamination of plants with infected excrement occurs in the neighbourhood of badly infected hives. Such contaminated food is pathogenic to the larvae of cabbage white butterflies (*Pieris*), cinnabar moths (*Tyria jacobeae*) and gooseberry moths (*Abraxas grossulariata*), in which *Nosema apis* produces destruction of the tissue of the alimentary canal in the same way as in bees. Both imagines and larvae of these insects become infected with microsporidiosis when supplied with food contaminated with *Nosema* spores. (3) *Calliphora erythrocephala*, the blow-fly, becomes infected naturally by ingesting *Nosema* spores contained in the sweet excrement of bees; this infection has been repeated experimentally. Crane-flies may also become infected. (4) A Hippoboscid fly, *Melophagus ovinus*, has been infected successfully with *Nosema apis*, which is pathogenic to it.

It is suggested that search be made by competent observers in *Glossina* for microsporidian parasites allied to the *Nosema* of bees; for should such a pathogenic organism be found it might be a forward step in the solving of the problem of sleeping sickness.

THEOBALD (F. V.). **New Culicidae from the Sudan.**—*Ann. Trop. Med. & Parasit., Liverpool*, Series T.M., vii, no. 4, 30th Dec. 1913, pp. 591-602, 2 figs.

From a collection of CULICIDAE sent by Mr. Harold King from the Sudan, the following new species have been described, the types of which are in the collection of the Liverpool School of Tropical Medicine:—*Mucidus nigerrimus*, *Taeniorhynchus* (*Chrysoconops*) *nocturnus*, *Ochlerotatus* (*Reedomyia*) *sudanensis*, *Stegomyia* (*Kingia*) *maculoabdominalis*, *Ochlerotatus* (*Aedimorphus*) *quinquepunctatus*, *O.* (*Culicelsa*) *centropunctatus*, and *Culex* (*Heptaphlebomyia*) *kingii*.

CARTER (H. F.). **On certain mosquitos of the genera *Banksinella*, Theobald, and *Taeniorhynchus*, Arribalzaga.**—*Ann. Trop. Med. & Parasit., Liverpool*, Series T.M., vii, no. 4, 30th Dec. 1913, pp. 581-589, 6 figs.

After an examination of the male genital armatures of numerous species of African mosquitos, the author states that *Banksinella palpalis*, Newst. (*Neomelanoconion palpale*, Newst.) is specifically distinct from *B. luteolateralis*, Theo.; *Taeniorhynchus maculipennis*, Theo., which was recently placed as a synonym of *T. annettii*, Theo., by F. W. Edwards, is also a valid species, with which Edwards now agrees; while the author agrees with Edwards in sinking *T. violaceus*, Theo., as a synonym of *T. metallicus*, Theo.

O'FARREL (W. R.). **Hereditary infection, with special reference to its occurrence in *Hyalomma aegyptium* infected with *Crithidia hyalommae*.**—*Ann. Trop. Med. & Parasit., Liverpool*, Series T.M. vii, no. 4, 30th Dec. 1913, pp. 545-555, 3 pls.

In a preliminary note (Aug. 1913) the author gave a brief description of the flagellate stage and discussed the movements of *Crithidia hyalommae*, O'Farrel, 1913. The practical proofs of the hereditary transmission of *C. hyalommae* are as follows:—(1) The intestinal diverticula of the ticks were never found to harbour parasites; (2) the haemocoelic fluid was the habitat of the early pre-flagellate forms; (3) these early pre-flagellate forms developed into full-grown *Crithidia* in the haemocoelic fluid; when these were present in large numbers they were found to migrate to the ovarian system; (4) the hereditary infecting forms were found entering the ova; (5) plasmodial forms were found in the deposited eggs.

WATSON (Dr. M.). **Mosquito Reduction and the Consequent Eradication of Malaria.**—*Trans. Soc. Trop. Med. Hyg., London,* vii, no. 2, Dec. 1913, pp. 59-82.

A definite connection was traced in Selangor between malaria and its carrier, *Anopheles umbrosus*, which breeds in stagnant pools in the jungle. Drainage was commenced and has resulted in the disappearance of malaria over many acres of land. Not only was malaria found to be connected with jungle pools on low, flat, coastal lands, but it was also intense in the hill lands where there were no swamps and where the water was perfectly clear. Here malaria is carried by a mosquito called by the author at that time *N. willmori* (properly *A. maculatus*), which breeds in clear streams. Again drainage was resorted to and the percentage of cases was lowered. In the flat open land in Krian, where the irrigation water came from an artificial reservoir, in which dead jungle trees still stood, four species of *Anopheles* were present—*rossi*, *kochi*, *sinensis* and *barbirostris*; but the rice-fields were practically free from malaria. In the large open valleys, in addition to the four *Anopheles* found in Krian, three others were present at Bukit Gantang, namely, *umbrosus*, *nivipes* and *albirostris*, all of which carry malaria; and here there was much malaria present. *A. maculatus* was found on the hills at the side of the valley. Investigations for means of reducing the number of mosquitos are being carried out. The distribution of malaria in India is very similar to that in the Malay States. In India, *A. maculatus* is the commonest *Anopheles* and occurs in the Duars and the Jeypore hills; it has been reported from Ceylon and has been found in a Dutch island off Singapore and also in Hong Kong, and wherever this species is found malaria is severe. In Italy, where there was only a pool-breeding *Anopheles*, the hills were free from malaria, and where open drainiage was possible malaria could be eradicated.

The questions then arise: Is it possible that throughout the tropics one would always find a hill stream-breeder and intense malaria; and are all pool-breeders as amenable to open drainage as *A. umbrosa* on the flat land of the Malay States? For further investigations visits were made to Sumatra, Panama, British Guiana and Barbados. In Sumatra the absence of malaria is very extraordinary, and so far *A. maculatus* has not been taken there. There was some evidence of malaria near an island swamp, but no trace of it in the hill land. In Panama, drainage was the most important measure against *Anopheles* and oiling was resorted to where drainage was impracticable; while the success was at first due to protection from bites as much as to *Anopheles* reduction, the latter measure has become the more important. Here the chief *Anopheles* are *albimanus* and *argyrotarsis*, the former breeding in almost any pool, but not in running water. British Guiana is a country full of waterways and canals, and the filling up of drains, which are essential to the plantations, is impossible; the alternative appeared to be quinine, which was the policy adopted. Here the spleen rates were high in comparison with the death rates, but clearly 75 per cent. of the malarial problem in British Guiana is already solved and the way to eradicate the disease is by Anopheline reduction. In Barbados the author thinks that the absence of breeding places is the reason for the absence of malaria, rather than the presence of "Millions." In all cases it would seem that drainage indicates the way to overcome the disease.

In the discussion which followed Sir Ronald Ross expressed agreement with the methods advocated by Dr. Malcolm Watson, and referred to his own work on the extermination of malaria in India, where he used precisely the same method, the report of which was published in the Indian Medical Gazette for July 1899. Sir R. Ross also stated that quinine as a preventive has distracted attention from the fundamental method and expressed doubts whether quinine is really cheaper for the benefits given than is mosquito reduction. Dr. D. Thomson was of opinion that after the difficult work done in the Malay States it ought to be quite possible, by clearing the jungle, to reduce mosquitos in all the settlements at the mouth of the Niger. Dr. Andrew Balfour, referring to a letter from Mr. Sawer working in the Sudan, says that the results obtained by drainage in that country speak well for that method. Here the drains are deep, and graded drainage channels cut into the soil and undoubtedly benefit agriculture at the same time. The statement made by Dr. Watson that the absence of malaria in Barbados was due probably to the absence of suitable breeding places was criticised by Dr. G. C. Low, who stated that he found permanent collections of water forming swamps, especially near Worthing, about three miles from the capital of the island. From water taken from these swamps to St. Vincent, a neighbouring island, *A. albipes* and *argyrotarsis* (the West Indian malarial-carriers) were reared with ease. The isolation of the island, the situation of the suitable collections of water away from the harbour and main town, and the difficulty of mosquitos getting ashore from the ships which lie in an open roadstead a mile or more from shore, were considered by Dr. Low to be the chief factors dominating the absence of these insects; he agreed that the Barbados "millions" were not the cause. Dr. Low also stated that he has found *albimanus* breeding in running water. Dr. Bahr stated that in Ceylon malaria is essentially a disease of the low country, especially of the rice districts. Here *A. culicifacies* is the chief carrier; *A. maculatus* was encountered once in a swift flowing stream. *A. albirostris*, contrary to the experience of Dr. Malcolm Watson in Malaya, breeds in the muddy parts of paddy-fields. To a less extent malaria is a disease of the jungle in Ceylon. The problem of the abolition of the paddy-field is one of importance to the Colony and Dr. Bahr thinks that paddy-fields in the vicinity of towns should be abolished. He also suggested that the reason why a mosquito will transmit a parasite in one place and apparently fail to do so in another ought to be more fully investigated. The President, Sir R. H. Charles, stated that there is no question that improvement in agriculture is one of the most necessary works against malaria. In India this is a difficult task and village sanitation is at the root of the whole matter. Attention must be given to drainage, improved methods of agriculture, oiling, screening, and the proper use of quinine; but above all, the co-operation of the population in the methods undertaken must be gained. Dr. Watson, referring to Dr. Bahr's suggestion with regard to abolishing rice-fields, thinks that such a step cannot be recommended, and notes that in British Guiana the mosquito can be held in check by a system of completely flooding the rice-fields, and then rapidly drawing off the water. With reference to sanitation, Dr. Watson thinks that oiling all the collections of water over the country would never rid the country of malaria; it would be better to show the people that it is in their interests commercially to grow rice in a certain way, and by showing them a profit and incidentally reaping a health advantage out of it, the object desired is most likely to be attained.

Beal (W. P. B.). **Report Vet. Dept. Government of the Gold Coast for 1912, Coomassie,** 17th Nov. 1913, pp. 7 and 17.

The number of biting flies (chiefly *Stomoxys*) has been markedly lowered by the abolition of dung pits. Horseboys now carry all excreta and soiled bedding, etc., to the incinerators where they are immediately burnt. During the year there was an outbreak of trypanosomiasis among horses and mules at Accra. In May, Dr. O'Brien, Medical Officer of Health, found 1 horse and 4 mules to be infected. Between 30th July and 9th Sept. the author examined the blood of 83 horses and mules at Accra, and found 4 horses and 1 mule infected. Records show the existence of trypanosome infection in the cattle killed at the Accra slaughter house, which are taken from a herd replenished by breeding locally and in the Addah district, with an occasional importation from the Northern Territories, French Sudan and Togoland. This herd must be considered to be a reservoir for spreading trypanosomiasis. The author does not think that *Glossina* is here responsible for infecting the horses and mules, as these flies are rare in the locality. After further search two species of *Stomoxys* and one species of *Lyperosia* were found. These flies were very common, especially among cattle, and they will always maintain an endemic form of trypanosomiasis in the local herd. The author adduces evidence to show that 3 of the horses belonged to natives, who frequently ride among the cattle, and must have been infected from the latter. One of these horses was stabled about 30 yards from the 4 mules, no great distance for an infected *Stomoxys* to fly. The fourth horse belonged to a European and the author thinks it probable that infection was conveyed from cattle which frequently grazed around that particular stable. The species of trypanosome concerned in the outbreak in May showed a marked morphological resemblance to *T. cazalboui*. As shewn in the preceding report for 1911–12 [cf. this *Review*, Ser. B, i, p. 19] the administration of certain arsenical preparations as a prophylactic in a tsetse-fly district was of some use. During the past year a cheaper form than "Orsudan" was recommended, namely white arsenic, 2 to 3 grs. to be given daily when trekking through fly country.

Townsend (C. H. T.). **On the Identity of Verruga and Carrion's Fever.**—*Science, New York*, xxxix, 16th Jan. 1914, pp. 99-100.

Following upon the reopening of the question as to whether Carrion's fever and eruptive verruga (so-called) are respectively malignant and benign forms of one disease or entirely different diseases, which was discussed by Dr. Strong at Lima in November last, the present author gives some facts which bear upon the entomological and protozoological aspects of the case, and which uphold the theory of the unity of these diseases. These facts are as follows:—Carrion's fever and eruptive verruga have the same geographical distribution; they are connected by every grade of clinical symptoms; the bone pains which are characteristic of the benign form often occur with marked severity and such high temperature that the case must be diagnosed as malignant or Carrion's fever rather than benign or eruptive verruga; Carrion's fever is always followed by the eruption, usually of the miliary, but sometimes of the nodular type, the latter being more distinctive of the benign form, this indicating the identity of the malignant and benign forms etiologically. Infection by *Phlebotomus verrucarum* from the same locality produces both in man and laboratory animals sometimes one and sometimes the other form of disease, apparently according to the severity of the infection, due to the number of *Phlebotomus* concerned, or to the degree of resistance of the host infected. The bodies named *Bartonia bacilliformis* are present in both; these are not specific organisms, but changes wrought in the red cells by the activities of the as yet undiscovered verruga organism; neither Carrion's fever nor verruga eruption can be produced by the injection of blood containing *Bartonia* bodies alone, but both can be produced in man by injection of the virus from the human eruption, and the benign form can be produced in laboratory animals by such injection. Cases of eruption following either disease often, if not always, confer immunity against both. It is practically certain that the reservoir of infection, whatever it may be, supplies but one kind of microbe capable of developing in and being transmitted by the *Phlebotomus*. Both diseases are amenable to the same treatment, so far as this has been determined for either. All these facts have been verified by the author during his investigation of verruga transmission, in the verruga zones and in the laboratory: a few experiments are quoted, indicating the lines on which the work was done.

BRITTON (W. E.). **Mosquito Control Work in Connecticut in 1913.**—*Rept. Connecticut Agric. Expt. Sta. for* 1913, *New Haven*, 1914, pp. 242-249, 1 pl.

An act was passed in the State of Connecticut during 1913 under which any accumulation of water in which mosquitos are breeding is declared a public nuisance. It is also made the duty of the health officer to investigate any reported breeding place and order it to be abolished, screened or treated so as to prevent the breeding of mosquitos.

An examination of the pools and ditches in the park at Meriden, which are kept oiled, showed that the breeding of mosquitos had not been entirely prevented by this means. Some parts of West River were found to be teeming with larvae, and this probably accounts for the annual scourge of *Culex pipiens* experienced, during at least three years, from the end of July until the cold weather. As soon as possible the river and canals connected with it were oiled. Kerosene was used because it could be purchased immediately; six barrels of crude oil were also applied with excellent results. The oil was spread by means of two "double forester" pumps. The treatment was effective: a few live larvae were found subsequently, but thousands of dead ones floated down. A day or two later rain carried off most of the oil, and later one small brood of mosquitos developed. Unless some remedial action is taken, the condition probably will exist in West River each season of scant rainfall, so long as the pollution is allowed to continue. The bed should be cleared of rubbish and straightened. Similar outbreaks occurred near Urbana, Ill., where a creek is practically stagnant in late summer, and at Greenwich, Conn. A considerable amount of draining and filling has been done in the town of Greenwich, and the ditches in the salt marshes have been kept clear in New Haven, Shippan Point, Darien, South Norwalk and Fairfield.

HINDLE (E.), & CUNLIFFE (N.). **Regeneration in *Argas persicus*.**—*Parasitology, Cambridge*, vi, no. 4, Jan. 1914, pp. 353-371, 4 figs.

The present paper is an account of the regeneration of limbs and mouth-parts in *Argas persicus*; the investigations undertaken were to ascertain whether immature ticks whose mouth-parts have been mutilated or torn off by forcible removal of the parasite from the host possess the power of regeneration; and further to ascertain whether the small legs occasionally observed in nymphal and adult ticks are due to mechanical injury followed by regeneration. It was found that in all stages, if the limb be amputated sufficiently long before moulting, regeneration takes place, but that the regenerated appendage is practically always less than normal in size, although possessing the usual number of joints. In no case was there any evidence of atavistic regeneration, and when the legs of a larva were amputated it always regenerated nymphal legs. On comparing the periods elapsing between feeding and amputation, and amputation and moulting respectively, it was found that in each stage there is a minimum post-amputation period, beyond which no regeneration takes place; this period is relatively longer in the case of the larva than in other stages. The amputation of one or two joints causes a reduction in all the remaining joints; in experiments with first stage nymphs one, two, three, four and five joints respectively were amputated, and in all the regenerated limb was normally proportioned though reduced in size.

CUNLIFFE (N.). *Rhipicephalus sanguineus*: **variation in size and structure due to nutrition.**—*Parasitology, Cambridge*, vi, no. 4, Jan. 1914, pp. 372-378, 4 figs.

These investigations into the effect of malnutrition on *Rhipicephalus sanguineus* form a continuation to those made by Prof. Nuttall on *R. appendiculatus* [see this *Review*, Ser. B, i. p. 155]. The results of the present investigations corresponded entirely with those obtained by Prof. Nuttall.

CUNLIFFE (N.). **Observations on *Argas brumpti*, Neumann.**—*Parasitology, Cambridge*, vi, no. 4, Jan. 1914, pp. 379-381, 1 fig.

Very little is known regarding the biology of *Argas brumpti*; Dr. Brumpt found it in rocky situations where its host was probably the porcupine; Mr. Scholefield states that he found it on the Yatta Plains, British East Africa, where, according to the natives, it feeds only on large animals; when it bites man it causes great pain and sickness. The author has experimented with material consisting of 14 nymphs sent from Kitui, British East Africa, by Mr. Scholefield: as only the nymphs and adults are known of this species, an attempt was made to obtain eggs and larvae in the laboratory.

The nymphs were fed on fowls, and usually became engorged within an hour; during metamorphosis they were kept in an incubator maintained at 30° C. One female emerged on 22nd Jan. 1913, and four males soon after: the female was fed on the 12th and 17th days after emergence, but although afterwards placed on a fowl at intervals of 20 days, it refused to feed again until the 143rd day after emergence, and it had refused to feed from then to the time of writing. It was fertilised on the 13th, 70th, 142nd, 158th, and 168th days. Eggs were laid as follows:—53 eggs between 99–106 days, 66 eggs between 118–125 days, 21 eggs between 152–156 days, and 18 eggs between 161–166 days after emergence, making a total of 158 eggs up to the time of writing (4th Nov. 1913).

The eggs were kept under varying conditions of temperature and moisture; some were kept at 23–25° C., others at 30° C. and a few at 37° C., in each case under both dry and moist conditions. Larvae were obtained from only two batches of eggs, namely those laid at the periods beginning at the 118th and 161st days respectively: in both cases the eggs were kept at 30° C. and moistened daily. Nine larvae hatched out from the first batch of eggs after 24–27 days, and two larvae from the second batch after 26 days. It was found impossible to raise these larvae through the nymphal stages. Some larvae though repeatedly placed on a fowl, in some cases for a period of two or three days, nevertheless did not become attached. From these results it seems doubtful whether the fowl is a suitable host for this tick. In the case of *Argas persicus* the nymphal and adult stages can be reared on several species of birds and also on mammals, but the larvae do not seem to feed on any animal other than the fowl.

THEOBALD (F. V.). **A New Mosquito from Samoa.**—*Entomologist, London*, xlvii, Jan. 1914, pp. 36-37.

A new species of mosquito *Pseudotaeniorhynchus samoaensis* sp. n. is recorded from Apia, Samoa. The other mosquitos found in Samoa are *Stegomyia fasciata, F.*; *S. pseudoscutellaris*, Theo.; *Culex fatigans*, Wied.; and a species of *Mansonia*.

AUSTEN (E. E.). **On certain recently described Australian Species of** *Tabanus*.—*Ann. Mag. Nat. Hist., London*, xiii, no. 74, Feb. 1914, pp. 263-266.

The present paper revises some points in the nomenclature of the species of *Tabanus* described by Mr. Taylor, in his report to the Australian Institute of Tropical Medicine for the year 1911 [this *Review*, Ser. B, ii, pp. 11–12]. The species regarded by Mr. Taylor as *Tabanus abstersus*, Walker, is not that species. The names *T. fuscipes* and *T. lineatus* are already occupied, and the author suggests the name *T. taylori* instead of the former. The species regarded as *T. gregarius*, Erich., is a new species, and that regarded as a new species and called *T. tetralineatus* is *T. cinerescens*, MacLeay.

Austen (E. E.). **Do House-Flies Hibernate?**—*Entomologist, London*, xlvii, Feb. 1914, p. 69.

In view of the disease-bearing potentiality of the house-fly, *Musca domestica*, it is important to know more of its hibernating habits, a matter upon which writers are not agreed. Dr. Skinner in America stated that house-flies pass the winter in the pupal stage and in no other way, a conclusion at variance with results obtained in England by Newstead and Jepson. It is a question that has been taken up for investigation by the Local Government Board, which undertakes to have specimens of hibernating flies identified. In the present note the author writes with a view to soliciting help and interest in the work: flies hibernating in attics and other unoccupied rooms, in chinks and crannies of living rooms and in stables, barns and other outbuildings close to houses, should be collected and sent to Dr. S. Monckton Copeman, F.R.S., Local Government Board, Whitehall, S.W., or to the author, British Museum (Natural History), Cromwell Road, London.

Le Crésyl insecticide. [Cresyl as an insecticide.]—*Bull. Soc. Etude. Vulg. Zool. Agric., Bordeaux*, xii, no. 6, Dec. 1913, pp. 179-180.

A short note deals with the investigations of Bouet and Roubaud into the antiseptic and insecticidal properties of cresyl. These workers have demonstrated the efficacy of this product for destroying flies, mosquitos, fleas, etc. Cresyl fumes almost immediately stupefy the insect, and if the latter should revive, very marked lesions prevent its doing injury. A slight increase in the dose or a slightly prolonged time of contact leads to death. Flies and mosquitos, even if hiding in folds of canvas or in wickerwork, succumb rapidly to a dose of 75 grains per 35 cubic feet. This strength does not affect man or other mammals, so that the fumigation does not bar access to the rooms in which it is being carried out. The only trouble is a slight irritation of the conjunctiva. During the whole of the experiments Bouet and Roubaud were able to keep white rats in the rooms treated without observing any morbid symptom. The fumes do not injure household articles, metals, or gilding. The air need not be artificially agitated as cresyl is extremely volatile. These experimenters hold it to be the surest remedy for the rapid disinfection of insect-infested buildings, while it is at the same time an excellent and cheap antiseptic.

Brumpt (E.), & Pedroso (A.). **Recherches epidémiologique sur la Leishmaniose forestière américaine dans l'Etat de São-Paulo (Brésil).** [Epidemiological research on American forest Leishmaniasis in the State of São-Paulo (Brazil).]—*Bull. Soc. Path. Exot., Paris*, vi, no. 10, 10th Dec. 1913, pp. 752-762.

In September 1913, the authors undertook an expedition in the forest country of the State of São Paulo for the purpose of discovering, if possible, the host which transmits American forest Leishmaniasis. This disease which has been known for a long time and has been called by various names, pian-bois, forest-yaws, bouton de Bahia, etc., resembles in certain cases the well-known disease, Oriental sore, but in other phases it is sufficiently different to warrant its being regarded as a separate disease.

The malady is contracted by man in certain parts of the forest which may not have been previously inhabited; it is therefore endemic in these parts, either in wild mammals or in insects. That the disease is caused by leeches is regarded as impossible, since the majority of the men affected had never experienced bites from leeches. Mites are known to attack man, but there is no evidence in favour of the idea that they can transmit the disease. Ticks of the genus *Argas* are rare in Brazil; other ticks, particularly *Amblyomma cayennense*, are common and attack any part of the body; they are eliminated as possible vectors of the disease since the localisation of the ulcers does not correspond with the actual bite of the larval tick. For the same reason bugs must be disregarded; the species *Cimex lectularius* and *C. hemiptera* (*rotundatus*), moreover, are found more frequently in towns than in the forest.

Dipterous insects are far more open to suspicion, especially certain TABANIDAE. Deer are usually parasitised by a small species of *Lipoptena* (?) which may occasionally attack man; these and other similar flies are eliminated because they do not usually attack the parts upon which ulcers are found. On the other hand, many species of TABANIDAE, which bite indiscriminately, live in forests and are restricted to definite localities. Species of *Stomoxys* are not regarded as possible vectors, since they are found frequently in open country, where the disease is unknown. For the same reason *Simulium* cannot be incriminated, its distribution being too general, as compared with the definite localisation of the disease. *Phlebotomus* probably does not act as a vector, as it is nocturnal, and it is evident that the transmitting insect must be diurnal, since the disease is contracted by men who only spend the day in the forest. It is possible that certain of the CULICIDAE may act as vectors; but this cannot apply to those species which appear in December, January and February, because the season at which forest Leishmaniasis is prevalent is in May and June; this period corresponds exactly with the appearance of certain species of TABANIDAE.

The authors are of the opinion that the TABANIDAE are the most likely of all the forest blood-sucking insects to be connected with the transmission of the disease. Regarding the animals which act as a reservoir for the virus, the dog seems to be the most liable to attack; but so far not much work has been done from this point of view. An indication is given of the lines that future work on the subject will take; it will include the study of forest insects on the same lines as above; dissection of suspected insects to discover the organism, if any, which causes the disease; injections of suspected material, such as the proboscis, salivary glands, etc., of possible insect vectors, into dogs and other animals; and the systematic study of the biology of suspected insects.

METALNIKOFF (S.). **De la Tuberculose chez les Insectes.** [Tuberculosis in Insects.]—*C.R. Soc. Biol., Paris*, lxxvi, no. 2, 23rd Jan. 1914, pp. 95-96.

A few years ago the author published his work on tuberculosis in the larvae of the wax-moth, *Galleria mellonella*. The result of this work was to show that the tuberculosis bacillus when injected into the grub was quickly destroyed and the grub was not infected. Further experiments have shown that this destruction of the bacillus is due probably to a lipolytic ferment secreted by the cells of the body of the grub. The author has also experimented upon other insects, notably the caterpillar of *Achraea grisella*, which also feeds upon the wax in bee-hives. The bacilli of human tuberculosis were injected in large numbers, and all were destroyed within a few hours. The effect of injecting the bacilli from other animals was then tested: those from an ox proved harmless, being quickly destroyed; but the bacilli from fish caused the infection and death of the grubs, at the ordinary room temperature. If, however, the temperature was raised to 35° C. (the temperature which is most favourable for the growth and reproduction of the insects) the injected fish bacilli were destroyed.

LAVERAN, (A), & FRANCHINI (G.) **Infections experimentales de Mammifères par des Flagollés du Tube digestif de *Ctenocephalus-canis* et d'*Anopheles maculipennis*.** [Experimental infection of mammals with Flagellates from the alimentary canal of *Ctenocephalus canis* and *Anopheles maculipennis*.]—*C. R. Acad. Sci., Paris*, clvii, no. 18, 3rd Nov. 1913, pp. 744-747.

In a previous communication the authors showed that it is possible to infect mice with *Herpetomonas ctenocephalis*, a flagellate of the alimentary canal of the dog flea [*cf.* this *Review*, Ser. B., i p. 177]. The results recorded in the present paper show that the flagellates of the alimentary tract of *Anopheles maculipennis* can be similarly transmitted to rats and mice. In both cases the infections are characterised by the presence in the blood, liver and spleen of the typical Leishmania bodies. In animals infected with *Crithidia fasciculata* no flagellate elements were observed; the presence of these elements is exceptional in the infection due to *Herpetomonas ctenocephali*.

LAVERAN (A.), & FRANCHINI (G.). **Infection naturelle du rat et de la souris au moyen de puces de rat parasitées par *Herpetomonas pattoni*.** [Natural infection of rats and mice by rat fleas parasitised by *Herpetomonas pattoni*.]—*C.R. Acad. Sci., Paris*, clviii, no. 7, 16th Feb. 1914, pp. 450-453.

Following upon the experiments which showed that rats and mice could be infected by the flagellates from the alimentary canals of *Ctenocephalus canis* or of *Anopheles maculipennis* [see above], the authors have gone on to show that it is possible to infect these animals with the flagellates of the rat flea, *Ceratophyllus fasciatus*, identified by Chalton and Delanoë as *Herpetomonas pattoni*, Swingle, and with *Crithidia melophagi*, which are frequently found in the alimentary tract of the sheep fly, *Melophagus ovinus*. These results lend some support to the opinion of those who hold that the trypanosomes of vertebrates and those of Leishmania originate as the flagellates of an invertebrate.

African Coast Fever; Report of the Veterinary Conference of 10th April 1913.—*Rhodesia Agric. Jl., Salisbury*, xi, no. 2, Dec. 1913, pp. 261-266; xi, no. 3, Feb. 1914, p. 436.

At the above-mentioned conference Mr. Gray opened a discussion on African Coast Fever and detailed briefly the position in the Union. The older methods consisted of stamping out the disease by means of slaughter, by fencing infected areas, controlling the movements of stock and quarantining infected veld for a period of fifteen months. When the short-interval dipping system was discovered by Col. Watkins-Pitchford this method was adopted and combined with the fencing. The result was that the disease had been banished, except in one or two areas largely occupied by natives, and even there it was fast disappearing. Details of the disease and methods employed in different districts were given, and the position in the Transvaal was stated to be exceedingly satisfactory and in Natal very promising. Passing from Natal to the native territories, Mr. Gray said the position was more serious and the disease was still rampant. Lack of funds prevented the erection of sufficient tanks in these territories and inoculation was resorted to. There is still much work to be done, although 192,000 head of cattle had been inoculated in Transkei.

Mr. Elder reported that in Swaziland, a native territory, up to four years ago they were unable to do much towards checking the spread of African Coast Fever owing to the lack of funds and not having the full confidence of the natives. Illegal movement of cattle was stopped by branding the cattle, this system having been adopted about three years ago. When short-interval dipping was initiated funds were raised by imposing a tax of 2s. per annum per head of cattle owned by Europeans in the country and 2s. per annum upon each adult native. All dipping was free and it was found to be the exception for cattle to die of African Coast fever where dipping was in force.

Mr. Botelho, of the Province of Moçambique, reported that all cattle in infected areas were slaughtered. All these areas were now free from disease, except one (Chibuto) where it had re-appeared. No movement of stock was allowed and all infected animals were immediately slaughtered. Lack of funds had prevented sufficient dipping tanks being erected, but recently £10,000 had been voted for this purpose.

In Rhodesia, Mr. Sinclair stated that the procedure had been very similar to that described in the Transvaal. The first step in dealing with the cattle was to compel the owners to stable the calves, and when weaned to remove them to clean veld on a waggon. In several cases the calves contracted the disease while stabled, either owing to infection in the stable or to infected ticks being introduced in the hay. The temperature-camp method had proved successful and to this the three-day dipping system was added. Mr. Sinclair thought that eventually dipping will conquer African Coast Fever. In Rhodesia at the present time the position was very satisfactory. Details of the position in centres infected during 1911 and 1912 are given and show a great reduction in the number of infected areas and in the number of cases. This result is attributed to dipping in and around infected areas, and Mr. Sinclair states that if a man has his farm fenced and a dipping tank erected, he need not fear African Coast Fever.

In British East Africa Mr. Stordy thinks fencing impracticable owing to the size of the farms. Dipping had not been practised there. All cattle movement was regulated by permit. No cattle were allowed to be brought from endemic areas before they were eighteen months to two years old. These were placed in a slightly infected area and if they survived for about six weeks to two months they were branded and granted permission to trek throughout the country. This system had worked exceptionally well.

Mr. Sinclair stated that he considered it inadvisable to make any alteration in the quarantine regulations, and this opinion was supported by Mr. Gray, who pointed out that there was still much to be learnt about the disease. So far as was known, no Coast Fever existed in North-Eastern Rhodesia; in the northern portion of Nyasaland it was reported to be endemic.

HEWITT (C. Gordon). **The Occurrence of the Warble Fly** *Hypoderma bovis*, **De Geer, in Canada,** *Canadian. Entomologist, London, Ont.*, xlvi, no. 1, Jan. 1914, pp. 1–2.

In the early writings on the warble-fly occurring in the United States the species was referred to as *Hypoderma bovis*. In 1891 Curtice concluded that the American species was *H. lineata*, Villiers, and from this time until 1912 subsequent workers have referred only to *H. lineata* in speaking of the North American species. During the summer of 1912, Dr. Hadwen discovered the common species of fly in Canada was *H. bovis* and not *H. lineata* [see this *Review*, Ser. B, i, p. 60]. Work since this time has shown that *H. bovis* is widely distributed in Canada and it is probable that it occurs with *H. lineata* in the United States. The economic importance of this species renders the state of uncertainty as to its presence or absence all the more remarkable. The adults of the two species have good distinctive characters.

HEWITT (C. Gordon). **On the Predaceous Habits of** *Scatophaga*: **a new Enemy of** *Musca domestica*.—*Canadian Entomologist, London, Ont.*, xlvi, no. 1, Jan. 1914, pp. 2-3.

The observations made by G. E. Sanders would indicate that *Scatophaga stercoraria* destroys numerous other Diptera, especially Muscid flies. This fly has been seen capturing *Musca domestica*, L., *Calliphora erythrocephala*, Mg., *Stomoxys calcitrans*, L., *Fannia canicularis*, L., *Pollenia rudis*, F., *Orthellia cornicina*, F., *Bibio longipes*, Lw.; while a female *S. merdaria* was seen to take *Scatops notata*, L. The preference of *Scatophaga* for Muscid flies is noticeable.

NOTICES.

The Editor will be glad to receive prompt information of the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion, the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

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THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

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R. **Os carrapatos sob ponto de vista agricola.** [Ticks from the agricultural point of view.]—*Chacaras e Quintaes, S. Paulo*, vii. no. 6, pp. 43-48, 2 figs.

In this more or less popular article, intended for the information of farmers, the author says that the commonest ticks in Brazil are *Rhipicephalus sanguineus* and *Boophilus* (*Margaropus*) *annulatus*, both of which prefer cattle as a host, but occasionally attack other animals, including man. The piroplasmosis of cattle (*mal da tristeza*), a disease caused by ticks, is discussed at some length, as well as the use of trypan blue as a remedy.

Danou (B.). **Note sur les Camélidés et leur Laine.** [Note on the Camel and its wool.]—*Bull. de l'Off. Gouv. Gén. de l'Algérie, Paris*, no. 23, 1913, pp. 146-157.

A section of this paper deals with the diseases and accidents which may affect the transport camel in Algiers; amongst these is a form of trypanosomiasis transmitted by a Tabanid fly called in Algiers the "debab"; this fly has a natural enemy, another fly called the "aïchoug." The appearance of the aïchoug is welcomed by the natives as it is a sure sign that the "debab" will soon disappear. A native doggerel declares that one aïchoug kills 100 debab, blinds 100 and lames 100 more.

Tucker (E. S.). **Formaldehyde Gas not effective upon Flies.**—*Biological Papers, Kansas Acad. Sci., Kansas*, xxv, 1913.

A number of house-flies were observed in a room which was being fumigated with formaldehyde gas. The size of the room was 12 feet by 14 feet by 8 feet 8 inches, and 2 lb. of formalin and ½ lb. of permanganate of potash crystals were used to produce the gas. The operation was started at 6 p.m. and the room was kept tightly closed until the following morning, when inspection failed to disclose a single dead fly. In this case the gas was confined fully 13 hours; the minimum temperature was 56° and water had been sprinkled on the floor to increase the humidity. These conditions should have brought about perfect chemical action. Formaldehyde gas as an insecticide is apparently only effective upon insects when they are confined in concentrated gas for some time.

Hearsey (H.). **Nyasaland Sleeping Sickness Diary,** *Zomba*, pt. xxii, 31st Dec. 1913, 10 pp. [Received 17th March 1914.]

In this part are recorded nineteen additional cases of sleeping sickness notified during the past four months. The preventive measures instituted in the Proclaimed Area of the Dowa district are attended with satisfactory results. The importance of avoiding being bitten by tsetse-flies is being instilled into the minds of the natives. Clearing operations are progressing satisfactorily and Dr. Conran reports quite a perceptible diminution in the number of flies in the villages in the vicinity of the clearings. The village latrine system has been instituted, but is not working as satisfactorily as was anticipated. Every effort is being made to induce natives to use for building purposes the timber

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already felled in the clearing operations, instead of visiting neighbouring fly-infested forests for wood. Removal of villages has not been insisted on as a compulsory measure, since it is hoped that persuasion will work better.

ROUBAUD (E.) & LAFONT (A.). **Expériences de transmission de trypanosomes humains d'Afrique par les moustiques des habitations** (*Stegomyia fasciata*). [Experiments on the transmission of human trypanosomes by the mosquito of dwelling houses (*Stegomyia fasciata*).]—*Bull. Soc. Path. Exot., Paris*, vii, no. 1, 14th Jan. 1914, pp. 49-52.

The authors have carried out a series of experiments on the transmission of human trypanosomes by *Stegomyia fasciata*. Similar work has been done previously by Blanchard and Heckenroth at Brazzaville [see this *Review*, Ser. B., i, p. 187]. The material for the present experiments consisted of larvae of the mosquito sent by Dr. Dupont from the European and native quarters of Dakar in Senegal; these were reared to the adult condition, and kept in large cages measuring $6\frac{1}{2}$ feet in height, and 5 feet in length and width, with suitable arrangements for introducing the cages containing the animals to be experimented with. The experiments, which lasted for three months, were confined to inoculations with the two species of human trypanosomes, *T. gambiense* and *T. rhodesiense*, the virus being obtained either directly from Senegal or from the laboratory of M. Mesnil. Experimental conditions, such as the species of the animal, the duration of its exposure to the mosquitos, the relative distances between infected and uninfected animals, etc., were varied as much as possible: the general principle being to place in the fly cage a cage containing infected animals (rats, guinea-pigs, patas monkeys), another cage containing uninfected animals being introduced either at the same time or later. In addition to *S. fasciata*, a few specimens of *Culex 5-fasciatus* and *C. decens* were present, but not in sufficiently large numbers to play an important rôle in the experiments. The results showed that infection was only produced in those animals which had been placed very near the infected animals, and only then when the latter were heavily infected; the mosquitos being only capable of transmitting the virus mechanically immediately after the infective feed. A distance of one yard separating the animals' cages was sufficient to protect the uninfected animals from infection. It was also demonstrated that the virus became inactive 24 hours after being ingested by the mosquito.

The authors hold, however, that in spite of the somewhat negative character of these results, the evidence that mosquitos carry human trypanosomes is not lessened. The animals used in the experiments were small, and covered with hair, which rendered them less liable to being bitten than are human beings. The monkeys used were only attacked on those places where they had been shaved. Within certain limits, mechanical transmission of human trypanosomiasis by mosquito is quite possible.

ROUBAUD (E.). **Parasitisme chez les reptiles du** *Phlebotomus minutus*, **Rond., var.** *africanus*, **Newstead.**—*Bull. Soc. Path. Exot., Paris*, vii, no. 1, 14th Jan. 1914, pp. 83-85.

The variety *africanus* of *Phlebotomus minutus* is widely distributed in tropical Africa. Previous to the observations recorded in the present paper, the author has observed this insect attacking a lizard. This isolated observation might have been accidental, but that reptiles may be regarded as among the normal hosts of *Phlebotomus* is indicated by the further observations made by the author in the neighbourhood of Dakar in Senegal, where he found numbers of specimens of *P. minutus* var. *africanus* feeding on a python. The python was at the time kept in a cage; when moving it was unattacked by the flies, which withdrew to the corners of the cage, but as soon as it came to rest, the insects swarmed upon it, sucking its blood.

Howlett has observed that in India, Geckos are the natural hosts of *P. minutus* [see this *Review* Ser. B. i. p. 211]. Evidence of this kind bearing upon the biology of the species of *Phlebotomus*, may prove of service in dealing with Mediterranean fever, transmitted by *P. pappatasii.*

TOWNSEND (C. H. T.). **Human Case of Verruga directly traceable to** *Phlebotomus verrucarum* **(Dipt.).**—*Entom. News, Philadelphia,* xxv, no. 1, Jan. 1914, p. 40.

The author gives a brief outline of the case of his assistant in the verruga work, who, in spite of the precautions taken during the stay at Verrugas Canyon, developed unmistakable symptoms of the disease. Proper nets were used for sleeping under, but during the night Mr. Nicholson evidently brought his hands into contact with the net, for in the morning there were fifty-five unmistakable *Phlebotomus* bites on the back of his hands and wrists. Examination of Mr. Nicholson's blood after a few days (1st October) showed the presence of verruga x-bodies. These continued in small numbers without clinical symptoms of note. About twenty-five days later a decided rise of temperature occurred and the x-bodies were found to be much increased in number. His case appeared to be of the benign type and his temperature soon lowered. At the time of writing (10th November) no eruption had appeared. Salvarsan was administered intravenously for the purpose of determining whether it would prove a specific against the disease.

EDWARDS (C. W.). **Cattle-Tick Eradication.**—*Philippine Agric. Review, Manila,* vii, no. 1, Jan. 1914, pp. 44-45.

In many parts of the Islands the cattle tick is a serious menace to the live-stock industry. The ill effects from these pests may be classed as twofold: (1) Loss of condition through the constant irritation and loss of blood; (2) diseases transmitted to the cattle by these agents. A tick formula given, and which has been used with excellent results at the Trinidad stock-farm, is:—Arsenic trioxide, commercial, 8 lb.; sodium carbonate, crystallised, 24 lb.; yellow soap, 24 lb.; pine tar, 6½ pints. Dissolve the arsenic in 16 to 25 gals. of water by boiling 30 to 40 minutes and add a sufficient amount of water to make 83 gals. Dissolve the soda in 16 to 25 gals. of water; dissolve the soap in the soda solution; pour the tar into this in a fine stream, stirring at the same time. Mix the two solutions and add enough water to make 415 gals. The effectiveness of the mixture appears to be increased by substituting one-half of the amount of pine tar with 1 quart of coal tar, and increasing the amount of soap by one-sixth (28 lb.). In Trinidad the solution is applied as a spray. The entire mixture should be stirred before each application. The animal after treatment should not be unduly exposed to the hot sun, or driven any considerable distance. Young calves with heavy coats should be bathed with soap and water three or four days after treatment, so as to prevent severe irritation of the skin. In localities where ticks are numerous it will be found necessary at first to administer the mixture every fifteen days and to exclude the herd, as much as possible, for a definite period from infected areas.

Bacot (A. W.) & Martin (C. J.). **Observations on the Mechanism of the Transmission of Plague by Fleas.**—*Jl. Hygiene, Cambridge, Plague Supplement III*, 14th Jan. 1914, pp. 423-439, 4 figs., 3 pls.

The conclusion that fleas play an important *rôle* in the spread of plague was arrived at on epidemiological grounds as long ago as 1897 by Ogata. Since that time much work has been done on the transmission of plague by fleas. The Commission for the Investigation of Plague in India (1907) discussed the following possible methods by which the flea may transmit plague: (1) by the animals eating the infected fleas; (2) by the proboscis of the flea mechanically conveying the bacilli from the infected to the healthy animal; (3) by the salivary glands of the flea becoming infected, the bacilli being then inoculated along with the saliva; (4) by a regurgitation of the stomach contents through the oesophagus and pharynx, the bacilli being then injected with the saliva, or on the pricker, or being rubbed into the wounds made by the pricker; (5) by a retention of infected blood in the pharynx or about the mouth parts of the flea, the bacilli multiplying there and then being inoculated into the animal as in (4); (6) by the bacilli contained in the faeces being deposited on the skin, and then being either injected by the pricker or rubbed into the wounds made by the pricker. Methods 1 to 3 are set aside on what seem satisfactory grounds. Many hundreds of fleas were dissected, but in no case were plague bacilli found outside the alimentary canal and the authors state that their observations agree on this point with those of the Commission. Experiments on (6) carried out by the Commission and by the authors demonstrate that transmission of the plague by this method is possible. The authors applied to bitten areas on rats, (*a*) the surface of the spleen of a rat recently dead from plague; (*b*) a strong emulsion of plague bacilli from the stomachs of fleas, which had been nourished on animals with septicaemia. In both cases some of the rats died of the plague. One difference between the bacilli from the spleen and those from the flea's stomach was that the former were not taken up by the phagocytes of the authors' own blood whereas the latter were ingested freely. Other observations led to the belief that bacilli grown in the stomach of the insect are not of a high degree of virulence. Infection by this means must leave much to chance. Experiments were then made to ascertain whether or not the flea could infect during the act of sucking. Details of these experiments are given and in all the possibility of infection by dejecta was precluded. Under these conditions it was found that two species of rat-fleas, *Xenopsylla cheopsis* and *Ceratophyllus fasciatus*, fed upon septicaemic blood, can transmit the plague during the act of sucking and that certain individuals suffering from a temporary obstruction of the proventriculus were responsible for most of the infections obtained and probably for all. In a proportion of infected fleas the development of the bacilli was found to take place to such an extent as to occlude the alimentary canal at the entrance to the stomach. Fleas in this condition can suck blood since the pump is the pharynx but they only succeed in distending the contaminated oesophagus, and on the cessation of the pumping act some of the blood is forced back into the wound, carrying with it plague bacilli. Fleas suffering from obstruction do not necessarily perish and after a few days the culture obliterating the lumen of the proventriculus may disappear and the passage become open again. Since however they are incapable of imbibing fresh fluid, they are in danger of drying up if the temperature is high and the degree of saturation of the atmosphere low. The authors suggest the possibility that this fact may to some extent explain why in India epidemic plague is confined to the cooler and moister seasons, and particularly why the epidemics are abruptly terminated on the onset of the dry weather.

BACOT (A. W.). **On the Survival of Bacteria in the Alimentary Canal of Fleas during Metamorphosis from Larva to Adult.**—*Jl. Hygiene, Cambridge, Plague Supplement III.* 14th Jan. 1914, pp. 655-664.

In this paper the author describes experiments undertaken to decide (*a*) if the gut of the flea-larvae may become infected with bacteria that are present in the food on which they are nourished, e.g., the faeces of their parents; and (*b*) if these organisms can survive within the gut during the metamorphosis from larva to pupa and pupa to imago. The fleas were artificially infected during the period of active larval life and examined for the infecting organism during their various stages, as active larvae, resting larvae taken from cocoons, pupae, and adults. The infecting organisms used were:—*B. pyocyaneus, Staphylococcus aureus, S. albus, B. enteritidis* (Gäertner), *B. violaceus* and *B. pestis.* Full details of the experiments and the results are given, and by them it is shown (1) that the alimentary canal of the flea larva may become infected with the following bacteria if mixed with its food, viz.:—*B. pyocyaneus, B. enteritidis, S. albus,* and *S. aureus*; (2) that an infection of the larval gut may persist until the resting period of the larva in the cocoon; and (3) that there is no satisfactory evidence that such infection can survive the pupal stage.

It has been shown in another paper that flea larvae thrive on a diet composed of their parents' faeces and that for some species it is a normal, perhaps a necessary, source of food. Verjbitski states that *B. pestis* is to be found in the faeces of four different fleas, fed on animals suffering from plague. The conditions in the alimentary canals of flea larvae do not, however, appear to be very favourable to the growth of *B. pestis.* In larvae of *Ceratophyllus fasciatus,* the number of cases in which the microscopic examination gave a positive result was very small, and the bacilli few and scattered. No trace was found of the massed multiplication which is so noticeable a feature in infected adult fleas. An interesting contrast to the non-survival of bacteria in the flea's gut after the larval stage is afforded by the Diptera, an order with which the Siphonoptera have affinities. Infection of the alimentary canal at the larval period has been shown to persist to the adult stage in the case of the house-fly (*Musca domestica*), *Calliphora erythrocephala* and a species of *Sarcophaga*.

Bacot (A. W.). **The Effect of the Vapours of various Insecticides upon Fleas (*Ceratophyllus fasciatus* and *Xenopsylla cheopis*) at each Stage in their Life-History and upon the Bed-Bug (*Cimex lectularius*) in its Larval Stage.**—*Jl. Hygiene, Cambridge, Plague Supplement III*, 14th Jan. 1914, pp. 665-681, 1 fig.

The author carried out a series of experiments in order to test the relative efficiency of various insecticides and disinfecting fluids, and the effectiveness of the vapour under conditions permitting free access of air. In the experiment a small tin box without its lid was placed at the bottom of the jar to contain the insecticide, and the fleas in their various stages were placed in boxes fastened about two inches above the insecticide. The insecticides used were solutions of pure phenol, lysol and formalin, commercial benzine and paraffin oil, flake naphthalin and crushed camphor. The fleas experimented with were *Xenopsylla cheopis* and *Ceratophyllus fasciatus*; a few experiments were also made with the bed-bug, *Cimex lectularius*. Details of the experiments are given and also tabulated summaries of the results. Naphthalin was found to be the most generally effective agent in killing fleas in all stages, and dissolved in benzine could be poured into cracks and crevices. For use in rat-holes, especially in foundations, a soap-carbolic or soap-petroleum emulsion (duly watered down) might be used with the addition of flake naphthalin. Adult fleas or bugs are best treated with some liquid insecticide, and whether crude phenol or petroleum be the basis of the insecticide, it should be always made into an emulsion with soap, so that contact with the insect may be secured. The vapours of both phenol and lysol solutions are also efficacious, affecting the intestinal tract. Benzine is uncertain as a vapour, some fleas recovering after the benzine has evaporated. A few experiments were made for the purpose of testing the effect of a strongly smelling ointment in preventing fleas and bugs from biting. A saturated solution of naphthalin in benzine was added to melted vaseline. The ointment killed a number of *Pulex irritans*, and a number of second instar *Cimex lectularius* did not feed, but were not otherwise affected. The death of the fleas was probably due to the benzine vapours. Subsequent tests showed that the ointment was only a partial protection against the bugs.

Bacot (A. W.). **A study of the Bionomics of the common Rat Fleas and other Species associated with Human Habitations, with special reference to the influence of Temperature and Humidity at various periods of the Life-History of the Insect.**—*Jl. Hygiene, Cambridge, Plague Supplement III*, 14th Jan. 1914, pp. 447-654, 8 pls., 12 charts, 3 figs.

In this paper Mr. Bacot reports an extensive and elaborate investigation of the effect of external conditions on the development of the eggs, larvae, pupae and adults of various fleas, viz., *Ceratophyllus* *fasciatus*, *Pulex irritans*, *Ctenocephalus canis*, *Leptopsylla musculi* and *Xenopsylla cheopis*. The different stages were subjected to various conditions, though chiefly carried out in four incubators, two of which were maintained at 75° F., but with different degrees of humidity, and a similar pair at 85° F. In addition a cellar and cupboards were used. The methods employed in rearing fleas and experimenting with them at the various stages are described.

The eggs were placed on paper or cloth in the receptacle in which the larvae were to be reared, sand and food being added before the eggs were put in, and subjected to varying conditions. The results show that, compared with the later stages in the life-history, eggs are relatively insusceptible to external conditions. The upper limit of temperature which is fatal to eggs has not been determined. *C. fasciatus* hatched at 85° F.; of *P. irritans*, 9 per cent. hatched at 93° F. and once 27 per cent. of the eggs of *X. cheopis* hatched at 93° F. At low temperatures the numbers which hatch are reduced ; at 40·9° F. eggs of *C. fasciatus* hatched, while those of *X. cheopis* and *P. irritans* failed. As regards the influence of humidity, it is safe to say that a temperature of 65° to 80° F. with a humidity of ·70 or over is most favourable and that if the temperature be above 60° F. humidities below ·50 to ·55 are harmful. In the case of *P. irritans* there is possibility of complete failure at a humidity of ·50, but 70 per cent. of the eggs of *C. fasciatus* hatched at a temperature of 75° F. with a humidity of only ·48. Low temperatures check or prevent oviposition, and in the case of *C. fasciatus* and *P. irritans* warmth (75° F.) combined with low humidity favours the fertility of eggs laid.

The larval stage may be subdivided into two periods, (1) an active and (2) a quiescent or resting phase, passed within the cocoon. It is shown that in the dry incubators (75° F. and 84° F. and humidity ·60) and warm cupboard (67°–69° F. and humidity ·65–·71) active larvae of *P. irritans*, as well as of *C. fasciatus* and *X. cheopis*, died, while in the cocoon stage some survived. In the case of all the species investigated, the newly hatched larvae were able to live from several days to over a month without food, provided the conditions were not otherwise unfavourable. Besides food and temperature, a certain amount of moisture is necessary. Local moistening by the urination of animals or sweat from their bodies may convert what would otherwise be an impossible place into a favourable situation ; while draughty conditions, with a comparatively high humidity, may be less favourable than a drier situation with a nearly still atmosphere. Investigation as to the nature of the food of larvae was also made. It was proved that the faeces of the adult fleas are a possible diet and favourable for the larvae of all three species. In the case of *C. fasciatus* this food seems a necessity. Low temperature is responsible for very protracted active larval life, but temperature is not the sole factor determining the length of the period elapsing between the hatching of the egg and the spinning of the cocoon. In the experiments on the cocoons it was proved that the length of the cocoon period is largely determined by conditions of temperature, a fall in temperature causing *X. cheopis* and *P. irritans* to lengthen their cocoon period, an effect not seen in *C. fasciatus*. *C. fasciatus* frequently passes the cold weather in the cocoon, and a similar disposition is shown by *Ctenocephalus canis* and *P. irritans*.

The cocoon affords protection against drought and also against excessive moisture, as was shown by experiments in which cocoons were immersed in water for 12 hours and survived.

On adults, experiments were made to ascertain the duration of life when fed and unfed. At 45°–50° F., with nearly saturated air, fleas can live for many days unfed, specimens of *P. irritans* surviving for 125 days and *Ceratophyllus gallinae* for 127 days. However, under only moderately unfavourable conditions of temperature and humidity the powers of endurance are but slight in the absence of food. In a box, if fed on their natural host, *P. irritans* may live for upwards of 513 days, *C. fasciatus* for 106 days and *X. cheopis*, fed on man, 100 days. *C. canis* and *C. gallinae* have lived for 234 and 345 days when fed on man. The author is of the opinion that feeding on warm-blooded animals is essential to reproduction in this insect. In these experiments no support has been obtained for the theory that flea breeding can take place in the absence of an animal host to provide food for the adult, and there was no evidence that the amount of food taken had any influence on the fertility of the eggs laid, but only upon the number. As a result of these experiments it is shown that, taking its different stages into account, a flea may survive for very long periods without a host being present—for example, *C. fasciatus* for 22 months, *P. irritans* for 19 months, *X. cheopis* 10 months, *C. canis* 18 months and *C. gallinae* 12 months.

REID (H. A.). **Bots. Their Natural Powers of Resistance.**—*Jl. Agric., Wellington, N. Z.*, viii, no. 1, 20th Jan. 1914, p. 53.

On 24th November the writer received two specimens of bots taken from the nasal cavities of a sheep. These had been placed in a bottle with 2 per cent. formalin solution two days previously and when received one was found to be still alive. They proved to be larvae of *Oestrus ovis*. The bot was kept in this solution and found to be still alive up till 28th November. This observation serves to illustrate how ineffectual is the administration of drugs destined to destroy these parasites during the life of their host. [To be effective the drugs must be administered in a liquid having a very feeble surface tension, so that it can penetrate the specially protected tracheal system of the larvae; for the value of bile in this connexion, *cf. Bull. Ent. Research*, i, 1910, p. 229.—ED.]

WENYON (C. M.). **Kala-Azar in Malta, with some Remarks on the various Leishmaniases.**—*Trans. Soc. Trop. Med. Hyg., London*, vii, no. 3, Jan. 1914, pp. 97-118, 1 pl.

The author in this paper first of all brings to notice observations he made on kala-azar in Malta. Comparing these with observations made in India, North Africa, Italy, Sicily, Greece and China, he concludes that in all the localities the disease is identical. As to the question of the etiology of the disease, there is still much doubt as to the mode of transmission. Basile in Europe, and the Sergents, L'Heritier and Lemaire in North Africa, have carried out experiments in which they caused fleas from infected dogs to feed on dogs assumed to be free from disease after examination of the liver by puncture. The results were all positive, but the author points out that dogs of a country where the natural canine disease exists were employed and that although the liver was free, the spleen and marrow may have been infected before the experiment. Realising this possible source of error when experimenting in Malta, he sent over to England for four dogs. Two of these were kept clean in a mosquito-proof cage and to the other two dogs over 300 fleas, captured from infected dogs, were transferred. Between five and six weeks after this both the latter dogs died. A careful examination of smears of the liver, spleen and bone marrow failed to reveal any leishmania. All the organs were anaemic and it was fairly evident that the dogs had died of profound anaemia and not of kala-azar. Thus this experiment proved negative. Other observations were made on the fleas themselves, and it was found that fleas may be naturally infected with a flagellate closely resembling the various forms of leishmania. As to what is the transmitting host of this disease in Malta, all that can be said is that it is most probably one of the biting arthropods which occur there. It has been suggested that infection may take place through the parasites escaping from the body by way of the gut. The larval fleas feed upon the faeces of the adult fleas. In these faeces, which consist of partly digested blood, there are passed numbers of small bodies which are very like the leishmania found in kala-azar. It is these small leishmania forms which produce infection when ingested by the larval flea. The injection of leishmania from a case of kala-azar into a mouse was found to produce a condition somewhat comparable to that arising from an injection of the leishmania forms of the flea flagellate. This has suggested to the author that in dealing with the parasites of the leishmania group we may have to do with an insect parasite which is just adapting itself to a vertebrate host. Thus the insect in question may be able to infect itself either by feeding on the blood of an infected vertebrate or by eating the faeces passed by an already infected insect. It is possible that the leishmania diseases are of this type and that we have to do with a flagellate of an insect which naturally passes from insect to insect directly, but occasionally obtains a footing in the human body, producing the diseases known as kala-azar and oriental sore.

The author states that there is apparently little evidence to warrant the conclusion that a human being must necessarily be infected from a dog. It is however important to prevent dogs, and also children, that show symptoms pointing to kala-azar from coming into contact with other dogs or children, for there is every chance, especially in Malta, for the human fleas to find their way to the dogs and the dog flea does occasionally attack man. The paper concludes with an account of the methods of diagnosis of kala-azar and of oriental sore, with some observations on the latter disease; and the author closes with the suggestion that kala-azar, whether in children or adults, in all parts of the world is caused by the parasite *Leishmania donovani*, while oriental sore is caused by *L. tropica* in the Old World and probably also in South America, though this cannot be regarded as settled.

In answer to a remark by the President during the discussion that the possibility of deriving the disease by oral ingestion had not been mentioned, Dr. C. M. Wenyon stated that he had made no experiments to test this question, but suggested that something might be learnt by feeding susceptible animals like monkeys on the organs of cases of kala-azar.

BAHR (P. H.). **A Study of Epidemic Dysentery in the Fiji Islands.**—*Brit. Med. Jl., London*, 7th Feb. 1914, pp. 294-296.

The author in studying the epidemics of dysentery which have occurred in Suva in recent years was struck by the fact that the maximum incidence of the disease occurs during the months of December, January, February, March and April, the period of the highest mean temperature and of the largest rainfall. The water supply of Suva is beyond reproach, therefore any suspicion of its contamination by infected faecal matter can be dismissed. There is no evidence that the direct infection of foodstuffs plays any part in the spread of the disease, since acute dysentery occurs amongst all races in Fiji, though their respective dietaries are entirely different. The house-fly (*Musca domestica*) was then suspected of being a medium by which infection could be conveyed to foodstuffs. In these islands *M. domestica* constitutes a plague of considerable importance. Investigations on the bacteriological flora of flies captured in a dysentery ward were undertaken, but only twice was the typical Shiga-Kruse bacillus isolated from the lower intestinal tract of the fly. However this result may be of some value when considered in conjunction with the seasonal distribution of the disease in Fiji and the concomitant prevalence of the house-fly. Later experiments on the transmission of the dysentery bacillus by the fly were carried out by the London School of Tropical Medicine. The flies were infected by means of bread soaked in a broth culture of the dysentery organism. In none of the experiments could the organisms be recovered after the fifth day. The author was unable to obtain any evidence of the multiplication of these same organisms in the fly. Somewhat similar results have been obtained by Graham-Smith in his experiments with typhoid bacillus and *B. enteritidis*. Some of the data obtained seem to suggest that in the intestinal tract of the fly under certain conditions dysentery bacilli of one group can acquire the characteristics of another, though more experiments are necessary on this point.

PRENTICE (Rev. G.). **Sleeping Sickness, Tsetse, and Big Game.**—*Brit. Med. Jl., London*, 7th Feb. 1914, pp. 293-294.

Referring to his experience in Nyasaland and Rhodesia, the author has watched the spread of tsetse-fly for many years and long ago warned the Government of the risks they were incurring in allowing it to spread. The author attributes the increase of tsetse-fly entirely to the increase in big game. In districts at one time rich in cattle, sheep and goats, investigation revealed the presence of four dogs, and these recently imported. He believes that the first step in the eradication of trypanosomiasis is a severe onslaught on wild animals to drive them back from human settlements. In the opinion of the author there is ample proof that wherever game is killed off *Glossina morsitans* disappears.

Arnold (W. J. J.). **The Etiology of Beri-Beri.**—*Brit. Med. Jl., London*, 7th Feb. 1914, pp. 299-300.

In considering the etiology of beri-beri the author contradicts the theory that the disease is due to the eating of decorticated rice. From his own observations and from those recorded by others he has been long impressed with the probably infectious nature of the disease, and urges that measures of disinfection be carried out till accurate knowledge is obtained. There is a great deal that points to the conveyance of the disease by parasites. The bug is more likely than lice to harbour the possible germ. The bug clings more to places and its eggs are difficult to destroy. The organism may even develop in the latter. The part, if any, played by parasites in the etiology of this disease must be thoroughly investigated by modern methods before the question is finally settled.

Price (J. D.) & Rogers (L.). **The uniform success of Segregation Measures in eradicating Kala-Azar from Assam Tea-Gardens: its bearing on the probable mode of Infection.**—*Brit. Med. Jl., London*, 7th Feb. 1914, pp. 285-289.

The segregation measures adopted in attempting to eradicate kala-azar from tea-gardens in Assam have met with uniform success. It has been proved that a distance of a few hundred yards—not more than 300 or 400 in certain instances—suffices for the permanent protection of coolie lines, provides no infected person is allowed to reside in them. Therefore any mode of infection through such flying insects as mosquitos may be excluded. Christophers, Donovan, Patton and others have demonstrated that the kala-azar parasite can sometimes be found in small numbers in the peripheral blood. Rogers obtained the development of the flagellate stage in sterile citrated normal saline solution, kept at a temperature below 75° F. Such a sterile saline medium is not likely to occur in nature except in the stomach of some biting insect. Rogers obtained the most copious development by neutralising or slightly acidifying the salt solution, and also found that the contents of the stomachs of bed-bugs, after sucking human blood, often showed such a reaction combined with sterility, and consequently he suggested the bed-bug as the most likely carrier of the infection. Although he failed to obtain experimental proof of this theory during his stay in Assam, yet soon afterwards Patton succeeded in occasionally demonstrating the development of the flagellate stage of the parasite in bed-bugs fed on kala-azar patients. It has been objected that Patton has succeeded in obtaining very few positive results, but this is not a serious obstacle to the theory. Bed-bugs can be collected by the score from every coolie hut, so that if one bed-bug in a hundred was capable of carrying the infection of kala-azar every person in an infected house would rapidly develop the disease. The disease however spreads slowly, but if people go on living in infected houses the great majority of them do eventually contract it. The comparative rarity of the parasite in the peripheral blood accounts for much difficulty in the natural infection of the insects, but it would be quite sufficient for bed-bugs very rarely to become capable of conveying the infection to enable them to become efficient carriers of the disease. In an experiment by Dodds Price the houses were fumigated with sulphur, the beds disinfected with a solution of corrosive sublimate in boiling water, and old clothes burned. As a result the disease disappeared from a row of badly infected coolie huts for several years. It is also known that bed-bugs can live for many months without food so that the clinging of the infection to houses harbouring them is not surprising. On the whole the bed-bug theory best accounts for all known facts, including a few instances of infection of Europeans through cohabiting with native women suffering from kala-azar.

Faure (J. C.). **Mosquitos and Malaria.**—*Agric. Jl., Union of S. Africa, Pretoria*, vii, no. 2, Feb. 1914, pp. 223-242, 13 figs.

A detailed popular account of the relation between mosquitos and malaria, together with a description of the life-history of these insects and the generally adopted methods of prophylaxis.

Noel (P.). **La Destruction des Mouches** [Destruction of flies].—*Bull. Trim. Lab. Rég. d'Entom. Agric., Seine-Infér., Rouen*, Jan.-Mar. 1914, pp. 12-14, 1 fig.

Two traps are described which the author believes to be very efficient for catching flies. The first consists of a trough of 10 to 20 gallons capacity, half-filled with water with 10 to 20 lb. of iron sulphate in solution. Supported by means of two iron rods placed over the trough is a cage of wire-netting, in which are put pieces of meat, fish, etc., to attract the flies. The insects congregate on the meat to oviposit, and the larvae which eventually hatch out mostly fall into the iron sulphate solution below and are killed. The meat in the trap must be renewed daily.

The second trap described contains sweetened liquid to which the flies are attracted, but from which they cannot escape. A wooden box has several circular holes made in its sides, each about 4 inches in diameter. Fitted into these holes are cones made of metallic gauze, with the narrow ends inside the box. The cones open into chambers which are separated from the centre of the box by wire gauze. In the centre is placed a vessel containing the sweetened liquid, and a band of flannel is arranged round the two cylinders of wood which can be revolved from time to time by means of a handle on the outside of the box; one of these wheels is at the top of the box, and the other in the liquid, and the flannel band is stretched vertically between them; the flannel is kept moistened with the liquid and serves to attract the flies by means of its odour. The flies enter the wide ends of the cones, but can only very seldom find their way out again when once inside. It is necessary to turn the handle at intervals during the day to keep the flannel moist. The trap must be cleared of dead flies each week. The formula for the liquid used is as follows: brown honey, 20 lb.; brown sugar, 4 lb.; molasses or treacle, 4 lb.; water, $1\frac{1}{2}$ pints; beer, $\frac{3}{4}$ pint.

Swingle (L. D.). **The Transmission of Swamp Fever in Horses.**—*23rd Ann. Rept. Univ. Wyoming Agric. Exp. Stn., Laramie*, 1912-1913. 30th Sept. 1913, pp. 93-124.

The occurrence of swamp fever in Southern Wyoming was reported in 1909 by Dr. Whitehouse; the disease has done much damage in neighbouring States. The present paper gives the details of experiments made to investigate the means of transmission of the disease. The injection of the blood of an infected animal into a healthy one, and feeding infected blood to healthy animals gave negative results, and an attempt was made to find out whether Tabanid flies acted as transmitters of the disease. A screened pen large enough to contain three horses was built out-of-doors in the sun; the roof and the south and west sides were built with wire mosquito screening. On the whole the experiments failed to give very definite results, partly owing to the difficulty of keeping the flies alive long enough; but from the observations made it seemed possible that transmission might occur through healthy horses eating grass infected with the excrement of the flies which had fed on diseased horses. On the other hand Francis and Marsteller (1908) kept a healthy susceptible horse in the pasture with diseased horses all the summer, although numerous flies were present, a fact which constitutes some evidence against transmission by flies.

NUMES (L. F.). **Linfangite epizootica.** [Epizootic Lymphangitis.]—*Boletim da Repartição de Agricultura; Secretaria Geral do Governo da Província de Moçambique, Lourenço Marques*, no. 10, Jan. 1914, pp. 14-16.

The author describes the symptoms and etiology of the disease, and in the course of his remarks says that Harber, a veterinary surgeon in Natal, has advanced the theory that under certain favourable circumstances the micro-organism of this disease, as in the case of tetanus, may be capable of independent existence, and seeks in this way to explain the appearance of isolated cases in localities at a considerable distance from a known focus, and in which there is no proof of contact with infected animals. He further suggests that the infection may be transmitted by dust storms or by flies. The author regards this theory as of sufficient consequence to justify the protection of sick horses from flies.

RODHAIN (J.). **Sur une Larve de Muscinae vivant dans le nid de *Passer griseus*, au Congo.** [On a larva of a species of *Muscina*, living in the nest of *Passer griseus*.]—*Revue Zool. Africaine, Brussels*, iii, no. 2, 20th Jan. 1914, pp. 213-217, 1 fig.

Larvae and pupae of a fly belonging to the sub-family MUSCINAE were taken by the author from nests of the grey-headed sparrow (*Passer griseus*) at Bambili, in the Congo. On examination the larvae were found to contain avian blood. The larvae were reared, and the different stages up to the adult condition are described. The fly has not been determined, but it is not a species of *Cheiromyia*, the genus to which other MUSCINAE of similar habits belong. The larvae were also fed on the blood of other sparrows and on fowls.

JAMES (S. P.). **Reports of Sanitary Inquiries in Jaffna and the Northern Ports, and in Galle.**—*Ceylon Sessional Papers, Colombo*, iv, 1914, 8 pp., 1 map.

During the visit of the author to the Jaffna District, Ceylon, it was found that malaria was probably the cause of a large proportion of the deaths. The disease is present in endemic form throughout the year and, with great regularity, becomes epidemic about six weeks or two months after the onset of the heavy rains of the north-east monsoon. Two species of *Anopheles*, namely *A. culicifacies* and *A. rossi* were collected, but the adults were rare. *A. culicifacies* is probably the chief malaria-carrier, and at the time of the author's visit was breeding almost exclusively in wells. The larvae of *A. rossi* were present in pools, swamps, earth drains, wells and tanks. At Pallai and on the Kalmunai spit investigation revealed a quite serious degree of infection.

A report is also made on the prevalence of other mosquitos. *Stegomyia fasciata* was present in Jaffna, Kankesanturai, Point Pedro, and Kayts. Other species found are *S. scutellaris*, *Culex fatigans*, *C. microannulatus*, *C. tigripes*, *Culiciomyia nigerrima* and *Taeniorhynchus tenax*. In Galle mosquitos are more prevalent than in Colombo. *S. fasciata* and *S. scutellaris* were found in every ward, their proportions to other mosquitos being respectively, in Fort 66 per cent. and 11 per cent., in Kaluwella 34 per cent. and 9 per cent., in Galupiyadda 10 per cent. and 21 per cent., in Kumbalwella 6 per cent. and 23 per cent., and in Hirimbure 2 per cent. and 21 per cent. Of other mosquitos *C. fatigans* and *Desvoidya obturbans* were most frequent and specimens of *Toxorhynchites immisericors*, *C. microannulatus*, *C. vishnui*, *C. gelidus*, *Culiciomyia nigerrima*, *T. tenax* and several species of Anophelines were also found. The breeding places in which the four commonest mosquitos were found included disused tins, disused and broken bottles, water-storage vessels, wells, coconut shells, oyster shells, fallen leaves, natural pools, earth drains, spittoons, holes in trees and water-holding plants. Additional breeding places in which the larvae of other kinds of mosquitos were found were paddy fields, a canal, a quarry, the pits of water in which coconut husks are soaked, ponds and tanks. In Galle it is very desirable to raise the general sanitation by meeting the primary sanitary needs in connection with water supply, conservancy, drainage, etc., and until this is carried out an anti-mosquito campaign would probably be of little value.

LUDLOW (C. S.). **Philippine Mosquitos.**—*Psyche, Boston, Mass.*, xxi, no. 1, Feb. 1914, pp. 30-32.

The author in these pages gives a detailed description of two Philippine mosquitos, namely, *Myzomyia flavirostris*, sp. nov., taken at Camp Wilhelm, Tayabas, and *Popea palawanensis*, sp. nov., taken at Puerto Princessa, Palawan Island.

LUDLOW (C. S.). *Myzomyia* (*Anopheles*) *ludlowii*, **Theobald.**—*Psyche, Boston, Mass.*, xxi, no. 1, Feb. 1914, pp. 32-33.

The author reports that the specimens on which the species was founded and which she sent to Mr. Theobald, were taken by Dr. Graves on the Benguet Road, Island of Luzon, during the construction of that road. The location is definitely inland and there is no sea or brackish water within many miles of the Benguet River. No other species were found and during that time malarial fever was very prevalent. This means that *A. ludlowii* may breed in fresh water and contradicts the definite statement seen by the author that "*ludlowii* is exclusively a saline breeder." It may also breed in salt or brackish water as well.

SMITH (S. A.). **The Development of** *Anopheles punctipennis*, **Say.**—*Psyche, Boston, Mass.*, xxi, no. 1, Feb. 1914, pp. 1-19, 2 pls.

Anopheles punctipennis is a strictly American species, and there is growing up a reasonable doubt as to whether in the North it is really a malaria-carrier, or at least whether the malaria carried by it is not different from that conveyed by *A. maculipennis*. Experiments were made by John Hopkins in which he allowed 58 females of *A. punctipennis* to bite patients suffering from aestivo-autumnal malaria, but afterwards no parasites were found in the walls of the stomach or intestine, in the body cavity, or in the salivary glands. This, however, seems of little value, for out of 48 similar inoculations of *A. maculipennis* only 8 were infected. *A. punctipennis* in the stages of larvae, pupae and eggs have been taken from seven different pools near Ithaca, from October to the middle of August. The people living close by do not suffer from malaria, whereas down on the flats at the head of Cayuga Lake, where *A. maculipennis* is common, there is always more or less malaria. The details of the conditions of the pools in which specimens were gathered are given. The larvae were found to feed chiefly on surface algae, though small animals are attacked. Dr. J. B. Smith in his account of mosquitos and their enemies places as the chief enemy weather conditions, and next, diseases. Chironomid larvae, which build their tubes in the algal filaments, have often been observed to destroy the larvae of *A. punctipennis*. According to Kulagin, mating occurs in the autumn or rarely after hibernation, and the females deposit their eggs during the whole of the next spring and summer. He considers there is but one generation in a season. Duprée found that specimens kept in the laboratory would lay at six or seven different periods, from 100 to 300 eggs at a time being deposited singly or in small clusters. They are apt to float below the surface although some are on the surface, with the concave side downwards. Five stages of the larva are described and also the pupa. The period of the larval stage is between 21 and 25 days, the pupal period being about two days. The paper concludes with a lengthy bibliography.

HUTCHISON (R. H.). **The Migratory Habit of House fly Larvae as Indicating a Favourable Remedial Measure.**—*Bull. U. S. Dept. Agric., Washington, D.C.*, no. 14, 28th Feb. 1914, 11 pp.

The migratory habit, which is so much in evidence during the prepupal stage of the house-fly, has long been known, and in this paper the author cites numerous instances. It is quite evident that as pupation draws near the larvae pass from the very moist regions of a manure heap and seek the comparatively dry outer regions. If no such places are to be found in the heap, they will leave it to pupate in the ground, under boards or stones, or in loose material of any kind. The habit of seeking the comparatively dry regions near the edge of heaps is probably an adaptation to afford an easy path to freedom for the adult. At the same time the larvae avoid light and also the extremely hot portions of the manure heap. This habit offers an important point of attack in the attempts to control the pest, and Levy and Tuck were the first to take advantage of it in their experiments. They placed manure in a barrel in the bottom of which several holes had been bored, with the result that on the following day thousands of maggots were found in a tub placed beneath. While these experiments were going on the author was also carrying out others, based on the same idea. These experiments clearly demonstrate the habitual nature of the migration and the efficiency of the maggot trap which is designed to take advantage of this mode of action. Whether the trap can be adapted to the handling of manure in a practical way and on a large scale is still a question for further investigation, and problems arise as to how deeply manure may be heaped over such a trap without interfering with migration, and how long the manure must be kept in a trap before it is entirely free from larvae. The period of infestation appears to be rather short, and even under the most favourable conditions maggots will rarely be found in a given lot of manure after 10 or 12 days' exposure. The disposal of the maggots is another practical consideration, the experiments showing that 98 or 99 per cent. of the total number can be made to leave the manure, provided it be kept moist; even from comparatively dry manure as many as 70 per cent. can be destroyed. That the maggot trap possesses certain advantages is obvious and ought to lead to many attempts to develop it along practical lines. Cheapness would be one of its strong points. Incidentally it may be noted that this trap offers a convenient and easy means to the investigator who wishes to collect coprophagous larvae in large numbers.

CHITTENDEN (F. H.). **Concerning Remedies for Chiggers.**—*Jl. Econ. Entom., Concord.*, vii, no. 1, Feb. 1914, p. 152.

It has been stated that cattle or sheep are of value in destroying harvest mites (*Trombidium* sp.) by merely trampling on them. More recently it has been thought that sheep are of more value in this respect than cattle, and it is believed that this is due not only to the fact that sheep keep the grass more closely cropped than would cattle, but that the mites ascend the limbs of the sheep and are killed by the oil in the wool.

WATSON (M.). **Malaria and Tropical Agriculture.**—*Trop. Agric. Peradeniya*, xlii, no. 2, Feb. 1914, pp. 151-154.

In this paper the author gives an outline of work that has been done in connexion with malaria and its relation to the agriculturist. A similar paper has been published in the *Trans. Soc. Trop. Med. Hyg.*, London, vii., No. 2, Dec. 1913 [see this *Review*, Ser. B., ii, pp. 46–48].

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

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MITZMAIN (M. B.). **Insect Transmission of Anthrax.**—*Jl. Trop. Med. and Hyg., London*, xvii, no. 4, 16th Feb. 1914, pp. 61 (Abstract).

The author gives a preliminary note of a number of experiments on the rôle of suctorial insects in the dissemination of anthrax. The experiments were made with an artificially infected guinea-pig, which died of the disease upon the third day. The flies were applied two and a half hours to a few minutes before the death of the animal. Guinea-pigs were used to receive the infective bites of *Stomoxys calcitrans* and *Tabanus striatus*. With both species the infection was successfully transferred by the direct method in which the flies were interrupted while feeding on the sick animal. The exposed animals died during the evening of the third day, typical symptoms of anthrax being exhibited, and in addition a gelatinous and haemorrhagic oedema was observed in the subcutaneous region of the area upon which the flies were applied in biting. The agar cultures when injected reproduced the disease in guinea-pigs with fatal results. Similar results were obtained in all essentials when horse flies were used to transfer the disease. A series of experiments is at present being conducted with anthrax in cattle and horses, guinea-pigs and other rodents being employed as intermediate hosts for the disease.

MAY (Dr. A.). **Report upon Sleeping Sickness in Northern Rhodesia to December 1913.**—*Administration Press, Livingstone*, 1914, 29 pp.

Luapula, Mweru and Tanganyika Areas. The whole country to the east of the Luapula and Lake Mweru has been depopulated, and it may now be reasonably considered that practically all risk of the extension of the disease is at an end. There are now 23 cases under treatment, and it seems improbable that this number will be increased. Restrictions on the movements of the natives need now aim only at the prevention of their return to *Glossina palpalis* areas. In the Tanganyika District (Dr. W. H. T. Storrs) no fresh case of the disease has been found since October 1910. Since the establishment of the Segregation Camp the total number of cases admitted has been 34. There are now 6 patients in this camp; it is anticipated that these can shortly be discharged with safety and the camp closed. Regarding the distribution of *Glossina palpalis*, it is found there has been no extension of fly up the Lovu River beyond the limit defined by Dr. Leach (1909). The Lake shore was also examined from Kasakalawe to Kituta, and also some 6 or 7 miles up the Lunzua River. Fly was abundant at both Kasakalawe and Niamkolo, but none was found at Kituta. In the Mweru District (the late Dr. D. C. Master) one new case of the disease has been found during the last 18 months. Owing to the complete removal of the population from infected areas it is unlikely that more than a very few as yet undetected cases will be found in this district. No change has taken place in the distribution of *Glossina palpalis* previously recorded, except that during July, as noted by Dr. E. G. Storrs, no fly could be found at the mouth of the Luao River. This is probably a seasonal change only in the distribution of this species; fly was numerous in this place during the preceding February. It is abundant on the Belgian shore close to Kilwa Island, but a careful palpation of the population did not lead

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to the discovery of any case of disease, which is considered to be a strong argument in favour of the view that the fly is here no longer infective.

Human Trypanosomiasis in G. morsitans areas. Since the last report (Feb. 1912) 29 cases of the disease have been found—1 European and 28 natives—and the total number since August 1909 amounts to 95. A detailed statement is given as to the district in which the various cases were found, and this shows a marked reduction as compared with the previous survey. In the Mpika section of the Luangwa area 91 per cent. of the population was palpated; only 2 positive cases of trypanosomiasis were found in 2,613 individuals, while the percentages of glandular enlargement were as follows:—Men 44 per cent., women 24 per cent., children 53 per cent. Similarly, in another area enlarged glands were found to be very common in children (55 per cent.) and least so in women (37 per cent.).

In view of the abundance of *G. morsitans* and the suitability of the conditions, it is considered remarkable that the disease has not spread in the Luangwa Valley. Dr. May offers the following possible explanations:—(1) The disease is an old one, having in all probability existed for a considerable number of years before it was recognized, and is endemic, the bulk of the population being immune; (2) the extent to which game is infected with *T. rhodesiense* may not be so extensive as has been suggested; (3) the facts suggest that there is still a link wanting in the chain of evidence in favour of the view that the trypanosome of the game is identical with that which causes human trypanosomiasis.

This last criticism is further emphasised and reference is made to Dr. Taute's experiments upon himself. For an experiment to investigate the relationship between game and *Glossina* and between game and human trypanosomiasis, the Lukasashi Valley, north of the Nkuski-Petauke road, is considered to be an eminently suitable locality. It is suggested that the area to be dealt with should be not less than 400 square miles, that it should be effectively fenced, and that the experiment should extend over three years. The cost is roughly estimated at £11,350.

One or other of the following conditions will be found to result from this experiment:—(*a*) the total absence of fly from the area cleared of game; (*b*) a diminution in the amount of fly present; (*c*) unchanged conditions as regards the prevalence of fly. In the event of either (*a*) or (*b*) being found to have followed the removal or destruction of game within a given area, it will then be necessary to determine:—(1) whether the fly has died as the result of the removal of one of its sources of food-supply; or (2) whether the fly has migrated in search of food. Until a method for the determination of these essential points be available an experiment giving these results will be open to grave doubts. If condition (*c*) results after the removal of game, this also will not be in any sense conclusive as to the effect of the experiment. Our present ignorance of the binomics of this fly, and therefore our inability to interpret correctly the results following such an experiment, leads to the opinion that it would not be justified by its results. The present agitation for the general destruction of game as a preventive of the spread of sleeping sickness does not appear to the author to be well grounded. Exception is taken to various statements which have been made in England to the effect that sleeping sickness is increasing and spreading in Rhodesia, and it is contended that these are entirely contradicted by the evidence available. It is now accepted that, although certain unfavourable climatic conditions exist to a more marked extent in some districts than in others, transmission of trypanosomiasis is possible wherever tsetses occur, but the disease is likely to remain sporadic in character.

An outline is given of the general programme for future entomological work. Mr. Ll. Lloyd, since the termination of the Luangwa Commission, has made experiments at Ngoa on the effect of the blood of different animals upon the breeding capacity of the fly. The pupae produced by the series fed upon mammals were on the average slightly larger than the others, but otherwise there appeared to be no special advantage in a mammalian diet. Mr. Lloyd also carried out a series of experiments to determine whether *G. morsitans* will feed on small mammals, birds, reptiles or amphibians. Twenty-nine experiments were made, which included lizards, chameleon, toad, fowl, rat, mouse, burrowing rodent, mongoose, bat, shrew and caterpillars, from the results of which it would seem that these animals do not provide a suitable food supply for the fly.

TELFER (W.). **Report on the Bloodsucking Flies on the Volta River.** *Enclosure from the Governor of the Gold Coast to the Colonial Office. Tamale*, 12th August 1913. [Received 17th Feb. 1914].

This is the report which was asked for, with a view to opening up the Volta River, from Yapsi to Yeji, for transport purposes. Dr. Telfer found no population on the river banks and only a sparse one inland. No cases of sleeping sickness were found, though a number of blood films were taken from the inhabitants including some fifteen canoemen employed on the river; one case was however reported by the District Commissioner at Yeji. Guinea worm and conjunctivis were prevalent. Biting flies were numerous, consisting of *Glossina palpalis* 37 per cent., *G. tachinoides* 55 per cent., *Tabanus* spp. 5 per cent., and Haematopota spp. 2 per cent. These flies were found in the undergrowth on the banks of the river and in the dense bush outside the villages. *Glossina* spp. were never found more than 40 feet from the river bank. Both banks of the river from Yapsi to Yeji are continuous fly belts. The author considers that if the waterway is to be used by Europeans rest-houses should be built, or tents and a fly-proof room provided.

L'Agriculture du Congo Belge. Rapport sur les années 1911 et 1912. Deuxième Partie. L'Agriculture au Katanga. [Agriculture of the Belgian Congo. Report for the years 1911-1912. Second Part. Agriculture in Katanga.]—*Bull. Agric. Congo Belge, Brussels*, iv, no. 2, June 1913, pp. 441–445. [Received 20th Mar. 1914].

Chapter 6 deals with the tsetse-fly, which occurs throughout the copper-mine districts and abounds around Elisabethville and Kambove. In 1912 Dr. Rhodain found *G. morsitans* to the west of the

Lualaba and Lubudi rivers, but only on a strip about $1\frac{1}{4}$ to 2 miles in breadth on their left bank and in the valleys of the lower reaches of all the chief tributaries. The fly is absent on the high lands west of Kinda, though its occurrence in the deep and wooded valleys may be suspected. It sometimes shifts its habitat, and though at one time unknown at Lualaba Kraal, it is now frequently found there up to within 12 miles of the river. It is present in sufficient numbers in the Kapiri valley to infect cattle in the neighbourhood. The grassy steppes of the high plateaus are free. This applies also to the high plateau which constitutes the Rhodesian frontier between Sakabinda and Musofi, although the fly passes the latter place and infests the district between it and Elisabethville. Mounts Kundelungu and Marunga are nearly free, especially in the higher parts. The rapid disappearance of the fly at Elisabethville and in its environs is remarkable. Four years ago a cyclist would be subjected to the attacks of hundreds of flies as soon as the sun had warmed the cool morning air. In 1911, the pest had begun to abate, although many mules were still lost when engaged in transport-work between Elisabethville and La Chasse. In 1912, the conditions had still further improved. At the former locality 3 horses were kept for 6 months without bein attacked; a number of mules were employed in agricultural work in the neighbourhood and the majority are still healthy; many dogs live there in perfect health.

As regards game destruction, it may be said that in certain cases this measure may be useful, but quite without effect in others. Deforestation is also a measure of doubtful value. The clearing of all shrubs and bushes appears useful if effected over very large areas. So far no really practical measure for eliminating *G. morsitans* has been devised, and it is only by entrusting the work to specialists furnished with ample funds for experiments on a large scale, that results may be expected.

ROUBAUD (E.). **Les Mouches piqueuses en Afrique occidentale et les Maladies à Trypanosomes.** [Blood-sucking flies and trypanosome diseases in West Africa.]—*Bull. Soc. Nat. Acclimat., Paris*, lx, no. 23, 1st Dec. 1913, pp. 737-743.

A concise summary is given of the present position of research in connection with trypanosomiasis in West Africa, especially in relation to the flies of the genera *Glossina* and *Stomoxys*. In French West Africa there exists six species of the genus *Glossina*: *G. palpalis*, *G. tachinoides*, *G. morsitans*, *G. longipalpis*, *G. fusca*, and *G. pallicera*, all of which are capable of transmitting the trypanosomes, though their power of infecting man or animals varies greatly in different localities. In addition to species of *Glossina* and *Stomoxys* some of the TABANIDAE, but not HIPPOBOSCIDAE, are regarded as possible disease-bearers. The author points out the fundamental importance of a knowledge of the biology of these insects in all questions dealing with the rearing and introduction of animals in regions where the flies occur.

Bonet (G.). **Les Trypanosomiases et le Gros Gibier en Afrique occidentale française.** [Trypanosomiasis and big game in French West Africa.]—*Bull. Soc. Nat. Acclimat., Paris*, lx, no. 24, 15th Dec. 1913, pp. 761-770.

After summarising the results of the work done by Bruce, Fraser and Duke, and Kinghorn and Yorke on trypanosomes in man and animals in South Africa, Uganda and Rhodesia, the author gives an account of similar work done by himself and Roubaud in French West Africa. About thirty different kinds of wild animals were examined for trypanosomes or their blood used for inoculations, and their distribution in relation to that of the tsetse-fly was observed. The blood of eight examples of *Cobus kob* was inoculated into sheep or goats without effect; this species and the related *C. unctuosus* or *defassa* are found in the bush bordering rivers where the tsetse is abundant. *Bubalis major* and *Damaliscus senegalensis* are found also in the tsetse-fly regions; the blood of the former, which lives in *Glossina morsitans* areas, was used for inoculation into a goat without result. The dwarf buffalo, *Bubalus pumilus* or *brachyceros*, is always followed by *G. morsitans* and less frequently by *G. longipalpis*. *Oreas derbyianus*, in company with numerous elephants, occurs in a district where *G. morsitans* is so abundant that no domestic animals except a race of dwarf cattle are able to live. The only positive result obtained by subinoculation was in the case of a bushbuck, *Tragelaphus scriptus*, the blood of which infected a sheep with *T. dimorphon*. A similar experiment with two reed buck was a failure. Two species of duyker, *Cephalophus nigrifrons* and *C. dorsalis*, reared in captivity, were infected with *T. cazalboui*, *T. dimorphon* and *T. pecaudi* by means of *G. longipalpis*; the animals exhibited no ill effects. In the same way a young *Tragelaphus scriptus* was infected with *T. dimorphon*; a year later the animal, although showing trypanosomes in the blood, was in perfect health. It thus seems that antelopes are very easily infected with trypanosomes, from which they suffer no detrimental effect. Elephants and hippopotami are common in French West Africa, and are frequently found associated with tsetse-flies, and in some cases the blood of the hippopotamus seems to be the sole source of food of *G. longipalpis*. It is concluded that the main food supply of *Glossina* is the big game and that the trypanosomes with which they are infected are derived from this source.

Without advocating a wholesale destruction of the big game in these regions, the author suggests that good results would follow if the hunting regulations were made less strict and that instead of forbidding the natives to hunt, they should be encouraged to do so.

Perrier (E.). **Le gros gibier; les mouches piquantes et les maladies à trypanosomes.** [Big game; blood-sucking flies and trypanosomiasis.]—*Bull. Soc. Nat. Acclimat., Paris*, lx, no. 24, 15th Dec. 1913, pp. 771-773.

The present paper sums up the case against the destruction of big game in Africa, as a means of stamping out trypanosomiasis. The points upon which the author lays special stress are (1) the flies carrying the disease at present would in no way be diminished in numbers by the absence of big game, since they would take to feeding on the smaller mammals; (2) any big step taken by artificial means and contrary to the course of nature is bound to have compensating effects in another and perhaps disadvantageous direction to readjust the balance. The author cites instances of this.

GILCHRIST (J. D. F.). *Marine Biological Report, Union of S. Africa, Prov. of the Cape of Good Hope, Cape Town,* 1913, no. 1, pp. 67-70, 1 pl.

It is doubtful whether the well-known fish from Barbados, known as "Millions," *Libistes poeciloides*, can become established in South Africa, though individuals have survived there for some months. Other fish which might prove of use in South Africa for the destruction of mosquito larvae and upon which investigation from this point of view might be repaid, are species of *Tilapia* from Pretoria; species of *Fundulus* from German East Africa, Longo Bay, Seychelles, Zanzibar, Victoria Nyanza and Lake Chaia; species of *Haplochilus* from Nyasa and Albert Nyanza; and species of *Galarias* from the south-west of the Cape Province.

JOHNSON (C. W.). **Insects of Florida.**—*Bull. Amer. Mus. Nat. Hist., New York*, xxxii, 1913, pp. 37-90.

A list is given of the Diptera of Florida, and includes 845 species representing 50 families with a short general account of their distribution. Of economic importance as containing species that are recognised as potential blood-suckers, are the families CHIRONOMIDAE, including 7 *Ceratopogon*, 5 *Culicoides*, and 3 *Johannseniella*; CULICIDAE, represented by 31 species, including 4 *Anopheles*, 1 *Megarhinus*, 1 *Psorophora*, 3 *Janthinosoma*, 1 *Stegomyia*, 8 *Aedes*, 1 *Culiseta*, 7 *Culex*, 2 *Mansonia*, 1 *Uranstaenia*, 1 *Deinocerites*, and 1 *Wyeomyia*: SIMULIIDAE, represented by 1 species of *Simulium*, and TABANIDAE, represented by 49 species, including 11 *Chrysops*, 1 *Haematopota*, 1 *Diachlorus*, and 36 *Tabanus*; a new variety of *Chrysops vittata* is described, for which the author proposes the name *C. vittatus* var. *Floridanus*.

SCHNEIDER (P.). **Beitrag zur Kenntnis der Culiciden in der Umgebung von Bonn.** [A contribution to the Knowledge of the Culicidae in the neighbourhood of Bonn.]—*Verhand. Naturhist. Ver. Preuss. Rheinlande u. Westfalens, Bonn*, lxx, (1913), no. 1, 1914, pp. 1-54.

The author found the following species within a radius of 15 miles round Bonn:—*Anopheles maculipennis*, Mg., *A. bifurcatus*, L., *A. nigripes*, Staeger, *Aëdes cinereus*, Mg., *Culex pipiens*, L., *C. territans*, Walk., *Theobaldia annulata*, Schr., *Culex cantans*, Mg., *C. vexans*, Mg., *C. annulipes*, Mg., *C. morsitans*, Theo., *C. nemorosa*, Mg., *C. lateralis*, Mg., *C. stictica*, Mg. (?), and *C. ornata*, Mg. (?). With the exception of *Theobaldia glaphyroptera*, *Grabhamia dorsalis*, *Culex rustica* and three uncertain German species, e.g. *flavirostris*, nearly all the species found in Germany occur near Bonn. German CULICIDAE closely resemble those of Belgium. A bibliography of 84 works published up to June 1912, is appended.

Blanchard (M.). **Epidémie de Fièvre Récurrente à Bikié.** [Epidemic of Relapsing Fever at Bikié.]—*Ann. Hyg. Med. Colon., Paris,* xvii, no. 1, Jan.-Feb.-Mar. 1914, pp. 81-86.

Relapsing fever has been observed for the first time, in an epidemic form, in the French Congo. The endemic areas were very localised and the inhabitants are usually attacked when children, so that most of the adults become immune. This localisation renders it very probable that infection is transmitted by the usual carrier of African relapsing fever, *Ornithodorus moubata.* This tick is sluggish and only leaves the soil to bite individuals lying on the earth. It hides after feeding, though accidentally it may be retained in the clothing and transported elsewhere. An epidemic occurred among some tirailleurs who acted as police at Omoye to the north of Bikié, but the disease was not transmitted to any of the natives of Bikié when the infected detachment returned there at the end of the military operations. Probably these tirailleurs were infected during the nights they passed in the villages abandoned by the natives at Omoye, and the disease did not spread in Bikié, since there were no ticks present, every effort to find any proving a failure. Investigations were next made to ascertain whether lice played any part in transmitting the spirillum of the disease, since they are the intermediate hosts of this fever in North Africa. All efforts in this direction proved negative. Many infected people carrying numerous lice about them lived and moved freely among other healthy people, but in no case did the louse prove capable of transmitting the disease. Many lice taken from infected patients were dissected, but no spirochaetes were found.

Leboeuf (—). **La Lèpre en Nouvelle Calédonie et Dépendences.** [Leprosy in New Caledonia and its Dependencies.]—*Ann. Hyg. Med. Colon., Paris,* xvii, no. 1, 1914, pp. 177-197.

This paper contains a detailed description of leprosy and deals with its occurrence, symptoms and means of propagation. The idea that leprosy is perhaps transmitted by the bite of a blood-sucking insect, dates back to 1876 (Leloir). The elaborate work of Bourret, Ehlers and With in the Danish Antilles and that of D. H. Currie at Honolulu, do not at all support the theory of transmission of the disease by insects. The author has also investigated the part played by mosquitos, bugs, fleas and lice (the only insects which can be suspected in New Caledonia), but the result of his observations is that these insects play no part at all in transmitting leprosy. This is not so in the case of the house-fly, for the author has proved that *Musca domestica* can absorb enormous quantities of Hansen's bacillus whilst feeding on leprous ulcers and that these bacilli can be recovered very abundantly from the evacuations of the flies thus infected. The fly may thus prove very dangerous by depositing its faeces on the mucous membranes or on the skin. It was found that on dissecting twenty-three house-flies taken from a house scarcely 150 metres from a lepers' infirmary no Hansen's bacilli could be recovered, whilst of thirty-six flies captured in one of the rooms of the infirmary, nineteen gave positive results. Transmission can then only occur in a very limited area near the infected person. This means of infection does not by any means exclude contagion by direct contact with a leper or with an object touched by him. In both cases, however, it is the same type of leper which is dangerous, namely those with open lesions, patients free from such lesions not being **a** source of infection through flies.

Orenstein (A.). **Zur Technik der moskitosicheren Häusereindrahtung.** [The technique of mosquito screening.]—*Archiv für Schiffs- und Tropen-Hygiene, Leipzig*, xviii. no. 1. Jan. 1914, pp. 16-21, 2 figs.

Verandas are indispensable for houses in the tropics. The frames of doors and windows fitted with metallic gauze screens against mosquitos are prone to warp and suffer from cleaning, and repairs are costly and unsatisfactory; moreover the chemical action of air, dust, and rust all have the effect of closing up the meshes, thus preventing the ingress of light and air. These evils are less noticeable on large surfaces such as provided on verandas. The first cost of veranda screens is high, but up-keep expenses are insignificant when compared with those entailed by screening doors and windows. Where money is not available for protection for the entire veranda, a portion only may be fitted up. A door suitable for the tropics should not warp, should open outwards and close again quickly. The author states that it is difficult to construct a really satisfactory screened door, but if one is imperative, the metallic gauze should be guarded by a wide-meshed wire netting. The frame requires stiffening with a diagonal lath or steel rod, which latter should be divided in the middle, the cut ends being fitted into a sleeve permitting the tension to be increased. Windows must be constructed so as to allow of screens being placed outside them by screwing the wooden screen-frame on to them. Movable screens are not practicable. Ventilators must be protected. The full breadth of the roll of metallic gauze should be used, as the finished edges afford a purchase for drawing it tight. The single gauze surfaces must not exceed 5 feet in height as they are then too weak. Many experiments conducted at Panama have shown that the gauze must contain 90 per cent. of copper and not more than 5 per cent. iron. As a general rule 18 meshes to the inch should be chosen. If No. 31 B.W.G. wire be used for the gauze—and this has proved to be the best—then 67·4 per cent. of the area allows air to pass. The gauze must be fastened with copper tacks covered with wooden moulding. Copper is necessary to prevent destructive electrolysis. In badly infested mosquito districts the outer doors should be provided with a mosquito-proof ante-chamber. That protection is of real practical use is proved by the figures given by the author covering the years 1909–1911.

Giemsa (G.). **Ueber die weitere Vervollkomnung des Mückenspray-verfahrens (Konspersionsmethode).** [Improvements in spraying methods against mosquitos.]—*Archiv. für Schiffs- und Tropen-Hygiene, Leipzig*, xviii, no. 1. Jan. 1914, pp. 26-29.

The author's first paper on this subject was published in the same journal in August 1911, page 533. He now states that this new method having proved practicable, further investigation to obtain greater perfection and cheapness of the spray-fluids was undertaken and is being continued. Without the addition of the expensive pyrethrum tincture, soap solutions alone may be used with good results. Spraying should be done with a $2\frac{1}{2}$ per cent. solution of potash soap. Equally satisfactory results were obtained with medical (soda) soap (Sapon. med. plv. of the German Pharmacopoeia) in $1\frac{1}{2}$ per cent. solution. It is not probable that such weak solutions will damage household goods, but tests might be made in the houses of the natives, or in cowsheds, etc. The author refers to his former statement that the toxic properties of pyrethrum are enhanced by comparatively small quantities of soap. It has since been found that a number of other substances acquire marked activity through the addition of soap, whereas otherwise they need to be employed in such a degree of concentration as to render them unpractical. Formaldehyde may be instanced as one of these. A solution of $1\frac{3}{4}$ oz. commercial formalin in $1\frac{3}{4}$ pints water causes great irritation to the lungs, and is innocuous to the insects. A solution of 10 drams spirit. sapon. kalini (Pharm. Germ.) in $1\frac{3}{4}$ pints water is also innocuous, but if the ingredients in both be mixed together, less than one-half of the quantities given above will kill the insects instantly. Any moderate traces of the smell of formalin are easily dissipated if a small quantity of ammonia be allowed to evaporate in the room. The following conclusions are of practical value: (1) Soaps form a valuable basis for culicide spray-solutions; (2) Complete success was obtained in the laboratory with the following: (*a*) 2 fluid oz. spirit. sapon. kalin. (Pharm. Germ.) in $1\frac{3}{4}$ pints water; (*b*) 8 drams medical soap (Sapon. med. plv. of the Pharm. Germ.) in $1\frac{3}{4}$ pints water; (*c*) 8 fluid scruples spirit. sapon. kalin. in 1 quart water containing 15 drams of commercial (35 per cent.) formalin; (*d*) 3 drams sapon. med. plv. in $1\frac{3}{4}$ pints water containing 11 drams of formalin. (3) With 60 per cent. alcohol, 33 per cent. stock solution of sapon. med. plv. may readily be prepared on the water-bath. (4) Soft water (rain water, when obtainable) must always be used; where water has more than 15 degrees of hardness more stock solution must be added. (5) Soap solutions containing formaldehyde act most energetically on mosquitos; in more concentrated forms they kill *Musca domestica* and *Stomoxys*; they may perhaps be of use against *Glossina morsitans* and *G. palpalis*, or ticks. (6) As soap solutions containing formaldehyde are powerful bactericides, they will also serve a disinfecting purpose. (7) These solutions have an advantage over the strong smelling Crysol solutions, inasmuch as their after-smell may easily be removed by ammonia. (8) The means indicated are so cheap as to admit of universal and thorough application.

RICARDO (G.). **Tabanidae from Formosa.**—*Supplementa Entomologica. Berlin*, no. 3, 27th Jan. 1914, pp. 62-65.

Two new species are described in this paper, *T. fulvicinctus and T. quinquecinctus.*

EDWARDS (F. W.). **On the Oriental Culicid Genus *Leicesteria*, Theobald.**—*Bull. Entom. Research, London*, iv, pt. 4, Feb. 1914, pp. 255-263. 7 figs.

The author gives a systematic account of the species of *Leicesteria*, including in this genus the species for which Dr. Leicester formed the genus *Chaetomyia*, and those placed by Theobald in the genus

Brevirhynchus. The genus now comprises the ten following species: *annulipalpis*, Theo., *flava*, Leic., *dolichocephala*, Leic., *magna*, Theo., *annulitarsis*, Leic., *cingulata*, Leic., *longipalpis*, Leic., *pendula*, *digitata*, and *pectinata*, the last three being new species.

DOANE (R. W.). **Disease-bearing Insects in Samoa.**—*Bull. Entom. Research, London,* iv, pt. 4, Feb. 1914, pp. 265-269, 3 pl.

The author gives an account of the disease-bearing insects observed by him during a visit to the island of Upolu, German Samoa, in the summer of 1913.

Among the most common of these insects was the mosquito *Stegomyia fasciata*, which pervades every dwelling, but disappears at sunset. No precautions are taken against it by the natives; the author found that the best way to rid a room temporarily of the mosquitos was to capture them with an insect net. Beyond the general annoyance they cause, no special harm is attributed to this insect in Samoa; yellow fever is unknown there at present, but it is not impossible that it may at any time be introduced, especially since the Panama Canal has opened up a direct communication with the regions where it is endemic; if it were once introduced, the numbers of *S. fasciata* present would render its spread very easy, and control measures would have to be adopted. When possible, tanks, vessels containing water, etc. in which the insect might breed were covered, but the author found larvae and pupae in numerous places which retained small quantities of water, and which could not be guarded, such for example as a sagging eave's trough, and the angles between the branches of trees.

Culex fatigans appears at sunset, and mosquito nets are necessary at all times of the year. Physicians believe that more than 50 per cent. of the Samoans are infected with *Filaria bancroftii* by means of this mosquito, many becoming typical cases of elephantiasis. White men become infected with these filaria as readily as natives and usually exhibit the symptoms of what is known as "moo-moo," which is the first stage of the disease, but this generally subsides after a few days. Besides carrying filaria, *Culex fatigans* transmits the organism that produces dengue fever, a disease very prevalent among the Samoans and frequently among white men also. *C. fatigans* is usually found breeding with *S. fasciata* near dwellings, but it may be found much further away in the field, or bush; the author has found its eggs and larvae in old troughs, stumps of trees, hollow places in logs, etc., more than half a mile from the nearest dwelling.

Stegomyia pseudoscutellaris is very common about the house, biting freely during the day, and continuing its feeding later than *S. fasciata*. It breeds in standing water and is the most annoying pest in the field. It is not definitely known whether it transmits any disease, but it is under suspicion of carrying the filaria of elephantiasis and the organism causing dengue also.

The mosquito *Finlaya kochi* was found in smaller numbers; many specimens were engorged with blood, and the author is inclined to attribute to this species certain specially irritating mosquito bites from which he suffered. It was found breeding in water collected at the base of tamu leaves.

Musca domestica, the house-fly, is also very troublesome. It is probably connected with the transmission of typhoid and other diseases, particularly framboesia or yaws, caused by the parasites *Treponema pertenue*, which is prevalent among children. Another disease, for the spread of which flies are held responsible, is one peculiar to the islands and prevalent among children; its effect is to cause sores round the eyes which may eventually lead to blindness.

The head louse, *Pediculus capitis*, is said to be common: the Samoans often treat the head with lime, sometimes adding also the juice of limes, as a remedy against it. No *Stomoxys* or other biting flies were found. A rat examined was infested with the plague flea, *Xenopsylla cheopis*, which emphasises the necessity of enforcing a strict quarantine against plague-infected ports. Dogs were badly infested with *Rhipicephalus sanguineus*, the tick which is concerned with malignant jaundice of dogs in South Africa and India; allied species of similar habits cause diseases of cattle. As cattle and horses are constantly being imported into Samoa, it would be desirable to keep a careful watch to prevent diseases being introduced in this way.

WOOSNAM (R. B.). **Report on a search for *Glossina* on the Amala (Engabei) River, Southern Masai Reserve, East Africa Protectorate.** *Bull. Entom. Research, London*, iv, pt. 4. Feb. 1914, pp. 271-278, 1 map.

In July–October 1913, the author made an expedition to the valley of the Amala (or Amara) river to search for *Glossina*. From his own observations and from what he learnt from natives regarding any effects that the fly had produced on themselves or on their cattle, he arrived at the following facts and conclusions. The species of tsetse-fly is the western *G. fusca*, which has never been recorded previously from the East Africa Protectorate. The altitude, 5,200 feet, is one of the highest at which species of *Glossina* have been found to exist permanently. On the upper part of the river the fly is confined to the west bank, a broad plain of park-like country, intersected by numerous small water-courses. The bush is not dense, consisting of some large forest trees with smaller ones in between, and with creepers, etc., affording shade, and is similar to the bush in which *G. palpalis* is found in Uganda and the Congo. The east bank of the river is more rocky and arid, with very little bush, and is not frequented by the fly. Natives with their cattle, sheep and goats have been living for many years practically in contact with the fly, although it is known that the fly has been the cause of death to cattle, mules, and horses; either the natives in this district are so familiar with the distribution of the fly that they are careful to avoid exposing their cattle to infection, or only a very small percentage of the flies present are infective, the reservoir of infection being limited, or the flies not receptive to it.

The author considers that, in existing circumstances, the presence of the tsetse-fly in this region calls for no alarm, and it is not necessary to adopt precautionary measures; all that need be done would be to warn newcomers to the neighbourhood that the fly does exist there; further, it does not appear advisable to allow natives suffering from trypanosomiasis in an early stage to visit the area in question until more definite knowledge about the fly on the Amala river has been obtained. The map accompanying the paper shows the fly area, from which shooting parties or others who visit the neighbourhood, can learn what areas it would be desirable to avoid. The following species of game and other animals are represented on both sides of the Amala in the portion investigated :—Rhinoceros, hippopotamus, giraffe, eland, waterbuck, zebra, roan antelope, wildebeest, topi, Coke's hartebeest, impala, reedbuck, bushbuck, steinbuck, oribi, duiker, lion, leopard, cheetah, serval cat, wart-hog, baboons and other monkeys, hares and numerous other small mammals; also birds such as guineafowl and francolin. In the fly area blood smears were obtained from topi, impala, zebra, wart-hog, and a hare; on examination none of these was found to contain trypanosomes.

Austen (E. E.). **New African Tabanidae. Part IV.**—*Bull. Entom. Research, London*, iv, pt. 4, Feb. 1914, pp. 283-300, 5 figs.

The following seven new species of Tabanidae are described from various parts of Africa :—Pangoniinae : *Chrysops pallidula* from Angola; Tabaninae : *Haematopota hastata* from Sierra Leone Protectorate, Gold Coast (Northern Territories), and Northern Nigeria; *H. harpax* from the Belgian Congo; *H. maculosifacies* from German East Africa; *H. ingluviosa* from Southern and Northern Rhodesia; *H. edax* and *H. nigripennis* from the Uganda Protectorate.

Macfie (J. W. S.). **A Note on the Action of Common Salt on the Larvae of** *Stegomyia fasciata*.—*Bull. Entom. Research, London*, iv, pt. 4, Feb. 1914, pp. 339-344, 1 pl.

Graham pointed out in 1910, that measures designed to destroy mosquito larvae, are either those which directly destroy the larva or those which indirectly do so by destroying its food material. Experimentally he found with *Pyretophorus costalis* that 3 per cent. solutions of common salt precipitated the algal food of the larvae causing them to become cannibalistic : in lesser concentrations, the growth of very young larvae was inhibited, possibly because their food material was destroyed, but hypertonic solutions hastened the development of fully grown larvae. The author gives an account of experiments made by him to determine to what extent the action of salt on mosquito larvae is due to the destruction of their natural food supply, and to what extent it is due to the hypertonic nature of the solution. The larvae employed were those of *Stegomyia fasciata*, this species being chosen because its breeding places can be most easily treated, and also on account of its importance in the transmission of yellow fever. A first series of experiments consisted of placing larvae in pure water containing salt, the solutions being of strengths between 0·5 per cent. and 5 per cent. The stronger the solution, the more quickly the larvae died, and as the factor of precipitation was omitted by the use of pure water, the result shows that the action was purely osmotic; the lowest concentration, 0·5 per cent. seemed to have little effect. It was found that the presence of debris, etc. did not appreciably alter the action of the salt solution. In a second series of experiments, in which solutions more dilute than the foregoing were used, to see if inhibition of development occurred owing to the precipitation of organic food material, it was found that death among the larvae occurred at a rate proportional to the strength of the solutions; whether death was due to starvation or to some other cause is uncertain; solutions of alum, which precipitates the impurities in water more markedly than salt, had no peculiar action on the larvae.

In Lagos, the larvae of *Stegomyia fasciata* are found most abundantly in water contained in domestic utensils. It would be of great advantage if common salt could be used as a larvicide in these cases, for, not only would the water not be rendered unfit for use in cooking, as it is by the application of kerosene, but also evaporation would tend to increase the strength of the solution and repeated applications would be unnecessary. It would also be possible to keep stores of water in the compounds without danger. The strength of the solution in the vessels would have to be at least 2 per cent. in order to ensure the destruction of the larvae.

Some experiments were also made to see whether larvae and pupae could mature in small temporary pools, subjected to intermittent desiccation. Such pools occur under the taps of tanks, etc., the pool being renewed once or twice in the day, evaporating between these times, but leaving the soil moist. It was found that pupae could complete their development in such circumstances, and that if the pools were renewed fairly frequently, immature larvae could also develop, so that it would be a wise precaution to treat such pools with larvicides.

Rothschild (N. C.). **The Tropical Bed-bug,** *Clinocoris hemiptera*, **Fabr.** *Bull. Entom. Research, London*, iv, pt. 4, Feb. 1914, p. 345.

From an examination of the type specimen of *Clinocoris hemiptera*, Fabr. in the Copenhagen Museum, the author confirms Dr. Horvath's views that the bed-bug described under the names *hemiptera, rotundata, macrocephala* and *horrifer* are all the same species, and should be called *hemiptera*, this being the oldest name. *Clinocoris foedus* was also examined and was found to differ slightly from *hemiptera*; whether the difference is specific or due to the shrinkage of the specimen cannot be decided until more material is available, but it is probable that *foedus* is a distinct species.

Froggatt (W. W.). **The Sheep-Maggot Fly and its Parasite.**—*Agric. Gaz. N.S.W., Sydney*, xxv, pt. 2, Feb. 1914, pp. 107-111. 1 pl.

The Metallic Blue Blow-fly (*Calliphora rufifacies*) is the species most harmful to sheep in Australia at the present time. It is an example of the adoption of injurious habits by a previously harmless insect, for until the past few years' it was not recognised as a pest, two other species, *C. oceaniae* and *C. villosa*, being much more harmful; these are now becoming comparatively unimportant pests. A description of *C. rufifacies* and its larval stages is given. The larvae are the so-called "hairy maggots": they hatch from eggs deposited on soiled wool; the larva develops on the wool and pupates there, the pupae usually dropping to the ground. Another species of blow-fly, only recently recorded as infesting sheep in Australia, is the Green-bottle Fly, the well-known English sheep-maggot fly (*Lucilia sericata*): it is common as a blow-fly of meat, etc. in the neighbourhood of Sydney, but it never been recorded from the wool, or wounds on sheep, until now. The life-history has been carefully studied: eggs laid at midday were active maggots in six hours; the maggots on meat are full fed in six days, when they pupate, and the perfect fly emerges on the sixth day after pupation.

Sheep-maggot flies have been carefully investigated at the newly established Sheep-Maggot Fly Experiment Station near Brewarrina; one of the most important results of the work done is the discovery of a parasite of *Calliphora rufifacies*. This parasite, the adult and larva of which are described, is a Chalcid wasp. Experiment shows that it is an effective parasite of the fly larvae and pupae, and it breeds very readily under artificial conditions, attacking the fly at an early stage, before it has seriously damaged the wool. Its life cycle occupied in some cases four weeks, but in others only eleven days.

LEGENDRE (J.). **Le Paludisme à Tananarive.** [Malaria at Antananarivo.]—*Bull. Soc. Path. Exot., Paris*, vii, no. 2, 11th Feb. 1914, pp. 105-109.

For several months the author made investigations on malaria at Antananarivo, where this disease has been present to a serious extent for about ten years. The results are summarised in two tables, from which it is seen that the rice fields of the plain are much less malarious than those of the hill districts, the greatest contrast being between Nosipatrana, a village on the edge of a large irrigated plain, where 30 per cent. of the children examined were suffering from malaria, and Ambohimiandra where 100 per cent. were attacked by the disease. It was found that the rice fields of the large plain Betsimisaraka, irrigated by canals derived from streams, were frequented by a fish, *Carassino auratus*, but those of the hillside, watered by springs and rain, were entirely destitute of fish, since there is no communication with the main streams. Predaceous aquatic insects are equally distributed in all the rice fields and greatly reduce the number of *Anopheles* larvae. Beyond the absence of fish, the author could find no other cause why malaria should be so much more prevalent on the hills than in the plain. The advantage gained by the villages being on the hills is lost because of the arrangement of the rice fields in terraces and the fact that, being above the elevation of the plain, irrigation cannot be employed. Certain measures were proposed with a view to reducing the intensity of malaria in these districts, namely, the periodic drying of the rice fields and the stocking of the fields with fish. From these observations it is seen that malaria is confined to the rice fields, and in Antananarivo at least half the rice fields are on the hills. In all places where the fields are arranged in terraces on the side of the hills, malaria is intense.

GIRAULT (A. A.). **Naphthalene and Fleas.**—*Entom. News, Philadelphia*, xxv, no. 3, March 1914, pp. 130-131.

The author says that napthalene, powdered and rubbed into the fur of domestic animals, is a means of ridding them of fleas; the fleas emerge from the fur in a lethargic condition and are easily killed. Napthalene seems to affect the health of the animal for a few hours or days, making it also lethargic, but this effect is not dangerous.

KNAB (F.). **Gad-Flies (Tabanidae) of the Genus** *Stibasoma.*—*Proc. U.S. Nat. Mus., Washington*, 23rd Dec. 1913, xlvi, pp. 407-412.

This paper gives a revision of the species of *Stibasoma* including *S. willistonii*, Lutz, *S. theotaenia*, Wied., *S. flavistigma*, Hine, *S. mallophoroides*, Walk., *S. festivus*, Wied., *S. dyridophorum*, sp. n., *S. pachycephalum*, Big., *S. bicolor*, Big., *S. dives*, Walk., *S. tristis*, Wied., *S. fulvohirtus*, Wied. The genus *Stibasoma* is restricted to tropical America, exclusive of the Antilles, ranging from Mexico to Uruguay.

BECK (M.). **Untersuchungen über ein am Rovuma (Deutschostafrika) vorkommendes Trypanosoma beim Menschen.** [Researches on a human Trypanosome occurring on the Rovuma (German East Africa).]—*Arch. für Schiffs- und Tropen-Hygiene, Leipzig*, xviii, no. 3, Feb. 1914, pp. 97–101, 1 pl.

This paper continues one by Beck and Weck [see this *Review*, Ser. B, i, p. 67] on an outbreak of trypanosomiasis on the Rovuma river, where 72 cases of sleeping sickness have been discovered. Investigations up to date show *Glossina morsitans* alone to be the carrier and in the districts affected, 8 to 10 per cent. of this fly are infected with trypanosomes, the identity of which has not yet been established. Most probably they are identical with the *T. rhodesiense* described by English doctors, but the posterior nucleur characteristic of *T. rhodesiense* only occurs exceptionally in fresh blood preparations. Comparative research leads to the conclusion that this trypanosome is not identical with that found in spontaneously infected animals (mules and cattle) nor with the one observed in a number of other animals (waterbuck and eland).

BRUMPT (E.). **Réduvides de L'Amérique du Nord capables de transmettre le** *Trypanosoma cruzi.* [Reduviids of North America capable of transmitting *Trypanosoma cruzi.*]—*Bull. Soc. Path. Exot., Paris*, vii, no. 2, 11th Feb. 1914, pp. 132-133.

Trypanosoma cruzi has been found in *Triatoma* (*Conorhinus*) *megistus* by C. Chagas and equally abundantly in *T. infestans* and *T. sordidus.* Whilst investigating a virus from Bahia, the author demonstrated that various bed-bugs (*Cimex lectularius*, *C. hemiptera* (*rotundatus*) and *C. boueti*) could be infected with *T. cruzi*, as well as a tick, *Ornithdorus moubata.* With Gonzalez-Lugo the author proved *Rhodnius prolixus* to be a carrier of *T. cruzi*, and this Hemipteron shows a long infection. *Rhipicephalus sanguineus* has been shown by Neiva to be an intermediate host. The *Triatoma* used in these experiments were from the Dallas Laboratory, Texas.

STORCH (O.). **Die Verbreitung der Anophelen in Niederösterreich und dem östlichen Osterreichisch-Schlesien.** [The distribution of *Anopheles* in Lower Austria and the east of Austrian Silesia.]—*Das österreichische Sanitätswesen, Vienna*, xxvi. no. 9, 26th Feb. 1914, pp. 77-81.

The preceding year's investigations on the distribution and abundance of *Anopheles* have been continued, but the Wachau and its neighbourhood and the east portion of Austrian Silesia, were visited, in addition to the vicinity of Vienna. In the latter district the author remarks that whereas Anophelines were somewhat abundant in the warm summer of 1911, their numbers were less in the cold, wet summer of 1912 and especially 1913. Of the Wachau and the richly watered Danube valley beneath it, the author's former experience holds good, namely, that breeding places for *Anopheles* larvae are provided by such shallow sheets of water as have escaped recent flooding and are protected from the wind by plants on their banks ; but as a rule, only species of *Culex* occur. In warm, dry summers Anophelines would probably be more frequent, but in any case the conditions are not favourable to widespread malaria. The third district is around Freistadt, in the east of Austrian Silesia, and abounds in *Anopheles*, malaria being prevalent. One doctor stated that he alone had some 700 cases a year. On alighting at Chybi the author was surprised at the numbers of mosquitos settled on the walls and ceilings in the station. This was the case in every building. The country is of a very marshy character, and though many fields have been reclaimed, a considerable number of pools still remain. Human habitations are numerous throughout the district and mosquitos occur abundantly in them. In the other districts referred to above, the breeding places of *Anopheles* are far removed from dwellings and thus but few of them are found indoors. Draining the marshland would cost too much, but by thoroughly destroying the vegetation around the pools they would cease to be suitable breeding places. This would also be profitable in another way, as these plants diminish the feeding capacity of these ponds for fish. Houses should not be built near such water and the people should be taught the danger attached to the presence of mosquitos. The compilation of exact statistics is a necessary initial step.

Girault (A. A.). **Preliminary studies on the biology of the Bed-bug, *Cimex lectularius*, Linn.**—*Jl. Econ. Biol., London*, ix, no. 1, March. 1914, pp. 25-45.

The experiments described in the present paper are concerned with the breeding of *Cimex lectularius* and its feeding habits. Different pairs of males and females were kept, and the eggs laid were counted ; in one case the female laid 190 eggs from 27th February to 24th June ; the last thirteen laid were not fertile. In another case 139 eggs were laid from 27th February to 12th May, all except five being fertile. A third female laid 168 eggs between 22nd February and 15th May, all being fertile except one. A fourth laid 130 eggs from 22nd February to 11th May, all fertile. A fifth laid 109 eggs from 10th January to 15th February. Eggs laid on 1st February hatched on 10th February, and the insects reached maturity on 18th March. Females of this generation laid 86 eggs from 25th March to 11th May in one case, and 89 eggs from 27th March to 15th May in a second. Larvae of the third generation hatched out on 20th April. The author showed experimentally that this bug will feed readily upon mice, sparrows, moles and guinea-pigs. Many individuals subsisted for some months on the blood of the guinea-pigs and oviposition occurred.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

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THE REVIEW OF APPLIED ENTOMOLOGY.

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RUTHERFORD (A.). *Stomoxys calcitrans* L.—*Trop. Agric., Peradeniya*, xlii, no. 3, March 1914, pp. 222-225.

F. C. Bishopp has recently given an account of a severe outbreak of this pest in Texas [see this *Review*, B, i, p. 96] and in October 1913 a bad outbreak occurred in Talawakelle. The Government Veterinary Surgeon reported that *Stomoxys* was swarming in the town and a cause of serious irritation to cattle and horses. The eggs, which are usually laid in masses in straw, hatch in from 1 to 3 days. The larva completes its growth in about 11 days, and 6 days later the adult emerges from the puparium. Green in Ceylon has bred *S. calcitrans* from decayed pumpkins and *S. plurinotata* from decayed shoots of the Giant Bamboo.

WHITING (P. W.). **Observations on Blow Flies; Duration of the Prepupal Stage and Colour Determination.**—*Biol. Bull., Mar. Biol. Lab., Woods Hole, Mass.*, xxvi, no. 3, March 1914, pp. 184-194.

The results of two main lines of experiments on blowflies are recorded. The first was concerned with the duration of the prepupal or migration stage of the larvae, and the conclusions may be summarised as follows: The length of the prepupal period is determined by factors of environment rather than of heredity, and these are complex and obscure in general; dryness, cold, or agitation due to crowding, tend to prevent pupation, while change from dryness to dampness, or the reverse, induces pupation. The prepupal stage may be extended for a long period, four months in one experiment, in warm temperature, without injury to the development of adult flies. Lack of opportunity for the larvae to bury themselves does not inhibit pupation. Exhaustion of the food supply before the larvae have attained full size has a tendency to produce undersized but normally formed flies. The causes producing misshapen flies are more obscure, but may in part be due to drying of the pupae. Delayed pupation in *Lucilia* larvae results in a change from white to pink in the fat body, but in two genera of larger flies, *Cynomyia* and *Calliphora*, the white colour is maintained although shrinkage of the whole body occurs. There is no evidence that overfeeding delays pupation, but much evidence that larvae will pupate immediately despite the fact that they have had abundant opportunity to overeat.

The second main line of investigation was concerned with coloration in the adult flies, and the results show that the factors influencing the colour of the adult is hereditary and that environmental factors, light and temperature, seem to have no effect upon the degree or rapidity with which the changes of colour take place as development advances.

LAVERAN (A.) & FRANCHINI (G.). **Infection de la Souris au moyen des Flagellés de la Puce du Rat, par la Voie Digestive.** [Infection of Mice with the Flagellates of the rat flea through the digestive tract.]—*C. R. Acad. Sci., Paris*, clviii, no. 11, 16th March 1914, pp. 770-772.

In the present paper, which is a continuation of the work by the authors on the infection of rats and mice by fleas infected with flagellates [cf. this *Review*, Ser. B, ii, p. 54], experiments are described

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which were made to see whether the infection was caused by inoculation of the parasites when the flea bites the mouse, or whether it was caused by the mouse swallowing the fleas. Mice were fed on bread containing heavily infected fleas (*Ceratophyllus fasciatus*); in every case the nfection was transmitted, which seems to prove that, if not the only method of infection, the swallowing of the fleas by the mice is an important one. This fits in also with the fact that the flagellates (in the present case *Herpetomonas pattoni*) are found almost exclusively in the posterior part of the alimentary canal of the flea, and it would be difficult to imagine how they could reach the mouth to be inoculated into the mouse. The authors succeeded also in infecting mice by causing them to swallow material infected with *Crithidia melophagi.*

LUCET (A.). **Recherches sur l'Evolution de l'*Hypoderma bovis* (de Geer) et les Moyens de le detruire.** [Experiments on the life-history of *Hypoderma bovis* and means of destroying it.]—*C. R. Acad. Sci., Paris,* clviii, nos. 11 and 13, 16th and 30th March 1914, pp. 812-814 and 968-970.

The effect of the parasite *Hypoderma bovis* on cattle is very serious; growth is inhibited, and the production of milk is reduced, the total loss due to it in France alone averaging annually about ten million francs (nearly £400,000). Under the climatic conditions of Paris, the larvae leave the infected cattle in May and June; pupation takes place on the ground, the pupal stage lasting from 30–35 days. The natural enemies of *H. bovis* are small rodents, birds and insects, and they are also attacked by fungi.

The adults are met with from the middle of June till September. The eggs arel aid on the surface of the skin and on the hair; they are white and elliptical, slightly compressed and rather over 1 mm. in length; at one end they are prolonged into a bifurcated process; when laid the egg already contains the tiny larva. A method of destroying the larvae *in situ* on the host consists of injecting 0·5 or 1 c.c. of tincture of iodine into the subcutaneous nodules caused by the parasites; this kills the larvae, which are absorbed without any ill effect resulting.

SERGENT (E.), FOLEY (H.) & VIALATTE (C.). **Transmission à l'Homme et au Singe du Typhus exanthématique par les Poux d'un Malade atteint de Fièvre récurrente et par des Lentes et Poux issus des précédents.** [The transmission of exanthematous typhus to man and monkey by means of lice from a recurrent fever patient, and by the progeny of the same lice.]—*C. R. Acad. Sci., Paris,* clviii, no. 13, 30th March 1914, pp. 964–965.

Experiments were made by the authors in Algiers, on themselves and others and on monkeys, to determine the nature of the transmission of exanthematous typhus and its relation to recurrent fever. The results showed that the bites of adult lice infected with the virus of recurrent fever can cause exanthematous typhus in man; that lice taken from a man thus infected can in their turn transmit the disease to monkeys if inoculated subcutaneously or into the peritoneum; by inoculating the blood of a monkey thus infected into another monkey, the latter takes the disease. It was

Published in Aug. No

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Roubaud (E.). **Oestrides gastricoles et cavicoles de l'Afrique occidentale francaise.** [Stomach and Sinus-inhabiting Oestrids of French West Africa.]—*Bull. Soc. Path. Exot., Paris*, vii, no. 3, 11th March 1914, pp. 212-215.

The sheep bot of French West Africa and its ravages have been described by the author in a previous paper. The present paper gives a short account of other bots of that region that have been more recently collected. The stomach-inhabiting Oestrids mentioned are, *Gastrophilus asininus*, Brauer, in the stomach of horses, and *Cobboldia loxodontis*, in the stomach of elephants. The following Oestrids, inhabiting the frontal sinuses of *Bubalis major* were found : *Oestrus variolosus*, Lw., *Gedoelstia cristata* and *Kirkia surcoufi*, Gedoelst.

Gedoelst (L.). **Note sur un Genre Nouveau d'Oestrides.** [Note on a new genus of Oestrids.]—*Bull. Soc. Path. Exot., Paris*, vii, no. 3, 11th March 1914, pp. 210–212.

In 1893 Blanchard described an Oestrid larva found in the frontal sinus of *Boselaphus* (*Bubalis*) *lichtensteini*, but differing from the larvae of other known genera ; he called it Kirk's larva. It is now described by the author under the name *Kirkia blanchardi* (gen. et sp. n.).

Sergent (Edm.) & Foley (H.). **Transmission de la Fièvre Récurrent par Dépôt sur les Muqueuses Intactes du Produit de Broyage de Poux prélevés sur un Spirillaire.** [Transmission of Recurrent Fever by deposits on the mucous membrane of healthy persons of crushed Lice taken from a case of Recurrent Fever.]—*C. R. Soc. Biol., Paris*, lxxvi, no. 11, 27th March 1914, pp. 471-472.

The investigations made previous to this by Nicolle, Blaizot, Conseil and Sergent on the transmission of recurrent fever, show that infection may occur when abrasions in the skin, or the eyes, are rubbed with fingers contaminated with infected lice, or when blood containing the spirilla enters the eyes ; [see this *Review*, Ser. B, i, pp. 70–72 and 235.] In the present paper experiments are described which show that monkeys can be infected when the products of crushed lice, fed for six days on a patient in the later stages of a first attack, were placed on the mucous membrane of the nose. Lice taken from the same patient four days after the end of a second attack and crushed and applied similarly to the nasal mucous membrane of a man, caused no infection, although containing numerous spirilla ; it should be noted that the subject was syphilitic and had recently been under prolonged iodo-mercury treatment.

Lewis (J. C.). **Equine Granuloma in the Northern Territory of Australia.**—*Jl. Comp. Path. and Therap., London*, xxvii, pt. 1, March 1914, pp. 1-23.

Equine granuloma is a disease confined to horses and occurring in tropical Australia ; though more common in marshy, low-lying districts, occasional cases of the disease are seen in parts of the territory where the rainfall is not of a tropical character. The method by which animals become infected has not yet been demonstrated; inoculating the discharge from the lesions or the blood of an infected animal into a healthy one gave negative results; no bacterial, fungoid, protozoan or metazoan parasites have been demonstrated. The inability to reproduce the disease artificially from horse to horse suggests either that an intermediate host is necessary, or that the appearance of the causative agent in the horse is an accidental phenomenon, its passage through this animal attenuating the virus sufficiently to prevent production of the lesion in healthy tissues when inoculation of the disease from horse to horse is attempted. Regarding the question of a carrier, it has been shown that the disease is not produced through the agency of leeches. Other possible carriers are Diptera, but evidence is strongly against the likelihood of infection by means of flies. The number of biting flies, chiefly TABANIDAE, is considerable, but with all the species observed there seems to be no preference as to the portion of the horse attacked, the back and the loins being bitten just as often as the legs and abdomen. Also, every horse during the wet season is bitten a great number of times by flies, and there seems to be no relation between the number of fly bites and the occurrence of the disease. The probability is that the virus is not transmitted by an intermediate host.

SURFACE (H. A.). **Livestock Rarely Poisoned from Spray.**—*Wkly. Zool. Press Bull., Pennsylvania Dept. Agric., Harrisburg,* March 1914, no. 255.

Ordinary caution in pasturing livestock in orchards after poisonous sprays have been used on the trees will, in the author's opinion, prevent any cases of poisoning. He writes as follows to an inquirer:—

"I have never known of but one case of poisoning from this, and that was from sheep that were poisoned by pasturing in a small orchard that was sprayed heavily, and they were allowed to remain in the orchard at the time. I think there is absolutely no danger to any livestock from this source if the owner will wait until there is at least one rain after turning the cattle into pasture on it. Where the orchard area is small, so that the stock would be confined to the freshly sprayed parts, and especially where an unusual amount of poison spray has been used, and to such a needless degree as to soak the trees with the spray liquid, there may be some danger of poisoning. I have seen many an orchard sprayed with arsenate of lead and the stock safely pastured there at the same time. The best methods of horticulture do not permit pasturing orchards, especially in the spring of the year when the ground is yet soft. At the time the blossoms fall, which is the time for the first arsenical spray, the grass is short and there is nothing to be gained by pasturing."

ROSS (E. H.). **House Flies and Disease.**—*Jl. R. Soc. Arts, London,* lxii, nos. 3200, 3201, 3202, 20th Mar., 27th Mar., 3rd April 1914, pp. 388-397, 423 and 442.

The whole question of house flies and their relation to disease is summarised. Dr. P. Caldwell Smith in discussing the paper contended that dust bins are the principal cause of flies in London; this was also the opinion of Dr. E. H. T. Nash, who further emphasised the fact that not only should dust be collected daily, but that it should be burnt as soon after collection as possible. in order to destroy eggs and larvae. Dr. C. E. Shelley stated that at a certain public school, epidemics had broken out in successive years, as a consequence of the fields in the neighbourhood being covered by manure and rubbish from London; it was noted that shortly after the spreading of this manure a great increase in the number of house flies occurred. A large sum had been spent in buying up the fields in the vicinity of the institution, with the result of a marked freedom from the epidemic.

TAYLOR (F. H.). **The Culicidae of Australia.**—*Trans. Entom. Soc., London*, 1913, pt. 4, 31st Mar. 1914, pp. 683-708.

This paper contains descriptions of three new genera and seventeen new species of CULICIDAE, and new records for several previously described forms. The new genera are *Calomyia*, *Caenocephalus* and *Dixomyia*; the new species are distributed among the following genera: 1 *Calomyia*, 1 *Grabhamia*, 6 *Culicada*, 2 *Leucomyia*, 2 *Culicelsa*, 1 *Caenocephalus*, 1 *Chrysoconops*, 1 *Dixomyia*, and 2 *Uranotaenia*.

COCKERELL (T. D. A.). ***Dermatobia* in Guatemala.**—*Entomologist, London*, xlvii, no. 611, Apr. 1914, p. 131.

The finding of a species of *Dermatobia* at Quirigua, Guatemala, is recorded. The larva of the Dipteron was found in an Indian, under the skin of the arm, causing great pain. The species corresponds with *D. cyaniventris*.

SIMPSON (J. J.). **Entomological Research in British West Africa: V. Gold Coast.**—*Bull. Entom. Research, London*, v, pt. 1, April 1914, pp. 1-36, 4 pl. 1 map.

This is a general account of the Gold Coast, its physical configuration, vegetation and climate, followed by a detailed narrative of the expedition in which are given the species of blood-sucking insects met with in various localities, including the records of captures by previous workers. Of these the Diptera include 70 species of CULICIDAE, 2 of CHIRONOMIDAE, 1 of SIMULIIDAE, 2 of PSYCHODIDAE, 45 of TABANIDAE, 18 of MUSCIDAE and 2 of HIPPOBOSCIDAE; besides these 1 species of bug, 4 of fleas and 10 of ticks were found.

The insect-borne diseases prevalent in the Gold Coast are discussed. After referring to malaria, the author states that yellow fever is far from uncommon and that *Stegomyia fasciata* is widely distributed, though most common among the coast towns. Sleeping sickness is more prevalent in the Gold Coast than in any other British Colony in West Africa; Ashanti is the chief centre of the disease, but it occurs over a wide area; the author thinks that the only way to get rid of tsetse in the present state of our knowledge of the bionomics of these flies is to clear the bush around villages.

A serious outbreak of plague occurred in the Gold Coast in 1908–9, but was effectually stamped out: every precaution is taken to destroy rats and other vermin which might harbour the carrier. *Xenopsylla* *cheopis.* Trypanosomiasis is common in cattle in the Gold Coast, particularly amongst those imported from the north, from the Moshi country; horses and dogs are also affected, sheep to a slight extent and one case in a goat has been recorded; pigs have not been found infected. Two cases of spirochaetosis have been recorded in sheep and one in a goat.

The distribution of the genus *Glossina* is dealt with in detail, and a map accompanying the description shows the localities where the different species occur and where sleeping sickness is prevalent. Ten species are recorded; belonging to the *palpalis* group are *palpalis, tachinoides, caliginea,* and *pallicera*; to the *morsitans* group, *longipalpis* and *morsitans*; to the *fusca* group, *fusca, nigrofusca* and *tabaniformis*; and to the *brevipalpis* group, *medicorum.* Regaiding the connexion between tsetse-fly and game, the author inclines to think that it is closer in the case of *G. morsitans* than in other species.

A list of the parasites of game and other mammals observed is given.

FROGGATT (W. W.). **Sheep Maggot Flies in Australia.**—*Bull. Entom. Research, London,* v, pt. 1, April 1914, pp. 37-39.

The most serious pests at the present time threatening the wool and sheep industry of Australia are the sheep maggot flies (blow-flies belonging to the genus *Calliphora*); *C. villosa* and *C. oceaniae* were the first to be observed as doing damage; more recently *C. rufifacies* has taken to sheep and done even more harm. This species has been dealt with by the author in a recent paper in the *Agricultural Gazette, N.S.W.*, for February 1914. [See this *Review* Ser. B. ii, p. 85.] The damage done in 1912 amounted to at least a million sterling in New South Wales alone, and as much again in Queensland, and was spreading in other states. All kinds of dips, dressings, etc., have been tried by sheep-owners, but nothing up to the present time has been discovered that will keep the flies from blowing wool for more than a few weeks. A Government Sheep Maggot Fly Experiment Station has, at the instance of sheep-owners, been recently established in the Brewarrina district. Here field investigations on the life-histories, range and habits of the different flies which occur in the district among sheep are carried on, and examination made of dead animals and animal remains found in the paddocks. The different substances and chemicals that can be used to attract flies to poisoned baits, or to keep them from laying their eggs or maggots upon wool, are studied. Enquiry is also made into the indigenous birds that destroy flies or maggots, and the value of natural parasites.

Important predatory enemies of the maggot fly are the Staphylinid beetle, *Creophilus erythrocephalus*, and a wasp, *Gorytes* sp. The most important parasite is a Chalcid recently discovered at Yarrawin. To aid in the dispersal of this parasite, farmers are recommended to ascertain whether it is present in maggots in their dead animals, in which case fly pupae will contain a number of tiny maggots or small ant-like creatures. These pupae should be collected and placed in a bag made of mosquito netting, the meshes of which will permit the parasites to escape but not their hosts. A similar parasite has been recently recorded from Longreach, Central Queensland, so that the distribution of the insect may be very wide.

Rothschild (N. C.). **On some Species of *Cacodmus*, a Genus of Bed-bugs (Clinocoridae).**—*Bull. Entom. Research, London*, v, pt. 1, April 1914, pp. 41-42, 5 figs.

Two specimens of *Cacodmus* have been sent from Uganda where they were taken on a bat; the author regards them as identical with *C. ignotus* described by him in 1912 from an unknown locality. A new species, taken on *Vespertilio dinyani* at Port Natal is described under the name *C. sparsilis*, the individual from which the description is made, having been originally regarded by the author as *C. villosus*.

Lloyd (L.). **Further Notes on the Bionomics of *Glossina morsitans* in Northern Rhodesia.**—*Bull. Entom. Research, London*, v, pt. 1, April 1914, pp. 49-60, 4 pl., 1 map.

Investigations on the influence of various bloods on the breeding capabilities of the fly are described in detail, with the aid of tables and lead to the following conclusions: *G. morsitans* willingly feeds on small mammals, birds and reptiles; its ability to do so depends on their agility; as it haunts the sleeping places of many of these it probably feeds on them to some extent when they sleep. Reptilian blood is not suitable to *G. morsitans* as a continued diet; mammalian has a slight advantage over avian blood as a diet, as is shown by the larger average size of the pupae bred in the laboratory. Evidence is wanting as to the exact relation of *G. morsitans* to the larger mammals; if these were destroyed it might take to feeding exclusively on man, and on the other hand it is still uncertain whether the fly does not live also on smaller mammals; experiments are suggested by which this latter point could be investigated; such as keeping tsetse and the animals to be investigated together in a large closed cage and ascertaining whether the fly was able to live and reproduce. The one feature common to the breeding places found, is that in close proximity to each there is some relatively dark place where the mother fly can hide during pregnancy. Pupae are deposited in much larger numbers close to places where large mammals are certain to pass frequently (e.g. paths, fords, drinking places) than elsewhere. These points are well demonstrated by photographs and a plan. On the high plateau of Northern Rhodesia *G. morsitans* begins to breed freely about the second month of the dry season (July) and almost or entirely ceases to do so in the rainy season.

Edwards (F. W.). **New Species of Culicidae in the British Museum, with Notes on the Genitalia of some African *Culex*.**—*Bull. Entom. Research, London*, v, pt. 1, April 1914, pp. 63-81, 12 figs.

Sixteen new species of Culicidae are described, eight of which are from Africa, two from Sarawak, one from Hong-Kong, one from the Malay States, three from Ceylon and one from India. The taxonomy of eight species already described from Africa is discussed, classification being based on the male genitalia.

Rothschild (N. C.). **On three Species of *Xenopsylla* occurring on Rats in India.**—*Bull. Entom. Research, London*, v, pt. 1, April 1914, pp. 83-85, 6 figs.

In view of the probability that one or more of the fleas occurring on the common rats (*Mus rattus* and *M. norvegicus*) are concerned in the transmission of plague, investigators should be able to discriminate between the various species of fleas before devising and applying the appropriate remedial measures. Three species of *Xenopsylla* are described in the present paper, all of which are found on Indian rats, namely *X. brasiliensis*, Baker, *X. cheopis*, Roths., and *X. astia*, Roths. These species occur in widely varying proportions, according to the part of the country in which the hosts are taken; sometimes two and even all three are to be found on a single rat. A short account of the technique of obtaining and preparing material is given.

Shircore (J. O.). **Suggestions for the Limitation and Destruction of** *Glossina morsitans*.—*Bull. Entom. Research, London*, v, pt. 1, April 1914, pp. 87-93, 1 map.

The author bases his suggestions on the existence of what he calls "primary fly centres" as opposed to the areas where the fly is only found at certain seasons; radiations of the flies occur from these centres to the surrounding neighbourhood in the wet season. When the dry season comes, the primary fly centres are the only regions where the fly can live, the drying up of the surrounding neighbourhood acting as a natural prophylactic measure. It is thought that the fly breeds mainly in these primary centres and the author suggests the isolation of the known centres early in the year by cutting off the forest connections through which radiations take place. The trees, etc., in the isolated centres should then be cut down and left to dry until the heat is at its greatest, when everything in the centre should be burnt; an extensive limitation of the flies would follow, since at that season the centres are the only regions in which the flies can live. In Nyasaland the radiations begin during the rains; in August and September (dry season) no flies are to be found except at the primary centres; certain centres have been located by the author near Domira Bay and are marked on the map accompanying the paper.

It follows that to apply this method of destruction of *G. morsitans*, a very exact knowledge of the country is required. Game plays a minor part in influencing the actual habitat of *G. morsitans*, being often present where there are no flies, or where flies are present in the wet season but absent in the dry.

The clearing of forests around villages has been found to have beneficial effects, and the author considers that such clearing together with the increase of agriculture, the splitting up of fly belts near villages and along main routes by forest destruction and burning, and the attacking of the fly "centres" will eventually lead the fly to live exclusively in a few regions which need not be traversed by man or domestic animals.

Austen (E. E.). **A Dipterous Parasite of** *Glossina morsitans*.—*Bull. Entom. Research, London*, v, pt. 1, April 1914, pp. 91-93, 1 fig.

A dipterous parasite, bred from a puparium of *Glossina morsitans*, was discovered by L. Lloyd at Ngoa, Northern Rhodesia. The fly proves to belong to the Bombyliidae, and has been named *Villa lloydi*, sp. nov.

BOUILOV (V.). **Нѣсколько словъ о пироплазмозѣ.** [A few words on piroplasmosis.] **« Ветеринарная Жизнь.»**—*Veterinary Life, Moscow*, no. 13, 9th April 1914, pp. 197-198.

The author refers to the statement he made at the Conference of Veterinary Surgeons in Tambov in 1908, that, according to the observations of foresters and woodcutters, the ticks which transmit piroplasmosis of horses live in early spring on *Euonymus verrucosus*. He has been trying to verify this observation, but only in May 1913 did he find two specimens of the tick on one bush. The bushes were growing along the high road, near a pine wood ; he found the ticks at 9 a.m. on a warm sunny day, after examining 25–30 bushes. He calls the attention of veterinary surgeons to this statement with a view to having it confirmed by others. He further says that, according to his observations during the last two years, piroplasmosis never begins before the opening of the buds of *Euonymus* and birch, which statement he would also be glad to have verified by others. He refers to the belief that the ticks usually attack horses early in the morning, or even at night, so that some surgeons recommend that horses should not be sent to pasture until after the dew has passed off, and he thinks that it is possible that during the day the pests may pass from the bushes to the ground or even into the soil. Some observations tend also to show that piroplasmosis occurs in localities where certain bushes and trees prevail, such as pine, birch, *Euonymus* and possibly some others. In 1912, no cases of the disease were recorded in the southern part of the government of Tambov, where occasional aspen and oak woods are scattered over the steppes, while 237 cases occurred in the northern parts of the government, where there are plenty of pine woods. Even within a single district where there is a difference in the flora of various parts the same phenomenon is noticed. He thinks it very desirable that further researches should be conducted in order to decide as to the influence of vegetation on the occurrence of the tick.

v. CELEBRINI (E.). **Ueber die Malariabekämpfung in österreichischen Küstenlande.** [Combating Malaria in Austrian Coast districts.]—*Verh. Gesell. Deuts. Naturf. Aerzte, Dresden*, lxxxv, no. 2, pt. 2. 1914, pp. 1117-1119.

The usual methods are advocated to avoid malaria in Austria, namely administration of quinine and the destruction of mosquito larvae by oiling standing water. Experience has shown that, up to the present, the former method is the more important in the districts in question.

DYAR (H. G.) & KNAB (F.). **New Mosquitos from Peru.**—*Insec. Inscit. Menstruus, Washington*, ii. no. 4, April 1914, pp. 58-62.

The two following new species of mosquitos are described from Peru, *Phalangomyia debilis*, gen. et sp. n, from Matucana, 7,300 feet, and *Aedes epinolus*, sp. n., from Ventanillas and Ancon.

Beloglazov (G. I.). **Эпизоотія пироплазмоза лошадей въ Тобольской губерніи.** [Epidemic of Piroplasmosis in Horses in the Govt. of Tobolsk.]—**« Архивъ Ветеринарныхъ Наукъ.»** [*Archives of Veterinary Science*], *St. Petersburg*, 1914, pt. 1, pp. 45.-56.

The author has made observations on piroplasmosis in the district of Tjukalinsk of the government of Tobolsk and describes some of the cases noticed by him. He is of opinion that the disease existed in this country before the emigration from European Russia started. It appears mostly in spring, and usually runs a severe course. He has found but few ticks on the diseased animals, probably because the owners remove them. Twenty to twenty-five years ago this part of the country was covered with woods, consisting of aspen, birch and a few pines ; now it is more or less a steppe covered with stunted bushes, and with numerous large and small salt-water lakes. Early in spring, when no new grass is yet available, the horses pasture on the hillocks covered with the dry grass of the previous year, which usually harbours ticks.

Belitzer (A. V.). **Пироплазмозъ лошадей въ Россіи.** [Piroplasmosis of Horses in Russia.]—**« Архивъ Ветеринарныхъ Наукъ.»** [*Archives of Veterinary Science*], *St. Petersburg*, 1914, pt. 1, pp. 73-78.

This is a report of a paper read by the author at the All-Russian Conference of Veterinary Surgeons in Charkov. Piroplasmosis of horses occurs in both North and South Russia, being carried by ticks, but it is still an open question whether the form of the disease transmitted by *Dermacentor reticulatus* is identical with that produced by *Hyalomma aegyptium*. In European Russia, piroplasmosis has been recorded in 37 governments and it is also found in Caucasia and in Asiatic Russia. A list of the governments in which it is known to exist and its intensity in each is given. More horses die from this disease than from anthrax or from all other epizootics together. *Dermacentor reticulatus* lives in the northern parts of Russia, the southern limit of its spread being the governments of Kursk, Voronezh and Saratov ; it is also found in the province of Ural, in the government of Tobolsk and in Primorsk (Maritime provinces). In the southern governments and in Turkestan the disease is spread by *Hyalomma aegyptium*. *D. reticulatus* winters in Central Russia in the mature stage, and early in spring attacks animals and men. In summer the tick passes through its intermediate stages on small mammals (rodents). At the end of summer and beginning of autumn, new sexual forms are developed and cases of piroplasmosis are again noticed ; although it is rather the exception for ticks to attack animals at this time, for the blood-sucking period, during which fecundation and oviposition take place, does not occur till the following spring. It has been proved in the government of Saratov that it is possible for ticks to be brought into warm stables in winter. The biology of *Hyalomma aegyptium* has not been studied in Russia.

Experiments, as well as observations, have shown that horses bred in the epizootic zone, which no doubt have passed through a slight form of the disease in their youth, are immune to piroplasmosis, and this is also the case with imported horses which have had the disease.

The author suggests that strong horses, which, if kept in a state of absolute rest, are able to withstand the disease, should be allowed to become infected in pastures; artificial inoculation with virulent blood is also recommended, especially in cases when infection in a natural way is unavoidable. All the horses which have had the disease should be grazed on the infected pastures, so as to maintain their immunity. Trypan blue is considered the best remedy for the disease.

EVANS (F. D.). **Thorough Drainage and the Prevention of Malaria.**—*Agric. Bull. Fed. Malay States, Kuala Lumpur*, ii, no. 8, March 1914, pp. 197-202.

The author deals with the anti-malarial drainage of hill land with subsoil pipe-drains, open earth-drains not being satisfactory under hill conditions. The importance of careful laying of the pipes and keeping them in order is emphasised. The experiments described were carried out by the Malaria Advisory Board, F.M.S., at Kuala Lumpur, and striking results have been obtained, though swamps are still existent. A table shows that the malarial death rate in 1913 was 4·2 per 1,000 against 9·9 in 1911, when the work was completed. Calculations from other figures for 1911 show that every Indian at the depôt was in hospital or given sick leave for malaria on an average, 7 times in the year, and these were picked healthy Sikhs and Pathans. The average monthly percentage of Indian recruits at the Police Depôt, Kuala Lumpur, detained in hospital or given sick leave for malaria was 57·0 in 1911, 27·3 in 1912, and 11·3 in 1913, despite a large increase in the population of the Depôt subsequent to 1911, when a considerable number of the men were unprotected by mosquito nets at night. An increase in the density of a population is invariably associated with a more rapid increase in the malaria sickness rate. Mention is made of draining experiments about to be made by the Government on Terentang Estate, Nigri Sembilan, of which the results will be published periodically.

The original cost of draining average hill land thoroughly should not exceed $36 per acre of gross area drained. The cost of maintenance for the first year is 10 per cent. of the original cost and 5 per cent. in subsequent years. These are maximum normal figures, but undesirable saving on constructional expenditure will certainly increase maintenance figures. The resulting greater efficiency of the labour force is emphasised.

BRITTON (W. E.). **The Browntail Moth.**—*Connecticut Agric. Expt. Sta., New Haven., Bull.* 182, March 1914, 25 pp., 16 figs.

In the course of this paper, mention is made of the rash caused on the human skin by the hairs of this caterpillar. The long hairs seem to be harmless and the trouble is due to the poisonous properties of the short barbed hairs on the red dorsal tubercles and various other parts of the caterpillar and the posterior extremity in the adult. Dr. E. E. Tyzzer, of the Harvard Medical School (2nd Annual Report of the Superintendent for Suppressing Gypsy and Brown Tail Moths, p. 154, 1907), reports that he found a definite poisonous principle which caused certain changes in the blood. The hairs are woven with the cocoon and enter into the formation of the egg mass, so that either may produce the rash. The remedy for this rash recommended by Kirkland consists of: Carbolic acid, $\frac{1}{2}$ drachm; zinc oxide, $\frac{1}{2}$ oz.; lime water, 8 oz.; it should be well shaken and rubbed thoroughly upon the affected parts.

BRUNETTI (E.). **Some Noxious Diptera from Galilee.**—*Jl. Proc. Asiatic Soc. Bengal, Calcutta*, ix, no. 1, June 1913, pp. 43-45.

The following species comprise the noxious Diptera, exclusive of the CULICIDAE, taken by N. Annandale in Galilee:—MUSCIDAE: *Musca domestica*, *Philaematomyia insignis*, *Stomoxys calcitrans*, *Lyperosia minuta*; HIPPOBOSCIDAE: *Hippobosca equina*. The most troublesome flies at Tiberias and Nazareth in October are sand-flies (*Phlebotomus*); they occur in large numbers, appearing at sunset. They were found to breed in half-dried algae just above the water-level on the sides of open cisterns. The two species found were *P. papatasii* and *minutus*. At Tiberias, the flies occur apparently throughout the year, but at Damascus they are only troublesome in the summer, disappearing by the end of October. A blood-sucking Chironomid was also common at Tiberias in October.

EDWARDS (F. W.). **Tipulidae and Culicidae from the Lake of Tiberias and Damascus.**—*Jl. Proc. Asiatic Soc. Bengal, Calcutta*, ix, no. 1, 1913, pp. 47-51.

The following is a list of mosquitoes taken by N. Annandale at Tiberias and Damascus: two species are new: *Anopheles palestinensis*, *A. culicifacies*, *Stegomyia fasciata*, *Culex modestus*, *C. pipiens*, *C. laticinctus*, sp. n., and *Uranotaenia unguiculata*, sp. n.

SCHMIDT (R.). **Die Salzwasserfauna Westfalens.** [Salt water fauna of Westphalia.]—*Jahresber. Westfäl. Prov.-Ver. Wissens. Kunst, Münster*, xli, 1913, pp. 29-95.

The following species of blood-sucking Diptera are mentioned in a descriptive list of the fauna of the salt springs of Westphalia: *Culex dorsalis*, *C. pipiens*, and *Simulium maculatum*.

Destrucción de las moscas. [Fly destruction.]—*Gaceta Rural, Buenos Aires*, vii, no. 77, Dec. 1913, pp. 466-467.

The following formulae are said to give effective results: (1) A 12 per cent. decoction of quassia chips is made by boiling for 5 to 10 minutes, and this is filtered through a cloth. Then a good quantity of sugar or molasses is added and the mixture is spread on pieces of blotting paper which are placed in the most infested places. The paper should be kept damp by wetting it from time to time. (2) A fly-catching paper may be made of Emétrico [?emetico=tartar emetic] 1 part, honey 40 parts, and water 200 parts: blotting paper is soaked in this and placed in a plate, care being taken to keep the paper damp. (3) Solutions made up of: Potassium bichromate 5 parts, sugar 15, tincture of pepper 10, and water 60, all by weight, may be employed in the same way. (4) To a strong decoction of quassia, a warm mixture of turpentine 300 parts, poppy oil 150 parts, honey 60 parts, is added, and the preparation is spread in a thick layer on strong paper. (5) A "tanglefoot" mixture is made by warming together Venice turpentine 1 part and American turpentine 4 parts and adding castor oil 2 parts; the mixture is spread on parchment paper. (6) Ten parts of resin and five of sesame oil are melted together. (7) Pine resin 25 parts, boiled linseed oil 18, yellow wax 2, castor oil 5, all by weight. (8) Laurel oil is used to keep flies away from horses; it does not damage the skin and gives lustre to the coat. Asafoetida (vinegar solution), walnut leaf decoction, and cresylic acid also act as deterrents. A castor-oil plant kept in a flower pot will effect the same result, the lower portion of the leaves exuding a viscous substance, poisonous to flies.

Hadlington (J.). **Mites and lice in Fowls.**—*Agric. Gaz. N.S.W., Sydney*, xxv, pt. 2, Feb. 1914, p. 105.

The author states that the red mites and lice which infect poultry can only exist on these or allied birds, and there is no fear of their transferring themselves from a fowl-house to any other building; a fowl-house would remain infested possibly from 2 to 4 months after the removal of the birds, but after this the insects would die out.

Zetek (J.). **Dispersal of *Musca domestica*, L.**—*Ann. Entom. Soc. America, Columbus*, vii, no. 1, Mar. 1914, pp. 70-72, 2 figs.

It was shown by experiment that flies breeding in a mass of manure about half a mile away from certain dwellings and 150 feet above them, found their way into the houses. A small quantity of the manure was placed in a pit and covered with a cage, the flies which hatched from it being sprayed with an aqueous solution of gentian violet to which a small amount of gum tragacanth was added. A large number of flies were caught on fly-papers in the dwellings, the marked ones being detected when treated with a solution of alcohol and glycerine. A noticeable diminution in the number of flies infesting the dwellings was observed when the manure was destroyed.

Bezzi (M.). **Studies in Philippine Diptera, I.**—*Philippine Jl. Science, Manila*, viii, Sec. D, no. 4, August 1913, pp. 305-332.

This paper is a catalogue of the Diptera hitherto recorded from the Philippine Islands, with descriptions of new species. In the list of mosquitos 18 species of *Anopheles* and 12 of *Stegomyia* are enumerated, and some 70 other species. The Tabanidae include 4 *Chrysops*, 1 *Haematopota*, and 4 *Tabanus*.

Mohler (J. R.) **Texas or Tick Fever.**—*Farmers' Bull., U.S. Dept. Agric., Washington, D.C.*, no. 569, 21st March, 1914, 24 pp., 4 figs., 1 map.

The author gives a brief account of the history of Texas fever and of the experiments conducted for the Bureau of Animal Industry, since 1889, by Smith, Kilbourne and Salmon. A list of synonyms of the disease is given, the best name for which he considers to be tick fever. The causative organism of the disease is *Piroplasma bigeminum*, which is transmitted by a tick, *Boophilus* (*Margaropus*) *annulatus*. The death rate varies from 10 per cent. in chronic cases up to 90 per cent. in acute cases. Recent experiments with this disease have been principally directed to obtaining a satisfactory chemical solution for use in cattle dips, and of developing some method that may easily be carried out for freeing fields and farms from the cattle tick. A map is given showing the boundary line of the infected area at the beginning of the tick eradication operations in 1906, and the extent to which the area has since decreased. Above the latitude where the cattle tick is destroyed by the cold of winter, the disease can be controlled by keeping southern tick-infested cattle from passing through the country during certain seasons.

After leaving the host, the female tick may lie quietly on the ground for several days before depositing its eggs. Oviposition may be spread over a period of 4–8 days in summer and 2 weeks or even longer in the autumn. A mature female will lay 1,500–3,000 eggs, and the immature females also lay eggs, but in smaller numbers. The female soon dies and the eggs hatch in from 13 days to 6 weeks, depending on the temperature. The eggs are very tenacious of life and under favourable conditions may remain dormant for several months—from late autumn to early spring. In warm weather and even during an open winter, the larvae, or seed ticks, can live for several months independently of their hosts. When they find the cattle, they fasten themselves to the soft skin inside the thighs and flanks, etc., and are capable of inducing the fever at this stage, although so small as to be scarcely visible to the naked eye. After being on the animal for about a week the first moult occurs and the nymph stage is reached, the parasite having added one pair of legs posteriorly; during this stage the sexual organs develop, and at the second moult they are complete. Male and female at this stage are of the same size. Copulation takes place about two weeks after the 6-legged seed tick reaches its host, or shortly after the second moult, after which the female slowly enlarges for 6–20 days in summer and then rapidly increases in size in the course of a day or two before dropping from the animal. In autumn and winter, development occurs more slowly, the tick not falling off for six weeks or more. After reaching the ground the female soon begins to deposit eggs, thus completing the life-cycle, which requires from 6–10 weeks in warm weather, and a much longer period during the cold season. The females transmit the infection through their eggs to their progeny and the latter are capable of infecting any susceptible animal to which they attach themselves; the disease therefore is not conveyed by the same ticks which take up the infected blood, but only by their offspring.

A descriptive list of 8 species of ticks found in the United States is given, of which the first six are by far the most common, while only the first-mentioned carries the fever in question. *Boophilus* (*Margaropus*) *annulatus* (Texas-fever or cattle tick), readily distinguished from the other seven ticks by the small size and reddish brown colour of the head and shield; found principally on cattle, less frequently on horses, mules and asses, and in one case found on a deer. *Ixodes ricinus* (castor-bean tick) has been collected from man, sheep, cattle, goats, horses, deer, dogs, cats, foxes, rabbits, birds, and a few other animals; it was one of the first ticks studied and has a wide distribution in the United States. *Dermacentor reticulatus* (net tick), found on man, cattle, horses, sheep and deer, is most common in the west, especially in California, Texas, and New Mexico. *Dermacentor electus* (American dog tick or wood tick), found on man, cattle, dogs, horses, rabbits and panthers, and has been collected in woods and on un-

Published in Aug. No.

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In certain cases in the south, animals have suffered from the disease, but no ticks have been found on them ; the author explains this on the hypothesis that the animal's blood was already infected with the microparasites and under normal conditions was immune from Texas fever, but as a result of a lowered vitality caused by some other disease or by privation, injury, rough handling, etc., this immunity has become reduced and finally overcome. The experiments of the Bureau of Animal Industry show that the blood of an immune animal may contain this microparasite for at least 13 years after removal of all sources of infection, so that such a recurrence may be termed a relapse.

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Other injurious effects may be produced by cattle ticks, apart from the fever. As a result of continuous loss of blood young animals may never develop fully, remaining thin, weak and stunted, and easily succumbing to other diseases owing to their lowered vitality. In milch cows the debilitating influence of the numerous ticks is shown in a greatly reduced milk supply, the loss averaging about one quart a day. In some cases the large number of bites over a limited area of skin may be followed by infection with pus-producing organisms, giving rise to abcesses. The discharge from such sores, or in some cases the mere oozing of blood serum through the incision made by the mouth-part of the ticks, keeps the hair moist and matted together, and such places are liable to become fly-blown, sometimes with serious consequences.

In dealing with the economic aspect of the tick problem, the author points out that the animals coming from infected districts and sold in the southern pens of northern stockyards realize $\frac{1}{4}$ to $\frac{1}{2}$ a cent per lb. less than the quoted market price, thus reducing the price per head by about $1.50. Hides that have been infected with ticks are graded as No. 4 quality, while if free, they would have been graded as No. 2 ; the difference in price is 3 cents per lb., so that with an average weight of 42 lb., the loss is $1.26 per hide. It has been snewn that the cost of tick eradication is 50 cents a head.

About 10 per cent. of all northern cattle taken south die of Texas fever, even after they are immunised by blood inoculations, and about 60 per cent. of these cattle succumb to this fever when not so treated. A further disadvantage to the souther farmer is that his animals are barred from most of the exhibitions in the north, and the northern farmers do not exhibit at southern stock shows. In fact, the losses in these and other directions are so great that they could be borne by no other cattle-raising section of the country except the south, whose excellent pastures, rich soil and healthy climate enable it to overcome such obstacles in meeting the competition of the west. These losses can all be entirely effaced at a small proportional cost.

Under natural conditions the disease appears in 13–90 days after exposure. After the seed ticks become attached to the animal, the disease will manifest itself in about 10 days in summer. Artificial inoculation of a cow with virulent blood under the skin or into a vein, produces the fever in from 3 to 10 days. The author gives full clinical details of the disease in its acute and chronic types and relapses, and also postmortem conditions. The mortality varies considerably; in adult susceptible animals it ranges from 90 per cent. in summer to 50 per cent. in winter. In animals under 9 months the course of the disease is usually short and rarely fatal, while among one-year-olds, during hot seasons, it is 25 per cent., and in cold seasons 10 per cent. Between $1\frac{1}{2}$–2 years the mortality is about double that at 1 year.

It has been proved by experiments made at the Bureau of Animal Industry that the disease can be carried by three known methods only:—(1) By the bite of the fever tick; (2) by inoculating the blood of sick animals; (3) by inoculating the infected blood of apparently healthy southern cattle into non-immune cattle. The digestive tract was shown to be proof against infection. After numerous experiments on various species of animals with highly virulent blood Texas fever has been produced in bovines only. Horses, asses, sheep, pigs, dogs, cats, mice, rats, guinea-pigs, rabbits, chickens and pigeons are among those which gave negative results. All bovine animals that have never been exposed to the disease are susceptible, although sucking calves are markedly resistant; under 8 months they contract the affection in a mild form and as a result become immune.

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NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

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VOL. II. Ser. B. Part 7.—pp. 103-118. JULY, 1914.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY.

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Newstead (R.). **First Preliminary Report on the Bionomics of** *Glossina morsitans.—Repts. Sleeping Sickness Comm. R. Soc., London*, xv, 1914, pp. 142-157, 3 plates.

This is a report of the expedition made by the author and Dr. J. B. Davey in Nyasaland in 1911, for the purpose of investigating certain facts in connexion with the bionomics of *Glossina morsitans*, and of devising, if possible, some means for its control, so that the authorities might be in a better position to check the spread of sleeping sickness in the Protectorate.

The country between Liwonde and Lake Malombe was traversed, as in that part the fly-area had been found to be more or less continuous; both banks of the river Shire were studied and the camp finally pitched near its banks about four miles south of Lake Malombe; this camp was occupied from July 18th to Nov. 2nd. A description of the physical features, climate, vegetation and vertebrate fauna of the district is given. Regarding the big game, it is stated that impala antelopes (*Aepyceros melampus*) are so abundant and so constantly present in this district that they probably supply a large proportion of the blood necessary for the life and propagation of the tsetse. Large troops of baboons (*Papio babuin*) were also seen. The flies apparently did not attack birds.

The fly seems to be confined to the low forest country and does not usually leave it, unless to accompany man or animals whose blood it can suck. Flies were liberated in more open spaces, where conditions were on the whole favourable to their existence; these flies were marked and it was hoped to ascertain whether they would remain, or fly back to their original habitat. The number of flies experimented with was too few to give satisfactory results; one fly, however, appears to have traversed the more open country for a mile and to have returned to the place where it was originally captured.

Counts were made to ascertain the proportions of the sexes at different times. In dry weather the proportion of males was considerably greater than that of females; in wet weather their predominance was less marked.

Pupae of *G. morsitans* were found in four different parts of the forest, all occurring in the so-called "sanya" country. The first pupa was found at the foot of a sanya or mopani tree (*Copaifera mopane*), about three-quarters of an inch below the surface of the soil. The second was lying at the foot of a tree buried about four inches deep in the earth of a termites' nest. These two pupae were empty. The third, which was living, was found just below the surface in a small quantity of earth in a cavity at the base of an ebony tree. The fourth, which was also living, was found in loose earth among the projecting roots of a baobab tree.

Breeding experiments showed that apparently the breeding season is continuous throughout the year; but it is likely that it is more extensive at the commencement of the rains and also at the end of the wet season than during the dry months. In two cases, the pupal period lasted for 26 days, and in one 24 days. The flies experimented with were fed on the blood of native fowls; the number of meals taken by the different females varied to a marked degree; the average duration of time between each meal was 2·56 days.

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Glossina morsitans is as active in the afternoon as in the morning, the period of chief activity being between the hours of 10 a.m. and 4 p.m.; on dull afternoons, especially if the temperature dropped, there was a marked diminution of the flies.

Experiments were made to test the colour preferences of the fly: the results were that khaki headed the list for attractiveness, followed in a diminishing sequence by red, blue, bare back of a native, and white; no flies were attracted by yellow; buff green canvas was found to be quite as attractive as khaki.

Regarding the natural enemies of *G. morsitans*, it was found that birds are not active agents of control, but as they are everywhere very prevalent, they must be at least considered of some potential importance. Those which were found to feed on *G. morsitans* were the common black drongo, *Dicrurus afer*, and the small bee-eater, *Melittophagus meridionalis*. The other birds which are thought most likely to prey upon tsetses are the helmet-shrikes (*Prionops* and *Sigmodus*), the grey babbler (*Crateropus*) and the roller (*Coracias caudatus*). No hymenopterous insects, such as *Bembex* or any other Sphegid, were seen to attack tsetses. The remains of one fly were found in a spider's nest: the spider was not identified as it was too much damaged in transit.

The bird-lime made by the natives of Nyasaland for trapping the flies was experimented with, but was found of little use. Results of experiments made with some tsetsefuges were unsatisfactory.

RICARDO (G.). **Species of *Tabanus* from Polynesia in the British Museum and in the late Mr. Verrall's Collection.**—*Ann. and Mag. Nat. Hist. London*, xiii, no. 17, May 1914, pp. 476–479.

Four species of *Tabanus* are described from Polynesia, two of which are new:—*T. lifuensis*, Bigot, from the island of Lifu, *T. caledonicus*, Ricardo, from the same locality, *T. rubricallosus*, sp. n., from New Caledonia, and *T. fijianus*, sp. n., from Fiji. The last-named is described as annoying horses and cattle in forest and open country, and was caught while feeding on the hand of the captor.

VALLADARES (J. F.). **Equine Biliary Fever in Madras.**—*Parasitology, Cambridge*, vii, no. 1, May 1914, pp. 88–94.

Concerning the mode of propagation of this disease in Madras, ticks came to be regarded with suspicion, and the author noticed that in all the cases he dealt with, the horses were infested with these acarids at one time or another. This suspicion is accentuated by the fact that in an outbreak of equine biliary fever in Southern Russia ticks, recognised as *Hyalomma aegyptium*, were found on the horses, although it has not yet been proved that this tick is the transmitting agent. Joliffe observed the absence of ticks in outbreaks of biliary fever amongst cavalry horses in India, and suggests that the parasite is disseminated by some winged insect, while Lingard assumed that mosquitos were the carriers. In Russia, Marzinovsky and Belitzer found the tick *Dermacentor reticulatus* on infected horses, and stated that locally bred horses are almost immune to the disease, whereas imported horses are very susceptible. Theiler demonstrated equine biliary fever to be a tick-borne disease in South Africa, the carrier being *Rhipicephalus evertsi*. As neither of these ticks is known in India, the intermediate host still remains to be discovered there. Belitzer has recommended that all young equine stock should be exposed to tick infection, whereby they would acquire a natural immunity.

NUTTALL (G. H. F.). **Tick Paralysis in Man and Animals.**—*Parasitology, Cambridge*, vii, no. 1, May 1914, pp. 95–104.

Since the appearance of the last papers by himself and Hadwen on tick paralysis [see this *Review*, Ser. B. i, p. 204], the author has obtained more evidence on the subject, from a paper by Borthwick, on its occurrence in sheep, and from another by Dr. Temple of Pendleton, Oregon, dealing with its occurrence in man. The present paper contains abstracts from these two contributions, giving the clinical details and points of interest regarding transmission in the various cases described, and discussing the bearing of these data upon the present state of our knowledge. Regarding the disease in sheep, the papers by Mally (1904) and Borthwick attribute a disease called "tick paralysis" in sheep in Cape Colony, to the animals being attacked by *Ixodes pilosus*, Koch. Both authors state that farmers in Cape Colony have no doubt as to the bearing of the tick upon infection; the use of Cooper's dip has served to check the disease in flocks attacked by paralysis, and to prevent the affection in animals exposed in localities where it prevails. The disease has a seasonal incidence, is acute in it sonset, and recovery occurs rapidly in most cases. Fever is absent and the disease is not communicable by blood inoculation. Recovery is hastened by the removal of ticks. In animals that have died from the disease, no noticeable pathological lesions are observable. The author says that in the absence of further data, these observations cannot be regarded as more than suggestive, but that the paper by Hadwen has thrown much light on the subject, as he not only observed a practically identical disease in sheep in British Columbia, but has also reproduced it experimentally by means of ticks (*Dermacentor venustus*, Banks).

That a similar affection appears to occur in other animals in British Columbia has been indicated by Hadwen, and Hadwen and Nuttall reproduced the disease in a dog in Cambridge, the ticks (*D. venustus*) having been collected from a human subject near Nelson, British Columbia. Todd cites cases of tick paralysis occurring in five children and one adult in British Columbia, assuming that the tick was *D. venustus*. Eaton cites a case in a child in Australia, the tick being undetermined. Since tick paralysis has been reproduced experimentally there is no doubt as to the existence of the disease. The symptoms described in the human subject agree with those observed in experimental cases in the sheep and dog, and with the symptoms noted in cases occurring in sheep in the field. The author refers to the general weakness of the data as to the exact species of tick concerned in the causation of the human cases. Todd and Temple merely refer to "ticks"; Temple sent three ticks for determination and they proved to be *Dermacentor albipictus*, *D. venustus*, and *Ornithodorus megnini* respectively; the last-mentioned species has probably nothing to do with the case, and it is not stated how the other two were collected. It is probable that *D. venustus* is found in Oregon where Temple's cases occurred. The author states from personal experience that it is by no means an uncommon thing to find ticks attached to the hair after a day in the bush in the Western United States, and that the cases reported by Todd and Temple where ticks were found attached to the head, might be due to coincidence. No particular species of tick appears to be concerned, since *D. venustus* in British Columbia, and *Ixodes pilosus* in South Africa both appear capable of inducing the same affection. That the disease is a definite affection, however, has been rendered certain by the experimental results obtained by Hadwen on sheep and by Hadwen and Nuttall on the dog, but as regards transmission, the only clear experimental evidence that exists is that implicating *Dermacentor venustus*.

STRICKLAND (C.). **Short Description of the Larva of *Lophoscelomyia asiatica*, Leicester 1905, and Notes on the Species.**—*Parasitology, Cambridge*, vii, no. 1, May 1914, pp. 12–16, 3 figs.

The author describes the larva of the bamboo-breeding *Anopheles* (*Myzorhynchus*) *asiaticus*, which he obtained from a cut bamboo at Ginting Simpah, F.M.S., at an altitude of 1,500 feet. One full-grown larva was observed to remain for about four weeks without pupating; the author placed it in a bottle and found that while kept in the light for another week it still remained in the same state: when, however, it was put in the shade it pupated immediately and two days later the imago had emerged. It seems that light has an inhibitory action on the pupation of this species, a suggestion that is in keeping with the fact that larvae in the cut bamboo always took refuge in the dark end. Light seems to have no inhibitory influence on the early growth of the larva; three very small larvae were kept in a bottle in the light and grew very well; they pupated after 35, 41 and 43 days respectively.

LUTZ (A.) and NEIVA (A.). **Contribuição para o estudo das Megarhininae.** [Contribution to the study of the Megarhininae.]—*Mem. Inst. Oswaldo Cruz, Rio de Janeiro*, vi, no. 1, 1914, pp. 50–57, 2 pl.

A very full account is given of the synonymy of *Megarhinus haemorrhoidalis*, F. The species is redescribed.

LUTZ (A.). **Notas dipterolojicas.** [Dipterological notes.]—*Mem. Inst. Oswaldo Cruz, Rio de Janeiro*, vi, no. 1, 1914, pp. 43–49.

The author has worked for some time past on the TABANIDAE of Brazil, particularly with regard to the earlier stages of these insects. Eggs which the author believed to be those of Tabanids were found on leaves at the edge of swiftly running water; the larvae were not obtained when the water was dredged, and it is probable that they develop underground in the soft, wet earth. The larvae reared from the eggs obtained are described; they are very active in their movements either in water or on dry land; they will not live long, however, in still water. Larvae of *Tabanus ochrophilus* and *Neotabanus triangulum* were found in the sand at the bottom of a channel where the water was only moving slowly, and these are described.

LIMA (A. da Costa). **Contribuição para o estudo da Biolojia dos Culicideos.** [Contributions to the study of the Biology of the Culicidae.]—*Mem. Inst. Oswaldo Cruz, Rio de Janeiro,* vi, no. 1, 1914, pp. 18–34, 1 pl., 2 figs.

Respiration in mosquito larvae is believed to be strictly aerial, and if this is the case, the larvae must constantly return to the surface of the water in order to inhale air. It would therefore follow that any Culicid larva will die if prevented from absorbing free air. The author has made some experiments on this subject, using larvae of species of *Limatus*, *Stegomyia* and *Culex*. The experiments were made to find out how long larvae would live when prevented from breathing air directly in different kinds of water, such as ordinary river water, rain water, boiled water, etc. The author finds that while generally breathing free air, mosquito larvae also take in the oxygen dissolved in water, through the branchial leaflets and also the general integument of the body. The younger the larva, the more easily it will get into the habit of living only on the air dissolved in the water; older larvae will die in less than a day if deprived of free air. Small larvae if provided with sufficient food will grow and become nymphs, but these die after a short time if still deprived of free air. The branchial leaflets are of no value in locomotion, which is as perfect in the larva deprived of them, as in those which have them. They are only used for respiration; larvae whose branchial leaflets show numerous tracheal ramifications remain normally longer under water than those with only small ones, and the former can live longer than the latter when they have no access to free air. Removal of the branchial leaflets causes the larvae to rise more frequently to the surface for air. *Stegomyia* larvae deprived of their leaflets and shut off from the external air remain alive for some time; any larva shut up in the experiment jar with boiled water, dies in a few hours. The water containing larvae dependent entirely on the dissolved gases must be frequently aerated. Larvae are asphyxiated under a petroleum film, not only because they cannot reach free air, but because the oil adheres to their bodies, preventing cutaneous respiration. Petroleum also has a poisonous effect on the larvae.

NEIVA (A.). **Contribuição para o estudo dos Reduvidas hematofagos.** [Contribution to the study of the blood-sucking Reduviidae.]—*Mem. Inst. Oswaldo Cruz, Rio de Janeiro,* vi, no. 1, 1914, pp. 35–39.

Two species of REDUVIIDAE have been recorded from Bahia, namely *Triatoma rubrofasciata* and *T. megista*. The author adds the following species to the list:—*T. sordida*, in the neighbourhood of running streams near Bahia, and widespread in S. America generally; *T. brasiliensis*, found in that part of Bahia bordering on Piauhy, living principally in the holes of mocós (*Cerodon rupestris*, Wied.); this species was identified in Paris as *T. infestans*, but the author believes this to be erroneous, as *T. infestans* is unknown in Bahia ; *T. geniculata*, distributed throughout the town, living in the holes of the armadillo (*Dasypus novemcinctus*) ; *T. maculata*, rarely on the banks of the S. Francisco river ; and a new species, *T. tenuis*, taken from a dwelling in Bahia. Of these seven species, three harbour trypanosomes ; *T. rubrofasciata* harbours *Trypanosoma boylei*, which according to Lafont is pathogenic to mice ; and *T. megista* and *T. sordida* are carriers of the so-called "Chagas" disease.

T. rubrofasciata has been associated by various writers with the transmission of kala-azar ; in Réunion and Mauritius specimens were found harbouring *Trypanosoma boylei*. Specimens taken in Bahia showed no trypanosomes, but when examples were fed, as larvae, on the blood of guineapigs which were infected with *T. cruzi*, while no trypanosomes were observable in the excrements of the larvae, after metamorphosis large numbers were found in the adults. Further experiments showed that *T. megista*, *sordida*, *geniculata*, *infestans*, *rubrofasciata* and the related *Rhodnius prolixus* are very suitable intermediate hosts for flagellates.

The following Reduviidae occur in dwelling-houses in Brazil : *T. megista*, from Guyana to S. Catharina ; *T. rubrofasciata*, from Para to Santos ; *T. brasiliensis* at Piauhy, Ceará, Rio Grande do Norte, Pernambuco and Bahia ; *T. rubrovaria* at Rio Grande do Sul ; *T. tenuis*, sp. n., at Bahia ; *T. vitticeps* at Espirito Santo and Rio de Janeiro ; and *Rhodnius prolixus* at Ceará.

Ermolov (A. S.). **Докладная записка г. Предсѣдателю Высочайше утвержденнаго Совѣщанія по благоустройству Черноморскаго побережья.** [Report by the Committee for the study of malaria in Russia of the Society of Russian Surgeons in the memory of N. I. Pirogov, on Investigations on Malaria in Caucasia in 1913,] *Moscow*, January 1914, 40 pp.

The report starts with a short review of the spread of malaria in Caucasia, where it has long been known and has frequently caused the death of whole settlements, and refers to the work of previous expeditions in Caucasia, organised by the Malaria Committee of the Pirogov Society of Surgeons in 1903, 1904, 1905, 1911, and 1912. The expedition of 1913, which had for its object the investigation of malaria over the whole Black Sea coast of Caucasia from Sotchi to Turkey, along the projected railway line there, is here dealt with.

According to the reports of all expeditions, there is hardly any spot along the coast where mosquitos and malaria are absent, except Krasnaia Polinia, although no definite connection between the numbers of mosquitos and the intensity of the disease could be established. The most common species of *Anopheles* in North and South Russia and along the coast is *Anopheles claviger*, except at Sotchi, where *A. bifurcatus* was found almost exclusively in the summer of 1913. In other parts of the country, the latter species is found less frequently and very seldom in Batoum. *A. superpictus* and *A. pseudopictus* were not found to the North of Batoum, though in some parts of this town they represent twenty per cent. of all the mosquitos there. *A. sacharovii* was found to the south of Batoum. The presence of

Stegomyia fasciata, the carrier of yellow fever, in Batoum and Poti, is of special importance. [*V. infra.*]

The Report contains suggestions as to the organisation of the antimalarial campaign in Caucasia and for regulations to be observed by the workpeople on the railways under construction.

Marzinovsky (E. I.). **Желтая лихорадка и комары** *Stegomyia fasciata*. [Yellow fever and the mosquito, *Stegomyia fasciata.*] N.D. (? 1914), 5 pp., 1 pl.

The author reports that *Stegomyia fasciata* has been found in Russia, on the Black Sea coast of Caucasia; he has found large numbers of these mosquitos in Batoum during the investigations conducted there by the Malaria Committee of the Pirogov Society of Surgeons and the same species has been also found in Poti by Dr. Ljachovetzky. He gives a description of the insect and information as to its biology. *Stegomyia fasciata* is found at Batoum in large numbers in houses, where they attack man mostly in the daytime, but also at night, strangers suffering more than natives; in the house in which the author lived, he was the only person attacked by the pests. The fact that, according to Clarac and Simond, *Stegomyia fasciata* is found only between 40° of north latitude and 40° of south latitude, while Batoum lies on 41·40° and Poti 42·20°, leads the author to conclude that these mosquitos have been imported by foreign steamers into these towns, where they have found favourable conditions for breeding. This view receives confirmation from the presence of these mosquitos only in Batoum and Poti, the only two ports on the coast which are visited by steamers from South America, Egypt and similar countries. Owing to the severe winter in these localities, it is assumed that the mosquitos winter in their larval stage. Investigation on the spot has shewn that in 1884 there was a severe epidemic of malaria in Poti, with a high death rate. The author states that the medical records are very incomplete, but he has reason to suspect that some of the cases in 1884 were not malaria, but yellow fever. Owing to the cold weather in this town the disease could not become endemic there, but the presence of these insects constitutes a serious danger to Russia, especially as the trade of those ports with hot countries increases yearly.

Farrant (Capt. A. L.). **Notes on "Mal de Caderas."**—*Jl. Bd. Agric. Brit. Guiana, Georgetown*, vii, no. 3, Jan. 1914, pp. 142-147.

Mal de caderas is an epizootic disease affecting horses, mules, and asses in South America, and is also known as:—peste de caderas (Brazil); mal de caderas, tumby-baba or tumby-a (Paraguay, Argentine). Discovered by Dr. Elmassian in 1901, the causative parasite was named *Trypanosoma equinum* by Vosges of Buenos Aires. According to Laurda the disease was imported into the island of Marajo (Brazil), whence it spread as far as the State of Matto Grosso (Brazil). Since 1860, its ravages there have been such as to cause all horses and mules to disappear and to be replaced by cattle, even for riding purposes. At the present time, the disease has greatly extended its range and it occurs in Brazil, Bolivia, Paraguay, the Argentine territories of the Chaco, Formosa and Misiones, and in the Argentine provinces of Corrientes, Santiago del Estero, and Catamarca. The disease is most prevalent in marshy districts and during the rains. Mules and donkeys, especially the latter, are more resistant than horses, and the disease can be conveyed to many other animals by inoculation. The first symptom of the disease in horses and mules is a watery discharge from the corner of the eyes, followed by ecchymosis of the mucous membranes, chiefly those of the *membrana nictitans*, which becomes of a claret colour. To observe these changes the lids of the eye must be everted. Other symptoms are :—Irregular fever, which only lasts for short periods during which trypansomes can usually be found if smears of blood are taken ; haematuria, though no organisms are present in the urine, with swelling of the penis ; eruptions and loss of hair on the neck and shoulders, followed by paralysis of the hind quarters in the later stages. The disease is nearly always fatal to horses, and lasts from 2 to 5 months in the horse and 6 to 12 in mules and asses. Mal de caderas can be very easily inoculated and traces of the virus placed on the surface of a wound (as in transmission by the house-fly) are sufficient to cause infection. Copulation does not give rise to infection. Nearly all observers consider that the disease is conveyed by biting flies, but this is not altogether in agreement with the recorded facts. The author believes *Stomoxys calcitrans* to be the chief cause of the spread of the present epidemic in Guiana. The only fact upon which all observers are agreed is that the capybara (*Hydrochoerus capybara*) or Caprincho, abounding in Paraguay and the Argentine portion of the Chaco, is the source from which the flies or other carriers obtain the virus. When the farmers of Paraguay find dead capybara on their farms, they know that mal de caderas will soon break out among the horses. To prevent infection, all animals should be dressed with the following solution : Kerosene 1 gal., water 2 gals., soap (soft or hard) 1 lb. Dissolve the soap in the water and add the kerosene with continual stirring whilst the water is boiling ; when cool, brush into the coat of the animal with a body or dandy brush. A great variety of drugs, including salvarsan, have been tried, but none have produced more than temporary improvement. Before affected animals have come very low in condition, the author has obtained good results by the administration, morning and night, of a mixture of potassium iodide and mercury biniodide. The animals must not be worked when under treatment.

In the same issue of the journal, pp. 132–138, there appear a number of notes on mal de caderas, extracted from the Experiment Station Record of the United States Department of Agriculture for the years 1902–1913. These notes cover all the published experimental work on this disease during the period in question.

Macfarlane (H.). **Report on work (other than routine work) done in the Bacteriological Institute during the six months, 1st July to 31st December, 1913.**—*Bacteriological Institute, Hongkong*, 28th Jan. 1914.

Up to date, 4,171 different samples of larvae have been collected, and from these samples 12,763 mosquitos have been bred and pinned. After a provisional classification, 5,736 of these specimens have been forwarded to the Director of the Imperial Bureau of Entomology and the remaining 7,027 specimens are being prepared for despatch as quickly as possible. Up to the present two distinct broods of *Stegomyia fasciata* have been found widely separated from each other in the city of Victoria. All the others are apparently *Stegomyia scutellaris*, except for a single *S. w-alba*, Theo.

Contre la Malaria. [The Malaria Campaign.]—*Bull. Assoc. Planteurs de Caoutchouc, Antwerp*, vi, no. 2, Mar. 1914, p. 30.

According to Dr. Watson, Sumatra, owing to the scarcity of *Anopheles maculatus* there, is markedly free from malaria as compared with the Federated Malay States.

Vaillard (Dr.). **Pour lutter contre les Mouches.** [To combat flies.] —*La Vie Agric. et Rur., Paris*, iii, no. 14, 7th March 1914, pp. 373-378, 3 figs.

The author records the following species of flies as associated with the transmission of disease: the common house-fly, *Musca domestica*, the small house-fly, *Homalomyia canicularis*, the blue-bottle fly, *Calliphora vomitoria*, a green and gold fly, *Lucilia caesar*, and the stable flies, *Stomoxys calcitrans* and *Muscina stabulans*; the two latter being rare in dwelling houses. In view of their disease-bearing potentialities, flies should be prevented access to dwelling houses wherever possible. Various methods are given for destroying flies once they have entered the house, such as traps containing soap solution, sticky papers, pyrethrum powder either as a fumigant, slowly burned, or as a powder, or formol mixed with milk. Bouet and Roubaud recommend fumigating with "cresyl," the fumes of which act instantaneously on flies and mosquitos, but are not harmful to metal work, leather, etc., and beyond causing slight irritation to the eyes, are harmless to human beings. Manure and rubbish heaps, etc., in which the flies breed, should be as far away as possible and treated with larvicides such as chloride of lime, a 20 per cent. solution of slaked lime, petrol and sulphate of iron, a solution of borax and arsenate of soda, or crude oil mixed with water.

No very efficient natural enemies are known. They are preyed on by species of *Bembex*, and the fungus *Empusa muscae* is very pathogenic to them, but has not yet been successfully cultivated artificially.

Saceghem (René Van). **Les Tiques. Les maladies qu'elles transmettent; les moyens de les detruire.** [Ticks: The maladies which they transmit and methods for their destruction.]—*Bull. Agric. du Congo Belge, Brussels*, v, pt. 1, March 1914, pp. 73-87.

This paper is a general review of tick-transmitted diseases and means of prevention and is largely historical. The author gives the following list of ticks and their hosts known in South Africa.

Margaropus annulatus, var. *decoloratus*: horses, cattle, sheep, goats, dogs and antelopes. *Rhipicephalus appendiculatus*: hares and lions in addition to the foregoing. *Rhipicephalus evertsi*: attacking horses, cattle, sheep, goats, antelopes and hares. *Rhipicephalus simus*: horses, cattle, sheep, goats, dogs, jackals, wild dogs and hedgehogs. *Amblyomma hebraeum*: horses, cattle, sheep, goats, dogs, wild dogs, antelopes and ostriches.

The ticks are especially common at the beginning of summer, when the heat and moisture required for their development are present. The greater the altitude and the more bare the soil, the fewer ticks there will be, but *M. annulatus*, the commonest tick of South Africa, had been found at all altitudes; *Rhipicephalus evertsi* is much less common and *R. appendiculatus* is rarely met with on elevated plateaux, but it is specially found in valleys where the vegetation is abundant. *Rhipicephalus simus* and *Amblyomma hebraeum* are chiefly found on broad sandy plains covered by a scanty vegetation. It has been noticed that the number of ticks increases proportionally with the number of head of cattle, and apart from their capacity for transmitting disease, they are very harmful to cattle in consequence of the quantity of blood which they extract. It has been calculated that in one year, the ticks on one beast are capable of removing 48 litres of blood and some ticks are capable of drawing as much as 2 cubic centimetres. Theiler mentions the case of a horse which died of acute anaemia as the consequence of an extraordinary attack by *M. decoloratus*. The ticks collected from this animal weighed 20 kilos (44 lb.). The eggs were unharmed under 4 months' exposure to a temperature of 0° C., and the same temperature does not kill either larva, nymph or adult. Prolonged immersion in water apparently has little effect upon them.

The author divides the ticks into 3 classes, according to whether they require one, two, or three hosts to complete their life-cycle. He says that the important facts to be known in the life-history of the tick are the dates of oviposition and hatching; the time required to complete the life-cycle on the host; the time that larva and nymph remain upon the host, and the time required by them, after quitting their host, to complete their respective metamorphoses; the time required by the female to gorge and detach herself; and lastly, the time that the larval, nymphal, and adult forms can survive.

The author then proceeds to deal with the life-history of the following ticks.

Margaropus annulatus var. *decoloratus*. This tick requires one host and takes 3 weeks to pass from larva to adult; after 3 weeks the gorged females commence to quit their host and by the fourth week all have done so. Five days after this, the female oviposits—at all events in the hot season. In summer, the eggs hatch in from 3 to 6 weeks, taking longer in winter. Young larvae kept in the laboratory may live as long as six months. In the open they station themselves on a plant and wait for a host. They do not feed on the juices of plants and perish if, after six months, they fail to find a host.

Rhipicephalus evertsi requires 2 hosts. In summer the eggs hatch 30 days after oviposition. The young larvae can live 7 months without food. They become nymphs on their host and these are found close to the point to which the larva was attached. The nymph falls off in from 16 to 21 days, moulting to the adult stage requires 24 days and the adult gorges itself and falls to the ground in from 6 to 10 days and is capable of living for a whole year on the soil apart from a host.

Rhipicephalus appendiculatus, capensis, nitens. These ticks require 3 hosts, the adult females gorging themselves in 4 days. The eggs hatch in the warm season in about 28 days, or several months in winter. Sixteen to twenty days later the larva becomes a nymph. In the laboratory the larvae have been kept for 7 months and nymphs for 6 months. Both the young larvae and nymphs are sluggish and not capable of attaching themselves for some days. The nymph requires 3 to 6 days for engorgement and, leaving its host, becomes adult 18 days later and then gorges itself in 7 days. The adults have been kept alive in the laboratory for 14 months. *R. simus* also requires 3 hosts. The eggs hatch in summer 30 days after oviposition. The larva becomes a nymph in 20 days, and the nymph an adult in 25 days more. *Amblyomma hebraeum*, is also a 3 host species. In summer the female lays her eggs 2 weeks after quitting the host, or 3 months in winter, hatching taking place in about 10 weeks or 6 months respectively. The larvae have been known to live 7 months, and remain 7 days on their host when found. Twenty-five days later the first moult occurs, but if conditions are unfavourable this may be delayed for 4 months. The nymph gorges itself in from 4 to 20 days and may live 6 months without a host. The adult appears 25 days later in summer or as much as 160 days in winter, gorges itself in from 10 to 20 days, and may live several months.

The author then goes on to discuss the transmission of disease, which is intimately associated with the mode of life of the tick. Where the tick has only one host, the disease can only be transmitted to one host by the same individual, but if the tick have two or three hosts it is possible for the same tick to transmit the disease to different animals. It is only by accident, or as the result of experiment, that a tick will change its host in one of its stages. It appears however that male ticks can and do pass from one host to another.

The propagation of tick-borne diseases is greatly increased by the capacity of ticks for transmitting infection to their offspring. This is the case with piroplasmosis, anaplasmosis, and spirillosis transmitted in South Africa by *M. annulatus*, as well as *Babesia canis*, transmitted by *Haemaphysalis leachi*. The infection acquired from the parent does not reappear in some species except in the adult; thus *H. leachi*, though capable of hereditary infection, is not infective except in the adult stage. Some authors believe that in the case of this tick it is the only possible mode of infection, but Christophers is of opinion that the adult tick, if fed in its nymphal stage upon a dog suffering from piroplasmosis, can transmit the disease as an adult without regard to any hereditary infection.

Tick-borne diseases may be divided into two categories, those which, after recovery, leave the animals still infected and a source of contagion for the ticks, and those in which the cure is complete and the parasites are entirely eliminated from the blood. In the first category are the diseases due to :—*Piroplasma bovis, equi, ovis, canis, Anaplasma marginalis* and *centralis*, *Theileria mutans*, and spirillosis of cattle; in the second category, East Coast fever (*Theileria parva*) and heartwater.

This explains the fact that animals imported into a district in Africa where there is no known case of acute piroplasmosis have acquired the disease, the reason being that they are bitten by ticks which have been infected from animals which have recovered from the disease, but are still carrying the virus in their blood.

The author then proceeds to discuss the various methods of treating animals attacked by ticks as follows :—Removal of the ticks by hand; Lounsbury's method, which consists in smearing the skin with a mixture of oil and sulphur; Gordon's method of rubbing with petroleum. These three methods are all open to the same objection in that they are expensive and hardly capable of application to a large number of animals.

The burning of herbage is regarded by some as a certain remedy and there is no doubt that enormous numbers may be destroyed in this way, but the author thinks that the value of the remedy has been exaggerated. Bush fires at the end of the hot season will kill all the young larvae attached to the herbage, but numbers of females have fallen to the ground and their eggs, as well as the ticks which are attached to the cattle, escape and the eggs hatch more rapidly, as the cover having been destroyed, they are exposed directly to the sun's rays. Firing the herbage undoubtedly diminishes the number of ticks, but in order to obtain satisfactory results, it is necessary to carry out the operation as late as possible, and this question is the subject of much discussion in South Africa.

The most practical and most extensively employed method is dipping; the author gives the following formulae for dips. Three day dip: Arsenite of soda 4 lb., soft soap 3 lb., petroleum 1 gallon, water 400 gallons. Five day dip: Arsenite of soda 8 lb., soft soap 5½ lb., petroleum 2 gallons, water 400 gallons.

The author then discusses the action of arsenical dips upon ticks and says that the ticks are killed by the direct action of the arsenite. In the numerous experiments which have been made, it has been proved that, after the use of a dip with arsenite of soda as a base, the number of female ticks which gorge themselves diminishes considerably, the young females dying before reaching this stage. The already gorged females are killed, or if they survive and lay eggs, these are few in number and many do not hatch, the larvae resulting from the remainder being feeble and hardly able to escape from the egg. The author says that as *M. annulatus* var. *decoloratus* requires 3 or 4 weeks to complete its metamorphosis, one dipping every 3 weeks is sufficient, but seeing that the young larva may live for 6 months and the adult nearly a year before attaching themselves to a host, the dip must be kept up for at least this period.

In the case of *R. evertsi* dipping is necessary at least every 8 days and must be continued for at least a year. *R. appendiculatus*, the chief carrier of East Coast fever, requires 3 hosts and dipping every 3 days is required in order to catch the tick in all stages of its existence, and this must be continued for at least 14 months. For *A. hebraeum*, dipping every 4 days, for 7 months at least, is required. It is thus obvious that before deciding on the frequency of dipping, the tick to be destroyed must be determined. It has been shown that animals can stand dipping every 5 days, but as a matter of practice they are dipped every 8th day and the treatment completed by hand. If an epidemic of East Coast fever should break out, it is absolutely necessary to dip the cattle every 3 days.

In conclusion the author reviews an objection which has been raised against dipping, since if it be regularly practised, large numbers of non-immune animals will be produced and these if transferred to a tick infested district, may acquire the diseases in an exceedingly virulent form. The author thinks that this objection, which at first sight is very serious, may be easily refuted, because the movements of cattle will always be dangerous as the virulence of disease is not everywhere the same and it is possible that an animal may be immunised against the organism of one country and not that of another, and animals having a latent infection are more susceptible to adverse conditions. The destruction of ticks also makes the introduction of European cattle possible, whereas under existing conditions such introduction is difficult. If however such imported cattle could, on their arrival in Africa, be at once distributed to regions where there are no ticks and no trypanosomiasis, they could live and breed as in Europe.

The author quotes a case from the Transvaal in which 20 Hereford cattle were imported from England direct, 3 years ago, and have done exceedingly well; the only precaution taken being rigorous protection against ticks. He concludes with an earnest appeal to all cattle-raisers to support universal dipping.

SWELLENGREBEL (N. H.) & OTTEN (L.). **Ueber "mitigierte" Pestinfektion bei Ratten und Meerschweinchen.** [On "mitigated" plague infection in rats and guinea-pigs.]—*Archiv für Schiffs- und Tropen-Hygiene, Leipzig,* xviii, no. 5, March 1914, pp. 149-159.

In Java, rats and guinea-pigs were infected experimentally with plague, and as a consequence showed the symptoms of a modified form of the usual disease, which the authors call "mitigated" plague. This form, which was transmitted by means of fleas (*Xenopsylla cheopis* and *Pygiopsylla ahalae*), is characterised by the length of time that the illness lasts, a month or more, and by various pathological differences. The authors suggest that this form may be due to the small quantity of virus which is injected, or to a partial immunity of the infected animal, or to the bacilli being less virulent. This "mitigated" form of the disease, especially when, as sometimes happens, it takes on the characters of the acute form, is possibly to be attributed to infection by rats from a distant locality. The fact that such a disease exists complicates the question of diagnosing plague in rats on ships.

HADLINGTON (J.). **The Fowl Tick.**—*Agric. Gaz. N.S.W., Sydney,* xxv, pt. 4, April 1914, pp. 345-349, 2 figs.

The author states that *Argas persicus* is one of the greatest handicaps to poultry-keeping in some of the hot dry districts of New South Wales. Many writers treat this pest as purely a blood-sucker, and all the trouble to fowls is ascribed to this and to the irritation caused by the bites, or to septicaemia. The deadly effects of ticks are caused by a blood parasite transmitted to the fowl inducing a fever which runs its course in a few days, and is usually either immediately fatal, or leaves the fowl so weak that it dies from anaemia; if it survives it is immune to further inoculations.

The adult tick is rarely found upon the fowl except at night. During the day it hides and lays its eggs in the cracks and crevices of the fowl-house, fences, loose bark of trees, and any place where the fowls roost. When the larval tick hatches, it attaches itself for a few days to the parts of the fowl least covered with feathers; it then drops off, and casts its skin; this process is repeated, until and after the tick is fully adult.

The first essential in attempting to combat the tick is to construct the fowl-houses properly, and the birds should be so controlled that they will only roost in the places provided for them. Open-fronted houses of corrugated galvanised iron with the framework on the outside, are suitable and should be painted to keep the house cool. The next best material is probably hardwood sawn palings, which if well seasoned and put very close, edge to edge, make a good house. The worst of all material is rough bush timber, or tongued and grooved boards, which serve to harbour the ticks. The fowl-house should be sprayed periodically, a good force-pump as used in orchards being necessary, so that every crack or crevice is reached ; about three sprayings are required. The best liquid for the purpose is kerosene emulsion ; one gallon of soft water is boiled and in it are dissolved 8 ounces of soft soap ; this is removed from the fire and 1 gallon of kerosene is slowly added ; the mixture is stirred until a foam-like emulsion is formed ; to this are added 10 gallons of water which must be soft. If a quart of wood-preserving oil (kerosene tar) be substituted for a quart of kerosene, the spray is still more effective, but it has the disadvantage of soiling the feathers of the fowls. Painting the roost with wood-preserving oil can also be recommended as an additional preventive. These measures are also most effective against ordinary fowl lice.

The Fowl Tick and Spirochaetosis.—*Agric. Gaz. N.S.W., Sydney,* xxv, pt. 4, April 1914, pp. 349-350, 2 figs.

The present account of spirochaetosis, transmitted by the fowl tick, *Argus persicus* (see above) has been compiled by the veterinary officers of the Stock Branch. The parasite referred to by Mr. Hadlington has been found affecting fowls in parts of Queensland, Victoria and many other parts of the world, and it has long been suspected that a similar tick fever was present in some of the dry, inland districts of New South Wales.

Spirochaeta marchouxi, vel gallinarum, has now been found in the blood of affected fowls in the latter State. Normally the fowl only becomes infected through the agency of the tick, the parasites multiplying rapidly in the blood, and later being usually found collected into clumps. After this stage has been passed, they normally disappear, though the bird may become weaker and die. If it recovers, it is generally immune to further attacks. Serum from a bird that has recovered, injected into a hitherto unaffected bird, will render the latter immune for a short time. Preparations of arsenic (atoxyl and soamin) have been found to have considerable curative properties, but from a practical point of view neither artificial immunisation nor drug treatment are as valuable as measures which eradicate ticks from the fowl-run.

Thomson (D.). **Attempts to find disease germs in the European Bed-Bug, *Cimex lectularius*, after feeding experiments in various diseases ; Leprosy, Lymphadenoma, Carcinoma, etc.**—*Ann. Trop. Med. Parasit., Liverpool,* Series T.M., viii, no. 1, 21st April 1914, pp. 19-28.

The author gives a brief review of recent work done on the transmission of many tropical diseases by blood-sucking insects and suggests that, as bugs, fleas or lice are all very common in the civilised countries of the north temperate zone, there is a considerable field open in this branch of research. Such diseases as lymphadenoma and the various leukoemias do not appear to have been investigated from this point of view, in spite of the fact that in them the blood is affected and there is a resemblance to certain tropical diseases in the enlargement of the spleen and lymphatic glands. The author himself was much impressed by a remarkable resemblance between a case of advanced lymphadenoma and kala-azar, which induced him to begin the feeding experiments. These experiments are described, 455 individuals of *Clinocoris* (*Cimex*) *lectularius* being employed, of which 184 were used as controls. The results were however inconclusive, no protozoal parasites being found.

Lloyd (Ll.). **Note on scratching birds and Tsetse-fly.**—*Ann. Trop. Med. Parasit., Liverpool*, Series T. M., viii, no. 1, 21st April 1914, p. 83.

The author remarks that it has occasionally been suggested that various scratching birds might act as a control of *Glossina* by devouring their pupae. The birds mentioned which live in the fly area are the domestic fowl and the guinea-fowl. The former never leaves the villages and therefore has little or no opportunity of finding the pupae. Guinea-fowl are very numerous in Northern Rhodesia and an examination of the contents of the crops of 10 birds was made in the Luangwa Valley. The crop of each was filled with vegetable matter, small bulbs, roots, and flower buds, a few insects were found in only three individuals, including Staphylinid beetles, coleopterous and lepidopterous larvae, but no pupae of any kind. Thus it is evident that the guinea-fowl is a vegetable feeder in the main, and cannot be considered to act as a control.

[A similar investigation of the crops of the various Francolins, *Francolinus* and *Pternistes* spp., would be of interest.—Ed.]

Gamble (M.). **A List of Blood-sucking Arthropods from the Lower Congo, with a Vocabulary.**—*Jl. Trop. Med. and Hyg., London*, xvii, no. 10, 15th May 1914, pp. 148-150.

The collection of blood-sucking Arthropods here recorded, was made by the author at San Salvador, in the Portuguese section of the Lower Congo Basin, at an altitude of 1,840 ft., in an undulating grass-covered country. The most common fly in that region is *Stomoxys nigra*, which is more abundant than *S. calcitrans*; it is a great pest in the hot season from March to May, attacking dogs, poultry and human beings; the author suggests its being the carrier of *Filaria perstans* in Africa, as well as pellagra in the United States. Tabanids and tsetse-flies were scarce. *Stegomyia fasciata* is common in the wet season. Specimens of *Eretmopodites chrysogaster* were bred from larvae found in an old tin. *Anopheles* are rare; *Culicoides grahami* is common at sunset in April and May. *Ornithodorus* is common in the sandy towns of Kibokolo, Ndamba and Mabaya: the natives dread the bite and the subsequent fever; some individual ticks, placed in a small cardboard box lived there for 21 months without food or moisture, thus showing the danger of occupying an old camping site. Dogs are much infested with ticks, but fowls are very free. The list of species given consists of 22 CULICIDAE, 17 TABANIDAE, 3 MUSCIDAE, 1 CHIRONOMIDAE, 2 TACHINIDAE, 3 SIMULIDAE, 2 fleas, and 9 ticks. A vocabulary is given of the native names for the more common species.

AKINSCHIN (Th.). **Паразиты-вши на животныхъ и ихъ уничтоженіе.** [Parasitic lice on animals and their destruction.]—**«Земледѣлецъ.»** [*The Agriculturist.*] *St. Petersburg*, no. 7. 1914, pp. 287.

Lice usually appear in spring and attack young cattle in large numbers, appearing generally on the neck or shoulders, on the back, at the root of the tail and less frequently over the body. The usual treatment consists of tobacco decoctions, benzine, etc., as dressings. The author recommends the following emulsion, which gave good results during several years at the Agricultural School in the district of Belebejev ; equal parts of kerosene and of hemp-seed oil are mixed together and the emulsion is applied by rubbing it in with a brush or a cloth, twice daily, till the lice disappear, which usually takes place on the 7th–8th day. During this time the animal must be washed with warm water and soft soap.

NOTICES.

The Commission for the Study of Malaria in Russia.

The Commission of the Society of Russian Medical Men, founded in memory of N. L. Pirogov, for the study of Malaria in Russia is completing the index of the Russian Literature of Malaria up to the end of 1913.

In future the indexes will be issued yearly, together with short abstracts of the articles, including, if possible, all the literature of Malaria for the preceding year.

The Commission will shortly edit works on Leishmaniasis and other diseases due to Protozoa and would therefore be grateful to authors of articles relating to this branch of medecine as well as veterinary medicine and phytopathology, if they would send printed copies of their works to the Commission.

Authors who send two copies of their works, will receive the bibliographic index edited by the Commission.

All communications should be addressed as under :—

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President de la Commision de la Société de Médecins Russes pour l'étude de la Malaria,
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NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

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THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY

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Marzinovsky (Dr. E. I.). **Роль насѣкомыхъ въ распространенiи заразныхъ болѣзней.** [The rôle played by insects in spreading infectious diseases.]—**« Природа.»** [*Nature*], *St. Petersburg* (?), June 1914, pp. 714-735, 14 figs.

In this article the author reviews, in a popular way, the part played by insects in spreading serious diseases, of which the usual instances are given. Professor Zabolotny and Dr. Deminsky have recently proved that the tarbagan and the earless marmot (*Spermophilus citellus*, L.) are also subject to plague and infect man, although it is not known yet what insects play the part of carriers of the disease. He mentions that piroplasmosis of cattle is spread in Russia by *Ixodes ricinus* and piroplasmosis of horses by *Dermacentor reticulatus*. In Transcaspia a disease, common also in Persia, where it is called "Miana," and resembling recurrent fever, is spread by *Ornithodorus tholozani*, and according to Dzhunkovsky this disease has been brought into Persia from Africa, where it is caused by the bites of *Ornithodorus moubata*. Dr. Sacharov has observed in Caucasia a disease of geese which is spread by *Argas persicus*. The principal symptom is a feverish condition, the birds becoming weak, hanging down their wings and perishing in great numbers. The same or a similar disease of poultry in South America is spread by *Argas reflexus*.

Bruce (Sir D.), Hamerton (A. E.), Watson (D. P.) & Bruce (Lady). **The Trypanosome causing Disease in Man in Nyasaland. Part III. Development in** *Glossina Morsitans*.—*Proc. Royal Society, London*, B. lxxxvii, no. 598, June 1914, pp. 516-525, 1 pl.

An account is given of the development of the human trypanosome in *Glossina morsitans*. The study was rendered difficult by the small number of flies obtainable, particularly in the pupal stage. Flies bred from captive individuals were less healthy and more difficult to rear than those from wild pupae. The human trypanosome in Nyasaland belongs to the same group as *T. gambiense*, the development taking place in the alimentary tract and salivary glands, not in the proboscis of the fly. The percentage of flies which become infected is the same as in *T. gambiense*, viz :—8 per cent. The percentage of flies which become infective is about 1 per cent. The length of time which elapses before a fly becomes infective varies from 14–31 days. The infective type of trypanosome in the salivary glands, corresponding with the final stage in the cycle of development, is similar to the short and stumpy form found in the blood of the vertebrate host.

Report of the Inter-Departmental Committee on Sleeping Sickness presented to both Houses of Parliament. *London*, May 1914 (Cd. 7349) 26 pp.

This important Report should be read in the original. The general conclusions arrived at by the Committee are as follows :—

In the opinion of the Committee, there are various ways in which, by experiment and research, further knowledge might be attained, whereby both the incidence and spread of sleeping sickness might be combated with some prospect of success.

Knowledge of the disease, its cause, and its remedies are still in the making, and hasty and imperfectly considered action of a drastic character, such as the attempt to effect a general destruction of wild animals, is not justified by the evidence before the Committee. On the other hand, the Committee recommend that until direct means of checking the fly have been discovered, the food supply of the fly and the chances of infection should be lessened in the vicinity of centres of population and trade routes by the removal of wild animals, and that for this purpose freedom be granted both to settlers and natives to hunt and destroy the animals within prescribed areas and subject to prescribed conditions.

So far as regards the disease in Uganda, the measures already taken have effectually checked the epidemic and removed the mass of the population from the danger of further infection. While, no doubt, it is desirable that the land lying near Victoria Nyanza should be rendered again available for the use of that population, this is not a question of immediate urgency and may well await the acquisition of further knowledge.

With regard to the Nyasaland and Rhodesian form of the disease, its incidence on the population is slight and it is not increasing. The evidence points to its being an old disease—endemic and not extensive, and though it is unsafe to prophesy, there is no apparent reason to anticipate its appearance in an epidemic form. Having regard to the importance of the question whether man forms a reservoir of the human trypanosome, the Committee lay emphasis on the desirability of further experiments as suggested in paragraphs 41 and 42. These read as follows:—

41 (*b*) Man. The rapid course of the disease, and the fact that infected persons usually have to lie up at once in their houses, tend to show that such persons are not of great importance as reservoirs. The invariable fatality of *T. rhodesiense* infection in man, however, is not without exception. Dr. Yorke records the case of one of his personal servants who remained well for a year after trypanosomes were found in his blood (App. B. § 608). And Dr. Stohr mentioned the case of a native who remained well for at least three months after trypanosomes were found in his blood (App. B. §§ 5663 and 5755). Further investigation may lead to the discovery of other similar cases. Such cases may form reservoirs of the disease.

42. It is desirable that a large number (not less than 500) of apparently healthy natives living in proclaimed *morsitans* areas in Nyasaland should be carefully examined for trypanosomes, both by the direct method and by inoculation of their blood into susceptible animals.

It must be recognised that the evidence all points to the conclusion that if tsetse-fly could be eliminated from contact with human settlement, sleeping sickness would practically disappear, infection conveyed by other biting flies being a negligible factor in the spread of the disease.

For this reason the Committee attach great importance to a proper and sufficient equipment of entomological research into the bionomics of the incriminated tsetse-flies. This form of research has, in their view, been insufficiently pursued up to the present time. The workers have been zealous, but few in numbers, and the work consequently limited to only a very small portion of the fly belts and areas from which the danger arises.

Different views are taken as to the prospect of dealing with the fly, but it was, as the Committee think truly, said by more than one of the witnesses that in this form of research there is a large element of chance—that accident may at any time lay bare a secret which may lead to the solution of the problem—and that the multiplication of workers is the multiplication of those chances.

The Committee think, therefore, that, within reason, there should be devoted to this form of inquiry a considerable portion of such funds as may be available in British Possessions, and that endeavours should be made to obtain the co-operation in this work of Foreign Powers in their African Possessions, the results of the work being from time to time collected and tabulated.

Research will, no doubt, be continued as to the nature of the different trypanosomes, and the part they play in the infection of man or of domestic stock.

The proposed experiment of removal of wild animals from a selected area may produce valuable results, both as regards knowledge of the habits of the fly, and as to the extent to which the infectivity of the fly, and subsequently the infection of man or stock, is derived from the wild animals.

As has been pointed out, the result of this experiment cannot be confidently anticipated. There are possible fallacies and uncertainties involved from the very nature of the problem, and in dealing with natural conditions there is always the possibility of unknown factors vitiating or defeating action based on the apparent results of any such experiment.

Nevertheless, the Committee think that there is sufficient to justify an expectation of useful results and they recommend that if a suitable locality can be found where an experiment can be carried out at a reasonable cost, it should be undertaken. They are, however, of the opinion that the carrying out of the other measures recommended should not be delayed pending the results of the experiment which cannot be expected to emerge for two or three years.

The Committee further express the hope that medical research as to treatment of the disease and the production of immunity will be continued.

The above recommendations relate mainly to the acquisition of knowledge on which further action may be based. As regards immediate action, the Committee strongly recommend that measures of clearing should be undertaken where they are practicable and would tend to check the spread of the disease and render life in settlements and travel by road safe for men and stock.

DA COSTA (B. G. B.). **Report on the Sleeping Sickness Mission in Principe, Oct. and Nov. 1913, embodied in Report of Consul-General Hall to Sir Edward Grey.** [Received 22nd April 1914.]

Dr. da Costa, the head of the Sleeping Sickness Mission in Principe makes the following report for the months of October and November 1913. In a report recently presented on his 10 months' residence in the island, the good results obtained by the destruction of *Glossina*, the isolation of the sick, the killing of animals infected with trypanosomiasis, and the use of the preventive injections of atoxyl immediately after the bite of the fly, have already been recorded. [See this *Review*, Ser. B, ii, pp. 13–16.] He regrets that it was not possible to put into practice other measures desirable for the complete eradication of the disease, and the following proposals were made to the Sleeping Sickness Commission.

With regard to the isolation of all infected persons, the Mission have found that the only satisfactory method of isolation is to convey attacked persons to places in the island where *Glossina palpalis* does not exist, and they have marked out certain suitable parts for these segregation camps. Gangs of workmen under the direction of the Medical Officer should be exclusively employed on sanitary work under his direction. All animals attacked should be immediately killed and all animals suspected isolated. Injections of atoxyl should be given only to persons who have been bitten by *Glossina*. Any labourer immediately on being bitten should leave his work and receive an injection of 0·6 decigrammes of atoxyl [*sic* in orig.] the dose to be repeated 48 hours later. All persons recently arrived in the island should be kept isolated in the courtyard of the plantation until instructions have been received from the Head of the Mission as to whether they may work freely or not. Any suspected case should be immediately isolated and means taken to confirm the diagnosis. Newly arrived labourers should not be allowed to work in places where the flies are numerous until they have been taught to realise that the bite of the fly is harmful. Prophylactic measures applied to labourers to extend as far as possible to domestic animals. All tsetse-flies should be sent to the Medical Officer in the city, with a note of the place in which they were caught.

Dr. da Costa points out that these measures are only the old ones in a somewhat different form, and he again expresses his regret that in consequence of the non-approval of the proposals made on the 16th Feb. 1913, the labours of the Mission have been greatly hindered, and it has been compelled to alter its plan of operations.

He says that the decrease in the numbers of *Glossina* at all points of the island where sanitation work has been carried out is an undeniable fact, and cites the following figures on the Sundi Plantation: when the Mission began its work, from 9,000–10,000 flies were caught there every month. During last October, the number caught by means of bird-lime was only 938, and in November fell to 380, in spite of the fact that now 22 men are engaged on this work, 16 of them exclusively, whereas formerly seven at the most were employed in catching flies. In November last, he inspected the Plantation during four days, especially the parts most infested previously, and not a single fly was seen by the officials, although they passed the whole day in the bush, and although at the time of their visit the conditions were favourable for attack by *Glossina*. At Porto Real, once the favourite haunt of *Glossina*, with a monthly catch of 7,000 flies, only 314 were caught in October 1913, and these on native property on which the sanitary regulations prescribed had not been carried out. In round numbers the figures for the whole island are, in October 1912, 15,973 flies caught, and in October 1913, 2,311. In spite of this undeniable diminution in the numbers of the fly, measures are still being actively pursued with a view to its more or less complete extermination. Gangs of men carrying limed cloths and accompanied by European foremen, are to be sent to suspected places, and the author says that if only the Mission had at its disposal the men necessary to finish the work at present in hand, and above all to keep the ground cleared, and to hunt down the few wild pigs still existing, these forming the chief source of the blood supply for the fly, there is no reason to doubt that the fly in the near future might be reduced to insignificant numbers.

Although the habits of *Glossina palpalis* are well known, he thinks it desirable to state that in Principe the fly lives almost entirely among great masses of vegetation, preferably in marshy places, along the banks of the rivers and streams well shaded by trees, climbing plants, and tall grass. It requires for its development, however, not only the shade and coolness provided by these conditions, but some mammal, which it can easily attack, and which lives by preference in the depths of thick bush. When the large herds of cattle, which lived half wild on the north of the island, disappeared, the fly had to depend almost entirely on the wild pigs, once extraordinarily abundant all over the island.

The mammalian wild fauna of the island is limited, consisting of a species of monkey, musk-cat and rats, which owing to their conditions of life do not offer an easy prey to the tsetse. *G. palpalis* cannot live under prolonged exposure to strong winds and the rays of a tropical sun, the latter especially interfering with the development of the pupa. This explains the well-known fact that the fly diminishes considerably during the dry and windy season with a temperature of 70° to 75° F., and that they increase immediately in the damp, rainy and hot season, with a temperature from 77° to 90° F. and a cloudy sky. The rapid disappearance of the fly is thus accounted for when infested areas are cleared, marshes drained, water channels cleaned, and at the same time, the wild pigs hunted down on a large scale.

Cacao plantations are apparently unsuited to the fly, probably on account of the methodical cleaning and cultivation practised, and inasmuch as more than half the island is planted with cacao trees, and as the sanitary work has been chiefly carried out in the north-eastern and western zones, which are still uncultivated, and in which in former times the flies principally abounded, it will be readily understood that the area within which the fly may live and thrive is becoming exceedingly limited, even supposing that they can adapt themselves to the blood of human beings, or of the few domestic animals exposed to their attacks in place of their former food, the blood of the wild pig.

From June to September of 1913, among 366 persons examined, five fresh cases of sleeping sickness were discovered. In October and November, the period to which the present report refers, 493 persons were examined, and only five, or one per cent., showed new infections of *Trypanosoma gambiense*, whereas in October 1912, the percentage of fresh cases was 1·8. Dr. da Costa points out that all the patients recently examined are persons who have resided in the island more than two years, and that the majority of them have long been suspected, although examination by the Ross-Ruge method failed to reveal the parasite. Other, more modern methods are now being used, and it is possible that the number of cases now discovered may be affected by the adoption of better methods of diagnosis.

In the case of domestic animals, all those on plantations situated in the zones formerly infested by *Glossina palpalis* were examined in November 1913, and out of 197, trypanosomes were found in five; three of these were oxen recently imported from South Angola, one an ox that had long been in the island, and one a mule from Lisbon. The percentage of animals attacked was therefore only 2·5, whereas a like examination by the same process in May 1912, shewed 19 per cent. of infection.

Dr. da Costa concludes by expressing the confident hope that if the sanitary measures proposed are efficiently carried out, sleeping sickness in Principe may become a thing of the past.

Tables are given at the end of the report shewing the number of labourers, the number of old cases of sleeping sickness, the number of persons examined, the results of the microscopic examination, the country of origin of new cases, and their period of residence in the island. Similar details are also given with regard to domestic animals.

MORSTATT (H.). **Kaffeekultur, Kaffeeschädlinge und andere schädliche Insekten im Bezirk Bukoba.** [Coffee cultivation, coffee pests and other insect pests in the province of Bukoba.]—*Der Pflanzer, Dar-Es-Salaam*, x, no. 3, March 1914, pp. 141-149.

This paper, which deals principally with the cultivation of coffee in Bukoba, concludes with notes on the insects harmful to man and animals in that district. Tsetse-fly exists in few localities, and the author took *Glossina morsitans* on two occasions. *G. palpalis* appears to be dying out, and sleeping sickness is correspondingly decreasing. A more important pest is *Ornithodorus moubata*, Murray, which carries recurrent fever; the natives of the district appear to be immune, but strangers are almost invariably attacked. Owing to the habits of the ticks it is difficult to escape their bites, though a certain amount of protection is obtained if the sites of old camps be avoided; mosquito nets afford protection, and as a further means of keeping off the ticks, the supports of the camp bed may be bound round with material moistened with petroleum. *O. savignyi*, common in Uganda, is not known in Bukoba. Mosquitos appear in very large numbers after the rains. *Anopheles* spp. are widespread. Tenebrionid beetles appeared to be common in the native huts, living in the straw covering the floors; the natives affirm that these beetles bite. *Rhipicephalus capensis* was taken on cattle and donkeys.

CARINI (A.) & MACIEL (J.). **Existence de la Maladie de Chagas dans l'Etat de Sâo Paulo.** [Existence of Chagas' disease in the State of Sâo Paulo.]—*Bull. Soc. Path. Exot., Paris*, vii, no. 4, 8th April 1914, pp. 289-292.

Human trypanosomiasis, discovered by Chagas for the first time in the State of Minas-Geraes, has been found to exist also in Goyaz, Bahia, and in the Argentine. Lafont discovered trypanosomes in the blood of animals in the island of Mauritius; this trypanosome resembled very closely the parasite causing the disease in the above-mentioned States, namely *Trypanosoma cruzi*. The authors have worked in São Paulo to see whether the trypanosome exists in blood-sucking insects there and whether, if found, the insects would prove capable of transmitting the disease. *Triatoma infestans*, *T. megista*, and *T. sordida*, were captured in large numbers and examined for flagellates in the alimentary canal, and numerous crithidial and trypanosome forms were found in the different stages of the insects, which developed in the same way as *T. cruzi*. To prove their identity with *T. cruzi*, inoculation experiments were made on guineapigs, cats, dogs and mice in the laboratory; after inoculation the blood of these animals contained flagellates of the typical *T. cruzi* forms. It was found that the infection could be transmitted by means of *Triatoma infestans*, as readily as by *T. megista*, so that both these species may act as carriers of the disease. *T. sordida* is not so frequently found carrying parasites as the other two species, but it was proved also capable of transmitting the disease.

At Pirassununga, Brotas and Annapolis cases of trypanosomiasis were observed in human beings. Many guineapigs were inoculated by the authors with blood from suspected patients; in those which died it was impossible to observe the trypanosomes in the blood, but in one case, microscopic sections of the muscles of the animal revealed *T. cruzi* in typical multiplication stages. This animal was inoculated at Brotas on 14th September 1913 with 5 c.c. of blood taken from a negro child 10 years old; the child was living in a hut infested with *Triatoma infestans* (many of which were infected with flagellates) and was backward for her age, showed symptoms of anaemia, and had the lymphatic ganglia, especially those of the neck, hypertrophied. The guineapig inoculated died on 19th October, 35 days after the inoculation. Sections were made of the leg muscles, which exhibited trypanosomes in the *Leishmania* stage.

CARINI (A.) & MACIEL (J.). **Distribution des Triatomes dans l'Etat de São-Paulo.** [Distribution of *Triatoma* in the State of São Paulo.] —*Bull. Soc. Path. Exot., Paris,* vii, no. 4, 8th April 1914, pp. 292-295, 1 map.

In the course of their work on human trypanosomiasis in the State of São Paulo, the authors undertook the study of the distribution of the species of *Triatoma* suspected of carrying the disease. It was found that the most common species was *T. infestans*, and that *T. megista* was more common than *T. sordida*. *T. megista* was found in the following localities: Bebedouro, Bôa Esperança, Campo Alegre, Dous Corregos, Franca, Ibitiuva, Jahù, Orlandia, Patrocinio de Sapucahy, São Carlos, Sertãozinho, Serrinha, and Villa Bomfin. *T. sordida* was found in Araraquara, Barretos, Igarapava, Ituverava, Jaboticabal, and Ribeirão Preto. *T. infestans* was found, roughly speaking, wherever the other two species occurred. The north-east part of the State is the most affected, where the population is densest and where the cultivation of coffee and sugar is mostly carried on. The insects were found infesting the dwellings of the labourers. It would seem from information obtained locally that the numbers of *Triatoma* are increasing.

Blacklock (B.). **On the Multiplication and Infectivity of** *T. cruzi* **in** *Cimex lectularius.—Brit. Med. Jl., London,* 25th April 1914, pp. 912-913.

The author's observations lead him to the following conclusions :—
T. cruzi is capable of living and multiplying in *Cimex lectularius* for long periods.

The parasites found in the bed-bug are infective on inoculation as early as twenty-one hours and as late as seventy-seven days from the infecting feed.

It is not possible to say which of the many different forms occurring in the bug causes infection in the vertebrate host.

Transmission of the disease to healthy animals by feeding infected bugs on them is of very rare occurrence. It was only once observed in the course of these experiments. There is no evidence of hereditary transmission of *T. cruzi* in *Cimex lectularius.*

Thompson (J. B.). **Annual Report of the Guam Agricultural Experiment Station for 1912.**—*Washington, D.C.,* 13th Nov. 1913, 29 pp., 6 pls., 7 figs. [Received 10th July 1914.]

In notes on native live-stock, the Agent-in-Charge, Mr. J. B. Thompson, says that neither foot-and-mouth disease, surra, nor rinderpest exists in Guam, and no contagious or infectious cattle diseases of any kind. The Texas cattle tick (*Margaropus annulatus*) and the Australian cattle tick (*M. annulatus australis*), reported as the carrier of Texas fever in the Philippines, are both found in Guam. On 19th December 1911, over two months after arrival, an imported Ayrshire bull died of what was believed to be tick fever, and all the remainder of the cattle imported at the same time were at once clipped close and found to be infested with minute ticks, so small as easily to escape detection. As native cattle had had access to the pasture, it seemed possible that the infection with ticks arose *in situ*, and the animals were examined daily and kept free from ticks with the idea of immunising them with blood of native stock, but the practical impossibility of keeping the animals absolutely tick-free for the 10 or 12 days necessary caused this idea to be abandoned. It is considered inadvisable to risk the introduction of the Texas-fever organism by the purchase of immune cattle and thus imperil the present cattle-raising industry of the island.

Barber (M. A.). **Cockroaches and Ants as Carriers of the Vibrios of Asiatic Cholera.**—*Philippine Jl. Science, Manila,* Sec. B, ix., no. 1, Feb. 1914, 4 pp.

The author says that cockroaches, especially *Periplaneta americana,* L., are very common in dwelling-houses in Manila at all seasons of the year, and as they are voracious feeders on all kinds of organic matter, and at night, especially, walk over and discharge their faeces on unprotected human food, and have also abundant means of access to human faeces, it suggested itself to the author that they might be a means of conveying Asiatic cholera.

The insects used for experiment were all winged adults, which were caught and kept for a day or two until hungry, and then placed singly in wide-mouthed bottles. Cultures of cholera on liquid human faeces were introduced into the bottles by means of a pipette. Powdered carmine was added to make it possible to identify a faeces sample with a given feeding. Cholera dejections were also used without addition of any kind, and it was found that a single insect would frequently ingest as much as 0·2 cubic centimetre. After feeding they were transferred to clean dry bottles in order to obtain faeces for testing; these faeces were generally discharged about six hours after the meal. On the day following, and on subsequent days, they were given beef broth containing maltose, but no cholera vibrios or carmine; an almost immediate discharge of faeces was the usual result. In eight cases after feeding with human cholera dejecta, cholera vibrios were recovered from the insects' faeces; in one case a few were found 79 hours after feeding, and in several cases they occurred in greater or less numbers from 24 to 48 hours after ingestion. In two cases faeces obtained $29\frac{1}{2}$ and $30\frac{3}{4}$ hours respectively after feeding gave negative results, although carmine still persisted therein and these same insects had passed faeces containing cholera vibrios 5 hours previously. The cockroaches were kept at a temperature of 29° to 31° C. Experiments were made to determine the life of the cholera vibrios after discharge from the cockroach, and it was found that if deposited in dry places, their life was very short, but on moist materials, such as fresh beef, lettuce, fish, etc., they remained mobile for at least 16 hours.

The author observed that cockroaches disgorge portions of their meal at various intervals after feeding, in some cases as long as an hour, and cholera vibrios were found in the ejected material. These insects exhibit no evidence of any infection by cholera, but simply retain the cholera vibrios in the intestine, where, according to the author, they multiply. Guineapigs were killed by the injection of cholera cultures which had been fed to a cockroach and discharged in the faeces, and there is no evidence of any loss of virulence in cholera vibrios after a period of 29 hours in the intestine of the insect.

The author made similar experiments upon red ants (probably *Monomorium latinode*, Mayr), but was not able to recover cholera vibrios from their crushed bodies nearly 9 hours after feeding.

HEISER (V. G.). **Reappearance of Plague in the Philippines after an Absence of Six Years.**—*Philippine Jl. Science, Manila,* Sec. B, ix, no. 1, Feb. 1914, p. 5-23.

After an absence of six years in human beings and five years in rats, plague again appeared in the Philippines in man on the 17th June 1912, and up to 1st October 1913 there had been in Manila 68 cases with 58 deaths, and in Iloilo 9 cases with 9 deaths. As Manila has a population of nearly 300,000 and consists largely of wooden buildings, harbouring many rats, a much larger number of cases would not have been surprising, and considering the daily communications by sea between Manila and plague-infected ports, it is remarkable that the island should have remained free for so many years. The author attributes this to the fact that all such vessels are fumigated at intervals of 6 months or less with sulphur dioxide, and that they unload either into lighters in the bay or on to rat-proof wharves.

The author gives the following summary of observations made upon rats and rat fleas.

During April 1912, several cases of pneumonic plague were detected on vessels from Hongkong and Amoy. Investigation of these cases and of all subsequent arrivals failed to show any connection between them and the first cases of plague on the 17th June in Manila. The disease was probably introduced by plague rats or insects present in cargo from infected ports which was not unpacked until it was distributed in the city. Rat-catching was carried on in Manila during the entire time that plague was absent, but no case of rat-plague was found until the 31st August 1912, in spite of the fact that over 14,000 rats had been caught in districts in which human cases had occurred since 17th June. Plague was found in rats, cats, bed-bugs and fleas. A serious human outbreak occurred in October, in which 21 cases were traced to the goods warehouse at the Azcarraga railway-station. The grey rats were found to be the commonest. The percentage of plague among rats had been very small, less than 0·002, whereas in cities in which plague occurs at least 2 per cent. of the rats are usually infected. Of the 48 infected rats which were encountered, only one sick of plague and another that had died of plague were found. The transmission of plague by fleas was definitely shown by guineapigs contracting plague from fleas from the bed of a human victim and by finding infected fleas in the desk of another patient. Multiple house infection occurred only three times, and all of the cases were within the incubation period of the disease. Seasons apparently had no influence upon the number of cases, whereas in the near-by ports of Hongkong and Amoy seasonal prevalence is most marked.

The only place in the Philippines in which plague occurred outside of Manila was Iloilo. The sanitary measures employed consisted in the isolation of the plague victim in a plague hospital. The rat-catching and rat-proofing measures were begun at the periphery of a zone which extended three blocks on each side of the house in which the plague infection had occurred, and this was apparently successful in preventing extensive spread of plague among rats. Further particulars of the campaign undertaken against rats are given.

SCHUBERG (A.). **Naturschutz und Mückenbekämpfung.** [Nature protection and combating mosquito larvae.]—*Arb. Kaiserl. Gesundheitsamte, Berlin*, xlvii, no. 2, 1914, pp. 252-290.

Experiments were carried out to discover to what degree substances poured on ponds and pools to destroy the larvae of mosquitos, etc., were injurious to other animal life in the water or to birds and mammals drinking it. It was found that while Saprol, phenol-free Saprol, "Larviol A" and "Larviol B" were to a certain extent poisonous, petroleum was only harmful to those organisms of which it choked the breathing apparatus. The results of experiments carried out on birds and mammals to test the effects of a film of petroleum or Saprol on their drinking water were negative, and no ill-effects were observed.

Lahille (F.). **Nota sobre la presencia accidental en Buenos Aires de unas Garrapatas de Camello.** [Note on the accidental presence in Buenos Aires of certain camel ticks.]—*Bol. Minist. Agric. Buenos Aires*, xvii, no. 2, Feb. 1914, pp. 289-293, 3 pls.

The Argentine Minister of Agriculture recently purchased a number of camels from Dakar and from the Canary Islands, which were found to be infested with ticks.

One of the camels from Dakar carried eight males of *Hyalomma aegyptium* and one male of *H. dromedarii*, considered by Neumann to be only a variety of the former. The genus *Hyalomma* has no representatives in Argentina, Brazil, or Chili. Twenty-seven males of *H. dromedarii* were obtained in all. One of the camels from the Canaries carried two female ticks, easily confounded at first sight with the common cattle tick of the country, *Boophilus microplus*, Can. Unfortunately no males could be found, but there is a little doubt in the author's opinion that these ticks are *Boophilus decoloratus*, Koch, not previously recorded on camels. He regards the possible establishment of this tick in the Argentine as a serious matter for cattle-breeders.

Ticks in the West Indies.—*Agric. News, Barbados*, xiii. no. 310, 14th March 1914, p. 90.

The following is a list of West Indian ticks, including a small collection made by Mr. T. P. Saunders and identified by Messrs. Nuttall and Warburton through the Imperial Bureau of Entomology:—*Argas miniatus* (the fowl tick), Antigua, Martinique, Barbados, Trinidad; *Argas* sp., St. Vincent (on rat); *Margaropus australis* (the cattle tick), St. Kitts, Nevis, Antigua, Montserrat, Guadeloupe, Dominica, Barbados, St. Vincent, Trinidad; *Amblyomma variegatum* (the gold tick), St. Kitts, Antigua, Guadeloupe; *Amblyomma hirtum*, Guadeloupe; *Amblyomma dissimile*, Antigua, Barbados, Trinidad; *Rhipicephalus sanguineus*, (the brown dog tick), Antigua, Dominica, Barbados, St. Kitts, Montserrat, St. Vincent; *Boophilus* sp., Barbados (on dog); *Hyalomma aegyptium*, Guadaloupe; *Hyalomma longirostre*, Trinidad; *Dermacentor nitens*, St. Kitts, Montserrat, St. Vincent, Trinidad; *Rhipicephalus* sp., Trinidad.

Venables (E. P.). **A Note upon the Food Habits of adult Tenthredinidae.**—*Canadian Entomologist, London, Ont.*, xlvi, no. 4, p. 121.

A captive specimen of *Tenthredo variegatus* was found to be a voracious feeder upon houseflies, a wound being made in the body through which the contents were extracted.

Major (H. S.). **The Dipping of Sheep in New South Wales.**—*Agric. Gaz. of N.S.W., Sydney*, xxv, pt. 5, May 1914, pp. 309-374.

The Minister for Agriculture has approved of the recommendation that the infestation of sheep with sheep-louse (*Trichodectes sphaerocephalus*) or sheep-tick (*Melophagus ovinus*) be declared a disease, and when the regulations become law, stock-inspectors will have the power to compel owners to dip infested sheep until they are free from these parasites.

Flocks in the cold, elevated districts of New South Wales seem to be most subject to attacks of vermin, the hot, dry conditions being apparently unfavourable to ticks and lice. The effect of the vermin on the sheep is to cause a marked deterioration in the health of the animal, which seriously affects the growth of wool. Dipping not only rids the animal of ticks or lice, but is said to improve the general growth of wool. An account is given of the methods of constructing dips and the process of dipping.

HENRY (M.). **External Parasites in Sheep.**—*Agric. Gaz. N.S.W., Sydney,* xxv, pt. 5, May 1914, pp. 374-375.

A short general account is given of the sheep-louse (*Trichodectes sphaerocephalus*) and the sheep-tick (*Melophagus ovinus*). New South Wales does not appear to be infested to the same extent as Victoria or South Australia, but there is no doubt that the sheep-louse in particular is spreading.

MARTINI (E.). **Some New American Mosquitos.**—*Insec. Inscit. Mens., Washington,* ii, no. 5, May 1914, pp. 65-76, 1 pl.

Three new species of mosquitos are described, *Lesticocampa espini*, from Corozal, Miraflores Lake and Culebra, in the Panama Canal Zone; *Culex prasinopleurus*, from Santiago de Cuba; and *Culex chalcocorystes*, from Porto Bello, Panama; the larva of the latter species is also described.

BAHR (P. H.). **Studies on Malaria in Ceylon, with special reference to its prevention in agricultural districts.**—*Parasitology, Cambridge,* vii, no. 2, June 1914, pp. 135-156, 6 pl., 2 maps.

Ceylon exhibits two definite climatic zones—the hot, low plains and the damp, cool, tea-bearing area of the Central Provinces—which probably have an important influence on the distribution of malaria in the island. This disease is a scourge in the low country, which may again be divided into the hot, damp, agricultural districts of the Western and Southern, and the hot, but dry jungles of the North and Eastern Provinces. Particulars of the malaria parasites found, the incidence of and mortality due to the disease and the antimalarial measures adopted are given. The Ceylon Anopheline mosquitos include:—*Anopheles rossii, culicifacies, albirostris, punctulata, listoni, sinensis, barbirostris, fuliginosus, jamesi, maculatus,* and *gigas*. In Kurunegala the disease has been studied in more detail than elsewhere, and here the parasite is mostly of the quartan type. At least six well-known malaria-bearing Anophelines occur in Kurunegala; of these the species *A. culicifacies* is by far the most abundant. The chief breeding areas of these mosquitos were found to be the paddy fields, and the author advocates the abolition of these within town limits. The systematic treatment of school-children with quinine, cementing drains and waterways in the town, especially streams in the railway cuttings, prohibiting the damming of streams for washing cattle or catching fish, and the prevention in general of water accumulating in pools, etc., which will afford breeding places for mosquitos, are advocated. In Kurunegala, the average death-rate from malaria is about 109 per annum, or 1·3 per cent., but in 1911 it rose to 175, or 2·1 per cent; over 22 per cent. of the government officers are annually incapacitated from service by malaria.

Bacot (A. W.) & Ridewood (W. G.). **Observations on the Larvae of Fleas.**—*Parasitology, Cambridge,* viii, no. 2, June 1914, pp. 157-175, 6 figs.

The eggs of fleas are not attached in any way to the skin, fur or feathers of the animal on which the parents are parasitic; they fall into the nest or drop to the ground in the lair or "run" of the host. The larvae hatch in from 3 to 10 days, according to the temperature, and are active, whitish maggots, eyeless and legless. They are not parasitic, but feed on organic matter in the lair of the host, or in the dust that collects on the ground in its proximity. The present paper gives a detailed account of the active full-grown larvae, after the second moult and before the pupal stage, of *Pulex irritans, Xenopsylla cheopis, Ctenocephalus canis, Ceratophyllus fasciatus, C. gallinae,* and *Leptopsylla musculi.* The anatomy of the head, antennae and mandibles is described. The chief food supply of some, probably most, species is the excreta of their parents, and although some larvae seem able to live on any small dry organic fragments they encounter, others, e.g. those of *Ceratophyllus fasciatus,* cannot be satisfactorily reared in captivity unless they are supplied with the excreta of adult fleas or particles of dried blood.

MacGregor (M. E.). **The posterior Stigmata of Dipterous Larvae as a diagnostic Character: with especial Reference to the Larvae incriminated in cases of Myiasis.**—*Parasitology, Cambridge,* vii, no. 2, June 1914, pp. 176-188, 3 pl., 8 figs.

The author has made a careful comparison of the morphological character of the posterior stigmata of the larvae of the following Diptera associated with myiasis:—*Lucilia caesar, Cynomyia cadaverina, Calliphora vomitoria, Sarcophaga sarraceniae, Chrysomyia* sp., *Musca domestica, Stomoxys calcitrans, Haematobia serrata, Gastrophilus equi,* and *Oestris ovis.* When cases of myiasis are met with, it is of the greatest importance that the species of fly concerned shall be readily determined without rearing the larvae to the adult stage, a method that can be but seldom undertaken, owing to the fact that the material to be pronounced upon is often dead. The present paper is intended to supply the need which has existed for good diagnostic characters for these larvae. The structure and differences in the posterior stigmata of the different larvae are described and illustrated by photomicrographs.

Yorke (W.) & Blacklock (B.). **The Identity of *T. rhodesiense* with the Trypanosome of the same Appearance found in Game.**—*Brit. Med. Jl.,* June 6th 1914, pp. 1234-1236.

This paper is largely a recital of the evidence that game animals constitute the reservoir of the trypanosome causing sickness in man, a view which the authors strongly support.

They state that, in Central Africa, human beings and game are known to be infected with trypanosomes identical as regards morphology and pathogenicity in laboratory animals and their development in *G. morsitans*, that the human trypanosome can be successfully inoculated into game, and that the peculiar sporadic occurrence of the disease in human beings suggests that they are infected from a widely spread reservoir of infection (the game) rather than from one another.

They also consider that the hypothesis that man enjoys marked natural immunity, and is in consequence to a great extent resistant to infection with this parasite, affords a satisfactory explanation of the distribution of the disease, of its comparative rarity, and of the fact that Taute's attempt to infect himself failed.

KNAB (F.). *Ceratopogoninae* **sucking the blood of Caterpillars.**—*Proc. Entom. Soc., Washington*, xvi, no. 2, June 1914, pp. 63–66.

The author has received from Florida some small Diptera with the information that they were sucking the blood of a caterpillar of the well-known papaya hawk-moth, *Erinnyis ello*, L.; the flies were of two widely different species, one of them being a biting Chironomid of the genus *Forcipomyia*, the other a Lauxaniid, *Pachycerina flavida*, Wied. The *Forcipomyia* proved to be a new species, which the author describes under the name *crucicida*. Other records have been made of *Forcipomyia* attacking caterpillars; and they have also been known to bite human beings and to attack adult insects.

NICOLLE (C.) & BLANC (G.). **Les Spirilles de la Fièvre récurrente sont-ils virulents aux phases successives de leur évolution chez le pou ? Demonstration de leur virulence à un stade invisible.** [The question of the virulence of the spirilla of recurrent fever in successive stages in the louse. Demonstration of their virulence in an invisible stage.]—*C. R. Acad. Sci., Paris*, clviii, no. 24, 15th June 1914, pp. 1815-1817.

The results of four series of experiments were positive and show that the spirilla of recurrent fever are virulent in the louse during the period immediately preceding the reappearance of the spirilla in a visible form; the spirilla are thus virulent in a stage of their life-history when they are invisible.

MACDOUGALL (R. S.). **Insect Pests in 1913.**—*Trans. Highland & Agric. Soc., Scotland*, 1914. Reprint, 19 pp.

In the course of this report on injurious insects, the author deals briefly with two forms of lice attacking dogs:—*Haematopinus piliferus*, which sucks the blood, and biting lice of the genus *Trichodectes*. The former is the most common and troublesome, and is found specially about the shoulders, loins and base of the ears. A 1 to 2 per cent. creolin bath is effective, the skin being well-rubbed and the bath repeated after six days. A stronger solution than 2 per cent. will act as a narcotic and irritant poison to both dogs and cats. Professor Gofton recommends the following, used as a soap: Strong mercurial soap, $1\frac{1}{2}$ oz.; lard, 4 oz.; soft soap to 1 lb.; give two dressings at intervals of one week, taking care to prevent the animal from licking or biting itself; long-haired dogs should be clipped.

LUDLOW (C. S.). **Disease-bearing Mosquitos of North and Central America, the West Indies, and the Philippine Islands.**—*War Dept., Office of the Surgeon-General, Washington, D.C., Bull.* no. 4, (Nov. 1913), 97 pp. 30 figs., 27 pls. [Received 2nd June 1914.]

The following mosquitos are recorded as carriers of malaria and other diseases:—*Anopheles crucians*, Wied., widely distributed in North America; *A. maculipennis*, Meig., Europe, Canada, U.S.A.; *A. (Myzomyia) rossi*, Giles, India and the Philippines, host for *Filaria bancroftii*, but probably negative to malaria; *A. funesta*, Giles, Tropical Africa and the Philippines; *A. (Cycloleppteron) grabhamii*, Theo., Jamaica; *A. (Myzorhynchus) sinensis*, Wied., Formosa, China and the Philippines; *A. barbirostris*, Van der Wulp, Selangor, Upper Burma, and the Philippines; reported to be experimentally positive to malaria; *A. (Nyssorhynchus) fuliginosus*, Giles, India and the Philippines; *A. (Cellia) argyrotarsis*, Rob., West Indies, Brazil, Canal Zone, etc., also carries *Filaria nocturna*; *A. albimana*, Wied., West Indies, Brazil, Canal Zone, India, etc.; *A. tarsimaculata*, Canal Zone, Central America, and southward; *Stegomyia fasciata*, F., of world-wide distribution in the Tropics, carrying yellow fever; *Culex fatigans*, Wied., all over the world, a host for *Filaria nocturna*, and concerned in the transmission of dengue; *Mansonioides uniformis*, Theo., South India, Perak, Philippines, positive to *Filaria nocturna* in Africa; and *Mansonioides africanus*, Theo., Tropical Africa and the Philippines, perhaps also positive to *F. nocturna*.

The following species are referred to as being probably negative to malaria:—*A. punctipennis*, Say, *A. indefinita*, Ludl., and probably *A. kochi*, Dön. *A. pseudopunctipennis*, Theo., and *A. franciscanus*, McC., are most probably, but not certainly, carriers of malaria. Particulars are also given of a number of doubtful species, including *ludlowii*, Theo., and many others, the relations of which to malaria are unknown.

Ausschuss zur Bekämpfung der Dasselplage. [The Committee to combat the warble-fly.]—*Deutsche Tierärztl. Wochenschr., Hannover*, xxii, no. 2, 10th Jan. 1914, pp. 30-31. [Received 8th July 1914.]

In a report of Dr. Gläser's address at the annual meeting held on the 16th December, the following results of his investigations during 1913 are given. In an experiment with 10 young heifers of the same age, five of which had been treated for warbles and the other five not, it was found that in six months the weight of the treated animals had increased, on an average, 31 lb. over that of the untreated ones. At current prices, a difference of 15 to 16 shillings would result in favour of the treated animals. In the trial conducted in the district of Neuhaus, 46,231 larvae were destroyed at a cost of about 9 shillings per 1,000. An expert man removed 12,253 larvae in $83\frac{1}{2}$ working hours at a cost of about 2s. 10d. per 1,000. This treatment is therefore remunerative. In the stalls a number of experiments were made with insecticide-washes with the object of killing the larvae. Birch-tar oil, costing about 4½d. per lb. gave excellent results.

POUILLAUDE (I.). **Les Mouches communes.** [Common Flies.]—*Insecta, Rennes*; iii, nos. 34-36, Oct.-Dec. 1913, pp. 410-12, 444-448, 479-482; iv, nos. 37-41, Jan.-May 1914, pp. 27-34, 73-75, 99-103, 146-148, 173-180, 25 figs.

The author in a series of papers gives an account of the commoner species of flies frequenting buildings, including *Scenopinus fenestralis*, and *Phora rufipes*, which are recorded as useful, since the larvae are parasitic on certain caterpillars, *Homalomyia canicularis*, *H. scalaris*, *Stomoxys calcitrans*, *Musca domestica*, *M. corvina*, *Pollenia rudis*, *Calliphora erythrocephala*, *C. vomitoria*, *Lucilia caesar*, *Sarcophaga carnaria*, *Muscina stabulans*, the larvae of which attack those of *M. domestica*, *Scatophaga stercoraria*, *Heteromyza filiformis*, *Themira putris*, *Nemopoda cylindrica* and *Piophila casei*. The genus *Drosophila* includes about 12 species in France, the larvae of which feed on vegetable matter. *D. funebris* occurs in houses, showing a preference for egg-laying on fermenting acid matter, bad fruit, etc. To this group also belongs *Chiromyia flava*. *Psychoda alternata* and *P. phalaenoides* are frequently found during fine weather on damp walls and on windows of houses. Colour seems to play little part in affecting the movements of flies, though many more larvae were found on a rubbish heap in full light than on one in the dark. The movements of flies are probably controlled by a form of phototropism. To this phenomenon may be due the influence of the threads of a meshwork, as demonstrated by Spence about 1834 at Florence. Hymenopterous parasites of flies include: *Figites scutellaris*, Rossi, *F. consobrinus*, *Spalangia nigra*, Latreille, *Stenomalus muscarum*, L., *Bothriothorax clavicornis*, Dalm., *Zygosis heteropterus*, Hartig, and *Alysia manducator*, Panz. In 1913, Portchinsky reported the larvae of *Stomoxys calcitrans* and *Hydrotaea dentipes* as feeding on the larvae of the house-fly [see this *Review*, Ser. B, i, pp. 146 and 149]. In 1913, Hesse was successful in cultivating a fungus, *Empusa muscae*, and killed with it *Stomoxys calcitrans*, *Musca domestica* and *Homalomyia canicularis* [see this *Review*, Ser. B, i, p. 11]. Water 50 parts, milk 25, sugar 10 and commercial 30 per cent. formol 15 parts, spread in a thin layer on plates, boards, etc. is recommended for killing the adult flies. Various other methods of dealing with this problem are discussed, including the addition of chloride of lime to stable manure, the trap-system suggested by Barlow [see this *Review*, Ser. B, i, p. 67], and the method of dealing with the adult fly employed by Berlese [see this *Review*, Ser. B, i, p. 68]. No method can be efficacious in any single village or town without general co-operation, and the best way to render such measures popular is to interest the public and to avoid vexatious procedure by simplifying the treatment. The text of a circular issued in this connection by the Entomological Station at Rennes is given. A bibliography of 50 works, issued up to 1913, completes the paper.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

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TAYLOR (F. H.). **Culicidae from Papua.**—*Trans. Entom. Soc., London*, pt. 1, 25th June 1914, pp. 185-205. 2 pl.

Up to the present, only nine species of CULICIDAE have been recorded from Papua. In the present paper 21 species are mentioned, including *Neosquamomyia breinli*, gen. et sp. nov. Other new species are *Stegomyia ornata*, *S. atra*, *Lepidotomyia lineata*, *Leucomyia* (?) *albitarsis*, *Taeniorhynchus papuensis*, *Melanoconion papuensis*, *Uranotaenia nigerrima*, *Hodgesia triangulata*. It is hoped to make a complete mosquito-survey of Papua.

CLARK (Dr. W. S.). **Report on Cases resembling Pappataci Fever, observed at Ibadan, S. Nigeria.**—*Yellow Fev. Bur. Bull., Liverpool*, iii, no. 2, 7th April 1914, pp. 145-147.

In recording five cases of fever among the European population of six persons on the Residency Hill, the author mentions that mosquitos were fairly plentiful around their bungalows, examples being found of *Culex fatigans*, *C. tigripes*, *Stegomyia fasciata* and *Culiciomyia* sp.; no Anophelines were found (December and January). Sandflies were also numerous and troublesome at dusk, but were not caught and identified. The author was not attacked by any febrile illness, though his bungalow was also infested by mosquitos; sandflies, however, were rare.

BACOT (A. W.). **Naphthalene for the destruction of Mosquitos in covered cisterns and wells.**—*Brit. Med. Jl., London*, 4th July 1914, p. 15.

The author publishes the results of a few experiments in the hope that workers abroad, where experiments on a practical scale are possible, may be induced to try naphthalene as a deterrent to the breeding of mosquitos.

Flake naphthalene sprinkled on the surface of water imparts a slight flavour to the water, but if suspended above it, so that no contact takes place, this defect is obviated, and the author thinks that the method may also prevent the presence of such species as *Stegomyia fasciata* in houses. For the author's experiments, half-pint jars were used, wet blotting paper was placed on the bottom and the naphthalene scattered on this. Trial was made of 1, 0·5, 0·2 and 0·1 grammes in the jars—10 adult *Culex pipiens* were introduced into each and secured by covering the jars with net; in each case a control jar without naphthalene was used; the capacity of the jars was 330 ccm. In all cases at the end of less than 20 hours the insects were all dead or dying; the controls withstood confinement for over 60 hours. The author next experimented with larvae, using two square-bottomed troughs with a surface of 462 centimentres, into each of which 4 litres of strained rain-water were poured. A square frame, 15 centimetres above the surface of the water and covered with netting, was placed over each trough, and 100 *Culex* larvae (86 in penultimate and 14 in final instar) were placed in each; 1 gramme of flake naphthalene was scattered over the surface of one trough and both were placed near

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a window at a temperature of 65° to 67° F. In twenty-four hours all the larvae in the treated water were dead, while those in the control all developed normally. The experiment was repeated with 90 small and 10 large larvae in each trough, only half a gramme of naphthalene being used. In twenty-seven hours all were dead in the test trough and all alive in the control; the room temperature in this case was lower, viz., 60° F. A third experiment with only 0·2 gramme of naphthalene was tried, all the small larvae were dead after 72 hours and only 10–12 per cent. of the larger ones survived; all the naphthalene had evaporated. The author did not have an opportunity of repeating the observations with naphthalene suspended above the surface of the water.

HOLBOROW (A. G.). **Oxidation of Arsenical Dipping Fluids.**—*Rhodesia Agric. Jl., Salisbury*, xi, no. 4, April 1914, pp. 579-581.

The apparent loss of arsenic in dipping-tanks, due to micro-organisms which cause a change, by oxidation, of sodium arsenite into sodium arsenate is here dealt with. The essential quality of a cattle dip is the presence of a correct proportion of sodium arsenite, the arsenate having less than half as much poisonous effect on ticks. When dips are in constant use the change is only partial, but when undisturbed and in warm weather, it may be complete. Investigations under local conditions were made, Cooper's dip being used at a strength of 1 gallon in 300 gallons of water, more dip being added to replace that taken out by cattle and to correct flood water. The arsenite and arsenate contents were determined at frequent intervals, the longest period during which the dips were at rest being four days. The results showed that oxidation was neither constant nor regular, and it is concluded that where cattle are constantly dipped at short intervals, there is no need to change the dip until it becomes too dirty for use.

SINCLAIR (J. M.). **Arsenical Poisoning.**—*Rhodesia Agric. Jl., Salisbury*, xi, no. 4, April 1914, p. 614.

The mortality amongst domestic animals from arsenical poisoning is increasing at an alarming rate, and the attention of stockowners is directed to the necessity of keeping cattle-dip and other preparations containing arsenic under lock and key. The greatest carelessness is frequently displayed in leaving such preparations so that they are readily accessible to animals. In two cases recently investigated by the Department of Agriculture, over forty head of cattle died through tins of pure dip being left on the veld.

MORRILL (A. W.). **Some American Insects and Arachnids concerned in the Transmission of Disease.**—*Arizona Med. Jl., Phoenix*, Jan. 1914. Reprint 12 pp., 8 figs. [Received 17th Aug. 1914.]

After briefly outlining the habits and life-history of the North American cattle tick, *Boophilus annulatus*, the author says that infection of cattle with *Piroplasma bigeminum* can only be effected in nature by the offspring of an infected tick. The parent tick is not therefore a direct carrier as an individual, but as the infection passes through the eggs its chances of reaching a susceptible animal are enormously multiplied. *Dermacentor venustus*, which is the carrier of Rocky Mountain spotted fever, is next dealt with. In the Bitter Root Valley of Montana, where the virulent type exists, the mortality from the disease is from 70 to 80 per cent., while in other neighbouring States a less malignant type occurs, with a mortality record of only 5 per cent. *D. venustus* has never been reported from Arizona. although known to exist in every adjoining State. In California it has been found only in the extreme north-east corner, and in New Mexico only in the north central portion. In Arizona species of *Anopheles* which carry malaria are unknown to the author, and the climate is too arid for *Stegomyia* to be likely to breed there. Dengue fever has been proved to be carried by mosquitos of the genus *Culex*, and in the irrigated valleys of Arizona, road-sides flooded with irrigating water and drinking holes for stock provide ideal breeding places for these mosquitos.

Pediculus vestimenti is believed to be the only carrier of typhus fever, and therefore the prevention of this disease should become a simple matter. *Clinocoris* (*Cimex*) *lectularius* is the known transmitter of leishmaniasis and cases of transmission of anthrax and leprosy by bed-bugs are recorded. The author has been unable to find any record of the existence of the bed-bug in the more densely populated Salt River Valley of Arizona, but at a certain locality in the central portion of the State, at an elevation of about 2,000 feet, this pest was on one occasion forced upon his attention. In south-west Arizona *Triatoma* (*Conorhinus*) *sanguisuga*, variously known as the " blood-sucking cone-nose," the " bellows bug," the " Arizona tiger," or the " Arizona bed-bug," is a troublesome household pest. The bite of this bug frequently produces red blotches on the body, and while the injection of a specific poison by the insect is admittedly probable, recent discoveries lead to the suspicion that various pathogenic organisms are not infrequently carried by it. A South American disease, known as " Barbiero fever," has recently been proved to be carried by species of *Triatoma*. The connection of bubonic plague with rat fleas and Florida sore eye with *Hippelates*, and the possible connection of pellagra with *Simulium*, and infantile paralysis and surra with *Stomoxys calcitrans*, are briefly indicated.

Summarising the more important observations and discoveries in connection with house-fly investigations, the author says that in one case the average number of bacteria on the bodies of 414 house-flies was found to be $1\frac{1}{4}$ million. Those collected in swill-barrels averaged about 4 million bacteria per fly, while specimens in more cleanly surroundings averaged only about one-tenth as many. House-flies will ingest tubercular sputum and excrete tubercle bacilli, the virulence of which may last 15 days.

Omitting diseases believed to be insect-borne, but concerning which there is still some doubt, the total estimated loss to the United States from disease-carrying insects is 357 million dollars annually.

COOLEY (R. A.). **Eleventh Annual Report of the State Entomologist of Montana.**—*Mta. Agric. Expt. Sta., Bozeman*, Bull. 98, Feb. 1914, pp. 126-127 and 132-135. [Received 17th Aug. 1914.]

In the course of his report on insect pests in 1913 [see this *Review*, Ser. A, ii, pp. 536-537] the Montana State Entomologist says that for some time horses in the eastern part of the State have been attacked during the summer months by what has been called the "nose-fly." The insect flies near the ground, frequently between the fore-legs of tho horse, and then suddenly darts up at the lips, where the eggs are deposited, instead of in the nostrils as is commonly supposed. Flies sent to the U. S. Bureau of Entomology have been identified as *Gastrophilus haemorrhoidalis*, L., the lip bot fly.

With regard to the spotted-fever tick in Montana, an Act was approved on 18th March 1913, to create a State Board of Entomology, having, among others, the following powers:—"To take steps to eradicate and prevent the spread of Rocky Mountain tick fever, infantile paralysis and all other infectious or communicable diseases that may be transmitted or carried by insects. To investigate and study the dissemination by insects of diseases among persons and animals." The Board shall have authority to make and prescribe rules and regulations, including the right of quarantine over persons and animals in any district of infection, and shall have the right to designate and prescribe the treatment for domestic animals to prevent the spread of such diseases.

Killing Lice on Chickens.—*Bull. Texas Dept. Agric., Austin*, no. 35, Jan.-Feb. 1914, p. 37.

At the third meeting of the Texas State Farmers' Institute the following methods were recommended for killing lice on chickens:—(1) Dipping the fowls in a 2 per cent. solution of chlorine. (2) A good lice powder was stated to be made of one pint of 2 per cent. chlorine solution and ½ pint of gasolene mixed together, and then as much air-slacked lime poured into the liquid as it will take up, stirring thoroughly during the addition. The mixture should be slightly damp when made and should be kept in air-tight receptacles. This can be used for dusting hens, and a little may be put into the bottom of the nests, but care must be taken not to use too much or it will spoil the eggs by giving them an objectionable flavour. The powder should be well dusted under the feathers.

TEICHMANN (E.). **Zur Biologie der Tsetse-Fliegen.** [The Biology of the tsetse-flies.]—*Zeitschr. für angewandte Entomologie, Berlin*, i, no. 1, April 1914, pp. 147-159, 2 pls.

The author and Dr. H. Braun bred hundreds of tsetse-flies at Amani, German East Africa, in the manner indicated by Kleine. For transport, large glass jars covered with mosquito-gauze were used, a layer of earth, planted with small plants, being spread on the bottom. Only a few of the flies died before reaching Amani, though the captures were made on the day preceding that of delivery. In all some 10,000 flies were brought in, mostly *G. brevipalpis*, but including *G. pallidipes* and *G. tachinoides*,* the latter being the scarcest. The flies were transferred on arrival to smaller glasses, containing 5 or 10 individuals. The females were kept exclusively for breeding, four being allotted to one male. On every third or fourth day the flies must be allowed to suck blood, and for this purpose the jars were turned upside down, with the mosquito-gauze cover in contact with the shaven skin of a warm-blooded animal. Goats and sheep are preferable to white rats. The latter must be laid on their backs on a board to which their limbs are secured, and only a few flies can be fed on one rat, as the animal suffers from the process. Six to nine jars may be placed on one goat or sheep. These animals are bound and thrown for the purpose. In numerous cases flies absorbed large numbers of trypanosomes without becoming infective. When, however, flies, after being fed on highly infected rats, were kept in a breeding cupboard at a temperature of 86° to 99° Fahr., and in an atmosphere saturated with moisture, the parasites increased in them and they became infective. The mere sucking of infected blood is thus not the only factor to be considered.

The author thinks that it would be correct to say that all species of *Glossina* are capable of transmitting all species of trypanosomes, provided suitable conditions be present. The paper concludes with a bibliography of nine works.

STORDY (R. G.). **East Coast Fever in British E. Africa.**—*Ann. Rept. Dept. Agric. Br. E. Africa for 1912-1913, London*, 1914. pp. 24-28.

In the course of his report on the Veterinary Department, the author says that East Coast fever is still very prevalent in the Nairobi and Kyambu Districts and parts of Machakos and Kitui: an outbreak occurred in the Nandi Reserve, and a few cases have been recorded from Lumbwa, N'joro, Uasin Gishu, Ravine, Sotik and the Kedong Valley. A death occurred in the township of Nakuru, which necessitated putting the place in quarantine and preventing an exhibition of cattle. The author says that the imposition of quarantine has proved a matter of great controversy, but there can be no doubt that it has to a large extent afforded a means of controlling this prevalent disease. However, the farming community within the infected area has by repeated agitation had the measure so modified, particularly in regard to the movement of stock, that the number of outbreaks has increased. It is pointed out that there are large areas within the infected districts of Nairobi and Kyambu eminently suited for dairy farming, but that nothing can be done so long as East Coast fever is rife, and all the efforts of the Veterinary Department have met with little else than condemnatory criticism from the majority of farmers. Farmers in the Rift Valley and the country adjacent to it held that, for some reason or another which they could not explain, the ticks responsible for the transmission of East Coast fever could not exist for any length of time in the Rift, and this argument was

* [There is no reliable evidence as to the occurrence of *G. tachinoides* in German E. Africa, and it is in the highest degree probable that the species here recorded under that name is really *G. austeni*, Newst.—ED.]

used so frequently that the author says it became necessary to prove or disprove the theory. Experimental paddocks were constructed, enclosed by strong double fences with a neutral zone between them. Susceptible cattle were introduced into the inner enclosure and infected ticks from the laboratory placed on them, and at the same time engorged female ticks were distributed in the paddock, which was by these means infected with a goodly number of larvae. In due course, when the animals showed symptoms of East Coast fever, clean larvae of the brown tick (*R. appendiculatus*) were placed upon them. The animals died, and the paddock was re-stocked with further susceptible animals, all of which succumbed to the disease carried to them by the ticks which had dropped off their predecessors. This was repeated through three generations, thus clearly proving that the brown tick was capable of living and transmitting the disease in the Rift Valley, and that the farmers' theories were dangerous and incorrect. On the death of all the animals, the carcases of which were burned, the grass paddocks were burned, but the fencing was left intact to insure the thorough cleaning of the area.

Under regulations framed by the Quarantine Board, all cattle belonging to natives within the infected areas of Kyambu and Nairobi were removed back to their respective reserves, and the author is of opinion that, until such time as some method of dealing with East Coast fever is possible, no native-owned cattle should be permitted to leave their reserves. Once the grazing of native stock on European farms is allowed, then surreptitious movement of animals, with all its attendant dangers, will take place.

Austen (E. E.) & Bagshawe (A. G.). **Suggestions for Entomological Research in connection with Sleeping Sickness.**—*Report of the Departmental Committee on Sleeping Sickness, Appendix D, London*, 1914, pp. 290-291.

The following are among the subjects to which the authors suggest that special attention should be directed :—

Influence of Odours. Efforts should be made to determine whether tsetse-flies in choosing a breeding-place are in any way influenced by odours ; or whether, as Mr. Lloyd believes in the case of *G. morsitans*, the existence of a relatively dark spot " where the mother fly can hide during pregnancy " is the dominant factor. The odours by which insects are attracted are not necessarily perceptible to the human nostril, and consequently it does not follow that because the breeding-places of *G. morsitans* and *G. palpalis* appear to human beings to have no distinctive odour, such odour is not apparent to a pregnant tsetse-fly. In India it has recently been found by Mr. F. M. Howlett that *Stomoxys calcitrans* will oviposit freely " on cotton-wool soaked in valerianic acid, one of the acids present in the fermenting vegetable stuff in which the eggs of this species are naturally deposited." There appear to be some grounds for hoping that, if it be possible to analyse the humus in tsetse-fly breeding-places, some substance or essence of a specially attractive nature may be found. If discovered, this would, of course, be used in connection with artificial breeding-grounds.

Artificial Breeding-Places. Every effort should be made to construct these, and to test their practical efficacy. If bird-lime or some other sticky substance were applied to the under surfaces of the dead branches or other timber used in the construction of such breeding-places, the latter might form traps for the adult flies as well as for the pupae. It is important to note that, in order that artificial breeding-places may have a reasonable chance of success, all known or probable breeding-places must, so far as possible, first be destroyed or rendered useless.

Range of Flight. Definite knowledge on this subject is urgently required in connection with *G. morsitans.*

The Precise Effects of Clearing. At present we do not know whether clearing actually results in the death of the flies, or merely causes them to migrate. If it were possible in *G. morsitans* country to find a series of small isolated patches of tsetse, each separated by a different distance (400 yards, half a mile, three-quarters of a mile, and so on) from the next patch of cover, the actual effect of clearing might be ascertained by marking and liberating a large number of *G. morsitans* in each patch in succession, and then destroying the vegetation and noting the result. If possible, a method of marking which does not in any way impair the activity of the fly should be adopted. The desired end might be attained by collecting large numbers of pupae, and breeding out the flies in cages so arranged that the insects on emerging become permanently marked with coloured powder.

Systematic Trapping and Catching continued for a considerable period of time (say, one year). This should be given a thorough trial. In the Island of Principe a marked reduction in the numbers of *Glossina palpalis* has been effected by catching the flies by means of black cloths smeared with bird-lime and worn by natives. The number thus trapped was 95,000 in the last six months of 1912, or over 500 a day. When tried in German East Africa, however, in the case of *Glossina morsitans*, the method yielded but poor results. It is suggested that the failure may be due to the employment on the cloth of some substance which is actually distasteful to the flies and that further experiments with the same substance that is used in Principe would be of value. It is obvious that catching the adults must, relatively at any rate, produce a far greater effect on an exceptionally slow-breeding fly like *Glossina*, than on an insect such as the house-fly, which may produce six hundred eggs at one time. Correct conclusions as to the value of trapping and catching cannot be deduced from a trial lasting only two or three months, in which a handful of natives are engaged ; the value of limed cloths and of nets in the hands of expert fly-boys should be tested in a selected locality for at least a year, and on a large scale. Some hundreds of natives should be employed in the work, and a corps of, say, a dozen keen and energetic fly-boys should be established in each village in a tsetse area. Payment should be by results, but small rewards would suffice, and the system should therefore prove inexpensive in working.

Insect Enemies. It is suggested that it might be worth while to attempt the introduction from the southern United States of the minute Hymenopterous (Chalcid) parasites of the genus *Spalangia*, which have been bred there in large numbers from the puparia of *Stomoxys calcitrans*, and also attack the pupae of other flies, including *Musca domestica* and *Lyperosia irritans* [see this *Review*, Ser. B, ii, pp. 22–24.]

Food. A large series of *G. morsitans* caught where game is plentiful should be examined to determine the percentages which have fed respectively on mammals, birds and reptiles. Mr. Lloyd, in Rhodesia, examined 310 flies and found mammalian corpuscles in the gut of 70, and nucleated red corpuscles, reptilian or avian, in the gut of 12, *i.e.*, in 15 per cent. of those which contained indigested blood. This is a considerable percentage, seeing that these flies are believed by many to depend on game for their subsistence. The examination should be repeated over a larger series, and an effort should be made to distinguish avian from reptilian blood.

Further, a large series of *G. morsitans* in an area free from game, such as that described by Major Stevenson Hamilton, should be examined to determine on what food they subsist, and whether they contain trypanosomes pathogenic to laboratory animals or stock. This might be done in an " experiment-of-game-destruction " area, if the flies remained in it and no favourable opportunity occurred under natural conditions, but a naturally game-free area is preferable, because here the flies have had time to adapt themselves to their environment and possibly have learned to attack animals which ordinarily they disregard.

HOWLETT (F. M.). **Report of the Imperial Pathological Entomologist.** *Rept. Agric. Research Inst. & Coll., Pusa, for 1912-13, Calcutta,* 1914, pp. 80-83.

The author says that the work of the *Stegomyia* Survey on the seasonal prevalence of the different species has established as a practical certainty that all species are normally in the habit of tiding over periods of drought in the egg stage, even though these periods may be of six months or even longer duration. The operations against *Stegomyia* at Pusa have been very successful, and in the year under report the species has become quite rare in the bungalows. The methods adopted have been the filling up, with earth or plaster of Paris, of all the known or probable breeding-places, particularly holes in trees and cut bamboos, and the simultaneous provision of trap breeding-places in the form of bamboo joints filled with water which are emptied out as soon as larvae make their appearance in them. The author regards this trap method as an advance on indiscriminate destruction and thinks it might be valuable in anti-malarial operations. Observations have been made as to the action of different chemical substances on the eggs and larvae of *Stegomyia scutellaris*, *Anopheles rossii* and *Culex fatigans* and *microannulatus*. It has been found that powdered calomel has many of the properties of a good larvicide, and the author thinks that it deserves an extended trial to ascertain its cost and efficiency under field conditions. Its action is slow, but sure, and apparently lasting, and the amount required is so small that water treated with it is in no way harmful or uncomfortable for ordinary use by man or cattle.

For flight determinations carmine powder and gentian violet have given good results in the identification of mosquitos.

The breeding of the West Indian " Millions " fish, though successful under semi-domestic conditions, proved a failure. The fish were transferred to large tanks in which they were apparently destroyed by large Dytiscid beetles, which attacked both the young fry and the adult fish. It is probable that the native *Haplochilus* is equally effective as a larva destroyer.

Sand-flies have been studied, especially *Phlebotomus papatasii*, *P. argentipes* and *P. minutus*, attention being generally directed to the discovery of the natural breeding-places of the last-named species [see this *Review*, Ser. B, i, p. 221.] Subsequent investigations have shown that the supposition that geckos were connected with the fly is correct. No definite results have as yet been obtained with regard to the hosts of *P. argentipes*. An enquiry into the breeding-places of Muscid flies at Poona is in progress, in consequence of a suspicion that they were connected with a form of enteritis, very prevalent in the town.

WEBB (P. T.). **Sheep in Rhodesia.**—*Rhodesia Agric. Jl., Salisbury*, xi, no. 4, April 1914, pp. 552-555.

In the course of this paper the author says that sheep scab exists in Rhodesia and that unless the provisions of the Scab Act are strictly observed, it will seriously threaten the sheep industry in the country. The greatest danger appears to come from native-owned sheep, which are allowed to move about the country with great freedom and without any inspection. Some experience is required in order to identify the pest, and many other parasites are frequently mistaken for it. Owing to the recent dry season and the operation of the Herbage Preservation Ordinance, grass burning has diminished and ticks have increased. Sheep have consequently suffered severely from these parasites, and the irritation produced causes them to bite and scratch themselves, which has a bad effect on the fleece ; inexperienced farmers frequently mistake the results for scab. The author says that by dipping his sheep every fourteen days he has succeeded in keeping them quite free from ticks ; Cooper's Fluid Sheep Dip was the preparation used.

MOUSSU (G.). **Les piroplasmoses bovines.** [Bovine piroplasmosis.]—*Jl. Agric. pratique, Paris*, xxvii, no. 16, 16th April 1914, pp. 490-494, 4 figs.

In France, the mortality among cattle suffering from bovine piroplasmosis has been 12-15 per cent. during the last few years, whereas this percentage reaches 50-80 per cent. in the tropics, America and South Africa. The figure given could be still further reduced to 1 or 2 per cent. if proper measures were taken. Formerly the disease was believed to be due to unsuitable grass, to the ingestion of resinous, tannic and other principles in the shoots of bushes or to poisoning by such plants as *Mercurialis annua*. The disease shows the following symptoms :—Fever, reduction or suppression of milk in milch cows, quickened pulse and breathing and especially bloody urine, the colour of which ranges from light pink to the dark brown of coffee grounds. Death may occur on the second or third day, but usually takes place after 5 or 6 days. In an autopsy it is possible to mistake piroplasmosis for anthrax. In France it occurs in the Departments of Manche, Calvados, Oise, Nord, Indre, Cantal, Côte-d'Or, Vendée, etc. The accurate determination of infected districts is desirable, as this disease can be efficiently controlled. As the result of careful observation it has been noticed that native cattle suffer little, whereas imported cattle are specially attacked. They need not necessarily be imported from a distance, the fact of their coming from a non-infected district being sufficient. Cattle brought from infected districts are naturally immune. As a general rule calves seem immune in infected localities, probably through acquiring immunity during their first year.

Extinción de las moscas. [Fly-destruction.]—*Gaceta Rural, Buenos Aires*, vii, no. 81, April 1914, pp. 726-727.

The Chief Medical Officer of Rosario (province of Santa Fé) has drawn up the following regulations for consideration by the municipal authorities:—Fly-destruction is to be obligatory within the municipality in all factories, institutions and buildings of a public or semi-public character; in these places all organic matter or refuse is to be treated by methods prescribed by the medical authorities; all food-stuffs are to be suitably protected from flies; warning and advisory notices are to be posted up by the medical authorities; fines are to be inflicted for non-compliance.

Townsend (C. H. T.). **El "reservoir" de la verruga.** [The Reservoir of Verruga.]—*Noticias, Lima*, no. 42, 12th April 1914, p. 2.

The author states that he has discovered a small lizard to be the reservoir of verruga. This reptile is found on stone walls and rocks in the verruga zone and outside it. Smears, stained with Giemsa, taken from lizards captured in the Quebrada de Verrugas, revealed bodies apparently identical with those of *Bartonia bacilliformis*. They are plentiful in the red corpuscles, fairly numerous in the blood plasma, and occur in the marrow, liver and spinal marrow. They have the appearance of small rods or granules of the same size, form, colour and structure as *Bartonia*. The spherical granules appear to constitute the infective stage. The author has found the same bodies in *Phlebotomus* from the Quebrada de Verrugas, in microtome sections of verruga papules from man and dog, and in the blood of dogs, rabbits, monkeys, etc., infected by *Phlebotomus*. If they are not identical with *Bartonia*, there is little doubt of their connection with verruga. It is notable that these bodies are seen in the small lizards captured in the Quebradas de Chosica, which are free from *Phlebotomus* and outside the verruga zone. A few only, and those in the form of ill-defined rods, are found in the blood of rats, dogs, asses, owls and pigeons from the Quebrada de Verruga. As in this district the Peruvian hare does not live near houses, *Phlebotomus* cannot be infected from this animal. In the Quebrada de Verruga *Phlebotomus* hides during the day in stone walls near the houses where the lizards are also found, and the transmission of infection must certainly take place there.

Chapin (R. M.). **Laboratory and field assay of arsenical dipping fluids.**—*U.S. Dept. Agric., Washington, D.C.*, Bull., no. 76, 29th April 1914, 17 pp., 6 figs.

The author says that the use of arsenical dipping fluids for the treatment of cattle infested with the Texas fever tick is increasing, and that it is becoming a matter of great consequence that farmers and others should have some more or less simple and ready means at hand for determining whether their dip is in good working order and really effective or not. It has now been more or less conclusively shown by Laws, that arsenate is somewhat less than half as effective upon ticks as arsenite of soda in these baths. The Texas fever tick is very resistant and can only be killed by the use of a somewhat strong solution, so strong, in fact, that if made only a little stronger the cattle themselves will begin to show effects ; that is to say, the margin of safety within which solutions of this violent poison may be satisfactorily used is rather narrow. Too little fails to kill the ticks and too much injures the cattle, and this fact contributes very largely to the hesitation of farmers to use the dip as it should be used, and it has in many cases aroused distrust and even opposition in those very persons whose cooperation in tick eradication work is most desired.

There are various points which need careful consideration. The bath may be made of the wrong strength, which is a very common occurrence ; impure material may be used, and mistakes in measurements and calculations may be made, even by careful persons ; but the greatest difficulty is to maintain the bath at the right strength once it has been prepared. It is obvious that a fresh bath cannot be made every time a few cattle are to be dipped ; the bath must be used over and over again, possibly for several months, sufficient fresh fluid being added from time to time to replace that carried out by the cattle. During hot seasons evaporation tends to concentrate it. The author suggests that this may be compensated for by marking the level of the dip on the side of the vat before a period of disuse, and then filling up to the mark with water when the dip is used again. Again, it is difficult to construct a vat holding from one to three thousand gallons entirely free from leaks, and therefore it is uncertain how far the lowering of the level of the dip is due to evaporation and how far to leakage. Rain water, surface water or even sub-soil water may find its way into the tank and alter the strength of the liquid in the other direction.

Over and above this there is the chemical difficulty caused by the oxidation process which goes on in the solution of arsenite of soda exposed to the ordinary conditions of the dipping tank. Many are of opinion that the change is fairly slow and not important. But the author states that, bearing in mind the small margin between the efficiency of the liquid as a dip and the possibility of its doing harm to the cattle, these changes due to oxidation are worth careful attention, whether they be caused by simple exposure to the air or, as is held by Fuller, by the growth of micro-organisms. These latter occasionally produce the converse result of reduction ; that is to say, there is a possibility of the conversion of arsenate to arsenite, thus strengthening instead of weakening the dip. The primary conditions which determine the direction in which changes usually take place seems to be the amount of use to which the dip is put, and apparently only in those dips through which large numbers of cattle are passed at very frequent intervals will reduction, that is to say, an increase of the proportion of arsenite to arsenate, take place; this occurs in some of the large stock-yard centres.

The necessity for knowing more or less accurately, at any required time, the precise chemical state of the dip is thus apparent, and the author thinks that this may be determined by modifications of laboratory methods, which in his opinion could be made use of by persons possessing only a limited chemical training. He describes in detail processes which may be used (*a*) by trained chemists, (*b*) by persons having only a slight chemical knowledge, and (*c*) by persons in the field possessing no chemical knowledge whatsoever, but who obtain results by strictly carrying out the manipulations of the "outfit" prepared by a trained chemist.

The process for the determination of arsenious acid and also the total arsenic actually present is described at length; the field outfit is figured and directions given for its use. It is not pretended that these field methods will give laboratory results, but, if carefully used, the author feels sure that the owner of the dip will be able to ascertain its condition with sufficient accuracy for the purpose.

Bandermann (F.). **Die Vernichtung der Stechmücken und ihre Folgen.** [Mosquito destruction and its results.]—*Entom. Zeitschr., Frankfurt a. M.*, xxviii, no. 1, 4th April 1914, p. 3.

The author states that the mosquito campaign instituted by the German authorities will probably upset the natural balance of insect life in Germany. In villages around Halle a.d. S. cellars have been lime-washed or fumigated with sulphur, and the rigorous enforcement of these measures makes it impossible to find a single insect of any kind in hundreds of cellars visited by the author in his official capacity.

Miessner (H.). **Zahlreiche tödliche Erkrankungen beim Rinde durch Simuliumstiche und Nachweis des Puppenstadiums dieser Mücken.** [Numerous deaths among cattle caused by *Simulium* bites and the investigation of the pupal stage of these flies.]—*Deutsche Tierärztl. Wochenschr., Hannover*, xxii, no. 18, 2nd May 1914, pp. 281-282.

In previous years few deaths among cattle in the Leine district have occurred from sandfly-bite, but this year there were many fatal cases. This abnormal mortality was due to the great increase in the number of flies. At the beginning of 1914, many districts in the vicinity of the river Leine were flooded, favouring the development of the early stages. Early in April, great heat caused the floods to recede and the *Simulium* emerged in swarms. The flies are usually found on the low ground by the Leine, but the wind prevailing on the 19th and 20th of April blew them from the river to the pasture land and the largest number of deaths occurred on the 20th and 21st of April. About 40 beasts are said to have perished within some $2\frac{1}{2}$ miles of the river-banks. The author thinks that the epidemic will, in time, spread down the river. The greyish white pupae, 4 millimetres long, were abundant on dried twigs, stalks, etc., which were either standing or had stood in water. Where the plants were standing in water no adult flies emerged, and this was confirmed in the laboratory. All the dead cattle exhibited reddish spots like flea-bites, which were very numerous near the genitalia and on the inner side of the legs. The sick animals lie down most of the time, appear to be exhausted and have a weak, rapid pulse. Later they become drowsy and then die. The neck is swollen from chest to throat, and on dissection this part was found saturated with a clear fluid, probably due to extravasation. Internal haemorrhages were noticed. No infectious causative agent has been discovered hitherto, and death was probably due to poison from the fly's salivary glands. The flies can be captured by running the lip of a bottle along the belly of the animal, when they will fall into the bottle. They can also be found with ease on the banks of the river, especially on the under-side of leaves, etc.

Nothing definite can be said as regards control. So far as is known, swarming lasts from 2 to 3 weeks, about the end of April and the beginning of May. A second generation is said to swarm in August. Pastures more than $1\frac{1}{4}$ miles distant from the banks are only infested when the wind blows toward them. In cool weather, which hinders the emergence of the adult fly, the cattle may be put out to graze. If grazing is imperative in warm weather, it should be done at night. It is advisable to clear away vegetation, including meadow-grass, near the banks, preferably in the autumn.

JACK (R. W.). **Illustrations of Natural Forest in relation to Tsetse-Fly.**—*Rhodesia Agric. Jl., Salisbury*, xi, no. 4., April 1914, pp. 548-576, 12 figs., 1 sketch map.

One of the objects of the author is to show, by means of photographs, the kind of country in which *Glossina morsitans* is, or is not, found, and to endeavour to account for the exceedingly local distribution of the fly. This tsetse-fly requires adequate shade, is a slow breeder and of gregarious habits, and there is reason to believe that it draws at least the greater part of its nourishment from the larger mammals, and that therefore, other conditions being favourable, it is likely to frequent parts of the country where such animals are found. Further, a thoroughly dry situation appears to be all that is necessary for the welfare of the pupae, though, as a matter of fact, the bases of large trees appear to be the favourite situations selected by the female for the extrusion of the maggots.

The author does not agree with the statement of early writers as to the sharp delimitation of the fly-belts. Fly is found in the wet season in parts of the forest from which it is altogether absent in the dry, and the writer says that he has never encountered fly suddenly in abundance, unless there were well-marked changes in the forest or country to explain the fact, and that where the edge of a fly-belt appears to be sharply defined it is in every case due to some change in the surroundings. The greater part of the surface of Rhodesia is covered with bush of some description. The sparsely covered acacia veld near Bulawayo and other open districts is far too deficient in shade, and never has been or could be a fly country. The bush generally is of two types, the mopani (*Copaifera mopani*), of which great belts exist within the fly areas, and the other type of bush known to the Matebele is "gusu," which term appears to indicate almost any species of not too open forest, apart from mopani, with little undergrowth except grass. The commonest trees in gusu bush are species of *Brachystegia*. Mopani generally grows on a poor soil, yielding but little grass even in summer, though, such as it is, this grass appears to be palatable to grazing animals. The gusu type of bush is generally found on more fertile soil, and the grass in it may grow to a considerable height during the wet season. There are other types of forest in the country, though none of them of any great extent.

In the dry season, the trees in general lose their foliage, but many, along the edges of water-courses and vleis, whether containing surface water or not, retain their leaves. The result is that, from July to the beginning of the rains, the fly is confined to the shade provided by such trees. When the bush comes into leaf, which in many parts is not before December, the fly scatters, and far from being found to be especially associated with water-courses and vleis, is generally more plentiful in the surrounding bush, whether gusu or mopani. Thorn brake is not much affected by tsetse, but it rarely covers any great extent of country. Large thorn trees (*Acacia catechu*, etc.) frequently form the shade near a vlei or river, and this suits tsetse very well in winter.

The author's photographs are intended to show the relationship of *G. morsitans* to vegetation, and he quotes an instance in which on one day nearly 100 tsetse were collected with a net in about an hour on the western side of a vlei, characterised by the presence of large shade trees. Returning by the eastern side, where the leafless bush came down to the edge of the vlei and terminated abruptly with no fringe of trees of evergreen habit, not a single fly was seen, although the distance from the termination of the forest on either side was not more than a few hundred yards.

He sums up his observations as follows:—Tsetse may be expected to be found in fly-infested areas in the gusu or mopani bush during the wet season, but not after the trees have lost their leaves in the dry season; during the latter period the shady banks of streams and water-courses and the shady borders of vleis, constitute danger zones, that is to say, the nature of the forest determines the suitability of a tract of country for tsetse, provided always that the suitable food supply be present. If there is no winter shade, no matter how suitable the forest may be to tsetse-fly during the summer, the fly cannot establish itself in that locality. The exact range to which the fly will spread from its winter haunts during the wet season has not been ascertained, but it is quite three miles, and may possibly be more. The fly will follow a food supply for a considerable distance, upwards of seven miles, but apparently returns regularly to its haunts. The author says that there is no fear whatever of tsetse spreading over the whole country; that the area suited to and inhabited by it in the early days is comparatively limited; that the pest retreats before civilisation; and that there is no danger whatever of the invasion of settled parts by the tsetse.

TAYLOR (F. H.). **A Revision of the Culicidae in the Macleay Museum, Sydney.**—*Proc. Linnean Soc. N.S.W., Sydney*, xxxviii, pt. 4, 26th Nov. 1913, pp. 747-760, 1 pl. [Received 12th July 1914.]

This paper contains a description of Skuse's types in the above Museum, at the University of Sydney. The author proposes to refer *Anopheles stigmaticus* and *A. atratipes* to *Pyretophorus*, *Culex flavifrons* and *C. vittiger* to *Culicada*, and to give a new name to *Grabhamia flavifrons*, Theo. *Culex linealis* is placed in *Culicelsa*, while *C. atripes* is transferred to *Scutomyia* and shown to be distinct from *Stegomyia punctolateralis*, Theo.

JACK (R. W.). **Report of Expedition to Sebungwe District, Southern Rhodesia.**—*Salisbury*, 14th Nov. 1913. [Received 30th March 1914.]

This expedition was undertaken between 25th August and 1st November 1913, to investigate the distribution of *G. morsitans* in the Sebungwe District of Southern Rhodesia. The main object of the trip, which aimed at improving the existing map of the infested country between the Sengwa and Umniati Rivers, was accomplished. Notes as to the distribution of the fly bore out previous experience in the dry season, the insect being confined to the shady banks of water-courses and vleis, and apparently only crossing a watershed if carried. The author, on one occasion, saw five tsetse-flies carried for six miles across a watershed on the back of a native and thinks this may often happen, but believes that the majority of specimens so carried make their way back to their old haunts when no serious barrier intervenes, otherwise the spread of the fly would be more rapid than is actually the case. On the Sengwa side, game is everywhere abundant in the fly-belts, but towards the southern end of the Umniati belt both fly and game are much scarcer. There is, however, abundant evidence that game is much more plentiful near the Umniati in the wet season. Game is also plentiful in many parts not infested by tsetse. Since the opening of part of the district to shooting, a large number of hunters have been there, but they are almost without exception in search of elephants, and the antelopes are left unreduced, except for those killed by sportsmen; such shooting is regarded as hardly likely to effect the removal of the reservoir of trypanosomiasis.

FLEMING (Dr. A. M.). **Report on the Public Health for the year 1913, Southern Rhodesia.**—*Salisbury*, 1914, 46 pp.

Seven hundred and seventy-nine persons out of a population of 30,344 were admitted to hospital in Southern Rhodesia during 1913 suffering from malaria, of which 13 died, as compared with 770 cases and 6 deaths in 1912. These cases however in no way represent the true malarial incidence in the country generally, as a large proportion of cases are treated in their own homes, frequently without medical assistance. There were 57 cases of blackwater fever as compared with 60 in 1912. The relation of malaria and blackwater fever, both to each other and to the rainfall, has been investigated, and it was found that blackwater fever is at its maximum some thirty days after that of malaria has been reached. Malaria commences to increase about thirty days after the advent of the early rains, and reaches a maximum in May, about three months after the greatest rainfall, and almost following on the cessation of the rains, when the pools and watercourses cease to be washed with torrential storms, and mosquito larvae have a chance to develop into imagines. Both malaria and blackwater fever have, in the course of the year, aroused a considerable amount of public interest and anxiety, especially in the Mazoe, Lomagundi and Abercorn districts. This is only to be expected when it is considered how marked has been the forward movement which has taken place in the last two or three years in the settlement of rural districts where malaria and its sequelae are most rife and where new settlers are especially exposed to infection. The parts of the country most affected are the rich valleys and areas at altitudes under 3,500 feet, though both malaria and blackwater are met with in practically every district. An entomological survey of the country is required to discover the distribution of the various Anophelines and their relation to disease. As these districts become more populated and as land comes under cultivation and suitable houses are erected, there is little doubt that both malaria and blackwater fever will tend to disappear. Except in the Sebungwe district, which has now been depopulated, trypanosomiasis has so far not appeared in any other of the fly areas in S. Rhodesia. Of individuals found infected in 1912, all have died except one native who apparently recovered. The whole country lying between the Sengwe and the Umniati Rivers and the northern portion of the Lomagundi district have been thrown open, and the destruction of the game within these areas has been encouraged. If advantage is taken of this and the game reduced, it is possible that some conclusion may be arrived at as to how far the presence or absence of game affects the distribution of the tsetse fly.

FANTHAM (H. B.) & PORTER (A.). **Some minute animal parasites or unseen foes in the animal world.** London: Methuen & Co., 1914, 319 pp. 56 figs. 8vo. Price 5/- net.

Protozoology, so far as it touches human life and needs, is the subject matter of this book. One chapter is devoted to a general account of sleeping sickness, trypanosomiasis of horses and cattle, and the herpetomonads of fleas and lice. Spirochaetes and the diseases caused by them, the researches of Nicole, Blaizot and Conseil on the transmission of recurrent fever by lice, and the nature of hereditary infection occupy another chapter; malarial parasites, their conveyance by mosquitos and the relation of yellow fever to *Stegomyia fasciata* are discussed at some length; red water and East Coast fever in cattle and the history of the cattle ticks inculpated, are described, and Patton's researches into the relation of bed-bugs to kala-azar and oriental sore are recorded. The remainder of the book deals with bee and silkworm diseases and protozoal diseases of fish, and a chapter is devoted to parasitic Ciliata, others to nasal polypus, muscle parasites and the relations of the parasitic Protozoa to their environment. In the final chapter the authors enlarge upon the economic importance of the study of the Protozoa as illustrated by loss of life from malarial fever, the interference with transport caused by trypanosomiasis in animals, the great loss of cattle from red water and East Coast fever and the like, and the important bearing of diseases caused by these organisms upon the food supply of the United Kingdom.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

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THE REVIEW OF APPLIED ENTOMOLOGY.

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Leese (A. S.). **Final Report for 12 months ending 31st March 1914.** British East Africa; communicated by the Colonial Office.

In January 1914, the author travelled south from Serenli, on the Juba R., by "Soames road" to Mfudu and examined it with reference to the prevalence of biting flies in the dry season, and the possibility of working camels on it in teams, as in Australia, but on the 4th March was called to military service with the Marehan Expedition. He describes the symptoms of trypanosomiasis in Jubaland camels and says that with two exceptions he has noted only one form of the disease, viz. that due to long flagellated trypanosomes resembling both *T. brucei* and *T. evansi*. These appear to be spread through the agency of both *Glossina* and *Tabanus*. The native idea is that the acute form is caused by tsetse and the chronic by *Tabanus*, but the author points out that in India both chronic and acute cases are found where no tsetse exist. In Jubaland the acute form runs its course and terminates in death in a few weeks. The sub-acute form lasts from two to four months, and in the chronic form the majority die in the first or second year of the disease, but a few recover after three years or more; hard-worked transport camels generally die, whilst many meat-camels recover. The animal continues to suffer after apparent recovery from occasional slight febrile attacks, of which the symptoms remain unnoticed, and it thus acts as a dangerous reservoir of infection for other camels, probably for a further period of $1\frac{1}{2}$ to 2 years, and sudden death may occur at any time. In these chronic cases in the camel, the natives seldom suspect "fly" but give the cause of death some fancy name such as "Kud" or "Shimbe," which are meaningless terms indicating any disease occurring suddenly and accompanied by symptoms of brain derangement or of paralysis. The author says that although no experiments have been possible in Jubaland, there is no doubt whatever that the disease is spread by biting flies and that *G. pallidipes* is probably the host in which the trypanosome undergoes part of its life-history, though any species of tsetse on the Juba River must be under suspicion. *Tabanus* spp. are also involved, but evidence points to their rôle being mechanical or direct and therefore possibly only dangerous in the presence of another infected animal. The habit of this fly is to pass from one animal to another and so inoculate a healthy camel from a diseased one, a process which experiment in North Africa, India and the Malay States has shown to be easy. He strongly advises that all transport officers should learn to recognise the species of *Tabanus*, and states that the larger species are more active and therefore more dangerous. He thinks it probable that biting flies such as *Haematapota* and *Lyperosia* occasionally contribute to the spread of the disease. He suggests as preventive measures that camels should not be taken to places infested by either tsetse or *Tabanus*, and that careful examination of remounts should be made to prevent a mixture of diseased with healthy animals.

In the dry season, *G. pallidipes* is confined to the vicinity of dense bush near water; in the rainy season and for some time after, it may be found as far as half a mile away from water and in greater numbers. In the hot season it is most active in the daylight before 9 a.m. and after 4 p.m. and occasionally bites after dark. Probably in the cooler

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season it is fairly active also at mid-day. Species of *Tabanus* are found near water, but have a wider distribution than *Glossina*, requiring little or no shade. They are most abundant during and after the rainy season, the numbers falling off greatly as the dry season advances. They are found biting camels as far as half a mile away from water, and in the hot season are most active in the daylight before 9 a.m. and after 4 p.m.; in the cool season they are more active at midday. *Haematopota* has very similar habits. *Lyperosia* occur in the desert as well as near the river and cannot be avoided, the numbers being much greater after rain than in the dry season. Early diagnosis and segregation of trypanosomiasis cases are necessary even in the desert, because Indian experience shows that these small biting flies are sometimes capable of spreading surra in camels.

Between Dakach and Serenli the author found no tsetse and comparatively few *Tabanus*, and thinks this route safe for camels, except during the rains and at least a month afterwards. On the road from Serenli to Garba Hari *Tabanus* is only found during and after the rains, and then only near permanent water, and camps should be at least a quarter of a mile from the water at these halts. Between the Farnwen River and Lolashid in November, after the "short" rains, the author never found any *Tabanus* except at Lolashid, and he does not think there is much danger except for camels living at Lolashid itself and for camels taken down to water at El Merera. Tsetse are reported abundant after rain below Dolo. At Serenli itself, *Tabanus* are surprisingly scarce even after the rains.

Mange in camels is rather easily cured in Jubaland in resting animals, because there is no cold weather and therefore no long coats, but the author advises that the dressing (sulphur 1 part, sim-sim 5 parts) should be preceded by washing (either in the sea or in water containing washing soda) and that it is useless merely to dress a camel once; in any advanced case the dressing should be applied all over the body on at least two and often three occasions at intervals of 6 or 7 days. Saddles and halters should be disinfected on the same day as the camel is dressed. Mange is most prevalent during and after the rains, and at that time camps should be constantly changed.

Although all untreated wounds are liable to fly-blow (maggots) in hot countries, there is one condition which occurs after rain in camels in Jubaland which the author never saw in India. The larvae either pierce the skin itself or reach the tissues through the punctures made by ticks and cause serious lesions. The author is of opinion that ulcerative lymphangitis which appears among ponies in November and December has some connection with tick bites. *Ornithodorus savignyi* was found between Garbahari and Lolashid.

Sanitary Survey of the San José Estate and Adjacent Properties on Mindoro Island, Philippine Islands, with special reference to the Epidemiology of Malaria.—*Philippine Jl. Sci., Manila*, ix, B, no. 2, April 1914, pp. 137-195, 3 maps.

The property included in this survey, which lies on the west coast of Mindoro Island, comprises from 10 to 13 square miles of territory, and has been notoriously unhealthy for many years, malaria being the principal cause of the high mortality. C. S. Banks, who gives an account of the mosquito survey in and near San José, states that the inhabitants are very much exposed to the attacks of mosquitos, the district lying near or on the zone of tidal swamps which extend over a huge area of semi-stagnant salt marsh, in which, unaffected by tides, algae abound and mosquito larvae find ample breeding grounds. While other species of Anopheline mosquitos occur in these localities in limited numbers, *Anopheles (Myzomyia) rossii* is extremely abundant; it is known to breed in both fresh and salt water, and is the only common species in the Philippine Islands which is a proved carrier of malaria. The use of oil and the removal of algae from breeding places of *A. rossii* are at the best but a makeshift until drainage operations can be instituted; but one or other of these methods must be employed so long as fresh or salt water remains stagnant in the neighbourhood. The surrounding towns and barrios must be permanently isolated from communication with San José, so long as mosquito-breeding conditions remain as they are now, and such a large percentage of the population are carriers of the malaria parasite. Drainage of the area adjacent to the railroad for its entire length will be necessary before this means of transportation can cease to be a menace to the inhabitants of San José.

MACKIE (Capt. F. P.). **Kala-azar in Nowgong (Assam).**—*Indian Jl. Med. Res., Calcutta*, i, no. 4, April 1914, pp. 626-662, 2 tables, 6 maps, 6 charts.

In an account of kala-azar in Nowgong (Assam), and of the experiments which he has made in connection with it, the author gives the following details of entomological interest. In the seven months under review 6,672 fly-papers were placed in kala-azar houses or in the hospital wards, one being pinned on the wall in the living room, and a second on the floor near the bed in each house. The blood-sucking insects captured were chiefly sand-flies (*Phlebotomus* sp.), species of *Culex* and a few ticks and fleas. With the exception of the sand-flies, in a certain percentage of which Herpetomonads occurred, none was found on dissection to contain flagellates. *Anopheles* spp. were uncommon, though some *A. rossii*, *A. fuliginosus* and a few *A. culicifacies* were taken; sixty-nine were dissected with negative results, though some were fed on patients who had peripheral *Leishmania*. Dissections of fleas and bed-bugs from kala-azar villages were also negative.

WILSON (H. C.). **A Note on the Treatment of Swamps, Stream Beds, Ponds, Wells and Pools, with a view to the Destruction of Mosquito Larvae.**—*Indian Jl. Med. Res., Calcutta*, i, no. 4, April 1914, pp. 691-701.

Fish are of great value in destroying mosquito larvae in pools and streams, and the introduction of poisons into waters where fish can live should be prohibited; cresol and oil treatment is recommended, but should be confined to small isolated puddles or pools, too small or of too temporary a character to stock with fish. If a pool is to be stocked with fish, or if the fish are conserved for the purpose of destroying mosquito larvae, surface weeds and floating débris must be removed and isolated pools near the foreshore filled in; in experiments made by the author the ponds selected were comparatively clear of surface weeds, and mosquito larvae were found near the margin; these ponds were stocked with larvae-eating fish and after a few days were examined, with the result that no larvae could be found excepting above some patches of surface weed; this weed was removed, and a further search made the following day, gave negative results.

The depressions formed when constructing irrigation tanks, railways, etc., in India afford extensive breeding-grounds for mosquitos; these should be filled in, if it is impossible to drain them; or if they are extensive and hold water for a long time, they should be linked up by means of trenches and stocked with fish. Shallow swamps and isolated pools should be drained, or if this is not possible, owing to the nature of the country, it is best to construct a pond at the lowest level and drain the swamp by open trenches into it. In malaria-infected areas when water is conveyed by small open irrigation channels, their course should be clearly defined, and all obstructions removed; the sides being protected by stone slabs. In the town of Cuddapah 50 per cent. of the wells were found infested with the larvae of *A. stephensi*; but the worst of these were found free from larvae three days after the introduction of suitable fish (*Haplochilus*). The destruction of small fish by basket traps of minute mesh should be prohibited in paddy fields, which form very good feeding grounds for the small *Haplochilus*. Holes dug for the purpose of obtaining water for young Casuarina trees form most dangerous mosquito breeding places, and these are to be found in every plantation along the coast; in the interests of public health the Government should compel owners of plantations to fill in such pits, and also the trenches often dug in coconut plantations. In street drains where it is impossible to get rid of all the water, kerosene oil should be used freely at least once a week. Drainage channels on the sea-coast subject to tidal influence are generally free from larvae and well stocked with fish, except where they are obstructed.

In Southern India *A. culicifacies* is most ubiquitous in its selection of a site for oviposition, but generally prefers clear water; *A. barbirostris* occurs in tanks, shady pools, pot-holes in rocks, stagnant waters, etc.; *A. fuliginosus* in marshes, swamps, paddy fields, etc.; *A. stephensi* in wells, puddles, cisterns, etc.; and *A. willmori* in hill streams and marshes.

Among the natural enemies of mosquito larvae are small Crustaceans, such as species of *Daphne*; Dytiscid beetles, either as larvae or adults; *Notonecta glauca*; and the following fish:—All species of *Chela*, especially the smaller ones, all species of *Rasbora*, small species of *Barilius*, all species of *Haplochilus*, small species of *Barbus* (all these being suitable for tanks, big ponds and swamps). For paddy fields, wells and small ponds all species of *Chela, Haplochilus,* and *Polyacanthus* and *Therapon jarbua* are recommended.

CRUICKSHANK (J. A.) & WRIGHT (R. E.). **Filariasis in Cochin.**—*Indian Jl. Med. Res., Calcutta,* i, no. 4, April 1914, pp. 741-785, 1 map, 7 pl.

The work described in this paper was carried out during ten visits paid by the authors to Cochin between July 1912 and June 1913, the length of each visit being 10 days. Besides the clinical examinations of 1,000 cases, studies of prevalent mosquitos, experiments to determine mosquito intermediaries and the filarial metamorphosis in the mosquito, and measures for the prevention of the disease in Cochin were undertaken. Mosquito breeding places abound in British Cochin and the adjoining districts, the following being the prevalent species :—*Armigeres* (*Desvoidya*) *obturbans*, *Stegomyia scutellaris*, *Culex fatigans*, *C. sitiens* (*micro-annulatus*), *Mimomyia chamberlaini* (*Radioculex clavipalpus*), *Culex* (*Leucomyia*) *gelidus* var. *bipunctatus*, *Anopheles* (*Nyssomyzomyia*) *rossii*, *Mansonioides uniformis*, *Mansonioides annulifera* (*septemguttata*), *Ochlerotatus*, *Anopheles* (*Myzorhynchus*) *barbirostris*. Of these the species of *Culex* were the most common ; *C. fatigans* seemed to breed chiefly in the surface drains, while *C. sitiens* larvae, although met with in practically every sort of breeding place, were much more common in the irrigation channels. Of the above-mentioned species, five at least have received attention in connection with filariasis ; James, in Travancore, found that *Filaria nocturna* reached an advanced stage of development in *C. sitiens* and *Stegomyia scutellaris* (*C. albopictus*, Skuse) ; he traced the full development in *Anopheles rossii* and another Anopheline not named. In other parts of the world *C. fatigans* and *Mansonioides uniformis* have been shown to be efficient intermediaries. The authors made experiments with *C. fatigans*, *C. sitiens* and *A. rossii* to determine their capacity for transmitting filaria in Cochin. Pupae of these species were collected and the adult allowed to emerge ; the mosquitos were fed on patients suffering from filarial fever, and were then kept in vessels and fed on bananas in some cases and blood in others, the development of the filaria in these mosquitos being described in detail. *Culex fatigans* was found to be an efficient intermediary and of the other species *A. rossii* is almost certainly so, while there is some evidence that *C. sitiens* and *Stegomyia scutellaris* may also act as carriers.

All recent work points to the fact that, effective drugs being unknown, the prevention of the disease caused by *Filaria bancrofti* resolves itself into a question of anti-mosquito measures on similar lines to those employed against malaria. Owing to climatic and industrial conditions this is a difficult problem in Cochin, but it is thought that a great deal could be nevertheless done in this direction.

GRIFFITHS (J. A.). **Report of the Veterinary Officer.**—*Ann. Rept. Nyasaland Protectorate Dept. Agric. for year ending 31st March, 1914, Zomba,* 30th April 1914, pp. 34-39.

No outbreak of trypanosomiasis investigated during the year appeared in very malignant form. Various herds in which there were infected individuals lost up to 25 per cent., but in general a diminution of fatal cases has followed early diagnosis and the removal of the animals to other pastures. In the majority of outbreaks in cattle the animals are infected with *T. pecorum*, and these cases are almost invariably fatal. One animal infected with *T. caprae* appears to be in good health after six months, although no treatment was carried out. In most cases the animals are in districts supposed to be quite free from tsetse-fly, but further entomological investigations are desirable. The author is doubtful whether *Glossina* should be considered to be the only carrier, and instances a case in which five animals were affected under circumstances which rendered tsetse transmission doubtful. The year's outbreaks, contrary to those in previous reports, have not been in working oxen, which may pass through possible areas of infection, but have been confined to herds of breeding stock, chiefly small ones kept for dairy purposes. Of diseases transmitted by ticks, anaplasmosis has been found to occur in the Lower Shire, Blantyre, Zomba and Mlanje Districts, being particularly fatal during the dry season, when the animals are in low condition owing to scarcity of food. At other times digestive disorders show the presence of these parasites in the blood cells. *Anaplasma centrale* is not common. It was the rule to find a mixed infection of anaplasmosis with *Babesia mutans*, which is one of the commonest parasites met with in the blood of animals in the Shire Highlands and Lower Shire areas. Native animals are very immune, the mortality being usually under 5 per cent., though this figure is occasionally exceeded under adverse conditions. A case of *Babesia theileri* is reported from North Nyasa, where the disease is presumed to be endemic. The author strongly urges the advantages accruing from dipping. Two spraying machines are available for public use. Cooper's improved cattle dip is used in these in solutions of 1–200 for the weekly dip and 1–300 for a 3 days dip. Private tanks have also been built.

BRUCE (Surgeon-General Sir D.), HARVEY (Major D.), HAMERTON (Major A. E.) & LADY BRUCE. **Trypanosome Diseases of Domestic Animals in Nyasaland—*Trypanosoma simiae* sp. nov.**—*Jl. R. A. M. C., London,* xxii, no. 5, May 1914, pp. 487-498, 2 pl.

In previous papers the morphology of *Trypanosoma simiae* and its action on animals have been described. In the present paper an account is given of its development in *Glossina morsitans*, which can transmit it from infected to healthy animals. *T. simiae* multiplies in the intestines and in the labial cavity of the proboscis of the fly, and here only developmental, not infective forms are found, there being no specific characters by which these forms can be distinguished from other pathogenic trypanosomes found in tsetse-flies. The final stage of development takes place in the hypopharynx, where the infective form of the parasite, similar in shape to the trypanosome found in the blood of infected animals, is produced. The flies do not become infective until about twenty days after their first infected feed.

SURCOUF (J. M. R.) **Note sur quelques Taons de la Collection de l'Ecole de Médecine Tropicale de Bruxelles.** [Note on some gad-flies in the collection of the School of Tropical Medicine in Brussels.]—*Rev. Zool. Afric., Brussels*, iii, no. 3, 25th May 1914, pp. 471-474.

A list is given, with localities, of TABANIDAE received by the School of Tropical Medicine in Brussels, consisting of 17 species of *Tabanus* and 2 species of *Haematopota* (*Chrysozona*).

KELLOGG (V. L.) & NAKAYAMA (S.). **Mallophaga of the Vizcacha.**—*Entom. News, Philadelphia*, xxv, no. 5, May 1914, pp. 193-201, 1 pl.

The authors describe two new Mallophaga taken by C. H. T. Townsend on the Vizcacha (*Lagidium peruanum*, Meyen) in Peru, viz.: *Gyropus alpinus*, sp. nov., and *Philandesia townsendi*, gen. et sp. nov.

WEBB (J. L.). **Arsenical Poisoning of Stock.**—*Agric. Jl. Union S. Africa, Pretoria*, vii, no. 5, May 1914, pp. 683-687.

In the majority of cases loss of farm stock from arsenical poisoning could be avoided were more attention paid to small details when handling arsenical mixtures. By the aid of the isometer the standard strength of the dipping solution can always be maintained and need never be made too strong. Even then scalding amongst cattle not previously dipped may sometimes occur, but for the first six times, three-quarter strength should be used, or if the tank be filled with standard strength solution, dip once every 10 to 14 days during the first 4 or 6 weeks. Dipping on wet or misty days should be avoided, or the dip will not dry off, and, where possible, shade should be provided for cattle which are being regularly dipped in full strength solutions. The most frequent cause of stock poisoning is carelessness in allowing them to have access to dipping solutions. Concrete sumps should be fitted with heavy lids, suitable draining arrangements from the sheds should be made, and when the tank is emptied a deep hole should be dug in which the dip and refuse can be placed. A fence should surround drying sheds and tanks. To prevent drinking during the actual dipping, large and small animals should not be dipped together, and beasts should not be allowed to follow each other too closely. Cattle are occasionally poisoned by standard strength dips applied at too frequent intervals. The paper closes with descriptions of the symptoms, post mortem appearances, and treatment of arsenical poisoning of stock.

The Life-History of the Scab Parasite.—*Agric. Jl. Union S. Africa, Pretoria*, vii, no. 5, May 1914, p. 725.

Investigations regarding the life-history of the common sheep-scab parasite (*Psoroptes communis* var. *ovis*) in South Africa have been conducted at Pietermaritzburg and at Onderstepoort. Most of the dipping fluids employed have failed to destroy the eggs, and it is necessary to regulate the interval between two successive periods, so that the second immersion is given before individuals hatched from eggs that survived the first dipping begin themselves to oviposit. According to observations at Pietermaritzburg, the second dipping should be given on the eighth day after the first, and not later than the ninth day according to Onderstepoort results. The former probably indicates the shortest possible period, and a dipping on the eighth day will reach those acari which would lay their eggs as late as the tenth day. The eggs all hatch within eight days, whether in the wool or in direct contact with the skin. As the dipping fluid remains active in the skin for one or two days, the period might be extended to nine or ten days, but not later.

Smith (Major L. F.) & Loughnan (Capt. W. F. M.). **Notes on Fevers in Aden.**—*Jl. R.A.M.C., London*, xxii, no. 6, June 1914, pp. 703-706.

Sandfly fever in Aden has been described by Captain Loughnan [see this *Review*, Ser. B, ii, pp. 12-13], while Major Smith, having come from Nowshera, in Northern India, where sand-fly fever is very prevalent from May to October, has noted variations in the symptoms which may be related to the species of sand-fly caught in each place. In Aden, *Phlebotomus minutus* is the only species caught in any numbers, while in Nowshera, *P. papatasii* is the only one of any importance, though *P. babu*, *P. minutus* and *P. sylvestris* also occur. The habits of these vary, *P. minutus* being small and difficult to see, the bite does not irritate much, and it only attacks in the evening and at night. At Nowshera, *P. papatasii* is fairly easy to see and to catch on walls, mosquito curtains, etc. Both sexes are said to bite by night and day, the bite being extremely irritating. Ordinary mul-mul, through which neither mosquito nor sand-fly can pass, should be used for curtains.

Malaria is non-existent among the troops at Aden, except for relapses in infections acquired elsewhere. There are no Anophelines nearer than Shaikh-Othman, ten miles away, but *Culex fatigans* and *Stegomyia fasciata* can be found in small numbers all the year round, breeding chiefly in shallow brackish wells.

Britton (W. E.). **A Remarkable Outbreak of** *Culex pipiens*.—*Jl. Econ. Entom., Concord*, vii, no. 3, June 1914, pp. 257-260.

In spite of anti-mosquito measures which have been taken during the past few years in New Haven, Connecticut, mosquitos (*Culex pipiens*) during the last three years have been more numerous than formerly. Swarms of mosquito larvae were found in the West River, at the edges of the main stream. This unusually large number of larvae is probably due to the absence of fish, which have been driven from that part of the stream by the dye stuffs emptied into the river from a neighbouring factory. Another unusually large outbreak of mosquitos occurring at Greenwich, Conn., in 1913, is attributed to a similar destruction of the fish in a dam in the river above the town.

Headlee (T. J.). **Anti-Mosquito Work in New Jersey.**—*Jl. Econ. Entom., Concord*, vii, no. 3, June 1914, pp. 260-267.

The State has undertaken the drainage of the salt marsh districts of New Jersey, where *Aedes cantator*, Coq., and *A. sollicitans*, Wlk., breed in large numbers. Already 100 miles of the coast have been drained, resulting in a large increase of the value of property. A law has been enacted by means of which local agencies for mosquitos control have been formed, which are closely related to the State control work. Regarding inland mosquito work, the general plan has been to find all the breeding places and eliminate them by draining, or where this is impossible stocking with fish or oiling has been carried out; the species dealt with are *Aedes sylvestris*, Theo., *Culex pipiens* and *C. salinarius*, Coq.

Morrill (A. W.). **House-fly Baits and Poisons.**—*Jl. Econ. Entom., Concord,* vii, no. 3, June 1914, pp. 268-273.

Experiments have been made with a view to securing definite information concerning the comparative attraction for the house-fly of some of the many materials used and recommended as baits or poisons. Vinegar in itself is an excellent bait for a fly-trap, but the addition of sugar or bread increases its attractiveness. Formalin (40 per cent.) differs greatly in its attractiveness on different days, but it makes an excellent fly-poison when combined with other substances, such as beer, milk, or bread; commercial alcohol (95 per cent.), 1 part in 20 of water, appears to be equally effective. Bichromate of potash gave no results. Cobalt appeared especially attractive when used with bread, and in one experiment, exhibited better killing effects than formalin. Sweet milk without the addition of other material seems to have little if any advantage over sour milk; combined with bread, sweet milk was very attractive, but not so much so as formalin or alcohol mixtures used with bread. Beer was a very attractive bait under certain conditions, fresh beer being more so than stale; it combines readily with formalin, but not with alcohol. Bread added greatly to the attractiveness of liquid fly-foods and poisons, and in this respect is superior to wheat bran. Over-ripe bananas were superior to ordinary ones and also to fresh or decayed oranges and apples. Commercial dried blood moistened with water had a greater attractive value than fresh or decomposed meat or fish; fresh fish was more attractive than decomposed fish. Cane sugar and syrup had relatively low attractive values when used alone. The value of sticky fly-paper was very materially increased by placing small amounts of attractive bait on the centre of each sheet; a thin slice of over-ripe banana is an inoffensive and effective bait for this purpose.

Hewitt (C. G.). **Further Observations on Breeding Habits and Control of the House-fly,** *Musca domestica.*—*Jl. Econ. Entom., Concord,* vii, no. 3, June 1914, pp. 281-289.

This is an interim report of the author's work on the breeding habits of *Musca domestica.* Six heaps of horse-manure, each about a cubic yard in volume, were enclosed in cages of galvanised poultry wire, and either left for two days for the flies to oviposit and then treated with an insecticide, or treated at once, when chloride of lime was used. After exposure for two or three days and treatment with insecticides the heaps were covered with wooden cases, in which holes were provided for the attachment of wire balloon fly-traps, the emerging flies being thus caught and counted. The number of flies which emerged from the untreated control cage was 13,332. In the heaps treated the numbers were:—Zenoleum, 8,040; iron sulphate, 7,850; chloride of lime (surface), 5,943; chloride of lime (mixed), 4,627; and kerosene emulsion, 3,481.

It was found that the mature larvae generally left the manure heap to pupate and buried themselves in the sand at some distance from the heap. Larvae were found pupating at a depth of 9 inches two feet from the heap. Experiments were made to find the relation between the temperature of the manure heap and the breeding of the flies, and it was found that at no great depth from the surface the heat was too great to allow the larvae to exist.

Hunter (S. J.). **The Sandfly and Pellagra. III.**—*Jl. Econ. Entom., Concord*, vii, no. 3, June 1914, pp. 293-294.

This is the author's third report on the entomological aspects of the causes of pellagra, and includes studies on the biting habits and morphology of the mouth-parts of *Simulium vitattum*. In experiments conducted in southern Montana, near the Madison River, it was found that the fly was active on cool days when the temperature was below 70°. The bite was not always immediately noticeable, and it seems probable that the fly attaches itself to its host by means of its mouth parts, since it is not readily detached when it has once settled down to feed. A monkey used during 1912 for inoculations from sandflies, and inoculated on 22nd December 1912, began to exhibit in November 1913, a marked stomatitis, accompanied by diarrhoea; it continued to lose in weight, and the colour of the face changed to a pale ashy grey. The author admits that the report does not at present warrant any conclusions for or against the theory that pellagra is carried by *Simulium*.

Howard (L. O.). **The Yellow-Fever Mosquito.**—*U.S. Dept. Agric., Washington, D.C., Farmers' Bull.* no. 547, July 1913, pp. 1-16, 6 figs.

This is a popular account of *Stegomyia fasciata*, F., and its relations with yellow fever. This mosquito is inseparably associated with man in the tropics and is essentially a town species, never found normally at great distances from habitations. A female will bite within 18–24 hours after emergence, and is recorded to have sucked blood 18 times in 31 days. Young, healthy individuals are more liable to be attacked than older ones, and white races than black. The mosquitos are most active in the early morning at sunrise, and on dull cloudy days; they do not bite in the sunlight or in the open. As a rule the adult does not live longer than 40 days, though a female has been kept alive for 154 days and a male for 72 days. The mosquito can transmit yellow fever 12 days after it becomes infected, and can probably do so throughout its life; it is very sensitive to differences of temperature, and displays its greatest activity at about 82°. There is no positive evidence that vessels anchored more than half a mile from shore will be visited by these mosquitos under natural conditions, but they may be carried great distances on ships, etc., and have been found in New York on vessels coming from Vera Cruz, and are carried frequently by trains from New Orleans and other southern cities to Baltimore, New York and other cities in the northern States.

The eggs are laid in one or more lots, and may remain dry for long periods, hatching when they reach water. *S. fasciata* breeds almost exclusively in artificial receptacles, such as gutters, discarded bottles, tins, etc. The incubation period is two days. The larval stage lasts for six days at least, and the larvae can resist a considerable salinity in the water and can also live out of water for some time if the surroundings be moist. The pupae are also very resistant to drying. The pupal stage occupies upwards of 36 hours, and the average life-cycle from 11–18 days.

The spread of yellow fever can be most effectually controlled by measures directed against the mosquitos and the protection of infected persons against their bites.

Galli-Valerio (B.). **Recherches sur la Spirochétiase des poules de Tunisie et sur son agent de transmission,** *Argas persicus*, **Fischer ; 3me Mémoire.** [Researches on the Spirochaetosis of Tunisian Fowls and its carrier, *Argas persicus*, Fischer.]—*Centralbl. f. Bakt.* 1te, *Abt., Orig., Jena*, lxxii, nos. 6–7, 20th Jan. 1914, pp. 526–528.

After noting that according to Nuttall *Spirochaeta gallinarum* and *S. anserina* are the same species, the author says that infected individuals of *Argas persicus* are capable of transmitting spirochaetosis during 9 or 10 months. Some of these ticks from Tunisia, 6 months after they reached Lausanne, were able to transmit a fatal disease to a fowl, without, however, spirochaetes being found in it. This disease could not be transmitted to a pigeon. *A. persicus* resists both high and low temperatures to a considerable extent. Of 10 individuals exposed for about 4 months to a temperature sometimes as low as 7° C. only one died. This species can apparently remain fasting for 21 months.

Insect trap.—*Canal Record, Ancon*, vii, no. 25, 11th Feb. 1914, pp. 239–240.

Mr. Bath, an inspector in the Department of Sanitation, Canal Zone, has patented an insect trap, the principal object of which is to trap mosquitos in a room, without subjecting the occupants to attack. The trap is designed to be placed over the inside of an opening in the wall, or a window, preferably near the ceiling, so that mosquitos attempting to enter may be caught. The trap consists of a long wooden frame with hooks for attachment to the wall and with an aperture 8 by 23 inches leading to the cage, a semi-tubular chamber of wire gauze nearly as long as the frame. The ends of this gutter-shaped chamber are closed with flat sheets of wire gauze. The mosquitos enter through a wedge-shaped inlet structure that fits into the main cage. The structure is built on a wooden frame of the same size as that described above and consists of a double-walled V-shaped gutter of wire gauze, cut away at the apex. Insects readily enter at the large rectangular base, travel along the sloping sides and pass, first one and then the other of the slit-like apertures at the apex, but refuse to pass back through the inlet. For use, the cage, with the inlet structure placed in position and kept there by the two wooden frames fitted together, is hung on the wall. Tests made by the inventor with a number of traps showed an average catch of 96 anopheles per diem per trap. Six traps used daily for 60 days captured 37,000 Anopheles. The largest recorded catch was one of 1,018 Anopheles taken by one trap in one night.

von Ezdorf (R. H.). **Prevention of malaria. Suggestions on how to screen the home to keep out effectively the mosquitos which spread the disease.**—*Public Health Reports, Washington, D.C.*, xxix, no. 9, 27th Feb. 1914, pp. 503–508, 2 pls.

Not only iron, but copper or bronze wire used for screening, should be treated with varnish or paint, as it is liable to oxidize and corrode in a damp climate, particularly near the sea-shore. In painting wire screening, the paint should be lightly daubed on the wire so that it will not run and fill the openings. The author finds that fireplaces are often left unscreened, thus nullifying the effect of a careful screening scheme. If the fireplace is constructed of iron, brick, stone, or other material not permitting the use of nails or tacks, adhesive plaster 2 inches wide may be used to attach the screen.

SALM (A. J.). **Sur les insectes suceurs de sang de l'Archipel de la Sonde.** [Blood-sucking insects of the Sunda Islands.]—*Arch. Parasitologie, Paris,* xvi, no. 3, 1st March 1914, pp. 404–410, 6 figs.

The author has collected 4 species of CHIRONOMIDAE attacking man in the Sunda Islands, which Professor de Meijere has determined as *Ceratopogon stimulans*, *C. salmi*, *C.* (*Forcipomyia*) *vexans*, and *Culicoides pungens*. The females alone bite, usually by day and preferably in the sun. Two species of Acarids, so small as to be scarcely visible to the naked eye, were found parasitic upon these midges.

VON EZDORF (R. H.). **Malarial fevers in the United States.**—*Public Health Reports, Washington, D.C.*, xxix, no. 15, 10th April 1914, pp. 871-877.

In connection with the investigation into the prevalence and geographical distribution of malaria undertaken by the United States Government, the author made surveys during 1913 in selected localities in Arkansas, Alabama and North Carolina. In each place visited Anopheline breeding places were found. *Anopheles quadrimaculatus* was the prevailing species and chiefly responsible for spreading malaria, though *A. punctipennis* and *A. crucians* also occurred. In these three States 802, 664, and 3,613 persons were examined, the percentages of infection being 6·6, 3·76, and 8·55 respectively. Employers in sawmills, on cotton fields, etc., increase their staff from 25 to 50 per cent. during the malaria season (1st June to 1st November) on account of the lowered productive capacity of the employees, and it is estimated that an average worker loses at least 2 weeks during the season on account of malarial fever.

Veld Burning.—*Rhodesia Agric. Jl., Salisbury,* xi, no. 5, June 1914, p. 664.

The Herbage Preservation Ordinance was promulgated in July 1913, and the Chief Native Commissioner, in his report for the year 1913, states that, partly owing to this measure and partly owing to the increasing good sense of the natives, grass fires have been practically non-existent. In several districts the natives have approached Native Commissioners with a view to the relaxation of the law in respect of reserves; they maintain that the long grass attracts the larger carnivora, and that they suffer severe losses in stock from the depredations of these animals. It is also stated that, as a result of the preservation of the pasturage, ticks and mosquitos are more numerous.

DIXON (W. R.). **East Coast Fever: its Prevention and Eradication.**—*Agric. Jl. Union S. Africa, Pretoria,* vii, no. 6, June 1914, pp. 841-852, 1 fig.

The author refers to the possibility of East Coast fever invading the coastal districts in the east of Cape Province from the Transkei Territories, and before enumerating protective measures and methods of eradication, he briefly describes the symptoms and post mortem lesions. The transmission of the disease [see this *Review*, Ser. B, i, p. 205, and ii, pp. 111–115] is then discussed, and when referring to dipping [see this *Review*, Ser. B, i, pp. 82–85, and ii, pp. 17, 59–60 and 157] the author says that operations should commence before the appearance of East Coast fever in the district. It will be found advantageous to hand-dress the ears, under the tails, etc., of cattle with the following mixture, dipping alone not being quite effective against the ticks that congregate there:—Stockholm tar, ½ gallon; resin (cheapest quality), 2½ pounds; caustic soda, ½ pound; water, 2½ gallons. Boil the caustic soda in one gallon of water and then stir in the powdered resin; boil for ten minutes until thoroughly dissolved and add the tar and water to make three gallons. Apply with a swab after dipping or between dippings. A dipping tank having a roof of corrugated iron is described and figured.

Short interval dippings are necessary because the brown tick, *Rhipicephalus appendiculatus*, usually remains on its host for from three to five days only, or even less, in the larval and nymphal stages. The quantity of arsenite of soda required for "three-day" dipping is considerably less than that used at longer intervals and consists of four pounds of arsenite of soda (80 per cent. arsenious oxide) to every 400 gallons of a mixture of soft soap (5½ lb.), paraffin (2 gallons), and water; for "five-day" dips, 8 lb. of arsenite of soda is used. The results of experiments tend to show that it is possible under ordinary conditions to dip cattle at intervals of three days for a long period with safety, and thus to stop the spread of the disease promptly, even where dipping has not been previously practised.

WILLCOCKS (F. C.). **The Predaceous Mite,** *Pediculoides ventricosus,* **Newp.**—*Agric. Jl. of Egypt, Cairo,* iv, no. 1, June 1914, pp. 17–51.

A full account is given of *Pediculoides ventricosus*, Newp., together with records of its attacks on man, with special reference to its recent ocurrence in the London Docks and in a Colchester oil mill, where the mite caused a supposed skin disease amongst labourers who were unshipping cargoes of Egyptian cotton seed in January, 1914. These cargoes came from Alexandria and since they were not complained of there, could not have been seriously infested when shipped. A rapid increase of *P. ventricosus* appears to have taken place in the cotton seed while it was in the holds of the ships, where the temperature may well have been between 70° and 80° F., which is the optimum temperature for the rapid increase of this mite. The trouble caused by *P. ventricosus* is not likely to persist, because with the extinction of *Gelechia gossypiella*, *P. ventricosus* will also disappear, owing to the scarcity of its hosts.

Hutchins (E.). **Annual Report of the Veterinary Department.**—*Ann. Rept. Uganda Dept. Agric. for the year ending 31st March 1914, Kampala,* 1914, pp. 28–35.

In view of the fact that *Glossina morsitans* is the natural carrier of *Trypanosoma pecorum* in Uganda, investigation is required of all the localities in which trypanosomiasis of cattle is known and the areas in which *Glossina morsitans* occurs, must be accurately mapped and defined. It will then be possible to avoid many of the losses for which these diseases are responsible in Buganda and the Western Provinces of the Protectorate.

Torres (T.). **Prophylaxie de la fièvre jaune à Manaos.** [Yellow fever prophylaxis at Manaos.]—*Bull. Office Internat. d'Hyg. Publique, Paris,* vi, no. 6, June 1914, pp. 989–995.

On their arrival at Manaos, the first step taken by the Commission presided over by the author was to determine the parts of the town in which cases of yellow fever had occurred in the preceding six months, that is, since 1st January 1913. In three months 4,624 houses were dealt with; all court-yards and floating craft in the harbour were inspected and a list of infection centres made. *Stegomyia* abounded in the heart of the town, but no Anophelines were observed, as indeed was to be expected from the absence of malaria. In the high temperature of Manaos, 29° to 30° C. (84°–85° F.), only eight days are necessary for a mosquito to pass all stages from larva to imago. Although the town had suffered from yellow fever since 1856 no deaths occurred in September and only one in October. This coincided with the decrease of mosquitos and their final disappearance. No case has now been found for six months.

Fuller (C.). **The Skin Maggot of Man.**—*Agric. Jl. Union S.A., Pretoria,* vii, no. 6, June 1914, pp. 866–874, 1 fig.

This paper is a compilation of the known facts regarding the Skin Maggot Fly (*Cordylobia anthropophaga*, Grünb.), variously known as the "Cayor Worm," "Tembu" or "Tumbu Fly," "Maggot Fly" or "Natal Maggot Fly." The maggots are essentially skin parasites, and besides man, dogs, cats, horses, donkeys, camels, guinea-pigs, monkeys and baboons and other wild and domesticated animals are attacked [see this *Review*, Ser. B, i, pp. 91–92 and 171.] Though painful, their attacks are not usually attended with serious consequences. The life-history is still incompletely known, though there is reason to think that this fly is viviparous, and that the eggs or young larvae are laid in some cases on clothing. Pupation takes place in the soil and occupies about a fortnight; there are at the most, two or three generations in the summer, and in South Africa attacks seem most frequent in March. The author suggests that an unknown parasite of the pupal stage is responsible for its rapid decadence and suppression for periods of years.

SERGENT (E.) & FOLEY (H.). **De la période de latence du Spirille chez le Pou infecté de Fièvre Récurrente.**—[The latent period of the Spirilla in the Louse infected with Recurrent Fever.]—*C.R. Acad. Sci., Paris*, clix, no. 1, 6th July 1914. pp. 119–122.

The virus of recurrent fever may assume a form other than that of the generally recognised spirillum. This form, in which the organism is very small, may appear in the periods of apyrexia which intervene between the attacks in man, and in the flea immediately after it has taken the meal of blood causing its infection. In both man and the louse this form is assumed for about eight days on the average, and the fact that this change of form takes place is an argument in favour of the Protozoan affinities of this parasite.

Sandfly Fever.—*Jl. Trop. Med. Hyg., London,* xvii, no. 16, 15th Aug. 1914, pp. 251–252.

At the meeting of the British Medical Association held this year in Aberdeen five papers were read dealing with various aspects of sand-fly fever. Captain P. J. Marett dealt with the bionomics of the Maltese species of *Phlebotomus*; the habits of the larvae were described in detail; the larvae lack eyes and live in dark places amongst rubbish; their food consists for the most part of the excreta of woodlice, lizards and bats; the optimum temperature for their development is above 70° F., and a certain amount of moisture appears to be essential; the necessary physical conditions are found in the interior of rubble walls, crevices of caves, and in Malta especially in the interior of the old bastions. The pupa is of a dull white colour; the adults are sexually mature within a few hours of emergence: the maximum distance of flight in a horizontal direction is about 50 yards. They are commonly attacked by an ectoparasite—a small red mite—and internally by the fungus *Empusa papatasii*. The species of *Phlebotomus* described by Newstead as occurring in Malta are *P. papatasii*, *P. minutus*, and *P. perniciosus*, all apparently capable of serving as hosts for the virus of sand-fly fever. In Malta the flies appear about the middle of May in small numbers, gradually increasing up to the middle of June; they are less numerous in July, but swarm again from the middle of August to the middle of September.

Colonel Birt dealt mainly with the clinical symptoms of the fever; after the attack, a high degree of immunity is developed, and second infections of the same individual are very rare.

Captain Graham described sand-fly fever in Chitral, which was originally described in 1906 by Macarrison under the name of three-day fever, but which corresponds in every detail with the disease in the Mediterranean. In the mountainous district of which the paper treats, it never occurs at an elevation above 7,000 feet. Two species of *Phlebotomus* occur—*P. papatasii* and *P. minutus*, both of which convey the infection. As regards racial susceptibility, the Gurkhas of the hill country are more prone to contract the fever than are the natives from the hot plains of the Punjab, the majority of whom have been previously infected.

Professor Galli (Rome) read a short communication on sand-fly fever in Italy, where the disease appeared suddenly after the great

Messina earthquake in 1908, when it was popularly called "the fever of the rubbish."

Captain Houston dealt with sand-fly fever in Peshawar, where the commonest species is *P. papatasii.*

GRAHAM-SMITH (G. S.). **Flies in Relation to Disease: Non-bloodsucking.**—Cambridge: At the Univ. Press, 1914, 2nd. Edit. xvi+389 pp., 32 figs., 27 pls. & 20 charts. 8vo. Price 12/6.

The second edition of this work has been increased in size by the addition of an appendix of 99 pages with three plates and a number of charts [see this *Review*, Ser. B, ii, pp. 19, 20]. A series of observations on the effect of the food of the larva upon the size of the adult blow-fly, is given, and the length of the thorax was found to vary between a maximum of 5·5 mm. and a minimum of 3·99. Some additional data are given as to the range of flight of flies and as to changes in their habits and hibernation. A large amount of carefully arranged information as to the relation of summer diarrhoea to meteorological conditions and especially to the possible carriage of the disease by flies, has been added, with a number of charts showing the relations between bright sunshine, soil temperatures and deaths from summer diarrhoea in Birmingham, Manchester and Cambridge. It is suggested that there is a somewhat remarkable connection between the diarrhoea death curve and the prevalence of bright sunshine, which, though inimical to disease-producing organisms, increases the activities of flies. Additional information is given as to cholera and other diseases in this connection. Attention is drawn to the importance of non-biting flies in the spread of diseases, inasmuch as many flies incapable of sucking blood are in the habit of feeding upon blood drawn for them from animals by biting species. Several pages are devoted to additional information on myiasis and recent work on the various enemies of flies in the several stages of their existence.

Horse Bots in Russia.—**« Сибирское Сельское Хозяйство. »** [*Agriculture of Siberia,*] *Tomsk,* no. 11, July 1914, p. 326.

To protect horses from the attacks of *Gastrophilus equi* during the summer months they should be kept under cover in the middle of the day and the neck, breast and fore legs should be frequently brushed, so as to remove the eggs. In the case of horses which must remain in the fields, the neck, breast and fore legs should be smeared with a mixture of soap and kerosene ; as this mixture dries quickly in the sun, it must be frequently renewed.

Horses are also attacked by the so-called "redtail gadfly," *Gastrophilus haemorrhoidalis*, the larvae of which live only in the rectum, and though not considered so dangerous as those of *G. equi*, cause considerable suffering to the animals. This species oviposits in summer near the root of the tail ; the larvae enter the rectum through the anus, where they live for some months, moult and pass out with the dung, and then pupate. An injection of hemp-seed oil is recommended as a remedy.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

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THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

ISSUED BY THE IMPERIAL BUREAU OF ENTOMOLOGY.

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Publication Office.—27, Elvaston Place, London, S.W.

Guercio (G. del). **Le Tipule ed i Tafani Nocivi nelle Risaie di Molinella (Bologna).** [Tipulids and Tabanids in the rice-fields of Molinella (Bologna).]—*Redia, Firenze*, ix, pt. ii (1913), 31st March 1914, pp. 299–345, 14 figs. [Received 12th November 1914.]

Various species of *Tabanus* occur in the rice-fields of Bologna, but that particularly referred to in this paper is *Tabanus ignotus*, Rossi (*T. albipes*, F.), which occurs in enormous numbers, and this was especially the case in 1911. It generally makes its appearance in the first half of June and is a great annoyance to the labourers, although it does not appear to bite man. Under artificial conditions it takes sweet food greedily, and should thus not be difficult to poison with sweet baits such as arsenic, copper salts, lead salts, etc. The insect prefers cool places, and is generally to be found in the shade, but is also found sitting on plants even in the open, especially *Arum, Sagittaria* and *Typha*. Excessive heat, particularly if the area affected be enclosed and moist, appears to kill the insect very quickly, and it is described as being killed by a sort of sunstroke if exposed to the sun in open fields when the soil is moist. The eggs are laid on the leaf-blades of the plants above-mentioned throughout the month of July and occasionally in the early days of August. Large larvae are to be found in the autumn and winter, and large numbers of smaller ones throughout the winter, for the most part in a condition ready to pupate in April or May of the following spring. The larvae of the Tabanid have some resemblance to those of *Tipula oleracea*, and more or less accurate observation is required to distinguish them. They are a little larger, more cylindrical, but of the same colour. Their habits also greatly resemble those of the *Tipula* larvae with which they are found, and pupation conforms in time with that of the *Tipula*. This takes place at the end of May and throughout June, when the larvae leave the rice-fields in great numbers and proceed to the banks which surround them, and to the neighbouring meadows to pupate. There is apparently only one generation in the year. These larvae are attacked by flacherie to some extent, and they and the *Tipula* larvae are said to do enormous damage in the rice-fields. Amongst the remedies, the proper maintenance of the banks of the rice-fields is the most important, as in this way the drowning of the larvae is more or less assured.

[It is unlikely that the Tabanid larvae, which are carnivorous, do the damage ascribed to them, and still less so that they could readily be killed by drowning.—Ed.]

Malloch (J. R.). **American Black Flies or Buffalo Gnats.**—*U.S. Dept. Agric., Bur. Entom., Washington, D.C.*, Technical Series, no. 26, 6th April 1914, 72 pp., 6 pls.

This publication gives an account of the American species of *Simulium*. The general characters of these insects, their early stages and life-histories, and their taxonomy, are discussed. Descriptions of individual species with their known range in the U.S.A. are given. *Prosimulium pecuarum*, Riley, the species popularly known as the Buffalo Gnat, is a great pest of cattle in the Southern States, particularly near the Mississippi and Ohio Rivers. It is now thought to be much less common than in former years, when it was recorded as having been so numerous and so persistent in its attacks as to kill mules and cattle.

The following new species are described :—*Prosimulium mutatum*, from New Jersey, British Columbia and Alaska: *Parasimulium furcatum*, from California; *Simulium aureopunctatum*, from Guatemala and other southern districts; *Simulium hippororum*, from Mexico; *S. bivittatum*, from new Mexico; *S. parnassum* from New Hampshire and Virginia; *S. arcticum*, from British Columbia; *S. clavipes*, from Guadaloupe; *S. jenningsi*, from Louisiana, which persistently attacks horses in South Carolina, *S. haematopotum*, from Mexico and Cuba; and *S. forbesi* from Havana, Ill. *S. johannseni* is a pest in the Illinois river region, near Havana, Ill., and occurs in great numbers but does not appear to attack man, while *S. forbesi* not only attacks stock but also man, and is exceedingly numerous. There is a good deal of evidence that *S. forbesi* can travel for distances of at least five miles. The staff of the Illinois State Laboratory of Natural History have found the parasites mentioned by Strickland [see this *Review*, Ser. B, i, p. 77] commonly in *Simulium* larvae in both the Illinois and Sangamon Rivers. Apparently *S. vittatum* was the only species affected, the percentage of parasitised individuals being very large.

The paper concludes with a catalogue of the North American and Central American SIMULIIDAE, and a list of the principal papers dealing with them is given.

MALISCH (—). **Die Malaria im Südosten Deutschlands.** [Malaria in south-eastern Germany.]—*Deutsche Mediz. Wochenschr., Berlin*, xl, no. 15, 9th April 1914, pp. 763–764.

The endemic malaria centre in the Pless district of south-eastern Germany is little heard of, as the disease is not notifiable and the inhabitants treat themselves with quinine without medical aid. In every one of the 100 cases observed by the author in 1913, water existed near by. Most of the cases occurred in May and June, continuing until early in October. The Pless district has about 125,000 inhabitants and an area of over 1,000 square kilometres of woodland and meadow land. The southern portion is covered with ponds. The ground does not allow the water to escape easily, rain falls abundantly, and the temperature is sufficiently warm to afford suitable conditions for *Anopheles*. *Corethra*, *Culex* and *Anopheles* are to be found everywhere and cover the ceilings of the cellars and cattle-sheds in the cold weather. The regulation of the Vistula and the work of many drainage societies is restricting the mosquito area.

MAYER (M.). **Uebertragung von *Spirochaeta gallinarum* durch Milben.** [The transmission of *Spirochaeta gallinarum* by Mites.]—*Arch. f. Schiffs- u. Trop. Hyg., Leipzig*, xviii, no. 7, April 1914, pp. 254–255.

In the Tropical Institute at Hamburg, canaries are used for maintaining a supply of *Spirochaeta gallinarum*. A canary injected with another infection having died of spirochaetosis, mites from a bird infected with the latter and kept in another cage were believed to have acted as carriers. Some well-fed individuals were taken from the dead canary and placed on two fresh birds, and after seven days one of them became infected and died of spirochaetosis. It is not certain if the mites transmit this infection by their bites, or owing to being swallowed by the birds, but it is considered evident that canary mites, and probably fowl mites also, are able to transmit *Spirochaeta gallinarum*.

KNAB (F.). **Simuliidae de Chile Septentrional.** [*Simuliidae* of North Chili.]—*Anales de Zoología aplicada, Santiago (Chili)*, i, no. 1, April 1914, pp. 17–22, 1 fig.

Three species of SIMULIIDAE found by C. E. Porter in North Chili are recorded, one being new:—*Simulium annulatum*, Philippi, *S. escomeli*, Roubaud, and *S. tenuipes*, sp. n.

SCHUBERG (A.) & BÖING (W.). **Ueber die Uebertragung von Krankheiten durch einheimische stechende Insekten.** [On the transmission of diseases by indigenous biting insects.]—*Arb. Kaiserl. Gesundheits., Berlin*, xlvii, no. 3, April 1914, pp. 491–512.

In 1912, Schuberg and Kuhn showed that the transmission of anthrax either from the bodies of dead or sick animals to healthy ones by *Stomoxys calcitrans* was possible. These results were obtained by observations on mice and guineapigs. Experiments have now been extended to larger animals, viz., goats and sheep. The spleen of guineapigs strongly infected with anthrax was used as the infective material to be absorbed by the flies, and in the tests of infectivity precautions were taken by killing the flies with ether or with steam in such a way as not to interfere with the possibility of cultivating anthrax from their bodies.

The general results went to show that in only one case was there any certain transmission of the disease to a sheep, and the authors were satisfied that the possibility of danger of infection through the bites of this fly is real, though probably only one of many means by which the infection is spread. The incidence of anthrax in Germany between the years 1902 and 1911 in cattle and in sheep is reviewed, and it appears that the period of maximum is not the same for the two animals, which may have an important bearing upon the possibility of transmission of the disease by biting flies. The possibility of flies obtaining infective material from cattle dead of the disease, in Germany at all events, is very limited, as the removal of the hides of such animals is forbidden and, therefore, the access of flies to infected material is greatly restricted. Experiments on the possibility of the conveyance of *Streptococcus* by *Stomoxys calcitrans* are described, and it is concluded that this is quite possible, if the flies have had access to an infected source within 24 hours before biting.

A list of important papers on the conveyance of disease by flies is given at the end of the article.

Casaux (J.). **Considérations épidémiologiques concernant la fièvre récurrente au Tonkin.** [Epidemiological observations regarding recurrent fever in Tonkin.]—*Bull. Soc. Méd. Chirurg. de l'Indochine, Hanoi*, v, no, 4, April 1914, pp. 142–150.

A number of observations are recorded on the epidemiology of recurrent fever in Tonkin, where it has probably been endemic for years, although not recognised until lately. Lice appear to be the most probable carriers, as infection spreads only when people are in contact with one another, and it is especially frequent in winter when the natives are confined to their huts.

Ringenbach (Dr.). **Tournée Médicale effectuée de Brazzaville à Pointe-Noire (Moyen-Congo et Gabon).** [Report on a journey of Medical Inspection from Brazzaville to Loango (Middle Congo and Gaboon)].—*Ann. Hyg. Méd. Colon., Paris*, xvii, no. 2, April–May–June 1914, pp. 361–387.

The object of this journey of about 350 miles was, amongst other things, to obtain data as to the prevalence of sleeping sickness in certain districts which had not as yet been investigated. The area travelled over is divided from east to west into three districts—Bakongo, Bakunyi, and Kuilu—and is important as supplying the market of Brazzaville with fresh food and labour. In the first district, 1,393 natives were examined and 17 found to be suffering from trypanosomiasis. *Glossina palpalis* was found everywhere, especially on the river banks, but in consequence of the absence of large game, the fly areas are limited to the neighbourhood of human habitations. Few flies were captured because the journey was made in the dry season. *Simulium* larvae were found in almost all the water courses. Mosquitos of the genera *Anopheles*, *Stegomyia*, and *Mansonioides* occurred, and in certain places numbers of Ceratopogoninae, while in ill-kept huts almost everywhere *Auchmeromyia luteola* chiggers, bugs and lice were common. In the second district, in 31 villages 1,064 natives were examined, of whom 54 were found to be suffering from the disease, an average of 5·07 per cent., but in two villages the percentage rose to 19·5.

Special reference is made to cases in one of these villages, Kinanga, situate about 50 yards from a river bank and surrounded by large banana plantations. The population was about 100, and the disease is well recognised amongst them. There is no thick bush in the neighbourhood of the village, but the banks of the river are covered with tall vegetation. This village is regarded as presenting an excellent example of "family contagion," which is held to account for the disappearance of whole villages, and as supporting the evidence obtained by the French sleeping sickness commission of 1907. In the Gaboon the scarcity of the male population is said to be remarkable, the reason being that the men have left the country to seek work elsewhere. In 33 villages 592 persons were examined and 21 found to be suffering from trypanosomiasis, an average of 3·54 per cent. It is said that the mortality is not high. *Glossina palpalis* was common, as also mosquitos of the genera *Anopheles* and *Mansonioides*. *Similium* larvae, as before, were found in all the streams, and in this part of the journey the party was greatly tormented by the bites of Ceratopogoninae.

LEGENDRE (Dr. J.). **Index endémique du Paludisme et sa Prophylaxie à Tananarive (Madagascar).** [Endemic index of Malaria and its Prophylaxis in Antananarivo.]—*Ann. Hyg. Méd. Colon., Paris,* xvii, no. 2, April–May–June 1914, pp. 531–535.

An endemic index showing the incidence of malaria in the town of Antananarivo has been prepared by examining all school children between 7 and 14 years of age, and the figures given show that in the west from 34 to 44 per cent. are attacked; in the north-east 58 per cent.; in the east the figure varies from 41 to 100 per cent.; in the south-east it is 64 per cent. and in the great western plain 30 per cent. It is suggested that the proximity of rice-fields and the breeding of mosquitos therein, more or less accounts for the unhealthy state of the town and the extent of the disease, but it is further pointed out that the distribution of water in the rice-fields, which is described in detail, has a very important influence upon the distribution of the insects. Those areas of water which are furthest removed from the irrigation canals are practically devoid of fish (CYPRINIDAE), and here the mosquito larvae have practically no enemies; the incidence of the disease is shown to vary from 100 per cent. on the side where the water of the rice-fields is absolutely devoid of fish, to 30 per cent. in another part where fish are more or less abundant.

A large amount of rice cultivation in certain areas is carried on under conditions which would not permit of stocking the water with fish, and it is suggested that the water should be run off from these areas for a period of 48 hours once a fortnight, the agricultural authorities being of opinion that this operation would not interfere with the growth of the rice. In certain areas it is advised that the cultivation of rice be prohibited altogether.

GOYON (Dr. de). **Note sur les Mouches piquantes et les Epizooties du Bas Dahomey.** [Biting flies and epizootics in Lower Dahomey.] —*Ann. Hyg. Méd. Colon., Paris,* xvii, no. 2, April–May–June 1914, pp. 632–634.

Various biting flies, and especially *Glossina*, are widely distributed in Lower Dahomey, but there are no records of observations connecting their distribution with that of disease. Sleeping sickness is very rare, but horses and cattle coming from Upper Dahomey are almost invariably attacked on arriving at the coast with a disease which presents all the symptoms of nagana. The coast area is traversed everywhere by lagoons which swarm with tsetse; the disease is known at Savé, 160 miles from the coast, at which point the rearing of stock is said to begin, and in this place about 5 per cent. of the animals are attacked. Two serious epizootics of the disease are recorded in that neighbourhood, one 4 or 5 years ago and the other more than 10 years, which were attributed by the natives to the bites of flies. The natives are perfectly aware of the habits of *Glossina* and have noticed that during the dry season, when there is no bush in the neighbourhood of the villages, the flies retire to damp bushy areas further away. Their own herds are then not troubled, but they say that the flies follow the herds of buffalo, and that their own cattle suffer most from the fly at the beginning of the rainy season, when, in order to find pasture, they must be taken to areas at some considerable distance from the villages.

The biting flies collected in the district include :—*Glossina palpalis*, which swarms around Port-Novo and in the lagoon region of the coast; *G. morsitans*, which is common in the wooded district of Allada; *Tabanus subangustus*, Ric., found very commonly in Lower Dahomey about water-courses and in the lagoons, its bite being excessively painful; *Haematopota strigipennis*, Karsch, abundant in Lower Dahomey; and *Simulium damnosum*, Theo., common all over the country.

MESSERSCHMIDT (Th.). **Experimentelle Beiträge zur Frage der Verbreitung der Typhusbacillen durch Staub und Fliegen.** [Experimental contributions to the question of the spread of Typhus bacilli through dust and flies.]—*Centralblt. Bakt., Parasit. u. Infekt.*, Ite. Abt. Orig., lxxiv, nos. 1–2, 27th May 1914, pp. 1–5.

Though dust and flies have been suggested as agents responsible for the spread of typhus bacilli, Heim is said to be the only worker who reports having been able to prove this with regard to dust. As to flies, details are given of three experiments with 20 rabbits infected with typhus bacilli and placed in a cowshed of 400 cubic feet space swarming with an estimated average of 800 flies. The negative results of these experiments confirm the observations made during the years 1905–1909 in the course of the typhus campaign in south-west Germany. The paper closes with a bibliography of 19 works.

LIGNIÈRES (J.). **L'anaplasmose bovine en Argentine.** [Bovine anaplasmosis in the Argentine.]—*Centralblt. Bakt., Parasit. u. Infekt.*, Ite. Abt. Orig., lxxiv, nos. 1–2, 27th May 1914, pp. 133–162, 5 figs.

Anaplasmosis is endemic in certain northern regions of the Argentine and may be accidentally carried to other zones by infected cattle. *Anaplasma argentinum* belongs to the same type as *A. marginalis*, Theiler. In nature, anaplasmosis does occur as a pure infection, but is associated with *Piroplasma bigeminum* and *P. argentinum* and appears to be transmitted by the same tick, *Margaropus microplus*. Infection is not conveyed by *Stomoxys*. Native cattle suffer little from anaplasmosis in regions where it is endemic, whilst imported stock, particularly the better grades and the adults, are seriously attacked. *Anaplasma* parasites remain alive and virulent for over a year in the blood of animals which have recovered, the first attack conferring immunity. Animals immunised against *Piroplasma bigeminum* and *P. argentinum* are susceptible to anaplasmosis and the converse also obtains. Tick destruction and the separation of infected from non-infected areas must be undertaken and immunisation is of great importance. The immunity conferred by the use of pure virus is assisted by the injection of blood from animals infected spontaneously in the tick zones, which contains parasites of the same type as those used for immunisation.

LEWIS (J.). **The Formation of Arsenate in Dipping Tanks.**—*Agric. Jl. Union S. Africa, Pretoria*, vii, no. 5, May 1914, pp. 658–664.

This paper is principally concerned with the operation of bacterial organisms in effecting the change of arsenate to arsenite in dipping tanks and *vice versa*. The author's attention was drawn to the subject by the discovery that an arsenate-free sample from a tank showed a rapid decrease in arsenite and increase in arsenate on being left in an open bottle for a few days, whereas fresh samples from a tank in which no dipping had meanwhile taken place, showed no change in the same time. Many bacteria, particularly those which infest the animal intestine, have been detected in tank liquors and have been shown to be capable of converting arsenate into arsenite, that is to say, the ordinary fouling of the liquor in the tank tends to maintain its efficiency as a tick-killing dip. Unfortunately other organisms operating in the opposite direction are apparently present. In those cases in which the tanks are frequently used, *i.e.*, at least once a fortnight, practically no arsenate may be present, but this is no proof that none is formed, but rather that the arsenite-producing organisms overmaster the action of those which operate in the other direction. These latter appear to remain active in the tanks for a longer time than the former, and consequently if the tanks remain out of use for a considerable time the arsenate will be formed in increasing quantities. Dip liquor from various tanks was exposed in the laboratory in narrow-necked flasks, and also in shallow dishes and it was found that where the dips were used once a week or only once a fortnight, the quantity of arsenate formed within about a week in the flasks was either nil, or too little to be detected with certainty, whilst oxidation was very rapid in the open dishes, amounting in some cases to as much as half of the total in 4 days. It is concluded that in tanks in use the conflicting actions of the arsenate and arsenite formers result in the liquid being kept sufficiently constant in composition for all practical purposes. Owners of stock are therefore advised to continue using a dip unless there is strong evidence that it has altered in composition. The article concludes with a number of tables of results of analysis of tank liquor under various conditions.

PRINGAULT (E.). *Cimex pipistrelli*, **Jen., Agent de la Transmission de la Trypanosomiase des Chauves-Souris.** [*Cimex pipistrelli*, Jen., the carrier of Trypanosomiasis in Bats.]—*C.R. Soc. Biol., Paris*, lxxvi, no. 19, 5th June 1914, pp. 881–884.

The etiology of *Trypanosoma vespertilionis*, Batt., has hitherto been unknown. Ecto-parasites and CULICIDAE have been suspected as transmitters, but experiments made with *Anopheles claviger* and *Culex pipiens* gave negative results. The ecto-parasites habitually found on bats are bugs, fleas and ARGASIDAE. Gonder could discover nothing in the fleas, the lice or the ticks, and believed that *Leiognathus arcuatus* was the transmitting agent, but was unable to effect such transmission because *Leiognathus* is incapable of living more than 4 or 5 days separated from bats, and the latter died in captivity after 6 or 8 days. Nicolle and Comte considered the carrier to be either the flea or the bug, because in a large number of bats examined, both these parasites were invariably found on those which had trypanosomes in their blood. In the present investigations 19 bats were taken from one nest in which 118 parasites were found, 89 of them being bugs; examination of the crushed extract of some of these revealed the presence of numerous trypanosomes. Bats, the blood of which showed no trypanosomes after 8 days of constant examination, were regarded as healthy and used for experiment. Forty-five bugs were placed in a glass vessel with five of these bats. Their blood was examined three times a day on the first and second days and subsequently once daily. In four bats, trypanosomes were found in the blood between the 27th and 72nd hour after contact with the bugs, the remaining bat not being infected. This is regarded as proving that trypanosomiasis in bats is carried by bugs.

In a further paper by the same author it is noted that *Trypanosoma vespertilionis*, Batt., was not found to be pathogenic to mice, rats, guineapigs or rabbits.

BERESOFF (W. F.). **Die schlafenden Fliegen als Infektionsträger.** [Hibernating flies as infection carriers.]—*Centralbl. Bakt., Parasit. u. Infekt.*, 1te. Abt. Orig., lxxiv, nos. 3–4, 13th June 1914, pp. 244–250.

Detailed accounts of experiments are given from which it is concluded that not only hibernating flies, but also their dead bodies, can convey infection.

ZUPITZA (M.). **Versuche und Vorschläge zur Verbesserung von Glossinenfangmethoden.** [Experiments and suggestions for the improvement of methods of trapping *Glossina*.]—*Arch. f. Schiffs- u. Trop. Hyg., Leipzig*, xviii, no. 11, June 1914, pp. 363–375, 2 figs.

An improved form of sticky trap is described which may prove useful in tsetse control. It is quite as efficient as a butterfly net, and one man only is required to use it. The trap is donned by a native clad in a porous, washable and dark coloured protective suit, and consists of a plaited wire screen of oxydised metal, consisting of iron wire, 2 millimetres thick, with a mesh of 1 centimetre. This is smeared with a sticky material. The best shape is that of an oval tube entirely enclosing the trunk and provided with armholes, and kept in position with shoulder-straps. For work in the scrub or among bushes a closer fitting device is better. The object of the open meshes, in conjunction with the porous undersuit, is to give free passage to body emanations. The sticky substance must be tenacious and free from any odour objectionable to *Glossina*; a resinous smell does not appear to be repellent. Experiments made with traps of a purely mechanical character, either portable or easily erected, were unsatisfactory, only those *Glossina* in the immediate vicinity being caught by this method.

SAUNDERS (P. T.). **Spraying for control of ticks in Antigua.**—*West Indian Bull., Barbados*, xiv, no. 2, 24th June 1914, pp. 122–125, 1 pl.

A satisfactory spraying machine, erected at a cost of £67, in March 1913, is described. The machine has an "entrance race" and an "exit race," which have sloping sides and are 1 foot wide at the ground, widening to 3½ feet at the top, in order to prevent animals from turning round in them. The machine itself is of galvanized iron, 12 feet long and 1 foot wide at the foot boards, increasing to 3½ feet at its greatest width, and 6 feet high. The dip is administered by means of atomizing nozzles, the position of which is so contrived as to fill the interior of the machine with a cloud of spray which thoroughly soaks an animal which passes through it in a few seconds. Two men are required to work the pump, the surplus dip being used again. As each animal carries away on its skin less than $\frac{1}{2}$ gal. of dip, the cost per head is very small, about $\frac{1}{3}d$. each time, or 18*d*. per head per annum. Once the cattle have become accustomed to the machine, spraying may be performed in a very short time. On one occasion 73 cattle were effectively and completely sprayed in 7 minutes. Two or three cases only of slight scalding have occurred, due to unskilful use of the spray fluid, the worst being that of a young bull, which was inadvertently sprayed three times in five days. Up to the present no animals except cattle have been sprayed, but there does not appear to be any reason why the operation should not be extended to horses and mules. The sprayed cattle have been completely freed from ticks and their general health has much improved.

SAUNDERS (P. T.). **Notes on some Parasites of Live Stock in the West Indies.**—*West Indian Bull., Barbados*, xiv, no. 2, 24th June 1914, pp. 132–138.

This paper is a report on parasites of live stock, collected in Antigua, Montserrat, St. Kitts and St. Vincent in the summer of 1913. The ticks include *Argas persicus*, Walk., from fowls, Antigua ; *Amblyomma variegatum*, F., from cattle, Antigua ; *Boophilus australis*, Fuller, from cattle, Antigua, Montserrat, St. Kitts, Nevis and St. Vincent ; *Dermacentor nitens*, Neum., from horses, St. Kitts, Montserrat and St. Vincent ; *Rhipicephalus sanguineus*, Latr., from dogs, Antigua, Montserrat, St. Kitts and St. Vincent.

The fleas include *Ctenocephalus felis*, Bouché, from dog, Antigua and Montserrat, from cat, St. Kitts, and rats, St. Vincent ; *Xenopsylla cheopis*, Roths., from rats, St. Vincent.

The following flies are recorded : *Sarcophaga otiosa*, Will., and *S. plinthopyga*, Wied., St. Vincent ; *S. aurifinis*, Walk., St. Kitts ; *Chrysomyia macellaria*, F. (screw-worm fly), Antigua, St. Vincent ; *Musca domestica*, L., St. Kitts, Antigua, St. Vincent.

The common or "creole" cattle-tick was obtained from Antigua, Montserrat, St. Kitts, Nevis and St. Vincent, and proved to be *Boophilus* (*Margaropus*) *australis*, Fuller, and this is probably the common cattle-tick in other islands of the West Indies. Another serious pest of cattle only, in Antigua, is *Amblyomma variegatum*, F., known locally as the "gold" tick, also as the "St. Kitts tick," from which island it is supposed to have been originally introduced, though it appears, in fact, to be quite unknown there. It is more probable that it was brought to Antigua with Senegal cattle many years ago. It is also known in Guadaloupe. This tick appears in small numbers about July or in very dry seasons a little earlier, and is abundant in the autumn. *Dermacentor nitens*, Neum., attacks horses and donkeys and is generally to be found in the external ear. The common dog tick of the islands is *Rhipicephalus sanguineus*, Latr. *Argas persicus* is a common pest of fowls and in some cases renders the rearing of chickens almost impossible. These ticks are frequently so numerous that the only effective method of destroying them is to burn the fowl house.

SAUNDERS (P. T.). **Mal de Caderas.**—*West Indian Bull., Barbados*, xiv, no. 2, 24th June 1914, pp. 138–143.

In this paper a general account of this disease and its distribution is given. It is regarded as practically certain that the Capybara (*Hydrochoerus capybara*) is the natural reservoir of it. This animal is known in Spanish-speaking countries as "caprincho," and its distribution agrees very closely with that of the foci of infection. It has been observed that when there is a serious epidemic of the disease in horses, it is frequently preceded by great mortality amongst the capybaras, and whenever numbers of these animals are found dead on the banks of the rivers, an outbreak of *mal de caderas* is to be expected [see this *Review*, Ser. B, ii, pp. 109–110]. The method of transmission from these animals to horses is at present being investigated in Brazil. The first idea, that it was carried from one animal to another through the bite of leeches, has been abandoned in favour of transmission by biting flies. In British Guiana, *Stomoxys calcitrans* is suspected, but the researches of Lutz and Neiva tend to show that TABANIDAE are the more probable agents in Brazil. Several species of *Chrysops* exist in Brazil and attack horses to a considerable extent. The symptoms, diagnosis and post mortem appearances, treatment, and prophylaxis of the disease are dealt with. The latter appears to resolve itself into a campaign against capybaras or the biting flies, combined with destruction of affected animals and proper disposal of carcases. Destruction of the capybaras is not considered feasible on account of the cost and the difficulties attending it, owing to the habits of the animal, nor is there a reasonable chance of success in dealing with the biting flies. The most practical measure seems to consist in the protection of domestic animals in screened stables or by smearing them with substances obnoxious to flies.

TOWNSEND (C. H. T.). **The Conquest of Verruga. A Brief Statement of the Results of the Investigation.**—*Peru To-Day, Lima*, vi, no. 2, June 1914, pp. 57–67, 20 figs.

This paper summarises the work done on verruga [see this *Review*, Ser. B, i, pp. 163–221; ii, pp. 29, 48, 59, 144], for which neosalvarsan may prove to be a specific [see this *Review*, Ser. B, ii, p. 59]. The human body may be protected against the bites of *Phlebotomus* by sleeping under a tight muslin net, and by applying an ointment composed of oi of aniseed, eucalyptus oil. oil of terebinth, and boracic ointment. Where electricity is available, the sandflies can be kept from a room by means of powerful lights until bed-time, after which an electric fan directed full at each open window will prevent their entering houses. It should be possible entirely to eradicate *Phlebotomus* from the vicinity of habitations by clearing away all stone walls and rock piles within a radius of several hundred yards, and by obliterating cavities in the rock within that radius by filling them with cemented masonry.

DA SILVA (P.). **Notes sur le Kala-Azar.** [Notes on Kala-Azar].—*Arq. Inst. Bact. Camara Pestana, Lisbon*, iv, fasc. 2, June 1914, pp. 147-172, 3 figs., 2 pls.

The occurrence of a case of undoubted kala-azar in Lisbon in 1910 led to an enquiry into the prevalence of the disease, and since that time, up to May 1913, 9 other cases have been discovered within a small radius of the capital, all in children ranging between 9 months and 9 years of age, of which 7 died. The dogs of the city were investigated and it was found that out of 300 examined between May 1910 and March 1911, 8 were attacked; in 1912, out of 109 dogs examined 4 were found infected, an average of 3·1 per cent. Inoculation experiments were carried out for the purpose of conveying the infection from an unquestionable case of kala-azar in a dog to other dogs, 12 in all, and it was found that though not all the dogs acquired the disease, nevertheless it proved to be transmissible from dog to dog. Attempts were then made to effect the transmission of the disease by means of fleas from diseased to healthy dogs. The dejecta of the fleas were carefully examined after they had fed upon the infected animals and, in a number of cases, parasites, apparently Leishman bodies, were found. Dogs were infected with the flea excreta by injection and also by allowing fleas which had fed upon an infected animal to bite one which showed no signs of the disease. The fleas used were *Pulex irritans* and *Ctenocephalus canis*, and although the dejecta of these fleas showed the presence of what were apparently Leishman bodies, the experiments failed. The author suggests that this was possibly due to an experimentally, and not a spontaneously, infected animal being used.

WEBSTER (F. M.). **Natural Enemies of Simulium: Notes.**—*Psyche, Boston, Mass.*, xxi, no. 3, June 1914, pp. 95–99.

Some of the material described by Malloch in a previous paper (p. 167) is here discussed. In one case, the parasite mentioned, if such it really were, was a species of Nematode. It is noted that whilst the pupae of *S. pecuarum*, Riley, would not develop adults if kept in stagnant water, nevertheless eggs of this species hatched *en route* when sent from Louisiana and Arkansas to Washington; pupae packed in Spanish moss frequently developed adults *en route*. Both this species and *S. invenustum* have been observed by the author attacking cattle. It is thought that the great outbreaks of buffalo gnats, especially along the Mississippi River, were largely due to neglect of the levees. When these were repaired and kept in order the pest practically ceased, but occasionally the levees give way and overflows occur in the spring and these insects then appear in considerable numbers.

CHAMBERS (F.) & SMITH (J.). **Immunisation of Imported Cattle against Northern Rhodesian Piroplasmosis and Anaplasmosis.**—*Jl. Comp. Path. and Therap., London*, xxvii, pt. 2, June 1914, pp. 155–171, 2 figs., 6 tables.

This is an account of the work done at an inoculation station to immunise imported cattle against piroplasmosis and anaplasmosis in Northern Rhodesia. The station was situated near the Victoria Falls, and every possible precaution was taken to prevent the introduction of ticks; after a month, two gorged and two ungorged female *Boophilus decoloratus* were found, also two specimens of *Rhipicephalus evertsi*, which must have been introduced either in food stuffs or in the clothing of natives.

Cook (F. C.), Hutchison (R. H.) & Scales (F. M.). **Experiments in the Destruction of Fly Larvae in Horse Manure.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. no. 118, 14 July 1914, 26 pp., 4 pls., 7 tables.

This is an account of a series of investigations made to find a chemical that will destroy *Musca domestica* in its principal breeding place, horse manure, without injuring the bacteria or reducing the fertilising value of the manure. A brief survey of former experimental work on this subject is given and the method of these investigations described. Where possible, three properties of the chemical under examination were determined: (1) The larvicidal power, determined by the percentage of larvae killed; (2) the bactericidal power, determined by the percentage of bacteria killed; (3) the chemical effect of the substance on the manure. The method of these determinations was as follows: The manure to be examined was put into a cage consisting of a wooden framework of inside measurement 2 by 2 by 4 ft., to which 2 layers of bronzed wire screening were attached 2 in. apart. Each cage stood on legs, to isolate it from predatory insects, and was placed in a galvanized iron pan, into which excess liquids drained, through holes in the bottom of the cage, any chance larvae that fell through these being counted. The top of the cage was a tightly fitting wooden door, with openings over which cone-shaped fly traps were fitted; there was a small trap-door on one side of the cage, through which samples of manure could be taken. In most experiments 8 bushels of manure were put in at the top of the cage, 10 gallons of the chemical solution were sprinkled on the manure in 3 layers; when a dry chemical was used it was scattered over the surface of the manure in 3 layers, 10 gallons of water being then added. The manure in the control cages was sprinkled with 10 gallons water, to make the moisture content of all samples as nearly as possible the same. After sprinkling, the cage doors were closed, the fly-traps put in place and when the flies began to emerge, the whole cage, except the entrance to the fly trap, was darkened. The flies caught in the traps were chloroformed and counted daily, the difference between the numbers of flies from a cage of treated manure and from a control cage is taken as an index of the larvicidal effectiveness of the chemical; bacterial and chemical analyses were made of samples taken from the treated and untreated manure; special precautions were taken to obtain uniform samples, but no small samples can be taken that will be truly representative. A parallel series of experiments, simulating natural conditions, was carried out by treating manure piles on the ground. In this way 24 different chemicals were tried at various concentrations; only 7 showed any effective larvicidal action in the strengths used and borax seems to be the most economical, practical and effective of them all. The experimental results are briefly as follows:—Kerosene emulsion, no appreciable larvicidal action and useless on a large scale; kainite, no larvicidal power, in an open pile experiment the bacterial count was 17·5 against 5·9 in the control, indicating a stimulating action of the compound on the bacteria, chemical analyses showed an increased amount of ammonia and the possible production of nitrates and nitrites; pyroligneous acid, little if any repellent or larvicidal power; Isthmian Canal Commission's larvicide, viz., 150 gallons carbolic acid, 150 lb. broken resin and 30 lb. caustic soda, is a good mosquito larvicide but is ineffective against house-fly larvae; iron sulphate, unsatisfactory, larvicidal power probably low; sodium chloride, at the rate of 2½ lb. per gallon, killed 55 per cent. larvae, and somewhat reduced the number of bacteria; copper sulphate, 1 lb. per gallon, killed 67 per cent. of the larvae, bactericidal power strong and injured the manure chemically, reducing the amount of soluble nitrogen; lime-sulphur, no larvicidal or bactericidal power; potassium cyanide, high larvicidal power, solutions of ·1 and ·02 per cent. strengths, killed 93 per cent. larvae, bactericidal action stimulating and no injurious chemical effects, but its poisonous nature minimises its practical value; Paris green, used in suspension, killed 70–90 per cent. larvae, the strong solutions were highly bactericidal, killing 50 per cent. bacteria, the weaker solutions were stimulating, like potassium cyanide; formaldehyde, larvicidal power high, killed from 75–85 per cent. larvae, bactericidal power high, chemically it increases the production of nitrates and ammonia; sodium fluoride, high larvicidal power, destroyed from 84–90 per cent. larvae, but the cost (about 1*s*. per lb.) may prohibit its general use; ammoniacal gas liquor, some larvicidal power, but also strongly bactericidal and the liquid form is not practically convenient; calcium cyanamide, used dry, a 20 lb. application killed over 99 per cent. larvae, average larvicidal power 58 per cent.; this substance is expensive, 1¾*d*. per lb., but its fertilising power as a means of adding nitrogen to the soil may make it valuable; borax, including sodium borate and calcined "colemanite" or crude calcium borate, had a marked larvicidal action and exerted no permanent injury on the bacteria, nearly all trials showed a larvicidal power of over 99 per cent.; the borax not only kills the larvae but also exerts a toxic effect on the eggs, which calcined colemanite did not. The minimum amounts of borax and calcined colemanite which are effective are ·62 lb. borax and ·75 lb. calcined colemanite to 8 bushels of manure in 2 or 3 gallons of water. In applying the borax sift it round the outer edges of the manure heap and then sprinkle 2 or 3 gallons of water over it; it should be applied to perfectly fresh manure, because it is in that that the flies lay their eggs. Borax may be applied in the same proportion to other manures, as well as to refuse and garbage, also to floors, crevices and street sweepings, and water should also be added. It is recommended that not more than 15 tons per acre of borax-treated manure should be applied to the field, because its effect has only been studied on a few crops; large amounts of borax are injurious to the growth of plants, and its cumulative effect has not been determined.

GAVER (F. van) & PRINGAULT (E.). **Contribution à l'étude des Culicidés de la region marseillaise.** [Contribution to the study of CULICIDAE in the neighbourhood of Marseilles.]—*C. R. Soc. Biol., Paris,* lxxvii, no. 26, 24th July 1914, pp. 401–402.

The author has investigated the Culicid fauna of the neighbourhood of Marseilles, chiefly by rearing out the larvae. The work was begun at the end of April, but was constantly interrupted by sudden falls of temperature, which killed large numbers of the larvae collected.

The species obtained were as follows in the order of frequency :—*Theobaldia annulata*, Schrank, *Culex pipiens*, L., *Anopheles maculipennis*, Meig., and *Culex lateralis*, Meig.

The largest number of larvae were found in the pools which were best protected from the wind, and which were well exposed to the sun during a large portion of the day ; they generally contained quantities of vegetable debris. *Anopheles* were specially abundant in these places, and it was only later that they were found in other pools of clear water containing growing plants. In the course of rearing the larvae it was found that the nymphs of *Anopheles* cannot withstand dirty water. although they appear to be very vigorous in the stagnant water of the pools in which they were collected ; the nymphs died off regularly and no adults were reared until the larvae were transferred to pure water. At first 15 to 20 males emerged for every female. As the work proceeded the number of females increased, but it was always less than that of the males.

This *Anopheles* was found by Langeron in Brittany and is also very common in the district of the Dombes, about Lyons, in the neighbourhood of Grenoble and in the Haute-Saône. The zone surrounding the Prado, which was especially searched, and is still very rich in *Anopheles*, was at one time reputed malarious. This is the first time that *Culex lateralis* has been found in France, although well known in other parts of Europe. In 1908, Aubert and Guerin found an adult *Stegomyia fasciata* in the park of the Château du Pharo, and one of the authors found another individual near the Préfecture, but does not feel justified in offering any hypothesis as to its origin.

A full list of Culicidae found will be shortly published.

Ticks and Lamziekte.—*Agric. Jl. Union S. Africa, Pretoria,* viii, no. 1, July 1914, pp. 1–3.

In this editorial note attention is drawn to the belief of many farmers in South Africa that lamziekte is due to ticks and that blue-ticks can penetrate through the ear into the brain of the animal. It is asserted that the disease is unknown except during the tick season, and a large amount of correspondence has taken place in the local papers on the subject. This theory is completely contradicted by the fact that over large areas where cattle dipping against the ticks has been vigorously carried out and ticks, to all intents and purposes, completely eradicated, lamziekte still exists and the farmers in such districts are perfectly aware that dipping has not the slightest effect upon the disease. The belief to the contrary is probably largely supported by the fact that the larval and nymphal stages of the red tick are passed deep in the ear. Sir A. Theiler, two or three years ago, found at Vryburg a specimen of *Ornithodorus megnini* on a cow suffering from lamziekte. This species, the " spinose ear tick " of America, was probably imported with Texas cattle after the war, as it is now known in many parts of South Africa. Though this tick also passes its larval and nymphal stages deep in the ear, and is undoubtedly very troublesome to cattle, it can have no connection with lamziekte, which is very prevalent where these ticks do not occur. The passage of a tick from the outer ear to the brain of an animal is a physical impossibility, and the view that ticks are the carriers or transmitters of this disease is not supported by facts.

Williams (C.). **The Control of Fluid in Cattle Dipping Tanks.**—*Agric. Jl. Union S. Africa, Pretoria*, viii, no. 1, July 1914, pp. 12-17.

In this paper the results of a number of analyses of tank fluids are given, with the object of showing the effect of temperature upon the dip and the oxidation of the arsenite it contains to arsenate [see above, p. 172]. There appears to be no doubt that this process takes place more rapidly in summer than in winter, but at the same time very little use was being made of these tanks during the winter, and, as it has already been shown that the constant use of a tank promotes the efficiency of the dip, the question of summer oxidation is probably not of great consequence. It is again pointed out that samples of dip kept in the laboratory undergo change very much more rapidly than the same fluids in tanks in use, and it is stated that the result of the analyses for farmers of tank liquor, during the past three or four years in the province of Natal, shows that in very few cases had the oxidation of arsenite to arsenate been at all serious. Dr. W. Pitchford maintains that any arsenate which may be produced in a tank by means of oxidation is relatively harmless to ticks and to the skins of the animals. Cooper and Laws [see this *Review*, Ser. B, i, pp. 133, 152–153 and 214–215] have practically established the fact that arsenate has only half the tick-killing property of arsenite, and in any case it is important that the quantity of arsenate present in the tank liquor should be more or less accurately known so as to keep the tank in efficient working order. The results of the addition of disinfectants to tank liquor in arresting oxidation have been investigated, and are briefly as follows:—Ten parts of sodium sulphite in 2,000 of dip had very little effect in arresting the oxidation, and one part each of carbolic acid and of common commercial coal tar disinfectant were also quite ineffective, but when the proportion was raised to 10 parts each in 2,000, oxidation was very largely arrested. As these results were obtained under laboratory conditions, in which oxidation has been shown to be much more rapid than in the tank itself, it is probable that a much smaller proportion in the tank would have an important effect, and it is suggested that the addition of a gallon or two of some of the ordinary coal tar disinfectant products now on the market to every thousand gallons of tank liquid would very materially reduce, if not entirely arrest, oxidation of arsenite to arsenate in the tank itself.

Many of the proprietary arsenical cattle dips at present on the market are said to be very efficient, but the farmers in South Africa generally prefer the use of arsenite of soda, either alone or in conjunction with paraffin or soft soap, forming what is known as the "Laboratory Dip." Although much of the arsenite of soda sold in South Africa for dipping purposes is well up to standard, in some instances it is very much below, and contains a varying proportion of arsenic oxide. The need of periodical analysis of dipping fluids and tank liquors is emphasised.

Lounsbury (C. P.). **Warble Flies: a Danger with Imported Cattle.**—*Agric. Jl. Union S. Africa, Pretoria*, viii, no. 1, July 1914, pp. 61–64, 1 fig.

There is no known record of warble flies being bred anywhere in

South Africa, and it is therefore a matter of great importance that any warbles in imported cattle should be destroyed. The present state of our knowledge of the mode of attack of *Hypoderma lineatum* and *H. bovis* is briefly set out, and the ordinary methods of treatment are given. It is stated that last year an apparently warbled hide was sent to the Department of Agriculture, and the fact was confirmed by an eminent British authority. This hide was said to have been purchased and tanned in South Africa, but the author thinks that it is more than probable that it came from an imported animal, and not from one bred and reared in South Africa.

MICHNIN (A. J.). **Паразиты домашнихъ птицъ и борьба съ ними.** [Parasites of domestic birds and the fight against them.]—**«Садъ, Огородъ и Бахча.»** [*Orchard, Market-Garden and Bachza*], *Astrachan*, no. 7, July 1914, p. 479.

This article deals generally with the parasites of poultry, particularly with the mite which attacks the legs of the birds, producing the so-called "scaly leg." This minute parasite bores in the epidermis, mostly between the toes and under the claws, but also spreads over the plumage. At the beginning of the disease small scales of a greyish colour are noticed on the legs of the birds, the scales gradually changing into yellowish grey crusts, and the legs appear as if covered by a coat of lime; the birds become lame, death resulting from exhaustion. The remedy consists in softening the crusts with glycerine or soft soap, and brushing them off and rubbing in afterwards an ointment made of sublimed sulphur, 15 parts, prepared chalk, 7 parts, and lard, 60 parts. Smearing with tar or with a mixture of kerosene and linseed oil in equal parts is also recommended. All woodwork in poultry houses should be smeared with a 5 per cent. solution of carbolic acid, and the floor, walls, etc., washed with milk of lime, containing one tablespoonful of creolin in every quart.

JAMES (Major S. P.). **Summary of a year's mosquito work in Colombo,** —*Indian Jl. Med. Research, Calcutta*, ii, no. 1, July 1914. pp. 227–267.

This is a summary of a Mosquito Survey of Colombo conducted in 1913. The mosquitos in that city may be divided into five broad groups, of which the two first may be classed as urban, the three last as rural: (1) Strictly household species, (2) other urban species, (3) strictly sylvan species, (4) migratory species, (5) species with peculiar habits. It has been proved, in Colombo, that the mosquitos of groups 1 and 2 can, by strictly local measures, be reduced to a number that is practically negligible, but that mosquitos of group 4 will continue to be troublesome in the town at certain seasons, however thoroughly measures confined to the town itself are carried out. Traps should prove of real value in dealing with these migratory species, as it appears that in Colombo about ten million mosquitos might be caught daily by this means, and this would be more effective than the destruction of a thousand million larvae. Against these migratory species anti-larval methods are not at present recommended for Colombo, except when required for purposes of investigation. It was the rule to investigate thoroughly each house and compound in the selected area before beginning to take measures for abolishing breeding places. After completing that preliminary enquiry, the overseer and his coolies begin measures with a "sanitary clean up" inside the house, then they deal with the roof-gutters and cisterns, then with the verandah, kitchen, out-houses and go-downs, and lastly with the compound. Much better results are obtained when the staff allotted to an area is changed once a month than when the same overseers and coolies are kept there permanently. In addition to the check exercised by the system of frequent inspection daily, "independent investigations" afforded a valuable means of ascertaining the correctness of the records made by the regular workers. Whenever possible, the water in a breeding place was got rid of and when, as in roadside gullies and catchpits, this could not be completely done, as much water as possible was removed before applying the larvicide, thus reducing expense and increasing efficiency. A mixture of crude oil and kerosene was first used, but was discarded, as larvae can remain alive at the bottom of a collection of water for 30 minutes at least, by which time the film of oil has usually become discontinuous. Various preparations of phenol were substituted, commercial cyllin being the most largely used. In practice, a stronger solution than experimentally proved necessary was used, enough cyllin being taken to make the water remain quite milky after it had been well stirred with a stick. This was a rule which the coolies easily understood and followed. For water storage cisterns, carbolic acid was found preferable to oil, its action being more certain. "Trap breeding places" provided a valuable supplementary measure and were a means of preventing the adult insects from seeking out inaccessible breeding places. They consisted of earthenware pots half-filled with water, and were removed on every sixth day, their place being taken by a duplicate set. After examination, the trap-pots were well dried in the sun for five days before being used again.

The traps mentioned in connection with the migratory mosquitos, consisted of a rectangular wood framework 5 feet long, 3 feet deep and 3 feet broad, closed with mosquito netting, one end of the trap being a door on hinges. They were placed on the ground in a shaded corner of a garden, a covering of sacking and thick tarpaulin rendering the interior dark and cool. Two or three pots of plants were placed inside each trap and several near the partly open door. The traps were set overnight, and in the morning about 8 or 9 o'clock the vegetation in their vicinity was disturbed as much as possible and straw and paper torches were burnt in all the surrounding out-houses and buildings so as to drive the mosquitos out into the open air. They soon found their way into the cool resting places provided by the traps, the doors of which were closed half an hour after the disturbance of the vegetation, and the insects were either killed by placing the traps in strong sunlight for an hour or two or collected one by one in test-tubes by a boy who entered the traps for the purpose. No sulphur or other strong smelling substance was used to kill them, as the traps might have been thus rendered unattractive.

The mosquitos of Colombo comprise 53 different species, of which no fewer than 17 are either dangerous or so numerous as to be a pest. A tabular statement is given of the places in which the common species breed. The staff for the survey campaign consisted of the author, his two assistants, one sanitary inspector, one sub-inspector, 12 overseers, and a varying number of coolies up to 50 in all, 24 being permanent trained men. The anti-mosquito campaign recommended for Colombo should be based upon an enactment making the householder and owner of property responsible for preventing the breeding of mosquitos on his premises.

PATTON (Major W. S.). **The occurrence of *Stygeromyia maculosa* in Madras, together with some observations on its habits.**—*Indian Jl. Med. Research, Calcutta,* ii, no. 1, July 1914, pp. 349–351, 4 figs., 1 pl.

A series of *Stygeromyia maculosa* was taken on a cow at Guindy, Madras, and both sexes are figured and described, the female for the first time. This fly is crepuscular in its habits, and all the specimens were caught at dusk. It is difficult to recognise, and easily escapes observation. It bites chiefly on the inner side of the legs, and when feeding or at rest the wings overlie each other as in *Glossina.* It is oviparous, and the egg and larva closely resemble those of *Stomoxys.*

PATTON (Major W.S.). **The behaviour of the parasite of the Indian Kala-azar in the dog flea, *Ctenocephalus felis*, Bouché, with some remarks on canine Kala-azar and its relation to the human disease.** —*Indian Jl. Med. Research, Calcutta,* ii, no. 1, July 1914, pp. 399–403.

The parasite of Indian kala-azar does not develop in the Madras dog flea, *Ctenocephalus felis*, but degenerates and disappears in eight hours. This, together with the fact that the dog has not been found infected with kala-azar, or at least with herpetomoniasis, in India, strongly supports the view that human kala-azar is not of canine origin. The human flea, *Pulex irritans*, has not been found in Madras. Assuming that the parasites of Indian and Mediterranean kala-azar are identical, it is difficult to understand why the one does not develop in the flea while the other does. The fact that the dog may be infected with *Herpetomonas ctenocephali* suggests that the so-called canine kala-azar may have nothing to do with the human disease and that its association with it is a coincidence. There is at present no proof that either *Ctenocephalus canis* or *Pulex irritans* transmit the parasite of human kala-azar from dog to man and man to dog, and the hypothesis advanced by Nicolle and supported by Basile and others appears to be based on very slender evidence.

MACKIE (Capt. F. P.). **A flagellate infection of sand-flies.**—*Indian Jl. Med. Research, Calcutta,* ii, no. 1, July 1914, pp. 377–379, 1 pl.

In the course of kala-azar investigations, 10 per cent. of the females of *Phlebotomus minutus* were found to be infected with a flagellate of the genus *Herpetomonas*, probably a natural parasite of the fly and not likely to have any relation to the occasional habit of *Phlebotomus* as a human blood-sucker. Howlett's statement that the natural host of *P. minutus* is probably the common wall lizard is confirmed. The flagellate does not appear to have been previously described, and the name of *Herpetomonas phlebotomi*, sp. n., is suggested for it

Carpenter (G. H.). **Injurious Insects and other Animals observed in Ireland during the year 1913.**—*Econ. Proc. R. Dublin Soc., Dublin,* ii, no. 9, July 1914, pp. 142–160, 8 figs., 1 pl.

In the course of his report for 1913 [see this *Review*, Ser. A, ii, pp. 655–656] the author refers to a case of the ox warble-fly (*Hypoderma bovis*, De Geer) in a horse, he having received in May, from Monkstown, Co. Dublin, a mature (fourth-stage) warble maggot, which had been extracted from the back of a thoroughbred mare. The larva agreed exactly with the corresponding stage of *H. bovis*, and it has lately been found that the distinctive characters of the larvae of *H. bovis* and *H. lineatum*, Vill., are confirmed by rearing the flies. There seems no doubt that the horse warble-maggot now recorded, had developed from an egg laid by *H. bovis*, and further observations on these parasites in horses would be welcome.

Bruce (Surgeon-General Sir D.), Hamerton (Major A. E.), Watson (Captain D. P.) & Bruce (Lady). *Glossina brevipalpis* **as a carrier of Trypanosome Disease in Nyasaland.**—*Proc. R. Soc., London,* B, lxxxviii, no. 600, 6th Aug. 1914, pp. 20–32, 1 pl.

An account is given of the habits of *Glossina brevipalpis* in Nyasaland and of the results of transmission experiments to ascertain its capacity for infecting man and animals with trypanosomes. This fly was found frequenting the roads in a small area of country at the mouth of the Lingadzi river on the west shore of Lake Nyasa. It is crepuscular in its habits, but was not found at dawn, and does not follow or settle upon passers-by, nor would it attack a dog which was repeatedly walked through its haunts in the evening. In the dim light these flies are not easy to see, but attract the searcher's attention by the sound of their buzzing as they are disturbed by his footsteps. They do not fly about in search of food, and only seem to move to settle again in the middle of the path. Out of the 500 flies caught and examined on the spot all were males, and of many thousands brought to the Laboratory only four were females. It is suggested that the females remain hidden in the dense bush and do not come into the open like the males.

Flies in captivity feed at any time if a goat or dog be applied to the sides of the cage, but are normally dormant by day and active at night. Of 50 flies dissected, seven contained mammalian blood. Dissections of wild flies showed that they were infected with *T. brucei* vel *rhodesiense*, *T. pecorum*, *T. simiae* and *T. grayi*, and experiments showed that this species is capable of acting as a carrier of *T. brucei* vel *rhodesiense*, *T. brucei* (Zululand strain, 1913), *T. pecorum* and possibly *T. caprae*.

——. **Trypanosome Diseases of Domestic Animals in Nyasaland. III.** *Trypanosoma pecorum*; **development in** *Glossina morsitans*.—*Proc. R. Soc., London,* B, lxxxviii, no. 600, 6th Aug. 1914, pp. 33–37, 1 pl.

Trypanosoma pecorum is capable of passing through a cycle of development in *G. morsitans*, the flies becoming infective some twenty days after feeding on an infected animal. Development, as in

T. simiae, takes place at first in the gut, afterwards passing forward into the labial cavity and finally into the hypopharynx. The final stage of development occurs only in the hypopharynx, where the trypanosomes revert to the "blood form" and flies become infective.

BRUCE (Surgeon-General Sir D.), HAMERTON (Major A. E.), WATSON (Captain D. P.) & BRUCE (Lady). **Trypanosomes found in Wild *Glossina morsitans* and Wild Game in the "Fly Belt" of the Upper Shiré Valley.**—*Ibidem*, pp. 38–41.

The trypanosomes found in wild *Glossina morsitans* and wild game of the Upper Shiré fly area are identical with those found 100 miles farther north in the Proclaimed Area. The trypanosome causing disease in man in Nyasaland (*T. brucei* vel *rhodesiense*) is frequently met with, so that it is probable that cases of this form of sleeping sickness will be found among natives of this district.

——. **The Food of *Glossina morsitans*.**—*Ibidem*, pp. 41–42.

The food of *Glossina morsitans* consists mainly of mammalian blood (99 per cent.), chiefly from species of antelope, and what appeared to be avian blood (1 per cent.) There is no difference in the feeding habits of the sexes. The flies probably feed once in five or six days.

——. **Infectivity of *Glossina morsitans* in Nyasaland during 1912 and 1913.**—*Ibidem*, pp. 43–48.

This paper gives a rough standard of the proportion of infected to non-infected tsetse-flies in an ordinary fly area where wild game abounds. In 1912, 6·53 per cent. of the *G. morsitans* found in the "Proclaimed" or Sleeping-sickness area, Nyasaland, were infected with pathogenic trypanosomes; in 1913, 8·58 per cent.

ALCOCK (Lt. Col. A.). **The Haemaproteus of the Indian Pigeon.**—*Nature, London*, xciii, no. 2336, 6th August 1914, p. 584.

This letter gives some notes on the *Haemaproteus* of the Indian pigeon. These birds have been found to be heavily infested both with this blood parasite and with *Lynchia*, and it is stated that there is strong evidence that the praeter-vertebrate life-history of the *Haemaproteus* of the Indian pigeon agrees with that discovered by Ross for the *Proteosoma* of the Indian sparrow and for the malaria parasite, the intermediary in the case of the *Haemaproteus* being a Hippoboscid fly of the genus *Lynchia*.

TOWNSEND (C. H. T.). **The Relation between Lizards and *Phlebotomus verrucarum* as indicating the Reservoir of Verruga.**—*Science, New York*, xl, no. 1023, 7th Aug. 1914, pp. 212–214.

Further facts bearing on the relations between *Phlebotomus* and lizards or other reptiles are recorded. Blood smears made from small rock lizards of several species from various localities in Peru showed rod and granule bodies exhibiting the identical morphology of the *Bartonia* bodies associated with verruga. The localities where the lizards were taken were well within the verruga zone with the exception of one, Chosica Canyon, just outside it. Guineapigs injected with the blood of lizards which were infected died with typical verruga symptoms. It would therefore appear that lizards and such reptiles act as a reservoir for the virus of verruga, and that an intermediate host is not required, *Phlebotomus* being merely a mechanical carrier and not a true alternative host of the organism. It remains yet to be proved whether reptiles are the sole reservoir of the virus or whether mammals may also carry it, though the author rather inclines to the former view.

KNAB (F.). **A Review of our species of *Trigonometopus* (Diptera; Lauxaniidae).**—*Psyche, Boston, Mass.*, xxi, no. 4, August 1914, pp. 123–126.

Two species of *Trigonometopus*, viz. :—*T. augustipennis*, sp. n., from Guadeloupe, West Indies, and *T. albifrons*, sp. n., from Nicaragua and Guatemala are described. Another specimen from Biscayne, Florida, is identified as *T. vittatus*, L.

LUDLOW (C. S.). **A New Anopheline.**—*Psyche. Boston. Mass.*, xxi no. 4, August 1914, pp. 129–130.

Anopheles (*Myzomyia*) *parangensis*, sp. n., is described from specimens taken in October and November from Parang, Mindanao, Philippine Islands.

CHALMERS (A. T.) & O'FARREL (Capt. W. R.). **Sleeping Sickness in the Lado of the Anglo-Egyptian Sudan.**—*Jl. Trop. Med. and Hyg., London,* xvii, no. 18, 18th Sept. 1914, pp. 272–284, 1 map. 8 tables.

This is a first of a proposed series of short notes on sleeping sickness in various parts of the Anglo-Egyptian Sudan. The history of the discovery of the trypanosomes of sleeping sickness and of the disease itself in the Belgian Congo and Uganda, countries adjoining the Lado, is reviewed. The presence of the disease has been recognised in the Lado since 1908, and in 1910 it had extended northwards along the River Yei and westwards along the River Tone. In 1911, an entomological survey of the Lado made by H. H. King showed that *Glossina palpalis* was to be found in every suitable place in the district, and the distribution of this species and of *G. morsitans* in this region was then mapped. Further investigations have led to the conclusion that there are two main areas of infection in the Mongalla Province : a western, centred around Yei, and an eastern, adjoining Kajo-Kaji. These seem to have arisen from two distinct sources of infection, the western from the Belgian Congo and the eastern from Uganda.

In 1913, experimental work was carried out in Khartoum on a strain of trypanosomes obtained from animals inoculated from sleeping sickness patients at Yei and temporarily called the Yei trypanosome. Examination of this form and comparisons of it with *T. rhodesiense*, *T. nigeriense*, *T. gambiense*, Congo and Uganda strains, leads to the conclusion that the Yei strain and the Congo strain are the same and that in all probability they and the Uganda strains are also the same. Since the determination of *T. gambiense*, Dutton, (1902) is still so problematical, the authors prefer to keep the name *T. castellanii*, Kruse, (1903) for these three similar strains. In conclusion the following divisions for the forms of sleeping sickness of

Africa is suggested: (*a*) Southern sleeping sickness, caused by *T. rhodesiense*, Stephens and Fantham (1910), and spread by *Glossina morsitans*, Westw.; (*b*) equatorial sleeping sickness, caused by *T. castellanii*, Kruse, and spread by *G. palpalis*, Rob.-Desv.; (*c*) northern sleeping sickness, which may be caused by as yet imperfectly known trypanosomes, including *T. gambiense*, Dutton, *T. nigeriense*, Scott-Macfie (1913), and perhaps also by other forms not yet known.

Bruce (Sir D.), Hamerton (A. E.), Watson (D. P.) & Bruce (Lady). **The Trypanosome causing Disease in Man in Nyasaland. Part IV. Experiments on Immunity.**—*Proc. R. Soc., London*, B, lxxxviii, no. 602, Sept. 1914, pp. 190–226.

An account is given of experiments made to discover whether the naturally infected dog strain of *Trypanosoma brucei* vel *rhodesiense* would protect against the other strains, which have been described in previous papers. The experiments were one-sided and incomplete, owing to lack of material, but they have, the authors believe, proved that (1) the naturally infected dog strain does not immunise animals against the human, wild *Glossina morsitans*, and Zululand, 1913, strains; (2) the wild *G. morsitans* strain and the naturally infected dog strain do not protect animals from the human or the Zululand, 1913, strain; (3) the wild *G. morsitans* strain does not protect against the human strain.

In spite of this evidence to the contrary, it is still considered by the authors that the naturally infected dog strain is a weak strain of *T. brucei* vel *rhodesiense.*

Ward (W. F.). **Effects of tick eradication on the cattle industry of the South.**—*U.S. Dept. Agric., Bur. Anim. Indust., Washington, D.C.*, 1914, 26 pp., 8 figs.

This popular publication details the recent improved condition of the cattle in the tick-free areas of the Southern States. An instance of the beneficial effect of tick-eradication is furnished by the city of Jackson, Tenn., and the territory surrounding it, where losses in cattle have fallen from an average of £1,300 per annum to about £20. Here, as in the other districts mentioned, attention is also drawn to the higher prices now obtainable for cattle.

Ross (P. H.) & Pirie (J. H. H.). **The transmission of trypansomes by** *Glossina longipennis.*—*Nairobi Laboratory Report for January–June* 1913, *Nairobi* iv, pt 1,1914, pp. 7–11; July–December 1913, iv, pt. 2, 1914, pp. 1–4.

It was noted in the report for the latter half of 1912 that a trypanosome conveyed by *Glossina longipennis* had been found. Experiments have now been made as to the animal reactions of this trypanosome and the possibility of transmitting it by *Glossina longipennis* under laboratory conditions. The result of the inoculation experiments was peculiar, in that for a time after high infection they appeared to fail entirely, but on being persisted in the same intensive infection was obtained as at first. Attempts to convey the trypanosome from an infected to a sound monkey by *Glossina longipennis* kept in the incubator at 25° C. (76° F.) apparently failed, and, although the temperature of the experimental animals rose, no trypanosomes could be found in the blood.

Dr. J. H. Harvey Pirie completes the account of the inoculation experiments reported above, but it was not possible to carry out proper transmission experiments with laboratory bred flies owing to the difficulty of obtaining live pupae. A quantity collected at Kibwezi failed to hatch.

Low (Dr. R. Bruce). **Report on the Progress and Diffusion of Plague and Yellow Fever throughout the World during the two years 1911 and 1912.**—*42nd Ann. Rept. Local Govt. Bd. 1912–13; Supplement containing the Report of the Medical Officer, London,* 1914, [Cd. 7181], Appendix A, no. 1, pp. 1–88 and no. 3, pp. 148–170.

In the division of this report dealing with plague, Dr. Bruce Low quotes Captain Justice, the Sanitary Commissioner, to the effect that in the Madras Presidency plague is almost entirely confined to the higher levels, which suggests that the cooler temperature of these levels and the higher rat flea prevalence thereby favoured has something to do with the existence of the disease. In Madras itself, which is a hot place, rat fleas can nevertheless live for a considerable time in the cooler months, as it is a known fact that in a cool atmosphere fleas will live 10 times as long as in hot dry weather. In the Central Provinces and Behar, the diminished activity of the infection during the second half of the year 1912 is attributed to the comparatively slight infestation of the local rats by fleas, the prolonged hot weather, and the delayed monsoon having been unfavourable to the multiplication of fleas. In the Federated Malay States, at Kuala Lumpur, between November 1911 and April 1912, 591 rats were examined for plague; 75 were found to be infected, of which 46 were taken in in December 1911. Most of those caught were *Mus rattus griseiventer*, Bonhote, which is essentially a house rat, but the numbers of which are kept down by the musk-shrew, which is common in the district. Almost the only flea found on the local rats was *Xenopsylla cheopis*, Roths. In Shanghai, a preventive measure of considerable value was the provision of rat-proof house-refuse receptacles on Chinese property. This resulted in a marked improvement in cleanliness and the rats being deprived of one of their chief sources of food ceased to infest the premises.

In the report on yellow fever, it is stated that cases have been brought to England and that in spite of all that has been done in Central America to suppress *Stegomyia fasciata*, the opening of the Panama Canal may afford fresh opportunities for the spread of this disease. In Rio de Janeiro, in 1913, cases of yellow fever occurred in the suburbs and there was a great increase in the number of mosquitos infesting the houses, owing to the disorganisation of the anti-mosquito brigade.

Owing to an imported case of yellow fever at Honolulu, in October 1911, 150,000 banana trees were cut down in the belief that *Stegomyia* breeds in the water which stands between the leaves and the stalk, and it was feared that the native *Stegomyia* might become infected. No further cases occurred. Reference is made also to cases of yellow fever on the Gold Coast in 1911 and the anti-mosquito measures adopted, but in March 1913, Lady Clifford, the wife of the Governor, his aide-camp and five natives were attacked by the disease. Three cases of yellow fever amongst Europeans occurred in May 1912 near Abomey in Dahomey, and a number of other suspicious cases both amongst Europeans and natives having occurred, stringent measures were taken for the destruction of mosquitos.

STRICKLAND (C.). **The Biology of** *Ceratophyllus fasciatus*, **Bosc., the Common Rat-Flea of Great Britain.**—*42nd Ann. Rept. Local Govt. Bd., 1912–13; Supplement containing the Report of the Medical Officer*, [Cd. 7181], Appendix B., no. 5, pp. 401–412.

This paper deals with the life-cycle of the rat flea and the conditions which influence the duration of the various stages of its life. In the conclusions given, the word "rubbish" is to be understood to mean refuse from rat cages consisting mainly of dried grain, excreta, gravel, straw, etc., which was found to be a good material for facilitating the breeding of larvae. The duration of the various stages is very variable even under the same conditions, temperature and humidity having the most influence. On an average, the egg hatches in 5–14 days, an increase of humidity having a retarding, and a moderately high temperature a slight accelerating effect. The larva is soon killed by a high temperature (70° F.) combined with a low degree of humidity (40 per cent.) However, under these conditions, the larvae will live longer if rubbish be present, for they are then able to bury themselves in it and thus obtain a certain amount of moisture. The pupal stage is much prolonged by cold, partly due to the non-emergence of the imago even when it is fully formed. The imago, at least when unfed, dies much more quickly in summer than in winter. Eggs are laid by the imago even at comparatively low temperatures (50° F.). The larvae and imagines like to bury themselves in rubbish, and in these circumstances their duration of life is much prolonged, even when other external conditions are somewhat severe. When sexually mature the imago frequently lives at least two months, but will not copulate unless it obtains rat's blood. It feeds readily on man and many other animals, but will not copulate after feeding on these facultative hosts, even though at least one of them—man—seems to be more attractive to it than its normal host, the rat. Oviposition invariably takes place within 24 hours of copulation, even when the insect has only been fed once after being starved for a period of many weeks. The rat's blood, therefore, probably contains some substance that possesses a stimulating effect on the flea's sexual organs. When starved, the imago will live for a very long time—at least 17 months—but only in the presence of rubbish in which it can bury itself. In the absence of rubbish the flea will only live for about a month, even under the most favourable conditions of temperature and humidity. It is therefore clear that the presence of rubbish containing organic matter is essential for the development of the flea.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

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THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

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Cook Young (Major A. W.). **The Prevalence of Flies in Delhi and their reduction.**—*Proc. Third All-India Sanitary Conf., Lucknow*, January 19th–27th, 1914, ii, pp. 141–147, Suppmt. to *Ind. Jl. Med. Research.* [Received 6th November 1914.]

The prevalence of flies in Delhi is a very marked feature in the insanitary condition of the city and it has been necessary to organise a campaign against them. More efficient removal of filth and refuse apparently had very little effect. Old heaps of rubbish were burned and the number of dumping grounds reduced. On the top of new rubbish not less than one foot of earth was deposited and it was found that where this was done the flies ceased to breed, especially when a system of trenching was used and the earth well rammed on the top. Nevertheless the nuisance was not very materially diminished and it was not until house to house inspection and individual cleansing and disinfection was thoroughly carried out that the plague was diminished. Stables and cow-sheds, which are very numerous in the city, were found to be the chief breeding places and these were specially dealt with. Manure for garden or agricultural purposes was not allowed to be stacked in any compound for more than 4 days. It was then directed to be dug into the ground and to be covered with not less than 1 foot of earth.

Food shops of all kinds were also greatly infested and provision of proper dust-bins and thorough inspection and cleansing proved useful. As the result of these and other measures, the reduction of flies has been steady, with the exception of one or two breaks. The first of these corresponded with the cessation of rain for about 10 days in June and the second from 15th to 25th October. This corresponds with the Dewali festival which is the "annual spring cleaning" of all the Hindoo houses in the city and an outbreak which occurred about 10 days later would seem to indicate that the flies had hatched out from eggs deposited in the rubbish cleared out of the houses during that festival. The result of the campaign has so far been satisfactory, but improved methods and still greater strictness in carrying out the administrative measures required are strongly urged.

De Mello (Froilano). **Contribution to the Study of Malaria in Gôa.**—*Proc. Third All-India Sanitary Conf., Lucknow*, January 19th–27th, 1914, iv, pp. 1–14, Suppmt. to *Ind. Jl. Med. Research.* [Received 6th November 1914.]

Malaria is endemic in Gôa. In Nova-Gôa, the commonest mosquito is *Anopheles* (*Nyssomyzomyia*) *rossi*; *Anopheles* (*Neocellia*) *stephensi* occurs, but is rare. There are large numbers of *Stegomyia*, *Culex fatigans*, *impellens* and *cynereus* [*sic*].

Marjoribanks (Major J. L.). **Report on Certain Features of Malaria in the island of Salsette.**—*Proc. Third All-India Sanitary Conf., Lucknow*, January 19th–27th, 1914, iv, pp. 23–51, Suppmt. to *Ind. Jl. Med. Research.* [Received 6th November 1914.]

The position and general features of the island are described and details given of climate and rainfall. The following Anopheline mosquitos have been found:—*Anopheles* (*Myzomyia*) *culicifacies*, *A. listoni*, *A.* (*Neocellia*) *stephensi*, *A.* (*Nyssorhynchus*) *fuliginosus*, *A. jamesi*, *A.* (*Pyretophorus*) *jeyporensis*, *A.* (*Nyssomyzomyia*) *rossi*, *A. punctulatus* and *A.* (*Myzorhynchus*) *barbirostris*, these being the same species as those found on Bombay Island by Dr. Bentley, with the addition of *A. jeyporensis* and *A. punctulatus*. Of a total of about 2,000 insects captured 87 per cent. were found to be *A. rossi*; the next most prevalent species was *A. fulginosus*, 6·9 per cent. on the east side of the island and 8·3 per cent. on the west side, followed by *A. barbirostris*, 2·8 per cent. and 2·2 per cent. respectively. The proportion of *A. rossi* larvae found varied greatly with the weather. They almost disappeared after a few weeks of dry weather, but re-appeared after a single shower of rain, and at some places are to be found in every puddle or hoof-print.

The occurrence of *A. rossi* in wells examined is not given, but of other species *A. barbirostris* constituted 33·7 per cent. of the larvae found; *A. fuliginosus*, 16·87 per cent.; *A. culicifacies*, 34·37 per cent.; *A. listoni*, 11·87 per cent.; *A. jamesi*, 3·12 per cent. In borrow-pits along the railway mosquitos continued to breed very late in the season and long after most other temporary breeding places had dried up. Although no rain had fallen since the beginning of September, larvae were found in 55 of these pits late in October; about 87 per cent. of the larvae (excluding those of *A. rossi*) consisted of *A. fuliginosus*, 8·6 per cent. of *A. barbirostris* and 4·3 per cent. of *A. culicifacies*.

Details are given as to the general breeding places of each species throughout the island, with notes as to their prevalence on the mainland. In the absence of dissection of adult mosquitos to discover which of them are the carriers of malaria in the island, no definite indication can be found from the distribution of *Anopheles* in Salsette. The species which have a reputation elsewhere as rural malaria-carriers are to be found in places which, as tested by the spleen census, are quite free from malaria, as well as in places notoriously subject to it. Whatever the carrier may be, it is evident that something more than the presence of facilities for breeding in abundance is required. There must be sufficient damp and shelter from the wind to enable the female to survive in considerable numbers till she becomes infected and for the parasite to pass through the necessary cycle. In the rural districts, anything like a general attack on the breeding places of the mosquito is out of the question, as they are not artificial, but natural and very widely distributed. Borrow-pits along the railway should be abolished or a connecting channel run through them so as to drain them effectually, and any excavations of the kind should be made in such a way that they will drain promptly and completely into the nearest water-course. Though the breeding places can scarcely be attacked satisfactorily, an attempt should be made to deal with the resting places of the adults. Villages outside the tree and grass-covered area and completely accessible to sea breezes, are extraordinarily free from malaria, and therefore it would be well to do what is possible to expose other villages, less favourably situated, to the sea breezes. The people should be encouraged to cut the grass early and keep it cut in the immediate neighbourhood of the houses, and also on the side of any hill which may command a village.

HORNE (Capt. J. H.). **Malaria in Wynaad.**—*Proc. Third All-India Sanitary Conf., Lucknow*, January 19th–27th, 1914, iv, pp. 71–74. Suppmt. to *Ind. Jl. Med. Research.* [Received 6th November 1914.]

The Wynaad has long been regarded as one of the worst fever areas in Southern India, and recently certain tea companies have made a serious effort to grapple with the malaria problem and have sought financial aid from the Government for an antimalarial scheme. With this in view, an investigation was carried out in May and June 1913. A description of the prevailing conditions is given. The country consists largely of a succession of low hills covered with grass or jungle or planted with tea. Between them is a network of swamp, for the most part overgrown with jungle and gradually emerging in definite streams. Besides these streams, there are others coming from the hills which are well stocked with various species of small fish in the lower parts of their course. The rainfall is heavy and constant, averaging 100 inches per annum. The maximum hot weather temperature seldom exceeds 85° F., and in the cold weather the Wynaad is the sanatorium of Malabar. The fever season lasts from March to May—that is, in the hot months—and the prevalence of fever previous to the monsoon is noteworthy and has led some observers to doubt its malarial nature. The disease is said to have diminished in the south-east, where the ground is more open within the last 40 or 50 years, but in other parts it breaks out in epidemics and causes serious labour difficulties. The population consists of aboriginal jungle tribes, permanently resident, and of traders and their families who reside in villages on the main roads and constantly change their residence. Ten thousand coolies are estimated to be employed in May and June. The adult *Anopheles* were difficult to obtain, chiefly owing to the nature of the house interiors. The principal species found were *A. listoni*, *A. willmori*, *A. jeyporensis*, *A. culicifacies* and *A. rossi*.

Anopheline larvae swarmed, the following eleven species being bred from them :—*A. maculipalpis*, *A. jamesi*, *A. karwari*, *A. maculatus*, *A. willmori*, *A. listoni*, *A. jeyporensis*, *A. rossi*, *A. barbirostris*, *A. aitkeni* and *A. leucosphyrus* (*elegans*). *A. maculipalpis* and *willmori* were the most abundant and were found breeding chiefly in surface drains and streams in swamps. *A. listoni* was also common, its chief breeding places being swamps and hill-streams. *A. jeyporensis* was found in only two places, both weedy pools, one of them a spring in an open field. *A. leucosphyrus* and *A. aitkeni* were also scarce ; the former was taken in a shady surface-well in the jungle, the latter in streams. Among CULICINAE, *Stegomyia scutellaris* and *Taeniorhynchus* were most in evidence. *Culex mimeticus* was frequently found breeding in swamps. *Ochlerotatus* (*Hulecoeteomyia*) *pseudotaeniatus*, closely resembling *Stegomyia fasciata* in markings, habits and type of breeding place, was also occasionally taken.

From tables given of the result of the examination of spleens of children it would appear that the jungle tribes are much more seriously affected than others.

Macdonald (Dr. W. R.). **A Short Note on the Use of Larvicidal Fish in Combating Malaria Fever.**—*Proc. Third All-India Sanitary Conf., Lucknow*, January 19th–27th, 1914, iv, pp. 75–77, Suppmt. to *Ind. Jl. Med. Research.* [Received 6th November 1914.]

In North Madras there was a severe epidemic of malaria with its highest death rate during November and December, 1912, and the first quarter of 1913. Within a total area of some five square miles of more or less porous sandy soil there were no less than 513 tanks and 2,627 wells, besides innumerable temporary pools and cesspits. The tanks were mostly used for irrigation, and it is noteworthy that the epidemic was most severe in the tank zone. The larvicidal fish usually met with in Madras City are *Haplochilus panchax*, *H. melastigma*, *H. lineolatus*, *Chela* spp., *Rasbora daniconius* (common minnow), and *Therapon jarbua*, in brackish water. *Haplochilus* is very voracious, and *Chela* and *Rasbora* also kill many larvae, while *Therapon jarbua*, though very efficient, is not so widely distributed. A large number of wells and tanks were stocked with fish, but these at first made no headway against the larvae, which were apparently too numerous for them. Several tanks close to the Tamil Mission Orphanage, in which all the inmates were sick of intermittent fever, were found to contain quantities of fish, and at the same time to be swarming with larvae. The water was, however, covered with a mass of algae, in which the fish and larvae were entangled. The building swarmed with *Anopheles* in February, as did also the dense jungle around. The larvae were found to be those of *A. ludlowi*, *A. fuliginosus*, *A. jamesi* and *A. barbirostris*, and could be obtained in practically any numbers. The weeds were removed, the margins trimmed and made smooth so as to destroy all pools and footprints. The water was covered with petroleum, which did not in anyway interfere with the fish, and by the end of March the mosquitos had diminished and the health of the occupants improved. By June there were no cases of fever and no larvae.

The use of fish for stocking tanks can never replace the more valuable and lasting measure of reclamation, but fish become important when financial considerations prevent more serious works being undertaken. The habits of these larvicidal fish require further study and it is exceedingly desirable that careful inquiry should be made as to chemical treatment of water which, while preventing the growth of algae and other aquatic weeds, will not destroy the fish.

Bisset (Major E.). **Relapsing Fever in the Meerut Division.**—*Proc. Third All-India Sanitary Conf., Lucknow*, January 19th–27th 1914, iv, pp. 114–119, Suppmt. to *Ind. Jl. Med. Research.* [Received 6th November 1914.]

A large portion of this paper is taken up with technical details as to the examination of human body-lice for spirochaetes. This disease was widely spread in the cold weather of 1911–12 and began to diminish in April. In December 1912, it broke out in epidemic form in two districts and in both it had been present for some weeks before discovery. Investigation showed that the disease also occurs during the hot months, but only in isolated cases, the explanation being that, as the weather gets colder, bed-coverings, in which lice thrive and multiply, are brought into use. Apparently there is a distinct connection between the prevalence of the disease and personal habits, though all classes may suffer. In the upper classes cases generally occur in children, who probably become infected with lice while at play. Lice can always be found in infected households and there appears to be a distinct relation between the numbers of these parasites and the severity of the infection. The way in which the disease is confined to families is most marked. All the families in the houses surrounding a certain courtyard may be infected, while the dwellers in a neighbouring one, separated only by a partition wall, will be entirely free. The source of infection is almost always traceable, and there is generally a history of a visit of a few days to a village where there have been cases of fever and the visitor on his return falls sick, the disease then spreading to his family. In infected villages there are no biting insects other than lice sufficiently common to account for the great prevalence of the disease. Despite diligent search, the author failed in a large number of cases to find a single bug and he suggests that the reason is that the beds are placed daily in the sun and are used as chairs in the courtyards. Ticks and spiders found in the houses were examined for spirochaetes with negative results. The author states that his experiments show that the bites of infected lice are innocuous and he has himself been bitten on three occasions without result, but direct infection may easily take place through the finger tip in the act of crushing the lice between the nails.

Among the preventive measures suggested is a general crusade against lice, and this is considered very feasible, because the headmen of villages are put to great inconvenience when their village is infected owing to the immediate scarcity of labour. Lice are easily killed by placing infested blankets or cotton quilts out in the sun, death occurring in a few hours. Many of the fatal cases are apparently due to the local belief that sick persons should not be fed.

Bentley (C. A.). **Note on Experiments to determine the Reaction of Mosquitos to Artificial Light.**—*Proc. Third All-India Sanitary Conf., Lucknow*, January 19th–27th 1914, v, pp. 9–11, Suppmt. to *Ind. Jl. Med. Research.* [Received 6th November 1914.]

A brief account is given of experiments on the attraction which artificial light has for mosquitos, the general result obtained being that the insects are responsive to light from artificial sources and that therefore its use serves to attract them to the immediate vicinity of man. This possibly affords an explanation of the fact observed by Fry and others in Bengal, that in some malarious districts the growth of very dense vegetation in villages is associated with a much lower spleen index than that found in villages possessing a more moderate amount of vegetation; it also explains the view held by King that a screen of trees shuts out malaria and mosquitos. It is suggested that the brilliantly lit bungalows of Europeans often serve as a means of attracting *Anopheles* from a very wide area, and the fact that mosquitos are thus attracted should be remembered in constructing mosquito-proof houses, especially in known malarious localities.

Rogers (Lieut.-Col. L.). **The Bearing of Assam Tea-Garden Experience on the Problem of the Etiology of Kala-Azar.**—*Proc. Third All-India Sanitary Conf., Lucknow,* January 19th–27th 1914, v, pp. 15–20, Suppmt. to *Ind. Jl. Med. Research.* [Received 6th November 1914.]

The author has long recommended segregation as a method of combating kala-azar. This method has been carried out on the Nowgong Tea Gardens for 16 years. Striking evidence was obtained that the disease nearly always broke out in that house of a village in which a kala-azar patient from a previously infected place had come to reside; 150 freshly imported coolies were placed in new lines and 50 others for want of room in the old infected one, no cases occurred in the new lines, but at the time of the author's visit 16 per cent. of those in the old were already dead of the disease. It is claimed that the segregation method has reduced the deaths from kala-azar on certain estates from 128 per 1,000 to nil in 6 years. Systematic destruction of bed-bugs in a portion of the infected lines seemed to produce a distinct result, no fresh case occurring for several years in the houses in which this had been carried out.

In the author's opinion, the principal argument against the bed-bug as a carrier of the infection is that the disease should be very much more common than is actually the case; but it is pointed out that persons may live in the same house with persons infected with kala-azar and yet for long escape infection, and after a number of years almost the entire population of a group of huts may die of kala-azar. It is more or less clear that the slow spread of infection is not due to lack of susceptibility to the disease, but to the probability that only a small proportion of the bed-bugs which swarm in every coolie house are carriers. It is probably sufficient for bugs only very rarely to become capable of conveying the infection to enable them to be efficient carriers of the disease. It is argued that the bed-bug theory is at present the only one which affords any reasonable explanation of the incidence and spread of kala-azar.

Liston (Major W. G.), Stevenson (Capt. W. D. H.) & Taylor (Capt. J.). **The Use and Advantages of Hydrocyanic Acid Gas as a Disinfectant for Plague-Infected Houses and Ships.**—*Proc. Third All-India Sanitary Conf., Lucknow,* January 19th–27th 1914, v, pp. 162–175, Suppmt. to *Ind. Jl. Med. Research.* [Received 6th November 1914.]

This is a lengthy and detailed account of experiments with hydrocyanic acid for killing rats and fleas, which tend to show that this poison is rapidly fatal to these parasites and that the process is capable of practical application.

Hadwen (S.). **Notes on the life-histories of blood-sucking Diptera of British Columbia, with special reference to the Tabanidae.**—*Proc. Entom. Soc. Br. Columbia, Victoria, B.C.,* no. 4, N.S., January 1914, pp. 46–49. [Received 17th November 1914].

In giving a list of Tabanidae known to occur in British Columbia reference is made to the pioneer work of R. V. Harvey, to whose list three species are added. Most of the author's collecting has been done on the lower Fraser River and on Vancouver Island, and it is thought that a number of up-country species are as yet unrecorded. Harvey's specimens, as well as some of the author's, were determined by Professor Hine; others were sent to the British Museum, which has led to some confusion in nomenclature. Hine's *T. fratellus*, Wills., is called *T. patulus*, Walk., in the British Museum; Hine also gives priority to *T. captonis*, Martin, over *T. comastes*, Wills.

Chrysops noctifer, O.S., which bites cattle and horses on the flanks and shoulders and is a serious pest at times, is invariably the first species to make its appearance, having been recorded as early as 30th April. Its season is at its height by the end of May; its numbers then diminish gradually, and by the middle of June very few are to be found. *C. proclivis*, O.S., appears about mid-May, is a pest in June, and becomes rare towards the end of July. *Tabanus hirtulus*, Big., is invariably the first of its genus, appearing in the latter part of May; its season is at its height in June, and it disappears about the middle of July. *T. hirtulus* is the worst pest of cattle on the Lower Mainland. *T. affinis*, Kirby, and *T. captonis*, Martin, appear a little after *T. hirtulus* and are at their worst in July. *T. sonomensis*, O.S., appears about 15th July, and continues up to the middle of August. *T. insuetus*, O.S., appears in the middle of July and has a short season, not being a serious pest in those districts where collected. *T. fratellus*, Wills., is a bad pest, but only occurs in the hottest weather, not before 15th July. It bites exclusively on the abdomen and might easily be overlooked by the casual observer; its habits are sluggish and it can easily be taken by hand. *Silvius gigantulus*, Lw., appears in July in limited numbers and bites the neck by preference. *T. aegrotus*, O.S., occurs in July only on Vancouver Island, and considering its size, it causes surprisingly little annoyance. *Chrysops frigidus*, O.S., *T. nivosus*, O.S., and *T. sequax*, Wills., are comparatively rare species.

The author has made many attempts to find the breeding places of these TABANIDAE, but without success. Observations were mostly made at Mount Lehman, a heavily wooded place, surrounded by hills, where no males could be found. Unsuccessful attempts were also made to find flies during wet weather in a field where they were always plentiful in fine weather. Entomologists in the Province agree that males are more frequently encountered in the mountains. The necessity for further study of the TABANIDAE in Canada is urged.

Stomoxys calcitrans appears with great regularity about the middle of April. *Lyperosia irritans* (*Haematobia serrata*), the horn-fly, and the black-flies, SIMULIIDAE, appear about the same time. A specimen of *Hypoderma lineatum*, new to the province, is recorded.

MATHIS (C.). **Epidémie de paludisme ayant sévi dans la province de Sontay durant l'été de 1913.** [On an epidemic of Paludism which raged in the province of Sontay (Tonkin) in the summer of 1913.] —*Bull. Soc. Path. Exot., Paris*, vii, no. 5, 13th May 1914, pp. 388–391.

A serious epidemic having been reported in certain villages in the province as having caused a considerable number of deaths, an expert was sent to investigate and discovered that the epidemic was due to the malignant tertian form of malaria. A number of Anophelines were taken in the infected villages, most of them belonging to the species common in Tonkin, including:—*Anopheles* (*Myzorhynchus*) *sinensis*, *A. pseudopictus*, *A. rossi*, *A.* (*Nyssorhynchus*) *fuliginosus* and *A. barbirostris*.

SERGENT (E.) & FOLEY (H.). **Exploration scientifique du Sahara Constantinois Oued Rir'-Oued Souf (avril 1912).** [Scientific exploration of the Constantine Sahara from Oued Rir' to Oued Souf, April 1912.]—*Bull. Soc. Path. Exot., Paris*, vii, no. 5, 13th May 1914, pp. 416–429.

Among the mosquito areas studied in the Sahara were Oued Rir, in which are a great number of large and deep pools fed by water from numerous artesian wells and irrigation canals. All the larvae found were Culicines, though the water was always more or less salt. The Anophelines found were all *Anopheles* (*Pyretophorus*) *chaudoyei*, Theo., first discovered and studied in the Touggourt district by Billet and Chaudoye. The measures advised by the authorities consisted in the removal of the population from the old half-ruined villages close to the marshes to a more elevated and therefore drier and better site. At Oued Souf no *Anopheles* were found. A few Culicine larvae, probably of *Theobaldia*, were found in tanks used for watering the Government Office garden. Malaria was practically absent.

BARCLAY (A. H.). **Nyasaland Sleeping Sickness Diary,** *Zomba*, pt. xxiii, 30th May 1914, p. 10. [Received 10th October 1914.]

Cases of sleeping sickness have occurred practically over the whole fly area of the Nyasaland Protectorate. Dr. Sanderson reports that it is difficult to understand why the Dedza district should be free of the disease, marching as it does with the infected Dowa district, the conditions of country, climate and fly being exactly similar. There is apparently some factor not yet recognised and until this is discovered it is not possible to make any statement as to the spread of the disease.

GLÄSER (H.). **Le Varon** [Warbles.]—*Ann. Méd. Vét., Brussels*, lxiii, no. 6, June 1914, pp. 358–364.

A large amount of work has been done in Germany by the Commission on Warble Flies regarding minute details of the life-history and this paper constitutes report No. 5 of this Commission. One of the questions considered is the time of day when the larvae quit their hosts It has been generally supposed that this takes place early in the morning, rarely in the middle of the day or in the evening. Observations were made on 12 head of warbled cattle during the whole period of infestation, and the results given in detail for each beast show that the maximum dropping of the larvae (70 per cent.) took place between 4.50 a.m. and 7 a.m.; another 14 per cent. before 8 a.m., 8 per cent. before 9 a.m. and the remainder at various other hours. The man in charge went on duty at 4.30 a.m. and on his entry it was observed that all the cattle immediately assumed a standing position and within the next three-quarters of an hour a number of larvae had dropped. After the beast had been fed and lain down the dropping of the larvae ceased and recommenced when the beast got up. It would thus appear that there is some connection between the movements of the animal and the dropping of the larvae and probably the reason is purely mechanical and due to varying tension of the skin produced by these movements. The next question enquired into was the number of days required by the larvae for residence in the host. The twelve beasts came under observation on various days between the 4th May and the 15th June and on the latter date 30 larvae were discovered under the skin. Comparing the results obtained with those of the previous year, the stay of the larvae in the host was apparently shorter in 1913 than in 1912, though, as it was impossible to determine the exact date on which the larvae took up their position, the period of residence was uncertain. Enquiries made amongst farmers elicited the opinion that extra feeding during the winter hastens the maturation of the larvae, and if this is really the case, extra food in winter will enable the larvae to be removed from the cattle before they are turned out to graze, thus ensuring the destruction of a high percentage of them. The animals under observation were infested by both *Hypoderma bovis* and *H. lineata*. The larvae of *H. lineata* are smaller and brownish grey, whilst those of *H. bovis* are larger and of a greenish brown. It would appear that the larvae of *H. lineata* reach maturity earlier than those of *H. bovis*. The relative percentages of *H. bovis* and *H. lineata* were 79 and 21 in 1912 and 76 and 24 in 1911. These proportions are apparently dependent to some extent on the weather. Bad weather in May and June affects *H. lineata* more than *H. bovis* and thus alters the percentage of the larvae found later in the year. With regard to pupation, experiments were made in flower-pots with 375 larvae. Neither cold nor damp seems to have any effect on pupation, which seems to be very little more than a hardening of the external integument. If the temperature was high and the weather at the same time dry, pupation was completed in 24 hours, but in unfavourable conditions might occupy from two to four days. The process is more rapid with *H. lineata* than with *H. bovis*. The duration of the pupal period was found experimentally to be 23 to 38 days in the case of *H. lineata* and 37 to 56 days in the case of *H. bovis*. The pupal stage of the males was shorter than that of the females.

SERGENT (E.), LEMAIRE (G.) & SENEVET (G.). **Insecte transmetteur et réservoir de virus du Clou de Biskra. Hypothèse et expériences préliminaires.** [The insect carrier and the reservoir of the virus of Biskra sore. Hypothesis and preliminary experiments.]—*Bull. Soc. Path. Exot., Paris*, vii, no. 7, 8th July 1914, pp. 577–579.

The connection between *Phlebotomus* and Biskra sore is argued from the fact that most of the cases occur in those houses in which *Phlebotomus* are most numerous. The species belonging to the group of *P. papatasii*, Scop., apparently bite man by preference and almost exclusively, but those belonging to the group of *P. minutus*, Rond., normally feed upon reptiles. Both species exist at Biskra, and the gecko, *Tarentola mauritanica*, L., is very common in all the houses. It therefore appeared desirable to enquire as to how far *P. minutus* *africanus*, Newst., was the carrier of the disease and whether the gecko served as a reservoir. *P. minutus* only bites man in the hot season and feeds exclusively during the cool season on hibernating geckos. The authors have demonstrated that *P. minutus africanus* not only feeds upon this gecko, but also bites man, and they have been able to prepare, from 15·7 per cent. of geckos examined, pure cultures of a *Leptomonas* resembling that obtained from cultures of oriental sore.

Sergent (E.) & Foley (H.). **De la periode de latence du spirille chez le Pou infecté de fièvre recurrente.** [On the latent period of the Spirilla in Lice infected with recurrent fever.]—*C. R. Acad. Sci., Paris*, clix, no. 1, July 6th 1914, pp. 119–122.

The blood of convalescents from recurrent fever is virulent during the whole of the first period of apyrexia, though it contains no visible spirilla. It has been shown that the louse is the carrier, but the most careful examination of the liquid matter obtained from crushed lice which had been fed from one to eight days previously on a fever case, and which was readily capable of infecting a monkey, failed to disclose any formed bodies. In fresh series of experiments on 45 lice, fed once on a fever patient, spirilla were only found on the eleventh day, and in twelve lice only five were found from the twelfth to the fourteenth day. After twice feeding three were found in six lice after five hours, one in six lice after 24 hours, none in 34 lice between the second and tenth days after feeding, and from the eleventh to the sixteenth days only five were found in 20 lice examined. Spirilla were also found in another series up to the 25th day after the last infective meal. In a fourth series over 500 lice were well fed once on a fever patient, the feeding continued on healthy subjects, they were then crushed in batches at intervals and monkeys inoculated with the extract on successive days up to eleven and it was shown that during the first eight days following the infective meal, though no spirilla were present, the extract was infective, and 122 lice of this batch showed no spirilla, even on the eleventh day. The experiments are regarded as proving conclusively that the virus of recurrent fever exists in an active form in the louse for at least eight days after infection, in spite of the fact that no organisms, visible to the microscope, can be found in the liquid from their bodies during this period.

Porta (A.). **Dermatosi occasionale nell'uomo dovuta ad un acaro (*Liponyssus lobatus*).** [Occasional human dermatitis due to an Acarid.]—*Zool. Anzeiger, Berlin,* xliv, no. 11, 7th July 1914, pp. 481–482.

A laboratory servant in charge of a number of specimens of *Vesperugo noctula* was compelled to handle every individual bat and to feed them with chopped-up meat. After about three weeks he was attacked by a slight pruritus of the fore-arm, which subsequently spread to the upper-arm, shoulders and breast, and ultimately to the whole body, with the exception of the feet, hands and head. The patient had no fever and was not otherwise ill, and it was discovered that the trouble was caused by an Acarid, identified by Berlese as *Liponyssus lobatus*, Kolenati. The skin-trouble strongly resembled that occasionally produced in man by *Pediculoides ventricosus.*

MANSION (G.). **Les Phlébotomes européens.** [European species of *Phlebotomus*.]—*Bull. Soc. Path. Exot., Paris,* vii, no. 7, 8th July 1914, pp. 584–590.

In this paper descriptions are given of the five European species of *Phlebotomus* viz:—*P. papatasii,* Scop., *P. perniciosus,* Newst., *P. minutus,* Rond., *P. nigerrimus,* Newst., and *P. legeri,* Mans.

LAVERAN (A.) & FRANCHINI (G.). **Infections de Mammifères par des Flagellés d'Invertébrés.** [Infection of mammals with the flagellates of invertebrates.]—*Bull. Soc. Path. Exot., Paris,* vii, no. 7, 8th July 1914, pp. 605–612.

The authors have previously demonstrated that mice and rats may be infected by injecting into the peritoneal cavity the flagellates *Herpetomonas ctenocephali* and *H. pattoni,* from the dog or rat flea, also with flagellates from *Anopheles maculipennis* (*Crithidia fasciculata*) or from *Melophagus ovinus* (*C. melophaga*). Mice have also been infected with *Herpetomonas pattoni* by ingestion of the faeces of infected rat-fleas.

MATHIS (C.). **Evolution d'un Trypanosome dans le liquide salivaire d'un Moustique.** [Development of a Trypanosome in the salivary secretion of a Mosquito.]—*C. R. Soc. Biol., Paris,* lxxvii, no. 24, 10th July 1914, pp. 297–300.

Up to the present, trypanosomes have only been found in mosquitos in the middle and hinder parts of the alimentary tract, and all these flagellates are either *Crithidia* or *Leptomonas*. None can be considered true trypanosomes and experiments, made more particularly with *T. gambiense,* tend to support the hypothesis that the rôle of the mosquito in the transmission of trypanosomiasis is purely mechanical. The author has found in the salivary glands of a species of *Culex,* taken in January 1914 at Hanoi, multiple flagellate forms which seem to indicate that this mosquito acted as a true host. A large number of other mosquitos taken on the same spot showed no trypanosomes, and the failure of attempts to infect mosquitos with *Trypanosoma annamense,* the agent of surra in Indo-China, excludes this particular form, but it would nevertheless appear that a trypanosome exists which is capable of undergoing in the mosquito an evolution analagous to that observed in *Glossina*.

Die Krankheitsübertragung durch Ameisen. [The transmission of disease by ants.]—*Entom. Zeitschr., Frankfurt a. M.,* xxviii, no. 15, 11th July 1914, p. 86.

Dr. Bate's observations on the big yellow ants in the Panama Canal zone have proved that they are able to carry about for a whole day typhus bacilli with which they have come in contact. This probably applies also to cholera and dysentery germs. Ants do not ingest the bacilli or distribute them in their excreta. [See this *Review*, Ser. B, ii, p. 9].

Les Parasites du Bétail. [Parasites of cattle.]—*Rev. Agric. Vitic. Afr. Nord., Algiers,* xii, no. 123, 18th July 1914, pp. 68–69.

A mixture of 5 oz. of assafoetida, 13 oz. of vinegar and 20 oz. of water is said to keep *Tabanus*, *Stomoxys* and warble flies away from cattle when the thinner-skinned parts of the body have been well washed with it every five or seven days.

SMART (A. G. H.). **Epidemic Malaria and Construction Works.**—*Trans. Soc. Trop. Med. & Hyg., London,* vii, nos. 7–8, July 1914, pp. 251–258, 1 sketch map.

The waterworks for Alor Star, the capital of Kedah, F.M.S., were under construction early in 1914. The water was tapped from two streams, which united a little lower down, the coolie lines being situated at the junction. From May to December 1913, only 10 coolies were admitted into Hospital suffering from malaria, but there were 97 cases in the first quarter of 1914. Though the course of the river had not been interfered with, the water was very low and the following larvae were found there in January 1914 : *Anopheles leucosphyrus*, *A. kochi*, *A. sinensis*, *A. maculatus*, *A. karwari* aud *Uranotaenia campestris*. To provide drinking water, a service pipe was brought down from well above the lines, and pools which formed where the joints of the pipe leaked, contained larvae of *A. maculatus*. At a later visit it was found that the stream had been cut off from the dam and the original bed was a series of shallow pools full of decomposing vegetation. The only larvae then to be found there were those of *Culex ager*. Above the dam, numbers of larvae of *A. maculatus* or *A. karwari* were obtainable. In a small jungle pool, fed by a spring, *A. maculatus*, *A. leucosphyrus*, *Lophoceratomyia barkeri*, *U. campestris*, and *Culex concolor* were found together, evidently owing to the reduction in breeding places.

FRANCIS (E.). **An attempt to transmit Poliomyelitis by the bite of** ***Lyperosia irritans*****.**—*Jl. of Infectious Diseases, Chicago,* xv, no. 1, July 1914, pp. 1–5, 2 figs.

Lyperosia irritans is found in great numbers on cattle and especially black cattle, hardly ever on white or yellow animals. Six thousand flies were collected, only four *Stomoxys* being found among them, but great difficulty was experienced in keeping them alive in captivity unless constantly fed on living animals. Though freely fed on monkeys inoculated with poliomyelitis and then allowed to bite healthy ones, none of the latter acquired the disease.

Extracts from the Report of the Chief Veterinary Surgeon for the Year 1913.—*Rhodesia Agric. Jl., Salisbury,* xi, no. 6, August 1914, pp. 830–838.

It is stated that regular dipping and enclosure from tick infection of cattle in Rhodesia has been a successful preventive against piroplasmosis and anaplasmosis. The increase in the number of cases of trypanosomiasis in the Hartley district seem to be due to the increase in the number of cattle, as there is no recognisable increase in the number of tsetse-fly in these areas and no extension of their range. A serious extension of the *Glossina* area is, however, reported in the Lomagundi district.

Compulsory Dipping Ordinance.—*Rhodesia Agric. Jl., Salisbury,* xi, no. 6, August 1914, pp. 854–856.

A new law, the Compulsory Dipping Ordinance, renders the dipping of cattle, and such other animals as may be prescribed, compulsory on the commonages of towns and villages and enables compulsory dipping to be applied in any rural area, where such is the wish of the majority. Owners will be required to provide dipping tanks, but Government assistance will be given where this is impossible.

Paranaph and Scalo.—*Agric. News, Barbados,* xiii, no. 322, 29th August 1914, pp. 282–283.

Paranaph [see this *Review,* Ser. A, ii, p. 697] seems to be of great value as a tick wash or spray, especially when mixed with a special tick preparation. The following is said to give good results: Paranaph 5 lb., Cooper's Dip 5 oz., water 3 gallons. The paranaph is dissolved by stirring in $2\frac{3}{4}$ gallons of water and the dip is dissolved separately in 1 quart of water and then added. It has been stated that 1 oz. of commercial arsenite of soda may be used in place of the 5 oz. of dip. A hand syringe with an Abol nozzle is recommended for applying this mixture to tick-infested cattle, from $1\frac{1}{2}$ to 2 quarts being required for each beast. This mixture is said to kill all the ticks on the animal at each application, if carefully used as directed.

Hutcheon (D.). **Bots or "Paapjes".**—*Agric. Jl. Union S. Africa, Pretoria,* viii, no. 2, August 1914, pp. 194–200.

This paper, which is intended for the general information of farmers, deals almost entirely with the horse bot. The larva of *Hypoderma* (*Oestrus*) *bovis* has not been met with in Cape Colony, except on cattle imported from Europe. Sheep and goat bots are frequently found in the frontal sinus and the larvae of another species have been found in Cape Colony, in the skins of Angora goats imported from Asia Minor, but do not appear to have bred there. Farmers report that, though very little attention was given to the destruction of the larvae so imported, the flies never appeared, and it is probable that as the larval stage is completed in the host at the beginning of the Cape winter, instead of the beginning of summer as in Europe, the climatic conditions are not favourable to the development of the imago and the propagation of the species. Many South African antelopes suffer from bots of different species, and several others infest different parts of the intestine of the horse, but the common *Gastrophilus equi* is the species of most importance in the Colony. The favourite local method of treatment is as follows:—The horse is starved for 24 hours and then given a pound of brown sugar, dissolved in a quart of milk. This is supposed to loosen the hold of the bots on the gastric mucous membrane. After an hour or two a pint of strong tea is given, followed by a pint of coconut oil. The author has tested this remedy carefully, and on examining the stomach *post mortem* found that it had produced no effect whatever. During the spring and summer months, when the larval stage is complete, the bots loose their hold spontaneously and are ejected *per anum*, so that for a short time annually the stomach is free from them.

East Coast Fever Regulation.—*Agric. Jl. Union S. Africa, Pretoria,* viii, no. 2, August 1914, pp. 244–245.

The following East Coast fever regulations have been issued, amending and superseding Clauses 16 (*g*) and 17 (*f*) of Government Notice No. 1749 of 1914 :—16 (*g*). It shall be the duty of every owner or, in his absence, of any person taking charge of his cattle in an infected area to take the following precautions as to his cattle therein : (*a*) If the cattle are confined in a fenced enclosure he shall take all necessary steps to prevent them leaving such enclosure ; (*b*) if the cattle are not in a fenced enclosure he shall provide efficient and sufficient herds to prevent the cattle straying out of the infected area, or from any portion thereof from which they may not be moved without a permit, or from any portion thereof to which they have been confined by written order of the Government Veterinary Officer. 17 (*f*). It shall be the duty of every owner or, in his absence, of any person taking charge of his cattle within an East Coast fever area to take the following precautions as to his cattle therein : (*a*) If the cattle are confined in a fenced enclosure he shall take all necessary steps to prevent them leaving such enclosure ; (*b*) if the cattle are not in a fenced enclosure he shall provide efficient and sufficient herds to prevent the cattle straying out of any area from which they may not be moved without a permit or from any portion of such East Coast fever area to which they have been confined by written order of the Government Veterinary Officer.

Knab (F.). **Ceratopogoninae sucking the Blood of other Insects.**—*Proc. Entom. Soc. Washington, Washington D.C.*, xvi, no. 3, Sept. 1914, pp. 139–141.

Further notes on observations of Ceratopogoninae attacking mosquitos are given, [see this *Review*, Ser. B, ii, p. 132]. In one case, *Culicoides* sp. was found attached to common house mosquitos, presumably *Culex quinquefasciatus* ; in another, in Kuala Lumpur, examples of a *Ceratopogon* were found embedded in the abdomen of female Anophelines which had previously fed on blood, including *A. fuliginosus*, *A. karwari* and *A. sinensis*. Another *Culicoides* was found attached to a female *Anopheles*, but in this case the midge had its proboscis inserted in the anterior thoracic region of the mosquito and there was nothing to show that it was extracting the contents of the digestive tract.

Kennedy (A. F.). **Fish in Drains and Swamps in Bathurst.**—*Ann. Rept. Gambia Med. Dept. 1913, London*, 1914, pp. 20–21. [Received 26th November 1914.]

The Medical Officer of Health reports that during 1913 pools of water very rapidly dried up. The main drains swarmed with fish, which, for a day or two after heavy rains, ascended tributary streams for short distances and were found isolated in the upper reaches of these. In one main street-drain fish are found towards the sea-end even in the dry season, and these are transferred as required to other drains, private wells, etc. Private individuals are having their wells stocked with fish and this has been found to be a better prophylatic measure against the breeding of mosquitos than well-covers. Fish from the sea introduced into comparatively fresh water, take some time in adapting themselves to it, but revive after a day or two and destroy larvae with avidity. The following figures are given with regard to one particular drain which had been dry for some time and filled up to 90 yards from the sluice gate during high tide in April, the average depth being 4 inches. On 23rd April, the larvae present, half-grown or larger, were estimated to number 2,100. Eleven fish, six of 4 inch length and five of 2 inch, which had been kept for some time in a tub of fresh water, were introduced at 11 a.m. on this date and at 9 a.m. the following morning not a single larva could be found. Three fish about $1\frac{1}{2}$ inches long were put into a bath of well water on the 29th October and on the 30th full-grown larvae were introduced at intervals of about 5 minutes as follows: 12, 13, 25, 30, 30. In 20 minutes, all these larvae with the exception of seven had been eaten and 2 hours later all had disappeared. On 31st October two of these fish consumed thirty larvae in 3 minutes. Details of numerous experiments are also given, all tending to show that if the fish are properly treated, their capacity for destroying mosquito larvae is very great.

Reports of the Sleeping Sickness Mission in Principe, December 1913 to March 1914 (8 pp.) and April to June 1914 (6 pp.) embodied in Reports of Consul General Hall to Sir Edward Grey. [Received 5th September 1914 and 21st October 1914.]

These reports are a continuation of those for October and November 1913 [see this *Review*, Ser. B, ii, pp. 121–124]. In November and December 1912, more than 22,000 flies were caught in each month, and one year later the catch dropped to 1,358 in November and only 134 in December, although a larger number of labourers was employed in the work. On the banks of the River Papagaio, formerly very much frequented by flies, none were caught in the first fortnight of December 1914, and in another fly resort the same number of labourers caught only 25. Other places formerly of evil repute were also visited and in one no flies were found and in another only three.

During the month of December a very large estate, worked by an Agricultural Company, estimated to comprise about half the area of the island and formerly for many years a principal centre of fly and sleeping sickness, was diligently searched by 45 men and no fly was found. The nature of the country and the excellent conditions for the breeding of *Glossina* are described. In 1908, 23·9 per cent. of the employees on this estate were infected. In 1913, the figure had fallen to 11·1, and in January 1914, to 8. Summarising the results up to the end of January 1914, 170 men, employed daily, captured

19 flies only, almost the whole of them from one plantation, whereas in the corresponding month of the previous year 139 men captured 21,434. In the month of January 1914, the number of fresh cases of trypanosomiasis was only three, and two of these have resided for six years and seven months in the island, and it is supposed that these labourers had been infected some time previously, though the previous examination of their blood had given negative results. The other fresh case is that of a man from Cape Verde who had resided two years in the island. The report for February and March 1914 shows the steady diminution in flies caught. In these months of 1913, 173 men caught 11,865 and 9,450 respectively whilst on the most infested plantation 38 men succeeded in catching only *one* fly in the month of March 1914, and it is hoped that when this particular plantation is cleared of the few pigs remaining the fly will disappear also. In April only one fly was caught in the Sundi plantation previously famous as a breeding place, and during May and June none could be found, and it is noted that whilst more than 92,000 flies were caught in the first six months of 1911 the total catch, with a very much larger number of labourers, for the same period of 1914, was only 34. In order to obtain information from the largest possible number of sources the mission offered a reward of about 4s. each for every fly alive or recently dead, and notice of this was distributed all over the island publicly. At the end of the month no one had claimed the reward, the only flies caught since the beginning of the year were practically all from the northern part of the island, that is to say that part where the sanitary works could only be completed last April, and there is conclusive evidence that the disappearance of the fly has followed *pari passu* the carrying out of these works.

The total number of fresh cases discovered in the island from October 1913 to June 1914 was 19, and of these 10 had resided more than three years in the island, seven between two and three years and only one less than one year, and the Mission has come to the conclusion that, save in the rarest instances, infection cannot have occurred in the island since June 1913, and there is no reason to suppose that any case of infection has occurred since January 1914.

In a letter dated 3rd October 1914, received by Sir Edward Grey from the Portuguese Minister for Foreign affairs, it is stated that the Governor of San Thomé has reported by telegram the complete extinction of sleeping sickness in the Island of Principe. Four fresh cases of animal trypanosomiasis have been discovered in oxen, two known to have been imported from Benguella and a third from Cape Verde, though the animal originally came from Guinea, and Dr. Da Costa is of opinion that these were already infected when imported. The fourth animal had been eight years on the island and the trypanosome found in its blood is of a form which has not been reported in Principe and this animal had always been on the part of the island which has never been infested by fly.

The success of the operations is shown by the summary appended:—Over 203,000 flies were caught in 1912, 197,000 and over in 1913, and only 34 during 1914.

NOTICES.

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Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

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VOL. II. Ser. B. Title-page and Index. October, 1915.

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(C141) Wt.P1212/97. 1,500. 9.15. B.&F.Ltd. Gp.11/3.

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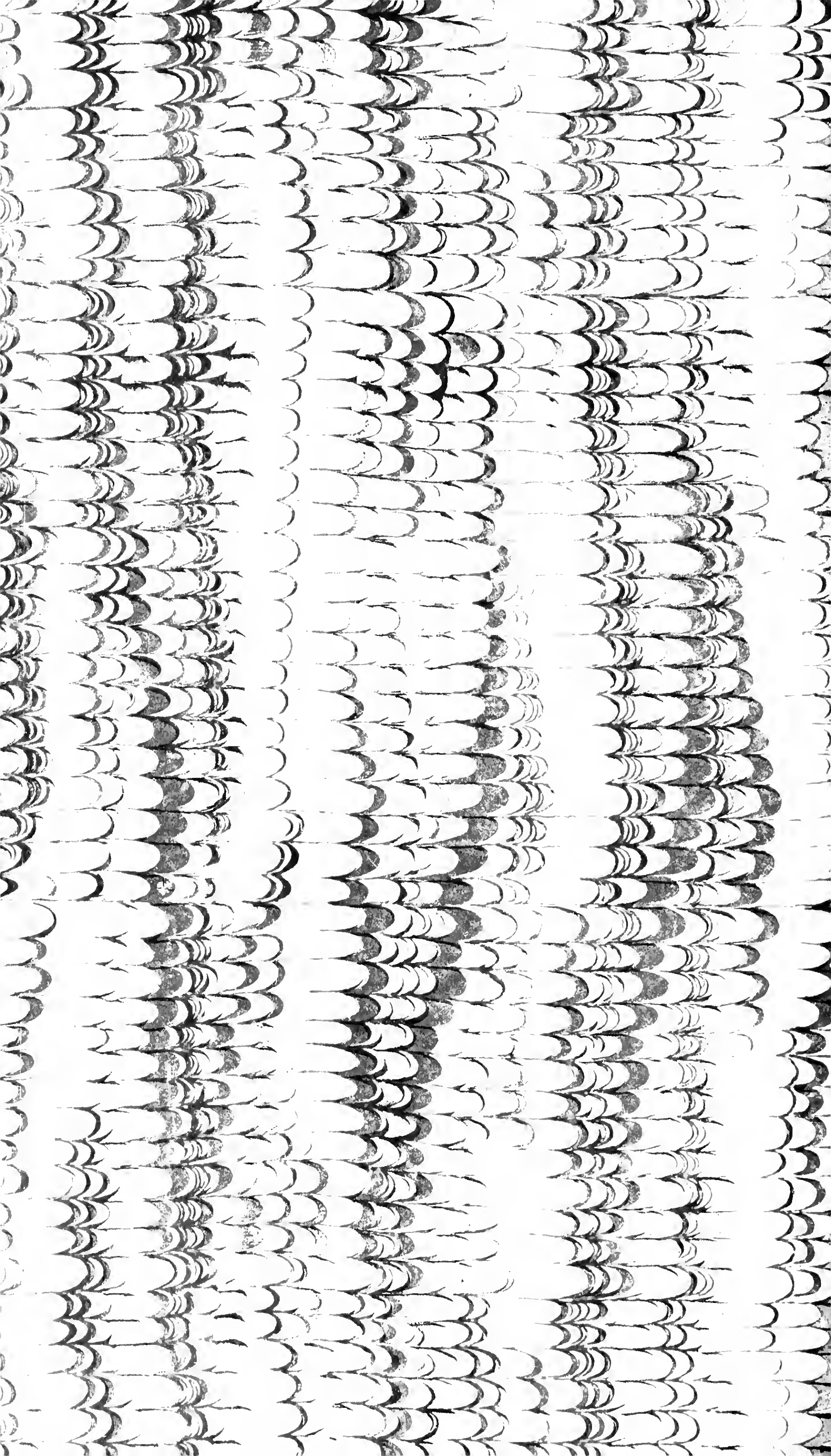

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