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BIOLOGY AND ECOLOGY OF SEVERAL SPECIES OF CALIFORNIA RANGELAND GRASSHOPPERS

(Orthoptera: Acrididae)

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Studies of the biology and ecology of rangeland grasshoppers have been badly neglected. Much of this neglect can be attributed to the large areas of grasslands involved and, during the era of control by scattering poison baits, the expense and difficulty of control. Westerners have long been aware that grasshoppers on our rangelands have caused economic loss. Like grasshoppers on croplands, those on the range do damage that goes beyond the actual loss of forage. They cut stems and blades, eating only a part of them; they prevent reseeding; they eat grass closer than livestock, and when extremely abundant may injure the crown of the plant so that subsequent growth is retarded; the soil is exposed to the eroding effects of wind and water and they even annoy livestock by jumping in their faces when the latter try to feed.

It was not until the advent of some of the newer insecticides such as aldrin that we realized just how damaging to the range the grasshoppers could be. Workers in the U.S.D.A. have estimated that when grasshopper populations average 6 to 7 per square yard, which I may say is a light infestation, those on 10 acres can eat as much grass as one cow. Many of our infestations in California this past summer were 5 to 10 times this heavy.

As a consequence of the growing awareness of the need for fundamental studies a cooperative regional project was set up with workers in Idaho, Montana, Colorado, Wyoming and California participating. A small sum was allocated to California last August permitting us to begin active participation.

Our objectives were three fold: (1) to make an intensive ecological study of a limited rangeland area inhabited by several of the important rangeland grasshoppers, (2) on the basis of this ecological study, to analyze and evaluate the roles of the various

[1] Presidential address, presented to the Pacific Coast Entomological Society on the occasion of its annual December meeting.

ecological factors (natural enemies, weather, microclimates, vegetation, soil, etc.) in the population dynamics of rangeland grasshoppers in this limited area, (3) to use this information in helping to better understand population dynamics of range grasshoppers, to predict grasshopper damage to rangelands, and to develop more effective and intelligent control measures.

Study areas were selected at the Hopland Range Experiment Station; a foothill area north of Oroville; and a foothill area in the Patterson Pass area of the Livermore hills.

These areas were visited at frequent intervals this past season, field studies and collections were made and this address today is based in part upon these studies.

Much information on species, sex, age composition, parasitism, etc. remain to be secured from the specimens still preserved in alcohol.

A check list of grasshopper species based on a list made by Dr. H. F. Strohecker shows that there are some 187 species in 58 genera occurring in California. At least 50 per cent of these could be classified as rangeland species, those species which normally feed on grasslands and seldom, unless in outbreaks, invade cultivated areas.

In any given area of rangeland it is normal to have a number of different species in close competition with one another. Cropland species, on the other hand, are only infrequently found competing with several other species.

In all three study areas eight or more species could be found, but the following four were predominant: *Melanoplus devastator*, the devastating grasshopper; *Camnula pellucida*, the clearwinged grasshopper; *Oedaleonotus enigma*, the valley grasshopper and *Dissosteira spurcata*, which has no common name. The following remarks are based upon these four species.

Melanoplus devastator is our most widespread rangeland species and except for localized populations of other species is also most abundant. It is found on the semiarid rangelands in California from Siskiyou county in the north to San Diego county in the south, at elevations from near sea level to over 5,000 feet. It is especially abundant in the oak-grassland plant associations of the Upper and Lower Sonoran life zones where clovers, filaree and annual grasses are dominant.

Outside of California it is recorded from Arizona, Nevada, Utah, Oregon and Washington.

In its nymphal stages this species inhabits much of the range and feeds on the legumes, filaree, bromes and hordeums as long as they remain succulent. When these plants become mature in late May and June the grasshoppers leave the higher parts of the range and congregate in great numbers in swales along roadsides or areas where drought resistant plants such as tarweed, *Hemizonia virgata*; buckthorn weed, *Amsinckia douglasiana*; bluecurls, *Trichostema lanceolatum*; milkthistle, *Silybum marianum;* wild buckwheat, *Eriogonum* spp. and yellow star thistle, *Centaurea solstitialis* can be found. Although they may only feed sparingly upon these latter plants they find them useful as roosting places on which to escape from the high soil-surface temperatures, which often reach or exceed 130°F during the summer.

The nymphs of the devastating grasshopper usually migrate downhill toward more succulent green vegetation, following ravines and lower land toward cultivated crops, often migrating five miles or more during this stage. Heavy movements of nymphs and some adults were taking place this past year by June 13 in the Oroville and Livermore areas as well as in other areas of the state. Grass was dry and shedding seed on hillsides at this date but swales were still green.

The direction of movement is determined by the slope of the land and not by wind direction. Hoppers move downhill with or against prevailing winds as shown by numerous observations made in the study areas. This results in heavy concentrations at the foot of the hills and canyon bottoms.

By the second week in July the species has largely reached the adult stage. The adults are strong fliers and may migrate in thick swarms fifteen or more miles in a single day. Adult movements are less predictable and may be delayed until quite late in the season. For example between July 25 and August 8 a spectacular movement of adult *M. devastator* from the Hopland study area took place. On the latter date it was difficult to collect several dozen adult specimens in an area where they had been extremely numerous less than two weeks previously.

This species is reported by Wilson (1947) to fail to reproduce outside the normal habitat. A residual population, however, remains in the foothills and constitutes the breeding population. A survey in late November in the Livermore hills revealed no *M. devastator* in low areas. Not until we checked halfway up the

Patterson Pass road at an elevation of about 800 feet did we start to encounter *devastator*. Adults were more common on the warmer south and east slopes near the ridge tops.

Dissections have shown that, unlike many of our other economic species that begin to oviposit within ten days after reaching the adult stage, *M. devastator* has a preoviposition period ranging from three to five and a half months, during which no ovarian development or copulation takes place. The breaking of this arrested development apparently is dependent upon the onset of the first fall rains with the concomitant appearance of green grass.

During a five-year period (1951–1956) weather data from Hopland has shown that the earliest date for the first fall rain of 0.5 inch was August 25 and the latest was November 13. Thus oviposition of *devastator* does not usually begin before September, and under conditions of prolonged delay of fall rains may not start until mid-November or even later. Eggs of this species were found in the Oroville area on October 5, 1956 at which time new grass was 1½ inches in height following 0.85 inch of rain. The eggs were on a south facing slope about three inches from the base of a small rock. Fifteen additional areas were examined but no more pods could be found at this date. A survey on November 24, 1957 in the Livermore hills failed to reveal egg pods of this species, however, many were found December 30 in the hills behind Mission San Jose, California.

The egg pods are not laid at random, but are deposited in restricted locations on well-drained hillocks, ridges, banks of ravines and slopes protected from prevailing winds where soil is gravelly or poor. Within these areas a relatively small area may contain many egg pods, with only a few in the surrounding soil.

Many pods are deposited in association with the basal growth of such plants as Russian thistle, milkweed, mustard, tarweeds and others. Some are laid in the soil at the edge or even under rocks if a crevice is present. Still others are laid in the matted roots of filaree or in small, well-drained bare spots.

The eggs begin hatching approximately ten days later in the spring than do those of most other economic species in the same area. This is probably due to the lateness in time of oviposition and in total cumulative heat units following oviposition. The minimum effective temperature for egg development of related species is approximately 60°F.

The hatching period, lasting from late April to late July, ranges from 50–103 days, and is thus much longer than that of other economic species in the same area. In most years it is at least twice as long as that of *Camnula pellucida* or *Oedaleonotus enigma*. Many nymphs of *M. devastator* may still be present when associated species are at their peak of oviposition.

The longevity of adults varies markedly and is dependent on climatic conditions. Winters having relatively high temperatures, with sufficient moisture to produce ample food, increase the length of life. Adults have been reported as late as mid-February. The late season adults become very dark, almost lead colored.

Camnula pellucida occurs very abundantly in California and in many localized areas, especially where grasses are more luxuriant, may outnumber *M. devastator*. This species is found in grasslands of mountain meadows, foothills and valleys throughout cismontane California to elevations exceeding 7,000 feet. Outside our boundaries it is found in the northern tier of states into adjacent Canada and in all the states lying west of the 100th meridian. It is primarily a grass feeder but when in outbreak numbers is very destructive to other types of vegetation such as small grains.

Oviposition usually begins the latter part of July and continues through August. Adults were found copulating July 17 at Oroville this past season. This species differs from other California grasshoppers in that it has definite oviposition areas and according to Wilson (1936) goes back and forth between 10 a.m. and 3 p.m. between these areas and the feeding grounds. These oviposition sites are usually on uncultivated grassy knolls and are small in area and well defined. Those studied by Wilson at Tulelake varied from 2 to 20 acres in size. Males attend the ovipositing females and may greatly outnumber the females.

The eggs hatch from early May to the latter part of June.

C. pellucida is migratory in habit both in the immature as well as the adult stages. In some areas it is called the warrior grasshopper because the nymphs march in bands from one field to another.

Oedaleonotus enigma ranges throughout the Pacific Coast, having been reported from California, Oregon, Washington, Idaho, Nevada and Arizona. Its distribution in California is similar to that of *M. devastator* though populations have been more localized.

It reaches its greatest abundance along the eastern foothills of the Coast Ranges.

O. enigma is typically a grassland-foothill species. Eggs are laid from July to October. Hatching occurs in early April usually two to three weeks earlier than *devastator*. Egg laying habitats include rolling foothills, valley slopes and uncultivated gravelly flat land with sparse vegetation. Favored egg-laying spots include around and under rocks, under cover of turkey mullein or adjacent to the basal growth of such weeds as thistles, milkweed, poverty weed and saltbush.

Numerous characteristic egg pods were found in the Oroville area during a survey in early October. Small hummocks only several feet above the general ground level were favored and here between or beside small stones, and especially beneath turkey mullein, oviposition took place.

Only the brachypterous adults have been encountered in the Livermore, Oroville and Hopland areas. The long winged form has been reported from other areas in California.

Dissosteira spurcata occurs in the rangeland areas of California from Tehama County in the north to San Diego in the south and was present in fair numbers at all three study areas. It is also reported from Utah and Nevada. Little is known about its biology so the following observations will be of interest.

Beginning in early July the males of this species engage in mating flights. A single male can be seen to jump into the air a foot or two above a patch of flattened grass or bare spot. The flight is noiseless for about 5–8 seconds then with a slower wing-beat and the abdomen pointed almost downward he begins to make a characteristic buzzing song which lasts about 20 seconds but may continue for 35. The male then abruptly drops to the ground and makes three or four raspng noises by sharply raising the hind legs and rubbing them against the tegmina. A female or two is usually on the ground beneath the singing male. Males were readily collected by approaching with 15 to 20 feet while they were engaged in the nuptial flight and then scooping them up with an insect net in a quick dash. Mating was not observed.

This past season witnessed one of the heaviest rangeland grass-hopper outbreaks since the spectacular one in 1949. Grasshoppers were extremely abundant in the ranges around the Central Valley and caused considerable damage. *Melanoplus devastator* was the predominant species. It was necessary to treat thousands of acres of rangeland to prevent serious damage to adjacent croplands.

The severity of the grasshopper outbreak can be explained to a certain extent by climatological data for 1956–57. At Hopland, 3.03 inches of rain fell in October and permitted females of *M. devastator* to oviposit over a long period of warm, relatively dry weather in November and December with a total precipitation of less than one inch during the latter two months. Moderate rains totaling 29.4 inches fell during the rainy season permitting good grass growth. Maximum daily temperatures remained below 60°F until the latter part of March. Moderate rains during March, April and May with relatively cool weather held back the egg hatch. During the late May early June hatching period no rain fell to harm the nymphs or permit a disease outbreak.

During the heavy movement out of the Livermore hills the country took on a desolate appearance due to defoliation of many trees, shrubs and grasses. The following is a list of some of the plants heavily fed upon: apricot, fig, privet, *Genista, Pyracantha, Cydonia, Cotoneaster,* cottonwood, *Buddleia,* Persian walnut, *Baccharis,* elderberry, pepper, poison oak, willow, gum weed, mullein, grape, juniper and most of the legumes and grasses. Perhaps the most notable were the few plants not attacked such as *Robinia,* toyon, *Acacia,* Lombardy poplar and elm. These were only lightly fed upon.

Temperature plays an important role in regulating many activities of grasshoppers. A number of observations were made this past season and more extensive ones with the aid of our new mobile laboratory are planned for the future.

Hoppers are quite sluggish when the ground temperature is around 60°F. and can easily be picked up by hand. If they do jump at this temperature they seem unable to do so a second time and can then be captured. Above 70°F. they become quite active and can only be caught then with the aid of a net.

During the heat of the day when ground temperatures in full sun exceeded 110°F. the grasshoppers concentrate in the more grassy areas and around clumps of taller vegetation, such as Harding grass clumps. As temperatures continue to rise the grasshoppers discontinue activity and seek shady spots or climb up grass or weed stems and remain there until late afternoon. Temperature readings taken at Hopland on 24 July showed the ground temperature to be 131°F. at 2:30 p.m. At this time few hoppers could be found on the ground. Most of them were clinging to grass stems several inches to one foot above ground. Air temperatures taken at the same time as the ground temperatures, showed it to be 29 degrees cooler one foot above the ground. Similar readings beneath the shade of an adjacent oak, where hoppers were numerous showed a ground temperature of 91°F. and only one degree cooler one foot above ground. No hoppers were clinging to vegetation beneath the oak at these temperatures.

After nightfall the ground temperatures are usually warmer than air temperatures, for example at 9:30 p.m. on 24th of July at Hopland the ground temperature was 76°F. while the air temperature was four degrees cooler. As the night progressed the hoppers gradually descended the grass stems and by the following dawn had burrowed into the grass clumps. The ground temperature at 7:15 a.m. was 57°F. while the air temperature was 56. No activity took place at these temperatures.

The commonly accepted technique for determining adult populaitons by estimating the number of individuals on a number of estimated square foot samples, leaves much to be desired. Adults tend to fly, in many instances while beyond the range of human visual acuity. There is a moving wave of adults preceding the counter. In addition the eye tends to be attracted to a moving object and thus there is a tendency to pick out those square foot areas where hoppers are present and moving and avoiding the areas where none are present. All of these factors tend to give an incorrect estimate of the population.

Several of these difficulties can be overcome by counting adults at night. A wire screened wooden frame, one foot square was constructed. Several nails projecting from the bottom edge prevented it from skidding or rocking. After darkness had fallen and the hoppers had ceased activity the frame was thrown at random in an area where hoppers had been most numerous during the day. Atomized lighter fluid or an aerosol insecticide was then used to agitate the hoppers enclosed beneath the wire mesh which were then counted with the aid of a flashlight. In several areas where these counts were made the cage sample showed far fewer adults than were estimated during the day.

Grasshoppers have many natural enemies. Without the effects of parasites, predators, diseases and adverse climatic factors, grasshoppers would be much more abundant and outbreaks would be more frequent and severe. Some affect the eggs while others affect the immature and adult stages. Among the more effective enemies in California are Bombyliidae, Meloidae, Sarcophagidae, spiders, rodents and other mammals, birds and diseases. Parker and Wakeland (1957) report that rangeland species suffer far less from egg pod predators than do those species in croplands. The fact that most species of rangeland grasshoppers scatter their egg pods more widely than species of crop grasshoppers, makes it more difficult for predators to find them and may be one reason for the lower percentage of egg pods destroyed in grasslands. The above authors also found predatism to be always highest during those years of greatest egg pod numbers. Another possible explanation of the higher predatism in cropped areas is the fact that Bombyliidae adults frequently gather in large numbers to feed on the blooms of annual plants growing on disturbed ground along fence rows and roadsides and numerous Meloids feed on legumes such as alfalfa, *Melilotus* and composits such as *Hemizonia.*

Wilson (1936) studying *Camnula pellucida* in the Tulelake area of California in 1928 found a Bombyliid, *Aphoebantus hirsutus,* to attack up to 62 per cent of the egg pods of this grasshopper and in spots to completely eliminate the threat of an outbreak. I have found, as yet unidentified, Bombyliidae larvae on the egg pods of *O. enigma* at Oroville, but only in very small numbers.

According to MacSwain (1956) the known life cycles of the meloid subfamily Lyttinae, which includes *Epicauta,* indicate that females lay eggs in excavations in the soil. However, observations made in the Oroville area would indicate that this habit does not hold true for all members of the genus. A number of adult meloids were collected feeding upon the flowers of *Hemizonia,* a tarweed. These were identified by Werner as mostly *Epicauta puncticollis* with several *E. californica* also present. These are very common and widespread species in California. According to MacSwain nothing is known about the life cycle of *puncticollis.* Parker and Wakeland (1957) list it as the only meloid egg pod predator known in California. The area where these meloids were found was heavily infested with *M. devastator.* On October 4, 1956 numerous meloid eggs were found on the under surface of a rock and on the soil beneath. The rock was not resting flat on the ground but was somewhat concave permitting adult beetles to crawl beneath and oviposit.

At least 13 distinct egg masses were found with one mass containing 150 eggs. A total of about 1,500 eggs were present in all stages of development. Some triungulin larvae were hatching at this date and were running rapidly over the surface of the rock. They continued to hatch until October 25th when approximately 1,000 larvae had been collected and preserved in alcohol. Dr. MacSwain identified the larvae as mostly *E. puncticollis* with some *E. californica* present. Dr. Hurd collected eggs of *E. californica* in the Patterson Pass area of Alameda county in November, 1948 and larvae emerged 26 days later. Thus the incubation period is between 21 and 26 days, with the larvae overwintering.

On July 25, 1957, at Hopland in an area of sparse vegetation with sandy soil, a female *Tachysphex tarsatus* Say (det. R. M. Bohart) was observed to attack and subdue a second instar nymph of an oedipodine grasshopper. She pounced upon the nymph which was nearly her size, clinging tenaciously to it while they both struggled on the ground. The grasshopper fighting for its life, the female *Tachysphex* for food for her future offspring. The wasp quickly stung the nymph under the thorax and the hopper immediately gave up the struggle. She paused briefly, placed herself astride the victim, grasped its head with her mouthparts and the abdomen with her hind legs and proceeded to drag the victim over the ground in short flying hops. She was captured during her journey.

Williams (1913) made some careful observations on this species in Kansas and reported that the nest is made in sandy soil, about one and one-half inches long, terminating not quite an inch below the surface of the ground. The tunnel, which is dug before the hunt begins, is left open while the female is sarching for young grasshoppers. It is of comparatively large bore, slightly inclined, and not more than two inches long. As a rule a single nymphal grasshopper suffices for one wasp larva. Williams reported never having seen a nest with more than two hoppers per nest. The female lays an egg on the ventral part of the hopper's thorax and then closes the burrow with the loose soil at the entrance. She then leaves, presumably to repeat the process again and again.

References Cited

MacSwain, J. W.
1956. A classification of the first instar larvae of the Meloidae. Univ. Calif. Pub. in Ent. vol. 12:1–182, 29 pl.

Parker, J. R. and Claude Wakeland
1957. Grasshopper egg pods destroyed by larvae of bee flies, blister beetles and ground beetles. U.S.D.A. Tech. Bull. 1165.

Williams, F. X.
1913. Monograph of the Larridae of Kansas. Kans. Univ. Sci. Bull. 8:119–213.

Wilson, C. C.
1936. Notes on the warrior grasshopper *Camnula pellucida* and its egg parasite *Aphoebantus hirsutus*. Coq. in Northern California, 1928–29. Jour. Econ. Ent. 29(2):413–416.
1947. Control of the devastating grasshopper in California. Bull. Calif. State Dept. Agric. 36(3):97–102.

ZOOLOGICAL NOMENCLATURE: NOTICE OF PROPOSED USE OF THE PLENARY POWERS IN CERTAIN CASES FOR THE AVOIDANCE OF CONFUSION AND THE VALIDATION OF CURRENT NOMENCLATORIAL PRACTICE. (A(N.S.)40)

Notice is hereby given that the possible use by the International Commission on Zoological Nomenclature of its Plenary Powers is involved in applications relating to the under-mentioned names included in Double Part 10/11 of Volume 13 and Part 1 of Volume 16 of the *Bulletin of Zoological Nomenclature* which will be published on 30th December, 1957.

(a) *Application in Part 1 of Volume 16*

(1) *Calandra (Calendra)* Clairville & Schellenberg, 1798, suppression of, in favor of *Sphenophorus* and *Sitophilus*, both Schoenherr, 1838, respectively, in interests of universality of nomenclature; *abbreviatus* Fabricius, 1787 *(Curculio)* and *oryzae*, emendation to, of *oryza* Linnaeus, 1783 *(Curculio)*, validation of (Class Insecta, Order Coleoptera) (Z.N.(S.)255).

The present Notice is given in pursuance of the decisions taken on the recommendation of the International Commission on Zoological Nomenclature, by the Thirteenth International Congress of Zoology, Paris, July 1948 (see *Bull. Zool. Nomencl.* 4:51–56, 57–59; *ibid.* 5:5–13, 131).

Any specialist who may desire to comment on any of the foregoing applications is invited to do so in writing to the Secretary to the International Commission (Address: 28 Park Village East, Regent's Park, London N.W. 1, England) as soon as possible. Every such comment should be clearly marked with the Commission's File Number as given in the present Notice, and sent *in duplicate*.—FRANCIS HEMMING, *Secretary to the International Commission on Zoological Nomenclature.*

NOTES ON EMERGENCE AND A PARASITE OF MEGACHILE GENTILIS CRESSON

(Hymenoptera: Megachilidae)

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Several nests of *Megachile (Litomegachile) gentilis* Cresson were collected from the stems of blue elderberry, *Sambucus coerulea* Rafinesque, at Davis, California, in January of 1954 and 1955, by the writer. The nests were placed in cages near the collection site, thus allowing the specimens to emerge under field conditions.

Five male specimens of *M. gentilis* emerged from five cells of an eight cell series on May 8 to May 11, 1954. Three male specimens of *Coelioxys novomexicana* Cockerell were reared from three of these cells on May 4 to May 6, 1954.

In 1955, four different cell series were obtained. Seven male specimens of *M. gentilis* emerged from two of these series on May 10 to May 15, while eleven female specimens emerged from all four series on May 10 to May 16, 1955. Two specimens, one male and one female, of *C. novomexicana* were reared from two of the cell series. The male emerged May 5 and the female May 7, 1955.

Michener[1] listed no host of *C. novomexicana.* Therefore, this host-parasite relationship constitutes the first known record of a host, *M. gentilis,* of *C. novomexicana.* I am indebted to T. B. Mitchell for identification of the bees.

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[1] Michener, C. D., 1951. Family Megachilidae. In Muesebeck, C. F. W., et al., Hymenoptera of America north of Mexico, synoptic catalog. U. S. Dept. Agr., Agr. Monog. no. 2, pp. 1136-1186. (p. 1185).

FOUR NEW SCLERORACUS FROM THE WESTERN UNITED STATES

(Homoptera: Cicadellidae)

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University of Wisconsin, Madison

The determination of certain species in the genus *Scleroracus* Van Duzee (= *Ophiola auctt.*) is difficult, and particularly troublesome are forms previously known as *striatulus* Fallén. A study of the internal male genitalia has shown that *striatulus* Fallén is European, and that several undescribed species are represented in North America. The complex was previously restricted by Ball (1928, Bul. Brooklyn Ent. Soc., 23:190) who described *osborni*, and Oman (1947, Iowa State Jour. Sci., 21:206) who illustrated the internal male genitalia of *vaccinii* Van Duzee. Three of the new species described at this time are in the *striatulus auctt.* complex and have distribution in western North America.

Scleroracus balli Medler, new species

Similar to *osborni* (Ball) in size, shape of the crown, and broad appearance; but much darker in color, with different leg markings and distinctive internal male genitalia. Length: male 4.0 mm., female 4.5 mm. Width of head across the eyes: male 1.3 mm., female 1.5 mm. Crown obtusely angular, one and one-third longer at middle than against the eye, about half as long as the pronotum.

Color: Dark brown in general appearance. Crown, pronotum and scutellum with very dark brown markings, somewhat diffused on pronotum except on anterior margin. Crown with well-defined transverse bands, the bands between eyes connected at middle. Forewing subhyaline, veins broadly margined with fuscous, inner apical cells entirely dusky, outer apical cell not entirely darkened. First cross vein appearing to be broadly white because of fuscous edging. Legs testaceous, heavily marked with brown-black, the fore and middle femora with light bands near middle and at apex, tibiae dark; hind femora dark basally, testaceous apically, except for a narrow dark band just at apex. *Genitalia:* Aedeagus as illustrated in figure 1, the spine on shoulder resembling that of *corniculus* (Marshall). Female sternite VII slightly emarginate at middle, lateral margins angled, broadly darkened with fuscous on the posterior margin.

Holotype male and allotype female: Estes Park, Colorado, July 18, 1935 (Oman). Paratypes: 6♂♂, 5♀♀, Estes Park, Colo., July 18, 1935 (Oman); 1♂, 2♀♀, Pingree Park, Colo., August 22, 1931 (R. H. Beamer); 1♂, 1♀, Anaconda, Mont., August

12, 1931 (R. H. Beamer); 1♂, 2♀♀, Walden, Colo., August 20, 1931 (R. H. Beamer).

Holotype, allotype, and paratypes in the United States National Museum, paratypes in the Kansas University Museum.

This species has been described from the dark forms, but the color is variable. Pale specimens have the lines on the crown faded, infuscation of the forewing reduced, and markings on the legs lost. The band posterior to the ocelli usually remains distinct.

The distribution of *balli* is predominantly at higher elevations of the Rocky Mountain Region. In addition to the types one hundred and twenty-five specimens in the Kansas University collection have been examined from Colorado (Sloss, Walden, Muddy Pass, Pingree Park), Montana (Anaconda) and Manitoba (Red Deer River, Mafeking, Swan River, Deepdale). The species is named in memory of E. D. Ball.

Scleroracus myralis Medler, new species

Resembles *osborni* (Ball) in size, and shape of crown, but without the distinctive leg markings of that species. Length: male 4.0 mm., female 4.6 mm. Width of head across the eyes: male 1.2 mm., female 1.6 mm. Crown obtusely angular, slightly longer at middle than against the eye, two-thirds as long as the pronotum.

Color: Light tan or ochreous in general appearance. Crown with brown transverse markings faded, but the typical pattern distinguishable, band posterior to ocelli distinct. Pronotum and scutellum without distinct brown markings. Forewing with varnished texture, hyaline, the veins distinct, narrowly edged with fuscous. Legs light tan, devoid of brown markings. *Genitalia:* Aedeagus as illustrated in Figure 2. Female sternite VIII very slightly produced at middle, sharply angled at sides.

Holotype male and allotype female: SNYDERVILLE, UTAH, July 16, 1935 (Oman). Paratypes: 2♂♂, 1♀♀, Colo. 2009, 1♂ Colo. 2158, 2♂♂, Colo. 1581; 1♀, Snyderville, Utah; 1♀, Altus, Utah, 30 July, 1911; 1♀, 1♂, Yellowstone Park, Wyo., July 20–25, 1920 (AAN).

Holotype, allotype, and paratypes in the United States National Museum. Paratypes in the Minnesota University Museum.

The type is light in color and had faded markings, but the species has darker forms with distinct dark-brown markings on the crown, thorax and scutellum.

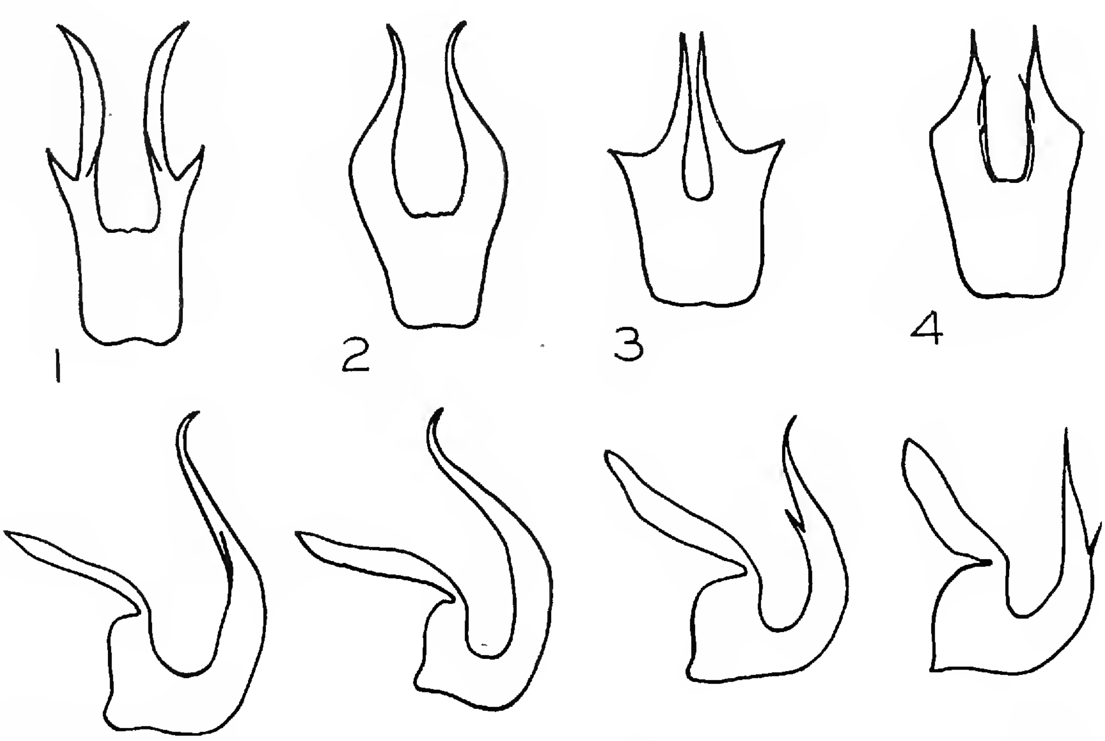
In the dark forms the anterior and middle femora are banded with dark brown at base and before the apex but the posterior femora remain ochreous. The uniformly narrow fuscous edging of the wing veins gives this species a somewhat distinctive appearance in either the pale or dark form.

Scleroracus taramus Medler, new species

Similar to *osborni* (Ball) in the obtusely angled shape of the crown, but with different leg markings, a more contrasting pattern of the forewing, and distinctive internal male genitalia. Length: male 4.5 mm., female 5.0 mm. Width of head across the eyes: male 1.3 mm., female 1.5 mm.

Color: Crown, pronotum and scutellum with distinct fuscous spots and lines, the transverse markings on the crown in characteristic pattern, the posterior and middle bands connected to each other at center and near eyes. Forewing whitish subhyaline, cells and veins outlined distincly with fuscous, inner apical cell smoky. Fore and middle femora twice-banded with fuscous, hind femora unicolorous tawny. *Genitalia:* Aedeagus as illustrated in Figure 3. Female sternite VII slightly sinuate on posterior margin, the lateral angles acute; the posterior margin marked with brown.

Holotype male and allotype female: Richfield, Utah, July 15, 1930 (light trap). Paratypes: 1 ♀, Richfield, Utah, July 15, 1930 (light trap); 1 ♀, Ft. Collins, Colo., July 19, 1936 (Oman); 1 ♂, Little Beaver Cr., Colo., July 11, 1937 (R. H. Beamer); 1 ♀, Dolores, Colo., August 2, 1900; 1 ♀, Salida, Colo., July 24, 1900; 1 ♂, 1 ♀, Macedonia, Colo., July 1, 1931 (R. H. Beamer); 1 ♂, 1 ♀, Jemez Springs, N.M., July 15, 1919.



Explanation of Figures

Caudal and lateral views of aedeagus: Fig. 1, *Scleroracus balli;* Fig. 2, *S. myralis;* Fig. 3, *S. taramus;* Fig. 4, *S. beameri.*

Holotype, allotype, and paratypes in the United States National Museum, paratypes in the Kansas University Museum and DeLong collection.

Scleroracus beameri Medler, new species

Resembling *shastus* (Ball) in the angled shape of the crown; but darker, and with distinctive internal male genitalia. Length: male 4.2 mm., female 4.8 mm. Width of head across the eyes: male 1.3 mm., female 1.5 mm.

Color: Species dark brown in general appearance. Crown, pronotum and scutellum ochreous. Crown distinctly marked with black or dark-brown transverse lines in the pattern characteristic of the genus. Ocelli red. Pronotum with extensive irregular dark markings, anterior margin not marked at middle. Scutellum darkly marked at lateral and posterior angles. Forewing whitish subhyaline, veins distincly whitish, outlined by dark brown, first cross vein and apices of claval veins at commissure broadly white. Fore and mid-femora twice-banded with fuscous, hind femora infuscated. *Genitalia:* Aedeagus as illustrated in Figure 4. Female sternite VII broadly excavated, lateral angles acute, middle part of entire segment dark brown, posterior margin more widely brown.

Holotype male and allotype female: HECITA, OREGON, July 11, 1935 (R. H. Beamer). Paratypes: 17♂♂, 7♀♀, Hecita, Oregon, July 11, 1935 (R. H. Beamer); 2♀♀, Florence, Oregon, July 11, 1935 (R. H. Beamer); 1♀, Rochester, Washington, July 22, 1931 (R. H. Beamer); 1♀, Ft. Lewis, Washington, July 5, 1935 (Oman).

Holotype, allotype, and paratypes in the Kansas University collection, paratypes in the United States National Museum.

I take pleasure in dedicating this species to R. H. Beamer, who for many years was curator of the Snow Collection at Kansas University, and was an indefatigable collector of leafhoppers.

INSECT PHOTO SALON

At its annual meeting on June 25–27, 1958, the Pacific Branch of the Entomological Society of America will hold its third annual Insect Photo Salon at the El Cortez Hotel in San Diego, Calif. All persons, professional or amateur, are invited to submit photographs of insects, spiders, and related arthropods for exhibit at this Salon. All requests for entry blanks and information as to entries should be addressed to: DR. LELAND R. BROWN, *Co-chairman, Insect Photo Salon Committee, Department of Entomology, University of California, 300 Veteran Avenue, Los Angeles 24, Calif.*

MITES FOUND ON MICE OF THE GENUS PEROMYSCUS IN UTAH. IV. FAMILIES LAELAPTIDAE AND PHYTOSEIIDAE[1]

(Acarina)

Dorald M. Allred
Brigham Young University

In three previous papers (Allred, 1956a, 1956b, and unpublished manuscript), the author discussed the general mite infestation of five species of white-footed mice in Utah, *Peromyscus boylii, P. crinitus, P. eremicus, P. maniculatus,* and *P. truei,* and the species of mites of the families Haemogamasidae and Dermanyssidae found on these mice over a five-year period. This paper is a continuation of the results of that study.

LAELAPTIDAE

Eubrachylaelaps circularis (Ewing), 1933

(Plate II, Figs. 36, 40, 41, 45, 47, 49; Plate VI)

Ewing (1933) described *E. circularis* from two females taken from two specimens of *Peromyscus truei* collected at Salina, Sevier County, Utah, by J. S. Stanford in November and December, 1928. When compared with Ewing's description of the type and with notes by Jameson (1950, 1951), mites that were collected recently in Utah differ very little.

This species occurs frequently on mice of several species of *Peromyscus*. Jameson (1950) listed *P. truei, P. boylii,* and *P. hylocetes* as known hosts. In addition to the type locality of this species in Utah, Keegan (1953) has record of one female taken from *P. truei.* These mites probably are state-wide in distribution. They are known to occur in Utah at elevations from about 2250 to 6250 feet in all of the life zones from the Lower Sonoran to the Canadian. They were collected most frequently in the Upper Sonoran and Transition life zones.

A total of 392 female mites of this species was taken from 71 mice. The mites were collected every month, although those in the southern part of Utah were found only during the period from April to September. The largest numbers were collected in April, June, and July.

Mites of this species possess an ovoviviparous type of repro-

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[1] Part IV of an abstract from a thesis for the PhD degree, University of Utah, June, 1954. This work supported (in part) by a research grant awarded to the Brigham Young University by the Microbiological Institute, National Institutes of Health, United States Public Health Service.

duction. There is only one egg produced at a time. The egg is relatively large and occupies almost one-half the space of the idiosoma. It develops into a six-legged larva within the body of the female. Each of 236 gravid females that was collected contained one egg or larva. Gravid mites were found every month except October and December. Apparently mites of this species reproduce throughout the year in Utah.

In 22 collections of mice that were infested by *E. circularis*, this was the only mite found on its host. In the remaining collections, this species was associated with the following species the numbers of times indicated: *Haemolaelaps glasgowi*, 19; *H. megaventralis*, 1; *Eubrachylaelaps debilis*, 3; *Bryobia praetensis*, 1; *Euschongastia criceticola*, 1; *Ischyropoda armatus*, 1; *Ornithonyssus bacoti*, 3; *Dermanyssus becki*, 1; *Hirstionyssus* sp., 5; *Ornithonyssus* sp., 1; *Listrophorus* sp., 1; *Hermannia* sp., 1; *Euhaemogamasus* sp., 1; Trombiculinae sp., 1; Laelaptidae sp., 1; Trombidiidae sp., 1.

Table 1.—Species and percentages of mice infested by mites of the species *Eubrachylaelaps circularis*, 1948–1953.

	No. Mice Collected	*% Mice Infested*	*No. Mites Collected*	*Ave. No. Mites Per Infested Mouse*
P. boylii	37	0.5	145	7.4
P. crinitus	67	3.0	35	17.5
P. eremicus	201	7.0	65	4.5
P. maniculatus	2907	0.6	79	4.7
P. truei	59	50.8	68	2.3

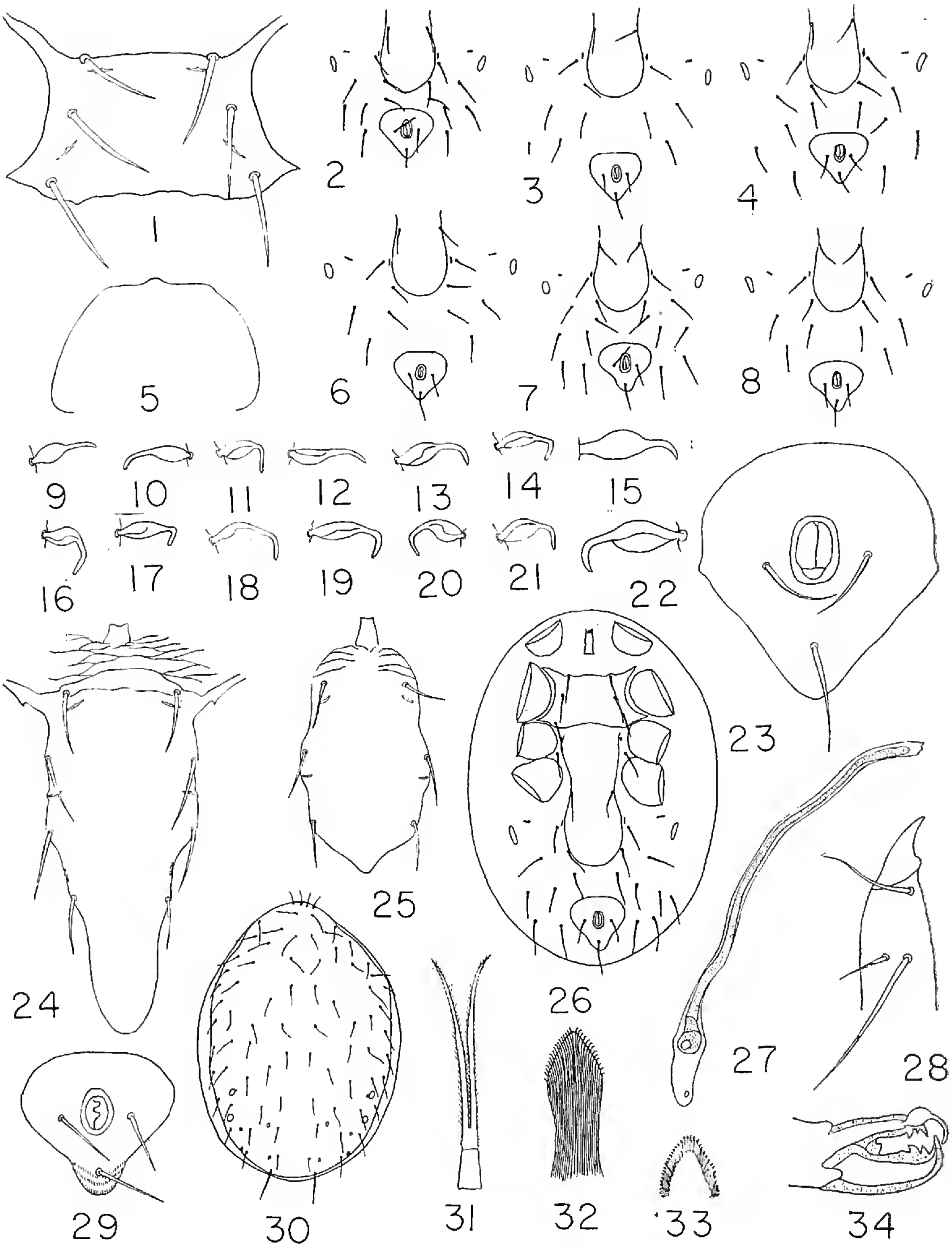
EUBRACHYLAELAPS DEBILIS Jameson, 1950

(Plate II, Figs. 37, 42, 43, 46, 48; Plate VI)

Jameson (1950) described this species from 21 females taken from *Peromyscus maniculatus* from California in February and July, 1949. Specimens taken in this study in Utah agree with the description of the type.

This species was reported from California and Oregon by Jameson (*op. cit.*). Keegan (1953) reported records from *Peromyscus maniculatus* and *P. crinitus* collected in Utah in October and November, 1951. This species is state-wide in distribution. It is known to occur at elevations between 2250 and 10,000 feet in all of the life zones from the Lower Sonoran to the Hudsonian, although it was collected most frequently in the Upper Sonoran and Transition life zones.

These mites were collected during the period from February



EXPLANATION OF PLATE I

Haemolaelaps glasgowi: fig. 1, sternal plate of female; figs 2–4, 6–8, 26, arrangement of ventral setae and plates of female; fig. 5, tectum of deutonymph; figs. 9, 10, pilus dentilis of protonymph; figs. 11–16, 18–21, pilus dentilis of female; fig. 17, pilus dentilis of nymph; fig. 22, pilus dentilis of deutonymph; fig. 23, anal plate of deutonymph; fig. 24, sternal plate of deutonymph; fig. 25, sternal plate of protonymph; fig. 26, ventral view of female; fig. 27, right peritreme of female; fig. 28, ventral view of right cornicula of deutonymph; fig. 29, anal plate of female; fig. 30, dorsal plate of female; fig. 31, tritosternum of female; fig. 32, hypopharynx (labium of Strandtmann) of deutonymph; fig. 33, hypopharynx of female; fig. 34, lateral view of chelicera of female.

to October, the largest numbers being found in May and June. Those mites that were collected in western Utah south of the 38th parallel and in eastern Utah in the Colorado River Basin were found only during the period from April to July. Those north of the 38th parallel were found only during the period from February to October.

Mites of this species have an ovoviviparous type of reproduction. One mounted female was observed wherein a six-legged larva was about half-way out of the genital opening. Each of 499 females collected over a nine-month period contained one egg or larva; apparently mites of this species also produce one egg at a time.

Twenty-eight of the 111 times that it was collected, *E. debilis* was the only mite found on its host. At other times, it was associated with the following species the numbers of times indicated: *Eubrachylaelaps circularis*, 3; *E. hollisteri*, 1; *Hirstionyssus* spp., 17; *Haemolaelaps glasgowi*, 46; *H. megaventralis*, 3; *Euschongastia criceticola*, 2; *Ornithonyssus bacoti*, 3; *Shunsennia ochotona*, 1; *Radfordia lemnina*, 1; *Euhaemogamasus* spp., 7; *Dermanyssus becki*, 1; *Hypoaspis gurabensis*, 1; *Trombicula myotis*, 2; *Ischyropoda armatus*, 3; *Euladelaps* sp., 1; Phytoseiidae sp., 3; Laelaptidae sp., 3; Parasitidae sp., 3; Gamasolaelaptidae sp., 1; Ascaidae sp., 1; Eremaeidae sp., 2; Pachylaelaptidae sp., 2.

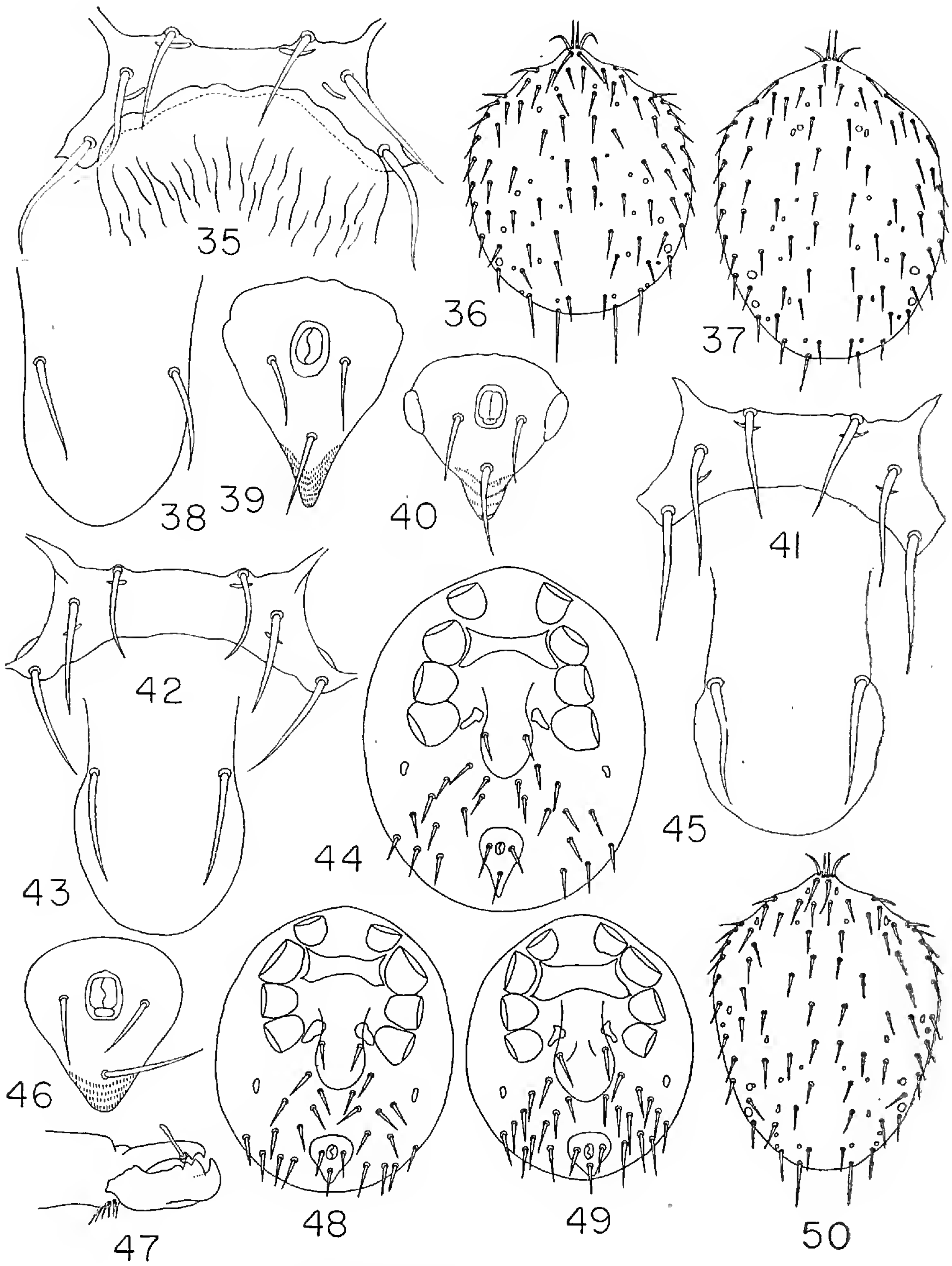
Table 2.—Species and percentages of mice infested by mites of the species *Eubrachylaelaps debilis*, 1948–1953.

	No. Mice Collected	*% Mice Infested*	*No. Mites Collected*	*Ave. No. Mites Per Infested Mouse*
P. crinitus	67	1.5	2	2.0
P. eremicus	201	1.0	2	1.0
P. maniculatus	2907	3.7	623	5.8
P. truei	59	1.7	10	10.0

EUBRACHYLAELAPS HOLLISTERI (Ewing), 1925

(Plate II, Figs. 35, 38, 39, 44, 50; Plate V)

Ewing's (1925) description of *Eubrachylaelaps hollisteri* is very general and lacks illustrations. This species should be redescribed once sufficient specimens have been collected from a broader geographic range. Ewing's type specimens were taken from caged mice of the species *Peromyscus californicus* sent to the National Zoological Park at Washington, D.C., from San



Explanation of Plate II

Eubrachylaelaps hollisteri: fig. 35, sternal plate of female, showing overlap of genitoventral plate; fig. 38, genitoventral plate of female; fig. 39, anal plate of female; fig. 44, arrangement of ventral setae of female; fig. 50, dorsal plate of female. *Eubrachylaelaps circularis:* fig. 36, dorsal plate of female; fig. 40, anal plate of female; fig. 41, sternal plate of female; fig. 45, genitoventral plate of female; fig. 47, lateral view of chelicera of female; fig. 49, arrangement of ventral setae of female. *Eubrachylaelaps debilis:* fig. 37, dorsal plate of female; fig. 42, sternal plate of female; fig. 43, genitoventral plate of female; fig. 46, anal plate of female; fig. 48, arrangement of ventral setae of female.

Francisco, California. Ewing designated the latter area as the type locality.

Mites of this species collected in this study conform to the description of the type. *E. hollisteri* probably is state-wide in distribution in Utah. It has been collected most commonly in the southern part of the state at elevations between 2250 and 5750 feet, principally in the Lower and Upper Sonoran life zones.

Table 3.—Species and percentages of mice infested by mites of the species *Eubrachylaelaps hollisteri*, 1948–1953.

	No. Mice Collected	*% Mice Infested*	*No. Mites Collected*	*Ave. No. Mites Per Infested Mouse*
P. crinitus	67	12.0	57	7.1
P. eremicus	201	10.4	70	3.4
P. maniculatus	2907	0.1	17	4.2
P. truei	59	3.4	3	1.5

A total of 147 female mites of this species was collected from 35 mice during the period from February to September, although only two mites were collected in February and one mite in September. No mites of this species were collected in March and August. The largest numbers were collected in April, May, and July.

Mites of this species have an ovoviviparous type of reproduction. Each of 115 gravid mites contained one egg or larva. Every month that this species was collected, gravid mites were present.

Twenty-five of the 35 times that it was collected, *E. hollisteri* was the only mite found on its host. At other times, it was associated with the following species the numbers of times indicated: *Trombicula belkini*, 1; *Ornithonyssus bacoti*, 1; *Brevisterna utahensis*, 2; *Hirstionyssus* spp., 3; *Eubrachylaelaps debilis*, 1; *Haemolaelaps glasgowi*, 2; *Dermanyssus becki*, 2; *Euhaemogamasus* sp., 1.

Haemolaelaps glasgowi (Ewing), 1925

(Plate I, Figs. 1–34; Plate IV)

Ewing (1925) described *H. glasgowi* from a single female specimen collected from a "wild rat" at Urbana, Illinois in 1912. Strandtmann (1949) discussed the synonymy, morphology and variations of this and related species of *Haemolaelaps*. Specimens

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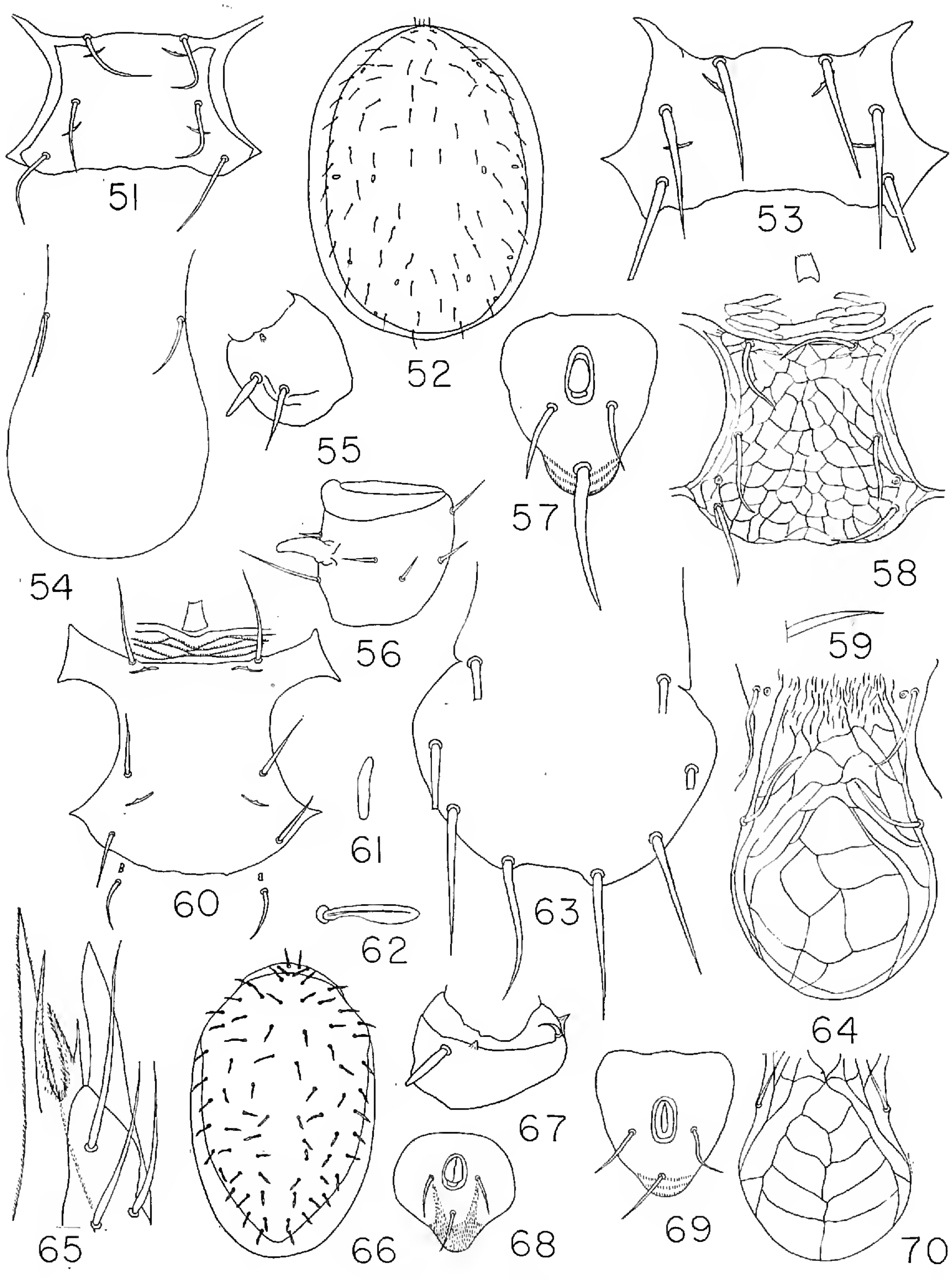
Explanation of Plate III

Haemolaelaps megaventralis: fig. 51, sternal plate of female; fig. 52,



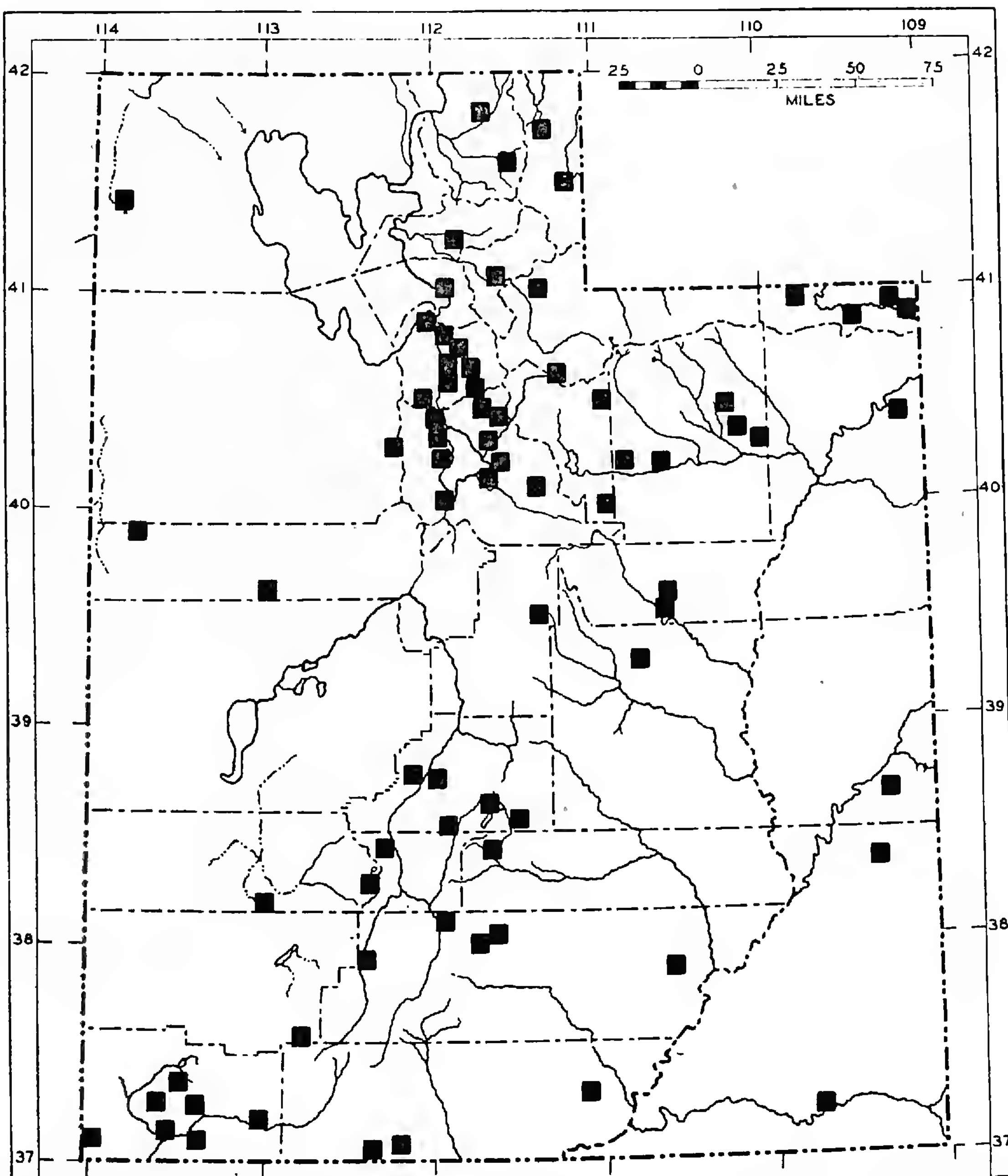
dorsal plate of female; fig. 54, genitoventral plate of female; fig. 59, pilus dentilis of female; fig. 61, metapodal plate of female; fig. 69, anal plate of female. *Laelaps nuttalli:* fig. 53, sternal plate of female; fig. 55, ventral view of right coxa I of female; fig. 57, anal plate of female; fig. 63, genitoventral plate of female; fig. 67, ventral view of right coxa II of female. *Hypoaspis leviculus:* fig. 56, ventral view of right femur II of female; fig. 58, reticulation of sternal plate of female; fig. 64, gentioventral plate of female, showing reticulation, metasternal setae and pores. *Hypoaspis gurabensis:* fig. 60, sternal plate of female; fig. 62, dorsal seta of female; fig. 65, ventral view of left half of gnathosoma of female; fig. 66, dorsal plate of female; fig. 68, anal plate of female; fig. 70, reticulation of genitoventral plate of female.

of this species from Utah collected in this study show some variations in the distance between the anal and genitoventral plates, and the amount of inflation and recurvation of the pilus dentilis. In Strandtmann's (*op. cit.*) key to the species of *Haemolaelaps*, he separated *H. glasgowi* and *H. geomys* partly on the basis of the amount of curvature of the slender terminal portion of the pilus dentilis. Mites collected in this study vary considerably with reference to the amount of curvature of this structure. Because of its variability, it appears that the pilus dentilis should be used primarily to separate the species into major groups rather than to separate two distinct species. In some specimens from Utah, the distance betwen the anal and genitoventral plates approaches that which is distinctive of specimens of *H. megaventralis*. A considerable range of variation in the distance between these ventral plates occurs in *H. glasgowi*. Strandtmann (*op. cit.*) stated that there are certain intraspecific differences which are apparent when comparing specimens from one host with those of another. These differences also occur between specimens from the same animal host, especially where large numbers of mites are concerned.

Mites of this species apparently have a preference for the Rodentia, although *H. glasgowi* has been taken from a variety of habitats and hosts including birds. It is known to occur principally in the western hemisphere and has been reported from almost all of the United States. Keegan (1953) reported that mites of this species occur on animals of the following species in Utah: *Citellus leucurus, Eutamias minimus, Onychomys leucogaster, Reithrodontomys megalotis, Peromyscus crinitus, P. maniculatus, Dipodomys ordii,* and *D. microps*. This species of mite is statewide in distribution in Utah at elevations between 2250 and 10,000 feet in all of the life zones from the Lower Sonoran to the Hudsonian. It has been collected most frequently in the Lower Sonoran and Transition life zones.

Haemolaelaps glasgowi was the species collected most frequently during this study. A total of 1253 mites representing 1080 females, 79 males and 94 nymphs was collected from 316 mice. According to Strandtmann (*op. cit.*), mites of this species may be recovered during any season that the host can be captured. In this study, mites were collected every month. There were twice as many found in June than in any other month. The largest numbers were collected during the period from April to August, and there was a conspicuous decline in the numbers of mites taken in September. During the winter, early spring, and autumn months, the numbers of mites collected were sufficiently low to be indicative of a seasonal fluctuation.

These mites have an ovoviviparous type of reproduction, and give birth to the first nymphal form (Strandtmann, *op. cit.*). Only one egg develops and matures at a time, and the larval stage is passed within the body of the female. Each of 252 gravid females found in this study contained only one egg, larva or nymph. Each



Explanation of Plate IV

Collection localities of *Haemolaelaps glasgowi* in Utah.

egg was of a large size and occupied almost one-half the idiosoma. Many females were engorged with blood, and some of these engorged specimens were gravid. Gravid females were collected every month except November and December. Mites of this species probably reproduce throughout the year in Utah.

Male mites were collected every month except May and September; they were most abundant in April. Nymphs were collected every month except January, August and September; largest numbers were found in June and July.

Table 4.—Species and percentages of mice infested by mites of the species *Haemolaelaps glasgowi*, 1948–1953.

	No. Mice Collected	*% Mice Infested*	*No. Mites Collected*	*Ave. No. Mites Per Infested Mouse*
P. boylii	37	21.6	48	6.0
P. crinitus	67	1.5	1	1.0
P. eremicus	201	8.4	36	2.1
P. maniculatus	2907	9.7	1158	4.1
P. truei	59	13.5	10	1.3

Mites of this species were associated with other mites belonging to more than 40 species. There were fluctuations in the numbers of mites that were associated with *H. glasgowi* during the five years that collections were made. There were also variations in the numbers of kinds of mites associated with this species.

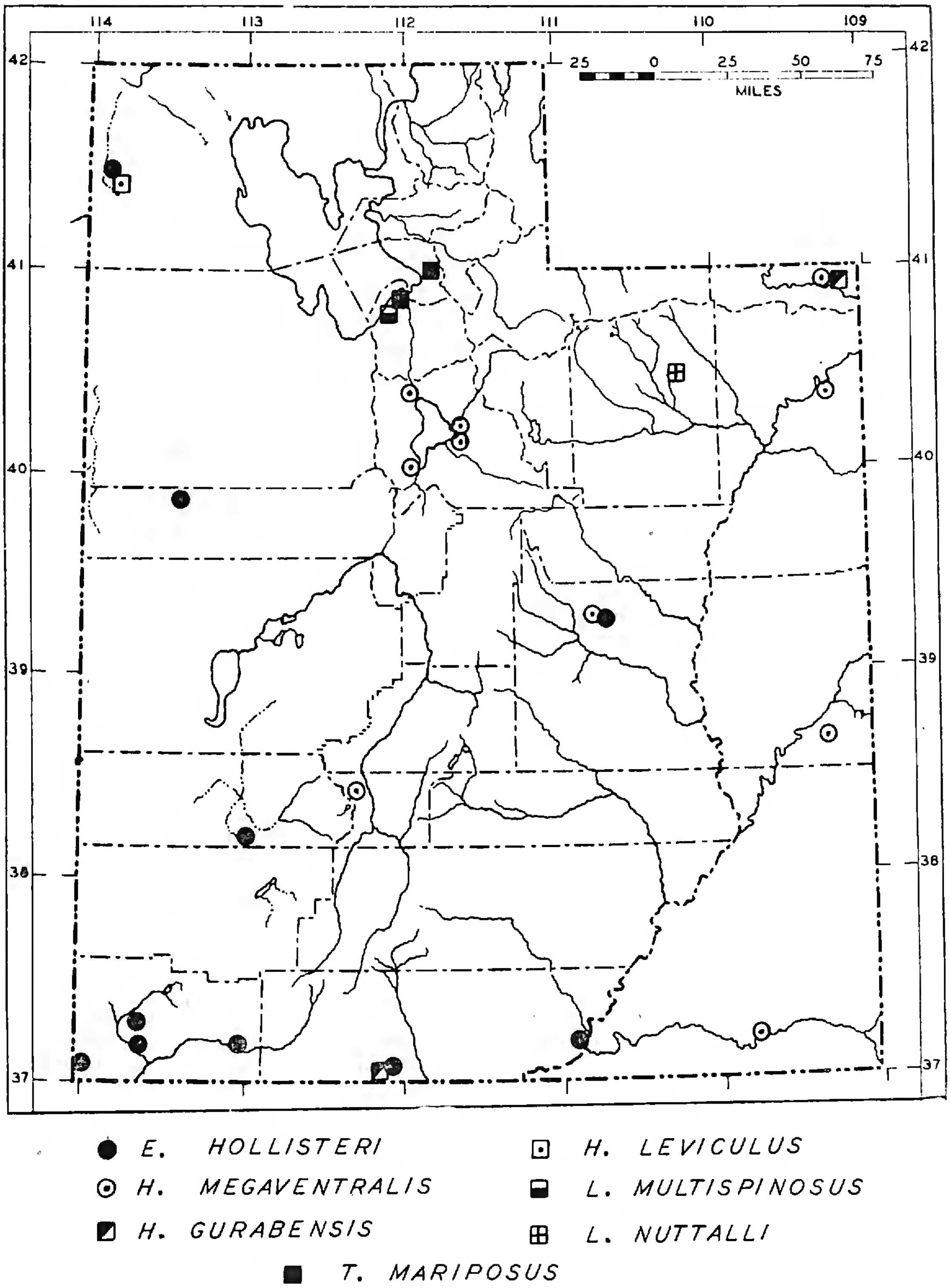
HAEMOLAELAPS MEGAVENTRALIS (Strandtmann), 1947

(Plate III, Figs. 51, 52, 54, 59, 61, 69; Plate V)

Strandtmann (1947) described this species from specimens collected from a gray squirrel from Georgia. The mites collected in this study agree in most morphological respects with the description of the type. Strandtmann (1947, 1949) stated that mites of this species have a slight preference for squirrels and birds, although they have been taken from a variety of mammals. *Haemolaelaps megaventralis* has been reported from several countries of both the northern and southern hemispheres. In North America, records are known from eastern and western United States, Mexico, and Canada. In Utah, this species probably is state-wide in distribution. It has been collected at elevations between 4000 and 5750 feet in the Upper Sonoran Life zone.

Table 5.—Species and percentages of mice infested by mites of the species *Haemolaelaps megaventralis*, 1948–1953.

	No. Mice Collected	*% Mice Infested*	*No. Mites Collected*	*Ave. No. Mites Per Infested Mouse*
P. maniculatus	2907	0.3	11	1.4
P. truei	59	15.0	14	1.5



EXPLANATION OF PLATE V

Collection localities of *Eubrachylaelaps hollisteri, Haemolaelaps megaventralis, Hypoaspis gurabensis, H. leviculus, Laelaps multispinosus, L. nuttali,* and *Typhlodromus mariposus* in Utah.

Thirteen nymphs, one male, and 11 females were collected from 17 mice in April, May, June, and November. Four of the 23 times that it was collected, *H. megaventralis* was the only mite found infesting its host. At other times, it was associated with the following species the numbers of times indicated: *Eubrachylaelaps debilis,* 3; *Haemolaelaps glasgowi,* 4; *Ischyropoda armatus,* 1; *Euhaemogamasus ambulans,* 1; *Hirstionyssus* sp., 4; *Garmania* sp., 2; *Hypoaspis* sp., 1; *Eulaelaps* sp., 1; *Rhizoglyphus echinopus,* 1; *Glycyphagus* sp., 1; Neoparasitidae sp., 1; Cunaxidae sp., 1.

Hypoaspis gurabensis (Fox), 1946

(Plate III, Figs. 60, 62, 65, 66, 68, 70; Plate V)

Fox (1946) described *H. gurabensis* from a single female collected from a "domestic rat or mouse" from Puerto Rico. The mites collected in this study in Utah conform to the description of the type. This species probably is statewide in distribution, but was not commonly found on mice of the genus *Peromyscus.* Mites were found at elevations between 5000 and 5500 feet in the Upper Sonoran life zone.

Fox (*op. cit.*) suggested that mites of this species probably are parasites or associates of ants. If this is true, it is probable that the infestations of mice in this study were accidental and occurred from the scavenger ants that visited the carcasses of trapped mice. Four females of this species were collected in May and June.

Hypoaspis leviculus (Eads), 1951

(Plate III, Figs. 56, 58, 64; Plate V)

Mites of this species collected in this study vary only slightly from the description of the type. Eads (1951) described the type specimen as having one large pair and one small pair of metapodal plates. Mites collected in this study have one large pair and three or four small pairs. The peritremes of the type specimens extend beyond coxae I; in the mites from Utah the peritremes end at the anterior fourth of coxae I.

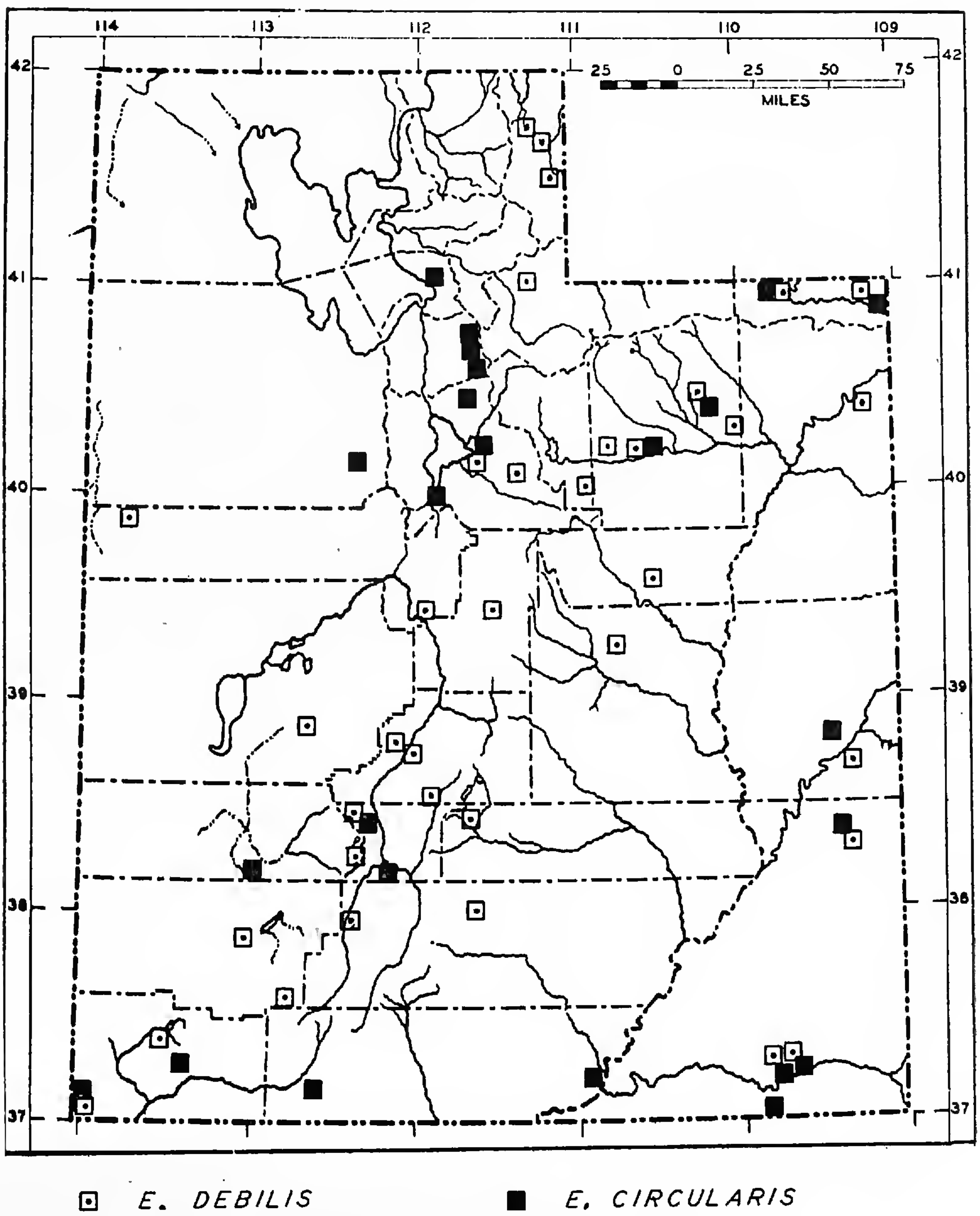
The type specimens were collected in Texas from pocket mice, *Perognathus hispidus,* grasshopper mice, *Onychomys leucogaster,* and cotton rats, *Sigmodon hispidus.* Eads, *et al* (1952) reported additional collections from grasshopper mice from Texas. Keegan (1953) recorded this species from *Perognathus parvus, Peromyscus maniculatus, P. crinitus,* and *O. leucogaster* from Utah. In this study, two females were collected in October at an elevation of about 4500 feet in the Upper Sonoran life zone.

Laelaps multispinosus Banks, 1909

(Plate V)

Banks (1909) described this species from specimens taken from a muskrat from Canada. The single female collected in this study conforms to the description of the type.

According to Tipton (unpublished manuscript), mites of this genus parasitize animals that dwell in water or marshy habitats. Animals of other kinds possibly are accidentally infested by these



Explanation of Plate VI

Collection localities of *Eubrachylaelaps debilis* and *E. circularis* in Utah.

mites when they wander into marshy habitats. The female mite in this study was collected from a mouse taken from a marshy area west of Salt Lake City, Salt Lake County, in October.

LAELAPS NUTTALLI Hirst, 1915

(Plate III, Figs. 53, 55, 57, 63, 67; Plate V)

One female mite of this species was collected in March from a mouse from Bluebell, Duchesne County, at an elevation of about 6500 feet in the Upper Sonoran life zone. Other species associated with *L. nuttalli* are *Hirstionyssus occidenalis* and *Euschongastia criceticola.*

Table 6.—Checklist and host correlation of the numbers and kinds of mites of the families Laelaptidae and Phytoseiidae taken from each of five species of *Peromyscus*.

	No. Mites Taken From Each Species Of *Peromyscus*				
Species of Mite	*P. boylii*	*P. crinitus*	*P. eremicus*	*P. maniculatus*	*P. truei*
Eubrachylaelaps circularis	145	35	65	79	68
Eubrachylaelaps debilis		2	2	623	10
Eubrachylaelaps hollisteri		57	70	17	3
Haemolaelaps glasgowi	48	1	36	1158	10
Haemolaelaps megaventralis				11	14
Hypoaspis gurabensis				4	
Hypoaspis leviculus				2	
Laelaps multispinosus				1	
Laelaps nuttalli				1	
Typhlodromus mariposus				17	

PHYTOSEIIDAE

TYPHLODROMUS MARIPOSUS (Fox), 1946

(Plate V)

Fox (1946) described this species from two females collected from "*Rattus* species or *Mus m. musculus*" and from rats, *R. norvegicus*, from Puerto Rico. Thurman and Branch (1948) reported this species from *R. norvegicus* from Florida. In this study, 17 female mites were collected in September, October, and November.

Discussion

In Utah, mites of several species most commonly occur in certain faunal areas. *Eubrachylaelaps hollisteri* and *Haemolaelaps megaventralis* are generally southern in distribution. *Eubrachylaelaps hollisteri* apparently has extended its range into Utah from the south by way of the Virgin River and Colorado River drainages, and the valleys of eastern Nevada in the Great Basin area. *Haemolaelaps megaventralis* apparently has extended its range northward into Utah by way of the Colorado River drainage.

Mites of certain species, although not host specific, are associated more frequently with one kind of white-footed mouse than with another. Mites of the species *H. megaventralis* and *E. circularis* were found most frequently on *Peromyscus truei*, and *E. hollisteri* on *P. crinitus*. Such a frequent association allows a mite species to rapidly extend its range to correspond to the range of its preferred host, as long as climatic conditions are favorable for the survival of the mites. Mites of the species *H. megaventralis* were found almost exclusively in those areas which correspond to the known distribution of mice of the species *P. truei*. Mites of the species *E. hollisteri* apparently are also restricted to the range of their preferred *Peromyscus* hosts, yet mites referrable to *E. circularis* are not restricted to the range of their "preferred" host, *P. truei*. Mites of the species *E. debilis* and *H. glasgowi* were not found in a majority on any one kind of mouse, and were widely distributed over the entire area of the state.

Mites are influenced in their activity and reproductive periods by climatic conditions. In the Upper Sonoran and Transition life zones in Utah, *H. megaventralis*, *E. circularis*, and *E. debilis* were found on mice most frequently during the period from May to September. In the Lower Sonoran zone and similar areas, *E. hollisteri* was most abundant on mice during the period from May to July.

Haemolaelaps glasgowi occurs on mice of the genus *Peromyscus* in Utah more frequently and in larger numbers than mites of any other species. Next in frequency of occurrence are mites of the three species of *Eubrachylaelaps*: *E. circularis*, *E. debilis*, and

E. hollisteri. *Hirstionyssus occidentalis* also is commonly found on *Peromyscus* (Allred, unpublished manuscript).

References

ALLRED, D. M.

1956a. Mites found on mice of the genus *Peromyscus* in Utah. I. General infestation. The Great Basin Naturalist (In Press).

1956b. Mites found on mice of the genus *Peromyscus* in Utah. II. Family Haemogamasidae. Proc. Ent. Soc. Wash. (In Press).

Mites found on mice of the genus *Peromyscus* in Utah. III. Family Dermanyssidae (Unpublished Manuscript).

BANKS, N.

1909. New Canadian mites. Proc. Ent. Soc. Wash., 11:133–143.

EADS, R. B.

1951. New mites of the genus *Androlaelaps* Berlese. J. Parasit., 37(2): 212–216.

EADS, R. B., G .C. MENZIES and V. I. MILES

1952. Acarina taken during west Texas plague studies. Proc. Ent. Soc. Wash., 54(5):250–253.

EWING, H. E.

1925. New parasitic mites of the genus *Laelaps*. Proc. Ent. Soc. Wash., 27(1):1–7.

1933. New genera and species of parasitic mites of the superfamily Parasitoidea. Proc. U.S. Nat. Mus., 82(30):1–14.

FOX, I.

1946. A new genus, *Borinquolaelaps*, and new species of mites from rats in Puerto Rico. J. Parasit., 32(5):445–452.

JAMESON, E. W., JR.

1950. *Eubrachylaelaps debilis*, a new Laelaptid mite (Acarina: Laelaptidae) parasitic on the deer mouse, *Peromyscus maniculatus* (Mammalia: Cricetidae). J. Parasit., 36(1):62–64.

1951. *Eubrachylaelaps martini*, a new mite (Acarina: Laelaptinae) from the volcano mouse (Mammalia: Cricetinae). J. Parasit., 37(6): 556–559.

KEEGAN, H. L.

1953. Collections of parasitic mites from Utah. The Great Basin Nat., 13(1–2):35–42.

STRANDTMANN, R. W.

1947. *Atricholaelaps megaventralis*, a new species of parasitic mite (Acarina: Laelaptidae). Proc. Ent. Soc. Wash., 49:112–114.

1949. The blood-sucking mites of the genus *Haemolaelaps* (Acarina: Laelaptidae) in the United States. J. Parasit., 35(3):325–352.

THURMAN, D. C. and N. BRANCH

1948. United States records of *Typhlodromus mariposus* (Fox) from rats in Florida. J. Econ. Ent., 41(1):102.

A FORMOSAN APHID, MICROMYZUS FORMOSANUS TAKAHASHI, ON SHALLOTS IN CALIFORNIA

(Homoptera: Aphididae)

E. O. Essig

University of California, Berkeley, California

In the fall of 1953, an elderly gentleman brought to our office in Agriculture Hall, University of California, a few plants of shallots, or eschallots, *Allium ascalonicum*, which he thought were being injured by an insect. However, a rather close examination did not reveal the nature of the trouble, and I took the plants home and planted them in the garden for further observations. During the past, the tops of these plants were occasionally used

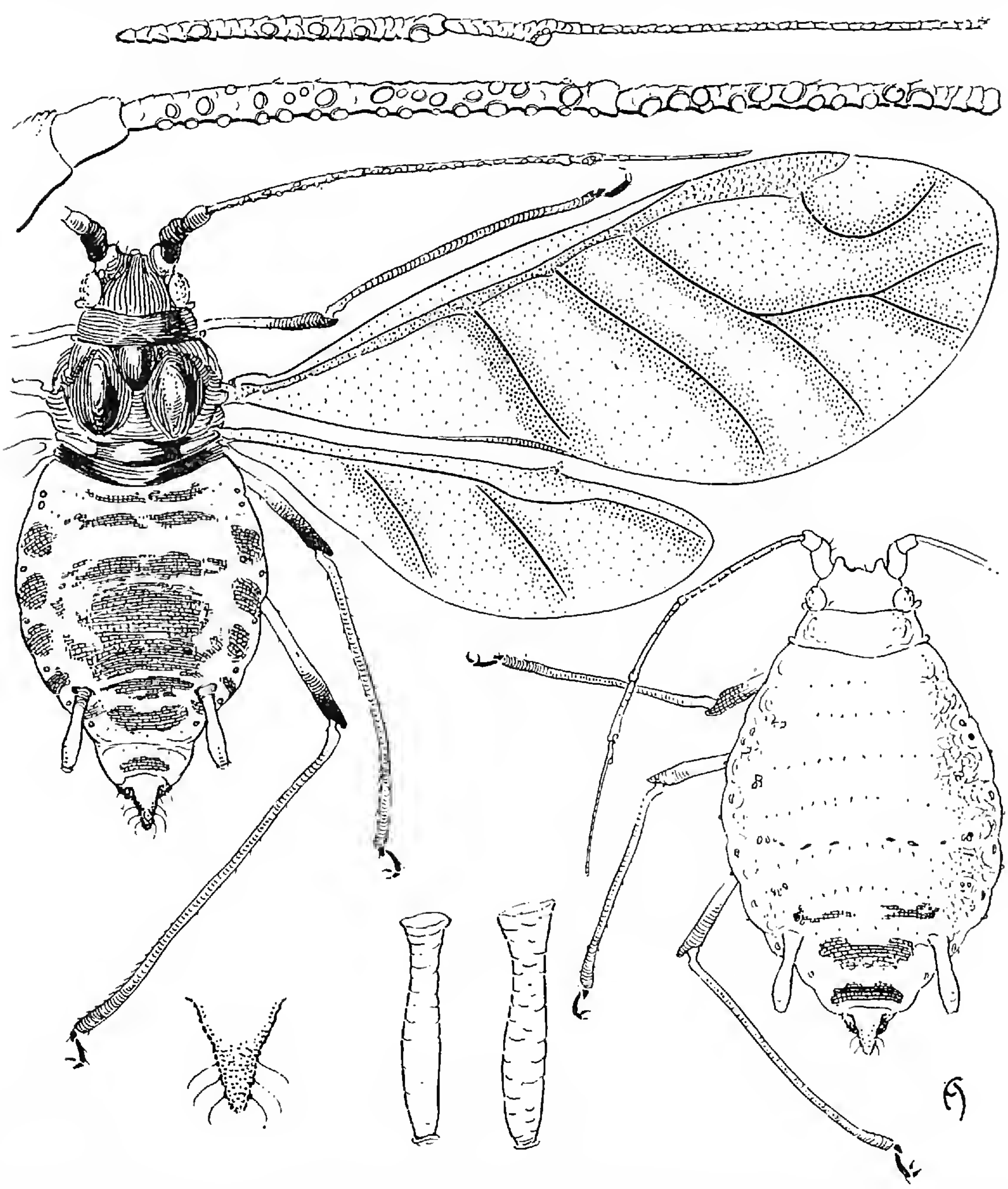


Fig. 1. *Micromyzus formosanus* Takahashi (Drawings by Frieda Abernathy)

for seasoning certain foods, without noticing any insect infestations even under close scrutiny.

Fortunately on November 10, 1956, the writer was asked to gather some shallot tops for culinary purposes. In so doing, he discovered that one clump, containing many plants, was heavily infested with a cloudy-winged aphid which was at once recognized as the shallott aphid, *Micromyzus formosanus* Takahashi. An intensive scanning of the literature revealed that this aphid was first collected on *Polygonium chinensis,* at Taihoku, on the island of Formosa, and was described as *Myzus formosanus* by Ryoichi Takahashi in March, 1923, in Report No. 4 Aphididae of Formosa, Part 2, Department of Agriculture, Government of Formosa, Taihoku, in March, 1923; and also in Report No. 22, Part 5, p. 68, May, 1931.

Dr. Orhez Shinji, in his 1215-page work on the Japanese Aphididae, lists *Myzus formosanus* Takahashi on *Polygonium chinensis* in Formosa in 1941.

The most complete and important paper devoted to this insect is that of J. P. Doncaster and B. Kassanis, of the Rothamsted Experimental Station, Harpenden, England, in the Annals of Applied Biology, Vol. 33, No. 1, pp. 65–68, Plate 6, Fig. 1, August 1945.

As near as I can ascertain at the present time, this aphid has been reported as occurring in the Japanese districts of Batoran, Shinton, Tokyo and Toyen; in sixteen localities in Great Britain, and at Berkeley, California. The recorded host plants are chiefly members of the Lilaceous family, and more particularly on *Allium* spp.

TEMNOSOMA, A GENUS OF BEES NEW TO THE UNITED STATES

(Hymenoptera: Halictidae)

A female of *Temnosoma smaragdinum* Smith was collected at Tucson, Aricona, June 25, 1932 by R. H. Crandall. This specimen has the transverse striae at apex of the enclosure of propodeum so faint as to be discernible only in certain lights, but Smith, in the original description, states these are more or less obsolete in different examples. The species was described from southern Mexico, and has been recorded by Cockerell from Cordoba and San Rafael in Vera Cruz. Our specimen belongs in the collection of the University of Arizona, at Tucson.—P. H. TIMBERLAKE, *University of California, Riverside.*

RECENT COLLECTIONS OF MALLOPHAGA AND ANOPLURA FROM SOUTHERN CALIFORNIA[1]

RAYMOND E. RYCKMAN AND ROBERT D. LEE
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Lice have not been collected or adequately studied in many sections of the United States; Southern California is not an exception in this regard.

The biting and sucking lice herein reported were collected from mammals and birds caught during investigations concerned with insecticide studies for the control of ectoparasites under field conditions and studies on *Neotoma,* the host for Triatominae. A limited number of specimens was contributed by friends who knew of our interests in Mallophaga and Anoplura. This material was collected from 1951–1954 in five counties of Southern California: Orange, San Diego, Riverside, San Bernardino, and Inyo Counties; two collections are included which were made a few miles outside the state of California: one in Yavapai County, Arizona, the other in Northern Baja California, Mexico. The collections listed represent several new county, state, and host records.

During the time the specimens were accumulated the authors were assisted by C. T. Ames, K. Y. Arakawa, C. P. Christianson, B. A. Deem, K. C. Fischer, C. C. Lindt, and D. Spencer. The authors also acknowledge with appreciation the assistance of Lt. John I. Scanlon who identified the lice, and Dr. Henry W. Setzer who identified a number of the mammals. Mr. W. C. Hanna very kindly rendered counsel on certain taxonomic problems with the birds.

The fourth edition (1931) of the *American Ornithological Union's Check List of North American Birds (With Supplements)* was used as the authority for the birds discussed, and the *List of North American Recent Mammals* by Miller and Kellogg (1955) was the taxonomic authority for the mammals. Supplementary works on birds and mammals also used were Allen (1951), Harrison (1955), Hoffman (1927), Hooper (1938), Ingles (1954), and Orr (1940). *The Sucking Lice* by Ferris (1951), and *A Check List of the Genera and Species of Mallophaga* by Hopkins

[1] Collection of a major portion of the material presented in this paper was made possible by a contract (DA-49-007-MD-185) from the Research and Development Division, Office of the Surgeon General, Department of the Army.

and Clay (1952) were found to be valuable references on the sucking and biting lice.

ANOPLURA

Hoplopleuridae:

Hoplopleura acanthopus (Burmeister, 1839)

Microtus californicus sanctidiegi Kellogg, 1922 (meadow mouse)—*San Juan Capistrano, Orange County, California, September 10, 1951; *Camp Pendleton, Oceanside, San Diego County, California, March 8, 1953; and *Reche Canyon, Riverside County, California, January 6, 1953. Previously reported from *Microtus constrictus* Mendocino City; *M. californicus,* Covelo; and *Microtus* sp., South Yolla Bolly Mt., California (Ferris, 1921).

Hoplopleura hesperomydis (Osborn, 1891)

Peromyscus maniculatus gambelii (Baird, 1858) (deer mouse)—*Whitney Portal, 13 miles west Lone Pine, Inyo County, California, September 27–30, 1951. Previously reported from Yosemite National Park on *P. maniculatus*; on *Onychomys torridus pulcher,* San Bernardino County; and on *Mus musculus* from Stanford University (Ferris, 1916).

Peromyscus maniculatus sonoriensis (LeConte, 1853) (deer mouse)—*Reche Canyon, Riverside County, October 11, 1951.

Peromyscus boylii rowleyi (Allen, 1893) (brush mouse) — *Reche Canyon, Riverside County, October 12, 1951; and seven miles south Congress Junction, Yavapai County, Arizona, December 17, 1952: Previously reported from California on *Peromyscus boylii* and on *Mus musculus* at Stanford University (Ferris, 1921).

Haemodipsus setoni Ewing, 1924

Sylvilagus audubonii sanctidiegi (Miller, 1899) (Audubon cottontail rabbit)—*Camp Pendleton, Oceanside, San Diego County, California, August 13 and November 25, 1952; and *Loma Linda, San Bernardino County, California, January 19 and 23, 1953. Previously reported from *Lepus californicus* in California (Ferris, 1932).

Polyplax abscisa Fahrenholz, 1938

Microtus californicus sanctidiegi Kellogg, 1922 (meadow mouse)—*San Juan Capistrano, Orange County, California, September 10, 1951; *Camp Pendleton, Oceanside, San Diego County, California, March 8, 1953; and *Reche Canyon, Riverside County, California, January 6, 1953. This louse has previously been reported on *Microtus* sp. at South Yolla Bolly Mt., California; *M. californicus* from Marin County, California; and on *M. intermedius* from Nevada (Ferris, 1942).

Neohaematopinus laeviusculus (Grube, 1851)

Citellus beecheyi beecheyi (Richardson, 1829) (Calif. ground squirrel) —*San Juan Capistrano, Orange County, California, August, 1951–March, 1952; Dana Point, Orange County, California, October, 1951–March, 1952, May–September, 1952, November and December, 1952, and June, 1953; *Camp Pendleton, Oceanside, San Diego County, California, March and April, 1952, and June–November, 1952; and *Corona, Riverside County, California, August, 1952.

Citellus beecheyi parvulus Howell, 1931 (Calif. ground squirrel)—*Loma Linda, San Bernardino County, California, November, 1951, February and March, 1952, July–November, 1952, and February, April, May and July, 1953; and *Mt. San Jacinto, Riverside County, California, June, 1952.

N. laeviusculus is at times very abundant on *Citellus beecheyi* during the spring months; however, the above collection records from 446 hosts indicate that this louse occurs on ground squirrels in Southern California throughout all of the year including the hot, dry summer months. This louse has previously been reported from *C. beecheyi*, *C. b. douglasii*, and *C. beldingi* in California (Ferris, 1923).

Neohaematopinus neotomae Ferris, 1942

Neotoma fuscipes simplex True, 1894 (dusky-footed wood-rat)—*Lake Mathews Canyon, Riverside County, California, December 13, 1951.

Neotoma fuscipes macrotis Thomas, 1893 (dusky-footed wood-rat)—*Mill Creek Canyon, San Bernardino County, California, March 17 and 26, 1953.

†*Neotoma lepida intermedia* Rhoads, 1894 (desert wood-rat) — **Reche Canyon, Riverside County, California, January 6, 1953.

Neohaematopinus neotomae has previously been reported from *Neotoma albigula* at Tucson, Arizona; *Neotoma fuscipes streatori* at Monterey, California; and *Hodomys alleni* at Manzanillo, Mexico (Ferris, 1942).

MALLOPHAGA

Trichodectidae:

Trichodectes osborni (Keler, 1944)

†*Spilogale gracilis microrhina* Hall, 1926 (spotted skunk)—*Reche Canyon, Riverside County, California, October 3, 1951; and *Dana Point, Orange County, California, October 22, 1952. New host record for this subspecies.

Trichodectes mephitidis (Packard, 1873)

Mephitis mephitis holzneri Mearns, 1897 (striped skunk)—*San Juan Capistrano, Orange County, California, October 4, 1951.

Trichodectes minutus (Paine, 1912)

Mustela frenata latirostra Hall, 1936 (long-tailed weasel) — *Loma Linda, San Bernardino County, California, March 25, 1952 and May 17, 1953; and *Camp Pendleton, Oceanside, San Diego County, California, April 3, 1952.

Geomydoecus californicus (Chapman, 1897)

Thomomys bottae (Eydoux and Gervais, 1836), (botta pocket gopher) —*Loma Linda, San Bernardino County, California, November 21 and 25, December 7 and 16, 1951, January 21, March 3, October 14, and December 19, 1952, and January 21–24, 1953; and San Jose, Baja California, Mexico, November 8, 1953.

Mustela frenata latirostra Hall, 1936 (long-tailed weasel) — *Loma Linda, San Bernardino County, California, December 6, 1951 and March 24, 1952.

Menoponidae:

COLPOCEPHALUM UNCIFERUM Kellogg, 1896

Pelecanus erythrorhynchos Gmelin, 1789 (white pelican)—*Mentone, San Bernardino County, California, March 17, 1954.

PSEUDOMENOPON PACIFICUM (Kellogg, 1896)

Fulica americana americana Gmelin, 1789 (coot or mud-hen)—*Lakeview, Riverside County, California, December 24, 1953.

PSEUDOMENOPON sp.

Grebe (this host was not identified to species)—*San Juan Capistrano, Orange County, California, November 1, 1951.

DENNYUS sp.

Aeronautes saxatalis saxatalis (Woodhouse, 1853) (white-throated swift)—*Loma Linda, San Bernardino County, California, December 31, 1953. The single specimen collected was a nymph and could not be taken to species.

PIAGETIELLA PERALIS (Leidy, 1878)

Pelecanus erythrorhynchos Gmelin, 1789 (white pelican)—*Mentone, San Barnardino County, California, March 17, 1954.

TRINOTON sp.

Mergus merganser americanus Cassin, 1852 (American merganser duck)—*Mentone, San Bernardino County, California, March 17, 1952.

Anas cyanoptera cyanoptera (Vieillot, 1816) (Cinnamon teal duck)—*Loma Linda, San Bernardino County, California, December 27, 1953.

HOHORSTIELLA LATA (Piaget, 1880)

Columba livia livia Gmelin, 1789 (rock dove or domestic pigeon)—*Loma Linda, San Bernardino County, California, November 29, 1953.

Ricinidae:

RICINUS SUBHASTATUS (Durrant, 1906)

Pipilo fuscus crissalis (Vigors, 1839) (brown towhee)—*San Jose, Baja California, November 6, 1953.

Laemobothriidae:

LAEMOBOTHRION BUTEONIVORUM (Packard, 1872)

Buteo swainsoni Bonaparte, 1838 (Swainson's hawk)—*Loma Linda, San Bernardino County, California, October 12, 1953.

Philopteridae:

ANATICOLA CRASSICORNIS (Scopoli, 1763)

Anas cyanoptera cyanoptera (Vieillot, 1816) (cinnamon teal duck)—*Loma Linda, San Bernardino County, California, December 27, 1953.

ANATICOLA MERGISERRATI (DeGeer, 1778)

†*Mergus merganser americanus* Cassin, 1852 (American merganser duck)—*Mentone, San Bernardino County, California, March 17, 1952. The only North American record of *Anaticola* from mergansers in Wilson's (thesis) record of this species from *Mergus serrator, in litt.* Scanlon.

COLUMBICOLA COLUMBAE (Linnaeus, 1758)

Columba livia livia Gmelin, 1789 (rock dove or domestic pigeon)—*Loma Linda, San Bernardino County, California, September 29, 1953.

AQUANIRMUS AMERICANUS (Kellogg and Chapman, 1899)

Grebe (this host was not identified to species)—*San Juan Capistrano, Orange County, California, November 1, 1951.

STRIGIPHILUS SPEOTYTI (Osborn, 1896)

Speotyto cunicularia hypugaea, Bonaparte, 1825) western burrowing owl)—*Dana Point, Orange County, California, December 17 and 18, 1951.

DEGEERIELLA GIEBELI (Hopkins, 1947)

Buteo jamaicensis culurus Cassin, 1855 (red-tailed hawk) — *Loma Linda, San Bernardino County, California, December 17, 1953.

SUMMARY

The material presented above was collected from 1951–1954 in five counties of Southern California: Orange, San Diego, Riverside, San Bernardino, and Inyo Counties; two collections are included which were made a few miles outside of California: one in Yavapai County, Arizona, the other in Northern Baja California, Mexico. Six species of Anoplura were associated with twelve hosts which constituted nineteen county records, one state record, and one host record. Nineteen species of Mallophaga were associated with twenty-one hosts and comprised twenty-two county records, one state record, and two host records.

LITERATURE CITED

ALLEN, A. A.

1951. Stalking birds with color camera. 1st ed., 328 pp. The National Geographic Society, Washington, D.C.

COMMITTEE OF THE AMERICAN ORNITHOLOGICAL UNION

1931. Check List of North American Birds (With Supplements). 4th ed.

FERRIS, G. F.

1916. Notes on Anoplura and Mallophaga from mammals, with descriptions of four new species and a new variety of Anoplura. Psyche. 23(4):97–120.

1921. Contributions toward a monograph of the sucking lice. Stanford University Publications, Biological Sciences. 2(2):59–133.

1923. Contributions toward a monograph of the sucking lice. Stanford University Publications, Biological Sciences. 2(4):183–270.

1932. Contributions toward a monograph of the sucking lice. Stanford University Publications, Biological Sciences. 2(5):271–413.

1942. Some North American, rodent-infesting lice (Insecta: Anoplura) Microentomology. 7(3):84–90.

1951. The sucking lice, California Academy of Sciences. Memoirs Pacific Coast Entomological Society. 1st ed., vol. 1, 320 pp.

HARRISON, H. H.

1955. American birds in color. 486 pp. Wm. H. Wise & Co., Inc., New York.

HOFFMAN, R.
1927. Birds of the Pacific states. 353 pp. Houghton Mifflin Co., Boston.
HOOPER, E. T.
1938. Geographical variations in wood rats of the species *Neotoma fuscipes.* University of California Press. Univ. Calif. Pub. Zool. 42(4):213–245.
HOPKINS, G. H. E. AND CLAY, T.
1952. A check list of the genera and species of Mallophaga. 1st ed., 362 pp. British Museum Natural History, London.
INGLES, L. G.
1954. Mammals of California and its coastal waters. Rev. ed., 396 pp. Stanford University Press, Stanford.
MILLER, G. S. AND KELLOGG, R.
1955. List of North American recent mammals. 1st ed. 954 pp. Smithsonian Institution, U.S. National Museum Bulletin 205, Washington, D.C.
ORR, R. T.
1940. The rabbits of California. California Academy of Sciences. Occasional Papers of the California Academy of Sciences No. XIX.

† New host record.
* New county record.
** New State record.

LONGEVITY OF SOME ANTHOPHORID BEE LARVAE
(Hymenoptera: Apoidea)

Large collections of anthophorid bee cells containing overwintering larvae have been brought into the laboratory and held for long periods of time. Usually these larvae pupate and emerge at about the same time as those in the field. A few may fail to transform and die after a protracted period in the larval stage. An exception occurred with 10 of 75 larvae of *Melissodes robustior* Cockerell collected near Marsh Creek Canyon, Contra Costa County, California on November 4, 1954. This bee is a fall emerging species and its burrows were located in a layer of moist clay in the bed of an intermittent stream. These cells were kept in pill boxes and were next examined in February, 1957. All but ten had transformed to the adult stage and these ten larvae were removed from their cells and placed in separate pill boxes. All of them pupated in April or early May, 1957 and developed into one male and nine females. (However, only three females became perfect adults with fully expanded wings.) It is apparent that the ability to prolong the resting stage would be of considerable adaptive value to desert-dwelling forms but its significance for this species is not clear.—J. W. MACSWAIN, *University of California, Berkeley.*

REARING RECORDS FOR SOME CALIFORNIA CERAMBYCIDAE

John A. Chemsak
University of California, Berkeley

During the early part of 1957, dead tree branches and limbs were collected in the areas around San Francisco Bay. All of the wood material was boxed and caged in the laboratory and the adult cerambycids were collected as they emerged. Five different species were reared from three different hosts.

Phymatodes nitidus LeConte

A total of nine females and five males of this species were reared from Sargent cypress, *Cupressus goveniana* Gord., collected at Carson Ridge, Marin County, California, on January 9, 1957. The selected material consisted of small dead branches which were attached to the trees. Emergence of adults began on March 7 and continued until April 27.

Necydalis cavipennis LeConte

N. cavipennis was reared from a small dead trunk section of California live oak, *Quercus agrifolia* Nee., which was in a fairly advanced state of decay. The material was collected at Strawberry Canyon, Berkeley Hills, Alameda County, California, on January 14, 1957. Emergence dates of the adults were from April 19 to April 26 with a total of five females being taken.

Xylotrechus nauticus Mannerheim

Two specimens were reared from the thick bark of California live oak collected in the Berkeley Hills on March 10, 1957. A female emerged on April 13 and a male on May 6.

Xylotrechus insignis LeConte

One specimen, a male, emerged from willow, *Salix* sp., on April 4, 1957. The host material was collected two miles west of Pittsburg, Contra Costa County, California, on March 21, 1957.

Saperda horni Joutel

This species was reared from willow collected two miles west of Pittsburg, California. Willow limbs were brought in on two dates, February 15 and March 21. One male emerged from the latter on May 6 and three males and one female from the former in May.

A few observations were made in the field on the habits of the larvae of *S. horni.* These appear to bore in the heartwood of living branches of willow making their galleries up the center of limbs. The galleries are about one-half inch in diameter and are loosely packed with dark-brown, moist frass.

AN ATTRACTANT FOR TWO SPECIES OF CERAMBYCIDAE
(Coleoptera)

A long series of *Dendrobias mandibularis mandibularis* Audinet-Serville was taken under somewhat unusual circumstances on July 18, 1957 by C. W. O'Brien in Arizona. While stopping at a roadside picnic stand 15 miles north of Rock Springs, Yavapai County, he observed large numbers of cerambycids in the trash barrels. These beetles were being attracted by watermelon rinds in the barrels. A total of 32 males and 34 females were collected. Mr. O'Brien mentioned, however, that this series was merely a sample of the total number present.

Also taken with this series of *Dendrobias* were two females of *Eustromula validum* (LeConte). No other specimens of this species were observed at the time. Little is known of the food habits of the adults of these two species. Schwarz[1] states that those of *Dendrobias* are especially fond of printers ink and sometimes obliterate the large letters on the posters of theatrical performances, etc., which are pasted on walls and fences.

D. mandibularis, while not an uncommon species in the southwestern United States, is seldom observed in such profusion, and long series from any one locality are scarce as a rule. *E. validum,* on the other hand, is seldom numerous except at light. Use of watermelon as bait may offer a fairly good method for collecting series of this species.

The attractive powers of watermelon have been shown for other groups of insects. For instance, Bohart[2] reporting on mating habits of halictid bees, reported that several species of bees were observed on fermenting juice of watermelon.—JOHN A. CHEMSAK, *University of California, Berkeley.*

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[1] Schwarz, E. A. Food habits of longicorn beetles. Proc. Ent. Soc. Wash., 6:21-22. 1904.

[2] Bohart, G. E. Observations on the mating habits of halictid bees. Pan-Pac. Ent., 26, (1):34-3. 1950.

A NEW SUBSPECIES OF THE GENUS CICINDELA

(Coleoptera: Cicindelidae)

D. K. Duncan
Globe, Arizona

Cicindela tranquebarica cibecuei Duncan, new subspecies

Uniformly robust form. Elytra brilliant dark navy blue in sunlight, appearing black under artificial light. Typical but massive white markings, similar to *C. tranquebarica kirbyi* LeConte.

Body dark shining blue beneath. Legs dark blue. Femora clothed with stiff, erect white hairs. Tibiae with stiff white hairs about one third the length of those on the femora and less dense. Sides of thorax and abdomen clothed with dense, erect white hairs. Middle of abdominal segments with scattered inconspicuous, long, fine white hairs. Thorax above, deep navy blue, with sparse, erect, white hairs, becoming more numerous laterally. Head deep navy blue, vertex and cheeks naked, front and palpi with long erect white hairs. Labrum and base of mandibles ivory white. Length: 12–14 mm. Width: 5–6 mm.

The deep blue color with no cupreous or brassy reflections, and the broad, often connected elytral markings readily distinguish this subspecies.

The type series of 119 specimens vary by having the markings connected laterally on 21; the humeral and median lunules only connected laterally on 14; the median and apical lunules only connected on 10; the remaining 74 having these markings very narrowly separated.

The markings are extremely uniform through a large series taken from several localities on Cibecue Creek, Arizona, in 1953, 1954 and 1956.

Holotype male, Cibecue Creek, near Cibecue, Gila County, Arizona, April 22, 1956, D. K. Duncan. *Allotype female*, same data as holotype, April 8, 1953, D. K. Duncan. *Paratypes*, same data, seven specimens, D. K. Duncan, R. A. Tunis and Ralph Premeau, April 8, 1953; 50 specimens, D. K. Duncan, April 15, 1954; 60 specimens, D. K. Duncan and F. H. Parker, April 22, 1956.

The holotype and allotype together with 18 paratypes have been deposited in the American Museum of Natural History, New York City. Twenty paratypes have been deposited in the University of Arizona collection, Tucson, Arizona.

I am indebted to Dr. Mont A. Cazier, Curator, American Museum of Natural History, for examination of this insect and comments, and to Mr. Frank H. Parker of Globe, Arizona, for helpful comments.

AN EARLY RECORD OF THE KHAPRA BEETLE IN ARIZONA[1]

M. W. NIELSON
University of Arizona, Tucson

Armitage (1935) reported the first record of occurrence of the khapra beetle, *Trogoderma granarium* Everts, in the United States. According to Allen and Linsley (1954), specimens were identified from infested grain in two warehouses in Tulare County, Calif., in October, 1953. Armitage (1954) stated that the khapra beetle was soon found also in other California counties, and that a study of these infestations showed this insect to have been present in the State as early as 1946, although it was not recognized until seven years later. Padget (1954) reported that the khapra beetle was first recognized in Arizona in December, 1953. The following record is believed to be the earliest yet reported of the occurrence of the khapra beetle in Arizona.

On April 15, 1956, a sealed pint jar containing insect-infested barley was discovered in a storeroom at the Tempe, Ariz., U.S.D.A. Laboratory. The data on the label showed that the material was collected March 16, 1953, from an infested grain bin in Phoenix, Ariz. A commercial pest control operator had brought the jar of infested grain to the laboratory where specimens from it were tentatively identified as belonging to a dermestid species.

The day following its discovery, this jar was taken to the Khapra Beetle Laboratory of Agricultural Marketing Service at Mesa, Arizona, where it was opened. An examination revealed living adults and larvae of the khapra beetle. The insects had apparently lived and multiplied in the sealed jar for three years and one month. Specimens were identified as *Trogoderma granarium* Everts by W. H. Anderson of Entomology Research Branch.

LITERATURE CITED

ALLEN, PAUL, AND E. G. LINSLEY
1954. Proceedings Pacific Coast Entomological Society. Pan-Pacific Ent. 30(1):89–90.

ARMITAGE, H. M.
1953. 34th Annual Report. California Dept. Agr. Bull. 42(4):202–203.
1954. Current insect notes. California Dept. Agr. Bull. 43(1):41–42.

PADGET, L. J.
1954. Status of the khapra beetle in the western states. Cooperative Economic Insect Report. 4(25):557–562.

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[1] Arizona Agricultural Experiment Station Technical Paper No. 399.

PACIFIC COAST ENTOMOLOGICAL SOCIETY

Proceedings

Two Hundred and Fifty-second Meeting

The two hundred and fifty-second meeting of the Pacific Coast Entomological Society was held at 2:10 p.m. on Saturday, March 2, 1957, in the Morrison Auditorium of the California Academy of Sciences, San Francisco. President W. W. Middlekauff presided at the meeting. The following members were present: D. D. Jensen, D. D. Linsdale, J. A. Powell, L. R. Gillogly, J. H. Freitag, R. L. Doutt, J. W. Tilden, W. D. Murray, A. Ross, P. F. Torchio, K. S. Hagen, M. B. Gershenson, O. W. Graf, Jr., D. MacNeill, H. B. Leech, W. C. Day, R. L. Usinger, P. D. Ashlock, J. L. Herring, A. E. Michelbacher, E. G. Linsley, E. O. Essig, S. W. Hitchcock, P. D. Hurd, Jr., J. A. Chemsak, W. A. Russell, F. E. Skinner, L. M. Henry, E. S. Ross, K. F. Innes, W. H. Lange, D. P. Furman, J. W. Green, W. W. Middlekauff and R. C. Miller. Visitors were Mrs. J. A. Powell, D. W. Tuff, R. Schonert, Mrs. W. C. Day, Virginia Ashlock, Kate Herring, Mrs. Lorin R. Gillogly, J. G. Gillogly, A. Gillogly, J. W. Chapman, W. E. Ferguson, D. Giuliani, F. R. Brace, T. H. Lauret, Kay Furman, Grace MacNeill, B. J. Adelson.

The minutes of the meeting held December 15, 1956 were read and approved.

The President selected the Committee to decide on the date and arrange for the meeting place for the annual field trip: J. W. MacSwain, chairman, E. S. Ross and R. M. Bohart.

The President read the following report of the Book Review Policy Committee:

"Report of a Committee to Establish a Book Review Policy for the Pan-Pacific Entomologist"

The committee, named below, met on November 1, 1956 and drew up the following recommendations:

1. The Editor will be directly responsible in all matters pertaining to the review or notice of new books and other important works. Such authority may be delegated by him to a person serving as book review editor.
2. Books will not be reviewed or noticed simply because they have been received for such purpose from a publisher. Prime consideration will be given to the appropriateness of such reviews or notices appearing in the journal. Thus, most works treating the applied phases of entomology, and certain types of popularizations, will not ordinarily receive attention. Neither will titles appearing in entomological periodicals unless they were published as separate works.
3. Books suitable for review or notice will be placed in two categories:
   (a) Books or works of special significance worthy of *critical review* by a qualified reviewer.

(b) Works of lesser importance, or routine in character, which merely warrant a notice or short descriptive comment.

4. Works in the first category will be reviewed by a person designated by the Editor or Book Review Editor.
Ownership of such books may be assumed by the reviewer upon submission of a review acceptable to the Editor.
In the absence of a specially qualified outside reviewer, it is recommended that books be reviewed by persons willing to donate the books to the Society's library which is incorporated in that of the California Academy of Sciences.
5. Works in the second category, above, will be reported upon by a staff member of the Academy and thus automatically become available to the Society as a whole in the above library.
6. Reviews and notices will not be confined merely to books received for review. As a means of increasing the usefulness of the journal, every effort should be made to provide a comprehensive coverage, at least in list form, of new works significant to the various basic fields of entomology. If desired, review copies may be solicited for this purpose from publishers.

E. G. Linsley
R. L. Usinger
E. S. Ross

The following named individuals were nominated and unanimously elected to full membership in the Society: Ibrahim K. Kaddou, T. S. Acker, William E. Ferguson, Donald W. Tuff, Richard K. Eppley, Carole J. Worthington, Robert L. Langston, Dr. Gordon L. Bender.

In response to the call for Notes and Exhibits, Dr. J. W. Tilden displayed a box of empidid flies, or balloon flies, which he had collected in Mitchell Canyon, Mount Diablo, Contra Costa County, California. The balloons produced by these flies were more fragile and contained a larger insect than those made by flies of the genus *Empimorpha* which Dr. Kessel had collected in Marin County. The flies from Mitchell Canyon seemed closer to the genus *Empis*.

Dr. E. S. Ross presented a color motion picture on the alkali bee *Nomia melanderi*. He prefaced the showing with remarks on techniques involved in taking the pictures.

Dr. R. L. Usinger described the activities of the Royal Entomological Society and the South London Entomological and Natural History Society as illustrative of a wholly professional group and of a mixed professional and amateur group respectively in England. The former is comprised of a relatively small group of professionals meeting under formal circumstances. They have an excellent, large library as a major asset. The mixed professional and amateur group has numerous, well attended meetings, numerous exhibits, a large membership and numerous field trips. They also have a library, of more modest proportions. The interests of the group are largely in non-professional aspects.

Frank Skinner led the discussion which followed in formulating future policies with respect to activities of the Pacific Coast Entomological Society.

The discussion developed the following ideas:

1. The notes and exhibits section of the meetings should be maintained and even expanded.
2. Meetings could well include:
   (a) a 5-minute report on technique
   (b) a 5- to 10- minute travel report with slides
   (c) a 5-minute historical account of entomological interest
   (d) a major speaker to take 20 to 30 minutes
   (e) occasional outstanding addresses to supplant all of above.
3. One meeting a year may be scheduled at one of the following institutions: University of California, Davis; Stanford University; San Jose State College; University of California, Berkeley.
4. Society to develop a sustaining interest in a field project such as the insect fauna of the salt marshes of the bay area. Reports to be made at regular Society meetings.
5. Newspaper announcements of Society meetings.

Frank Skinner stated that he plans to poll the opinion of the membership on the above items and also to include the question of Friday night vs. Saturday afternoon meetings.

Kenneth Hagen presented a motion that the individual showing the greatest entomological interest as exhibited at the Annual Science Fair be given a one year membership in the Society with a free subscription to the Pan-Pacific Entomologist for one year. The move was seconded.

E. S. Ross proposed the wording be amended to replace the subscription with the gift of a book of entomological interest.

The motion in amended form was carried unanimously.

A motion was introduced by R. C. Miller that the President appoint a committee with authority to act on the above award motion since the next Annual Science Fair is scheduled for the near future. The motion was seconded and carried unanimously.

The President adjourned the meeting after reminding the membership of the "coffee social" to follow immediately in the Entomology Museum. —Deane P. Furman, *Secretary.*

Two Hundred and Fifty-third Meeting

The two hundred and fifty-third meeting of the Pacific Coast Entomological Society was held at 7:45 p.m. on Friday, April 12, 1957, in the Student Room of the California Academy of Sciences, San Francisco. President W. W. Middlekauff presided at the meeting. The following members were present: W. W. Middlekauff, E. L. Kessel, D. D. Jensen, D. P. Furman, D. D. Linsdale, V. Stombler, J. G. Edwards, D. J. Burdick, C. J. Worthington, R. K. Eppley, R. L. Doutt, T. S. Acker, E. S. Ross, J. A. Powell, L. R. Gillogly, W. A. Doolin, A. E. Michelbacher, E. O. Essig, T. A. Briggs, S. W. Hitchcock, J. A. Chemsak, O. W. Graf Jr., Brad Perry, H. B. Leech, F. E. Skinner. Visitors were C. J. De Mars, Katherine Furman, D. W. Price, Lucinda Doutt, Mrs. L. R. Gillogly, Marie Essig, Martha Michelbacher, R. Schonert, D. H. Groves, S. Murray Sager, Minos E. Tzanakakis, J. O. Romke, Fred D. Bennett, Alden D. Hiaddey, J. J. Gillogly, A. R. Gillogly, Wm. J. Arnold, Phyllis Middlekauff, Mrs. D. W. Tuff, Susan Tuttle.

The minutes of the meeting held March 2, 1957, were read and approved.

President Middlekauff introduced Brad Perry, a ninth grade student from Hogan Junior High School, Vallejo, as the recipient of a year's honorary membership in the Society and an entomological book of his choice, as the award for the best entomological exhibit at the Fourth Annual Bay Area Science Fair. Richard M. Brown, a ninth grade student at Mount Diablo High School, Concord, and Fulton L. Saier, an eighth grade student at Jordan Junior High School, Palo Alto, received honorable mention for their fine collections.

The President stated that the response to the questionnaire polling the Society membership opinions on future policies and activities has been good, but that the data have not yet been compiled.

Dr. Jensen nominated for membership in the Society Mr. C. J. De Mars and Mr. D. H. Groves currently at the University of California. They were unanimously elected.

Dr. E. S. Ross stated that the annual field trip of the Society would probably be held on May 12 at Russelman Park.

In response to the President's call for notes and exhibits, Dr. R. L. Doutt exhibited two species of parasitic wasps attacking the Mediterranean flour moth: *Idechthis canescius* (Grav.) and *Habrobracon juglandis (=Bracon hebetor)*.

Jerry A. Powell exhibited a series of tachinid flies of the genus *Achaetoneura*, of interest because there were 32 specimens reared from a single cocoon of *Antheracea (Telea) polyphemus* Cramer. The moth cocoon was collected in February near Pittsburg, Contra Costa County, California, on willow. In addition, a second series of ten specimens of the fly were shown from another cocoon, in which the size of the individuals was markedly larger, presumably a function of the numbers of larvae parasitizing one moth pupa.

Mr. H. B. Leech exhibited a book entiled "Coleopteros do Brasil" by Jacintho Guérin in 1953; 356 pages plus 41 plates.

Mr. Lorin Gillogly exhibited the aphid, *Kakimia muesebecki* Knowlton and Allen, taken on flowering currants in a Watsonville nursery. According to L. Blanc, who identified the aphid, it is rather rare. It was described from *Ribes* at Redwood Canyon, California in 1939.

Mr. Gillogly also exhibited a pair of adult nitidulid beetles with larvae identified as *Epuraea monogama* Crotch. These were collected April 7, 1957 in a *Polyporus volvatus* fungus near Felton in Santa Cruz County. The fungi occur on dead coniferous logs or standing trunks.

In a notation on phengodid larvae and their food habits, Mr. Gillogly stated that in 1942 in Elysian Park, Los Angeles, California, he found several large larviform phengodids and phengodid larvae feeding upon snails which they had killed. They were found in the Roman white snail *Otala lactea,* but not in *Helia asparta.*

Dr. Furman exhibited a small clubionid spider, *Cheiracanthium inclusum* Hentz, similar to one identified by Dr. W. J. Gertsch of the American Museum of Natural History. The particular interest of the exhibit was that this species has now been incriminated as responsible for painful bite effects in man in California. Details are to be published elsewhere.

Mrs. L. R. Gillogly exhibited a common California weed, *Epilobium paniculatum* Nutt., which has been found to be a food plant of the larvae of the emerald sphinx moth, *Arctonotus lucidus* Boisduval. Although the moth appears to be limited to California, it is statewide in distribution. It is not often seen in collections.

Dr. J. Gordon Edwards showed two excellent color slides of *Grylloblatta barberi* Caudell.

Dr. E. S. Ross showed several interesting color slides, including close-ups of an albino frog found locally by Mr. Bander. A new genus and species of Enicocephalidae was pictured. Numerous slides of insects and a large jungle toad from South America were shown.

Dr. Ross described his plans for an African insect collecting and photography trip. The party will consist of Dr. and Mrs. Ross and Robert E. Leech. At present he is equipping a 1½-ton truck for the trip. He plans to leave on May 20th for New Orleans, thence to depart by freighter for Africa. The party will debark at Metadi, the port for Leopoldville and thence travel around the southern end of the continent and up the east coast.

Professor E. O. Essig commented on the very interesting fauna characteristic of Madagascar. It is not like that of adjacent Africa. He stated that he has two new genera and species of aphids from Madagascar which differ from any other aphids seen in possessing very long spines extending from the sides and back.

Dr. R. L. Doutt narrated a color motion picture showing the feeding, oviposition and other habits of parasitic and predaceous insects and mites. The outstanding close-up photography was by Ken Middleham of Riverside, California. The film was edited by Dr. Charles A. Fleschner.

The meeting was adjourned at 8:35 p.m.—Deane P. Furman, *Secretary.*

Two Hundred and Fifty-fourth Meeting

The annual field meeting of the Pacific Coast Entomological Society was held at Russelman Park, Contra Costa County, May 5, 1957. The following members were present: E. O. Essig, E. S. Ross, H. Ruckes, H. B. Leech, John MacSwain, Jane MacSwain, D. P. Furman, E. G. Linsley, W. H. Nutting, W. Russell, J. A. Powell, F. E. Skinner, J. E. Swift, O. W. Graf Jr., P. D. Hurd, Brad Perry, A. E. Michelbacher, J. A. Chemsak, J. L. Herring, P. D. Ashlock, Paul Opler, W. Ferguson. Vistiors present were as follows: Mrs. E. O. Essig, Mrs. E. S. Ross and family, Mrs. H. Ruckes and family, Mrs. W. H. Nutting and family, Elsa Russell, Fran Powell, Marge Swift, Mrs. O. W. Graf and family, Grace and Kathy Hurd, Sue Tuttle, Bert and

Libby Adelson, Tom Leech, Frances Leech, Juanita Linsley, Kay Furman and family, Dr. and Mrs. R. W. Furman, Derham Giuliani, John and Lois Bogonono, Mary and Billy Leech, Jean, Roger, David and Susan Skinner, Stephanie, Robin and Rickie Ferguson, R. F. Smith and family, F. Bruce, Mr. and Mrs. H. Vannoy Davis, Celeste Green, Phil Bonhag and family, Mr. and Mrs. C. B. Perry, R. Howsmon, Kate Herring, Martha Michelbacher, R. E. Leech.

Once again the Society enjoyed a perfect day for the field meeting. Swishing collecting nets and clicking cameras were evident in almost equal numbers, reflecting an increasing interest in the pictorial, as well as actual, collection of insects in their natural habitats. Swimming, baseball and visiting rounded out a festive day.—DEANE P. FURMAN, *Secretary.*

Two Hundred and Fifty-fifth Meeting

The two hundred and fifty-fifth meeting of the Pacific Coast Entomological Society was held at 7:45 p.m. on Friday, October 11, 1957, in the Morrison Auditorium, California Academy of Sciences, San Francisco. Vice-President D. D. Jensen presided at the meeting. The following members were present: H. B. Leech, J. E. Swift, G. F. Ferris, L. M. Henry, P. H. Arnaud Jr., F. E. Skinner, E. O. Essig, A. E. Michelbacher, E. L. Kessel, J. A. Powell, T. S. Acker, E. G. Linsley, P. D. Hurd Jr., D. D. Linsdale, J. A. Chemsak, W. A. Doolin, D. MacNeill, R. L. Langston, D. Burdick, A. Ross, P. F. Torchio, C. J. Worthington, A. E. Pritchard, D. M. Maddox, D. D. Jensen, D. P. Furman. Visitors were Mike Kenny, G. J. Crowley, D. Breedlove, B. Barichievich, Mrs. J. A. Powell, Mr. and Mrs. E. E. Lindquist, Mrs. D. P. Furman, Mrs. E. G. Linsley, Mrs. Grace Hurd, Mrs. B. J. Adelson, Nancy Rutledge, Mrs. J. M. Burns, Dolores Damissio, Marie Moor, Patricia Heaton, Stennett Heaton, B. J. Adelson, S. G. Smith.

The minutes of the meetings held April 12 and May 5, 1957 were read and approved.

The following nominees for membership in the Society were unanimously elected: Dr. Frank A. Cole, Paul A. Opler, Thompson C. Lawrence, Evert E. Lindquist, Dr. Ernest S. Booth, Jack Hall, Clarence S. Davis, Mrs. Ruth Whitney, Michael Kenny, Gerald Crowley, Dennis Breedlove, Bruce Barichievich.

Dr. Jensen appointed the following committee to select nominees for officers of the Society for 1958: A. E. Michelbacher, Chairman; H. B. Leech, Laura Henry.

Dr. Jensen introduced as the speaker of the evening, Dr. S. G. Smith, Head, Section of Cytology and Genetics, Forest Insect Laboratory, Sault Sainte Marie, Canada. The title of the address was "Cyto-taxonomy of Insects."

Following a short discussion of Dr. Smith's address, notes and exhibits were presented.

Don MacNeill introduced Mr. Stennet Heaton who exhibited some interesting color slides demonstrating the versatility of the Leitz Ultra Pac compared with other means of taking photomicrographs at medium to high magnifications.

John Chemsak showed a few slides representing areas visited in Chiapas, Mexico, where he collected insects and amber last summer.

Dr. Kessel played part of a tape recording made in 1952 of a conversation with our former colleague Dr. E. C. Van Dyke.

Don Burdick exhibited a living mantispid and also color slides of the insects in characteristic postures.

H. B. Leech discussed briefly the current collecting trips of Gene Monroe and of Ed Ross in New Guinea and Africa respectively.

Dr. E. L. Kessel exhibited several hundred unmounted smoke flies *(Microsania)* which he had strained out of the smoke of a backyard smudge at Spenard, Alaska, during his recent trip. Although unreported from Alaska and Yukon territory, he captured microsanias also at Girdwood and at Gardiner Creek in Alaska and at several of the official camp grounds along the Alaska Highway in the Yukon—in fact wherever he built a fire, these tiny dipterans congregated in the smoke. The trip produced some 200 other flies of the family Platypezidae none of which were previously reported from the Yukon and very few of which had been taken before in Alaska, British Columbia, and Alberta.

The meeting was adjourned to the "Coffee Social" at 9:20 p.m.—Deane P. Furman, *Secretary.*

Two Hundred and Fifty-sixth Meeting

The two hundred and fifty-sixth meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on Saturday, December 7, 1957, in the Morrison Auditorium, California Academy of Sciences, San Francisco. President W. W. Middlekauff conducted the meeting. The following members were present: E. O. Essig, A. E. Michelbacher, D. Breedlove, T. Lawrence, S. W. Hitchcock, D. D. Jensen, M. Kenny, P. D. Hurd, W. E. Ferguson, K. S. Hagen, A. E. Pritchard, F. E. Skinner, H. E. Stark, D. G. Denning, E. Cott. W. A. Doolin, O. W. Graf Jr., C. J. Worthington, A. Ross, W. A. Russell, D. D. Linsdale, H. B. Leech, W. W. Middlekauff, D. P. Furman. Visitors were David Peterson, John Nickel, Michael Tomei, Marie Moor, Dennis Hyms, Nancy Rutledge, Dolores Damiano, Loretta Denning, James Denning.

The minutes of the meeting held October 11, 1957, were read and approved.

Lionel A. Stange, Louis A. Ruud, Kevin P. Shea and R. G. Dahl were elected to membership in the Society.

Mr. Frank Skinner, Chairman of the Program Committee, announced that 77 of the questionnaires sent to members had been returned. The majority favored the changed format of meetings now in operation. Other suggestions approved included newspaper announcements of meetings and the principle of holding one meeting a year at some outside institution.

Mr. H. B. Leech, Chairman of the Auditing Committee, stated that the books of the Society are in order and are accepted as they stand.

Dr. Middlekauff exhibited a sample of privet hedge defoliated and debarked by grasshoppers.

Dr. Furman exhibited living larvae and an adult of *Hermetia illucens* (Linnaeus) which have been found breeding quite commonly in poultry manure of the San Joaquin Valley. Under favorable conditions larval populations form an almost solid mat of one to two inches in depth. Such populations work over added manure very rapidly. Laboratory experiments indicate that housefly larval development is inhibited or stopped short of the pupal stage in competition for food with the stratiomyids.

Dr. Michelbacher reported that the nominating committee proposed the following as officers of the Society for 1958: Dilworth D. Jensen, President; Richard L. Doutt, Vice-President; Deane P. Furman, Secretary; R. C. Miller, Treasurer. They were unanimously elected.

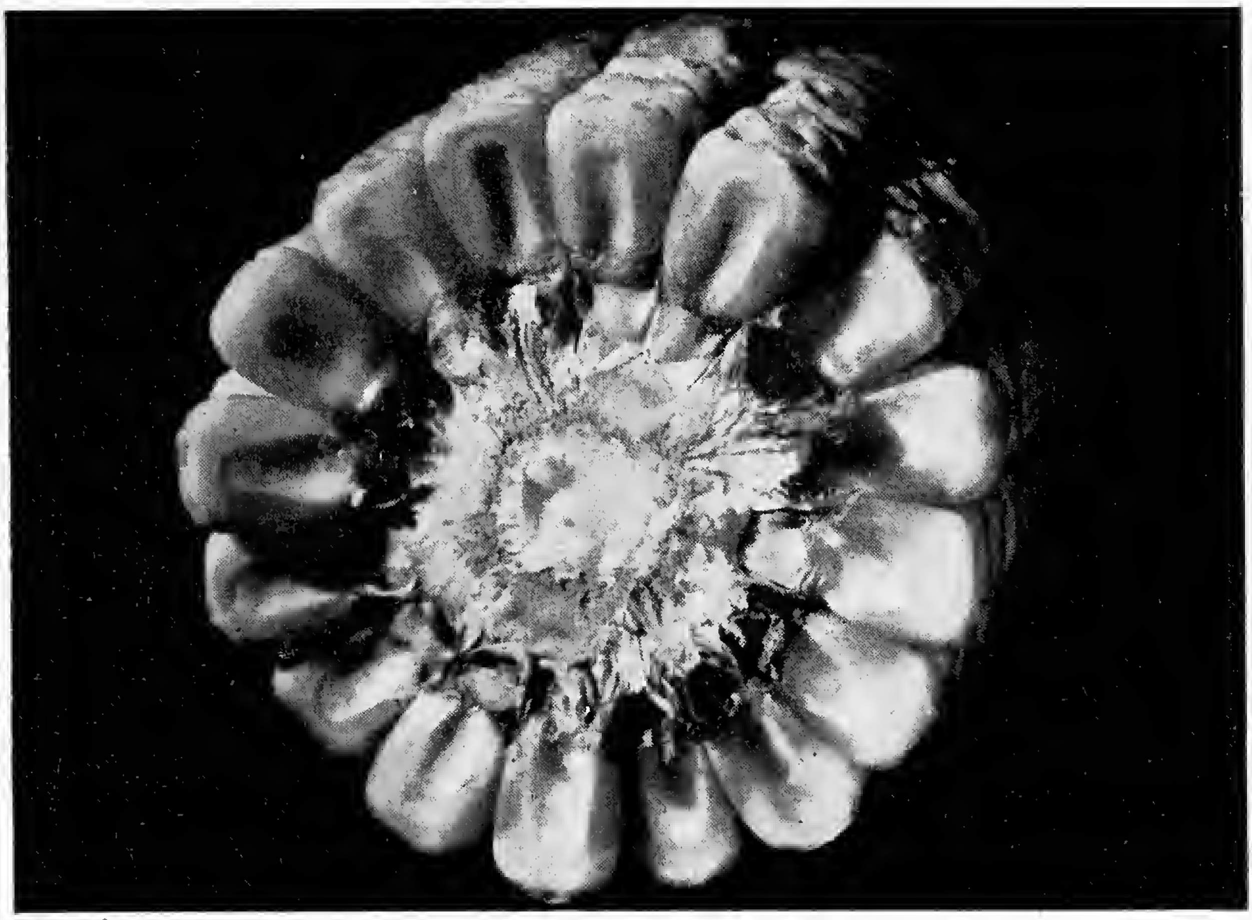
The chairmanship of the meeting was then turned over to President-elect Jensen who called on Dr. Middlekauff to give his presidential address entitled "Biology and Ecology of Several Species of California Rangeland Grasshoppers" which is published in this issue.

Following a discussion of the presidential address the meeting was adjourned.—DEANE P. FURMAN, *Secretary.*

HARZWANZEN OR "RESIN BUGS" IN THAILAND

Two species of Reduviid bugs, *Ectinoderus longimanus* Westwood and *Amulius malayus* Stal, were observed while on an excursion with the Entomology Section at the Ninth Pacific Science Congress in Bangkok. On November 23, 1957, the group stopped south of Bangkok at Bang Lamung and observed holes one foot or so in diameter cut in the trunks of large *Dipterocarpus alatus* trees. Pools of resin accumulate in these holes and the material is collected for use as a varnish and to caulk boats. Burning, which is illegal in Thailand, stimulates flow of resin and chars the wood around the hole.

This microhabitat attracts stingless bees, *Trigona (Tetragona) iridipennis* F. Smith (det. H. F. Schwarz), which were seen swarming in front of the holes and which collect the resin for their nests. Lying in wait for the bees at the edges of the pools of resin were the large (15–30 mm.) resin bugs mentioned above. Bugs of these genera have been reported previously by Roepke, W. (Miscellanea Zoologica Sumatrana, LXVIII, pp. 1–5, 1932) and Miller, N.C.E. (Proc. Royal Ent. Soc. London, A, 17:54–55, 1942) as living in cracks in the bark of *Agathis alba, Altingia excelsa,* and *Pinus merkusii,* and catching *Trigona* bees in Sumatra and Malaya. They reported that the bugs dip the front legs in sticky exudations to cover the tibiae and one segmented clawless tarsi. Long erect hairs on the tibiae serve to hold the fluid. The legs are held forward like those of a pseudoscorpion and are used to trap the bees.—R. L. USINGER, *University of California, Berkeley.*



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THE PAN-PACIFIC ENTOMOLOGIST

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THE PAN-PACIFIC ENTOMOLOGIST

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BIOLOGICAL NOTES ON THE BURROW AND PREY OF ANOPLIUS VENTRALIS TARSATUS (BANKS)

(Hymenoptera: Pompilidae)

JERRY A. POWELL

University of California, Berkeley

A female of *Anoplius (Anoplius) ventralis tarsatus* (Banks)[1] was observed in a burrow-making process which is quite unusual in the recorded behaviors for the North American species of the genus *Anoplius,* in that the nest was constructed in a bifurcate pattern in two separate diggings.

The wasp, when first encountered, was in the process of digging the burrow at 1:42 p.m., March 19, 1957. The locality, about two miles west of Pittsburg, Contra Costa County, California, is one generally of sandy-silt soil on the valley plain of the Sacramento River. The female wasp had selected a spot on a hard-packed, bare path traversing a heavily weeded vacant lot, but at a place where the soil had previously been loosened, presumably by some burrowing animal. The digging within the hole was interrupted every few seconds by a brief period of backing out, dragging the sand several centimeters from the burrow entrance. The paralyzed spider, a large, immature lycosid, was in evidence, lying on the bare soil about 26 cm. to the east of the burrow site. The pompilid, on finishing the excavation process, about two minutes after the observations began, seemed to experience some difficulty in locating the prey, searching generally in the right direction within an area of a square foot or more. The spider was located after about one minute and was then dragged by one leg, the wasp walking backward, toward the burrow. The female wasp left the prey four times before reaching the tunnel entrance with it, each time to search about for a few seconds in finding the burrow and then to disappear inside for a few seconds. She finally backed down the tunnel, dragging the lycosid in, at 1:47 p.m. The first reappearance of the wasp did not occur until 1:56. At first only the abdomen appeared, and sand was pulled in, apparently in the filling process. However, it soon became obvious that additional digging was going on, since the wasp

[1] Determination by Marius S. Wasbauer, Department of Entomology, University of California, Berkeley.

began reappearing with loads of freshly-dug, damp soil and dragging these back from the entrance as in the original digging process. This behavior continued for fifteen minutes. Simple backing-out appearances were interspersed with those of busily kicking and scraping the debris about. Suddenly, at 2:11 p.m., the pompilid emerged quickly, flew into the tall grass nearby and disappeared.

The area was visited at frequent intervals during the next hour, but no sign of activity was encountered. The succeeding hour was spent some distance from the nesting site, and no attempt was made to check the area. At 4:10 p.m., as the afternoon was becoming cool and windy, an excavation of the burrow was commenced. The female wasp came out of the open burrow entrance almost immediately and this time was captured.

The main part of the burrow was found to consist of a straight entrance tunnel which entered the ground at approximately a 25° angle in an easterly direction. It was about 28 millimeters in length and six mm. in diameter, terminated by an oval cell which contained the spider. The cell was about seven by eleven mm., with the long axis at right angles to the entrance tunnel. The tunnel had been filled in and repacked for only about ten mm. at its lower end. A second tunnel, of the same diameter, joined the first at right angles to it at a point about eighteen mm. from the surface entrance. It proceeded in a southerly direction for about sixteen mm. then turned abruptly down, forming a vertical terminal portion, some eighteen mm. in length, with a slightly widened, curved tip. This terminus, the lowest point in the burrow, 33 mm. below the surface level, was not produced into a "cell" in the sense of provisioning cells. One might speculate as to the purpose of this second tunnel. Due to the late hour and the associated temperature, it might be surmised that the wasp had ceased activity for the day and was utilizing the burrow as a shelter for the night. However, the question of a possible use for this portion of the burrow in a second provisioning remains unanswered.

The spider was situated in the closed-off cell in a venter-side-down position, its body oriented with the long axis of the cell. A smooth, curved, elongate, white egg had been placed in a diagonal position on the side of the abdomen. The egg and spider were kept alive, but the egg did not hatch, probably due to desiccation. The spider was kept in a pill box, without being fed, and recovered partially. The same evening (March 19) it responded to stimuli to the legs on only one side of the body and did not seem to have any coordination. By the second day all the appendages reacted to stimuli, but the spider could not right itself when turned over, or move any distance. After the third day it seem to be fully recovered except that it did not attempt to run on a flat surface. (This is in marked opposition to other individuals of the same species observed in the field which ran a yard or more very rapidly at the slightest disturbance.) On March 24, although still weakly moving, it could not complete its final moulting, and it was preserved while in this condition. The spider was subsequently determined as an adult female of *Alopecosa gertschi* Schenkel, by Dr. Willis J. Gertsch of the Department of Insects and Spiders, American Museum of Natural History, who states *(in litt.)* that the species is widely distributed along the west coast.

The Pittsburg locality was revisited twice during the week following the observations, and no additional specimens of *Anoplius* were encountered, although individuals of the lycosid prey were quite abundant.

Although much more detailed biological observations have been given for *Anoplius imbellis* Banks (Wasbauer 1957), little is known of the nesting habits for the other members of the subgenus *Anoplius* in North America (See: Evans 1951). Essig (1926) has listed *Lycosa pratensis* (Emerton) (Lycosidae) as a prey for *A. ventralis tarsatus* (Banks) in Berkeley, California, and Williams (1919, 1931) states that the species, an introduction in Hawaii, preys on a variety of spiders there, digging a separate burrow for each one. (Given as *Psammochares luctuosus* (Cresson) by both authors.)

Literature Cited

Essig, E. O.

1926. "Insects of Western North America," 1035 pp., MacMillan Co., New York.

Evans, H. E.

1951. A taxonomic study of the nearctic spider wasps belonging to the tribe Pompilini (Hymenoptera: Pompilidae) Part II. Trans. Amer. Ent. Soc. 76:207–361.

Wasbauer, M. S.

1957. A Biological Study of Anoplius (Anoplius) imbellus Banks (Hymenoptera: Pompilidae). Wasmann Jour. Biol. 15(1):81–97.

WILLIAMS, F. X.
1919. Philippine wasp studies. Part II Descriptions of new species and life history studies. Hawaiian Sugar Planter's Assoc. Ent. Series Bull. 14:79–110.
1931. "Handbook of Insects and other Invertebrates of Hawaiian Sugar Cane Fields," 400 pp., Hawaiian Sugar Planter's Assoc., Honolulu.

BOOK REVIEW: MOST SIGNIFICANT ANIMALS?

ZOOGEOGRAPHY: the geographical distribution of aminals by Philip J. Darlington, Jr.; John Wiley & Sons, Inc., New York. xi + 675 pp. 80 figs. ($15).

It will undoubtedly be a shock to many entomologists to discover that such an outstanding Coleopterist as P. J. Darlington considers the vertebrates to be the "geographically most significant animals." However, his reasons for this viewpoint as well as his other opinions and principles are clearly stated. Although the vertebrates comprise only 3 or 4 per cent of the animal kingdom, "they are the best-known animals: most familiar, best collected, best classified, with the best fossil record." Furthermore, they are varied in habits and physiology. He does concede that invertebrates show the histories of some islands better than do the vertebrates.

The introductory chapter is required reading for anyone interested in any aspect of the distribution of animals. In this chapter, Darlington discusses clearly and concisely subjects such as mapping, climate, vegetation, geological time, and dispersal as they relate to zoogeography. In addition, he defines his usage of special terms and gives his "working principles of zoogeography."

The next five chapters are detailed treatments of the zoogeography of freshwater fishes, amphibians, reptiles, birds, and mammals. For each of these groups a short account of the classification, fossil record, and pertinent characteristics is given and then is followed by discussion of their limits of distribution, transitions and barriers in distribution, dominance and competition in relation to distribution. These five chapters each end with a summary of the pattern of distribution, a history of dispersal, and a list of families of the group. The family list contains among other things the region of occurrence, main pattern of distribution, numbers of genera and species, and fossil record.

On the basis of this detail, the main pattern of vertebrate distribution, discontinuities, faunal regions, and the transitions between regional faunas are discussed in the seventh chapter. Island patterns and the evolution of patterns follow in the next two chapters. Chapter ten is concerned with what zoogeography tells of the past. In the final chapter, Darlington reviews his principles of zoogeography and then traces man's geographical history.

The zoogeography of insects is still in a very early stage of development. Consequently, no one can judge, at this time, how well Darlington's conclusions and patterns of distributions for the vertebrates apply to the insects. Entomologists working in the infant science of insect zoogeography can, if nothing else, use the vertebrate patterns as standard patterns of reference and they had best heed Darlington's working principles as this field grows and matures.—RAY F. SMITH, *University of California, Berkeley.*

A NEW SPECIES OF COPIDOSOMA CLOSELY RELATED TO C. NANELLAE SILVESTRI[1]

(Hymenoptera: Encyrtidae)

C. D. F. MILLER[2]

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Gahan (1930) reported *Copidosoma nanellae* Silvestri as present in North America, heavily parasitizing *Recurvaria thujaella* Kft. Later he recognized his error and asked Peck (1951, p. 483) to record this species as "*Copidosoma* n. sp. (*nanellae* Amer. authors, not Silvestri)."

This is a transcontinental species that occurs as far south as Connecticut in the east and California in the west. It has been reared from a number of microlepidopterous hosts but is now economically important because of its controlling effect on *R. canusella* Free., *R. milleri* Bsk., *R. starki* Free., and *Recurvaria* spp., which are destroying many acres of lodgepole pine in the Rocky Mountains.

Dr. B. D. Burks, Entomology Research Branch, U.S. Department of Agriculture, Washington, stated in correspondence that Mr. A. B. Gahan, now retired, reversed his original decision on the identity of this form after he examined female co-types of *C. nanellae* from Portici, Italy. Dr. Burks wrote, "The chief difference between the Palaearctic and North American forms is in the antennae of the female. In *nanellae* the club is almost or quite as long as the funicle (five-sixths as long in [the Washington] specimens, although the original description says the two are equally long). The North American form has the female antennal club two-thirds to four-fifths as long as the funicle. The two also differ in the color of the legs; the European form has the mid-tibia almost entirely yellow, while this is mostly black in the North American form."

The writer has recently found that the male genitalia of species of *Copidosoma* are distinct. Comparison of the male genitalia of the two entities supplemented the evidence compiled by Mr. Gahan and verified that the North Amercian form is a new species.

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[1] Contribution No. 3714, Entomology Division, Science Service, Department of Agriculture, Ottawa, Canada.

[2] Associate Entomologist.

Copidosoma deceptor Miller, new species

Copidosoma nanellae Silvestri; Gahan, 1930, Proc. U.S.N.M. 77:7.

Copidosoma nanellae Silvestri; Britton, 1938, Bull. Connecticut State Geol. and Nat. Hist. Survey 60:141.

Copidosoma nanellae Silvestri; Procter, 1938, Biol. Survey of Mount Desert Region 6:425.

Copidosoma nanellae Silvestri; Doucette, 1941, J. Econ. Ent. 34:588.

Copidosoma sp.; Baird, 1942, Canad. Insect Pest Rev. 20:116.

Copidosoma nanellae Silvestri; Proctor, 1946, Biol. Survey of Mount Desert Region 7:485.

Copidosoma nanellae Silvestri; Graham, 1947. *In* Control of forest insects in the Province of Ontario by introduction of insect parasites. (Canada Dept. Agr.) Div. Ent. processed report, pp. 75–77.

Copidosoma nanellae Silvestri; Craighead, 1950, U.S. Dept. Agr. Misc. Pub. 657:614.

Copidosoma sp. Baird, 1950, Canad. Insect Pest Rev. 28:234.

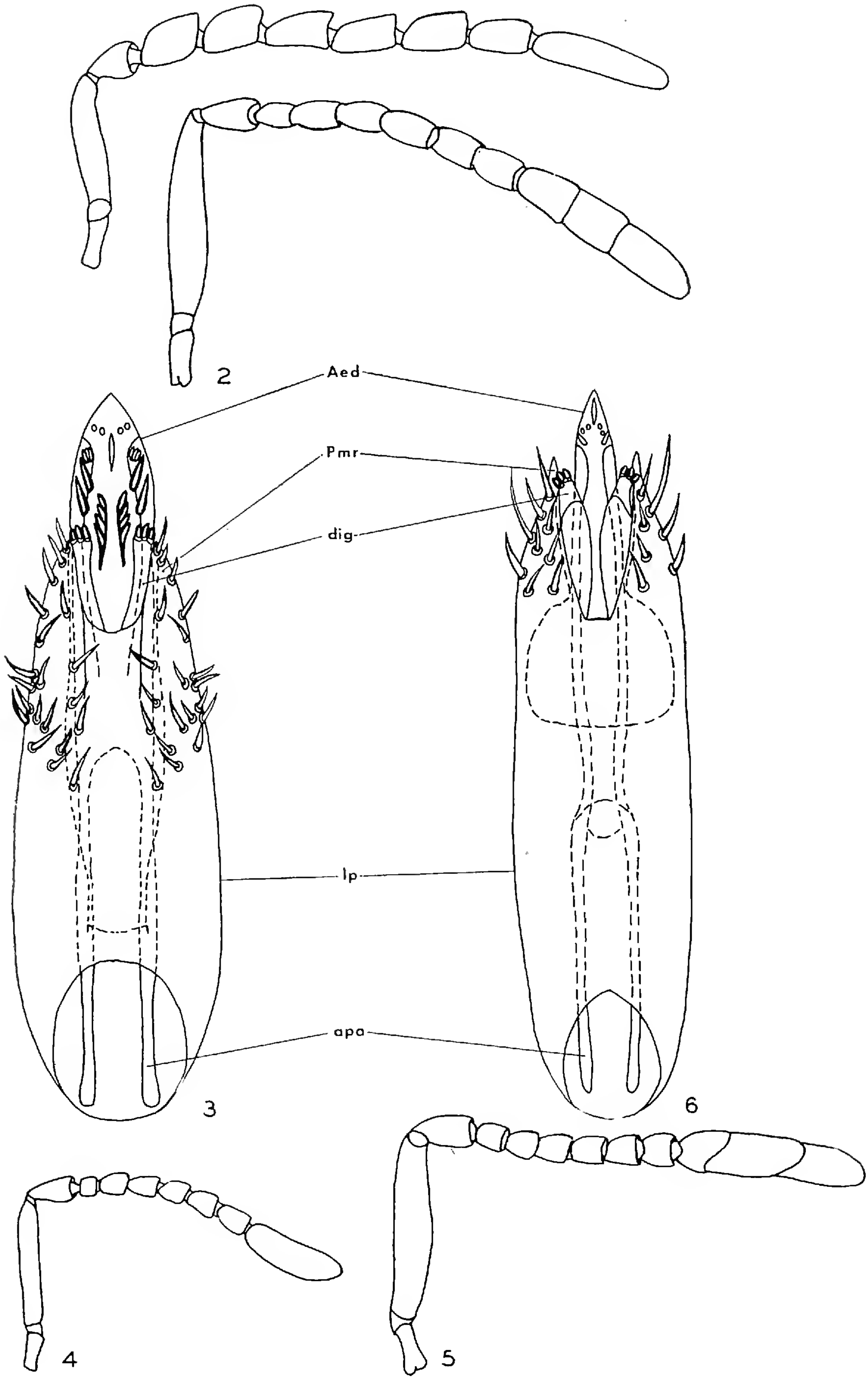
Copidosoma nanellae Amer. authors, not Silvestri; McLeod, 1951, Canad. Ent. 83:299.

Copidosoma nanellae Amer. authors, not Silvestri; Silver, 1957, Canad. Ent. 89:180.

Copidosoma n. sp. (*nanellae* Amer. authors, not Silvestri); Peck, 1951, U.S.D.A. Agr. Monogr. No. 2, p. 483.

Male: Head.—Black, subtriangular from anterior aspect, closely punctate; mandible brownish-yellow, tridentate; malar space half the longitudinal diameter of the compound eye; clypeus with 5–6 erect, black hairs; distance between lateral ocellus and compound eye equal to diameter of middle ocellus; distance between lateral ocelli greater than that between them and middle ocellus; compound eyes bare; scrobes smooth. *Antenna* (Fig. 1).—Black; scape as long as pedicel and first flagellar segment combined; pedicel equal in width to but shorter than the first flagellar segment; flagellum filiform; funicular segments equal in length and width; club twice as long as last funicular segment; flagellum strongly pubescent. *Thorax.*—Black, the scuteum and mesopleura with purplish reflections; scutum and scutellum subequal in length, and having obscure, widely scattered, black, suberect hairs; scutum closely punctate; scutellum coriaceous except for smooth, shiny distal portion; avilla coriaceous. *Wings.*—Stigmal vein longer than marginal; linear calva indistinct; marginal hairs short; costal cell of posterior wing short and narrow. *Legs.*—Black, the bases and apices of femora and tibiae white; tarsi whitish except for apical segments, which are blackish; spur of middle tibia a little shorter than metatarsus. *Abdomen.*—Black, subtriangular; strongly depressed, shorter than thorax; genitalia as in Fig. 3.

Female: Resembling the male except in the following characters: *Antenna* (Fig. 2)—Club-shaped; scape longer than pedicel and first three flagellar segments combined; pedicel wider than and almost twice as long as the first flagellar segment; funicle progressively wide apically; club triarticulate, 3/4 as long as the funicle; flagellum with a minute obscure pubescence. *Abdomen.*—Ovipositor extending 1/3 its length beyond apex of abdomen.



Explanation of Figures

Figs. 1–3, *Copidosoma deceptor* Miller. 1, Male antenna. 2, Female antenna. 3, Male genitalia; aed, aedeagus; pmr, parameres; dig, digitus; lp, basiparamere; apo, basal apodeme of aedeagus. Figs. 4–6, *Copidosoma nanellae* Silvestri. 4, Male antenna; 5, Female antenna; 6, Male genitalia.

Holotype: male, CASCADE VALLEY, 22 MILES NORTHEAST OF BANFF, ALBERTA. Reared from *Recurvaria* sp. on lodgepole pine. Genitalia and antenna on chalcid slide number 217, type number 2156, Canadian National Collection. *Allotype: female,* Mount Eisenhower, Banff National Park, Alberta, June 30, 1950. Reared from *Recurvaria* sp. on lodgepole pine. Genitalia and antenna on chalcid slide number 218, C.N.C.

Paratypes: 38 females, 49 males from Connecticut, New York, Maine, Nova Scotia, New Brunswick, Quebec, Ontario, Alberta, British Columbia, Idaho, Oregon, Colorado, and California in Canadian National Collection, U.S. National Museum, British Museum (Natural History), University of Naples Museum, Geneva Museum, and Dr. Vittorio Delucchi's private collection.

HOSTS: *Acleris variana* (Fern.), Nova Scotia; *Eucordylea huntella* Keif., Oregon; *Exoteleia dodecella* (Linn.), Connecticut; *Paralechia pinifoliella* Cham., New York; *Recurvaria apicitripunctella* Clem., Ontario; *R. canusella* Free., British Columbia; *R. milleri* Bsk., California; *R. moreonella* Heinr., Oregon; *R. piceaella* Kft., New York, Quebec; *R. starki* Free., Alberta; *R. thujaella* Kft., Maine, New Brunswick; *Recurvaria* sp. on *Rhododendron,* Oregon; *Recurvaria* spp. on *Pinus contorta* var. *latifolia* Engleman, British Columbia, Alberta.

COPIDOSOMA NANELLAE Silvestri

Copidosoma nanellae Silvestri, 1922, Boll. Lab. Zool. Agr. Portici 16: 295–301.

The female of *deceptor* is so similar to that of *nanellae* that for years the two were considered conspecific. The following is a description of the characters of *nanellae* that are significantly different from those of *deceptor*.

Male: Antenna (Fig. 4).—Black; scape as long as the pedical and the first three flagellar segments combined; flagellum club-shaped; funicular segments progressively lengthened; pedicel wider and more than twice as long as the first flagellar segment; club three times as long as the apical funicular segment; flagellum with a minute obscure pubescence. *Fore Legs.*—Bases of femora black. *Middle Legs.*—Tibiae almost entirely yellow. *Abdomen.*—Genitalia as in Fig. 6.

Female: Antenna (Fig. 5).—Pedical twice as long as the first flagellar segment; club 5/6 as long as funicle. *Fore Legs.*—Bases of femora black. *Middle Legs.*—Tibiae almost entirely yellow.

Lectotype male, AVELLINO, ITALY, June 10, 1919, *Recurvaria. Lectoallotype female,* same data as lectotype. *Co-types* 8 males, 1 female, same data as lectotype; all types in the University of Naples Museum, Portici, Italy.

Credit is due to Mr. G. S. Walley and Dr. O. Peck, the author's colleagues, for helpful suggestions and for criticisms of the manuscript. The author wishes to give special thanks to Drs. V. Delucchi and B. D. Burks for the loans of material from the University of Naples and United States National Museums, without which the completion of this paper would have been impossible.

Literature Cited

Gahan, A. B.

1930. Synonymical and descriptive notes on parasitic Hymenoptera. Proc. U.S. Nat. Mus. 77:1–12.

Peck, O.

1951. Superfamily Chalcidoidea. *In* Hymenoptera of America north of Mexico. Synoptic catalog, by C. F. W. Muesbeck, K. V. Krombein, H. K. Townes, and others, pp. 410–594., U.S. Dept. Agr., Agr. Monogr. 2.

A NOTE ON SALMACIA FRONTOSA VARIETY ATRA (COCKERELL)

(Diptera: Larvaevoridae)

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The purpose of this note is to call attention to a name originally proposed in the genus *Gonia* which appears to have escaped the notice of several revisers (Tothill, 1924; Morrison, 1940; Brooks, 1944) of North American *Salmacia* Meigen, 1800 (=*Gonia* Meigen, 1803). Aldrich (1905, pp. 478–479) may have omitted the name from his catalogue in the belief that it was an unpublished Coquillett manuscript name, since a card from the Aldrich file with this name bears the notation "[Coq. MS]." Cockerell's name is a homonym, since the combination *Gonia atra* Meigen was first proposed in 1826. I can not at this time assign the name to any certain synonymy.

Salmacia frontosa var. atra (Cockerell)

1889. *Gonia frontosa* var. *ater* Cockerell, Tenth Rep. Colo. Biol. Assoc.:

[1] I wish to acknowledge with thanks information and aid received from Dr. Hugo G. Rodeck, Director of the University of Colorado Museum, and Dr. Alan Stone, Entomology Research Division, U.S.D.A.

[p. 3]. [The entire reference reads: "We have been overhauling our flies of the genus *Gonia* by the light of Dr. Williston's paper in 'Canadian Entomologist,' 1887. Among the western Custer county specimens is one of *G. frontosa* with the thorax and abdomen almost entirely black, the striping and banding of the type being practically obsolete; we shall call it var. *ater.* We have also two species belonging to the Exul group. One may be a form of *G. exul,* the other would seem to be new. A fourth species, from Dillon, looks like a *Gonia,* but probably belongs to a distinct genus."]

1889. *Gonia frontosa* var. *ater,* Cockerell, West Amer. Scient. 6(47):106:
[Distribution: near Swift Creek, Custer County, Colorado. "thorax and abdomen almost entirely black."]

1893. *Gonia frontosa* var. *atra,* Cockerell, Trans. Amer. Ent. Soc., 20:368:
[In list of Custer County, Colorado insects. References provided are: "10th Rep. Colo. Biol. Asso'n.; 'West. Am. Sci.' 1889, September, p. 106."]

Correspondence with Dr. Hugo G. Rodeck, revealed that there are no specimens in the collections of the University of Colorado Museum which bear Cockerell's trinomial, nor are there any specimens from Custer County which might be the basis of this description. A search of the *Salmacia* in the collection of the U. S. National Museum proved negative as well.

Literature Cited

Aldrich, J. M.

1905. A catalogue of North American Diptera (or two-winged flies). Smithsonian Misc. Coll., 46(1444):1–680.

Brooks, A. R.

1944(1943). A review of the North American species of *Gonia* sens. lat. (Diptera, Tachinidae). Canadian Ent. 75(12):219–236, figs. 1–13.

Cockerell, T. D. A.

1889. Contributions towards a list of the fauna and flora of Wet Mountain Valley, Colorado. I. (Compiled for the Colorado Biological Association.) The West Amer. Scient. 6(47):103–106.

1889. Notes. Tenth Report of the Colorado Biological Association. [pp. 2–3, pages unnumbered]. [Custer County Courant?]

1893. The entomology of the mid-alpine zone of Custer County, Colorado. Trans. Amer. Ent. Soc., 20:305–370.

Morrison, F. O.

1940. A revision of the American species of *Gonia* Meigen (Diptera: Tachinidae). Canadian Jour. Res., Sec. D, 18:336–362, figs. 1–22.

Tothill, J. D.

1924. A revision of the nearctic species of the genus *Gonia* (Diptera: Tachinidae). Canadian Ent. 56(8):196–200; (9):206–212.

DESCRIPTIONS OF NEW NEOTROPICAL TABANIDAE MOSTLY IN THE CALIFORNIA ACADEMY OF SCIENCES

(Diptera)

CORNELIUS B. PHILIP[1]

This report contains discussion and descriptions of Tabanidae mostly from the West Coast of South America, in part based on collections made by Drs. E. S. Ross and A. E. Michelbacher in 1950 to whom the writer is indebted for privilege of studying their material. All types described below are in the California Academy of Sciences (CAS), San Francisco. Study of pertinent types in European museums by the writer in 1953, on a travel grant from the American Philosophical Society, facilitated the present report. BMNH is the abbreviation used for British Museum (Natural History).

Mycteromyia philippii Philip, new species

Philippi (1865) misidentified the only species, *Pangonia conica* Bigot which he mentions in the characterizing of his genus *Mycteromyia,* though he adds and describes three new species under the genus, namely, *fusca, brevirostris,* and *murina. M. fusca,* "9 lin." (about 18 mm.) is undoubtedly the true larger *M. conica* with reddish legs and bases of the antennae, and isolated triangles not forming a pale-haired line on the abdomen. A pair of each sex compared with the type female of *M. conica* in BMNH was dissected by Mackerras (1955) who calls attention to the remarkable genitalia in this genus; he was mistaken, however, in stating that *Mycteromyia* was "originally monotypic for *Pangonia conica* Bigot."

Specimens in CAS agreeing with *M. "conica"* Philippi not Bigot appear to be a direct, unnamed species.

Holotype female, 13 mm. Eyes bare. Front grayish pollinose with coarse, sparse black hairs, sides subparallel, about equal in height and breadth, three plain ocelli not on a raised prominence at the vertex. Subcallus and frontoclypeus gray pollinose, the latter with two lateral brown bands and produced about equal to the height of the front. Antennae, palpi and proboscis entirely black, the palpi longer than the antennae, and the proboscis nearly as long as the abdomen. Cheeks and posterior head whitish pollinose and pilose, including beard. *Thorax* prominently striped with four

[1] From the U. S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, National Institute of Allergy and Infectious Diseases, Rocky Mountain Laboratory, Hamilton, Montana.

dark brown stripes on a gray ground, the sublateral stripes broken at the humeral sutures; covered with sparse brown and gray hairs. Scutellum black with grayish tinges laterally and margined with white hairs. Pleura gray with mostly pale hairs. Coxae and femora dark brown, predominantly black haired. Tibiae and tarsi dark reddish with black hairs but no hind-tibial fringe. Wings subhyaline, the crosslveins ("nervis transversis") with faint clouds but the longitudinal veins not margined with brown as in *M. conica*, cell R_5 closed and long petiolate, spur-veins as long as stems. Subepaulets bare. Halteres dark brown. *Abdomen* dark brown, velvety black underneath, and with coarse black hairs extending around onto the sides of tergites 3 to 7. Coarse white hairs on tergites 1 and 2 except on extreme margins, and in a narrow, continuous median line to the tip of the abdomen.

Holotype locality: "Chile, E. P. Reed Collection."

Allotype male, 13 mm. Eyes dichoptic. Like the ♀ and readily associated but differs in following respects:

Front narrower (index, 1:1.67), snout a little shorter than front, and proboscis a little longer than the abdomen. Pale hairs of beard and body pale yellowish, confined on the first two tergites to the hind margins, the median line expanding on each incisure. Tergite eight swollen and bulbous with mixed black and pale hairs.

Allotype locality: "Las Trancas, 10–8–39, Chile, E. P. Reed Collection."

Paratype females, 1, "Q. Seca, El Panque, 29–8–37, Chile, E. P. Reed Collection"; 1, "El Sauce, Elqui, 5–XI–37, Chile, E. P. Reed Collection" (In Coll. C.B.P.); "Hda. Illapel, Coquimbo, Chile, 24–25 Oct., 1954. Luis E. Penna" (In Coll. L. L. Pechuman). Agree with the holotype but the pale hairs on the dorsum of the abdomen considerably worn in two, revealing the first two tergites as with gray integument, and two submedian dark dashes on the second.

M. bejaranoi Barr. and Duret from Neuquen, Argentina, has some similar features but lacks the black venter, there are pale middorsal triangles rather than a longitudinal line, and the tibiae are reddish-yellow haired.

From the description of hairy body but bare eyes, and long proboscis, *Pangonia obscuripennis* Philippi also suggests a species of *Mycteromyia,* but the closed first posterior cell is not mentioned. This species probably has some resemblance to the following, *M. asper,* new species, but the red of the former is confined to the sides of tergites 2 and 3, the first segment is gray, the beard is yellowish, the wing veins are brown margined, and it is a larger insect with apparently longer proboscis.

Mycteromyia asper* Philip, new species

A rather small, dark species with red-sided abdomen, spotted wings, bicolored legs, and an especially shaggy, black-haired crest on the front and with long, white-haired beard.

Holotype female, 10.5 mm. Eyes bare. Front very wide, divergent above, basal width greater than height as 1:0.8, buff-gray pollinose with a large median patch of sooty pollen in the middle, at the top of which (and just ahead of the vertex) is located a low ocellar tubercle with three ocelli. Snout ash-gray pollinose, unusually short, forming a transverse ridge beneath the antennae. The latter short and slender, entirely black, the scape unusually short, expanded in the distal half to equal the pedicel and basal annulus in thickness as well as the last in length; scape hardly twice the length of the beadlike pedicel, both with coarse black hairs; flagellum a little more than twice the length of the two basal segments combined, the apical annulus but little longer than the adjoining one. Palpi black with concolorous hairs, longest on the basal segment, the two segments about equal in length, the apical segment more slender and tapering, not clavate. Proboscis a little longer than the thorax. Vestiture of entire head especially long and shaggy, a heavy black patch on the front, the beard creamy white with scattering black hairs around the lower ocular margins, and sparse black and yellow ones on the snout. *Thorax,* including the antealar tubercles and scutellum, black with five narrow gray lines and with similar diagonal connections laterally at the sutures in front of the wing bases. Vestiture sparse black and yellow dorsally, denser buff below with a median patch of dark hairs on the pleura. Coxae and femora black, the former with bushy pale hairs grading into black and some yellow on the femora. Tibiae reddish, the fore and hind pair darkened apically, covered with short brown hairs: no hind-tibial fringe. Wings tinted with prominent clouds on the cross-veins, cell R_5 closed and petiolate, spur-veins present. Knobs of halteres bright yellow. Subepaulets bare. Sides of abdomen and entire venter brick red; tergite 1 dull black with outer margins red, brighter black geminate spots on tergites 2 to 4 enclose flat, pale yellow triangles tallest on 4 which nearly bisects the black. Vestiture shaggy and black; pale yellow hairs predominate on tergite 1, and on the triangles and outer corners of the following tergites. Hairs of venter predominantly pale yellow anteriorly but blackish caudad.

Holotype locality: "Fray Jorge Forest, Coquimbo, Chile. 11 December, 1950, Ross and Michelbacher."

The red-sided abdomen is distinctive from all other species including *M. brevirostris* Philippi which is a more uniformly brownish insect with brown basal antennal segments and scutellum, and pale brown legs. The proboscis is reported as not as long as the thorax. Kröber (1930b) adds the following characters which differ from *M. asper*: Front almost quadrilateral with yellowish

* Latin, rough, in reference to the shagginess, particularly of the head.

hair; basal annulus of flagellum enlarged; snout a little longer than the front; white hairs on the hind border of the scutellum and parts of the abdomen; and halteres brown.

Mycteromyia eriodes* Philip, new species

A medium-sized, grayish, hoary species resembling a woolly bombyliid with spotted wings, elongate proboscis nearly as long as the body, and bulbous genitalia.

Holotype male, 14 mm. Eyes bare, widely dichoptic. Front gray pollinose with sparse yellow bristles below, brown at vertex, sides subparallel; 1.4 times higher than basal width between the inner corners of the eyes; vertex depressed below upper eye level; ocellar tubercle set well below vertex, with three plain ocelli; no calli. Subcallus pearly gray pollinose, bare in middle, a few short yellow hairs laterally. Snout from base of antennae, equal in length to height of front, brown with sparse gray pollen except on a faint brown line on each side, and with very few pale hairs. Scape cylindrical, dark brown, twice the length of the pedicel; flagellum black with eight annuli, the basal one a little longer than thick, the apical one elongated over twice the length of the preceding. Palpi brown with pale hairs, the apical segment clavate and about three and one-half times longer than median thickness and a little longer than the slender labellae. Proboscis black. Beard dense and white. *Thorax* above and below and scutellum covered with dense, long white pile, the notum with four prominent bare brown lines. Coxae brown, remainder of legs reddish yellow, with long white hairs basally, short brown hairs on the tibiae, no hind-tibial fringe. Wings slightly tinted with prominent clouds on the cross-veins, the veins dark brown apically, reddish basally, cell R_5 closed and petiolate, spur-veins present. Halteres pale reddish; subepaulets bare. *Abdomen* compact and wide, rapidly constricted to the sixth segment, the brownish gray integument obscured by heavy white pile with especially dense fringes on the incisures, the eighth tergite pale reddish, swollen and bulbous with coarse yellow hairs, sparser dorsally. Venter contrasting chocolate brown with concolorous hairs.

Holotype locality: "CHILE, OLMUE, October 23, 1917." "E. P. Reed Collection." Labelled "*Mycteromyia conica* Bigot det. Reed."

Paratype males: 1, same data (in Coll. C.B.P.); 1, same locality but "18 October, 1917"; 1, Valparaiso, 15 November, 1922, E. P. Reed Coll. (CAS).

The unusual woolliness due to long white pile over the whole body is distinctive. Compared to the type male of *M. cinerascens* (Bigot) (thought to be a female by Bigot) and another male from Valparaiso Province, this is much paler and more hirsute. *M. cinerascens* (specimen from Valparaiso agreeing with type in

* From Greek, woolly.

BMNH) has sparser and shorter, yellow hair on notum and abdomen, the venter is not contrasting brown, and the palpi are longer and darker. Though Kröber must have seen the type of *cinerascens* in the British Museum, it is apparent that most of his remarks really refer to *eriodes*.

MYCTEROMYIA HIRTIPALPIS (Bigot)

Syn. *M. edwardsi* Kröber. The types were compared by Fairchild and the writer in the British Museum. The eyes are bare and Kröber (1930a) was mistaken in erecting a new genus, *Caenopangonia*, for *hirtipalpis* on hairy eyes. Except for the proboscis described as long as thorax and abdomen together, *M. murina* Philippi also agrees and would be the earliest name. Possibly the proboscis was unusually extended. *Silvestriellus patagonicus* Brèthes from Santa Cruz (? Argentina) may also be this species but the description is inadequate to decide.

A series of five specimens in CAS and Pechuman Collections from various localities in Chile suggests either considerable variation in amount and distribution of pale hairs, especially underneath, or that there is a closely knit, composite group here. In one the hairs of the thorax and basal abdomen are rust red rather than straw yellow, in another, they are almost entirely blackish. The question cannot be settled with the material at hand. The proboscis is a little shorter than the abdomen in all. *M. philippii* Philip is at once distinguished from this group by its longer snout, proboscis and palpi.

In view of the new species described from Argentina by Barretto and Duret (1954) and those above, it is unfortunate that the existence of Philippi's types are unknown. The type, said to be in Vienna, of *M. robusta* Kröber from country unknown, was not found during a visit by the writer in 1953. Like *M. asper* Philip, it has a reddish sided abdomen, but is a much larger species with front divergent below.

The specimens from Chile in Vienna identified by Kröber (1930) as *M. fusca* and *M. brevirostris* were studied. The former has sides of abdomen more orange yellow than olive brown and could not be *M. philippii* (nor *M. fusca* Philippi = *M. conica* Bigot). I cannot place this specimen but it may relate to *M. bejaranoi* Barrett and Duret from Neuquen. It is possible that the two females under *M. brevirostris* with nearly denuded, almost orange yellow abdomens are correctly placed by their concolorous scutellums and legs and short proboscides. In these, the frontoclypeus (snout) is hardly produced so that the scape extends beyond the oral margin viewed from the side. The comparative extent to which the frontoclypeus is produced will be an important morphological criterion in members of this genus, among which there appears to have been an almost precinctive, evolutionary burst of extraordinary specialization in southern South America.

MESOMYIA (VEPRIUS) RUBRICORNIS (Kröber), new combination

The male only was originally described. Ross and Michelbacher took a female "18 km. east of San Carlos, Nuble, Chile, 24–XII–50" which may be designated the allotype. The bright red, disc-like antennal plate serves to associate this otherwise entirely black insect with the male, and also to distinguish it from *M. carbo* (Macquart) (syn. *presbiter* Rondani). The two species otherwise resemble one another so closely it would be exceedingly difficult to assign specimens with broken antennae. The present allotype female, 12 mm., has the frontal keel only slightly expanded below, whereas, two *carbo* have the keel clavate over half the width of the fronts, but this may be only individual variation. The plates are even more disclike in shape in the allotype than in *carbo*. A considerable amount of plant pollen adherent to the body of the allotype indicates flower visitation.

A male each is at hand from Penco and Angol, Chile, with antennae intact. Mackerras (1955) has shown the correct generic assignment of the group.

SCAPTIODES GAGATINA (Philippi), new combination

This is a small, shining black species with clear wings that appears to be not uncommon in some parts of Chile. A series was taken by Ross and Michelbacher "west of Angol, Crest of Sierra Nahuelbuta, 1200 meters, 3 January, 1951." Kröber (1934) assigned the species unnaturally to *Dasyommia* because of the ocellar tubercle and hairy eyes. *Scaptoides nigerrima* Enderlein, a probable synonym, was placed in Tribe Lepiselaginae because of the lack of tooth on the antennal plate, a character which combined with the bare subepaulets justifies Mackerras (1954) in placing the species closer to *Dasybasis* and *Stenotabanus* in the Diachlorini.

The type of *S. nigerrima* was studied on loan from Berlin Museum through courtesy of Professor Fritz Peus, and is somewhat soiled preventing synonymy here with certainty, but structural characters appear in good agreement indicating at least congeneric relationships with *gagatina.*

Chaetopalpus acroterius Philip, new species

A small, black species with contrasting, bright yellow appendages (hence the name from "acroteria," the extremities of the body) and yellow baso-costal areas of the otherwise fumose wings.

Holotype female, 10 mm. Eyes plainly hirsute with rather short yellow hairs; pattern (relaxed) unbanded. Front with sides plainly convergent above, index of basal width to maximum height, 1:1.9, shining black with inconspicuous black hairs, smooth in the upper half, finely, transversely wrinkled below with a bulge in the middle but no defined callosity; three ocelli on a prominent, raised tubercle at the vertex. Subcallus very small and narrow, the upper margin shining brown, the lower margin a narrow band of yellow pollen just above the antennae. Face and cheeks pale brown pollinose with black hairs, separated by unusually deep, apodemal furrows on each side. Antennae with two basal segments dull yellow with coarse, sparse black hairs, the pedicel half as long as the scape, neither produced above, the third segment bright yellow, the plate nearly as tall as the scape, and tapering to meet the annuli more gradually than the abrupt juncture between disclike plate and annuli seen in *C. coracinnus,* while the terminal segment is more pointed than in the latter; the plate has suggestions of transverse sutures but these are not plain like those dividing the terminal four annulations, or as seen in the flagellum of *Protodasyapha hirsutuosa* (Philippi). Palpi and proboscis black, about equal in length, and hardly longer than the front, densely black haired, the first segment bulbous subshiny, the second segment cylindrical, gently curved and tapered to a blunt point without evident sensorial pits. There is a wide, gray pollinose post-ocular rim on the head with brown and some yellow hairs on the hind margin. *Thorax* entirely, coxae and femora dull blackish brown, with sparse black pile, longer below. All tibiae, tarsi, and halteres contrasting bright yellow with concolorous hairs on the legs, no definite hind tibial fringe. Wings smoky, the stigma, costal cell, and first M cell basad of the two basal cells plainly yellow. Cell R_5 wide open, short spur-veins present. Subepaulets reduced to small, bare scales, and the tegulae smaller than usual. *Abdomen* subshining blackish brown, with sparse inconspicuous brown and black hairs.

Holotype locality: VALPARAISO, CHILE, November, 1900. P. Herbst.

It is difficult to decide for generic placement if the flagellum of the antennae has pseudoannulations in the basal plate or if there are actually more than five segments. Some head characters suggest relationship to Nearctic *Apatolestes comastes* Williston, and *Brennania hera* (Osten Sacken) but these Nearctic species have sensorial grooves or pits on the edges of the palpi, and lack the deep apodemal grooves on the sides of the face, plus better developed subcalluses and less differentiated but plainer basal annulations in the antennal flagellum.

Chaetopalpus abaureus* Philip, new species

A small, dark brown, predominantly golden-haired species with long and slender palpi.

Holotype male, 9 mm. Eyes densely yellowish-brown haired, the upper facets but little enlarged. Ocellar tubercle dark brown with three ocelli and long brown hairs, raised above the upper eye level. Frontal triangle small, brown with a strong median sulcus. Fronto-clypeus depressed giving the cheeks on either side a swollen appearance, the whole brown and covered with long, dense golden and brown pile. Beard golden yellow. Scape and pedicel reddish brown with bushy black hairs, the former a little longer than tall; flagellums missing. Proboscis very short, the golden-haired palpi reaching to its tip. Apical, palpal segment dull orange, slender and tapering downward to a blunt point, a little over three times as long as basal thickness; basal segment brown and swollen. *Thorax* and dorsum of the abdomen deep chocolate brown entirely covered with long golden yellow pile (viewed from the side), lighter under the wing bases. Coxae, fore femora on the basal two-thirds, and fore tarsi brown, remainder of legs bright reddish; hairs predominantly yellow basally with brown ones intermixed on the tibiae, and predominating in the hind-tibial fringe. Wings smoky with clouds intensified on the basal cross-veins; cell R_5 open, spur-veins present. Halteres brown with yellow seams. Subepaulets bare. Dorsum of abdomen blackish, extreme lateral margins of tergites 2 to 4 and the incisures of 2 and 3, as well as the entire venter orange-red with dark shadows on sternites 1, 2, and 7. Pile on entire abdomen long and golden yellow.

Holotype locality: "15 MILES SOUTH OF LOS VILOS, COQUIMBO, CHILE, 13 December, 1950, Ross and Michelbacher."

C. mendozanus Enderlein from Argentina, as discussed and figured by Kröber (1930a), appears to be closest but differs in having short chunky palpi with black hair, the pale vestiture whitish gray on thorax and abdomen blackish rather than golden, the halteres bright ocher yellow. The two may turn out to be color phases of the same species but the palpal shapes are quite different, at least in the males.

Fidena nitida Philip, new species

A compact medium-sized, polished black species of the *nitens* group with shining black snout, black appendages, the tibiae contrasting bright yellow, white beard and wings sharply darkened basad of the outer tips of the basal cells.

Holotype female, 16 mm. Eyes densely covered with short brown hair.

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* Latin, from golden (quality), in reference to the over-all golden yellow color of the vestiture.

Front blackish with black hairs, sides parallel, index 1:3, the three ocelli on a prominence at vertex. Subcallus narrow, thinly dusted with black pollen; snout piceous, shining, subequal to front in length. Beard dense, snow white. Antennae and palpi black, slender, the former considerably longer than the snout, the palpi a little less than one-quarter the length of the proboscis; the last is elongate, subequal in length to the head and thorax combined, excluding the snout. *Thorax* and scutellum blackish, with some dark brown shading, entirely black haired except for two narrow white lines above the wing bases. Pleura, chest, coxae, femora, and their vestiture, coal black. Tibiae, tarsi, and their hairs contrasting bright yellow. Wings pale yellow, the basal cells sharply dark brown. Halteres black, subepaulets bare. *Abdomen* broad, compact, enameled black in appearance with short black hairs, small white patches of hairs on the outer corners of tergites 2 and 5, and of sternites 2, 3, 4, and 5. Hairs of middorsum entirely black.

Holotype locality: "PERU: MONSON VALLEY, TINGO MARIA, 21–X–1954. Schlinger and Ross."

The coal-black antennae and palpi, and narrower front will separate this from *F. eriomeroides* Lutz, and the bicolored legs and absence of median, white-tufted triangles on the last few abdominal segments from *F. nitens* Bigot, both of Brazil.

FIDENA ALBIFRONS (Macquart)

Originally described in *Pangonia, sens. lat.*, the species has been variously transferred to *Lilaea*, *Listraphapha* and finally *Lilaeina*, which Mackerras (1955) places with question as a synonym of *Fidena*. Though females are well-known from several localities, the first male, which is described below was taken by the Ross Expedition at Zapallar, Aconcagua Province, Chile, 27 November, 1950.

Allotype male, 14 mm. Differs from the female in the usual sexual characters and is readily associated. Upper eye facets enlarged about twice the size of the lower ones, the area merging gradually with the lower area, densely pale brown hirsute. Ocellar tubercle prominent and situated well above the upper eye level; adorned with a patch of coarse decurved, black bristles. Fronto-clypeus more truncated at the insertion of the proboscis than in the female and the scape and pedicel darker, almost black; flagellum black. Palpi very short, barely reaching the base of the proboscis, the apical segment ovoid, shorter than the basal, covered with coarse black hairs. Proboscis but little longer than the height of the head. Beard pale yellow. Thorax more hirsute than in the female, the dorsal lines as plain. Legs unicolorous blackish-brown. Wings hyaline, with cell R_5 closed at the margin in both wings. No spur-veins.

The writer compared several females provided by L. L. Pechuman with the type of *albifrons* in Paris in 1953. The type agrees with variants of this species having closed cell R_5, basal annulus of the flagellum longer than usual, moderately long palpi, yellow beard and body hairs, and reddish femora. It bears the label "Chile, Gay" and is intact except for a missing wing and antenna. There is unusual variation in some characters among females as noted by others, and Kröber (1930a) appears correct in considering as a synonym, *Pangonia subandina* Philippi, which the describer had differentiated only by the open cell R_5. This cell in series shows all intergradation from open and but little narrowed to closed and petiolate. Two specimens taken at the same time showed the closed condition in one, and in the other these cells are just closed at the margin in one wing and narrowly open in the other. There is a short spur-vein in one wing of each of two other specimens. The antennae and palpi may be brown or black. The latter are especially variable in shape showing graduations from short, blunt and very broad to narrow, and attenuated to a point at nearly one-third the length of the proboscis. The legs may be blackish, reddish, or bicolored with only the femora dark. These variations are not in constant combinations in series or specimens so as to suggest confusion of more than one species of the practicality of varietal establishment.

Scione acer* Philip, new species

(= *S. incompleta* Kröber, 1930c, *nec* Macquart, 1845)

A dark species with blackish, pale margined notum, basally reddish abdomen, partially bicolored legs, and wings heavily fumose in the basal half.

Holotype female, 11 mm. Eyes with thick, blackish brown hair. Front convergent above, index 1:2.8, vertex black with three ocelli and with two marginal spots of pale brown pollen on either side of the median ocellus, a large median patch of blackish pollen, and below it to the subcallus, a narrower band of yellowish brown pollen, the whole covered with heavy black hairs. Subcallus dark brown, a paler spot on either side of the antennal fossae. Fronto-clypeus only moderately produced, length about equal to the height of the front, brown pollinose and pilose. Cheeks gray with a dense, white beard. Antennae brownish black with long black hairs on the two basal segments. Apical palpal segment reddish brown, rather short and broad, ratio of width to length as 1:2.7, attenuated to a point at little less than one-fourth the length of the proboscis. The latter is relatively short, a little less than the height of the head. *Thorax* including antealar tubercles and scutellum blackish, the usual anterior, two pale lines narrow and not extended beyond the sutures; covered with black hairs, a small patch of pale yellow ones on either shoulder, and a line of the same color from

* Latin, sharp or piercing.

above the wing bases to the outer corners of the scutellum. Pleura and chest dark brown with concolorous hairs and pale yellow tufts beneath the bases of the wings. Coxae and femora blackish with long, concolorous hairs, longest on the fore coxae; tibiae dark reddish brown with short, black hairs, no fringe on the hind pair which are almost as dark as the femora. Wings tinted on the outer halves with clouds on the cross-veins, more heavily fumose inward of both the stigma and cross-veins at the tips of the two basal cells; cells R_5 and M_3 closed and petiolate, vein M_2 weakened toward the margin in only one wing. "Knots" but no spur-veins are present. Subepaulets dark brown, bare. Halteres brown. *Abdomen* of the usual compact shape, reddish brown on the basal three segments, darkening caudad, mostly blackish haired, with pale yellow hairs over the entire venter, on the outer corners of the tergites, and forming an easily-rubbed dorso-median row of small, pale triangles.

Holotype locality: "DEPT. HUANURO, HCDA. EXITO, PERU, alt. 1150 m., IX–1936. Mrs. Y. Mexia, Collector." Van Dyke Collection.

Since *Pangonia incompleta* Macquart is the genotype of *Scione*, it is unfortunate that the type female (seen by the writer in Paris in 1953) was not studied by either Ricardo (1902) or Kröber (1930c), when each reviewed the species. A tendency in species of this group for vein M_2 (from the discal cell) adventitiously to fade before reaching the wing margin was the basis for Macquart's name.

The type female from "Colombie" also bears a MS label "fascipennis" and is intact except that the hairs of the beard and chest appear to have been eaten off by book lice. It is in almost exact agreement with a female I have from Bogota, Colombia. Compared to Kröber's description, *S. incompleta* female is a redder species including the entire antennae and legs, the palpi are brown and narrower, the front is wider below and more convergent above (index 1:1.19), the snout is a little longer than the height of the front, and the proboscis more than a third longer than the head, lines on the brown thorax are evident, the abdomen does not darken as much caudally and there are more yellow hairs on the thorax and abdomen. The wings are less strongly tinted basally and have stronger costal shadows beyond the stigma. It is evident that Kröber described the female of the present new species rather than the true *S. incompleta*.

As Schiner (1868) and Ricardo (1902) have pointed out, however, there is the further complication in assignment of the name that Macquart's original description was based more on a (now missing) very dark cotype male. The type male may eventually be found, but it is not likely to be the male of *S. acer* n.sp. since the abdomen is described as blackish without mention of lateral red.

Scione distincta (Schiner), from Colombia, is also a dark species with bicolored legs, but like *S. albifasciata* (Macquart) and *S. maculipennis* (Macquart), *S. distincta* has a more plainly lined thorax, and longer snout and palpi than *S. acer*. The types of all three of the foregoing species were seen by the writer in 1953.

Tabanus (Macrocormus) rubricauda* Philip, new species

A medium-sized, slender, reddish species with tinted wings, long spur-veins, and abdomen with median pale triangles inconspicuous or absent.

Holotype female, 12 mm. Eyes bare, unbanded (relaxed). Front narrow, slightly convergent below (index 1:5.7), dark yellow pollinose, a small blackish spot at vertex with a vestigial, median ocellus, the brown, basal callosity triangular and plainly separated from the ocular margins, prolonged above without sudden constriction into a narrowing dark brown, attenuated keel which reaches to the upper third of the front. Subcallus reddish, with yellow pollinosity. Fronto-clypeus grayish-yellow pollinose with sparse yellow hairs. Cheeks yellow pollinose with a short, pale yellow beard. Scape and pedicel red with short black hairs; flagellums missing (however, a broken one adherent to the body could well belong since it has somewhat the shape and color of related *T. sorbillans;* it has red plate and darker annuli, the two portions subequal in length, and the plate compact, subequal in width, and gently excavated, the tooth low but acute). Palpi deep yellow, long, slender, crescentic and blunt, covered with short black hairs. Proboscis fleshy, less than a fourth longer than the palpi. *Notum* and scutellum dark brownish black, unlined but with black and appressed yellow hairs. Pleura reddish with darker shadows, yellow pile predominating. Fore coxae grayish black with pale hairs; fore-femora blackish with concolorous hairs, the two hind pairs predominantly reddish with mostly yellow hairs and some dark brown ones basally; tibiae reddish, the fore pair brown on the apical half, hind-tibial fringe and most of the other hairs black. Wings distinctly tinted, deeper yellow in the costal cells and margining the outer radial and cross-veins; spur-veins about equal to stems, cells R_5 wide open. Subepaulets hairy. Halteres reddish. *Abdomen* dull reddish darkening caudad with red incisures, predominantly black-haired dorsally, entirely yellow-haired ventrally; the only evidence of small triangles (because of wear) is a small gray pollinose spot on the posterior margin of tergite 2 and a few yellow hairs on the median, hind margins of 5 and 6.

Holotype locality: "DEPT. HUANURO, HCDA. EXITO, PERU, alt. 1150 m., IX–1936. Mrs. Y. Mexia, Collector." Van Dyke Collection.

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* Latin, red tail.

Paratype female, same data, in the collection of the author, is in close agreement but a little more worn, and the notum appears blacker. There is only a small black spot and no vestigial ocellus at the vertex, and again no evidence of original, abdominal triangles though scattering black hairs remain on tergites 3 and those following.

The species, though smaller and without abdominal triangles, is obviously related to *T. sorbillans* Wiedemann, the type of the subgenus *Macrocormus*. Other differences are the gradually tapered frontal keel, the darker notum and fore legs, black hind-tibial fringes, and (if correctly associated) more compact antennal plates. The darker fore legs, notum and scutellum, and tapered frontal keel also appear to separate this species from other related species in the subgenus.

Tabanus (Taeniotabanus) carneus Bellardi

Three females taken by Ross and Michelbacher at "Puna I.," Ecuador, 6 May, 1951, show variation in abdominal pattern that deserves mention. Otherwise all three agree in structure, size, red coxae, femora and scutellums, dark, median, integumental spot on tergite 2, and frontal index of 1:4. Fairchild's figs. 24 and 25 (1942a) would illustrate the fronts of these. The eye patterns of all three (relaxed) lack the usual heavy, purple, upper band. One has the usual three broad, even, yellow longitudinal stripes on the abdomen, though the median one is more constricted on on tergite 2, and frontal index of 1:4. Fairchild's figs. 24 and specimens have patterns that, unaccompanied by the preceding female, would be difficult to associate here. The median lines are not as contrasting and are narrower, consisting of rows of truncated, connected triangles, a little widened on the hind tergal margins; the stripe would be even less distinct if the pale overlying hairs were worn off. The sublateral yellow lines also are not as distinct as in the first specimen and are composed of series of elongate, though mostly connected and even dashes. Other species with this type of median stripe such as *T. maya* Bequaert, differ in having more jagged sublateral lines and/or narrower fronts, or darkened legs basally and black scutellums.

T. subsimilis Bellardi from Mexico is a previously unidentified form of *lineola* of which the writer studied the type in Turin, Italy, in 1953. It is worn dorsally but intact and resembles the above two Ecuador variants in head characters, red-tipped scutellum and median stripe, but the lateral stripes are jagged and the coxae and varying portions of the femora are blackish gray in the type. The writer has a Michoacán, Mex., female in close agreement with the type for comparison with the Ecuador *carneus*.

References

Barretto, M. P., and Duret, J. P.

1954. Sôbre alguns tabânidas Argentinos, com a descrição de três novas espécies de *Mycteromyia* Phil. (Diptera, Tabanidae) Rev. Brasil. Ent. 1:203–212.

Fairchild, G. B.

1942a. Notes on Tabanidae (Dipt.) from Panama. VII. The subgenus *Neotabanus* Ad. Lutz. Ann. Ent. Soc. Amer., 35:153–183.

1942b. Ibid. IX. The genera *Stenotabanus* Lutz, *Lepiselaga* Macquart and related genera. Ann. Ent. Soc. Amer., 35:289–309.

Kröber, O.

1930a. Die Tribus Pangoniini der neotropischen Region. Zool. Anz,, 89:213–228.

1930b. Tabanidae. In Diptera of Patagonia and South Chile, Pt. V, Fasc. 2, pp. 106–161.

1930c. Die sudamerikanischen Arten der Gattung Scione Wlk. (= Rhinotrichista End.) (Dipt.). Stett. Ent. Zeit., 91:141–174.

1934. Catalogo dos Tabanidae da America do Sul e Central, incluindo o Mexico e as Antilhas. Rev. de Entomologia 4:222–276.

Mackerras, I. M.

1954. The classification and distribution of Tabanidae (Diptera). I. Gen-Review. Austral. Jour. Zool. 2:431–454.

1955. The classification and distribution of Tabanidae (Diptera). II. History: Morphology: Classification: Subfamily Pangoniinae. Austral. Jour. Zool., 3:440–511.

Philippi, R. A.

1865. Aufzählung der chilenischen Diptera. Verh. zool. bot. Ges. Wien, 15:707–724.

Ricardo, G.

1902. LXVI. Further notes on the Pangoninae of the Family Tabanidae in British Museum Collection, 9:424–438.

Schiner, J. R.

1868. Reise de Oesterreichen Fregatte Novara. Diptera, Family Tabanidae, pp. 79–105.

Addendum: While this report was in press, study of the supposedly, long-lost type of *Agelanius meridianus* Rondani located in Naples, Italy, has revealed this to be unquestionably congeneric with *Chaetopalpus annulicornis* Philippi as discussed in a paper now in preparation. Recent information also affects the status of the subgenus *Veprius* mentioned in text.—C. B. P.

NEW CALIFORNIA PLECOPTERA

STEPHEN HITCHCOCK
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In the course of collecting stoneflies for the past several years in California the following new species have been discovered. I would especially like to acknowledge the help of Mr. Stanley G. Jewett, Jr., who kindly consented to examine this and other material.

Capnia quadrituberosa Hitchcock, new species

Male.—Length of body 6.5 mm., general color in alcohol brown, in lighter colored specimens there appear a row of darker spots on each of abdominal tergites 1–8. Pronotum embossed. Wings of normal length, uniformly hyaline, venation typical of genus. First seven abdominal segments without special structures. Eighth tergite with membraneous area in distal half of sclerite and a pair of tubercules on posterior edge of sclerite. Ninth tergite with middle area membraneous except at extreme anterior margin, pair of prominent lobes directed posteriorly at distal margin of tergite. Tenth tergite membraneous medially. Supra anal process (epiproct) rather short, extending to posterior margin of ninth tergite, forked at tip, shaped as in figure 1.

Female.—Length of body 7.5 mm., general features typical of genus. Eighth abdominal sternite with posterior margin of subgenital plate slightly produced and with sclerotization as in figure 3.

This species appears closest to *Capnia umpqua* Frison but differs in the number and position of protuberances on the abdominal tergites. It also differs in the shape and size of the supra anal process. The nymphs of the two species appear very much alike.

Holotype male and allotype female and seven male and one female paratypes, SMALL STREAM TRIBUTARY TO FEATHER RIVER CROSSING ROUTE 40A NORTH OF OROVILLE, CALIFORNIA, January 22, 1955. The holotype and allotype have been deposited in the collection of the California Academy of Sciences, paratypes in the collections of the author and Stanley G. Jewett, Jr.

Leuctra divisa Hitchcock, new species

Male.—Length 6 mm., general color in alcohol brown, head darker in color, pronotum patterned. General form and wing venation typical of genus. No processes on abdominal tergites. Ninth abdominal sternite with vesicle (ventral lobe), ninth sternite projecting posteriorly. Paraprocts (titillator) fused, extending obliquely up and back, slightly enlarged at distal end. Ninth tergite indented anteriorly. Tenth tergite indented on posterior margin and divided longitudinally. A pair of sclerites extending in from base of each cercus and attached to posterior edge of tenth tergite by membraneous area. A pair of triangular shaped sclerites on each side of supra anal process. Supra anal process (epiproct) tucked underneath and behind tenth tergite. Cerci fairly long, lightly sclerotized, with numerous long hairs on outer surface.

This species probably represents a new subgenus in the genus *Leuctra*. It can be separated from other North American species by the presence of a vesicle, lack of processes on abdominal tergites, shape of cerci, shape of tenth tergite, and the fused paraprocts. The shape of the tenth tergite somewhat resembles that of *Leuctra infuscata* but the latter does not have the tenth tergite completely bisected and differs in several other respects.

Stanley G. Jewett, Jr., has informed me (personal communication) that he has a single female leuctrid from Lagunitas, Marin County, California, which may be the female of this species. It has a peculiar tongue-like protrusion of the sub-genital plate.

Further placing of this species will depend on new collections.

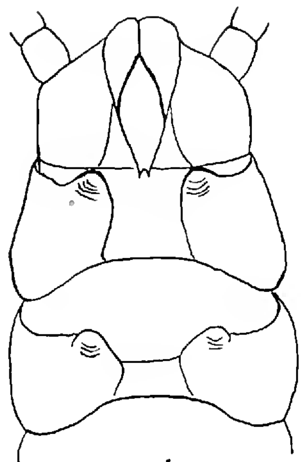
The holotype male is from WOODACRE, MARIN COUNTY, CALIFORNIA, April 14, 1956, and has been deposited in the collection of the California Academy of Sciences.

Nemoura marionae Hitchcock, new species

Male.—Length of body 6 mm. Scape and pedicel light colored, rest of antennae dark, labrum light with sides dark, color pattern of head varying between specimens, pronotum with dark longitudinal band on each side of midline, prescutum of mesothorax dark on anterior edge, mesonotum with dark band on each side of midline which has a light colored triangular spot with its apex reaching the posterior margin and base resting on anterior margin; metanotum dark with light stripe on midline, abdomen light brown; femora with dark band just before distal end, tibia with dark band at proximal end; last two tarsal segments dark. Remnants of two pairs of cervical gills. Wings hyaline. Vesicle (ventral lobe) at base of ninth sternite. Genitalia as in figures 6 and 7; lobe present at base of cercus; supra anal process (epiproct) membraneous at tip with a roughly triangular shaped sclerotized piece with a notch at apex; paraprocts (subanal lobes) curved with an included pocket and roughened edge at tip, figure 9.

EXPLANATION OF FIGURES

Fig. 1, *Capnia quadrituberosa* male genitalia, dorsal. Fig. 2, *Capnia quadrituberosa* male genitalia, lateral. Fig. 3, *Capnia quadrituberosa* female eighth sternite, ventral. Fig. 4, *Leuctra divisa* male genitalia, lateral. Fig. 5, *Leuctra divisa* male genitalia, dorsal. Fig. 6, *Nemoura marionae* male genitalia, lateral. Fig. 7, *Nemoura marionae* male genitalia, dorsal. Fig. 8, *Nemoura marionae* female sternites. Fig. 9a and b, *Nemoura marionae* subanal lobes of male paratypes.



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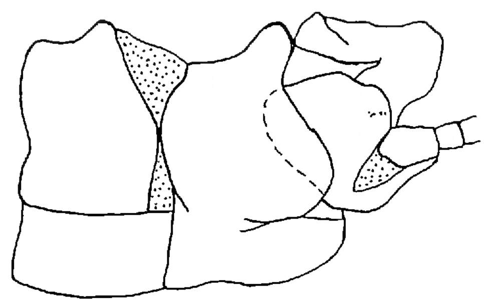

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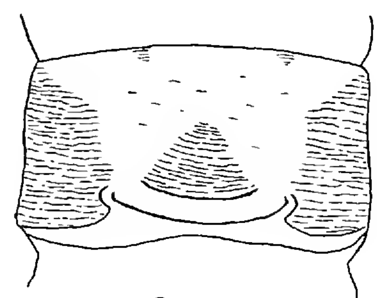

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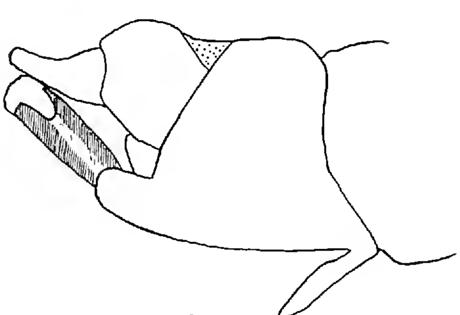

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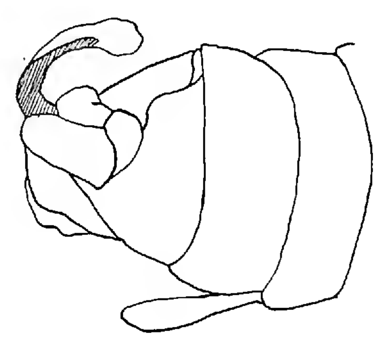

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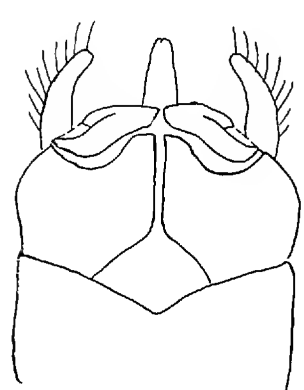

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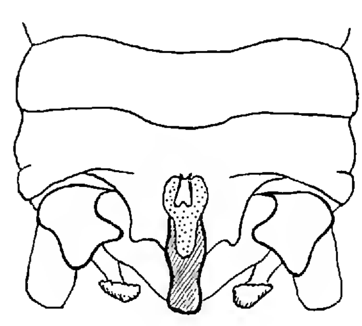

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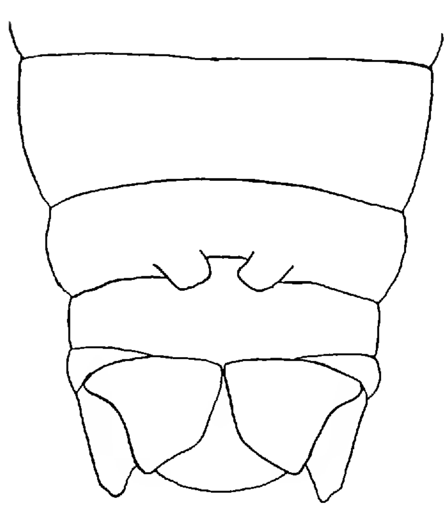

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Female.—Length of body 8 mm., general shape and color as in male. Eighth sternite with two short truncate lobes as in figure 8.

The female genitalia appears somewhat like that of *Nemoura venusta* Banks and so would be in the subgenus *Amphinemura* Ris. However, the male has a lobe at the base of the cercus as in the subgenus *Malenka* Ricker. There seems to be a more definite color pattern than in many *Nemoura* but the exact pattern will vary between specimens.

The male epiproct sometimes may be withdrawn down and in so that it is not visible.

This species has been found only by a small brook emerging from a spring and flowing into Sagehen Creek near Hobart Mills, California. Although no specimens were found mating in nature, a live male and female placed in a large bottle assumed the mating position in a very short time. There were no other *Nemoura* with branched cervical gills present at the time. The male holotype was captured August 9, 1955 and the female allotype, July 26, 1955. The holotype and allotype will be placed in the collection of the California Academy of Sciences. Paratypes collected July 26, 1955 and August 9–10, 1955 are in the collections of Dr. William E. Ricker, Mr. Stanley G. Jewett, Jr., and the author.

In addition to the above new species, it may also be of interest to record the following species found in California for the first time:

Nemoura producta Claassen was collected in Marin County north of San Francisco and this would appear to be the southern most extension of its distribution down the Coastal Range of California from the Coast and Cascade Mountains to the north.

Alloperla delicata Frison was captured in Sierra County and although this is its first recorded capture in California, it has been found in nearby states.

Capnia columbiana Claassen collected in Nevada County also has a distributional range of nearby states.

Capnia lineata Hanson was collected by Jon Herring in Santa Clara County. This species, identified by Mr. Stanley G. Jewett, Jr., represents the first specimens collected since the types. It was known previously only from Idaho.

CRYPTOGNATHUS STERNALIS, A NEW SPECIES OF PROSTIGMATID MITE FROM OREGON

(Acarina: Cryptognathidae)

G. W. KRANTZ

Oregon State College, Corvallis

The genus *Cryptognathus* was erected in 1879 by Kramer, with *C. lagena* Kramer named as the type species. In 1902, Oudemans removed the genus from the family Raphignathidae, in which he had placed it in 1893, and made *Cryptognathus* the type genus of the new family Cryptognathidae. Berlese (1916) subsequently described a second species, *Cryptognathus cucurbitae*, and the subspecies *C. cucurbitae* var. *subnitida*.

Baker and Wharton (1952) diagnose the cryptognathids as follows: Small, scarlet red mites measuring from 300 to 400 microns in length; body oval in shape and lacking a suture between propodosoma and hysterosoma; dorsum with a net-like skin pattern, and skin punctate; chitinous extensions of the propodosoma forming a tube which is open ventrally and through which the gnathosoma can be extruded or withdrawn; chelicerae shear-like; chelae small and almost straight, untoothed, and sharp for piercing; genital suckers absent.

In August of 1956, the writer received from Everett C. Burts, research assistant in the Department of Entomology at Oregon State College, a series of mite specimens collected in rotting plant debris at The Dalles, Oregon, on March 28, 1956. Among these specimens was a single cryptognathid mite which, upon examination, proved to be a previously undescribed form.[1]

The new species may be distinguished from the other members of the genus through the use of the following key:

1. Dorsum of idiosoma with net-like skin pattern covering only the lateral edges; length 300 microns; found in Italy, and in nest of *Sciurus n. niger* in Florida..............*Cryptognathus cucurbitae* Berlese
– Net-like skin pattern covering the dorsum of the idiosoma............2
2. Skin pattern obsolete; length 265 microns; found in Africa............... ....*Cryptognathus cucurbitae* var. *subnitida* Berlese
– Skin pattern distinct; body of a length greater than that mentioned above 3
3. Rostral prolongation hyaline; length 350–400 microns; found in moss in Europe...*Cryptognathus lagena* Kramer
– Rostral prolongation deeply sculptured; length 340 microns; found in rotting plant debris in Oregon...

[1] Six additional females taken from an oak treehole in Corvallis, Oregon, on February 4, 1958, were examined prior to the publication of this paper.

....*Cryptognathus sternalis* Krantz, new species

Cryptognathus sternalis Krantz, new species

(Figs. 1 and 2)

Female.—Oval in form, the widest point being slightly posterior to coxae IV. Total body length, including the extruded gnathosoma, measures 489 microns. Idiosomal length about 340 microns. Greatest width measures 218 microns. *Dorsum* (Fig. 1) *Idiosoma* with a dorsal plate which does not cover completely the lateral and posterior extremities of the dorsum (secondary extension posteriorly may be result of mounting procedure); with a distinct net-like pattern over its entire surface; strongly punctate. Rostral extension truncate, measuring 78 microns long and 78 microns wide at its base; curving ventrally but open on the ventral aspect; rostral plate deeply sculptured, the identations of the pattern being oval or reniform in shape. A pair of short setae (20 microns) inserted immediately behind the posterior border of the sculptured area. Two pairs of eyes located at the ends of a crescentic ridge lying in a transverse position on a line between the insertions of coxea II and III; two pairs of setae inserted anterior to the ridge and directly interior to the eyes; with a small blunt protuberance of unknown function between and anterior to the insertions of the abovementioned setae. Seven pairs of dorsal and one pair of lateral setae. Insertions of dorsal setae, as well as those of the venter and appendages, noticeably raised. Lateral and posterior marginal areas scalloped, weakly folded. *Anus* posterior; protected dorsally by a pair of triangular plates on each of which is inserted one dorsal and one lateral seta. *Gnathosoma* (Figs. 1 and 2c) long, measuring 218 microns from its base to the tip of the capitulum; sharply divided at points of insertion of the chelicerae. *Capitulum* spear-shaped; with a pair of incurved terminal structues, each of which is flanked by a short lateral seta. Lateral to base of capitulum are inserted the six-segmented *palpi,* measuring 103 microns in length; terminal segment small and bluntly pointed; palpal tibia with at least three setae, the external being the longest; at least two setae located on palpal genu, palpal femur with one, and trochanter with two, dorsal setae. Basad of the palpal insertions are a pair of short club-like organs (Fig. 2c) which may be sensory in function. *Chelicerae* inserted midway between the base and terminal end of gnathosoma; with sharp smooth chelae making up one-third of the total cheliceral length of 113 microns; distal half of chelicerae weakly sculptured. A pair of *spiracular openings* located between the insertions of the chelicerae, with the peritremes forming an arch behind them. *Venter* (Fig. 2a) *Idiosoma* punctate ventrally; with net-like pattern confined to the anterior and posterior portions of the venter, and to the extreme lateral margins. Punctate pattern absent on median anterior portion of the idiosoma; with apodemal remnants of coxae II and III bordering the non-punctate area; median anterior portion flanked anteriorly by a pair of setae inserted between its lateral anterior elongations (Fig. 2b); with a pair of short spine-like processes external and posterior to the abovementioned setae, and a series of short sensory setae or setal processes located along the posterior incurved border. *Genital* opening near the posterior border of idiosoma; covered by two plates, along the anterior border of which are inserted three pairs of genital setae; with a pair of outlying setae inserted laterad of the most posterior pair of genital hairs. *Anal opening* with a pair of lateral ventral plates, each bearing a single seta. Five pairs of primary ventral setae present, the most anterior pair inserted internally to smooth sternal area; second pair located internally to coxae IV; third pair behind and slightly external to first; fourth pair internal to second and noticeably shorter than the latter; fifth pair inserted immediately anterior to the sculptured posterior portion of the idiosoma. Three pairs of lateral

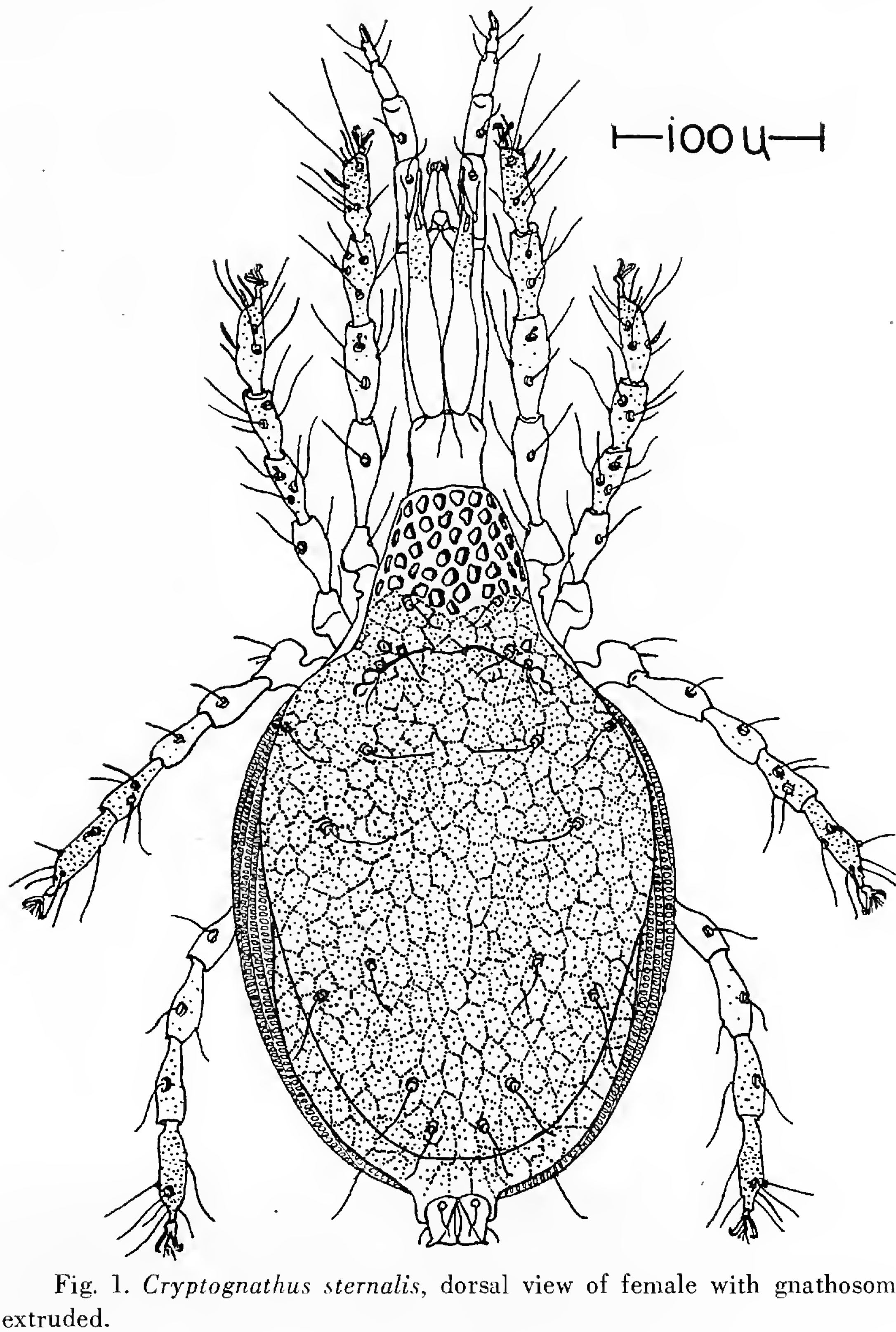

Fig. 1. *Cryptognathus sternalis*, dorsal view of female with gnathosoma extruded.

posterior sensory pores present, the most posterior pair lateral and external to the fourth pair of primary setae. Two pairs of pore-like structures located externally and behind the second pair of primary setae. *Legs* (Fig. 1) All tarsi with well developed claws and a haired empodium; distal segments of all legs noticeably sculptured, with the pit-like markings disappearing toward the insertions of these appendages. Tarsus I with twelve setae, two of which are long sensory hairs (49 microns) inserted adjacent to each other on the dorsal distal portion; with a shorter rod-like hair inserted dorsolaterally on the median external portion. Tibia I with seven setae, one of which has a ventral position; with two dorsal distal hairs, the external nearly twice the length of the internal hair. Five setae located on genu I; with a short knobbed sensory organ inserted toward the dorsal distal end of the segment. Femur I with three setae, one being ventrally inserted. Trochanter I swollen externally and bearing a single seta on its lateral internal aspect. Length of leg I, 222 microns. Tarsus II with ten setae, none of which are as long as the sensory setae on tarsus I; with a rod-like hair inserted dorsolaterally on the median external portion. Tibia II with six setae, the single ventral hair occupying a position similar to that of the ventral setae on the following segments. Genu II with four hairs, two of which are dorsal in insertion; with a knobbed sensory organ similar to that on genu I. Femur II and trochanter II resembling femur and trochanter I, except for their somewhat shorter combined length. Length of leg II, 185 microns. Tarsus III with eight setae, and a rod-like sensory hair on the dorsal aspect. Five setae inserted on tibia III, the two ventral hairs exceeding the others in length. Genu and femur III each with two setae; with one inserted dorsally and one placed ventrally on each segment. Trochanter III swollen externally; with a ventral and a dorsal seta. Length of leg III, 195 microns. Tarsus IV with seven setae and a short dorsal hair approximating in insertion and length the rod-like hair on the preceding tarsi. Tibia IV with two setae, one inserted dorsally and the other ventrally. Trochanter IV not quite as swollen as those of preceding legs; with no setal insertions. Length of leg IV, 234 microns.

Discussion

Probably the most interesting morphological feature of this unusual acarid is the presence of a well-defined sternal area which resembles, in some respects, the sternal plate of the more primitive mesostigmatid mites. The sternal area of *C. sternalis* apparently is not a true plate but a symmetrical region lacking the punctate markings distributed generally over the remainder of the venter. However, it appears possible that this entity may be a remnant of a true sternal plate. Not only is there a definite resemblance to the mesostigmatid sternal plate in shape and disposition, but setal homologies could easily be assumed, especially when comparing the sternal area in question with the sternal plates of nymphs of various parastid and other gamasid mites.

Holotype female, THE DALLES, OREGON, in rotting plant debris

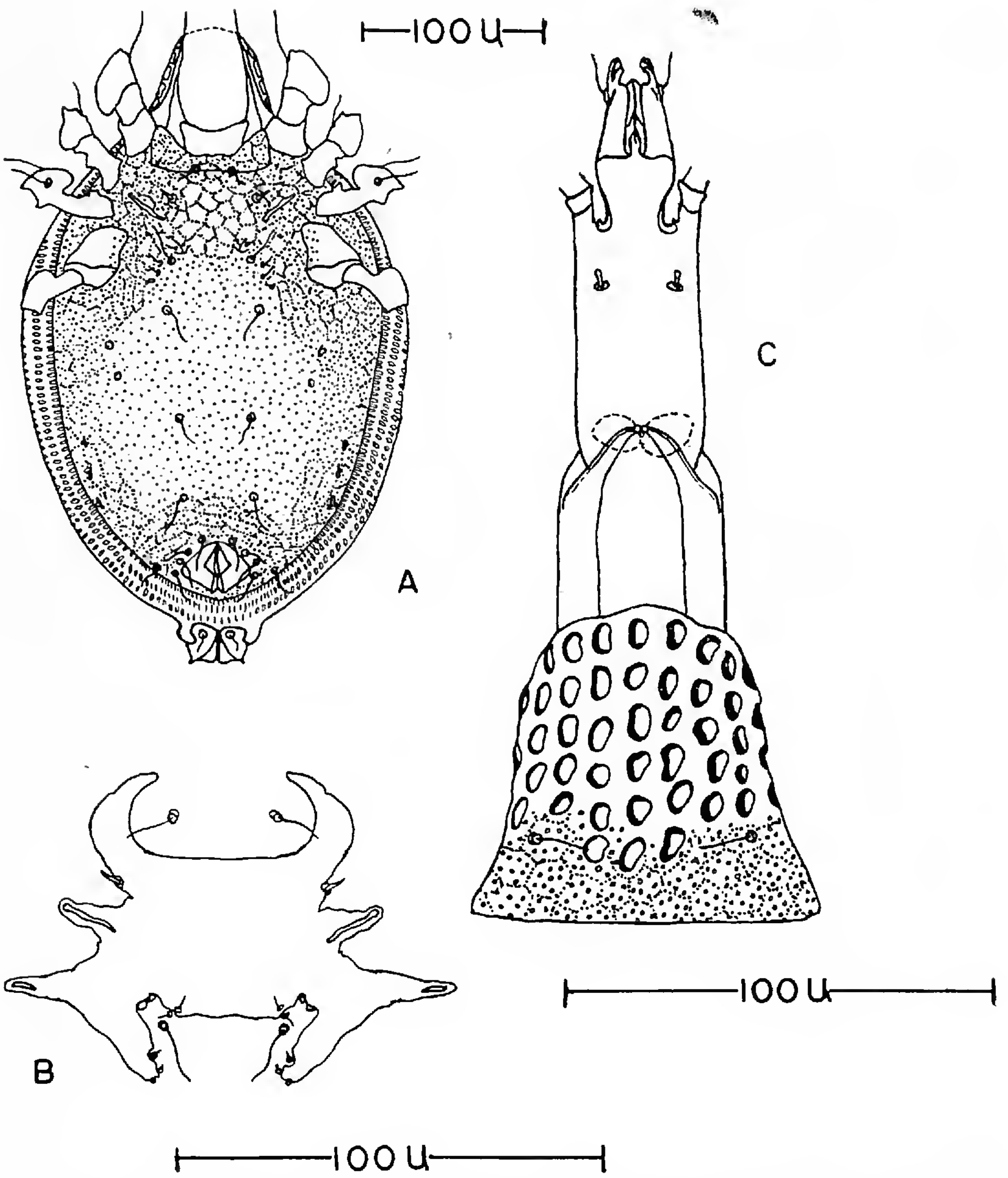

Fig. 2. *Cryptognathus sternalis*, *(a)* Venter of female; *(b)* Anterior sternal area; *(c)* Dorsal view of gnathosoma with chelicerae removed.

under cherry trees on March 28, 1956, collected by E. C. Burts, will be deposited in the collection of the U. S. National Museum in Washington, D.C.

The drawings were made and data was collected with the aid of a Spencer phase contrast microscope equipped with dark medium contrast objectives and illuminated by a Spencer advanced laboratory illuminator.

Literature Cited

Baker, E. W., and G. W. Wharton
1952. Cryptognathidae. An Introduction to Acarology. Macmillan Co., N.Y., pp. 183–184.

Berlese, A.
1916. Centuria seconda di Acari nuovi. Redia 12:132–133.

Thor, Sig
1931. Bdellidae, Nicoletiellidae, Cryptognathidae. Das Tierreich 56:78–81.

THE SMOKE FLY, HORMOPEZA COPULIFERA MELANDER
(Diptera: Empididae)

During the summer of 1957 I collected flies at many localities in the Pacific Northwest during a trip to Alaska. Although I was chiefly concerned with the Platypezidae, and in this connection tried for *Microsania* (the genus of platypezid smoke flies) at various places where a fire could be safely built, time and again after I had swept my net through the smoke I found that I had strained out specimens of an empidid along with the microsanias. I presumed that they belonged to a species of *Hormopeza,* but they were much larger than the specimens of *Hormopeza brevicornis* Loew that I had previously swept from smoke in California (Kessel, Pan-Pac. Ent., 28:56–58. 1952).

The flies proved to belong to *Hormopeza copulifera* Melander (Gen. Insect. Diptera, Fam. Empididae, p. 96. 1927). This seems to be the largest known species of the genus, and may attain a length of 5 mm. or more. The species was described from material collected at Coeur d'Alene, Idaho, August 24, 1916. Paratypes were from Idaho, Washington, Alberta, and Alaska. This species has not been reported from smoke. The data indicate that most of the specimens taken heretofore have been captured on windows.

I collected *H. copulifera* from smoke at the following localities: Spenard, Alaska (Aug. 22); Ten Mile Creek, M.P. 813, Alaska Highway, Yukon Territory (Aug. 31); Rancheria, M.P. 710, Alaska Highway, Y.T. (Aug. 31); Watson Lake, M.P. 632, Alaska Highway, Y.T. (Sept. 1); Glacier National Park, Montana (Sept. 6). The flies were numerous and in some instances outnumbered the *Microsania* specimens. On one occasion they were encountered when no microsanias were taken.

Because so many empidids are notorious predators, I suspected at first that the hormopezas collected in smoke with microsanias at Mill Valley, California, were present to prey on the latter flies. But as indicated in my 1952 note, there was no evidence of such predation by *H. brevicornis* on that occasion. Likewise, no such evidence was obtained for *H. copulifera* in 1957.

The first species of *Hormopeza* to be associated with smoke was *H. obliterata* Zetterstedt, a European form. This was reported to be a smoke fly by Sharp (Ent. Monthly Mag., 54:244, 1918). —EDWARD L. KESSEL, *University of San Francisco and California Academy of Sciences.*

SOME PARASITES AND PREDATORS OF FRUIT PESTS IN THE PACIFIC NORTHWEST

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For more than forty years the Department of Agriculture's fruit insects laboratories in the Pacific Northwest have been collecting information on the parasites and predators of insects and mites of economic importance. Specimens were collected or reared at Wenatchee, Washington, from 1914 to 1916, in the area around Portland, Oregon, in 1917 and 1918, and at Yakima, Washington, since that time. About 90 species have been determined, many of them new to science at the time they were collected. The determinations were made by specialists in the Department of Agriculture and the U.S. National Museum, including Banks, Caudell, Cushman, Gahan, Girault, Heidemann, Knab, Muesebeck Rohwer, Sabrosky, Sailer, Schwartz, and Walton.

These parasites and predators are listed below under each host in the order in which they commonly appear in systematic lists. Life history and other data have been published for some of these beneficial insects, and reference is made at the appropriate places to such publications.

Acarina (including *Bryobia proetiosa* Koch., *Metatetranychus ulmi* (Koch), *Eotetranychus carpini borealis* (Ewing), *Tetranychus mcdanieli* McG., and *T. telarius* L.) The occurrence and abundance of predators are discussed in *(10)*.

Conwentzia sp. Coniopterygidae. Clark County, Wash.

Scolothrips sexmaculatus (Perg.). Thripidae, Yakima, Wash.

Typhlodromus spp. Phytoseiidae. Also called *Seius* in older literature.

Mediolata mali (Ewing). Raphignathidae. Yakima.

Orius insidiosus (Say). Anthocoridae. Yakima.

Stethorus picipes Casey. Coccinellidae. Yakima.

Androloma mac-cullochi similis (Stretch.) Forester moth.

Gravenhorstia sp. Ichneumonidae. Wenatchee, Wash.

Ametastegia glabrata (Fall.). Dock sawfly. Parasites and percentage of parasitization mentioned in *(4)*.

Eurytoma sp. Eurytomidae. May be secondary. Wenatchee.

[1] Retired.

Trichogramma minutum Riley. Trichogrammatidae. Egg parasite. Wenatchee.

The following ichneumonidae, all from Wenatchee: *Mastrus smithii* (Pack.) Cush. and *Hoplocryptus notatus* (Prov.), *Cubocephalus canadensis* (Prov.), *Scambus pterophori* (Ashm.), *Hympamblys albopictus* (Roh.), *Cubocephalus erythropus velox* (Cress.), and *Bathythrix claviger* (Tasch.).

Anacampsis fragariella Busck. Western strawberry leafroller.

Agathis cincta (Cress.). Braconidae. Northport, Wash.

Aphididae (including *Anuraphis roseus* Baker, *Aphis cerasifoliae* Fitch, *A. pomi* Deg., *Hyalopterus arundinis* (F.), *Macrosiphum artemisiae* (Fonsc.), *Monellia caryae* (Monell), *Myzus cerasi* (F.), and *M. persicae* (Sulz.). Some of the predators listed below are discussed in *(7)*.

Chrysopa plorabunda Fitch. Chrysopidae, Wenatchee.

C. majuscula Banks. Chrysopidae. Salem, Oregon.

Kimminsia disjuncta (Banks). Hemerobiidae. Salem, Oregon.

Anthocoris borealis Dallas. Anthocoridae, Wenatchee.

Camptobrochis brevis Uhl. and *C. nebulosus* Uhl. Capsidae. Wenatchee.

Podabrus tomentosus (Say). Lampyridae. Wenatchee.

Metasyrphus arcuatus (Fall.) and *Syrphus opinator* O.S. Syrphidae. Wenatchee.

Lasiophthicus pyrastri (L.) Syrphidae. Wenatchee.

The following Coccinellidae, all from Wenatchee: *Adalia annectans* Cr., *A. bipunctata* (L.), *Coccinella 5-notata* Kby., *C. 9-notata* Hbst., *Cycloneda sanguinea* (L), *Hippodamia convergens* Guer., *H. lecontei* Muls., *Hyperaspis* sp., and *Scymnus lacustris* LeC.

Aphis gossypii Glov. Melon aphid.

Aphidius (Lysiphlebus) testaceipes (Cress.). Braconidae. Wenatchee.

Arachnida. Spiders.

Tromatobia rufopectus (Cress.). Ichneumoidae. Egg predator parasite. Wenatchee.

Archips argyrospila (Wlk.). Fruit-tree leaf roller.

Podisus modestus Dall. Pentatomidae. Wenatchee.

Stomatolydella infernalis Tns. Larvaevoridae. Kennewick, Wash.

Aplomya caesar (Ald.). Larvaevoridae. Kennewick and Wenatchee.

The following ichneumonidae: *Horogenes pterophorae* (Ashm.), *Horogenes eureka* (Ashm.), and *Itoplectis 4-cingulatus* (Prov.), from Wenatchee, and *Exochus* sp. from Kennewick.

Archips rosaceana (Harr.). Oblique-banded leaf roller.

Glypta simplicipes Cress. Ichneumonidae. Ellensburg, Wash.

Ascogaster quadridentata Wesm. Codling moth parasite. See *(9)*.

Perilampus fulvicornis Ashm. Parilamidae. Yakima.

Kimminsia disjuncta (Banks). Brown lacewing.

Anacharis sp. Figitidae. Salem, Oregon.

Carpocapsa pomonella (L.). Codling moth. Introduction of parasites discussed in *(9)*.

Ascogaster quadridentata Wesm. and *Agathis conspicuus* (Wesm.) Braconidae. Introduced into the Yakima Valley.

Mastrus pilifrons (Prov.) Ichneumonidae. Wenatchee.

Pimpla sanguinipes Cress. Ichneumonidae. Yakima.

Scambus hispae (Harr.) Ichneumonidae. Wenatchee.

Trichogramma minutum Riley. Trichogrammatidae. Egg parasite. Wenatchee and Yakima.

Chrysopidae. Lacewings.

Isodromus niger Ashm. Encyrtidae. Yakima County.

Keonolla confluens (Uhler). Sharpshooter.

Ufens niger (Ashm.). Trichogrammatidae. Yakima.

Coccinella 5-notata Kby. Lady beetle.

Tetrastichus melanis Burks. Eulophidae. Wenatchee.

Conwentzia sp. Dusty wing.

Dendrocerus conwentziae rufus Gahan. Ceraphronidae. Clark County, Wash.

Corythucha spp. Lacebugs.

Podisus modestus (Dall.). Pentatomidae. Clark County.

Orius tristicolor (White). Anthocoridae. Clark County.

Perilitus sp. Lady beetle parasite.

Nabis ferus L. Nabidae. Wenatchee.

Epicallima coloradella Walsh. Scavenger moth.

Idechthis sp. and *Itoplectis 4-cingulatus* (Prov.) Wenatchee.

Eriosoma lanigerum (Hausm.). Woolly apple aphid. Predators discussed in *(7)*. Introduction of *Aphelinus* discussed in *(1)*, *(2)*, *(3)*, *(6)*,

(7), *(12)*, and *(13)*.

Chrysopa plorabunda Fitch and *C. majuscula* Banks. Chrysopidae. Wenatchee.

Camptobrochis nebulosus Uhl. Capsidae. Wenatchee.

Adalia bipunctata (L.) and *Coccinella 5-notata* Kby. Coccinellidae. Wenatchee.

Aphelinus mali (Hald.). Eulophidae. Introduced into Pacific Northwest.

The following Syrphidae, all from Wenatchee: *Eupeodes volucris* O. S., *Metasyrphus arcuatus* (Fall.), *Syrphus opinator* O. S.., and *Scaeva pyrastri* (L.).

Lithophane spp. Green fruitworms.

Apanteles sp. Braconidae. Yakima.

Gymnonychus californicus Marl. Pear leafworm. Percentage of parasitism mentioned in *(11)*.

Cleptes provancheri Aaron (?). Cleptidae. Wenatchee.

Hippodamia convergens Guer. Convergent lady beetle.
Perilitus sp. Braconidae. Wenatchee and Yakima.

Hyphantria cunea (Drury). Fall webworm.
Habrocytus sp. Pteromalidae. Portland.

Lithocolletis crataegella (Clemens). Apple leaf blotch miner.
Sympiesis rex Grlt. Eulophidae. Salem, Oregon.

Lithocolletis tremuloidiella (Braun). Aspen blotch miner.
Sympiesis sp. Eulophidae. Spokane.

Zotheca tranquilla Grote. Stalk borer.
Hypopteromalus percussor Grlt. Pteromalidae. May be secondary. Wenatchee.
Glypta simplicipes Cress. and *Scambus alboricta* (Cress.). Ichneumonidae. Wenatchee.

Malacosoma pluviale (Dyar). Western tent caterpillar.
Rogas sp. Braconidae. Clark County.
Hypopteromalus percussor Grlt. Pteromalidae. May be secondary. Wenatchee.
Hyposoter fugitivus pacificus Cush. Ichneumonidae. Wenatchee.

Pachynematus sp. Sawfly
Ctenochira extricata (Davis). Ichneumonidae. Wenatchee.

Pandemis pyrusana (Kearf.) Pandemis moth. Parasitism mentioned in *(8)*.
Nemorilla floralis (Fall.). Laraevoridae. Yakima County.
Horogenes sp. Ichneumodiae. Yakima County.

Papilio bairdii oregonia Edw. Swallowtail.
Apanteles lunatus (Pack.). Braconidae. Wenatchee.

Phalaenids. Cutworms. Discussion of digger wasp and its inquilines in *(5)*.
Podalonia luctuosa (Smith). Sphecidae. Yakima.
The following Sarcophagidae live as inquilines on the sphecid larvae: *Hilarella hilarella* (Zett.), *Metopia leucocephala* (Rossi) and *Taxigramma heteroneura* Mg.

Phenacoccus sp. Mealybug.
Lygocerus sp. Ceraphronidae. Hyperparasite. Yakima County.
Uarhopalus sheldoni Ashm. Encyrtidae. Okanogan County, Wash.

Psylla pyricola Foerst. Pear psylla.
Anthocoris borealis Dallas. Anthocoridae. Entiat, Wash.
A. musculus (Say). Anthocoridae. Yakima County.

Nematus mendicus Walsh. Cottonwood sawfly.
Ctenochira sp. Ichneumonidae. Yakima.

Rhagoletis cingulata (Loew). Cherry fruit fly.
Trybliographa sp. Figitidae. Salem, Oregon.

Sanninoidea exitiosa graefi (Hy. Edw.). Peach tree borer.
Cryptus tejonensis Cress. Ichneumonidae. Clark County.

Scolytus rugulosus (Ratz.). Shot-hole borer.

Cheiropachus colon (L.), and *Rhaphitelus masculatus* Wlk. Pteromalidae, Yakima.

Spilonota ocellana (D. and S.). Eye-spotted bud moth.

Horogenes pterophorae Ashm. Ichneumonidae. Wenatchee.

Agathis annulipes (Cress.) Braconidae. Wenatchee.

Syrphids. Syrphus flies.

Diplazon tibiatorius (Thumb.), *D. pectoratorius* (Thumb.), *Syrphoctonus decoratus* (Cress.), and *S. maculifrons* (Cress.). Ichneumonidae. Wenatchee.

Literature Cited

Childs, L., and D. G. Gillespie

(1) 1930. Notes on the introduction of the woolly apple aphid parasite, *Aphelinus mali*. Jour. Econ. Ent. 23:790.

(2) 1932. Production and spread of the woolly aphid parasite. *Aphelinus mali* in the Hood River Valley. Jour. Econ. Ent. 25:1013.

Haegele, R. W.

(3) 1939. *Aphelinus mali* Hald. Idaho Univ. News Letter 22:3.

Newcomer, E. J.

(4) 1916. The dock false-worm: an apple pest. U.S. Dept. Agr. Bul. 265.

(5) 1930. Notes on the habits of a digger wasp and its inquiline flies. Ann. Ent. Soc. Amer. 23:552.

(6) 1940. Natural dispersion of *Aphelinus mali* (Hald.). Jour. Econ. Ent. 33:811.

(7) 1950. Orchard insects of the Pacific Northwest and their control. U.S. Dept. Agr. Cir. 270.

Newcomer, E. J., and F. W. Carlson

(8) 1952. The leaf roller moth *Pandemis pyrusana* (Kearf.). Jour. Econ. Ent. 45:1079.

Newcomer, E. J., and W. D. Whitcomb

(9) 1924. Life history of the codling moth in the Yakima Valley of Washington. U.S. Dept. Agr. Dept. Bul. 1235.

Newcomer, E. J., and M. A. Yothers

(10) 1929. Biology of the European red mite in the Pacific Northwest. U.S. Dept. Agr. Tech. Bul. 89.

Nougaet, R. L., W. M. Davidson, and E. J. Newcomer

(11) 1916. The pear-leaf-worm. U.S. Dept. Agr. Bul. 438.

Venables, E. P.

(12) 1931. *Aphelinus mali* Hald., a parasite of the woolly aphis. Ent. Soc. Brit. Columbia, Proc. 28:16.

Yothers, M. A.

(13) 1934. Report on the introduction of *Aphelinus mali* Hald., a parasite of the woolly apple aphid in the Wenatchee, Wash., dist. Wash. State Hort. Assoc. Proc. 30:71.

COLLOQUIUM ON ZOOLOGICAL NOMENCLATURE TO BE HELD IN LONDON IN JULY, 1958 IN CONNECTION WITH THE FIFTEENTH INTERNATIONAL CONGRESS OF ZOOLOGY

It is hoped that at the Fifteenth International Congress of Zoology to be held in London in July, 1958 it will be possible for that Congress finally to approve and adopt the new text of the International Code for Zoological Nomenclature as revised by the preceding Congresses held in Paris in 1948 and Copenhagen in 1953. As arranged at the Copenhagen Congress, a draft of the revised text will be submitted for this purpose to the London Congress.

In order to assist the Congress in the examination of the draft of the revised Code and to provide ample opportunity for the discussion of the questions involved, arrangements have been made between the Secretariat-General of the Congress and the International Trust for Zoological Nomenclature under which a Colloquium on Zoological Nomenclature is being organised by the International Trust on the lines of the Colloquium organised by that body in connection with the Copenhagen Congress.

The Colloquium will open on Wednesday, the 9th July, i.e. one week prior to the opening of the London Congress. It is hoped that this body will be able to relieve the Congress of the bulk of the work involved in the scrutiny of the draft of the revised Code and will be able to submit to the Congress agreed recommendations as to the text to be adopted. Invitations to the Colloquium have already been issued by the Trust to a large number of zoologists known to be interested in zoological nomenclature. In addition, arrangements have been made between the Trust and the Secretariat-General of the Congress under which an invitation to the Colloquium will be issued by the Trust to any member of the Congress who expresses a desire to take part in its discussions but who has not as yet received a separate invitation.—FRANCIS HEMMING, *Managing Director and Secretary, International Trust for Zoological Nomenclature and Secretary to the International Commission on Zoological Nomenclature.* September, 1957.

NEW WESTERN TRICHOPTERA

D. G. Denning
Walnut Creek, California

Collections of caddisflies examined recently have disclosed several undescribed forms which show some interesting modifications and relationships to presently known species. As is often characteristic of the western montane fauna several of the new species belong to closely related species complexes. The Trichoptera described herein are from Washington, California, Idaho and Alberta. I am deeply indebted to Dr. C. P. Alexander of the University of Massachusetts, Mr. Borys Malkin, University of Washington, and Mr. D. L. Abell for sending me material used in this paper. Unless indicated otherwise types of the new species are in the writer's collection.

Agapetus cornuta Denning, new species

This, the twenty-fifth Nearctic species described in the genus can easily be distinguished from other species by the large acute horn-like processes of the tenth tergite. Approximately half of the known species occur in the western montane region.

Male.—Length 5 mm. General color of body, legs and antennae dark brown, wings fulvous. Fifth sternite with the usual concentric organ; mesal process of sixth sternite peg-like and directed caudad. *Genitalia* as in fig. 1. Ninth segment annular, ventral portion about twice width of the narrowed dorsal part. Tenth tergite consists of a pair of divergent heavily sclerotized plates, connected basally by a membranous sheath, fig. 1B; each lateral lobe narrow, the dorsal margin curved sharply near apex as a prominent acuminate prong, apex broadly triangular and directed caudad, best seen from lateral aspect, fig. 1A. Cerci from dorsal view, fig. 1B, narrowed apically, arising from ventral portion of tenth tergite and about half its length; from lateral aspect dorsal and ventral margins parallel, apex truncate. Clasper broadened distally, dorso-distal corner sub-triangular, about midway the length of dorsal margin a small slender spine arises from mesal surface and projects mesad; ventro-distal corner obtuse, when viewed from ventral aspect mesal margin of apex dentate, tip dark brown in color.

Holotype male, Klickitet Creek, near Goldendale, Washington, Aug. 28, 1952, D. G. Denning.

Wormaldia lacerna Denning, new species

This, the twelfth Nearctic species, is a member of the Moesta Group, which contains the following three Nearctic species: *gabriella, moesta* and *lacerna. Gabriella*, fig. 4, which possesses a long wide tongue-like mesal process on the seventh abdominal sternite and one of variable lengths on the eighth, fig. 4B, is a western species known to extend eastward at least to Churchill, Manitoba, and Western South Dakota; for comparison to *lacerna* the male genitalia are figured. The new species, *lacerna,* possesses a short mesal process on the seventh and none on the eighth sternite and is at present known only from the northwestern United States. The third Nearctic species, *moesta,* is known only from eastern Canada and the United States and possesses a long slender mesal process on both the seventh and eighth sternites.

Male.—Length 7 to 8 mm. General color of head, thorax and wings fulvous, legs, spurs and antennae flavescent. Forewings with R_2 absent, as in *gabriella.* Mesal process of seventh sternite slender and short, extending beyond margin no longer than half the width of the sternum, fig. 2C, eighth sternum with scarcely any indication of a mesal process. *Genitalia* as in fig 2. Ninth segment annular, considerably narrowed dorsally, ventral portion produced caudad almost as far as apex of tenth tergite. Cerci digitate, slender throughout, apex subacute, fig. 2A. Tenth tergite typical for genus, undivided, carcinate and tapering to an acute apex extending caudad practically as far as apex of cerci, fig. 2B. Basal segment of clasper longer than wide, in the shape of a parallelogram; apical segment constricted near base, expanded distally with apical margin circular and directed caudo-dorsad. In this latter respect it bears some similarity to *gabriella* Banks.

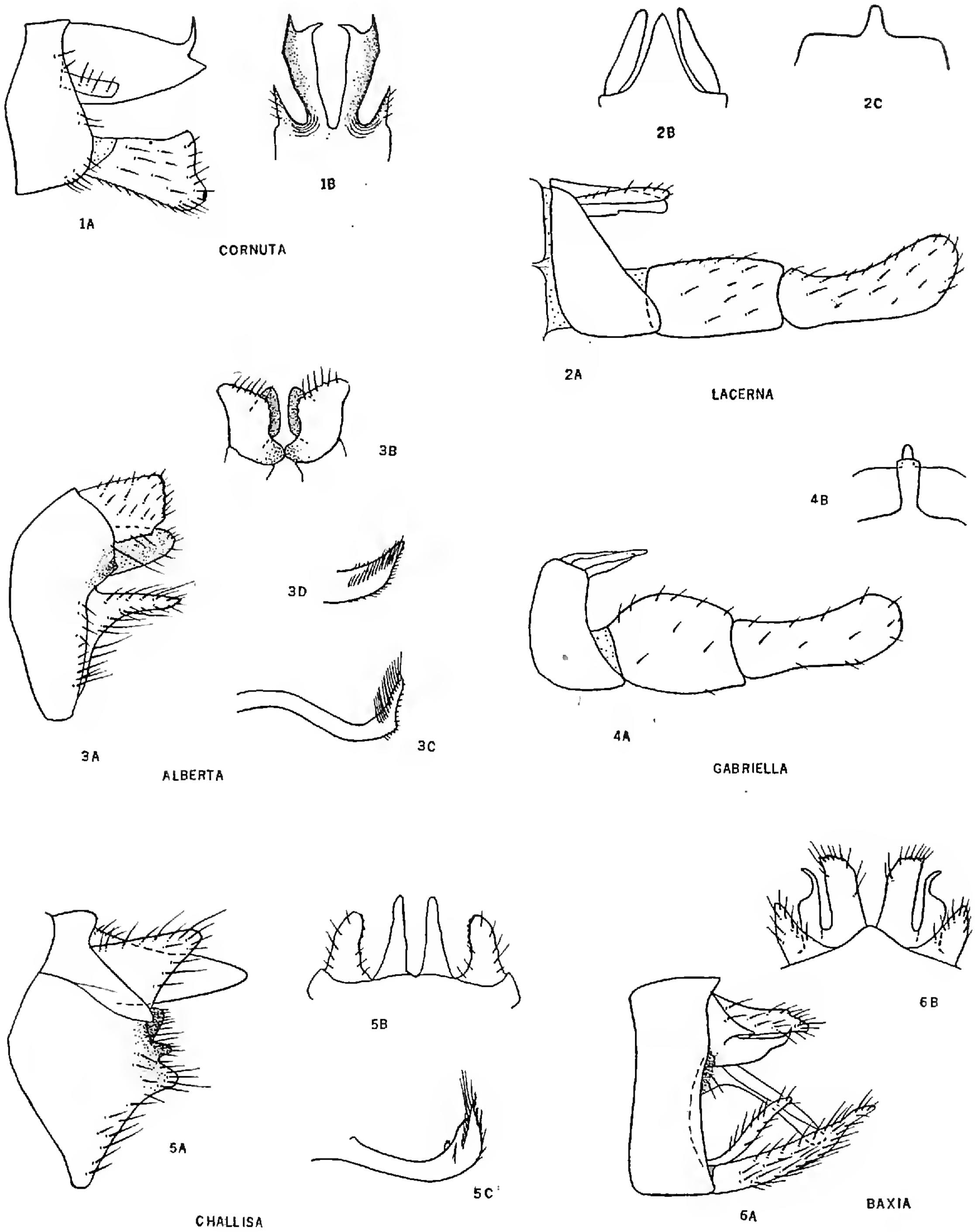
Holotype male, SATUS CREEK, NEAR GOLDENDALE, WASHINGTON, Oct. 2, 1952, D. G. Denning. *Paratypes,* two males, same data as for holotype.

WORMALDIA OCCIDEA (Ross)

1938. *Wormaldia cruzensis* (Ling). Pan-Pacific Ent., 14:64, *New Synonymy.*

In the Collection of the California Academy of Sciences a collection of Wormaldia containing four males and two females, apparently collected in the same series as the holotype *cruzensis* from Felton, Santa Cruz County, California, was recently examined. These specimens were found to be identical to the type *cruzensis* which is in the Collection of the California Academy of Sciences, San Francisco. A study of *cruzensis* indicates that it is a synonym of *occidea* Ross.

In Ross' study of the Philopotamidae in his monumental "Evolution and Classification of the Mountain Caddisflies" the *Wormaldia* are divided into various Groups. The Anilla Group contains this and a half dozen additional Nearctic species. *Wormaldia anilla* and *occidea* are very closely related and in some specimens separation is difficult largely because the mesal process



Explanation of Figures

Fig. 1. *Agapetus cornuta*, male genitalia; 1A, lateral aspect; 1B, tenth tergite and cerci, dorsal aspect. Fig. 2. *Wormaldia lacerna*, male genitalia; 2A, lateral aspect; 2B, tenth tergite, dorsal aspect; 2C, eighth sternum. Fig. 3. *Limnephilus alberta*, male genitalia; 3A, lateral aspect; 3B, cerci and tenth tergite, dorsal aspect; 3C, lateral arm of aedeagus; 3D, lateral arm of aedeagus, apex, mesal surface. Fig. 4. *Wormaldia gabriella*, male genitalia; 4A, lateral aspect; 4B, seventh and eighth sternum. Fig. 5. *Limnephilus challisa*, male genitalia; 5A, lateral aspect; 5B, cerci and tenth tergite, dorsal aspect; 5C, lateral arm of aedeagus. Fig. 6. *Lepidostoma baxea*, male genitalia; 6A, lateral aspect; 6B, tenth tergite and cerci, dorsal aspect.

of the seventh sternum is variable in size. In the "*cruzensis*" specimens from Santa Cruz County, California, the mesal process of the seventh sternum is considerably shorter than found in specimens from other western localities which have been examined by the writer.

Limnephilus alberta Denning, new species

This species can be distinguished from others in the genus by the short massive cerci, reduced plate-like tenth tergite lobes, and the slender apically acute lateral arm of the aedeagus.

Male.—Length 16 mm. Head and thorax dark brown, antennae, legs and palpi yellowish, spurs 2–3–4. Wings dark brown with darker mottling along veins, irrorate with clear markings. Front basitarsus distinctly longer than second segment. Eighth tergite with no mesal lobe or patch of black setae. *Genitalia* as in fig. 3. Ninth segment slender, narrowed ventrally, and reduced to a narrow bridge dorsally. Clasper projecting caudad just beyond any other portion of segment, dorsal margin straight, ventral margin evenly arcuate and forming a sub-acute apex. Cerci short and massive, directed dorso-caudad; distal margin from dorsal view, fig. 3B, widely rounded and dentate; ventral margin, lateral aspect fig. 3A, considerably shortened; from caudal aspect distal surface black, circular, concave and heavily sclerotized. Tenth tergite reduced, divided into two widely separated lateral lobes; when viewed dorsally, fig. 3B, platelike, lateral surface convex; from lateral aspect 3A, apex widely ovate, black, heavily sclerotized and setation sparse. Entire lateral arms of aedeagus sclerotized, sharply angulate distally, fig. 3C; mesal surface of apex bearing a row of fulvous, flattened dense setae reaching dorsad beyond apex of structure, fig. 3D.

Holotype male, PIPESTONE RIVER, NEAR LAKE LOUISE, ALBERTA, Aug. 22, 1954, D. G. Denning. *Paratype* male, 12 miles west of Banff, Alberta, July 23, 1949, C. P. Alexander.

Limnephilus challisa Denning, new species

This species is a member of the *cockerelli-harrimani* Banks section and is apparently closest to *lopho Ross.* It may easily be distinguished from that species and others, by the cerci being considerably shorter than the tenth tergite and the small appressed padlike ventral lobe of the tenth tergite.

Male.—Length 14 mm. Head, thorax and femora dark brown, remainder of legs, spurs, antennae and palpi fulvous, wings light brown, lightly irrorate with dark brown. Front basitarsus about one and one-half times length of second segment. Eighth tergite simple, mesal patch of black setae absent. *Genitalia* as in fig. 5. Ninth segment considerably narrowed dorsally and ventrally, sternum about one-third width of dorsum. Claspers consist of a short plate with distal margin incised to form a short triangular dorsal lobe and a large obtuse ventral lobe, bearing scattered short setae, fig. 5A. Cerci projected posteriad about two-thirds distance of tenth tergite; from lateral aspect cercus is triangular; from dorsal aspect, fig. 5B, it is short, stocky, and digitate, thickened at base and gradually tapering to a rounded apex, mesal surface very heavily sclerotized and minutely dentate. Tenth tergite divided into two distinct lobes, long, narrowed and acuminate from dorsal aspect, fig. 5B; from lateral aspect dorsal margin oblique, ventral margin straight, apex subacute; ventral lobe padlike, closely appressed to sclerite and bearing dense black setae. Aedeagus with lateral arm completely sclerotized, fig. 5C, apex curved abruptly dorsad and bearing a brush of dense, long stout setae.

Holotype male, HYNDMAN CREEK, CHALLIS, BLAINE COUNTY, IDAHO, July 22, 1952, Borys Malkin. *Paratypes,* four males. Same data as for holotype.

Lepidostoma baxea Denning, new species

This is the second described species in the Cantha Group, and it can be differentiated from *cantha* Ross by the totally different baso-ventral sclerotized spur of the tenth tergite. In *cantha* these structures curve mesad and then laterad, in *baxea* they project directly caudad and only the extreme apical portion is curved laterad.

Male.—Length 8 mm. Thorax, head, legs and antennae ferruginous, wings gray with irregular scattering of black scales. Costal vein slightly reflexed most of length of costal cell, densely lined with black scales. First antennal segment without any modifications; maxillary palpi erect, the apparent single segment bearing a dense brush of long black scales. All spurs normal except inner spur of fore legs which is enlarged and covered with small black scales. In *cantha* and members of the Pluviale Group to which *baxea* and *cantha* are closely related, the legs and spurs are not modified. *Genitalia* as in fig. 6. Ninth segment annular, practically same width throughout, dorso-mesal margin projecting slightly caudad. Tenth tergite divided into two lateral lobes, consisting of an elongated tapering mesal lobe held roof-like and a caudad directed ventro-lateral spur, the distal portion slender, acute and curved laterad, best seen from dorsal aspect, fig. 6B. Claspers long, slender and tapering toward a truncate apex, heavily clothed with long hair; baso-dorsal lobe short, slender and digitate, fig. 6A. Aedeagus arcuate and bearing a pair of stout acuminate rods along contour of structure.

Holotype male, DRY CREEK, FRESNO COUNTY, CALIFORNIA, May 1, 1954, D. I. Abell, deposited in collections of California Academy of Sciences.

While most streams are of considerable interest because of the many ecological differences they exhibit from source to mouth, this stream as a productive source of such insects as Trichoptera, is unusual because of its intermittent flow, being dry in summer and fall. Dry Creek has been classified by Usinger (1956:15) in

Aquatic Insects of California, as a long-flow fluctuating intermittent stream. In the Central Valley Foothill region of California such long-flow intermittent streams are common; it is not known how productive of Trichoptera others of these kind of streams may be.

References

ROSS, HERBERT H.
1956. Evolution and Classification of the Mountain Caddisflies. The University of Illinois Press, Urbana. 213 pp.

USINGER, ROBERT L.
1956. Aquatic Insects of California, University of California Press, Berkeley and Los Angeles. 508 pp.

A NEW SPECIES OF STETHORUS WEISE FROM GUATEMALA NOW BEING RELEASED IN CALIFORNIA

(Coleoptera: Coccinellidae)

J. C. HALL AND C. A. FLESCHNER
University of California, Riverside

In the winter of 1955, the junior author sent to the University of California at Riverside, Citrus Experiment Station, Department of Biological Control, a large number of live specimens of an undescribed species of *Stethorus* Weise found preying on avocado brown mites, *Oligonychus punicae* (Hirst), on avocado trees in Guatemala. This *Stethorus* was introduced into the United States in an attempt to establish it as a predator of Tetranychid mites.

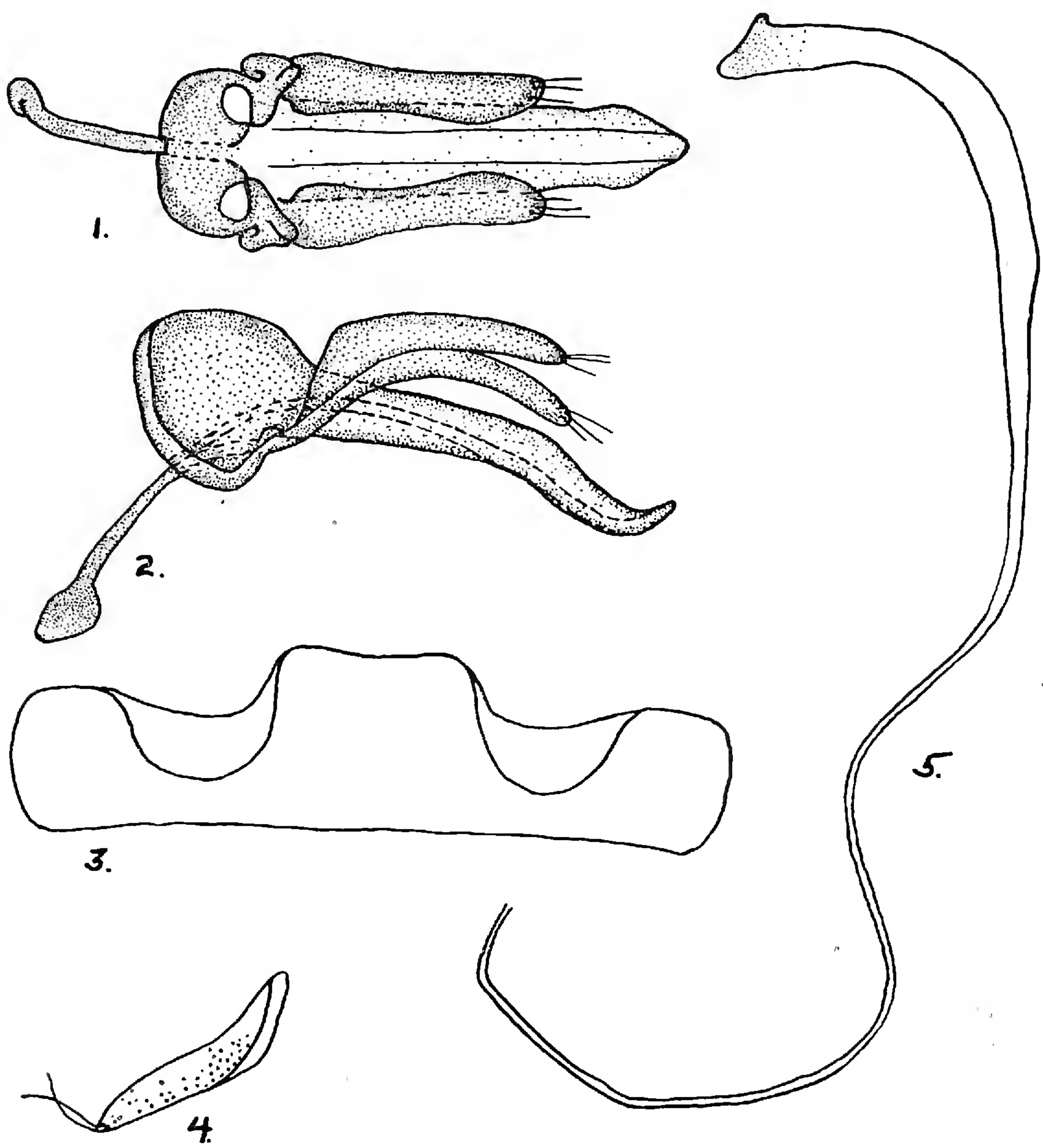
Approximately 40,000 beetles have been released in citrus and avocado groves in seven California counties. In addition, 1,350 beetles have been sent to the Fruit Insects Laboratory of the United States Department of Agriculture at Orlando, Florida, for release there, and 300 beetles have been sent to the Texas Agricultural Experiment Station at Weslaco, Texas. At present it is not certain whether this *Stethorus* will become established in California.

The following description is given at this time in order to make the name available for future publications and also to aid in its identification.

Stethorus guatemalensis Hall and Fleschner, new species

In coloration *S. guatemalensis* is similar to *S. punctum* (Le Conte); the genitalia is very much like *S. picipes* Casey. *S. guatemalensis* may be distinguished from *S. punctum* by the subparallel sides of the pronotum and the broad femoral lines, from *S. picipes* by the yellow legs and mouthparts.

Body black; antennae, clypeus, mouthparts, apex of femora, all of tibiae and tarsi yellowish; pubescence yellow, long, erect, and recurved as usual. Prothorax nearly twice as wide as long, sides continuous, not strongly converging; punctures coarse, feeble, and close set, slightly stronger on lateral margins. Elytra twice as long as broad (narrower than in *S. picipes*), punctures coarse, moderately strong, close set in middle, finer and closer together on sides. Pubescence of venter short, yellow, appressed. Femoral lines broad, extending two-thirds or more posteriorly on abdominal segment one; last visible sternite of male with a shallow, rounded depression in middle of posterior margin. Male genitalia (Fig. 1): Very much like *S.*



Explanation of Figures

Fig. 1, Dorsal view of aedeagus and associated parts. Fig. 2, Lateral view of the same. Fig. 3, First abdominal sternite. Fig. 4, Ninth abdominal sternite of the female. Fig. 5, Sipho.

picipes; sipho long, thick basally, thin apically; capsule bulbous, only slightly furcate; basal plates large, rounded; parameres short, thick, approximately two-thirds as long as the aedeagus, several short hairs at tip; trab short, thin, apex swollen; aedeagus thick, apex in dorsal view, acutely rounded, lateral view, tip bent upwards at about a 45° angle. Ninth sternite of female, with each half acutely rounded at base, comparatively slender, apex pointed, with 2–3 long setae, longer than width of segment.

Only a very small amount of variation in the above mentioned characters has been noticed. The pubescence varies from yellow to white; the pale color of the mouth parts and legs may be yellow or orange; the femora are occasionally grayish in the middle only; femoral lines vary from half to two-thirds the length of the first abdominal segment.

Holotype and *allotype:* ANTIGUA, GUATEMALA, March 5, 1955 (C. A. Fleschner), from avocado; deposited in the collection of the California Academy of Sciences, San Francisco. Paratypes from material reared in the insectary of the University of California at Riverside are deposited in the U.S. National Museum, University of California at Berkeley and at Davis, and in the authors' collections.

S. guatemalensis has been released in the following counties in southern California: Ventura, Orange, San Diego, San Bernardino, Santa Barbara, Los Angeles, and Riverside. Releases have also been made in Texas and Florida.

BOOK REVIEW

A TEXTBOOK OF ENTOMOLOGY. Second Edition. By Herbert H. Ross. John Wiley & Sons, Inc., New York. xi+519. 1956. Price $7.75.

This second edition of Ross' popular and well balanced Textbook of Entomology represents a considerable revision. Some of these changes are: the addition of recent data in many sections of the text, a new and pleasing style of type, a doubling of the number of references, the addition of treatments on the phylogeny of the Arthropoda and of the Insecta, an added treatment on population dynamics, modified or new keys for the identification of insect orders and families accompanied by more illustrations of diagnostic characters, a number of improvements in the illustrative material, and many other changes such as the correction of minor errors which are made possible by this second edition. Together these changes provide an authorative and up-to-date textbook for the beginning entomologist and for the general zoologist who wish an introduction to this interesting group of animals. The changes in illustrations and particularly the full labeling of many anatomical structures will be a major aid to these students.—J. W. MACSWAIN, *University of California, Berkeley.*

SYNONYMY IN THE ORIENTAL SPECIES OF THE SUBGENUS MICROSCOLIA BETREM

(Hymenoptera: Scoliidae)

J. Chester Bradley
Ithaca, N. Y.

Scolia (Microscolia) macrocephala (Gribodo) and S. (M.) bella Rohwer

Through courtesy of the authorities of the City Natural History Museum of Genoa I have had opportunity to study the holotype of *Triscolia macrocephala* Gribodo. It is not the taxonomic species that Betrem in his Monographie der indo-australischen Scoliiden, Treubia, 1892, v. 9, supplement, p. 205, had supposed it to be, but is a taxonomic species omitted in that monograph. The following addition to Betrem's key to females, *loc. cit.* p. 198, will provide for it.

4c. Vertex very sparsely punctate, almost smooth; tergum 3(2) almost smooth, much more finely punctate than in kollari; mesoscutum with two smooth strips near the middle (but on one side in the type the strip is somewhat encroached upon by punctures; wings reddish purple, as in *kollari;* Jolo Island........................*macrocephala* Gribodo

The taxonomic species from the Philippines that Betrem misidentified as *macrocephala* will take the name of its oldest synonym, namely *bella* Rohwer, therefore, for the heading "*Scolia macrocephala* Gribodo" on p. 205 read "*Scolia bella* Rohwer," and in the key to females, p. 199, for "*S. macrocephala* Rohwer" (a *lapsus* for Gribodo), couplet 5b and couplet 2a in the key to males, read "*S. bella* Rohwer."

Scolia (Microscolia) parastasiae Betrem and S. (M.) kuehni (Micha) Betrem

Dr. Betrem (Stett. Ent. Zeit., 1933, 94:252) has pointed out that *parastasiae* Betrem (1928:206) is the female of *kuehni* Micha (Mitt. Zool. Mus. Berlin, 1927, 13:91) and has given additional characters for the male and figured its genitalia. The center heading "*Scolia parastasiae* nov. spec." (Betrem, 1928:206) must therefore read "*S. kuehni* (Micha)" Betrem. In Betrem's key to females, p. 198, couplet 3a, change "*parastasiae* Betr." to "*kuehni* (Micha)," and in the key to males, p. 199, couplet 2a should lead to "*megacephala* Rohwer from the Philippines and *kuehni* (Micha) from Buru." An examination of Micha's holotype of *kuehni* in the Berlin Museum, (studied through courtesy of Dr. H. Bischoff) in 1929 had convinced me that it could not be distinguished externally from *megacephala* Rohwer.

SCOLIA (MICROSCOLIA) PSEUDOFORAMINATA (Gribodo) Betrem

I have also had an opportunity to study Gribodo's holotype of this species in Genoa. It is neither a synonym of *macrocephala* (Gribodo) nor of *bella* Rohwer, as given by Betrem (1928:205). On the contrary *bellina Rohwer* is its junior synonym and the center heading "*Scolia bellina* Rohwer" on p. 205 must be replaced by "*Scolia pseudoforaminata* (Gribodo) Betrem." In his key to males, p. 200, couplet 7b, "*bellina*" must likewise be changed to "*pseudoforaminata.*"

In the type of *pseudoforaminata* the wings are bronzy, not deeply colored, apically with a weak rosy reflection; antennae ferruginous; legs and abdomen with a perceptibly ferruginous shade, the abdomen strongly overlaid with irridescent blue; the setae on the apical part of the abdomen, appearing black, are seen on close examination to have a decided reddish brown shade. There are many white hairs on the underside of the head and thorax.

SCOLIA (MICROSCOLIA) MAGRETTII (Gribodo) Betrem

I hereby designate the female syntype of *magretti* in the collection of the Genoa museum to be the lectotype. It belongs to the taxonomic species *kollari* Saussure, (Betrem, 1928:204) under which Betrem has already listed the male as a synonym (at the same time also listing the male as a separate species, see below) Betrem specifically excluded the female from the synonymy of *kollari,* p. 204, and of his interpretation of *magrettii.* As this leaves no place in his scheme for the female, it seems likely that he intended, in the synonymy of *kollari,* that one should read "*magrettii* ♀, *nec* ♂" instead of vice versa.

Both the female lectotype of *magrettii* and the male allotype (also in the Genoa Museum) belong to *kollari.* The sternal fringes 2 and 3 of the male are white, the head, pleura, sternum venter except apically and legs are largely white-haired. Gribodo erred in saying black. The wing color in each sex is alike, a little deeper more brown bronze and less green bronze than in a specimen before me determined by Betrem as *magrettii.* In fact the male allotype agrees exactly with a male which Betrem has determined as *kollari.*

Since the name "*magrettii* Grib." cannot be applied to the taxonomic species to which Betrum has applied it on p. 206, this species must be named anew:

Scolia (Microscolia) obiensis Bradley, new species

Male described by Betrem (1928:206) under the misapplied name "*Scolia magrettii* Grib." and differentiated under that name in his key to males, p. 200, couplet 8a.

Holotype, from Obi Islands, the "plesiotype of *magrettii*" referred to by Betrem, p. 206, in the Leiden Natural History Museum.

I have studied the holotype of *Scolia tyrianthina* Kirby, of *Scolia hydrocephala* (Micha) and the lectotype of *Scolia cephalotes* Burmeister and find them correctly placed in Betrem's key to the females, p. 198.

The holotype of *papuana* (Micha) is correctly placed by Betrem (1928:207), as a synonym of *pygmaea* Saussure.

In addition to the Oriental species of *Microscolia,* there are some from Africa which will be treated in a manuscript now ready for print.

Oriental Species of Microscolia

cephalotes Burmeister, ♀, ♂. Java.
foraminata Saussure.
tyrianthina Kirby, ♀, ♂. Andaman Islands.
hydrocephala (Micha) Betrem, ♀, ♂. Ceylon and southern India.
karnyi Betrem, ♂. Mentawei Islands.
kollari Saussure, ♀, ♂. Borneo, Sumatra, Malacca, Tenasserim.
magrettii (Grib.) Betrem; *aglana* Cameron; *crassiceps* Cameron; *pachycephala* (Micha); *sumatrana* (Micha); *chalcoptera* (Micha); *aeneipennis* (Micha); *violaceipennis* (Micha).
khasiana Betrem ♂. Assam.
macrocephala (Gribodo) Betrem. Jolo Island.
bella Rohwer, ♀, ♂. Philippine Islands.
pseudoforaminata (Gribodo) Betrem. Philippine Islands.
bellina Rohwer.
megacephala Rohwer, ♀, ♂. Philippine Islands.
obiensis Bradley. Obi Island.
kuehni (Micha) Betrem. Buru Island.
parastasiae Betrem.
pygmaea Saussure, ♂. Australia, New Britain, New Mecklenburg.
papuana (Micha).
maindroni Betrem, ♂. New Guinea (For supplementary description cf Betrem 1933, p. 252).
apicata Smith, ♀, ♂. Celebes.

THE OCCURRENCE OF ANOPLODERA CRASSIPES (LECONTE) IN OLD LUMBER

(Coleoptera: Cerambycidae)

Anoplodera crassipes (LeConte) occurs throughout the Pacific Slope of the United States from sea level to high elevations and the adults are collected on the flowers of many plants. The species has been recorded from a number of tree species including *Abies grandis, Pseudotsuga taxifolia, Pinus* spp., *Sequoia sempervirens, Umbellularia californica* and *Eucalyptus* sp. Apparently the larvae may feed in freshly killed trees as indicated by the following unpublished record from the collections of the U. S. Forest Service at Berkeley. A lodgepole slab, infested with *Dendroctonus monticolae* Hopkins, was taken at Eleven Mile Meadow, Yosemite National Park, California, on August 7, 1935, by G. R. Struble. Later, an adult of *A. crassipes*[1] (Hopkins No. U. S. 21018a) emerged.

Several additional collections of *A. crassipes*[1] were made in an older residential section of Oakland, California. These are of interest in that the beetle was surviving in old Douglas fir[2] lumber in an area where none of its tree hosts existed. Originally this lumber had been part of a shed and chicken house that had been built in 1897. In 1941 these structures were demolished and some of the rough timbers were used to build fences and garden paths. The beetles were breeding in the more decayed portions of the boards on the ground and in the lowest portions of the fences where they were in contact with the ground. The beetles were discovered, as larvae, in a piece of 2″ × 8″ laying on the ground on February 17, 1957. On May 30, 25 pupae and one larva were removed from one end of a partially decomposed 1″ × 12″ board. A few days later, a number of adults and a few pupae were collected from other boards and a few adults were found on a small composite. The beetles appeared to be confined largely to partially decomposed wood and had apparently been breeding in this lumber for many generations.—J. W. MacSwain, *University of California, Berkeley.*

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[1] Identified by E. G. Linsley, University of California, Berkeley.

[2] Identified by R. A. Cockrell, University of Californa, Berkeley.

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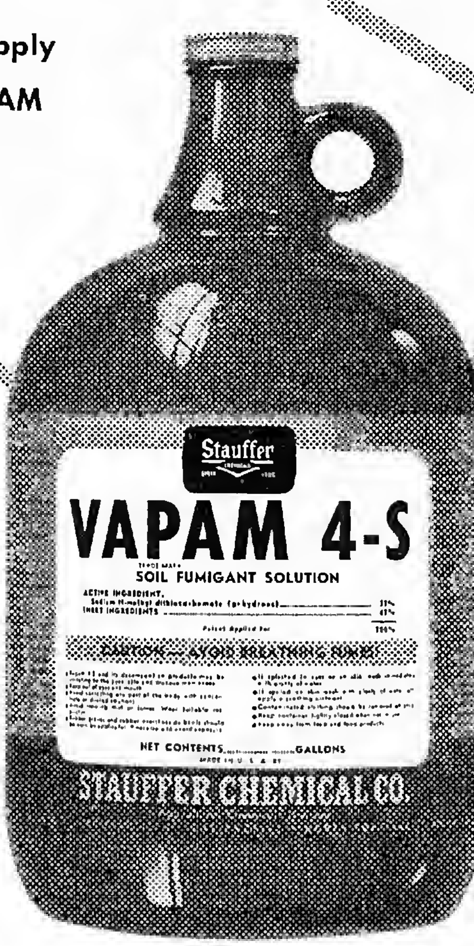

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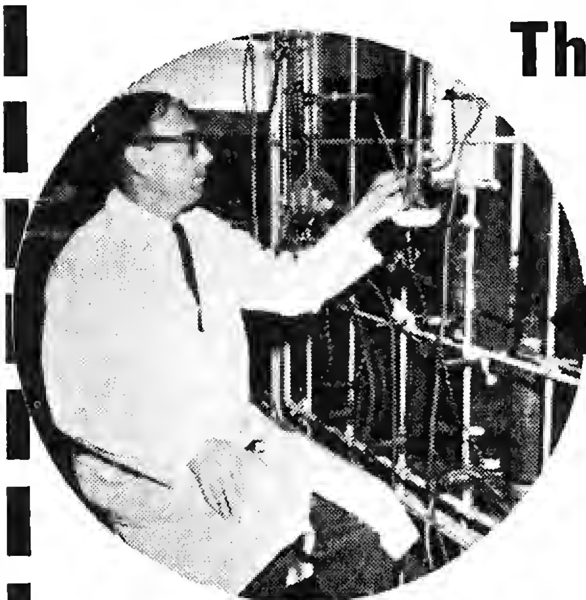

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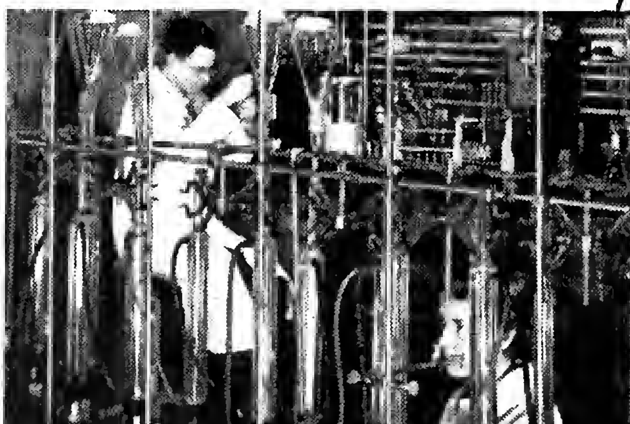

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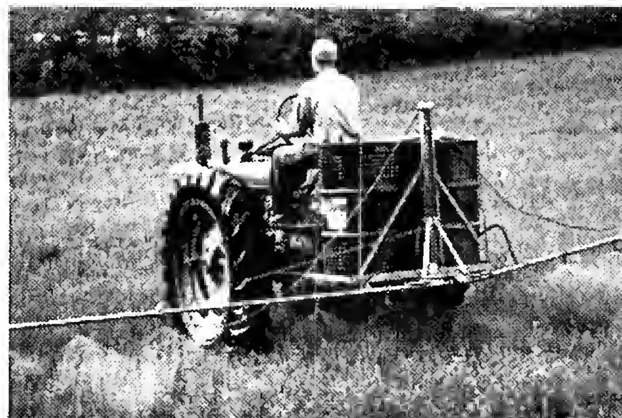

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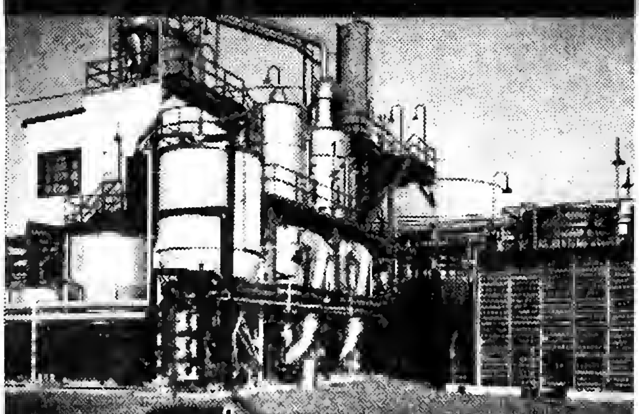

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THE ROLE OF CERAMBYCIDAE IN FOREST, URBAN AND AGRICULTURAL ENVIRONMENTS

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In temperate regions, most larval Cerambycidae feed upon wood or solid tissues of dead or dying plants, less commonly in rotten wood. In the tropics, a greater proportion of species are live stem borers, but in either case, their primary ecological role is the reduction of wood to humus [Shelford (1913); Adams (1915)]. They play an important part in the succession of insects found in the various stages of a gradually disintegrating tree, a role which varies from host to host and region to region [Blackman and Stage (1918, 1924); Graham (1925); Richards (1926); Krogerus (1927); Ingles (1933); Savely (1939); Derksen (1941); Eidmann (1943); Palm (1950); Craighead (1950); Keen (1952); Becker (1955)]. However, in fulfilling this role they enter into competition with man for food, fiber and shelter [Craighead (1923, 1950); Linsley (1937); Keen (1952); Duffy (1953, 1957), etc.], and, as a result, economically, the family comprises one of the most important groups of insects in the world [Anon. (1957)]. The present summary enumerates some of the ways in which the species affect man's economy.

Forests.—In the economy of the temperate forest, Cerambycidae as a whole, play a beneficial, reducing role. However, when storms or fires sweep through forested regions and blow down or scorch commercial timber, Cerambycidae may destroy the wood before it can be utilized [Craighead (1950)] or develop in salvaged lumber [Kimmey and Furniss (1943)], subsequently emerging from structural timber [Eaton and Lyon (1955)]. Among species which attack living trees, many cause serious injury or death or attack wood with a high economic value to man. Thus, one small outbreak of one species affecting only eight square miles of forest, killed 45,000 trees aggregating nearly one million cubic feet of timber [Anon. (1957)]. Shiraki (1952) lists about 50 species injurious to forest trees in Japan, Escherich (1923) a similar number for the forests of Central Europe. The latter designates 21 species as serious pests of coniferous wood, including five species which attack living trees, and 31 species, of which about 20 are also primary, which attack wood of broad-leaved forest trees. In North America, Craighead (1950) and Keen (1952) recognize about 20 species of twig girdlers, 12 of gall makers, 25 which bore under the bark or in the wood of living trees, and ten root borers as destructive forest pests. They list another 75 or more species which injure the wood of recently dead or felled trees with the bark on [of the 232 species "nuisables" listed by Beaulne (1932) for Canada, many are of minor importance].

In tropical regions, forest species are less well known, except in India, Burma, and Ceylon, where they are regarded as the most destructive group of forest insects. Beeson and Bhatia (1939) have summarized data on 350 species associated with 568 species of trees, shrubs and woody climbers. The sal tree (*Shorea robusta*) has 37 species which attack it, and large numbers are also associated with certain other trees. One dry wood borer, *Stromatium barbatum* (Fabricius), has 311 known food plants. In South America, more than 100 species injurious to forest trees are enumerated by Costa Lima (1936) and Bosc (1942); numerous African species by Duffy (1957). In South Africa and Australia various species damage forest reserves and plantings, especially of wattles (*Acacia*) and gums (*Eucalyptus*) [Tillyard (1926); Tooke (1949); Dürr (1954)], and even the introduced Monterey pine is subject to attack [McKeown (1947); Gourlay (1951)].

In Central and South America, a large number of species have pruning habits and contribute to the littering of the forest floor. Thus, the parent beetles of *Oncideres* ("serradores") girdle twigs and branches, in some cases an inch or more in diameter, and oviposit beyond the girdle, thereby providing freshly killed tissue in which the larvae can develop [Fonseca (1931); Linsley (1940); Bruch (1941); Bosc (1942); Bondar (1954)]. In some cases, at least, the adults also score the bark with the mandibles to loosen it as an aid to larval feeding [Lane (1944)]. This habit also contributes to the increase of other wood boring insects which avail themselves of the niche provided by *Oncideres* [Linsley (1940)].

Forest products.—Larvae of Cerambycidae cause serious defects in lumber, some resulting from attack on living trees, others shortly before cut logs are sawed. In temperate forests, the resultant reduction in grade probably causes a greater monetary loss than do the tree-killing species [Craighead (1950)]. Further, defects in living trees are frequently enlarged by other insects until the heartwood is completely destroyed.

Damage to seasoned lumber by roundheaded borers may occur where lumber is seasoned or stored in open yards near forests [Miller (1943)]. However, very few species oviposit on dry barkless wood and thus become domestic pests. An exception is the "old house borer" or "Hausbock," *Hylotrupes bajulus* (Linnaeus), which is particularly destructive in central Europe, but has been introduced by commerce into other continents. The larvae feed in the sapwood, and to a lesser extent the heartwood of dry, seasoned, coniferous timber such as telephone poles, fences, and roof and attic supports. Duffy (1953) and Dürr (1954, 1956) have summarized the economic importance of this species and provided extensive bibliographies. However, the Indian *Stromatium barbatum* Fabricius also attacks wooden structures, including furniture, supporting timbers, panels, shelves, etc. [Beeson and Bhatia (1939); Emden (1937); Menon (1954)] and a number of others infest wood prior to utilization and cause damage through subsequent emergence [Houlbert (1912), Leech (1944), Dürr (1952); Eaton and Lyon (1955)]. Emerging adults will sometimes gnaw through hardwood flooring, veneer, sheet rock, asphalt roofing, zinc and lead, not to mention rugs and softer household materials, or damage furniture [Craighead (1923); Shafik (1928); Linsley (1938); Duffy (1953)]. Structural timbers in contact with the ground are also subject to direct attack, especially when old and moist. Thus Lundberg (1957) reports *Chlorophorus herbsti* Brahm in an old oak fence, Palm (1957) damage to railroad ties by *Leptura* spp., and MacSwain (1958) injury to fencing and lumber by *Anoplodera crassipes* (LeConte).

Shade trees.—In temperate regions, roundheaded borers mostly attack shade trees only when other factors, such as defoliation, diseases, drought, frosts, or transplanting make them susceptible to attack [Felt (1905-06); Herrick (1935)], and it is often difficult to place responsibility for the death of the tree [Craighead (1950)]. However, Pechuman (1940) considers feeding by adults of *Saperda tridentata* Olivier of primary importance in the transmission of Dutch Elm disease, and *Anoplodera nitens*

(Förster) has been charged with carrying the spores of chestnut blight [Grandi (1951)]. *Monochamus* spp. have also been implicated in the transmission of diseases of forest trees [Reid (1958)].

In tropical regions, living shade and ornamental trees are attacked by a large number of Cerambycidae [Beeson and Bhatia (1939); Costa Lima (1936); Duffy (1957)]. Thus, *Aeolesthes sarta* Solsky is a very serious tree killer in Afganistan and western Pakistan [Vogt (*in litt.*)].

Fruit and nut trees.—Trees grown for fruit and nut crops, both native and introduced, are also widely attacked by cerambycids. Of 118 kinds of injurious Cerambycidae in Japan, 49 are associated with fruit or nut trees, including mulberry, and four with grape vines [Shiraki (1952)]. In Australia [Lea (1902)], parts of Asia [Batra (1942); Deshpande and Karandakar (1948); Janjua and Mehra (1949)], and in North America [Craighead (1923)] the more important pome fruits are attacked by species formerly associated with the native trees, as the *Amelanchier* and *Crataegus*-infesting apple-tree borers (*Saperda* spp.) of New England [Brooks (1920a, b); Hess (1940)]. In most areas where grapes are grown, various endemic Cerambycidae attack the vine [Mayet (1890); Craighead (1923); Shiraki (1952)]. Sometimes a species ordinarily considered to be secondary will suddenly become a pest of the living 2- or 3-year-old wood, as *Chlorophorus varius* Mull. in Egypt [Zoheiry (1950)], and in Europe, the imported North America *Neoclytus acuminatus* (Fabricius), considered to be a polyphagous dead wood feeder at home, appeared as a serious vine pest in various Italian localities [Manzoni (1930a, b)]. Several species of *Oberea* girdle stems of fruit and nut crops, one of the best known being the raspberry cane borer, *O. bimaculata* (Oliver), which is also injurious to perennial asters [Hugerford (1939)].

Although fruit tree injury is usually caused by cerambycid larvae, adults may scar the fruit surface [King (1920)], or burrow into soft fruits, such as ripening peaches [Gunn (1916)].

However, by far the most important cerambycid pests are those which attack tropical and subtropical fruits and nuts [Nguyên-Cong-Tiêu (1928); Sharma and Singh (1940); Gressitt (1942); Mendizabal (1943); Rehman (1943, 1946)], including such crops as cloves [Kalshoven (1936)], coffee [Maxwell-Lefroy (1909); Vayssière (1935); Costa Lima (1936); Corella

(1942); Lepesme and Villiers (1944)], cacao [Costa Lima (1936, 1955); Risbec (1937); Corella (1942)], fig [Horton (1917); Kalshoven (1955); Gunn (1919); Husain and Khan (1941); Shiraki (1952)] and citrus [Waterston (1940); Pruthi and Mani (1945); Chang (1954); Taylor (1957)]. Fig growing is impossible in some parts of India because of attack by Cerambycids [Anon. (1957)]. Forty-eight species attack native and introduced species of *Coffea* in tropical Africa, and native species have taken to *Citrus* in most of the areas where it has been introduced. In eastern Asia, at least four of these last are major pests [Clausen (1931), Hoffman (1934); Gressitt (1942); Lieu (1945, 1947)], including *Anoplophora macularia* Thomson, which in some areas infests 90 per cent of the trees in spite of preventive measures [Anon. (1957)]. Another 15 species, although occasionally destructive, are regarded as minor pests [Hubbard (1885); Back (1918); Bitancourt, Fonseca and Autuori (1933); Costa Lima (1936); Dumbleton (1937); Cottier (1938)]. Most of these are polyphagous and have turned to citrus from distantly related hosts, but in Australia *Citriphaga mixta* Lea, overlaps from the desert kumquat (*Eremocitrus glauca*) [Froggatt (1919)] and *Uracanthus cryptophagus* Olivier from the native finger lime (*Microcitrus australasica*) [Olliff (1892)], one or two are probably native to that host [Kunhi (1928); Murthi (1931); Ramachandran (1953)].

Although several polyphagous Cerambycidae attack palms in various parts of the world, relatively few species are regularly associated with this group of plants [Lepesme (1947)]. However, at least three (e.g. *Olethrius tyrannus* Thomson, *O. insularis* Fairmaire, *Xixuthrus costatus* Montrouzier) attack coconut in the South Pacific, several are associated with the date palm [e.g. *Polyarthron pectinicornus* (Fabricius), *Apatophysis barbara* Lucas, *Pseudophilus testaceus* Gahan] in Asia Minor or North Africa, *Macrodontia cervicornis* (Linn.) infests the piassava palm (*Attalea funifera*) in Brazil [Costa Lima (1936)], and a few others are attached to *Chamaerops* in the Old World tropics or to *Sabal* in the New World.

Vegetable and Field Crops.—As pests of vegetable and field crops, cerambycids are less well known. However, species of *Phytoecia,* which live in the stems of umbellifers and composites are capable of severe injury to seed carrots [Kemner (1918), Duffy (1953) and to Jerusalem artichoke [Shiraki (1952)], and have been accused of damaging cabbages [Grandi (1951)]. Stems of sweet potato in Java are injured by *Nupserha fricator* Dalman [Kalshoven (1955)], those of egg plants in British Guiana by *Alcidion deletum* Bates [Cleare (1931)], and those of cucurbits in Argentina by *Bebelis lignosa* Thomson [Bosc (1942)]. *Ropica dorsalis* Schwarzer and three species of *Apomecyna* bore in water melon, musk melon and cucumber vines in China or Japan [Gressitt (1942); Shiraki (1952); Shu-Chen (1952)], and related species attack stems of French beans in Portuguese East Africa [Saraiva (1939)], of pumpkins and melons in the Sudan [Pollard (1954)], South Africa [Fuller (1914)], and Queensland [May (1946)]. In southwestern United States, the larvae of *Dorcasta cinerea* (Horn) bore in stems of sunflower and other oil-seed crops, as do those of *Agapanthia dahli* Richter in the Ukraine [Paramanow (1953)]. Similarly, *Ataxia hubbardi* Fisher infests stalks of cotton in Texas [Morgan (1907)], as does *Tragiscoschema bertolonii* Thomson in Mozambicque [Lesne (1930)], and *T. wahlbergi* Fahr and *Volumnia westermanni* Thomson in Portuguese East Africa [Saraiva (1939)]. In southern Europe, stems of wheat, barley and rye are fed upon by larvae of *Calamobius filum* Rossi [*Grandi* (1951)], and in North America the related *Hippopsis lemniscata* (Fabricius) attacks the stems of *Vernonia* and other plants [Schwitzgebel and Wilbur (1942)]. Stems of jack-beans in Hawaii are infested with *Sybra alternans* Wied. [Swezey (1928)].

A number of subterranean forms are injurious to turf and grass plots, as the North American *Homaesthesis emarginatus* Say [Craighead (1923)] and the European *Dorcadion fulginator* (Linnaeus) [Grandi (1951)]. The roots of maize are damaged by *D. arenarium* Scopoli in Italy [Grandi (1951)], those of sugar cane by larvae of *Philus pallescens* Bates in China [Gressitt (1942)] and by various Prioninae and Lamiinae elsewhere [Box (1953)]. In the Mediterranean region, larvae of *Vesperus* are especially injurious to roots of alfalfa, root vegetables, and potato tubers [Grandi (1951)]. The larvae of *Plocaederus* feed in the roots of *Ferula asafoetida* in Afganistan [Vogt (*in litt.*)] and those of *Thyestilla gebleri* Falderman, sever the roots of hemp in Japan [Kojima (1929)]. Dry derris roots are also attacked by numerous Cerambycidae both in Asia [Miller (1934)] and in South America [Downes and Williams (1950)].

Seed infesting species.—Although seeds of various plants, in particular conifers and legumes, are attacked by a great variety of insects, few are regularly utilized by Cerambycidae. A North American *Paratimia* and an Indian *Chlorophorus* infest full-grown green or maturing pine cones [Fisher (1915); Champion (1919)]. The South American lamiine *Lophopoeum timbouvae* Lameere feeds in the seed pods of various legumes [Bruch (1940); Bosc (1942); Costa Lima (1955)], as does a species of *Leptostylus* in Puerto Rico [Wolcott (1923)]. A related species lives in the fruits of *Sapindus* in Brazil [F. Lane (*in litt.*)], and *Baryssinus leguminicola* Linell in the seeds of *Enterolobium* in Paraguay [Chittenden and Linell (1896)]. In North America, *Lepturges spermophagus* Fisher infests unripened seeds in green pods of cowpeas in Mexico [Fisher (1917)], and *Ataxia sulcata* Fallén and *Leptostylus terraecolor* Horn, mangrove seeds in Florida [Craighead (1923)]. In Africa, several species of *Sophronica,* small lamiines of the tribe Apodasyini, develop in dry coffee berries [Anderson (1930); Lepesme (1950)]. Other species of the same genus infest fruits of *Parkia,* and also seeds of *Acacia,* along with the tetraopine, *Enaretta castelnaui* Thomson [Duffy (1957)].

Orchids and flowers.—In Java, a larval *Diaxenes* lives in the fleshy roots of various orchids and the adults feed on young leaves, flowers and fruits [Franssen and Tiggelovend (1937)]. Related species infest orchids in Burma and the Philippines [Gahan (1894); Swezey (1945)].

Garden plants, especially those with woody stems, as roses and crotons, are also subject to attack by Cerambycidae [Hardouin (1945); Setty and Rao (1953)]. However, in Europe, larvae of *Parmena* are destructive to plants like asphodels, hellebores, and euphorbias [Villiers (1946); Grandi (1951)], and various species of *Phytoecia* damage the stems of ornamental umbellifers, borages, and composites, including *Achillea* and *Chrysanthemum* [Gressitt (1942); Grandi (1951); Shiraki (1952)].

Opuntia cactus.—The escape of ornamental American *Opuntia* cactus in rangelands of Australia and South Africa has led to the intentional introduction of cactus insects, including Cerambycidae [Dodd (1940); Pettey (1946, 1953)], in the hope of retarding the spread or establishing biological control of this weed. *Moneilema ulkei* Horn, *M. variolare* Thomson, and *Lagochirus funestus* Thomson were introduced into Australia from Texas and apparently established, but proved of minor importance in comparison to the moth, *Cactoblastis cactorum* (Berg.) from South America [Dodd (1940)]. *M. ulkei* was introduced and reared in South Africa but apparently never released [Lepesme (1950)]. On the other hand, nearly 300,000 individuals of *L. funestus* were released between 1942 and 1945 in the most heavily infested areas, but although it has more than three annual generations, and supplemental releases have been made, the populations have continued to decline. Lepesme (1950) attributes the lack of success in establishing the species to the drowning of larvae in sap produced by the plant, predation on the adults by ants, spiders and lizards, and the reduction of oviposition influenced by lack of rainfall. Weber (1951a, b, 1952), Dodd (1952), and Fullaway (1954) record the release of *Moneilema armata* LeConte, *M. crassa* LeConte, and *L. funestus* on the Island of Hawaii as part of a program to suppress the tree cactus, *Opuntia megacantha,* and indications were that *L. funestus,* at least, would become established, as it has in Australia [McKeown (1952); Lepesme (1958)]. More recently, *Aerenicopsis championi* Bates, has been introduced from Mexico as a potential agent for the biological control of lantana [Weber (1956)].

Dispersal by commerce.—Cerambycidae have been dispersed accidentally by commerce in various parts of the world, but not so readily as bark beetles. Thus, although New Zealand has nine introduced species [Hudson (1934); Blair (1937)], five of these are from Australia, and in North America, the less than half a dozen introduced species are all of European origin. Possibly no cerambycids have been so widely dispersed by commerce as two of the smallest European species, *Nathrius brevipennis* (Mulsant) and *Gracilia minuta* (Fabricius), which have been carried to all the continents in wicker work, particularly willow basketry. However, in California, where the former species is now established it attacks primarily dead and dying twigs of walnut and fig [Middlekauff and Underhill (1949)]. The asiatic clytine *Chlorophorus annularis* (Fabricius), carried over the world in bamboo, has not been established in areas where this plant is not endemic. Likewise, the North American *Eburia quadrigeminata* Say, although commonly transported through commerce in furniture [Cann (1937); van Emden (1939-40); Blair (1948)] has failed to establish overseas. A related species, *Xystrocera globosa* Olivier has been widely dispersed in Asia and is established in the Mediterranean region [Peyerimhoff (1945)], and the large asiatic *Batocera rubra* Linnaeus is now found in Puerto Rico [Wolcott (1956)].

Among Cerambycidae dispersed by commerce, Australian Phoracanthini are deserving of special mention [Lepesme (1950)]. Even locally they are readily transported in firewood, are commonly found in houses, and have the vernacular name "firewood beetles" [Tillyard (1926)]. *Phoracantha semipunctata* (Fabricius) has become established in South Africa [Lounsbury (1918)], Portuguese East Africa [Saraiva (1939)], South America [Bruch (1918); Bosc (1943); Santis (1945)] and the eastern Mediterranean basin [Lepesme (1950a); Bytinski-Salz (1952); Neumark (1953); Alfieri (1957)] where it infests *Eucalyptus globulus* and other introduced species of gum. *P. recurva* Newman has followed *Eucalyptus* to New Zealand [Tillyard (1926)], as have *Coptocercus rubripes* Boisduval and *C. truncatus* Aurivillius [McKeown (1947)]. *Coleocoplus senio* Newman, another Australian phoracanthine, has become established in Fiji on "turpentine tree," *Synacarpia laurifolia,* [Lever (1946); McKeown (1947)]. On the other hand, very few native cerambycids attack living eucalyptus in areas where it has been introduced. Exceptions include *Phymatioderus bizonatus* B. in Chile [Porter (1940)] and *Paramallocera iliniza* Kirsch in Ecuador [Rodriguez (1945)].

Summary

In the temperate regions of the world, most Cerambycidae are forest scavengers and relatively few species attack and kill living trees. Some of these, however, are of considerable economic importance in relation to forest, fruit and ornamental trees. More are of significance because of attacks or injury to recently felled or fire or storm damaged trees. A few attack or injure forest products, seeds, vegetable, field, and ornamental crops or garden plants. In general, their greatest importance is in relation to tropical agriculture and forestry where they injure some of the most valuable timber and horticultural crops in the world. A few species have been utilized in the suppression of weed plants, as cactus, and some have been transported about the world unintentionally by man.

Literature Cited

Adams, C. C.
1915. An ecological study of prairie and forest invertebrates. Bull. Illinois State Lab. Nat. Hist., 11:30–280.

Alfieri, A.
1957. Additions a la faune Coléoptérologique de l'Egypte et du Sinai. Bull. Soc. Ent. Egypte, 41:123–127.

Anderson, T. J.
1930. Annual report of the senior entomologist. Ann. Rept. Dept. Agric. Kenya 1929, pp. 433–463.

Anonymous
1957. Wood-boring beetles. Jour. Washington Acad. Sci., 47(10):339.

Back, E. A.
1918. *Clytus devastator*, a new pest of the Florida orange. Jour. Econ. Ent., 11:411–414.

Batra, H. N.
1942. Calender for the control of major fruit pests in North-West Frontier Province. North-West Front. Prov. (India), Agric. Dept., Quart. Notes, 4:13–26.

Beaulne, J. I.
1932. Longicornes nuisables aux végétaux ligneux du Canada. Nat. Canad., 59:196–203, 219–222.

Becker, G.
1955. Grundzüge der Insektensuccession in *Pinus*-Arten der Gebirge von Guatemala. Zeitschr. Angew. Ent., 37:1–28.

Beeson, C. F. and B. M. Bhatia
1939. On the biology of the Cerambycidae of India, Burma and Ceylon (Coleopt.). Indian Forest Records (n. s.) Ent., 5:1–235.

Bitancourt, A., J. P. Fonseca, and M. Autuori
1933. Manual de Citricultura. Part II.

Blackman, M. W. and H. H. Stage
1918. Notes on insects bred from the bark and wood of the American larch. New York State Coll. Forestry, Tech. Publ. 10:11–115.
1924. On the succession of insects living in the bark and wood of dying, dead, and decaying hickory. New York State Coll. Forestry, Tech. Publ. 24:3–269.

Blair, K. G.
1937. Synonymy of the Cerambycidae of New Zealand. Ent. Mo. Mag., 73:261–268.
1948. Some alien Coleoptera occasionally found in Britain. Ent. Mo Mag., 84:123–124, 1 pl.

Bondar, G.
1954. A biologia do genero *Oncideres* (Col. Ceramb.) e desçricão de nova especie. Agronomia, 12:29–31 (1953).

Bosc, J. M.

1942. Segunda lista de Coleopteros de la Rep. Argentina dañinos a la Argricultura. Ingeniero Agronomica, 4:49–63.

Box, Harold E.

1953. List of sugar-cane insects. A synonymic catalogue of sugar-cane insects and mites of the world, and of their insect parasites and predators, arranged systematically. Commonwealth Inst. Ent., London. 101 pp.

Brooks, F. E.

1920a. The roundheaded apple tree borer. United States Dept. Agric. Bull. 847, pp. 1–42.

1920b. The spotted apple tree borer. United States Dept. Agric., Bull. 886, pp. 112.

Bruch, C.

1918. Captura de cerambicidos. Physis, 4:354–355.

1940. Misceláneas Entomologicas III. Notas Mus. La Plata, Zoologia, 5:118.

1941. Misceláneas Entomologicas VII. Notas Museo La Plata, 6:355–369, pls. 1–5.

Bytinski-Salz, H.

1952. Two important tree borers in Israel. FAO Plant Prot. Bull., 1(3):38–39.

Cann, F. R.

1937. Further records of *Eburia quadrigeminata* Say. Ent. Mo. Mag., 73:55–56, 1 pl.

Champion, H. G.

1919. A cerambycid infesting pine cones in India, *Chlorophorus strobicola* n. sp. Ent. Mo. Mag., 55:219–224.

Chang, S. C.

1954. A preliminary note on the longicorn beetles destructive to citrus plants in Taiwan [In Chinese, English summary]. Jour. Agric. Forestry [Taiwan], 3:55–75, figs.

Chittenden, F. H. and M. L. Linell

1896. A pod-inhabiting longicorn found at the Columbian Exposition. Proc. Ent. Soc. Washington, 4:42–43.

Clausen, C. P.

1931. Insects injurious to agriculture in Japan. U. S. Dept. Agric. Circ. 168. pp. 1–115.

1933. The citrus insects of tropical Asia. U. S. Dept. Agric. Circ. 266.

Cleare, L. D.

1931. The egg-plant stem-borer, *Alcidion deletum* Bates (Col. Cerambycidae). Agric. Jour. British Guiana, 4(2):82–90, fig.

Corella, L. B.

1942. Observaciones sobre Longicornios perjudiciales a varios cultivos arbôreos, y especialmente a los de cacao y café en los territorios españoles del Golfo de Guinea. Ann. Agr. Terr. esp. Golfo de Guinea, 1942:39–91.

Costa Lima, A. M. da

1936. Terceiro catalogo dos insectos que vivem nas plantas do Brazil. 460 pp. Minist. Agric. Dept. Nac. Prod. Vegetal, Escola Nac. Agronomia, Rio de Janiero, Brazil.

1955. Insectos do Brasil. Coléopteros. Vol. 9, part 3. 289 pp. Esc. Nac. Agron., Rio de Janeiro, Brazil.

Cottier, W.

1938. Citrus pests: (2) the citrus borer. New Zealand Jour. Agric., 57:28–29.

Craighead, F. C.

1923. North American cerambycid larvae. Canada Dept. Agric., Bull. 27 (n. s.), pp. 1–239, pls. 1–44, figs. 1–8.

1950. Insect enemies of eastern forests. U. S. Dept. Agric., Misc. Publ. 657, pp. 1–679, figs. 1–197.

Derksen, W.

1941. Die Succession der pterygoten Insekten in abgestorbenen Buchenholz. Zeitschr. Morph. Ökol. Tiere, 37:683–734.

Deshpande, V. G. and K. R. Karandakar

1948. Insect pests of fruits and fruit-trees in Deccan. Bombay Univ. Jour., v. 16 (n. s.), pt. 5 (no. 23), pp. 1–14, Sect. B.

Dodd, A. P.

1940. The biological campaign against prickly-pear. 177 pp. Commonwealth Prickly Pear Board, Brisbane, Queensland.

1952. *Lagocheirus funestus* Thomson. Proc. Hawaiian Ent. Soc. 1951, 14:366.

Downes, J. A. and D. Williams

1950. The insect fauna of the dried roots of *Lonchocarpus* and *Derris.* Colonial Plant and Animal Products, 1(1):33–51, figs.

Duffy, E. A. J.

1953. A monograph of the immature stages of British and imported timber beetles (Cerambycidae). British Museum (Natural History), London. pp. v–viii, 1–350, figs. 1–292, pls. 1–8.

1957. A monograph of the immature stages of African timber beetles. British Museum (Natural History), London, England. 338 pp.

Dumbleton, L. J.

1937. Borers in fruit trees. New Zealand Jour. Agric., 55:295–298.

Dürr, H. J. R.

1952. A description of the woodborer *Oxypleurus nodieri* Muls. (Coleoptera:Cerambycidae). Jour. Ent. Soc. So. Africa, 15:83–89.

1954. The European house borer *Hylotrupes bajulus* (L.) (Coleoptera: Cerambycidae) and its control in the western Cape Province. Union So. Afr. Dept. Agric. Bull 337. 78 pp., figs.

1956. The morphology and bionomics of the European houseborer, *Hylotrupes bajulus* (Coleoptera:Cerambycidae). Union So. Africa Dept. Agric., Ent. Mem., 4:1–136, figs.

Eaton, C. B. and R. L. Lyon
1955. *Arhopalus productus* (Lec.) a borer in new buildings. Calif. Forest & Range Exp. Sta., Tech. Paper no. 11, pp. 1–11, figs. 1–3.

Eidmann, H.
1943. Successionen westafrikanischer Holzinsekten. Mitt. Akad. Deutsch. Forstwiss., 1:240–271.

Emden, F. I. van
1937. An Indian cerambycid damaging tea cases. Bull. Ent. Research, 28:321–323.
1939–40. Larvae of British beetles. 1. A key to the genera and most of the species of British cerambycid larvae. Ent. Mo. Mag., 75:257–273; 76:7–13, 6 figs.

Escherich, K.
1923. Die Forstinsekten Mitteleuropas, Vol. 2. 663 pp. Paul Parey, Berlin, Germany.

Felt, E. P.
1905–06. Insects affecting park and woodland trees. New York State Mus., Mem. 8, 2 vols.

Fisher, W. S.
1915. One new genus and two new species of Cerambycidae. Proc. Ent. Soc. Wash., 17:77–79.
1917. A new species of longhorn beetle infesting cowpeas from Mexico. Proc. Ent. Soc. Washington, 19:173–174.

Fonseca, J. Pinto da
1931. Observações sobre a biologia do Oncideres aegrota Thoms. Rev. de Ent., 1(1):37–41.

Franssen, C. J. H. and L. M. J. Tiggelovend
1937. Some notes on the life history of *Diaxenes phalaenopsidis* Fish. (Col., Cerambycidae). Ent. Med. Nederlandisch-Indie, 4:55–57, figs.

Froggatt, W. W.
1919. The native lime-tree borer *(Citriphaga mixta* Lea). Agric. Gazette New South Wales, Misc. Publ. 2075, pp. 261–267.

Fullaway, D. T.
1954. Biological control of cactus in Hawaii. Jour. Econ. Ent., 47:696–700.

Fuller, C.
1914. The pumpkin stem-borer *(Apomecyna binubila* Pasc.). Agric. Jour. Union of So. Africa, 8:240–242.

Gahan, C. J.
1894. Description of a new longicorn beetle of the genus *Diaxenes*, which has been found injuring some imported orchids. Ann. & Mag. Nat. Hist. ser. 6, vol. 13:520–521.

Gourlay, E. S.
1951. Notes on insects associated with *Pinus radiata* in New Zealand. Bull. Ent. Res., 42:21–22.

GRAHAM, S. A.
1925. The felled tree trunk as an ecological unit. Ecology, 6:397–411.

GRANDI, G.
1951. Introduzione allo studio dell' Entomologia. Vol. 2. Bologna, Italy. 1332 pp.

GRESSITT, J. L.
1942. Destructive long-horned beetle borers at Canton, China. Lignan Nat. Hist. Surv. Mus., Spec. Publ. 1, 60 pp.

GUNN, D.
1916. Some destructive fruit and flower beetles. II. A new insect pest of the peach. Bull. Dept. Agric. Pretoria (Div. Ent.), 8:1–8, 2 figs.
1919. The fig and willow borer *(Phryneta spinator)*. Bull. Dept. Agric. So. Africa, 6:1–22.

HARDOUIN, R.
1945. Le cycle évolutif de *Clytus arietis* L. dans le rosier mort. Bull. Soc. Ent. France, 50:58–60.

HAYWARD, K. J.
1942. Primera Lista de insectos Tucomanos perjudiciales. Est. Exp. Agric. Tucoman, Publ. Misc. No. 1. 110 pp.

HERRICK, GLENN W.
1935. Insect enemies of shade-trees. Comstock Co. Ithaca, N. Y. 417 pp.

HESS, A. D.
1940. The biology and control of the round-headed apple-tree borer, *Saperda candida* Fabricius. New York State Agric. Ext. Sta. Bull. 688:3–93.

HOFFMAN, W. E.
1934. Tree borers and their control in Kwangtung. Lingnan Agric. Jour., 1:37–59.

HORTON, J. R.
1917. The three-lined fig-tree borer. Jour. Agric. Research, vol. 11, pp. 371–382, 3 pls.

HOULBERT, C.
1912. Dégâts produits par *Criocephalus rusticus* dans le bois de construction. Insecta, 2:302–310.

HUBBARD, H. G.
1885. Insects affecting the orange. U. S. Dept. Agric. Div. Ent. 227 pp.

HUDSON, G. V.
1934. New Zealand beetles and their larvae. Ferguson & Osborne Ltd., Wellington, New Zealand. 236 pp.

HUNGERFORD, H. B.
1939. *Oberea bimaculata* (Oliv.) injuring perennial asters. Jour. Econ. Ent., 32:596.

HUSAIN, M. A. AND A. W. KHAN
1941. Bionomics and control of the fig tree borer *(Batocera rufomaculata* De Geer), Coleoptera Lamiidae. Indian Jour. Agric. Sci., 10:945–959, 1 pl.

Ingles, L. G.
1933. The succession of insects in tree trunks as shown by collections from various stages of decay. Jour. Ent. Zool., 25:57–59.

Janjua, N. A. and R. N. Mehra
1949. The biology of *Quettania coeruleipennis* Schwarzer (Coleoptera) in Baluchistan. Bull. Ent. Research, 40:203–206.

Kalshoven, L. G. E.
1936. Boorders in Kruidnagelboomen. Landbouw., 12:165–190.
1955. Notes on the habits and ecology of Indonesian forest insects of minor importance. Z. Cerambycidae, Lamiinae. Ent. Ber., 15(24): 528–533, figs.

Keen, F. P.
1952. Insect enemies of western forests. U. S. Dept. Agric. Misc. Publ. 273 (Rev.) 280 pp.

Kemner, N. A.
1918. Stjälkbocken *(Phytoecia cylindrica* L.) ett skadedjur pa flock-blomstrigs växter bl. a. pa morotplantor for fröskörd. Entomologiska Avdelningen, 26:1–8.

Kimmey, J. W. and R. L. Furniss
1943. Deterioration of fire-killed Douglas-fir. U. S. Dept. Agric. Tech. Bull. 851, 61 pp.

King, J. L.
1920. Round-headed apple-tree borer injuring apple fruits. Jour. Econ. Ent., 13:432–433.

Kojima, T.
1929. Immature stages of some Japanese cerambycid-beetles, with notes on their habits. Jour. Coll. Agric., Univ. Tokyo, 10:101–128, pl. 6.

Krogerus, R.
1927. Beobachtungen über die Succession einiger Insektenbiozönosen in Fichtenstümpfen. Notulae Ent., 7:121–126.

Kunhi Kannan, K.
1928. The large citrus borer of South India. Dept. Agric. Mysore State, Ent. Ser., Bull. 8, 24 pp.

Lane, Frederico
1944. Breve noticia sôbre um inseto "serrador." O Democratica, no. 1404, Sao Roque, 22 de Julho de 1944, p. 1, figs.

Lea, A. M.
1902. A list of the insect pests known to attack the apple in Australia and Tasmania. Agric. Gaz. & Jour. Council Agric., Tasmania, 9(10):221.

Leech, H. B.
1944. The cerambycid beetle, *Phymatodes dimidiatus,* in cedar structural timbers. Canadian Ent., 76:211.

Lepesme, P.
1947. Les insectes des palmiers. 903 pp. Paul Lechevalier, Paris.
1950. Notes longicornesques. Longicornia, 1:587–590.
1958. Notes longicornesques. Longicornia, 3:771–773.

LEPESME, P. AND A. VILLIERS
1944. Les longicornes du caféier en Afrique intertropecale. Min. Col. Trav. Sect. Tech. Agric. Trop. 1:27.

LESNE, P.
1930. Coup d'oeil sur les principaux ennemis du cottonier au Mozambique. Rev. Bot. appl., 10:781–791.

LEVER, R. J. A. W.
1946. Entomological notes. 3. An introduced beetle borer from Australia. Fiji Dept. Agric., Agric. Jour., 17(1):10.

LIEU, K. O. V.
1945. The study of wood borers of China. I. Biology and control of the citrus-root-cerambycids, *Melanauster chinensis,* Forster (Coleoptera). Florida Ent., 27:62–101.
1947. The study of wood borers in China. II. Biology and control of the citrus-trunk cerambycids, *Nadezhdiella cantori* (Hope) (Coleoptera). Musée Heude, Notes d'Ent. Chinoise, 11:69–119.

LINSLEY, E. G.
1937. Biology and economic importance of the Cerambycidae, Bull. Calif. Dept. Agric., 26(2):261.
1938. Longevity in the Cerambycidae. Pan-Pacific Ent., 14:177.
1940. Notes on *Oncideres* twig girdlers. Jour. Econ. Ent., 33:561–563.

LOUNSBURY, C. P.
1918. The *Phoracantha* beetle. A borer pest of eucalyptus trees. Local Ser. Div. Ent. Dept. Agric. So. Africa, 24:1–20.

LUNDBERG, STIG
1957. Bidrag till kannedomen om svenska Coleoptera. Ent. Tidskr., 77: 176–178, illus.

MACSWAIN, J. W.
1958. The occurrence of *Anoplodera crassipes* (LeConte) in old lumber (Coleoptera:Cerambycidae). Pan-Pacific Ent., 34:00.

MANZONI, L.
1930a. Un nuovo nemico della vite. Il *Plagitmesus erythrocephalus.* Ann. Staz. Sperim. Vitic. Conegliano, 3(2), 7 pp., 2 figs.
1930b. Ein neuer Rebschädling, *Plagitmesus erythrocephalus,* Cerambyc. Nachr Bl. deuts. Pfl. Sch. Dienst, 10(9) 77, fig.

MAXWELL-LEFROY, H.
1909. Indian insect life. Thacker, Spink & Co., Calcutta, India. 786 pp.

MAY, A. W. S.
1946. Pests of cucurbit crops. Queensland Agric. Jour., 62:137–150, illus.

MAYET, V.
1890. Les insectes de la vigne. Montpellier. 470 pp.

MCKEOWN, K. C.
1947. Catalogue of the Cerambycidae of Australia. Memoire 10, Australian Mus., Sydney. 190 pp.
1952. Notes on Cerambycidae. Proc. Roy. Soc. New South Wales, 1950–51:23–24.

MENDIZABAL, M.
1943. Cerambicidos de interes agricola. Bol. Pat. Veg. Ent. Agric. Madras, 11:387–410.

MENON, K. D.
1954. Longhorn beetle attack on timber in buildings. Malayan Forester, 17:143–146, figs.

MIDDLEKAUFF, W. AND J. UNDERHILL
1949. A new host record for *Leptidiella brevipennis* (Muls.) (Coleoptera: Cerambycidae). Pan-Pacific Ent., 25:128.

MILLER, J. M.
1943. Damage to ponderosa pine lumber and rustic poles by the black-horned pine borer. U. S. Dept. Agric., Bur. Ent. Plant Quar., E. 599, 9 pp.

MILLER, N. C. E.
1934. Control of insect pests in stored derris. Malay Agric. Jour., 22: 367–368.

MORGAN, A. C.
1907. The cotton stalk-borer. U. S. Dept. Agric. Bur. Ent., Bull. 63: 63–66, pl. 3.

MURTHI, B. K.
1931. The lime tree borer. Jour. Mysore Agric. Exp. Union, 4:69–75.

NEUMARK, S.
1953. The preservative treatment of round *Eucalyptus camaldulensis (E. rostrata)* poles in Israel, its laws and application. Ilanoth, 2:49–99, 26 figs.

NGUYEN-CONG-TIEU
1928. Notes sur les insectes comestibles au Tonlsin. Bull. Econ. Indochine, 198:735–744.

OLLIFF, H. S.
1892. A new longicorn beetle attacking orange trees. Agric. Gazette New South Wales, 3:895.

PALM, T.
1951. Die Holz- und Rinder-Käfer der nordschwedischen Laubbäume. Med. Från Statens Skogsforsk., 40(2):3–242.
1957. Virkesförstörande insekter i järnvägssyllar p a Böda kronopark. Ent. Tidskr., 77:158–163.

PARAMANOW, S.
1953. Hauptschädlinge der olkulturen der Ukraine. Zeitschr. f. Angew. Ent., 35(1):63–81.

PECHUMAN, L. L.
1940. Notes on the feeding and breeding habits of *Saperda tridentata* Oliv. Bull. Brooklyn Ent. Soc., 35:113–116.

PETTEY, F. W.
1946. Biological control of the prickly pear. Fmg. in So. Africa 1946, rept. no. 6, 3 pp. Pretoria.
1953. The boring beetles of prickly pear in South Africa and their

importance in the control of *Opuntia megacantha*. Sci. Bull. Dept. Agric. So. Africa, no. 340, 36 pp., 10 figs.

PEYERIMHOFF, P. DE
1945. Les genres de Coléoptères importés on acclimatés dans la faune Euro-Mediterranéenne. Rev. Franc. d'Ent., 12:5–11.

POLLARD, D. G.
1954. The melon stem-borer, *Apomecyna binubila* Pascoe (Coleoptera: Lamiinae) in the Sudan. Bull. Ent. Research, 45:553–561.

PORTER, CARLOS E.
1940. Notas breves de entomologia agricola (continuación) 61. Cerambicido encoutrado en tronco de Eucaliptus. Rev. Chilena Hist. Nat., 43:140.

PRUTHI, HEM SINGH AND M. S. MANI
1945. Our knowledge of the insect and mite pests of citrus in India and their control. Imp. Council Agric. Res., Sci. Monogr., 16. 42 pp.

RAMACHANDRAN, S.
1953. A note on the identity of the cerambycid borer of oranges in South India. Indian Jour. Ent., 14:214 (1952).

REHMAN, KHAN A.
1943. Cherry and apple tree borer (*Aeolaesthus holosericea* F.) in the Punjab. Proc. 29th Indian Sci. Congr., 3(8):174–175.
1946. Insect pests of fruit trees. Punjab Fruit Jour., 10:141–144.

REID, JAMES
1958. Province of Ontario, Forest disease Survey. Ann. Rep. Forest Insect and Disease Surv. 1957, Canada Dept. Agric. pp. 49–51.

RICHARDS, O. W.
1926. Studies on the ecology of English heaths. III. Animal communities of the felling and burn successions at Oxshott Heath, Surrey. Jour. Ecol., 14:244–281.

RISBEC, J.
1937. Observations sur les parasites des plantes cultivées aux Nouvelles-Hebrides. Faune Colon. Française, 6(1):1–214.

RODRIGUEZ LZ. LUIS
1945. Un plaga de los Eucaliptos. Bol. Inst. Botan. Univ. Central (Ecuador), 4(5):117–122, figs.

SANTIS, L. DE
1945. El taladro de los Eucalyptus (Phoracantha semipunctata Fabr.). Ing. Agron., 7:127–138.

SARAIVA, A. C.
1939. A preliminary list of the insect pests of crops and fruit trees in Portuguese East Africa. Jour. Ent. Soc. So. Africa, 2:101–114.

SAVELY, H. E.
1939. Ecological relations of certain animals in dead pine and oak logs. Ecol. Monographs, 9:323–385.

SCHWITZGEBEL, R. B. AND D. A. WILBUR
1942. Coleoptera associated with ironweed, *Vernonia interior* Small in Kansas. Jour. Kansas Ent. Soc., 15:37–44.

Setty, H. T. Ranga and H. H. Rao

1953. On the occurrence of two species of *Xylotrechus* on *Codiaeum maculata*, a garden croton. Current Sci. (India), 22(10):308–309.

Shafik, M.

1928. Control of the longhorn beetle *Stromatium fulvum* (Villiers) on valuable furniture in Egypt. Bull. Ministr. Agric. Egypt, 182:1–9.

Sharma, H. N. and B. N. Singh

1940. Insect pests of fruit trees in Kumaun and their control. Bull. United Prov. Dept. Agric., 21:1–8, pl.

Shelford, V. E.

1913. Animal communities in temperate America as illustrated in the Chicago Region. Chicago, Ill. 362 pp.

Shiraki, T.

1952. Catalogue of injurious insects in Japan (exclusive of animal parasites). Prelim. Study No. 71, Econ. Sci. Sec., Nat. Resources Div., Gen. Headquarters, Supreme Commander for Allied Powers, Tokyo, Japan. 4 vols.

Shu-Chen, Chang

1952. A study of two species of melon-vine long-horn [In Chinese; English summary]. Jour. Agric. Forestry, 1:127–132, figs.

Swezey, O. H.

1928. *Sybra alternans* Wied. Proc. Hawaiian Ent. Soc., 7:16.

1945. Insects associated with orchids. Proc. Hawaiian Ent. Soc., 12: 343–403.

Taylor, H. S.

1957. Citrus borer. New Zealand Jour. Agric., 94:357–358, figs.

Tillyard, R. J.

1926. The insects of Australia and New Zealand. Angus & Robertson, Ltd. Sydney, Australia. 560 pp.

Tooke, F. G. C.

1949. Beetles injurious to timber in South Africa. Sci. Bull. Dept. Agric. So. Africa, 293:1–95.

Vayssiere, P.

1935. Sur la biologie peu connu de trois Coléoptères de nos colonies. Bull. Soc. Ent. France, 40:160–162, fig.

Villiers, A.

1946. Coléoptères cérambycides de l'Afrique du Nord. Faune de l'Empire Française V. Paris, France.

Waterson, J. M.

1940. A new pest of citrus in Bermuda. Bull. Bermuda Dept. Agric., 9:52–53.

Weber, P. W.

1951a. *Moneilema crassa* LeConte. Proc. Hawaiian Ent. Soc. 1950, 14(2):218.

1951b. Recent liberations of beneficial insects in Hawaii. Proc. Hawaiian Ent. Soc. 1950, 14(2):327–330.

1952. Recent liberations of beneficial insects in Hawaii—2. Proc. Hawaiian Ent. Soc. 1952, 15:127–130.

1956. Recent introductions for biological control in Hawaii—1. Proc. Hawaiian Ent. Soc. 1955, 16:162–164.

WOLCOTT, G. N.

1923. Insectae Portoricensis. Jour. Dept. Agric. Puerto Rico, vol. 7, no. 1, pp. 5–313.

1956. *Batocera rubra* Linnaeus in Puerto Rico. Puerto Rico Univ. Jour. Agr., 40:86.

ZOHEIRY, M. S.

1950. The wasp beetle, *Chlorophorus varius* Mull. (Coleoptera:Cerambycidae), a new pest of grape vines in Egypt. Proc. 8th Int. Congr. Ent., Stockholm, 1948, pp. 727–731, 6 figs.

BOOK NOTICES

EVOLUTION AND CLASSIFICATION OF THE MOUNTAIN CADDISFLIES. By Herbert H. Ross. vii+213 pp., 370 text figs. (most are compound), 45 text charts. Urbana: The University of Illinois Press. July 27, 1956. Price $6.00.

This book is a "must" for trichopterists and for taxonomic libraries, since it contains the original descriptions of 4 new genera (one from Baltic amber), 8 new subgenera, 32 new species, and in addition 4 new species of *Wormaldia* with E. W. King as co-author. It is of interest to workers in many other groups, especially aquatics, because of the unusually full and illuminating geologic and biogeographic analyses, and as a model in procedure in an investigation of phylogeny. The histories and dispersal patterns of the three most primitive families of Trichoptera, the Philopotamidae, Rhyacophilidae and Glossosomatidae, are investigated on a world basis.

ANNOTATED CATALOGUE OF AFRICAN GRASSHOPPERS. By H. B. Johnston. xxii+833 pp. New York: Cambridge University Press. January 16, 1957. Price $18.50.

This must be a nearly perfect catalogue for its purpose. The extended format used for the very full synonymies has resulted in a large and expensive book, but will save users endless time. The area covered is that of the continent of Africa, with the adjacent islands of the Atlantic and the Indian Ocean, but not those of the Mediterranean.

The species in each genus are arranged alphabetically. For each species the type locality (plus sexes described) and wherever possible the present location of the type or types, are given; then a numbered synonymy with references, and by use of these numbers a concise listing under the headings Desc., Figs., Ecol., Bion., Econ. and Dist. — HUGH B. LEECH, *California Academy of Sciences, San Francisco.*

A NEW GENUS OF TYCHINI FROM CALIFORNIA

(Coleoptera: Pselaphidae)

Robert O. Schuster[1] and Gordon A. Marsh[2]

The tribe Tychini has been represented in California by five species of "*Tychus*." In attempting to name specimens of this tribe from California, it became apparent that a number of undescribed forms existed, and that two genera were involved, neither of which are congeneric with the European *Tychus* of Leach. This paper proposes a new genus for that segment of the California fauna which is unique in the asymmetry of the male genital structure. The other group, with symmetrical genital structures, is similar in many respects to the genus *Cylindrarctus* of the eastern United States and is not included in this study.

We wish to acknowledge the loan of material from the following institutions and collections: The California Academy of Sciences, the California Insect Survey, the collection of Dr. Orlando Park, the University of California at Davis, and the United States National Museum. Information and specimens of the type species, *Tychus niger* (Paykell), were furnished by Claude Besuchet of the Muséé Lausanne, Suisse.

The illustrations accompanying this paper have been drawn by us with the aid of a compound microscope and ocular grid. They are sufficient in detail only to the extent necessary to insure recognition of the species being considered.

Since the descriptions, illustrations and measurements have been made from slide-mounted male specimens, it is recommended that similar mounts be made of specimens that are to be compared with the information in this paper.

Numerous additions to this genus may be expected to result from future collecting in large uncollected geographic areas. Due to uncertain locality data, or the absence of male specimens, a few undescribed forms are not considered. The specimens thus far known are mainly from, or contiguous to, the montane areas of central and southern California. Two species occur in the Sacramento Valley, but the mountainous areas of the state will probably be found to contain the majority of the species.

[1] University of California, Davis, California.

[2] Berkeley, California.

Hesperotychus Schuster and Marsh, new genus

Type of genus: *Hesperotychus adustus* Schuster and Marsh, new species.

Tychini in which the following characters occur consistently:

(1) Head with large, prominent eyes. (2) Antennal club of three segments, noticeably wider than those preceding. (3) If present, two isolated vertexal foveae visible from above. (4) Third palpal segment not more than 75 per cent length of fourth. (5) Fourth segment of maxillary palpus not bearing conspicuous integumental projection other than cone. (6) Pronotum with two basolateral foveae and the base with one moderate central fovea and from zero to six small punctures. (7) Elytron with two antebasal foveae, discal stria and simple flank. (8) Abdomen of five visible tergites in either sex, seven sternites in the male, six in the female. (9) Male protrochanter spined and metatrochanter spined or flanged, mesotrochanter not modified. (10) Protibia and metatibia usually with distal spine, mesotibia usually simple. (11) Second metatarsus equal to or shorter than third. (12) Tarsal claw and accessory present, claw of male proleg cleft. (13) Male genitalia asymmetric.

This genus is similar to *Tychus* in the asymmetry of the male genital structure. However, the placement of the parameres in *Tychus* is lateral (fig. 13), whereas in *Hesperotychus* it is apical. *Tychus* exhibits sexual dimorphism in the fifth antennal segment while *Hesperotychus* does not. None of the European species have male sexual modification of the trochanters, and while this character is of doubtful generic value, its occurrence in all of the California species has influenced its use in this paper.

The species comprising this genus are closely related and the male genitalia in conjunction with the secondary sexual characters of the male trochanters provide the more usable variables upon which the species are based. Minor differences between these structures are observed even in the small population samples presently available. However, the possibility of a species transgressing the noted discontinuities is highly improbable.

Hesperotychus adustus Schuster and Marsh, new species

(Figs. 1, 2, 3, 15, 19, 20)

Male (slide). Head .30 mm. long × .25 mm. wide; pronotum .33 mm. × .34 mm.; elytra .47 mm. long; abdomen .58 mm. × .57 mm.; total length approximately 1.25 mm. Brown, legs, palpi and antennal club lighter; vestiture fairly short, sparse, straight, somewhat appressed on appendages and elytra, apical setae of elytra noticeably longer; short hairs are represented weakly along with predominant long curved setae on head, pronotum and abdomen; gular area of head with dense, long setae. Head longer than wide; tempora rounded; prominent coarsely faceted eyes of approximately 18 facets slightly behind middle; two vertexal foveae separated by three times the distance from fovea to eye located behind anterior margin of eyes;

antennal tubercules moderately developed, gently rounded and barely disrupting the elliptical outline of the head; antennal club of three distinct segments; mandibular rami with five teeth; fourth segment of maxillary palpus with moderate cone but lacking other gross integumental structures; labrum subquadrate with two prominent apical sinuate structures; ventral surface of head medio-apically tumid with weak median carina extending a short distance basally; genal areas densely clothed with monaxial setae, some of which are longer than the majority. Pronotum with two basolateral and one mediobasal foveae, basal punctures weak; brachypterous; elytra with two small antebasal foveae; subhumeral fovea and epipleural sulcus absent. Mesosternum with median carina extending to anterior margin of mesocoxal cavities; abdomen with sixth ventral medianly emarginate with numerous minute tubercules surrounding the emargination; the seventh a subtriangular penal plate. Protrochanter with long tapering projection (fig. 20); metatrochanter with narrow curved flange (fig. 19). Genitalia as illustrated (fig. 3).

Female as in the male except: (1) small eyes of about seven facets; (2) only six sternites; (3) trochanters not armed; (4) tibia lacking spines.

This species is based on four males and seven females collected in Palm Canyon, Borrego State Park, San Diego County, California on April 25, 1955, by R. O. Schuster. The series was recovered from *Washingtonia filifera* debris. The holotype male and one paratype are deposited in the California Academy of Sciences, the remaining paratypes in the California Insect Survey.

In addition to the differing number of sternites and the trochanteral characters, the sex of a given specimen is easily determined by the deflection of the male abdomen opposed to the upward curvature of that of the female. The lone female of this species that was dissected was brachypterous.

The measurements of this species, as well as those following, were made as follows: Head width behind the eyes and not including eye facets; elytra along the suture; fourth segment of palpus excluding the cone; total length from front of head and not including antennae. All other measurements are the maximum possible.

The elliptically shaped head, resulting from the slight discontinuity of the antennal tubercules from the sides of the head, and the small metatibial spine are the only gross external characters allowing the separation of this species from its congeners. *Hesperotychus adustus* may be expected to occur in many of the isolated canyons in the area of Borrego State Park, particularly where *Washingtonia filifera* is found. Because of the disjunct nature of suitable habitats, numerous morphologically distinct populations are to be expected.

Hesperotychus claudus Schuster and Marsh, new species

(Fig. 4)

Male (slide). Head .29 mm. long × .28 mm. wide; pronotum .32 mm. × .35 mm.; elytra .52 mm. long; abdomen .51 mm. × .56 mm.; total length approximately 1.64 mm. Dark brown, elytra and extremities lighter; body pubescence moderately dense, long, suberect, that of appendages shorter, more appressed. Head scarcely longer than wide; tempora rounded; eyes of about 24 facets; vertexal foveae separated by three times the distance from fovea to eye, located on a line even with the front margin of the eyes; antennal tubercules moderate, discontinuous from head which is convergent and straight in front of eyes; mandibular rami with five or six teeth; tumosity and median carina of apical declivity well developed. Basal punctures of pronotum not apparent; apterous. Mesosternal carina long, extending over three-quarters the distance to the anterior margin of the coxal cavities; emargination of sixth ventral extremely slight, tubercules present. Protrochanter with moderately long projection; metatrochanter with narrow flange; protibia with large triangular subapical spine; metatibia not spined. Genitalia as illustrated (fig. 4).

Female. Unknown.

A single male was collected on the ASH MOUNTAIN ROAD, SEQUOIA NATIONAL PARK, TULARE COUNTY, CALIFORNIA, on April 30, 1955, by H. R. Moffit and is deposited in the California Academy of Sciences.

The genital structure of this species is comparable to that of *H. adustus* in the large base and relative simplicity of the dorsal paramere. The moderate spine of the protrochanter and the narrow flange of the metatrochanter are common to both species. The antennal tubercules are more noticeably set off from the head than is the case in *H. adustus* and the metatibial spine of *H. claudus* seems to be obsolete.

Hesperotychus nanus Schuster and Marsh, new species

(Figs. 5, 21)

Male (slide). Head .28 mm. long × .27 mm. wide; pronotum .33 mm. × .36 mm.; elytra .51 mm. long; abdomen .61 mm. × .60 mm.; total length approximately 1.56 mm. Red-brown, elytra, legs and palpi slightly lighter; pubescence of extremities short, sub-appressed, longer hairs of body somewhat curved. Head longer than wide; tempora rounded; eyes of about 12 facets; vertexal foveae separated by approximately three times the distance from fovea to eye, located on line slightly anterior to margin of eyes; antennal tubercules rounded, moderately distinct from side of head; mandibular rami not visible; tumosity and median carina of apical declivity moderately developed. Basal punctures of pronotum present; brachypterous. Mesosternal carina extending half the distance to the anterior margin of the coxal cavities; emargination of sixth ventral weak, surrounding tubercules few in number. Protrochanter with fairly long, straight spine; metatrochanter with short, thin flange (fig. 21); pro- and metatibia not spined. Genitalia as illustrated (fig. 5).

Female. Unknown.

This species is known from one male, the holotype, collected from leaf mold at Davis, Yolo County, California on April 10, 1950, by W. J. Wall and is deposited in the California Academy of Sciences. One female, not a paratype, considered as probably belonging to this species is so labeled in the University of California at Davis collection.

If the size of the eyes and number of facets are not variable in this genus, this species can be separated from the others considered in this paper by the small number of eye facets. The characters of the male genital structure in addition to the modification of the trochanter and the unspined metatibia show the affinity of this species to the preceding. These same structures are also the most useful in the discernment of these species.

Hesperotychus aspersus Schuster and Marsh, new species

(Figs. 6, 18, 22, 23)

Male (slide). Head .31 mm. long × .31 mm. wide; pronotum .35 mm. × .36 mm.; elytra .61 mm. long; abdomen not measurable; total length approximately 1.8 mm. Brown, elytra and extremities lighter; pubescence longer on body parts, shorter on legs and elytral disc; hair of metatibia suberect. Head as long as wide; tempora nearly straight; eyes of about 30 facets; vertexal foveae obsolete; antennal tubercules rounded-angulate, not prominent; mandibular rami not visible; tumosity of apical declivity weak; median carina obsolete. Pronotum with basal punctures; winged. Mesosternal carina extending half the distance to the anterior margin of the coxal cavities; median emargination of sixth ventral nearly obsolete, tubercules present. Protrochanter with long thin straight projection (fig. 23); metatrochanter with moderate thin flange (fig. 22); protibia with apical triangular spine (fig. 18); metatibia spined. Genitalia as illustrated (fig. 6).

Female. Unknown.

This species is known from one male, the holotype, collected 2 miles east of Morgan Hill, Santa Clara County, California, on February 3, 1953, by J. D. Lattin and is deposited in the California Academy of Sciences.

This species is allied to all of the preceding on the basis of the trochanteral modifications. However, the absence of vertexal foveae is shared only by species in which the metatrochanter possesses an extremely long, thin spine.

Hesperotychus moratus Schuster and Marsh, new species

(Fig. 7)

Male (slide). Head .31 mm. long × .30 mm. wide; pronotum .35 mm.

× .38 mm.; elytra .61 mm. long; abdomen .69 mm. × .61 mm.; total length approximately 1.75 mm. Black; body pubescence moderately dense, long, suberect, that of appendages shorter, more appressed; head longer than wide; tempora somewhat angulate; eyes of about 28 facets; vertexal foveae separated by three times distance from fovea to eye located in front of anterior margin of eyes; antennal tubercules rounded, moderately discontinuous from head; mandibular rami with six teeth; tumosity of apical declivity moderate, median carina broad but weak. Pronotum with basal punctures; winged. Mesosternal carina short, extending less than one-half the distance to the anterior margin of the coxal cavities; sixth ventral with moderate emargination and tubercules. Protrochanter with short blunt projection; metatrochanter with narrow curved flange; protibia with small subapical spine; metatibia with moderate subtriangular spine. Genitalia as illustrated (fig. 7).

Female. Unknown.

The type series is composed of three males collected at MENDOCINO, MENDOCINO COUNTY, CALIFORNIA, by J. R. Helfer on the following dates: November 10, 1954 (holotype), February 12, 1955 and March 6, 1955. The holotype male is deposited in the California Academy of Sciences, two paratypes in the collection of the California Insect Survey.

This is the only species with a narrow metatrochanteral flange in which the body color is black. While this character may be of some value in older specimens, fresher material will presumably be some shade of brown and the male genital structure should be used in making determinations.

HESPEROTYCHUS HEXAGONUS (Casey), new combination

(Fig. 8)

Tychus hexagonus Casey 1897, Coleopterological Notices, VII. Ann. New York Acad. Sci., pp. 616–617.

This species, described from a male, should be placed in *Hesperotychus* on the basis of the trochanteral modifications and the asymmetric genital structure (fig. 8). The type, USNM 38740, was collected March 8, 1892, at Ojai, Ventura County, California.

Hesperotychus fenyesi Schuster and Marsh, new species

(Figs. 9, 16, 24, 25)

Male (slide). Head .34 mm. long × .27 mm. wide; pronotum .35 mm. × .36 mm.; elytra .61 mm. long; abdomen .56 mm. × .63 mm.; total length approximately 1.6 mm. Red-brown; dual nature of pubescence pronounced particularly on extremities where the longer hairs are recurved, the shorter appressed. Head longer than wide; tempora somewhat angulate; eyes of about 24 facets; vertexal foveae separated by a distance over three times that from fovea to eye, located in front of anterior margin of eyes; antennal tubercules rounded, noticeably discontinuous from the sides of the head, which are straight and convergent in front of eyes; mandibular rami with six teeth; tumosity and median carina of apical declivity present but narrow. Basal punctures of pronotum present; winged. Mesosternal carina ending well before the anterior margin of the mesocoxal cavities; tubercules around emargination of sixth ventral fairly noticeable. Protrochanter with short conical projection (fig. 25); metatrochanter with broad flange (fig. 24); protibia with small subapical spine; metatibia with moderate apical, triangular spine (fig. 16). Male genitalia as illustrated (fig. 9).

Female. Unknown.

The holotype and four paratype males are labeled "PASADENA, FEB., CALIF., A. Fenyes collection." Three additional male paratypes are labeled "Pasadena, Cal., Dr. A. Fenyes." The holotype male and four paratypes are deposited in the California Academy of Sciences, two paratypes in the California Insect Survey and one in the collection of Dr. Orlando Park.

In this species the metatrochanteral flange occupies nearly the entire posterior margin of the trochanter. The long recurved setae of the metatibia are not present in other species with this type of trochanteral modification.

Hesperotychus macclayi Schuster and Marsh, new species

(Figs. 10, 17, 26, 27)

Male (slide). Head .34 mm. long × .33 mm. wide; pronotum .38 mm. × .42 mm.; elytra .66 mm. long; abdomen .60 mm. × .62 mm.; total length approximately 1.8 mm. Black, elytra and extremities reddish; pubescence of body suberect, hair on legs short and appressed except those on the latrad surface of the metatibia. Head longer than wide; tempora gently rounded; eyes of about 30 facets; vertexal foveae separated by distance over three times that from fovea to eye; located in front of middle of eyes; antennal tubercules curved, therefore not too prominently separated from head; mandibular rami with six teeth; tumosity and carina of apical declivity moderately developed, winged. Pronotal punctures present. Mesosternal carina extending half way to the anterior margin of the coxal cavities; emargination of sixth ventral moderate, tubercules obscure. Protrochanter with short, blunt projection (fig. 27); metatrochanter with broad flange (fig. 26); protibia with small subapical spine 2/9 removed from apex; metatibial spine sharp, triangular (fig. 17). Genitalia as illustrated (fig. 10).

Female as in the male except: Only six sternites; trochanters not modified; metatibia lacking spine.

The type series is a collection of five males and twenty-five females by A. T. McClay at SEBASTOPOL, SONOMA COUNTY, CALIFORNIA, on April 9, 1936. Three specimens considered conspecific but not included in the type series, were collected at Forestville, Sonoma County, California, by A. T. McClay on the following dates: Male, female on May 17, 1937, a female on April 28, 1938. A male labeled "Alameda County, California, Van Dyke collection" also seems to belong to this species. The holotype is deposited in the California Academy of Sciences, five paratypes in the California Insect Survey, one paratype in the collection of Dr. Orlando Park, and the remaining paratypes in the collection of the University of California at Davis.

The trochanteral modifications are similar to those of *H. fenyesi*. However, the setae of the metatibia are uniformly long. The narrow genital structure would seem to ally this species more strongly to those following.

Hesperotychus aculeatus Schuster and Marsh, new species

(Fig. 11)

Male (slide). Head .30 mm. long × .30 mm. wide; pronotum .31 mm. × .35 mm.; elytra .56 mm. long; abdomen .69 mm. × .61 mm.; total length approximately 1.40 mm. Black, elytra and extremities light brown; pubescence of extremities uniform, longer hair of body relatively straight. Head as long as wide; tempora divergent, gently curved; eyes of about 25 facets; vertexal foveae not present; antennal tubercules rounded-angulate, moderately discontinuous from side of head; mandibular rami with five large teeth; tumosity of apical declivity weak and median carina obsolete. Basal punctures of pronotum present; winged. Mesosternal carina ending before the anterior margin of the coxal cavities; emargination of sixth ventral slight. Protrochanter with long thin spine curved from origin and straight distally; metatrochanter with long spine gently curved except for sharply recurved apex; protibia with small subapical spine; mesotibia with minute apical spine; metatibial spine long, thin, set at about a 45° angle from tibia. Genitalia as illustrated (fig. 11).

Female as in the male but differing in the following respects: Only six sternites, condition of wings not known; trochanters not modified; tibia lacking spines.

The type series was collected at DAVIS, YOLO COUNTY, CALIFORNIA, by A. T. McClay, on the following dates: Male (holotype), female, March 9, 1955; male, March 13, 1955; and male, March 14, 1955. The holotype male is deposited in the California Academy of Sciences, one paratype in the California Insect Survey, and the remaining paratypes in the collection of the University of California at Davis.

The exceptionally long projections of both the pro- and metatrochanter serve to distinguish this species, even when point-

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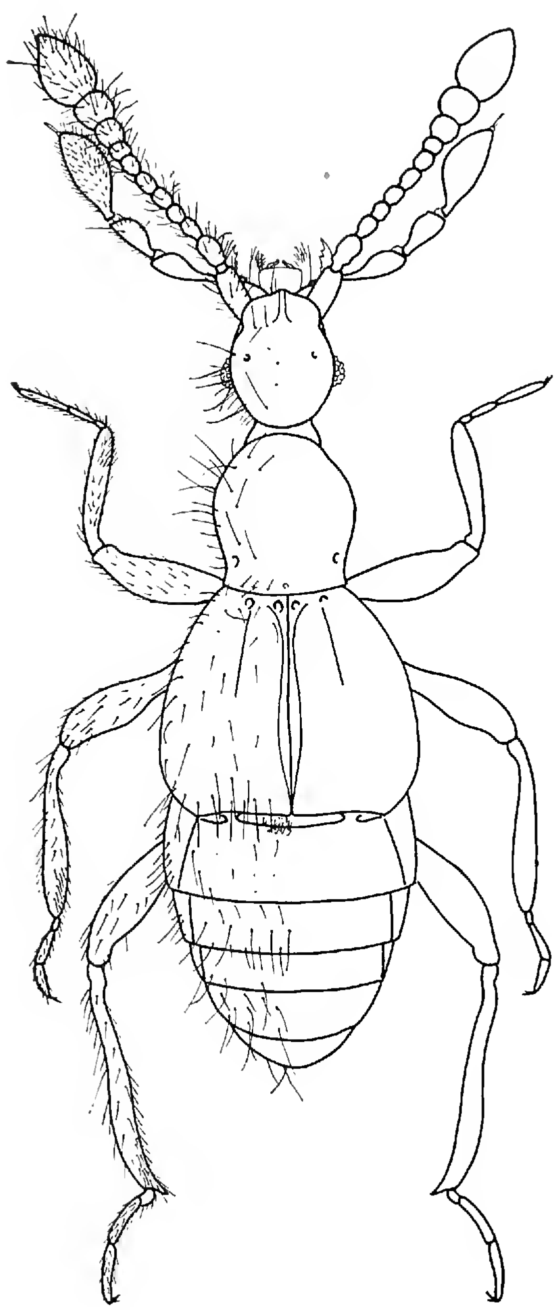
EXPLANATION OF FIGURES

Fig. 1, dorsal aspect of male. Fig 2, maxillary palpus. Figs. 3–13, dorsal aspects of mole genitalis. Figs. 14–17, apices of male metatibiae. Fig. 18, apex of male protibia. Figs. 19, 21, 22, 24, 26, 28, male metatrochanters. Figs. 20, 23, 25, 27, 29, male protrochanters.



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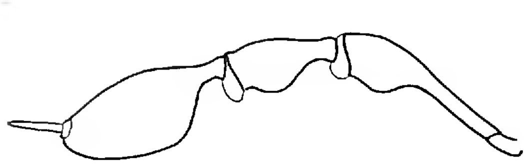

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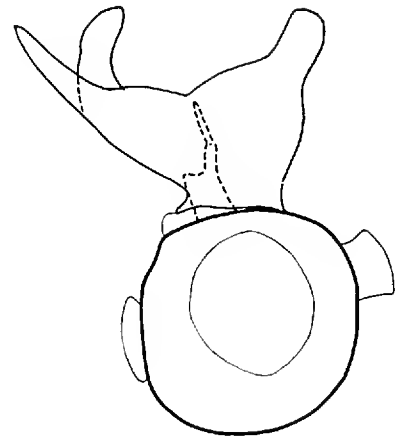

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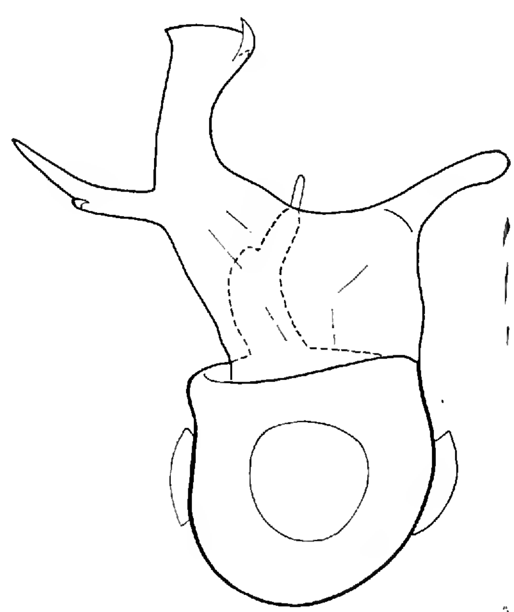

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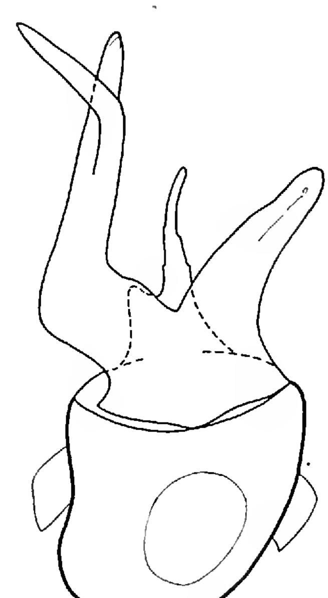

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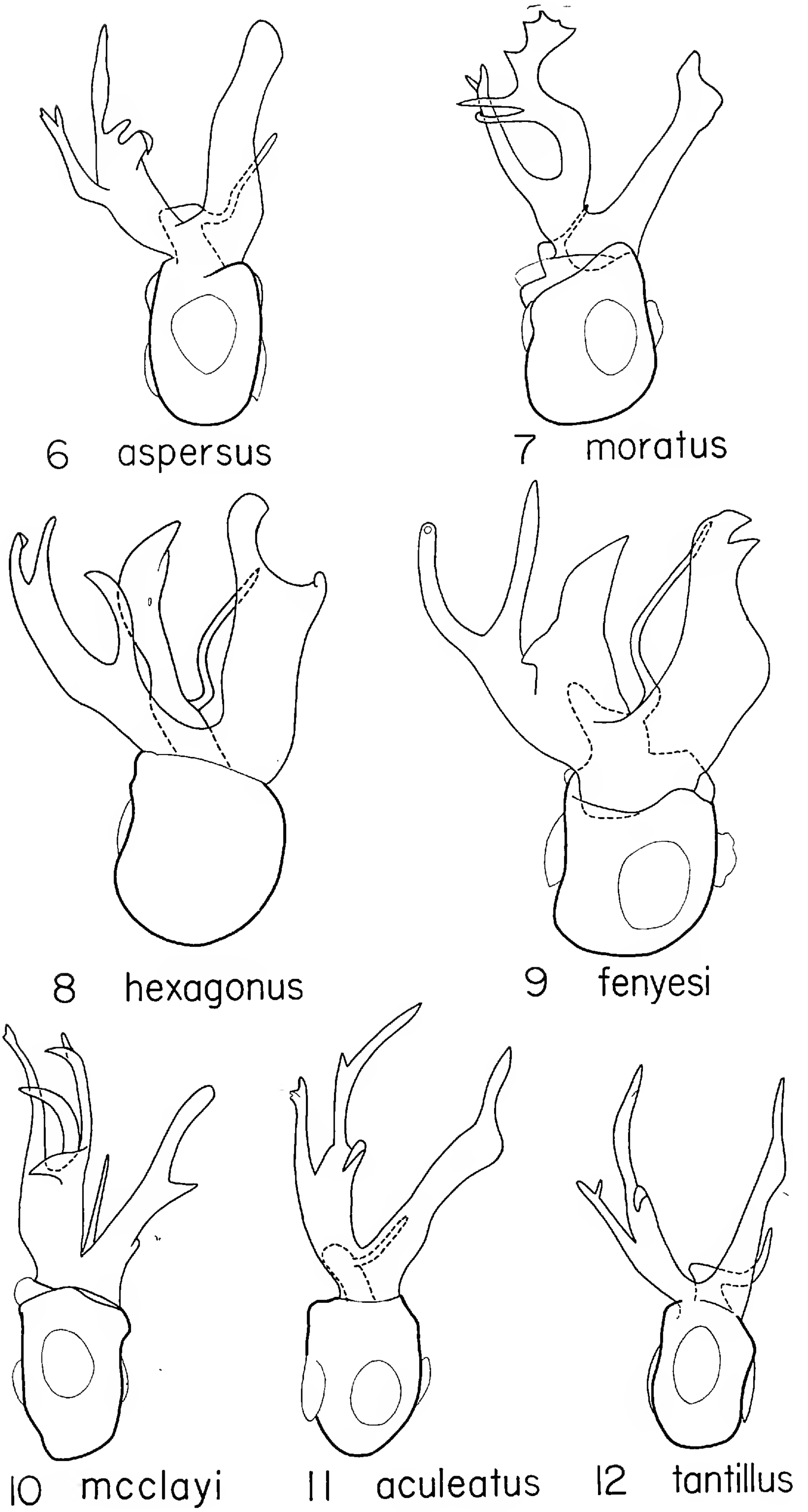
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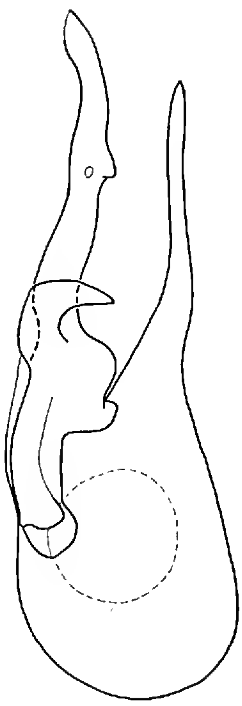
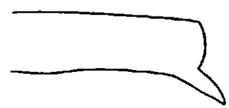
7 moratus
8 hexagonus
9 fenyesi
10 mcclayi
11 aculeatus
12 tantillus



13 Tychus niger



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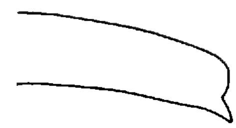
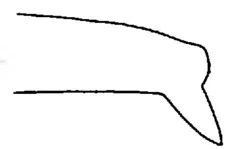


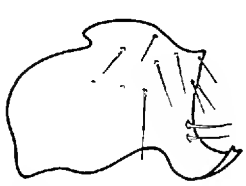
15 adustus

16 fenyesi



17 mcclayi

18 aspersus



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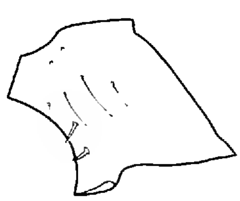

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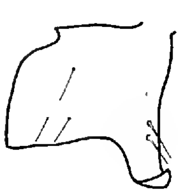

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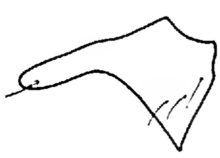

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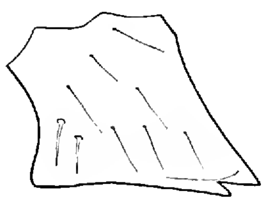

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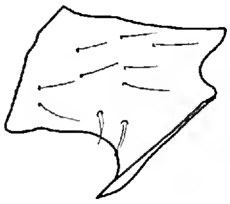
fenyesi



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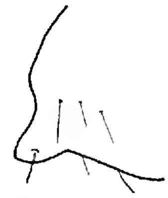

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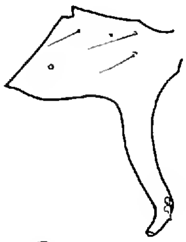
mcclayi



28

29

tantillus

mounted, from other species occurring in central California. The two larger setae occurring on the metatrochanter proper in the other species are to be found near the apex of the projection in *H. aculeatus*. Vertexal foveae are obsolete, the tentoria abortive and not connected to the dorsal surface of the head capsule.

This species is closely related to the following and the variation is considered in the discussion of that species.

Hesperotychus tantillus Schuster and Marsh, new species

(Figs. 12, 14, 28, 29)

Male (slide). Head .29 mm. long × .27 mm. wide; pronotum .30 mm. × .33 mm.; elytra .53 mm. long; abdomen .59 mm. × .55 mm.; total length approximately 1.25 mm. Brown, elytra and appendages lighter; pubescence of extremities uniform; longer hair of body relatively straight. Head longer than wide; tempora gently curved; eyes of about 30 facets; vertexal foveae not present; antennal tubercules rounded-angulate; mandibular rami with five teeth; tumosity of apical declivity weak; median carina very faint. Basal punctures of pronotum present; winged. Mesosternal carina very short, extending about one-third the distance to the anterior margin of the mesocoxal cavities; protrochanter (fig. 29), metatrochanter (fig. 28) and metatibia (fig. 14) as in *H. aculeatus*; mesotibia with minute apical spine. Genitalia as illustrated (fig. 12).

This species is known from two males labeled "PASADENA, CAL., Dr. A. Fenyes." The holotype male is deposited in the California Academy of Sciences, the paratype in the California Insect Survey.

The principal differences between this species and *H. aculeatus* are the lighter color, a few more eye facets, a shorter mesosternal carina, and minor genitalic variation evidenced mainly in the left side of the dorsal paramere. When specimens become available from other localities and in sufficient numbers to allow determination of the range of morphological variability, the status of this species should be reconsidered.

The authors have not seen the types of *Tychus tenellus* LeConte or *Tychus micropthalmus* Brendel, but from the species descriptions, believe them to belong in *Hesperotychus*.

BIBLIOGRAPHY

BOWMAN, JOHN R.

1934. The Pselaphidae of North America. Pittsburgh (privately published), pp. 1–149.

BRENDEL, EMIL, AND H. F. WICKHAM

1890. The Pselaphidae of North America. Bull. Lab. Nat. Hist. St. Univ. Iowa, 1:216–304; 2:1–84, pls. 6–12.

BRENDEL, EMIL

1893. Trans. Amer. Ent. Soc. 20:277–284.

CASEY, THOMAS L.
1897. Coleopterological Notices. VII. Ann. New York Acad. Sci. 7:281–684.

KARAMAN, Z.
1955. Revision Des Tribus Tychini (Col. Psel.) Mit Besonderer Berucksichtigung Der Balkanishen Arten. Acta. Musei Macedonici Scientiarum Naturalium. Skopje. Tom III, 4:26 pp. 105–144.

LEACH, WILLIAM E.
1817. On the stirpes and genera comprising the family Pselaphidae; with the names of the British species. The Zoological Miscellany; being description of new or interesting animals, 3:80–87.

LECONTE, JOHN L.
1861. Classification of Coleoptera, pt. 1 Smithsonian Misc. Coll., III, pp. 1–286.

PARK, ORLANDO
1953. New or little known pselaphid beetles of the United States with observations on taxonomy and evolution of the family Pselaphidae. Bull. Chicago Acad. Sci. 9:249–283, pls. 1–5.
1953. Discrimination of the genera of Pselaphid beetles of the United States. Bull. Chicago Acad. Sci. 9:299–331, pls. 1–5.
1956. New or little known species of pselaphid beetles from southeastern United States. Jour. Tennessee Acad. Sci. 31(1):54–100, 32 figs. in text.

SCHAUFUSS, L. W.
1887. Beschreibung neuer Pselaphiden. Tijdschrift voor Entom. 30:91–165.

BOOK NOTICE

MOSQUITOES OF NORTH AMERICA (NORTH OF MEXICO). By Stanley J. Carpenter and Walter J. LaCasse. viii+360 pp., 288 text figs., 127 pls. Berkeley and Los Angeles: The University of California Press. June 20, 1955. Price $10.00.

The first 24 pages contain sections on life history, collecting, preparing specimens for study, external anatomy (of all stages), and the internal anatomy of the female mosquito. Pages 25–329 comprise the taxonomic section, 331–353 a numbered bibliography of 770 items, 355–360 the systematic index. Each plate illustrates an adult mosquito, from a drawing by one of three Japanese artists.

Keys to the subfamilies, and for the tribes of Culicinae, are for adults, pupae and larvae; keys to the species of the various genera are usually to adult females, male terminalia, and fourth instar larvae; characters for the subgenera are included in the keys to adult females. The species treatments are arranged alphabetically under subgenera or genera; this obscures phylogenetic relationships, but is excellent for quick reference. The many plates must have added a great deal to the cost of publication, but will not be nearly as much used as the very good text figures.—HUGH B. LEECH, *California Academy of Scinces, San Francisco.*

RECENT PUBLICATIONS

The following five items appeared in the series "Bulletin of the California Insect Survey," published by the University of California Press, Berkeley and Los Angeles:

CALIFORNIA WASPS OF THE GENUS OXYBELUS (Hymenoptera: Sphecidae, Crabroninae). By Richard M. Bohart and Evert I. Schlinger. Vol. 4, No. 4, frontispiece+pp. 103–142, incl. pls. 9–16 and 23 text maps. April 11, 1957. Price 75 cents.

Despite the restrictive title this paper will be useful throughout the continent. It contains a key to the genera of Oxybelini of North America, and one to the species of *Oxybelus* in America [*sic!*] and northern Mexico.

THE THRIPS OF CALIFORNIA. PART I: SUBORDER TEREBRANTIA. By Stanley F. Bailey. Vol. 4, No. 5, pp. 143–220, incl. pls. 17–23. April 12, 1957. Price $1.50.

This paper gives keys to the world species of *Ankothrips, Erythrothrips, Orothrips* and *Stomatothrips;* to the known species of *Dactuliothrips, Leucothrips* and *Rhipidothrips;* to the North American species of *Aeolothrips, Bregmatothrips, Heterothrips, Linothrips, Scirtothrips* and *Scolothrips;* only the California species of other genera are included.

THE TYPICAL MUSCID FLIES OF CALIFORNIA (Diptera:Muscidae, Muscinae). By Bruce F. Eldrige and Maurice T. James. Vol. 6, No. 1, pp. 1–18, 4 text figs. (maps); pp. 14–17 are pls. 1–3 and explanations; p. 18 is blank. July 15, 1957. Price 50 cents.

This contains a short essay on the classification of the family Muscidae and the subfamily Muscinae; a key to the tribes of Muscinae, and one to both genera and species of the Muscinae of California, Oregon and Washington; distributional records, with notes on biologies.

THE CONOPID FLIES OF CALIFORNIA (Diptera). By Sidney Camras and Paul D. Hurd, Jr. Vol. 6, No. 2, frontispiece+pp. 19–50, 4 text figs., 25 maps. September 3, 1957. Price 75 cents.

Biological data; keys to the subfamilies, genera and species of California Conopidae, and to the California subgenera of *Physoconops;* synonymies and distributional records. As in some other papers in the series, species not yet reported from California, but to be expected, are included . . . in this case 7 species (and one in which a mislabeling is suspected), including the genus *Robertsonomyia.*

THE EMBIOPTERA OF CALIFORNIA. By Edward S. Ross. Vol. 6, No. 3, frontispiece+pp. 51–58, 7 text figs. September 3, 1957. Price 50 cents.

Bionomics; key to the California species of Embioptera (any instar); distributional records and discussion of the three species, only one of which is native.—HUGH B. LEECH, *California Academy of Sciences, San Francisco.*

A NEW GENUS OF BRACHYCISTIDINE WASPS
(Hymenoptera: Tiphiidae)

Marius S. Wasbauer
University of California, Berkeley

In the course of preliminary investigations on the North American Brachycistidinae, the author has had to depend heavily on various collections of Mexican material for purposes of establishing generic relationships within the subfamily which is primarily Austral in distribution.

Early in 1955, a series of very large, robust specimens from Lower California came to my attention. Because of their unique combination of characteristics, they were set aside as representing a posible new genus. Later, a group of species occurring in the United States and referable to *Brachycistis,* as currently understood, was found to share many of the same morphological traits. Comparison of these species with other known brachycistidines, clearly indicates the necessity for their inclusion in a separate genus.

Acanthetropis Wasbauer, new genus

Male.—Head rounded, broader than long; ocelli enlarged; compound eyes slightly convergent below, inner margins broadly emarginate; antennal socket with broad carina or thickening beneath; clypeus transverse, central portion slightly convex, with a narrow, apically projecting ledge; mandibles tridentate, a weakly developed carina extending from mandibular base to a point just proximad of innermost tooth, the carina obsolescent near its middle, strongly produced distally, forming a ridge or low dentiform process which is minutely striate on upper surface; maxillary and labial palpi well developed and conspicuous. *Thorax* robust, moderately long; pronotum narrow, tranverse, nearly vertical, humeral angles rounded, not prominent; mesonotum with parapsidal furrows long, strongly impressed; mesepisternum carinately produced or with a low, rounded protuberance anterodorsally, not evenly convex. Propodeum with a dorsal median longitudinal sulcus, area laterad of sulcus raised, sloping off more or less abruptly posteriorly, dorsal, lateral and posterior faces seperated by a strong carina which margins entire propodeum dorsally. Coxae simple, not carinate. Wings long, venation well developed; forewing with three submarginal and three discoidal cells, third submarginal cell two-thirds or more the length of the second, first transverse cubital vein arising beyond basal third of first submarginal cell; marginal cell elongate, the costa extending distad of stigma for a distance greater than half the length of stigma. Hind wing with radial and cubital veins well developed, cubitus arcuate, forming an angle with transverse cubital of less than 135 degrees, jugal lobe much shorter than submedian cell. First metasomal segment considerably narrower than second in dorsal aspect, the sternum with median sulcus expanded posteriorly into a broad concavity; second metasomal sternum with a strong, basal, median, logitudinal carina. Digitus of genitalia sagittate at apex, without a long, lanceolate process extending apically; valsellar plate with a number of long, stout spines on mesal surface.

Female.—Unknown.

Type of genus: *Acanthetropis lamellatus* Wasbauer, new species.

The genus *Acanthetropis* is separable from all other known brachycistidine genera by the very long marginal cell of the forewing, excavated first metasomal sternum and longitudinally carinate second sternum. Its closest affinities are probably with the genus *Colocistis* Krombein with which it shares the transverse carina of the propodeum, anterodorsal protuberance of the mesepisternum, ornamentation of the second metasomal sternum, short digitus and large size.

Acanthetropis lamellatus Wasbauer, new species

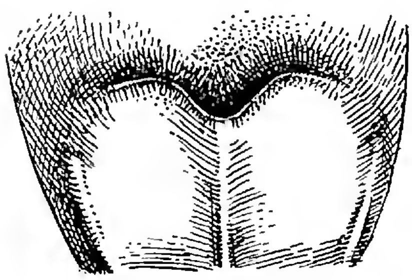
Male.—Dark mahogany brown, posterior metasomal segments slightly darker, antennae and legs amber yellow, tips of mandibles piceous. Vestiture shining white or faintly yellowish. *Head* very broad, length (measured from a line drawn across tops of lateral ocelli to apex of clypeus) .68 the width. Face shining with a few small scatered punctures, stronger between lateral ocelli and on occiput. Antennae moderately long, scape with a few long, erect hairs ventrally, flagellum sparsely clothed with minute appressed whitish pubescence, length of first flagellar segment 3.1 its greatest width. Lower rim of antennal socket not sharp or carinate below. Basal half of clypeus shining, impunctate, apical half with a number of irregularly spaced, broad, shallow punctures and long apically directed hairs. Gular carina not strongly elevated anteriorly, not visible below mandibular condyle in lateral aspect. Mandibles with a number of long, stout, amber-colored hairs on outer surface. *Thorax* strongly punctured, sparsely clothed with medium to long, erect or suberect hairs; anterior face of pronotum shining medially, nearly impunctate, lateral faces strongly punctate. Mesonotum with punctures smaller, more closely set anteriorly; mesepisternum with a strongly raised, ridge-like elevation below anterodorsal protuberance; propodeum with the dorsal sulcus strongly impressed, shining, raised area laterad of sulcus finely reticulate, impunctate except for small lateral area, posterior declivity sharp, carinate, area between declivity and posterior transverse carina smooth, shining; posterior face separated from lateral face by lateral diagonal carina meeting posterior carina dorsally, obsolete before posterior rim. Wings as illustrated (fig. 3). First metasomal segment short, stout, second metasomal sternum with basal carina broad, terminating at a raised, transverse lamella (fig. 1). Genitalia (fig. 2) with aedeagus gradually expanded before apex.

Female.—Unknown.

Length 14 (11–14) mm.

Holotype male and eleven paratypes, LA PAZ, LOWER CALI-

FORNIA, October 7, 1941 (Ross and Bohart); seven paratypes, fifteen miles north San Ignacio, Lower California, June 24 to 27, 1938 (Michelbacher and Ross); six paratypes, fourteen miles



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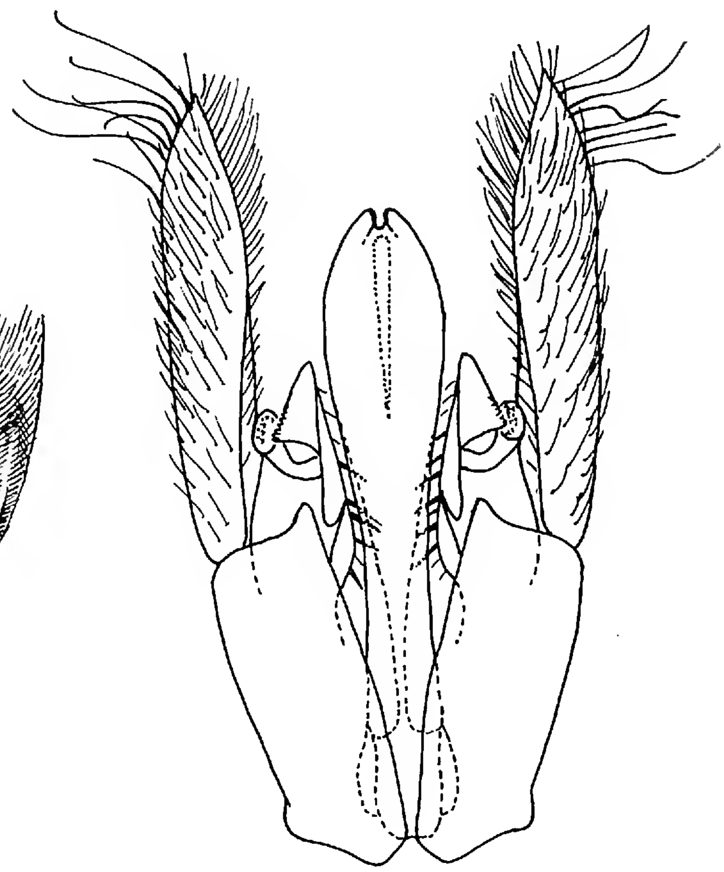

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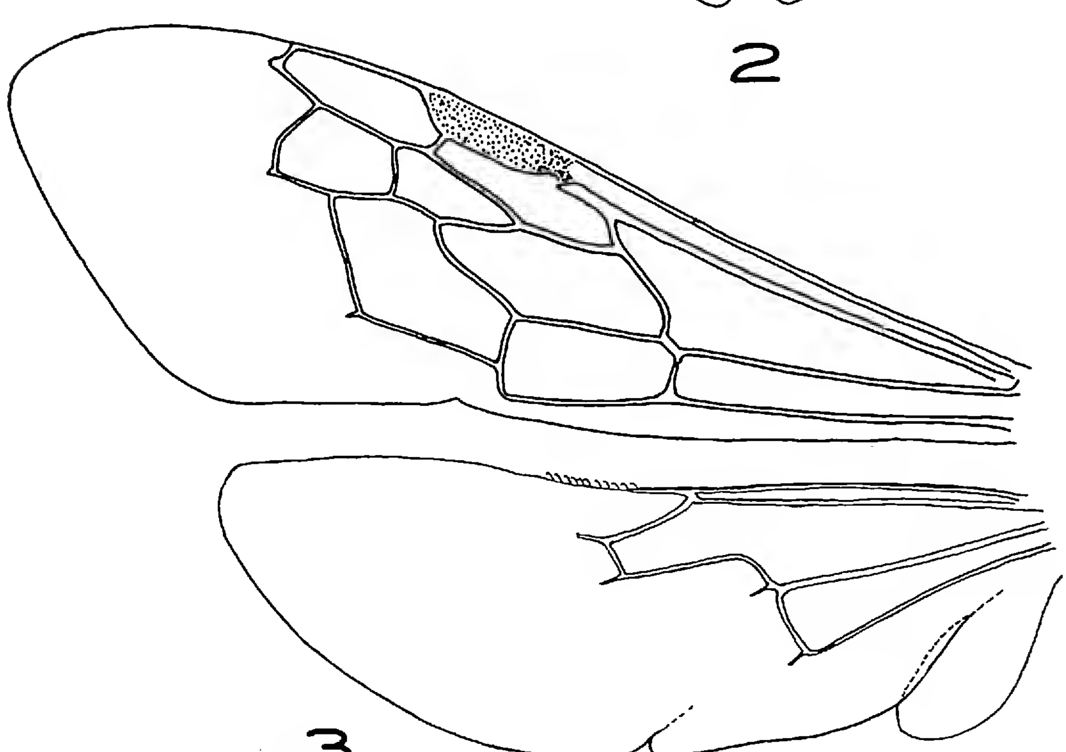

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Explanation of Figures

Acanthetropis lamellatus Wasbauer, new species. Fig. 1, basal portion of second metasomal sternum. Fig. 2, male genitalia, dorsal aspect. Fig. 3, wings (drawn from paratype).

south El Arco Mine, Lower California, June 23, 1938 (Michelbacher and Ross). The holotype and eleven paratypes have been deposited in the collection of the California Academy of Sciences, six paratypes with the California Insect Survey and seven paratypes with the U.S. National Museum.

In addition to the species described above, the following should be placed in the genus *Acanthetropis: Brachycistis idiotes* Cockerell, *B. noctivaga* Bradley, *B. normalis* Bradley and *B. aequalis* Fox (new combinations).

NESTING HABIT AND PREY RECORD OF HARPACTOSTIGMA (ARCESILAS) LAMINIFERUM (FOX)

(Hymenoptera:Sphecidae)

On July 2, 1957, while collecting along a highway cut above the Salmon River approximately three miles southeast of Whitebird, Idaho County, Idaho, the writer observed a single female of *Harpactostigma (Arcesilas) laminiferum* (Fox) (det. K. V. Krombein) in flight transporting an unidentified prey. The wasp alighted on the vertical face of a clay bank and entered a small crack. This crack was carefully enlarged and near the bottom a tunnel opening approximately one-quarter inch in diameter was found. While the tunnel was being exposed the wasp appeared and was captured. Further excavation revealed the tunnel to be approximately seven inches long, extending downward for most of its length then curving to the right and terminating in a cell about twice the tunnel diameter.

Within the cell were five nymphal and one adult *Scolops.* Unfortunately, the adult Fulgorid was not intact, and it and the nymphs could be recognized only to genus. However, from comparisons with identified material known or likely to occur in Idaho the specimens appeared to be *Scolops hesperius* Uhler, according to Richard C. Froeschner.

Since the adult *Scolops* was found in a damaged condition lacking head, prothorax, and some appendages even in the absence of larvae of *H. laminiferum* the use of adult *Scolops* as prey by this wasp is questionable. However, the presence in the nest of five *Scolops* nymphs, apparently paralyzed but otherwise in good condition, serves as a valid prey record.

The above note is significant since, to the writer's knowledge, this represents the first record of prey preference by a member of this genus.—ARTHUR R. GITTINS, *University of Idaho, Moscow.*

A NEW SPECIES OF THE GENUS COLLETES FROM THE COLORADO DESERT OF CALIFORNIA

(Hymenoptera:Apoidea)

P. H. TIMBERLAKE

Citrus Experiment Station, University of California, Riverside

A fine new species of *Colletes* was collected near Hopkins Well, about 18 miles west of Blythe, Riverside County, California, April 28–29, 1952, where one female was taken by Paul D. Hurd, Jr., and one male by J. G. Rozen. In 1958 the locality was revisited and many specimens of this bee were collected at flowers of *Larrea* and at the nesting site during the period of April 13 to 18 by J. A. Powell, P. D. Hurd, J. W. MacSwain, E. G. Linsley and the author. Subsequently Dr. Hurd discovered five specimens in the California Insect Survey collection which had been taken with *Martinapis* at flowers of *Cercidium* on April 22, 1950, near Indio by E. G. Linsley and J. W. MacSwain.

Colletes stepheni Timberlake, new species

This new species is remarkable for its large size, morphological characters and its habits. The male runs in Stephen's table (1954, Univ. Kans. Sci. Bull., 36:174–201) to *prosopidis*, but differs from that species and the related *algarobiae* and *deserticola* in its much larger size and by having the first joint of the flagellum more than twice as long as the pedicel, the ocelli very large, the pubescence of the head and thorax unusually dense and the clypeus much more prominent. The female runs to *salicicola* but differs in its large size, prominent clypeus, large ocelli and by having a well-defined and finely rugose pygidial plate.

It is a pleasure to name this very distinct species of the *daleae* group in honor of W. P. Stephen, who has given us an excellent revision of the North American species of the genus *Colletes*.

Male.—Black, the apex of tergite 7 reddened and the apical segment of venter mainly ferruginous. Apex of all tibiae reddened and the tarsi ferruginous. Flagellum of antennae ferruginous in large part, but the first joint entirely dark and the following four or five joints becoming successively less blackened on the upper side only. Apex of mandibles reddened. Tegulae amber color. Wings faintly smoky hyaline, the nervures testaceous brown, the subcosta black.

Head broad, the eyes strongly diverging above. Ocelli somewhat greater in diameter than the thickness of antennal scapes. Clypeus prominent, strongly elevated and rather abruptly declivous on each side and at base. Labrum bulbously convex at base. Malar space as long as wide. Antennae long, the first joint of flagellum twice as long as the pedicel and somewhat shorter than the second joint, which with following joints is twice as long as thick. Spines of prothorax obsolete. Face densely and minutely punctured, the punctures becoming sparse and faint on exposed parts of vertex. Clypeus polished, medially sulcate and moderately closely and finely punctured. Thorax minutely and closely punctured, the punctures of the mesopleura somewhat coarser and closer than those of mesoscutum. Basal area of propodeum entirely smooth and shining, or sometimes with fine oblique rugae on each side of the base. Abdomen dullish, with dense microscopic setigerous punctures. Tergite 7 narrowed to the rounded apex, nude and finely rugose on disk. Pubescence long, dense, plumose and white on head and thorax, but clypeus nearly nude, although partially covered by the long pendant hairs from sides of face and supraclypeal region; hair of thorax above tinged with ochreous. Abdomen with dense white hair bands at apex of tergites 1 to 5, the hair on tergite 6 and sides of tergite 7 comparatively thin; hair on disk of tergite 1 long, thin and white, but somewhat denser on the lateral margins; hair on disk of tergites 2 to 5 fine, depressed, mostly very short, but becoming longer and more erect on tergites 4 to 6. Seventh ventral plates subquadrate, moderately widened and truncate at apex, each with a slight fold on the middle of the apical margin; outer apical corner of each plate rounded, with moderately long dense hair, and the commisural margin with fine short hair. Parameral appendage of stipites small, about one and one-half times longer than wide and rounded at apex; volsellae massive; lateral wings of sagittae testaceous, moderately wide and widest at their middle; dorsal wings absent. Length, 9.5–13 mm.; anterior wing, 7–8.5 mm.

Female.—Black, the pygidial plate rufescent, and the apical ventrite more or less and irregularly reddened; apical margin of the ventral segments 2 to 5 narrowly whitish hyaline. Apical two-thirds of mandibles and middle of labrum tinged with dark red. Legs black, the small joints of tarsi ferruginous, the claws piceous in apical half, and the tibial spurs testaceous. Antennae black from base of scape to the second or third joint of flagellum, thence becoming more ferruginous above toward apex, and ferruginous beneath from apex nearly to base of second joint of flagellum. Tegulae amber color. Wings faintly dusky hyaline, becoming more definitely dusky in apical field; nervures and stigma testaceous brown, the nervures except the black subcosta more ferruginous toward base of wing.

Head broader than long, with eyes strongly divergent above. Ocelli large, distincly greater in diameter than greatest thickness of antennal scapes, the posterior pair less than one-half of their diameter from occipital margin of vertex. Facial fovea obscured by pubescence, but broad and rounded at posterior end. Malar space about one half as long as wide. Clypeus strongly elevated, prominent and with a medium sulcus. Mandibles obtuse at apex, the inner tooth represented by the oblique narrowing of the inner margin. Prothorax without spines. Basal area of propodeum smooth, the basal pits weakly developed or more or less obsolete in middle. Tergite 6 with a distinct pygidial plate with converging sides and rounded apex, the disk finely rugose with some of the rugae irregularly longitudinal. Tarsal claws with a strong inner tooth. Antennae rather elongate, the flagellum cylindrical, with the middle joints nearly twice longer than thick, the first joint longer than the second and more than twice as long as the pedicel. Pubescence dense, plumose and white, becoming ochreous on dorsum of thorax and tinged with ochreous in ocellar region of vertex. Hairs in the pits on apical margin of clypeus, and those fringing the mandibles and sides of tergite 6 golden ferruginous, and hair on inner side of tarsi bright ferruginous. Tergites 1 to 5 each with a broad white apical band, the disk of tergites with very fine and short depressed hair, not concealing the surface, except at base of tergite 2; base and sides of tergite 1 with long, rather thin white hair. Venter of abdomen with moderately short and dense hair which becomes denser at apex of segments and fringes the margin to form weak bands. Clypeus finely punctured, the punctures somewhat lengthened, moderately close on disk and sparse on the declivous sides. Face above clyeus and the thorax very finely and closely punctured, the puntures of mesoscutum about one to two puncture widths apart. Disk of first tergite before the band with extremely fine and moderately close punctures and exposed part of disk of following tergites with dense microscope punctures. Length, 13–15 mm.; anterior wing, 9–9.5 mm.

Holotype male and allotype female, 18 MILES WEST OF BLYTHE (HOPKINS WELL), RIVERSIDE COUNTY, CALIFORNIA, on *Larrea*, April 15, 1958 (Timberlake). Paratypes as follows: 5 females, Indio, Riverside County, on *Cercidium floridum*, April 22, 1950 (E. G. Linsley and J. W. MacSwain); 1 female, 1 male, 18 miles west of Blythe, the female on *Geraea canescens*, April 28, 1952, the male, April 29 (Hurd and Rozen); and 141 males, 102 females, 18 miles west of Blythe, April 13–18, on *Larrea divaricata*, except 110 males, some females taken at nesting site, some males asleep at night on dead grass stems (*Hilaria rigida*), and 1 pair taken at light (Timberlake, Powell, Hurd, MacSwain and Linsley).

BOOK NOTICE

FISHING WITH NATURAL INSECTS. An Angler's Guide to Useful and Interesting Information about Many Common Insects and a Few Imitation Lures that Fishermen use for Bait. By Alvah Peterson. x+176 pp., 63 figs., most of them compound. Columbus, Ohio. For sale by the author, Entomology Division, Ohio State University, Columbus 10, Ohio. 1956. Price $6.00.

The subtitle is a fair description of the text. It is essentially a how-to-do-it book for anglers, who will read a good deal of entomology while searching for the particular bit they want. The factual information is accurate, but by simplifying for non-technical readers Dr. Peterson has made some generalizations which will bother the critical entomologist. The drawings are nearly all good. The photographic illustrations vary from excellent to very poor; many of them have been so heavily retouched that they no longer resemble photographs. The book could have been shortened and the text improved by stricter editing. — HUGH B. LEECH, *California Academy of Sciences, San Francisco.*

HYPERISUS MARGINICOLLIS (LECONTE) A NEW COMBINATION

(Coleoptera:Anobiidae)

HERBERT RUCKES, JR.
University of California, Berkeley

During recent studies of the genitalia of the Anobiidae, the author found that the male and female genitalia of *Hyperisus plumbeum* Mulsant and Rey were almost identical to the genitalia of *Ernobius marginicollis* (LeConte) and unlike any other of the genitalia examined. It has been indicated earlier (Ruckes, 1957) that *E. marginicollis* does not belong in the genus *Ernobius*. The biology of *marginicollis* is entirely different from the species of *Ernobius*. All host records of *Ernobius* indicate that this genus is restricted to the conifers, the larvae being reared from the stems, cones and under the bark of these hosts. *E. marginicollis* has been reared, according to all host labels examined, from the stems of lupine and from "weeds."

After the examination of a long series of *marginicollis* it was noted that the front coxae are only moderately prominent and are separated by a distinct posternal process and the prosternum is long before the coxae; these characters alone will remove the species from the genus *Ernobius*.

HYPERISUS MARGINICOLLIS (LeConte), new combination

Dark brown to black, elongate. Head, pronotum and elytra with long recumbent pubescence intermixed with short erect hairs. Antennae eleven segmented, male with ninth segment longer than preceding five united, female with ninth segment slightly longer than preceding three united. Palpi with terminal segments fusiform, being widest at or behind the middle. Tarsi relatively narrow. Front coxae only moderately prominent, separated by a distinct prosternal process. Prosternum long before the coxae, being more than half the coxal diameter from front to back. Sides of pronotum margined and serrulate.

REFERENCES CITED

RUCKES, HERBERT, JR.
1957. A synopsis of the California deathwatch beetles of the genus *Ernobius* Thomson, with descriptions of two new species which attack pine cones. Pan-Pacific Ent., 33(4):157–161.

OBSERVATIONS ON THE NESTING HABITS OF COLLETES STEPHENI TIMBERLAKE

(Hymenoptera:Apoidea)

PAUL D. HURD, JR. AND JERRY A. POWELL
University of California, Berkeley

During the past several spring seasons field parties of the California Insect Survey have made repeated attempts, while collecting on the Colorado Desert of California, to obtain a series of an undescribed bee, the largest *Colletes* known to occur in America north of Mexico. The bee was first recognized from two specimens collected in April, 1952, near Hopkins Well, some 18 miles west of Blythe, Riverside County, California. It was, therefore, one of the goals of a return trip to Hopkins Well this year to secure a series sufficiently large enough to permit characterization of the species. The bee, *Colletes stepheni,* is described in an accompanying paper by P. H. Timberlake (1958), for it was our good fortune not only to collect an adequate series, but also to discover an extensive nesting site.

The nesting area, which was studied April 14 to 17, 1958, is located on the prominent, drifting sand dunes immediately south of U.S. Highway 60–70 just to the east of Hopkins Well, Riverside County, California. The site extended in an arc, some 12 yards in width for approximately 170 yards on the north and west facing slopes of the curving dunes. Within this zone most of the burrows were localized into six principal groups consisting of 39, 28, 22, 22, 15 and 12 burrows. The entire nesting area probably had some 200 burrows active at that time. The drifting sand dunes in the area occupied by the nests are partially held in place by scattered bushes of two predominant perennial plants,[1] Creosote Bush *(Larrea divaricata* Cav.), and a tall dry, clumped grass with the culms 2 to 3 feet in height known as Galleta *(Hilaria rigida* (Thurb.) Benth.). Unusually heavy rains of the preceding winter occasioned a profusion of annual growth consisting promarily of *Oenothera deltoides* Torr. & Frem. and *Psilostrophe cooperi* (Gray) Greene, which also aided in the stabilization of the dune surfaces.

The nests were grouped in unvegetated areas with the range of distance between burrows being about 15 cm. to three meters. The most evident feature of the burrow, which is plugged during

[1] The plant identifications used in this paper were made by Helen K. Sharsmith, University of California Herbarium, Berkeley.

most of the day, is the large and distinctive tumulus that is formed on the downward slope below each nest entrance. As will be noted in the illustration (fig. 1), the fan-shaped mound rather resembles the tailings of a mine shaft.

The nesting area was first discovered late one afternoon when large numbers of the males were seen coursing with an audible hum over the closed burrows. On the subsequent day (April 15) the sequence of this late afternoon flight was observed. The first male was seen at 4:59 p.m. (Pacific Standard Time) and by 5:15 p.m. the main flight had commenced. At this time 20 to 30 males were coursing, some two or three inches above the sand, over one group of nests in an area of approximately 200 square yards. This activity was evident over the entire nesting area. The concentration of individuals continued to increase until by 5:30 p.m. the audible hum was evident. From this time until the sun dropped below the horizon at 5:58 p.m. the flight gradually diminished, continuing to do so through the period of twilight. The last active male was observed at 6:21 p.m., well before dark. At the conclusion of their flight the individuals dispersed to nearby vegetation for the night. Large numbers of them were discovered sleeping on the tall seasoned culms of the Galleta grass where nearly all individuals rested in a head down position clinging with their legs. It is not known whether this was a preferred resting site, but males were not found sleeping elsewhere.

During the main flight occasional small groups (3–6) of males were frequently congregating on the sand, scratching or attempting to dig, tumbling and struggling with one another using their mandibles and legs. Some were seen scratching at the burrow entrance plugs. Often individuals entered depressions in the sand or burrow-like holes and bumped various objects lying about the nesting site, such as small dark plant fragments, an empty wasp cocoon, and frass pellets of the sphinx moth, *Celerio lineata* Linnaeus. One male pounced on a small tenebrionid beetle (*Blapstinus* sp.) as it crawled through the nesting site. Perhaps the most remarkable observation was that involving the males' activity about a dead adult female andrenid bee, *Andrena rozeni* Linsley and MacSwain,[2] lying on the surface of the sand. The dead *Andrena* was repeatedly tumbled by the *Colletes* males, and several males each in turn attempted to copulate with it by

[2] Determined by E. G. Linsley and J. W. MacSwain, University of California, Berkeley.

climbing upon its back and actually extruding the genitalia in contact with the tip of the dead female's abdomen.

It is assumed that the purpose of this evening flight is that of seeking out and copulating with the females as they open their burrows. The one copulation that was observed occurred at 6:03 p.m. when several frenzied males were seen at a burrow tumulus where a female was unplugging her burrow. The female was dragged out by two or three struggling males, one of which apparently successfully managed to copulate with her. Almost immediately the other males left, and after several seconds the pair separated, probably due to the intervention of the observer. For some reason, possibly the stage of the nesting activity of the colony, almost no females opened their burrows during the male flight. It would appear likely that females requiring copulation must unplug their burrows while this evening male flight is in progress. However, during the period of observations, nearly all

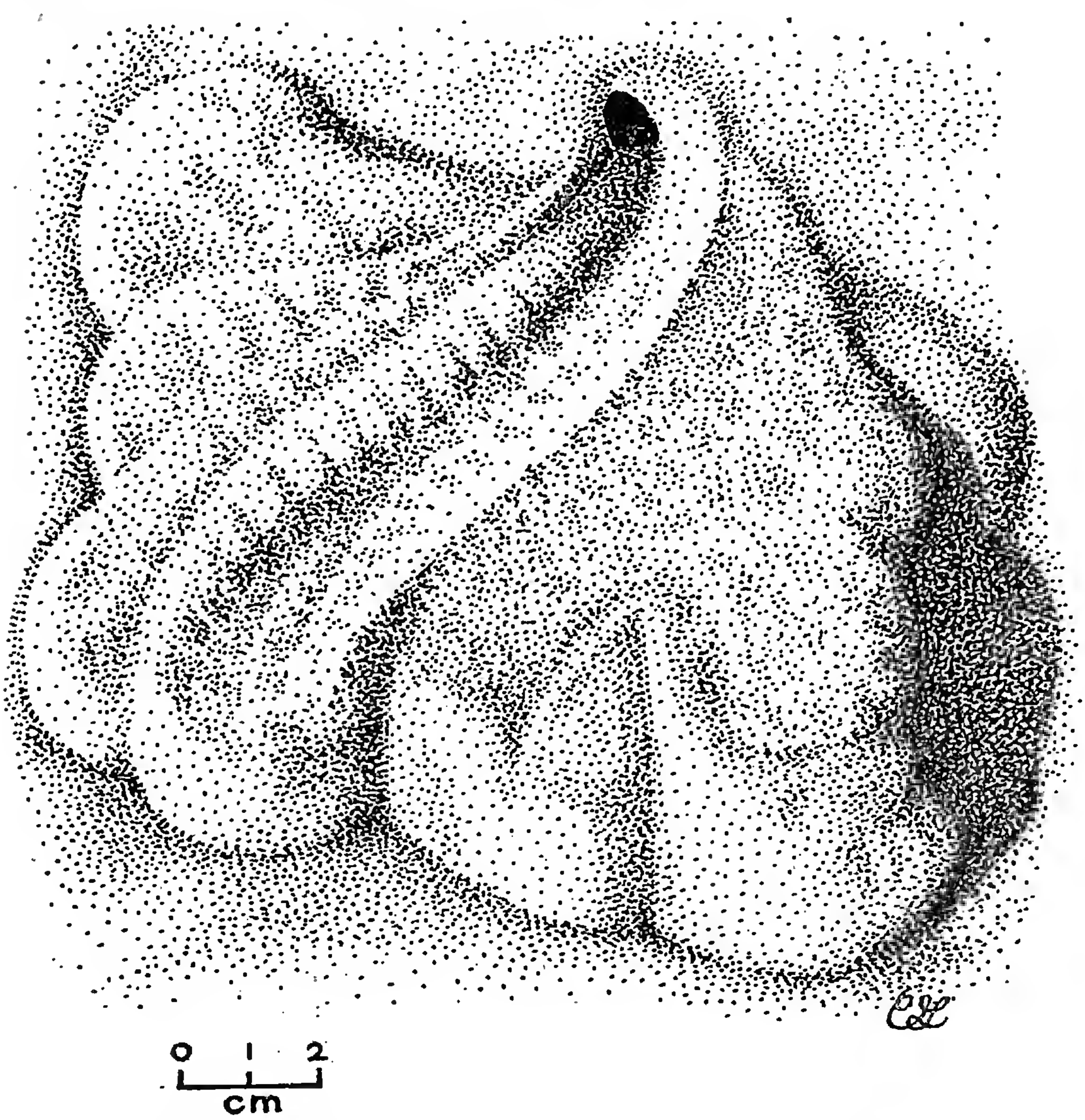

Fig. 1—Burrow tumulus of *Colletes stepheni* Timberlake.

the burrows remained closed for about an hour after the end of the male flight.

Observations revealed that the excavation of the burrows by the females was carried out during the night with the first individual engaged in this activity having been seen at about 7:14 p.m., well after dark. More females continued to open burrows and commence digging as the evening progressed. By 8:00 p.m. 10–20 per cent had begun work, and by 10:30 p.m. the majority of the burrows were unplugged with their occupants active. The digging process was continuous until at least 11:30 p.m., when our investigations were postponed for the night. Observations were suspended between the hours of 11:30 p.m. to 4:30 a.m. and it is not known how long the excavation continued.

On the basis of several bees observed, the digging process seemed to be relatively uniform in pattern. Following the gradual removal of the plug, the female was seen to always back out abdomen first, pushing the excavated sand with her abdomen and hind legs. After three or four trips to the surface, in which small loads of dry sand were deposited near the entrance, successively closer each time, the female backed completely out of the burrow and pushed the accumulation across the surface of the tumulus, forming a depressed trackway (fig. 1). When the pushed sand reached the periphery of the tumulus, it cascaded from the end of the trackway, adding to the steep outer margin of the tailings. This trackway, during the course of an evening's digging, was shifted from side to side across the surface of the tumulus. As the bee backed out, the trackway assumed a characteristic reticulated appearance due to a curious oscillating of the abdomen and legs.

Upon revisiting the nesting site before dawn (4:40 a.m., April 17) the burrows were open. It seems likely that they remained open all night. We assume from females seen by E. G. Linsley, J. W. MacSwain and P. H. Timberlake at the pollen source, Creosote Bush (*Larrea divaricata* Cav.) as early as 4:20 a.m. that the morning's provisioning had already begun. However, judging from activity at the burrows when we arrived and at the height of the provisioning period (5:00 a.m. to 6:30 a.m.) it is presumed that the pollen gathering had begun only shortly before. Since the first pollen-laden females were seen returning at 4:55 a.m. (just at sunup) we know that the first departures had already occurred. Males were found still sleeping on the culms of Galleta while a few other males were flying about the general nesting area.

The time data obtained on the pollen collecting flights are tabulated in Table 1. The flights averaged about 20 minutes and ranged from 12 to 39 minutes. Much of this variation is attributable to differences between individuals, for example female *C* took longer than *A* or *D*. Females when leaving burrows hovered in a small arc a few inches above and downhill from the tumulus before departing. Returning females were seen to either enter without hesitation or to momentarily hover above the entrance before entering the burrow. The plugging was accomplished in stages usually requiring a number of trips to the surface by the female with excavated material. For example, one female which commenced plugging at 6:03 a.m. required seven trips to the surface before the entrance was closed externally at 6:17 a.m.

Table I—Departure (d) and arrival (a) times of pollen trips. (Pacific Standard Time, A.M.)

observed female	d	a	d	a	d	a	d	a	burrow plugging completed
A.	4:51	5:08	?	5:23	5:26	5:38	?	6:00	7:04
B.	?	5:23	5:25	5:47	5:49	6:13	6:15	6:27	7:12
C.	?	5:15	5:17	5:47	5:49	6:19	6:22	6:47	7:11
D.	?	5:27	?	5:43	5:45	6:00	6:03	6:22	7:04
E.	?	5:31	5:33	6:12	—	—	—	—	6:58
F.	?	5:10	—	—	—	—	—	—	6:17
G.	?	5:29	?	5:46	5:49	6:07	—	—	7:21
H.	?	5:37	?	6:01	6:05	6:36	—	—	7:01

By 7:20 a.m. in one site under study, 21 of the 28 burrows were already plugged. All burrows were closed by 8:00 a.m. Reports from the floral source indicated that the morning activity of the males (nectar) and the females (nectar and pollen) had largely ceased by 6:20 a.m. Apart from the few males seen briefly about the nesting site before sunrise, no male activity comparable to the evening flight took place over the burrows. It is believed that the males spend the day in abandoned burrows or other holes in the dunes. This is suggested in part by their absence on the Galleta grass, as well as by numbers of males observed in one instance leaving an abandoned burrow in the evening.

The four burrows excavated for study showed a general similarity in configuration and depth. Individual variation was nonetheless evident in the degree and direction of lateral displacement. The nests were initiated in a substrate consisting of unconsolidated dune sand to a depth of approximately 50 cm. Below this level existed a layer of hard-packed dune sand which when removed remained in consolidated chunks. A moisture layer commenced four or five cm. below the surface and extended about 45 cm., approximately to the upper level of the underlying compacted layer. This situation explains the dry sand being deposited at the surface by the females which were excavating below the moisture level. From the entrance the tunnel, which was about 7 mm. in diameter, progressed inwardly almost horizontal to the surface for about 15 cm. The initial portion of the nesting tube when plugged is filled with sand for about 8–10 cm. from the entrance. Following the horizontal portion the tunnel curved into a nearly vertical drop of 45–50 cm. At about this point the burrow angled away to either the right or left, continuing downward somewhat less steeply to a depth of about 75 cm. from the surface. The final section of the burrow varied considerably between individuals, but in general made a second steep drop before attaining the cell level. The fact that the exposed portion of the tunnel remained intact on the wall of our excavation indicates that the bee may have structurally supported the burrow by some means, but no lining was evident. One burrow successfully excavated was found to be still under construction. The female bee was found at the end of the nesting tube 130 cm. long, some 90 cm. below the surface of the dunes. In another case a single partially provisioned cell was located at the end of the burrow about 98 cm. beneath the dune surface. The apparently unlined cell contained a membranous cellophane-like capsule, provisioned with a viscous liquid mixture of *Larrea* pollen and nectar. No egg was found, however the cell had been partially damaged since the female had been forced backward into it during our digging operation. The tunnel in this instance was estimated to be 140 cm. long and had four angles of 35° to 45° during its course (alternating from sinistral to dextral).

During the course of our study three hymenopterous parasite species were observed in the nesting area. Two of these appeared to have a definite relationship with the bees under study. Nine females of a large undetermined *Sphaeropthalma* [*sensu* Schuster 1958][3] (Mutillidae) were collected crawling on the sand in the

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[3] Determined by W. E. Ferguson, University of California, Berkeley.

nesting area between 7:20 p.m. and 8:10 p.m., and one of these was taken shortly after it came out of an open *Colletes* burrow. Extensive collecting during several evenings in other areas of the dunes failed to reveal its presence. Another mutillid, *Dasymutilla arenivaga* Mickel, although observed wandering through the nesting site, seems more likely to be associated with bembicine wasps nesting on the dunes. A large ferruginous and undetermined parasitic bee of the genus *Nomada* was seen to enter an open active burrow at 6:55 a.m. and remain within for about 20 seconds. The bee, a female, was collected on its reappearance.

Since *Colletes stepheni* Timberlake is itself so unique and exhibits so unique a nesting behavior, no attempt is made to compare it with any of its congeners. A summary relating to the bionomics of the genus has been provided by Stephen (1954: 155–163). The only North American species of the genus *Colletes* whose nesting habits have been previously reported upon in some detail is the eastern United States *C. inaequalis* Say.

Celeste Green, Scientific Illustrator, University of California, Berkeley, kindly prepared the accompanying figure from photographs taken at the nesting site.

Literature Cited

Schuster, Rudolph M.
1958. A revision of the sphaeropthalmine Mutillidae of America north of Mexico. II. Ent. Americana 37:1–130, 7 plates, 3 tables.

Stephen, W. P.
1954. A revision of the bee genus Colletes in America north of Mexico. (Hymenoptera, Colletidae). Univ. Kansas Sci. Bull., 36:149–527, 87 figs., 8 maps.

Timberlake, P. H.
1958. A new species of the genus Colletes from the Colorado Desert of California (Hymenoptera:Apoidea). Pan-Pacific Ent. 34:143–145.

RECENTLY PUBLISHED

OBSERVATIONS ON THE HABITS OF STYLOPS PACIFICA BOHART. By E. G. Linsley and J. W. MacSwain. University of California Publications in Entomology, Vol. 11, No. 7, pp. 395–430, incl. pls. 51–53, 1 text fig. University of California Press, Berkeley and Los Angeles. April 30, 1957. Price 75 cents.

A fine paper in which some erroneous ideas are corrected and the subject clarified. The illustrations are excellent.

THE NEOTROPICAL SPECIES OF THE "SUBGENUS AESCHNA" SENSU SELYSII 1883 (Odonata). By Philip P. Calvert. Memoirs of the American Entomological Society No. 15. vi+251 pp., pls. I–XLVII; 19 tables, 7 maps, on un-numbered pp.; +i–iv [index]. American Entomological Society, Academy of Natural Sciences, Philadelphi. December 31, 1956. Price $10.00.

A thorough and meticulously annotated work, with full descriptions of the adults and the known larvae, ecological data, discussions, and investigation of the literature; this results from decades of study.

A SYNOPSIS OF HYMENOPTEROUS PARASITES OF MALACOSOMA IN CALIFORNIA (Lepidoptera, Lasiocampidae). By Robert L. Langston. University of California Publications in Entomology. Vol. 14, No. 1, pp. 1–50, 13 tables. University of California Press, Berkeley and Los Angeles. November 7, 1957. Price $1.00.

Gives descriptive notes on the adults and larvae of California species of *Malacosoma* with distribution and host records. Parasite recoveries are tabulated, and literature records noted.—Hugh B. Leech, *California Academy of Sciences, San Francisco.*

BOOK NOTICE

TAXONOMIST'S GLOSSARY OF GENITALIA OF INSECTS. Edited by S. L. Tuxen. 284 pp., 215 text figs. Copenhagen: Ejnar Munksgaard. Late 1956. Price 80 Danish Kroner (about $12.75).

This exceedingly useful book is divided into two parts. Part I (pp. 19–174) contains descriptions of the genitalia, arranged by orders (following Grassé), and as described by 30 contributing specialists. Part II is a glossary of terms, with definitions; to this four additional specialists contributed, but major credit must go to the editor. The arrangement is alphabetical, the treatment first general then by use in various orders as required, with invaluable cross-references and lists of synonyms.

With such a large number of contributors, there is naturally a variation in method of illustration, with some very fine examples of draftsmanship. If more authors had used Michener's system of naming all parts of figures in full on the drawings (*e.g.*, Hymenoptera, figs. 153–159, p. 134), the six-page "List of abbreviations on the figures" would not have been needed. We owe much to Dr. Tuxen for his highly successful editorship. It is fortunate for many of us that the book is in English.

At the same time it is too bad that this book, by authors who are essentially taxonomists, could not have been preceded by the latest work of a master morphologist: "A revised interpretation of the external reproductive organs of male insects," by R. E. Snodgrass (Smithsonian Miscell. Coll., Vol. 135, No. 6, pp. 1–60, 15 text figs. Smithsonian Institution, Washington, D.C. December 3, 1957). This contains basic revaluations and should be in the hands of everyone using the book by Tuxen, *et al.*—Hugh B. Leech, *California Academy of Sciences, San Francisco.*

THE LOUSE POPULATIONS ON SOME DEER MICE FROM WESTERN OREGON[1]

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Between August 27 and 31, 1956 a series of 194 deer mice (*Peromyscus maniculatus* Wagner) were taken from the vicinity of Beverly Beach State Park which is just south of Otter Rock, Lincoln County, Oregon. The animals were collected by setting out lines of snap traps along the trails and old logging roads which traversed the area. The traps were placed one to the station with a spacing of about 30 feet between stations. The traps were baited with peanut butter, and, for the most part, left set for two days. A total of 657 trap stations took 111 deer mice the first night and 620 stations took 87 deer mice the second night of trapping, which is at the rate of 169 and 140 deer mice per 1000 trap stations for the first and second nights, respectively. These trap success figures indicate a very high population density.

To prevent transfers of lice from one host specimen to another and to reduce loss, each mouse was placed in a separate one-pint size polyethylene home food freezer bag immediately on recovery from a trap (Cook, 1954b). Each bag was numbered, and each skin was returned to this original bag after the host was examined, skinned and the skin dried. The recovery of the lice was accomplished by placing the whole skin in a solution of trypsin followed by KOH (Cook, 1954a). The lice were then strained out of the resulting solution.

This report is concerned with the population structure and occurrence of the two species of Anoplura *Hoplopleura hesperomydis* (Osborn) and *Polyplax auricularis* (Kellog and Ferris) which were found on the deer mice.

Rate of Infestation

In all, 65.3% of the deer mice examined harbored *H. hesperomydis* and/or *P. auricularis*. The former were the more common being found on 57.2% of the hosts while the latter were found on but 18.9%. Only 10.7% of the deer mice were found to be infested with both species of lice.

When it was discovered that two species of lice were com-

[1] Paper No. 3855 Scientific Journal Series, Minnesota Agricultural Experiment Station, St. Paul, Minnesota.

monly found on this host population two hypotheses were set up to be tested. The first was that since some mice do not have lice that there was a difference in the "resistance" to louse infestations among these hosts. If this were true it should follow that the two species of lice would be found on the some hosts more commonly than would be expected by chance. The other hypothesis suggested that either the two species of lice had separate and distinct host requirements or that there would be direct competition between them. In either case they should be found together less often than would be expected by chance distribution. In order to test these hypotheses we calculated Cole's (1949) coefficient of interspecific association. The value $C \pm O = 0.007 \pm 0.016$ suggests that neither hypothesis was correct and the two species of lice are distributed among the hosts independently of each other. This situation allows the population data for the two species to be analyzed separately.

Hoplopleura hesperomydis was found on about 57% of the deer mice. However, there is some difference in the rate of infestation between the sexes. This louse was found on 62% of the males but on only 52% of the females. A Chi-square value of 7.01 suggests that this is a real difference rather than one to be expected by chance. When the sample is broken down into size groups (these groups are assumed to represent age classes with those over 90 mm. in body length representing adults and those under this length representing sub-adult mice) there is no significant variation in rate of infestation in the male deer mice. There is considerable apparent difference in rate of infestation between the size classes of females with an indication that the adult females have a lower rate of infestation than the sub-adult females. A Chi-square value of 24.3 suggests that this is a real difference. The rate of infestation is much higher than that found by us (Cook and Beer, 1955) from deer mice from northern Minnesota. The Minnesota infestation rates for *H. hesperomydis* were 41 and 15% as compared with 57% for this sample. The tendency for the males to have a higher infestation rate is suggested in both studies. However, the Minnesota deer mouse material showed no indication of shift in infestation rate with size (age) of host in either sex.

A much lower proportion of the deer mice were found to be infested with *P. auricularis* than with *H. hesperomydis*. About

19% of the deer mice were infested by *P. auricularis* and there was again a difference in the rate of infestation of the males and females. About 13% of the female and 25% of the male deer mice were infested. A Chi-square value of 13.8 again suggests that this is a significant difference. There is very little apparent variation in the rate of infestation with size class in either the male or female deer mice. However, the samples are very small and definite conclusions cannot be made in relation to the rate of infestation and age of host.

Louse Population Structure

The detailed population structure of the lice on the infested deer mice is given in table 1. In all, 1327 *H. hesperomydis* and 86 *P. auricularis* were examined. The size of the infestations

Table 1.—Louse populations on *Peromyscus maniculatus*

Sex of Host	Body Length in mm.	No. of Hosts Examined	Per Cent Infested	Total Lice	Lice per Infestation Max.	Min.	Ave.	Structure of Louse Populations in per cent: Adults ♂♂	♀♀	Developing Instars 1st	2nd	3rd
				Hoplopleura hesperomydis								
♀♀	70-89	63	65	387	59	1	9.4	32	43	13	7	5
	90-105	31	26	168	106	1	21.0	21	47	24	7	1
		94	52	555			11.3	28	44	16	7	4
♂♂	70-89	85	61	657	247	1	12.6	27	36	32	4	2
	90-105	17	65	115	37	1	10.5	44	47	7	2	0
		102	62	772			12.3	29	37	28	3	2
				Polyplax auricularis								
♀♀	70-89	63	14	32	12	1	3.6					
	90-105	31	10	4	2	1	1.3					0
		94	13	36			3.0	19	53	3	25	0
♂♂	70-89	85	20	33	3	1	1.9					
	90-105	17	47	17	3	1	2.1					
		102	25	50			2.0	32	48	10	6	4

varied greatly as has been reported from other studies (Cook and Beer, 1954; Hopkins, 1949). The average size of the infestations for *H. hesperomydis* and *P. auricularis* was 11.8 and 2.3 lice, respectively. The maximum number of *H. hesperomydis* was 247 and of *P. auricularis* 12. Both louse species show a skewed distribution of population sizes with the maximum being many times the mean. There is considerable variation in the average size of infestation between size (age) classes as shown in Table 1 but the significance of these differences is difficult to determine owing the the presence of a few heavily infested animals. For instance, nearly two-thirds of the *H. hesperomydis* found on the adult female deer mice were from one deer mouse. There appears to be little difference between the infestations on the male and female deer mice (see table 1).

The adult lice made up from 66 to 80% of the total population indicating a rather low rate of reproduction at this time. Our studies of *H. hesperomydis* on deer mice in northern Minnesota have indicated a higher proportion of immatures (Cook and Beer, 1954) where we found from 38 to 60% adults with an average of 45%. The sample of *P. auricularis* is too small to discuss in detail except that it appears to follow the same general pattern as that found in *H. hesperomydis.*

The age structure of the *H. hesperomydis* shows a relatively high proportion of 1st instars, a moderate number of 2nd instars, and only a few 3rd instars (see Table 1) indicating either a rather high mortality rate among the young lice or that the 1st instars remain in this stage longer than the later instars. There are no data on the developmental rate of this species. The proportions of the several instars are in line with that reported for Minnesota materials (Cook and Beer, 1954).

In both species of lice the females were more abundant than the males, the male *H. hesperomydis* on the female deer mice made up about 39% of the adults while on the male mice they comprised about 44%. The *P. auricularis* had a similar sex ratio with about 35% of the adults being males.

Literature Cited

Cole, L. C.

1949. The measurement of interspecific association. Ecology, 30:411–424.

Cook, E. F.

1954a. A modification of Hopkins technique for collecting ectoparasites from mammal skins. Ent. News, 15:35–37.

1954b. A technique for preventing post mortem ectoparasite contamination. Jour. Mammalogy 35:266–267.

Cook, E. F. and J. R. Beer

1955. The louse populations of some cricetid rodents. Parasitology, 45:409–420.

Hopkins, G. H. E.

1949. Host associations of the lice of mammals. Proc. Zool. Soc. Lond., 119:387–604.

A NEW SPECIES OF IDIOGRAMMA FOERSTER WITH NOTES ON TWO OTHER SPECIES

(Hymenoptera: Ichneumonidae)

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In the course of a study of a new species of *Xyela* on Coulter Pine, *Pinus coulteri,* one mile east of Mount Hamilton, Santa Clara County, California, a new species of *Idiogramma* was collected. This new species keys out to *I. fraternus* Townes and Townes (Townes and Townes, 1951) but may be distinguished by the length of the forewing (greater than 3.5 mm. as opposed to less than 3.5 mm.) and the ratio of the ovipositor length to that of the forewing (1.4 versus 1.0). The difference in the length of the forewing is greater when like sexes are compared. The forewings of the males of *I. fraternus* measure 2.7–3.0 mm. while the forewings of the new species range from 3.7–4.0 mm. (males) and vary from 4.5–5.0 mm. (females).

Idiogramma titana Burdick, new species

Female: Mandible a little narrower at base of teeth than at middle, teeth weakly divergent and distinctly recurved; frons not yellow laterally; a faint longitudinal impression extending between the posterior ocelli to back of head; occipital carina interrupted medially; forewing 4.5–5.0 mm. Color: ground color black; face to upper edge of antennal sockets, clypeus, mouthparts, except teeth of mandible, lower 0.2 of temple, underside of scape and pedicel, tegula, hind corner of pronotum, fore coxae, trochanters, fore and middle femora, fore and middle tibiae, short thin band at apex of first tergite, and a narrow apical band on the second and following tergites (interrupted laterally) pale yellow; tarsi brownish.

Male: Like female except venter of abdomen yellow and forewing 3.7–4.0 mm. long.

Holotype female, 1 mile east of Mount Hamilton, Santa Clara County, California, May 25, 1956 (D. Burdick) associated with *Pinus coulteri.* The allotype and the four paratypes have the same data as the holotype. The holotype and allotype are deposited in the U.S.N.M. One pair of the paratypes has been placed in the California Insect Survey, the remaining pair has been presented to H. K. Townes.

The most striking feature of this new species is its size, which is about twice that of any of the known species. The size may be correlated with that of the suspected host, an undescribed species of *Xyela*, which is twice as large as any known *Xyela*, and is the only one living on Coulter Pine at the Mt. Hamilton locality. This genus of ichneumonids has been associated with *Xyela* since R. A. Cushman (1937) found that the ovarian eggs of the wasp were identical to those found on the *Xyela* larvae. Also, the adult parasites are known only from the vicinity of pines during the period of the growth of the staminate cones. The *Xyela* larvae feed within these cones and drop to the ground shortly after the cones open to release the pollen.

From the same locality, four males of *I. fraternus*, but no females, were collected from Coulter Pine. The females may be associated with the Digger Pine, *Pinus sabiniana* which was shedding pollen on this date (May 21, 1956) while the Coulter Pine did not start shedding pollen for another two or three weeks. This supposition is supported by a correlation of the distribution of *I. fraternus* with *Xyela minor* Norton and *X. bakeri* Konow. These two species range from east to west on a number of species of pines including Lodgepole Pine, *P. contorta*, and Ponderosa Pine, *P. ponderosa*, which are the pines from which *I. fraternus* was collected by Townes and Townes (1951).

I. contortae Townes and Townes was collected from Bishop Pine, *Pinus muricata*, four miles west of Plantation, Sonoma County, California, on April 21, 1957. This wasp has been taken from Lodgepole and Ponderosa Pine (Loc. cit.), and its presence on Bishop Pine is probably due to the similar time of staminate cone development (hence, similar time of *Xyela* larval emergence time) of Lodgepole and Bishop Pine along the Pacific coast. There is apparently no host specificity as the *Xyela* species found on Bishop Pine are different from those on Lodgepole Pine.

I wish to thank H. K. Townes for his encouragement and gift of specimens for comparison.

Literature Cited

Cushman, R. A.

1937. The genus Lysiognatha Ashmead. Jour. Wash. Acad. Sci. 27(10): 438–444.

Townes, H. and M. Townes

1951. A revision of the genera and of the nearctic species of Grypocentrini. Proc. Ent. Soc., Washington 53(6):303–313.

NEW SPECIES OF LINDENIUS FROM WESTERN NORTH AMERICA

(Hymenoptera:Sphecidae)

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The genus *Lindenius* Lepeletier and Brullé is a group of small black crabronids with restricted yellow markings. The species are largely Holarctic and were placed in two subgenera, *Lindenius* and *Trachelosimus* Morawitz, by Pate (1947). In a recent paper on the Palearctic forms de Beaumont (1956) has avoided the use of subgenera and has substituted species groups. He listed five groups and six additional isolated species. Examples of each group have been furnished us by P. M. F. Verhoeff. All of the seven previously known North America species are referable to *Trachelosimus* which corresponds to the *pygmaeus* group of de Beaumont. One of these, *dugesianus* Leclercq (1950), described from Guanajuato, Mexico, we have seen also from Sinaloa, Nayarit, and southwestern United States (southern California, Arizona, New Mexico, western Texas). Arizona specimens were kindly compared with the type by J. Leclercq. We are adding three new species to the *pygmaeus* group and a fourth which seems to be isolated.

Holotypes of the new species will be deposited in the California Academy of Sciences, San Francisco. Paratypes will be distributed to cooperating institutions insofar as possible. We wish to acknowledge the following individuals and institutions for materials used in preparation of this paper: P. M. F. Verhoeff, Netherlands, J. Leclercq, Belgium; J. de Beaumont, Switzerland; E. S. Ross, California Academy of Sciences (C.A.S.) ; G. D. Butler, University of Arizona; K. V. Krombein, U.S. National Museum; W. L. Brown, Jr., Museum of Comparative Zoology; P. H. Timberlake, University of California, Riverside; P. D. Hurd, California Insect Survey, University of California, Berkeley; and A. T. McClay, University of California, Davis.

Lindenius californicus Court and Bohart, new species

Male.—Length of body 4 mm., forewing 2.8 mm. Color, black with whitish yellow as follows: mandible on basal one-half, scape in front, humeral ridge broken medially, pronotal tubercle partly, scutellar spot, femora distally, fore and mid tibiae extensively in front, hind tibia on outer basal one-half, tarsi darkening apically; wings lightly smoky; flagellum in front, tegula, and wing veins brown; mandible tip and pygidium reddish brown.

Pubescence silvery, mostly scanty, dense on clypeus and inner orbit, mesopleuron, and thoracic venter (longest). Puncturation moderate; mesonotal punctures separated by about 1.5 diameters, intervening area shagreened in trough, mostly polished elsewhere; scutellum with many scattered fine punctures; propodeal enclosure faintly striate; pleuron well punctured, rather dull; propodeum and metapleuron shiny but finely shagreened; abdomen shiny, practically impunctured. *Head* with mandible evenly curved; oral fossa oval, distinctly broader than long; clypeal apex truncate, notched submedially (similar to that of female, figure 8); antennal sockets nearly contiguous, well removed from compound eyes, scape nearly straight, flagellum not beaded or ridged beneath (fig. 7); supra-antennal tubercle sharp; ocellocular distance 2.3 times diameter of lateral ocellus; development of head in midline behind ocelli about four-fifths ocellar breadth; occipital carinule ending simply about 1.3 ocellus diameters from hypostomal carina; no genal carina. Thorax with humeral and posthumeral angles present (fig. 1); mesonotum with a deep median trough, somewhat flattened at bottom, sharp-edged laterally, the edges not punctate, area between trough and tegula very slightly concave with a small tubercle at middle, area rounded off at front toward pronotum (fig. 1); propodeum in posterior view with an upper inner smooth area on each side and an outer punctato-striate area.

Female.—Length of body about 6 mm., forewing 3.8 mm. About as in male except as follows: upper frons closely punctured. Ocellocular distance 1.9 times diameter of lateral ocellus. Propodeal enclosure very finely and obliquely striate. Pygidial shape as in fig. 11.

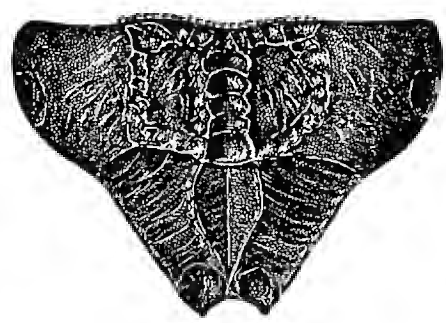
Holotype male (C.A.S.), DAVIS, YOLO COUNTY, CALIFORNIA, June 28, 1957 (H. K. Court). *Paratypes* (all from California), 6 females, Oakley, Contra Costa County, September 26, 1937 (E. C. VanDyke); 1 female, Firebaugh, Fresno County, September 9, 1948 (R. F. Smith); 3 males, 7 females, Tracy, San Joaquin County, May 31–October 26, 1949–1952 (J. MacSwain, R. Smith); 4 males, 1 female, Vallejo, Solano County, August 31, 1953 (E. I. Schlinger); 7 males, 8 females, topotypes, June 27–October 23, 1952–57 (R. Bechtel, R. Bohart, H. Court, J. Downey, A. McClay, E. Schlinger, A. Telford); 2 males, 1 female, Elkhorn Ferry, Yolo County, August 1, 1956 (R. M. Bohart); 1 female, Woodland, Yolo County, August 17, 1955 (A. T. McClay).

We have also seen California specimens from Amador County (Ione) and Mendocino County (Hopland).

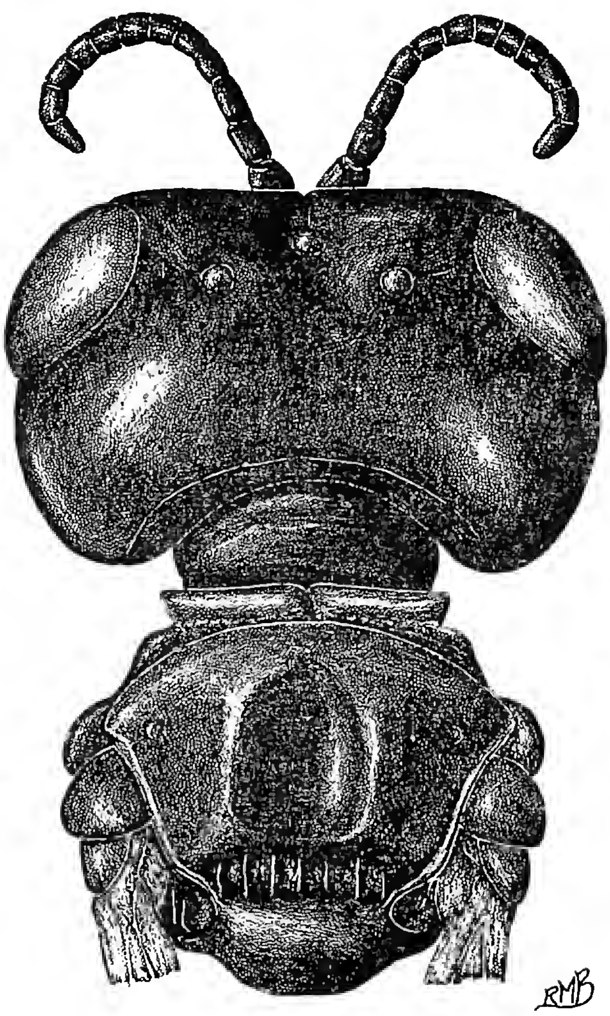
The broad mesonotal trough and lateral tubercle indicate a relationship with *tecuya* Pate. In *californicus* the area between the trough and the tegula is hardly impressed and is not limited anteriorly whereas in *tecuya* this area is definitely depressed and limited by a carina or ridge which runs from the anterior end of the trough laterally to the tegula. A third related species, *inyoensis*, is much like *californicus* but has only a slight central depression instead of the deep trough. All three species, in addition to the mesonotal modeling, are characterized by rather heavy thoracic puncturation.

Lindenius inyoensis Court and Bohart, new species

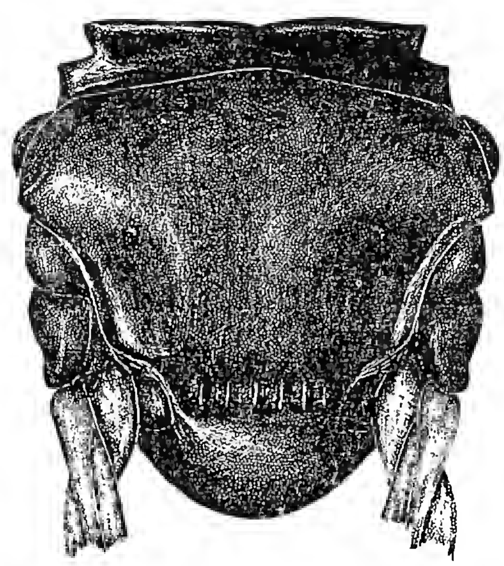
Male.—Markings, pubescence, puncturation, and structure as described for *californicus* except as follows: Head and forelegs missing. Forewing length 3.1 mm. Thorax including tegula all black. Puncturation moderately fine but close on thorax, mesonotal punctures contiguous anteriorly, separated by about a puncture diameter posteriorly, scutellum slightly longitudinally striate, punctured as on posterior part of mesonotum; propodeal enclosure areolate. Mesonotum very slightly depressed medially forming a low rounded submedian ridge, area between ridge and tegula flattened, with a small ridge-like tubercle near middle, area rounded off



2. neomexicanus ♀



1. californicus ♂



3. inyoensis ♀

EXPLANATION OF FIGURES

Figs. 1–3, structural features of *Lindenius* species. Fig. 1, head and most of thorax from above, holotype. Fig. 2, dorsal view of propodeum, holotype. Fig. 3, pronotum, mesonotum and scutellum, holotype.

in front toward pronotum but sharply angled and ridged just in front of tegula (fig. 3).

Female.—About as described in male, head as described for female *californicus* except as follows: Scape partly dark in front; ocellocular distance 2.0 times diameter of lateral ocellus; occipital carinule ending simply about 2 ocellus diameters from hypostomal carina. Pronotum with small sublateral humeral yellow spot and obscure spot on tubercle. Length 5 mm., forewing 3.2 mm. Pygidium (fig. 14).

Holotype female (C.A.S.), LITTLE LAKE, INYO COUNTY, CALIFORNIA, September 3, 1956 (R. M. Bohart). Paratopotype, 1 male, May 20, 1951 (E. I. Schlinger).

Reference should be made to the treatment of *L. californicus* for a discussion of this species.

Lindenius tylotis Court and Bohart, new species

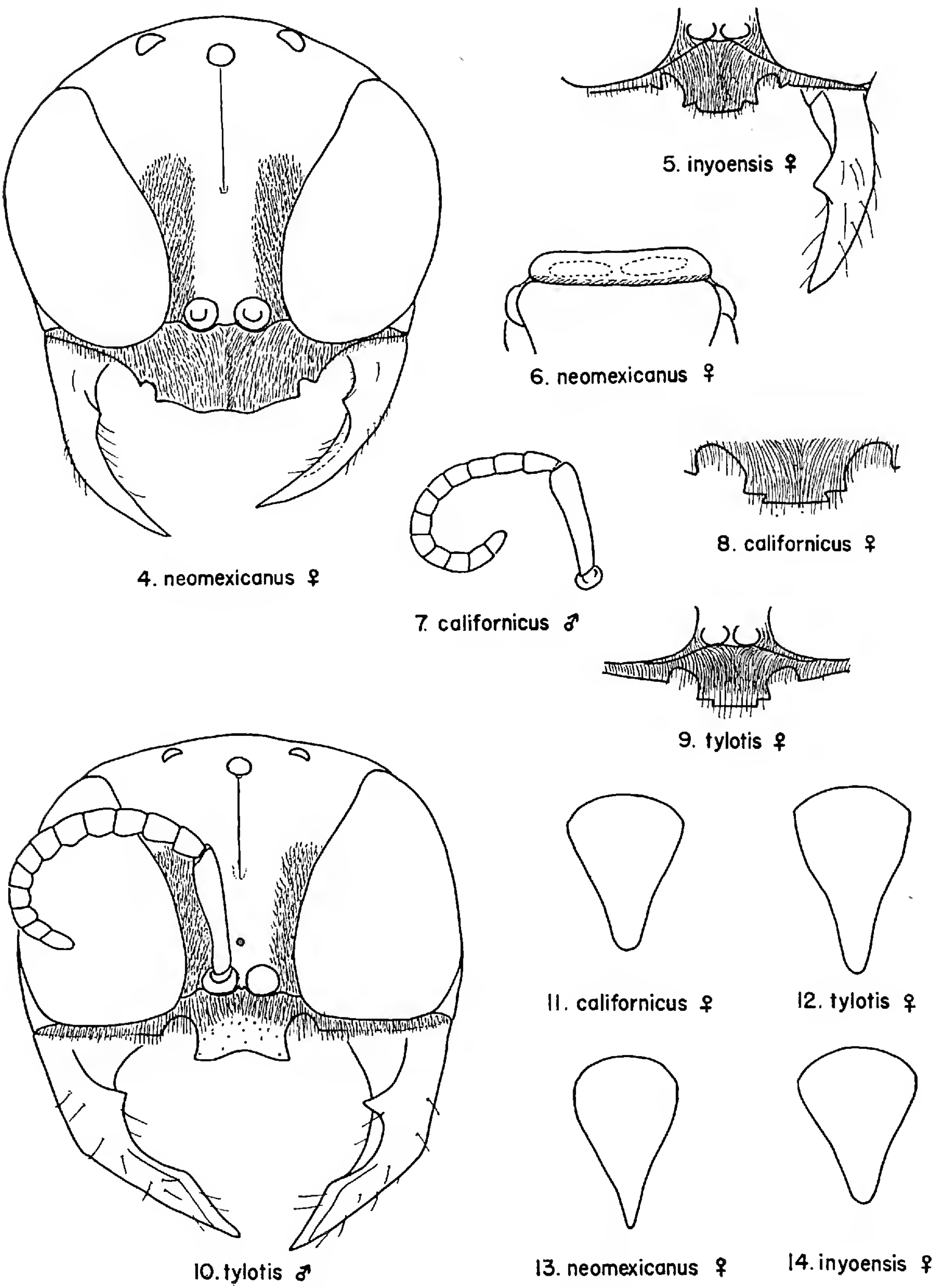
Male.—Length 5.5 mm., forewing 3.5 mm. Markings, puncturation, and structure as described for *californicus* except as follows: Scutellum dark, fore femur extensively yellow in front, hind tibia yellow on basal one-third, flagellum, tegula, and wing veins nearly black. Pubescence of mesopleuron scanty; median cell of forewing with anterior one-half moderately setose; puncturation fine and mostly sparse, punctures of mesonotum minute, separated by about 3 times their diameter, intervening area polished; integument of frons, vertex, mesonotum, scutellum, pleuron, and abdomen shiny. Mandible bent inward near middle, expanded subapically (fig. 10); clypeus with broad, bare, shiny concavity on apical one-half, apex sharply and somewhat irregularly truncate (fig. 10); antennal sockets nearly contiguous; scape swollen in distal two-thirds, flagellum somewhat serrate beneath, each segment with a linear tylus (fig. 10); development of head in midline behind ocelli equal to ocellar breadth; occipital carinule ending in an obtuse angle or tooth, about 2.2 ocellus diameters from hypostomal carina. Mesonotum smoothly convex, with a faint sublateral mark or scar opposite tegula.

Female.—About as in male except as follows: Puncturation of head and thorax a little closer than in male but fine; pubescence of thoracic venter short and moderate; fore femur with a distal yellow spot. Head with mandible evenly curved; clypeus notched subapically, not depressed, outline as in fig. 9; flagellar segments simple, length proportions about as in male; occipital carinule ending simply 1 ocellus diameter from hypostomal carina; ocellocular distance 2.0 times the diameter of lateral ocellus. Pygidium incurved laterally, apical part long (fig. 12).

Holotype male (C.A.S.), DAVIS, YOLO COUNTY, CALIFORNIA, May 15, 1956 (R. M. Bohart). *Paratypes,* 47 males, 33 females, topotypes, April 21–August 15, 1948–57 (R. Bechtel, R. Bohart, H. Court, D. Dahlsten, J. Downey, A. McClay); 40 males, 100 females, Arroyo Seco Camp, Monterey County, California, May 5–June 6, 1956–57 (R. Bechtel, R. Bohart, D. Burdick).

We have also seen specimens from Contra Costa County (Danville), Glenn County (Hamilton City), Mariposa County

(El Portal), San Joaquin County (Corral Hollow), Shasta County (Hat Creek), Tulare County (Wood Lake), and Tuolumne County (Tuolumne City).



Explanation of Figures

Figs. 4–14, structural features of *Lindenius* species. Fig. 4, anterior view of head, holotype. Fig. 5, clypeus and mandible, holotype. Fig. 6, dorsal view of pronotum, holotype. Fig. 7, antenna, holotype. Figs. 8, 9, clypeus paratypes. Fig. 10, anterior view of head, holotype. Figs. 11–14, pygidial outlines.

This species resembles *dugesianus* Leclercq in that the mandibles of the males are similarly shaped. However, those of *tylotis* are more strongly bent and broader subapically. In addition the flagellum of *tylotis* has the segments distinctively ridged and subserrate beneath. The females of the two species are distinguished by the very sharp lateral angles of the median clypeal lobe and the sparser setation of the median cell of the forewing in *dugesianus*. *Tylotis* is the largest species known in North America, but the size is variable. Our largest specimens, with a body length up to 7.5 mm., are females from Arroyo Seco in the coastal mountains of Monterey County and Tuolumne City in the lower Sierra. Other females are as small as 5.5 mm.

Lindenius neomexicanus Court and Bohart, new species

Female.—Length of body 5 mm., forewing 3.8 mm. Color, black with whitish yellow as follows: Mandible mostly, scape in front, flagellum beneath, transverse disconnected spot on pronotum, spot on tubercle, posttegula partly, fore femur distally, fore and mid tibiae broadly in front, hind tibia basally; wings nearly clear, veins brown; mandible, tarsi partly, and pygidial tip reddish brown. Pubescence silvery, mostly scanty, dense on clypeus and lower orbit. Median cell of forewing moderately setose in anterior one-half, sparse otherwise. Puncturation fine, top of head lightly shagreened, mesonotum, scutellum, and postscutellum more heavily so, dull; mesonotal punctures separated by about three times their diameters, intervening area minutely reticulate; enclosure of propodeum divided by broad, longitudinal, pocketed groove, submedially with somewhat oblique carinae, posterior area of propodeum with a central triangular depression, flanked by roughened area traversed by faint transverse carinulae, pleuron with fine scattered punctures, shagreened, propodeum laterally shiny; abdomen practically impunctured, faintly shagreened. *Head* with mandible evenly curved, slender, a weak obtuse tooth on inner margin at basal one-third; oral fossa nearly circular; clypeal apex broad, wavy, extending over mandibles when closed, flanked by small sinus and secondary tooth (fig. 4); antennal sockets separated by one-half their diameter from each other and from compound eye, scape simple, nearly straight, first flagellar segment equal in length to pedicel, following two slightly shorter; no supra-antennal tubercle; dorsal view more than twice as broad as long, least interocular distance about two-fifths distance at anterior ocellus; occipital carina bending inward and ending about four ocellus diameters from hypostomal carina; genal carina complete from mandible base to occipital carina. Pronotum rounded, not carinate, with a narrow posterior groove (fig. 6); mesonotum smoothly convex with a faint sublateral scar opposite tegula. Abdomen with pygidium (fig. 13) sharp, shiny, depressed toward apex.

Male (abdomen missing).—Markings and structure about as in female except as follows: Length of forewing 2.9 mm. Pronotum black. Antennal sockets separated from each other and compound eye by a little more than one-half their diameter; lease interocular distance one-half as great as distance at anterior ocellus. First three flagellar segments subequal, a little shorter than pedicel.

Holotype female (C.A.S.), OMEGA, CATRON COUNTY, NEW MEXICO, August 18, 1951 (E. L. Kessel). Paratype male (R. R. Dreisbach collection, Limon, Colorado, August 16, 1949 (R. R. Dreisbach and R. K. Schwab).

The long oral fossa, the absence of a supra-antennal tubercle, and the simple pronotum relate this species to several of the Palearctic groups. However, the genal carina is a distinctive character of at least group significance. Furthermare, the clypeus is peculiar in its broad median lobe flanked by a weekly developed sinus.

LITERATURE CITED

BEAUMONT, J. DE

1956. Notes sur les *Lindenius* paléarctiques. Mitt. Schweizerischen Ent. Ges. 29:145–185.

LECERCQ, J.

1950. Sur quelque carbroniens du groupe *Lindenius-Entomognathus*. Bull. Inst. Roy. Sci. Nat. Belgique 26(6):1–8.

PATE, V. S. L.

1947. New Pemphilidine wasps, with notes on previously described forms: II. Notulae Naturae Acad. Nat. Sci. Phil. no. 185, p. 1–14.

BOOK REVIEW

THE WATER BEETLES OF FLORIDA. By. Frank N. Young. x+238 pp., 31 text figs. (most are compound). University of Florida Studies, Biological Science Series, Vol. V, No. 1. Gainesville: University of Florida Press. May 25, 1954. Price $6.00.

In his preface Dr. Young writes, "At the beginning of my studies of the water beetles of Florida, I had in mind the production of a work which was to be largely ecological in approach. . . . Unfortunately, the problem of applying names to the various forms proved so difficult and involved that the greater part of my time and effort was expended upon preliminary taxonomic problems, many of which are still unsolved." Others have had this trouble — for instance Dr. L. H. Weld, who wanted to work out the biologies of gall wasps, but instead has been forced to spend a lifetime on the taxonomy of the group—and certainly points out the urgent need for basic taxonomic work.

Based on an examination of some 30,000 specimens, Dr. Young treats the families Dytiscidae, Noteridae, Haliplidae, Gyrinidae, Hydrochidae, Hydrophilidae, Limnebiidae, Dryopidae and Elmidae. The section on ecological distribution (pp. 5–34, 1 map) is the first such treatment for any Nearctic aquatic beetles, and is supplemented by notes throughout the taxonomic part. Since his interests extend far beyond water beetles, and include studies on the distribution of land snails, he has written a discussion of the topography and vegetation of Florida of value to many besides coleopterists.

The taxonomic section (pp. 36–220) is a pleasure to use, and has been drawn up with a view to helping the non-specialist. The language is simple and clear. Differentiating characters which might puzzle the beginner are illustrated in the key to families and subfamilies; outline drawings of a typical example of each of four families, dorsal and ventral with parts named, head the treatment of those families. In the discussion of species the data are given in a regular manner for each: synonomy, diagnosis, taxonomic notes, variation, range, habitat preferences, selected references, and specimens examined. Herein lies one of my few criticisms of the book, and it is a matter of typography only: the prominence given to the last two of the above divisions, as capitalized centered headings, make it difficult to pick out the name, in centered italics, beginning the discussion of each species.

The extent of his field work is shown constantly by his records of widespread captures for species previously listed from only one or two localities, or a single county. Throughout the text there are concise references to the literature (accurately cited in full in a terminal bibliography), an invaluable help.

Dr. Young is to be commended for his treatment of the Noteridae and Hydrochidae as distinct familes, and the Berosinae as a valid subfamily of the Hydrophilidae (through *Derallus* may have to be excluded, as he says). The dytiscid genera *Laccodytes* Régimbart, *Brachyvatus* Zimmerman and *Anodocheilus* Babington (written *Anodochilus* by Young), not recognized in former papers published in this country, are correctly treated. His use of subgenera in *Hydroporus* is less acceptable, but the solution is not one for a regional study. It can be solved only by a thorough reworking of the various genera and subgenera proposed at the expense of *Hydroporus s. lat.*, and must be done with at least a Holarctic basis.

Since *Celina contiger* Guignot was not seen by Young, and has been known only from the type, it may be well to record a male taken at light by Carl Parsons at Sebring, Okeechobee County, September 10, 1942. With it were examples of *Pronoterus semipunctatus* (LeConte) and *P. addendus* Blatchley. For persons using the book beyond the boundaries of Florida it is worth remembering that the rare *Hoperius planatus* Fall resembles the common *Rhantus calidus* (Fabricius) closely enough in general facies to be passed over by the uncritical.

The spelling of one generic name in the Hydrophilidae should be changed: *Spherchopsis* to *Sperchopsis* (pp. 24, 33, 166, 172).

Dr. Young should also be congratulated for his candid admission of many unsolved problems, and for drawing attention to them throughout the text, an excellent stimulus for other students. Some of these puzzles must await adequate collections from the Antillean-Caribbean region and South America; others, especially at the species level in the genus *Hydroporus*, will be unriddled on the basis of U.S.A. material. His book is a fine beginning and guide, and is highly recommended.—HUGH B. LEECH, *California Academy of Sciences, San Francisco.*

A NEW ASTEROLECANIID SCALE ON SUCCULENTS FROM MEXICO

(Homoptera; Coccoidea; Asterolecaniidae)

HOWARD L. MCKENZIE
University of California Davis

The discovery of mounted examples of this most unusual scale came quite by accident during a routine search for new California species of mealybugs. Superficially, the new Asterolecaniid resembles certain mealybugs belonging to the genus *Antonina* which, in the adult stage, are characterized by having much reduced antennae, and legs entirely lacking (apodous). Slide preparations of the new scale were found intermixed in a box of indeterminate mealybugs belonging to Stanford University, this material on loan to the University of California at Davis.

It has been the good fortune of the author to have had the aid of Professor G. F. Ferris, one of the world's foremost Coccidologists at Stanford University, not only in working up the technical description of this extraordinary scale, but also in the delineation of the species. To him the author is deeply indebted, and to show his gratitude wishes here to dedicate the species in his honor.

Following the technical description of the genus and species, a revised key to North American genera of Asterolecaniidae is presented.

Sclerosococcus McKenzie, new genus

Genotype.—This genus is here established for the reception of a single species, *Sclerosococcus ferrisi* McKenzie, described as new in this publication.

Recognition characters.—Apparently to be assigned to the family Asterolecaniidae by reason of its possession of geminate (8-shaped) pores. Body of the adult female entirely membranous except for the three terminal segments, which are somewhat sclerotized. Form ovoid, tapering to the posterior end. Legs entirely lacking in the adult female. Antennae present, reduced to a single segment which is deeply invaginated at its apex and bears three or four quite stout setae. Body with, in the cephalic and thoracic regions both dorsally and laterally, a broad band of rather small, circular pores, each of which seems to contain six loculi and which are for the most part arranged in groups of from two to several. Spiracles each with a crescent of similar, but noticeably smaller pores. Interspersed among these pores are a considerable number of large tubular ducts which terminate at their inner end in a geminate (8-shaped) pore. Between these and the terminal segments of the body is an area which bears dorsally a number of much smaller ducts of a similar type. The fourth to sixth segments from the posterior end of the body bear each a transverse series of quite large circular pores which present a quinquelocular appearance. All pores and ducts present an evident variation in numbers as between opposite sides of the same body in the same individual. Anal opening in a very small ring, hairless and concealed on the dorsal side of the body by the overhanging terminal segment, and on the ventral side by a narrow median sclerotized flap. The sclerotization of the terminal segments of the body extends over the dorsum and around the margin slightly to the ventral side of the body. Embryonic nymphs are contained within some of the available specimens, but none of these are in condition to permit illustration. Antennae six-segmented.

This species seems unmistakably to belong to the family Asterolecaniidae, a family which Ferris (1955) has defined in Atlas of the Scale Insects of North America, Volume VII, pages 8–14. Apparently the most distinctive feature of this family is the common presence of pores of the geminate (8-shaped) type. The new genus, *Sclerosococcus,* differs from any that has been described in the absence of any of the features that are distinctive of other families. It shares with *Mycetococcus* Ferris, a sclerotization of terminal abdominal segments, but is easily differentiated from this and all other Asterolecaniidae by the nature and distribution of its various ducts and pores.

Sclerosococcus ferrisi McKenzie, new species

(Figure 1)

Hosts and distribution.—FROM "SUCCULENTS" FROM MEXICO, TAKEN IN QUARANTINE AT LOS ANGELES, LOS ANGELES COUNTY, CALIFORNIA, August 31, 1933, by W. F. Hiltabrand.

Type material.—Type slide (one specimen) and three paratypes will be deposited in the University of California, Department of Entomology and Parasitology, museum collection, Davis, California. Three paratype specimens will be placed in the Stanford University, California, collection, and two paratypes will be sent to the United States National Museum, Washington, D.C.

Habit.—No information.

Recognition characters.—The description of the genus will apply as the description of this species. Length about 1.00 mm.

As previously mentioned, there are no known species of Asterolecaniidae which this new form approaches. At the moment,

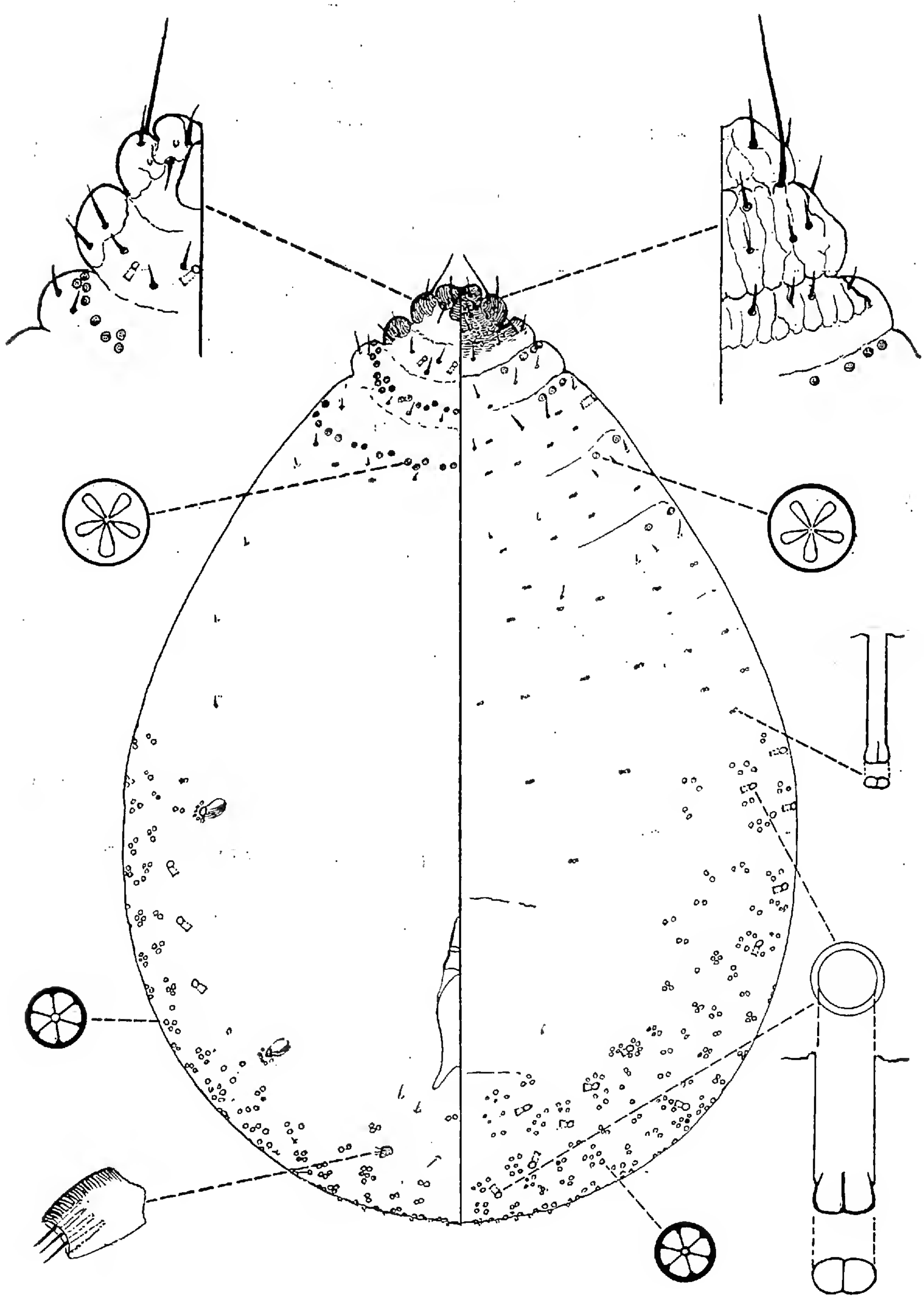


Figure 1.—*Sclerosococcus ferrisi* McKenzie, a new Asterolecaniid scale infesting succulents from Mexico, taken in quarantine at Los Angeles, California.

it appears to stand by itself as a sort of entomological curiosity.

With the addition of the new genus, *Sclerosococcus*, just described, it seems advisable to recast the key to North American genera of Asterolecaniidae as given by Ferris (1955) in his Atlas of the Scale Insects of North America, Volume VII, page 14. The modification of the key is here presented.

Key to North American Genera of Asterolecaniidae

1 Adult female with the apical lobes and posterior extremity of the abdomen strongly sclerotized 2

Adult female at times with the anal lobes sclerotic but this never involving the posterior extremity of the body 3

2(1) Cephalic and thoracic regions, both dorsally and ventrally, with small, circular six loculi pores, these pores arranged in groups from two to several; circular quinquelocular pores present, both dorsally and ventrally, on fourth to sixth abdominal segments from posterior end .... *Scleroscococcus*

Circular six loculi pores lacking anywhere on body; quinquelocular pores not present on abdomen .... *Mycetococcus*

3(1) Adult female with no evidence of anal lobes; with no evidence of pores other than a dorsal circle of quinqueloculars; with a small, dorsal, median, sclerotized plate; occurring as far as known only on palms .... *Mycococcus*

Adult female without these characters, with geminate pores 4

4(3) Adult female always with a distinct, sclerotized, caudal plate overlaying the anal opening .... *Cerococcus*

Adult female without a caudal plate 5

5(4) Adult female without tubular ducts; with only geminate pores on the dorsum .... *Pollinia*

Adult female always with some tubular ducts on dorsum 6

6(5) Adult female always with 7–8 segmented antennae, these well developed .... *Lecaniodiaspis*

Adult female with the antennae represented by mere tubercles .... *Asterolecanium*

EXACT DATA FOR CERTAIN LOCALITY LABELS USED BY F. E. BLAISDELL

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Like many collectors in the same period, it was Dr. Blaisdell's habit in his earlier years to use printed locality labels marked in general terms, such as "Cal." By a series of dots and strokes in red or black ink, he developed a code on these and others to indicate restricted localities. His notebook containing the code is in the Department of Entomology of the California Academy of Sciences, but since he exchanged beetles extensively with other collectors, it may be well to place the data on record. Of course, they should be used only to interpret labels known to have originated from Dr. F. E. Blaisdell, Sr.

Following is his code, in places paraphrased and with counties inserted. Comments by the writer are in parentheses.

On Base Label "Cal.":

(1) With a red dot in the "C"—Stockton, San Joaquin County.
(2) Red dot in lower part of "a"—Sissons, Siskiyou County. (This town, some 10 miles south of Weed on U.S. Highway 99, is now called Mount Shasta City.)
(3) Red dot over "a"—Vicinity of Sacramento, Sacramento County.
(4) Red dot over "a", and a red line at each end of "Cal."—Vicinity of Los Angeles, Los Angeles County.
(5) Red dot over "a", and a red line under "Cal."—Siskiyou County.
(6) "Cal." underlined in red—Shasta Retreat. (Dr. Blaisdell records this as in Shasta County, elevation 2,416 feet, but it is actually in southern Siskiyou County, about a mile north of Dunsmuir.)
(7) Red line above and one below "Cal."—"Summit from Riverton to point of descent through Sierra Nevada, up grade, along the American River." (I judge this to be from Riverton eastward on U.S. Highway 50 to Echo Summit, all in Eldorado County.)
(8) Red line through "Cal."—San Francisco County.
(9) Red line across the top of "l"—Lincoln, Placer County.
(10) Two vertical red lines under "a"—Blue Lakes, Alpine County.
(11) Red line at each end of "Cal."—Tallac, above Lake Tahoe, elevation 6,280 feet. (In Eldorado County, on the southern shore of Lake Tahoe, and just north of Fallen Leaf Lake.)
(12) Vertical red line through "C"—San Mateo County, near Holy Cross Cemetery.
(13) Oblique red line from bottom of "C" to top of "l"—"Big Trees and vicinity." (Calaveras Big Trees, on State Highway 4, in southeastern Calaveras County; this is nearly due east of Mokelumne Hill, which was Dr. Blaisdell's home for eight years.)
(14) "Cal." in red parentheses—Hermit Valley, Alpine County.
(15) "Cal." in black parentheses—Fyffe to Riverton on the South Fork of the American River, Eldorado County.

On Other California Labels:

"*Guerneville, Sonoma Co. Cal.*"—With a red mark added under the "G", is for Monte Rio, Sonoma County. (This is about three miles downstream on the Russian River from Guerneville.)

"*Lake Co. Cal.*"—With a red dot under "a" of Lake, is Anderson's Springs. (This is a few miles northwest of Middletown on State Highway 29.)

"*MOKEL. HILL, CAL.*"—(Dr. Blaisdell practiced medicine at Mokelumne Hill, Calaveras County, 1892–1900.)

(1) "O" with a red center—Glencoe, 10 miles northeast of Mokelumne Hill.

(2) "K" reddened—West Point, 20 miles northeast of Mokelumne Hill.

(3) Red line under "HILL"—Same as preceding: West Point.

"*Napa Co. Cal.*"—With a red dot over first "a" in Napa, is St. Helena, Napa County.

OTHER LOCALITY LABELS:

"*Ky.*"—With a red line over the "y" is Versailles, Woodford County, Kentucky.

"*Or.*"—

(1) "O" with a red line across center—Oregon City, on Willamette River, 15 miles south of Portland.

(2) Plain, no markings—From about Portland and St. Johns on Willamette River.

"*W.T.*"—"Plain label about Seattle, Washington State. A few bearing such in my collection have been taken at Vancouver, Columbia R. Others received by exchange."

EVIDENCE FOR HURRICANE TRANSPORT AND DISPERSAL OF AQUATIC HEMIPTERA

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Although Aerobiology, the study of the dissemination of insects, pollen, microörganisms and other objects, has attracted considerable interest, very little attention has been paid to the part that tropical disturbances play in the transport of insects. Hurricanes are not rare phenomena but occur with amazing frequency in the tropics and provide a dynamic means of distributing organisms.

Three species of water-striders have long held my interest as they are all of West Indian and Central American origin and one in particular was definitely introduced by the hurricanes that lashed Florida in 1947 and again in 1950.

The Fall of 1947, particularly September and October, was one of much tropical disturbance in Florida. Hurricanes originating in the French West Indies struck the coast time after time. These storms, like most hurricanes of the area, began in the Lesser Antilles and moved northwestward across Puerto Rico, Dominican Republic, then across Cuba or the Bahamas into Florida.

When the weather cleared, after a particularly severe hurricane of 1947, I had occasion to collect insects in the Florida Keys. On Big Pine Key, Monroe County on November 27, I found a large colony of *Rheumatobates minutus* Hungerford and *Microvelia portoricensis* Drake. Both species were known before from Puerto Rico and in the case of *R. minutus,* Yucatan and Panama also. I collected many specimens from a small pond in coral rock. The pond was a temporary one that had been filled by the heavy rains of the preceding storms. The two species apparently did not become established as further collecting in the early Spring of 1948 failed to reveal a single specimen. Additional evidence for the hurricane transport of *R. minutus* is shown by its sudden appearance on a small pool at Florida Southern College in Lakeland. It was discovered at the end of the hurricane season of 1950. The small pool on the campus of the university was under almost daily examination by Dr. Roland Hussey prior to the appearance of this insect, so it could have hardly escaped his attention. As in the case of the Florida Keys colony, this one did not become established either but disappeared in a few days. Both alate and apterous forms were collected in the Keys; Dr. Hussey reports alate and partially de-alated specimens from Lakeland.

The third species is *Rheumatobates clanis* Drake and Harris, known previously from British Honduras and northwestern Cuba. I collected it from salt water on the Gulf coast of Florida (Bayport, Hernando County) on a single occasion after the hurricane of 1947, mentioned above. Whether this species has become established is unknown..

It seems plausible that all three of the above species were transported in the adult stage, inasmuch as I do not have nor do I recall seeing nymphs of any of these species. It seems unlikely that eggs or nymphs could have been transported, reached the adult stage yet not managed to survive for a few months.

PREY OF ROBBER FLIES OF THE GENUS STENOPOGON

(Diptera: Asilidae)

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The genus *Stenopogon* is one of the dominant groups of rather large robber flies found in the western United States; only one species is known east of the Mississippi Valley. These flies are strong and active hunters and rather indiscriminate in their choice of food. The writer has just finished classifying the material in the collection of the California Insect Survey, where 20 of the 23 known California species are represented; it is quite evident from this study that the species *S. rufibarbis* Bromley is the most abundant and widespread in California, and most of our prey records refer to this species.

Robber flies feed on a vast array of insects, piercing their prey with a strong beak (hypopharynx) and sucking the body fluids from soft bodied flies and butterflies or heavily armored beetles. Many species are attracted to social Hymenoptera for their food, or to many of the solitary wasps and bees; there is even a record of a large *Pepsis* wasp having been taken by an asilid, *Saropogon* (Hurd, 1952:269). Bromley published several lists of the prey of different species, beginning in 1914, and found that some asilids "specialized," while others were general feeders.

The fragile little robber flies of the genus *Leptogaster* usually attack small ground spiders or winged aphids; certain species of *Stichopogon* also prey on small spiders. The huge flies of the genus *Proctacanthus* often capture butterflies and grasshoppers, but also rely on honeybees for food. Banks (1913) noted that many robber flies preferred to try for their food among the Hymenoptera. Linsley (1944) published a paper on the prey of the asilid *Callinicus calcaneus* in California; here the prey consisted entirely of megachilid and andrenid bees, with an apparent preference for the bright colored *Osmia* species rather than the more abundant but dull colored *Andrena* species.

Melin (1923) published a most complete work on the biology of the Swedish asilids, in which he described the habits of practically all of the known species of Sweden; he described the speci-

---

[1] The writer is indebted to several entomologists for the determination of asilid prey. Dr. Herbert Ruckes determined the Hemiptera, Dr. Paul D. Hurd, Jr. named the Hymenoptera and miscellaneous and Jerry A. Powell the Lepidoptera.

alized mouth structures of the species and furnished excellent illustrations.

The battle for life and food does not always go to the robber fly, as various observers have noted that large web-spiders or large wasps may capture and kill the predatory asilid flies. Bromley (1914) saw a *Crabro* wasp capture and kill the large *Erax aestuans*. Harshbarger (1894) describes a combat between a large American Mantis, *Stegomantis carolina,* and a large species of *Asilus,* which ended in the robber fly losing his legs and his proboscis and escaping when the observer interfered!

We have four prey records for *Stenopogon breviusculoides* Bromley, all from central Califronia; the most interesting is the capture of the mantid, *Litaneutria minor* (Scudder), a specimen taken by Hurd. The same species of robber fly captured the large bombyliid fly *Poecilanthrax arethusa* O. S. and a small bee of the genus *Lasioglossum* (specimens collected by Hurd). There is also one record of the capture of a honeybee (specimen collected by W. C. Bentinck).

In his "Robberflies of Texas" (1934) Bromley recorded the prey of three species of *Stenopogon.* The species *aeacidinus* Williston took a small syrphid fly, a blister beetle *(Epicauta),* a smaller male robber fly of its own species and a stink bug, *Thyanta custator* Fabricius. The asilid *S. latipennis* was captured with a small grasshopper nymph of *Melanoplus* and a different stink bug, *Chlorochroa uhleri* Stål. The asilid *S. subulatus* Wiedemann was taken with a female grasshopper of the genus *Melanoplus.*

In July, 1946, Paul Hurd and Ray F. Smith noticed many specimens of a *Stenopogon* fly while sweeping alfalfa patches at Cedarville and Lake City in Modoc County, California. The species of fly proved to be *S. rufibarbis* Bromley. Seventeen specimens of this robber fly were captured with honey bees (there was a hive near the alfalfa field), some of the predators had taken other insects and a few were without prey. One fly had taken the bee *Anthophora urbana* Cresson, one had taken a winged ant of the genus *Formica.* This species of robber fly was taken with the rhagionid fly, *Dialysis lauta* Loew, at Strawberry, Tuolumne County, California, July 20 (W. C. Bentinck), also with the brilliant colored beetle, *Dichelonyx* sp. in Hope Valley, Alpine

County, California (J. W. MacSwain) and with the beetle *Serica anthracina* Le Conte at Sonora Pass, 9000 feet, Tuolumne County, and Summit Camp, Lassen County, California, June (Hurd). This common asilid was recently taken at Strawberry, California, June, with the bug *Peribalus tristis* Van Duzee as prey.

Two other species of *Stenopogon* in the survey collection have been pinned with prey. *S. cazieri* Brookman was taken with the small butterfly, *Strymon saepium* Boisduval, San Antonio Valley, California, June (C. D. MacNeill). *S. obscuriventris* Loew was taken with the brilliant blue beetle, *Chrysocha cobaltina* LeConte, at Mt. Laguna, San Diego County, California, July (B. J. Adelson), also taken with a green pentatomid, *Thyanta pallidovirens* Stål, in Del Puerto Canyon, Stanislaus County, California, April (Hurd).

Literature Cited

Banks, N.

1913. Asilids catching Hymenoptera. Proc. Ent. Soc. Wash., 15:51.

Bromley, S. W.

1914. Asilids and their prey. Psyche, 21:192–198.

1923. Observations on the feeding habits of robber flies. Part I. *Proctacanthus rufus* Will. and *P. brevipennis* Wied. Psyche 30:41–45.

1930. Bee-killing robber flies. Jour. N. Y. Ent. Soc., 38:159–175.

1934. The robber flies of Texas. Ann. Ent. Soc. Amer., 27:74–110.

1936. Asilids feeding on bumblebees in New England, Psyche, 43:14.

1946. The Diptera or true flies of Connecticut. Asilidae. Third Fasicle, Part VI, 3–4 (on prey).

Harshbarger, W. A.

1894. The bold Robber fly and the Mantis. Ent. News, 5:169.

Hurd, Paul D. Jr.

1952. Revision of the Nearctic species of the Pompilid genus *Pepsis* (Hymenoptera, Pompilidae). Bull. Amer. Mus. Nat. Hist., 98: 257–334.

Linsley, E. G.

1944. Prey of the robber fly *Callinicus calcaneus* Loew. Pan-Pac. Ent., 20:67–68.

Melin, D.

1923. Contributions to the knowledge of the biology, metamorphis and distribution of the Swedish asilids. Zool. Bid. från Uppsala, 8: 7–53 (on prey).

A SMALL COLLECTION OF DIPTERA FROM MAGUEY NEAR MEXICO CITY, MEXICO

W. E. SNOW
Division of Health and Safety, Tennessee Valley Authority, Wilson Dam, Alabama

While visiting the ganaderia of Don Roberto Sanchez Tapia near Tlalnepantla, Mexico City, Mexico, on November 10, 1955, a maguey plant (*Agave* sp.) was observed with nearly a liter of foul water in the base. The center of the plant, normally used by local people for making pulque, had apparently been removed several months before as large rat-tailed maggot larvae were then evident in the wet cavity. Several other plants with the centers rotted away were also inspected, but no other collections were found. These maguey plants were randomly distributed over open hilly country between 2200–2400 meters, although plots of maguey under cultivation were also observed on flat hilltops nearby.

In this region rainfall drops off rapidly after September with monthly averages of 122.3 mm., 38.0 mm., 16.6 mm., and 8.8 mm. being recorded from September through December. Average monthly temperatures for the latter part of the year as measured at nearby Teoloyucan are September 16.5° C., October 14.7° C., November 13.2° C., and December 12.4° C.

The sample of foul water and samples of moist organic debris present in an encrusted layer just above the water line in the base of the maguey were taken to a residence in Mexico City to observe and record emergence of the insect forms then in an immature stage. A few larvae and pupae of the mosquito *Culex stigmatosoma* Dyar were apparent in the water and emergence of adults continued for about a week after the sample had been removed from the field. Several larvae belonging to the family Heleidae were present in the ooze removed from the bottom of the cavity. They become quite active after the water with its rich organic content was placed under room conditions. An adult male determined as *Culicoides albomacula* R. & H. emerged on January 1, 1956, but the others were apparently lost due to an oily scum which appeared at the surface as decomposition of the organic matter continued. Judging by the time necessary for *C. albomacula* to complete its development, this species probably overwinters in the larval stage similar to tree-hole *Culicoides* in the United States. The syrphid larvae were also affected adversely by the scum and did not survive beyond January. Judging by their size and length of the posterior air tube, they are probably larvae of the genus *Meromacrus* or *Eristalis*. In an effort to strand the scum on the sides of the container, the rearing jar was tilted excessively and the water level replenished by tap water during the first week in January. Several days later a mosquito larva with a silvery abdominal sheen was noted actively moving among the debris. Within two weeks pupation had taken place and a female *Aedes muelleri* Dyar later emerged. It is probable that some temperature or chemical conditioning was necessary before the egg would hatch upon submergence since ample opportunity for wetting occurred when the collection was brought from the field to Mexico City in November over very poor roads. As a member of the *Ochlerotatus* group, it was not expected that *A. muelleri* would occur in maguey but rather in ground pools. Samples of moist debris from the encrusted ring which occurred around the inner part of the maguey plant just above the water line were also productice of adult Diptera. In January a female dolichopodid of the genus *Medetera* and a muscid fly of the genus *Coenosia* emerged from this layer. Representatives of both genera are commonly reared from moist debris in tree cavities in the United States. A fungivorid, *Leiaamabilis* (Will.), also appeared from the sample of moist debris in January. A female pseudoscorpion of the genus *Dinocheirus* sp. was found crawling in the debris after the sample was taken from the field.

The occurrence of both *A. muelleri* and *C. albomacula* in maguey is of interest since the larval habitat of neither species has previously been defined in the type locality (Mexico City).

Acknowledgment is gratefully given to the following taxonomists for identification of the various arthropods represented in this single collection: Drs. F. C. Harmston (Dolichopodidae), C. C. Hoff (Chernetidae), C. W. Sabrosky (Muscidae), A. Stone (Culicidae, Fungivoridae), and W. W. Wirth (Heleidae).

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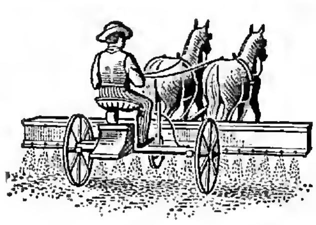

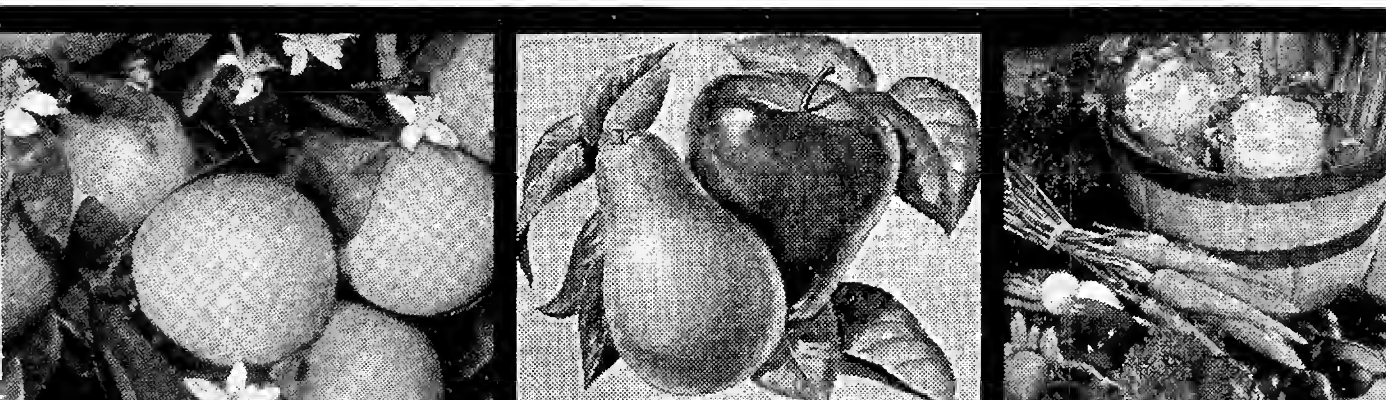

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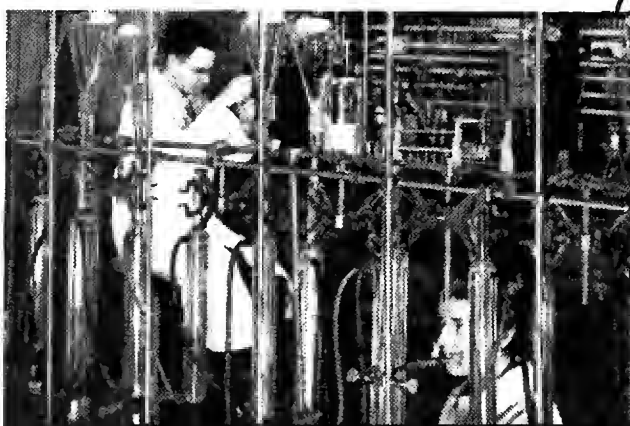

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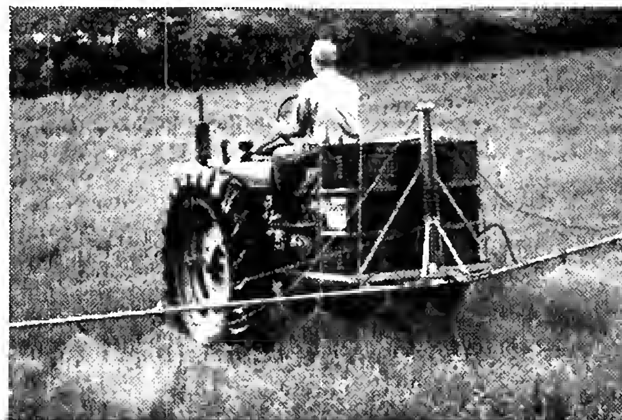

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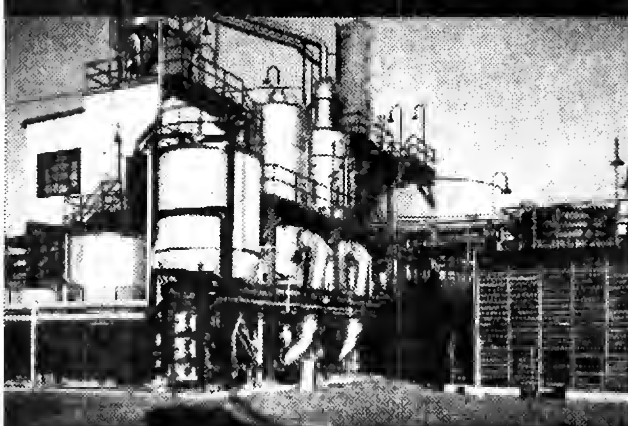

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ARTHROPOD ENEMIES OF THE LODGEPOLE NEEDLE MINER, RECURVARIA MILLERI BUSCK
(Lepidoptera:Gelechiidae)

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Forest Service, U. S. Department of Agriculture

The lodgepole needle miner, *Recurvaria milleri* Busck, has many natural enemies. Studies have shown that the most numerous, in terms of kinds and numbers, are other arthropods. The majority of these are either parasitic or predaceous insects, but some are predaceous mites and spiders. In California, where the needle miner is a major pest of lodgepole pine, its arthropod enemies are important because of the part that they may play in controlling outbreaks.

Natural enemies of the needle miner have been studied in conjunction with other biological investigations of outbreaks over the past 40 years. These studies have shown what kinds of arthropods parasitize or prey upon the needle miner, especially during the larval and pupal stages. This paper contains a compilation of the species of insects, mites, and spiders recorded through 1956 as natural enemies of this forest pest. The exact role of each is not well known, but altogether they probably exert an important influence on needle miner populations.

The studies on which this paper is based have been made in areas where needle-miner outbreaks were in progress. The principle outbreaks have been in the lodgepole pine forests in Yosemite National Park on the headwaters of the Tuolumne River, Tuolumne County, and the Merced River, Mariposa County. There have been three periods of outbreaks in these forests since 1910. The first extended from about 1910 to 1922; the second from about 1933 to 1941; the third started in 1947 and was still active in 1957.

The first published records on natural enemies of the lodgepole

[1] Maintained at Berkeley, California, in cooperation with the University of California.

needle miner are of parasites discovered by Patterson (1921) during studies conducted between 1917 and 1919. Yuill[2] found several more parasitic species in 1937 and later attributed a sudden decline in needle-miner populations to parasitism. More recently, McLeod (1951) published additional information on the parasites of this insect.

Since 1954, investigations on the natural enemies of the needle miner have been intensified, and many additional parasitic species have been discovered. The present list of species known or suspected to be parasites includes representatives of 14 families and 41 genera. Most of them belong to the order Hymenoptera; a few to Diptera.

The only records of predators are those obtained in the most recent studies. Only one of the predaceous species is an insect, belonging to the order Diptera. Of the others, two are mites (Acarina) and the remaining two are spiders (Araneida).

Table 1 contains a list of the arthropod enemies of the lodgepole needle minei.[3] The list is divided into four groups, and in each group the species are listed phylogenetically. The first group includes only parasites that have been reared from needle miner larvae and pupae, leaving no doubt as to their direct association with the host. Some of the species in this group, however, may be hyperparasitic. The next two groups have a more remote association with the host. The second group includes species reared from lodgepole pine foliage infested with needle miner larvae and pupae. The third group includes parasitic species collected near lodgepole pines infested with needle miners. Both of these groups contain species that are probably needle miner parasites, but convincing evidence of this fact is lacking since they were not reared specifically from this host. The fourth group consists of predators, mainly arthropods other than insects found feeding upon needle miner larvae.

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[2] Yuill, J. S. Life history and control of the lodgepole pine needle miner, *Recurvaria milleri* Busck, in Yosemite National Park. Season of 1938. Forest Insect Laboratory, Berkeley, Calif. (Manuscript report) February 3, 1939.

[3] The assistance of the Insect Identification and Parasite Introduction Section, Entomology Research Division, Agricultural Research Service, U. S. Dept. of Agriculture, is acknowledged in identifying this material. Identifications were made by specialists whose names appear in the table.

Table 1.—Parasites and predators of the lodgepole needle miner

Order & Family	Genus & Species	Determined by
	Species reared from needle-miner larvae or pupae	
HYMENOPTERA		
Braconidae		
	Meteorus n. sp.	C. F. W. Muesebeck '56
	Apanteles californicus Muesebeck	" "
Ichneumonidae		
	Scambus aplopappi (Ashmead)	R. A. Cushman '36
	Itoplectis behrensii (Cresson)	(Muesebeck et al, 1951)
	? *Phaeogenes* n. sp. "Probably represents a new genus & species"	L. M. Walkley '56
Eulophidae		
	Sympiesis sp.	B. D. Burks '56
	Dicladocerus n. sp.	" "
	Zagrammosoma americanum Girault	" "
Encyrtidae		
	Copidosoma sp.	" "
Pteromalidae		
	Amblymerus spp.	" "
	Hypopteromalus sp.	" "
Chalcididae		
	Spilochalcis side (Walker)	" "
	Species reared from needle-miner-infested foliage	
HYMENOPTERA		
Brachonidae		
	Aphidius varigatus Smith	C. F. W. Muesebeck '56
	Eubadizon Probably n. sp.	" "
	Apanteles alticola (Ashmead)	" "
Ichneumonidae		
	Scambus hispae (Harris)	R. A. Cushman '18
	Cremastus evetriae Cushman	" "
	Itoplectis conquisitor (Say)	L. M. Walkley '56
	Hemiteles sp.	" "
	Horogenes sp.	" "
Trichogrammatidae		
	Trichogramma sp.	A. B. Gahan '36
Eulophidae		
	Sympiesis n. sp.	B. D. Burks '56
	Tetrastichus sp.	" "
	Zagrammosoma n. sp.	" "
	Chrysocharis n. sp.	" "
	Derostenus sp.	" "
	Diaulomorpha n. sp.	A. B. Gahan '36
	Cirrospilus flavaviridis Crawford	" "
	Achrysocharoides n. sp.	" "
	Euderus sp.	" "

Order & Family / Genus & Species	Determined by	
Thysanidae		
Thysanus sp.	B. D. Burks	'56
Encyrtidae		
Aphycus sp.	"	'53
Blastothrix longipennis Howard	"	"
Lyka sp.	"	'52
Chalcididae		
Spilochalcis albifrons (Walsh)	"	'55
DIPTERA		
Empididae		
Tachydromyia sp.	P. H. Arnaud	'56
Chamaemyiidae		
Leucopis sp.	C. W. Sabrosky	'53

Species collected in needle-miner-infested stands

Order & Family / Genus & Species	Determined by	
HYMENOPTERA		
Ichneumonidae		
Campoletis sp.	L. M. Walkley	'56
Mymaridae		
Ooctonus sp.	B. D. Burks	'56
Polynema sp.	"	"
Eulophidae		
Tetrastichus silvaticus Gahan	B. D. Burks	'56
Encyrtidae		
Syrphophagus sp.	"	"
Torymidae		
Torymus sp.	"	'53
Pteromalidae		
Tridymus sp.	"	'56
Spintherus sp.	"	"
Eurytomidae		
Eurytoma sp.	"	"
Platygasteridae		
Platygaster sp.	C. F. W. Muesebeck	'56
Sphecidae		
Xylocelia sp.	K. V. Krombein	'56
Passaloecus mandibularis (Cresson)	"	"

Species found feeding on needle miner larvae

Order & Family / Genus & Species	Determined by	
DIPTERA		
Empididae		
Euthyneura sp.	P. H. Arnaud	'56
ACARINA		
Anystidae		
Anystis sp.	E. W. Baker	'57

Order & Family	Genus & Species	Determined by
Erythraeidae		
	Balaustium sp.	" "
ARANEIDA		
Thomisidae		
	Misumenops sp.	R. E. Crabill, Jr. '57
Salticidae		
	Sitticus sp.	" "

Copidosoma sp. is the only parasite listed in this table which is believed to attack the egg. No parasites or predators have been observed to attack the adult stage of the needle miner.

The value of the different species as control agents has not been carefully determined, but some observations on this point have been made. Patterson (1921) credited 12 per cent of the needle-miner parasitism in 1919 to *Eutelus*[4] n. sp., *Copidosoma* sp., *Epiurus*[4] sp., *Aethecerus* n. sp., *Apanteles* n. sp., *Habrocytus* n. sp., and an unnamed eulophid. In 1939 Yuill[2] reported the most common parasites as *Apanteles californicus* Mues., *Amblymerus* n. sp., *Neoderostenus*[4] n. sp., and *Phaeogenes* n. sp. McLeod[5] reported these same four parasites by relative abundance in rearings made in 1949. He found that *Apanteles* sp. was most numerous, *Amblymerus* sp. next, *Phaeogenes* sp. third, and *Neoderostenus* sp. fourth. However, in material reared in 1951, McLeod reported that *Amblymerus* sp. was most numerous, *Dicladocerus* sp. second, *Apanteles* sp. third, and *Neoderostenus* sp. fourth. Since 1954 the five most common parasites of the needle miner, judged from the consistency with which they have occurred in rearing by the senior author, have been *Apanteles californicus* Mues., *Sympiesis* sp., *Dicladocerus* sp., *Zagrammosoma americanum* Gir., and *Copidosoma* sp.

Parasite species that have occurred most consistently during the last two outbreak periods (1933–1941; 1947 to this writing (1957)) are listed separately in table 2. Four of them—*Apanteles californicus* Mues., *Scambus aplopappi* (Ashm.), *Copidosoma* spp., and *Amblymerus* spp.—also were taken during the previous outbreak (Patterson, 1921).

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[4] Synonomy: *Eutelus*=*Amblymerus*; *Epiurus*=*Scambus*; *Neoderostenus*=*Achrysocharoides*.

[5] McLeod, J. H. Excerpt from November 1951 monthly report of the Biological Control Investigations Laboratory, University of British Columbia, Vancouver, B. C. (Manuscript report)

Table 2.—Parasites taken most often in latest two needle-miner outbreaks

Order & Family	Genus & Species	Number times collected 1931-37	1953-56	Total
HYMENOPTERA				
Braconidae				
	Apanteles californicus Muesebeck	4	1	5
Ichneumonidae				
	Scambus aplopappi (Ashmead)	3	0	3
Eulophidae				
	Sympiesis sp.	1	3	4
	Dicladocerus sp.	2	3	5
	Zagrammosoma americanum Girault	2	2	4
	Tetrastichus spp.	2	3	5
Encyrtidae				
	Copidosoma spp.	1	4	5
Pteromalidae				
	Amblymerus spp.	3	3	6
Chalcididae				
	Spilochalcis spp.	2	2	4

Literature Cited

McLeod, J. H.
1951. Notes on the lodgepole needle miner, *Recurvaria milleri* Busck (Lepidoptera:Gelechiidae), and its parasites in western North America. Canad. Ent. (83):295:301.

Muesebeck, C. F. W., K. V. Krombein, H. K. Townes, and others
1951. Hymenoptera of America north of Mexico, Nynoptic Catalog. U. S. Dept. Agric., Monog. 2. 1420 pp.

Patterson, J. E.
1921. Life history of *Recurvia milleri* the lodgepole needle miner, in the Yosemite National Park, California. Jour. Agr. Res. 21:127–142 (illus.).

A belated correction: *Sphinx* (*"Spinx"*) *sequoiae* Bdv. Under "Notes on the Larvae of Certain Lepidoptera," 1905, Ent. News, XVI: 153, I described what I though to be the egg, larva and pupa of this rather small gray sphinx moth, from Shasta County, California. But the pupa, or pupae did not hatch. What were probably described were the early stages of *Smerinthus jamaicensis* Drury.

As far as I am aware, the early stages of *Sphinx sequoiae* are still unknown, but its caterpillar may well feed upon one of the coniferous trees.—Francis X. Williams.

A STUDY OF THE NORTH AMERICAN GENUS MEGARAFONUS CASEY

(Coleoptera:Pselaphidae)

R. O. SCHUSTER AND G. A. MARSH

The genus *Megarafonus* was proposed by T. L. Casey in 1897 for the single species *M. ventralis* from northern Oregon. A second species, *M. fundus,* was described by Park in 1943 from southern Mexico, discontinuously extending the range by nearly 2100 miles. As a result of newly acquired material, three additional species are included in the genus, two from Oregon which correspond with Casey's original generic diagnosis, and one from north central California which digresses markedly in the male genitalia and other pertinent structures.

In view of some external divergences and the disjunct geographic area, permission to dissect the type of *M. fundus* was requested of Dr. Park. He kindly agreed, and we owe him a sincere debt of gratitude, as the results confirmed suspected genitalic divergence from that of *Megarafonus s. str.* Dr. Park is aware of and in agreement with our treatment of the genus.

The genus now extends from Alaska to Mexico with three areas of differentiation, each represented by a newly proposed subgenus. Further discussion of these areas and representative species will be considered within each species group.

The morphological characters which appear at present to be of generic rank and partially illustrated in figures 1 and 2 are as follows: (1) body pubescence mostly short, but with some long, curved setae; (2) head with two vertexal foveae not connected to frontal sulcus; (3) frontal sulcus open between antennal bases; (4) antennae of eleven segments in both sexes, third segment small, club indistinct, of three segments; (5) maxillary palpi of four segments; (6) abdomen in both sexes of five visible tergites and seven visible sternites; (7) mesocoxae contiguous, coxal cavities not confluent; (8) metacoxae contiguous; (9) two, large, equal tarsal claws.

The following key will separate two related genera, *Caccoplectus* and *Sonoma,* which could possibly be confused with *Megarafonus* and includes the proposed subgenera.

1. Tarsi with single claw .... *Caccoplectus*
   Tarsi with two equal claws 2
2. Frontal fovea (sulcus) not extending between antennal tubercles .... *Sonoma*
   Frontal fovea (sulcus) extending between and separating antennal tubercles 3
3. Cervix lacking setae or pubescence; base of male genitalia less than one-third total length, with median longitudinal suture on dorsal surface .... *Megarafonus, s. str.*
   Cervix with setae or pubescence; base of male genitalia greater than one-third total length, medain longitudinal suture of dorsal surface obsolete 4
4. Cervix with collar of monaxial setae, frontal sulcus nude; base of male genitalia nearly one-half total length; parameres void of apical setae .... *Nanorafonus*
   Cervical and frontal sulcus filled with frosted squamose pubescence; base of male genitalia one-half total length; parameres with apical setae .... *Nafonus*

Subgenus Megarafonus Casey

To this subgenus are restricted those species of *Megarafonus, sensu lato,* which have a nude frontal sulcus and cervical area. Also, the male genitalia have a small base, less than one-third the total length and a well developed median dorsal suture.

They occur within the moist coastal conifer forests extending from northwestern California into southern Alaska and may occupy the entirety of this range, being found at both extremes. *M. ventralis* has been recorded from southern Alaska and northern Oregon and will probably occur wherever suitable environments exist between these locations. Two new species are from northwestern and south coastal Oregon, and females of an as yet unidentified species have been taken in Del Norte County, California. It is unlikely that this subgenus will occur much further south in California.

A critical analysis of some twenty external features yielded no characters suitable for species recognition. Therefore, it has been necessary to recognize species of this subgenus on the basis of strikingly different divergences of the asymmetric male genitalia which assume genitalic configurations as indicated in figures 10–14.

As can readily be seen, the asymmetry for any single species, with the exception of *M. ventralis,* is either to the left or to the right using characteristics of the base for orientation. Furthermore, the possibility that the median lobe may rotate at the point of juncture on the base and thus account for a false sinistral or dextral condition is eliminated since the median lobe is rigidly fused to the base.

Megarafonus (Megarafonus) lentus Schuster and Marsh, n. sp.

Male.—Head 0.43 mm. long × 0.48 mm. wide; pronotum 0.51 mm. × 0.61 mm.; elytra 0.61 mm. × 0.73 mm.

Testaceous; dorsoventrally compressed; facies and proportions of parts as illustrated in figure 1; vestiture mainly short, dense, but with occasional long, curved setae. Head with large eyes, six or seven facets visible from above; two, small vertexal foveae behind posterior margin of eyes; median frontal sulcus (fovea) open anteriorly, widest at center; antennae of eleven verticillate segments, 1.0 mm. long; maxillary palpi of four segments; ventral surface of head without obvious sexual modification. Pronotum with two large foveae at basal angles, and two small basal and one median fovea at the apices of a nearly equilateral triangle, the median within a larger triangular depression. Elytra apparently connate, each elytron with about four major foveae; subhumeral fovea and epipleural sulcus lacking; wings absent. Abdomen of five visible tergites, the first four with lateral margins, the last two with noticeable spiracular pits; seven sternites, the second, third, and fourth with an anterior transverse sulcus, the sixth distally emarginate, the seventh a slightly asymmetric penal plate with rounded apex (fig. 4). Legs simple. Genitalia as illustrated (fig. 10).

Holotype male was collected at SEASIDE, CLATSOP COUNTY, OREGON, April 7, 1955, by Vincent D. Roth. Paratype males were collected by Mr. Roth as follows: one male, Seaside, same data as for holotype; two males six miles east of Buxton, Washington County, Oregon, April 6, 1955, and one male Saddle Mountain, Clatsop County, Oregon, June 5, 1955.

The holotype is deposited in the California Academy of Sciences, one paratype in the collection of Dr. Orlando Park, the remaining paratypes in the collection of the California Insect Survey.

The males of this species, as previously indicated are seemingly separable only on the basis of the male genitalia and specifically, the median lobe. The divergence of the median lobe would indicate that *M. lentus* is most distantly removed from its congeners. However, the difference in this structure is not so great as to obscure the relationship to *M. ventralis.* External characters which eventually may be of some diagnostic value when the range of variation becomes established include the chaetotaxy of the labrum and seventh sternite as well as the relative positions of the elytral fovea. The females of this species have not as yet been associated with the males. However, they differ from the males by having a simple, non-emarginate sixth and apically emarginate seventh ventral abdominal sternite.

MEGARAFONUS (MEGARAFONUS) VENTRALIS Casey

Megarafonus ventralis Casey, Ann. N. Y. Acad. Sci., IX, p. 550.

This species was excellently considered in the original description. It is separable from *M. lentus* on the basis of the male genitalia (fig. 13).

The known records for this species are as follows: Alaska, Massett, Queen Charlotte Island, Rev. Keene. Oregon, Portland, Hubbard and Schwarz; Buxton, Washington County, V. D. Roth.

Unlike the other species of *Megarafonus s. str.*, which have but one condition of asymmetry, *M. ventralis* exhibits both sinistral and dextral male genitalic forms within a single species population. This anomaly is further discussed here as pending further investigation it may well apply to all species of this subgenus.

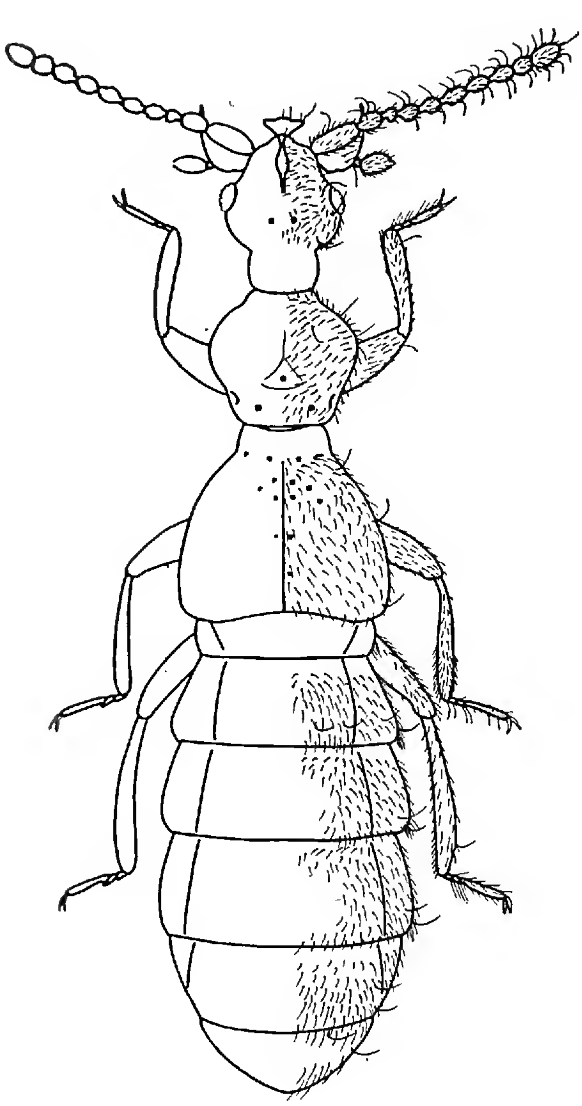
Three males of *M. ventralis* from Buxton, Washington County, Oregon, yielded both genitalic forms, two in which the asymmetry is to the left, and one, a mirror image, in which the asymmetry is to the right.

There is the possibility that the underlying cause for the development of mirror images in the genitalic structure could be a species isolating mechanism. At present, however, we prefer to postulate genitalic variability with one form possibly sterile, instead of sympatric sinistral and dextral species.

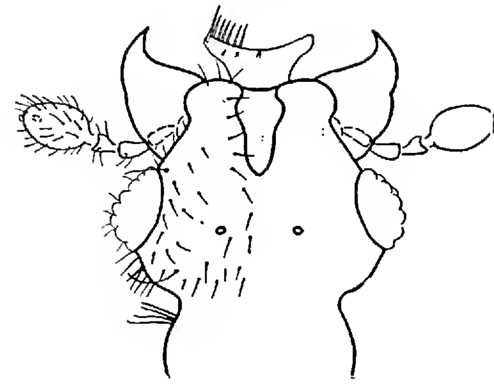
In a specimen from Gates, Marion County, Oregon, the genitalic structure (fig. 11) is comparable to *M. ventralis* (fig. 13) but differing mainly in the greater arcuation of the left paramere and median lobe. The degree of difference is not so great that it may not be considered to fall within the probable range of variability of *M. ventralis* even though males of *M. ventralis* from three other localities are rather constant in the shape of this structure.

EXPLANATION OF FIGURES

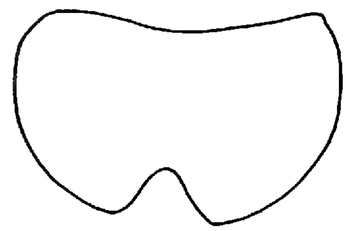
Fig. 1, dorsal view, male. Fig. 2, head capsule, dorsal view, male. Fig. 3, sixth sternite, male. Fig. 4, seventh sternite male. Fig. 5 seventh sternite, female. Figs. 6, 7, dorsal and lateral views, male genitalia.



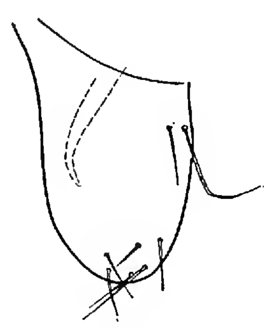
1 lentus



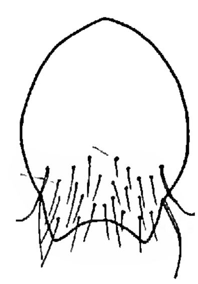
2 parvus



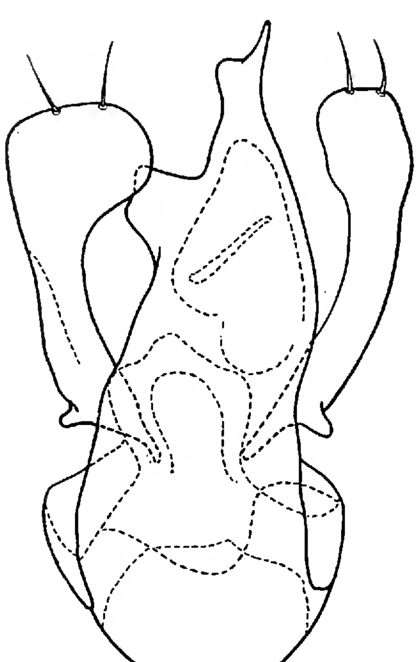
3 ventralis



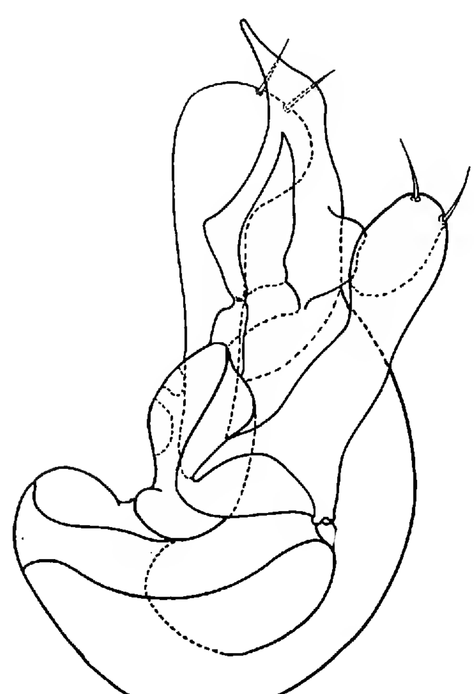
4 lentus



5 lentus



6 fundus



7 fundus

Megarafonus (Megarafonus) mancus Schuster and Marsh, n. sp.

Male.—Head 0.44 mm. long×0.49 mm. wide; pronotum 0.57 mm.×0.65 mm.; elytra 0.57 mm.×0.81 mm.

As described for *M. lentus* with the exception of the male genitalia (fig. 12).

Holotype and two male paratypes were collected at GOLD BEACH, CURRY COUNTY, OREGON on May 11, 1954 by J. Capizzi. The holotype is deposited in the California Academy of Sciences, the paratype in the California Insect Survey.

The males of this species are distinct on the basis of the genitalia. The configuration of the median lobe, while unique, combines and exaggerates those characteristics of both *M. lentus* and *ventralis*. The extreme apex of the median lobe has broadened considerably and has an arcuately incised inferior flange which is subtended by an elongate projection shorter than but resembling that of *M. lentus*. Females have not been associated with the males.

The type locality is in south coastal Oregon, closely approximating the extreme southern periphery for the entire distributional range of *Megarafonus s. str.*

Nanorafonus Schuster and Marsh, new subgenus

Type: *Megarafonus parvus*, Schuster and Marsh, new species.

Although similar in many respects to other members of *Megarafonus, s. str.*, the following species has been placed in a new subgenus mainly on the basis of the male genitalia and the presence of monaxial cervical setae. However, other characters such as its considerably smaller size and toothless condition of the mandibular rami may prove to be equally diagnostic.

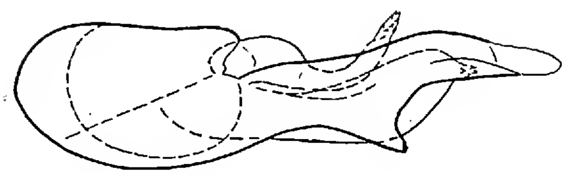
Megarafonus (Nanorafonus) parvus Schuster and Marsh, n. sp.

Head 0.22 mm. long×0.27 mm. wide; pronotum 0.31 mm.×0.37 mm.; elytra 0.36 mm.×0.46 mm.

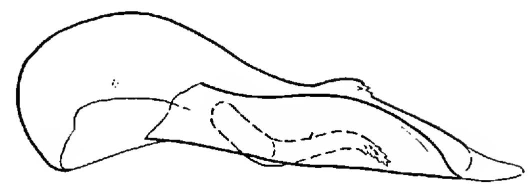
Testaceous; vestiture mostly short but with occasional long, peripheral setae. Head shaped as illustrated (fig. 2); two vertexal foveae not connected to frontal sulcus, frontal sulcus open between antennal tubercles; antennae of eleven segments, the third small, the last three forming an indistinct club; mandibles arcuate, the rami essentially toothless; maxillary palpi of four segments, proportioned as in figure 2; sides and bottom of cervix with a collar of monaxial setae. Pronotum with fovea near each lateral basal angle, two small foveae near base and one small median lovea

EXPLANATION OF FIGURES

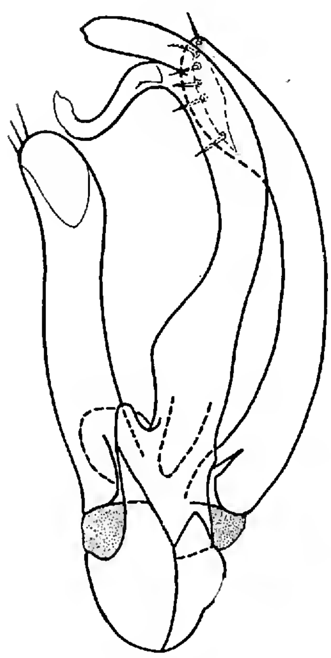
Figs. 8–14, male genitalia (dorsal views excepting fig. 9 which is lateral).



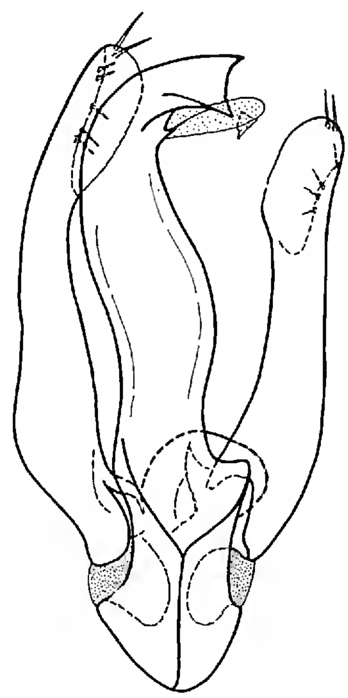
8 parvus



9 parvus

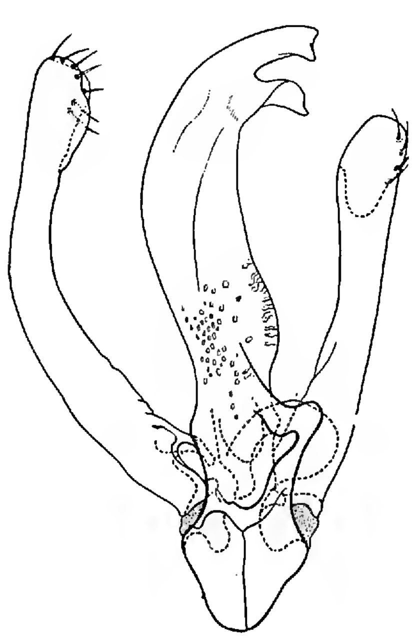


10 lentus

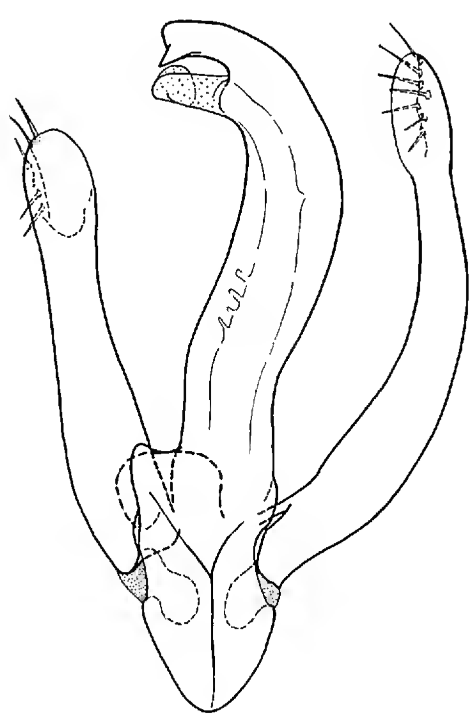


11 ventralis

12 mancus



13 ventralis



14 ventralis

at basal one third. Elytra with fovea at origin of sutural stria and one discal fovea slightly lateral and apical to the former; epipleural foveae and sulcus absent. Abdomen of five visible tergites, the first four with lateral margins, the first three with anterior, transverse pubescent foveae; seven visible sternites, 2, 3, and 4 with transverse pubescent foveae, the sixth emarginate, the seventh an oval penal plate. Legs lacking any particular modification; second tarsal segment partially projecting below elongate third. Genitalia as illustrated (figs 8, 9).

This species is known from a single male, the *holotype,* taken by Berlese funnel from mixed litter of pine, oak, madron, and moss. The sample was collected NEAR STRINGTOWN HILL, NORTH EAST OF OROVILLE, BUTTE COUNTY, CALIFORNIA, February 9, 1956, by R. O. Schuster. The type, a slide mount, is deposited in the California Academy of Sciences.

Nafonus Schuster and Marsh, new subgenus

Type: *Megarafonus fundus* Park

This is a monotypic subgenus most closely allied to *Megarafonus, s. str.,* from which it differs by having prominent areas of frosted squamose pubescence along the posterior margin of the tempora and filling the frontal and cervical sulci. The base of the male genitalia is one-half the total length and lacks a median longitudinal suture. A complete diagnosis of the type will be found in the original description.

MEGARAFONUS (NAFONUS) FUNDUS Park

Megarafonus fundus Park, Bull. Chicago Acad. Sci., Vol. 7, p. 172.

The type was collected by Henry Dybas from Las Vegas, Veracruz, Mexico, at an elevation of 5500 feet. Because the general facies closely approximated that of Casey's *M. ventralis* from Oregon, *M. fundus* was considered congeneric and described as such by Park, thus uniting a Neotropical element with the nearctic. Subsequent dissection of the type and examination of the male genitalia has substantiated Park's original concept in part, but the degree of relationship is not so great that *M. fundus* can still be considered as an integral component of *Megarafonus, s. str.*

FERRIS MEMORIAL ISSUE

The January, 1959 issue of the Pan-Pacific Entomologist is to be dedicated to the Memory of Professor G. F. Ferris and will contain a series of articles relating to his life, teaching and scientific accomplishments.—*Editor*

NOTES ON THE GENUS GAESISCHIA MICHENER, LaBERGE AND MOURE, WITH DESCRIPTIONS OF A NEW SPECIES AND SUBGENUS FROM MÉXICO

(Hymenoptera:Apoidea)

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The eucerine genus *Gaesischia* previously included a large number of South American species arranged in three subgenera (Moure and Michener, 1955) and one species placed in a fourth subgenus (*G. exul* Michener, LaBerge and Moure) from Arizona, México and Guatemala. Recently, the author discovered in a collection of eucerine bees sent to him for study by the California Insect Survey, University of California, the previously unknown female of *G. exul* together with a new species from México representing an undescribed subgenus. These specimens are described below.

The new subgenus described below is as closely related to the genus *Dasyhalonia* Michener, LaBerge and Moure as it is to the genus *Gaesischia*. It seems necessary, therefore, to group the three subgenera of *Dasyhalonia*, as described by Moure and Michener (1955), together with the subgenera of *Gaesischia* and the new subgenus described below into one genus—*Gaesischia*. This is done below following the descriptive section and a table summarizing the most significant characters of the eight subgenera is included. The position of the new subgenus between the four previously known subgenera of *Gaesischia* and the three subgenera previously grouped in the genus *Dasyhalonia* is clearly shown in this table. In the description given below of the female of *Gaesischia exul* characters of subgeneric or generic value are italicized.

The female of *Gaesischia* does not appear in my key to the eucerine genera of North and Central America (LaBerge, 1957). The female of *G. (Gaesischiana) exul* can be readily separated from other North American eucerine genera by the short broad hind tibiae which are equal in length to no more than the first seven flagellar segments together. The subgenus *Prodasyhalonia*, which is described below, can be readily separated from other North American eucerines by the presence of a strong inner apical spine on the anterior coxa. This spine is at least half the length of the trochanter.

Table I.—Diagnostic characteristics of the subgenera of *Gaesischia*

	Gaesischia	*Gaesischiopsis*	*Agaesischia*	*Gaesischiana*
1.	Head elevated behind ocelli.	Head elevated.	Head elevated.	Head elevated.
2.	Maxillary palpus 5- or 6-segmented.	4-segmented.	5-segmented.	5-segmented.
3.	Clypeus close to eye.	Close to eye.	Close to eye.	Close to eye.
4.	Jugal lobe of hind wing slightly shorter than cubital cell.	Slightly shorter than cubital cell.	Slightly longer than (or sub-equal to) cubital cell.	Slightly shorter than cubital cell.
5.	Female subapical flagellar segments longer than or sub-equal to width.	Longer than or subequal to width.	Longer than or subequal to width.	Longer than or subequal to width.
6.	Female anterior coxal spine half length of trochanter.	Spine reaching apex of trochanter.	Spine absent.	Spine absent.
7.	Female scopal hairs plumose.	Scopae plumose.	Scopae plumose.	Scopal hairs simple.
8.	Male penultimate flagellar segment more than twice as long as broad.	More than twice as long as broad.	More than twice as long as broad.	More than twice as long as broad.
9.	Male ultimate flagellar segment slightly compressed.	Not at all compressed.	Markedly compressed.	Markedly compressed.
10.	Male fourth and fifth sterna without long bristlelike hairs.	Fifth sternum with subapical row of long, bristlelike, coarse, uncurled hairs.	Without long bristlelike hairs.	Without long bristlelike hairs.
11.	Male sixth sternum with pair of carinae converging posteriorly.	With pair of carinae converging posteriorly.	With pair of carinae converging posteriorly.	With pair of carinae converging posteriorly.

Table I.—Diagnostic characteristics of the subgenera of *Gaesischia*—(Continued)

	Prodasyhalonia	*Dasyhalonia*	*Zonalonia*	*Pachyhalonia*
1.	Head slightly elevated.	Head not elevated.	Head not elevated.	Head not elevated.
2.	5-segmented.	5- or 6-segmented.	6-segmented.	6-segmented.
3.	Clypeus close to eye.	Close to eye.	Separated from eye by one-third minimum flagellar diameter.	Separated from eye by one-third minimum flagellar diameter.
4.	Slightly shorter than cubital cell.	Slightly shorter than cubital cell.	Slightly shorter than cubital cell.	Slightly shorter than cubital cell.
5.	Longer than or subequal to width.	Subapical flagellar segments of female broader than long.	Broader than long.	All flagellar segments of female longer than broad.
6.	Spine longer than half length of trochanter	Spine absent.	Spine absent.	Spine absent.
7.	Scopae plumose.	Scopae plumose.	Scopae plumose.	Scopal hairs serrate but not branched.
8.	More than twice as long as broad.	Penultimate flagellar segment of male less than twice as long as broad.	Less than twice as long as broad.	Less than twice as long as broad.
9.	Markedly compressed.	Not at all compressed, tapering.	Slightly compressed, tapering.	Markedly compressed, tapering.
10.	Male fourth and fifth sterna (often third) with very long, coarse, curled, subapical, bristlelike hairs.	With very long, coarse, curled, subapical, bristlelike hairs.	With very long, coarse, curled, subapical, bristlelike hairs.	With very long, coarse, curled, subapical, bristlelike hairs.
11.	Male sixth sternum with strong median lamella ending in posteriorly directed tooth.	With weakly elevated mediobasal area bearing hair tuft.	With strongly elevated mediobasal area.	With strongly elevated mediobasal area sometimes ending in tooth.

GAESISCHIA (GAESISCHIANA) EXUL Michener, LaBerge and Moure.

Gaesischia exul Michener, LaBerge and Moure, 1955, Dusenia, 6:224–226; LaBerge, 1957, Amer. Mus., no. 1837:34.

Female.—Measurements: Length about 12 mm.; width about 3.5 mm.; wing length (including tegula) about 9 mm. *Color:* Integument black except as follows: labrum, base of mandible and *subapical half of clypeus yellow;* flagellar segments 3 to 10 and apical half of mandible refuescent; legs except coxae yellow to red; tegulae testaceous; wing membranes hyaline, veins dark brownish black; metasomal terga with apices broadly hyaline, yellow; sterna reddish yellow. *Structure and sculpture:* First flagellar segment shorter than second and third together, third equals about seven-eighths of first, segments 3 to 9 subequal, last segment subequal to first. Maxillary palpal segments in ratio of about 2:3:3:1:1; distal part of galeae subequal in length to eye. *Clypeus protruding beyond eye by about half width of eye in profile, protruding surface flat and sharply declivous posteriorly with well-defined carina between flattened and declivous areas.* Galeae shiny above, with extremely delicate reticular shagreening; clypeus coarsely punctate, surface scarcely dulled by delicate cross-striations. Mesoscutum with large shallow punctures separated by half a puncture width, surface (and bottoms of punctures) dulled by extremely fine tessellation especially on anterior half; scutellum and mesepisternum with smaller, deeper, less crowded punctures and surfaces shiny, delicately shagreened; propodeum with dorsal surface subequal to metanotum in length, coarsely punctate with surface delicately shagreened, moderately shiny. *Hind wing with jugal lobe slightly shorter than cubital cell. Anterior coxa without inner apical spine; hind tibia less than four times as long as broad and equal in length to first seven flagellar segments or less;* tibial spurs normal. Metasomal tergum 1 with punctures in basal half separated basally by one or two puncture widths and sparser toward middle of tergum, impunctate apically; terga 2 and 3 with minute round punctures separated mostly by one puncture width in median half and by two puncture widths in apical hyaline area; *tergum 6 with gradulus without lateral parts;* pygidial plate V-shaped, pointed at apex. *Hair:* Head ochraceous, brighter on vertex. Thorax white on lower lateral surfaces to bright ochraceous above. Metasomal tergum 1 with long ochraceous hairs basally, scattered, short, appressed, yellow hairs apically; *terga 2 to 4 with diffuse, short, closely appressed, pale ochraceous pubescence;* terga 5 and 6 with long, pale ochraceous to yellow hairs; sternal hairs yellow medially to pale ochraceous laterally. Legs pale ochraceous except as follows: distitarsi, fore basitarsi, inner surfaces of tibiae and middle and hind basitarsi yellow; basitibial plates covered with yellowish brown hairs; *scopal hairs simple, short, white.*

Distribution.—Southern Arizona, México and Guatemala. The female described above was collected by R. C. Bechtel and E. I. Schlinger on an expedition sponsored by the Associates in Tropical Biogeography, University of California at DONAJI, OAXACA, MEXICO on April 17, 1953, and is in the collection of the California Insect Survey, University of California at Berkeley.

Prodasyhalonia LaBerge, new subgenus

Type Species—Gaesischia mexicana LaBerge, new species.

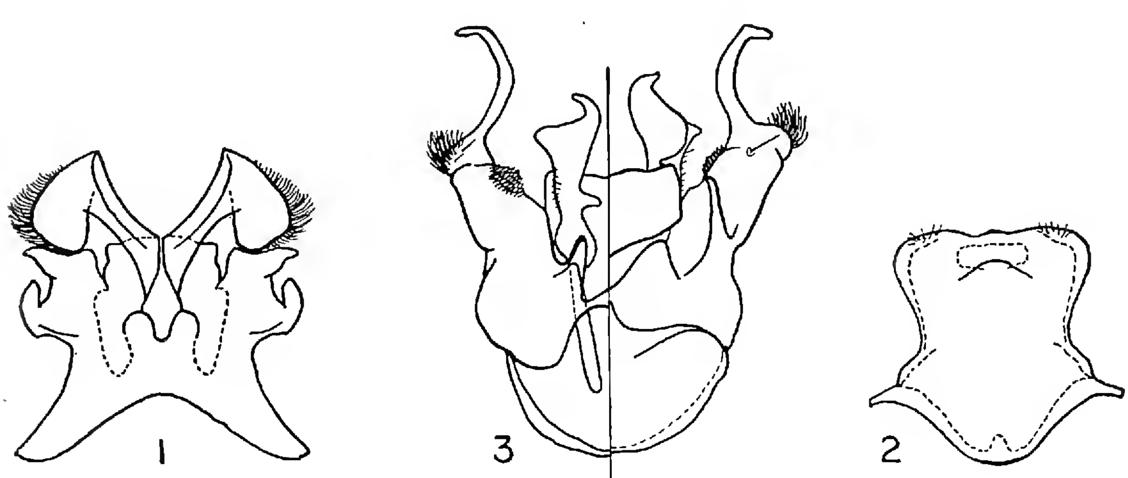
Female.—Clypeus with extremely narrow subapical yellow band; maxillary palpus five-segmented. Jugal lobe of hind wing slighty shorter than cubital cell; anterior coxa with inner apical spine more than half length of trochanter; hind tibia more than four times as long as broad, equal in length to about first nine flagellar segments together; tibial spurs normal; scopal hairs plumose. Second tergum with basal and subapical bands of appressed, pale, plumose pubescence; tergum 6 with gradulus with short cariniform lateral parts. See Table I for additional characters.

Male.—Maxillary palpus five-segmented; flagellum with segments 4 to 10 subequal in length, last segment much compressed, less than three times as long as broad, penultimate segment normal. Jugal lobe of hind wing slightly shorter than cubital cell; hind basitarsus much flattened; middle tibial spur slightly shorter than from its base to anterior tibiofemoral articulation; anterior coxa without apical spine; second tergum with basal and subapical pale pubescent bands; sternum 5 with very long, apically curled, subapical, coarse, bristlelike hairs; sternum 6 with strong median longitudinal lamella ending posteriorly in a pointed apex; sternum 7 with expanded median plates and lateral plates deeply emarginate laterally. See Table I for additional characters.

Gaesischia (Prodasyhalonia) mexicana LaBerge, new species

Female.—Measurements: Length about 10 mm.; width about 3 mm.; wing length (including tegula) about 7.5 mm. *Color:* Integument black except as follows: clypeus with extremely narrow subapical yellow band; tegulae testaceous posteromedially; wing membranes somewhat infumate, yellow; metasomal terga 1 to 4 narrowly hyaline; apical half of mandible and distitarsi rufescent. *Structure and sculpture:* Flagellum as in *exul* but third segment equals about three-fourths first segment and last segment slightly shorter than first. Maxillary palpal segments in ratio of about 14:14:8:5:6; distal part of galeae slightly shorter than eye. Clypeus protruding beyond eye by less than half width of eye, surface rounded, without sub-basal carina. Galeae dulled above by dense regular tessellation; clypeus with coarse, round, shallow punctures, surface dulled by sparse cross-striations. Mesoscutum with large round punctures separated by half to one puncture width, surface shiny; scutellum similar but punctures more crowded; mesepisternum similar but punctures crowded and slightly shallower; propodeum with dorsal surface subequal in length to metanotum, with distinct round punctures, surface dulled by fine tesselation, posterior surface (except shiny upper triangle) and lateral surfaces coarsely punctate and finely tessellate. Metasomal tergum 1 punctate over about basal eight-ninths, punctures in median area of basal fourth separated by two to four puncture widths, apical to middle separated by half a puncture width or less; terga 2 and 3 as in *exul* but punctures more crowded in apical areas; pygidial plate V-shaped with rounded apex. *Hair:* Head white except abundant dark brown vertex. Mesoscutum and scutellum with short dark brown hairs except white peripherally; thorax otherwise white. Metasomal tergum 1 with long white hairs in basal half, with short, simple, appressed, dark brown hairs in apical half; tergum 2 with basal and apical bands of white pubescence separated by band of dark brown, appressed, relatively sparse and simple hairs, apical pale band broadly interrupted medially; tergum 3 similar to 2 but interband zone with sparse pale pubescence and apical pale band uninterrupted; terga 4 and 5 covered with diffuse pale pubescence and long brown bristlelike hairs; tergum 6 dark brown; sternal hairs brown medially to white laterally. Legs white except as follows: inner surfaces of basitarsi dark reddish brown; inner surfaces of hind tibiae yellow; outer surfaces of fore and middle tibiae near apices and surrounding basitibial plates pale brown.

Male.—Measurements: Length about 9 mm.; width about 2.5 mm.; wing length (including tegula) about 7 mm. *Color:* Integument black except as follows: clypeus yellow except extreme basal margin and apical margin; flagellar segments 1 to 8 and base of 9 red below, dark brown above; eyes gray; wing membranes slightly infumate, yellow; tarsi and tibiae dark red; terga 1 to 5 with narrow apical margin hyaline, yellow. *Structure and sculpture:* Minimum length of first flagellar segment equals about one-sixth of maximum length of second; maxillary palpae as in female but third segment longest; sculpturing as in female. Thoracic sculpturing as in female. Metasomal sculpturing as in female but terga 3, 4 and 5 similar to tergum 2; sternum 7 with expanded median plate directed laterally with short dorsal and ventral subapical, blunt tubercles. Gonostylus strongly curved with apex directed ventrolaterally, with long stout hairs at base on ventrolateral surface; spicules at apex of gonocoxite short and blunt; apicodorsal process of gonocoxite short, thin, subapical (Figs. 1 to 3). Hair: As in female except as follows: mesocutum and scutellum with less



Explanation of Figures

Figs 1–3—Terminalia of *Gaesischia mexicana,* approximately $\times 25$. 1) Sternum 7, ventral view. 2) Sternum 8, ventral view. 3) Genital capsule, dorsal view at right, ventral view at left.

brown hairs; tergum 2 with apical pale pubescent band reduced to short lateral fasciae each equal to less than one-fourth of width of tergum; tergum 3 like tergum 2 but apical pale band not so broadly interrupted medially; tergum 4 like tergum 3 of female; terga 5, 6 and 7 with ochraceous hairs and pubescence. Legs white to pale ochraceous except inner surfaces of tarsi and tibiae yellow to red.

Type Material.[1]—Female holotype, male allotype, and one female and one male paratype from 4 miles west of El Jocote, Chiapas, Mexico, were collected on March 4, 1953, by R. C. Bechtel and E. I. Schlinger. In addition, one female and two male paratypes from Chiapas, México, are as follows: one male from 4 miles southeast of Soyalo, February 28, 1953, R. C. Bechtel and E. I. Schlinger; one male from 4 miles northwest of Ocosingo, March 9, 1953, Ray F. Smith; one female from 9 miles south of Ixtapa, March 1, 1953, R. C. Bechtel and E. I. Schlinger. The holotype and allotype are in the collection of the University of California at Berkeley. The paratypes are in the collection of the Universtiy of California and in the Snow Entomological Collection, the University of Kansas, Lawrence.

Acknowledgments

I am grateful to Dr. P. D. Hurd of the University of California for the loan of specimens in his care. I am also indebted to Dr. C. D. Michener of the University of Kansas for the loan of specimens of the several subgenera of *Gaesischia* and *Dasyhalonia.*

Literature Cited

LaBerge, Wallace E.

1957. The genera of bees of the tribe Eucerini in North and Central America. The American Mus. Nov., No. 1837:1–44.

Michener, C. D., W. E. LaBerge and J. S. Moure

1955. Some American Eucerini Bees. Dusenia, 6:213–230.

Moure, J. S. and C. D. Michener

1955. A contribution toward the classification of Neotropical Eucerini. Dusenia, 6:239–331.

BOOK NOTICES

A LIST OF COLEOPTERA FROM THE VICINITY OF WILLAPA BAY, WASHINGTON. By Melville H. Hatch and Trevor Kincaid. ii+23 pp., 1 map [p. i is the front cover; pp. ii and 22 are blank, 23 is unnumbered and has a map mounted on it]. Privately published. The Calliostoma Company, 1904 East 52nd., Seattle 5, Washington. 1958. Price 50 cents, post paid.

[1] This material was collected in the course of an expedition sponsored by the Associates in Tropical Biogeography, University of California.

This is a list of 493 species of beetles and the localities in which they were taken, from the vicinity of what used to be known as Shoalwater Bay, in the southwestern corner of Washington. Most of the collecting was done by Kincaid; most of the identifications are by Hatch. Set in type and printed by Professor Kincaid, in an edition of 300 copies.

THE GRASSHOPPERS AND LOCUSTS (ACRIDOIDEA) OF AUSTRALIA. Volume III. Family Acrididae: subfamily Cyrtacanthacridinae, tribes Oxyini, Spathosternini, and Praxibulini. By James A. G. Rehn. Melbourne, October, 1957. 273 pp., 29 pls. For sale by Melbourne University Press, University Grounds, Melbourne N. 3, Victoria, Australia. Price £A 2, plus post.

The first two volumes of this series have been noticed in this journal (Vol. 29, No. 1, p. 18; Vol. 30, No. 4, p. 262). The third volume continues the work in the same thorough manner.—HUGH B. LEECH, *California Academy of Sciences, San Francisco.*

A ROSE TIP SAWFLY NEW TO CALIFORNIA

(Hymenoptera:Tenthredinidae)

On May 20, 1949, Mr. Albert Foster[1] collected three larval sawflies boring in rose terminals. These were subsequently identified as possibly *Ardis sulcata* (Cameron), a species which is widely distributed in Europe. Mr. Foster reported them stunting and killing the terminals.

Recently while identifying some sawflies from the collection of the California State Department of Agriculture two adult females of this species were found, thus confirming the presence of this rose pest in California. The specimens were reared from rose buds in May, 1938 from larvae collected April 12, 1937, Soda Creek, Napa County, California by H. H. Keifer. This locality is approximately six miles southwest of Monticello.

Eide[2] reported this species causing injury to Manetti and wild roses near Puyallup, Washington, in 1940. Damaged tips, adults or larvae were observed fairly widespread in Washington and Oregon. He was able to rear a number of adults and gave some interesting biological data.

Keifer's specimens are thus the earliest North American record for this pest of rose, antedating the northwest collections by three years.—WOODROW W. MIDDLEKAUFF, *University of California, Berkeley.*

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[1] Then Deputy Agricultural Commissioner, Santa Clara County.

[2] Eide, Paul M., 1948. A tip-infesting sawfly on rose. Jour. Econ. Ent. 41 (5) :819-821.

A NEW GENUS OF THE GERRIDAE FROM THE SOLOMON ISLANDS

HERBERT B. HUNGERFORD AND RYUICHI MATSUDA[1]

In 1954, E. S. Brown collected five specimens of a small gerrid in the Solomon Islands. They have been sent to us for determination by the British Museum. These specimens belong to a new genus and species.

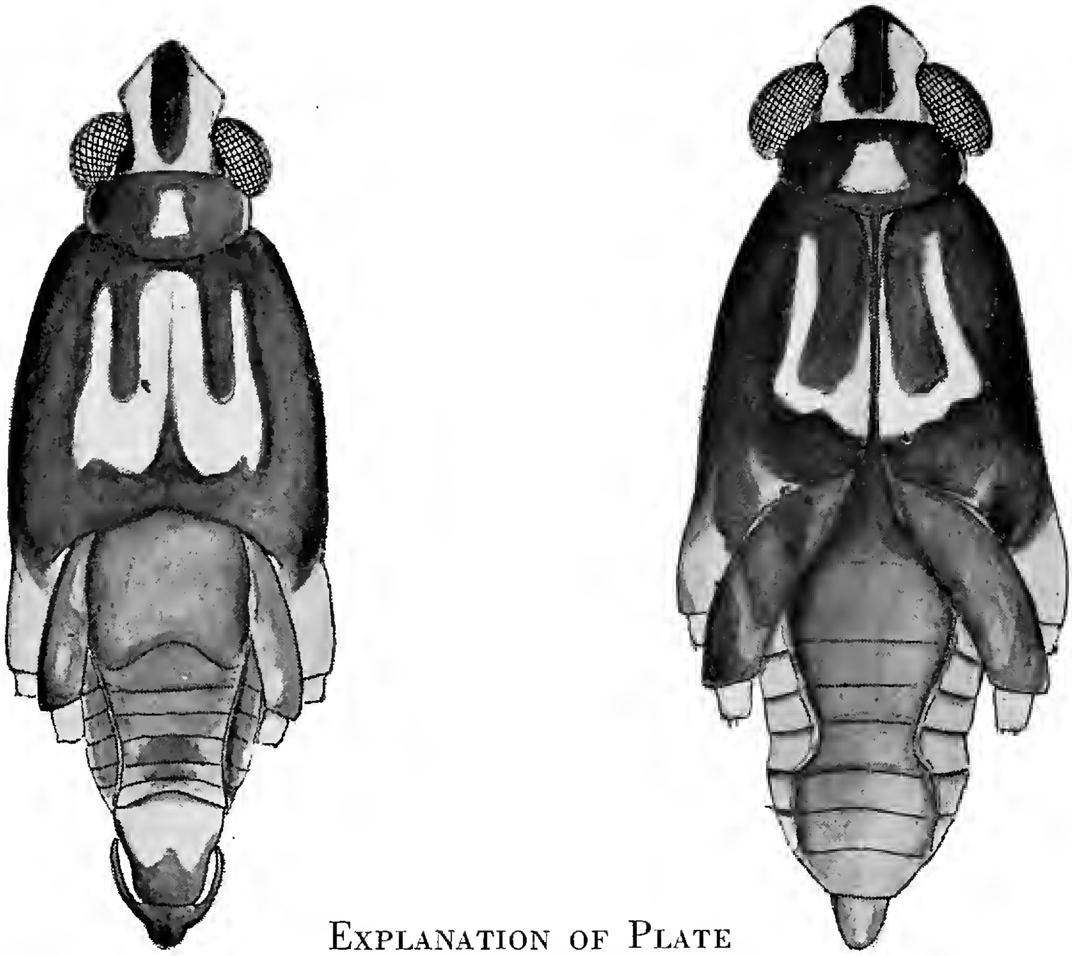
Rheumatometroides Hungerford and Matsuda, new genus

Type species of the genus: *Rheumatometroides browni* Hungeford and Matsuda.

Body elongate, ovate in outline and small, female a little larger than male; head between eyes widened posteriorly; antennal cavity located far anterior to anterior margins of eyes; eyes covering anterolateral angles of pronotum; rostrum extending beyond prosternum, robust, reflexed, first segment long, a little over half as long as head on its ventral surface, third segment thickened and curved as in *Rheumatometra;* antennae slender, first segment with numerous setae as long or longer than diameter of the segment, much longer than second but shorter than second and third segments together. *Pronotum* narrower than head including eyes, more or less produced medially on posterior margin, especially so in female; mesonotum with medially keeled longitudinal groove extending throughout the entire length in female, posterior margin of mesonotum concave; metaacetabula flattened, obliquely converging anteriorly in female; metasternum entire, with omphalium in male; front leg slender, without sexual difference in shape, tibia simply thickened apically, first tarsal segment greaty reduced; middle leg with tibia longer than femur, first tarsal segment a little longer than second segment; hind leg with femur over two and a half times as long as tibia, first tarsal segment shorter than second segment. *Abdomen* with anterior margins of first and second tergites distinct; ninth segment with suranal plate in male with conspicuous spinous process on each side, directed anteriorly; paramere somewhat reduced.

This genus is quite peculiar in the following characters: (1) The first rostral segment is long; (2) In the female the mesonotum is provided with distinct medially keeled longitudinal groove; (3) The omphalium is present in the male; (4) The suranal plate in the male with conspicuous lateral process. In the female of *Rheumatometra philarete* Kirkaldy the mesonotum is also with median longitudinal groove, but only posteriorly. In the genus *Hynesionella* the suranal plate is also with conspicuous process on each side, but this has apparently occurred independently in both genera. The presence of the omphalium is peculiar to this

[1] Contribution No. 996 from the Department of Entomology, University of Kansas. This report is a by-product of a project conducted with the aid of a grant from the National Science Foundation.



EXPLANATION OF PLATE

Plate 1. *Rheumatometroides browni* Hungerford and Matsuda, male left, female right.

genus, in no other related genera is the omphalium recognizable.

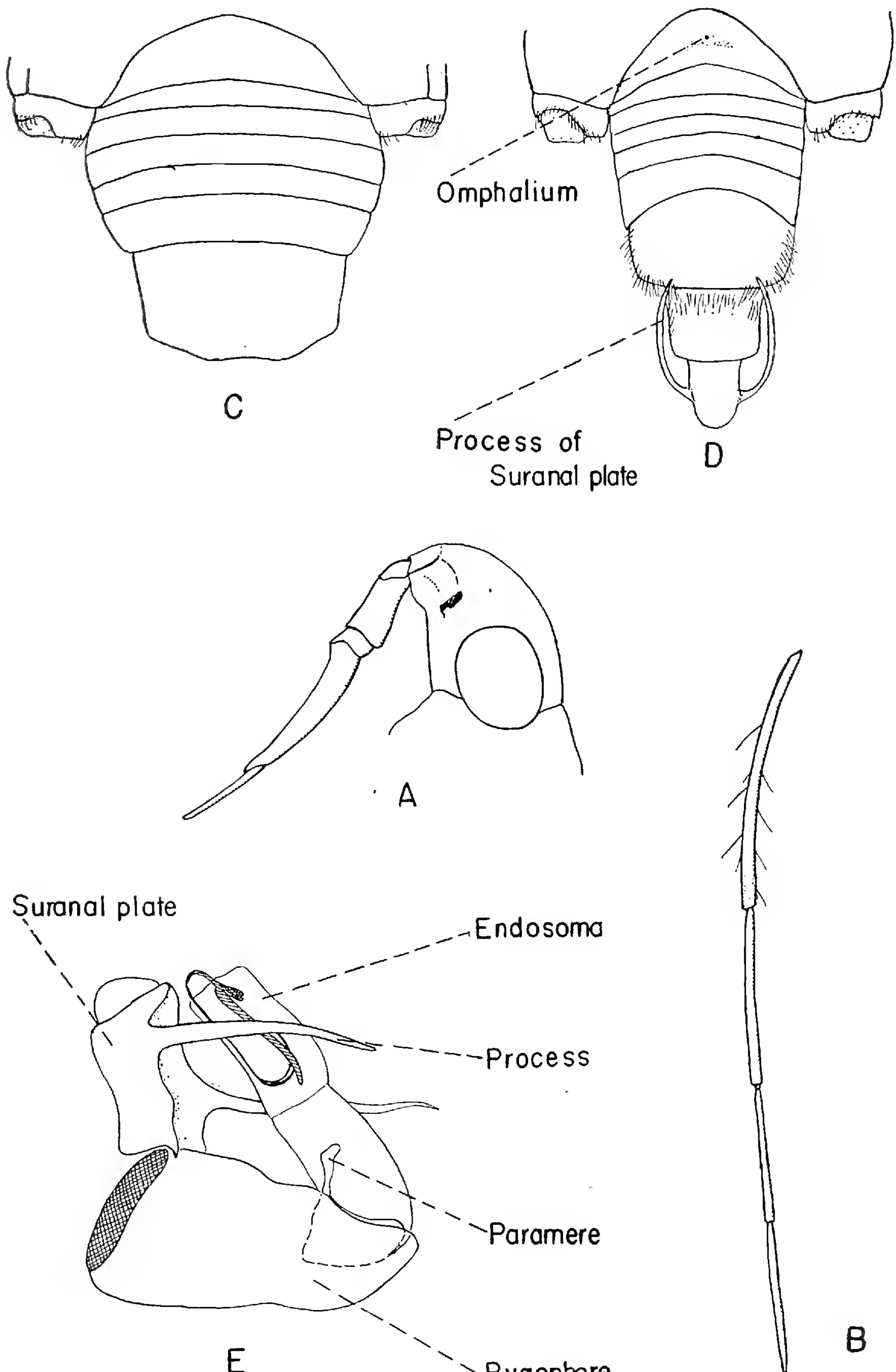
Rheumatometroides browni Hungerford and Matsuda, new species

(Plates 1 and 2)

Size: Apterous male 3.15 mm. long; 1.16 mm. greatest width. Apterous female 3.25 mm. long; 1.26 greatest width. *Color:* Black with testaceous to reddish markings as shown in plate 1; antennae, beak and legs dark except base of anterior femora; mesopleura and metaacetabula with broad black bands, the former with a band of grayish pile superimposed; thoracic venter pale testaceous, abdominal venter more or less embrowned. *Structural characteristics:* Relative length of antennal segments in a male: 1st : 2nd : 3rd : 4th :: 40 : 26 : 21+ : 23–; total antennal length to body length in a male :: 2.6 mm. : 3.15 mm.; rostrum rather stout with third segment extending onto mesosternum; front femur and tibia moderately stout, the former with diameter a little greater than base of middle femur; middle leg

Table 1.—The relative lengths of the leg segments.

	Femur	*Tibia*	*1st tarsal seg.*	*2nd tarsal seg.*	*Total tarsal length*
Front leg	45	40	5.3	18.7	24
Middle leg	110	132	44.3	38.7	83
Hind leg	120	48	7+	13–	20



Explanation of Plate

Plate 2. *Rheumatometroides browni* Hungerford and Matsuda, A) Lateral view of the head, B) The male antenna, C) Ventral view of the female abdomen, D) Ventral view of the male abdomen, E) Lateral view of the male genital segment.

much longer than hind leg (325:188); metasternum of male slightly elevated on its median line and with omphalium well recognizable; first four abdominal sternites very short, the following one a little longer and the last one nearly as long as all that precede it in male; first genital segment of male also long and ventrally depressed, with last abdominal segement together considerably longer than preceding abdominal segments; seventh tergite of male as long as five preceding tergites; lateral process of suranal plate of male as shown in plate 1 and plate 2 figure E; paramere somewhat reduced, as shown in plate 2, figure E; last ventral abdominal segment of female large, longer than three preceding segments together; genital segments withdrawn.

This species stands quite alone. The presence of the omphalium in the male, its large process on the suranal plate and so forth separate it from its nearest relatives. It is described from two males and three females bearing the label "Solomon Is. Kolombangara, Jack Harbour. 1, X 1954, E. S. Brown." Holotype, allotype and three paratypes belong to the British Museum. It is hoped that the two dissected paratypes may be deposited in the Francis Huntington Snow Entomological Collections at the University of Kansas.

ERRATA

MURAYAMA, J. J.

1957. Bark-beetles and pine-hole borers recently imported into Japan with timbers from the United States and other foreign countries. Pan-Pacific Ent., 33(1):35–37.

Page	*Line*	
36	13	Barboso read Barbosco
"	20	Douglas fir read Spruce & fir
"	25	1951 read 1953
37		Add a line between the lines 8 & 9: Eureka, ", ", 1954
"	10	1943 read 1953
"	15 & 16	1944 read 1954
"		Cancel the lines 18 & 19 (Port, Species, Subfamily & species etc.)
"	21	Eichhorn read Eichhoff
"	23	" read Sandakan
"	25	Apiton read White fir
"	33	St. Muria read St. Maria
"	28	Nsipit read Nasipit, 1951 read 1953, White fir read Lauan
"	29	Camarives read Camarines, Lauan read Apiton
"		Add a line between the lines 29 & 30: Nasipit, Osaka, Lauan, 1953
"	30	Lauan read Paulownia
"	33, 37 & 38	1951 read 1954
"	26	Stroheim read Strohmeyer, Paulonia read Lauan
"		Add a line between the lines 38 & 39: Appari, Osaka, Lauan, 1954
"	39	*aleajahi* read *aleajalis*, Cancel Appari
"	40	Basilan read Bislig
"	41	Add ", ", 1952

FOUR NEW SPHECID WASPS FROM WESTERN NORTH AMERICA

(Hymenoptera:Sphecidae, Larrinae)

FRANCIS X. WILLIAMS
Reserach Associate, Department of Entomology
California Academy of Sciences

Tribe TACHYTINI

Tachysphex nitelopteroides Williams, new species

(Figure 1)

Female holotype.—Length 6:30 mm. Generally pale reddish; head black, clypeus and antennae except the infuscate 4 apical segments, pale reddish, mandibles except apices, yellowish red; mesosternum in part blackish; middle and hind tarsi slightly infuscate, fore tarsal comb pale yellowish, the spur pale, meso- and metatibial spurs dark; wings mainly hyaline, but in the fore wings there is a feeble infuscate band extending from the costa, through the base of the marginal cell, the apex of the first submarginal cell, all of the second submarginal, and the apex of the second discoidal cell, though diffusing slightly beyond these limits; venation rather pale brown, costa darker, stigma blackish; fourth tergite with some blackish on either side. Vestiture generally sparse, golden on frons, genae and occiput, somewhat silvery on base of clypeus, appressed silvery pile on pleurae and sternum of mesothorax, on disc and apex of propodeum, and an obvious patch laterally on the second tergite. Clypeus shining, disc convex with some large punctures, its produced portion gently outbowed, margin smooth and rather wide, lateral angles strong; mandibles well notched beneath and provided with some rather long pale erect hairs; antennae slender, segments 3 and 4 subequal; frons very finely punctate, giving it a granulate appearance; vertex with many fine separate punctures; the flattened posterior ocelli are shining and there is a depression ending as broad wedge beyond them; interocular spac at vertex slightly less than antennal segments 2 plus 3. Thorax smooth and shining, though under greater magnification finely punctured; disc of propodeum coriaceous, posterior face with a smooth area in which there is a wedge-shaped depression in its upper part, the pleurae shining and with fine scattered punctures. Forewings with marginal cell distinctly surpassing third submarginal, second submarginal cell very narrow at marginal cell; in the hindwings the transverse-median crossvein is about half the length of the second abcissa of the median vein. Abdomen shining, pygidium polished, narrow and pointed, bounding carinae very slightly inbowed, disc finely reticulate and with sparse large punctures.

Male allotype.—Length 4 mm. Dorsulum and abdomen shining. Black; clypeal rim, mandibles, palps mostly, basal part of antennae, pronotum, propleurae, wing bases, scutellum except base, and metanotum reddish, legs blackish to deep brown, paler from tibiae apically, posterior legs the darkest; venation brownish. Head finely granulate punctate, more clearly punctate on the shining vertex and clypeus; mandibles sharply pointed, strongly notched beneath; clypeus with the disc convex, the produced part gently rounded out and with lateral angles, otherwise with no teeth; antennae pilose, with segment 3 slightly shorter than segment 4. Thorax finely punctate; dorsum of propodeum granulate punctate, sides polished, posterior face with a groove. Fore femora beneath near base with a small emargination. Venation as in female. Last visible sternite roundly emarginate, lobes acute. Vestiture (the specimen has been somewhat rubbed): silvery pile on frons, genae, thorax, more or less, base of legs and femora in part, and propodeum, and with a conspicuous patch on side of tergite 2.

Holotype female, LA PAZ, BAJA CALIFORNIA, MEXICO, October 11, 1954 (F. X. Williams), at flowers of small prostrate *Euphorbia; allotype,* male, same date, except October 12; both deposited in the California Academy of Sciences, San Francisco.

Named for its superficial resemblance to some of the species of wasps belonging to the genus *Nitelopterus,* in color, wing infuscation in the female, and small size. From the more typical *Tachysphex* the new species differs chiefly in its marginal cell distinctly surpassing the short third submarginal cell.

Tribe MISCOPHINI

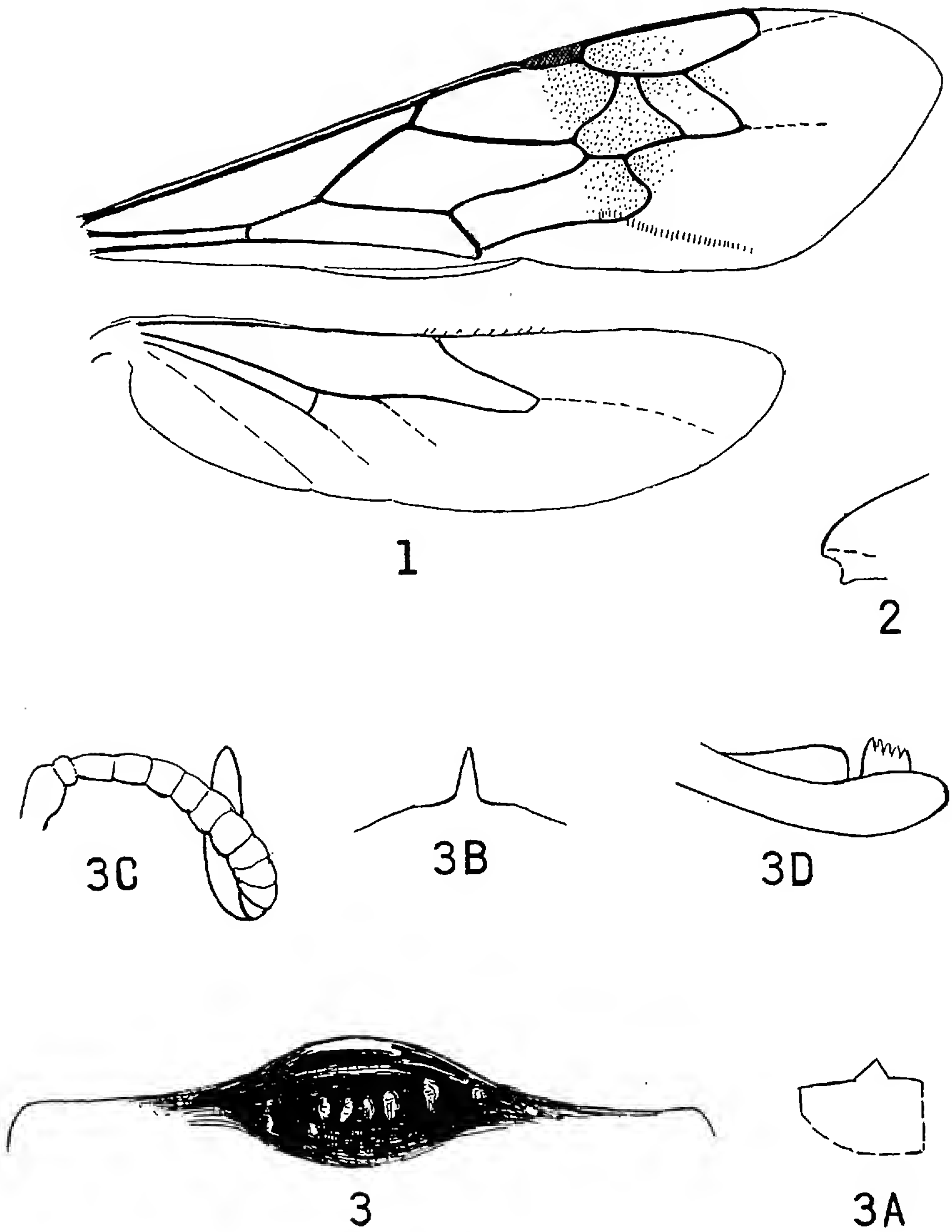
Solierella boregensis Williams, new species

(Figure 2)

Female holotype.—Length 5 mm. Black; mandibles reddish for apical half; lobes of pronotum, and tegulae in part, a long spot anteriorly beneath on femora 1 and 2, and a stripe above on tibiae 2 and 3, creamy white; tarsi chiefly reddish brown; abdomen red. Mandibles not emarginate beneath, malar space nearly two-thirds as long as width of mandible at base; clypeus broadly cuneate anteriorly, its apex very slightly extended toothlike, and with a sharp arched carina that is well above the true apical clypeal margin, this raised portion as seen in lateral profile is emarginate and drops steeply to the clypeal margin. A well-formed V arises mesad above the antennae and expands broadly and less definitely to the compound eyes that each ridge follows to partly embrace the posterior ocelli. Ocelli forming approximately a right-angle triangle; vertex rather coarsely punctate, subshining; antennae slender, articles 3 and 4 subequal, their apical width about twice their length. Scutum and scutellum shining, the moderate punctures well spaced, thus not forming any subcoriaceous areas, pleurae largely reticulate; disc of propodeum, with a median furrow, sides very finely striate, posterior face with rather coarse striae and a subtriangular depression. Fore tarsi with a comb of sparse bristles, there being one long bristle on articles 1–4, those on 1–3 fully twice as long as the middle width of their respective articles. First recurrent and the first transverse-cubital veins interstitial. Abdomen shining, closely and finely hair-punctate. Vestiture: silvery pile, dense on frons, clypeus, genae, base of pronotum, pleurae, edging of propodeal disc, legs in part, and somewhat banding the abdomen.

Male allotype.—Length 4 mm. Slender. Black; mandibles reddish for their apical half; prothoracic lobes, a long spot anterioly beneath on femora

1 and 2, and a stripe above on all tibiae, tegulae in part, creamy white, tarsi brownish; ablomen red, but the base and apex in part blackish. Clypeus with the median portion tumid though slightly angled in profile, cuneate anteriorly and provided with a strong keel that in lateral profile ends as a simple and



EXPLANATION OF FIGURES

Fig. 1, *Tachysphex nitelopteroides* Williams. Female, holotype. Fig. 2, *Solierella boregensis* Williams. Female, holotype. Clypeus distal end in lateral aspect to show vertical emargination. Fig. 3, *Solierella semirugosa* Williams. Female, holotype. Clypeus in fronta aspect; 3A, Female. Coxa to show dorsal process. 3B, Male, allotype. Clypeus, anterior margin; 3C, Male, allotype. Antenna to show the naturally reflexed 13th segment. 3D, Male, allotype. Aedeagal lobe, lateral aspect.

rather gross point; mandibles not excavate beneath, malar space from 3/4 to 4/5 the width of a mandible at base; antennae rather slender, thickest from articles 3–10, article 3 expanding from its base so that the length is less than twice its apical width, articles 3 and 4 subequal, 13 about 1/3 longer than 12. Scutum and scutellum shining, rather closely punctate, pleurae shining and strongly punctate; disc of propodeum subopaque, granulate and with a strong median groove, pleurae with a fine granulate appearance. First recurrent vein almost attaining the second submarginl cell. Abdomen shining, finely and closely hair-punctate, the segments not thickened apically. Aedeagus, as in a paratype of *Solierella vierecki* (Rohwer) from Boulder, Colorado, with the exception that in *S. boregensis* there is a very slight emargination along the outer (non-dentate) side of the uncal lobe. Vestiture: dense silvery pile, as in female.

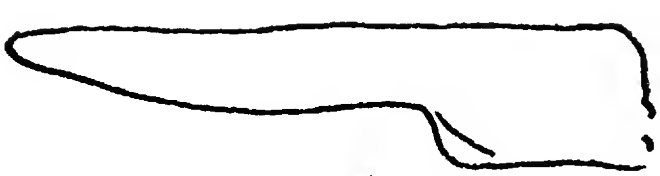
Holotype female and allotype male, BOREGO, SAN DIEGO COUNTY, CALIFORNIA, April 29, 1955, (F. X. Williams) deposited in the California Academy of Sciences.

Differs from *Solierella vierecki* (Rohwer), its near relative, that also occurs in the Borego Desert area, but has been more commonly found in the lower foothills region about La Mesa, near San Diego, in being much more heavily clothed with silvery pile, which obscures the frontal carinae, the V appearing slightly narrower in the new species. *Solierella boregensis* has no pronotal markings, the dorsulum is polished and much less strongly punctate than in *S. vierecki*, where these surfaces are partly coriaceous. In *S. boregensis*, holotype, ♀, the clypeus shows a vertical emargination, and the fore tarsal bristles are long, whereas in *S. vierecki* these are minute.

Solierella semirugosa Williams, new species
(Figures 3–3D)

Female holotype.—Length 4.2 mm. Black: generally shining above; mandibles black at extreme base, then whitish to about middle, thence reddish; apex of scape beneath testaceous; apical portion of pronotal lobes, tegulae in part, postscutellum, a long spot beneath from apex of fore femora, a shorter spot on mid femora, and a stripe above on all tibiae, creamy white tinged with yellow; venation brownish, paler at wing bases, apex of fore wings slightly infumate; abdomen red, its extreme apex in part fuscous. Head much wider than high; clypeus widely arched mesad, disc tumid, not carinate, with strong punctures for its basal half and a good polished margin; mandibles only slightly emarginate beneath; practically no malar space; frons with the low rounded interantennal ridge expanding as a V-shaped subopaque and rugulosely punctate area that rather suddenly widens to extend to the compound eyes to limit the vertex anteriorly; antennae slenderly subclavate, articles 3 and 4 subequal; vertex shining but closely and rather coarsely punctate; ocelli in approximately a right-angle triangles, posterior ocelli somewhat more than their diameter from the compound eyes, these ocelli outwardly lying in a shallow depression. Pronotum short, collar somewhat sugulose; scutum and scutellum polished, with well separated punctures, the pleural punctation heavier, largely obscured by the silvery pile; disc of propodeum without bounding carinae, shining, coarsely sculptured, with a median carina in a groove that is strongest apically, and with well-spaced oblique and transverse carinulae, pleurae striate reticulate, posterior face with a wide shining top-shaped depression and rather coarse transverse striae. Bristles of fore tarsal comb, segments 1–4, generally one and one-half times longer than the width of their respective tarsal segments, in addition, there are two shorter spines anteriorly along the middle of fore tarsal segment 1, these spines a little longer than the width of the segment at their origin; dorsal process of hind coxae acute; second submarginal cell subtriangular, first and second submarginal cells each receiving a recurrent vein. Abdomen shining, with some very fine close punctures; pygidial area marked laterally by dark, short close-set bristles. Vestiture: silvery pile on the lower frons, genae, base of pronotum, mesopleurae, borders of propodeal disc, and rather incompletely banding the abdominal tergites.

Male allotype.—Length 4 mm. Black; marked as in female except abdomen has only an indication of reddish on the apex of some tergites, and the tarsal segments are generally creamy white; puncturation is about as in the female. Non-carinate clypeus with median gibbous portion strongly punctate and with a stout spike arising from its otherwise subtruncate margin; malar space about equal to one-half the width of the mandible at base; antennae with the 12 articles shorter than in female, article 13 greatly elongate so as to equal the sum of the six preceding articles,



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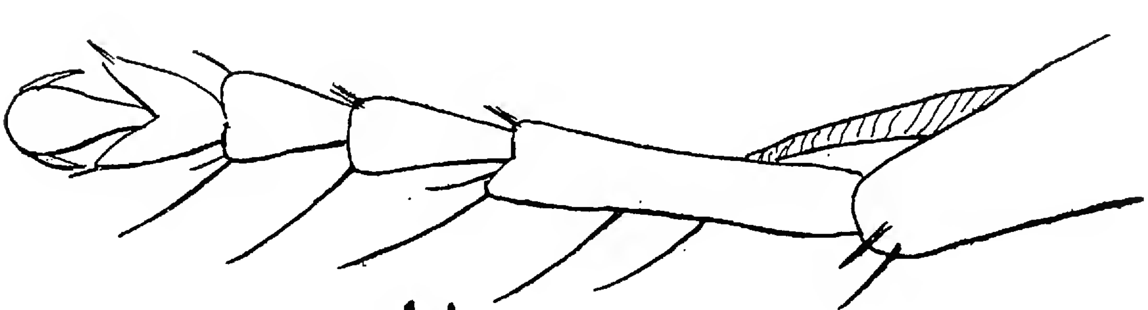

4A

Explanation of Figures

Fig. 4, *Solierella mandibularis* Williams. Female, holotype. Mandible from outer side, 4; fore tarsal comb, 4A.

and it is strongly hinged backwards, be the wasp alive or dead; the two posterior ocelli bounded posteriorly by a shallow, gently procurved depression that extends across the vertex. Aedeagal lobes, as viewed from side, each shows a short elevated row of teeth on the subclavate apical portion, while basad of this is an elongate lobe.

Holotype female and allotype male in fresh condition, BOREGO, SAN DIEGO COUNTY, CALIFORNIA, April 23 and 29, 1955, respectively (F. X. Williams). Paratypes: 3 females and 24 males, topotypical, taken in late April, 1955, May 11 and 12, 1955, and 2 females, topotypical, April 30, 1957 (F. X. Williams); all or nearly all these specimens were taken on *Euphorbia polycarpa*. Other paratypes of *Solierella semirugosa* are, 1 female, Borego, San Diego County, California, April 25, 1955 (P. D. Hurd), 1 female, Hopkins Wells, Riverside County, California (E. G. Linsley), 1 male, Palm Springs, Riverside County, June 2, 1953 (R. M. Bohart), 1 male, Davis, Yolo County, California, August 13, 1955 (R. M. Bohart) and 1 male, Davis, August 20, 1955 (A. T. McClay).

Perhaps closest to *Solierella timberlakei* Williams (1950), of which only the female holotype is known (locality, six miles south of Palm Springs, Colorado Desert, California). The male of *Solierella semirugosa* is easily recognized by its stout clypeal spike, backwards-directed 13th antennal segment and the lamina before the raised aedeagal comb. The female has the fore tarsal comb of bristles that are distinctly longer than the length of the middle joints of the fore tarsus, in *Solierella timberlakei* these *bristles* are only about half the length of the middle joints.

Solierella mandibularis Williams, new species

(Figures 4 and 4A)

Female holotype.—Length 3.75 mm. Black; moderately shining and generally closely punctate; mandibles reddish apically, dull yellow mesad, black at base; two wide pronotal spots, edge of pronotal lobes, postscutellum, femora 1 and 2 with a spot anteriorly beneath, tibiae above, chiefly dull yellow; tarsi pale yellow to brown; venation testaceous. Head reticulate-punctate. Middle part of clypeus convex, shining, punctations few except at base, not carinate, margin truncate, marginal strip rather wide. Mandibles with a strong notch beneath near base; malar space at middle nearly equal to basal width of mandibles. Antennae rather slender, article 3 a little shorter than 4. Ocelli in about an equilateral triangle. Thorax closely punctate, metapleurae polished. Disc of propodeum reticulate, with some diverging basal striae and an apical trough, pleurae reticulate, posterior face reticulate and with some widely spaced transverse carinulae and a V-like depression. Fore tarsal comb consisting of long pale spines of which there are three on segment 1, and one each on segments 2 and 3, and all of a length well exceeding the diameter of the tarsal segments at the point of attachment of these spines. Second submarginal cell receiving second recurrent vein. Tergites strongly punctate. Vestiture: moderate silvery pile.

Holotype female from CRONISE VALLEY, SAN BERNARDINO COUNTY, CALIFORNIA, April 29, 1956; on *Prosopis* (P. D. Hurd, collector) and is on deposit in the California Academy of Sciences. Male unknown.

Separated from *Solierella albipes* (Ashmead) and *S. bridwelli* Williams by having a tarsal comb and by its much more generous malar space. The ventral mandibular notches are about equal in *S. mandibularis* and *S. albipes*, but in *S. briwelli* it is much less developed.

PHORETIC SCELIONIDS ON GRASSHOPPERS OF THE GENUS MELANOPLUS

(Hymenoptera:Scelionidae)

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In the course of an ecological study of the insect fauna of an old-field community[1] in southern Livingston County, Michigan, a number of grasshoppers of the genus *Melanoplus* were collected with one, two or three adult winged parasitic wasps, *Scelio bisulcus* (Ashmead), clinging to the undersurface of the abdomen. The numerous references in the literature to scelionids on North American grasshoppers are apparently based on two early records: that of Ashmead (1893:241) for a specimen of *Scelio* found on a "short-winged locust" and that of Warner (1903) for another taken from *Dichromorpha viridis*. Ashmead supposed that the wasp attaches itself to the grasshopper with the intention of finding out where the eggs were to be deposited. Recently, Channa Basavanna (1953) observed individuals of *Lepidoscelio viatrix* to leave the Indian grasshopper *Orthacris (Colemania)* when it oviposited and to lay their eggs in its egg masses. A general discussion of the phoretic relationship between scelionids and grasshoppers, together with a photograph of *L. viatrix* attached to its orthopteran host, was published by Brues (1917).

The abandoned field, situated on the Edwin S. George Reserve

[1] This project is supported by a grant (G-3223) from the National Science Foundation.

of the University of Michigan, is a 12-acre plot bordered by oak-hickory woodlots and covered with mixed grasses (especially *Poa compressa* and *Aristida purpurascens*) and a variety of forbs. It has not been cultivated for more than 30 years and is now infiltrated with widely scattered seedlings of hardwoods and junipers. In 1957, four species of *Melanoplus* — *keeleri luridus* (Dodge), *c. confusus* Scudder, *f.-r. femur-rubrum* (De Geer), and *m. mexicanus* (Saussure)—were collected from the field. The last species was relatively uncommon. Scelionid wasps were observed on 13 individuals of the first three species, as follows:

keeleri luridus: one wasp on each of five specimens—July 31, September 3, 5.

c. confusus: seven wasps on four specimens, one grasshopper with three, one with two wasps—July 15.

f.r. femur-rubrum: one wasp on each of four specimens—September 5, 9, 14.

These specimens were collected by U. N. Lanham, R. E. Lanham and F. C. Evans. All the wasps and their grasshopper hosts were adult females; none of several hundred male and immature grasshoppers that were examined carried wasps. So persistently did the wasps cling to the grasshoppers that one was still attached after its host had thumped about in a small cardboard box for an hour or more, and others held on with a death grip when in cyanide tubes. The wasps had seized with their jaws the intersegmental membranes at the anterior end of the abdomen, beneath and on the lower sides and no farther back than the second suture. All faced the same direction as the grasshopper. The strongly depressed body form, unusual for a hymenopteran, would seem to fit them well for their mode of transport.

We are indebted to C. F. Muesebeck for identification of the wasps and to I. J. Cantrall for that of the grasshoppers.

Literature Cited

Ashmead, W. H.
1893. Monograph of the North American Proctotrypidae. Bull. U. S. Nat. Mus. 45:1–463.

Brues, C. T.
1917. Adult hymenopterous parasites attached to the body of their host. Proc. Nat. Acad. Sci. 3:136–140.

Channa Basavanna, G. P.
1953. Phoresy exhibited by *Lepidoscelio viatrix* Brues. Indian Jour. Ent. 15:264–266.—II. 15:384–385.

Warner, W. V.
1903. [A note on *Scelio*]. Proc. Ent. Soc., Washington 5:308.

A RECORD OF AGABUS SEMIVITTATUS LeCONTE FROM CALIFORNIA

(Coleoptera:Dytiscidae)

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AGABUS SEMIVITTATUS LeConte

Agabus semivittatus LeConte, 1852. Ann. Lyceum Nat. Hist. New York, 5:204.
Agabus spilotus LeConte, 1859. Smithson. Contrib. Knowl., 2 (Art. 6) :5.
Agabus texanus Sharp, 1882. Sci. Trans, Roy. Dublin Soc., (2) 2:505.

It seems to have escaped notice for a long time that the type of *Agabus semivittatus* LeConte was from California. So far as I know it had not been found again in California for over a hundred years, until Dr. John Belkin and party took a male and two females at China Ranch, Inyo County, on May 30, 1955. China Ranch is just south of Tecopa, near the San Bernardino County line. The species is not included in my key to those known from the state (1956:319–321).

LeConte's original description gives merely "Colorado" as the type locality. This actually refers to the Colorado Desert of California. In the introduction to his paper (1851:125) he wrote, "My collection was made in the following manner: . . . San Diego, in May, June and September; Vallecitas [now Vallecitos] and the Desert of the Colorado, in October and November; Colorado River, December and March; Valley of the Gila, in January and February." since he specified "Ad flumen Colorado" for many other cases in this paper, it is fair to presume that he meant the Colorado desert for *A. semivittatus*; he may have found it in some small source of water in what is now the Imperial Valley. It is interesting to note that the then dry bed of the present Salton Sea was not discovered and explored until 1853–54.

LeConte (1863:17) placed his *A. spilotus* (Fort Laramie [Wyoming]) as a variety of *A. semivittatus*, and Crotch (1873:417) made it a synonym; I have specimens compared with the types by Dr. P. J. Darlington, Jr. Fall (1922:10), in listing *A. texanus* Sharp as a probable synonym, wrote "Some examples, more especially those from Texas and the southwest are a little less evenly oval than the typical form of the species . . .", as if the typical form was not from the southwest. On the basis of 12 Texas and 34 Arizona specimens studied, I, too, doubt there is any basis for a division of the species, but if a subspecies is named it will have to be from the eastern part of its range, since the three names already proposed are all for western material.

In addition to the localities given by Fall, I have seen specimens from UTAH: St. George. KANSAS: Douglas County; Onaga. SOUTH DAKOTA: Rapid City. OKLAHOMA: Wichita National Forest; McClain County; Norman. ARKANSAS: Bentonville. MISSOURI: St. Louis; Ranken; Columbia. MICHIGAN: South Haven; E. S. George Reserve, Livingston County. TENNESSEE: Elmwood. VIRGINIA: (state record only). PENNSYLVANIA: Bear Lake; Clarks Valley; Easton; Wind Gap. NEW JERSEY: Colonia; Phillipsburg; Princeton. NEW YORK: Chautauqua; Jones Beach; Ithaca; Long Beach; Meadowdale; N. Lebanon. MASSACHUSETTS: Framingham; Natick. QUEBEC: Como.

In my key to the California species (1956:319–321) *A. semivittatus* will trace to couplet 9, where it will not fit either choice, since the prosternal process is rather broad and flat, but not sharply acuminate, while there is only a partial row of punctures paralleling the lower posterior margin of the hind tibia. If put through the second choice it will run to couplet 15, where it fits the second part except that the elytral reticulation is as fine in the female as in the male. From there it could be traced to *A. approximatus* Fall, but is immediately distinguished by the dark epipleurae, broad, flat prosternal process, and sharply rectangular hind angles of the pronotum. The male of *A. semivittatus* has the anterior protarsal claw toothed near the base, and the aedeagus is simple apically, not bifid in profile.

REFERENCES

CROTCH, G. R.

1873. Revision of the Dytiscidae of the United States. Trans. Amer. Ent. Soc., 4 (3&4):383–424.

FALL, H. C.

1922. A revision of the North American species of Agabus together with a description of a new genus and species of the tribe Agabini. John D. Sherman, Jr., Mount Vernon, N.Y. 36 pp.

LECONTE, J. L.

1851. Descriptions of new species of Coleoptera, from California. Ann. Lyc. Nat. Hist. New York, 5:125–184.

1852. [continuation of the above] *Loc. cit.*, pp. 185–216.

1859. The Coleoptera of Kansas and eastern New Mexico. Smithson. Contrib. Knowl., 2 (art. 2):1–58, 2 pls., frontispiece a colored map.

1863. List of the Coleoptera of North America. Prepared for the Smithsonian Institution. Smithson. Miscell. Coll., No. 140, pp. 1–49. This is Part I. Part II appeared in 1866.

LEECH, H. B. AND H. P. CHANDLER

1956. Aquatic Coleoptera. Chapter 13 *in:* Aquatic Insects of California, with keys to North American genera and California species. Edited by Robert L. Usinger. Univ. Calif. Press, Berkeley and Los Angeles. (Coleoptera, pp. 293–371, figs. 13:1–13:61.) Published September 10, 1956.

A STRIDULATORY MECHANISM IN ARHAPHE CICINDELOIDES WALKER

(Hemiptera:Heteroptera:Pyrrhocoridae)

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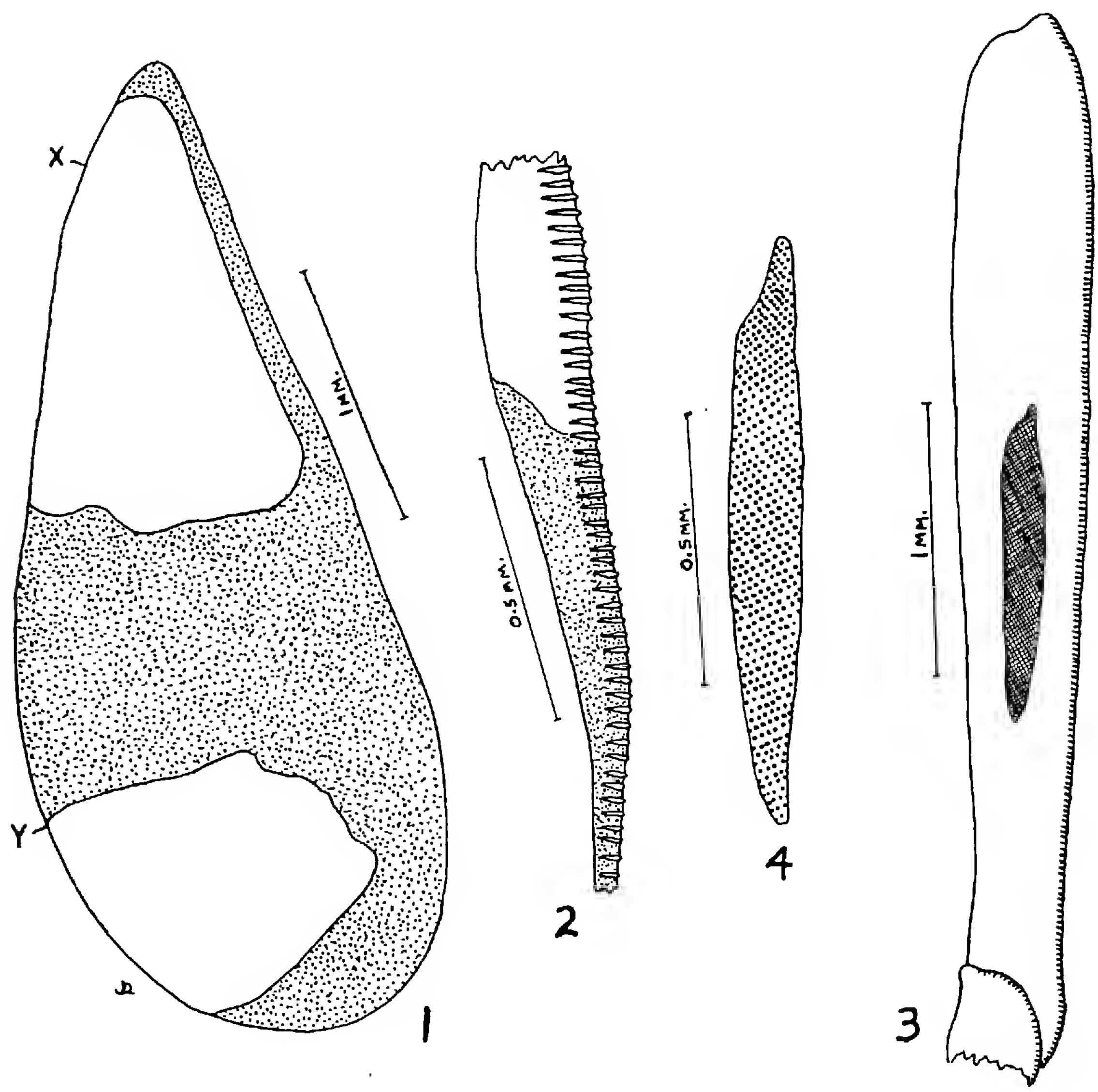
Stridulation in the Heteroptera has received only limited attention during the long period that this taxon has been studied. The recent summary by Leston (1957) has provided a thorough review of the accumulated knowledge on the subject. As Leston states (*loc. cit.*, p. 370), only the Aradidae (Usinger, 1954) and the Pentatomorpha (Leston, 1954) have received recent treatment. When the general paucity of information is considered, it is perhaps unwise to draw sweeping conclusions based on such a small amount of information. This is particularly true in the face of conclusions reached by Usinger (*loc. cit.*, p. 543) in the Aradidae, in which he feels that stridulatory mechanisms have arisen independently at least five times within that family and are not of any fundamental phylogenetic significance. Investigation now in progress tends to support this idea in the Lygaeidae. That they may prove valuable in certain groups is demonstrated by Leston (1957:372), in which all of the genera of Cydnidae examined exhibited the same type of wing strigil. Thus, as with any character, its relative value must be determined for each group under consideration before broad generalizations can be made.

A structure of apparent stridulatory nature was observed in *Arhaphe cicindeloides* Walker during the routine identification of a small collection of Heteroptera. The stationary portion, or strigil, is located on the outer edge of the hemelytron, occupying most of the margin (Fig. 1). The strigil consists of series of short ridges running at right angles to the long axis of the wing (Fig. 2). These ridges are approximately 0.04 mm. long and there are about 38 ridges per millimeter. The mobile portion, or plectrum, is located on the caudal surface of the hind femur in a central position (Fig. 3). It consists of an elongate area with minute papillae arranged in rows (Fig. 4). This portion is rubbed against the wing margin. The mechanism is found in both sexes. A literature search has failed to disclose any previous mention of a stridulatory mechanism in the genus *Arhaphe* or in the family Pyrrhocoridae.



EXPLANATION OF FIGURES

Stridulatory mechanism of *Arhaphe cicindeloides* Walker. Fig. 1, Left hemelytron (setation omitted), X-Y indicates region occupied by strigil. Fig. 2, Lateral view of portion of hemelytron showing details of strigil. Fig. 3, Left rear femur, caudal view, showing location and extent of plectrum. Fig. 4, Enlargement of plectrum showing arrangement of minute papillae.

Mr. Peter D. Ashlock, University of California, Berkeley, kindly checked the two other species of *Arhaphe, A. breviata* Barber and *A. carolina* H.–S. in the collections of the California Academy of Sciences and states that they have a mechanism similar to that found in *A. cicindeloides.* Thus the structure apparently is a generic character and should be added to the general generic description.

Arhaphe is included in the tribe Largini (Euryophthalmini) of the Larginae (Euryophthalminae) by Hussey (1929). *Japetus* and *Thaumastaneis,* the other myrmecoid genera related to *Arhaphe,* should be examined for similar structures. Representatives of two other genera included in the Largini, *Largus* and *Stenomacra,* were examined but no stridulatory mechanisms were observed. A thorough study of sound producing organs within the relatively small family Pyrrhocoridae would do much to further our knowledge of the systematic value of these structures.

Literature Cited

Hussey, Roland F.

1929. General catalogue of the Hemiptera. Fasc. III. Pyrrhocoridae. Northhampton. 1–144.

Leston, D.

1954. Strigils and stridulation in Pentatomoidea (Hem.): some new data and a review. Ent. Month. Mag., 90:49–56.

1957. The stridulatory mechanisms in terrestrial species of Hemiptera Heteroptera. Proc. Zool. Soc. London, 128:369–386.

Usinger, R. L.

1954. A new genus of Aradidae from the Belgian Congo, with notes on stridulatory mechanisms in the family. Ann. Mus. Congo Tervuren (Zool.), 1:540–543.

NOTES ON THE COLLECTION OF PHLEBOTOMUS STEWARTI MANGABIERA AND GALINDO

(Diptera:Psychodidae)

The collections of *Phlebotomus stewarti* Mangabiera and Galindo were made while collecting mosquitoes with an American model Mosquito Light Trap. The light source was a 50 watt white frosted vibration service bulb. The trap was located 10 feet from a stable with the light source five feet above the ground. The stable is located on a hillside approximately 100 yards from a small creek which runs most of the year, and there is also a small, partially covered reservoir 30 feet from the light trap fed by a small spring.

The San Mateo County Mosquito Abatement District operated five light traps throughout the District from March 1 to November 1, 1956. The insects collected from the light traps were sorted for mosquitoes and later sorted again for *Phlebotomus*. Only the trap stationed on the Hooper Estate, Woodside, California, produced *Phlebotomus stewarti.* The collection of insects was removed from the light trap and brought to the laboratory every other day. The first occurrence was on the first of June when 26 specimens were collected. This figure represents three trap nights.

The following data gives the numbers and the dates the specimens were trapped:

		♂	♀			♂	♀			♂	♀
June 1st	(26)	6	20	Aug. 3rd	(2)		2	Oct. 1st	(4)	3	1
6th	(none)			8th	(3)	1	2	5th	(4)		4
11th	(3)	1	2	13th	(6)	1	5	10th	(21)	3	18
15th	(9)	2	7	22nd	(4)	1	3				
July 18th	(2)		2	Sept. 5th	(18)	2	16				
25th	(8)	2	6	11th	(16)	2	14				
				14th	(2)		2				
				19th	(14)	3	11				
				24th	(12)	1	11				

A total of 154 adults of *P. stewarti* were taken during the period of June 1 until October 10. Close examination did not reveal any specimens taken after October 10 or before June 1. Also the collections indicated a definite break of adults on October 10. It is curious that the two peak collections are the first day and the last day they were collected.

A search of the eaves about the barn and adjacent pump house did not produce any *Phlebotomus* although other psychodids were present under the eaves and in the shrubbery. From the available literature this collection appears to be the first in San Mateo County. It is possible that a close look at light trap collections may turn up more records of *Phlebotomus* in the State.

I wish to thank Dr. L. W. Quate for his determination of the specimens even though the specimens were in such poor condition by being collected in the light trap.—THOMAS H. LAURET, *San Mateo County Mosquito Abatement District.*

BRACONID WASPS REARED FROM LEPIDOPTEROUS LARVAE IN ARIZONA, 1957[1]

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During 1957, approximately 12,000 lepidopterous larvae from crop areas in southern Arizona were reared to determine the numbers and kinds of insect parasites present. Individual larvae were collected from cotton, alfalfa, corn and sorghum, held in ½-pint waxed paper cups with transparent plastic lids and fed fresh alfalfa. The tachinid flies which emerged have been discussed by Butler (1958). This paper treats the braconid wasps.

Ten species and 55 individual rearings were obtained. These represent three subfamilies: Microgasterinae with four species of *Apanteles* and three of *Microplitis*, Cheloninae with a single species, *Chelonus texanus* Cresson, and Rogadinae, with two species of *Rogas*. The ten species are discussed below. Under each species there is a summary of the rearings and also of the adult records in the University of Arizona Collection, most of which were from a state-wide survey of the insects associated with crops, as described by Butler and Werner (1957) and Werner and Butler (1958). Two hundred and fifty adult records are included. Numbers in parenthesis in the text represent numbers of separate collections, not of specimens. All of the specimens, from rearings and survey, have been determined by C. F. W. Muesebeck. The author wishes to take this opportunity to thank Mr. Muesebeck for his kind assistance.

Apanteles marginiventris (Cresson).—A single specimen was reared from *Laphygma exigua* (Hübner) on cotton from Higley. Adult collection records indicate that this species is most abundant in Yuma (6) and Maricopa (11) Counties but there are single records from Santa Cruz and Gila Counties. Adults were swept from alfalfa (14), cotton (2), and Bermuda grass (1) during January (1), February (1), April (1), July (5), August (4), September (1) and November (6).

Apanteles medicaginis Muesebeck.—Ten rearings were made from *Colias philodice eurytheme* Boisduval. *A. medicaginis* is widely distributed throughout Arizona and it has been collected during the following months: January (2), June (5), July (2),

[1] Arizona Agriculture Experiment Station Journal Series Paper No. 478.

August (16), September (8), October (4), November (13) and December (1).

Apanteles militaris (Walsh).—Two rearing records were obtained for this parasite, one from *Laphygma exigua,* swept from alfalfa at Sahuarita in July, and the other from an unidentified dead caterpillar found on corn at Pearce in August. Twelve adult records were obtained from alfalfa. This species is generally distributed throughout southern Arizona and was collected during the following months: January (1), February (1), April (3), May (1), June (2), July (3), August (1) and November (2).

Apanteles sp., possibly new.—A single specimen was rearded from *Trichoplusia ni* (Hübner) from cotton southeast of Willcox in August.

Microplitis alaskensis Ashmead.—Four rearing records were obtained from *Trichoplusia ni* from cotton (2), alfalfa (1) and lettuce (1). Three adults were swept from alfalfa. Except for one collection from Navajo County, all collections were made in Cochise County. This species was taken in the summer, as follows: July (2), August (4), September (1) and November (1).

Microplitis brassicae Muesebeck.—Four rearing records were also obtained for this species from *Trichoplusia ni* but all from cotton. Two adults were swept from cotton and one from alfalfa. Adults were collected from Maricopa (4), Pima (1), Cochise (1) and Mohave (1) Counties in April (1), June (1), July (3) and August (2).

Microplitis croceipes (Cresson) is an important parasite of *Heliothis* spp. and 18 rearings were made from alfalfa (9), sorghum (6), cotton (2) and weeds (1). Collections of adults were from alfalfa (14), cotton (3), corn (1) and *Lepidium* (1). Adults were collected only in the central and south-eastern part of the state, during June (3), July (17), August (23), September (1) and October (1).

Chelonus texanus Cresson had the widest host range of the braconids reared. It was obtained from *Laphyma exigua* (7), *L. frugiperda* (J. E. Smith) (4), *Heliothis* sp. (1) and *Prodenia ornithogalli* Guenée (1) on alfalfa (7), corn (4), cotton (1) and Swiss chard (1). Adults were swept from alfalfa (94), cotton (11) and Bermuda grass (2). *C. texanus* is very common in crop areas and was collected in every county and throughout the year except during the winter. Monthly records are: March (2), April (2), May (6), June (19), July (43), August (27), September (21), October (6) and November (14).

Rogas molestus Cresson.—A single specimen of this species was reared from *Trichoplusia ni* on alfalfa at Amado in August.

Rogas perplexus Gahan.—Two rearings were obtained, one from *Trichoplusia ni* on alfalfa at Elfrida in July and the other from *Heliothis* sp. on cotton at Safford in August.

LITERATURE CITED

BUTLER, G. D., JR.
1958. Tachnid flies reared from lepidopterous larvae in Arizona, 1957. Jour. Econ. Ent. 51(4):561–562.

BUTLER, G. D., JR. AND F. G. WERNER
1957. The syrphid flies associated with Arizona crops. Ariz. Agr. Expt. Sta. Tech Bul. 132.

WERNER, F. G. AND G. D. BUTLER, JR.
1958. The reduviids and nabids associated with Arizona crops. Ariz. Agr. Expt. Sta. Tech. Bul. 133.

THE PARASITES OF THE CLOVER SEED CHALCID IN THE UNITED STATES[1]

(Hymenoptera: Chalcidoidea)

GEORGE D. BUTLER, JR.[2] AND HARRY L. HANSEN[3]

The clover seed chalcid, *Bruchophagus gibbus* (Boheman), annually causes serious losses to alfalfa and clover seeds throughout the United States. Its destructiveness is reduced by a number of chalcidoid parasites. This paper presents a key for the identification of the clover seed chacid and its parasites and a brief summary of their areas of recorded occurrence and important sources of published information. The key and figures were prepared by B. D. Burks[4] and the distribution records are from Muesebeck *et al.* (1951) and Hansen (1955).

The following key to the clover seed chalcid and its parasites in the United States was prepared by Dr. B. D. Burks. This key was based on dry female specimens reared from alfalfa, clover or other

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[1] Arizona Agricultural Experiment Station Journal Series Paper No. 463.

[2] University of Arizona, Tucson.

[3] West Virginia University, Morgantown (Parasite records collected while a graduate student, University of California, Berkeley).

[4] U. S. Department of Agriculture, A. R. S., U. S. National Museum.

suitable hosts and is not designed for identification of fresh specimens from field sweepings.

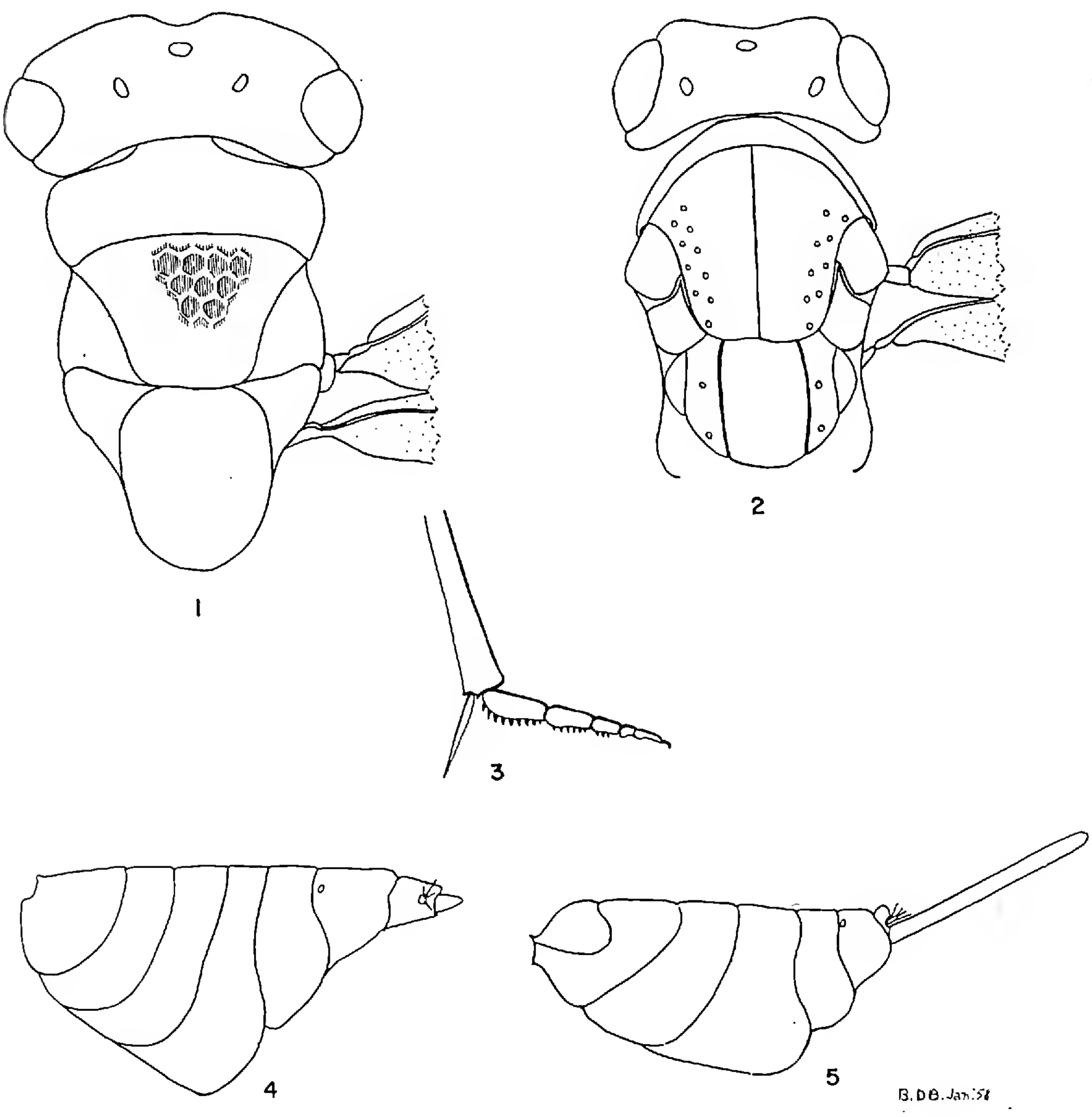
Key to the Clover Seed Chalcid and its North American Parasites

(Females—Dry Reared Specimens)

1. Body dull black; pronotum semi-quadrate and thoracic notum with thimble-like punctations, fig. 1 .... *Bruchophagus gibbus* (Boheman)
   Body partly or mostly shining metallic green, blue-green, or blue, never dull black; pronotum not semi-quadrate; thoracic notum not with thimble-like punctation 2
2. Virtually wingless, hindwings minute, forewings reduced to a pair of triangular vestiges which are normally held upright .... *Eupelmella vesicularis* (Retzius)
   Wings fully developed, forewing long enough to reach or surpass the posterior end of the abdomen 3
3. Midtarsus with a ventral comb of short, black spines, fig. 3; mesothorax flattened dorsally and with a pair of logitudinal ridges .... *Eupelmus* sp.
   Midtarsus without a ventral comb; thorax without logitudinal ridges 4
4. Ovipositor long, projecting for a distance at least one-half as great as length of abdomen, fig. 5 5
   Ovipositor projecting only slightly, fig. 4 7
5. Projecting portion of ovipositor one-half to two-thirds as long as abdomen .... *Liodontomerus perplexus* Gahan
   Projecting portion of ovipositor longer than abdomen 6
6. Forewing clear .... *Liodontomerus insuetus* Gahan
   Forewing with a large, vaguely defined dark spot behind the marginal vein .... *Liodontomerus longfellowi* (Girault)
7. Hind tibia partly dark brown to black; thorax black or navy blue with 4 metallic blue or green spots anteriorly .... *Trimeromicrus maculatus* Gahan
   Hind tibia entirely yellow or light tan thorax not black or navy blue with metallic spots 8
8. Scutellum with 2 dorsal, longitudinal grooves, fig. 2; tarsus with 4 segments 9
   Scutellum without dorsal, logitudinal grooves; tarsus with 5 segments 10
9. Body dark metallic blue; hind femora mostly dark .... *Tetrastichus bruchophagi* Gahan*
   Body yellow with bright metallic green spots; hind femora mostly or entirely yellow .... *Tetrastichus venustus* Gahan

* An occasional specimen has the hind tibae darkened; the heads of species of *Tetrastichus* almost always collapse when the specimens dry.

10. Central area of propodeum shagreened; antenna with 3 ring segments and 5 funicle segments..............*Amblymerus bruchophagi* (Gahan)
    Central area of propodeum almost smooth, with a few obscure, oblique carinae; antenna with 2 ring segments and 6 funicle segments..*Habrocytus medicaginis* Gahan



EXPLANATION OF FIGURES

Fig. 1, *Bruchophagus gibbus* (Boheman). Head and thorax, dorsal, showing bases of right wings and some sculpture; Fig. 2, *Tetrastichus bruchophagi* Gahan. Head and thorax, dorsal, showing bases of wings, setal pits, thoracic grooves; Fig. 3, *Eupelmus* sp. Mid tarsus; Fig. 4, *Habrocytus medicaginis* Gahan. Female abdomen, lateral aspect, showing ovipositor, cercus, and seven gastral segments; Fig. 5, *Liodontomerus perplexus* Gahan. Female abdomen, lateral aspect, showing exerted ovipositor, cercus, and seven gastral segments (abdominal segments III–IX). (Figures drawn by B. D. Burks, January 1958.)

FAMILY EULOPHIDAE

Tetrastichus bruchophagi Gahan

The females are dark blue-green in color except for a yellow apex on each femur and tibia. The tarsi are yellow except for the apical segment, which is dark. The antennae are dark brown and there are three funicular segments. The males are similar to the females except that the antennae have four funicular segments.

This species is generally distributed throughout the United States. It is the most active parasite of the clover seed chalcid in central California. Details of the life history and descriptions of the stages are given by Urbahns (1917). *T. bruchophagi* has also been reported as a hyperparasite of the alfalfa weevil parasite, *bathyplectes curculionis* (Thompson) (Muesebeck, *et al.* 1951).

Tetrastichus venustus Gahan

The females are yellow with metallic green spots. The male is usually all dark metallic green, with the ventral half of the frons yellow.

This is a rare parasite although the recorded distribution includes Arizona, California, Indiana and Iowa. Urbahns (1920) reared this species in small numbers from alfalfa seed but other workers have not found it.

FAMILY EUPELMIDAE

Eupelmus sp.

Urbahns (1920) records a single larva dissected from an alfalfa seed from Pasadena, California. Other workers have not encountered this species.

Eupelmella vesicularis (Retzius)

This species is listed as being parasitic on 42 host species, including the clover seed chalcid. Its distribution is recorded as Maine to Virginia and also Colorado, Oregon, Tennessee, Utah and Washington. Sorenson (1934b) found only an "occasional" specimen in Utah. Males are not known from North America.

FAMILY TORYMIDAE

Liodontomerus insuetus Gahan

The females are similar to *L. perplexus* except that the forewings are clear with no evidence of a fuscous spot in the median area. The ovipositor is slightly longer than the abdomen, which is bronzy in color and has the tergites tinged with green basally. The males of the three species of *Liodontomerus* look very much alike, but the genus can be recognized in the male by having the cerci exserted and at the apex of abdominal tergite IX, not biscuit-like and located anterior to that margin.

The distribution of this species includes Arizona, California, Kansas, New Mexico and Oklahoma. It is only rarely collected in these states. Some locality records are discussed by Urbahns (1920).

LIODONTOMERUS LONGFELLOWI (Girault)

This species has been often referred to as *L. secundus.* The females of *L. longfellowi* differ from *L. perplexus* in that the segments of the antennal funicle are subquadrate, in that there is always a vaguely defined fuscous spot in the median area of the forewing and in that the ovipositor is distinctly longer than the abdomen. The male is similar to the female except for the short abdomen and other secondary sexual characters.

L. longfellowi is recorded primarily from the northern half of the United States. It has only been found associated with the clover seed chalcid on red clover. The recorded distribution is Idaho, Iowa, Minnesota, Ohio, Oregon, West Virginia (a new record) and Wisconsin. Urbahns (1919) studied the life history of this species.

LIODONTOMERUS PERPLEXUS Gahan

The females of this species have the head and thorax brassy green, the abdomen bronzy above and darker on the sides. The segments of the antennal funicle are broader than long. The forewings may or may not have a cloudy area in the median portion. The ovipositor is about two-thirds as long as the abdomen. The males are similar to the females except that the third flagellar segment is reduced and appears similar to a ring joint and the abdomen is very short and blunt. The upper parts of the legs are darker green than the body with the extemities yellowish.

This species is only associated with the clover seed chalcid on alfalfa. It is widely distributed, with records from Arizona, California, Colorado, Idaho, Iowa, Nebraska, North Dakota, Oklahoma, South Dakota, Utah and Washington. A detailed description of the stages and the life history is given by Urbahns (1919).

FAMILY PTEROMALIDAE

AMBLYMERUS BRUCHOPHAGI (Gahan)

This species has also been called *Eutelus bruchophagi* Gahan. The female is similar in size and shape to the clover seed chalcid. The head is broad with dark brown eyes and antennae. The head and thorax are blackish-green, the legs are dark brownish or reddish-brown with the tarsi paler. The male is smaller than the clover seed chalcid. Its head and body are a bright metallic green. The antennae are bright yellow with a black club. The eyes are brown and the legs reddish-yellow.

The distribution of this species includes the states of Idaho, Utah, Wyoming and northern California. It emerges earlier in the spring than the clover seed chalcid or its other parasites. Urbahns (1919) discusses the biology and Sorenson (1930) discusses the adults and (1934a,b) gives rearing and sweeping records.

HABROCYTUS MEDICAGINIS Gahan

The female resembles *Amblymerus bruchophagi* in size and general appearance. *H. medicaginis* has two ring segments in the antennae while *A. bruchophagi* has three. *H. medicaginis* is bluish or bronzy green in general coloration. The head is broader than long in width, slightly exceeds the width of the thorax. The antennae are brown. The anterior margin of the pronotum is sharp. The males look very much like *Trimeromicrus maculatus* but can be separated by the difference in the number of ring segments, two in *Habrocytus* and three in *Trimeromicrus*.

This species has been reported from Arizona, California, Connecticut, Idaho, Iowa, Kansas, Minnesota, Nebraska, New Mexico, New York, Nevada, North Dakota, South Dakota, Utah, Washington and Wisconsin. Urbahns (1916) gives a detailed account of the life history of this species and it is mentioned by Sorenson (1930, 1943a,b).

TRIMEROMICRUS MACULATUS Gahan

The females are purplish black with four pale blue-green spots on the mesoscutum, one anteriorly on each side of the median line and another on the scapulae. The first abdominal tergite is brassy green, the following tergites are green except for broad black apical borders. The males are similar to the females except the abdomen is short and blunt and there are no pale spots on the thorax.

It is found in Arizona, California, Illinois, Kansas, New Mexico, South Dakota, Utah and Washington. This species is considered to be an important parasite in Arizona and California. Urbahns (1919) discusses its life history and distribution. Other hosts which *T. maculatus* attacks are the sunflower seed weevil, *Desmoris fulvus* (LeConte) and the alfalfa gall midge, *Asphondylia websteri* (Felt).

LITERATURE CITED

HANSEN, H. L.

1955. The host relationships of the seed-chalcid, *Bruchophagus gibbus* (Boheman) (Hymenoptera:Eurytomidae) Universiy of California (Berkeley) Ph.D. Thesis (unpublished).

MUESEBECK, C. F. W., K. V. KROMBEIN AND H. K. TOWNES

1951. Hymenoptera of American North of Mexico. U.S.D.A. Agr. Mono. 2.

SORENSON, C. J.

1930. The alfalfa seed chalcis fly in Utah. Utah Agr. Expt. Sta. Bul. 218.

1934a. Chalcis-fly in alfalfa seed. Utah Agr. Expt. Sta. Bul. 250:50.

1934b. Chalcis-fly infestations of alfalfa seed and parasitism of the chalcis fly in Utah, 1930 to 1933 inclusive. Proc. Utah. Acad. Arts Letters 11:241–44.

URBAHNS, T. D.

1916. Life history of *Habrocytus medicaginis*, a recently described parasite of the chalcis fly in alfalfa seed. Jour. Agr. Res. 7(4):147–153.

1917. *Tetrastichus bruchophagi*, a recently described parasite of *Bruchophagus funebris*. Jour. Agr. Res. 8 (7):277–282.

1919. Life history observations on four recently described parasites of *Bruchophagus funebris*. Jour. Agr. Res. 16 (6):165–173.

1920. The clover and alfalfa seed chalcis-fly. U.S.D.A. Bul. 812.

SYNONOMY OF DINODERUS PUBICOLLIS VAN DYKE

(Coleoptera:Bostrichidae)

HUGH B. LEECH

California Academy of Sciences, San Francisco 18

Examination of the type series of *Dinoderus pubicollis* Van Dyke showed that it consisted of two previously described species. Dr. Vrydagh verified this from paratypes, and mentioned it in his revision of the genus (1956:495–496), but kindly left the fuller announcement to me.

Fisher, knowing Van Dyke's species only by description, included it in his key (1950:25) to the species recorded from North America north of Mexico (but including Baja California). For other synonymies, see his paper.

DINODERUS (DINODERASTES) JAPONICUS Lesne

Dinoderus japonicus Lesne, 1895. Ann. Soc. ent France, 64(1):170.
Dinoderus pubicollis Van Dyke, 1923 *(partim)*. Bull. Brooklyn Ent. Soc., 18(2):45. **New synonymy.**

The type and six paratypes[1] are *D. japonicus*.

As the recorded host plant is bamboo, it is possible that Van Dyke's specimens, all from Los Angeles, California, were not actually dug out of mesquite wood.

DINODERUS (DINODERUS) MINUTUS (Fabricius)

Apate minutus Fabricius, 1775. Systema Entomologiae, p. 54.
Dinoderus pubicollis Van Dyke, 1923 *(partim)*. Bull. Brooklyn Ent. Soc., 18(2):45. **New synonymy.**

Three paratypes of *D. pubicollis* are *D. minutus*.

The larvae of this species breed in bamboos and canes. All specimens of the type series of *D. pubicollis* are labeled simply "Los Angeles Co. Cal.".

DINODERUS (DINODERUS) BREVIS Horn

Dinoderus brevis Horn, 1878. Proc. Amer. Philos. Soc., 17:549 (in key), 550–551 (descr.).

[1] In his description Van Dyke referred to the "Type and nine paratypes", but he actually wrote out labels for only four of them.

Fisher (1950:28) lists this as intercepted in bamboo in five states. To these may be added California, where examples were taken at Berkeley in November, 1934, in bamboo from Calcutta, India.

References

Fabricius, J. C.

1775. Systema Entomologiae sistens Insectorum, classes, ordines, genera, species, adjectis synonymis, locis, descriptionibus, observationibus. Flensburgi et Lipsiae, Korte. 832 pp. [Not seen.]

Fisher, W. S.

1950. A revision of the North American species of beetles belonging to the family Bostrichidae. U.S. Department of Agriculture, Miscellaneous Publication No. 698. 175 pp. U.S. Government Printing Office, Washington, D.C.

Horn, G. H.

1878. Revision of the species of the sub-family Bostrichidae of the United States. Proceedings of the American Philosophical Society, 17:540–555.

Lesne, P.

1895. Descriptions de genres nouveaux et d'espèces nouvelles de Coléoptères de la famille des Bostrychides. Annales de la Société Entomologique de France, 64(1):169–178.

Van Dyke, E. C.

1923. New species of Coleoptera from California. Bulletin of the Brooklyn Entomological Society, 18(2):37–53.

Vrydagh, J. M.

1956. Contribution à l'étude des Bostrychidae (Coleoptera Teredilia) VII. Le genre Dinoderus Stephens 1830. Mémoires de la Société Royale d'Entomologie de Belgique (1955), 27:495–513. [Published in May, 1956.]

BOOK REVIEW

THE INVERTEBRATA, A MANUAL FOR THE USE OF STUDENTS, by L. A. Borradaile and F. A. Potts, with chapters by L. E. S. Eastham and J. T. Saunders. 3rd ed. revised by G. A. Kerkut. Cambridge Univ. Press. American Branch: 32 East 57th Street, N.Y. pp. xvii + 795, 523 figs., 1958. Price $8.50.

This new edition of a standard text will be welcomed by those who used earlier editions and presumably by future generations of students. In the new edition information is organized under each group with a "diagnosis" followed by a narrative account. The illustrations have been provided with full labels in place of the frustrating abbrevations of earlier editions. A terminal chapter summarizes for each group the important literature. This is perhaps the best innovation, though the choice of references is questionable in some instances.

Recent discoveries have been incorporated in some places, including the phylogenetically significant molluscan, Neopilina, but the Phylum Brachiata or Pogonophora is not mentioned, the Crustacean group Caphalocarida is overlooked and, as in earlier editions, the Symphyla are ignored. Also the Tardigrada, Pentastomida and Pycnogonida are reduced to orders of the Arachnida with no comment as to their unique features. These criticisms are serious in a book to which one looks for the latest views on fundamental relationships of invertebrate types.

It is stated on the jacket that the chapter on insects was completely re-written by Prof. Eastham. Certainly a revision was long overdue and the new version drops the Berlese theory of insect metamorphosis and adopts the now popular arrangements of Palaeoptera (Odonata, Ephemeroptera) and orthopteroid orders. Unfortunately, a few unaccountable deviations from the usual arrangement were adopted including the archaic "Rhynchota" for Hemiptera, and Planipennia for Neuroptera. The Strepsiptera were placed with the Hymenoptera rather than with the Coleoptera, possibly following the treatment in Grassé, Traité de Zoologie, but few if any specialists would agree with this. Also the Paraneoptera (Heterometabola or Exopterygota) are placed after the Holometabola, a strange and undefended sequence.

The treatment of the Apterygota also leaves something to be desired. Collembola and Protura are bracketed with Diplura with no mention of the significant differences that have led most recent authors to recognize the separate classes Myrientomata and Oligoentomata. To summarize, "Borradaile and Potts" is still the best textbook in invertebrates but the revision is uneven and lacking in depth at critical points.—R. L. USINGER, *University of California, Berkeley.*

* New names in bold face, synonyms and homonyms in italics.

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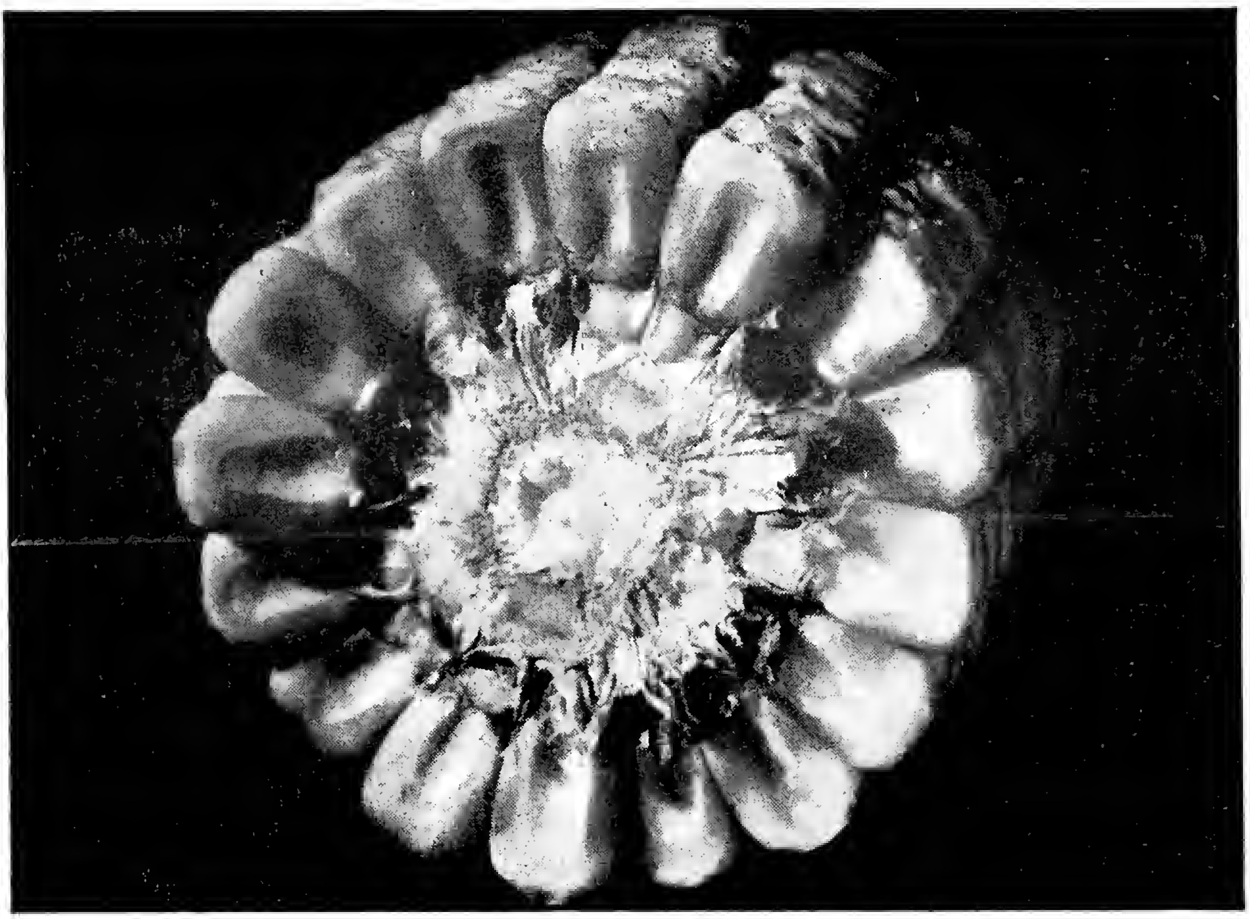

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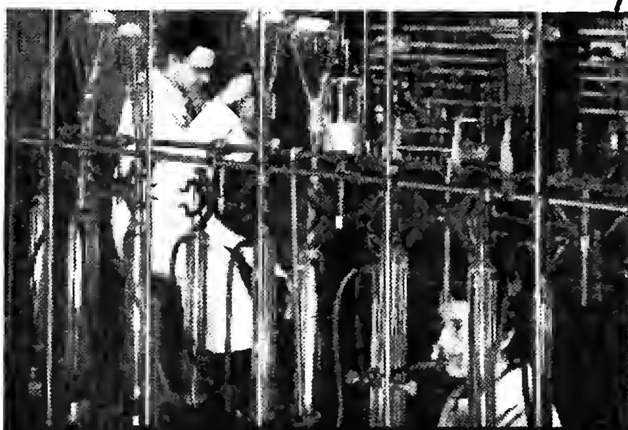

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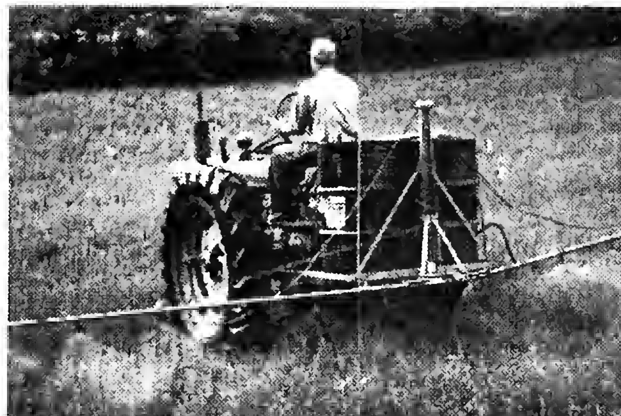

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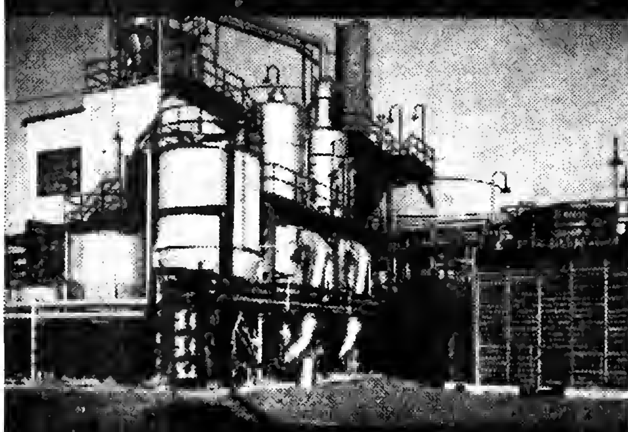

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