

PROCEEDINGS  
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HAWAIIAN  
ENTOMOLOGICAL SOCIETY

I

PART 4

(With Plate and Text Figures)



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# Hawaiian Entomological Society

Founded 1905

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\* Original. † Honorary.

JANUARY 3rd, 1907

The twenty-fourth regular meeting was held in the Entomological Laboratory of the H. S. P. A. Experiment Station, Mr. Giffard in the chair.

Member elected: Mr. G. A. Jordan.

NOTES AND EXHIBITION OF SPECIMENS.

Dr. Perkins exhibited a number of aculeate Hymenoptera from the Hawaiian Isles and Australia, and made remarks thereon.

(i) *Prosopis*.

About a score of species of this genus and allied forms from Australia were exhibited. Dr. Perkins emphasized the great variety of habitus and structure of these Australian forms as compared with the fifty or more distinct Hawaiian species he had separated from *Prosopis* under the name of *Nesoprosopis*. The latter were in general of very uniform and inconspicuous appearance, and none of the Australian species at all resembled them structurally.

The brightly metallic Australian species, those with bright yellow thoracic markings and red abdomen, and the conspicuous forms, had no analogy with the Hawaiian series. Australia also yielded the extraordinary black and yellow wasp-like genus *Hylaeoides*, which not only exactly reproduced the appearance of some Australian wasps, but even had the very remarkable structure of the second ventral segment shown by some of these.

"Very similar to the metallic true *Prosopis* of Australia is a series of metallic species which form a new genus of bees, allied indeed to *Prosopis*, but with an acutely lanceolate tongue and indicating a direct origin of a sharp-tongued bee from an obtuse-tongued one. This genus is therefore of great interest as it connects the two distinct series of bees—the Obtusilingues and Acutilingues.

Another extraordinary new genus allied to *Prosopis* is an insect so like to some fossorial wasps that it would hardly be recognized as a bee at all without careful examination, but might be suspected of being an abnormal Pemphredonid or Crabronid, the general form and incrassate head resembling these wasps. It is, however, a true bee and not even a parasitic

species, as are some of our red and black Hawaiian *Nesoprosopis*, since the curved sweeping hairs of the front legs are well developed and have noticeably dilated, or spatulate, apices.

I should have said above, that, as conjectured by Cockerell, F. Smith must have, by confusion, dissected some wasp in mistake for the wasp-like *Hylaeoides* above referred to, since his figures of the mouth-parts are those of a wasp and not like those of this bee, which I have myself dissected."

(ii) *Lithurgus*.

Dr. Perkins then exhibited an anomalous *Lithurgus*, and made the following remarks:

"The bee here exhibited is one of the Megachilidae and is a comparatively recent introduction into the Hawaiian islands. The first specimen taken was caught by Mr. Marlatt of the Department of Agriculture at Washington, when in company with Koebele and myself at Waialua, I think in 1900. On this occasion we took plenty. If the characters given by Ashmead and others for the genera of this family be considered adequate and correct, then this bee constitutes, I believe, an undescribed genus, or it may be considered as a species of *Lithurgus* sens. lat. Ashmead states that European *Lithurgus* have no pulvilli, while other American writers state that American species described under the genus have a pulvillus at least in the male and a new genus has been described for one of these. This species, however, is said to have 3-jointed labial palpi. The Hawaiian insect has 4-jointed labial palpi, its mandibles are *Lithurgus*-like, 3-dentate at apex, and there is a pulvillus at least in the male. Its other oral characters are not at all *Megachile*-like. Its maxillary palpi are 4-jointed not 2-jointed. (Ashmead, however, gives *Megachile* 4 joints to these organs!) The tongue is not folded so as to merely lie beneath the head in repose, but is extended straight-back along the sternum, which is channeled for its reception, while the labrum is much less long than in *Megachile* and projects very little backward from the clypeus."

(iii) *Odynerus*.

Dr. Perkins then read some remarks on the "Habitus and Structure of Australian *Odynerus* and Allies compared with those of Hawaii."

Some thirty species of Australian *Odynerus*, or closely allied forms, were exhibited, showing the great variety of appearance and bright colours as compared with the remarkably general blackness of the Hawaiian species. The variety of structure was also large. A few typical *Odynerus* of other countries were also exhibited, and Dr. Perkins remarked on the necessity of the study of exotics; with the study of a few *Prosopis* and *Odynerus* one knows all the Hawaiian species.

In a discussion on the habits of aculeate Hymenoptera, Dr. Perkins, in reply to Dr. Cobb, stated that the caterpillars, stored up for the food of the larvæ, were put through a process of stinging and malaxation. Dr. Cobb had never observed the caterpillars to be dead or even injured. Mr. Swezey stated that sometimes the caterpillars are so insufficiently paralyzed as to pupate, and even crawl about after being stung. The larva of the bee is hung up in the cell and feeds by descending onto the caterpillar.

Dr. Cobb observed that the drawing of insects was more desirable when from living specimens. He had found that he could paralyze them by means of bee stings; while a wasp's sting would kill an insect, the *Odynerus* sting would only paralyze. He had produced paralysis in Diptera by either inserting the bee sting poison on the point of a needle in the neighborhood of the thoracic ganglia or by presenting the same parts of the specimen to the bee-sting directly. An insect so stung retained its natural color and position ideally for drawing.

Mr. Swezey stated that he never was severely stung by *Odynerus* in all his handling of them.

Mr. Giffard exhibited specimens and presented the following notes:

1. *Calandra* (?) sp. (Introduced) 1 specimen.

Taken on October 14, 1906, from the base of a new pseudobulb of *Phalaenopsis amabilis* imported from the Philippine Islands during month of October. Larva of above also seen in the same plant.

2. *Calandra remota* (Hawaiian) 6 specimens.

Taken on October 20, 1906, at 1000 feet elevation on Tantalus in decaying stems of banana (*Musa cavendishii*). 20 specimens in all taken.

3. *Brachypeplus guttatus* (Hawaiian) 6 specimens.

Taken on October 1 of 1906 at 1300 feet elevation on

Tantalus in exudation on *Acacia koa*. This species is not common. In all 18 specimens were taken, including larvæ.

Mr. Swezey exhibited specimens and presented the following notes: Since the beginning of the rainy weather in December, vegetation has sprung up luxuriantly in the dry district of Kaimuki, where everything appeared dead on the unoccupied land. Amongst the revived vegetation are tangles of the "morning glory," (*Ipomoea tuberculata*) growing over Lantana and other bushes, and on stone walls. At the present time the caterpillars of *Sphinx convolvuli* may be seen in hundreds and they have nearly stripped the leaves from the vines. They are of all sizes from young to full grown; and they vary in color from nearly uniform green to nearly uniform black with a close series between, in most of which the characteristic pattern for the species shows. Harrison G. Dyar has described the green form and the brown form in Entomological News, VI, p. 95-96, 1895. In this no mention is made of other variations; but Poulton in Trans. Ent. Soc. London, p. 515-554, 1888, gives full details of life history, and variations of caterpillars, illustrated with two plates.

Dr. Cobb remarked that at one time he found his morning glory and sweet potato vines were eaten by these caterpillars. At his suggestion they were offered to his chickens but they refused to eat them; after a slight starvation they ate them quite readily and he got rid of them by feeding them to the fowls. Mr. Swezey thought that these caterpillars were an exception to the rule in that he had so far bred no parasites from them; Dr. Perkins replied that while the grown caterpillars were not parasitized, the very young stages were heavily so. The native species of the same group were badly killed by *Tachina* and *Echthromorpha*.

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FEBRUARY 7th, 1907

The twenty-fifth regular meeting was held in the Library of the Board of Agriculture and Forestry, Mr. Giffard in the chair.

Under miscellaneous business, the Secretary read a communication from the President in which he announced the generous contributions, towards a *Publication Fund*, by the following firms:

W. G. Irwin & Co., Vice-President, W. M. Giffard.....	\$ 25.00
Alexander & Baldwin, Acting Manager, E. E. Paxton.	25.00
H. Hackfeld & Co., Vice-President, W. Pfothenhauer..	25.00
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A total of .....\$200.00

The thanks of the Society were extended to the President for his efforts in making this collection in behalf of the Society and the Secretary was instructed to send to each of the contributors a letter of thanks and a set of the Society's Proceedings as far as published.

The two amendments to the Constitution presented at the December meeting were voted upon and carried.

#### NOTES AND EXHIBITION OF SPECIMENS.

Mr. Wilder was glad to be informed by Mr. Craw that the scale bug recently collected on his mango trees was not *Coccus mangiferae* as originally supposed. Mr. Kotinsky stated that while this scale insect was found on mango trees purchased in the Moanalua Gardens, it was not found in Mr. Wilder's yard. The *Coccus* observed on trees other than of Moanalua-origin proved to be *Coccus acuminatus*. As regards the white "cottony" or "felty" scale on the Indian Mango trees in Moanalua, while Mr. Kotinsky was inclined to group it in the *Diaspidinae*, Mr. C. L. Marlatt of the U. S. Bureau of Entomology, in a recent letter, unhesitatingly called it *Odonaspis* sp., and Mr. E. E. Green believed "that it will more probably fall within the Dactylopiines." A study of the early stages is doubtless necessary to the elucidation of the problem, but this will have to be done from the material on hand as all the known plants infested with it were fumigated and the insect probably exterminated.

Mr. Kotinsky exhibited a specimen of *Danaus plexippus*, the legs of which were encircled and held fast by the tendril of a cucurbitaceous vine. When discovered the insect was dead, and was being attacked by ants. There was no means of ascertaining whether the butterfly died a natural death, or was caught and held fast in the clutches of the tendril while resting over night.

From this comparison it is seen that so far as known, there are two habits of living for members of this family: larvae of some species live on algae in running water or moist places; larvae of other species breed in manure and decomposing organic matter.

Mr. Kotinsky had been pestered by this and another small dipteron swarming about the lamp in his study. He was certain that they both breed in the moist rice chaff placed in a sake tub with growing ferns. Mr. Swezey observed that the comparison between the Brazilian species and the one studied by Mrs. Swezey is interesting in that the former replenished the air supply by means of tracheal gills while the latter breathed by means of spiracle tubes, as well as tracheæ.

### Notes on Crabronidae [Hymen.]

BY R. C. L. PERKINS, SC. D. (\*)

### Observations on recent Swarms of Caterpillars at Kaimuki

BY OTTO H. SWEZEY.

The copious rains of December and January caused a luxuriant growth of grass and weeds to spring up in this barren district; and also the Lantana and other nearly dead shrubbery to take on a vigorous growth. This growth was soon attacked by numerous caterpillars, however, and in many cases the plants entirely stripped of their foliage. The following species were most conspicuous:

*Vanessa cardui*, feeding on *Malva*.

*Vanessa huntera*, feeding on *Gnaphalium*.

*Sphinx convolvuli*, feeding on *Ipomoea*, also occasionally on *Xanthium*.

*Deilephila lineata*, feeding on *Portulaca*, *Boerhaavia* and occasionally *Xanthium*.

*Leucania unipuncta*, feeding on various grasses.

*Leucania amblycasis*, an occasional caterpillar in grass.

*Agrotis crinigera*, feeding on grasses, *Datura* and *Sida*.

*Agrotis dislocata*, feeding on grasses and *Gnaphalium*.

*Agrotis saucia*, not numerous, feeding on *Sonchus* and other weeds.

*Agrotis ypsilon*, a few on *Sonchus* and other weeds.

\* Owing to the absence of Dr. Perkins, the MS. of this paper was not obtainable.—Eds.

*Heliothis armigera*, only a few, feeding on flowers and buds of *Sida* and *Malva*.

*Spodoptera mauritia*, feeding on *Xanthium*, *Stramonium*, and the following grasses: *Eragrostis*, *Cenchrus echinatus*, *Panicum cinereum*, *P. nephelophilum* var. *xerophilum*, *Cynodon dactylon*, *Chloris radiata*, *Chloris* sp., *Eleusine indica*, *Eleusine* sp.

*Spodoptera exigua*, feeding on grasses, *Nicotiana glauca* and *Sonchus*.

*Plusia chalcites*, feeding on nearly everything; has stripped *Sonchus*, even eating the tender stems; has eaten off many tips of Lantana shoots; stripped or riddled the leaves of the following: *Datura*, *Xanthium*, *Ipomoea*, *Sida*, tomato, and many other plants.

*Omiodes accepta*, feeding on grasses.

*Omiodes continuatalis*, feeding on "pili" grass (*Heteropogon contortus*).

*Omiodes localis*, feeding on grasses.

*Omiodes demaratalis*, feeding on grasses.

*Hymenia recurvalis*, feeding on *Euxolus* and *Portulaca*.

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MARCH 7th, 1907

The twenty-sixth regular meeting was held in the Entomological Laboratory of the Experiment Station, H. S. P. A., Mr. Giffard in the chair.

Members elected: Messrs. E. D. Tenney, E. E. Paxton and T. Clive Davies.

#### NOTES AND EXHIBITION OF SPECIMENS.

Dr. Perkins presented notes on new Dryinidae from Arizona collected by Prof. Koebele during last year\* and exhibited the following series of specimens:

*Chalcogonatopus* 14.

*Agonatopus* (n. g.) 5.

*Gonatopus* 1.

*Neogonatopus* 2.

*Pseudogonatopus* 2.

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\* Published as Bull. Ent. H. S. P. A., IV pp. 1-59 (1907).

- Agonatopoides* (n. g.) 1.  
*Eucamplonyx* (n. g.) 1.  
*Apterodryinus* (n. g.) 1.  
*Neodryinus* 1.  
*Hesperodryinus* (n. g.) 3.  
*Perodryinus* (n. g.) 1.  
*Demodryinus* (n. g.) 2.

Dr. Perkins also exhibited a species of *Eupelmus*, remarking that while the pronotum in the females of the *Gonatopus* and its allies is freely movable, a most unusual condition in Hymenoptera, the thorax of the *Eupelminæ* is still more remarkable, the suture between the mesonotum and scutellum allowing of movement. Thus while the thorax behind the posterior margin of the mesonotum is in one position at about right angles to the mesonotum itself, it can at the will of the insect be so straightened out that the mesonotum and parts behind it are in the same horizontal plane.

Mr. Kotinsky then read a note on "Hawaiian species of *Pseudococcus* allied to *citri*." The author was certain that the *Pseudococcus* on pineapple, sisal, and sour-sop was distinct from *P. citri* but had not as yet discovered taxonomic characters to differentiate them.

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APRIL 4th, 1907

The twenty-seventh regular meeting was held in the Library of the Board of Agriculture and Forestry, Mr. Giffard in the chair.

NOTES AND EXHIBITION OF SPECIMENS.

Dr. Cobb exhibited a linen tester, the lower lens of which was graduated in two directions to  $\frac{1}{2}$  and  $\frac{1}{4}$  mm. which he thought should facilitate the counting of punctures and other structures upon a given area of an insect. He also exhibited an ordinary pocket lens the cover of which was so perforated that a dissecting pin penetrating the perforation might be extended below to the focal distance and center of the lens, thus serving as an aid in dissection.

Mr. Terry exhibited specimens and read a note on what he considered was accidental parasitism, viz.: *Chalcis obscurata* bred from a Tachinid pupa within that of a lepidopterous pupa. Dr. Perkins stated that judging from the fact that the

same chalcid was bred from Ichneumons within lepidopterous pupae it would seem to show that the insect is a primary and secondary parasite at the same time and that we are gradually being forced to abandon the old idea of a parasitic insect being either exclusively primary or exclusively secondary.

Mr. Kotinsky recorded an addition to the Hawaiian insect fauna by the permanent establishment of *Erucoila impatiens* Say on the Islands, Mr. Jordan and he having collected four specimens that morning at Palolo. Mr. Swezey added that he had collected a specimen of the same species in town on the 29th of the previous month.

PAPERS READ.

**A Note on the Introduction of *Culex fatigans* into the Hawaiian Islands. [Diptera]**

BY G. W. KIRKALDY.

In 1861 Osten Sacken gave 1828-30 as the date of the supposed introduction of mosquitoes into these Islands,\* while lately Van Dine referred it back to 1826\*\*.

According to Fornander (\*\*\*) S. M. Kamakau (one of the older Hawaiian historians) "states that fleas and mosquitoes were unknown in the Hawaiian group until the arrival of Cook's ships," implying that they were introduced then; so that if this is correct these pests arrived hereabout 1778-9 instead of 1826-30.

**Odynerus Parasites [Hymen.]**

BY OTTO H. SWEZEY.

(i) *Melittobia hawaïiensis* Perkins.

A large number of this parasite was reared from material handed me by Mr. W. M. Giffard, collected by him in Moana-

\* "Einführung von Mücken auf der Sandwich-Inseln," 1861 Stettin. Ent. Zeit., XXII, 51-2; see also the same author, "Facts concerning the importation or non-importation of Diptera into distant countries," 1884, T. E. S. London 494.

\*\* "Mosquitoes in Hawaii," 1904, Bull. Hawaii (U. S.) Agr. Sta. 6 p. 1-30.

\*\*\* "An account of the Polynesian Race," II. 199.

lua Valley, at about 200 feet elevation, January 14, 1907. A large number of small pupae was in a mass together with the remains of some larva upon which they had fed as parasites. There was no means of determining what this host larva was; but it was supposed to be either an *Odynerus* or a *Pison* larva, as there were *Pison* cocoons and remains of *Odynerus* nests in the pieces of rotten wood (Breadfruit tree) in which this mass of parasitic pupae was found. There were also cocoons of what appeared to be a *Megachile*; also a beetle larva which on rearing proved to be *Ceresium simplex*, and also among the numerous burrows was "frass" of some wood-boring *Tineid* larva, all of which made it the more difficult to determine the true host with certainty.

The following week these pupae transformed to the adult parasites.\* They were nearly all females, but one male was observed. After remaining together in a tube for a few days after maturing, 12 females were removed to a tube containing several larvae of the mud-dauber wasp (*Sceliphron caementarius*); several larvae of this wasp were also put in the tube with the remaining parasites. Many females were observed in the act of ovipositing in these larvae. In a week's time, small larvae of the parasite were observed very numerous feeding externally on the larvae of the wasp, and in about another week they entirely consumed their hosts and began to pupate. The first ones matured in 21 days from the time eggs were first laid. A count made of the number of parasites per host gave 448 for one (of which only 8 were males), and 324 for another. In one instance a larva within a cocoon was parasitized. No opening could be found by which an adult parasite could have entered. The eggs must have been laid by piercing the cocoon with the ovipositor, in which case perhaps the eggs were not deposited within the host, but on the outside where they normally feed after hatching. Perhaps this would be the normal method of laying eggs.

After starting the above experiments in breeding this parasite, some larvae of *Odynerus nigripennis* and *Pison hospes* were obtained, and parasites admitted to them. They bred upon these the same as upon the former host. In the case of the *Pison* larvae, one without a cocoon remained unparasitized, while two within cocoons were parasitized.

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\* Being referred to Dr. Perkins for identification he has described it as a new species.

These experiments prove that this parasite will attack and breed upon three different kinds of wasps, of somewhat different habits; but does not help to determine what it was upon which they were originally discovered by Mr. Giffard. Undoubtedly it was either *Odynerus* or *Pison*. From its prolificness, if it has but recently become introduced, it will soon be numerous enough and sufficiently spread so that observers will ere long be finding it, and mayhap under circumstances in which its host can readily be determined.

If it should prey chiefly upon *Odynerus* species, its presence will be detrimental, as the *Odyneri* store up caterpillars for food for their young; but if it should prey chiefly upon *Pison* and *Sceliphron* its presence would be beneficial as these latter wasps both store up spiders for their young.

(ii) *Agelaiaspis* sp. (?)

This small Chalcid-fly I have found widely distributed in the Hawaiian Islands; having found it breeding on *Odynerus* larvae, or finding the remains of larvae upon which they have fed, in nests of *Odynerus nigripennis* which I have examined in Nuuanu and Makiki Valley, Oahu; Iao Valley, Maui, and in Kau, Hawaii. In each of the places mentioned I have found that the parasites were numerous. In one instance, I bred 105 parasites from one *Odynerus nigripennis* larva. Where I have found parasitized larvae they have always been full-grown; and when the parasites become fullgrown and pupate they have eaten the entire contents of their host and completely fill its skin. They can be seen thru the partially transparent skin, packed so close that the skin bulges where it conforms to the parasites inside. The adult parasites escape from the mud cell of the wasp by gnawing a tiny hole thru the plug of mud which sealed it.

I first observed this parasite in December, 1905. In June, 1906, I made several attempts to breed them on the larvae of *Sceliphron caementarius*; but was entirely unsuccessful. The other parts of its life cycle yet remain to be worked out.

This is unquestionably a detrimental parasite, as it, so far as I know, preys only on *Odynerus* species.

**Melittobia hawaiiensis sp. nov.** [Hymen.]

BY R. C. L. PERKINS.

Black, or brownish black, the thorax with a faint aeneous reflection, the head and thorax also faintly metallic. The mandibles are reddish and the scape of the antennae is more or less pale, sometimes clear yellow, at other times only more or less obscurely brown in dried specimens. The tibiae and tarsi are yellow, the femora dark, or at least more or less sordid. In fresh specimens the ocelli are enclosed in a pale ring, and the eyes pale-margined, while there is a pale median line on the face, furcate above and below, forming an elongate X-like mark. The mesothoracic sutures are mostly pale, as also the parapsidal furrows and the scutellar grooves. In dry specimens generally all these pale markings disappear. Head convex in front in fresh examples, but collapsing altogether in dry ones; the antennae with elongate scape, widening to the apex, and about as long as the pedicel and funicle joints together, the pedicel obconical and longer than the first funicle joint, the latter not differing much from the two following, and transverse on their widest faces, the club ovate, twice as long as its greatest width, about equal to the three funicle joints together, and with a spine at the apex. Thorax with very short hairs and very minutely punctured, the propodeum smooth and shining and with a median groove. Abdomen usually subparallel-sided in dry specimens and elongate, being about as long as the head and thorax together or rather more. Length rather more than 1mm. Wings evenly dotted with short hairs and with short marginal fringe; the marginal vein with two rows of long and some shorter setae. Male quite unlike the female, blind and with very different antennae, which are 9, not 8-jointed. Color, yellow or brown, sometimes more or less darker in parts, the apical joints of the antennae more or less black. Scape very large, subtriangular, and about as long as all the other antennal joints together; it is concave beneath and some of the following joints are usually withdrawn into the concavity, which is partly closed by the incurved sides, pedicel laminate and often entirely hidden beneath the scape, first funicle joint triangular, very narrow at the base, second and third not differing much from one another, both being wide, fourth very short and transverse, club three-jointed, the funicle joints are set with longish setae.

Wings rudimentary, the front pair about as long as the thorax, the marginal vein very long, reaching nearly from base to apex and clothed with many long bristles.

var. *peles* nov.

A single specimen taken at Kilauea in July, 1906, is probably a distinct species; it appears to be larger and wider, and is darker in color; the scape of the antennae is altogether dark, or at most a little rulescent. The thorax is not aeneous.

Hab: Oahu and Hawaii (var. *peles*).

Dr. Perkins said that in his description of *M. hawaiiensis*, he did not indicate the location of the type and did not consider it necessary, among other reasons, because the specimens could not be preserved in satisfactory condition for subsequent comparison.

### An Omiodes Egg-Parasite.

*Trichogramma prestiosa* Riley [Hymen.]

BY OTTO H. SWEZEY.

On the leaves of wild bananas growing in a gulch near the upper part of the sugar plantation, at Honomu, Hawaii, I observed some caterpillars of a species of *Omiodes* not as yet to be determined till the caterpillars have matured.\* I also found several batches of eggs which proved to be the same species. Very few caterpillars hatched from these eggs, however, as they were nearly all parasitized, the parasites emerging March 25-30. There were 1 to 3 per egg. They gnawed out before their wings had expanded.

I referred specimens to Dr. Perkins, who, on comparing them with the original description of *Trichogramma prestiosa* finds it is apparently this species. I have since observed them at the Capitol grounds, Honolulu, in the act of ovipositing in eggs of the palm leaf-roller (*Omiodes blackburni*). I take it to be the first record of their presence here. I do not know whether Mr. Koebele introduced them, or whether they have

\* On maturity, these proved to be a new species, which has been described by Mr. Swezey under the name *Omiodes meyricki*. Bull. V, Exp. Sta. H. S. P. A. Div. Ent. p. 24, 1907.—[Eds.]

been accidentally introduced. The species occurs thruout the United States from Massachusetts to Colorado, and from Canada to Florida and Texas. It is recorded as bred from eggs of cotton worm (*Aletia argillacea*), cotton boll-worm (*Heliothis armigera*), zebra moth (*Mamestra picta*), codling moth (*Cydia pomonella*) and *Ianassa lignicolor*.

This is a valuable addition to the large list of parasites preying upon leaf-roller caterpillars in these islands. No doubt it will be found to be well distributed already.

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MAY 2nd, 1907

The twenty-eighth regular meeting was held in the Entomological Laboratory of the Hawaiian Sugar Planters' Experiment Station, Mr. Giffard in the chair.

NOTES AND EXHIBITION OF SPECIMENS.

Mr. Terry exhibited a native Dipteron (*Drosophila picticornis*, Grimshaw) bred in Honolulu from decayed bananas, from a few females taken on Tantalus.

Mr. Kotinsky exhibited a female specimen of the Orthopteron *Holochlora venosa* Stal, collected by Mr. G. A. Jordan in an orchard up Nuuanu Valley during the last week of April. Mr. Giffard's collection of the first specimen seen on these islands, about a year and a half ago, was recorded in these Proceedings (page 32), where it was assumed to be a species of *Microcentrum*. Since then another specimen was collected in Makiki and deposited in the Territorial entomological collection, and more recently Mr. Jordan collected several females in various stages of development in Nuuanu Valley. Egg-batches in slits of young shoots of Mango and Orange had since been collected, and the young hatched from them were submitted to Mr. Swezey, who stated that they looked different from similar stages of the other Locustids on these islands. Dr. Perkins had in his collection similar egg batches collected in Honolulu some ten years ago. So far no parasites had been bred from the eggs, and it would be interesting to find out the cause of the apparent rarity of the species.

Mr. Craw reported the receipt of a colony of parasites of orange aphid from California and the difficulty of locating it.

here for want of aphid on citrus plants in Honolulu. Mr. Kotinsky had, however, located a citrus tree at Wahiawa, well stocked with aphid and there released a colony of the parasites.

Mr. Kotinsky reported breeding *Eretmocerus corni* Hald. from pupae of *Aleyrodes hibisci* collected in Honolulu. The parasite was determined by Dr. Perkins.

PAPERS READ.

**Breeding Experiments and some Observations on the Life History of *Rhyncogonus blackburni* Sharp.**

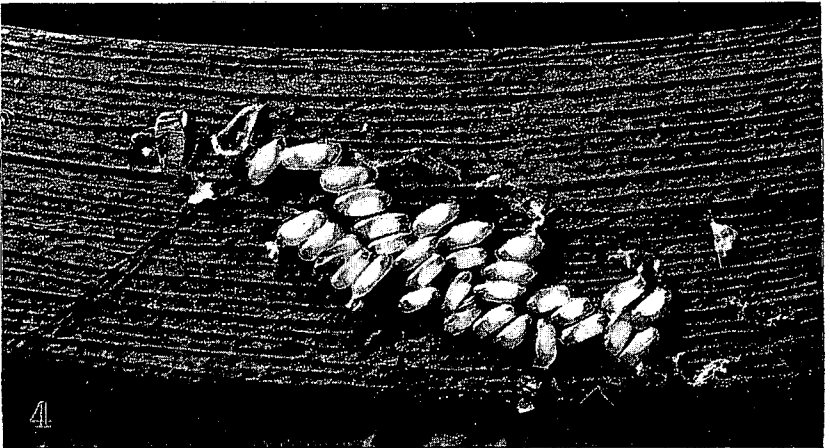
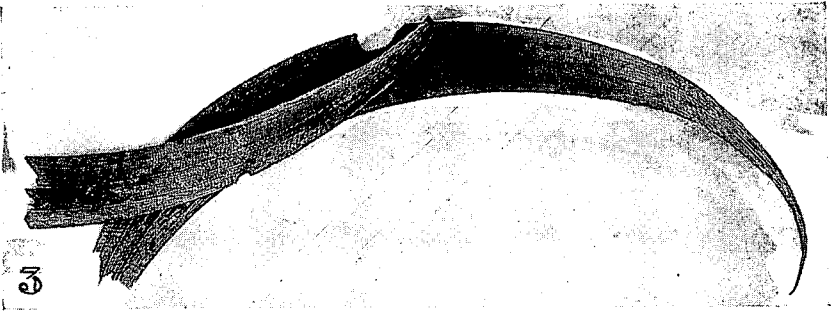
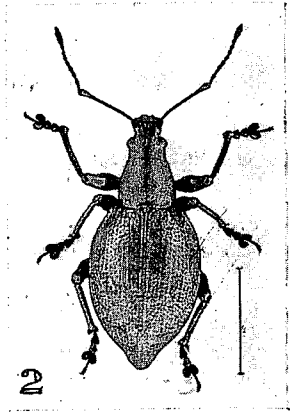
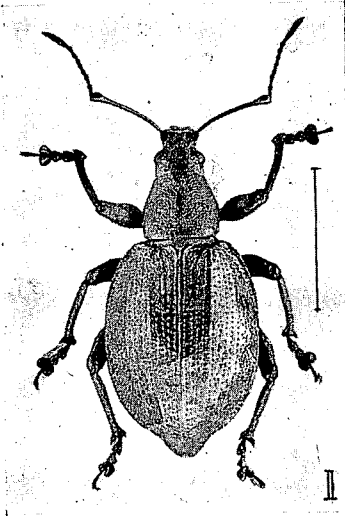
BY W. M. GIFFARD.

The absence of any information relative to the life history of this interesting Hawaiian *Otiiorhynchine* (Pl. 3, Figs. 1 & 2) led me to undertake a series of general observations as to its methods of reproduction. These observations are at present limited to the oviposition and the earlier stages of the larva, but owing to the fact that this insect is restricted to the native forest belt and that these observations have of necessity been conducted in the forest itself, it has been impracticable up to the present time to make a close study of many points in its life history which would probably be of great interest. The experiments undertaken were first conducted within a closed vessel at an elevation of 1300 feet. In this instance eighteen beetles in all were taken by me from a tree (*Acacia koa*) in the native forest adjacent to my mountain home on Tantalus, six of which were females, and twelve males. Two of the females disappeared from the jar within the first week of their captivity, leaving only four of that sex to breed with. These four females were confined with a number of the males for a period of sixty days, fresh koa twigs with leaves attached having been supplied to them every sixth day. The first batches of eggs, three in number, were discovered twenty days after the beetles had been confined. During the next forty days, forty-two batches of eggs were taken, making forty-five batches in all during the period of captivity. Of these the largest proportion was placed in another breeding jar for further observation. It will therefore be seen that during the period of sixty days above referred to, each female produced an average of say

eleven egg batches. These egg batches were found attached to the koa leaves in single layered masses consisting of from seven to fifty-two eggs (Pl. 3, Fig. 4.) In every instance under examination, whether in captivity in jars or under a net on selected branches of the living tree itself, it was found that the female concealed her egg batch by covering it with an adjoining leaf or some portion thereof. To attain this purpose, the female deposits a quantity of mucous around the margin of the egg batch to which the protecting leaf adheres. (Pl. 3, Fig. 3). My observations during the above period show that the time necessary for the hatching of the eggs averaged in these instances about thirteen days from the date of their oviposition. The larvae hatched out from all these eggs have been deposited in soil and roots in glass jars for future observation.

The scarcity of the beetle led me to make an effort to find a possible parasite and in consequence the adoption of another method of experimenting was undertaken. Having selected a suitable koa tree, I placed over one of its smaller branches a net bag within which were deposited the remaining beetles from the jar, adding several others taken by me subsequently. Whether owing to the ovipositing period having nearly ceased or for other unknown reasons, I found a marked decrease of egg production in spite of the addition of several females to the colony. During a period of seventy-seven days only twenty-one batches were found, as against forty-five in the sixty days previously noted. Periodic visits were made every tenth or twelfth day to the tree, transferring both net and beetles to a new branch on every visit, at which time the egg batches were counted and recorded, but left exposed for any attack of parasites during the ensuing ten or twelve days. The hatching period in these instances averaged sixteen days from the date of oviposition, or an average of about six days after cutting away the egg batches from the branch.

At the close of the experiments above referred to, ten live beetles, (six males and four females) were taken from the net and placed in a small glass jar to further determine the time necessary for the hatching of such eggs as might be oviposited. Eight batches in all were taken from the jar within forty-eight hours of the confinement of the colony. The leaf concealing each batch was carefully withdrawn and the eggs in each counted. The total oviposition by these four females during the forty-eight hours was found to be two hundred and thirty



GIFFARD—ON RHYNCOGONUS BLACKBURNI

eggs, averaging over twenty-eight to a batch, the minimum being fifteen and the maximum fifty-two in the eight batches referred to. My earlier observations disclosed the fact that the females in captivity in large glass breeding jars oviposited to a much greater extent than when placed under a net on branches of the tree in the open, and these later investigations further show that in the smaller enclosure (a jam jar) the oviposition was still more rapid and that the batches contained a much larger percentage of eggs than in the previous experiments.

The sexes of the beetles comprising the whole colony under observation (including those bred in jars) has been determined as thirteen males and eight females.

At the beginning of the outdoor experiments referred to, koa trees were searched for egg batches and after much labor one leaf was found apparently similar in appearance to those produced by the colony. This leaf was taken home and placed in a glass test tube and ten days later instead of the larvae I found that Chalcid parasites were emerging, eleven of which were saved and three or four others accidentally lost. At this early period of my observations it was not certain, however, that this Chalcid was a true parasite of the egg of *Rhyncogonus*, but that it really was such was afterwards proven. One of the egg batches which had been left exposed on the tree, at a subsequent visitation, was placed in a glass tube and some of the eggs began hatching on the sixth day after their removal from the tree. Noticing but few larvae emerging from this particular batch, it was left in the tube for a longer period than usual and nineteen days later two Chalcid parasites emerged through the protecting leaf cover of the egg mass. This fact and later investigations of the remaining eggs proved conclusively that these Chalcids were similar to the previous species above referred to, and that they were true egg parasites. Both these Chalcids, as well as the previous lot, were identified by Dr. Perkins as an Eupelmid (Text Fig. on p. 133). I understand Dr. Perkins intends to supplement my observations on the breeding of this parasite by a few notes of his own, which may further elucidate its habits.

#### EXPLANATION OF PL. 3.

Fig. 1. *Rhyncogonus blackburni* ♀; fig. 2. ♂ of the same; fig. 3. Koa leaves enclosing egg batch; fig. 4. Egg batch exposed.

## Supplementary Notes on *Rhyncogonus blackburni* and Its Parasites.

BY R. C. L. PERKINS.

(With figure)

In the Annual Address to this Society for the year 1905, after giving an account of the insects inhabiting a portion of the mountains near Honolulu, in some concluding remarks I observed that "to know the life-history of *Rhyncogonus blackburni* and why it remains so comparatively weak in individuals, or to fully ascertain the life-history of some of the Carabids, and why again some are so common, others so extremely rare, would be far more interesting than the discovery of half a dozen new *Proterhinus* which would surely differ but little from species already known." From Mr. Giffard's interesting paper just read, it will be seen that the desired information as to the *Rhyncogonus* is now largely supplied.

The distribution on Oahu of *Rhyncogonus blackburni* is not exactly known, but it is almost certainly absent from the Northern third of the long Koolau range, which has been much collected over, and it is probably absent from the middle third also. It has never been taken, in fact, on any part of the range north of Nuuanu Valley, which very possibly limits its distribution. It occurs throughout the mountains south of Nuuanu, wherever they have been investigated, but only at certain elevations being absent from the higher and wetter portions of the range. It is partial to many other trees besides *Acacia koa*, such as *Straussia*, *Euphorbia*, etc., and is even found on ferns such as *Gleichenia dichotoma*. It is absent from, or at least has never been found in the Waianae range of mountains. In its own limits it is overlapped by *R. koebelei* and possibly other species, and outside the limits it is replaced by several other forms at present undetermined. It is rather of a social nature (being like other *Rhyncogonus* in this respect) so that not infrequently four or five individuals will be found in company, sometimes even closely packed together, when at rest, and the sexes are usually *in coitu*. In beating trees, it is often found singly, but this is no doubt due to the fact that some fall clear of the beating cloth or umbrella, and consequently are not noticed.

The large size of the beetles (as compared with most native Coleoptera) and their extreme tenacity of life under almost any

circumstances as well as the ease with which they are collected, when considered in connection with the sparseness of individuals, rendered it almost certain that they would be subject to the attacks of parasites. It was also certain that these parasites when discovered would be of small size and that a moderate sized Ichneumonid or Braconid was not to be looked for, since none such (other than can be otherwise accounted for) are to be found in the haunts of *Rhyncogonus* throughout the islands. Through Mr. Giffard's perseverance, we are now able to say that one check, and no doubt a very important one, to the multiplication of *Rhyncogonus blackburni* is an egg-parasite of the genus *Eupelmus*, the species being previously undescribed. From the specimens of egg-masses of the beetle submitted to me by Mr. Giffard, from which two of the parasites had emerged, I suspect that one egg affords sufficient food for one parasite, though the latter is of large size for the amount of nutriment that it would thence obtain. When I exposed these egg masses by separating the koa leaves, which were very firmly glued together and concealed them, in both cases I found the remaining eggs, together with some dead larvae of the beetle, to be covered with a mass of minute Acari, which had partially devoured them, as also several still immature pupae of the *Eupelmus*. The attacks of Acarids are frequently a cause of great trouble in rearing insects in captivity in these islands, but seem to be of comparatively small account under natural conditions. The two parasites, that had emerged from one of the egg-masses had escaped by the same round hole gnawed through the Acacia leaf. The other eggs-mass had also been parasitized, but the contents all destroyed by the Acarids. Probably the *Eupelmus*, like some other egg-parasites, will only attack the eggs when comparatively freshly laid, and the extremely wet weather would sufficiently account for the fact that not more of the egg-masses, exposed to parasitic attack by Mr. Giffard, were parasitized. No doubt, in many of the eggs experimented with, embryonic development had already advanced too far before their exposure to parasites. It is noteworthy that the one egg-mass found under natural conditions yielded parasites only.

The Hawaiian species of *Eupelmus* are numerous, and the parasite of *Rhyncogonus* is one of the smallest of these. The genus as represented in the islands is very remarkable for the diversity in habits of the different species. One is known to be parasitic on Coleopterous larvae (Anobiidae), one has been

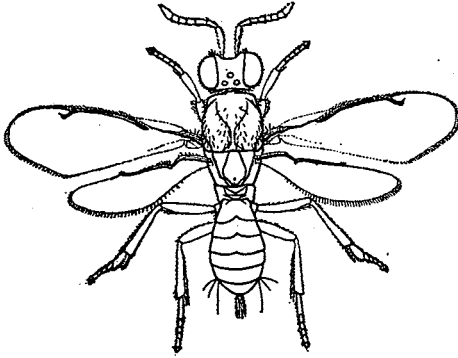
bred by Mr. Swezey and myself from the puparium of the Neuropterous *Anomalochrysa*, and one by Mr. Terry from the eggs of the Locustid, *Brachymetopa*. Another I have bred freely from very rotten wet wood, which yielded otherwise only Lepidopterous (Gelechiid) larvae, but in this case the host is necessarily uncertain.

The species are very difficult to determine, being variable, and with extreme sexual dimorphism, so that the sexes can not possibly be correlated except by breeding. Judging by the bred specimens I have examined, there is no such variation in the length of the ovipositor, as Ashmead allows in his descriptions in the Fauna Hawaiiensis, and the sexes are almost certainly wrongly assigned in that work. I have somewhat reluctantly described this egg-parasite of *Rhyncogonus*, for though I am quite satisfied it is undescribed, I do not feel that the material of this genus that is accessible to me for study at the present time, is sufficient for a proper understanding of the importance of specific characters in the Hawaiian species. Nothing is likely to prove a greater hindrance to the advance of knowledge of the Hawaiian fauna than the description of new forms off-hand in these difficult genera of many endemic species, when one is imperfectly acquainted with the value of their characters, and these can only be appreciated after studying a comprehensive collection. The material accessible to me for study and comparison is less than two hundred specimens of indigenous *Eupelmus* and I should be very pleased to obtain specimens (which are the most easily collected of all native Chalcids) from the members of the Society. With a thousand examples from various localities, an adequate knowledge of the Hawaiian forms might be obtained and the Hawaiian species redescribed to advantage. The fact that this species has been bred, and the interest that attaches to it in connection with Mr. Giffard's paper on the habits of *Rhyncogonus blackburni*, may excuse the deficiencies, which will no doubt be subsequently found, in my description.

*Eupelmus rhyncogoni* sp. nov.

Female, metallic green, the face blue-black or purplish black, the thorax and head with more or less brassy reflections in parts, the abdomen usually metallic blue, green in part; the scape of the antennae, all the legs including the coxae, and the mesopleura are testaceous; the scape is darker, more brown

in some examples, but in others quite clear, with the apex only infuscate; the flagellum black or brownish black, the coxae



x-18

slightly darkened and metallic at the base, at least outwardly, the mesosternum is brownish or pitchy with metallic reflection, the mesepileura very distinctly metallic in front, but elsewhere slightly or not at all; the ovipositor yellowish.

Head appearing finely shagreened, and with very shallow punctures; thorax clothed with pale pubescence, appearing shagreened from the close reticulate surface sculpture and with very shallow obsolescent punctures; scutellum and axillae also shagreened, the propodeum smooth and shining; wings hyaline, faintly yellow-tinged, the neuration pale, but darker basally. Abdomen sculptured, having a close microscopic reticulation of the surface; ovipositor short, about as long as the basal joint of the hind tarsi. Length 2.5 mm.

Male dark metallic blue, the thorax with more or less green reflections, the legs dark, with the knees, tips of tibiae, and tarsi obscured or sordidly pale; base of abdomen brightly metallic blue, the rest black with dark purplish tinge.

Scape of antennae subtriangular, the lower side strongly rounded, the lower apical angle being rounded off or effaced; the pedicel much smaller than the first of the funicle joints, which do not differ much from one another, being mostly rather longer than their greatest width, and densely short-haired, noticeably more so than the pedicel. Thorax appearing shagreened from dense microscopic reticulation and with feeble punctures, the propodeum smooth and shining. Wings hyaline, clearer (not yellow-tinged) than in the female, a large oblique hairless

area extending from beneath the middle of the marginal vein. Length 1.75 mm, but some are much smaller than this.

Hab. Oahu, Mount Tantalus; bred from eggs of *Rhyncogonus blackburni* by Mr. W. M. Giffard. I have drawn up the description from five of these, and from one male and several females captured by myself at various times in the mountains around Honolulu. Last October on a wet day two females were captured hiding in the leaves of *Freycinetia*, in company with the male of a very different species of *Eupelmus*.

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JUNE 6th, 1907

The twenty-ninth regular meeting of the Society was held in the library of the Board of Agriculture and Forestry, Mr. Swezey in the chair.

#### NOTES AND EXHIBITION OF SPECIMENS.

Mr. Wilder expressed the regret that a specimen of *Holochlora venosa*, apparently a male, that he captured in his yard was unfortunately lost.

Mr. Swezey exhibited a series of moths bred from caterpillars found on wild banana leaves at Honomu, Hawaii, at an elevation of about 1500 feet. He considers it a new species of *Omiodes*, and has named it *meyricki*, for Mr. E. Meyrick, who worked up the Macrolepidoptera for the "Fauna Hawaiiensis." This species is closely allied to the palm leaf-roller (*Omiodes blackburni*). Mr. Swezey exhibited moths of this latter species, also, for comparison, as well as egg-clusters and caterpillars of both species; and pointed out the distinctions between the two species. The egg-masses of *meyricki* are more rounded and less flat than those of *blackburni*, and are placed directly on the surface of the leaf; whereas those of *blackburni* are elongate, and are placed in a groove of the leaf or along beside a mid-rib or vein. The caterpillars of *meyricki* are very smooth and nearly free from black markings; while those of *blackburni* have many black spots on the head; the cervical shield is heavily black-marked; and the tubercles of all segments are more or less margined with black. The pattern of the wings of *meyricki* is identical with that of *blackburni* except that the postmedian line of hind wings is distinctly nearer the margin. The fore wings of the males of *meyricki* are suffused with ferruginous, while those of *blackburni* have

more or less dark fuscous suffusion. The hind wings of both sexes of *meyricki* are darker fuscous than those of *blackburni*. Some of the scales in the patagia of *meyricki* are tipped with fuscous, not so in *blackburni*. (Full description of moth and caterpillar, and life history published elsewhere.)\*

## PAPERS READ.

## Biological Notes on the Hemiptera of the Hawaiian Isles No. 1.

BY G. W. KIRKALDY.

The classification of the Hemiptera has, in the past, been based entirely <sup>(1)</sup> upon characters afforded by the imago, so that it is not surprising that the Hemiptera remain, in that respect, in a very unsatisfactory state.

The Ontogeny of a living thing is an epitome of its Phylogeny, though this may sometimes be partially obscured, among Insects perhaps less in an exopterygote, paurometabolous Homomorph, as, *e. g.*, a Hemipteron, than in an endopterygote homometabolous Heteromorph, such as a Lepidopteron <sup>(2)</sup>. It is therefore remarkable that the usually easily reared Hemiptera have been neglected in this wise to a greater extent than any of the larger Orders of Hexapoda <sup>(3)</sup>, neglected so greatly that a biologic note on any Hemipteron save a destructive pest is a matter for happy surprise.

This is all the more remarkable when it is considered that the form of the ova and the manner of their deposition and the colours, patterns and structures of the nymphal instars, are in themselves profoundly interesting and that they also yield characters of generic or specific value.

In former times, the adult wingless forms of certain Hemiptera were rejected as being immature; of recent years, nymphs have been mistaken for adults and relied upon for the creation of genera! for example, *Budaeus* and *Critobulus* in the Geocor-

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\* Bull. Ent. H. S. P. A., V. p. 24 (1907).

(1) Except in the Sternorhynchous Homoptera.

(2) In many Diptera, this recapitulation is exceedingly rapid, and probably greatly obscured.

(3) Easily reared under sufficiently natural conditions, but, in these Islands, it is almost impossible to rear-up, at sea-level, from ova or young nymphs, bugs and hoppers inhabiting the mountain forests.

idae, *Stegius* and *Eriximachus* in the Reduviidae, described by Distant, and *Acanthicus* of Laporte in the Membracidae.

Hemiptera usually deposit their ova on the surface of leaves or twigs, or insert them in slits made in these. The nymphs are usually free, but in some groups are concealed in spume or in calcareous cases, while a few form galls. They differ from their adults principally by the condition of the flight organs, which are gradually developed outside the body, forming in the ultimate nymphal instar four, more or less free, pads. Other distinctions lie in the number and form of the segments of the antennae, labium and legs, the absence of ocelli, the shape of the head and nota, and the development of the genitalia.

In the early instars, the abdomen is only feebly chitinized and, in some families at least, there are median and lateral sternites, with very wide sublateral submembranous parts, the sclerites down the middle also being widely separated one from another. As the instars progress, the membranous areas decrease, till they constitute merely linear separations between the segments, in the fifth instar.

In most Hemiptera, there are apparently 5 nymphal instars. It is still often stated as 4 larval and one pupal, but these are terms that have no place rightly in the horismology of the Homomorpha.

In the Homoptera, adult or nymphs, there are no odoriferous glands though in certain Sternorhynchi there are "honey-glands." In most adult Heteroptera, the orifices of the notorious odoriferous gland are situated on the metapleura, though in some there is a single opening on the metasternum medianly and in a few the glands appear to be absent.

In the nymphs of the first series, the openings are placed on the (abdominal) tergites and afford valuable classificational characters, which have been partially worked out (4) but require much extension.

According to Gulde's researches, it may be supposed that the Cimicidae, Aradidae, Nabidae, Reduviidae, Anthocoridae and Clinocoridae possess 3 glands, opening on the fourth, fifth and sixth tergites (5); of these, the first is paired, having two openings, in many of the Cimicidae. In Lygaeidae, Neididae,

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(4) In a valuable paper by Gulde, entitled "Die Dorsaldrüsen der Larven der Hemiptera-Heteroptera", 1902 Ber. Senckenb. Naturf. Ges. Frankf. a. M. 85-136, Plates 7-8.

(5) This applies apparently only to the 5th instar.

Macrocephalidae and most Geocoridae, there are 2 glands, opening onto the 5th and 6th tergites; in a few Geocoridae, however, there is an opening also on the fourth. In the Tingidae, there are openings on the fourth and fifth; in the Acanthiidae and Miridae, on the fourth only.

So far as is known—but the knowledge is very scanty—the ova of Cimicidae, Lygaeidae, Pyrrhocoridae, Geocoridae, Tingidae, Anthocoridae, Clinocoridae, Reduviidae, Nepidae, Belostomatidae, Corixidae, Poekillopteridae and Issidae are deposited externally, while those of Naucoridae, Notonectidae, Cicadidae, Cercopidae, Tetigoniidae, Membracidae, Fulgoridae and Asiracidae are inserted more or less internally.

O. M. Reuter commenced his celebrated "Hemiptera Gymnocerata Europae" with the Miridae, on the ground that these appear to be the 'lowest' and most authors seem to agree with him, accepting the Cimicidae as the 'highest.' On the contrary, I think that the nymphal, coxal and venational characters, stamp the Cimicidae as the most primitive of existing Hemiptera; the specialized venation, the nymphal and coxal characters, etc., placing the Miridae at the end of one twig of the second main branch of the Pagiopod series of Heteroptera, the Notonectidae being another of the terminal twigs of the great branch from which the Miridae have sprung.

Distant, in the most recently promulgated classification of the families of the Heteroptera, separates the "Pentatomidae" (i. e. Cimicidae) from all the other families (6) by the character of the scutellum reaching to at least the base of the membrane. As a matter of fact, this is also the case in Aradidae and some Macrocephalidae, so that Distant's classification breaks down at the start. The principal divisions of "Gymnocerata" and "Cryptocerata" are also now discredited.

The following is an attempt to group the Heteroptera more naturally. I have dealt with the Homoptera elsewhere (7).

## PHALANX 1 TROCHALOPODA.

### SUPERFAMILY 1 CIMICOIDEA.

Families *Cimicidae*, *Aradidae*, *Lygaeidae*, *Pyrrhocoridae*, *Geocoridae* and *Tingidae*.

(6) After excluding the aquatic and semiaquatic families.

(7) Bull. Ent. H. S. P. A., III. (1907)

## SUPERFAMILY 2 NEPOIDEA.

Families *Nabidae*, *Gerridae*, *Reduviidae*, *Nepidae*, *Macrocephalidae* and *Emicocephalidae*.

## PHALANX 2 PAGIOPODA.

## SUPERFAMILY 1 MIROIDEA.

Families *Anthocoridae*, *Climacoridae*, *Polycetenidae*, *Miridae*, *Dipsocoridae*, and *Aepophitidae*.

## SUPERFAMILY 2 NOTONECTOIDEA.

Families *Acanthiidae*, *Ochteridae*, *Naucoridae*, *Belostomatidae*, *Corixidae* and *Notonectidae*.

The following notes are unfortunately very imperfect, but as so many of the adult Hemiptera differ in colour, pattern and form from their nymphal instars, it seems better to record the known stages of some of those found in Hawaii than to wait indefinitely for full data. The duration of the instars is so variable here as to be of little value for reference, while such details derived from forest dwellers in captivity at the coastline probably bear little relation to their free life.

So little is known of Heteropterous Metamorphoses, that it is scarcely possible to institute comparisons, but the following facts seem of interest:

1. *Oechalia grisea* is remarkably constant in general form through all its stages, except the usual gradual lengthening; the lateral margins of the pronotum in the later stages are also more or less laminate and roughly crenulate. The free first segment of the labium, a character separating the Cimicinae from the Pentatominae, is present in *Oechalia* at the first instar.

2. *Coleotichus blackburniae* has the usual Pentatomine head-form in the nymphal instars, suddenly and considerably altered in the adult. The piceous ground colour of the early nymph stages, deepens to deep black by the fourth and alters to indigo blue in the fifth, but the tergites in the adult are dead black again, while the jewelled green and red head and pronotum bear little semblance to those of the nymphs.

3. *Ithamar hawaiiensis* varies in form and colour in the stages, and in one or more stages is particoloured bristly.

4. *Rhopalus hyalinus* shows the inadequacy and inaccuracy of the old character for separating the Lygaeidae from the Geocoridae, viz., "Supericornes" and "Infericornes." In the nymphs of *Rhopalus*, the antennae are inserted on a line between the eyes and the apex of the head, and the same is the case in the adults, in some of which indeed, they are below the line. The proper character lies in the tegminal venation. In the former there are many veins, at least 8, in the membrane; in the latter, not more than five (8).

In *R. hyalinus*, the early nymph stages have a blood-red ground colour, but in the fourth or fifth, the nymphs are greenish testaceous, with dark markings, etc.!

4. The collar in certain Geocorids is present in the nymphs as well as in the adults, affording apparently a good group-character.

5. The labium in young nymphs is of the very long, apparently gradually shortening. The truth is that the abdomen in particular expands and lengthens, while the labium remains almost stationary.

The following forms are considered at more or less length:

*Cimicidae:*

1. *Oechalia grisea*. (fig. 1)
2. *Coleotichus blackburniae*. (figs. 2-4)
3. *Geotomus pygmaeus*.

*Lygaeidae:*

4. *Rhopalus hyalinus*.
5. *Ithamar hawaiiensis*.

*Geocoridae:*

6. *Orthoea pacifica*.
7. *Clerada apicicornis*.
8. *Nysius vinitor*.
9. *N. delectus*.
10. *Metrarga nuda*.

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(8) The Neididae, treated either as a separate family or as a subfamily of the Lygaeidae, are rightfully a subfamily of the Geocoridae. On the other hand, the Pyrrhocoridae, sometimes ranked as a subfamily of the Geocoridae, are more closely allied to the Lygaeidae. Many authors persist in terming the Geocoridae, "Lygaeidae," although they do not contain the genus *Lygaeus* F. (= *Hoplopterna* Stal). *Lygaeidae* Kirkaldy = *Coreidae* auctt. *Geocoridae* Kirkaldy = *Lygaeidae* auctt.

*Tingidae:*

11. *Teleonemia lantanae*.

*Nabidae:*

12. *Nesotyphlias* (g. n.) *lusciosus*.
13. *Reduviolus innotatus*.
14. *R. blackburni*.
15. *R. kahavalu* (sp. n.)

*Reduviidae:*

16. *Zelus peregrinus*.

*Miridae:*

17. *Hyalopeplus pellucidus*.

*Tetigoniidae:*

18. *Conosanus hospes*.
19. *Nesophrosyne* (g. n.) *perkinsi*.
20. *Nesophryne* (g. n.) *filicicola* (sp. n.)

*Poekillopteridae:*

21. *Siphanta acuta*.

*Asiracidae:*

22. *Nesosydne* (g. n.) *koae* (sp. n.)

## Cimicidae.

It is in this family and in the Reduviidae, that the maximum of ornateness in Hemipterous ova is displayed.

It is impossible to find space here even to mention all the various papers on the biology of the family. Fabre (9) has discussed the metamorphoses of some French forms and especially the mechanism employed in opening the egg-shell; the latter subject has been treated also by Hepmons (10). Farbe in the paper cited (9) also discussed the interesting subject of maternal solicitude, criticizing the earlier writers on the phenomenon and relegating the affair to the limbo of fairy tales. He, in turn, has been criticized by myself and I have

(9) "Les Pentatomes," 1901 Rev. Quest. Sci. L. 158 repr. in *Souv. entom.* VIII 66 textfs.

(10) "Über einen Apparat zum Öffnen der Eischale bei den Pentatomiden," 1906 *Z. Wiss. Insektenbiol.* II 73-82, figs. 1-2.

shown that his strictures were based upon misapprehension and want of information (11).

The complete metamorphoses are known in very few species. Of the following, however, considerable information is recorded, viz., *Murgantia histrionica* (12), *Bathypoecilia thalassina* (13), and *Tectocoris lineola* (14).

In Mexico, *Euschistus spurculus* is made into a kind of flour (15) and eaten, while in India, *Erthesina fullo* (16) and *Aspongopus nepalensis* (17) form a part of the diet of certain natives, the last named species being mixed with rice.

The Cimicidae are probably extensively parasitized. *Phasia* sp. and *Ocyptera bicolor*, among the Diptera, have been noted; *Eucorysses grandis* has been recorded as the host of a stylopid, while a *Telenomus* destroys the eggs of *Eurygaster* and an *Encyrtus* those of *Murgantia*.

#### *Oechalia.*

Of this genus, *grisea* was described by Burmeister, *pacifica* and *patruelis* by Stal. Unable to find differential characters in the adults, I followed Blackburn in recognizing only one species. Lately however my doubts have been revived and increased by the discovery of two types of ova.

Both are pale bronzy green. In the first, the upper rim of the egg is furnished with from 9 to 11 whitish, black-tipped capitate processes and there is no ornamentation on the operculum or egg-shell. These ova were found deposited on a fern leaf. In the second, the number of processes was greater, ranging from 14 to 16, and beside a circular row of about 14 short black teeth on the operculum, the sides were reticulated

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(11) Kirkaldy "Upon Maternal Solicitude in ..... Non-social Insects," 1903 Entom. XXXVI 113, and 1904 Smithson. Rep. for 1903, p. 577 (with bibliography), see also Schouteden 1904 Rev. Univ. Bruxelles, VIII, 771. And Dodd "Notes on Maternal Instinct in Rhynchota," 1904 T. E. S. London 483-6, Pl. 28.

(12) Howard 1895 Circ. U. S. Div. Ent., (2) X, 1-2; 1 fig.

(13) Schouteden 1906 Z. Wiss. Insketenbiol., II, 82-8, figs. 1-9.

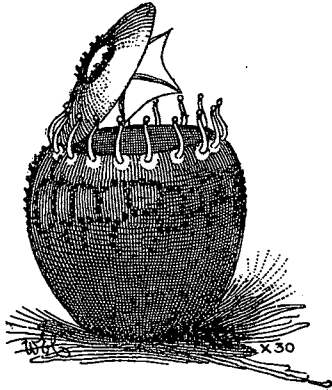
(14) Dodd, see No. 11.

(15) Signoret 1877 B. S. E. France (5) VII p. XXXVI.

(16) Distant 1878 P. E. S. London p. LVII.

(17) Waterhouse 1900 Entom. XXXIV 251.

with granules. These ova were found on some herbaceous plant. (fig. 1.)



Ovum of *Oechalia grisea*,  
after emergence of nymph.

Fig. 1.

The species of *Oechalia* are carnivorous, preying on caterpillars of *Omiodes accepta*, *Scotorythra rara*, etc., though they do not always disdain vegetal juices, at least in captivity. They lurk principally in Filices, or in Kukui (*Aleurites triloba*), and when captured, usually feign death.

In attacking a small larva of *Hymenia recurvalis* in captivity a nymph of *Oechalia* inserted its stylets in one of the clasping legs and maintained its hold,—despite the larva's struggles—without at all employing its fore legs (18).

The following descriptions refer to the species which I suppose to be *grisea* (Burm.) and at the same time *patruelis* Stal.

*First instar.* Vertex and nota, lateral margins of tergites (except sutures), odoriferous flaps, etc., blackish or dark fuscous. Apex of vertex, underside and the rest of the tergites, antennae, labium, eyes, legs, etc., sanguineous. Last segment of tarsi at the apex, and the arolia fuscous; claws red. Last

(18) A popular error among Entomologists is to suppose that the labium (rostrum) acts as a piercing instrument. In such bugs as *Oechalia*, the labium is directed to the supposed prey, and its suitability is ascertained by the sensory hairs at the apex, then the stylets pierce the skin and the labium is applied to the orifice thus made, possibly entering a little as it becomes enlarged.

segment of antennae fuscous, except the extreme base. Rounded, very convex above, flat or concave beneath. Head almost perpendicular. Antennae composed of four segments, the first not reaching to the apex of the head, the second one-half longer than the third and equal to the fourth. Labium reaching to the middle of the abdomen, long and stout.

*Second and third instars* very similar to the first.

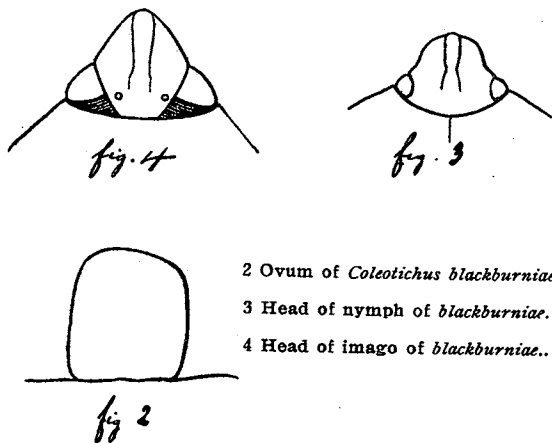
*Fourth instar* Head and nota blackish brown, inclining to bronzy in large part; anterior half of tylus, lateral margins of juga, antennae, lateral margins of pronotum (except basally), and mesonotum, some marks on head and nota, etc., pale sanguineous, the antennae more or less fuscous in parts. Tergites creamy (with black marks on the lateral margins) variegated with sanguinescent, odoriferous flaps bronzy. Beneath pale, partly sanguineous, lateral margins more or less marked with blackish. Femora, tibiae and tarsi sanguineous, the femora speckled and lined (sparsely), the tibiae apically and basally, the apex of the apical segment of the tarsi, blackish-brown. Juga extending apically a little farther than the tylus, which is equally wide throughout, otherwise as in adult; feebly rastrate. First segment of antennae scarcely reaching to the apex of the juga, second about  $3\frac{1}{2}$  times as long as the first and about one-third longer than the third, which is subequal to the fourth. Labium reaching to the hind coxae, originating as in the adult. Tarsi all bisegmentate, the second segment longer than the first. Lateral margins of pronotum laminate, minutely crenulate all along. Three odoriferous flaps, none paired.

*Fifth instar* is like the 4th, but more purplish-bronzy. The tylus more pointed apically. Blackish brown, bronzed on head, nota, flaps, etc., antennae blackish-brown, apical half of second segment reddish. Lateral margins of nota narrowly yellowish. Labium pale. A reddish black annulus on the hind tibia. Second segment of antennae somewhat obliquely flattened, four times as long as the fourth and about one-half longer than the third, which is equal to the fourth. Second segment of labium two-sevenths longer than the first, one-half longer than the third and a trifle longer than the fourth, the first scarcely reaching beyond the middle of the gula, the second not reaching the apical margin of the prosternum, the third reaching the middle of the mesosternum and the fourth the base of the hind coxae. Lateral margins of pronotum widely reflexed anteriorly, sinuate and minutely crenulate, anterolateral angles rectangular.

*Coleotichus blackburniae* F. B. White. (18a)

This probably endemic Scutellerine is the handsomest of Hawaiian Insects. It is found principally on koa trees (*Acacia koa*), on the leaf-like phyllodes on which it lays its eggs. While *Oechalia* is quiet and a death-feigner, *Coleotichus* whirrs off with a tremendous racket and a great speed, when disturbed. It is apparently vegetarian.

The *ova* are very different from those of *Oechalia*, being golden green (yellowish white in alcohol), not appreciably sculptured and without an operculum. They are deposited in batches of about 19, usually 1 in the middle, 6 around that and 12 around these. They are roundly hexagonal. Their height is about 1.155 mill., diameter from side to side 1.154 mill., from angle to angle 1.442 mill. Beyond a sparse, very minute granulation there is no sculpture visible x. 118. (fig. 2.)

2 Ovum of *Coleotichus blackburniae*.3 Head of nymph of *blackburniae*.4 Head of imago of *blackburniae*..

*First instar* (?) [perhaps second] Head, nota and coriaceous parts of abdomen blackish, the rest sanguinious, except for the infusate apex of tarsi, etc. Rounded, very convex dorsally,

(18a) Schouteden in his valuable Monographs of *Coleotichus* and of the Scutellerinae, writes this "*blackburni*." It was, however, named after Mrs. Blackburn and was published as written above.

flat beneath. Labium reaching well beyond hind coxae. Antennae 5, 7, 8, 16. I can see only two odoriferous orifices (on the 5th and 6th.)

*Third instar* (?), like the last described, but less rotundate and the dark coriaceous areas on tergites so much larger, that the blood red parts consist only of a sublateral curved band, three anterior transverse stripes and 2 or 3 posterior. Head much as in the 5th instar. Labium reaching to middle of abdomen. Antennae 10, 17, 15, 22. Orifices as before.

*Fourth instar* black, like the third, but labium reaching little beyond the hind coxae. Orifices, etc., as before.

The *fifth instar* is dark dull indigo blue; the abdominal sutures and submembranous parts blood red; the sterna medially and the labium partly, brownish yellow. Leg-hairs testaceous. Vertex more rounded and wider anteriorly than in the adult, also more concavely sinuate, while the head and pronotum are flush all along. (figs. 3-4). Head and nota aciculate. First segment of antennae not reaching to the apex of the vertex; second segment the longest, more than twice as long as the first and one-fifth longer than the third which is a trifle shorter than the fourth <sup>(19)</sup>. Labium reaches just beyond the middle coxae. Sterna longitudinally sulcate. Tarsi all bisegmentate. Abdomen transversely striate above at least in the middle. Beside the usual orifices, there are a pair, widely separated, on the fourth tergite.

### 3 *Geotomus pygmaeus* Dallas.

This species is easily separated from the two preceding by the colour, minute size and bristly legs. The Cydninae, to which subfamily it belongs, are an offshoot of the Pentatominae. I can not give any information on the metamorphoses of this form, but suspect that the ova are dropped at the roots of small plants, and that the nymphs are to be found there or under stones, possibly in ants' nests. Mr. Swezey has found the adults under dried cow dung.

The present species has been described under eleven names

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(19) As in other hemipterous nymphs, abnormal segments occurs. Thus in one nymph in my collection, the two antennae are discrepant, one normal, the second segment in the other only half the length of its corresponding segment.

and is an immigrant into Hawaii. It is distributed over the entire Oriental Region, running into the Palearctic in Japan and China; it is also recorded from Celebes and New Caledonia.

### Lygaeidae.

The ova in all cases known to me are of very similar form, i. e. "Kidney-bean shaped." *Myrmus miriformis* <sup>(20)</sup>, *Dalader acuticosta* <sup>(21)</sup>, *Anasa tristis* <sup>(22)</sup>, *Leptocoris trivittatus* <sup>(23)</sup>, etc., have been figured and with, generally, some nymphal instars.

The lifehistory of *Myodocha acuta* is also now fairly well known <sup>(24)</sup>.

Like the Cimicidae, some Lygaeids are carnivorous, some phytophagous. They are subjected to the attacks of very similar parasites; *Anasa* is attacked by *Trichopoda* (a Tachinid), by *Telenomus* and *Hadronotus* (Hymenopterous egg-parasites) and by a bacterial disease. *Phyllomorpha laciniata* is remarkable for its stridulation and its mode of carrying its ova <sup>(25)</sup>.

#### 4 *Rhopalus hyalinus* Linneus.

This species is almost cosmopolitan and is firmly established in the Hawaiian Isles, though it must be a comparatively recent introduction, as Blackburn did not take it. Its principal food-plant is Pualele (*Sonchus oleraceus*) upon the young, closed, flowerbuds (and sometimes stems) on which the bright red eggs are laid in clusters. I have also found them on Ilima (*Sida cordifolia*) at sea level and Mr. Swezey records them from *Euphorbia cordata* and other plants. They have been reported from *Saccharum officinarum*, but they were certainly from clumps of *Sonchus* in the canefields.

In this species, as in *Nysius vinitor* and *delectus*, the male and female copulate end to end, both dorsal and horizontal. They can recopulate several times with the same partner.

(20) Leuckart 1855 Müllers Archiv.

(21) Annandale 1905 T. E. S. London, 55-9, Pl. VIII.

(22) Chittenden 1899 U. S. Div. Ent. Circ. (2) XXXIX, 1-5, figs. 1-3.

(23) Howard 1903 U. S. Div. Ent. Circ. (2) XXVIII, 1-3, fig. I.

(24) cf. (e. g.) Zehntner, 1901 Indisch. Nat., I 77-94.

(25) Bolivar 1894 Feuille Jeunes Nat. (3) XXIV 43-4; and many other references.

The *ova* are very similar in form to those of *Myrmus*, "Kidney bean shaped," that is, oval in profile, a little smaller at the micropyle end than at the other, subconstricted medially above. The micropyle end is obliquely truncate, one micropyle being on this truncate part, the other on the concave venter. The microples are similar to those of *Myrmus*, but the dorsoposterior apparatus in *Myrmus*, figured by Leuckart, is apparently not present in *Rhopalus*.

Colour testaceous, the vermilion-sanguineous embryo showing through and colouring the whole egg, (Micropyle colourless); when nearly ready for hatching they become dark crimson. They are deposited with the concave part downward, mostly on the involucre of the *Sonchus*. If undisturbed, the average number is 20 to 25 in each batch, but the same female lays more than one batch and recopulates after oviposition. Length a little less than one millimetre.

They hatch in about 6-7 days and the adult state is reached in 13-16 more.

The nymphal instars are remarkable for the gradual change of colour from blood-red in the first, to greenish-testaceous in the fifth.

*First instar.* The colour on hatching is pale sanguineous, the head and nota darken in a little while and the whole bug darkens in a day or so. The bug is elongate, oval and flexible, two and four-fifths as long as the maximum width. The antennae are inserted on a line from the eye to the base of the labrum and are twice as long as the head in profile, their respective proportions being 6, 10, 11, 19; the first three are cylindric, the fourth slightly fusiform. The thorax and abdomen together are 3 2-3 longer than the head. The body and legs are furnished sparsely with dark bristly hairs. The eyes are not nearly contiguous with the pronotum. The labium reaches practically to the apex of the abdomen, or at least beyond the middle, its proportions being 12, 13, 12, 19. Width of head with eyes a trifle more than that of the pronotum. The legs are articulated almost at the lateral margins of the thorax and are widely distant. The second segment of the hind tarsi is twice as long as the first, scarcely so much in the fore and middle pairs. Arolia free, extending to about half the length of the claws, of which there are two on each tarsus, acuminate and slightly curved. Odoriferous orifices very small, transverse oval, situated on the apical margin of the fourth and fifth tergites.

*Second instar* very similar to the first, but the antennae are  $2\frac{1}{2}$  times as long as the head, 17, 15, 16, 26. The labium is only 5-6ths of the entire length, 15, 19, 12, 22. The pronotum is  $\frac{1}{2}$  wider than the length of the head.

*Third and fourth instars* not very dissimilar.

*Fifth instar.* Yellowish-green testaceous; a thin line of this from between the eyes to the base of the abdomen. Head speckled with blackish, and four greyish brown suffused spots at the base of the head behind the eyes; a thin black impressed line just inside the eyes, eyes pale redbrown. Antennae testaceous, apical three-fourths of the fourth segment greyish-fuscous, the rest of the antennae speckled with blackish-brown, sparsely blackly-pilose, as also the head and legs. Thorax and abdomen whitish pilose. Pronotum greyish-fuscous, except the lateral margins and the central line. Tegminal pads dark greyish fuscous, lateral margins pale. Legs yellowish testaceous, sparsely speckled with blackish-brown and red. Under-side greenish testaceous, with coxae and trochanters. Tergites with 2 pale yellow spots on the middle of the 5th segment and 3 red spots. Orifices black.

Head about as long as across the eyes, somewhat declivous in front of them, scarcely so wide as the hind margin of the pronotum. Fourth segment of antennae as long as the maximum width of the head, first segment scarcely reaching beyond the apex of the head; 7, 12, 14, 22. Eyes not nearly touching pronotum, head narrowed in behind them. Bucculae very minute. Tylus extending beyond juga. Labium with the first segment not reaching to the base of the head, second touching the fore coxae, 4th segment reaching the hind trochanters. Pronotum about twice as wide as long; hind margin about a half wider than the anterior, slightly sinuate. Fore coxae subcontiguous, the others subremote.

*Adult.* When freshly emerged, the colour is pale opaque luteous, everywhere (except the tegmina) thickly speckled with crimson. Soon there begin to appear dark greenish specks, changing to black. Eyes pale maroon, ocelli red. Tegmina immaculate.

*Rhopalus hyalinus* is attacked by a chalcidoid egg-parasite, which is not yet named.

##### 5 *Ithamar hawaiiensis* Kirkaldy.

This seems confined to Ilima (*Sida cordifolia*) as a food-plant. In the winter of 1903-4, it was plentiful, but not

knowing at that time the peculiarities of the coast region, I did not observe it particularly. The winters of 1904-5 and 1905-6 were so dry that almost no *Sida* flowered at Leiahi, and 1906-7 was little better. Lately, however, Mr. Swezey kindly brought me some empty egg-shells and 3 nymphs, so that I am able to present some few remarks on them. This bug is undoubtedly vegetarian.

*Ova* are deposited in patches of 5 or more on the underside of the leaf. The shape is more or less of the usual Lygaeid-form. Pale bronzy-golden when empty, a little infusate at the dorsal constriction. There is no operculum, the anterior dorsal part being simply split open and off at the hatching. Reticulation microscopic, fine and rather superficial. Micropyles opaque white, much as in *Rhopalus*.

*First nymphal instar.* Whole body strongly furnished with black and with white bristly hairs. Head greenish testaceous, posteriorly piceous. Eyes red. Antennae, first segment greenish, the rest whitish, the second with a black ring near the apex, fourth with several rings. Thorax varyingly piceous. Legs whitish translucent, ringed with black. Abdomen pale greenish, tergites covered with white elongate papillae, blackly piliferous; also with one red papilla and two black, medianly. Orifices very small, blackringed.

#### Geocoridae.

The only Geocorid whose lifehistory is at all known is *Blissus leucopterus* <sup>(26)</sup>. The ova are elongate oval, truncate at the micropyle end, with 4 micropyles. They are laid among the roots of grasses, about or below the surface of the ground. I have not found the eggs of *Nysius vinitor* here, nor has Mr. Froggatt succeeded in Australia. The lifehistories of *Scolopostethus pictus* <sup>(27)</sup> and *Stalagmostethus turcicus* <sup>(28)</sup> have been partially worked out. Most Geocorids seem to be phytophagous, but carnivorous forms are known.

Bacterial diseases attack the members of this family, but insect parasites seem rarer.

(26) Webster 1898 Bull. U. S. Div. Ent. (2) XV, 1-82, figs. 1-19.

(27) Mjoberg 1906 Z. Wiss. Insektenbiol II 142-3, fig. 10,

(28) Townsend 1887 Ent. Amer. III 53-5.

*Orthoeca* (29)

The Hawaiian Isles now possess two immigrant species of this genus, both from the Australasian Region. *O. nigriceps* has been established here for at least 30 years, while *O. pacifica* has been here for scarcely more than a sixth of that time. This is interesting as showing that it is not impossible for some of the ancient endemic genera to be polyphyletic.

6 *pacifica* (Stal)

The adult is frequently attracted by 'light' and was first seen, I believe, at Waikiki in 1902 or 1903. It is common in Australia and Fiji. I have not yet found the ova, but have discovered the ultimate nymphs in my garden in Honolulu. They run quickly and occur in *Maniania* grass (*Cymodon dactylon*), though I do not think they feed on it.

*Last nymphal instar.* Black, the main area of the pronotum having a slight greenish metallic tint. Antennae coloured as in the adult, except that the first three segments are often suffused with blood-red; all four are only shortly and sparsely hairy. The vertex is without greyish pubescence. The first and fourth labial segments are blackish, the 2nd and 3rd yellowish testaceous, sometimes more or less fuscate. The mesonotum between the terminal pads is white, and the pads themselves are narrowly bordered externally with white. The underside is black, the pleurites both of tergites and sternites sanguinescent, and both dorsally and ventrally there is a large white opaque lateral spot a little apical of the apex of the tegminal pads. Legs yellowish-testaceous, fore femora, apex of middle femora, apical two-thirds of hind femora, apical two-thirds of hind tibiae, etc., blackish.

The head is as in the adult, but rather less convex and is wider between the rather smaller eyes, the vertex at base being one-half wider than the eyes together; the fourth segment of the antennae is formed as in the adult and is a trifle more than twice as long as third and three-fourths longer than the second, which is twice as long as the first. The labium is robust and reaches to the middle of the middle coxae. The first segment

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(29) Distant's Oriental genus *Budaecus* is based on a nymph of *Orthoeca* or a closely allied genus. Distant says his specimens are "apparently" nymphs; judging from his figures, there is not the slightest doubt.

is the longest, but does not nearly reach to the base of the gula, it is one third longer than the second and twice and two-fifths as long as the third which just reaches the base of the fore trochanters; the first segment is also nearly twice as long as the fourth. The pronotum is subconvex, narrowly reflexed laterally and wide so behind; there is a collar in front which narrows laterally. The collar and the hind lobe are separated from the polished main lobe by deep impressions. The hind margin of the pronotum is one tenth wider than the head and eyes, and two-ninths wider than the pronotum anteriorly. The pronotum is one half wider behind than its middle length, the main lobe being four times and four-fifths as long as the hind lobe, the lateral margins are not sinuate, the coxae are all nearly contiguous.

7 *Clerada apicicornis* Sign.

This bug is common in old houses, in neglected boxes, drawers, etc. I suspect that it feeds on *Lepisma* and perhaps on small Blattids.

*Final nymph*: Head brown, laterally dark fuscous, underside yellowish brown. Labium, sterna and legs yellowish-brown. Antennae dark fuscous, basal half of second segment paler, fourth yellowish white. Pronotum dark purplish fuscous, scutellum, etc., paler, with a pale median line from apical margin of pronotum to hind angle of scutellum. The lateral margin of pronotum yellowish brown, the same parts as well as the posterior parts of the tegminal pads are brown, the rest of the latter dark fuscous. Abdomen sanguineous, the tips blackish.

The head is similar to that of the adult, but the eyes are a little smaller. The form of the pronotum is very different, the lateral margins being reflected. The hind margins still more widely so. The pronotum is twice as wide at the base than at the apical margin, lateral margins slightly convexly rounded (not concavely sinuate). The labium reaches to the middle coxa the first segment reaching to the anterior margin of the eye, the second not as far as the base of the head, the third to the middle of the fore trochanter. The third segment is the longest and is more than one-half longer than the first, a little more than twice as long as the second and is three times as long as the fourth. The antennae are four times as long as the pronotum the second segment is about three-fourths longer

than the first, more than twice as long as the second, and a trifle longer than the fourth. There are three odoriferous orifices.

The nymphs like the adults, are conspicuous by the clear, whitish, last antennal segment.

*Nysius* Dallas.

This genus is evidently of considerable geologic antiquity, as it is not only very widely distributed, but has a number of undoubtedly endemic species on various oceanic islands. In these islands, however, outside the 14 described endemic species, there are three introduced species, viz., *coenosulus*, reported in 1859, *delectus* in 1878 and *vinitor* now recorded.

8 *vinitor* Bergroth.

This is a well known pest in Australia on 'vines' of all sorts, cherries and many other kinds of fruits and vegetables (30). In Hawaii, it is very common on Ihi (*Portulaca oleracea*) and has been reported from melon-vines.

I have not yet discovered the eggs, nor has any of the Australian Entomologists.

*Fifth instar*: Yellowish or greenish testaceous, vertex with 2 dark brown median straight stripes and 2 lateral (2 on each side) more irregular stripes, turning outwards apicalwards, also some obscurer spots or marks. Clypeus laterally bordered straightly with dark brown. Antennae pale fuscous, fourth segment a little darker. Nota and tegminal pads irrorated with dark and pale fuscous, a central pale line down the middle. Abdomen irrorated with reddish brown. Femora (except apically and basally) dark fuscous, rest of the legs pale. Tarsus reaching just beyond the hind coxae. Pronotum medially a little laminate. Fore coxae approximate, the others a little remote, though not much. Arolia rounded, free, shorter than the claws. Odoriferous orifice very short and wide, on the 5th tergite.

9 *delectus* F. B. White.

This is very close to the preceding but much larger. The nymphs are very similar, but proportionally larger than each

(30) See French, 1891, Handb. Destr. Ins. Victoria I 104, XII; and Froggatt 1901 Agr. J. N. S. W., XII, 352-6 Pl. [B].

stage. I have found them only on Kuku (*Bidens pilosa*), but commonly on that plant.

*Metrarga* F. B. White.

This is a curious genus of bark-dwellers, also found in such sheltering situations as Ieie (*Freycinetia arborea*) and under fallen leaves, etc.

10 *nuda* F. B. White.

The nymphs do not appear to be remarkable, but I have seen very limited material. Antennal tubercles acute and prominent; eyes not touching pronotum. Pronotum about 3 times as wide as long, the lateral margins laminate and minutely crenulate. Abdomen laterally explanate, odoriferous orifices elongate and very short, on fifth and sixth tergites.

Fam. Tingidae.

The metamorphoses of this family are a little better known, comparatively, than most of the other Heteropterous families. Many of the species seem to be gallmakers. *Maecenas pyri* produces three kinds of spots on leaves, (a) round spots, containing excrementa, these being very injurious; (b) raised spots, containing an egg in each, (c) minute punctures<sup>(31)</sup>.

*Copium cornutum* forms galls in *Teucrium chamaedrys*<sup>(32)</sup>. In other species, the eggs are deposited externally. Nymphal instars of various species have been described and figured by Felt<sup>(33)</sup>, Heidemann<sup>(34)</sup> and Morrill<sup>(35)</sup>, the latter figuring ova also.

(31) Carlet 1882 C. R. Ac. Paris XCV, 1012.

(32) White 1877 E. M. M. XIII, 283; Rübsaamen 1895 Bull. Soc. Nat. Moscou 420, Pl. XV f. 8 & Pl. XVI f. 39.

(33) 1904, Bull. N. York Mus. LXXVI, 125, Pls. 3-4.

(34) P. E. S. Washington VIII, 10, f. 2-3.

(35) Psyche, 1903, X 127, Pl. 3.

11 *Teleonemia lantanae* Distant (36)

This Tingid was purposely introduced from Mexico to check the *Latana camara* and has already succeeded to a wonderful degree.

I have not seen the ova, but they are probably laid in spots raised on the leaf.

The last nymphal instar is, like that of most Tingid nymphs, spinose.

Suboval flat above or slightly concave, sternites convex. Testaceous, varying to yellowish-brown, the abdomen sometimes sanguineous, spines fuscous. Vertex with an apical porrect spine on each side of the middle and a median semierect one just behind; a sublateral semierect one near the eye on each side at the base. Labium reaches to the middle of the metasternum, first segment reaching the base of the head, second the apex of the fore coxae, third the middle of the mesosternum; the fourth segment is the longest, being one-fourth longer than the first, two-thirds longer than the second and twice and a half as long as the third. The bucculae, etc., as in the adult. The antennae are twice as long as the width of the fore margin of the pronotum, the third segment is twice as long as the fourth, which is more than twice as long as the second, first and second subequal. The pronotum is five-sided and is about one-half wider than long, excluding spines. There is a semierect spine at the posterolateral angle. The tegminal pad has one semierect lateral spine near the apex. The hind femora are short, reaching to about half the length of the abdomen, the trochanters are all remote, though a trifle nearer to one another than to the lateral margins of the body. The tergites have 5 lateral semierect spines, and one medium spine near the apex, also 3 rows of smaller ones down the middle. These spines are almost all shortly hairy, and in addition there are smaller spines and capitate hairs scattered over the body. The sternites are convex. The length of the nymph is  $2\frac{1}{2}$  times as great as its width. The pronotum behind is about three-fourths wider than in front.

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(36) As Distant states that he has compared our Lantana Tingid with the types of *T. notata* and *subfasciata*, I have temporarily accepted his name, though his description is poor and based on inadequate material, and I cannot see how it is separable from *T. notata*.

## Fam. Nabidae.

I formerly treated this as a subfamily of the Reduviidae, but the labial structure, the venation and the constitution of the abdominal segments, abundantly justify its rank as a separate family.

So far as known, the ova are inserted in slits made in leaves or stems (<sup>37</sup>) thus widely differing from the true Reduviidae.

The species are all presumably insectivorous; *Reduviolus lativentris* preys on the eggs of the butterfly *Pieris* (<sup>38</sup>), while *Arachnocoris* spp. live en famille with colonies of spiders, for what purpose is not quite clear (<sup>39</sup>). *R. innotatus* is an ally of the Sugar Planter.

*Nesotyphlias* gen. nov.

For the present, this may be briefly separated from *Reduviolus* by the absence of ocelli, by the clavus being fused with the corium, and by the minute membrane. Type *Nabis* (?) *lusciosus* White.

It is true that none of these characters by itself is sufficient to form a genus, but taken together and considered from the special aspects of the Hawaiian Fauna, I think the recognition of this and the allied species as a separate, well defined group of Nabidae is justified.

12 *lusciosus* (F. B. White.)

There are, I think, more than one species standing, in my collection, under this name. The nymphs are not remarkable. They have well-developed tegminal pads and are found on koa and ohia, on the lookout for prey.

*Reduviolus* Kirby.

In the "Fauna Hawaiiensis," I have fallen into confusion over three species. They are as follows:

- (a) INNOTATUS Blackburn—*R. blackburni* Kirkaldy, an Australian immigrant (not Blackburn).

(37) Swezey 1905 Bull. Ent. H. S. P. A., I Pl. 17 fs. 1-4. Chapman 1906 Entom. XXXIX 73-4, Pl. 3.

(38) Marchal 1900 B. S. E. France 330-2.

(39) Scott 1881 E. M. M., XVII 272-4.

- (b) BLACKBURNI White is a closely allied Australian immigrant.
- (c) KAHAVALU sp. nov.—*R. innotatus* Kirkaldy, an endemic Hawaiian form; (not Blackburn).

13 *R. innotatus* Blackburn.

This, as mentioned above, is the *R. blackburni* of Swezey's and my own writings. It is common on *Saccharum officinarum* and on Maniana grass (*Cynodon dactylon*), where it preys on Leafhoppers and other small game. The ova and one nymphal instar have been described and figured by Swezey (1905 Bull. Ent. H. S. P.A., I 235, Pl. 17. fs. 2-4). The habits of *R. blackburni* are probably similar.

Fam. Reduviidae.

The ova in this family, typically at least, are mostly provided with an ornamental cap of curious structure, which is pushed off on emergence. The metamorphoses are partially known in *Harpactor iracundus* (40) and (41) *Triatoma sanguisuga* (42), *Reduvius personatus* (41), *Endochus cingalensis* (43) and *Arius cristatus* (44), as well as an unknown form described and figured from Brazil (45).

As in the other families, Dipterous parasites and Hymenopterous egg-parasites are known.

As is indicated by the form of the labium, this family is preeminently raptorial, but it has been stated that they are sometimes phytophagous, or rather sap-sucking. (46)

14 *Zelus peregrinus* Kirkaldy.

This, as elsewhere remarked, may be the inadequately described *Z. renardii* Kolenati, from the Western United States, but I do not feel convinced.

It was first known in these Islands in 1897 and is now well

(40) Xamheu 1902 Le Nat. XXIV, 211.

(41) Leuckart 1855 Müller's Archiv. Pl. VIII, fs. 10-11 and 14.

(42) Howard 1900 Bull. U. S. Ent. (2) XXII 28, figs. 22-4.

(43) Sharp 1901 Cambr. N. H., VI, f. 272.

(44) Lugger 1900 Bull. Minnesota Agr. Sta. 69 p. 33, f. 25.

(45) Sharp 1892 T. E. S. London 191, Pl. VIII and Pl. IX figs. 4-8.

(46) Distant 1903 Faun. Ind., Rh. II 196.

distributed all over, the brown egg masses being at times conspicuous on *Hibiscus rosasinensis*, *Saccharum officinarum*, *Citrus*, etc.

It is a fiercely carnivorous bug, preying on Coccinellids, Leafhoppers, and in its younger stages, on Aphidae, so that it is as much injurious as beneficial from a human viewpoint.

The *ova* are cylindric, slightly curved, from about 1.2-1.5 mill. long, in masses of 20 to 40. They are castaneous with an opaque white operculum, the latter depressed within the margins. The micropyle is median and single. According to Swezey, who was partially studied this Reduviid (47) a female in captivity laid 269 ova. These are exceedingly sticky, as are also the legs, etc., of the nymphs. They hatch in 8 to 10 days.

*Third (?) instar* [possibly a young fourth]. Pale green covered all over white with granules, which are whitely piliferous. Antennae translucent whitish, (first segment green) with black and with white hairs. Eyes bronzy pink. A thin red line medio-longitudinally from the anterior margin of the pronotum to the base of the mesonotum. Legs whitish translucent, annulated with pale fuscous, pilose as are the antennae. Tergites thickly covered with white papillae which are whitely piliferous.

*Fifth instar*. Greenish testaceous, varying into pale greenish yellow or greenish white, or a tinge of bluish on the tergites. Hind area of head suffused anteriorly with orange red; 2 spots at the base of same area, 2 at base of pronotum, 2 anteriorly on mesonotum and 2 on its scutellum, the posterior margins of the tergites, etc., orange red. Eyes madder brown. Antennae greenish testaceous, the second segment lined longitudinally with blackish, third blackish-grey, widely annulated with white medianly, fourth pale fuscous. Tegminal pads partly fuscous. Underside greenish testaceous, with some orange-red marks on the abdomen and some blackish marks on the last three segments. Legs closely speckled with black, except the apical half of the tibiae and the tarsi (apex of apical segment of latter black); coxae and trochanters immaculate. Body almost glabrous, the antennae and the middle and hind legs sparsely hairy, the fore tibiae rather closely hairy. Antennae very slender, 18, 5, 16, 6. First segment of labium annuliform, second reaching scarcely to mid eye, third

(47) Bull. Ent. H. S. P. A., I, 232, Pl. XVI fs. 1-3 (1905).

reaching a trifle beyond the base of the head and fourth to the middle of the fore coxae. Pronotum widened posteriorly, hind margin convexly rounded. Anterior margin a little emarginate, the interlateral angle acute and prominent. Scutellum separated. Tegminal pads long and slender, prominently tuberculate anterolaterally (as also the wing pads). Prosterna sulcate, but not striated for stridulation, fore coxae almost contiguous. Meso- and metasterna not sulcate, apparently not divided, middle and hind coxae remote, the left from the right, the hind coxae articulated remote from the hind margin of the metasternum. Each of the tergites (except the apical) has a slender lateral spine which is an elongate tubercle on the first ones, but the last three are elongate, laterally porrect except the apical one (on the penultimate segment) which is oblique. According to Swezey, the whole nymphal period occupies 29 to 34 days.

#### Fam. Anthocoridae.

These bugs are probably mostly insectivorous, being fierce foes of Aphids, Chermids, Psocids, Bark-beetles, young leaf-hoppers, etc., though they perhaps also feed on minute fungi.

The only notes on their metamorphoses are those of Swezey (48), who has partially studied them.

15 *Triphleps presequens* and 16 *Physopleurella mundulus*.

The eggs are elongate oval with a raised collar at the micropyle end. They are deposited singly on leaves, etc.

#### Fam. Miridae.

The known ova are inserted, much as in Asiracids, in the leaves or stems of plants. The metamorphoses of *Poecilocapsus lineatus* (49) and *Helopeltis theivora* (50), etc., have been studied.

This family is mostly phytophagous, but some species are insectivorous, caterpillars, butterfly's eggs, aphidae, etc., forming their prey. *Miris dolabratus* has been reported as attacking a Dipterous adult, but it is scarcely credible, the bug having probably been really a *Reduviolus*. *Plagiognathus obscurus* is recorded as biting a human being.

(48) 1905 Bull. Ent. H. S. P. A., I 235, Pl. XVI fs. 4-7.

(49) Slingerland 1893 Bull. Cornell. Exp. Sta. [58] p 207, figs.

(50) Dudgeon 1894 Ind. Mus. notes III No. 5, p. 33, figs.

17 *Hyalopeplus pellucidus* (Stal)

Although only known so far from the Hawaiian Isles, this species is hardly an endemic form, and may be looked for in Australia or one of the Southern Isles. It is principally attached to *Hibiscus rosasinensis*, at least in the Lowlands.

The ultimate *nymph* is pale translucent greenish; the vertex has three purplish-red or sanguineous percurrent lines, (the outer ones sinuate) running obscurely onto the pronotum, there is also a lateral percurrent line on the gula. The antennae have the apical third of the second, third and fourth segments purplish-red (or pinkish or blood-red) and the rest is speckled with the same; the form is as in the adult. Labium with the apex dark fuscous. The head and antennae have black and yellow pilosity mixed, the nota and tergites have short black bristly hairs. Beneath there are golden yellow hairs. The hind femora and tibiae are sparsely speckled with red. The head is shaped much as in the adult, being about one-half wider than long, the vertex is wider than the eyes together. The second segment of the antennae is three times as long as the first and nearly twice as long as the third, also twice and two-thirds as long as the fourth. The labium reaches to the middle of the hind coxae, the first segment being one-third longer than the second and twice as long as the third, second and fourth subsequial. The pronotum is a little longer than the head, and a little less long than its apical width, the hind margin is about two-thirds wider than the apical margin. The scutellum is rounded behind. There is one odoriferous orifice on the basal margin of the fourth tergite. The xyphus is angularly rounded behind, the coxae are subcontiguous.

*Penultimate stage* is very similar to the last, but of course the tegmina are less developed. The labium reaches nearly to the apical margin of the 2nd sternite, but the actual length is the same as in the last instar, as also the proportions, and it is the body which is shorter. The antennal proportions are practically as in the ultimate instar; the hind margin of the pronotum is scarcely wider than the apical, and is nearly one-half wider than its median length.

## Fam. Tetigoniidae.

All known ova are inserted in leaves or stems. A general summary of the metamorphoses in this family is given in Bull. Ent. H.S.P.A. I. 274.

18 *Conosanus hospes* (Kirkaldy)

This is an Australian and Fijian species, first described from these Islands (as *Deltocephalus hospes*) where it is a comparatively recent immigrant. The 5th nymphal instar has been described and figured, as well as the long and short-winged adults (51).

*Nesophrosyne* gen. nov.

Allied to *Nephotettix*, but characterized by the venation. There is one large median subapical cell and a small exterior subapical cell, pedicellate at both ends.

Type *Eutettix perkinsi* Kirkaldy.

19 *perkinsi*.

A small whitish species found on Ilima (*Sida cordifolia*) at Leiahi, Kaimuki and elsewhere.

*Fifth nymphal instar*: ♂ creamy, eyes greyish; a sub-lateral spot on each side at junction of pro-and mesonotum, one at base of metanotum on each side, and one similarly near base and one near apex of abdomen, sometimes also a few specks, blackish. A short, suberect bristle sublaterally and a longer horizontal lateral one, on each tergite, also a number of long horizontal bristles apically, white. Leg bristles white. ♀ as above, but as a rule, immaculate.

The other stages are similar, except that the abdomen is extremely narrow.

*Nesophryne* gen. nov.

Allied to *Eutettix*, but the habitus is quite different, and the vertex much shorter, more declivous, with the eyes scarcely so wide as the transversely striolate pronotum.

20 *flicicola* sp. nov.

Tegmina brownish-yellow with fuscous veins, the cells sparsely irrorate medianly with brownish. ♂ valve pale; ♀ pygophor brownish yellow.

Length ♂ 5½, ♀ 6½ mill.

(51) Kirkaldy 1907 Bull. Ent. H. S. P. A., III Pl. I fs. 14-17.

Hab. Kauai, Kalihiwai, 400 ft., on fern (probably *Gleichenia dichotoma*)—Oct., Giffard.

*Nymph* of fifth instar pale brownish yellow, varyingly infusate on the nota, a pale fuscous band across the bend of the head. Like the adult, but the head a little more produced, subangularly.

Hab. with the adult.

Fam. Poekillopteridae.

The metamorphoses of this and the two next families have been summarized by myself in Bull. Ent H.S.P.A. I. 277.

21 *Siphanta acuta* (Walker)

The metamorphoses have been partially studied by myself (52). This introduced species has now spread from the guava and coffee districts into the native forests, where it feeds on *Acacia koa* and other trees. It is parasitized by *Aphanomerus pusillus*, an introduced egg-parasite and attacked by a fungus.

Fam. Asiracidae.

*Nesosydne* gen nov.

Differs from *Delphacodes* and allied genera by the form of the tibial spur, which is solid, subcultrate, elongate, very narrow and armed with a few strong teeth. Arboreal. Type *koa* Kirkaldy.

22 *koa* sp nov.

May be at once distinguished from any other Hawaiian asiracid by the green color and long tegmina. There is a variety, (*rubescens*), found with it, suffused with pinkish. It is likely to be found on Oahu practically wherever *Acacia koa* occurs, but I am not sure of its distribution on the other islands.

*Nymph in fifth instar* is green (or suffused with pink) and resembles the adult in most particulars.

(52) Bull. H. S. P. A. III. Pl. VI figs. 17-20.

# ANNOUNCEMENTS

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Meetings are held the first Thursday of each month at 7:30 P. M., notice of the place of assembly being sent to each member by postcard one week previous

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Members exhibiting specimens at meetings of the Society are requested to hand to the Secretary, *at the meeting*, a note in writing of the generic and specific names of all specimens exhibited together with localities, and any remarks thereon which the exhibitors wish published. In the absence of such notes in writing, the Secretary and Editors will not be responsible for the accuracy of the report of such exhibition or for entire omission of any reference thereto in the Proceedings.

\* \* \* \* \*

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