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WITH PLATES XXVI–XXVII

DERMAPTERA AND ORTHOPTERA OF HAWAII

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The Dermaptera and Orthoptera of Hawaii

By Morgan Hebard

INTRODUCTION

The acquisition of a collection of Dermaptera and Orthoptera from Hawaii first directed our attention to the literature of that region bearing on these orders. It was found that the earlier literature comprised a paper by Bormans in 1882, one by Brunner in 1895, and a number of scattered records and descriptions of new species by various other authors. In 1899 Perkins published in the Fauna Hawaiiensis a much more complete paper on the Dermaptera and Orthoptera of Hawaii than had previously been possible, and in 1910 he published a supplement in the same series. Subsequent to Perkins's work, Swezey had published detailed and highly commendable papers on several species found in Hawaii, and since 1905 frequent records and notes have appeared in the Proceedings of the Hawaiian Entomological Society.

It is unfortunate that many of the species, particularly among the adventive forms, were originally very casually identified. On this account a considerable number of species incorrectly appear in the literature as occurring in Hawaii, the records being based on species that are similar in certain features, but almost all very readily distinguishable when compared with material of the forms they were supposed to represent. In compiling the previous records, Perkins was unable to make the necessary comparisons; as a result his work included a large proportion of the earlier errors.

This situation gradually became clear to us, and we immediately began to make efforts to examine material of as large a number of the Hawaiian species as possible. In this work the material in the United States National Museum loaned by Mr. A. N. Caudell was of much service, but the prompt and extensive assistance furnished by that active and thorough worker, Mr. O. H. Swezey, was invaluable. Largely through the aid of Mr. Swezey

we have now been able to examine material representing all of the very doubtful forms recorded, excepting *Oniscosoma pallida* Brunner and *Conocephaloides hawaiiensis* Perkins, material of these species being at present lacking in the Hawaiian collections. Mr. Swezey has sent us for study a rich series from the collections of the Experiment Station of the Hawaiian Sugar Planters' Association, the Territorial Board of Agriculture, the Bernice P. Bishop Museum, and from the private collection of Mr. P. H. Timberlake. The total probably represents a larger collection than had previously been reported on, and we take the present opportunity to describe the new species included and make the numerous corrections necessary to place the nomenclature on a more secure basis.

We take great pleasure in expressing our hearty thanks to Mr. O. H. Swezey for his exceptionally valuable aid, and also to Dr. C. M. Cooke, who has saved us many weary hours of search in locating the numerous localities recorded in the following pages.

The conclusions in the present study are based on a comparison of the material from Hawaii with that in the collections of the Philadelphia Academy of Sciences, where are represented most of the species with which Hawaiian forms have been confused.

Much remains to be done, we believe, in determining the actual number of forms native in Hawaii, their geographic, racial, or full specific significance and their geographic distribution. In some species there are also striking, though less important, variants that can be satisfactorily understood only after much collecting has been done, with careful observation as to the effect of local environmental conditions, of soil, humidity, and vegetation.

A total of six hundred and eighty-eight specimens has been examined, representing forty of the forty-one genera and all but two of the adventive species that have been recorded from Hawaii. A large proportion of the native species have undoubtedly been represented, but the questionable validity of a number of described forms gives rise to doubt as to the actual number of species indigenous to the islands of Hawaii.

The Hawaiian Dermaptera and Orthoptera are grouped as follows:

	Specimens examined	Genera	Species	Native species	Adventive
Dermaptera	171	8	12	6*	6
Orthoptera					
Blattidae	95	15	16	2†	13
Mantidae	2	2	2	0	2
Phasmidae	0	0	0	0	0
Acrididae	18	2	2	0	2
Tettigoniidae	48	5	13	10‡	3
Gryllidae	354	9	30§	24§	6

* All ?; † Both ?; ‡ One ?; § Or more

DERMAPTERA

Eleven species of earwigs are discussed below and three other female specimens that were examined from the island of Hawaii represent one or two additional but at present not determinable Hawaiian species of the genus Anisolabis. These in the opinion of the writer represent all the species of this order that have been taken in all Hawaii.

Of these species, five are unquestionably adventive, while several more are probably so. Four are as yet known only from the Territory of Hawaii, but all of them may have a distribution roughly parallel to that of the three species that are known to be represented as well on islands in the south Pacific.

LABIDURIDAE

Psalinae

ANISOLABIS Fieber

Three Hawaiian species have been referred to the genus Anisolabis Fieber. One of these, *annulipes* (Lucas), has been placed by Burr in the genus Euborellia, a genus based on male genitalic features alone. It is possible that monographic study of this very large group will afford additional evidence, warranting the separation of these genera and, consequently, we are in favor of recognizing Euborellia for the present. Unfortunately the male genitalia have not been studied for the other species here recorded; it would therefore appear advisable to refer them to Anisolabis until that work has been done.

All of these species are subject to variation, the least decided being in *eteronoma* Borelli, and it is almost certain that the records from Hawaii of *maritima, littorea,* and *pacifica* and the description of *aporonoma* are entirely based on material of the species here discussed. It seems therefore that those names have no valid standing in the Hawaiian list.

Many of the species have a wide distribution and are readily introduced by commerce into favorable regions. Thus, judging from the known distribution of *annulipes,* it seems probable that the

species has been introduced in Hawaii. Further knowledge of the Asiatic, Austro-Malayan, and Papuan faunas is needed before the probable origin of the other species can be determined. At the present time, *eteronoma* and *perkinsi* are known only from Hawaiian material.[1]

Anisolabis eteronoma Borelli

1909. *Anisolabis eteronoma* Borelli, Boll. Lab. Zool. Scuola Agr. Portici, III, p. 315. [♂, ♀; Hilo, Hawaii.]

1882. *Anisolabis littorea* Bormans (not *Forficula littorea* White, 1874), Ann. Mus. Civ. Stor. Nat. Genova, XVIII, p. 339. [Oahu; Haleakala, Maui.[2]]

Hilo, Hawaii, VII, 1918, (U. S. Inspector), 1 ♂, [Hebard Coll.].

Kohala, Hawaii, V, 20, 1917, (O. H. Swezey), 1 ♀, [Hebard Coll.].

Mount Tantalus, Oahu, (O. H. Swezey), 1 ♀, [H. S. P. A.]; I, 5, 1919, (J. A. Kusche), 1 ♂, [Bishop Mus.]; V, 26, 1919, (J. A. Kusche), 1 ♀, [Hebard Coll.].

Pauoa Ridge, Oahu, V, 29, 1919, (J. A. Kusche), 1 ♀, [Hebard Coll.].

Bormans found that the Hawaiian material he had recorded agreed absolutely with the description of *littorea* except in size. By comparing his description and measurements with the material in hand, with the description and figure given by White and with a pair of *littorea* from New Zealand, kindly loaned to us by the Paris Museum, the Hawaiian insects are seen to be not only smaller than *littorea* but to differ further in the proportionately longer forceps, annulate antennae and male forceps which lack an abrupt proximo-internal flange. There does not appear to be the slightest possi-

[1] Three specimens, in addition to those recorded, are before us, showing the presence in Hawaii of at least one more species belonging to the genus. It is possible that these specimens represent one or two undescribed species, but without more material representing both sexes, further comment on them seems inadvisable.

[2] These records have subsequently been published by Brunner and Perkins.

bility that these two forms represent variants or races of the same species.

Compared with *A. maritima* (Géné), the present species may be readily separated by the darker and annulate antennae, with joints heavier; pronotum which does not widen caudad; more highly polished dorsal surface, due to the less numerous microscopic hairs; ultimate tergite with a more pronounced ventrolateral keel; preceding tergite of male similarly produced, but with minute, scattered, impressed punctae and a moderate keel, not ruguloso-striate, and heavier and proportionately shorter forceps, which, in the male, differ decidedly in being much less strongly curved and of the same type developed in *E. annulipes* (Lucas).

Compared with *annulipes,* the insect is easily distinguished by its much larger size, less globular antennal joints, immaculate limbs and numerous other features. It is evident that Burr was in error in believing *eteronoma* to be a synonym of *annulipes.*[3]

Length of body,[4] ♂ 15.3-17, ♀ 15-16.4; length of forceps ♂ 4.1-4.2, ♀ 4-4.8 mm.

Anisolabis perkinsi Burr (Plate xxvi, 1 and 2.)

1910. *Anisolabis perkinsi* Burr, Trans. Ent. Soc. London, 1910, p. 178. ♂, ♀; Kaholuamanu (nec Koholuamano) and Waimea, Kauai (nec Kaui).]

1910. [*Anisolabis*] *xenia* Burr, (not of Kirby, 1891), Proc. U. S. Nat. Mus., XXXVIII, p. 448. [♂: [Kaumana], Hawaii; [Mount] Tantalus (nec Tantalas), [Oahu].[5]]

Kaumana, Hawaii, 1500 feet, 1900, (H. W. Henshaw), 1 ♂, [U. S. N. M.].

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[3] It is regrettable that in many places Burr has indicated synonymy, apparently in haste, without justification, for examination of our material shows that, as in the present case, distinct species had actually been described.

[4] Exclusive of the forceps, as is customary.

[5] It is evident that Burr's paper on the National Museum collection of Dermaptera was hurriedly prepared, for many of his identifications, as already noted, are incorrect.

Oahu, (A. Koebele), 1 ♂, [Terr. Bd. Agr.].
Waimea Mountains, Oahu, III, 13, 1910, (O. H. Swezey), 1 ♂, [Hebard Coll.].
Kauai, 2000 to 4000 feet, II and III, 1919, (J. A. Kusche), 3 ♂, 7 ♀; 4000 feet, IV, 4, 1919, (J. A. Kusche), 1 ♂; 3000 feet, IV, 11, 1919, (J. A. Kusche), 1 ♀ [Hebard Coll.].
Kokee, Kauai, II, 1919, (J. A. Kusche), 1 ♀, [Bishop Mus.].
Maui, 2000 feet, III, 19, 1919, (J. A. Kusche), 1 ♀, [Hebard Coll.].

The species is apparently very plastic and may, indeed, divide into several insular races. Additional material is, however, required before nominal recognition of any of the forms would be justifiable.

The males before us, with four exceptions, represent the type shown in Plate XXVI, 1. These have the lateral portions of the distal abdominal tergites irregularly and weakly rugulose, with irregular impressions. The male from the Waimea Mountains, Oahu, is similar to these except in having the broadened proximal portion of the forceps form a broad tooth on the internal margin, instead of tapering gradually distad as in the others. One Kauai male has the forceps more slender, tapering more gently than those of the others and showing a very weak curvature from base to apex. In this specimen the lateral portions of the distal abdominal tergites are very finely impresso-punctate rather than irregularly rugulose, appearing smooth except under high magnification. This is apparently the simplified type developed in the species. Such a condition is known for many species of earwigs and in many specimens gives a very different facies from the normal condition.

The male labelled simply "Oahu" and that from Kaumana, Hawaii, agree with the Kauai specimen in the smoothness of the abdominal tergites and even, weak convexity of the forceps. These appendages, however, show a broad tooth on the internal margin proximad, similar to but weaker than that of the specimen from the Waimea Mountains, Oahu, and the male from Hawaii shows a weak median thickening, as figured on Plate XXVI, 2.

In the females the forceps are elongate, tapering gently and evenly from their moderately heavy bases, and very slender in their distal half, so that decided similarity is shown to the type of forceps developed in females of the genus Labidura. The internal margin of the forceps is smooth in this sex, without a trace of tuberculation or serrulation. As stated by Burr, the more slender limbs, elongate first antennal joint and more cylindrical and less globular succeeding antennal joints are features of importance.

Previous to Burr's description the species had apparently been recorded from Hawaii as *A. pacifica* (Erichson), and Perkins evidently believed the insect to represent *A. maritima* (Géné), stating that the species was common in the mountains over the entire group of islands.

MEASUREMENTS (IN MILLIMETERS)

♂	Length of body	Length of pronotum	Caudal width of pronotum	Greatest width of abdomen	Length of forceps	Basal width of forceps
Kauai	12.8	2	2.2	3	3.7	1
Kauai	15	2.1	2.3	3.5	3.7	1.1
Kauai	15.5	2.1	2.2	3.4	3.8	1
Kauai	14	2.2	2.4	3.6	3.7	1.15
Kauai	15.3	2.2	2.4	3.5	3.8	1.2
♀						
Kauai	13	2.1	2.1	3.2	3.9	.9
Kauai	12	2.2	2.3	3.3	4.5	1.2
Kauai	13.2	2.2	2.2	3.3	4.3	1
Kauai	16	2.6	2.8	3.8	4.9	1.3
Kauai	17.5	2.8	3	4.3	5	1.4
Kauai	18.3	2.8	3	4	5.1	1.2
Maui	20*	2.7	2.8	4.1	4.8	1.2

* Abdomen pressed out.

Euborellia annulipes (Lucas)

1847. *Forficesila annulipes* Lucas, Ann. Soc. Ent. France, (2), V, p. LXXXIV. ["Jardin des Plantes, Paris"; probably introduced.]

Hawaii, 4000 feet, V, 8, 1919, (J. A. Kusche), 1 juv. ♀, [Hebard Coll.].

Hawi, Hawaii, V, 21, 1917, (O. H. Swezey), 1 ♂, [H. S. P. A.].

Niulii, Hawaii, V, 22, 1917, (O. H. Swezey), 1 ♀, [H. S. P. A.].

Mount Kaala, Oahu, 4000 feet, VI, 12, 1919, (J. A. Kusche), 1 ♂, [Hebard Coll.].

Mount Tantalus, Oahu, 1, 5, 1919, (J. A. Kusche), 1 ♂, 1 ♀, 2 juv. [Bishop Mus.]; XII, 11, 1904, (O. H. Swezey), 2 ♀, [H. S. P. A.].

Hamakuapoko, Maui, VIII, 14, 1918, (O. H. Swezey), 2 ♀, [H. S. P. A.].

Kauai, 2500 to 4000 feet, III, 26 to IV, 16, 1919, (J. A. Kusche), 5 ♀, 2 nearly adult ♂, 9 nearly adult ♀, 4 smaller juv. [Hebard Coll.].

Kokee, Kauai, II, 1919 (J. A. Kusche), 7 ♂, 11 ♀, [Bishop Mus.].

We agree with Burr[6] in placing *A. aporonoma* Borelli as a synonym of *annulipes,* though the other species from the island of Hawaii that Borelli described, *A. eteronoma,* is certainly distinct.

In a few of the specimens here recorded, the cephalic portion of the pronotum is pale, ochraceous-tawny, in strong contrast with the dark brown caudal portion. A similar color variation is found in the series of Californian specimens before us.

Most of the specimens, excepting those from Kauai, have the limbs fully as annulate as is usual in North American material of the species. Those from Kauai, with a few exceptions, however, have these markings reduced to a varying but usually a decided degree, though absent in some specimens. Moreover the antennal annuli are obscure or absent in many specimens of the series—a rare condition in this species. Most specimens agree closely in limb coloration with the description of *aporonoma* and it would appear that this color variation led to the making of this synonym. In *aporonoma* the femora are immaculate yel-

[6] Trans. Ent. Soc., London, 1910, p. 175, (1910).

lowish, except that the caudal face of the cephalic femora shows a weak blurred suffusion of brown mesad. A large number of specimens so marked have the tibiae all lightly and inconspicuously suffused with brown proximad. This condition, though very rarely encountered, is duplicated by a few North American specimens at hand.

Two females in the series from Kokee, Kauai, are of particular interest in being fully macropterous—a very rare condition in the species.[7]

Not only is the species generally abundant in the Hawaiian islands, but it has also been recorded from the islands Palmyra and Laysan.

LABIDURINAE

Labidura riparia (Pallas)

1773, *Forficula riparia* Pallas, Reise Russ. Reichs, pt. II, p. 727. [Shores of Irtysch River, western Siberia.]

Maui, 2000 feet, III, 19, 1919, (J. A. Kusche), 1 ♂, [Hebard Coll.].

Mokapu, Oahu, VIII, 29, 1920, (O. H. Swezey), 1 ♂, [Hebard Coll.].

Kaimuki Zoo, Oahu, VIII, 1905, 1 ♂, [H. S. P. A.].

Kapahulu, Oahu, V, 15, 1907, 1 ♂, 1 ♀, [H. S. P. A.].

Manoa Valley, Oahu, IV, 2 and X, 22, 1916, 2 ♂, 2 ♀, [Timberlake Coll.].

Honolulu Plantation, II, 6, 1914, 1 juv. ♀; X, 20, 1914, 1 ♀, [H. S. P. A.].

Nuuanu Valley, Oahu, V, 8, 1914, (O. H. Swezey), 1 ♀, [H. S. P. A.].

Waipahu, Oahu, III, 28, 1919, (O. H. Swezey), 2 ♀, [H. S. P. A.].

Kauai, 3500 and 4000 feet, IV, 1 to V, 3, 1919, (J. A. Kusche), 2 ♂, 4 ♀, [Hebard Coll.].

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[7] Discussed exhaustively by Pantel, Mem. R. Acad. Cienc. y Artes Barcelona, XIV, pp. 1-160, (1917).

Most Hawaiian specimens have the wings reaching only very slightly beyond the tegmina, in one male only do the wings show no reduction whatever. The series averages dark and depauperate, the females closely similar to the smallest and darkest females in the series before us from Bermuda and Cuba.

The males have the ultimate abdominal tergite with caudal margin showing no traces of paired projections between the forceps, the latter comparatively short and weakly specialized with a minute tooth on the ventro-internal margin just beyond the median point.[8]

We find this species first recorded from Hawaii as "*Labidura* sp. not common"[9] and later by Perkins as *Labidura icterica* Serville, from "Oahu, Honolulu and in the country" and from altitudes of a thousand feet or more.

LABIIDAE

LABIINAE

Sphingolabis hawaiiensis (Bormans)

1882. *Forficula hawaiiensis* Bormans, Ann. Mus. Civ. Stor. Nat. Genova, XVIII, p. 341, 3 figures. [♂, ♀ ; Hawaii.]

Oahu, (A. Koebele), 1 ♀, 1 juv., [Terr. Bd. Agr.].

Koolau Mountains, Oahu, III, 8, 1917, (J. C. Bridwell,) 1 ♀, [Bishop Mus.].

Makaleha Valley, Oahu, XII, 13, 1919, (O. H. Swezey), 1 ♀, [H. S. P. A.].

Mount Tantalus, Oahu, I, 15, 1919, (J. A. Kusche), 1 juv. ♀, [Hebard Coll.].

Waialae-Iki, Oahu, II, 27, 1917, (O. H. Swezey), 1 ♂, 2 ♀, [Bishop Mus.].

Kauai, (A. Koebele), 1 ♂, [Hebard Coll.].

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[8] One male has the sinistral arm of the forceps unspecialized, cylindrical, curving more strongly distad and smaller than the dextral arm, which is normal.

[9] By F. W. Terry. Hawaiian Sug. Pl. Assn., Div. Ent., Bull. No. 1, p. 164, (1905).

Lihue, Kauai, III, 3, 1917, (O. H. Swezey), 2 ♂, 2 ♀, [H. S. P. A. and Hebard Coll.].

Variation in size as well as in the strength of the armament is decided. The extremes of the three males from Kauai measure as follows; length of body 11.7-13.5, length of pronotum 1.55-1.9, width of pronotum 1.55-1.8, length of tegmen 3.2-3.8, exposed length of wing 1.84-1.97, length of forceps 4.2-6.1 mm.

Labia pilicornis (Motschulsky) (Plate xxvi, 3 and 4.)

1863. *Forfiscelia pilicornis* Motschulsky, Bull. Soc. Imp. Nat., Moscou, part 2, p. 2 [♀ ; Nura Ellia Mountains, Ceylon.]

This species is apparently nearest *L. frühstorferi* Burr, described from Lombok. It differs in having the meso-distal portion of the abdomen brown, often as light as the forceps, the almost unicolorous limbs and the moderately prominent though very small male pygidium. From the description we are unable to say whether the female forceps and pygidium show other differences.

The species clearly shows Indo-Malayan, Melanesian or Oceanic, rather than American affinities.

This material was first believed to represent an undescribed species and the following treatment was prepared. We have not deleted this, as the species has never been thoroughly diagnosed.

There is little question that *pilicornis* has been introduced from the Orient.

Kaimuki, Oahu, Hawaii. February 19, 1921. (P. H. Timberlake.)

Description of male: Size very small, form slender. Head microscopically very finely but thickly pilose, shining; weakly cordiform, owing to a very weakly indicated obtuse-angulate emargination of the caudal margin; the medio-longitudinal suture weakly indicated as a bare line in occipital portion. Eyes small, about three-fifths as long as cheeks. Antennae with 13 joints; the first large, as long as the third plus twice the length of the second, expanding suddenly near base, thence with sides parallel; second minute; third elongate, cylindrical, expanding very feebly and evenly distad; fourth elongate ovate, three-quarters as long as the third; the fifth elongate, weakly pyriform, nearly as long as the third; succeeding joints similar, but increasing slightly in length distad, the longest nearly four times as long as broad.

Pronotum shining, thickly though minutely punctulate, these punctulations the sockets of minute but stout hairs, except on convex prozonal portion where the hairs are weaker and absent on the sulci, supplied near cephalic margin with a few bristles; length very slightly less than width; lateral margins parallel, rounding broadly into the broadly convex caudal margin; surface of pronotal portion moderately convex, with a mediolongitudinal linear sulcus and two weaker, shorter sulci on each side, which converge slightly caudad, remaining portions deplanate.

Tegmina about twice as long as pronotum, with apices nearly transverse, showing very faint obliquity; shining, though minutely but thickly punctulate, these punctulations the sockets of minute but stout hairs and with a few bristles latero-cephalad and many along the caudal margin. Exposed portion of wings half as long as tegmina and similarly hairy. Abdomen with dorsal surface shining, supplied with even finer hairs than head; glands absent; distal tergite broadly and weakly impressed meso-caudad, caudal margin transverse, ventral surface more heavily hirsute, penultimate sternite with caudal margin transverse.

Pygidium small, moderately convex declivent to lateral margins and base of apical portion, very slightly longer than broad, lateral margins very weakly concave, convergent to the apex, which is narrow but angulate emarginate, the latero-caudal projections thus formed being minute, acute-angulate. Forceps moderately elongate, as hairy as abdomen, proximal portion nearly straight, strongly triquetrous, distal third flattened oval in cross-section, curving very gently inward to the sharp apex; ventro-internal margin with a minute flange beneath the pygidium, the margin of that flange suddenly and roundly terminated and alone visible from above, remaining portions of ventro-internal margin showing traces of very weak serrulation.[10]

Limbs short, femora stout; first tarsal joint with length very slightly greater than combined length of the minute second and elongate third joints, hairy, its ventral surface with two rows of weak bristles and with an internal fringe of closely placed hairs, arranged in successive lamellate series.

Description of ♀; same data as for ♂, except taken October 28, 1920.

Agrees with male except in the following features. Abdomen broader. Distal abdominal tergite smaller. Pygidium very strongly declivent, narrow, fitting tightly between arms of forceps,[11] its ventral margin narrowly lamellate and horizontal, the caudal margin of this portion transverse between the minute, dentiform, latero-caudal angles, from which the sides of this portion are straight and parallel proximad.

Forceps straight when closed, leaving no intervening space,[12] curving inward slightly at apices; dorsal surface not flat as in male, internal

[10] From this it would appear that some males of the species have this margin supplied with weak and widely spaced serrulations.

[11] The additional portions can only be seen when the forceps are opened to some degree.

[12] In one female the forceps show a weak curvature and in this specimen, when closed, would not fit tightly together throughout.

surface deplanate, the ventro-internal margin very minutely and slightly irregularly, microscopically serrulate from base to near apex.

	MEASUREMENT (IN MILLIMETERS)				
	Length of body*	Length of pronotum	Width of pronotum	Length of tegmen	Length of forceps
♂					
Kaimuki, Oahu	5	.82	.88	1.35	1.65
Kaimuki, Oahu	4.8	.85	.92	1.36	2.05
♀					
Kaimuki, Oahu	4.3	.75	.82	1.12	1.22
Kaimuki, Oahu	4–4.8	.75–.94	.75–.95	1.15–1.36	1.36–1.41
Waikiki, Oahu	5	.88	.95	1.43	1.36

* As is customary, the length given is exclusive of forceps.

Head, pronotum, tegmina and exposed portions of wings blackish mummy-brown, hairy covering nearly as dark. In one paler specimen, paler and tinged with tawny, the cephalic portion of the pronotum tawny. Abdomen russet, deepening to mummy-brown proximo-laterad. Pygidium and forceps tawny. Antennae, limbs and underparts buckthorn-brown, the ventral surface of the abdomen showing a tawny tinge. In examples of recessive coloration the limbs are somewhat paler.

In addition to the described pair, a series of one male and five females from Kaimuki, Oahu, are before the writer. These were taken by O. H. Swezey and P. H. Timberlake, February 17 to December 18, 1914 to 1921, caught "at light," "in house," and "in a box of apples." Another female was taken at Waikiki, Oahu, by O. H. Swezey, at light.

Labia curvicauda (Motschulsky)

1863. *Forficelisa curvicauda* Motschulsky, Bull. Soc. Nat. Moscou, XXXVI, pt. II, p. 2, Pl. II, fig. 1. [Nura-Ellia mountains, Ceylon.]

Kaimuki, Oahu, V, 1915, (O. H. Swezey, 1 ♂, [H. S. P. A.].

This minute species is known to be widely distributed through the tropical and subtropical regions of the earth.

Labia dubronyi new species. (Plate xxvi, 5 to 7.)

1882. *L[abia] pygidiata* Bormans, (not of Dubrony, 1879, Ann. Mus. Civ. Stor. Nat. Genova, XVIII, p. 340. [Oahu, Hawaii.]

Since Bormans' first record of this species, from Hawaii as *pygidiata,* material from these islands has been referred incorrectly to that species by all subsequent authors. It has been definitely recorded from Kona, Hawaii, and Perkins has stated that it is "widely distributed; found under the bark of trees in the mountains."

Burr has pointed out the differences between the Hawaiian insect and true *pygidiata,*[13] but did not consider the former distinct. We are convinced that the differences noted fully warrant our present action.

Though closely related to *pygidiata, dubronyi* may readily be separated by the paler and different coloration, decidedly shorter tegmina and wings, male pygidium with interval between distal projections less than that between these and the lateral projections, male forceps with meso-distal tooth the termination of a gradually widening flange and situated ventrad rather than dorsad on the internal surface, and female forceps with internal margins heavily and irregularly serrate in proximal two-thirds, with a moderate and gradually narrowing flange of the ventro-internal margin in distal third and without a trace of median widening.

Both sexes of *pygidiata* have been figured by Dubrony,[14] the female of the present species by Burr.[15]

In certain features, this very much smaller insect shows a somewhat similar development to that found in *Sphingolabis hawaiiensis* (Bormans).

Type: ♂ ; Hauula, Hawaii. August 2, 1914. (O. H. Swezey.) [Hebard Coll., Type No. 769.]

Size small, form slender. Head with scattered pile and delicate, erect hairs, shining; distinctly but angularly cordiform, owing to the rather abrupt rounding of the latero-caudal portions of the occiput and a broad though distinct obtuse-angulate emargination of the caudal margin; the medio-longitudinal suture weakly indicated in occipital portion. Eyes very small, scarcely over half as long as cheeks. Antennae with 12 or 13 joints; first large, about as long as third plus twice length of second,[16] expanding suddenly at end of proximal third, thence with sides

[13] Fauna Br. India, Dermapt., p. 123, (1910).

[14] Ann. Mus. Stor. Nat. Genova, XIV, p. 365, 3 figures, (1879).

[15] Fauna Br. India, Dermapt., pl. v, fig. 41, (, nec), 1910).

[16] It is clear that slight individual variation occurs in the length of the proximal antennal joints. In some specimens such differences are apparent between the antennae.

parallel; second minute; third elongate, cylindrical, expanding very feebly and evenly to distal portion; fourth elongate ovate, nearly or quite as long as third; succeeding joints elongate spindle-shaped, increasing very slightly in length but decreasing appreciably in width distad and very small at intersections. (In most specimens the longest joints are three or even four times as long as broad.)

Pronotum shining, very minutely impresso-punctulate, these punctulations being the sockets of minute hairs,[17] except in convex prozonal portion where these are much fewer and weaker, supplied latero-cephalad with a few delicate bristles; length appreciably greater than width; lateral margins diverging very slightly caudad, rounding broadly into the very feebly convex, nearly transverse, caudal margin; surface of prozonal portion moderately convex, with a feeble medio-longitudinal linear sulcus and a weak or obsolete impression on each side.

Tegmina appreciably less than twice as long as pronotum, with apices straight, truncate, transverse; surface shining, very minutely impresso-punctulate, the punctulations being the sockets of minute hairs.[18] Exposed tips of wings about one-fourth (averaging this in the series, rarely one-third) as long as tegmina and similarly hairy. Abdomen with dorsal surface shining, supplied with even finer hairs, glands subobsolete; distal tergite with caudal margin very weakly and broadly obtuse-angulate convex above inner portion of each cercal shaft, surface feebly impressed meso-caudad.[19] Lateral portion of abdomen with a scattered supply of delicate bristles, ventral surface as hirsute as dorsal and lateral portions. Penultimate sternite with caudal margin broadly convex laterad and broadly concave mesad.

Pygidium strongly declivent, then flattened out into a large horizontal plate with lateral margins broadly concave divergent to blunt points, which are situated slightly beyond the middle, then broadly concave and convergent to an equal degree to the small, sharply rounded distal apices, between which the distal margin is deeply and roundly emarginate. Forceps moderately elongate, hairy proximad, with many delicate bristles in other portions; straight proximad, flattened internally and weakly dorsad, from this portion showing a very slight inward curvature to the strongly incurved immediate apices, the distal portion strongly flattened oval in cross-section; slightly beyond the pygidium a ventro-internal flange commences, widening gently and evenly and terminating at end of proximal three-fifths in a moderately large acute-angulate tooth, directed ventro-mesad.

Limbs as described for *pilicornis,* except that the metatarsus is slightly

[17] The hairy covering of this species is not so dense and the hairs are decidedly finer in proportion to the body bulk than in *L. pilicornis,* (Motschulsky).

[18] See footnote 17.

[19] The greater specialization of this tergite in females of *dubronyi* is an unusual occurence in the Dermaptera, the male sex showing the greater specialization in most of the species of the order.

longer than the combined length of the succeeding tarsal joints and the bristles on its ventral surface are heavy.

Allotype: ♀ ; same data as type. [Hebard Coll.]

Differs from the male in the following characters. Abdomen broader. Distal tergite with a low and feebly striate, transversely oval convexity above the base of each arm of the forceps and bearing mesad on the caudal margin a small but conspicuously projecting node, directed dorso-caudad.

Pygidium about as wide at base as an arm of the forceps, strongly declivent and showing a strong transverse convexity; with a very narrow, transverse horizontal flange at apex ventrad, terminating on each side in a minute point, which is concealed except when the forceps are somewhat opened.

Forceps well separated, with a weak curvature, as in the male; dorsal surface flattened proximad, narrowing to distal portion and there terminating at the external margin; internal surface deplanate in proximal three-fifths, with dorsal and ventral margins coarsely and irregularly denticulate, thence with ventral margin developed into a weak flange, its margin slightly irregular, terminating near apex of forceps.

MEASUREMENTS (IN MILLIMETERS)

	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Length of forceps
♂					
Hauula, Oahu, *type*	6.5	1.02	.88	2.48	2.58
Ookala, Hawaii, *paratype*	4.6	.88	.81	1.15	2.02
Hawaii, *paratypes* (3)	5.9-7	.85-.95	.82-.88	1.18-1.97	1.88-2.11
♀					
Hauula, Oahu, *allotype*	5.4	1.02	.95	1.33	2.18
Opaeula, Oahu, *paratype*	7.7	1.05	1.02	1.56	2.38
Kuliouou, Oahu, *paratype*	4.5	.76	.74	1.09	1.54
Hawaii, *paratypes* (3)	5.9-6.2	.92-.95	.85-.88	1.27-1.32	1.84-2.18

The great individual size variation, sometimes found in species of Dermaptera, is well exemplified by the females measured.

Head and prozonal portion of pronotum blackish brown, remaining portions of pronotum and all of tegmina translucent honey-yellow, exposed portions of wings similar, but occasionally of a faintly darker shade. Antennae bister. Limbs honey-yellow, median femora suffused proximad with blackish brown, caudal femora very heavily suffused proximad with this color. Abdomen russet; the ultimate tergite rich blackish chestnut-brown. Forceps tawny.

The series before us shows individual variation in the amount of russet entering into the general coloration. Intensification and recession of coloration is also marked. In the maximum recessive examples the distal portion of the abdomen is only very slightly darker than the other portions.

Specimens Examined: 13, 5 males and 8 females.

Hawaii, (A. Koebele), 3 ♂, 3 ♀, *paratypes.* [Terr. Bd. Agr. and Hebard Coll.].

Ookala, Hawaii, X, 18, 1908, (O. H. Swezey), 1 ♂, *paratype,* [H. S. P. A.].

Oahu, (A. Koebele), 1 ♀, *paratype,* [Terr. Bd. Agr.].

Hauula Valley, Oahu, VIII, 2, 1918, (O. H. Swezey), 1 ♂, 1 ♀, *type* and *allotype,* [Hebard Coll.].

Opaeula Gulch, Oahu, III, 30, 1913, (O. H. Swezey), 1 ♀, *paratype,* [H. S. P. A.].

Makaleha Valley, Oahu, XII, 13, 1919, (O. H. Swezey), 1 ♀, *paratype,* [H. S. P. A.].

Kuliouou Valley, Oahu, VI, 25, 1916, (P. H. Timberlake), 1 ♀, *paratype,* [Timberlake Coll.].

Prolabia arachidis (Yersin)

1860. *Forficula arachidis* Yersin, Ann. Sci. Ent. France, (3), VIII, p. 509, pl. X, figs. 33 to 35. [[Adventive at] Marseilles, France.]

Kaimuki, Oahu, I, 8, 1917, (O. H. Swezey; in case of canned tomatoes from Oregon), 2 ♀, [H. S. P. A.]; III, 14, 1914, (O. H. Swezey; in box of apples), 1 ♂, 2 ♀, [H. S. P. A. and Hebard Coll.].

Honolulu, Oahu, (Van Dine), 1 ♀,[20] [U. S. N. M.].

This species, which has been widely distributed by commerce in tropical and subtropical regions, is apparently a recent introduction in Hawaii.

[20] This specimen was recorded by Burr as *Labia arachidis,* Proc. U. S. Nat. Mus., XXXVIII, p. 453, (1910), constituting the first record for the species from the Hawaiian Islands.

CHELISOCHIDAE

CHELISOCHINAE

Sparattina nigrorufa (Burr) (Plate xxvi, 8 and 9.)

1902. *S*[*pongiphora*] *nigrorufa* Burr, Termes. Fuzet., XXV, p. 4, pl. XX, fig. 3. [♂, ♀; Stephansort, Astrolabe Bay and Simbang, Gulf of Huon, New Guinea.]

Hilo, Hawaii, VIII, 21, 1912, (O. H. Swezey; Hilo Sugar Company Plantation), 1 ♂, 1 ♀, [H. S. P. A.[.

Waiakea, Hawaii, III, 31, 1916, (O. H. Swezey), 1 ♂, 1 ♀, [Hebard Coll.].

Careful consideration of the species of several large genera was necessary before we could place this insect. The specimens examined agree closely with the description and comments by Burr on his *Spongiphora nigrorufa* that he assigned later to Spongovostox,[21] though the evidence indicates that Burr assigned other congeneric species to Chaetospania. We have strong evidence to show further that Sparattina, placed by Burr in synonymy under Chaetospania, is valid, including Papuan and Malayan species that he referred to Chaetospania and other genera.

Further study of papers by Burr shows plainly that his concepts of the genera involved were decidedly confused. The material here recorded belongs to the Chelisochinae, as does another Sumatran specimen before us apparently representing a different species of the same genus. Material of two Malagasy species in the Philadelphia Collections, belonging to Chaetospania,[22] are, on the other hand, referable to the Labiinae. Thus the species placed by Burr in the genus Chaetospania are evidently referable to at least two distinct genera, belonging to different families.

The species may be readily recognized by the figures here

[21] Since writing the above we find that Burr, in 1915, referred his *nigrorufa,* without comment, to his Chelisochid genus Hamaxas, Tidschr. voor Ent., LVIII, p. 118. It appears very possible that Hamaxas may prove to be a synonym of Sparattina. Genus monotypic. Genotype.—*Sparattina flavicollis* Verhoeff, from Java.

[22] Genus monotypic. Genotype.—*Chaetospania inornata* Karsch, from Madagascar.

given. Though in general appearance resembling closely species of Chaetospania, the present material has the second joint of the tarsi provided with a plantula, or narrow lobe, produced beneath the third joint nearly to its median point, a characteristic of the Chelisochidae.

Head, pronotum, tegmina, wings, and dorsal surface of abdomen shining black, the latter showing brownish distad in some specimens. Antennae blackish-brown, with one or two joints buffy, preceding the two or three distal joints. Ventral surface of abdomen chestnut brown. Forceps ochraceous-tawny or tawny. Limbs clear, translucent buckthorn-brown.

Length of body ♂ 8-8.5,[23] ♀ 7.9-8.2; length of pronotum ♂ 1.25-1.36, ♀ 1.27-1.43; width of pronotum ♂ 1.15-1.25, ♀ 1.29-1.3; length of tegmen ♂ 2.03-2.09; ♀ 2.31-2.34; length of forceps ♂ 2.72-3.61; ♀ 2.18-2.31 mm.

Chelisoches morio (Fabricius)

1775. *F[orficula] morio* Fabricius, Syst. Ent., p. 270. [Otaheita.]

Hawaii, 4000 feet, V, 8, 1919 (J. A. Kusche), 1 ♂, [Hebard Coll.].

Pukoo, Molokai, I, 1907, (W. M. Giffard), 1 ♂, [H. S. P. A.].

Lanihuli, Oahu, IX, 3, 1916, (J. C. Bridwell), 2 ♀, [Bishop Mus.].

Mount Konahuanui, Oahu, VI, 6, 1919, (J. A. Kusche), 3 ♀, [Hebard Coll.].

Mount Tantalus, Oahu, V, 26, 1919, (J. A. Kusche), 3 ♀, [Hebard Coll.]; XII, 11, 1904, (O. H. Swezey), 1 ♂, 1 ♀, [H. S. P. A.].

Pauoa Ridge, Oahu, V, 29, 1919, (J. A. Kusche), 4 ♂, 1 ♀, [Hebard Coll.].

Pacific Heights, Oahu, XI, 1903, 1 ♀, [Terr. Bd. Agr.]; (O. H. Swezey), 1 ♀, [H. S. P. A.].

Mount Olympus, Oahu, VI, 18 and 23, 1919, (J. A. Kusche), 2 ♂, 3 ♀, [Hebard Coll.].

Palolo, Oahu, VI, 24, 1917, (J. C. Bridwell), 1 ♂, [Bishop Mus.].

[23] The body length given by Burr, 19 mm., is an error for 9 mm., as shown by the scale given with the figure on the plate.

South side of Oahu, V, 15, 1919, (J. A. Kusche; in center of "Ki," *Dracaena terminalis,* and banana leaves), 1 ♂, 3 ♀, [Hebard Coll.].

We cannot commend too highly the excellent discussion of this species and its life history, given by F. W. Terry in "Leaf Hoppers and Their Natural Enemies." [24]

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[24] Exp. Sta., Hawaiian Sugar Pl. Assn., Div. Ent., Bull. 1, pt. 5, pp. 164 to 171, pls. VIII and IX, (1905).

ORTHOPTERA

BLATTIDAE

Of the sixteen species of cockroaches now known to be in Hawaii, all but one, *Oniscosoma pallida* Brunner,[25] have been treated below. All but two are undoubtedly adventives and these two may have been introduced from the islands of the southern Pacific, where both are found.

Not a single species of cockroach peculiar to Hawaii exists.

Ectobiinae

ALLACTA Saussure and Zehntner

1893. Abrodiaeta Brunner, Ann. Mus. Civ. Stor. Nat. Genova, XXXIII, p. 21.

1895. Allacta Saussure and Zehntner, in Grandidier, Hist. Nat. Madagascar, XXIII, p. 45.

Two species were originally referred to Abrodiaeta Brunner, *modesta* and *latipennis*, both described by Brunner. In 1895, Saussure and Zehntner proposed the name Allacta for this genus, as Abrodiaeta Brunner had been found to be preoccupied. The first type designation[26] is invalid, as the species indicated, *lobata* of Saussure, was not mentioned by name in the original generic description. We, therefore, here select *modesta* (Brunner) as genotype of Allacta.

Saussure and Zehntner, in 1895, considered that the genus included two very distinct sections, the first Oriental (and Australasian), the second Malagasy. In 1907, Shelford properly separated these as distinct generic units, describing and naming the Malagasy section Anallacta.[27].

We find that Allacta belongs to an Oriental and Australasian phylum which at the present time is very poorly understood.

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[25] Referred to the Panchlorinae. Recorded by Bormans from Haleakala, Maui, Ann. Mus. Civ. Stor. Nat. Genova, XVII, p. 345, (1883).

[26] Kirby, Syn. Cat. Orth., I, p. 99, (1904).

[27] Gen. Ins., Orth., Blatt., Phyllodromiinae, Fasc. 73, p. 18.

Though widely different in certain features, the genus Eoblatta agrees so closely in other characters that it is clear the two are derived from a common ancestor, more recent than that connecting them with any of the known American forms. This phylum we believe should be placed at or near the end of the Ectobiinae, showing in numerous respects close convergence toward certain types developed in the Pseudomopinae.

In recognizing the genus Allacta the following characters are, we believe, of value. Form moderately broad; tegmina and wings showing some atrophy, not projecting beyond apex of abdomen, often showing some distal truncation and not fully so large in proportion to body bulk in female as in male; discoidal sectors of tegmina weakly oblique. Ventrocephalic margin of cephalic femora armed with a row of spines that are entirely piliform, terminating in two heavy, distal spines. Dorsal surface of male abdomen unspecialized, but conspicuously constricted in distal portion. Large pulvilli present on all four proximal tarsal joints. Arolia present between the simple but strongly asymmetrical tarsal claws.

Allacta similis (Saussure) = Balta

1869. *Bl[atta] similis* Saussure, Mem. Soc. Phys. Nat. Genève, XX, p. 243. [♂, Australia ?]

1895. *Phyllodromia obtusata* Brunner, Proc. Zoöl. Soc. London, 1895, p. 892. [♀, Kona, etc., Hawaii.]

Kirby, in 1904, first referred *obtusata* to the genus Allacta, a decision that we believe to be fully warranted. After careful consideration of the literature, we feel compelled to place *obtusata* in synonymy under *similis*. Saussure's description is unusually complete and no features are given by which the type can be separated from the Hawaiian material at hand.

Kealakekua, Hawaii, 3000 feet, VIII, 8, 1919, (P. H. Timberlake), 5♂, 1♀, [Timberlake Coll.].

Olaa District, Hawaii, 2500 feet, (W. H. Ashmead), 2♂, [U. S. N. M.]

Ridge south of Iao Valley, West Maui, 2000 feet, VII, 28, 1919, (P. H. Timberlake), 1♀, [Timberlake Coll.].

Mount Kaala, Oahu, 2500 feet, (P. H. Timberlake), 1♂; (J. A. Kusche), 1♂, 2♀, 1 juv., [Hebard Coll.].

Waianae Valley, Oahu, 2800 feet, VI, 1, 1919, (P. H. Timberlake), 1 ♀, [Timberlake Coll.].

Lanihuli, Oahu, III, 26, 1916, (P. H. Timberlake), 1 ♂, [Timberlake Coll.].

Cooke Trail, Oahu, III, 19, 1916, (P. H. Timberlake), 1 ♂, [Timberlake Coll.].

Mount Konahuanui, Oahu, VI, 6, 1919, (J. A. Kusche), 1 ♀, [Hebard Coll.].

Mount Tantalus, Oahu, II, 19, 1916, (P. H. Timberlake), 1 ♂, 1 ♀ with ootheca; V, 26, 1919, (J. A. Kusche) 1 ♀, [Hebard Coll.].

Mount Olympus, Oahu, VI, 23, 1919, (J. A. Kusche), 1 ♂, [Hebard Coll.].

Kauai, 2500 to 4000 feet, III, 26 to IV, 28, 1919, (J. A. Kusche), 11 ♂, 7 ♀, 1 with ootheca, 8 juv., [Hebard Coll.].

In the present species the ventro-caudal margin of the cephalic femora is armed with one or two, and one distal, spines; the ventral margins of the other femora with more numerous, rather weak spines, those of the caudal margins being slightly the heavier.[28]

In specimens of the maximum recessive coloration, the color pattern is very weakly indicated.

EOBLATTA Shelford

1911. *Eoblatta* Shelford, Ent. Monthly Mag., (2), XXII, p. 155.

"Type of the genus: *Blatta notulata* Stål."

The original hurried diagnosis of this genus, referred to the

[28] In two females which, we believe, represent *Allacta conjuncta* (Walker), from New Zealand, in the Hebard Collection, the limb armament is seen to show decidedly greater atrophy, the margins discussed above armed only with a single distal spine, except the ventro-caudal margins of the median and caudal femora, which are supplied distad with a few additional spines. Brunner's *latipennis* is apparently based on specimens of more than one species, the material from New Zealand very possibly representing the species described by Walker as *conjuncta*.

Group Blattellae of the Pseudomopinae, was apparently based on a misidentification, as material now before us shows the tegminal discoidal sectors to be longitudinal, not oblique, and the ventro-cephalic margins of the cephalic femora to be armed after "type A" and not after "type B".

In size, form and sex contrast close agreement with the Pseudomopine genus Latiblatella Hebard is shown. The present genus is easily distinguished, however, by many features of primary importance as well as by the color pattern, which in the genotype is more highly developed and intricate than in any known species of Latiblattela.

The position of this genus is suggested, under our treatment of the genus Allacta on page 327.

The following features we believe to be of importance in recognizing the genus Eoblatta. Form moderately broad. Tegmina moderately broad; fully developed in male, slightly shorter in female; discoidal sectors longitudinal. Wings with costal veins clubbed and intercalated triangle very small. Dorsal surface of male abdomen unspecialized and not suddenly constricted in distal portion. Ventro-cephalic margin of cephalic femora with a row of spines that decrease suddenly in size mesad, those distad being piliform, terminating in three heavy distal spines; ventro-caudal margin armed with (3 and 1 distal) spines. Large pulvilli on all four proximal tarsal joints. Large arolia present between the simple, asymmetrical tarsal claws, the cephalic being very much shorter than the caudal claw.

Eoblatta notulata (Stål) (Plate XXVI, figure 11.)

1860. *Blatta notulata* Stål, Kongl. Svenska Freg. Eugenie's Resa, Ins., p. 308. [♂, Taiti (= Tahiti).]

1865. *Ph[yllodromia] hieroglyphica* Brunner, Nouv. Syst. Blatt., p. 105. [♂, ♀: Borneo; Taiti (= Tahiti).]

We are fully in accord with Kirby who, in 1904, indicated the above synonymy, except that the species is certainly not a member of the genus Allacta, to which he assigned it. Shelford, in 1908, also concurred in the synonymy but assigned the species to the genus Phyllodromia.

Stål's description is less satisfactory than that of Brunner, but we are unable to understand Brunner's reason for describing his

Tahitian material as distinct and referring Stål's name, with a query, to a Cambodian species which he described as new.

The species has previously been recorded from Hawaii only under the name *hieroglyphica.*

Hawaii, 4000 feet, V, 8, 1919, (J. A. Kusche), 1 ♂, 1 ♀, [Hebard Coll.].

Makiki Valley, Oahu, V, 7, 1910, (P. H. Timberlake), 1 ♀, [Timberlake Coll.].

Pauoa Ridge, Oahu, V, 29, 1919, (J. A. Kusche), 1 ♂, [Hebard Coll.].

Round Top, Oahu, I, 16, 1916, (P. H. Timberlake), 1 ♀, [Timberlake Coll.].

Mount Olympus, Oahu, V, 18 and 22, 1919, (J. A. Kusche), 5 ♂, 1 ♀, [Hebard Coll.].

Palolo Valley, Oahu, V, 30, 1919, (P. H. Timberlake), 1 ♂, [Timberlake Coll.].

Pseudomopinae

Blattella germanica (Linnaeus)

1767. [*Blatta*] *germanica* Linnaeus, Syst. Nat., Ed. XII, I, p. 668. [Denmark.]

Honolulu, Oahu, I, 1905, 1 ♂, [Hebard Coll.].

Kaimuki, Oahu, (O. H. Swezey; in house), 1 ♂, [H. S. P. A.].

This cosmopolitan pest has not previously been recorded from the Hawaiian islands.

Symploce hospes (Perkins)

1899. *Phyllodromia hospes* Perkins, Fauna Hawaiiensis, II, p. 5. [♂; Kauai and Honolulu, (Oahu).]

1916. *Symploce lita* Hebard, Trans. Am. Ent. Soc., XLII, p. 357, pl. XVII, fig. 8, pl. XVIII, figs. 1 to 4 [♂, ♀: Key West, Florida; Vera Cruz, Vera Cruz and San José del Cabo, Lower California, Mexico.]

Opportunity to examine Hawaiian material has proved beyond question the synonymy indicated above. The description of *hospes* is insufficient to make determination possible from it alone and the appended statement by Brunner, that the species is allied to *conspersa,* misled us completely; *Phyllodromia conspersa* Brunner is a South American member of the genus Neoblattella, referable to the Group Blatellae, and Symploce is a member of the group Ischnopterae, the genus showing an Epilamprine tendency.

Perkins apparently did not have a specimen of the female, which on account of its deeper color and short, quadrate tegmina, has a very different general facies from the male.

Illingworth has published some interesting notes on this species.[29]

Oahu, II, 10, 1914, (from Illingworth), 1 ♀, [U. S. N. M.]; III, 1913, (from Illingworth), 1 ♂, [U. S. N. M.].

Honolulu, Oahu, VI, 1901, (W. H. Ashmead), 1 ♂, [Hebard Coll.].

Length of body ♂ 11.1-12.8, ♀ 11; length of pronotum ♂ 2.9-3.2, ♀ 3.3; width of pronotum ♂ 3.7-3.8, ♀ 4; length of tegmen ♂ 11.3-12.4, ♀ 3.5; width of tegmen ♂ 3.3-3.8, ♀ 3 mm.

Loboptera sakalava (Saussure)

1891. *T[emnopteryx] sakalava* Saussure, Soc. Ent. Zurich, VI, p. 25. [♀, Madagascar.]

1899. *Loboptera extranea* Perkins, Fauna Hawaiiensis, II, p. 6. [♂, ♀ : on the coast, Maui, and Hilo, Hawaii.]

Comparison with the original description and material of *sakalava* from the Comoro Islands and German East Africa, in the collection of the Academy of Natural Sciences of Philadelphia, offers full proof of the synonymy indicated above. In addition, a female is at hand from Tahiti, taken June 6, 1906, by O. E. Brenner, and now in the collection of the United States National Museum.

We refer the species to the genus Loboptera, as comparison

[29] Proc. Hawaiian Ent. Soc., III, p. 138, (1915).

with material of the genotype, *L. decipiens* (Germar), in the Philadelphia Academy collection, shows full agreement in the following characters, which we believe define the genus.

Tegmina greatly reduced, to a similar degree in the sexes. Ventrocephalic margin of cephalic femora armed with a row of stout spines, which decrease gradually in size distad. Pulvilli present on four proximal tarsal joints. Well developed arolia present between the simple and symmetrical tarsal claws. Dorsal surface of male abdomen unspecialized. Interocular space broad. Ocellar spots very small and inconspicuous.

The genus temnopteryx is generally recognized as including forms with short, quadrate tegmina, as opposed to Loboptera, including forms with lobiform, lateral tegmina. We have not been able to examine the genotype of the former, *T. capensis,* but from material of other species at hand, it would appear very probable that Temnopteryx will be found to be a synonym of Loboptera. Hence we think it best to refer *sakalava* to the genus Loboptera. This species, with *L. indica* Brunner, has tegmina intermediate between the two types, these organs overlapping only in their proximal portions, owing to the obliquity of their distal margins.

Hawaii, 4000 feet, V, 8, 1919, (J. A. Kusche), 1 small juv., [Hebard Coll.].

Kaunamano, Hawaii, 1500 feet, 1900, (H. W. Henshaw, 3 ♂, 1 juv. ♂, 1 juv. ♀, [U. S. N. M. and Hebard Coll.].

Honolulu, Oahu, VI, 1901, (W. H. Ashmead), 1 adult, [U. S. N. M.].

The intricate, highly specialized male genitalia are distinctive. In the remarkable subgenital plate the only difference shown by the males at hand is a certain amount of variation in the size of the appendages. The tegminal venation is almost obliterated; the anal sulcus is, however, conspicuous, transverse in its distal half, delimiting distinctly the greatly shortened anal field.

Small immature examples of this species have the antennae dark brown, with a broad whitish annulus distad. In addition to the pale cephalic and lateral borders of the pronotum, the mesonotum is buffy in proximal half and the first abdominal tergite is very narrowly buffy laterad at the cephalic margin.

BLATTINAE

Cutilia soror (Brunner)

1865. *P*[*olyzosteria*] *soror* Brunner, Nouv. Syst. Blatt., p. 219. [♂, Amboina.]

Kahoolawe Island, (H. A. Pilsbry), 1 ♂, 2 ♀, [Acad. Nat. Sci. Phila.].

Kawaihapai, Oahu, II, 4, 1913, (H. A. Pilsbry), 1 juv., [Acad. Nat. Sci. Phila.].

This species, originally described from Amboina, is now known to be widely distributed through the islands of the southern Pacific. It was first correctly recorded from Hawaii by Perkins,[30] who also included in his list *Methana ligata* Brunner, possibly mistaking immatures of the present insect for adults of that species. Brunner[31] records *Methana ligata* as from Hawaii on the authority of Bormans, but on turning to the citation[32] we find that *Periplaneta ligata* had instead been recorded. It would appear almost certain that all the Hawaiian records of either *Periplaneta ligata* or *Methana ligata* are properly referable to *Cutilia soror*.

The caudal metatarsus is elongate and biseriately spined beneath, bearing a large distal pulvillus. This feature is characteristic of the genus Cutilia, distinguishing it from the related Platyzosteria—according to Shelford, who, however, placed *soror* in the latter genus,[33] though Kirby had already referred it to Cutilia.[34]

The insect is said to be almost as common in the houses at Honolulu as *P. decorata* (= *Neostylopyga rhombifolia* (Stoll)).

Neostylopyga rhombifolia (Stoll)

1813. [*Blatta*] *rhombifolia* Stoll, Natuur. Afbeeld. Beschr. Spoken, Kakkerlakken, p. 5, register p. 14, pl. IIId, fig. 13. [Apparently an immature female, no locality given.]

[30] Fauna Hawaiiensis, II, p. 6, (1899), as *Polyzosteria soror*.

[31] Proc. Zoöl. Soc. London, 1895, p. 893, (1895).

[32] Ann. Mus. Civ. Stor. Nat. Genova, XVIII, p. 344, (1883).

[33] Trans. Ent. Soc. London, 1909, p. 256, (1909).

[34] Syn. Cat. Orth., I, p. 134, (1904).

Kahoolawe Island, (H. A. Pilsbry), 1 juv., [Acad. Nat. Sci. Phila.].
Honolulu, Oahu, VI, 1906, 2 ♀, [H. S. P. A.].
Waikiki, Oahu, (W. H. Ashmead), 1 ♀, [U. S. N. M.].

This adventive species appears in the Hawaiian literature as the synonymous *decorata* of Brunner, referred to Periplaneta or Stylopyga. It is generally distributed through the warmer regions of the earth.

Periplaneta americana (Linnaeus)

1758. [*Blatta*] *americana* Linnaeus, Sys. Nat., Ed. X, p. 424. [America.]

Honolulu, Oahu, X, 1906, 1 ♂, [H. S. P. A.].

Periplaneta australasiae (Fabricius)

1775. [*Blatta*] *australasiae* Fabricius, Syst. Ent., p. 271. ["In nave e mare Pacifico et regionibus incognitis revertente."]

Kawaihapai District, Oahu, II, 4, 1913, (H. A. Pilsbry), 1 ♀, [Acad. Nat. Sci. Phila.].
Mount Olympus, Oahu, V, 18, 1919, (J. A. Kusche), 1 juv., [Hebard Coll.].

This, like the preceding species, is a domiciliary adventive. It is, however, more frequently to be found out-of-doors.

PANCHLORINAE

Leucophaea maderae (Fabricius)

1793. [*Blatta*] *maderae* Fabricius, Ent. Syst., II, p. 6. [Madeira.]
Hilo, Hawaii, VII, 1918, (from U. S. Inspector), 1 ♀, [Hebard Coll.].

The first record of the occurrence of this introduced, domiciliary, tropical species was by Alfken for specimens taken in a native

hut at Kalae, Molokai, in 1896 or 1897.[35] Since then it has been recorded as *Rhyparobia maderae:* one from house at Pahala, Hawaii, one from Honolulu, Oahu, and one from Kekaha, Kauai, by Swezey; from a store on Maui, by Wilder; nine from Hilo, Hawaii, by Illingworth, and by Perkins, in 1910, from Maui, Oahu, Molokai and Hawaii.

Pycnoscelus surinamensis (Linnaeus)

1767. [*Blatta*] *surinamensis* Linnaeus, Syst. Nat., Ed. XII, I, p. 687. [Surinam.]

Honolulu, Oahu, XI, 4, 1905, and IV, 1906, 2 ♀, 2 juv. ♀, [H. S. P. A.].

This introduced species was first reported, as scarce, from the vicinity of Honolulu by Bormans, in 1882. The insect is more apt to be found about the habitations of man than indoors.

Nauphoeta cinerea (Olivier)

1789. *Blatta cinerea* Olivier, Encycl. Method., Ins., IV, p. 314. [Adults and juv., L'Ile de France (Mauritius).]

Oahu, XI, 1914, 1 ♂, [Hebard Coll.].

This adventive species appears in the Hawaiian literature usually under Burmeister's synonymic name *bivittata*, though the error has been pointed out by Kirkaldy.[36]

OXYHALOINAE

Diploptera dytiscoides (Serville)

1839. *Blatta dytiscoides* Serville, Hist. Nat. Ins., Orth., p. 102. [♂, ♀; "Nouvelle-Hollande."]

Mount Konahuanui, Oahu, VI, 6, 1919, (J. A. Kusche), 1 ♀, [Hebard Coll.].

Mount Olympus, Oahu, VI, 3, 1919, (J. A. Kusche), 1 ♂, 1 ♀, [Hebard Coll.].

[35] Zoöl. Jahrb., XIX, p. 565, (1904).

[36] Proc. Hawaiian Ent. Soc., I, p. 88, (1907).

Saussure's genus Diploptera has one year of priority over Brunner's Eleutheroda, under which generic name this species is generally recorded in the literature of Hawaii.

The species is common and injurious in the Territory, infesting particularly the Monterey Cypress trees (*Cupressus macrocarpa* Hartweg) and doing particular damage by gnawing away the bark. Like a number of other species, it is apparently adventive from the islands to the south.

CORYDIINAE

Euthyrrhapha pacifica (Coquebert)

1804. *Blatta pacifica* Coquebert, Ill. Iconogr. Ins., III, p. 91, pl. XXI, fig. 1. [Islands of the Pacific Ocean.]

Honolulu, Hawaii, III, 6, 1904, 1 ♂, [Hebard Coll.].
Kauai, 500 feet, VIII, 1, 1908, (W. H. Ashmead), 1 ♂, [U. S. N. M.].

This insect probably reached the Hawaiian islands by the same route as the preceding species.

Holocompsa fulva (Burmeister)

1838. *C[orydia] fulva* Burmeister, Handb. Ent., II, Abh. II, pt. I, p. 492. [Egypt.]

Hilo, Hawaii, XI, 24, 1914, 1 ♂,[37] [Univ. of Hawaii].

This specimen, the only one which has been taken in Hawaii, agrees fully with the male described by Brunner,[38] from Khartoum, Kordofan.

Head with face dark chestnut brown, ocelli and mouthparts slightly paler, eyes blackish. Pronotum mummy-brown, antennae and tegmina slightly paler. Ventral surface of cephalic femora and median and caudal coxae chestnut brown, other portions slightly paler, particularly the trochanters and tarsi.

[37] First recorded by Illingworth, Proc. Hawaiian Ent. Soc., III, p. 254. (1916).

[38] Nouv. Syst. Blatt., p. 348, (1865).

Length of body 4.5, length of pronotum 1.7, width of pronotum 2.2, length of tegmen 4.2 mm.

MANTIDAE

No native species of Mantidae are found in Hawaii; two species have been introduced.

EREMIAPHILINAE

Orthodera ministralis (Fabricius)

1775. *M[antis] ministralis* Fabricius, Syst. Ent., p. 277. [Australia.]

Kilauea, Kauai, IX, 11, 1906, (F. Terry), 1 ♀, [H. S. P. A.].

This species was introduced in a restricted district on the north side of the Island of Kauai and was first recorded, as the synonymous *O. prasina* Burmeister, by Perkins.[39]

MANTINAE

Tenodera sinensis (Saussure)

1871. *T[enodera] aridifolia* var. *sinensis* Saussure, Mélanges Orth., I, p. 419. [♀; Ningpo, China.]

Hawaii, 4000 feet, V, 8, 1919, (J. A. Kusche), 1 ♀, [Hebard Coll.].

This specimen agrees fully with Japanese material of the species before us. It has apparently been recently introduced in Hawaii, probably from Japan. In 1906 Swezey referred to several Mantid oothecae found in the Hamakua District, Hawaii,[40] and at a meeting of the Entomological Society[41] in 1912, Ehrhorn exhibited specimens of oothecae, juvenile and adult of a Japanese mantis. These are certainly referable to the present species.

In 1910 Kirkaldy first records the species correctly from Hawaii as "formerly, reported only from Hamakua and Hilo dis-

[39] Fauna Hawaiiensis, II, p. 7, (1899).

[40] Proc. Hawaiian Ent. Soc., I, p. 19, (1905).

[41] Proc. Hawaiian Ent. Soc., II, p. 215, (1913).

tricts of Hawaii, now present in Kohala, Hawaii,"[42] while the same year Perkins[43] reports it from Hawaii as "now common on the windward side."

PHASMIDAE

No walking-sticks are known from Hawaii.

ACRIDIDAE

There are no native species of Grasshopper in Hawaii, though two species have been introduced.

LOCUSTINAE

Oxya velox (Fabricius)

1787. *G[ryllus] velox* Fabricius, Mantissa Ins., I, p. 239. [China.]

South side of Oahu, V, 15, 1919, (J. A. Kusche), 1 ♂, [Hebard Coll.].

Pauoa Ridge, Oahu, V, 29, 1919, (J. A. Kusche), 1 ♀, [Hebard Coll.].

Diamond Head, Oahu, V, 23, 1919, (J. A. Kusche; feeding on Passiflora), 1 ♂, 2 ♀, [Hebard Coll.].

This species has been established in Hawaii longer than the other introduced grasshopper, *Atractomorpha ambigua* Bolivar.

PYRGOMORPHINAE

Atractomorpha ambigua Bolivar

1905. *A[tractomorpha] ambigua* Bolivar, Bol. R. Soc. Espanola Hist. Nat., V, p. 209. [; Shanghai, Kiang-Su, China].

Mount Konahuanui, Oahu, VI, 6, 1919, (J. A. Kusche) 1 ♀, [Hebard Coll.].

Mount Olympus, Oahu, VI, 3, 1919, (J. A. Kusche), 1 ♀, [Hebard Coll.].

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[42] Proc. Hawaiian Ent. Soc. II, p. 95.

[43] Fauna Hawaiiensis, II, p. 689.

South side of Oahu, V, 15, 1919, (J. A. Kusche), 3 ♂, 3 ♀, 1 juv., [Hebard Coll.].

Kauai, III, 26 and IV, 2 and 4, 1919, 3500 and 4000 feet, (J. A. Kusche), 3 ♂, 1 ♀, [Hebard Coll.]

This species is a comparatively recent adventive in Hawaii, having first appeared there, according to Perkins,[44] about 1900. It was first recorded from the Islands in 1906, by Kotinsky, as *A. crenaticeps* Blanchard,[45] identified as that species by Swezey and confirmed by Bruner. Swezey has later given interesting data as to the life history of the species.[46]

At the time those records were published, Bolivar's "Notas sobre los Pirgomórphinos, X, Subfam. Atractomorphinae,"[47] in which *ambigua* was described, had probably not been seen by either Swezey or Bruner.

Comparison of the present material with a series of seven males and ten females from Shanghai, China, in the Hebard Collection, shows conclusively that but one species is represented, the Shanghai topotypes agreeing closely with Bolivar's description, except that the type is apparently a very large individual. F. W. Terry,[48] in his "Notes on Some Insects Observed in South China which are also Common in Hawaii," found the species of Atractomorpha, which was common about Hong Kong and Kowloon, the same as the Hawaiian insect, and recorded it as *crenaticeps*. Though closely related, *ambigua* may be distinguished from *crenaticeps* and *similis* (Bolivar) by the distinctly weaker pronotal carinae and the presence on the pronotal lateral lobes, mesad near the caudal margin, of a small area, which is smooth and colorless.

The species is known only from the islands of Oahu and Kauai, having been first recorded from Kauai as *crenaticeps* by Swezey in 1918.[49]

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[44] Fauna Hawaiiensis, II, p. 687, (1910).

[45] Proc. Hawaiian Ent. Soc., I, p. 38, (1906).

[46] Proc. Hawaiian Ent. Soc., I, p. 106, (1907).

[47] Bol. R. Soc. Espanola Hist. Nat., V, pp. 196-214, (1905).

[48] Proc. Hawaiian Ent. Soc., II, p. 92, (1909).

[49] Proc. Hawaiian Ent. Soc., III, p. 379.

TETTIGONIIDAE

A single native genus, including nine species, now standing as valid in the literature, is known from the Hawaiian islands. In addition there are four species of katydids, representing four more genera, all of which were very probably introduced, though at present one of these is known from the island of Hawaii only.

PHANEROPTERINAE

Elimaea punctifera (Walker)

1869. *Phaneroptera punctifera* Walker, Cat. Dermapt. Saltat. Br. Mus., II, p. 342. [♂, Silhet.]

Hawaii, 4000 feet, V, 8, 1919, (J. A. Kusche), 2 ♂, [Hebard Coll.].

Oahu, V, 24, 1919, (J. A. Kusche), 1 ♂, [Hebard Coll.].

Mount Kaala, Oahu, 4000 feet, VI, 12, 1919, (J. A. Kusche), 1 ♂, 2 ♀, [Hebard Coll.].

Mount Olympus, Oahu, VI, 3, 1919, (J. A. Kusche; feeding on *Dracaena australis*), 1 ♀, [Hebard Coll.].

Diamond Head, Oahu, V, 23, 1919, (J. A. Kusche; feeding on Passiflora), 2 juv. ♂, [Hebard Coll.].

This introduced species is recorded in the Hawaiian literature as the synonymous *E. appendiculata* Brunner, which synonymy was indicated by Kirby in 1906.[50]

Holochlora japonica (Brunner)

1878. *H[olochlora] japonica* Brunner, Monogr. der Phaneropteriden, p. 181. [♂, Japan.][51]

Mount Tantalus, Oahu, V, 26, 1919, (J. A. Kusche), 1 ♂, 1 ♀, [Hebard Coll.].

These specimens fully agree with a series in the collections of the Philadelphia Academy, one male and seven females from

[50] Syn. Cat. Orth., II, p. 396.

[51] Brunner has subsequently recorded a male of this species from China.

Kyoto, Japan, and five males and two females from Shanghai, China.

The species is one of the most recent introductions in Hawaii. It was first recorded in 1906, with a query, as a species of Microcentrum,[52] from a specimen taken by W. M. Giffard in his house, October 24, 1905, and as *Holochlora venosa* Stål by J. Kotinsky, from Makiki and the Nuuanu Valley,[53] Oahu. At that time it was noted that egg clusters of apparently the same species had been taken in Honolulu, some ten years before.[54]

Stål's *venosa* was described from a Javanese female, Brunner later describing the male sex, also from Javanese material. That species, though agreeing in many features, is separable from *japoinca* by the narrower tegmina, much more deeply cleft male subgenital plate and subemarginate apex of the female subgenital plate.

The female sex of the present species has the subgenital plate triangular, not fully as long as its proximal width, medio-longitudinally carinate and with apex rounded.

Length of body ♂ 24, ♀ 26; length of pronotum ♂ 5.8, ♀ 6.7; length of tegmen ♂ 35, ♀ 45.8; greatest width of tegmen ♂ 7.8, ♀ 11; length of cephalic femur ♂ 6.2, ♀ 7; length of caudal femur ♂ 24.5, ♀ 28.4 mm.

Copiphorinae

BANZA Walker

1870. Banza Walker, Cat. Dermapt, Saltat. Br. Mus., III, p. 476.

1888. Microsaga Saussure, Ann. Ent. Soc. France, (6), VIII, p. 154.

1891. Brachymetopa Redtenbacher, Verh. Zool.-Bot. Ges. Wien, XLI, p. 330.

The above synonymy was first pointed out by Kirby, the genotype for each being selected as *parvula* of Walker.[55]

[52] Proc. Hawaiian Ent. Soc., I, p. 32.

[53] Proc. Hawaiian Ent. Soc., I, p. 126, (1907).

[54] Perkins states that since 1906 the eggs have been found, inserted in the young shoots of trees, Fauna Hawaiiensis, II, p. 687, (1910).

[55] Syn. Cat. Orth., II, p. 254, (1916).

The treatment of the genus by Perkins is the best to be found in the literature.[56] It seems probable that further study will show many of the species to be subdivisible into geographic races, or at least into topomorphs.

The genus Banza shows close similarity in general appearance to the genus Belocephalus, peculiar to the extreme southeastern United States.

Ten species of the genus are recognized by us, their distribution being as follows:

Hawaii. *nitida* (Brunner)
Maui, *brunnea* (Perkins) and *mauiensis* (Perkins)
Lanai. *deplanata* (Brunner)
Molokai. *molokaiensis* (Perkins)
Oahu. *parvula* (Walker) and *unica* (Perkins)
Kauai, *kauaiensis* (Perkins) and *affinis* (Perkins)

Banza parvula (Walker)

1869. *Saga parvula* Walker, Cat. Dermap. Saltat, Br. Mus., II, p. 293, [♂, Oahu.]

1870. *Banza nigrifrons* Walker, Cat. Dermapt. Saltat. Br. Mus., III, p. 477. [♂, Loochoo Islands].[57]

1882. *C*[*onocephalus*] *blackburni* Bormans, Ann. Mus. Civ. Stor. Nat. Genova, XVIII, p. 346, 3 figures. [Hawaiian islands.]

1891. *Brachymetopa discolor* Redtenbacher, Verh. Zool.-Bot. Ges. Wien, XLI, p. 431, pl. III, fig. 49. [♂, ♀; Honolulu, Oahu].

The above synonymy, excepting *blackburni,* was first published by Kirby. In 1910,[58] Perkins stated that *discolor* Redten-

[56] Fauna Hawaiiensis, II, pp. 8-13, pl. I, figs. 1-7, pl. II, figs. 1-4, (1899).

[57] Probably due to an error in labelling, the species of this genus being apparently peculiar to the Hawaiian Islands.

[58] Fauna Hawaiiensis, II, p. 687.

bacher represented the brown phase, *blackburni* the green phase, of a single species. This conclusion was reached after two days of investigation, during which time a series of forty-seven adult specimens was taken at the same locality.

Waianae Mountains, Oahu, III, 15, 1910, (O. H. Swezey), 1 green ♀, [H. S. P. A.].

Kalihi, Oahu, III, 15, 1917, (Blackburn; on Freycinetia), 1 green juv. ♀, [Hebard Coll.].

Cooke Trail, Oahu, IX, 9, 1917, (P. H. Timberlake), 1 brown ♂, [Timberlake Coll.].

Mount Tantalus, Oahu, (O. H. Swezey), 1 brown ♂; VIII, 12, 1906, 2 brown ♂; 2000 feet, VIII, 26, 1906, (J. Kotinsky), 1 brown ♀, [H. S. P. A., Terr. Bd. Agr. and Hebard Coll.].

Honolulu, Oahu, (J. Kotinsky), 1 brown ♂, [Terr. Bd. Agr.].

Mount Olympus, Oahu, V, 18, 1919, (J. A. Kusche), 1 green juv.; VI, 3, 1919, (J. A. Kusche) 1 brown ♂, 1 green ♀; VII, 31, 1917, (P. H. Timberlake), 1 green ♂, [Hebard Coll.].

Palolo Crater, Oahu, VII, 31, 1917, (Blackburn), 1 green ♀, [Hebard Coll.].

Palolo Ridge, Oahu, X, 20, 1918, 1 juv. ♀, [H. S. P. A.].

Banza nitida (Brunner)

1895. *Brachymetopa nitida* Brunner, Proc. Zoöl. Soc. London, 1895, p. 894. [♂ ♀; Kona [district] and Mauna Loa at 2000 feet, Hawaii.]

Hawaii, (W. H. Ashmead), 1 ♂, [Hebard Coll.].

Kealakekua, Hawaii, 3500 feet, (P. H. Timberlake), 1 juv. ♂, [Timberlake Coll.].

Hilo, Hawaii, (D. B. Kuhns), 1 ♀, [U. S. N. M.].

Kilauea Volcano, Hawaii, 4000 feet, VII, 21, (W. H. Ashmead), 1 ♂, [U. S. N. M.].

Perkins has described three varieties of this species: *hiloensis*, *punae* and *crassipes*.[59] Study of large series from the island will

[59] Fauna Hawaiiensis, II, p. 10, (1899).

show whether these represent geographic races or the less important topomorphs. From the present material it appears probable that *crassipes,* described from Kilauea Volcano at 4000 feet, should be recognized as a geographic race, warranting full trinomial status.

In the topotypic specimen before us the tibiae are strikingly heavier than in the other specimens, thickened tibiae being the character given as diagnostic for *crassipes* by Perkins. This race is found at the highest elevation at which individuals of the species have been recorded.

Banza kauaiensis (Perkins)

1899. *Brachymetopa kauaiensis* Perkins, Fauna Hawaiiensis, II, p. 10. [♂, ♀ ; Makaweli, Kauai, at 2000 feet.]

Kauai, 3500 feet, IV, 1 and 14, 1919, (J. A. Kusche), 1 ♂, 2 ♀ ; 4000 feet, IV, 2, 1919, (J. A. Kusche), 1 ♀, [Hebard Coll.].

We believe that the present material represents a topomorph of *kauaiensis,* distinguishable from the typical condition by the more elongate tegmina. In the specimens before us these organs are as well developed as in the maximum for *B. nitida* (Brunner). The species is readily distinguished from *nitida* by the shorter and heavier vertex, decidedly finer and more numerous tegminal venation and male cerci, with ventral tooth directed mesad, its apex pointing in the same direction as that of the dorsal tooth. The material before us of both these species has the dorsal margins of the caudal tibiae well supplied with minute spines.

A series of fourteen immature examples, showing both green and brown color phases, apparently represent this species. These were taken by J. A. Kusche on the island of Kauai, between March 26 and April 27, 1919, and are now in the Hebard Collection.

Banza unica (Perkins)

1899. *Brachymetopa unica* Perkins, Fauna Hawaiiensis, II, p. 10. [♀ ; Mountains near Honolulu, Oahu.]

Mountains of Oahu, summer of 1917, (P. H. Timberlake), 1 ♀, [Hebard Coll.].

Kuliouou, Oahu, XII, 22, 1918, (P. H. Timberlake; on leaves of Clermontia), 1 ♀, [Timberlake Coll.].

The Kuliouou specimen is bright green, the one in the Hebard Collection brown but showing green on the tegmina. Both show clearly the striking facial marking and acute tegmina, characteristic of the species.

As this species was previously known from a single specimen, we give the following measurements for the two females before us: length of body 19.7-22.8, length of pronotum 5.2-5.6, length of tegmen 11.3-10.8, width of tegmen 4-4.2, length of caudal femur 11.4-11.4, length of ovipositor 10.3-11.1 mm.

Listroscelinae

Xiphidiopsis lita new species (Plate xxvi, 12 and 13.)

Without males of this insect we are unable to make as full a comparison as could be desired. The species of the genus, however, show in the female sex differences by which separation may readily be made.

It is hoped that males of *lita* may soon be taken in order that their genitalia, probably showing intricate specialization, may be described and figured.

Many species of *Xiphidiopsis* are found in the tropical Asiatic, Malayan and Melanesian regions, and, although not previously reported from north of the Philippines, unstudied material representing the genus is now before us from as far north as the province of Fukien, China.

Type: ♀ ; Hilo, Hawaii. August 31, 1919. (O. H. Swezey.) [Hebard Coll., Type No. 771.]

Size medium for the genus. Vertex small, acute, triangularly produced, though with apex bluntly rounded, its dorsal surface very weakly convex and showing a subobsolete medio-longitudinal impressed line. Last joint of maxillary palpus very slightly longer than fourth, enlarging suddenly near the truncate apex.

Pronotum elongate, with dorsal surface very feebly convex, the portion produced caudad about one-third of the total length; lateral margins

rounding into lateral lobes, these margins showing very weak and broad concavity meso-proximad, caudal margin forming an arc decidedly less than a semicircle; lateral lobes with cephalic margin broadly convex to ventral angle, which is broadly rounded at slightly more than ninety degrees, caudal margin with a shallow but distinct humeral sinus. Tegmina extending beyond apex of ovipositor, wings surpassing these by slightly more than the pronotal length.

Supra-anal plate small and bluntly triangular, fitting into a rounded emargination of the preceding tergite. Cerci simple, cylindrical, over four times as long as greatest width. Ovipositor elongate, with proximal two-fifths swollen, distal portion very weakly curved dorsad, with margins unarmed; dorsal valves acute at apex, ventral valves minutely notched at apex, with immediate apex slightly thickened and decurved. Subgenital plate with free margins convergent, broadly convex and very weakly oblique to median section, where the plate is triangularly produced at slightly less than ninety degrees, with apex rounded, this produced portion as long as its basal width.

Femora and genicular lobes unarmed. Cephalic tibiae with tympanum apert on both faces, four pairs of decided ventral spines and a distal pair of smaller spines. Median tibiae with ventral margins armed with (six) cephalic and (five) caudal spines, which are small. Caudal tibiae with very numerous, minute ventral and fewer, more slender, minute dorsal spines.

General coloration, including the immaculate antennae, light turtle green. Eyes cinnamon-brown. The lateral margins of the pronotal disk are outlined in amber-yellow, these lines continued on the occiput to the eyes.

Owing to the very delicate structure of this insect, specimens often become greenish-yellow when drying.

Length of body[60] 13.2, 10.7-13.2; length of pronotum 4, 3.9-4; width of pronotal disk 1.8, 1.8; length of tegmen 18.7, 18.8-19.8; width of tegmen 2.5, 2.6-2.8; length of caudal femur 10.8, 10.8-11.9; length of ovipositor 8.4, 9-9.7 mm.

In addition to the type, six females from the same locality taken by Pemberton July 15, 1919, and by Swezey April 20, 1920, and August 31, 1919, are designated paratypes. These specimens are in the collection of the Hawaiian Sugar Planters' Association and in the Hebard Collection.

Conocephalinae

Conocephalus saltator (Saussure)

1859. *X[iphidium] saltator* Saussure, Rev. et Mag. de Zoöl., (2), XI, p. 208. [♀, Guiana.]

[60] The measurements of the type are given first, followed by the extremes for the paratypic females.

1905. *Xiphidium varipenne* Swezey, Exp. Sta. Hawaiian Sugar Pl. Assn., Div. Ent., Bull. I, pt. 7, p. 216, pl. XIV, 16 figures. [♂, ♀, juv.; Honolulu and elsewhere in the Hawaiian Islands.]

Comparison of Hawaiian specimens with the large American series in the collections of the Philadelphia Academy proves conclusively the synonymy indicated above. At the time *varipenne* was described, the literature on the genus was in great confusion, due largely to the very unsatisfactory treatment in Redtenbacher's "Monographie der Conocephaliden."

The discussion of the species by Swezey, covering twelve pages, is extremely interesting and contains much valuable data.

Rehn and Hebard have more recently shown that *Xiphidium meridionale, propinquum* and *brachypterum* are synonyms of this species.[61]

Previous to Swezey's description of *varipenne,* the species had appeared generally in the Hawaiian literature as *Xiphidium fuscum,* owing to Brunner's original misidentification.

Hawaii, 4000 feet, V, 8, 1919, (J. A. Kusche), 4 ♀ (1 brachypterous), [Hebard Coll.].

Mount Konahuanui, Oahu, VI, 6, 1919, (J. A. Kusche), 1 ♂, 1 ♀ (brachypterous), [Hebard Coll.].

The species appears to have been introduced into Hawaii about 1890, and was reported as occurring "only around Honolulu," in 1899. It is now plentiful and very widely distributed in the Territory.

In the Americas, *saltator* is the most widely distributed and abundant of the tropical species of the genus, occurring from Costa Rica and Montserratt in the West Indies southward to Paraguay.

GRYLLIDAE

The first six species recorded below are probably all adventive in Hawaii, though some of them may have reached the islands

[61] Trans. Am. Ent. Soc., XLI, p. 269, (1915).

before the coming of civilization. The native genus *Paratrigonidium* is represented by ten species in the material before us and most of the sixteen species recognized by Perkins are, we believe, valid. In addition the Prognathogryllides, a group erected by Perkins, is peculiar to Hawaii. We find that three instead of five genera are represented: the first genus by at least three species, possibly by five, the second by one, and the third by a few species but certainly not by eleven, as Perkins supposed.

Gryllotalpinae

Gryllotalpa africana Beauvois

1805. *Grylло-talpa africana* Beauvois, Ins. Rec. Afr. et Amer., p. 229, pl. Orth. IIc, fig. 6. [♀ ; "Royaume d'Oware," in present Nigeria, Africa.]

South side of Oahu, V, 15, 1919, (J. A. Kusche), 1 ♀, [Hebard Coll.].

Kauai, 3500 feet, IV, 1, 1919, (J. A. Kusche), 1 ♂, [Hebard Coll.].

These specimens agree closely with material from Japan and from Shanghai, China, in the collections of the Philadelphia Academy. We agree with Hirase[62] in considering Scudder's *G. oryctes*, described from Shanghai, China, a synonym of the present, very widely distributed, species.

The first record of this species in Hawaii outside the island of Oahu was that by Swezey, from Waimea, Kauai.[63]

Gryllinae

Gryllodes sigillatus (Walker)

1869. *Gryllus sigillatus* Walker, Cat. Dermapt. Saltat, Blatt. Suppl. Br. Mus., p. 46. [♀ ; Swan River, [Australia].]

Kahoolawe Island, (H. A. Pilsbry), 1 juv., [A. N. S. P.].

[62] Monogr. Gryll. Formosa, p. 7, (1911).

[63] Proc. Hawaiian Ent. Soc., III, p. 380, (1917).

Manoa Valley, Oahu, VI, 1901, (W. H. Ashmead), 1 ♂, [U. S. N. M.].

The adult specimen before us shows a very decidedly intensive coloration, the pale cephalic markings being almost obliterated and the pronotal disk darkened cephalad as well as caudad.

This introduced species is common at low elevations in the Hawaiian islands. It has apparently been carried by commerce around the world, being now established in North and South America and the West Indies and having been recorded from Australia, India, Mauritius and Nossi Bé.

The established synonymy of this species is *Gryllus pustulipes* Walker and *Gryllodes poeyi* Saussure. Chopard's *Gryllodes subapterus* is also a synonym, based on a male in the last juvenile instar.

The species has appeared generally in Hawaiian literature under the synonymic name *poeyi*.

Bryllus oceanicus Le Guillou

1841. *Gryllus oceanicus* Le Guillou, Rev. Zoöl., 1841, p. 293.[64] [Nukahiva, Marquesas.]

1869. *Gryllus innotabilis* Walker, Cat. Dermapt. Saltat. Suppl. Blatt. Br. Mus., p. 47. [♂, ♀; Loo Choo [Islands, Japan].]

Hawaii, 4000 feet, V, 8, 1919, (J. A. Kusche), 1 ♂, [Hebard Coll.].

Mount Konahuanui, Oahu, VI, 6, 1919, (J. A. Kusche), 1 ♀, [Hebard Coll.].

Diamond Head, Oahu, V, 23, 1919, (J. A. Kusche), 1 juv., [Hebard Coll.].

Kauai, III, 26 to IV, 16, 1919, (J. A. Kusche), 9 ♂, 8 ♀, 4 juv., [Hebard Coll.].

This insect has long been present and widely distributed in

[64] Swezey's record of "*Gryllus pacificus*" attacking sugar cane (Proc. Hawaiian Ent. Soc., III, p. 459, (1918), was an error for *oceanicus* and was corrected in the list of errata.

Hawaii and has usually been reported from this region under the synonymic name *innotabilis*.

Saussure states that its range is widespread in Oceania and that it occurs also in Borneo and Japan. One female taken at Sapporo, Japan, is in the collections of the Philadelphia Academy. Like the Japanese material recorded by Saussure, it is darker than the usual type but can be matched by the Hawaiian specimens before us showing the maximum intensification of coloration.

Gryllus conspersus Schaum

1862. *Gryllus conspersus* Schaum, in Peters, Reise nach Mozambique, V, p. 117. [♀, Mozambique.]

Mount Tantalus, Oahu, XII, 11, 1904, (O. H. Swezey), 1 ♂, [H. S. P. A.]; I, 5, and 8, 1919, (J. A. Kusche), 3 ♀, [Bishop Mus.].
Honolulu Plantation, Oahu, X, 23, 1914, 1 ♂, 1 ♀, [Hebard Coll.].
Niu Valley, Oahu, (O. H. Swezey), 1 ♀, [H. S. P. A.].
Koko Crater, Oahu, (O. H. Swezey), 1 ♀, [Hebard Coll.].
Kauai, III, 26 to IV, 11, 1919, (J. A. Kusche), 6 ♂, 8 ♀, 3 juv., [Hebard Coll.].
Kokee, Kauai, II, 1919, (J. A. Kusche), 4 ♂, 3 ♀, [Bishop Mus.].

This species has not previously been recorded from Hawaii. It has been recorded by Saussure from Africa, Mozambique and the East Indies, and by Shiraki from Formosa. One specimen before us in the Hebard Collection is from the Loo Choo Islands of Japan.

The insect may be readily distinguished from *G. oceanicus* Le Guillou, the other introduced species of the genus in Hawaii, by its decidedly smaller size, head with a narrow but conspicuous transverse buffy line between the ocelli, the vertex in some specimens showing a transverse buff band, and by the more widely separated and sinuate veins of the lateral fields of the tegmina.

MYRMECOPHILINAE

Myrmecophila quadrispina Perkins

1899. *Myrmecophila quadrispina* Perkins, Fauna Hawaiiensis, II, p. 14. [♂, ♀; Honolulu, [Oahu].]

Honolulu, Oahu, XII, 16, 1913, (O. H. Swezey), 1 ♂, [Hebard Coll.].
Waipahu, Oahu, III, 11, 1919, 1 ♀, [Hebard Coll.].
Aiea Valley, Oahu, XI, 19, 1917, 1 juv. ♂, [Hebard Coll.].

The more important characters of this species may be noted as follows:

Dorso-internal margin of caudal tibiae armed with four spines of alternating length, the second twice as long as the first, the third two-thirds as long as the first, and the fourth equalling the second in length. Dorso-external margin of caudal tibiae armed with a single spine, as long as the second spine of the dorso-internal margin. Caudal tibia armed at apex with three pairs of spurs; the ventral pair minute and of equal length; the median pair with external slightly shorter than the internal, which in turn is slightly shorter than the disto-internal spine; the dorsal pair very elongate, with external slightly longer than the internal, the external nearly three-quarters, the internal fully two-thirds, as long as the caudal metatarsus. Dorsal surface of caudal metatarsus armed along the median line with three spinulae, as large as the second (the smallest) spine of the dorso-internal margin of the caudal tibiae, and with two distal spurs, which approximate the length of the distal tarsal joint.

Body blackish mummy-brown, sometimes with pronotal generic spots indistinctly indicated, very slightly paler and more reddish. Antennae buffy, weakly suffused with brown beyond proximal portion. Palpi, cerci, cephalic and median limbs buffy. Caudal femora blackish mummy-brown with genicular areas buffy, caudal tibiae buffy suffused with mummy-brown, the spines and tarsi buffy. The immature example before us is much paler, the darkest portions being clay-colored.

Length of body ♂ 2.24, ♀ 2.92; width of body ♂ 1.36, ♀ 1.77; length of caudal femur ♂ 1.56, ♀ 1.7; width of caudal femur ♂ 1[65] (X 1.56), ♀ 1.05 (X 1.62); length of caudal metatarsus ♂ .75, ♀ .92; length of ovipositor ♀ 1.63 mm.

CYCLOPTILOIDES Sjostedt

1909. Cycloptiloides Sjostedt, Wissensch, Ergeb. Schwed. Zool. Expedit. dem Kilimanjaro, dem Meru, 1905-1906, p. 109.

[65] With number of times its width is contained in its length added.

1912. Glaphyropus Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1912, p. 189.

We are fully satisfied as to the above synonymy, and in fact the genotype, *C. meruensis* Sjostedt, is very closely related to *americanus* (Saussure), which species was selected as genotype of Glaphyropus. At the time the latter genus was described, the authors had not seen Sjostedt's paper.

Cycloptiloides americanus (Saussure)

1874. *Cycloptilum americanum* Saussure, Miss. Sci. Mex., Rech. Zool., VI, p. 426, pl. VIII, figs. 41 and 42. [Cuba.]

Honolulu, Oahu, (E. M. Ehrhorn), 1 , [Terr. Bd. Agr.]; VI, 1917, (J. C. Bridwell), 1 , [Bishop Mus.].

Kaimuki, II, 26, 1921, (P. H. Timberlake; in rubbish in shed), 2 ♂, 3 ♀, 3 juv. ♂, 1 juv. ♀, [Timberlake and Hebard Colls.]; VII, 20, 1917, (O. H. Swezey), 1 juv. ♂, [H. S. P. A.].

In 1910 this species was first recorded from the Hawaiian islands as *Paranemobius schauinslandi* Alfk., by Perkins, who cancelled his determination in a footnote on the same page.

TRIGONIDIINAE

Paratrigonidium subroseum Perkins

1899. *Paratrigonidium subroseum* Perkins, Fauna Hawaiiensis, II, p. 17. [♂, ♀; Mountains of Oahu, 2000 feet.]

Oahu, (A. Koebele), 2 ♀, [Terr. Bd. Agr.].

Opaeula Valley, Oahu, III, 30, 1913, (O. H. Swezey), 1 ♂, [H. S. P. A.].

Mount Kaala, Oahu, VII, 9, 1913, (O. H. Swezey), 1 ♂, [H. S. P. A.].

Kalihi, Oahu, V, 17, 1914, (O. H. Swezey), 1 ♀, [H. S. P. A.].

Lanihuli, Oahu, X, 25, 1914, (O. H. Swezey), 1 ♂, [H. S.

P. A.]; 2000 feet, IX, 3, 1916, (P. H. Timberlake), 1 ♀, 1 juv. ♂, [Timberlake Coll.].

Cooke Trail, Oahu, VIII, 27, 1916, (P. H. Timberlake), 1 ♂, [Timberlake Coll.].

Mount Konahuanui, Oahu, VI, 23, 1916, (P. H. Timberlake), 1 ♂, 1 juv. ♂, [Timberlake Coll.].

Mount Tantalus, Oahu, V, 30, 1915, (Busck and Swezey), 1 ♂, 1 ♀, [U. S. N. M. and H. S. P. A.]; IV, 7, 1901, (W. M. Giffard), 1 ♂, [Terr. Bd. Agr.]; VI, 10, 1917, (J. C. Bridwell), 1 ♀, [Bishop Mus.].

Mount Olympus, Oahu, X, 1918, (P. H. Timberlake), 1 ♂, [Timberlake Coll.].

Manoa Valley, Oahu, VII, 27, 1913, (O. H. Swezey), 1 ♂, [H. S. P. A.].

Manoa Cliffs, Oahu, IX, 1, 1918, (P. H. Timberlake), 1 ♂, 2 ♀, [Timberlake Coll.].

Palolo Crater, Oahu, IV, 8, 1917 and X, 20, 1918, (P. H. Timberlake, 2 ♂, [Timberlake Coll.].

Palolo Hill, Oahu, IV, 9, 1916, (P. H. Timberlake; on *Freycinetia arborea*), 1 juv. ♂, [Timberlake Coll.].

Palolo Ridge, Oahu, VIII, 14, 1916, (P. H. Timberlake), 1 juv. ♂, [Timberlake Coll.].

Palolo, Oahu, I, 17, 1915, (O. H. Swezey), 1 ♀; VIII, 24, 1906, 1 ♀, [H. S. P. A.].

Waialae Iki, Oahu, V, 2, 1920, (O. H. Swezey), 1 ♀, [H. S. P. A.].

Niu Ridge, Oahu, II, 10, 1918, (P. H. Timberlake), 1 ♂, [Timberlake Coll.[.

The male from Manoa Cliffs has each slender, straight, lateral projection of the genital valves armed with two minute teeth instead of one; the other males of the series have each of these projections unidentate.

Though most of the specimens before us are immaculate in coloration, some show traces of dark markings. In these, a few of the proximal antennal joints are darkened, while the cephalic and median tibiae show faint annulation and the dorsal surface of the caudal femora weak dorsal tessellation proximad. In addition, a few specimens have the lateral lobes of the pronotum somewhat darkened.

Few of the specimens at hand have retained any traces of the pink tinge, said to be shown by living specimens. Strange to say, three or four specimens that have the head, pronotum, and limbs showing a distinct pink tinge appear to have been killed before they had become thoroughly hardened after reaching maturity, though as a rule such material discolors badly in drying.

This species was formerly known only from the mountains of Oahu, and in 1905 was found by its describer on ohia trees.[66]

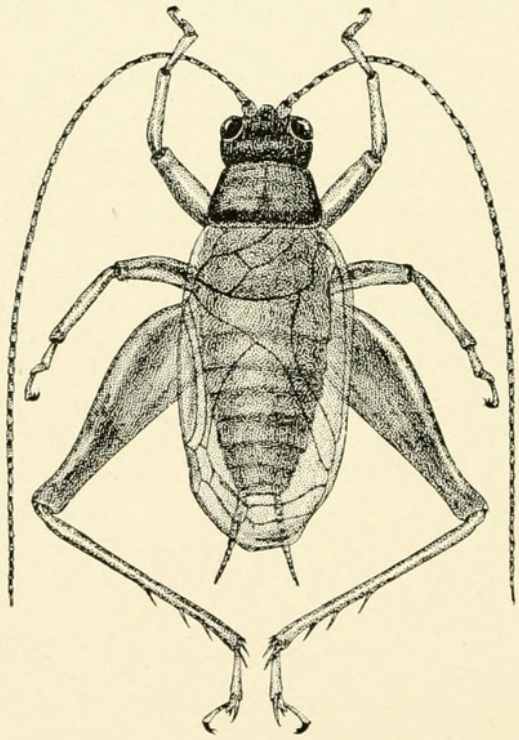

FIGURE 1. *Paratrigonidium roseum* Perkins.

[66] Proc. Hawaiian Ent. Soc., I, p. 50, (1906).

Paratrigonidium roseum Perkins (fig. 1.)

1899. *Paratrigonidium roseum* Perkins, Fauna Hawaiiensis, II, p. 16, pl. I, fig. 9. [♀, Mountains of West Maui at 3000 feet.]

Iao Valley, Maui, 1500 feet, III, 6, 1909, (W. M. Giffard), 1 ♂, [Hebard Coll.].

This male apparently represents the opposite sex to that of the female described as *roseum*. It is of considerably larger size, however, and additional material from Maui may show the presence on that island of an undescribed species.

In the present specimen the caudal portion of the pronotum is dark, the cephalic portion, head and limbs apparently rose-color in life, the antennae, tegmina and cerci light-yellowish and immaculate.

Length of body 8.7, length of pronotum, 1.35, cephalic width of pronotum 1.85, caudal width of pronotum 2.45, length of tegmen 6.8, width of tegmina 3.7, length of caudal femur 5.9 mm.

The genital valves are retracted and consequently have not been examined in this unique specimen.

Paratrigonidium grande Perkins (Plate xxvii, 1.)

1899. *Paratrigonidium grande* Perkins, Fauna Hawaiiensis, II, p. 19, pl. 1, fig. 12. [♂, ♀ : Puna, Kau and Kona Districts, Hawaii.]

Kaumana, Hawaii, X, 25, 1908, 1 ♂, [H. S. P. A.]

Kealakekua, Hawaii, 3000 feet, VIII, 8, 1919, (P. H. Timberlake), 3 ♂, 1 ♀, [Timberlake and Hebard Colls.].

Olaa District, Hawaii, V, 1900, (H. W. Henshaw), 1 ♀ ; VII, 20, (W. H. Ashmead), 1 juv., [U. S. N. M. and Hebard Coll.].

Kilauea Volcano, Hawaii, V, 20, 1915, (A. Busck), 4 juv., [U. S. N. M. and Hebard Coll.] ; 4000 feet, VII, 6, 1910, (W. M. Giffard), 3 ♂, 5 ♀, 1 juv. ♀, [Terr. Bd. Agr. and Hebard Coll.].

The large size of this species readily distinguishes it from the other forms of the genus known from the island of Hawaii.

The lateral projections of the genital valves are moderately heavy and elongate in males of *grande*, curving gently outward and then more strongly

inward to the sharp apices. As a result the distal extremity is itself sharp and directed mesad, not bearing on its internal face the minute tooth directed mesad that is characteristic of most of the species of the genus.

The series from Kilauea is recessive in coloration; straw color, with limb markings very weak and in two of the males the triangular area of the tegmina, normally suffused with darker brown, shows but a faint trace of such suffusion.

Paratrigonidium debile Perkins

1899. *Paratrigonidium debile* Perkins, Fauna Hawaiiensis, p. 21. [♂; Mountains of Oahu, 2000 feet and upward.]

Mount Kaala, Oahu, VIII, 11, 1912, and IX, 7, 1913, (O. H. Swezey), 1 ♂, 2 ♀, [H. S. P. A. and Hebard Coll.].

Mount Konahuanui, Oahu, VI, 6, 1919, (J. A. Kusche), 2 ♂, [Hebard Coll.].

Mount Tantalus, Oahu, XI, 25, 1906, (O. H. Swezey), 3 ♂; 1300 feet, I, 21 and II, 25, 1906, (W. M. Giffard) 2 ♂; 1500 feet II, 2, 1906, (W. M. Giffard), 1 ♂; 1800 feet, II, 18, 1906, (W. M. Giffard, 1 ♂; 2000 feet, VIII, 29, 1909, (J. Kotinsky), 1 ♂, [Terr. Bd. Agr., H. S. P. A., Hebard Coll. and U. S. N. M.].

Mount Olympus, Oahu, V, 18, 1919, (J. A. Kusche), 1 ♀, [Hebard Coll.].

This species is evidently close to *P. varians* Perkins, differing in the average shorter and more truncate male tegmina. The general coloration is pale, with limb markings subobsolete or weakly defined. In the male, however, the darkened triangular area of the tegmina is conspicuous.

The contrast between *debile* and *varians* is somewhat analogous to that which exists between the North American species, *Nemobius fasciatus* (DeGeer) and *Nemobius maculatus* Blatchley, though in the present case genitalic differences are not apparent.

Paratrigonidium filicum Perkins (Plate xxvii, 2.)

1899. *Paratrigonidium filicum* Perkins, Fauna Hawaiiensis, II, p. 17, pl. II, fig. 6. [♂, ♀; Olaa (district), Hawaii, at 2000 feet.]

Hawaii, (W. H. Ashmead), 1 ♀, [U. S. N. M.].

Upper Hamakua Trail, Kohala Mountains, Hawaii, IX, 2 and 3, 1919, (O. H. Swezey), 3 ♂, 1 ♀, [H. S. P. A. and Hebard Coll.].

Olaa District, Hawaii, 2000 and 2500 feet, VII, 20, (W. H. Ashmead), 1 ♂, 1 ♀; V, 1900, (H. W. Henshaw), 2 ♀, [U. S. N. M. and Hebard Coll.].

The resemblance of this insect to *P. varians* Perkins is closer than that of any of the four other species of the genus known to occur on the island of Hawaii. The brown coloration, with maculation of the limbs very weakly indicated, is closely approached by individuals of that species showing the maximum of recessive coloration.

The present species averages larger in size, while in the males before us, each slender, straight, lateral projection of the genital valves is heavy and armed at the apex with two very minute teeth.[67]

Paratrigonidium varians Perkins (Plate xxvii, 3 and 4).

1899. *Paratrigonidium varians* Perkins, Fauna Hawaiiensis, II, p. 18. [♂, ♀ : Puna [District] at 2000 feet and Kau [District] at 4000 feet, Hawaii; mountains of West Maui; Honolulu at 2000 feet, [Oahu]; Makaweli at 2000 feet, Kauai.]

Kealakekua, Hawaii, 3000 feet, VIII, 8, 1919, (P. H. Timberlake), 1 ♂ intensive, [Timberlake Coll.].

Olaa District, Hawaii, V, 1900, (H. W. Henshaw), 1 ♀, [U. S. N. M.].

Mountain View, Hawaii, III, 31, 1906, 1 ♂ intensive, [H. S. P. A.]

Maui, (A. Koebele), 1 ♂, [Terr. Bd. Agr.].

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[67] One or two minute teeth in this position occur, as a rule, in both *subroseum* and *varians*, but in those species these projections are more delicate and the teeth are considerably more slender and delicate.

Olowalu, Maui, 1200 to 1300 feet, III, 24, 1908, (W. M. Giffard), 1 ♂, [Hebard Coll.].

Halepakai, Lanai, 3400 feet, X, 18, 1907, (W. M. Giffard), 1 ♀,[68] [Hebard Coll.].

Hauula Valley, Oahu, VIII, 2, 1914, 2 ♂, 1 ♀, 1 ♂ intensive, [H. S. P. A. and Hebard Coll.].

Punaluu Valley, Oahu, VI, 11, 1916 and VIII, 9, 1914, (O. H. Swezey), 2 ♂, 2 ♀, 1 ♀, intensive, [H. S. P. A. and Hebard Coll.].

Waiahole Valley, Oahu, III, 28, 1915 and VIII, 13, 1916, (O. H. Swezey) 2 ♂, 1 ♀; X, 20, 1918, (P. H. Timberlake), 1 ♂, 1 ♀, ♀ intensive, [H. S. P. A., Timberlake and Hebard Colls.].

Wahiawa District, Oahu, VII, 4, 1920, (O. H. Swezey, 1 ♀ intensive, [H. S. P. A.].

Mount Kaala, Oahu, III, 4, 1917, (J. C. Bridwell), 1 ♀, intensive, [Bishop Mus.].

Waiawa, Oahu, V 4, 1913, (O. H. Swezey), 1 ♂, [H. S. P. A.].

Nuuanu Pali, Oahu, XI, 19, 1916, (W. M. Giffard), 2 ♀, [Terr. Bd. Agr. and Hebard Coll.].

Kaumuahona Ridge, Oahu, V, 12, 1907 and VI, 6, 1916, (O. H. Swezey), 2 ♂, 2 ♀; VI, 17, 1917, (J. C. Bridwell), 1 ♂; VIII, 27, 1916 and IX, 9, 1917, (P. H. Timberlake), 2 ♀, [H. S. P. A., Bishop Mus., Timberlake and Hebard Colls.].

Mount Tantalus, Oahu, II, 18, 1906, (W. M. Giffard), 1 ♂, 1 ♀; VI, 10, 1917, (J. C. Bridwell), 1 ♀; VI 24, 1907, 1 ♀, all intensive, [Terr. Bd. Agr., Bishop Mus. and H. S. P. A.].

Mount Olympus, Oahu, VII, 2 to X, 20, 1916 to 1918, (P. H. Timberlake), 5 ♀, [Timberlake and Hebard Colls.].

Palolo, Oahu, I, 7, 1915, (O. H. Swezey), 1 ♀; VI, 24, 1917, (J. C. Bridwell), 1 ♀, [H. S. P. A. and Bishop Mus.].

Palolo Ridge, Oahu, IX, 8, 1918, (P. H. Timberlake), 1 ♂, [Timberlake Coll.].

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[68] A gordius worm has partly emerged from this specimen.

Kuliouou Valley, Oahu, VII, 25, 1916 and XII, 22, 1918, (P. H. Timberlake), 2 ♂, [Timberlake and Hebard Colls.].

Kauai, 3500 to 4000 feet, III, 29 to IV, 13, 1919, (J. A. Kusche), 2 ♀, 1 juv., [Hebard Coll.].

The intensively colored specimens have the limb markings heavy and the head and pronotum pale but heavily marked and suffused to varying degrees with very dark brown. Many of the other specimens have the head and pronotum immaculate, rather dark reddish-brown.

In the series from Oahu, a number of females fit the description of *P. exiguum* Perkins, as do the males, except that in none of the males are the tegmina quite so short as 4 mm. The insect is clearly one of the most widely distributed and plastic members of the genus, and the synonymy of *exiguum* appears to be very possible but can not be determined without examination of the pair from the Waianae Mountains (Oahu) upon which that name is based.

Examples of the present species, many showing close superficial resemblance to individuals of *P. pacificum* (Scudder), may be quickly separated from them by the lesser number of veins in the lateral fields of the tegmina and the ovipositor, the transverse suture of which is meso-distad, instead of mesad. The latter type is peculiar to *pacificum*, of the known species of Paratrigonidium.

Paratrigonidium crepitans Perkins

1899. *Paratrigonidium crepitans* Perkins, Fauna Hawaiiensis, II, p. 19. [♂, ♀; Kauai, at 4000 feet.]

Kauai, 3500 and 4000 feet, III, 29 and IV, 1, 1919, (J. A. Kusche), 3 ♀, [Hebard Coll.].

These females differ from those of *P. varians* Perkins before us in their smaller size, with dorsal surface of head, pronotum, and tegmina solidly dark brown, causing the paler lateral margins to be conspicuous.

Paratrigonidium saltator Perkins

1899. *Paratrigonidium saltator* Perkins, Fauna Hawaiiensis, II, p. 16. [♀; Olaa [District], Hawaii, at 2000 feet.]

Moanalua Valley, Oahu, 2000 feet, XII, 31, 1905, (W. M. Giffard), 2 ♀, [Terr. Bd. Agr. and Hebard Coll.].

Nuuanu Pali, Oahu, XI, 16, 1919, (W. M. Giffard), 1 ♀, [Hebard Coll.].

Kaumuahona Ridge, Oahu, IV, 11, 1909, (O. H. Swezey), 1 ♀, [Hebard Coll.].

Palolo, Oahu, I, 3, 1915, (O. H. Swezey), 1 ♂, [Hebard Coll.].

Mount Tantalus, Oahu, II, 2 to XI, 26, 1905 to 1907, (W. M. Giffard), 11 ♂, 9 ♀, [Terr. Bd. Agr. and Hebard Colls.].

Pacific Heights, Oahu, V, 30 and X, 20, 1905, (O. H. Swezey), 2 ♂, [H. S. P. A.].

Waialae Ridge, Oahu, IX, 22, 1917, (P. H. Timberlake), 1 ♂, [Timberlake Coll.].

The solid blackish coloration of the cephalic and median femora and dorsal surface of the caudal femora contrasts strikingly with the pale yellowish brown of the head, antennae, pronotum, tegmina and other portions of the body and limbs in this species. Thus the coloration is striking and in no way to be confused with that of the other species of the genus

It has been stated that *saltator* hides at the bases of the leaves of Freycinetia.

Paratrigonidium atroferrugineum Brunner

1895. *Paratrigonidium atroferrugineum* Brunner, Proc. Zoöl. Soc. London, 1895, p. 895. [♂, ♀ ; Molokai at 4000 feet.]

Molokai, 2800 feet, X, 27, 1913, (W. M. Giffard; in swamp land), 1 ♂, 1 ♀, [Hebard Coll.].

This, the handsomest known species of the genus, ranks high among the most distinctively and beautifully colored Gryllidae of Earth. The color figure of the male, given by Perkins,[69] is excellent. In the male before us the lateral fields of the tegmina are apricot-yellow, strongly washed with old-rose color in the proximal

[69] Fauna Hawaiiensis, II, pl. I, fig. 10, (1899).

portions and blackish toward the free (ventral) margin to near the distal portion.

This species is said to be found among the leaves of Metrosideros.

Paratrigonidium pacificum (Scudder) (Plate xxvii, 6.)

1868. *Trigonidium pacificum* Scudder, Proc. Boston Soc. Nat. Hist., XII, p. 139. [♀, Hawaiian Islands.]

Kaumana, Hawaii, X, 25, 1908, 1 ♀, [H. S. P. A.]

Hamakua District, Hawaii, IV, 15, 1906, 1 ♀, [H. S. P. A.]

Mount Hualalai, Kona side, Hawaii, VI, 16 and 17, 1905, (J. Kotinsky), 1 ♂, [Terr. Bd. Agr.].

Kealakekua, Hawaii, VIII, 8, 1919, (P. H. Timberlake), 3 ♀, [Timberlake and Hebard Colls.].

Olaa District, Hawaii, 2000 feet, VII, 20, (W. H. Ashmead), 1 ♂, 1 ♀, [U. S. N. M.]

Kilauea Volcano, Hawaii, I, 15 and VII, 1906, (W. M. Giffard), 1 ♂, 4 ♀; V, 20, 1915, (A. Busck), 2 juv., [Terr. Bd. Agr., U. S. N. M. and Hebard Coll.].

Keanae, Maui, VIII, 22, 1918, (O. H. Swezey), 1 ♂, 1 ♀, [H. S. P. A.].

Molokai, 1600 to 2000 feet, X, 30, 1913, (W. M. Giffard; in mountain forest), 1 ♀, [Terr. Bd. Agr.].

Punaluu Valley, Oahu, VI, 11, 1911, (O. H. Swezey), 1 ♂, [Hebard Coll.].

Mount Kaala, Oahu, V, 18, 1920, (O. H. Swezey), 1 ♀; 2500 to 3000 feet, VII, 22, 1917, (Timberlake and Bridwell), 2 ♂, [H. S. P. A., Bishop Mus. and Timberlake Colls.].

Waianae Valley, Oahu, VI, 1, 1919, (P. H. Timberlake), 1 ♀, [Hebard Coll.].

Waiawa, Oahu, VIII, 13, 1916, (P. H. Timberlake), 1 ♂, [Hebard Coll.].

Mount Tantalus, Oahu, I, 14, 1906, (W. M. Giffard), 1 ♀, [Terr. Bd. Agr.]; VI, 24, 1906, 1 ♀, [Hebard Coll.].

Mount Olympus, Oahu, V, 18, 1919, (J. A. Kusche), 1 juv., [Hebard Coll.]

Manoa Valley, Oahu, VII, 27, 1913, (O. H. Swezey), 1 ♂, [H. S. P. A.]

Palolo, Oahu, VIII, 24 and X, 6, 1906, (O. H. Swezey), 2 ♂, [H. S. P. A.].

Palolo Crater, Oahu, IV, 8, 1917, (P. H. Timberlake), 2 ♀, [Timberlake and Hebard Colls.].

Waialae Iki, Koolau Mountains, Oahu, III, 8, 1917, (J. C. Bridwell), 1 ♂, [Bishop Mus.].

Kuliouou Valley, Oahu, VI, 25, 1916, (O. H. Swezey), 1 ♀, [H. S. P. A.].

Kauai, III, 26 to IV, 14, 1919, (J. A. Kusche), 3 ♂, 13 ♀, 2 juv., [Hebard Coll.].

Kalihiwai Valley, Kauai, X, 7, 1906, (W. M. Giffard; from fern), 1 ♀, [Terr. Bd. Agr.].

Variation in size and in strength of the limb markings is shown by the series. The specimens from Kilauea Volcano are the largest.

P. pacificum is distinguished from all other known species of the genus by the greater number of veins in the lateral fields of the tegmina and by genitalic features.

In the male the subgenital plate tapers more strongly distad and the lateral portions curl upward, the genital valves as a rule being wholly concealed. When these project they are seen to be terminated by two stout projections, diverging from the median line and not springing from the external portion of each valve, as do the projections of the genital valves in the other species of Paratrigonidium.

In the female the ovipositor is distinctive in having the transverse suture median in position.

Though this species is said to be largely terrestrial, whereas the other species are thamnophilous or arboreal, the tarsal claws of

pacificum are similar in having their internal margins armed with from 1 to 4 minute,[70] though well-developed, teeth.

The species is reported as found throughout Hawaii, in the mountain forests and especially in damp and shady places.

Eneopterinae

PROGNATHOGRYLLUS Brunner

1895. Prognathogryllus Brunner, Proc. Zoöl. Soc. London, 1895, p. 896.
1899. Aphonogryllus Perkins, Fauna Hawaiiensis, II, p. 26.
1899. Nesogryllus Perkins, Fauna Hawaiiensis, II, p. 27.

Genotype, selected by Kirby,[71] *Prognathogryllus alatus* Brunner.

The synonymy of Nesogryllus, due to the sexual dissimilarity shown in the genus, was pointed out by Perkins in 1910,[72] having been obscurely indicated in 1906.[73]

Failure to recognize the immature condition resulted in the description of the genus Aphonogryllus. In the earlier instars of Prognathogryllus tegmina and wings are absent, the former alone indicated by lateral lobation of the mesonotum. Moreover, no trace of a tympanum on the cephalic tibiae exists, this being first indicated merely by a slight depression in the later instars and fully developed only in the adult. Noting such dissimilarity, Perkins described Aphonogryllus, based on immature males of the present genus.

In all of the Prognathogryllides the cerci are not longer than the total length of the caudal tarsi, except in females of the present

[70] The smallest of these teeth have evidently been worn off in some examples. This condition may account for the minimum number indicated. In some specimens of *grande,* the largest species of the genus, five such teeth are visible.

[71] Syn. Cat. Orth., II, p. 109, (1906).

[72] Fauna Hawaiiensis, II, p. 689.

[73] Proc. Hawaiian Ent. Soc., I, p. 50.

genus, in which they are very much longer than that dimension.

Prognathogryllus robustus Perkins

1899. *Prognathogryllus robustus* Perkins, Fauna Hawaiiensis, II, p. 25, pl. I, fig. 14. [♀, high central plateau of Kauai.]

Kauai, 3500 and 4000 feet, IV, 1 and 28, 1919, (J. A. Kusche), 1 ♂, 1 ♀, [Hebard Coll.].

Length of body ♂ 16.2, ♀ 17.2; length of pronotum ♂ 3.4, ♀ 3.3; greatest (caudal) width of pronotum ♂ 4, ♀ 3.8; length of tegmen ♂ 13.3, ♀ 8; greatest width of dorsal field of tegmen ♂ 6.2, ♀ 3; length of caudal femur ♂ 8, ♀ 7.7; width of caudal femur ♂ 2.2, ♀ 2.3; length of cercus ♂ 2.8, ♀ 6.6; length of ovipositor 9.3 mm.

Prognathogryllus alatus Brunner (Plate xxvii, 7 and 8.)

1895. *Prognathogryllus alatus* Brunner, Proc. Zoöl. Soc. London, 1895, p. 896, fig. 1. [♀; Waimea Mountains at 4000 feet, Kauai.]

1899. *Aphonogryllus apteryx* Perkins, Fauna Hawaiiensis, II, p. 26, pl. II, figs. 9, 9a, 9b and 9c. [[juv.] ♂; Mountains of Oahu, at 2500 and 3000 feet.]

Failure to recognize as such the early stages of this insect resulted in the above synonymy, further discussed under the generic treatment.

Waianae Mountains, Oahu, III, 15, 1910, (O. H. Swezey), 1 ♀ intensive coloration, [H. S. P. A.].

Lanihuli, Oahu, 2000 feet, X, 19, 1919, (P. H. Timberlake; in hollow twig), 1 juv. ♀, [Timberlake Coll.].

Cooke Trail, Oahu, III, 12, 1916, (P. H. Timberlake; in hollow stem), 1 juv. ♂, [Hebard Coll.].

Malamalama, north slope of Mount Konahuanui, Oahu, VII, 28, 1918, (O. H. Swezey), 1 ♂, 2 ♀, intensive coloration, [H. S. P. A. and Hebard Coll.].

Mount Tantalus, Oahu, III, 11, 1906, (W. M. Giffard), 1 ♂ ; VIII, 4, 1912 and X, 1, 1911, (O. H. Swezey), 3 juv. ♀ ; 1200 feet, III, 23, 1907, (W. M. Giffard), 1 ♀ ; 1500 feet, II, 2, 1906, (W. M. Giffard), 1 ♀ ; 1800 feet, IX, 15, 1907, (W. M. Giffard), 1 ♀ , 1 juv. ♂ , intensive coloration; 2000 feet, II, 24, 1906, (W. M. Giffard), 1 ♂ , 2 ♀ , 3 juv. ♂ , (with tegminal and wing pads) ; 2000 feet, VII, 29, 1909, (J. Kotinsky), 1 ♂ , [Terr. Bd. Agr., H. S. P. A., Hebard Coll. and U. S. N. M.].

Mount Olympus, Oahu, VI, 3, 1919, (J. A. Kusche; in hollow branch of Freycinetia), 1 ♀ , 1 juv. ♂ , (with tegminal and wing pads), intensive coloration, [Hebard Coll.].

Manoa Cliff Trail, Oahu, IX, 1, 1918, (P. H. Timberlake), 1 ♂ , [Timberlake Coll.].

Palolo, Oahu, VI, 24, 1917, (J. C. Bridwell), 1 juv. ♂ (without tegminal or wing pads), [Bishop Mus.].

This handsome insect is decidedly the largest species of the genus. Compared with the largest female before us, however, the smallest females are seen to have a very different general facies, due to their great size reduction and recessive coloration. The reduction in limb and cercal length in these, though great, is seen to be less marked than the reduction in ovipositor length.

As a result of the decided size variation in the species, one immature male before us in the first of the instars that show tegminal and wing pads, is no larger than another immature male in the last instar in which the tegminal and wing pads are lacking.

Compared with *P. oahuensis* Perkins, the present insect, though slender, is seen to be much more robust than that species, while the smallest individuals approximate in size the largest of *oahuensis,* both species being subject to very great size variation. Owing to the heavier build, the pronotum of *alatus* is much broader, as is the stridulating area of the male tegmina. In females, the ovipositor of *alatus* varies from slightly longer to over three times as long as the maximum known for *oahuensis.* In addition the present species shows a distinctive and striking

color pattern, particularly on the pronotum, except in specimens of the maximum recessive coloration, in which the color contrasts are weakly indicated.

From the present insect, *P. robustus* Perkins is readily distinguished by its broader form, broader stridulating field of the male tegmina, broader female tegmina, proportionately shorter limbs and apparent absence of a striking color pattern.

As no species of the genus has as yet been thoroughly analyzed the following description is here given.

Size large, decidedly variable; form slender. Head with occiput elongate, convex, the interocular area cephalad of that portion flattened, this more decided than in *oahuensis*. Maxillary palpi with fourth joint approximately two-thirds as long as third (approximately three-quarters as long as third in *oahuensis*); fifth joint slightly longer than third, expanding evenly distad, with apex rather strongly obliquely truncate. Antennae stout and very elongate, considerably over twice body length.

Pronotum rounded hexagonal, slightly longer than broad, greatest width meso-caudad, from which point the lateral (ventral) margins converge weakly cephalad and for the brief distance rounded; cephalic and caudal margins transverse, the latter showing a weak trace of angulate production; surface showing a longitudinal rounded ridge on each side, paralleling the lateral margins, separating the somewhat impressed discal portion from the narrow and moderately concave lateral portions of the pronotum, and at the caudal margin the pronotum is thickened and delimited cephalad by a distinct sulcus, paralleling the caudal margin (this condition is very weakly indicated in *oahuensis*).

Tegmina of male as shown in Plate XXVII, 8, reaching to base of supra-anal plate. Tegmina of female considerably longer than pronotum though not twice as long, varying in length, represented by oval pads with apices broadly rounded (much as in *oahuensis*, not as broad distad as in *robustus*), venation distinct. Wings vestigial.

Supra-anal plate triangular, with apex rounded, this more decided in female; dorsal surface concave mesad. Genital valves of male dorso-laterad in position, produced dorso-caudad in elongate, heavy, somewhat irregularly chitinous processes which taper distad and are curved strongly upward at their acute apices, these processes with dorsal portions subchitinous and connected in proximal half with the blunt, short, tongue-like dorso-median portion of the valves by a membranous web. Ovipositor longer than caudal tibia; varying to slightly over half as long as caudal tibia; curved weakly dorsad, varying to straight, with apex very weakly reflexed; apex thickened and grooved. Cerci of female very elongate,[74] nearly as long as ovipositor.

[74] This and the characters given below, with one exception, are of generic, rather than of specific value.

Femora unarmed. Cephalic and median tibiae with a minute, but stout, dorso-distal spine, the former with an oval, apert tympanum on the cephalic face. Caudal tibia with three small but stout external distal spurs, of which the median is slightly the longer, and with two similar internal distal spurs, of which the dorsal is twice as long as the ventral; dorso-internal margin armed with (6 to 9) long, curved spines, and other minute, irregular spinulae proximad; dorso-external margin armed with more numerous, smaller[75] spines, the dorsal surface between these margins supplied with spinulae.

Coloration of recessive examples ochraceous-buff tinged with ochraceous-tawny. Head ochraceous-tawny, with four, weakly defined, longitudinal lines on occiput of ochraceous-buff, the face russet. Pronotum ochraceous-tawny, with a pair of ochraceous-buff, elongate and nearly rectangular markings, which are situated meso-proximad and diverge strongly caudad, failing to reach the narrowly pale cephalic margin and more broadly pale lateral margins. Abdomen with a transverse line of darker flecks on each tergite, of which the median pair is the heaviest and with distal portion darkened. Limbs more strongly tinged with ochraceous-tawny.

Coloration of intensive examples much sharper and more contrasting. Head shining blackish-brown, with two longitudinal lines on occiput of buffy (the external pair of lines obliterated); palpi, mouthparts and ventral surface buffy. Pronotum blackish brown, with paired markings and margins buffy and in striking contrast. Tegmina tawny. Abdomen and limbs buffy more strongly and extensively marked with blackish brown. Cephalic and median femora distad and tibiae proximad, marked with large flecks of blackish brown. Caudal femora suffused with blackish brown distad, with genicular areas tawny and dorsal surface showing interrupted streaks of blackish-brown. Caudal tibiae with a blackish-brown proximal annulus, dorsal surface blackish-brown except briefly proximad and distad and internal spines and spurs tawny, black tipped.

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[75] In this species the internal spines are proportionately much more elongate than in *oahuensis*.

MEASUREMENTS (IN MILLIMETERS)

♂	Length of body	Length of pronotum	Greatest width of pronotum (at caudal margin)	Length of tegmen	Width of tegmen	Length of caudal femur
Malamalama	27	4.7	5.3	16	6.6	11.3
Mount Tantalus	25	4.5	5	15.9	6.4	11
Mount Tantalus	24	4.2	4.8	15.8	6.2	10
Manoa Cliff Trail	26.3	4.6	5.2	15.7	6.3	11.7

♀	Length of body	Length of pronotum	Greatest width of pronotum (meso-caudad)	Length of tegmen	Width of tegmen	Length of caudal femur	Length of ovipositor
Waianae Mountains	23.8	4.9	4.2	5.8	3.1	12	14.4
Malamalama	27	4.9	4.9	5.8	3.8	12.7	13
Malamalama	24	4.9	4.9	5.8	3.7	12.7	12.7
Mount Tantalus	31	5.3	5.1	7.1	4	13.3	14
Mount Tantalus	28.7	4.7	4.1	6.2	3.3	10.8	7.2
Mount Tantalus	26.7	4.8	4.3	6.4	3.7	11.3	8
Mount Tantalus	28.3	5	4.2	7.7	3.3	11.3	8
Mount Tantalus	23.3	4.2	3.8	5.5	2.9	10.3	7.8
Mount Olympus	35.2	6.3	6	9.2	4.9	16.3	22

Prognathogryllus oahuensis Perkins (Plate xxvii, 9.)

1899. *Prognathogryllus oahuensis* Perkins, Fauna Hawaiiensis, II, p. 25. [♀ ; Waianae Mountains, Oahu.]

1899. *Nesogryllus stridulans* Perkins, Fauna Hawaiiensis, II, p. 27. [♂ ; mountains, Oahu, at 3000 feet.]

Sexual differences, which were supposed to have generic significance, led to the above synonymy.

The small series before us shows that this species is also decidedly variable and there is a possibility that Perkin's *elongatus* and *inexspectatus,* both from Kauai, may represent the same species, in which case the name *elongatus* would have priority. Without examining the types and additional material from Kauai, this problem can not be solved.

Kaumuohona Ridge, Oahu, X, 26, 1913, (O. H. Swezey; from Labordia), 1 ♂, [Hebard Coll.].

Manoa Cliff Trail, Oahu, VIII, 1, 1918, (P. H. Timberlake; in twig of Touchardia), 1 juv. ♀, [Timberlake Coll.].

Palolo Crater, Oahu, V, 18, 1918, (P. H. Timberlake), 1 ♀, [Hebard Coll.].

Palolo, Oahu, 1800 feet, (W. M. Giffard), 1 ♀, [Terr. Bd. Agr.].

Niu Ridge, Oahu, V, 16, 1909, 1 ♀, [Hebard Coll.].

Kuliouou Ridge, Oahu, VI, 25, 1916, (O. H. Swezey), 1 ♀, [H. S. P. A.].

MEASUREMENTS (IN MILLIMETERS)

	Length of body	Length of pronotum	Greatest width of pronotum	Length of tegmen	Width of tegmen	Length of caudal femur	Length of ovipositor
♂							
Kaumuohona	24.8	4.7	4	13.4	4.6	11.4	.. ..
♀							
Palolo Crater	28	4.7	3.7	6.3	3	12	7.6
Palolo	23.2	4.1	3.2	5	2.7	11.1	7.8
Niu	22.8	4	2.8	4.3	2.6	8.7	6
Kuliouou	20	4	3	5	2.2	9.8	6.8

Thaumatogryllus variegatus Perkins

1899. *Thaumatogryllus variegatus* Perkins, Fauna Hawaiiensis, II, p. 27, pl. I, fig. 16. [♂, ♀; mountains of Kauai, at 4000 feet.]

Kauai, 1912, (W. M. Giffard), 1 ♀, [Hebard Coll.]

This genus is very close to *Leptogryllus* Perkins, differing only in the deeper and less prognathous head, decidedly longer palpi, more strongly, though very finely, hirsute limbs, closer and more regular minute, but stout, spines of the dorsal margins of the caudal tibiae, more elongate distal spurs of the same, the dorsal of which, both internally and externally, is more than twice as long as the ventral and very much more elongate tarsi.

In both genera the cephalic tibiae are armed with one, the median tibiae with two, very small disto-ventral spines; the cerci are armed with a minute spine,[76] while the female subgenital plate is triangularly produced, with apex truncate.

[76]Stronger in the present specimen than in the examples before us of Leptogryllus, in which genus are found occasional individuals that lack this spine.

Length of body 15, length of pronotum 4.3, greatest (meso-caudal) width of pronotum 3.8, exposed length of tegmen 1.2, width of tegmen 2.8, length of caudal femur 10.8, length of caudal metatarsus 3.1, length of ovipositor 8.5 mm.

LEPTOGRYLLUS Perkins

1899 *Leptogryllus* Perkins, Fauna Hawaiiensis, II, p. 28.

At the time this genus was proposed, the author described seven species, including one previously described by Brunner, and in 1910 three more species were described by Perkins. A series of forty-three specimens now before us, largely from Oahu and Hawaii, shows that here is a problem sufficiently intricate to necessitate extensive collecting, comparison with the types and probably breeding experiments, before the actual number of valid species of this singular Hawaiian genus can be determined.

In the present series at least three groups are found. The first of these has the limbs relatively short and heavily annulate. To this group belongs *forficularis* (Brunner), but whether or not additional species should be recognized we can not say. The

second group has the limbs relatively elongate and immaculate. To it belongs *nigrolineatus* Perkins, but the validity of the other species, referable to this type, is as uncertain as in the first group. The third is represented by a single comparatively stout species, with limbs relatively short and showing very weak traces of annuli.

As some smaller immaculate individuals have shorter limbs, these groups are by no means sharply distinguished one from the other, and recession of coloration in the annulate type may cause such annuli almost to disappear, as might be expected. Proceeding further we find that individuals of the first two types have tegmina varying from minute, lateral, and scarcely projecting lobes, to small, but overlapping, lobes, which wholly cover the metanotum. Though each series shows a large proportion of the specimens runing constant to one or the other of these extremes, yet certain individuals are intermediate.

The metanotum of adult males, in which this area is exposed, shows a slight, twin convexity, each side with a median impression. In males with the metanotum nearly or wholly covered by the tegmina, however, we find much higher specialization, as shown on Plate XXVII, 11. This might be considered most important in determining the number of species represented, were it not for the fact that we know tegminal size to be often (though not always) attributable to individual variation within a species, whereas the disappearance of glandular specialization may result solely from tegminal reduction, leaving the otherwise specialized area unprotected.

In length of ovipositor many of the Gryllidae show very great individual variation and in the present genus the extremes to be found in each species are probably decided.

In the immature stages minute, lateral tegminal lobes are present, even at a time when no more than half the adult size has been attained. This fact adds the further difficulty that some of the males, possessing them, though apparently adult, may not be mature and might have had the larger overlapping lobes when adult.

We, therefore, record the material before us as representing

but two species and comment on a third, aparently a distinct, form. We believe that, of the eleven species described, most are synonyms, based on features which, though often showing marked differences, will be found on more thorough investigation to be valueless from a specific or even from a racial standpoint. In fact it may develop that but a single plastic species exists, breaking into many more or less intergrading phases.

Several aberrant specimens in the present series, discussed below, would each be described as representing a new species, were the condition as indicated above not understood.

The problem can be adequately worked out only by a student resident in the Hawaiian islands. To one interested in Orthoptera this should prove a most attractive, though difficult, task.

Leptogryllus forficularis Brunner (Plate xxvii, 10 and 11.)

1895. *Prognathogryllus forficularis* Brunner, Proc. Zool. Soc. London, 1895, p. 897. [♀ ; Kona, Hawaii, at 3000 feet.]

Niulii, Hawaii, V, 22, 1917, (O. H. Swezey), 1 ♀, [Hebard Coll.].

Waimea District, Hawaii, X, 20, 1912, (O. H. Swezey), 1 ♀, [H. S. P. A.].

Olaa District, Hawaii, 2500 feet, (W. H. Ashmead), 1 ♂, 1 ♀, [U. S. N. M.].

Mount Kaala, Oahu, III, 4 to IX, 26, 1916 to 1920, (Swezey; Bridwell), 1 ♂, 3 ♀, [H. S. P. A., Bishop Mus. and Hebard Colls.].

Lanihuli, Oahu, IX, 3, 1916, (J. C. Bridwell), 1 ♂, [Bishop Mus.].

Mount Konahuanui, Oahu, II, 22, 1914, (O. H. Swezey), 1 ♂, [H. S. P. A.].

Kaumuohona Ridge, Oahu, X, 26, 1913, (O. H. Swezey; from Labordia), 1 juv. ? ♂, [Hebard Coll.].

Mount Tantalus, Oahu, 2000 feet, XI, 25, 1906, (W. M. Giffard), 1 ♂, [Terr. Bd. Agr.].

Mount Olympus, Oahu, XI, 21, 1909, (O. H. Swezey), 1 ♀; XII, 18, 1910, (O. H. Swezey), 1 juv. ♀, [H. S. P. A. and Hebard Coll.].

Palolo, Oahu, X, 6, 1906, 1 ♀, [H. S. P. A.].

Kauai, 3000 to 4000 feet, IV, 11, and 28, 1919, (J. A. Kusche), 1 ♀, 2 juv. ♂, [Hebard Coll.].

Of the specimens from the island of Hawaii, the Niulii and Olaa District individuals agree closely with the condition described by Perkins as *similis,* the limbs showing scarcely a trace of annulation. The Waimea District female is similar, but has the limbs distinctly annulate, the annuli by no means so deep and contrasting as in most of the specimens from the island of Oahu.

The female from the island of Kauai, and the specimens from Kaumuohona Ridge, Mount Olympus and Palolo, on the island of Oahu, agree rather with the condition described by Perkins as *kauaiensis,* particularly in the tegminal development. That author's *fusconotatus* appears to be based on a larger male of *forficularis,* such as those from Lanihuli and Mount Tantalus, on the island of Oahu, here recorded. In these specimens the metanotum shows a weak median twin convexity, with an impressed point mesad on each side (Plate XXVII, 10). The Kaumuahona, Oahu, male not only appears to be immature but has the metanotum unspecialized. The other two Oahuan males show high metanotal specialization beneath the tegmina (Plate 11, fig. 11). All of the specimens from Oahu and Kauai have conspicuously annulate limbs.

Leptogryllus nigrolineatus Perkins (Plate xxvii, 12.)

1899. *Leptogryllus nigrolineatus* Perkins, Fauna Hawaiiensis, II, p. 28. [♂, ♀; mountains of Oahu and Maui.]

Niulii, Hawaii, V, 22, 1917, (O. H. Swezey), 1 ♂, 1 juv. ♂, 1 juv. ♀, [H. S. P. A.]

Waimea District, Hawaii, X, 20, 1912, (O. H. Swezey), 1 ♀, [H. S. P. A.].

Upper Hamakua Ditch Trail, Kohala Mountains, Hawaii, IX, 3, 1919, (O. H. Swezey; on Cibotium), 2 ♀, [H. S. P. A. and Hebard Coll.].

Kilauea Volcano, Hawaii, 4000 feet, VII, 24, 1906, (W. M. Giffard), 1 ♂, 1 ♀; I, 15, (W. M. Giffard), 1 juv. ♀; II, 12, (W. M. Giffard), 1 ♀, [Terr. Bd. Agr. and Hebard Coll.].

Keanae, Maui, VII, 16, 1920, (O. H. Swezey), 2 ♀, [H. S. P. A. and Hebard Coll.].

Opaeula Valley, Oahu, III, 30, 1913, (O. H. Swezey), 1 ♀, [Hebard Coll.].

Mount Tantalus, Oahu, 1300 feet, X, 27, 1906, (W. M. Giffard), 1 ♂, 2 ♀; 1500 feet, I, 30 and XI, 10, 1906, (W. M. Giffard), 1 ♂, 2 ♀, [Terr. Bd. Agr. and Hebard Coll.].

Waialae Iki, Oahu, V, 2, 1920, (O. H. Swezey), 1 ♂, [Hebard Coll.].

The above series, like that recorded under *forficularis,* includes a variety of forms, which we do not believe should be given either specific or racial status at the present time.

All have much longer legs than the series of *forficularis,* and in none are these members more than very faintly annulate. No trace of annuli is shown in the series from Niulii, Hawaii, Mount Tantalus, and Waialae Iki, Oahu, the adult from the latter locality only having the tibiae almost black. Were such color differences worthy of name, that specimen would, from the description, be considered quite as distinct as Perkins's *apicalis.*

In tegminal development the material of both sexes from Niulii, Hawaii, Mount Tantalus, and Waialae Iki, Oahu, has these organs completely covering the metanotum, that segment greatly specialized as shown on Plate 11, figure 12. Those from Keanae, Maui, show further tegminal reduction, in that these organs overlap, but reach and cover only the proximal portion of the metanotum; the metanotum, apparently as a result, showing depressions but no conspicuous specialization. The female from Opaeula Valley, Oahu, has the tegmina lateral but separated by an interval less than

the tegminal width, whereas the rest of the series have minute, lateral tegmina.

The caudal femora, in adults, vary in length from 9.6 to 11.8, the ovipositor from 6.3 to 6.8 mm.

LEPTOGRYLLUS, sp.

Leptogryllus, sp.

A male and an immature male from Mount Olympus, Oahu, taken September 5, 1915, by A. Busck, in the United States National Museum, are of the same general body bulk as the series of *L. nigrolineatus* Perkins, have the limbs immaculate and minute lateral tegmina, but the caudal femora short and stout.

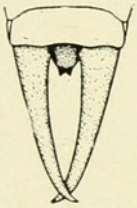
These specimens can not be placed at the present time with any certainty. They have a distinctive facies, are too large for *forficularis* and much too short limbed for *nigrolineatus*.

The measurements of the adult male are: length of body 16, length of pronotum 4, width of pronotum 3.6, exposed length of tegmen 0.4, width of tegmen 0.9, length of caudal femur 9.3, width of caudal femur 2.6 mm.

EXPLANATION OF PLATES

Plate XXVI

1. *Anisolabis perkinsi* Burr. Dorsal outline of apex of male abdomen and forceps. Kauai. (× 8½)
2. *Anisolabis perkinsi* Burr. Dorsal outline of apex of male abdomen and forceps. Kaumana, Hawaii. (× 8½)
3. *Labia pilicornis* (Motschulsky). Dorsal of male forceps and pygidium. Kaimuki, Oahu. (× 8½)
4. *Labia pilicornis* (Motschulsky). Dorsal view of female forceps and pygidium. Kaimuki, Oahu. (× 8½)
5. *Labia dubronyi* new species. Dorsal view of male pygidium. *Type.* Hauula, Oahu. (Greatly enlarged.)
6. *Labia dubronyi* new species. Dorsal view of male forceps and pygidium. *Type.* Hauula, Oahu. (× 7)
7. *Labia dubronyi* new species. Dorsal view of female forceps and pygidium. *Allotype.* Hauula, Oahu. (× 7)
8. *Sparattina nigrorufa* (Burr). Dorsal view of male. Hilo Sugar Company, Hawaii. (× 5)
9. *Sparattina nigrorufa* (Burr). Dorsal view of female forceps and pygidium. Waiakea, Hawaii. (× 9)
10. *Allacta similis* (Saussure). Ventral outline of male subgenital plate. Mt. Kaala, Oahu. (Greatly enlarged.)
11. *Eoblatta notulata* (Stål). Ventral outline of male subgenital plate. Hawaii. (Greatly enlarged.)
12. *Xiphidiopsis lita* new species. Ventral outline of female subgenital plate. *Type.* Hilo, Hawaii. (Greatly enlarged.)
13. *Xiphidiopsis lita* new species. Lateral outline of apex of female ovipositor. *Type.* Hilo, Hawaii. (Greatly enlarged.)



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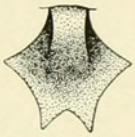

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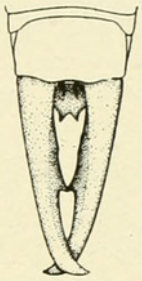

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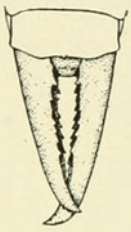

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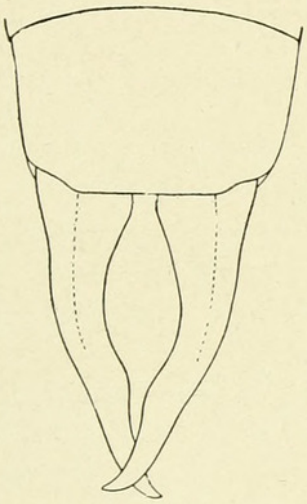

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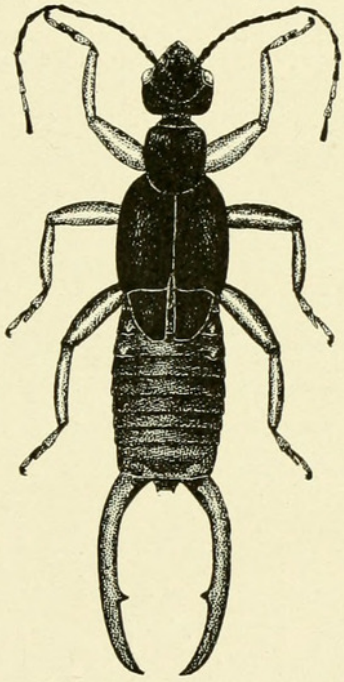

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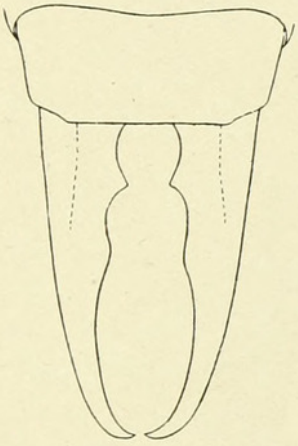

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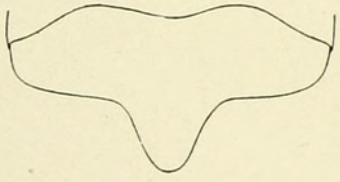

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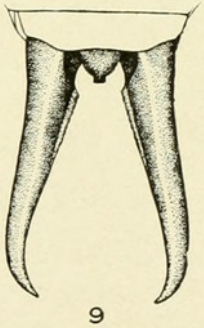

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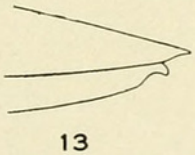

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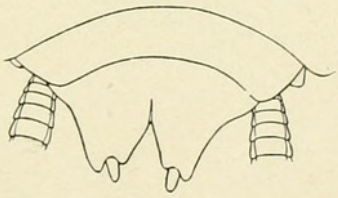

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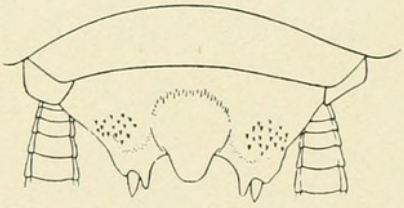
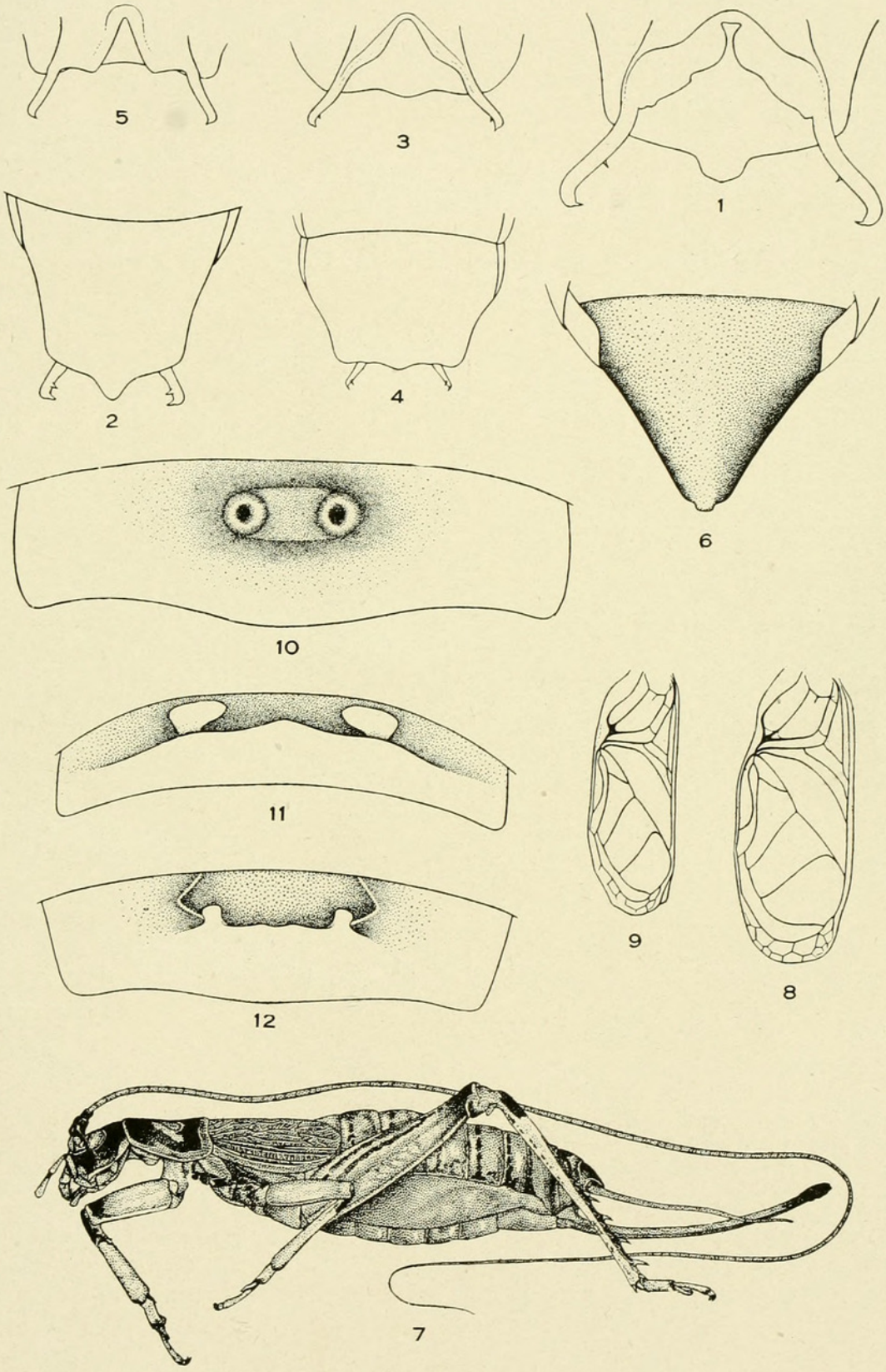


11

DRAWINGS SHOWING SECTIONS OF HAWAIIAN DERMAPTERA AND ORTHOPTERA. DORSAL VIEW OF SPARATTINA NIGRORUFA.

PLATE XXVII

1. *Paratrigonidium grande* Perkins. Dorsal outline of distal margin of male subgenital plate and distal portion of titillatores. Kealakekua, Hawaii. (Greatly enlarged.)
2. *Paratrigonidium filicum* Perkins. Ventral outline of male subgenital plate and projecting portions of titillatores. Kohala Mountains, Hawaii. (Much enlarged.)
3. *Paratrigonidium varians* Perkins. Dorsal outline of distal margin of male subgenital plate and distal portion of titillatores. Olowalu, Maui. (Same scale as figure 1.)
4. *Paratrigonidium varians* Perkins. Ventral outline of male subgenital plate and projecting portions of titillatores. Olowalu, Maui. (Same scale as figure 2.)
5. *Paratrigonidium saltator* Perkins. Dorsal outline of distal margin of male subgenital plate and distal portion of titillatores. Mount Tantalus, Oahu. (Same scale as figure 1.)
6. *Paratrigonidium pacificum* (Scudder). Ventral view of male subgenital plate. Punaluu, Oahu. (Same scale as figure 2.)
7. *Prognathogryllus alatus* Brunner. Lateral view of largest known female. Mount Olympus, Oahu. (× 1½)
8. *Prognathogryllus alatus* Brunner. Dorsal view of dextral tegmen of male. Manoa Cliff Trail, Oahu. (× 2)
9. *Prognathogryllus oahuensis* Perkins. Dorsal view of dextral tegmen of male. Kaumuahona, Oahu. (× 2)
10. *Leptogryllus forficularis* (Brunner). Dorsal view of metanotum of male, showing reduced specialization in condition lacking tegmina. Mount Tantalus, Oahu. (Greatly enlarged.)
11. *Leptogryllus forficularis* (Brunner). Dorsal view of metanotum of male, showing specialization in condition in which the tegmina almost completely cover this segment. Mount Konahuanui, Oahu. (Same scale as figure 10.)
12. *Leptogryllus nigrolineatus* Perkins. Dorsal view of metanotum of male, showing specialization in condition in which the tegmina completely cover this segment. Mount Tantalus, Oahu. (Same scale as figure 10.)



DRAWINGS SHOWING SECTIONS OF HAWAIIAN ORTHOPTERA. DORSAL VIEW OF PROGNATHOGRYLLUS ALATUS.