Studies of Hawaiian Neuroptera

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INTRODUCTION

This paper had its inception in my attempts to determine the unidentified Hawaiian Neuroptera in Bishop Museum. Early in my studies, I found that it was almost impossible to name most of the species from literature alone. No keys had been published to aid in the determination of our species, and I found it essential to prepare keys before I could work over our collections. I consider this paper only a preliminary contribution toward the knowledge of the Hawaiian Neuroptera; it is far from complete. This report should be used in conjunction with Perkins' excellent section on Neuroptera in Fauna Hawaiiensis, and his remarks in the introduction to that work will be found most useful.

Herein are presented keys to the families, genera and, with the exception of a key to the species of the hemerobiid genus Nesomicromus, keys to the species of all of the Hawaiian Neuroptera. There are 60 species of Neuroptera in Hawaii, 54 of these are endemic products, the other six are either purposely or accidentally introduced species. The 60 species are distributed among four families as follows: Coniopterygidae, 1; Myrmeleonidae, 2; Chrysopidae, 28; Hemerobiidae, 29.

The following nomenclatorial changes are made herein: Eidoleon wilsoni (McLachlan), new combination for Myrmeleon wilsoni McLachlan; Distoleon perjurus (Walker) is not a synonym of Eidoleon bistrigatus (Rambur); Anomalochrysa proteus Perkins is a synonym of A. hepatica McLachlan; Anomalochrysa deceptor Perkins is a synonym of A. maclachlani Blackburn; Anomalochrysa rhododora xerophylla Perkins is a synonym of A. rhododora Perkins.

Many new locality data are presented herein, and the ranges of some species are shown to be somewhat greater than indicated by Perkins. More extensive collecting must be done to ascertain the limits of the ranges of many species. Dr. Perkins made the largest collection of Hawaiian Neuroptera yet assembled, and I doubt that there have been as many specimens of Hawaiian Neuroptera collected in all the years since Perkins' activity as were collected by that diligent worker.

I wish to thank Professor Nathan Banks of the Museum of Comparative Zoology, Boston, and Mr. D. E. Kimmins of the British Museum (Natural History) for helpful notes pertaining to the Myrmeleonidae and the Hemerobiidae.

KEY TO THE FAMILIES OF NEUROPTERA FOUND IN HAWAII

1. Small insects (less than 4 mm. long) with few wing veins and covered with a white powdery exudation ......... Coniopterygidae
   Without such an exudation; larger insects with many veins ..... 2

2(1). Antennae enlarged distally to form a distinct club ........ Myrmeleonidae
   Antennae entirely moniliform or filiform and not enlarged distally ... 3

3(2). Radius of fore wings with but one sector; transverse veins between costa and subcosta not branched, at least in the basal half ......... Chrysopidae
   Radius of forewings with two or more sectors, that, with their subsequent branches, reach the wing margin; the veins rarely indistinguishable and the wing coriaceous and areolated, but then the hind wings atrophied or absent; usually many branched cross veins between costa and subcosta .......... Hemerobiidae

CONIOPTERYGIDAE

Genus Coniocompsa Enderlein
Coniocompsa vesiculigera Enderlein: loc. cit.

This is an adventitious species recorded thus far from Malacca and Hawaii. It has been swept from Euphorbia and Gossypium tomentosum; it occasionally comes to light. It has been found on Maui and Oahu, and most of the specimens in local collections have been taken in the dryer regions of Oahu.

MYRMELEONIDAE

Confusion exists in literature in regards to the identities of the Hawaiian ant lions. I hope that the following notes will help to clarify the situation.

Genus Eidoleon Esben-Petersen

Eidoleon Esben-Petersen: Arkiv für Zoologi 11(26) : 15, 1918.

KEY TO THE SPECIES FOUND IN HAWAII

Expanse of fore wings 70 to 90 mm.; most of the cells of the fore wings obviously infuscated along the cross veins ......... E. wilsoni (McLachlan)
Expanse of fore wings less than 70 mm. to less than 60 mm.; only a few of the cells of the fore wings infuscated along the cross veins, most of the cells without any infuscation ............. E. bistrigatus (Rambur)

Eidoleon wilsoni (McLachlan), new combination.


This species has the cross vein of Eidoleon in the hind wing and belongs in the same genus as bistrigatus. The species has been found only in Hawaii and Lanai. It has been reported as common
at various places on Hawaii, including Pahala, Kau, Pokakuloa, Kawaihae, West Kohala, Kilauea, and Puuwaawaa. It is well represented in local collections.

**Eidoleon bistrigatus** (Rambur) Esben-Petersen.


_Eidoleon bistrigatus_ (Rambur) Esben-Petersen: Arkiv för Zoologi, 11: 15, 1918.

When Walker described _Myrmeeleon perjurus_ (Cat. Neuropt. Insects, British Mus., part 2, 1853), he gave the type locality as Hawaii. An error was made in the locality record, because _M. perjurus_ has not been collected in Hawaii. I have seen specimens of _M. perjurus_ collected in Guam, and it is probable that the type material came from the western Pacific. This confusion of locality data has resulted in the reduction of _M. perjurus_, apparently based upon misidentified Hawaiian specimens, as a synonym of _Eidoleon bistrigatus_, but it is distinct from that species. _M. perjurus_ is now included in _Distoleon_. _Eidoleon_ differs from _Distoleon_ because it has a small cross vein from the second anal to the wing margin of the hind wing, but such a cross vein is absent in _Distoleon_. True _perjurus_ lacks the cross vein and is generically distinct from _bistrigatus_.

_Eidoleon bistrigatus_ is widespread from Australia to the Tuamotu Archipelago in southeastern Polynesia. It has been taken on Hawaii, Maui, Molokai, and Oahu in the Hawaiian Islands, but it is evidently rare. I have seen only four Hawaiian specimens.

**CHRYSOPIDAE**

**KEY TO THE GENERA FOUND IN HAWAII**

| Fore wings with only two series of gradate cells | .......... | Chrysopa |
| Fore wings with three or more series of gradate cells | .......... | Anomalochrysa |

**Genus Chrysopa** Leach


Two species of _Chrysopa_ are commonly found widespread in the islands. One of these (_C. microphya_) has been recorded only from Hawaii and doubtfully from the Tuamotu Archipelago; the other (_C. lanata_) is a South American species. The two species may be distinguished as follows:

Fore wings with the dividing nerve of the third cubital cell joining _M_ before the first cross vein between _M_ and _Rs_ .......... _C. lanata_ Banks

Fore wings with the dividing nerve of the third cubital cell joining _M_ beyond the first cross vein between _M_ and _Rs_ .......... _C. microphya_ McLachlan


This species is widespread in South America and has been found on Easter Island. It was first recorded here by Timberlake in 1919.
It often comes to light. Timberlake says that the adults do not eat aphids but feed freely upon honeydew. Swezey has found the larvae (which he states are not covered with debris) feeding upon the eggs of *Siphanta acuta*. The adults are more delicate than those of *C. microphya* and have “weaker” veins. This species has been taken in numbers also on the leeward Hawaiian Islands: Pearl and Hermes Reef, Midway, Ocean Island.


The larvae of this species cover themselves with debris and feed upon leafhoppers, mealy bugs, scales, aphids, nymphs of *Siphanta acuta*, and other insects. The pupae of this species, as well as *C. lanata* and various Anomalochrysa, are heavily parasitized by the ichneumon wasp *Hemiteles tenellus* (Say). Miss Cheesman (1927) recorded this species from Fakarava, Tuamotus, but was not positive that the insects she had collected belonged to this species. The wing veins on most examples are bold. Williams (Insects and Other Invertebrates of Hawaiian Sugar Cane Fields, pp. 130-131, 1931) gives additional data on the life history of the species.

In addition to these two species a third has been recorded from Hawaii, but there is now reason to believe that the record is erroneous. The other species is *C. oceanica* Walker, 1853 (*C. V-rubrum* Brauer, 1866) a species found widespread in Oceania from the New Hebrides to the Society Islands. However, the species might yet be found here, or it may live on some of our outlying islands. It would run to *C. microphya* in the synoptic table and can be separated from that species as follows:

- Fore wings with the cells in the anterior gradate series only about half as long as the cells in the posterior series; head without red maculae as in *C. oceanica*; expanse less than 25 mm. .......... *C. microphya* McLachlan
- Fore wings with the cells in the anterior gradate series about as long as the cells in the posterior series, with several cells continuing from Rs to M which are not broken by cross veins; head usually with a V-shaped red median mark just behind the antennae and a red macula in the middle of the face; expanse 30 or more mm. ............... *C. oceanica* Walker

Genus Anomalochrysa McLachlan


*Anomalochrysa* is a species complex that does not lend itself to facile tabulation. Many of the species are variable. The number of series of gradate veins, for example, is often found to be subject to considerable variation in both fore and hind wings. I have not only given a general key to the species, but, to facilitate determination, I have prepared a separate key to the species of each main island. Considerable difficulty was had in preparing these keys, and they may be subject to some future modifications. However, I have found
them most useful and believe that other workers will be able to identify most specimens without great difficulty with the aid of the keys.

The eggs of *Anomalochrysa* are not stalked but are deposited directly on the plant surface, often in groups. Williams (1931, p. 130) says "Their elongate-oval, stemless eggs, frequently deposited one alongside the other, are provided at one extremity with a small button-like protuberance." The larvae are naked and do not cover themselves with debris as do most *Chrysopa*. The principal food of the larvae is Psocidae, but some of the species feed upon lepidopterous larvae, introduced aphids and others are known to eat homopterous insects, including the sugar cane leaf hopper. Williams, 1931, gives some notes on the biology of some of the species.

**ANNOTATED LIST OF THE SPECIES OF ANOMALOCHRYSA**

   Molokai.
   Oahu: Mt. Tantalus; Kealakei.
   Oahu: Koolau Mts.
   Maui: Iao Valley.
   Hawaii: Kohala Mts.; Kona, 3000 ft.
4. *Anomalochrysa frater* Perkins: *op. cit.*, p. 52, pl. 4, fig. 18.
5. *Anomalochrysa fulvescens* Perkins: *op. cit.*, p. 60, pl. 3, figs. 13, 14, 15, 16.
   Maui: Haleakala, 5000 ft.
   Kauai: Kumuwela; Waimea, 4000 ft.
   Hawaii: Kau, 4000 ft.
   *Anomalochrysa proteus* Perkins: Fauna Haw. 2(2): 59, pl. 3, figs. 11, 12, 13, **new synonym**.
   I have been unable to find any differences on specimens in Perkins' paratype series of *proteus* to separate them from a series of specimens of *hepatica* in Fauna Hawaiensis series determined by Perkins. I made cleared dissections of the male genitalia of specimens under each name and found them to be identical in structure.
   Oahu: Koolau Mts., 2000 feet; Waialua; Mt. Tantalus; Manoa Valley; Mt. Kaala; Wailupe; Mt. Konahuanui.
   Maui: Haleakala, 5000 ft.; Kula Pipe Line, 4500 ft.
   Hawaii: 2000–8000 ft.; Kilauea; Kau, 4000 ft.; Kona, 4000–5000 ft.; Humula; Hoookomo; Hualalai; Mauna Loa, 4000 ft.

9. Anomalochrysa longipennis Perkins: op. cit., p. 53, pl. 3, fig. 5.
Hawaii: Kilauea.

This synonymy is based upon a comparison of the type of A. maclachlani with paratypes of A. deceptor and a note on the type of A. maclachlani written by Perkins.
The holotype of A. maclachlani is now in Bishop Museum; the left wings are the only parts remaining on the card mount.
Maui: Haleakala, 5000 ft.
Hawaii: Mauna Loa; Kealakekua, 3000 ft.; Kilauea; Kau, 4000 ft.; Kona, 3000 ft.; South Kona; Puna, 2000 ft.

Molokai: 4000 ft.

Hawaii: Mauna Loa, 7000 ft.; Kilauea, 4000 ft.; Kau, 4000 ft.
This species is very closely allied to A. viridis, but cleared dissections of the male genitalia show distinct differences in structure and chaetotaxy. In this species the aedeagus is somewhat more strongly arcuate; the ventral lobe is short and does not project much beyond the lateral lobes; the lateral lobes have the setae fine and hair-like, and not bristle-like.

Molokai: 3000 ft.

Hawaii: Mauna Loa, 4000 ft.
The unique, badly damaged type is now in Bishop Museum; the body and most of the left hind wing are gone.

Hawaii: Olaa.

Hawaii: Kilauea; north Kona, 4000 ft.

17. Anomalochrysa princeps Perkins: op. cit., p. 47, pl. 3, fig. 1, pl. 4, figs. 20, 20a.
Esben-Petersen, in Insects of Samoa 7(3): 98, 1928, described
a new genus, for a new Samoan species and said that *A. princeps* "should probably be assigned to the new genus." Esben-Petersen separated his new Samoan genus (*Austrochrysa*) from *Anomalochrysa* because the genotype (*A. samoana*) had the third cubital cell rectangular instead of triangular, and his reason for suggesting transferring *A. princeps* to *Austrochrysa* was that the third cubital cell of *A. princeps* is usually quadrangular. However, the third cubital cell varies in shape not only among the species of *Anomalochrysa*, but also among individuals of one species. In our collection there is a specimen of *A. princeps* whose left side belongs to *Anomalochrysa*, but its right side belongs to *Austrochrysa*. *Austrochrysa* was described from a unique; I believe it best to await the discovery of additional material before transferring *A. princeps* to *Austrochrysa*. *A. princeps* is, however, one of the most distinct species of the Hawaiian Chrysopidae.

   Hawaii: Kona, 4000-5000 ft.; Mauna Loa; Hualalai; Kilauea; Kilauea Bird Park; Humuula; Hamakua, 1800 ft.; Kau, 1500 ft.

   Hawaii: Kilauea; Kona, 4000 ft.; Humuula; Kealakekua, 3500 ft.

   *Anomalochrysa rhododora xerophylla* Perkins: loc. cit., new synonym.
   Hawaii: Kilauea; 29 miles, Olaa.
   This species and its "var." were described from uniques. The two holotypes are in Bishop Museum. Two additional specimens in our collection intergrade between the two forms described by Perkins. It appears probable to me that this species may be a geographical subspecies of *A. fulvescens* of Maui, but additional specimens are needed for careful study.


   Kauai: 3500 ft.; Kokee; Kaholuamanu; Kalalau; Waimea, 4000 ft.

   Maui: Haleakala, 5000 ft.; Olinda 4200 ft.; northwest side Haleakala, 6000 ft.; Iao Valley; Ukulele Pipe Line, Haleakala.

24. *Anomalochrysa sylvicola* Perkins: op. cit., p. 48, pl. 3, fig. 2.
   Kauai: Waimea, 4000 ft.
   The female type is in Bishop Museum.

Kauai: Waimea, 4000 ft.; Waialeale; Alakai Swamp; Kalalau; Halemanu.

This species is closely allied to *A. montana*, but the male genitalia are different. The ventral lobe projects well beyond the lateral lobes which have numerous stiff bristles in addition to fine hair.

26. **Anomalocharysa zoë** Perkins: *op. cit.*, p. 56.


Hawaii: Hilo, 1500 ft.; Kau, 1500 ft.; near Hilo, 2000 ft.

**KEYS TO THE SPECIES OF ANOMALOCYRSA**

Hereafter are given six keys to Anomalocharysa: 1, a general key to the species; 2, key to the Kauai species; 3, key to the Oahu species; 4, key to the Molokai species; 5, key to the Maui species; 6, key to the Hawaii species.

**I. GENERAL KEY TO THE SPECIES OF ANOMALOCYRSA**

Note: I have not seen *A. molokaiensis* Perkins nor *A. nana* Perkins and they are not included in this key. *A. molokaiensis* is allied to *A. princeps* and the type has an expanse of 43 mm.; *A. nana* has only 19 antepetrostigmatic cells and is 23 mm. in expanse. Both species were found on Molokai, and are separated in the key to the Molokai species.

1. Fore wings with the dividing vein of the third cubital cell normally joining the distal side of the cell at a distance from its junction with M, and not M, so that the proximal part of the cell has four sides instead of three; the third cross vein from Cu₁ beyond the origin of Cu₂ bifid; a large species, 33-43 mm.; Hawaii

   A. princeps Perkins

   Without some or any of these characters .................................................. 2

   2(1). Fore wings with the posterior side of the third cubital cell very long, as long or longer than the posterior (cubital) side of the second cell .......................................................... A. gayi Perkins

   Fore wings with the posterior side of the third cubital cell shorter than the second, although elongated in some species ............................................. 3

   3(2). Fore wings with the dividing vein of the third cubital cell joining the distal side of the cell at M, or joining M with the distal side in a distinct swelling of M, and in many examples with the second cross vein from Cu₁ conspicuously swollen where it joins Cu₂ ........................... 4

   Fore wings with the dividing vein of the third cubital cell not joining the distal side of the cell at M, but joining M normally at a distance from the distal side of the cell (occasionally, e.g., in *longipennis*, joining M close to the distal side, but without a distinct swelling of M) ................................................. 7

   4(3). Third cross vein from Cu₁ beyond the origin of Cu₂ joining Cu₂ far from its apex; Oahu .......................................................... A. cognata Perkins

   Third cross vein from Cu₁ joining Cu₂ very close to its apex or joining the wing margin close to Cu₂ .................................................. 5

   5(4). Wings strongly fulvescent, especially the anterior pair which are often mottled with darker spots and areas; the veins always strongly colored; Maui .......................................................... A. fulvescens Perkins
Wings not strongly fulvescent, variable in color, hyaline, whitish, brownish, or spotted

6(5). Fore wings subopaque or opaque, the cells with much coloring, whitish or brownish and maculate, with numerous cross veins in the Rs–M field so that there are as many as six to nine rows of cells in the gradate series; hind wings with four or five rows of gradate cells

A. rhododora Perkins

Fore wings hyaline or almost so, the membrane not extensively colored; fore wings with four rows of cells in the gradate series, hind wings with three

A. Zoe Perkins

7(3). Fore wings with the third cross vein from Cu, beyond the origin of Cu, joining the wing margin at a distance from Cu, usually the distance between the apex of this cross vein and Cu, about equal to that between the third cross vein, never joining the margin very close to Cu

Fore wings with the third cross vein from Cu, either joining Cu, before its apex, or joining it or almost joining it at the wing margin, but never distant separated from it at the wing margin, always closer to Cu than to the fourth cross vein from Cu

A. Longipennis Perkins

8(7). Fore wings with the distal side of the third cubital cell conspicuously oblique and fully one third longer than the dividing vein of the cell

Fore wings with the distal side of the third cubital cell only moderately oblique and at most only one fourth longer than the dividing vein of the cell

11(8). Fore wings with the cell between 3A and the wing margin greatly narrowed or almost closed by a swelling of the wing margin near the branch from 2A; Hawaii

A. Longipennis Perkins

Fore wings with the cell between 3A and the wing margin wide and not at all narrowed near the branch from 2A by a swelling of the wing margin

10(9). Molokai species; fore wing veins not spotted, but sometimes with some spots in the cells

A. Zoe Perkins

Hawaii species; fore wings with a "few small black spots on the basal portion" on the veins

A. Paurostica Perkins

11(8). Hairs on the dorsum of the abdomen of the male coarse, dense, long, conspicuously erect and directed anteriorly; first series of cells behind Rs in both wings of both sexes not conspicuously high and narrow as compared to those between R and Rs

A. Hepatica McLachlan

Hairs on the dorsum of the abdomen of the male fine, not very long, usually comparatively sparse, mostly directed caudad; first series of cells behind Rs in both wings of both sexes conspicuously high and narrow as compared to the cells between R and Rs, usually three or four times as high as wide

12(11). Fore wing with the cell formed between 3A and the wing margin entirely open throughout its length, the wing margin not so thickened near to where the branch of 2A joins 3A as to close the cell

A. MacLachlani Blackburn

Fore wing with the cell between 3A and the wing margin not entirely open, but closed or almost closed by the arcuation of the hind margin at just before half the length of 3A from its base and again at a distinct swelling of the margin just before the point where the branch of 2A joins 3A; Kauai only

A. Simillima Perkins

13(7). Fore wings with only three rows of cells between Rs and M

14(13). Hind wings with only two rows of cells between Rs and M

15(14). The posterior series of cells between Rs and M in the fore wings con-
sisting of only four or five cells; the gradate nerves extending the line of M in fore wings assuming a conspicuous zigzag course beyond the first two or three basal cells of the posterior series of gradate cells; abdominal hairs, especially below, long and conspicuous; body often with considerable red coloration.

_A. haematura_ Perkins

The posterior series of cells between Rs and M in fore wings consisting of more than five cells; the gradate nerves extending the line of M in the fore wings not assuming a strongly zigzag course after the first few cells of the posterior series of gradate cells; body usually yellowish or brownish and without conspicuous reddish coloration; costal margin of the fore wings of the male conspicuously lobed beyond the middle. 

16(14). Fore wings with the third cross vein from Cu4 beyond the origin of Cu5 joining the wing margin close to Cu5 but not joining Cu5 distinctly before its apex; fore wings normally conspicuously suffused with brown in the female and the veins very bold; Hawaii. (Note: Rarely an abnormal specimen of _A. viridis_ Perkins from Kauai will run to here, but it may be distinguished by its small size and paler, greenish color) .................. _A. rhaphidioides_ Perkins

17(16). Fore wings with the third cross vein from Cu4 obviously joining Cu5 at a distance from the wing margin .................. 17

18(17). Anterior wing membrane whitish, with all the cells distinctly infuscate along the veins; Oahu .................. _A. cognata_ Perkins

Anterior wing membrane entirely hyaline, not whitish nor infuscated along the veins .......................... 18

19(18). Hair on abdomen conspicuously coarse, stiff, mostly dark, long; body usually with considerably red coloration. .. _A. haematura_ Perkins

Hair on abdominal tergites short and comparatively sparse or moderately long and fine, usually pale, never coarse and stiff .... 20

20(19). Kauai species .......................... _A. viridis_ Perkins

Hawaii species .......................... _A. montana_ Blackburn

21(13). Fore wings with the third cross vein from Cu4 beyond the origin of Cu5 joining the wing margin close to the apex of Cu5, but not joining Cu5 distinctly before its apex. ........ 22

Fore wings with the third cross vein from Cu4 obviously joining Cu5 before its apex .......................... 23

22(21). Hawaii species; wing veins bold, dark colored; expanse 35–36 mm. .......................... _A. reticulata_ Perkins

Kauai species; wing veins pale, greenish; expanse 28–32 mm. .......................... _A. viridis_ Perkins

23(21). Hind wings with four series of cells at least in some places between Rs and M .................. 24

Hind wing with at most three series of cells between Rs and M .......................... 27

24(23). Fore wings with the cells distinctly infuscate along the veins; Hawaii .......................... _A. peles_ Perkins

Fore wings not infuscate along the veins .......................... 25

25(24). Expanse 35–37 mm.; fore wings with 29–32 antepterostigmatic cells between C and Sc; without a dark spot in the cell between 3A and the wing margin; Kauai .......................... _A. stivicola_ Perkins

Expanse 26–32 mm.; fore wings usually with not more than 25 antepterostigmatic cells; with or without a dark spot in the cell between 3A and the wing margin .......................... 26

26(25). Fore wings with a dark macula near the apex of the cell between 3A
and the wing margin; dorsal abdominal hair of the male coarse, dark, erect or directed anteriorly.  A. frater Perkins
Fore wings without a dark macula in the cell between 3A and the wing margin; dorsal abdominal hair of the male fine, mostly pale, directed caudad.  A. viridis Perkins

27(23). Fore wings with the cells faintly infuscate along the gradate nerves; Hawaii.  A. debilis Perkins
Fore wings without infuscation along the gradate veins, the cells entirely hyaline.  A. viridis Perkins

28(27). Abdominal tergites of the male with coarse, anteriorly inclined, usually dark hair; apices of the wings angulate.  A. frater Perkins
Abdominal tergites of the male with fine, posteriorly directed hairs; apices of the wings angulate or rounded.  A. soror Perkins

29(28). Fore wings more rounded than angulate at their apices, not distinctly angulate the apical side of the third cubital cell usually but not always forming nearly a right angle with Cu1.  A. viridis Perkins
Fore wings distinctly angulate at their apices, the apical side of the third cubital cell always distinctly oblique and forming less than a right angle with Cu1; Kauai.  A. viridis Perkins

II. KEY TO THE ANOMALOCHRYSA OF KAUAI

1. Fore wings with the posterior (cubital) side of the third cubital cell as long or longer than the posterior side of the second cell.
   A. gayi Perkins
Fore wings with the posterior side of the third cubital cell obviously shorter than the posterior side of the second cell.  A. rufescens McLachlan

2(1). Hind wings with only two rows of cells between Rs and M; costal margin of the fore wings of the male conspicuously lobed beyond the middle.  A. debilis Perkins
Hind wings with three or more rows of cells between Rs and M.  A. simillima Perkins

3(2). Fore wings with the third cross vein from Cu1 beyond the origin of Cu1 not joining Cu2 but reaching the wing margin at a distance from the apex of Cu2; the cell between 3A and the wing margin closed or nearly closed by a distinct swelling of the wing margin near the branch from 2A.  A. sylvicola Perkins
Fore wings with the third cross vein from Cu1 not reaching the wing margin but joining Cu2 or joining the wing margin very close to the apex of Cu2; the cell between 3A and the wing margin not closed by a swelling of the wing margin.  A. viridis Perkins

4(3). Expanse 35–37 mm.; fore wings with 29–30 antepterostigmatic cells between C and Sc.  A. simillima Perkins
Expanse 28–32 mm.; fore wings usually without more than 25 antepterostigmatic cells.  A. viridis Perkins

III. KEY TO THE ANOMALOCHRYSA OF OAHU

1. Hind wings with at most two series of cells between Rs and M.  A. haematura Perkins
Hind wings with at least three series of cells between Rs and M.  A. sylvicola Perkins

2(1). The posterior series of cells between Rs and M in fore wings consisting of only four or five cells; the gradate nerves extending the line of M in the fore wings assuming a conspicuous zigzag course beyond the first two or three basal cells of the posterior series of cells between Rs and M; abdominal hairs, especially below, long and conspicuous; body often with considerable red coloration.  A. haematura Perkins
The posterior series of cells between Rs and M in fore wings consisting of more than five cells; the gradate nerves extending the line of M in the fore wings not assuming a strongly zigzag course after
the first few basal cells in the posterior series of cells between Rs and M; body usually yellowish or brownish without conspicuous reddish coloration; costal margin of fore wings of male conspicuously lobed beyond the middle. A. rufescens McLachlan 3(2). Fore wings with all cells infuscate along their veins; the dividing vein of the third cubital cell usually joining M at or near to the distal side of the cell so that the distal part of the cell often has but four sides. A. cognata Perkins Fore wings without distinct infuscation along the veins; at most faintly infuscate along the gradate veins only in A. viridis; the distal part of the third cubital cell always with five sides. A. debilis Perkins 4(3). Fore wings with the third cross vein given off from the lower side of CuU beyond the origin of CuU not reaching the wing margin, but joining CuU, the cells faintly infuscate along the gradate veins. A. angulicosta Perkins Fore wings with the third cross vein from CuU reaching the wing margin and not joining CuU. A. hepatica McLachlan 5(4). Fore wings with the dividing vein of the third cubital cell either joining M at the base of the distal side of the cells or the distal side conspicuously oblique, much longer than the dividing nerve, or both characters present. A. zoe Perkins Fore wings with the third cubital cell not so formed. A. maclachlani Blackburn 6(5). Hairs on the abdominal tergites of the male coarse, dense, long, conspicuously erect, directed cephalad, usually dark colored; first series of cells behind Rs in both wings of both sexes not unusually high and narrow. A. molokaiensis Perkins Hairs on the abdominal tergites of the male fine, not long, pale mostly directed caudad; first series of cells behind Rs in both wings of both sexes conspicuously high and narrow compared to those between R and Rs. A. nana Perkins

IV. KEY TO THE ANOMALOCHRYSA OF MOLOKAI

I have not seen the first two species listed.

1. Posterior wings with more than three rows of cells between Rs and M
   A. molokaiensis Perkins Posterior wings with only three rows of cells between Rs and M. 2
2(1). Fore wings with only about 19” antepterostigmatic cells; expanse 23 mm. A. nana Perkins Fore wings with more than 25 antepterostigmatic cells; expanse more than 30 mm. 3
3(2). Fore wings with the third cross vein given off from the lower side of CuU beyond the origin of CuU joining CuU, the fourth cubital cell with its anterior and posterior sides subequal in length. A. angulicosta Perkins Fore wings with the third cross vein from CuU joining the posterior wing margin; the fourth cubital cell obviously narrower posteriorly. A. zoe Perkins

V. KEY TO THE ANOMALOCHRYSA OF MAUI

1. Fore wings with the dividing vein of the third cubital cell apparently joining the base of the distal side of the cell in a swelling of M; fore wings, especially, conspicuously brownish, often maculate. A. fulvescens Perkins Fore wings with the dividing vein of the third cubital cell distant from the base of the distal side of the cell; wings not so colored. A. fulvescens Perkins 2
2(1). Fore wings with the third cross vein given off from the lower side of
Cu₂ beyond the origin of Cu₃ joining Cu₄ .......................... 3
Fore wings with the third cross vein from Cu₁, not joining Cu₂ but reaching the wing margin ........................................ 4
3(2). Fore wings with the cells faintly infuscate along the gradate veins
   A. debilis Perkins
   Fore wings without infuscation along the gradate veins, the cells entirely hyaline ................................. A. soror Perkins
4(2). Hind wings with the first series of cells behind Rs high and narrow, obviously much higher and narrower than those between R and Rs, often four times as high as wide; hairs on the abdominal tergites of the male fine, not long, pale, mostly directed caudad
   A. maclachlani Blackburn
   Hind wings with the first series of cells behind Rs not conspicuously high and narrow but rather similar in shape to those between R and Rs, although mostly higher than those cells, but not usually more than twice as high as wide, never approaching four times as high as wide; hair on the abdominal tergites of the male coarse, dense, long, conspicuously erect, directed forward, usually dark in color
   A. hepatica McLachlan

VI. KEY TO THE ANOMALOCHRYSA OF HAWAII

1. Fore wings with only three series of cells between Rs and M ...... 2
   Fore wings with more than three series of cells between Rs and M . 6
2(1). Fore wings with the distal side of the third cubital cell greatly elongated so that the posterior (cubital) side of that cell is as long or longer than the posterior side of the second cell ... A. gayi Perkins
   Fore wings with the third cell not so formed .......................... 3
3(2). Fore wings with the third cross vein from Cu₁ beyond the origin of Cu₂, reaching the wing margin close to the apex of Cu₂, but not joining Cu₂; fore wings normally conspicuously suffused with brown in the female ................................. A. raphidioides Perkins
   Fore wings with the third cross vein from Cu₁ beyond the origin of Cu₂ joining Cu₂ before its apex; fore wings not conspicuously colored ........................................ 4
4(3). Fore wings with not more than 20 antepterostigmatic cells between C and Sc ........................................ A. ornatipennis Blackburn
   Fore wings with more than 20, usually about 25, antepterostigmatic cells between C and Sc ........................................ 5
5(4). Fore wings with the third cross vein from Cu₁ beyond the origin of Cu₂ close to its apex ................................. A. frater Perkins
   Fore wings with the third cross vein from Cu₁ joining Cu₂ at a distance from the apex, not much beyond the middle of the segment of Cu₂ beyond the second cross vein from Cu₁
   A. montana Blackburn
6(1). Fore wings with the third cross vein from Cu₁ beyond the origin of Cu₂ not joining Cu₃ but reaching the wing margin at a distance from Cu₃, as close to the fourth cross vein as to the third ................................ 7
   Fore wings with the third cross vein from Cu₁ either joining Cu₃, and not reaching the wing margin, or reaching the margin joining to Cu₃, or very close to Cu₃, never distantly separated from the apex of Cu₃ ........................................ 11
7(6). Hind wings with only three series of cells between Rs and M ...... 8
   Hind wings with four series of cells between Rs and M ............. 10
8(7). Fore wings with the distal side of the third cubital cell at most very slightly longer than the dividing nerve of the cell
   A. hepatica McLachlan
   Fore wings with the distal side of the third cubital cell very oblique,
about one third longer than the dividing nerve of the cell .............. 9

9(8). Fore wings with the cell between 3A and the wing margin greatly
narrowed or almost closed by a swelling of the wing margin near
the branch of 2A .......................... A. longipennis Perkins
Fore wings with the cell between 3A and the wing margin wide and
not at all narrowed near the branch from 2A by a swelling of the
wing margin ................................... A. paurostica Perkins

10(7). Hind wings with the first series of cells behind Rs high and narrow,
obviously much higher and narrower than those between R and Rs,
often four times as high as broad; hair on the abdominal tergites of
the male fine, usually pale and comparatively sparse, mostly directed
caudad ........................................ A. maclachlani Blackburn
Hind wings with the first series of cells behind Rs not conspicuously
high and narrow, but rather similar in shape to those between R
and Rs, although mostly higher than those cells, but usually not
more than twice as high as wide, never approaching four times as
high as wide; hairs on the abdominal tergites of the male coarse,
dense, long, mostly dark, conspicuously erect and directed forward
A. hepatica McLachlan

11(6). Fore wings with the dividing nerve of the third cubital cell normally
joining the distal side of the cell at a distance from M; the third
cross vein from Cu, beyond the origin of Cu₂ bifid; a large species,
33-43 mm. in expanse .......................... A. princeps Perkins
Fore wings with the dividing nerve of the third cubital cell joining M,
and not the distal side of the cell, at the base or at a distance from
the base of the distal side of the cell; the third cross vein from Cu,
not bifid ........................................ 12

12(11). Fore wings with the dividing nerve of the third cubital cell joining M
at the base of the distal side of the third cell so that the cell has
only three or four sides; fore wings whitish, brownish or maculate,
with numerous cross veins in the Rs-M field so that there are as
many as six to nine rows of cells in the gradate series
A. rhododora Perkins

13(12). Hind wings with four series of cells between Rs and M; fore wings
with the cells narrowly infuscate along the veins .... A. peles Perkins
Hind wings with only three series of cells between Rs and M; fore
wings either entirely hyaline or only infuscate along the gradate
nerves ......................................... 15

14(13). Hind wings with four series of cells between Rs and M; fore wings
with the cells narrowly infuscate along the veins .... A. peles Perkins
Hind wings with only three series of cells between Rs and M; fore
wings either entirely hyaline or only infuscate along the gradate
nerves ......................................... 15

15(14). Fore wings with the third cross vein from Cu₃ joining the wing mar-
gin close to Cu₃ but not joining Cu₂; expanse 35-36 mm.
A. reticulata Perkins
Fore wings with the third cross vein from Cu₃ joining Cu₂ before its
apex; expanse 24-32 mm. .......................... 16

16(15). Fore wings with the cells faintly infuscate along the gradate nerves;
dorsal abdominal hair of the male pale, directed caudad
A. debilis Perkins
Fore wings without any infuscation along the gradate nerves; dorsal
abdominal hair of the male dark, anteriorly inclined
A. frater Perkins
HEMEROBIIDAE

My rather brief studies of Oceanic Hemerobiidae have convinced me that many of the genera in the family are apparently founded on poor characters. Some species have so much variation in the wing veins that various individuals could be placed in two or more genera. In fact, there may be enough difference between the right and left wings to place a specimen in one genus or another, depending upon which side of the individual is examined. It appears to me that the endemic Hawaiian Hemerobiidae are polyphyletic. However, there is much variation and many connecting forms among the species and much careful study must be done before they can be split up into different genera.

Williams (The Insects and Other Invertebrates of Hawaiian Sugar Cane Fields, pp. 128-130, 1931) gives some good notes on the biology of several species.

KEY TO THE GENERA OF HEMEROBIIDAE FOUND IN HAWAII

1. Hind wings fully developed .......................... 2
   Hind wings atrophied and minute or absent; flightless species with coriaceous fore wings .................. 5

2(1). Fore wings with a recurrent vein given off from near the base of the subcosta in the costal area .............. 3
   Fore wings without a subbasal recurrent vein in the costal area .... 4

3(2). Fore wings with only two radial sectors, the cell formed by the recurrent vein in the costal area three times as long as high; prothorax narrower than the head; antennae in our species conspicuously bicolored, the basal third or more mostly black
   Sympherobius Banks
   Fore wings with three radial sectors, the cell formed by the recurrent vein in the costal area only twice as long as high; prothorax broader than the head; antennae in our species entirely yellowish
   Nesobiella Kimmins

4(2). Fore wing with medius closely approaching CuU, not separated from CuU by much more than the diameter of the vein near to where M branches; hind wings with the distal branch of 1A with only a few small simple marginal branches near the apex, but without a distinct fork; apices of fore wings always rounded; one common, pale brown species .............................................. Eumicromus Nakahara
   Fore wing with medius usually, but not always, well separated from CuU, usually separated by almost twice or more than twice the diameter of a vein where it most closely approaches CuU; hind wings usually with the distal branch of 1A with a distinct fork that arises well before the apex of the distal branch, in some species from near the middle of the distal branch, and which usually has some small marginal branches; fore wings either distally rounded or concave, often conspicuously angular ..................... Nesomicromus Perkins

5(1). Hind wings present, but reduced to small or minute, fleshy flaps; antennae longer than a fore wing ........... Pseudopsectra Perkins
   Hind wings absent; antennae shorter than a fore wing .......... Nesothauma Perkins

Genus Sympherobius Banks

We have one introduced representative of this genus in Hawaii; it is:

This rather small (expanse about 10 mm.) brown lace wing can easily be recognized. It might be confused with Nesobiella hospes (Perkins) because of the presence of a recurrent vein in the basal costal area, but, in addition to the generic characters mentioned in the key, this species differs from our Nesobiella in having the antennae conspicuously bicolored (the basal third or more is mostly black); the cell formed by the recurrent vein in the costal area is three times as long as high and the head is broader than the prothorax.

This species was described from Arizona and was introduced to Honolulu by Rust in 1929. I have seen specimens from Oahu only. Swezey, in 198^, found what he considered to be the larvae of this species feeding on *Pseudococcus longispinus* (Targ.). It was taken in some numbers by W. C. Look in fields of potatoes at Poamoho, Oahu, in December, 1939. Essig (1929) records the species from California, Nevada, Arizona, and New Mexico where it feeds upon mealybugs.

**Genus Nesobiella Kimmins**


This is a monotypic genus; its genotype is:

*Nesobiella hospes* (Perkins) Kimmins.

*Megalomus hospes* Perkins: Fauna Haw. 2(2): 36, pl. 4, figs. 1, 2, 16, 16a, 1899.


This species is found on all of the main islands, usually in the mountains. Perkins and Kimmins give good figures that will enable the species to be easily identified.

Although this species has been found only in Hawaii, Perkins thought that it would ultimately be found to be introduced. Perkins (Fauna Haw. Introduction, p. clxxi) says "It flies at dusk and sometimes is attracted by lights in the nighttime, hiding by day amongst dead leaves attached to trees, and amongst dead fern fronds. When beaten from these it feigns death like others of the group."

**Genus Eumicromus Nakahara**


*Eumicromus navigatorum* (Brauer) Kimmins.


Archaeomicromus navigatorum (Brauer) Esben-Petersen: Insects of Samoa 7(3): 93, 1928.


This species was introduced from Queensland, Australia, by F. X. Williams and released at Hilo, Hawaii in 1920. It was reported established and feeding on aphids in 1921. It can be distinguished from most of the Nesomicromus whose fore wings are rounded at their apices because of its pale brown coloration. I have seen specimens from all of the main islands except Lanai, but it probably occurs there. This species is widespread from eastern Australia to the New Hebrides, through Fiji and into Samoa.

Genus Nesomicromus Perkins


I have, unfortunately, seen authentically named specimens of only about one half of the described species of this Hawaiian genus. It is, therefore, impossible for me to present keys to the species here, but I hope to prepare identification tables when future conditions render such an undertaking possible. Many of the species are known from unique types.

The holotypes of the species described by Perkins in his "Supplement to the Neuroptera," Fauna Haw. 2(6): 691-696, 1910, N. angularis, N. phaeostictus and N. ombrias are in Bishop Museum; the other holotypes are in the British Museum.

Prof. Banks has called my attention to the fact that, because medius in the fore wing of Nesomicromus minimus Perkins forks opposite to the second cross vein between Cu1 and Cu2 instead of before that cross vein, the species should be transferred to the oriental genus Nenus Navas (Mem. Ac. Barcelona (3)10(9): 67, 1912). This character appears to be satisfactory for separating N. minimus from most of the species of Nesomicromus I have examined, but it cannot be used to generically separate N. minimus from Eumicromus navigatorum. I have examined a large series of Eumicromus navigatorum and have found that there is much variation to the point of forking of medius in the fore wing. On some specimens medius forks far behind the second cross vein between Cu1 and Cu2, on others it forks near or opposite that cross vein, and on other specimens it forks beyond the cross vein.

Segregation of the species of Nesomicromus into groups must be based upon careful study of series of specimens and an examination of all of the types.

**LIST OF THE SPECIES OF NESOMICROMUS**

   Molokai, 4500 ft.
2. *Nesomicromus angustipennis* Perkins: Fauna Haw. 2(2): 38, pl. 4, fig. 5; 1899.
   Kauai: Waimea, 4000 ft.

   Maui: Haleakala, 5000 ft.

4. *Nesomicromus brunnescens* Perkins: *op. cit.*, p. 43, pl. 4, fig. 9.
   Molokai: 5000–6000 ft.
   Lanai: Halepaakai, 3000 ft.
   Maui: Haleakala, 5000 ft.

   Kauai: Waimea, 4000 ft.; Halemanu, 4000 ft.

   Molokai.

   Kauai: Makaweli, over 2000 ft.
   Oahu: Waianae Mts., 1500 ft.

   Oahu: Waianae Mts., 3000 ft.

   Maui: Haleakala, 4000 ft.

    Maui: Haleakala, 5000 ft.

11. *Nesomicromus latipennis* Perkins: *op. cit.*, p. 38, pl. 4, fig. 4.
    Hawaii: Kona, 3500 ft.

    Hawaii: Kilauea.

13. *Nesomicromus minimus* Perkins: *op. cit.*, p. 45, pl. 4, fig. 11.
    Hawaii: Kona, 4000 ft.; Kilauea; Kau, 4000 ft.

    Oahu: Waianae Mts., 3000 ft.

    Molokai: above 4000 ft.

    Oahu: Koolau Mts., 1500 ft., near Honolulu.

    Hawaii: Kilauea, 4000 ft.

    Oahu: Koolau Mts., 1500 ft.

    Hawaii: Kilauea; Kau, 4000 ft.
   Maui: Haleakala, 5000 ft.

   Oahu: Mt. Tantalus.
   Molokai: 3000 ft.
   Maui: Haleakala, 5000 ft.
   Hawaii: Kau, 4000 ft.; Kilauea.

   Widespread and common on all of the main islands; genotype.

**Genus Pseudopsectra** Perkins


This genus is not only one of the most aberrant genera of Hawaiian Insecta, but it is one of the most unusual genera of the Neuroptera. Dr. Perkins erected the genus to receive the rare *Pseudopsectra lobipennis* from Mt. Haleakala, Maui. Until now, we have considered the genus to be a peculiar development of Maui only, but Mr. O. H. Swezey found another in the highlands of Kauai in 1921, and Dr. R. L. Usinger found a distinct new species in the saddle between the great mountains of Mauna Kea and Mauna Loa on the island of Hawaii in 1935. I consider these discoveries among the most important made since Dr. Perkins' extensive work. We must now recognize the fact that the Mauian *P. lobipennis* is not a unique, localized, mutant form isolated on Haleakala, but that there are more species that share its peculiar characters. Messrs. Swezey and Williams tell me that Bridwell, in their company, found a specimen evidently belonging to the genus on Mt. Kaala, Oahu, many years ago, but that he lost the vial containing the specimen while descending the precipitous slopes of the mountain, and that the specimen never reached the laboratory.

These data recall the history of the flightless dolichopodid genus *Emperoptera* which was erected by Grimshaw in 1902 for an Oahuan fly and remained monotypic until 1938 when a second species was described from Maui (see these "Proceedings" 10(1): 145, 1938).

The genus *Pseudopsectra* is an offshoot of the extensively developed Hawaiian genus *Nesomicromus*. It differs from *Nesomicromus* because it is flightless and has the hind wings reduced to minute, fleshy lobes and the fore wings much reduced in size, coriaceous and convex or angulate. In the original generic description Perkins said "Nervuration without hairs," but this statement must now be amended, for the new species from Hawaii has the veins all densely set with long hairs. On the genotype the veins are set with minute setae that cannot easily be seen with a hand lens but are discernible under the microscope. The species of *Nesomicromus* vary as to the hairyness of the wings, on some the hairs are conspicuous, but on others they are minute and hardly discernible.
The discovery of the two new species of *Pseudopsectra* greatly reduces the morphological gap between that genus and *Nesothauma*. I believe that the two genera have been similarly derived, and if it were not for the short antennae of *Nesothauma*, I would merge them. The hind wings on the genotype of *Pseudopsectra* are small cordate lobes, those of the new species from Kauai are much smaller and minute, and on the genotype of *Nesothauma* there are no traces of hind wings. We might expect a similar variation and gradation in the length of the antennae, but on all three species now assigned to *Pseudopsectra* the antennae are distinctly longer than the fore wings, but on *Nesothauma* the antennae are shorter than the fore wings. The fore wings of the new species are intermediate in texture and venation between those of the genotypes of the two genera; the wings of the Kauai species are closer to those of *Pseudopsectra*; and the Kauai species resemble those of *Nesothauma*. The new Kauai species has the fore wings peculiarly transversely angulate in the basal costal area as does *Nesothauma haleakalae*. The crown of the head, pronotum and mesonotum of the Kauai species are set with large conspicuous tubercles, and on *Nesothauma haleakalae* these areas are minutely tuberculate. The Maui and Hawaii species of *Pseudopsectra* have those areas hairy but not tuberculate.

The species of *Nesomicromus* can be divided into two groups according to the shape of the wings. In one group the species have the apices of the fore wings rounded; in the other group they are concave at least at the apex, and some of those with the concave apices also have the posterior margins sinuous. It appears to me that the *Pseudopsectra* from Maui and Hawaii and *Nesothauma* have all been derived from species of *Nesomicromus* falling in the group with apically rounded wings and that the Kauai species has been derived from an angulate winged species resembling *Nesomicromus paradoxus* Perkins.

I take pleasure in dedicating the following species to their diligent collectors and my close friends Mr. O. H. Swezey and Dr. R. L. Usinger.

**Pseudopsectra usingeri**, new species (fig. 1)

*Male.*—Brown, fuscous to piceous; antennae brownish testaceous at the base but becoming darker distally; legs testaceous with the fore and mid tibiae slightly infuscated; head with the face brown, the crown brown in the middle to the vertex; but piceous on either side near the pronotum; pronotum predominantly piceous, almost black and with a yellowish brown macula or maculae on either side; mesonotum similarly colored; abdomen basically piceous but with about the apical half of the dorsum brownish yellow; wings basically brownish yellow but with numerous, variable dark markings mostly on the veins but also some on the membrane, the most conspicuous marks, under magnification, consisting of a series of dark maculae subequally spaced around the entire wing margin, those on the posterior margin most conspicuous.

*Head* with the face bare, smooth and conspicuously shiny; crown dull, coarsely, densely punctate, coarsely reticulate, with numerous long hairs;
terminal segment of the maxillary palpi flattened, lanceolate-acuminate; the
distance across the eyes one-fourth greater than the distance from the base
of the pronotum to the apex of the crown. Thorax with the pronotum fully
one-third broader than long (3.4:2.2), coarsely, densely, confusedly punctate,
coarsely reticulate and bearing numerous long, erect hairs; mesonotum one-
sixth broader than long, sculpture and clothing similar to that of the pro-
notum; metanotum coarsely reticulate, bare. Abdomen coarsely reticulate,
clothed with long, erect conspicuous hair, especially toward the apex; termi-
nalia with the lateral appendices nipple-like in lateral view, deeply concave
on the inner side, with numerous small tubercles bearing long hairs, the apical

Fig. 1. Pseudopsectra usingeri Zimmerman, new species; holotype. Photo-
graph by W. Twigg-Smith.

hairs longest and tending to form a slender fascicle; the inner, or lower
"spines" erect, capable of extending to the apices of the lateral lobes, not
decussate, lacina-like. Wings with the fore pair two and one-half times as
long as broad; all of the veins and margins closely set with very long, erect,
conspicuous hairs; all of the veins are very heavy and with an excessive num-
ber of similarly developed cross veins that give the wing a coarse, close retic-
ulate pattern, radius with seven sectors; hind wings 0.5 mm. long, 0.5 mm.
wide, subcordate in shape, with an anterior basal tooth-like lobe bearing a
cluster of long hairs (frenulum), with one prominent longitudinal vein that
runs obliquely from near the base of the prominent veins to about the middle
of the hind margin and one cross vein from about the middle of the longitudi-
nal vein to the anterior margin. Expanse: 8.25 mm.
Island of Hawaii, T. H. Holotype male taken one mile north of Humuula, July 30, 1935, and one female paratype from Sophora at Humuula, August 2, 1935; both specimens were collected by Dr. R. L. Usinger and are in Bishop Museum. The paratype was attacked by mold and the right wing and abdomen became detached from the specimen when it was remounted; all of the parts have, however, been preserved on the card holding the specimen.

This species may easily be distinguished from Pseudopsectra lobipennis Perkins because of its densely hairy wings alone. There are numerous other characters that may be used for differentiation, however. The wings on P. usingeri are proportionately narrower than those of P. lobipennis and their venation is greatly complicated by the excessive number of cross veins. On P. lobipennis there are a few cross veins between R and Sc and none between Sc and C, whereas these areas contain numerous cross veins on P. usingeri. Because of the hairs and denseness of the wings, it is much easier to trace the venation of P. usingeri with transmitted light than reflected light. On P. lobipennis the most prominent vein in the hind wing is branched near the apex and the posterior branch continues to the hind margin of the wing; such a branch is evidently lacking on P. usingeri. There are apparent differences in the terminalia, but to accurately discuss them, cleared dissections must be made; the mutilation of the holotype of P. usingeri and one male paratype of P. lobipennis before me is inadvisable.

**Pseudopsectra swezeyi**, new species (fig. 2)

Female.—Brown, fuscous and black; antennae yellowish brown, the basal segment with a dark transverse cloud; head with the face brown with some obscure dark areas, yellowish brown behind the antennae; pronotum yellowish brown, mesonotum with some darker areas, metanotum mostly yellowish brown, the pleurae fuscous; abdomen basically fuscous with the tergites mostly yellowish brown; legs basically yellowish to yellowish brown, all the coxae with a dark transverse cloud, fore and mid femora with a dark, broad median band, fore and mid tibiae with a rather similar mark but which is divided into two bands, hind femora and tibiae without such dark marks; fore wings basically yellow with the veins varying in color from yellow to brown through fuscous to black, the wing margin with yellow, dark brown or black marks alternating.

Head with the front reticulate, sparsely setose, the sutures marked by more polished, slightly elevated lines, the median line most conspicuous, crown protuberant and conspicuously multituberculate; terminal segment of the maxillary palpus about twice as long as the penultimate, flattened, lanceolate-acuminate; the distance across the eyes almost equal to the median length of the pronotum and crown; antennae distinctly longer than the fore wings. Thorax with the pronotum about one-sixth broader than long, set with numerous, long, very conspicuous, sharply pointed, cone-like tubercles, set in three transverse zones, the first zone consisting of a single tubercle on either side of the median line at the base, the second zone containing six or seven tubercles on either side of the median line just behind the middle, this median zone connected to the anterior zone by two tubercles along either side of the median line, the anterior zone consisting of ten or twelve tubercles near the anterior margin, the median line is free from tubercles and appears as a
Fig. 2. *Pseudopsectra swezeyi* Zimmerman, new species; holotype. The lower figure is the left wing. Photographs by W. Twigg-Smith.
rather broad, shallow longitudinal depression; mesonotum with several tubercles on either side of the median line; metanotum not tuberculate. **Abdomen** reticulate but comparatively shiny; with two types of hair, one short and minute, the other long and conspicuous, the long hairs more numerous on the lower side and terminal segment and arising from small tubercles on those areas. **Legs** with the fore and mid femora conspicuously multidenticulate on the lower sides, the hind femora with minute denticles. **Wings** with the fore pair shaped as illustrated, not quite twice as long as wide (9:5), strongly transversely angulate toward the base from the costa to the radius, with microscopical setae only and no hairs; with some conspicuous tubercles near the base of the radius, all of the veins very heavy and the entire wing set with an excessive number of similar developed cross veins, the veins rather difficult to trace and abnormally placed, apparently as follows: Sc inconspicuous, traceable for only a short distance from the base, R continued to near the middle and then curved downward to join Rs (?) beyond the middle, with four superior sectors, Rs (?) with two superior sectors directed with the longitudinal axis that join R in its downward curve, forked just before R joins its upper branch, Cu (?) traceable to the apex; hind wings minute, halter-like, 0.15 mm. long. Expanse about 10 mm.

Island of Kauai, T. H. Holotype female, in Bishop Museum, collected by Mr. O. H. Swezey at Nualolo, September 1, 1921.

This is an aberrant insect. The tuberculate head and thorax are unique, and together with the peculiarly shaped fore wings will enable one to recognize the species at a glance.

The wings are apparently rigidly fixed, because they could not be spread forward; the left wing was removed to expose the side of the body. The angulation of the wings near the base (thus making the costal area fit more or less horizontally over the back) is very similar to that of *Nesothauma haleakalae* Perkins and their texture is like that of that species rather than the genotype of *Pseudopsectra*.

**Genus Nesothauma Perkins**


This genus contains one species on which there are no traces of hind wings. The fore wings are greatly modified.

*Nesothauma haleakalae* Perkins: loc. cit., p. 47, pl. 4, figs. 13, 13a, 13b.

There is considerable variation in the color of the wings of this species, some examples have more black than others, but in most specimens the wings are tessellated. The wings are strongly and conspicuously transversely angulate in the basal fourth and overlap over the abdomen for about one-half of their lengths. It is difficult to trace the veins, because of the heavy texture and supernumerary cross veins. The entire wing has a coarsely reticulate appearance and recalls those of some tingitid bugs. In the natural position, this species greatly resembles a large psychodid fly.

This insect is rare. It has been found only high on the slopes of Mt. Haleakala, Maui. Perkins collected it at 5,000 feet in March 1894 and October 1896.