Revision of the Hawaiian Pemphredoninae (Hymenoptera: Sphecidae)

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The present study is a revision of the Hawaiian species of the sphecid subfamily Pemphredoninae. All the native species of the subfamily are included in the two genera *Deinomimesa* and *Nesomimesa*. Two introduced genera, *Stigmus* and *Passaloecus,* are represented each by a single species. Keys to the subfamilies of Hawaiian Sphecidae are included to facilitate separation of the pemphredonines.

Very little of the biology of Hawaiian pemphredonine wasps is known. Since other pemphredonines visit flowers for their nectar it is believed the Hawaiian species do also, but no host plants have been recorded.

Species of *Nesomimesa* and *Deinomimesa,* insofar as known, are fossorial wasps which make their nests in the ground or in dead plant stems, provisioning their young with paralyzed flies or leafhoppers. The female of *N. antennata* Perkins preys upon several families of Homoptera and one family of Diptera. The host records include: a tipulid fly (Perkins, 1899); a cixiid, *Oliarus* sp. (Williams, 1927); and a flatid, *Siphanta acuta* (Walker), (Williams, 1927). Williams (1927) described the habits of *Nesomimesa hawaiiensis* Perkins and stated that it preyed upon *Perkinsiella saccharicida* Kirkaldy (Delphacidae). He found the nests, each of which consisted of a single burrow which terminated in several cells, in a bank of earth. Timberlake (1920) reported that *Deinomimesa haleakalae* Perkins preyed on mature and immature *Nesophrosyne* sp. (Cicadellidae) and nested in horizontal burrows along banks of trails. Bridwell (1915) observed a female of *N. antennata* nesting in a dead stem of *Erigeron.*

I have examined many specimens during this study, including paratypes of the species described by Perkins which are housed in the Bishop Museum. The female of *Nesomimesa punae* Perkins was not available in the Bishop Museum collection. However, Dr. J. L. Gressitt examined the type specimen of *N. punae* at the British Museum (Nat. Hist.), London, and provided photographs and notes which enabled me to identify a single female of this species in the Hawaiian Sugar Planters' Association collection.

I am indebted to many persons for assistance during the course of study. Special appreciation is extended to Dr. J. Linsley Gressitt, who suggested this problem and to Dr. Larry W. Quate and Mr. J. W. Beardsley, who

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KEY TO THE SUBFAMILIES OF HAWAIIAN SPECIDAE

1. Inner margin of compound eyes deeply emarginate ..... **Trypoxyloninae**
   Inner margin of eyes unemarginate or very shallowly emarginate 2
2. Inner margins of compound eyes widely divergent at vertex ..... **Crabroninae**
   Inner margins of compound eyes straight, concave or convex, but not widely divergent at vertex 3
3. Third submarginal cell narrow, sigmoid shaped ..... **Larrinae**
   Third submarginal cell narrow, broadly truncate, or petiolate; not sigmoid 4
4. Marginal cell broadly truncate at apex ..... **Astatinae**
   Marginal cell rounded or pointed at apex 5
5. Middle tibia with two apical spurs; petiole cylindrical ..... **Sphecinae**
   Middle tibia with a single apical spur; petiole subcylindrical ..... **Pemphredoninae**

The subfamily Pemphredoninae is represented in Hawaii by four genera, two of which have only a single species here. One of these, *Stigmus inordinatus* Fox, was listed by Perkins (1910) on the basis of a single specimen taken in Honolulu. This species has not been reported in Hawaii since, and it seems possible that the specimen may have been misidentified or erroneously labeled. *Passaloecus luzonensis* (Rohwer) from the Philippines was first collected in Hawaii in 1945 by Williams (PROC. HAW. ENT. SOC. 12:480, 1946).

KEY TO THE GENERA OF PEMPHREDONINAE FOUND IN HAWAII.

1. Fore wing with two discoidal cells; one recurrent vein present ..... **Stigmus**
   Fore wing with three discoidal cells; two recurrent veins present 2
2. Third discoidal cell truncate; abdomen subsessile ..... **Passaloecus**
   Third discoidal cell not truncate; abdomen petiolate 3
3. Propodeum with strongly raised lines; petiole generally stout, distinctly carinate. Female with labrum exposed; fore femur in most cases enlarged. Male with anterior margin of clypeus slightly emarginate ..... **Deinomimesa**
   Propodeum smooth or with weakly raised lines; petiole generally elongate and smooth. Female with labrum not exposed; fore femur not swollen. Male with anterior margin of clypeus slightly pointed or rounded ..... **Nesomimesa**

The head structures of the female sex present taxonomic characters useful in separating our endemic species of pemphredonines. The females of *Deinomimesa* may be separated easily by means of the shape of clypeal margin. In *Nesomimesa* the genal spines of the females, when well developed, provide a convenient character for the separation of species; however, these spines are sometimes very poorly developed, particularly in smaller specimens.

The ventral apex of petiole is subject to interspecific variation in both sexes and is valuable in both identification of the species and association of the sexes. In *Nesomimesa* the ventral apex of the petiole is generally smooth, shiny, more or less rounded, and bears a membranous (figs. 12, 13, 14, 16) or semi-membranous (figs. 15, 17) area. The latter is sclerotized at least on the lateral portions. These areas vary in length and width, and are bordered by sclerotized bands which project medially and posteriorly in different shapes and forms. In *Deinomimesa* the ventral apical structures of the petiole are much more well defined than in *Nesomimesa*. The surface of the pre-membranous area of *Deinomimesa* is shiny, generally flat, and of various outlines in the middle. Large punctures and a carina are present in the lateral areas (figs. 19–22). The membranous of semi-membranous areas also vary in length and width as in *Nesomimesa* (figs. 19–22), and the sclerotized bands bordering the membranous areas differ in size and shape.

The structures mentioned above have not been used previously as taxonomic characters but were found useful in separating the Hawaiian pemphredonine wasps.

Genus **Nesomimesa** Perkins

Nesomimesa Perkins, 1899, FAUNA HAWAIIENSIS 1 (1) :8 (Type: *Nesomimesa hawaiiensis* Perkins. Subsequent designation by Pate, 1937).

Medium or small-sized black species; male elongate and female robust. Fore wing 5 - 10 mm. long.

Clypeus densely pilose, short, broad, and elevated at base in female; truncate and slightly raised at middle in male. Mandible long, extending beyond clypeal margin in female; mandible short, partially hidden under clypeus in male. Antennae clavate in female, subclavate in male. A conspicuous, broad, flat spine of variable size present beneath gena in female; sometimes greatly reduced in *N. hawaiiensis, N. antennata,* and *N. nitida.* Second cubital cell of fore wing petiolate or narrow at radius and a little wider below. Second recurrent vein sigmoid, arising from second intercubital vein. Head and thorax with punctures of two different sizes. Fore tarsus testaceous in male and ferrugineus in female; base of hind tarsus armed with stout spines along both sides. Propodeum pubescent to pilose

and with fewer raised lines than *Deinomimesa*. Abdomen smooth and shiny. Petiole 3.6 to 10 times as long as maximum width. Ventral apex of petiole with membranous or semi-membranous area enclosed posteriorly by a medially rounded sclerotized band; followed by a deep rectangular depression which rises apically in a gradual incline. Ventral apex of the petiole triangular-shaped and attached to the second abdominal sternite at the corners; its surface moderately concave. Membranous or semi-membranous area between petiole and sternite of second abdominal segment semi-elliptical in outline, in either a horizontal or a vertical plane. Center of membranous area with a small depression in some species. A sclerotized band with a median projection situated posterior to the membranous area (figs. 12–16). Pygidial area flattened, punctured, with appressed spines, and subcarinate along its edges. Genitalia (figs. 1–6) similar in size except in *N. kauaiensis*.

Key to Species of Nesomimesa

1. Fore wing pitchy black; membranous area with small a depression in middle, bordered by a posteriorly curved band which is weak laterally but becomes wider medially (fig. 16); female with genal spine straight, its apex tapering to a blunt point when not reduced (fig. 26) ..... **sciopteryx**
   Fore wing lighter in color, infuscate to subhyaline; membranous or semi-membranous areas bordered by various sized bands, not as above (figs. 12, 13, 14, 15, 17) 2
2. Ventral apex of petiole with a minutely punctate semi-membranous area sclerotized at least laterally 3
   Ventral apex of petiole with an impunctate entirely membranous area 4
3. Semi-membranous area 4–5 times as long as wide, bordered posteriorly by a heavy medially rounded band (fig. 15); female with genal spines distinctly curved forward and sharply pointed at apex when fully developed (fig. 27) ..... **kauaiensis**
   Semi-membranous area 10 times as long as wide, developed into deep furrow and bordered posteriorly by a large punctured band with a small oval-shaped depression in middle (fig. 17); female unknown ..... **perkinsi**
4. Mesonotum and scutellum dull; membranous area 6–7 times as long as wide, bordered posteriorly by a narrow band which gradually broadens toward middle (fig. 12) ..... **hawaiiensis**
   Mesonotum and scutellum shiny; band otherwise (figs. 13, 14) 5
5. Membranous area bordered posteriorly by large flat crescent-shaped band (fig. 14) ..... **nitida**
   Membranous area with small round depression in middle supported apically by narrow band of medium size (fig. 13) ..... **antennata**

Nesomimesa hawaiiensis Perkins (figs. 1, 12, 23).
Nesomimesa hawaiiensis Perkins, 1899.

Male. Length 6.5 - 10 mm. Fore wing infuscate. Third antennal segment 5.0 - 6.6 times as long as second. A blunt, pyramid-shaped point produced between antennae. Distance between antennae 1.8 - 2.0 times length of second antennal segment. Frontal carina low, broken in places, reaching anterior ocellus.

Groove between metapleural pits shiny and shallow; pits small. Posterior metapleuron pilose. Scutellum somewhat rounded and shiny; postscutellum rugose at base. Tarsal comb of fore leg with approximately 40 separated teeth.

Anterior part of propodeum polished, its lateral areas with minute raised lines curving toward a deep elongate median groove. Petiole 5.0 - 10 times as long as maximum width, rounded above and flattened at sides, with a low carina along each lateral margin; underside of petiole rounded. A small depression at base of second abdominal tergite. Ventral apex of petiole with membranous area in a horizontal plane, 6–7 times as long as wide, bordered apically by a narrow band gradually expanding medially (fig. 12). Apical segment of gonocoxite (fig. 1) 5 times as wide as width of gonostylus; with many medium-sized setae. Gonostylus 10 times as long as broad; inner and outer margins with minute setae. Volsella with minute spines and setae on outer edge.

Female. Length 11 - 13 mm. Similar to male except as follows: Fore wing subhyaline, its apex infuscate. Genal spine 0.10 - 0.13 mm. wide at middle, inner edge twisted through 90 degree angle near the base and carried slightly forward, apical portion of spine rather sharply pointed (fig. 23). Spine sometimes reduced; short and narrow or stubby and triangular-shaped. Third antennal segment 6.8 - 7.0 times as long as second. Edge of preoccipital ridge 0.05 mm. wide.

Groove between metapleural pits shiny and deeply sculptured; pits large. Scutellum flat and somewhat dull.

Anterior part of propodeum bare and shiny, with a faint median longitudinal groove; lateral areas rugulose. Base of propodeum with a few raised lines. Petiole 5 times as long as maximum width; rounded above.

Specimens examined. Paratypes at Bishop Museum: 7 males, 8 females, Kau, Hawaii, 1,200 m. June, Aug., Sept., 1895; 1 male, 1 female, Kona, Hawaii, 950 m., 1,200 m., Aug., 1894, 1896; 9 males, 1 female, Kilauea, Hawaii, June, July, 1906; 1 female Hualalai, Hawaii, 1,200 m., 1892, R.C.L. Perkins.

HAWAII: male, Kaumana, Apr., O. H. Swezey; male, Keanaholu, 1,643 m., Oct., O. H. Swezey and F. X. Williams; 14 males, 14 females, Kilauea, 1,200 m., May, June, July, Aug., Sept., W. M. Giffard, E. H. Bryan, Swezey; 5 males, 5 females, dry forest, July, Giffard; 3 males, female, Glenwood Olaa, 720 m., May, Giffard; 18 males, 15 females; Pa-

hala, Mar., Apr., May, June, Nov., Dec., Williams, Swezey, N. Fujioka; 4 males, Honaunau, July, Giffard; male, Judd Trail, Aug., Swezey; male, Hualalai, 2,000 - 2,200 m. Aug., Williams (BISHOP, HSPA).

This species resembles *N. antennata,* but the genal spine, when fully developed, is 0.10 to 0.13 mm. wide in *hawaiiensis* and 0.16 to 0.23 mm. wide in *antennata.* The apex is more or less directed vertically in *hawaiiensis* rather than being curved away from the body. Female specimens with short spines are difficult to distinguish. In both sexes of *antennata* the apex of the petiole has a wider band (fig. 13) than does *hawaiiensis* (fig. 12). The mesonotum is shiny in *antennata* and rather dull in *hawaiiensis.*

Nesomimesa antennata Perkins (figs. 2, 13, 24).
Nesomimesa antennata Perkins, 1899.

Male. Length 7 - 13 mm. Fore wing infuscate marginally, hyaline toward its base. Third antennal segment 6.0 times as long as second. An acute cone-shaped point between antennae. Distance between antennae 1.8 - 2.0 times length of second antennal segment. Frontal carina low, elongate, nearly reaching anterior ocellus. Scutellum and postscutellum shiny. Tarsal comb of fore leg crescent-shaped with 30 - 32 teeth set close together.

Groove between metapleural pits shiny, deep, and narrowly elongate; pits small; posterior metapleuron pilose.

Anterior part of propodeum dull and bare. Center of propodeum with a deep, wide, sculptured groove; median raised lines paralleling each side of groove. Petiole 5 times as long as maximum width, rounded above, more or less flattened at its sides, and rounded beneath. A small depression at base of second abdominal tergite. Ventral apex of petiole with membranous area in a vertical plane, 8 times as long as wide, bordered apically by narrow band; a small median depression anterior to the band (fig. 13). Apical segment of gonocoxite 3 times as wide gonostylus; with a cluster of minute setae and a few scattered medium-sized setae posteriorly. Gonostylus 7.5 times as long as broad; a few setae present at its apex. Volsella with a row of minute setae at inner edge.

Female. Length 10 mm. Similar to male except as follows: Genal spine when fully developed 0.16 - 0.23 mm. wide at middle; inner edge twisted through 90 degrees and carried slightly forward so that the apical portion is somewhat forward of base. Apex of spine twisted at right angle and not truncate (fig. 24). Spine sometimes reduced, short, and narrow or triangular-shaped. Third antennal segment 6.2 times as long as second. Distance between antennae 2.5 times length of second antennal segment. Edge of preoccipital ridge 0.06 mm. wide.

Groove between metapleural pits shallow, wide, shiny, and sculptured; pits large. Scutellum somewhat rounded and very shiny.

Anterior part of propodeum shiny and without setae. Base of propodeum with a few raised lines; a narrow, elongate, shiny median groove hidden beneath long setae. Petiole 4 times as long as maximum width, rounded above.

Specimens examined. Paratypes at Bishop Museum: 4 females, 4 males, Waianae Mts., Oahu, 600 m., Apr., 1892, R.C.L. Perkins; male Koolau Range, Oahu, 600 m., Oct., 1893; female, 4 males, Kaala Mts., Oahu, 600 m., Mar., 1892; 6 males, Honolulu, Oahu, 600 m., Sept., 1892, R.C.L. Perkins; 9 females, Honolulu Mts., Oahu, 450 m., probably 1892, R.C.L. Perkins.

OAHU: 10 males, 2 females, Kuliouou, Mar., June, Aug., O. H. Swezey, E. H. Bryan; 7 males, 2 females, Palolo Crater, July, Aug., J. F. Illingworth, Swezey; 7 males, Mt. Olympus, Feb., July, Swezey; female, Manoa, Mar., Bryan; 20 males, 22 females, Tantalus, 450 m., 570 m., Jan., Mar., Apr., June, July, Sept., Oct., Perkins, W. M. Giffard, Swezey; 2 males, Nuuanu Mts., 600 m., Mar., Giffard, Bryan; male, Konahuanui, July, Bryan; male, female, Kahauiki, Nov., Dec., Swezey; female (ex. window) Cooke Trail, Mar., June, Swezey; 2 males, female, Pacific Hts., Dec., Swezey; 3 males, Kalihi Ridge, Apr., Bryan; female, Moanalua, Oct., Bryan; 3 males, female, Oahu Mts. (T.H.) Giffard; 2 males, 2 females, Hawaiian Is. (no dates), T. Blackburn; male, 3 females (no dates), Koebele; 4 females, Mt. Kaala, July, Sept., J. C. Bridwell, Swezey; male, Wahiawa, June, Swezey; 3 males, Kaukonahua, June, Bridwell; male, 5 females, Waialua, 570 m. Perkins (BISHOP, HSPA).

The membranous area of *antennata* is in a vertical plane whereas it is in a horizontal plane in *hawaiiensis;* and the central depression is smaller than that of *hawaiiensis.*

Nesomimesa nitida Perkins (figs. 3, 14, 25).

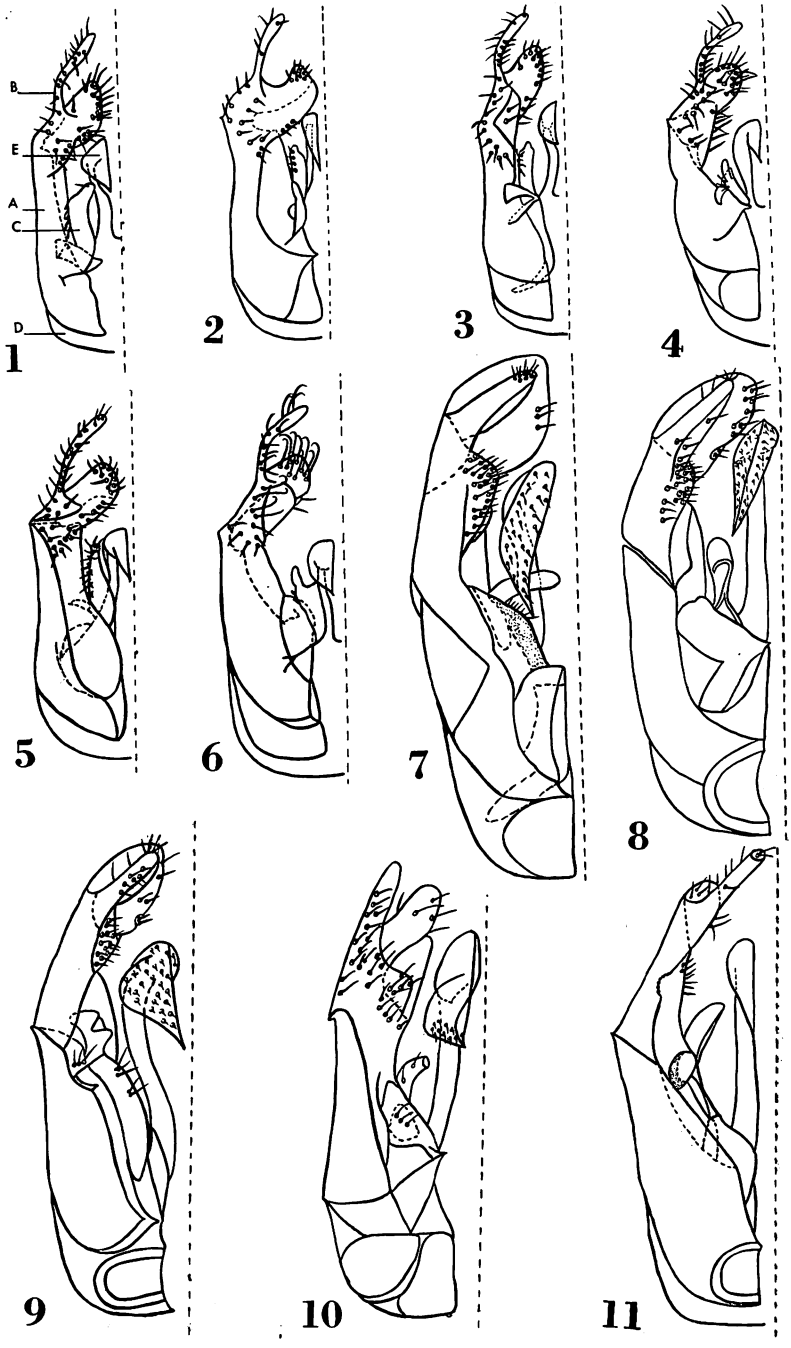
Nesomimesa nitida Perkins 1899.

Male. Length 7 - 10 mm. Fore wing infuscate and slightly violet iridescent. Third antennal segment 6.0 times as long as second. A rather noticeable pyramid-shaped point between antennae. Distance between antennae 2.0 times length of second antennal segment. Frontal carina low and elongate, slightly raised in middle, reaching anterior ocellus.

Groove between metapleural pits shiny, shallow, and shorter than usual length; pits large. Scutellum and postscutellum shiny. Tarsal comb of fore leg with approximately 45–50 teeth closely set together.

FIGS. 1–6.Genitalia of *Nesomimesa.* 1, *N. hawaiiensis*: A, gonocoxite; B, gonostylus; C, volsella; D, gonobase; E, penis; 2, *N. antennata;* 3, *N. nitida;* 4, *N. sciopteryx;* 5, *N. perkinsi;* 6, *N. kauaiensis.*

FIGS. 7–11. Genitalia of *Deinomimesa.* 7, *D. hawaiiensis;* 8, *D. punae;* 9, *D. ferox;* 10, *D. haleakalae;* 11, *D. cognata.*


B
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Anterior part of propodeum polished, its middle with a light longitudinal marking. Propodeum with a deep, V-shaped, elongate, median groove; lateral areas with many prominent raised lines. Petiole 4 times as long as maximum width, rounded above, flattened laterally, and rounded beneath. A small flat area present at base of second abdominal tergite. Ventral apex of petiole with membranous area in a horizontal plane, 6–7 times as long as wide, bordered medially by a thick, flat, crescent-shaped band (fig. 14). Apical segment of gonocoxite 3 times as wide as gonostylus (fig. 3); with many setae at outer margin. Gonostylus 6 times as long as broad; inner margin and base with a row of minute setae. Volsella similar to *antennata*.

Female. Length 10 - 12 mm. Similar to male except as follows: Fore wing entirely subhyaline. Genal spine when fully developed 0.26 - 0.33 mm. wide at middle; inner edge twisted through 90 degrees near base and carried slightly forward; apex of spine twisted at right angle and truncate (fig. 25); spine sometimes reduced. Third antennal segment 6.5 times as long as second. Distance between antennae, 2.5 times length of second segment. Edge of preoccipital ridge 0.06 - 0.07 mm. wide.

Groove between metapleural pits shiny, shallow and V-shaped; anterior metapleural pit larger than posterior. Scutellum flat, highly polished.

Anterior part of propodeum distinctly polished; base of propodeum with a few raised lines and a deep, elongate, median groove. Petiole 4 - 4.5 times as long as maximum width, rounded above.

Specimens examined. Paratypes at Bishop Museum: 3 females, 8 males, Molokai Mts., Molokai, 950 m. May, June, Aug., 1893; 5 males, female, Koele, Lanai, 600 m. Jan., July, 1894; female, West Maui Mts., Iao Valley, May, 1896; female Haleakala, Maui, 1,500 m., Sept., 1896, R. C. L. Perkins.

MAUI: female, Honomanu, June, E. H. Bryan; 9 males, Kula Pipe Line, June, Aug., O. H. Swezey, R. R. Whitten; 2 males, female, Halehaku, June, Bryan; 4 males, Ukulele, July, P. H. Timberlake; 6 males, 6 females, Olinda, June, July, N. L. H. Krauss, Swezey; male, female, Kailua, June, Bryan; male, 2 females, Wailuku, Sept., F. X. Williams; 4 males, female, Iao Valley, May, July, Aug., Williams, Swezey (BISHOP, HSPA).

LANAI: male, Apr., W. M. Giffard; male, Lanaihale, 980 m., June, D. E. Hardy (HSPA).

This species can be separated from *N. antennata* and *N. hawaiiensis* by the elongate frontal carina which is raised in the middle. The genal spine of *nitida,* when well developed, is truncate at the apex rather than pointed as in *antennata* and *hawaiiensis.* Added to this is the fact that in both sexes the membranous area of the ventral apex of the petiole is 6–7 times as long as broad, and is supported by a thick crescent-shaped band protruding in the middle.

Nesomimesa sciopteryx Perkins (figs. 4, 16, 26).

Nesomimesa sciopteryx Perkins, 1899.

Male. Length 8 - 9 mm. Fore wing pitchy black with a slight violet iridescence. Clypeal margin somewhat tridentate. Third antennal segment 4.8 times as long as second. A short acute point produced between antennae. Distance between antennae 1.8 times length of second antennal segment. Frontal carina low and elongate.

Groove between metapleural pits narrow, deep, shiny and sculptured; pits small; posterior metapleuron pilose. Scutellum shiny. Tarsal comb of fore leg crescent-shaped, with 30 - 40 teeth set wide apart.

Anterior part of propodeum V-shaped, smooth, shiny and without setae. Posterior and lateral areas of propodeum sparsely covered with long white setae. Propodeum with a broad, deep, sculptured, median groove; with raised lines in a distinct pattern laterally. Petiole 4 times as long as maximum width; rounded above, each side with a small carina developed posteriorly; rounded beneath except for a flat apex. Dorsal apex of petiole without a small depression. Ventral apex of petiole mostly dull, shiny along edges; membranous area in a vertical plane, 9 times as long as broad, bordered by a posteriorly curved band which is weak laterally but becomes wider medially (fig. 16). Apical segment of gonocoxite 3 times as wide as gonostylus (fig. 4); with many medium-sized setae. Gonostylus 5 times as long as broad; with 3 visible medium-sized setae, followed posteriorly by many minute setae. Volsella with a small lobelike sack developed at apex.

Female. Length 11 - 13 mm. Similar to male except as follows: A strong genal spine projecting straight downward without twisting at base (fig. 26); spine sometimes reduced. Third antennal segment 5.0 times as long as second. Distance between antennae 3.0 times length of second antennal segment. Edge of preoccipital ridge 0.33 mm. wide, hardly visible.

Groove between metapleural pits shiny, appearing as a V-shaped trough; pits large. Scutellum flat and shiny.

Anterior part of propodeum shiny except dull in middle. Base of propodeum with a few short raised lines and a deep elongate median groove; clothed with long silver setae. Petiole 3.6 times as long as maximum width, slightly arched and rounded above.

Type in British Museum (Nat. Hist.).

Specimens examined. KAUAI: 3 females, Halemanu, June, Aug. H. T. Osborn, O. H. Swezey; female, Kamuwela, July, Swezey; male, Kokee, July, Swezey (HSPA).

This rather distinct species exhibits pitchy black, slightly violet iridescent wing coloration which serves as a convenient character for separating it from the allied species, *N. kauaiensis*. In the female, the genal

spine differs from that of *kauaiensis* in that it extends downward without forward curvature, the apical part tapering to a blunt point. In the male of *sciopteryx* the shiny semi-membranous area is in a vertical plane, but in *kauaiensis* the membranous area is in a horizontal plane.

Nesomimesa perkinsi, new species (figs. 5, 17).

Male. Length 9 - 10 mm. Fore wing infuscate. Third antennal segment 4.2 times as long as second. A small acute point between antennae. Distance between antennae 1.3 times length of second segment. Frontal carina small and not clearly visible beneath pilose area.

Groove between metapleural pits shiny and deep; anterior metapleural pit larger than posterior. Scutellum shiny. Tarsal comb of fore leg with approximately 35 teeth of uniform length.

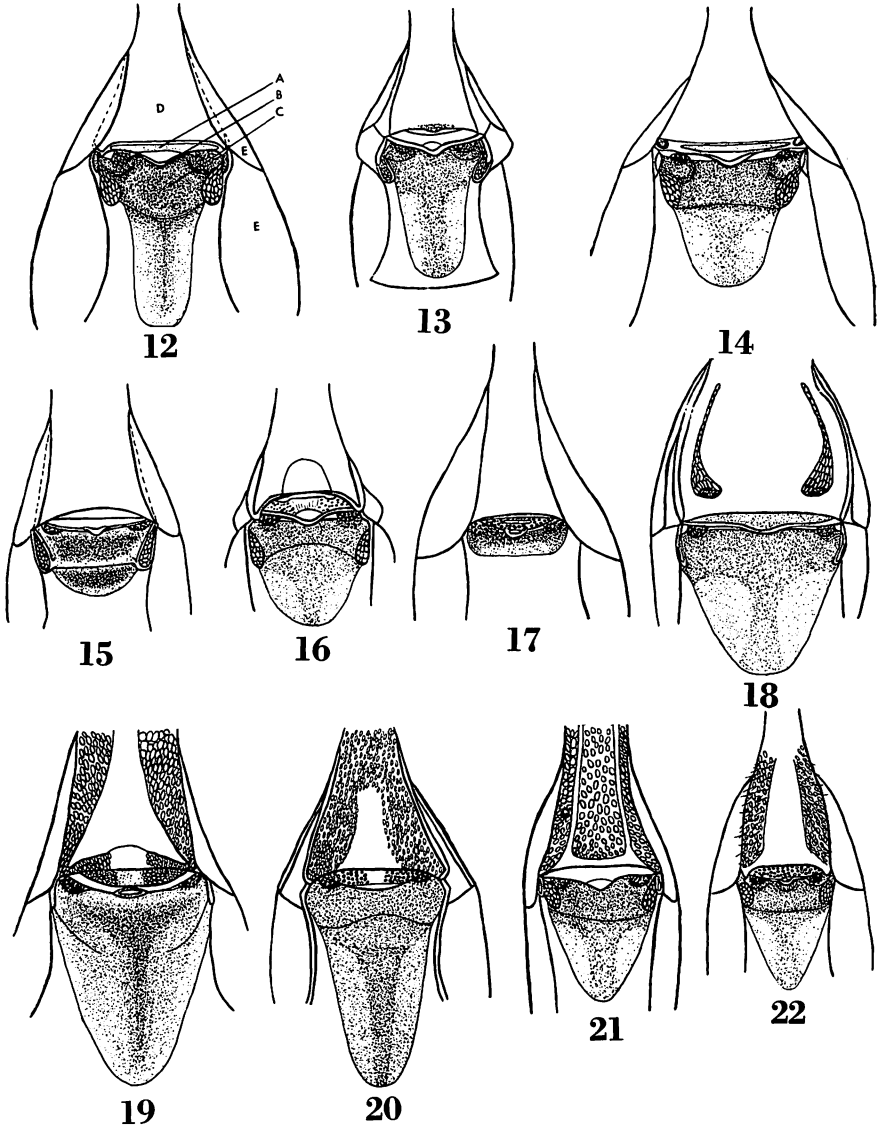
Anterior part of propodeum coarsely punctate; longitudinal groove at base of propodeum deeply sculptured. Petiole 4.5 times as long as maximum width, somewhat rounded above; a small carina developed along each lateral edge close to base; rounded beneath. A small depression at base of second abdominal tergite. Semi-membranous area of ventral apex of petiole in a vertical plane, 10 times as long as wide, with a deep longitudinal furrow in center, bordered posteriorly by large punctured band with an oval depression in middle (fig. 17). Apical segment of gonocoxite (fig. 5) 3.6 times as wide as gonostylus, with numerous setae. Gonostylus 6 times as long as broad, with numerous setae. Volsella somewhat cone-shaped, with inner margin spinous.

Holotype (BISHOP 2739): male, Wailupe, Oahu, May 30, 1919, coll. O. H. Swezey.

Paratypes: male, Mt. Tantalus, Oahu, Nov., 1906, O. H. Swezey; male, Mt. Tantalus, Oahu, Dec., 1911, W. M. Giffard (HSPA); 2 males, Lanihuli R., Oahu, Sept., 1911, J. C. Bridwell (BISHOP).

Female. Unknown.

The membranous area of the ventral apex of the petiole is 10 times as long as wide, and is reduced to a deep furrow which is bordered posteriorly by a large punctate band with an oval depression in the middle. These characters will separate the new species from *antennata* and *hawaiiensis.* In addition, the volsella of the male genitalia of this species is cone-shaped with numerous spines on the inner margin (fig. 5), while the volsella of *hawaiiensis* (fig. 1) and *antennata* (fig. 2) are digitiform with fewer spines and setae. The gonostylus of *perkinsi* has as many setate as *hawaiiensis,* but twice as many as *antennata.* I believe that the female, when captured, will exhibit distinct morphological characters.



FIGS. 12–17. Ventral apex of petiole of Nesomimesa. 12, N. hawaiiensis: A, membranous area; B. band; C, depression; D, apical portion of the ventral petiole, E, abdominal tergite; 13, *N. antennata;* 14, *N. nitida;* 15, *N. kauaiensis;* 16, *N. sciopteryx;* 17, *N. perkinsi.*

FIGS. 18–22. Ventral apex of petiole of *Deinomimesa.* 18, *D. cognata;* 19, *D. ferox;* 20, *D. haleakalae;* 21, *D. hawaiiensis;* 22, *D. punae.*

Nesomimesa kauaiensis Perkins (fig. 6, 15, 27).
Nesomimesa kauaiensis Perkins, 1899.

Male. Length 8.5 - 13 mm. Fore wing subhyaline. Third antennal segment 5.0 times as long as second. A short acute point between antennae. Distance between antennae 2.0 times length of second antennal segment. Frontal carina low and elongate.

Groove between metapleural pits shiny and deeply sculptured; pits large. Scutellum with a weak longitudinal groove in middle. Tarsal comb of fore leg crescent-shaped, with 30 teeth.

Anterior part of propodeum smooth and bare; rest of propodeum sparsely covered with long white setae. Base of propodeum with a few median raised lines. Petiole 4 - 4.5 times as long as maximum width, rounded above, the venter more or less flattened. A small depression at base of second abdominal tergite. Semi-membranous area of ventral apex of petiole 4 - 5 times as long as wide, bordered posteriorly by thick band slightly protruding in middle (fig. 15). Apical segment of gonocoxite (fig. 6) 5 times as wide as gonostylus, with setae longer than in other species, its apex conspicuously curved. Gonostylus 9 times as long as broad, with scattered long setae at inner margin. Volsella resembling that of *N. sciopteryx*.

Female. Length 11 - 13 mm. Similar to male except as follows: Genal spine present, not twisted at base, curved forward and sharply pointed at apex when fully developed (fig. 27); spine sometimes reduced, triangular in shape. Third antennal segment 4.3 times as long as second. Distance between antennae 2.5 times length of second antennal segment. Edge of preoccipital ridge 0.03 mm. wide.

Groove between metapleural pits narrow and shiny; pits small. Scutellum flat and shiny. Postscutellum shiny, with a faint median longitudinal groove.

Anterior part of propodeum smooth and polished except dull in middle. Base of propodeum with two short raised lines and a deep, median, longitudinal, sculptured groove. Petiole 4 - 4.5 times as long as maximum width, rounded above and at base, with a median raised line which gradually increases in height apically.

Specimens examined. Paratypes at Bishop Museum: 6 males, 5 females, Mts. Waimea, Kauai, 950 m., 1,200 m., May, June, 1894; male, Koholuamanu, Kauai, 1,200 m., Apr., 1895, R. C. L. Perkins.

KAUAI: male, 9 females, Koholuamanu, 1,200 m., May, July, Aug., W. M. Giffard; female, Kumuwela, July, O. H. Swezey; female, Kokee, Aug., Swezey (BISHOP, HSPA).

This species can be separated from *N. sciopteryx* by the lighter color of the wings. In *kauaiensis* the semi-membranous area is 4 - 5 times as long as wide and is bordered posteriorly by a medially humped band, whereas, in *sciopteryx,* the membranous area is 9 times as long as wide,

and the posterior bordering band is flat in the middle.

Genus **Deinomimesa** Perkins

Deinomimesa Perkins 1899, FAUNA HAWAIIENSIS 1:11. (Type: *Deinomimesa ferox* Perkins; subsequent designation by Pate, 1937).

Medium or small-sized black species; male elongate and female robust. Fore wing 6–9 mm. long.

Clypeus densely pilose, truncate, with its margin somewhat elevated in middle in male; greatly raised, exposing labrum entirely or in part in female. Mandible large and greatly curved in female; small and partially hidden beneath clypeus in male. Antennae clavate in female and subclavate in male; basal segments entirely fuscous, five apical segments orange-yellowish beneath. Second cubital cell petiolate or narrower at radius and wider below. Second recurrent vein of fore wing sigmoid, arising on cubitus three-fourths the distance between second and third intercubital veins. Head and thorax minutely punctate. Fore tarsus generally testaceous in male and fuscous in female. Propodeum pilose, with many distinct raised lines. Abdomen ferrugineus, shiny and smooth. Petiole generally 1 to 7 times as long as maximum width; distinctly carinate in female, more so than in male. Ventral apex of petiole with membranous or semi-membranous area bordered posteriorly by a medially rounded sclerotized band, followed by a deep rectangular depression which rises apically in a gradual incline. Pygidial area flat, spinose, punctate and carinate along edges. Male genitalia (figs. 7–11) nearly twice as large as in *Nesomimesa*.

KEY TO SPECIES OF DEINOMIMESA

1. Males; clypeus truncate, round or slightly emarginate apically in middle; labrum unexposed 2
   Females; clypeus protruding; labrum partly or wholly exposed 6
2. Petiole with a narrow, strongly-raised, medio-dorsal longitudinal carina ..... **ferox**
   Petiole without such a carina, carinae if present less strongly developed 3
3. Petiole stout, 0.4 mm. wide, 1.2–1.3 mm. long; with a medium-sized mediodorsal longitudinal carina and a smaller carina along each lateral margin ..... **cognata**
   Petiole elongate, 0.2 mm. wide and 1.3–1.6 mm. long, with a relatively small medio-dorsal longitudinal carina; with or without smaller lateral carinae 4
4. Petiole somewhat roof-shaped above ..... **haleakalae**
   Petiole flattened above 5

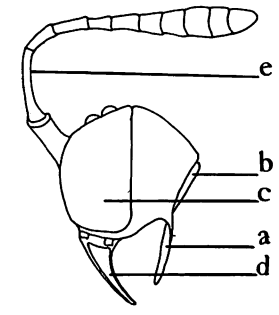
5. Petiole flattened at its sides, its edges somewhat sharp dorsally ..... **hawaiiensis**
   Petiole not flattened at its sides; its edges somewhat carinate and rounded ..... **punae**
6. Clypeus with a deep, square emargination in middle (fig. 28) ..... **ferox**
   Clypeus either not deeply emarginate, or with a semi-circular emargination 7
7. Clypeus with a broad semi-circular emargination (fig. 32) ..... **cognata**
   Clypeus not emarginate 8
8. Clypeal margin angulate and pointed in middle (fig. 31) ..... **haleakalae**
   Clypeal margin rounded 9
9. Clypeus wide, broadly rounded, semi-spherical in shape and extending a greater distance downward; labrum only partly exposed (fig. 30) ..... **hawaiiensis**
   Clypeus narrower, subacutely rounded and extending a shorter distance downward; labrum almost completely exposed (fig. 29) ..... **punae**

Deinomimesa ferox Perkins (figs. 7, 19, 28).
Deinomimesa ferox Perkins, 1899.

Male. Length 9–10 mm. Fore wing infuscate along apical margin, less cloudy at base. Third antennal segment 6.0 times as long as second. A short acute point between antennae. Distance between antennae 2.3 times length of second antennal segment. Frontal carina low at both ends, height increasing slightly toward middle, so that it appears somewhat humped in profile.

Groove between metapleural pits deep, shiny and V-shaped; pits large. Scutellum dull and rounded; postscutellum with median raised lines. Tarsal comb of fore leg slightly curved, with about 35 uniform, widely separated teeth.

Anterior part of propodeum dull, with medium punctation; with large raised parallel lines extending diagonally on each side from base of postscutellum forming a series of V-shaped carinae. Entire propodeum with prominent raised lines; a short, wide, longitudinal sculptured groove in center. Petiole 3 times as long as maximum width, pyriform, its sides flattened, with a narrow, sharply raised, median longitudinal carina. Ventral apex of petiole triangularly flat in middle, its posterior margin slightly elevated; membranous area in a horizontal plane, 4–5 times as long as wide, shiny, bordered posteriorly by a wide band with an oval-shaped opening in middle (fig. 19). Apical segment of gonocoxite (fig. 7) 3 times as wide as gonostylus, with several minute setae; a dense area of setae on preceding segment. Gonostylus 2 times as long as broad, pointed, with group of setae at its apex, the terminal area flat. Volsella with minute setae.



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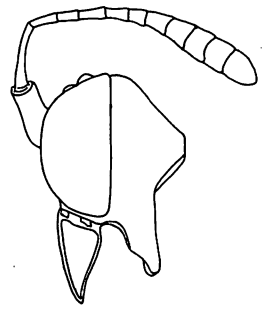

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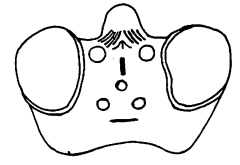

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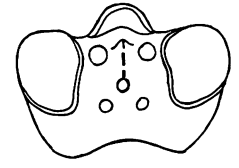

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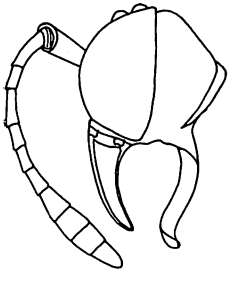

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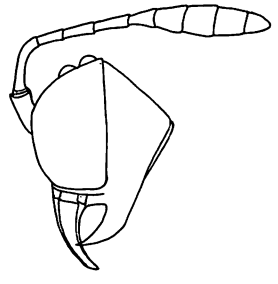

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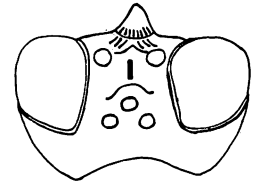

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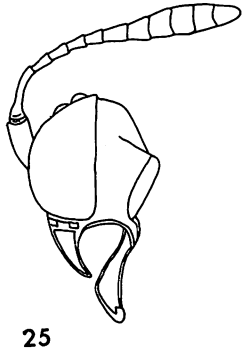

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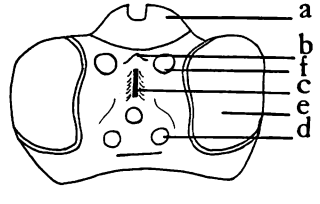

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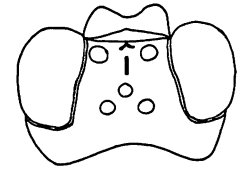

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FIGS. 23–27. Lateral view of the heads of female *Nesomimesa*. 23, *N. hawaiiensis*: a, genal spine; b, preoccipital ridge; c, compound eye; d, mandible; e, antenna; 24, *N. antennata;* 25, *N. nitida;* 26, *N. sciopteryx;* 27, *N. kauaiensis.*

FIGS. 28–32. Dorsal view of the heads of female *Deinomimesa*. 28, *ferox*: a, clypeus; b, cone-shaped projection between antennae; c, frontal carina; d, ocellus; e, compound eye; f, antennal fossa; 29, *D. punae;* 30, *D. hawaiiensis;* 31, *D. haleakalae;* 32, *D. cognata.*

Female. Length 11–13 mm. Similar to male except as follows: Clypeal margin deeply and squarely emarginate in middle, exposing entire labrum (fig. 28). Third antennal segment 5.7 times as long as second. Distance between antennae, 2.0 times length of second antennal segment.

Groove between metapleural pits deeply sculptured. Scutellum shiny, with a longitudinal groove in middle.

Anterior part of propodeum dull, with several raised lines. Base of propodeum with a concave depression and a narrow, median longitudinal groove; a few raised lines produced posteriorly. Petiole pyriform, nearly as broad as long, with a prominent median longitudinal carina. Ventral apex of petiole with a slight concave depression anterior to the membranous area which has a small carina at each side. Second abdominal tergite with a median longitudinal groove.

Specimens examined. Paratypes at Bishop Museum: 5 females, Halemanu, Kauai, 1,200 m., May, 1895; 3 females, Mt. Waimea, Kauai, 1,200 m., 600 m., May, 1894, Feb., 1897; female, Kaholuamanu, Kauai, 1,200 m., Apr., 1895 R. C. L. Perkins.

KAUAI: female Mt. Waialeale, June, W. M. Giffard; female, Robinson, Makaweli, 570 m., July, Giffard; female, Summit Camp, Feb. F. X. Williams (BISHOP, HSPA).

This species is best recognized by its pyriform petiole with its sharply raised median longitudinal carina. *D. cognata,* a relative of *D. ferox,* has a wider median carina which is of nearly uniform height throughout and does not increase in height posteriorly, as does the carina of *D. ferox*. The clypeal margin of the female of *ferox* is deeply and squarely emarginate in the middle, but in female of *cognata* the clypeal margin is semi-circularly emarginate.

Deinomimesa punae Perkins (figs. 8, 22, 29).
Deinomimesa punae Perkins, 1899.

Male. Length 10 mm. Fore wing infuscate. Third antennal segment 4.7 times as long as second. A tall and pyramid-shaped point between antennae. Distance between antennae 2.3 times length of second antennal segment. Frontal carina relatively short, not reaching anterior ocellus.

Groove between metapleural pits elongate and very deeply sculptured; pits small. Scutellum pubescent and not heavily sculptured. Tarsal comb of fore leg with about 40 teeth of uniform size set close together.

Anterior part of propodeum shiny, with several prominent vertical and slightly raised diagonal lines. Base and lateral areas of propodeum with more strongly raised lines. Petiole 5 times as long as maximum width, with a small median longitudinal carina; a small carina along each lateral margin; rounded beneath. Ventral apex of petiole flat and pubescent; its side pilose, with large prominent punctures. Semi-membranous area in a vertical plane, 5–6 times as long as wide, bordered

posteriorly by narrow band protruding roundly in middle (fig. 22). Apical segment of gonocoxite (fig. 8) 2.6 times as wide as gonostylus. Gonostylus 2.7 times as long as broad. Setae of volsella hardly visible.

Female. Length 10 mm. Similar to male except as follows: Fore wing subhyaline and slightly iridescent. Clypeus narrow, subacutely rounded and extending a short distance downward; labrum nearly all exposed (fig. 29). Third antennal segment 4.0 times as long as second. Distance between antennae 2.0 times length of second antennal segment.

Groove between metaplural pits narrow and deep. Scutellum dull, with scattered medium-sized punctures; a longitudinal groove in middle. Postscutellum dull, with many curved raised lines.

Anterior part of propodeum dull, densely punctate, with many curved raised lines dominating entire area. Base of propodeum with semi-circular raised lines, followed by a narrow, deep, median longitudinal groove which extends half the distance to the apex. Petiole 6.5 times as long as maximum width, with median raised lines near apex of dorsum, its sides each with a small well developed carina. Second abdominal tergite without a longitudinal groove.

Type in British Museum (Nat. Hist.).

Specimens examined. HAWAII: male, female, Hualalai, 2,000–2,200 m., Aug., F. X. Williams (HSPA).

The lateral areas of the ventral apex of the petiole are pubescent and pilose in this species, whereas in *hawaiiensis,* these areas are bare. The semi-membranous area of *punae* is bordered posteriorly by a narrow band which is rounded medially, while in *hawaiiensis* the band bordering the membranous area is weak and has a triangular-shaped protrusion in the middle. The clypeal margin of the female of *punae* is narrow and subacutely rounded, whereas in the female of *hawaiiensis* the clypeal margin is relatively wide and broadly rounded. The gonostylus of this species is larger with fewer setae than that of *hawaiiensis.*

Deinomimesa hawaiiensis Perkins (figs. 9, 21, 30).
Deinomimesa hawaiiensis Perkins, 1899.

Male. Length 7–9 mm. Fore wing smoky. Third antennal segment 3.75 times as long as second. A short acute point developed between antennae. Distance between antennae 1.5 times length of second antennal segment. Frontal carina low, bearly visible through pilosity.

Groove between metapleural pits narrow; pits small. Scutellum pubescent and not heavily sculptured. Tarsal comb of fore leg with approximately 30 teeth of uniform size.

Anterior part of propodeum with longitudinal raised lines; its pilose base with many broad raised lines. Petiole 7 times as long as maximum width, its sides flattened, with sharp corners along each edge, rounded

beneath; with a median longitudinal carina. Ventral apex of petiole shiny, flat, and without setae; each lateral margin with a small prominent carina and large punctations. Membranous area in a horizontal plane, 10 times as long as wide, bordered posteriorly by a weak band with a triangular-shaped projection in middle (fig. 21). Apical segment of gonocoxite (fig. 9) 3.8 times as wide as gonostylus, with a few setae along its periphery; a cluster of setae on preceding segment. Gonostylus 3 times as long as broad; with setae along dorso-lateral edge. Volsella with few setae.

Female. Length 10–11 mm. Similar to male except as follows: Clypeus raised, its margin strongly rounded partially exposing the labrum (fig. 30). Third antennal segment 4.0 times as long as second. Distance between antennae 2.0 times length of second segment.

Groove between metapleural pits very narrow. Scutellum dull, with large punctation; postscutellum with many curved raised lines.

Anterior part of propodeum dull, triangulate, its outline shiny. Two heavy raised parallel lines extending from base of propodeum to middle; area between these with a deep, wide depression with an elongate shiny median groove. Petiole 6 times as long as maximum width, with a median longitudinal carina; its lateral margins each with a well developed small carina. Second abdominal tergite with a longitudinal groove.

Specimens examined. Paratypes at Bishop Museum: 3 males Kau, Hawaii, 1,200 m., July, 1895, R. C. L. Perkins.

HAWAII: 15 males, 2 females, Kilauea, 1,200 m., July, Aug., Perkins, W. M. Giffard; 5 males, Hualalai, 2,200 m., Aug., F. X. Williams (BISHOP, HSPA).

In order to separate males of this species from those of *D. punae,* it is important to check for the absence of setae at the lateral apex of the petiole and, in addition, to note the narrow membranous area with its median triangular-shaped band. The female of *hawaiiensis* can be distinguished from that of *punae* by its wider and semi-spherical shaped clypeal margin.

Deinomimesa haleakalae Perkins (figs. 10, 20, 31).
Deinomimesa haleakalae Perkins, 1899.

Male. Length 8–9 mm. Fore wing subhyaline to infuscate. Third antennal segment 6.0 times as long as second. A tall, flat-topped projection developed between antennae. Distance between antennae 2.3 times length of second antennal segment. Frontal carina small but distinct.

Groove between metapleural pits deep and shiny. Scutellum dull, more or less rounded; postscutellum with many raised lines. Tarsal comb of fore leg slightly curved, with about 40 teeth set close together.

Anterior part of propodeum dull, without setae, and with five sets of

medium sized raised lines extending from base of postscutellum to center of propodeum. Basal portion of propodeum with large raised lines, sparsely pilose; with a short, wide, sculptured, median longitudinal groove. Petiole 6 times as long as maximum width, roof-shaped, with a small longitudinal carina along each lateral margin; rounded beneath. Ventral apex of petiole flat in center, strongly sculptured laterally. Semi-membranous area in vertical plane, 6–7 times as long as wide, shiny, with minute punctures, bordered posteriorly by a flat band protruding at its middle (fig. 20). Apical segment of gonocoxite (fig. 10) 4 times as wide as gonostylus; a few scattered setae at apex. Gonostylus 3 times as long as broad; inner margin with numerous setae. Volsella in shape of an elongate tube.

Female. Length 11–12 mm. Similar to male except as follows: Fore wing infuscate except for sightly darker marginal cell. Clypeal margin angulate and pointed in middle; labrum entirely exposed (fig. 31). Third antennal segment 4.0 times as long as second. Distance between antennae 2.1 times length of second antennal segment.

Groove between metapleural pits wide, shiny. Scutellum flat; post-scutellum dull, pubescent, with a few raised lines at base.

Anterior part of propodeum shiny, with median raised lines. Petiole 5.2 times as long as broad, without a median longitudinal carina; the dorsal surface more or less rounded and without small carinae at its edges.

Specimens examined. Paratypes at Bishop Museum: 2 males, Haleakala, Maui, 1,200 m., May, 1896, R. C. L. Perkins.

MAUI: female, Haipuaena, June, E. H. Bryan; female, Olinda, 1,660 m., May, W. M. Giffard and D. T. Fullaway; 5 males, Ukulele, Aug., N. L. H. Krauss (BISHOP).

The male of *D. haleakalae* is distinguished from those of *D. hawaiiensis* and *D. punae* by its petiole, which is roof-shaped above with a slight median longitudinal carina. Also, in the latter two (figs. 21–22), there is heavy punctation along the lateral and basal part of the ventral apex of the petiole, whereas in *D. haleakalae* the punctation is weak (fig. 20). The semi-membranous area is shiny with minute punctures and is surrounded apically by a flat band, partly protruding in the middle. The female *haleakalae* is easily separated from those of *hawaiiensis* and *punae* by its clypeal margin which is angulate and projects as a sharp point medially.

Deinomimesa cognata Perkins (figs. 11, 18, 32).

Deinomimesa cognata Perkins, 1899.

Male. Length 8–9 mm. Fore wing subhyaline. Third antennal segment 6.0 times as long as second. A short acute point between antennae. Distance between antennae 2.6 times length of second antennal segment. Frontal carina low, visible beneath sparse, long, white setae.

Groove between metapleural pits somewhat shiny and shallow; pits large. Scutellum flat, dull, with no visible groove. Tarsal comb of fore leg with about 40 teeth.

Anterior part of propodeum dull, without setae, with a slight indication of a median longitudinal line, and with 3 diagonal raised lines laterally. Base of propodeum with strongly raised lines. Petiole 3.1 times as long as maximum width, with a median longitudinal carina and a small carina along each lateral margin; rounded beneath. Ventral apex of petiole flat and shiny in middle, with a heavily sculptured or punctured carina at each side; membranous area in a horizontal plane, 13 times as long as wide, bordered posteriorly by a thin medially protruding band (fig. 18). Apical segment of gonocoxite (fig. 11) 4 times as wide as gonostylus. Gonostylus 3 times as long as broad, with few setae at its apical margin. Volsella similar to that of *D. ferox*.

Female. Length 10–12 mm. Fore wing smoky. Clypeal margin broad and semi-circularly emarginate in middle (fig. 32); labrum partly exposed. Third antennal segment 4.2 times as long as long as second. Distance between antennae 3.0 times length of second antennal segment.

Groove between metapleural pits shiny and deep. Scutellum with a slight median longitudinal indentation.

Anterior part of propodeum polished. Petiole 1.4 times as long as maximum width, becoming wider dorso-ventrally toward apex, with a median dorsal longitudinal carina which gradually increases in height toward the apex. A slight horizontal indentation on base of second abdominal tergite. Ventral apex of petiole with a deep, wide, convex depression in middle.

Specimens examined. Paratypes at Bishop Museum: male, 2 females, Halemanu, Kauai, 1,200 m., May, 1895, R. C. L. Perkins.

KAUAI: 2 males, Kalalau trail, June, Aug., O. H. Swezey; 2 females, Alakai Swamp, July, C. N. Forbes; male, Kaholuamanu, Apr., Swezey; male, Kokee, June, H. T. Osborn; 2 males, 2 females, Kumuwela, June, July, Swezey (BISHOP, HSPA).

The male of this species can be distinguished from other species of *Deinomimesa* by the prescence of a heavily punctate lateral carina on each side of the ventral apex of the petiole. The membranous area is elongate, and is bordered posteriorly by a thin band which protrudes roundly in the middle. The clypeal margin of the female of *cognata* differs from that of other *Deinomimesa* females in that it is broadly and roundly emarginate.

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