

## A new species of the endemic Hawaiian genus *Paraliancalus* Parent, with notes on the genus *Liancalus* Loew (Diptera: Dolichopodidae)<sup>1</sup>

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The genus *Paraliancalus* was originally proposed by Parent (1938) for the single endemic Hawaiian species *Liancalus metallicus* Grimshaw, 1901, a widespread species found on most of the main Hawaiian Islands. It is one of the largest Hawaiian dolichopodids, being some 8 mm in length. Possibly due to this large size and assuming the genus contained only one species, dolichopodid workers have not paid close attention to specific morphological characters of the specimens, assuming all belonged to the type species, *P. metallicus*.

Recently, examination of a few male specimens in the Bishop Museum by one of us (DJB), showed that the genus is actually represented in Hawaii by two morpho-species, both of which are similar in appearance but differ in leg and genitalic characters. After borrowing specimens from the University of Hawai‘i Insect Museum and examining all material in the Bishop Museum, we conclude that there are indeed two species of *Paraliancalus* in Hawai‘i. We herein describe and illustrate the second species as *Paraliancalus laciniatfemur*, **n. sp.**, which is thus far known only from the island of Maui. Also, because the type species was originally described in the widespread genus *Liancalus* Loew, we have included some notes on this genus.

### Materials and Methods

Specimens examined in this study derive from or are deposited in the Bishop Museum, Honolulu, Hawai‘i, USA (BPBM), the Natural History Museum, London, UK (BMNH), Hawaii State Department of Agriculture (HDOA), and the University of Hawai‘i Insect Museum (UHIM). Format of description follows Evenhuis (2007). Measurements are in millimeters and were made on representative dry specimens. Body length is measured from the base of the antennae to the tip of the seventh abdominal segment. The CuAx ratio is the length of the m-cu crossvein/ distal section CuA. The position of features on elongate structures such as leg segments is given as a fraction of the total length, starting from the base. The relative lengths of the podomeres should be regarded as representative ratios and not measurements. The ratios for each leg are given in the following formula and punctuation: trochanter + femur; tibia; tarsomere 1/ 2/ 3/ 4/ 5.

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The following abbreviations and terms are used: I, II, III: fore-, mid-, hindlegs; C, coxa; T, tibia; F, femur; ac, acrostichal setae; ad, anterodorsal; av, anteroventral; dc, dorso-central setae; dv, dorsoventral; hm, postpronotal setae; np, notopleural setae; pa, postalar setae; pd, posterodorsal; pm, presutural supra-alar setae; ppl, proepisternal setae; pv, posteroventral; sa, postsutural supra-alar setae; sr, presutural intra-alar setae.

### Systematics

#### *Paraliancalus* Parent

*Paraliancalus* Parent, 1938: 213. Type species: *Liancalus metallicus* Grimshaw, 1901, by original designation.

*Diagnosis.* Easily separated from other Hawaiian hydrophorine genera by the presence of a large black bristle on the lateral surface of the hind coxa. It is separated from *Liancalus* Loew by characters presented in the key below.

*Paraliancalus* Parent is one of the largest dolichopodids in Hawai'i (5–8 mm in length) and is known to occur on almost all of the main islands. Despite their rather large size, they are uncommon in collections.

From the label data, most specimens of both species apparently were collected above 450 m. Like the closely related *Liancalus* Loew, *Paraliancalus* is primarily found resting on vertical seeps but have also been collected by sweeping vegetation. In their revision of Hawaiian Dolichopodidae, Hardy & Kohn (1964) redescribed *Paraliancalus* and its type species *Liancalus metallicus* Grimshaw and gave characters for all parts of the body except the legs. Recent examination of a series of specimens in BPBM and UHIM shows there are two morpho-types in the males of this endemic Hawaiian genus: one with strong setae present at the base of the mid femora and one lacking these strong spines. In addition, there are differences in the vestiture of the hind femur, the color of pollinosity of the frons, and in the structure and setation of certain male genitalic components.

Females cannot as yet be differentiated but are known from the following islands: Hawai'i, Maui, Moloka'i, O'ahu, and Kaua'i. No males have been seen by us from O'ahu or Kaua'i so we cannot conclude if the true *P. metallicus* occurs in those populations or is another species.

#### Notes on the genus *Liancalus* Loew

*Liancalus* is a genus in the subfamily Hydrophorinae with 19 described species from the Palearctic, Nearctic, Afrotropical, and Oriental regions (Yang *et al.*, 2006). Adults are commonly found resting on wet rock surfaces and seeps. Species are relatively large (body length usually > 6 mm) with elongate legs. The genus has a diagnostic ventral digitiform projection on the proepimeron behind base of coxa I. As well, the male postabdomen (see Fig. 6a) is distinctive in having tergite 5 prolonged ventrally on each side, forming two lateral flaplike projections that act as a hood for the hypopygial apex (these flaps have been incorrectly cited in the literature as being derived from sternite 4, and this mistake was repeated in the key by Bickel, 2009). Other characters found in many



**Fig. 1.** Lectotype male of *Paraliancalus metallicus* (Grimshaw) in BMNH, lateral view showing how it is mounted and pinned.

*Liancalus* species include modification of the male wing apex (falcate tips, spots, etc.), an elongate filiform male cercus, and 3–4 pairs of scutellar setae.

Although *Paraliancalus* was initially regarded as a *Liancalus*, the two genera are distinct but probably closely related. If indeed these two genera are sister taxa, *Paraliancalus* is the more plesiomorphic group, lacking the proepimeron projection and the tergite 5 flaps. The two genera can be separated by the characters given in the key below.

The following characters are shared by *Liancalus* and *Paraliancalus*, some of which are found in other genera of Hydrophorinae: pair of large postvertical setae present on dorsal postcranium, out of line with the postorbital series; male face usually wide; fronto-clypeal suture distinct, at least laterally; both FII and FIII with strong anterior preapical setae; coxa III with strong lateral seta, crossvein dm-cu equal to or longer than distal section of CuA; abdomen ovate, not dorsosventrally flattened.

KEY TO SPECIES OF HAWAIIAN *PARALIANCALUS*  
(based on males)

1. Proepimeron with ventral digitiform projection behind base of fore coxa; scutellum with 2–3 pairs of marginal setae; acrostichal setae as single row or absent; six long dorsocentral setae present; male tergite 5 ventrally prolonged and forming hood for hypopygial apex (Fig. 6a); cercus often elongate and filiform; Palearctic, Nearctic, Oriental & Afrotropical Regions ..... *Liancalus* Loew
- Proepimeron rounded at base of fore coxa; scutellum with single pair of marginal setae; ac setae absent; acrostichal setae absent; 5 long dorsocentral setae present; male tergite 5 with only short ventral projection; male cercus short digitiform or subtriangular; Hawaiian Islands ..... *Paraliancalus* Parent .. 2
2. Mid femur with spines basally on ventral surface (Fig. 4b); hind femur with dense fringe of setae on ventral surface; frons gray pollinose; genitalia with cercus broadly rounded apically bearing long wavy hairs that extend in all directions (Fig. 5b) ..... **laciniifemur** Evenhuis & Bickel, **n. sp.**
- Mid femur lacking spines ventrally (Fig. 4a); hind femur with only row of very short fine hairs on ventral surface; frons silvery pollinose; genitalia with cercus tapering to narrow apex, with wavy hairs directed caudally (Fig. 5a) .....  
..... **metallicus** Grimshaw

***Paraliancalus metallicus* Grimshaw**  
(Figs. 1–3, 4a, 5a, 6b)

*Liancalus metallicus* Grimshaw, 1901: 13. Becker, 1922: 42; Van Duzee, 1933: 310; Bryan, 1934: 409, 449; Williams, 1934: 393.

*Paraliancalus metallicus* (Grimshaw): Parent, 1938: 213; Williams, 1940: 306; Hardy, 1952: 455; Hardy & Kohn, 1964: 248; Ibara, 1972: 160, 211; Bickel & Dyte, 1989: 405; Nishida, 1992: 98, 1994: 92, 1997: 77, 2002: 95; Polhemus, 1996: 23, 37, 41, 42, 53; Evenhuis & Grootaert, 1997: 74; Englund *et al.*, 1998: 24, 30, 2000: 104, 2002: 17, 2003: 8, 2006: 231, 2007: 229.

*Type Material Examined.* Lectotype ♂ (designated by Hardy & Kohn, 1964: 12) from HAWAIIAN ISLANDS: **Hawai‘i**: “Olaa”, December 1896, R.C.L. Perkins (BMNH). *Other Material Examined.* HAWAIIAN ISLANDS: **Hawai‘i**: Na‘alehu, Mountain [Home] Road, 23 Apr 1965, D.E. Hardy (UHIM); 1♂, Honokane Valley, 7 Jul 1971, M.D. Delfinado (UHIM); 1♂, Waia‘ama Stream, 2600 ft [ca. 800 m], 12 Feb 2002, D.J. Preston, sweeping vegetation over water (BPBM). **Maui (West)**: 2♂, Mahinahina, 21 June 1932, N.L.H. Krauss (BPBM); 1♂, Pu‘u Kukui, 900 m, 9–31 Oct 1971, J.L. Gressitt, Malaise trap (BPBM), 1♂, Pu‘u Kukui Ridge, 4000 ft [ca. 1020 m], 20 Jul 1971, D.E. Hardy (UHIM). **Maui (East)**: 1♂, Kula Pipeline, 25 Aug 1929, O.H. Swezey (BPBM); Kipahulu Valley, camp #1, 3100 ft [ca. 945 m], 10 Aug 1967, K.Y. Kaneshiro (UHIM). **Moloka‘i**: 1♂, Pu‘u Kolekole, Jul 1952, D.E. Hardy (BPBM); 1♂, Pu‘u Kolekole, 3000 ft [ca. 915 m], Jul 1953, D.E. Hardy (BPBM).

**Description.**

**Male** (Fig. 1). Body length: 6.0–8.2 mm. Wing length: 5.5–8.0 mm.

**Head.** Vertex and occiput shining black, with blue, blue-green, or magenta highlights; occiput golden tomentose; postocciput and postgena gray tomentose, with blue-green highlights ventrally; frons (below ocellar tubercle), face and clypeus silvery tomentose;



Fig. 2. *Paraliancalus metallicus* (Grimshaw), wing.



Fig. 3. Type labels for *Paraliancalus metallicus* (Grimshaw) in BMNH.

postvertical seta strong and positioned on dorsal postcranial slope; oc black, about two-thirds length of antennal arista, short weak vertical present laterad of ocellar seta; eyes separated below antennae by slightly less than width of antennal sockets, and face slightly tapering in width to clypeus; eye facets uniform; palp dark brown; proboscis brown, extending below eye in lateral view; antennal segments brown; scape ca 2 x width, sub-cylindrical; pedicel flattened; postpedicel short, length subequal to width; arista dorsal, slightly less than head height.

*Thorax.* Mesoscutum and scutellum dark brown to black, with metallic greenish, bluish, purplish, or magenta highlights; pleura gray tomentose; thoracic setae black: 5 dc

(with row of tiny hairs anterior to first dc); 2 np; 1 ph; 1 pa; 1 sc; ac absent; row 3–4 propleurals; median scutellar setae strong, laterals reduced to tiny hairs; proepimeron without ventral digitiform projection posteriad of CI; halter stem yellow, knob brownish yellow to yellow.

*Legs.* Coxae gray tomentose, remainder of legs shiny dark brown to black; CI with 6–7 strong black curved setae apically, two weaker setae near base, and longitudinal row of fine hairs laterally, 3–4 irregular rows of fine hairs mesally; CII and CIII with single long strong black setae laterally, CII with patch of curved black setae apically; all legs with short claws and pulvilli; all femora with row of short fine hairs ventrally (cf Fig. 4a); I: 8.6; 8.5; 5.2 /3.0/ 2.2/ 1.1/ 1.1 TI with offset dorsal-posterior setal pairs at 1/5 and 1/2 with dorsal seta stonger than posterior seta, and with strong subapical posterior seta; II: 10.0; 11.4; 6.5/ 4.2/ 2.8/ 1.7/ 1.2; FII with dorsoanterior preapical seta at 5/6, and row of 5–6 shorter pv seta in distal quarter; TII with ad seta at 1/6, 2/5, with pd seta at 1/6, 3/5, and strong apical ad, pd and pv setae; III: 12.0; 15.2; 5.2/ 5.0/ 3.0/ 1.8/ 1.5; FIII with dorsoanterior preapical seta at 5/6, and 2 subapical av and 2 subapical pv seta ; TIII strong ad setae at 1/4, 2/5, 3/5, and 4/5, pd at 1/5, and strong apical av, pv and ad setae.

*Wing* (Fig. 2). pale smoky throughout; squama with brown setae; CuAx ratio: 2.3.

*Abdomen.* Shiny dark brown with strong black setae on tergite I, shorter black hairs dorsally on each tergite, a few longer hairs laterally; sternites gray pollinose, bare; tergite 5 with short rounded ventroapical projection bearing short setae (Fig. 6b).

*Genitalia* (Fig. 5a). Hypopygium dark brown; cerci bulbous basally and long thin proximally, with numerous long wavy setae at apex (all directed caudally), short setae along dorsal and ventral surfaces; surstylus deeply forked, with dorsal arm bearing elongate digitiform projection; phallus (in extended position) with antler-like projections in middle on dorsal surface; hypandrium with extensive and dense thorny projections on dorsal (= inner) surface).

**Female:** similar to male except as noted: face and clypeus wider.

**Remarks.** Grimshaw (1901) based his description of *metallicus* on three specimens: one male syntype from “Olaa” on the island of Hawai‘i collected by R.C.L. Perkins in December 1896, a female syntype from Moloka‘i, and one female syntype from Kaua‘i (all three are in the BMNH). Hardy & Kohn (1964: 12) designated a lectotype by use of the wording “Type male” in the figure caption for the habitus of *P. metallicus* since only one male specimen was part of the syntype series. The lectotype has been examined in this study and lacks spines at the base of the mid femur. The type is pinned through the thorax and mounted on a celluloid stage (Fig. 1). The pin bearing the stage and labels has slight verdigris above and below the stage. The lectotype has the left wing broken off and glued to the celluloid stage, the left mid leg is glued to the specimen pin, and the right mid leg is broken off and missing; otherwise the specimen is in good condition. The labels for the lectotype are displayed in Figure 3. The red-ringed “Type ♂” label was placed on the specimen before the BMNH collection was moved to a country estate to avoid the bombing of London during WWII.

The exact type locality for the lectotype cannot be traced as the journal from this particular trip to the Big Island was one of the lost journals of Perkins (Evenhuis, 2007: 339). All that is known is Perkins left the Big Island in mid-December 1896 to return to Honolulu, so the collection of the male in “Olaa” (which could be anywhere from just below the current Volcano Village to the town of Ke‘e‘eau) must have been made in the first half of the month of December.



Fig. 4. *Paraliancalus*, male mid femora; a. *P. metallicus* (Grimshaw); b. *P. lacinafemur*, n. sp.

Females of *Paraliancalus* are difficult to differentiate, and female specimens from islands other than Maui are likely to be *P. metallicus*.

***Paraliancalus lacinafemur* Evenhuis & Bickel, new species**

(Figs. 4b, 5b)

*Types.* Holotype ♂ (deposited in BPBM 17,293) from HAWAIIAN ISLANDS: **Maui (East):** Waikamoi, May 1967, N.L.H. Krauss (in BPBM). *Paratypes.* HAWAIIAN ISLANDS: **Maui (East):** 1♂, Waikamoi, 4000 ft [1020 m], 24 Jul 1965, D.E. Hardy (UHM); 1♂, Waikamoi Flume trail, 9 Jul 1968, J.A. Tenorio (UHM); 1♂, Kipahulu Valley, camp 2, 1250 m, Aug 1967, R. Wilson (BPBM); 1♂, Olinda, 1 Aug 1932, N.L.H. Krauss (BPBM); Haleakalā National Park, upper Kipahulu Valley, HAVO Transect #1, 1250 m, 29 Mar 1983, F.G. Howarth (BPBM); 1♂, Kipahulu Valley, tributary to Palikea Stream, 1500 ft [ca 457 m], 15 May 1993, D.A. Polhemus (BPBM; preserved in ethanol). **Maui (West):** 1♂, Honokohau Stream, 1500–1520 ft. [ca. 457–463 m], seep at end of hike, 23 Jan 2003, R. Englund (BPBM; preserved in ethanol). All specimens pinned unless otherwise noted.

**Description.**

**Male.** Body length: 6.2–7.2 mm. Wing length: 6.0–7.0 mm.

*Head.* Vertex and occiput shining black, with blue, blue-green, or magenta highlights; occiput golden tomentose; postocciput and postgena gray tomentose, with blue-green highlights ventrally; frons gray pollinose, face and clypeus silvery tomentose; oc black, about two-thirds length of antennal arista, short weak vertical present laterad of ocellar seta; eyes separated below antennae by slightly less than width of antennal sockets, slightly tapering in width to clypeus; palp dark brown; proboscis brown, extending below eye

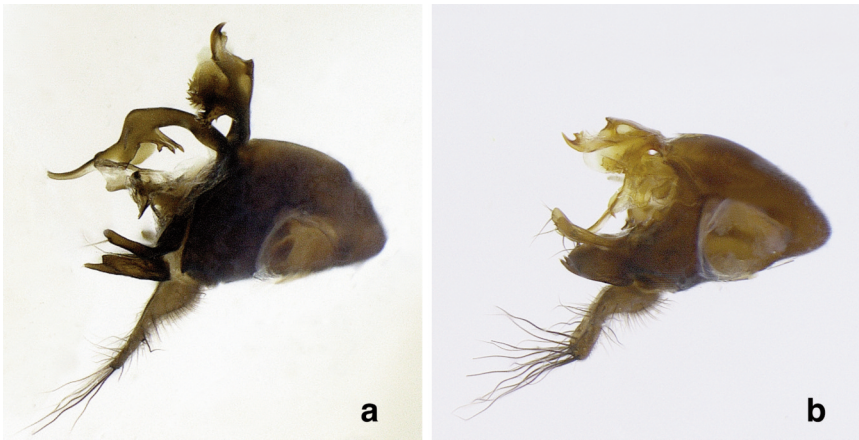


Fig. 5. *Paraliancalus* male genitalia, lateral view. a. *P. metallicus* (Grimshaw); b. *P. laciniaefemur*, n. sp.

in lateral view; antennal segments dark brown; scape ca. 2 x width, subcylindrical; pedicel flattened; postpedicel short, length subequal to width; arista slightly less than head height.

*Thorax.* Mesoscutum and scutellum dark brown to black, with metallic greenish, bluish, purplish, or magenta highlights; pleura gray tomentose; thoracic setae black: 5 dc (with row of tiny hairs anterior to first dc); 2 np; 1 ph; 1 pa; 1 sc; ac absent; 3–4 propleurals; halter stem yellow, knob brownish yellow to yellow.

*Legs.* Coxae gray tomentose, remainder of legs shiny dark brown to black with greenish highlights; CI with 6–7 strong black curved setae apically, longitudinal row of fine hairs laterally, 4–6 irregular rows of fine hairs mesally; CII and CIII with single long strong black setae laterally, CII with patch of curved black setae apically; femora with fine hairs on all surface, longer hairs ventrally, FI and FII with patch of short black curved setae apicomesally, FII (Fig. 4b) with 2 strong black spines basally on ventral surface, shorter, finer setae in row ventrally toward apex; TI with 2 strong setae on lateral surface, fine hairs and setae elsewhere; TII with 5 strong setae on lateral surface: 1 pair basally, 1 medially, 1 pair apically; TIII with 6 strong setae on lateral surface: 1 pair basally, 3 in medial two-thirds, 1 pair apically. Remainder of leg segments without strong setae.

*Wing* (cf. Fig. 2). pale smoky throughout; squama with black setae.

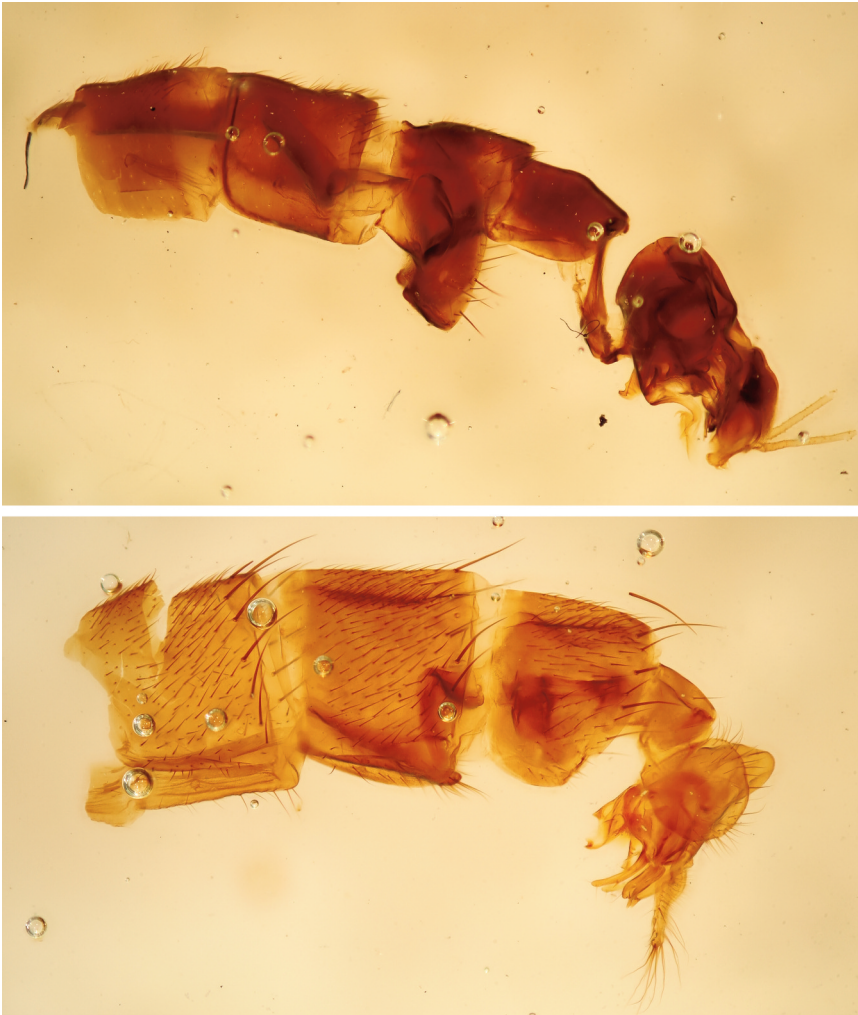
*Abdomen.* Shiny dark brown with strong black setae on tergite I, shorter black hairs dorsally on each tergite, a few longer hairs laterally; sternites gray pollinose, bare.

*Genitalia* (Fig. 5b). Hypopygium dark brown; cerci bulbous basally, with long, thin arm that is broadly rounded at apex, with numerous long wavy setae at apex (splayed in various directions), short setae along dorsal and ventral surfaces; hypandrium with thorny projections on dorsal (= inner) surface, less extensive than in *P. metallicus*.

**Female:** Unable to differentiate females in species of this genus.

**Remarks.** This species appears to be restricted to the slopes of Haleakalā on East Maui and Honokohau Stream on West Maui. Males from other localities on Maui and from other islands all belong to *P. metallicus*.





**Fig. 6.** Male postabdomens, left lateral view. **a.** *Liancalus virens* (Scopoli); **b.** *P. metallicus* (Grimshaw).

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