

REVISION OF HAWAIIAN CRABRONINAE WITH SYNOPSIS OF HAWAIIAN SPHECIDAE (Hym.)

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The present study involves descriptions, keys to genera and species, distribution, and biology of the Hawaiian crabronids. Also included are keys to the genera and species of introduced sphecids in Hawaii. A key to the 6 subfamilies of Sphecidae in Hawaii was given in a previous paper (Yoshimoto, 1959), which covered the subfamily Pemphredoninae. Only the Pemphredoninae (previous paper) and Crabroninae contain sphecid species limited to Hawaii.

The Hawaiian Crabroninae consist of 22 endemic species, including 2 new species, belonging to the cosmopolitan genus *Ectemnius* Dahlbom. They are placed in 2 subgenera, *Nesocrabro* Perkins and *Oreocrabro* Perkins. Both subgenera are endemic to the Hawaiian Islands.

Perkins (1899) placed the Hawaiian Crabroninae in the subgenus *Crabro* (*Solenius*) Lepeletier and Brullé and genus *Nesocrabro* Perkins. Later, Perkins (1902) concluded that the Hawaiian species of the subgenus *Solenius* are not congeneric with the European genotype, *Crabro vagus* (L.), and he erected 4 new genera to receive them, *Oreocrabro*, *Hylocrabro*, *Melanocrabro* and *Xenocrabro*. Pate (1944) placed all of the Hawaiian Crabroninae in the subgenera *Nesocrabro* and *Oreocrabro* of the genus *Ectemnius* Dahlbom, and synonymized the 3 remaining genera of Perkins with the subgenus *Oreocrabro*. Leclercq (1954) followed Pate's classification, as is done in this paper.

A single species of *Nesocrabro* collected in Japan was described by Tsuneki (1958). From the description, it is evident that this species, *Ectemnius* (*Nesocrabro*) *shimoyamai* Tsuneki, is significantly different from the Hawaiian forms; therefore, I believe that this species does not belong to *Nesocrabro*, although it appears to belong to a closely related group.

Zimmerman (1948) theorized that the Hawaiian crabronids may have evolved from a single Asiatic ancestral species. He postulated that the ancestral form gave rise to the 2 groups which are now endemic to the Hawaiian Islands. Most of the species are restricted to a single island and often to a single mountain or a valley.

The biology of the Hawaiian Crabroninae is not completely known, but Williams (1927) made excellent observations of the nesting habits and gave a summary of data from other investigators. Crabronids are fossorial wasps and in Hawaii they have been known to build their nests in two kinds of material, decaying wood and soil. Some species appear to prefer only decaying wood for their nests while others have been known to use both soil and wood. Prey records show acalyprate and calyprate Diptera to be the preferred in-

sects used in provisioning the nests. A summary of known biological information on our species is given in Table 1.

Table 1. Summary of available biological data on Hawaiian Crabroninae

<i>Name</i>	<i>Investigators</i>	<i>Nest</i>	<i>Prey</i>
<i>Ectemnius (Nesocrabro) rubrocaudatus</i>	Swezey & Williams (1932)	Under stone in sandy soil; Decayed log	Calliphoridae
<i>E. (N.) stygius</i>	Perkins (1906)		<i>Dyscritomyia</i> sp., Calliphoridae
<i>E. (N.) stygius</i>	Bridwell (1917)	Decayed log	<i>Prostethochaeta</i> sp., <i>Dyscritomyia</i> sp., Calliphoridae
<i>E. (N.) compactus</i>	Williams (1927)	Soil	
<i>Ectemnius (Oreocrabro) abnormis</i>	Williams (1927)	Decaying <i>Elaeocarpus</i> sp.	<i>Dyscritomyia</i> sp., Calliphoridae; <i>Eutrela xanthochaeta</i> Ald., Trypetidae
		Decaying <i>Aleurites moluccana</i> (L.)	<i>Dyscritomyia</i> sp., Calliphoridae; <i>Coenosia</i> sp., Muscidae; Sarcophagidae
		Decaying <i>Osmanthus</i> sp.	<i>Lucilia sericata</i> (Meigen), Calliphoridae; <i>Lispocephala brevispina</i> Mall., Anthomyiidae
<i>E. (O.) tumidoventris</i>	Malloch (1928)		
<i>E. (O.) tumidoventris</i>	Swezey & Bryan (1929)	Dead "lehua" <i>Metrosideros</i> ?	
<i>E. (O.) tumidoventris</i>	Bridwell (1919)		<i>Ceratitis capitata</i> (Wied.), Trypetidae
<i>E. (O.) atripennis</i>	Swezey & Williams (1932)	Decaying log and soil	
<i>E. (O.) hawaiiensis</i>	Perkins (1899)		<i>Dyscritomyia</i> sp., Calliphoridae
<i>E. (O.) hawaiiensis</i>	Williams (1927)	Decayed log	
<i>E. (O.) nesiotetes</i>	Bridwell (1920)	Soil	<i>Ceratitis capitata</i> (Wied.), <i>Eutrela xanthochaeta</i> Ald., Trypetidae; Drosophilidae
<i>E. (O.) discrepans</i>	Williams (1927)	Old stump	<i>Eurynogaster</i> sp., Dolichopodidae

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SUBFAMILY CRABRONINAE

Genus *Ectemnius* Dahlbom

The genus *Ectemnius* is widely distributed throughout the world. Pate (1944) reported that the Hawaiian crabronids have distinctive features, but are closely related to typical *Ectemnius*. He placed the Hawaiian species in two subgenera, *Nesocrabro* and *Oreocrabro*, which are endemic to the Hawaiian Islands.

KEY TO SUBGENERA OF HAWAIIAN CRABRONINAE

- Eyes widely separated, distance between eyes at level of antennae greater than distance from anterior clypeal margin to anterior edge of antennal fossae (fig. 3, a, b)..... **Nesocrabro**
- Eyes narrowly separated, distance between eyes at level of antennae barely as great as distance from anterior clypeal margin to anterior edge of antennal fossae (fig. 3, c, d)..... **Oreocrabro**

Subgenus *Nesocrabro* Perkins

Nesocrabro Perkins, 1899, Fauna Hawaiiensis 1: 27 (type: *Crabro rubrocaudatus* Blackburn & Cameron, 1866; by original designation).

Ectemnius (*Nesocrabro*), Pate, 1944, Amer. Midl. Nat. 31: 381.

Medium to small-sized black species. Wing infuscate to colorless. Antennal scape 5-6× as long as greatest width, without markings; clypeus quadrate, with dense, long golden or silvery setae; mandible bidentate or tridentate, usually ferrugineous or blackish (yellow with black apex in *compactus* Perkins). Distance between eye margin and antennal fossa at least as great as distance between antennal fossae; frontal area weakly rugose to moderately punctured; setae reddish-brown. Pronotum with or without yellow band; mesonotum distinctly punctate, rugose, with sparse reddish-brown setae; scutellum rugose; post-scutellum smooth to rugose, distinctly punctured, with or without yellow markings. Legs stout, tibiae not strongly spinose, usually ferrugineous to infuscate, yellow markings on few species. Abdomen shiny, ferrugineous, black or slightly metallic bluish-green, with or without yellow bands; tergites 2-4 with sparse whitish pubescence; tergites 5 and 6 clothed with golden-red suberect setae or whitish pubescence; propodeum without well-defined raised lines, or rugulose with median longitudinal groove. Pygidium elongate-triangular, narrowly constricted medially, surface smooth or rugose, spinose, lateral margins carinate. Gonostylus wing-shaped, periphery with short and long spines; volsella small, elongate, sharply pointed at apex.

The subgenus *Nesocrabro* can be separated from the related subgenus *Oreocrabro* by its suberect, golden-red to silvery-buff clypeal setae. In *Nesocrabro* the eye margins and the antennal fossae are widely separated, while in *Oreocrabro* the eye margins and antennal fossae are contiguous or nearly contiguous.

KEY TO SPECIES OF SUBGENUS NESOCRABRO

1. Distance between eye margin and antennal fossa 1.5× as great as distance be-

	tween fossae.....	giffardi
	Distance between eye margin and antennal fossa 2× as great as distance between fossae	2
2 (1).	Abdomen with yellow band or bands; ♀ with yellow spots on legs	3
	Abdomen without yellow band or bands; ♀ without yellow markings on legs.....	4
3 (2).	Last abdominal tergite with golden-red setae	bidecoratus
	Last abdominal tergite with whitish setae	compactus
4 (2).	Fore wing colorless.....	stygius
	Fore wing slightly infusate	5
5 (4).	Postscutellum with yellow band; inner surface of fore tibia partly testaceous...	
	adspectans
	Postscutellum without yellow band; inner surface of fore tibia not testaceous...	
	rubrocaudatus

Ectemnius (Nesocrabro) rubrocaudatus (Blackburn and Cameron)

Crabro rubrocaudatus Blackb. & Cam. 1886, Manchester Lit. Phil. Soc. Mem. **10**: 232.

Nesocrabro rubrocaudatus, Perkins, 1899, Fauna Hawaiiensis **1**: 27.

Ectemnius (Nesocrabro) rubrocaudatus, Pate, 1944, Amer. Midl. Nat. **31**: 382.—Leclercq, 1954, Mon. Hym. Crabro. p. 282 (cited as synonym of *N. bidecoratus*).

Male: Length 8–10 mm. Wing infusate with slight tinge of blue iridescence. Mandible black; clypeus clothed with golden-red setae; antennal scape black, robust 2.3× as long as segment 3; segment 6 emarginate, feebly rounded at apex (fig. 4, d); shiny, cordiform depression between and above antennal fossae; frontal area dull, with many distinct minute punctures, rugulose toward vertex; vertex with very many minute punctures, indistinctly rugulose. Pronotum without yellow spot; mesonotum dull, rugulose, with many minute punctures; scutellum and postscutellum with no yellow marking, dull, rugose, and finely punctured. Legs ferrugineous. Anterior part of propodeum with prominent, short, longitudinal raised lines; with shallow median longitudinal groove; posterior part of propodeum with many transverse raised lines running from lateral part of propodeum to deep median longitudinal groove. Abdomen shiny, reddish-brown, with sparse pubescence on tergites 3–5; 2 apical segments clothed with dense suberect golden-red setae. Gonostylus (fig. 1, e) 6× as long as maximum width; few short spines on anterior and posterior areas.

Female: Length 10–12 mm. Similar to ♂ except as follows: Pronotum without yellow band; postscutellum black, sometimes with weak yellow bands anteriorly. Abdominal tergite 2 reddish-brown to metallic bluish, tergites 3–5 shiny metallic blue-black with sparse whitish pubescence; tergite 6 metallic purplish-blue, clothed with golden-red suberect setae. Pygidium elongate-triangular (fig. 2, b), surface rugose, minute setae, lateral margins carinate, with tiny testaceous spot apically and no distinct minute striations at apical margin.

Specimens examined: Hawaiian Is., Blackburn (holotype, ♂, BISHOP 74). HAWAII: 3 ♂, Kona, 900–1200 m, Aug., Sep., Nov., Perkins, Giffard; ♀, Hilo, 560 m, Dec. Perkins; 2 ♂, ♀, Kau, 1200 m, Sept., Nov., Perkins, Giffard; 2 ♂, Puna, 600 m, Dec., Perkins; 2 ♂, 4 ♀, Oloa, June, Perkins; 5 ♂, 16 ♀, Kilauea, Jan., Feb., Apr.-July, Nov., Perkins, Giffard, Fullaway; 4 ♂, 8 ♀, Hilo Volcano Rd., Kilauea, Perkins; ♀, South Kona, 600 m,

Perkins; ♂, Upper Hamakua Ditch trail, Oct., Swezey; 3 ♂, 2 ♀ Kulani, June, Weber; 12♂, 9♀, Nauhi Gulch 1500–1800 m, Sept.-Oct., Swezey & Williams; ♂, ♀, Kohala Mts., Nov., Swezey; 4 ♂, Pahala, Mar., Apr., Williams, Bridwell; ♂, Paauilo, 760 m, Dec., Williams; ♂, Hualalai, 1200 m, Aug., Williams; 2 ♂, 2 ♀, Hawaii, Koebele.

The ♀ of this species can be recognized by the absence of minute striations on the apical margin of the pygidium and absence of a yellow band on the pronotum and post-scutellum. The metallic purplish-blue of apical tergite instead of the metallic blue-black or blue-green colors will separate the ♀ of this species from that of *adspectans*. The ♂ is recognized by the absence of yellow markings on the pronotum, scutellum and postscutellum.

Ectemnius (Nesocrabro) adspectans (Blackburn and Cameron)

Crabro adspectans Blackb. & Cam., 1886, Manchester Lit. Phil. Soc., Mem. 10: 231.

Nesocrabro adspectans, Perkins, 1899, Fauna Hawaiiensis 1: 29.

Ectemnius (Nesocrabro) adspectans, Pate, 1944, Amer. Midl. Nat. 31: 382.—Leclercq, 1954, Mon. Hym. Crabro. p. 282,

Nesocrabro daemonius Perkins 1899, Fauna Hawaiiensis 1: 28.

Male: Length 8–10 mm. Wing infusate. Mandible black; clypeus clothed with golden-red setae; antennal scape black, somewhat robust, 2.5× as long as segment 3; 6 emarginate, feebly rounded at apex (fig. 4, d); cone shaped depression between and above antennal fossae; frontal area shiny, punctate-rugose, vertex shiny with scattered puncturation. Pronotum with narrow yellow band or incomplete bands or spots on hind margins; mesonotum with distinct, scattered puncturation; scutellum usually with narrow yellow band near anterior margin, sometimes wanting; postscutellum with weak transverse yellow band anteriorly, band narrowly constricted at its middle; sometimes with interrupted band in middle. Legs ferrugineous; inner surface of fore tibia partly testaceous. Anterior part of propodeum with prominent short, longitudinal raised lines; posterior part of propodeum with a median longitudinal groove; many transverse raised lines running from lateral part of propodeum to median longitudinal groove. Abdomen shiny, clothed with sparse pale pubescence; tergites 2–5, pitchy to bluish reddish-brown on hind margins, apical tergite with golden-red setae. Petiole with whitish yellow spot medially; abdominal sternite 2 with small yellow spot. Gonostylus (fig. 1, a) 8× as long as maximum width; apex clothed with pubescence.

Female: Length 10–12 mm. Similar to ♂ except as follows: Pronotum with yellow band on hind margin; anterior portion of scutellum yellow. Abdominal tergite 2 reddish-brown, 3–5 metallic-black, 6 bluish-green, 5 and 6 clothed with golden-red suberect setae; abdominal sternite 2 with a yellow spot medially. Pygidium elongate-triangular (fig. 2, a), narrowly constricted medially and tapering to apex, lateral margins slightly curved upward, surface smooth with few short setae.

Specimens examined: Hawaiian Is., holotype, ♂, BISHOP 1384. MOLOKAI: ♀, Kahani, Molokai Mts., 950 m, Aug., 5 ♂, 2 ♀, Molokai Mts., 1200 m, Sept., Perkins; ♂, Waikolu Valley, Oct., Weber. MAUI: ♂, West Maui Mts., 5 ♂, Iao Valley, May, Perkins; ♀, Haleakala, 650–1200 m, Perkins. HAWAII: 2 ♀, Kilauea, 1200 m, Mar., May, Giffard, Williams.

This species is closely allied to *rubrocaudatus* and *bidecoratus*. The ♀ is separated



Fig. 1. Male genitalia: a, *Ectemnius (Nesocrabro) adspectans*; b, *compactus*; c, *giffardi*; d, *stygius*; e, *rubrocaudatus*; f, *Ectemnius (Oreocrabro) atripennis*; g, *distinctus*; h, *tumidoventris*; i, *hawaiiensis*; j, *molokaiensis*; k, *frederici-smithi*; l, *nesiotes*; m, *polynesiensis*; n, *monticola*; o, *discrepans*; p, *abnormis*; q, *haleakalae*; r, *mandibularis*; s, *fulvicrus*; t, *curtipes*.

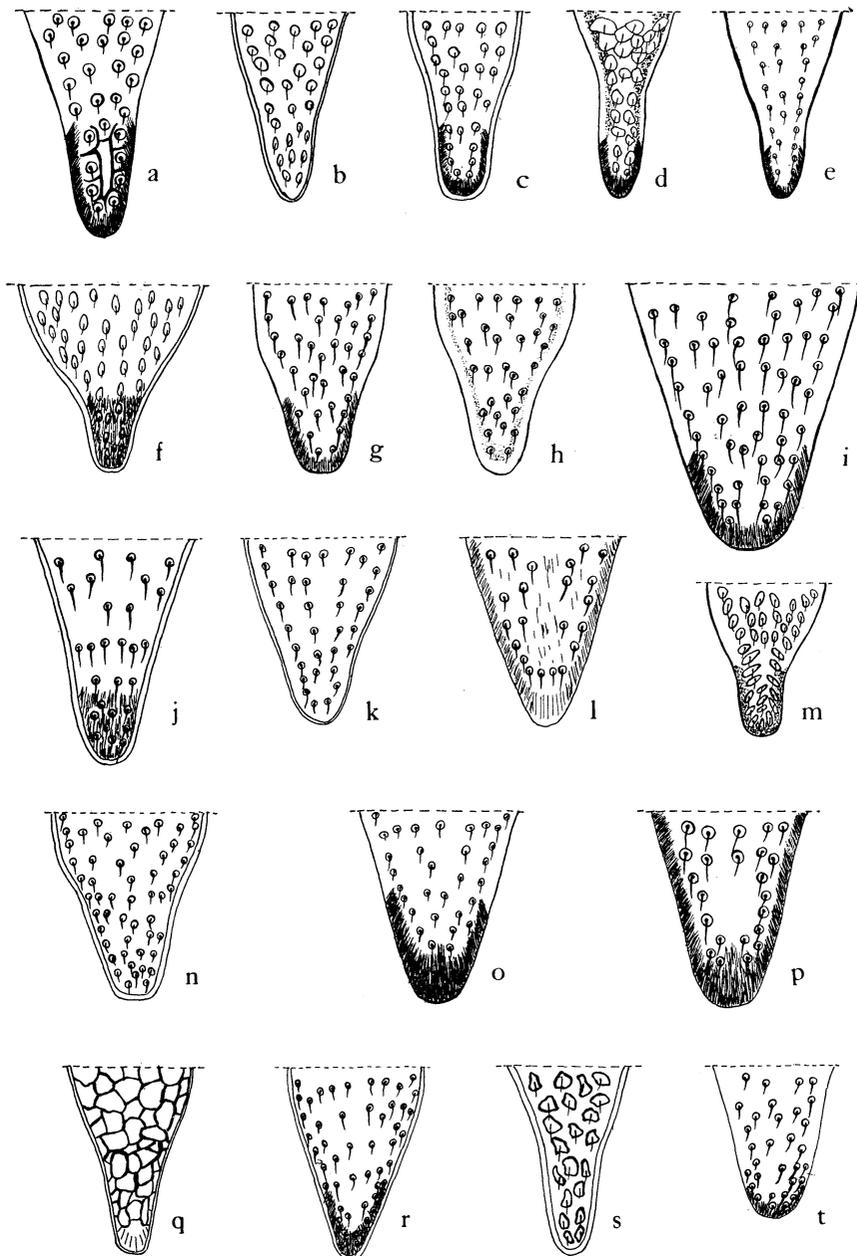


Fig. 2. Female pygidium: a, *Ectemnius (Nesocrabro) compactus*; b, *rubrocaudatus*; c, *bidecoratus*; d, *stygius*; e, *compactus*; f, *Ectemnius (Oreocrabro) atripennis*; g, *mandibularis*; h, *hawaiiensis*; i, *nesiotes*; j, *frederici-smithi*; k, *discrepans*; l, *fulvicrus*; m, *tumidoventris*; n, *monticola*; o, *weberi*; p, *polynesialis*; q, *abnormis*; r, *distinctus*; s, *curtipes*; t, *molokaiensis*.

from those 2 species by the pygidium of which the posterior half is narrowly tapered to an acute apex while in other species, the posterior half of the pygidium is not reduced. The apical margin of the pygidium of *adspectans* is heavily striated, but is smooth or finely striated in the others. In the ♂ of *adspectans* the pronotum is marked with a narrow yellow band and tergite 6 is metallic blue-green in color, while in *rubrocaudatus* and *bidecoratus* the pronotum is either with or without yellow spot and tergite 6 is metallic purplish-blue or blue-black.

Ectemnius (Nesocrabro) bidecoratus Perkins

Nesocrabro bidecoratus Perkins, 1899, Fauna Hawaiiensis 1: 27.

Ectemnius (Nesocrabro) bidecoratus, Pate, 1944, Amer. Midl. Nat. 3: 382.

Male: Length 8 mm. Wing infusate with slight iridescence. Mandible black; clypeus clothed with golden-red suberect setae; antennal scape brownish-black, 2.5× as long as 3; 6 emarginate, feebly rounded at apex (fig. 4, d); shiny, obovoid depression between antennal fossae with 4 circular impressions at bottom; frontal area punctate-rugose. Pronotum with yellow spots on hind margin; pronotal lobe without yellow marking; mesonotum dull, with very many minute and scattered medium-sized punctures; scutellum and postscutellum with yellow bands anteriorly, bands interrupted at center. Legs brownish-black, anterior part of femora with tiny yellow spot; apex of hind tibia with tiny yellow band. Anterior, posterior and lateral parts of propodeum with strongly raised longitudinal lines; shallow, longitudinal median groove extending posteriorly from anterior part of propodeum to large ovate depression; abdominal tergite 2 with broad W-shaped yellow marking medially, 3–5 shiny, metallic blue-black; 6–7 clothed with golden setae. Petiole with yellow spot medially; abdominal sternite 2 with broad rectangular yellow marking medially. Gonostylus distorted and unsuitable for study.

Female: Length 9–11 mm. Similar to ♂ except as follows: Wing subhyaline to hyaline. Mandible whitish-yellow with reddish-black apex; antennal scape with yellow spots on lateral margins, 3× as long as segment 3; deep cordiform depression with median ridge between and above antennal fossae. Pronotum with yellow band on hind margin; pronotal lobe sometimes with yellow spot near hind margin. Apex of inner surface of fore and hind tibiae sometimes with tiny yellow spots. Tergites 3–5 with complete or incomplete yellow band, sometimes with yellow spots on lateral margin or without markings; 6 clothed with golden-red setae. Pygidium elongate-triangular (fig. 2, c), surface shiny, smooth, with sparse, large punctures: long spine arising from each puncture, apical margin testaceous and lateral margin smoothly rounded with minute striations at apex.

Type: British Museum (Nat. Hist.), ♀.

Specimens examined: HAWAII: ♂, Pahala, Nov., 1918; 2 ♀, Kilauea, Feb., July, Giffard; ♀, Pahala, Mar., Perkins: 2 ♀, Oiaa, 22 miles, Perkins.

The broad "W" shaped yellow marking on abdominal tergite 2 and yellow marking on sternite 2 will distinguish this species from the related species *adspectans* and *rubrocaudatus*. The ♀ can be distinguished by the whitish-yellow mandibles and the complete or incomplete yellow bands on abdominal tergites 4–6. This species superficially resembles *compactus*, but the two may be easily separated by the color of the setae on tergite 6 which are golden-red in latter species and whitish in *bidecoratus*.

Ectemnius (Nesocrabro) stygius (Blackburn and Kirby)

Crabro stygius Blackb. & Kirby, 1880, Ent. Mo. Mag. 17: 88.— Blackburn & Cameron, 1886, Manchester Lit. Phil. Soc., Mem. 10: 230.

Nesocrabro stygius, Perkins, 1899, Fauna Hawaiiensis 1: 29.

Ectemnius (Nesocrabro) stygius, Pate, 1944, Amer. Midl. Nat. 31: 382.— Leclercq, 1954, Mon. Hym. Crabro. p. 282.

Male: Length 7–9 mm. Wing nearly colorless. Mandible black; clypeus clothed with golden-red suberect setae; antennal scape black, 2.7× as long as segment 3; 6 emarginate, feebly swollen apically (fig. 4, d); shallow cordate depression between and above antennal fossae; frontal area shiny, with distinct medium-sized punctures, rugose; rugulosity less intense along vertex. Pronotum with yellow spots or without yellow marking; mesonotum dull, rugulose, with very many moderate shallow punctures; scutellum shiny, with striations and minute punctures. Legs infusate. Anterior part of propodeum with prominent, short longitudinal raised lines; posterior part of propodeum with many transverse raised lines extending from lateral parts of propodeum to median longitudinal groove. Abdomen black, shiny, with sparse pubescence on tergites 3–5; 2 apical tergites clothed with golden-red setae; sternite 2 polished, with sparse pubescence. Gonostylus (fig. 1, d) 6–7× as long as maximum width; many small spines along inner margin.

Female: Length 10–12 mm. Similar to ♂ except as follows: Mandible tridentate, brownish, sometimes with yellow spot at base. Pronotum with yellow band on hind margin; postscutellum with yellow band at anterior margin; scutellum dull. Underside of apex of middle and hind femora with yellow spots. Abdominal tergites 2–5 shiny, metallic blue-black to bronzy, with whitish pubescence; 2 apical tergites metallic purplish blue-green with dense golden-red suberect setae. Petiole with yellow spot medially; abdominal sternites 2–3 each with large yellow area medially and small yellow spots laterally. Pygidium elongate-triangular (fig. 2, d), narrowly constricted medially, tapering to apex, surface with distinct large punctures and short setae; lateral margin carinate, and apical margin with dense minute striation.

Specimens examined: OAHU: ♀, Oahu, after Blackburn & Kirby (no date). Male, ♀, NW Koolau Range, 450 m (no date, probably Perkins); 14 ♂, 7 ♀, Waialua, 450 m., Aug., Sept., Perkins; 2 ♂, Tantalus, 300 m, Mar., Giffard; 16 ♂, 5 ♀, Mt. Kaala, Jan., Weber; ♂, ♀, Anahulu Trail, June, Weber; 2 ♀, Kawainui Trail, Sept., Weber; ♀, Olympus, Jan., Swezey; ♀, Kaukonahua, Oct., Swezey; ♀, Konahuanui, Oct., Williams; ♀, Manoa, Nov., Williams; 2 ♂, Kahuku, 450 m, Nov., Swezey; ♂, Pupukea, July; ♀, Pan Pac. Inst., Nov.; 2 ♀, Woodlawn, July, Aug.; ♀, Oahu, Koebele.

This species is very close to *rubrocaudatus* from which it may be distinguished by its colorless wings. The spines along the basal part of gonostylus are more numerous than those of *rubrocaudatus*. The *stygius* ♀ may be distinguished from *rubrocaudatus* ♀ by the elongate-triangular pygidium in latter, and posterior half of the pygidium tapering to an acute apex in the former species. The pronotum and postscutellum are banded with yellow markings in *stygius* ♀ and without markings in *rubrocaudatus*, ♀.

Ectemnius (Nesocrabro) compactus (Perkins)

Nesocrabro compactus Perkins, 1899, Fauna Hawaiiensis 1: 25.

Nesocrabro compactus lanaiensis Perkins, 1899, *ibid.* 1: 26.

Ectemnius (Nesocrabro) compactus, Pate, 1944, Amer. Midl. Nat. 31: 382. — Leclercq, 1954, Mon. Hym. Crabro. p. 282.

Male: Length 7–9 mm. Wing slightly infusate. Mandible ferrugineous; clypeus clothed with silvery buff suberect setae; antennal scape brownish-black, $2.6\times$ as long as segment 3; 6 emarginate, without apical process (fig. 4, e); deep triangular depression between and above antennal fossae; frontal area dull, with many shallow, minute punctures, and rugose. Pronotum with interrupted yellow band, or sometimes with spots at postero-lateral margins; pronotal lobe black, sometimes with mesal yellow spot; mesonotum and scutellum rugose, with very many shallow minute punctures; scutellum sometimes with interrupted whitish-yellow band or with pale spots near lateral margins; postscutellum with whitish-yellow band. Legs brownish-black. Anterior and lateral parts of propodeum with distinct raised lines; posterior part of propodeum strongly rugose with median ovate depression. Abdomen brownish-black, shiny, with whitish pubescence on tergites 3 and 4; tergite 3 with complete or incomplete yellow band, 4 or 5 with short yellow bands or spots near lateral margins, 6 and 7 with entire band, or 7 with yellow spots near lateral margins, or sometimes without markings; lateral margins of abdominal sternite 2 with yellow spots. Gonostylus (fig. 1, b) $5\times$ as long as maximum width, few short spines at base and apex.

Female: Length 8–10 mm. Similar to ♂ except as follows: Mandible whitish-yellow, ferrugineous at base and reddish-brown at apex; antennal scape with narrow longitudinal yellow markings at lateral margin, $2.9\times$ as long as segment 3; compact group of oval depressions between and above antennal fossae. Pronotum with yellow band on hind margin. Entire abdomen clothed with whitish pubescence. Pygidium elongate-triangular (fig. 2, e), posterior 1/2 tapering to acute apex, surface smooth, punctate with scattered short setae, lateral margins curved upward.

Specimens examined: Paratypes at Bishop Mus.: ♀, Mt. Waimea, Kauai, 950 m; 4 ♂, 4 ♀, Halemanu, Kauai, 1200 m, May; ♂, Kaholumanu, Kauai, Apr., Perkins; 2 ♂, ♀, Mt. Koele, Lanai, 600 m, Jan., Dec., Perkins. OAHU: 3 ♀ Waianae Mts., 450 m, Jan., Perkins. KAUAI: 6 ♂, ♀, Kokee, June-Sept., Zimmerman, Maehler, Osborn; 2 ♂, ♀, Kaholuanu, July, Aug., Giffard; 2 ♀, Waialalae, 1200 m, June, Giffard; 2 ♂, Lahuahakihaki, Oct., Giffard; 2 ♀, Kalalau, Aug., Swezey; ♂, Halemanu, Aug., Swezey; ♂, Summit Camp, Feb., Williams.

This species is closely allied to *giffardi* n. sp. The ♂ can be distinguished from that species by the presence of suberect silvery buff setae on the clypeus, a yellow band on the postscutellum and yellow spots on the lateral margins of abdominal sternite 2, whereas in *giffardi*, the clypeal pubescence is white with no yellow markings on postscutellum. The ♀ of *compactus* is easily distinguished from other members of the subgenus by the whitish pubescence on the entire abdomen.

Ectemnius (Nesocrabro) giffardi Yoshimoto, n. sp.

Male: Length 6–7 mm. Wing hyaline. Mandible black, apex ferrugineous; clypeus clothed with whitish pubescence; antennal scape brownish-black, $2.4\times$ as long as segment 3; 6 emarginate, without an apical process (fig. 4, e); deep, shiny, cordiform depression

between and above antennal fossae; frontal area with very many minute punctures and prominently rugose. Distance between eye margin and antennal fossa $1.5\times$ as great as distance between antennal fossae. Pronotum and pronotal lobe without yellow spot; mesonotum and scutellum with very many minute punctures and distinctly rugose; scutellum and postscutellum without yellow spot. Leg ferrugineous to brownish-black; inner surface of fore tibia not testaceous. Anterior and lateral parts of propodeum with distinct raised lines; shallow median longitudinal groove reaching mid-section of propodeum; posterior part of propodeum rugose, with median, ovate, concave depression. Abdomen brownish-black, shiny, with sparse whitish pubescence on tergites 4-7, tergite 3 with complete yellow band, 4 with yellow spot on lateral margin, 5 with incomplete yellow band or yellow spots at lateral margin, 6 with yellow band, 7 with narrow yellow band on anterior margin, lateral margins of abdominal sternite 2 with yellow spots. Gonostylus (fig. 1, c) $5\times$ as long as maximum width; several minute spines at apex and along inner margin, cluster of minute spines at gonocoxite.

Holotype, ♂ (BISHOP 2908), Kahuku, Kau, Hawaii, lava flow, 600 m, 27 Oct. 1914, W. M. Giffard. Paratypes, 2 ♂, Kahuku, Kau, Hawaii, 600 m, 12 Dec. 1911, 4 Dec. 1912, Giffard. Female unknown.

Giffardi is allied to *compactus*, but differs in the markedly shorter distance between the eye margin and antennal fossa. The clypeus is clothed with whitish pubescence in *giffardi* rather than with silvery buff and golden-red setae as in other members of this subgenus.

Subgenus *Oreocrabro* Perkins

Oreocrabro Perkins, 1902, Ent. Soc. Lond., Trans. 1902: 146 (type: *Crabro abnormis* Blackburn & Cameron, 1886, by original designation).

Ectemnius (*Oreocrabro*), Pate, 1944, Amer. Midl. Nat. 31: 381.

Hylocrabro Perkins, 1902, *ibid.* p. 147 (type: *Crabro tumidoventris* Perkins, by original designation).

Melanocrabro Perkins, 1902, *ibid.* p. 147 (type: *Crabro curtipes* Perkins, by original designation).

Xenocrabro Perkins, 1902, *ibid.* p. 148 (type: *Crabro unicolor* Smith, by original designation).

Medium to small-sized black species. Wing hyaline, subhyaline, or infusate with steel blue iridescence. Antennal scape rugulose, robust to slender often with yellow markings in ♀ and generally without yellow marking in ♂; antennal segment 6 emarginate in ♂ and not in ♀; clypeus quadrate or subquadrate with appressed golden or silvery pubescence, clypeal margin with median tooth rounded or shallowly emarginate; mandible usually bidentate (tridentate in a few ♀), color either whitish-yellow, ferrugineous or black; distance between eye margin and antennal fossa less than $1/2$ distance between antennal fossae; medio-frontal area depressed, often elongate, bare and shiny, sometimes pubescent; areas from near eye margin to vertex rugulose, and with 2 kinds of puncturation. Pronotum with or without yellow band, sometimes with yellow spot; mesonotum, scutellum, and postscutellum generally dull, with long fine setae; surface rugose to rugulose, with

puncturation of 2 kinds. Legs stout, usually ferrugineous or brownish-black; sometimes with yellow markings on legs; inner surface of fore tibiae often testaceous; tibiae not strongly spinose; inner surface of hind tibia pubescent. Abdomen shiny with whitish pubescence; whitish-yellow markings on abdominal tergites 2, 4-6, or without markings; 3 apical sternites strongly depressed in ♂, rounded in ♀; propodeum with long fine setae, minute puncturation, well defined raised lines, and median longitudinal groove. Pygidium variable in size and shape; surface dull and rugose, or shiny and smooth. Gonostylus wing-shaped, margins with short and long setae; volsella small, curved, with spine-like apex.

This subgenus is characterized by having the clypeal setae either silvery or golden in color. The frontal and thoracic areas are clothed with pale brown setae; the eye margin and the antennal fossa are either contiguous or nearly contiguous, as compared to subgenus *Nesocrabro*.

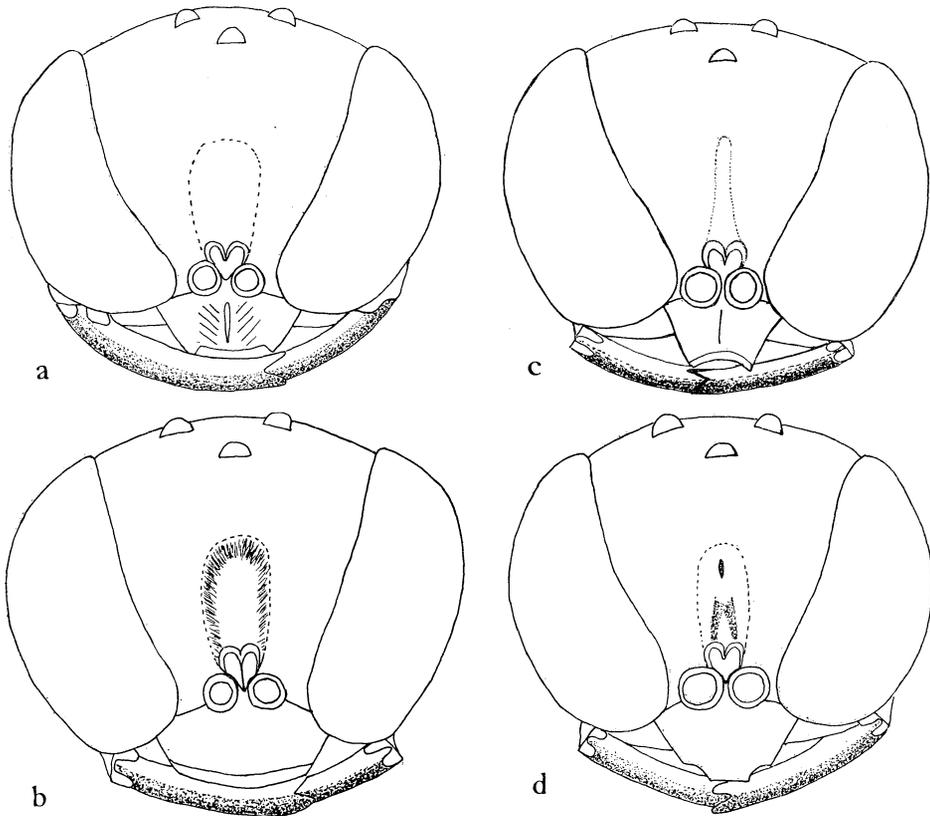


Fig. 3. Head of male: a, *Ectemnius* (*Nesocrabro*) *giffardi*; b, *rubrocaudatus*; c, *Ectemnius* (*Oreocrabro*) *tumidoventris*; d, *polynesialis*.

KEY TO SPECIES OF SUBGENUS OREOCRABRO

1. Distance between inner margin of eye and inner edge of rim of antennal

- fossa less than, or equal to, that between inner edges of rims of antennal fossae (fig. 3, c) 2
- Distance between inner margin of eye and inner edge of rim of antennal fossa greater than distance between inner edges of rims of antennal fossae (fig. 3, d) 15
- 2 (1). Female tibiae and femora, except hind femur, with yellow spots; ♂ antennal segment 6 with flat elongate process at apex (fig. 4, c) **abnormis**
 Female tibiae and femora without yellow spots; ♂ antennal segment 6 without flat elongate process at apex (figs. 4, a, b, d, e) 3
- 3 (2). Abdomen with complete or incomplete yellow band on tergite 3 4
 Abdomen without a band on tergite 3 5
- 4 (3). Inner surface of fore tibia orange-yellow **discrepans**
 Inner surface of fore tibia brownish-black **monticola**
- 5 (3). Female mandible tridentate; ♂ tarsal segment 1 of fore leg rectangular and flattened 6
 Female mandible bidentate; ♂ tarsal segment 1 of fore leg not rectangular and flattened, subterete 7
- 6 (5). Female clypeal margin deep, triangulately emarginate, clothed with golden setae; ♂ tarsal segment 1 of fore leg 3 × as long as broad; antennal segment 6 without apical process **curtipes**
 Female clypeal margin shallow, triangulately or semicircularly emarginate (fig. 3, c), clothed with silvery setae; ♂ tarsal segment 1 of fore leg 2 × as long as broad; antennal segment 6 with apical process **tumidoventris**
- 7 (5). Scutellum polished 8
 Scutellum dull 9
- 8 (7). Inner surface of fore tibia orange-yellow **molokaiensis**
 Inner surface of fore tibia brownish-black **monticola**
- 9 (7). Mandible and antennal scape jet-black **haleakalae**
 Mandible black; antennal scape brownish-black 10
- 10 (9). Abdomen with yellow band **weberi**
 Abdomen without yellow band 11
- 11 (10). Clypeal setae golden 12
 Clypeal setae silvery 13
- 12 (11). Inner surface of fore tibia orange-yellow **fulvicrus**
 Inner surface of fore tibia brownish-black **polynesialis**
- 13 (11). Mandible whitish-yellow, apex ferrugineous **atripennis**
 Mandible black or reddish-brown entirely 14
- 14 (13). Female with inner surface of fore tibia brownish-black; ♂ antennal segment 6 with a prominent projection at apex (fig. 4, a) **hawaiiensis**
 Female with inner surface of fore tibia orange-yellow; ♂ antennal segment 6 feebly rounded at apex (fig. 4, e) **nesiotes**
- 15 (1). Abdomen with complete or incomplete band on tergite 3 16
 Abdomen with yellow spots or without yellow marking on tergite 3 18
- 16 (15). Postscutellum without yellow band **frederici-smithi**
 Postscutellum with yellow band 17
- 17 (16). Inner surface of fore tibia orange-yellow **distinctus**

- Inner surface of fore tibia brownish-black **mandibularis**
 18 (15). Inner surface of fore tibia orange-yellow; postscutellum entirely yellow or with traces of yellow spots **distinctus**
 Inner surface of fore tibia brownish-black; postscutellum without yellow marking **mandibularis**

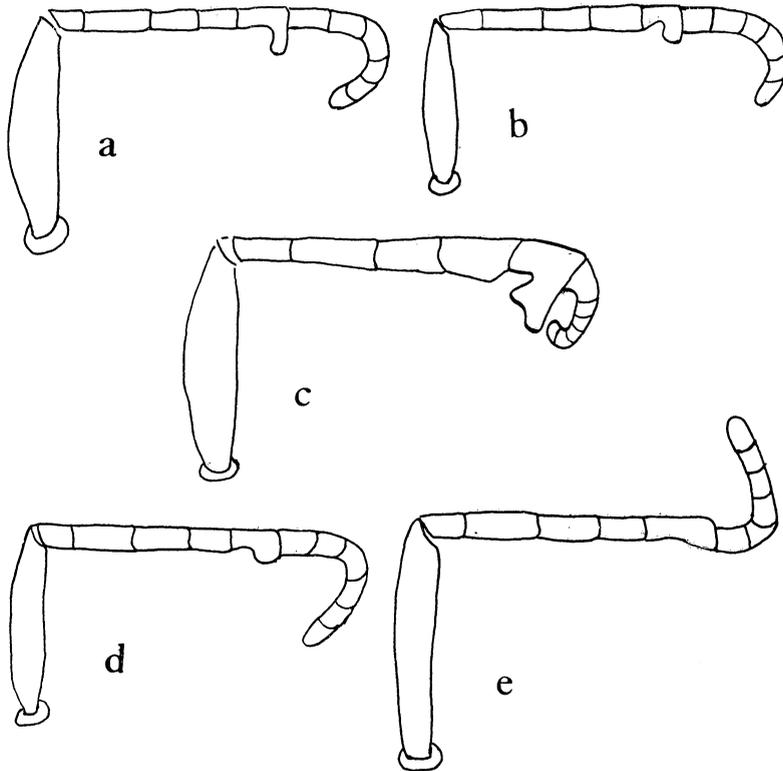


Fig. 4. Male antenna: a, *Ectemnius (Oreocrabro) hawaiiensis*; b, *molokaiensis*; c, *abnormis*; d, *mandibularis*; e, *atrypennis*.

***Ectemnius (Oreocrabro) abnormis* (Blackburn and Cameron)**

Crabro abnormis Blackb. & Cam., 1886, Manchester Lit. Phil. Soc., Mem. 10: 228.

Crabro (Solenius) abnormis, Perkins, 1899, Fauna Hawaiiensis 1: 25.

Oreocrabro abnormis, Perkins, 1902, Ent. Soc. Lond., Trans. p. 146.

Ectemnius (Oreocrabro) abnormis, Pate, 1944, Amer. Midl. Nat. 31: 381.—Leclercq, 1954, Mon. Hym. Crabro. p. 280.

Male: Length 9–10 mm. Wing infusate. Mandible bidentate; ferruginous or whitish-yellow with apex brownish-black; clypeus with appressed silvery pubescence; antennal scape brownish-black, 2.3 × as long as segment 3; 6 emarginate, with a flat elongate pro-

cess at apex (fig. 4, c); a large, shallow, ovoid-elongate depression between antennal fossae with small deep pit at bottom; eye margin touching antennal fossa; medio-frontal area with elongate shiny spot. Pronotum and pronotal lobe sometimes with yellow spot on hind margin; anterior part of mesonotum rugulose, with very many minute punctures; posterior part of mesonotum and scutellum with scattered large punctures. Tarsal segment 1 of fore leg flattened, $2\times$ as long as its maximum width; inner surface of fore femur and tibia orange-yellow; outer surface of fore, mid, and hind femora and tibiae (except hind tibia) with narrow longitudinal yellow markings or spots; mid leg sometimes without markings. Anterior part of propodeum with strongly raised lines; a shallow median longitudinal groove present; lateral parts of propodeum with strongly raised lines; posterior part of propodeum with a deep, elongate, longitudinal sculptured groove. Abdomen black, without yellow band. Gonostylus (fig. 1, p) $8\times$ as long as its maximum width, entire surface covered with dense pubescence.

Female: Length 11–13 mm. Similar to ♂ except as follows: Mandible whitish-yellow with black apex; antennal scape entirely whitish-yellow, except for narrow longitudinal black stripe on lateral margin, $3.5\times$ as long as segment 3. Posterior part of mesonotum with minute punctures and rugosity. Tarsal segment 1 of fore leg simple; inner surface of fore tibia orange-yellow; tibiae and femora, except hind femur, with yellow spots beneath. Pygidium elongate-triangular (fig. 2, q), narrowly tapering from middle part to apex, surfaces shiny, rugose, with minute and large punctures, few scattered short setae arising from each puncture.

Specimens examined: Holotype, ♂, BISHOP 2593, Hawaiian Is. OAHU: ♂, NW Koolau Range, Sept., ♂, Waialua, 450 m, 3 ♂, 2 ♀, Waianae Mt., Jan., Oct., Perkins, Swezey, Williams; 20 ♂, 8 ♀, Mt. Kaala, Jan., Nov., Weber, Swezey; ♂, Waipio Rdg., Mar., Swezey.

The apex of antennal segment 6 of ♂ *E. (O.) abnormis* is modified into a flat elongate process and this distinguishes it from all other known species. The ♀ *abnormis* is recognized from other species of *Oreocrabro* by the spotted yellow markings on the underside of tibiae and femora, except the hind femur.

Ectemnius (Oreocrabro) tumidoventris (Perkins)

Crabro (Solenius) tumidoventris Perkins, 1899, Fauna Hawaiiensis 1: 18.

Crabro (Solenius) tumidoventris leucognathus Perkins, 1899, *ibid.* 1: 19.

Hylocrabro tumidoventris Perkins, 1902, Ent. Soc. Lond., Trans. 1902: 147.

Ectemnius (Oreocrabro) tumidoventris Pate, 1944, Amer. Midl. Nat. 31: 381.— Leclercq, 1954, Mon. Hym. Crabro. p. 280.

Male: Length 7–9 mm. Wing infusate with slight violet iridescence. Mandible bidentate, whitish-yellow, apex dark brown; clypeus with appressed silvery pubescence; antennal scape brownish-black, $2.7\times$ as long as segment 3; 6 emarginate, feebly rounded at apex (fig. 4, d); face with 2 shallow ovoid or cordiform depressions between and above antennal fossae; eye margin touching antennal fossa; medio-frontal area with small shiny spot anteriorly. Pronotum without yellow band; posterior portion of mesonotum dull, rugulose, with scattered large punctures mixed with minute punctures; scutellum dull, with scattered large punctures and medial portion with shallow longitudinal depression;

postscutellum without yellow band. Legs brownish-black; inner surface of fore tibia orange-yellow; tarsal segment 1 of fore leg flattened, $2\times$ as long as broad. Anterior part of propodeum with strongly raised lines; posterior part of propodeum with Y-shaped carina, followed by longitudinal median groove; many strongly raised lines running to lateral parts of propodeum from median groove. Abdomen brownish-black; lateral margins of tergites 4 and 5 with or without yellow spots. Gonostylus (fig. 1, h) $6\times$ as long as maximum width, tapering to acute apex, surface sparsely covered with long spines.

Female: Length 8–11 mm. Similar to ♂ except as follows: Mandible tridentate, whitish-yellow with apex reddish-brown, lateral margins sometimes pale brown in color; antennal scape sometimes with longitudinal yellow marking on inner margin, $3.0\times$ as long as segment 3. Posterior portion of mesonotum and scutellum somewhat shiny, with scattered medium-sized punctures mixed with minute punctures. Tarsal segment 1 of fore leg simple. Pygidium elongate-triangular (fig. 2, m), posterior half tapering to acute apex, surface shiny, punctate-rugose with sparse short setae, lateral margins curved upward, forming a ridge.

Specimens examined: Paratypes at Bishop Mus.: 2 ♂, 3 ♀, Waianae Mts., Oahu, 600 m, Feb., 1896, 4 ♂, ♀, Honolulu, Oahu, 600 m, Mar., 1896, ♂, ♀, Koolau Range, Oahu, 600 m, Oct., 1896, Perkins; 3 ♂, 6 ♀, Kau, Hawaii, 1200 m, July, Aug., Sept., Dec., 1896, 5 ♀, Kona, Hawaii, 1200 m, Sept., Oct., 1892, ♀, Kilauea, Hawaii, 1200 m, July, 1894, 9 ♂, Puna, Hawaii, 600 m, Nov. Dec., 1896, Perkins; 3 ♂, 4 ♀, Molokai Mts., Molokai, 600–900 m, June, Nov., 1896, Perkins; 2 ♂, ♀, Iao Valley, Maui, May, June, 1896, Perkins. OAHU: 10 ♂, 7 ♀, 540 m, June, Nov., Dec., Perkins, Weber, Yoshizumi; 2 ♀, Haleanau, July, ex nest in dead *lehua*, Swezey; ♀, Kahauiki, Oct., Swezey; ♂, Kahuku, Nov., Swezey; ♀, Keana, Jan., Swezey; ♀, Kaukonahua, Swezey, ♂, 6 ♀, Kaala, June, Swezey, Giffard, Weber; ♀, Kawaiiki Trail, Nov., Weber; 5 ♂, 18 ♀, Koolau R., 480 m, May, June, July, Perkins; ♂, 2 ♀, Lanihuli, July, Oct., Nov., Bryan, Swezey; ♂, 5 ♀, Maunawili, Jan., Feb., Weber; ♀, Makaha, Waianae Mts., Jan., Perkins; 26 ♂, 5 ♀, Oahu Mts., Giffard; 2 ♂, 7 ♀, Olympus, Jan., Nov., Dec., Swezey, 6 ♂, 6 ♀, Pauoa, Feb., Dec., Swezey, Bryan; ♂, ♀, Pacific Hts., May, Swezey; ♂, Peahinaia Rdg., Apr., Swezey; ♀, Pupukea, Sept., Swezey; 2 ♂, Punaluu, Oct., Weber; 44 ♂, 42 ♀, Tantalus Jan. - Mar., May-July, Oct., Dec., Perkins, Giffard, Swezey (ex nest in dead branch of *kukui*); 4 ♀, Palolo, Mar., July, Sept., Oct., Bryan, Swezey; ♀, Waimano, Jan., Swezey; ♂, Wailupe, Nov., Swezey; ♀, Wahiawa, June, Swezey; ♀, Waiau, Mar., Bryan; ♂, Waianae, Nov., Swezey; 3 ♂, 5 ♀, 450 m, Jan., Perkins. HAWAII: ♀, Akaka Falls, June, Weber; ♀, Hilo, July, Swezey; 3 ♀, Judd Trail, Aug., Swezey (Prey record); 18 ♂, 13 ♀, Kilauea, Jan., June, July, Aug., Nov., Giffard, Williams; ♀, Kapapala, Dec.; 2 ♂, Kaumana, Apr., Oct., Swezey; ♂, Mountain View, Mar.; 2 ♂, ♀, Ookala, Oct.; 2 ♂, 2 ♀, Olaa, 500 m, Perkins, Giffard; 2 ♂, ♀, Nauhi Gulch, 1500–1800 m, Sept., Oct., ex cocoon in rotton log, Swezey & Williams; 2 ♂, Panaewa?, July, ex nest in *Pipturus*, Swezey; ♂, ♀, South Kona, 540 m, Perkins; 3 ♂, 2 ♀, N. Kona, Nov., 800 m, Giffard. MAUI: ♂, Haleakala, July, Timberlake; ♀, Hana, July; 4 ♂, 2 ♀, Iao Valley, Feb., Mar., June, Swezey, Giffard; ♀, Kula Pipe Line, Aug., Swezey; ♀, Kipahulu; 2 ♂, Olinda, May, Oct., Swezey; 2 ♀, Olowalu, Mar., Giffard; ♀, Waikamoi, Jan., Swezey. MOLOKAI: ♀, Molokai, Oct., Giffard; 4 ♂, 3 ♀, Kainalu, July, Swezey; ♀, Pukoo, Nov., Giffard; ♂, ♀, Waikolu, 1060 m, June, Swezey; 2 ♀, Molokai, Feb., Perkins.

This species is widely distributed in the Hawaiian Is. Both sexes of *tumidoventris* are

separated from the allied species, *curtipes* by the presence of slight violet iridescence of the wings as compared with no iridescence of wings in *curtipes*.

Ectemnius (*Oreocrabro*) *curtipes* (Perkins)

Crabro (*Solenius*) *curtipes* Perkins, 1899, Fauna Hawaiiensis 1: 24.

Melanocrabro curtipes, Perkins, 1902, Ent. Soc. Lond., Trans. 1902: 147.

Ectemnius (*Oreocrabro*) *curtipes*, Pate, 1944, Amer. Midl. Nat. 31: 381—Leclercq, 1954, Mon. Hym. Crabro. p. 281.

Male: Length 9–11 mm. Wing infusate. Mandible bidentate, black with apex ferrugineous; clypeus with appressed silvery pubescence, tinged with yellow; antennal scape brownish-black, 2.6× as long as segment 3; 6 emarginate, feebly rounded at apex (fig. 4, d); face with 2 deep, ovoid depressions between and above antennal fossae; eye margin touching antennal fossa; medio-frontal area with small median longitudinal groove. Pronotum without yellow band; mesonotum and scutellum dull, rugulose, with very many minute and large punctures; scutellum with median depression; postscutellum without yellow band. Legs ferrugineous to brownish-black; tarsal segment 1 of fore leg flattened, 3× as long as maximum width. Anterior part of propodeum with indistinct raised lines, shallow median elongate depression present; posterior part of propodeum with deep, median longitudinal groove; with many transverse raised lines intersecting at median groove. Abdomen reddish-black. Gonostylus (fig. 1, t) 4× as long as maximum width; broadly truncate posteriorly, surface densely pubescent.

Female: Length 12 mm. Similar to ♂ except as follows: Apical margin of clypeus triangulately emarginate, surface with appressed golden pubescence; mandible tridentate, whitish-yellow with lateral margins and apex black; antennal scape yellow, inner margin with brownish-black stripe, 3× as long as segment 3. Posterior part of mesonotum and scutellum with distinctly separated medium sized punctures. Legs black; tarsal segment 1 of fore leg simple. Posterior part of propodeum with transverse raised lines from lateral areas intersecting median longitudinal groove. Pygidium elongate-triangular (fig. 2, s), dull, with sparse large punctures and short setae, lateral margins strongly carinate.

Specimens examined: Paratypes at Bishop Mus.: ♂, ♀, Kona, Hawaii, 900–1200 m, Apr. 1892, Perkins. HAWAII: 4 ♂, Puna, 600–1200 m, Nov., Dec., 1896, Perkins.

This species is closely related to *tumidoventris*; however, ♂ *curtipes* can be separated from *tumidoventris* by its black mandibles, banded postscutellum, greatly flattened tarsal segment 1 and broad, truncate gonostylus. The ♀ is distinguished from that of *tumidoventris* by the golden pubescence on the clypeus and the yellow band on the postscutellum.

Ectemnius (*Oreocrabro*) *nesiotes* (Pate)

Crabro unicolor Smith, 1856, Catal. Hym. Brit. Mus. 4: 421 (*nec* Panzer, 1798, Faun. Ins. German. 50: no. 24).

Crabro (*Solenius*) *unicolor*, Perkins, 1899, Fauna Hawaiiensis 1: 23.

Xenocrabro unicolor, Perkins, 1902, Ent. Soc. Lond., Trans. 1902: 148.

Crabro nesiotes, Pate, 1937, Amer. Ent. Soc., Mem. 9: 4.

Ectemnius (*Oreocrabro*) *nesiotes*, Pate, 1944, Amer. Midl. Nat. 31: 381.—Leclercq, 1954, Mon. Hym. Crabro. p. 282.

Male: Length 7–10 mm. Wing infusate, with bluish iridescence. Mandible bidentate, black, with apex ferrugineous; clypeus with appressed silvery pubescence; antennal scape reddish-brown, 2.0–2.2× as long as segment 3; 6 emarginate, without apical process (fig. 4, e); face with deep, cordiform depression between and above antennal fossae, surface of depression rugose. Distance between eye margin and antennal fossa less than distance between antennal fossae; medio-frontal area with narrow, shiny, smooth stripe anteriorly. Pronotum without yellow band; mesonotum dull, rugulose, with very many minute punctures; scutellum dull, with scattered medium-sized punctures, and shallow depression; postscutellum with yellow band. Legs reddish-black; tarsal segment 1 of fore leg simple. Anterior part of propodeum with few raised lines and shallow median depression; posterior part of propodeum with prominent Y-shaped carina, followed by ovate median groove; with many transverse raised lines extending from median groove to lateral parts of propodeum. Abdomen reddish-black. Gonostylus (fig. 1, 1) 6.5× as long as maximum width; few short spines in anterior and posterior areas.

Female: Length 11–13 mm. Similar to ♂ except as follows: Antennal scape 2.5–2.6 × as long as segment 3. Inner surface of fore tibia orange-yellow. Abdominal sternite highly polished; fine, dense, whitish pubescence in circular pad on lateral margin of sternite 2. Pygidium triangulate (fig. 2, i), surface shiny, with scattered deep medium-sized punctures; small seta arising from each puncture, lateral margins slightly curved upward.

Type: British Museum (Nat. Hist.).

Specimens examined: OAHU: ♂, Anahulu Trail, Nov., Weber; ♂, Diamond Head, Mar., Giffard; 6 ♂, 4 ♀, Honolulu, 600 m, Mar., Dec., Perkins; 11 ♂, 5 ♀, Kaala Mts., 600 m, Jan., Oct., Perkins, Weber; 2 ♀. NW Koolau R., 450 m, Perkins; ♀, Kalihi, Nov., Yasuda; ♀, Kawaihapai, 600 m, Feb., Swezey; ♂, ♀, Lanihuli, Oct., Williams; 2 ♂, Pacific Hts., Oct., Swezey; ♂, Manoa, Dec., Williams; 2 ♀, Puu Kaua, June, Swezey; ♂, 3 ♀, Tantalus, Oct., Perkins, Giffard; 10 ♂, 4 ♀, Waianae, 600 m, Mar., Apr., Perkins, Swezey; 6 ♂, ♀, Waialua, Koolau Range, Mar., Nov., Perkins; ♀, Waimano, Feb., Swezey. HAWAII: ♀, Kona, 1200 m, Perkins; 5 ♂, Kilauea, May, Swezey; 79 ♂, 22.5 km South Kilauea, June, Weber; 10 ♂, Pahala, Apr., Williams; ♀, Puna, 600 m, Aug., Perkins. MAUI: 8 ♂, Iao Valley, Mar., July, Oct., Nov., Perkins, Giffard, Swezey; 5 ♂, 3 ♀, Haleakala, Mar., Perkins, Swezey; ♂, Haelaau?, 900 m, Dec., Walker; 2 ♂, ♀, Kula Pipe Line, Apr., June, Swezey, Bryant; ♂, Wailuku, Mar., Giffard; 2 ♀, Waiakoa, 800 m, Apr., Aug., Cooke, Zimmerman. MOLOKAI: 9 ♂, 19 ♀, Molokai Mts., 900 m, Feb., July, Perkins, Giffard; 2 ♀, Kainalu, July, Bryan; 17 ♂, 5 ♀, Molokai, Oct., Giffard. LANAI: 2 ♂, 2 ♀, Lanai, Oct., Giffard; ♂, Haalelepaakai, 900 m, July, Perkins; 8 ♂, ♀, Mt. Koele, 600 m, Feb., Perkins.

The ♂ of *nesiotes* is distinguished from the ♂ of *hawaiiensis* by the absence of apical process on antennal segment 6, while in *hawaiiensis*, a prominent apical process is present on antennal segment 6. In ♀ *nesiotes*, the inner face of the fore tibia is orange-yellow as compared to brownish-black in *hawaiiensis*.

Ectemnius (Oreocrabro) hawaiiensis (Perkins)

Crabro (Solenius) hawaiiensis Perkins, 1899, Fauna Hawaiiensis 1: 17.

Xenocrabro hawaiiensis, Perkins, 1902, Ent. Soc. Lond., Trans. 1902: 148.

Ectemnius (Oreocrabro) hawaiiensis, Pate, 1944, Amer. Midl. Nat. 31: 381.—Leclercq, 1954, Mon. Hym. Crabro. p. 281.

Male: Length 6–7 mm. Wing infusate with a slight iridescence. Mandible bidentate, black; clypeus with appressed silvery pubescence; antennal scape brownish-black, 2.0–2.2× as long as segment 3; 6 emarginate, apical process 2/3 as long as width of segment (fig. 4, a); face with shiny cordiform depression between and above antennal fossae; distance between eye margin and antennal fossa less than distance between antennal fossae; medio-frontal area shiny and glabrous. Pronotum without a yellow band; mesonotum dull, rugulose, with very many minute punctures; scutellum dull, with scattered medium-sized punctures and a small median depression; postscutellum without a yellow band. Legs brownish-black; tarsal segment 1 of fore leg simple. Anterior part of propodeum with short longitudinal raised lines, a shallow median groove present; posterior part of propodeum with a deep, median ovate groove; a few raised lines in lateral parts of propodeum. Abdomen brownish-black without yellow markings. Gonostylus (fig. 1, i) 5.5× as long as maximum width, surface sparsely covered with small spines.

Female: Length 9–10 mm. Similar to ♂ except as follows: Mandible entirely black, or with a medial yellow marking; antennal scape 3× as long as segment 3. Pygidium triangulate (fig. 2, h), surface polished, with scattered medium sized deep punctures; small seta arising from each puncture, apical margin with minute striation, lateral margins abruptly curved upward.

Specimens examined: Paratypes at Bishop Mus. 15 ♂, 8 ♀, Kona, Hawaii, 1200 m, July, Sept., 1892; 8 ♂, 12 ♀; Kau, Hawaii, 1200 m, June, July, Dec., 1896; 10 ♂, 5 ♀, Hilo, 1200 m, 1897, Perkins. HAWAII: ♂, Hamakua, 900 m, Perkins; ♂, Honaunau, June, Swezey; ♀, Hilo, Apr., Henshaw; 36 ♂, 20 ♀, Kilauea, May-Aug., Perkins, Swezey, Giffard, Williams; ♂, Kohala, May, Swezey; ♀, Puna, June, Perkins; 2 ♂, ♀, Pahala, Mar., Swezey, Williams; ♂, Puako Plant., Mar., Swezey; 7 ♂, 3 ♀, S. Kona, June-Aug., Swezey, Weber; ♂, Waimea, 1200 m, Perkins.

This species is easily confused with *molokaiensis*, since both are similar in size, color and shape. The following characters are useful in separating the 2 species. The mesonotum and scutellum are dull and the inner surface of the fore tibia is not orange-yellow in *hawaiiensis*; In ♀ *hawaiiensis* the pygidium is marked with minute striations at the apical margin.

Ectemnius (Oreocrabro) atripennis (Perkins)

Crabro (Solenius) atripennis Perkins, 1899, Fauna Hawaiiensis 1: 24.

Xenocrabro atripennis, Perkins, 1902, Ent. Soc. Lond., Trans. 1902: 148.

Ectemnius (Oreocrabro) atripennis, Pate, 1944, Amer. Midl. Nat. 31: 381.—Leclercq, 1954, Mon. Hym. Crabro. p. 281.

Male: Length 8–11 mm. Wing infusate with steely iridescence. Mandible whitish-yellow, apex and lateral margins black; clypeus with appressed silvery pubescence; antennal scape brownish-black, with longitudinal yellow stripe at inner margin, 2.0× as long as segment 3; 6 emarginate, without process at apex (fig. 4, e); face with dull, shallow, cordate depression between and above antennal fossae; distance between eye margin and antennal fossa less than distance between antennal fossae; medio-frontal area with elongate, shiny, glabrous area anteriorly. Pronotum without yellow marking; mesonotum and scutel-

lum dull, rugulose, with very many punctures; scutellum with small median depression; postscutellum without yellow markings. Legs ferrugineous to brownish-black; tarsal segment 1 of fore leg simple. Anterior part of propodeum with longitudinal raised lines; lateral parts of propodeum with more prominent raised lines; posterior part of propodeum with deep median ovate groove; many straight raised lines extending from lateral parts of propodeum to median longitudinal groove. Abdomen reddish-black, without yellow marking. Gonostylus (fig. 1, f) $6\times$ as long as maximum width, anterior surface without distinct spines.

Female: Length 10–13 mm. Similar to ♂ except as follows: Antennal scape $2.6\times$ as long as segment 3; medio-frontal area with small, shiny spot. Mesonotum and scutellum rugulose, much more strongly so than in ♂. Inner surface of fore tibia orange-yellow. Median part of propodeum with more strongly raised lines running from median longitudinal groove to lateral parts of propodeum than ♂, a shallow median groove from anterior part of propodeum meeting deep, wide, median groove of posterior part of propodeum. Abdominal sternites shiny. Pygidium triangulate (fig. 2, f), dull, rugose, with few setae, lateral margins roundly carinate.

Specimens examined: Paratypes at Bishop Mus.: ♂, 6 ♀, Hilo, Hawaii, 1200 m, 1897, 35 ♂, 38 ♀, Kau, Hawaii, 1200 m, June, Aug., Nov., 1895, 3 ♂, 13 ♀, Kona, Hawaii, 900 m, Aug., Oct., 1892, ♂, ♀, Puna, Hawaii, 600 m, Nov., 1896, Perkins. HAWAII: 2 ♂, Judd Trail, Aug., Swezey; 18 ♂, 22 ♀, Kilauea, 1200 m, May–Nov., Perkins, Giffard, Swezey, Williams; ♀, Kaumana, Apr., ex *Ohia lehua*, Swezey; ♀, Keokea, Wilder; ♀, S. Kona, Aug., Swezey; 2 ♂, 3 ♀, N. Kona, Nov., Giffard; 3 ♂, 2 ♀, Kilauea Dry Forest, Giffard; ♀, Nauhi Gulch, 1500–1800 m, Nov., Swezey & Williams; 5 ♀, Niulii, June, Swezey; ♀, OIaa Sugar Co., Feb., Swezey; 37 ♂, 34 ♀, Pahala, 800 m, Mar., Apr., Nov., Williams; ♀, Pohakuloa, Aug., Beardsley; ♂, Volcano House, Feb., Swezey; 18 ♂, ♀, OIaa, 19 miles, July, Giffard.

Atripennis is allied to *hawaiiensis* but the infusate wings without iridescence will at once separate *atripennis* from *hawaiiensis* and *nesiotes*. The antennal scape of *atripennis* is brownish-black with narrow, longitudinal, yellow markings on the lateral margin, but no yellow markings on the two latter species.

Ectemnius (*Oreocrabro*) *mandibularis* (Smith)

Crabro mandibularis Smith, 1879, Hym. Ins. Coll. Brit. Mus., Lond.: Brit. Mus. (Nat. Hist.), p. 138.

Crabro (*Solenius*) *mandibularis*, Perkins, 1899, Fauna Hawaiiensis 1: 21.

Xenocrabro mandibularis, Perkins, 1902, Ent. Soc. Lond., Trans. 1902: 148.

Ectemnius (*Oreocrabro*) *mandibularis*, Pate, 1944, Amer. Midl. Nat. 31: 381.—Leclercq, 1954, Mon. Hym. Crabro. p. 281.

Crabro denticornis Smith, 1879, Hym. Ins. Coll. Brit. Mus., Lond.: Brit. Mus., (Nat. Hist.), p. 139.

Crabro mauiensis Blackburn & Cameron, 1886, Manchester Lit. Phil. Soc., Mem. 10: 226.

Crabro (*Solenius*) *mauiensis*, Perkins, 1899, Fauna Hawaiiensis 1: 17.

Male: Length 6–8 mm. Wing infusate to subhyaline. Mandible bidentate, black, apex ferrugineous; clypeus with appressed silvery pubescence; antennal scape brownish-black, $2.2\text{--}2.4\times$ as long as segment 3; 6 emarginate, feebly rounded at apex (fig. 4, d); face with

shiny, deep, U-shaped or cordiform depression between and above antennal fossae; medio-frontal area with small rounded, shiny spot anteriorly, sometimes an indistinct narrow, longitudinal carina present. Pronotum generally without yellow spot, sometimes with tiny yellow spot on lateral margin; mesonotum and scutellum with very many minute punctures and scattered medium-sized punctures; entire postscutellum covered by distinct yellow band. Legs brownish-black, tarsal segment 1 of fore leg simple. Anterior part of propodeum with longitudinal raised lines and a shallow median groove; more strongly raised lines in lateral parts of propodeum; posterior part of propodeum with deep median ovate groove and many straight, strongly raised lines running from median groove to lateral parts of propodeum. Abdomen brownish-black, sometimes with yellow spots on lateral margins of tergite 3. Gonostylus (fig. 1, r) $7\times$ as long as maximum width, its posterior end narrow and elongate, surface with few scattered small spines.

Female: Length 9–11 mm. Similar to ♂ except as follows: Clypeus with appressed golden pubescence; mandible reddish-brown, with a yellow spot toward upper margin; antennal scape 2.5–2.6 \times as long as segment 3, with longitudinal yellow band on inner margin. Pronotum with complete or incomplete yellow band on hind margin; pronotal lobe with yellow spot on hind margin; sometimes scutellum with yellow spot near lateral margin. Propodeum with moderately raised lines; median longitudinal groove broadly ovate at apex, periphery of the ovate groove flattened into a gradual slope at anterior portion. Yellow spots or short bands sometimes on lateral margins of tergites 4 and 5; abdominal sternite highly polished, with fine dense whitish pubescence in circular pad on lateral margin of sternite 2. Pygidium triangulate (fig. 2, g), surface shiny, with minute scattered punctures and long seta arising from each puncture, lateral margins slightly curved upward.

Specimens examined: 2 ♂, 2 ♀, Hawaiian Is., Blackburn. MAUI: ♀, Haleakala Rd., 950 m, Mar., Maehler; 7 ♂, 3 ♀, Haiku, Aug., Swezey; 3 ♂, 6 ♀, Iao Valley, Aug., Swezey, Bryan; 2 ♂, Kahalui Rd., May, Giffard; 4 ♂, 3 ♀, Kula, June, Aug., Zimmerman; ♂, ♀, Makawao, Feb., Giffard; 7 ♂, 6 ♀, Olowalu, Mar., Giffard; ♂, ♀, Paia, Oct., Swezey; ♂, ♀, Punnene, Oct., Swezey; 15 ♂, 8 ♀, Waiakoa, Aug., Oct., Cooke, Zimmerman. MOLOKAI: 4 ♂, 3 ♀, Molokai Mts., 900 m, Nov. Perkins; 35 ♂, 27 ♀, Molokai, Jan., Oct., 900 m, Perkins, Giffard; ♂, 40 ♀, Molokai Airport, Apr., Beardsley; ♂, Kawela, Dec., Beardsley; ♀, Kanoa, Apr., on *Ipomoea pes-caprae*, Swezey; 4 ♂, 5 ♀, Res. A. S. Co., Jan., Giffard. LANAI: 2 ♀, Awalua, Feb., Perkins; ♀, Lanai hale, June, Hardy; 4 ♂, 4 ♀, Lanai, 900 m, Aug., Nov., Perkins, Illingworth, Giffard; 3 ♂, 3 ♀, Lanai Coast, July, Oct., Perkins, Giffard; 2 ♂, ♀, Mt. Koele, 600 m, Jan., Perkins. OAHU: 3 ♂, 9 ♀ Kahala, Mar., Giffard.

This species closely resembles *polynesiensis*, *weberi*, and *fulvicrus*, but both sexes of *mandibularis* can be separated from these 3 species by the distinct yellow band which covers the entire postscutellum and the distance between the eye margin and the inner edge of the rim of antennal fossa which is greater than the distance between the inner edges of the rims of the antennal fossae.

Ectemnius (*Oreocrabro*) molokaiensis (Perkins)

Crabro (*Solenius*) *molokaiensis* Perkins, 1899, Fauna Hawaiiensis 1: 16.

Xenocrabro molokaiensis, 1902, Ent. Soc. Lond., Trans. 1902: 381.

Ectemnius (*Oreocrabro*) *molokaiensis*, Pate, 1944, Amer. Midl. Nat. 31: 381.—Leclercq, 1954,

Mon. Hym. Crabro. p. 281.

Male: Length 6–7 mm. Wing infusate with slight bluish iridescence. Mandible bidentate, black, apex ferruginous; clypeus with appressed silvery pubescence; antennal scape brownish-black, 2.0–2.2× as long as segment 3; 6 emarginate, apical process about 2× as long as width of segment (fig. 4, b); face with deep cordate depression between and above antennal fossae; distance between eye margin and antennal fossa less than distance between antennal fossae; medio-frontal area shiny and bare. Pronotum without a yellow band; mesonotum shiny with minute punctures; scutellum shiny, with shallow median depression; postscutellum without a yellow band. Legs reddish-black, inner surface of fore tibia orange-yellow; tarsal segment 1 of fore leg simple. Anterior part of propodeum with longitudinal raised lines, and a shallow median elongate depression; posterior part of propodeum with a deep, ovate median groove; many raised lines crossing transversely from median groove to lateral parts of propodeum. Abdomen brownish-black. Gonostylus (fig. 1, j) 4.5× as long as maximum width, anterior and posterior ends with few small spines.

Female: Length 8–9 mm. Similar to ♂ except as follows: Mandible yellow, except upper and lower margins and apex reddish-black; antennal scape with longitudinal yellow marking on inner margin 3.0× as long as segment 3. Posterior portion of mesonotum and scutellum extremely polished. Pygidium triangulate (fig. 2, t), surface shiny, punctate, with short seta arising from each puncture; lateral margins slightly curved upward.

Specimens examined: Paratypes at Bishop Mus.: 7 ♂, 8 ♀, Molokai Mts., Molokai, 900–1500 m, Nov., 1893, 7 ♂, ♀, Haleakala, Maui, 1200 m, May, 1896, Perkins. MOLOKAI: ♂, Blackburn; ♀, Molokai Mts., June, Giffard; ♀, E. Kawela Gulch, June, Adamson; ♀, Waikolu Valley, Oct., Weber. MAUI: 5 ♂, ♀ Koolau, 900 m, Nov., Giffard; 3 ♂, ♀, Kula Pipe Line, Mar., Swezey; ♀, Waihee, Mar., Swezey; 3 ♂, 3 ♀, Olowalu, Nov., Giffard.

This species closely resembles *monticola*, but differs in that the abdomen is brownish black and the inner surface of fore tibia is orange-yellow.

Ectemnius (Oreocrabro) haleakalae (Perkins)

Crabro (Solenius) haleakalae Perkins, 1899, Fauna Hawaiiensis 1: 17.

Xenocrabro haleakalae, 1902, Ent. Soc. Lond., Trans. 1902: 381.

Ectemnius (Oreocrabro) haleakalae, Pate, 1944, Amer. Midl. Nat. 31: 381.—Leclercq, 1954, Mon. Hym. Crabro. p. 281.

Male: Length 8–9 mm. Wing infusate with violet iridescence. Mandible bidentate, jet black; clypeus with appressed silvery pubescence; antennal scape jet black; 2.4× as long as segment 3; 6 not greatly emarginate, without an apical process (fig. 4, e); face with large, shiny, cordiform depression between and above antennal fossae; medio-frontal area bare, with shallow, median, elongate groove. Pronotum without a yellow band; mesonotum shiny, rugulose, with very many minute punctures; scutellum dull, rugulose, with a shallow median depression; postscutellum without a yellow band. Legs black; tarsal segment 1 of fore leg simple. Anterior part of propodeum with many strongly raised lines; posterior part of propodeum with prominent Y-shaped carina, followed by a deep, median, ovate groove; many raised lines crossing from median groove to lateral parts of propodeum. Abdomen black, without yellow markings. Gonostylus (fig. 1, q) 7× as long as maximum width, entire surface scattered with small spines.

Female: (description taken from Perkins) Length 10 mm. Resembles *molokaiensis*. Wing almost clear. Clypeus with appressed golden pubescence. Posterior part of mesonotum smooth, shiny, and distinctly punctured. Scutellum smooth and shiny.

Type: British Museum (Nat. Hist.), ♀.

Specimens examined: 4 ♂, Haleakala Crater, Maui, July, Quate.

Haleakalae is restricted in area to Mt. Haleakala, Maui. It differs from other members of this subgenus by the jet black mandible, antennal scape, and legs. There are no ♀ specimens in local collections.

Ectemnius (*Oreocrabro*) *polynesiensis* (Cameron)

Crabro polynesiensis Cameron, 1881, Ent. Soc. Lond., Trans. 1881: 555.

Crabro (Solenius) polynesiensis, Perkins, 1899, Fauna Hawaiiensis 1: 22.

Xenocrabro polynesiensis, Perkins, 1902, Ent. Soc. Lond., Trans. 1902: 381.

Ectemnius (Oreocrabro) polynesiensis, Pate, 1944, Amer. Midl. Nat. 31: 381.—Leclercq, 1954, Mon. Hym. Crabro. p. 282.

Male: Length 7–8 mm. Wing subhyaline to infusate. Mandible bidentate, black, its apex ferrugineous; clypeus with appressed golden pubescence; antennal scape brownish-black, 2.2–2.6× as long as segment 3; 6 emarginate, feebly rounded at apex (fig. 4, d); face with dull, indistinct ovoid depressions between and above antennal fossae; distance between eye margin and antennal fossa as wide as distance between inner edges of antennal fossae; medio-frontal area dull, bare, and rugose. Pronotum without yellow spot; mesonotum and scutellum dull, rugulose, with very many minute punctures; postscutellum without yellow spot. Legs reddish-black; tarsal segment 1 of fore leg simple. Anterior part of propodeum with moderately to strongly raised lines, and shallow median groove; posterior part of propodeum with deep, median, ovate groove; strongly raised lines on lateral parts of propodeum. Abdominal tergite 2 reddish-brown, other tergites brownish-black, without a yellow band. Gonostylus (fig. 1, m) 6× as long as maximum width, anterior surface with 3–4 small spines, no spines visible at posterior end.

Female: Length 10–11 mm. Similar to ♂ except as follows: Mandible ferrugineous with yellow area toward upper margin; antennal scape brownish-black, with longitudinal yellow marking on inner margin, 2.7–2.8× as long as 3; medio-frontal area smooth. Scutellum rugose with large scattered punctures. Abdominal sternite shiny, lateral margin of sternite 2 with fine, abundant, whitish pubescence in circular pad. Pygidium triangulate (fig. 2, p), surface dull, smooth, with few scattered large punctures and short seta arising from each puncture; lateral margins with slight upward curve.

Specimens examined: 4 ♀, Hawaiian Is., Blackburn. HAWAII: 3 ♂, 6 ♀, Hilo, 1200 m, Perkins, Swezey; 11 ♀, Hualalai, 2100 m, Swezey & Williams; 2 ♀, Humuula, Oct., Swezey; ♀, Hakalau, Nov., 2 ♀, Hutchison Plant., Feb., ♀, Hillebrand's Glen, Nov.; 2 ♀, Kohala, July; 31 ♂, 50 ♀, Kau, 1200 m, Apr., June, Nov., Dec., Perkins; 7 ♂, 3 ♀, Kona, June, 1200 m, Perkins; 39 ♂, 30 ♀, Kilauea, 1200 m, May–July, Oct., Perkins, Swezey, Giffard; ♂, 9 ♀, Kawaihao, Oct., Fullaway; 2 ♂, 2 ♀, Kaumana, Oct., ♀, Niuhii, June, Swezey; ♂, 2 ♀, Nauhi Gulch, 2100–2600 m, Oct., Swezey and Williams; 2 ♂, 4 ♀, Oloa, June, Perkins; ♂, Parker Ranch, 1200 m, Illingworth; 3 ♂, 3 ♀, Pohakuloa, Aug., Beardsley; 2 ♂, 5 ♀, Pahala, Nov., Williams; ♂, Puako Plant., Mar.; 2 ♂, N. Kona,

Jan., Wilder; ♀, Naalehu, Dec.; ♀, Upper Hamakua Ditch Trail, Oct., Swezey.

Polynesialis resembles *haleakalae* but differs from the later by the brownish-black body, the golden clypeal setae and the apex of the antennal segment 6 of ♂ feebly rounded. These characters are lacking in *haleakalae*.

***Ectemnius (Oreocrabro) weberi* Yoshimoto, n. sp.**

Female: Length 8–9 mm. Wing subhyaline. Mandible bidentate: whitish-yellow, apex ferruginous; clypeus with appressed golden pubescence; antennal scape brownish-black with longitudinal yellow markings, 2.5× as long as segment 3; face with 2 ovate depressions between and above antennal fossae; distance between eye margin and antennal fossa as long as length between antennal fossae; medio-frontal area with small shiny ovate areas anteriorly. Pronotum with or without yellow spot on hind margin, sometimes with narrow band; mesonotum and scutellum dull, with very many minute punctures, latter with vertical median depression; postscutellum with or without yellow spot near lateral margin. Leg brownish-black, tarsal segment 1 of fore leg simple. Anterior part of propodeum with few short raised lines, shallow median groove present; posterior part of propodeum with shallow, broad, ovate median longitudinal groove; indistinct raised lines running from median groove to lateral parts of propodeum. Abdomen reddish-brown to brownish-black, tergite 3 with or without yellow spots near lateral margin, tergites 5 and 6 with complete or incomplete yellow bands, sometimes yellow spots near lateral margins on both tergites. Pygidium triangulate (fig. 2, o), surface shiny and rugulose, dense medium-sized deep punctures with short seta arising from each puncture, lateral margins slightly curved upward.

Holotype, ♀ (BISHOP 2909), 22 km south of Kilauea, Hawaii, 21 June 1949, P. W. Weber. Male unknown. Paratypes: 33 ♀, 22 km south of Kilauea, Hawaii, 21 June 1949, 8 ♀, 16 km south of Kilauea, Hawaii, 21 June 1949, Weber; ♀, Kulani, Hawaii, 22 June 1949, ♀, Kawaihaleuka, Hawaii, 17 June 1949, Weber; 5 ♀, Pahala, Hawaii, April 1918, Williams; 2 ♀, Pahala, Hawaii, April 1920, Swezey; 7 ♀, Range, Hawaii, 1948 (no collector).

This species is allied to *polynesialis*, *fulvicrus*, and *mandibularis*. Large numbers of ♀ were collected by the late P. W. Weber in Kilauea, Hawaii. The ♀ *weberi* differs from those 3 species by the 2 ovate depressions between and above the antennal fossae, a small shiny ovate area at the medio-frontal area, and tergites 5 and 6 with complete or incomplete yellow bands. These characters are lacking in these 3 allied species.

***Ectemnius (Oreocrabro) fulvicrus* (Perkins)**

Crabro (Solenius) fulvicrus Perkins, 1899, Fauna Hawaiiensis 1: 22.

Xenocrabro fulvicrus, Perkins, 1902, Ent. Soc. Lond., Trans. 1902: 148.

Ectemnius (Oreocrabro) fulvicrus, Pate, 1944, Amer. Midl. Nat. 31: 381.—Leclercq, 1954, Mon. Hym. Crabro. p. 281.

Male: Length 8 mm. Wing infusate to subhyaline. Mandible bidentate, reddish-brown; clypeus with appressed golden pubescence; antennal scape reddish-brown, inner margin with orange-yellow marking, 2.0× as long as 3; 6 emarginate, feebly rounded at apex (fig. 4, d); face with deep ovoid depressions between and above antennal fossae;

distance between eye margin and antennal fossa, equal to distance between inner edge of antennal fossae; medio-frontal area shiny, with elongate groove. Pronotum without yellow spot on hind margin; mesonotum and scutellum dull, rugulose, with very many minute punctures; scutellum with shallow median depression; postscutellum without yellow marking. Legs reddish-brown, inner surface of fore femur and tibia orange-yellow; tarsal segment 1 of fore leg simple. Anterior part of propodeum with indistinct raised lines; posterior part of propodeum with deep median ovate groove; strongly raised lines in lateral parts of propodeum. Abdominal tergites 2-3 reddish-brown, 4-5 brownish-black, 6 with yellowish-white band covering anterior 1/2. Gonostylus (fig. 1, s) 6× as long as maximum width, its anterior and posterior surfaces with many stout spines.

Female: Length 9-10 mm. Similar to ♂ except as follows: Wing subhyaline. Mandible with yellow spot on upper margin; antennal scape with longitudinal yellow stripe on inner margin, 2.4× as long as 3. Mesonotum and scutellum with scattered medium-sized punctures; posterior mesonotum and scutellum somewhat shiny. Anterior part of propodeum with few short raised lines at anterior margin; lateral part of propodeum with moderately raised lines. Abdominal sternites shiny, fine dense whitish pubescence in circular pad on lateral margin of sternite 2. Pygidium triangulate (fig. 2, 1), surface shiny, rugose with large punctures and long seta arising from each puncture, lateral margins slightly curved upward.

Specimens examined: Paratypes at Bishop Mus., 4 ♂, 2 ♀, Puna, Hawaii, 600 m, Dec., 1896; ♀, Kau, Hawaii, 1200 m, Aug., 1895; 3 ♀, Kona, Hawaii, 1200 m, July, 1892, Perkins. HAWAII: ♂, Hilo Volcano Rd., Nov., Giffard; ♀, Hamakua, 900 m, Perkins; ♀, Kilauea, July, Perkins; 3 ♀, S. Kona, Giffard, Swezey; ♀ Oloa, June, Perkins.

Fulvicrus resembles *polynesialis* but differs in that the inner surface of fore femur and tibia is orange-yellow. Also, the ♂ gonostylus of *fulvicrus* is narrow, elongate with 9-10 stout spines at the posterior and anterior ends, in contrast to *polynesialis* with 3-4 small spines at anterior surface and no visible spines at posterior end.

Ectemnius (Oreocrabro) monticola (Perkins)

Crabro (Solenius) monticola Perkins, 1899, Fauna Hawaiiensis 1: 15.

Xenocrabro monticola, 1902, Ent. Soc. Lond., Trans. 1902: 381.

Ectemnius (Oreocrabro) monticola, Pate, 1944, Amer. Midl. Nat. 31: 381.—Leclercq, 1954, Mon. Hym. Crabro. p. 282.

Male: Length 5-7 mm. Wing subhyaline to slightly darker. Mandible bidentate, black, its apex ferrugineous; clypeus with appressed silvery pubescence; antennal scape brownish-black, 2.0-2.1× as long as 3; 6 emarginate, apical process 2/3 as long as width of segment (fig. 4, a); a large, deep cordiform depression between and above antennal fossae; distance between eye margin and antennal fossa equal to distance between antennal fossae; medio-frontal area shiny and glabrous. Pronotum without yellow band; mesonotum rugulose with very many minute punctures; scutellum somewhat shiny, rugose and similarly punctured as in mesonotum; postscutellum without yellow band. Legs brownish-black, tarsal segment 1 of fore leg flattened, 2.2× as long as broad. Anterior part of propodeum with longitudinal raised lines; posterior part of propodeum with median Y-shaped carina followed by dull, ovate groove; lateral parts of propodeum with many rais-

ed lines. Abdomen brownish-black, tergite 3 with complete or incomplete yellow band, narrow at center, broad at lateral margins, 4 with spots on lateral margins or without spots, 5 with yellow spots on lateral margin or sometimes with complete band or without markings; 6 and 7 with complete yellow bands, former completely covering its segment or without markings. Gonostylus (fig. 1, n) $4\times$ as long as maximum width, no visible spine at anterior end.

Female: Length 8–9 mm. Similar to ♂ except as follows: Mandible whitish-yellow with apex reddish-brown; antennal scape with yellow stripe at inner margin, $2.8\text{--}3.0\times$ as long as segment 3. Posterior portions of mesonotum and scutellum polished. Tarsal segment 1 of fore leg simple. Abdominal tergite 3 with incomplete band or spot at lateral margin; 4–5 with spots at lateral margins or sometimes without markings, 6 with complete yellow band or spots at lateral margins; sometimes, abdomen without yellow spot or band. Pygidium triangulate (fig. 2, n), surface shiny, with many large, deep punctures and short seta arising from each puncture, lateral margins with small carina.

Specimens examined: Paratypes at Bishop Mus., 2 ♂, Kaala Mts., Oahu, 600 m, Mar., 1892; 2 ♂, Waianae Mts., Oahu, 600 m, Feb., 1896; 2 ♂, Halemanu, Kauai, 1200 m, May, 1895; 7 ♂, 7 ♀, Koholuamanu, Kauai, 1200 m, Apr., 1895; 5 ♂, ♀, Waimea, Kauai, 1200 m, May, 1894, Perkins. OAHU: ♀, Castle Trail, Oct., Bryan; 3 ♂, Diamond Head, Feb., Perkins; 3 ♀, Haaula, June,; ♂, Honolulu, Jan., Williams; 2 ♂, Honolulu Plant., Co., Jan., Williams; ♀, Kahala, Mar., Giffard; ♀, Kula, Oct., Beardsley; ♂, Kailua, July, Weber; 2 ♂, 3 ♀, Koolau R., 500 m, Perkins; ♀, Makiki, Mar., Giffard; ♂, Mt. Kaala, Jan., Weber; ♀, Maunawili, Mar., Weber; 2 ♂, 3 ♀, Manoa, Oct., Dec., Murashige, Swezey, Williams; 3 ♂, Waialua, 450 m, Feb., Perkins. KAUAI: ♀, Halemanu, Aug., Swezey; 7 ♂, 7 ♀, Kokee, June-Aug., Swezey, Osborn, Zimmerman; ♂, Kanani, Aug., Swezey; ♂, Kaunuohua Ridge, July, Zimmerman; 7 ♂, 9 ♀, Koholuamanu, 1200 m, Oct., Giffard; ♂, Kalalau, Aug., Swezey; ♀, Kumuwela, June, Swezey; 5 ♂, 3 ♀, Lihue, Aug., Perkins, Isenberg; ♀, Mana, Mar.; ♂, Mohihi Ridge, July, Zimmerman; 3 ♂, Nualolo, June, Swezey; 2 ♂, 2 ♀, Waialeale, 1200 m, Nov., Giffard.

This species is closely related to *molokaiensis*. It may be separated from that species by its black inner surface of fore tibia; the banded abdominal tergites, and the gonostylus having several short spines at the posterior end and no visible spines at the anterior end. Those characters are lacking in *molokaiensis*.

***Ectemnius (Oreocrabro) discrepans* (Giffard)**

Melanocrabro discrepans Giffard, 1915, Haw. Ent. Soc., Proc. 3: 115.

Ectemnius (Oreocrabro) discrepans, Pate, 1944, Amer. Midl. Nat. 31: 381.—Leclercq, 1954, Mon. Hym. Crabro. p. 281.

Male: Length 7–10 mm. Wing infusate with slight bluish iridescence. Mandible bidentate, reddish-black; clypeus with appressed silvery pubescence; antennal scape brownish-black, $2.0\times$ as long as segment 3; 6 emarginate, apical process $1/2$ as long as width of segment (fig. 4, b); face with deep cordiform depression between and above antennal fossae; eye margin touching antennal fossa; medio-frontal area shiny. Pronotum without yellow spot; mesonotum and scutellum dull, rugulose with very many minute and large punctures, former with median depression; postscutellum without yellow marking. Legs

reddish-brown; inner surface of fore femur, tibia and tarsus orange-yellow, tarsal segment 1 of fore leg simple. Anterior part of propodeum with raised lines, and shallow median longitudinal depression; posterior part of propodeum with deep, elongate median groove; lateral parts of propodeum with few raised lines. Abdomen reddish-brown, tergite 2 with yellow spot at lateral margin, 3 with complete or incomplete yellow band, narrow at center and broad at lateral margins, 5 with or without yellow spot at lateral margin, 6 with complete yellow band on upper margin; 7 with or without yellow spot at lateral margins. Gonostylus (fig. 1, o), $4.6\times$ as long as maximum width; ovate in outline, without visible spines at anterior end.

Female: Length 10–12 mm. Similar to ♂ except as follows: Mandible whitish-yellow, ferrugineous at apex; antennal scape with longitudinal yellow marking at inner margin, $3.2\times$ as long as segment 3. Posterior portion of mesonotum and anterior portion of scutellum shiny with distinct medium-sized punctures and latter without a median depression. Inner surface of fore tibia orange-yellow. Anterior propodeum with moderately raised lines; posterior part of propodeum with strongly Y-shaped carina and a deep, sculptured depression on each side; complete yellow band on tergites 3 and 6. Abdominal sternite shiny. Pygidium triangular (fig. 2, k), posterior 1/2 tapering to acute apex, surface shiny, rugose with large punctures and short seta arising from each puncture, lateral margins with small carina.

Specimens examined: Paratypes at Bishop Mus.: 2 ♂, Kaholuamanu, Kauai, 1200 m, Giffard. KAUAI: 4 ♂, Kaholuamanu, Aug., Giffard; 8 ♂, 3 ♀, Summit Camp, Feb., Sept., Swezey, Williams (prey record); ♂, 2 ♀, Kokee, Feb., July, Kusche, Fullaway; ♂, Kawaikoi, July, Swezey; ♂, Halemanu, June, Swezey; 4 ♂, Kumuwela, June, Dec., Usinger; ♂, Nualolo, June, Sept., Swezey; ♂, 2 ♀, Kokee, June, Aug., Swezey; ♂, ♀, Alakai Swamp, June, July, Swezey; ♂, Kalalau Trail, June, Swezey. (Williams, det., prey *Eury-nogaster* sp., family, Dolichopodidae).

Discrepans is allied to *monticola* but the inner surface of fore tibia is orange-yellow in the former and black in the latter.

Ectemnius (*Oreocrabro*) *frederici-smithi* (Schulz)

Crabro affinis Smith, 1879, Descript. Hym. Ins. Coll. Brit. Mus., Lond.: Brit. Mus. (Nat. Hist.), (*nec* Rossi, 1792–4, Mantissa Ins., Pisa, Polloni 4: 148, 154; *nec* Lepeletier de Saint-Fargeau et Brullé, 1834, Soc. Ent. France, Ann. 3: 683; *nec* Wesmael, 1852, Acad. R. Sci. Lett. et Beaux-Arts Belg., Bull. 19: 589).

Crabro (*Solenius*) *affinis*, Perkins, 1899, Fauna Hawaiiensis. 1: 19.

Xenocrabro affinis, Perkins, 1902, Ent. Soc. Lond., Trans. 1902: 382.

Ectemnius (*Oreocrabro*) *affinis*, Pate, 1944, Amer. Midl. Nat. 31: 382.

Crabro frederici-smithi Schulz, 1906, Spolia Hymenopterologica, p. 77–269.

Ectemnius (*Oreocrabro*) *frederici-smithi*, Leclercq, 1954, Mon. Hym. Crabro. p. 281.

Male: Length 6–8 mm. Wing subhyaline. Mandible black, apex ferrugineous; clypeus with appressed silvery pubescence; antennal scape brownish-black, $2.1\times$ as long as segment 3; 6 emarginate, feebly rounded at apex (fig. 4, d); face with cordate depression between and above antennal fossae; distance between eye margin and antennal fossa wider than distance between antennal fossae; medio-frontal area dull with minute punc-

tures. Pronotum without yellow band; pronotal lobe without yellow spot; mesonotum and scutellum with many minute punctures, slightly rugulose; scutellum with median depression; postscutellum without yellow marking. Legs brownish-black, inner surface of fore tibia orange-yellow; tarsal segment 1 of fore leg simple. Anterior part of propodeum with few raised lines, lateral parts of propodeum with many prominent raised lines; posterior part of propodeum with median ovate groove. Abdomen brownish-black, tergite 3 with complete or incomplete yellow bands near anterior margin, with yellow band $1/3$ to $1/2$ as wide as tergite, 4 with or without yellow spot at lateral margins, 5 and 6 with complete yellow bands. Gonostylus (fig. 1, k), $5.5 \times$ as long as maximum width, 3-4 small spines at posterior and anterior ends.

Female: Length 9-11 mm. Similar to ♂ except as follows: Mandible yellowish, with apex brownish-black; antennal scape with longitudinal yellow marking on inner margin, $2.2-2.4 \times$ as long as segment 3, face with 2 shallow elongate depressions between and above antennal fossae. Pronotum without yellow marking; posterior part of mesonotum and scutellum with large punctures. Anterior part of propodeum without prominent raised lines; lateral parts of propodeum rugulose. Abdomen with incomplete band on anterior margin of tergite 3, band $1/4$ as wide as tergite, tergite 4 without yellow band or spot, 5 and 6 with complete or incomplete yellow band at center or close to anterior margin or 6 without band. Pygidium triangulate (fig. 2, j) surface shiny, deeply punctured with short seta arising from each puncture, apical margin striated, lateral margins slightly curved upward.

Specimens examined: ♂, ♀, Hawaiian Is., Blackburn. KAUAI: Male, 2 ♀, Kauai, Apr., May, July; ♂, ♀, Halemanu, 1200 m, May, 6 ♀, Kauai Coast; 6 ♂, ♀, Makaweli, 600 m, Feb.; 7 ♂, 3 ♀, Waimea, 900 m, Feb., May, Oct., Perkins; 2 ♂, 9 ♀, Kaholu-manu, Apr., Aug., Oct., Kusche, Giffard; 7 ♂, ♀, Kauai, 1200 m, Apr., Aug., Kusche; 5 ♂, 5 ♀, Kalalau, Aug., Swezey; ♂, Kealia, Oct., Giffard; 19 ♂, 16 ♀, Kokee, June, July, Aug., Sept., Swezey, Bianchi, Osborn, Maehler, Zimmerman; ♂, Kilohana, Nov., Swezey; 5 ♂, ♀, Kumuwela, Aug., Swezey; ♂, 3 ♀, Halemanu, Aug., Swezey; ♀, Summit Camp, Nov., Swezey; ♂, Makaweli, June, Giffard; 11 ♂, Waimea, Apr., June, Hardy, Giffard; ♂, Waialeale, 1200 m, June, Giffard.

Frederici-smithi is allied to the preceding species, *discrepans*. It differs from that species by having the distance between antennal fossa and eye margin as wide as the distance between the antennal fossae and the apex of antennal segment 6 of the ♂ feebly rounded. In *discrepans*, the eye margin is touching the antennal fossa and the apex of antennal segment 6 of the ♂ has a prominent projection.

Ectemnius (Oreocrabro) distinctus (Smith)

Crabro distinctus Smith, 1856, Cat. Hym. Brit. Mus. (Nat. Hist.), 422.

Xenocrabro distinctus, Perkins, 1902, Ent. Soc. Lond., Trans. 1902: 382.

Ectemnius (Oreocrabro) distinctus, Pate, 1944, Amer. Midl. Nat. 31: 382. — Leclercq, 1954, Mon. Hym. Crabro. p. 282.

Crabro (Solenius) notosticus, Perkins, 1899, Fauna Hawaiiensis 1: 20.

Male: Length 6-8 mm. Wing infusate to subhyaline. Mandible bidentate, black,

apex ferrugineous; clypeus with appressed silvery pubescence; antennal scape brownish black, sometimes with yellow spot posteriorly, $2.3 \times$ as long as segment 3; 6 emarginate, feebly rounded at apex (fig. 4, d); face with deep, cordiform depression followed by 2 short elongate grooves between and above antennal fossae; distance between eye margin and antennal fossa wider than distance between inner margin of antennal fossae; medio-frontal area dull, no definite groove or shiny spot. Pronotum with interrupted yellow band, sometimes with yellow spot on lateral margin; pronotal lobe sometimes with tiny yellow spot at hind margin; mesonotum and scutellum dull, rugulose with excessive minute punctures; scutellum with shallow median depression; entire postscutellum with yellow band. Legs reddish-brown, inner surface of fore tibia orange yellow; tarsal segment 1 of fore leg simple. Anterior part of propodeum with few raised lines; posterior part of propodeum with deep, median, broad, ovate groove, many strongly raised lines in lateral parts of propodeum. Abdomen brownish-black, yellow spot on tergite 2 or without spot, a complete or incomplete yellow band on 3. Gonostylus (fig. 1, g) $5 \times$ as long as maximum width, no visible spine present.

Female: Length 9–10 mm. Similar to ♂ except as follows: Mandible whitish-yellow, lateral margins and apex ferrugineous; clypeus with appressed golden pubescence; antennal scape yellow with narrow brown stripe at outer margin, $2.5 \times$ as long as segment 3; medio-frontal area elongate and glabrous. Pronotal lobe with yellow spot on hind margin. Propodeum with indistinct raised lines. Abdomen black, tergite 2 with yellow spot medially, 3 with incomplete yellow band at lateral margin, sometimes without yellow markings on abdomen. Abdominal sternites strongly polished, fine dense whitish pubescence in circular pad at lateral margins of sternite 2. Pygidium triangulate (fig. 2, r), surface shiny, smooth except apical and lateral margins with striation, short seta arising from each minute puncture, lateral margins curved slightly upward.

Type: British Museum (Nat. Hist.).

Specimens examined: OAHU: 3 ♀, Anahulu Trail, June, Weber; 16 ♂, 15 ♀, Diamond Head, Feb., June, Perkins, Giffard; ♂, 6 ♀, Honolulu, Jan., Feb., Nov., Dec., Perkins, Swezey, Beardsley; ♀, Hon. Plant. Co., Feb., Williams (prey record); 5 ♂, ♀, NW Koolau Range, July, Perkins; 2 ♂, ♀, Koko Head, May, Illingworth; ♀, Kipapa, Mar., Weber; ♂, ♀, Kula, Mar., Oct., Beardsley; 2 ♂, ♀, Kaimuki, Jan., Feb., May, Swezey; ♀, Kunia, Sept., Weber; 2 ♂, 3 ♀, Ewa Coral Plain, Mar., Dec.; 2 ♂, ♀, Makiki, Apr., Giffard; 11 ♂, 11 ♀, Mt. Kaala, Mar., June, Aug., Weber, Swezey, Beardsley; ♂, Makua, Mar.; ♀, Mokuleia, May, Weber; ♂, Manoa, Nov., Williams; ♂, ♀, Mokuleia, May, Weber; ♂, Manoa, Nov., Williams; ♂, ♀, Niu, Aug., Swezey; 3 ♀, Nanakuli, Apr., May, Weber; ♂, 2 ♀, Oahu, Perkins, Bridwell, Giffard; 5 ♂, 4 ♀, Punchbowl, Feb., Mar., Perkins, Giffard; ♂, Pearl City, Feb., Bryan; 5 ♂, 3 ♀, Punaluu, Apr., Oct., Weber; 2 ♂, ♀, Puu Kaua, Mar., Weber; 2 ♂, ♀, Tantalus, Aug., Oct., Giffard, Yoshizumi; ♀, U. H. Farm, Dec., Hayashi; 3 ♂, 2 ♀, Waialua, 450 m, Apr., June, Sept., Oct., Perkins, Giffard; 2 ♂, 7 ♀, Waipio, Jan., July, Illingworth, Beardsley; 2 ♂, Waialae, Feb., Nov.; 3 ♀, Waipahu, Mar., Swezey; ♀, Wailupe, Nov., Weber.

Distinctus is widely distributed on the island of Oahu. It is distinguished from *frederici-smithi* by the presence of yellow markings on the pronotum and postscutellum, whereas in *frederici-smithi* such markings are absent.

SUBFAMILY LARRINAE

KEY TO GENERA OF HAWAIIAN LARRINAE

1. Mandible not emarginate before middle on exterior margin **Solierella**
 Mandible emarginate before middle on exterior margin 2
2. Face along inner orbits flat, not elevated or raised in fold **Tachyspex**
 Face along inner orbits with swelling or fold, never flat 3
3. Face and thorax with golden pubescence; legs orange-yellow **Liris**
 Face and thorax with whitish pubescence; legs black or only fore leg and hind femur orange yellow 4
4. Pronotum not depressed below level of mesonotum; ♀ with frontal area shiny and chiefly glabrous **Larra**
 Pronotum depressed and beneath general level of mesonotum; ♀ with frontal area dull and pubescent **Motes**

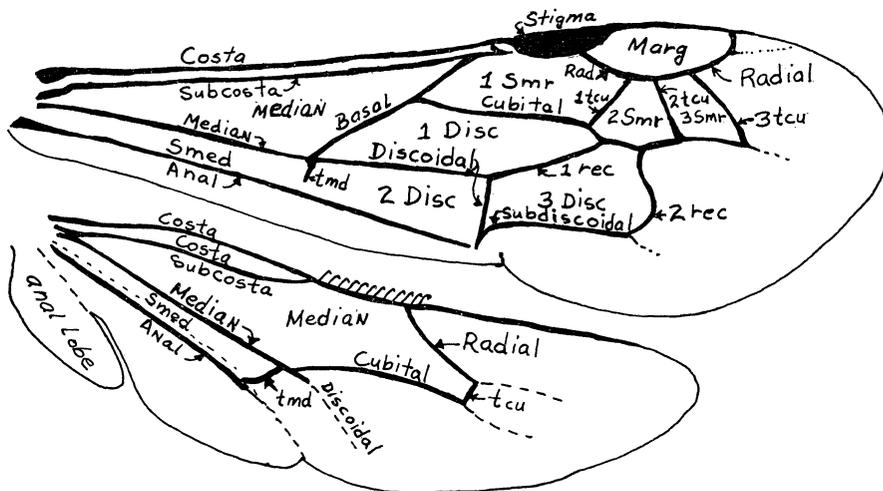


Fig. 5. Wings of a sphecid wasp.

Genus *Tachyspex* Kohl

There are 2 introduced species of the genus *Tachyspex* in Hawaii. Members of this group are known to prey on Orthoptera and make shallow one-celled nests in sand or soil.

KEY TO SPECIES OF TACHYSPHEX

- Clypeus rounded in center; emargination beneath mandible as wide as deep **fuscus**
 Clypeus flat or slightly raised in center; emargination beneath mandible 1.5 × as wide as deep **bituberculatus**

Tachysphex fuscus Fox

Tachysphex fuscus Fox, 1893, Acad. Nat. Sci. Phila., Proc. 45: 519. — Williams, 1932, Haw. Ent. Soc., Proc. 8: 17 (Hawaii).

Tachysphex foxii Rohwer, 1908, Ent. News 19: 222.

DISTRIBUTION: Oahu, all continental United States except Florida.

Tachysphex bituberculatus Cameron

Tachysphex bituberculatus Cameron, 1905, Ann. Mag. Nat. Hist. ser. 7, 15: 233. — Weber, 1948, Haw. Ent. Soc., Proc. 13: 203 (Hawaii).

DISTRIBUTION: Oahu, Philippines.

Genus **Motes** Kohl

There are 2 immigrant species of *Motes* reported from Hawaii, 1 from the Nearctic region and the other from the Orient and Micronesia. This genus is known to prey on crickets (Gryllidae) and nest in soil.

KEY TO SPECIES OF MOTES

- Recurrent veins 1 and 2 joining each other at cubital vein of submarginal cell 2 **argentatus**
 Recurrent veins 1 and 2 not joining each other, far apart on cubital vein of submarginal cell 2 **subtesselatus**

Motes argentata (Palisot-Beauvais)

Larra argentata Palisot-Beauvais, 1811, Insect. rec. en Afr. & Amer., p. 119.—Weber, 1950, Haw. Ent. Soc., Proc. 14: 16 (Hawaii).

DISTRIBUTION: Oahu, N. Amer. north to Que. and Wash., south to L. Calif. and Florida.

Motes subtesselatus (Smith)

Larrada subtesselata Smith, 1856, Cat. Hym. Brit. Mus. 4: 277.

Motes subtesselatus, Krombein, 1949, Haw. Ent. Soc., Proc. 13: 394 (distr. & syn.); Swezey, 1923, *ibid.* 5: 304 (Hawaii).

Notogonidea luzonensis Rohwer, 1919, Haw. Sugar Plant. Assoc. Exp. Sta., Ent. Ser., Bull. 14, p. 9.

DISTRIBUTION: Molokai, Kauai, Kwajalein Is., Philippines, India, Sumatra, Java.

Genus **Larra** Fabricius

This genus is cosmopolitan and the species prey on Gryllotalpidae.

Larra luzonensis Rohwer

Larra luzonensis Rohwer, 1919, Haw. Sugar Plant. Assoc. Exp. Sta., Ent. Ser. Bull. 14: 10.
—Williams, 1927, Haw. Ent. Soc., Proc. 6: 373 (Hawaii).

DISTRIBUTION: Hawaii, Oahu, Molokai, Philippines.

This species was purposely introduced from the Philippine Is. to control mole crickets (Williams, 1919).

Genus **Liris** Fabricius

This genus is known from the Ethiopian and Oriental regions and Micronesia.

Liris opulenta (Lepeletier)

Tachytes opulenta Lepeletier, 1845, Hist. Nat. Ins. Hym. 3: 246.

Liris opulenta, Weber, 1947, Haw. Ent. Soc., Proc. 13: 22 (Hawaii); Krombein, *ibid.* 13: 397 (distr. & syn.).

DISTRIBUTION: Oahu, Marshall Is., Mariana Is., Caroline Is., widely distributed in Ethiopian and Oriental regions.

This species was probably an accidental introduction to Hawaii from the Micronesian Is. The ♀ nests in soil and preys on large crickets (Gryllidae).

Genus **Solierella** Spinola

Members of *Solierella* are widely distributed in the world. They nest in soil and prey on nymphs of certain Orthoptera and Hemiptera.

Solierella rohweri (Bridwell)

Siloan rohweri Bridwell, 1920, Haw. Ent. Soc., Proc. 4: 398 (Hawaii).

Solierella rohweri, Krombein, 1949, *ibid.* 13: 399 (distr. & syn.).

DISTRIBUTION: Oahu, Maui, Molokai, Niihau, Marshall Is., Mexico, Central America.

This species was accidentally introduced to Hawaii from Central America or Mexico according to Bridwell (1920). The ♀ preys on nymphs of *Nysius* spp. (Lygaeidae) and nests in dry twigs.

SUBFAMILY TRYPOXYLONINAE

KEY TO GENERA OF HAWAIIAN TRYPOXYLONINAE

Fore wing with one distinct submarginal cell and one recurrent vein..... **Trypoxylon**
Fore wing with 2 distinct submarginal cells and 2 recurrent veins **Pison**

Genus **Trypoxylon** Latreille

There are 2 immigrant species of the genus *Trypoxylon* represented in Hawaii which

are of Oriental origin. This group is known to build clay cells and to provision them with spiders.

KEY TO SPECIES OF TRYPOXYLON

- Trochanters testaceous; eyes below antennae separated by distance equal to $2\times$ width of clypeus **philippinense**
 Trochanters black; eyes below antennae separated by distance equal to width of clypeus **bicolor**

Trypoxylon philippinense Ashmead

Trypoxylon philippinense Ashmead, 1904, *Canad. Ent.* **36**: 283.—Swezey, 1923, *Haw. Ent. Soc., Proc.* **5**: 192 (Hawaii).—Krombein, 1949, *ibid.*, **13**: 400 (distr.).

DISTRIBUTION: Hawaii, Oahu, Maui, Mariana Is., Philippines.

Trypoxylon bicolor Smith

Trypoxylon bicolor Smith, 1856, *Cat. Hym. Brit. Mus.* **4**: 377.—Perkins, 1910, *Fauna Hawaiensis* **2**: 606 (Hawaii).

DISTRIBUTION: Hawaii, Oahu, Maui, Molokai, Niihau, Singapore, Java.

Genus **Pison** Jurine

All 4 species of the genus *Pison* in Hawaii are known to be immigrants from the Oriental region. The genus is well represented in Micronesia and other Polynesian Is. Wasps of this group construct clay cells and provision them with spiders.

KEY TO SPECIES OF PISON

1. Recurrent veins 1 and 2 in line with transverse cubital veins 1 and 2 respectively. (fig. 5) **iridipenne**
 Only one recurrent vein in line with one transverse cubital vein..... 2
2. Recurrent vein 1 in line with transverse cubital vein 1, recurrent 2 not meeting transverse cubital 2 at cubital vein **argentatum**
 Recurrent vein 2 in line with transverse cubital vein 2, recurrent 1 not meeting transverse cubital 1 at cubital vein 3
3. Propodeum, scutellum and abdomen shiny; wing hyaline; frontal carina indistinct **insulare**
 Propodeum, scutellum and abdomen dull; wing pale brown; frontal carina prominent..... **hospes**

Pison argentatum Shuckard

Pison (Pisonitus) argentatus Shuckard, 1837, *Ent. Soc. Lond., Trans.* **2**: 79.

Pison argentatum, Bridwell, 1919, *Haw. Ent. Soc., Proc.* **4**: 123 (Hawaii).—Krombein, 1949,

ibid. 13: 403 (distr. & syn.).

DISTRIBUTION: Kauai, Mariana Is., Caroline Is., Samoa, Fiji.

Pison hospes Smith

Pison hospes Smith, 1879, Linn. Soc. Zool., Jour. 14: 676.—Perkins, 1899, Fauna Hawaiiensis 1: 14 (Hawaii).—Krombein, 1949, Haw. Ent. Soc., Proc. 13: 404 (distr. & syn.).

DISTRIBUTION: Molokai, Niihau, Marshall Is., Caroline Is., Samoa, Fiji, Tonga, Marquesas Is.

Pison iridipenne Smith

Pison iridipennis Smith, 1879, Linn. Soc. Zool., Jour. 14: 676.—Perkins, 1899, Fauna Hawaiiensis 1: 14 (Hawaii).

Pison iridipenne, Krombein, 1949, Haw. Ent. Soc., Proc. 13: 408 (distr.).

DISTRIBUTION: Oahu, Maui, Molokai, Niihau, Marshall Is., Mariana Is., Caroline Is., Samoa, Fiji, Tuamotu Arch., Marquesas Is.

Pison insulare Smith

Pison insulare Smith, 1869, Ent. Soc. Lond., Trans. 1869: 297.—Weber, 1949, Haw. Ent. Soc., Proc. 13: 332 (Hawaii).

DISTRIBUTION: Oahu, Kauai, New Hebrides.

SUBFAMILY SPHECINAE

KEY TO GENERA OF HAWAIIAN SPHECINAE

1. Recurrent vein 2 distad of transverse cubital 2 **Chlorion**
Recurrent vein 2 basad of, or in line with transverse cubital 2
2. Clypeus with apex generally bidentate; legs black with yellow markings **Sceliphron**
Clypeus with apex tridentate; legs metallic black..... **Chalybion**

Genus **Sceliphron** Klug

Sceliphron caementarium (Drury)

Sphex caementaria Drury, 1770, Illust. Nat. Hist. 1: 105

Pelopoeus caementarius, Perkins, 1899, Fauna Hawaiiensis 1: 8 (Hawaii).

Sceliphron caementarium, Krombein, 1949, Haw. Ent. Soc., Proc. 13: 388 (distr. & syn.).

DISTRIBUTION: Hawaii, Oahu, Molokai, Kauai, Niihau, Marshall Is., Mariana Is., S. Canada, continental U. S.

This species, commonly known as the muddauber, is of Nearctic origin and was accidentally introduced into Hawaii many years ago. The ♀ wasp makes mud cells and provisions them with spiders.

Genus **Chlorion** Latreille

The 2 immigrant species of *Chlorion* in Hawaii are of Neotropical origin. These wasps

make their nests in soil with a simple burrow extending to a cell at the end. The young are provisioned with insects of the orthopteroid families Acridiidae, Oecanthidae and Tettigoniidae.

KEY TO SPECIES OF CHLORION

Abdomen black..... **harrisi**
Abdomen reddish-orange **thomae**

Chlorion (Isodontia) harrisi Fernald

Chlorion (Isodontia) harrisi Fernald, 1906, U. S. Nat. Mus., Proc. **31**: 359.—Swezey, 1931, Haw. Ent. Soc., Proc. **7**: 393 (Hawaii).

Isodontia harrisi Williams (*nec* Fernald) 1932, *ibid.* **8**: 25.

DISTRIBUTION: Oahu, Kauai, continental U. S., Canada.

Chlorion (Priononyx) thomae (Fabricius)

Sphex thomae Fabricius, 1775, Systema Ent. p. 346.

Sphex (Priononyx) thomae, Murray, IN Muesebeck *et al.*, 1951, Hym. Amer. North Mexico. Synop. Cat. p. 962.

Chlorion thomae, Bianchi, 1954, Haw. Ent. Soc., Proc. **15**: 287.

Chlorion (Priononyx) thomae, Krombein, 1958, Hym. Amer. North Mexico, Synop. Cat., 1st Suppl. p. 191.

DISTRIBUTION: Oahu, Kauai, SE and W. U. S.

Genus **Chalybion** Dahlbom

The genus *Chalybion* is widely distributed in the world. Two immigrant species are recorded in Hawaii. These wasps use the abandoned cells of *Sceliphron* (muddauber) for their nest, which they provision with spiders.

KEY TO SPECIES OF CHALYBION

Wings entirely fuscus..... **californicum**
Wings subhyaline at apex, hyaline at base **bengalense**

Chalybion bengalense (Dahlbom)

Pelopoeus (Chalybion) bengalense Dahlbom, 1845, Hym. Europ. **1**: 433.

Chalybion bengalense, Weber, 1948, Haw. Ent. Soc., Proc. **13**: 205 (Hawaii).—Krombein, 1949, *ibid.* **13**: 386 (distr. & syn.).

DISTRIBUTION: Oahu, Molokai, Gilbert Is., Johnston I., Palearctic, Ethiopian, Oriental, Australian regions.

Chalybion californicum (Saussure)

Pelopoeus (Chalybion) californicus Saussure, 1867, Reise Novara, Zool., Hym. **2**: 26.

Chalybion caeruleum, Williams (*nec* Linn.), 1932, Haw. Ent. Soc., Proc. **8**: 17 (Hawaii).

Chalybion californicum, Pate, 1942, *Canad. Ent.* **74**: 217.

DISTRIBUTION: Oahu, Canada, entire continental U. S.

SUBFAMILY ASTATINAE

Genus *Astata* Latreille

Astata (*Dryudella*) *immigrans* Williams

Astata bella, Williams (*nec* Cresson), 1940, *Haw. Ent. Soc., Proc.* **10**: 364 (Hawaii).

Astata immigrans Williams 1946, *ibid.* **12**: 641 (distr., biol. & syn.).

Astata (*Dryudella*) *immigrans*, Townes, IN Muesebeck, *et al.*, 1951, *Hym. Amer. North Mexico Synop. Cat.* p. 940.

DISTRIBUTION: Oahu, Idaho.

Astata immigrans is probably an immigrant from the Nearctic Region. This species preys on *Nysius* spp. (Lygaeidae) and builds its nest in soil. The nest is simply a burrow extending to a cell.

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