

The Carabid Tribes Harpalini, Lebiini and Bembidiini in Hawaii
(Coleoptera)

By EVERARD B. BRITTON

Department of Entomology, British Museum (Natural History)

(Presented by E. C. Zimmerman at the meeting of December 8, 1947)

The works of Blackburn and Sharp established the greater part of the species of Hawaiian Carabidae, but identification has remained an impossibility without reference to the original series. As the types of the species described by both Blackburn and Sharp are in the British Museum, I have undertaken a revision of the carabid fauna of the Islands. The Nomiini have been the object of a special report recently published by Bishop Museum (Bishop Mus. Occ. Papers, 19 (4): 107-166, figs. 1-17, 1948). Work is now in progress on the remaining tribe, the Anchomenini.

I wish to express my thanks to Mr. E. C. Zimmerman for collaboration and advice, and for his care in the preparation of this paper for the press. It was at his suggestion that this work was begun, and in 1938 he turned over to me his manuscript revision of the Hawaiian Carabidae which he was unable to complete because of the lack of types in Honolulu.

The extreme isolation of the Hawaiian Islands is clearly reflected in the carabid fauna. Of the fifty or more tribes of Carabidae which are recognized, only five are represented in the Islands, and only three have existed there long enough to permit the evolution of endemic species. The tribes with endemic species are the Bembidiini, Nomiini and Anchomenini. The Nomiini and Anchomenini, which are not dealt with here, each comprise a single genus with a large number of species, all of which are endemic. The Bembidiini on the other hand, include five genera and 26 species, of which 19 are probably endemic. Of the four species of *Tachys*, one has been introduced from southeast Asia, one from the West Indies or Central America, while the other two have not yet been recognized outside the Islands. It is, however, unlikely that they are endemic. The two species, *Lymnastis swaluwenbergi* Jeannel and *Typhlonesiotes swaluwenbergi* Jeannel, minute insects found in cultivated soil, were probably introduced in soil attached to plants. The two species of *Gnatholymnaeum* are probably endemic, and have their nearest relatives in the Holarctic Region, and especially on the western coast of North America. Of the 18 species of *Bembidion*, all but one appear to be endemic, but it seems probable that *Bembidion* has existed in the Islands for a shorter time than the Nomiini and Anchomenini, which have radiated into a far greater number of species.

KEY TO THE TRIBES OF HAWAIIAN CARABIDAE

1. Head with one seta above each eye, and that situated between middle and posterior margins of eye.....**Harpalini.**
 Head with two setae above each eye, anterior seta situated at or beyond middle of eye or close to its anterior margin, posterior one situated at a distance from inner margin and above posterior margin or slightly behind it..... 2
- 2(1). Elytra truncate behind; claws serrate beneath.....**Lebiini.**
 Elytra entire, rounded behind; claws simple..... 3
- 3(2). Outer hollow (scrobe) of mandible bearing a single bristle..... 4
 Scrobe of mandible with no bristle.....**Anchomenini.**
- 4(3). Terminal segment of palpi minute or styliform, not similar to penultimate segment; two basal segments of anterior tarsi in male asymmetrically expanded, each with a tooth on anterior edge; apical emargination of elytra without an inner fold.....
**Bembidiini.**
 Terminal segment of palpi similar in size to penultimate segment; never unusually small; three or four basal segments of anterior tarsi in male slightly and symmetrically expanded, without a tooth on anterior edge; an inner longitudinal fold of elytra becoming visible externally in apical emargination.....
**Nomiini.**

HARPALINI

Genus STENOLOPHUS Dejean

Stenolophus limbalis LeConte.

Stenolophus limbalis J. LeConte 1860, Reports Explor. & Surveys railr. route Mississippi River to Pacific Ocean 9: 28, 1860 (Sept. 1857).

Oahu: introduced from California.

LEBIINI

Key to the Genera

1. Pronotum with many setae around margins and on disc; elytra finely and densely pubescent.....**Endynomena.**
 2. Pronotum with one seta before middle and one near hind angle only; elytra not pubescent.....**Plochionus.**

Genus ENDYNOMENA Chaudoir

Endynomena Chaudoir, Mon. des Callidides, Ann. Ent. Soc. Belg. 15: 186, 1872.

Endynomena pradierei (Fairmaire).

Plochionus pradierei Fairmaire, Rev. Mag. Zool. (2) 1: 34, 1849.
 Chaudoir, Ann. Ent. Soc. Belg. 15: 186, 1872.
Saronychium inconspicuum Blackburn, Ent. Mon. Mag., 14: 142, 1877.

Endynomena hubneri Fairmaire, Pet. Nouv. Ent. 2: 286, 1878.
Thyreopterus paroecus Csiki, Denkschr. Akad. Wiss. Wien, Math.-Naturw. K. 91: 164, 1915.

Length: 9 mm. *Colour*: entirely reddish brown. *Head*: flattened; eyes projecting, hemispherical; mandibles very strongly curved. *Pronotum*: cordiform, sides sinuate before posterior angles which are obtuse and blunt; lateral margins wide and flattened; basal depressions shallow. *Elytra*: flattened, widest at a point about one-quarter from apex; striae not impressed, intervals slightly convex, seventh and ninth with a series of large setiferous punctures. Head, pronotum, elytra, legs and antennae strongly pubescent. Hind wings fully developed.

Recently introduced. Widespread from India through the Pacific.

Genus PLOCHIONUS Dejean

Plochionus Dejean, *Species general des Coleopteres de la Collection de M. le Comte Dejean*, p. 250, 1825.

Key to the Species

1. Third and fourth segments of hind tarsus subequal in size and shape, or third but slightly longer, second only about one-third longer than broad; apices of elytra slightly obliquely truncate and forming a distinct, broad, flat triangle with suture at apex; teeth on claws short.....*pallens* Fabricius.
2. Third segment of hind tarsus distinctly longer than fourth, second segment fully twice as long as broad; apices of elytra more squarely truncate and not at all triangular; teeth on claws long.....*timidus* Haldeman.

Plochionus pallens Fabricius.

Plochionus pallens Fabricius, *Systema Ent.* p. 244, 1775.

Plochionus bonfilsii Dejean, *Spec. gen. des Col. de la col. de M. le Comte Dejean*, p. 251, 1825.

Plochionus valens J. LeConte, *Smith, misc. coll.* 6 (167): 5, 1863.

Length: 8 mm. *Colour*: entirely reddish brown. *Mandibles*: strongly curved; eyes projecting, hemispherical. *Pronotum*: quadrate, sides straight, not sinuate in front of posterior angles which are slightly obtuse but sharp. *Elytra*: flattened and obliquely truncate at apex; striae well-marked, unpunctured; intervals slightly convex, third with two setiferous punctures near third stria. Legs pubescent. Hind wings fully developed.

Introduced by shipping; almost cosmopolitan.

Plochionus timidus Haldeman.

Plochionus timidus Haldeman, *Proc. Acad. Nat. Sci. Phila.*, 1: 298, 1843.

Length: 7-8 mm. *Colour*: uniform dark brown; margins of pronotum and elytra translucent. *Pronotum*: with sides strongly rounded and hind angles slightly obtuse; ratio greatest width length = 1.4. *Elytra*: as in *P. pallens* but with apices more squarely truncate.

A recent introduction from North America. Recorded there as an effective predator on larvae of the web-worm moth (*Hyphantria cunea*) (Murtfeldt, *Canad. Ent.* 24: 279, 1892). Larval state lasts approximately 16 days, with three moults (Duffey, *Trans. Acad. Sci. St. Louis*, 5: 533, 1892).

BEMBIDIINI

Key to the Genera

1. Elytral striae obsolete on sides, only first two or three near suture distinct; first stria continued along hind margin and then recurved to form an arcuate groove at about middle of posterior part of each elytron; fore tibiae with outer margin obliquely cut off at apex.....**Tachys.**
Elytral striae not so developed, without a subapical recurved stria..... 2
- 2(1). Head, pronotum and elytra with coat of fine setae throughout.....**Lymnastis.**
Elytra and pronotum not setose throughout..... 3
- 3(2). Less than 1 mm. long; one blind soil-inhabiting species.....**Typhlonesiotes.**
More than 2 mm. long; eyes always present, but sometimes reduced..... 4
- 4(3). Mandibles elongate, narrow and dagger-like, projecting beyond labrum for a distance distinctly greater than length of clypeus and labrum combined; posterior supraorbital seta situated well behind eye; the fourth segment of anterior tarsus with two curved spines beneath, as long as terminal segment; anterior tibiae longitudinally grooved.....**Gnatholymnaeum.**
Mandibles not so elongated; posterior supraorbital seta situated close to hind margin of eye; fourth segment of anterior tarsus without spines beneath; anterior tibiae not grooved.....**Bembidion.**

Genus TACHYS Stephens

Tachys Stephens, Ill. British Ent. Mandib. 2: 24, 1828. Sharp, Fauna Hawaiiensis 3: 287, 1903.

Genotype: *Tachys scutellaris* Stephens.

Key to the Hawaiian Species

1. Elytra with only sutural stria distinct; posterior angles of pronotum obtusely rounded; testaceous.....**atomus** Blackburn.
Elytra with two or three distinct striae; posterior angles of pronotum acute..... 2
- 2(1). Elytra with three distinct striae; subparallel (fig. 2); testaceous.....**ceylanicus** (Nietner.)
Elytra with only two distinct striae..... 3
- 3(2). Eyes large and strongly convex; elytra sometimes with obscure yellow humeral and subapical spots; microsculpture of pronotum very strong; piceous-black; elytra subparallel (fig. 2).....**oahuensis** Blackburn.
Eyes small and only slightly convex; reddish brown, unicolorous; microsculpture of pronotum very faint or absent, surface shining; elytra ovoid (fig. 2).....**arcanicola** Blackburn.

Tachys atomus Blackburn.

Tachys atomus Blackburn, Ent. Mon. Mag., 15: 158, 1878.

Lymnastis capito Bates, Biologia Centrali-Americana, Col. (1): 287, 1884, *new synonym*.

Length: 1.10 mm. *Colour*: pale testaceous, including clypeus and labrum; head rather darker. *Head*: very large, almost as wide as pronotum; eyes small and pigmented; hind wings fully developed.

Oahu: "Not rare in mountain localities at about 1,500 ft." (*Blackburn*). Four examples.

Tachys atomus is identical with that described by Bates as *Lymnastis capito* from Guatemala. This species is certainly not a *Lymnastis*. It has been transferred to *Micratopus* by Jeannel (Soc. Ent. France, Livre du Centenaire, p. 168, 1932). In *Micratopus* however, the sutural stria of the elytra is not recurved at the apex, and the mentum has no tooth in the emargination. The unique type of *L. capito* Bates shows a very distinct recurved stria and the mentum has a strong tooth in the middle. The species cannot therefore be retained in *Micratopus*. I refer it provisionally to the genus *Tachys*, and *T. atomus* *Blackburn* will therefore need no change of genus. *T. capito* Bates was taken by G. C. Champion at San Geronimo, Guatemala, a locality only 15 miles from the Pacific Coast, and has since been discovered in Cuba.

***Tachys ceylanicus* (Nietner) (fig. 2).**

Bembidium ceylanicus Nietner, Ann. Mag. Nat. Hist. (3) 2: 423, 1858.

Tachys flaviculus Motchulsky, Etudes Ent. 8: 39, 1859.

Tachys anceps Putzeys, Ann. Mus. Civ. Genova 7: 742, 1875.

Tachys muscescens *Blackburn*, Ent. Mon. Mag., 15: 158, 1878, new synonym.

Tachys infans Bates, Ann. Mag. Nat. Hist. (5) 17: 154, 1886.

Tachys ceylanicus (Nietner). Andrewes, Ann. Mus. Civ. Genova, 7: 436, 1875.

Length: 2.0 mm. *Colour*: body uniformly testaceous, legs and antennae paler. *Elytra*: with three sutural striae deeply impressed, closely punctured, only first stria reaching apex; third interval with two punctures, close to the third stria; remaining striae only very faintly indicated; whole surface shining, without microsculpture. Hind wings fully developed.

Oahu: "In decaying vegetable matter on the plains of Honolulu" (*Blackburn*). One female. A common species throughout south-east Asia.

***Tachys oahuensis* *Blackburn* (fig. 2).**

Tachys oahuensis *Blackburn*, Ent. Mon. Mag. 15: 158, 1878.

Length: 2.4-2.6 mm. *Colour*: head, pronotum and elytra brown or piceous; mouthparts and legs testaceous; antennae with first two segments testaceous, remainder brown. *Elytra*: with only first and second striae impressed, second not reaching apex or base, obsoletely punctured; close on third stria; surface of head, pronotum and elytra with strong isodiametric microsculpture. Hind wings fully developed.

Oahu: "Not uncommon on salt marshes near the sea." (*Blackburn*.) Six examples. Molokai (E.C.Z.).

Tachys oahuensis belongs to the *quadrillum* species group of Andrewes (Ann. Mus. Civ. Genova, 51: 368, 1925).

Tachys arcanicola Blackburn (fig. 2).

Tachys arcanicola Blackburn, Ent. Mon. Mag., 15: 158, 1878.

Length: 1.92-2.09 mm. *Colour*: pronotum, elytra, legs, antennae and mouthparts, including labrum and clypeus pale testaceous; remainder of head brown; eyes dark pigmented, reduced, hardly convex. *Elytra*: with only two striae strongly impressed, unpunctured; other striae faintly indicated; two setiferous punctures on fourth interval; one near middle, other near apex opposite middle of apical recurved stria. Microsculpture very faint, stronger on head. Hind wings vestigial. 0.25 mm. long.

Oahu: 1,500 ft., under bark (Blackburn). Three examples, sea-level, July 1893, two examples (*Perkins*).

Tachys arcanicola is quite closely related to *T. pallescens* Bates, from Japan. Both belong to the *triangularis* species group of Andrewes (loc. cit. p. 14).

Genus LYMNASTIS Motschulsky

Lymnastis Motschulsky, Etudes Entomologiques, 11: 27, 1862.

Lymnastis of other authors.

Genotype: *Lymnastis indicus* (Motschulsky).

Subgenus PARALIMNASTIS Jeannel

Lymnastis (Paralimnastis) zwaluwenburgi (Jeannel), *emendation*.

Lymnastis (Paralimnastis) zwaluwenburgi Jeannel Soc. Ent.

France, Livre du Centenaire, p. 176, fig. 12, 1932. (Type of the subgenus.)

Length: 2.0 mm. *Colour*: entirely pale testaceous. Eyes minute but slightly convex; sutural angles of elytra differing from all other known species of *Lymnastis* in that they are not rounded and dehiscent, but sharp; three long setae on third interval.

Oahu: Honolulu, three examples found in the subterranean part of an old sugar cane stool (R. H. Van Zwaluwenburg).

The genus *Lymnastis* occurs in southern Europe, North Africa, East Africa, India, Burma, Indo-China, Java, Celebes, Borneo, New Guinea and eastern Australia. According to Jeannel the presence of a species of *Lymnastis* in Oahu proves that at an early geological epoch there were continental connections over the whole western Pacific from the Malay archipelago, as far as the Hawaiian Islands. This is entirely opposed to the usual hypothesis that the Islands are purely oceanic and have never been in connection with any continent. In view of the very convincing evidence that has been accumulated in favor of the view that the Islands are of oceanic origin, Mr. Zimmerman and I see no reason for accepting Dr. Jeannel's statement. *Lymnastis zwaluwenburgi*, like *Typhlonesiotes zwaluwenburgi* is undoubtedly a relatively recent introduction, and perhaps reached the islands in soil attached to cultivated plants or soil in ships' ballast.

Genus TYPHLONESIOTES Jeannel

Typhlonesiotes Jeannel *Revue Francaise d'Ent.* 3 (4): 323, 1937.
Genotype: *Typhlonesiotes swaluwenburgi* Jeannel.

***Typhlonesiotes swaluwenburgi* (Jeannel), emendation.**

Typhlonesiotes swaluwenburgi Jeannel, 1937, loc. cit., figs. 155-162. Zimmerman, *Proc. Hawaiian Ent. Soc.* 10: 132, 1938.

Length: 1.0 mm. *Colour*: entirely pale testaceous. *Eyes*: absent.

Oahu: numerous examples taken in the soil at the roots of sugar cane stools (R. H. Van Zwaluwenburg). Thirteen examples.

According to Jeannel this genus is very closely related to *Anillopsis capensis* (Peringuey) from South Africa, and the two can scarcely have diverged from their primitive common stock in spite of the fact that separation must have occurred in the very distant past. Jeannel further states that it is impossible that the Hawaiian species could have been introduced comparatively recently; that there is no evidence that such minute endogenous Carabidae could be introduced by accidental transport. Further, "Their natural habitat in the fissures of damp clay soils, is quite different from that of subterranean species of loose soil and of cultivation, such as *Somoplatus*, *Somotrichus*, *Perigona*, etc. which especially lend themselves to passive transport. *Typhlonesiotes* and *Anillopsis* are indigenous and it is necessary to go back to the Jurassic for the attachment of the Hawaiian archipelago, part of the north Pacific landmass to the continent of Gondwana, by way of Australo-Malasia" [translated from the French]. (Loc. cit. p. 361.)

As in the case of *Lynnastis swaluwenburgi*, Mr. Zimmerman and I cannot support these assertions. There is no reason why the accidental introduction of these two minute soil-living species should be any more improbable than that of any other Carabidae. In the past, soil has been introduced quite frequently especially on the roots of plants. Jeannel states that the natural habitat of these species is not in the soil of cultivation, but it must be observed that these species were discovered in such soil.

The fact that the two species were taken in the soil of sugar cane fields makes it probable that their introduction into the Hawaiian Islands was quite recent. The older introduction of cane was made from the East Indies and especially from Java, and in the days before plant quarantine regulations, soil was introduced with the plants.

Genus GNATHOLYMNAEUM Sharp

Gnatholymnaeum Sharp, *Fauna Hawaiiensis*, 3: 276, 1903.

Nesolymnaeum Sharp, *Fauna Hawaiiensis* 3: 277, 1903, *new synonym*.

Distinguished from *Bembidion* by the elongate mouthparts, the position of the posterior supraorbital seta, the presence of two

curved spines on the underside of the fourth segment of the anterior tarsus, and the grooves on the anterior tibiae (see key to the genera).

Genotype: *Gnatholymnaeum blackburni* Sharp.

Key to the Species

1. Elytral intervals strongly convex; eyes reduced in size; colour of head, pronotum and elytra dark brown; each elytron with a paler, obscure subapical spot; elytral striae only faintly punctured towards base; hind wings vestigial (fig. 2).....
Gnatholymnaeum blackburni Sharp.
2. Elytral intervals flat; eyes normal in size; colour of head, pronotum and elytra, bluish black; each elytron with an obscure subapical spot; elytral striae strongly punctured, hind wings fully developed.....
Gnatholymnaeum spurcum (Blackburn).

***Gnatholymnaeum blackburni* Sharp (fig. 2).**

Gnatholymnaeum blackburni Sharp, Fauna Hawaiiensis 3: 276, pl. 7, figs. 18, 25, 1903.

Length: 4.62-4.95 mm.

Kauai: (*Perkins*), five examples.

***Gnatholymnaeum spurcum* (Blackburn) (fig. 2).**

Bembidium (Notaphus) spurcum Blackburn, Ent. Mon. Mag. 17: 228, 1881.

Gnatholymnaeum (Nesolymnaeum) spurcum (Blackburn) Sharp, Fauna Hawaiiensis, 3: 277, 1903.

Length: 4.1-4.3 mm.

Maui: Haleakala.

Gnatholymnaeum is very closely related to *Amerizus*, a North American genus of five species. The two genera are only distinguishable by the fact that the metasternum, metacoxae and abdominal sternites are sparsely pubescent in *Gnatholymnaeum*. These genera are very near *Lymnaeum*, a genus of three species, which extends from western Europe to Japan and the Kurile Islands. *Lymnaeum* shares the following characters: eyes reduced; male genitalia with parameres of approximately equal length, the left with four apical setae (2 long, 2 short), the right with three apical setae (2 long, 1 short); the anterior projection of the metasternum with a distinct margin. *Lymnaeum* differs from *Amerizus* and *Gnatholymnaeum* in having the mouthparts of normal length and in the fact that the median line of the pronotum is not expanded into a channel in the basal third. This channel is, however, very faint in *Gnatholymnaeum*. There can be no doubt that *Gnatholymnaeum* arose from a *Lymnaeum*-like stock of holarctic origin and most probably from a species of *Amerizus* from the Pacific coast of North America.

Genus BEMBIDION Latreille

Bembidion Latreille, Histoire Naturelle Generale et Particuliere des Crustaces et Insectes. Paris, p. 82, 1802.

Bembidium Stephens, Illustrations of British Entomology, Mandibulata, 2: 2, 29, 1829.

Nesocidium Sharp, Fauna Hawaiiensis 3: 280, 1903, *new synonym*.

Atelidium Sharp, Fauna Hawaiiensis 3: 284, 1903, *new synonym*.

Metrocidium Sharp, Fauna Hawaiiensis 3: 285, 1903, *new synonym*.

Genotype: *Bembidion quadrimaculata* Linnaeus.

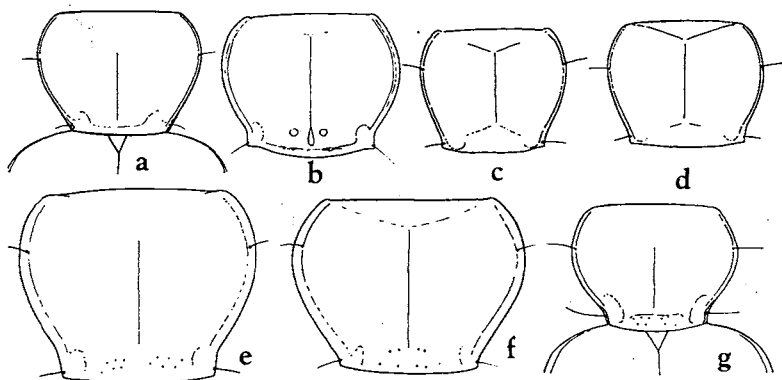


Figure 1.—Outlines of Hawaiian *Bembidion* thoraces: a, *B. ignicola* Blackburn; b, *B. munroi* (Sharp); c, *B. (Nesomicrops) kauaiensis* (Sharp); d, *B. (Nesomicrops) coecus* (Sharp); e, *B. teres* Blackburn; f, *B. pacificum* Blackburn; g, *B. molokaiense* (Sharp).

Key to the Hawaiian Species of *Bembidion*

- | | | |
|-------|---|----------------------|
| 1. | Eyes well developed, convex; length of eye more than 0.18 mm. | 2 |
| | Eyes greatly reduced, not projecting; length of eye less than 0.12 mm. (subgenus <i>Nesomicrops</i>)..... | 19 |
| 2(1). | Reticulate microsculpture of surface of head between eyes strong and obvious (at magnification $\times 60$)..... | 3 |
| | Microsculpture absent from head between eyes; surface smooth and shining | 10 |
| 3(2). | Pronotum with microsculpture of surface obvious, especially towards sides, (isodiametric mesh), body form depressed..... | 4 |
| | Pronotum without microsculpture, surface smooth and shining, body form convex..... | 8 |
| 4(3). | Greater part of elytra yellow, with a dark triangular patch in middle of outer margin extending inward as far as the fifth stria; a dark sutural patch near apex of elytra; antennae with basal two and one-half segments testaceous, remaining segments darker (fig. 2)..... | <i>advena</i> Sharp. |
| | Greater part of the elytra dark brown or aeneous-black in color; with ill-defined paler spots or patches..... | 5 |

- 5(4). Elytral intervals quite flat, striae not impressed; pronotum with basal depression on each side obvious, a short carina running to posterior angles.....*niloticum batesi* Putzeys.
Elytral intervals more or less convex, striae impressed; pronotum with basal depression on each side very small, with no carina near posterior angles..... 6
- 6(5). Length 2.7-3.3 mm.; elytra rounded equally sharply at apex and base (fig. 3); color of elytra reddish brown, darker on disc; apex of elytra paler but without a distinct pale spot at apices of intervals 5-8 (Kauai).....*rude* (Sharp).
Length 3.7-4.6 mm.; elytra rounded more sharply at shoulders than towards apex; colour of elytra aeneous—brown or black, a distinct pale spot at apices of intervals 5-8..... 7
- 7(6). Pronotum less transverse, ratio greatest width to length less than 1.22 (figs. 1e, 3) (Kauai, Oahu, Molokai, Maui).....*teres* Blackburn.
Pronotum more transverse, ratio greatest width to length more than 1.25 (figs. 1f, 3) (Kauai).....*pacificum* Blackburn.
- 8(3). Dorsal surface dark metallic green (fig. 3) (Maui).....*fulgens* (Sharp).
Dorsal surface uniform brown, or brown with humeral and apical pale spots (Kauai)..... 9
- 9(8). Dorsal surface of uniform brown colour; sides of pronotum straight in front of posterior angles (fig. 3).*corticarium* (Sharp).
Elytra brown with one pale spot at shoulder and another on apical half; sides of pronotum sinuate in front of posterior angles (fig. 3).....*perkinsi* (Sharp).
- 10(2). Shoulders of elytra quite obvious, not completely rounded off (see fig. 4 *ignicola*)..... 11
Shoulders of elytra completely rounded off (see fig. 4, *admirandum*) 12
- 11(10). Sides of the pronotum slightly sinuate just in front of posterior angles (fig. 1g); pronotum considerably constricted at base; elytral intervals moderately convex (Molokai, Maui, Kauai).....*molokaiense* Sharp.
Sides of pronotum straight, not sinuate in front of posterior angles (fig. 1a); pronotum broader at base; elytral intervals strongly convex (fig. 4) (Hawaii).....*ignicola* Blackburn.
- 12(10). Color metallic green or aeneous-black; legs and antennae reddish brown; eyes strongly convex (Oahu, Molokai, Hawaii)..... 17
Color reddish brown or black; legs testaceous or reddish brown; eyes moderately convex (Kauai)..... 13
- 13(12). Length more than 3.4 mm.; sides of pronotum very broadly explanate (fig. 4); shoulders and sides of elytra paler than disc.....*admirandum* (Sharp).
Length less than 3.0 mm.; sides of pronotum only narrowly explanate; elytra with or without paler shoulders..... 14
- 14(13). Head, pronotum and elytra black; antennae unicolourous, dark reddish brown (fig. 4) (Oahu).....*atomarium* (Sharp).
Head, pronotum and elytra reddish or aeneous-brown; antennae with base paler than apex (Kauai)..... 15
- 15(14). Pronotum with sides straight in front of posterior angles; shoulders of elytra of same colour as disc (fig. 3) (Kauai).....*corticarium* (Sharp).
Pronotum with sides distinctly sinuate in front of posterior angles; shoulders of elytra paler in colour than disc (Kauai)..... 16

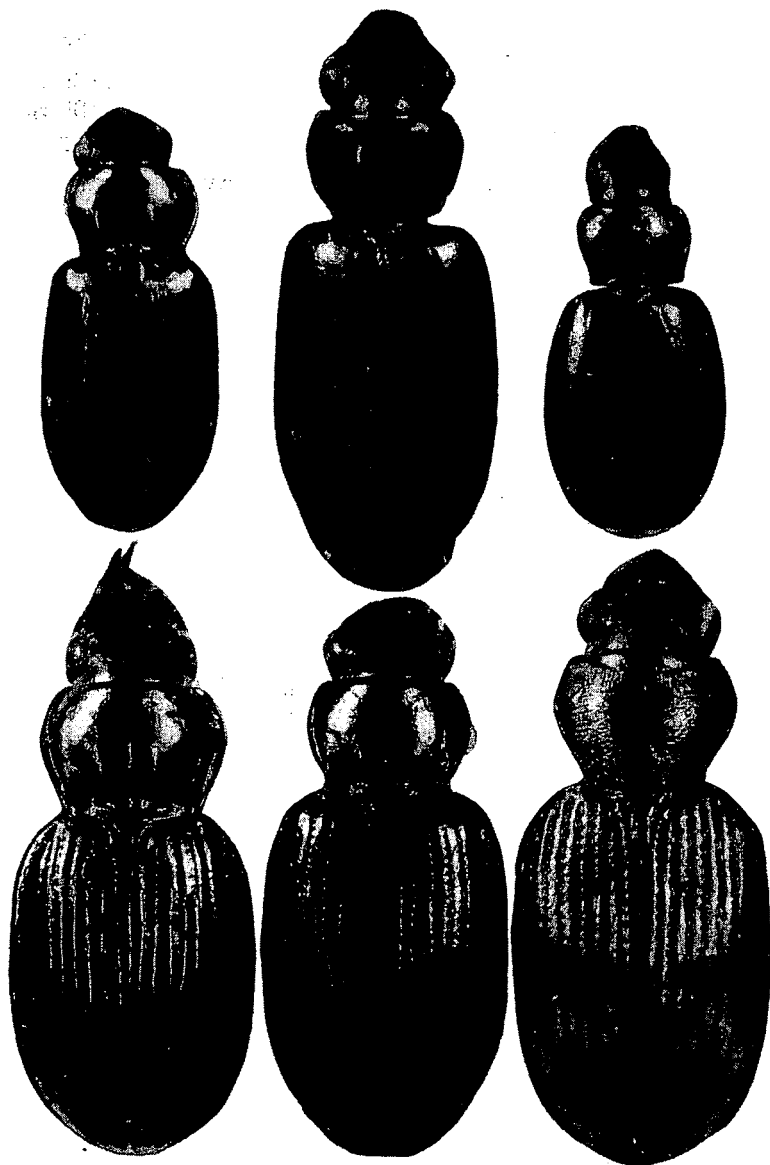


Figure 2.—Hawaiian Bembidiini. Top row, left to right: *Tachys ceylanicus* (Nietner), from the holotype of *Tachys muscescens* Blackburn; *Tachys oahuensis* Blackburn; *Tachys arcanicola* Blackburn. Bottom row, left to right: *Gnatholymnaeum blackburni* Sharp; *Gnatholymnaeum spurcum* (Blackburn), holotype; *Bembidion advena* Sharp, holotype.

- 16(15). Pronotum with a setiferous puncture at each posterior angle; lateral angles of pronotum wider (figs. 1b, 4).....**munroi** (Sharp).
Pronotum without setiferous punctures; lateral margins of pronotum narrower (fig. 4).....**munroi brevicolle** (Sharp).
- 17(12). Colour shining aeneous-black (fig. 5) (Oahu).....**koebelei** (Sharp).
Colour shining metallic green..... 18
- 18(17). Elytral striae strongly impressed and punctured; colour metallic green (fig. 5) (Molokai).....**smaragdinum** (Sharp).
Elytral striae feebly impressed and punctured; colour shining aeneous-green (Hawaii).....**auratum** (Perkins).
- 19(1). Eyes larger, 0.10 mm. in length, pigmented; pronotum more contracted at base, ratio greatest width to width at base = 1.42 (fig. 1c) (Kauai).....**kauaiensis** (Sharp).
Eyes smaller, 0.055 mm. in length, unpigmented; pronotum less contracted at base, ratio greatest width to width at base = 1.35 (fig. 1d, 4) (Kauai).....**coecus** (Sharp).

Bembidion advena Sharp (fig. 2).

Bembidion advena Sharp, Fauna Hawaiiensis 3: 278, pl. 7, fig. 19, 1903.

Length: 3.4 mm. *Colour*: head and pronotum aeneous-brown with purplish reflections; elytra bright yellow with extreme outer margins dark brown; a dark brown triangular patch based on middle of outer margin of each elytron, apex of triangle attaining fifth stria; a preapical dark brown patch common to both elytra, extending outwards on each as far as sixth stria; antennae dark brown with the two basal segments and the basal halves of the third and fourth segments testaceous; legs testaceous; mouthparts including the labrum, reddish brown. *Head*: with eyes large and convex; frontal grooves very feebly impressed, extending backwards only as far as middle of eyes; isodiametric microsculpture of surface of head, including clypeus, very strong and obvious. *Pronotum*: transverse; sides slightly sinuate in front of posterior angles which are sharp and slightly obtuse; surface with strong isodiametric microsculpture. *Elytra*: with shoulders rounded off; striae well impressed and regularly punctured, obliterated just posterior to subapical dark patch; scutellary striole well developed; striae 4-7 do not reach basal margin; intervals moderately convex, third with two setiferous punctures. Surface with strong isodiametric microsculpture.

Maui: Haleakala, 5000 ft. (*Perkins*), one example.

Bembidion niloticum batesi Putzeys.

Bembidion niloticum Dejean var. *batesi* Putzeys, Ann. Soc. Ent. Belg. 18, Compt.-Rend., p. iii, 1875. Netolitzky, Ent. Blatt., 10: 167, 1914.

B. niloticum Bates, Trans. Ent. Soc. Lond., p. 301, 1873 (not of Dejean).

Length: 3.7 mm. *Colour*: dark metallic aeneous-green with the apices of elytra yellowish; mouthparts, antennae and legs brown. *Head*: very broad, with prominent hemispherical eyes, frontal groove deep anteriorly, shallower behind, reaching hind margin of eyes. *Pronotum*: strongly transverse (1.06 mm. \times 0.72 mm.), widest just before middle, strongly contracted behind; sides very slightly sinuate in front of posterior angles which are very obtuse (about 130 degrees), but with a small rectangular tooth at apex; a small depression within angle, to apex of which runs a small carina. *Elytra*: with shoulders fairly prominent; striae not impressed to form grooves, but

marked by regular series of well-defined punctures, which disappear in apical quarter; a long scutellary striole present; intervals quite flat, third with two setiferous punctures situated at about one-third and two-thirds of length of elytra from base. Whole surface of head, pronotum and elytra covered with a very strong isodiametric microsculpture.

Oahu, Molokai.

Distribution: *B. niloticum* Dejean, Egypt, Asia Minor; var. *hamatum* Kolenati, Caucasus, Caspian, Turkestan; var. *batesi* Putzeys, China, Japan, Philippines. The Hawaiian form must therefore have been introduced from the oriental region. As the species was not discovered by the earlier collectors it seems likely that it must have been introduced quite recently.

***Bembidion teres* Blackburn (figs. 1e, 3).**

Bembidium (Lopha) teres Blackburn, Ent. Mon. Mag. 17: 229, 1881. Sharp, Fauna Hawaiiensis, 3: 278, 1903.

Length: 4.2-4.6 mm. *Colour*: dark aeneous-brown or greenish brown, a faint paler spot near apices of elytral intervals 5, 6 and 7; legs, antennae and mouthparts dark brown. *Head*: with eyes prominent, almost hemispherical; frontal furrows deep and irregular, extending from front of clypeus to a point opposite hind margin of eye, parallel, not converging towards clypeus. *Pronotum*: transverse, widest point just in front of middle (length 0.9 mm., breadth 1.1 mm.); strongly contracted behind, sides slightly sinuate in front of posterior angles which are obtuse but sharply pointed; disc rather flat; side margins flattened, moderately wide, slightly recurved. *Elytra*: with shoulders quite prominent; striae impressed and regularly punctured, disappearing in apical quarter; scutellary striole long; intervals slightly convex, third with two setiferous punctures, situated at about one-third of length of elytra from apex and base respectively. The whole surface has a strong isodiametric microsculpture. Hind wings fully developed.

Kauai, Oahu, Molokai, Maui. (*Blackburn, Perkins.*)

***Bembidion pacificum* Blackburn (figs. 1f, 3).**

Bembidium pacificum Blackburn, Ent. Mon. Mag. 15: 157, 1878. Sharp, Fauna Hawaiiensis 3: 279, 1903.

Length: 3.4-3.8 mm. *Colour*: head and pronotum dark aeneous-brown to black, elytra aeneous-brown, paler than pronotum; a yellow spot at apices of intervals 5 to 8, connected with pale yellow apices of elytra; base of elytra, including shoulders paler than disc; legs and first two and one-half segments of antennae testaceous; remainder of antennae brown.

Kauai: Waimea Mountains, 4000 ft. May 1894. (*Perkins.*)

Oahu: On damp ground, very local. (*Blackburn.*)

***Bembidion rude* (Sharp), new combination (fig. 3).**

Nesocidium rude Sharp, Fauna Hawaiiensis 3: 283, 1903.

Length: 3.0-3.4 mm. *Colour*: head and pronotum reddish brown; mouthparts and antennae reddish brown, latter with basal segments testaceous; legs testaceous; elytra dark brown with humeral and apical regions and lateral margins paler. *Pronotum*: strongly constricted at base, sides strongly sinuate, posterior angles obtuse but sharp; base roughened, with very strong microsculpture. *Elytra*: with intervals strongly convex, third with two seti-

ferous punctures; striae indistinctly punctured in their basal halves. Margins of the pronotum and elytra reflexed; shoulders completely rounded off.

Kauai: high plateau (*Perkins*).

Bembidion fulgens (Sharp), *new combination* (fig. 3).

Nesocidium fulgens Sharp, Fauna Hawaiiensis 3: 282, 1903.

Length: 2.6 mm. *Colour*: head, pronotum and elytra shining metallic aeneous-green; legs testaceous; antennae brown with two basal segments paler. *Pronotum*: (length 0.62 mm., breadth 0.74 mm.), with sides straight or only very slightly sinuate in front of posterior angles which are obtuse but sharp; base with a few indefinite punctures; surface shining, without microsculpture but somewhat rugose. *Elytra*: with shoulders completely rounded off; intervals convex, the third with two setiferous punctures; striae strongly punctured in basal half.

Mau: Haleakala, 5000 ft. (*Perkins*), three examples.

Bembidion corticarium (Sharp), *new combination* (fig. 3).

Nesocidium corticarium Sharp, Fauna Hawaiiensis 3: 283, 1903.

Length: 2.75-3.10 mm. *Colour*: reddish brown, with mouthparts, legs and antennae testaceous, latter darker towards their apices. *Head*: eyes only moderately convex (see fig. 3). *Pronotum*: strongly constricted at base, sides straight or very slightly sinuate before posterior angles which are obtuse. *Elytra*: ovoid without trace of shoulders; striae slightly impressed in basal half; punctures rather fine and widely separated; intervals slightly convex; third with two setiferous punctures.

Kauai: Waimea Mountains, 4000 ft.; Kaholuamanu (*Perkins*).
1 male, 2 females.

Bembidion perkinsi (Sharp), *new combination* (fig. 3).

Nesocidium perkinsi Sharp, Fauna Hawaiiensis 3: 282, 1903.

Length: 2.8-3.1 mm. *Colour*: head reddish brown; pronotum and elytra dark brown, latter with a pale patch in humeral region extending in as far as fourth stria, and a pale subapical diagonal band extending from margin inwards as far as second stria; antennae brown with first three segments pale, palpi testaceous with penultimate segments brown; legs testaceous. *Pronotum*: with posterior angles very obtuse but sharp; lateral margins very narrow. *Elytra*: markedly convex with very narrow margins; intervals convex, third with two setiferous punctures; striae indistinctly punctured towards base; shoulders completely rounded off.

Kauai: Kaholuamanu, 4000 ft. (*Perkins*).

Bembidion molokaiense (Sharp), *new combination* (fig. 1g).

Bembidium (Emphanes) molokaiense Sharp, Fauna Hawaiiensis, 3: 279, pl. 7, fig. 23, 1903.

Nesocidium laeticulum Sharp, loc. cit., p. 280, *new synonym*.

Nesocidium lahamense Sharp, loc. cit., p. 281, *new synonym*.

Length: 2.8-3.0 mm. *Colour*: shining aeneous-green, mouthparts, legs and antennae reddish brown, latter darker apically. *Pronotum*: (length 0.64 mm., greatest width 0.77 mm., width at base 0.47 mm.) strongly constricted at base, sides slightly sinuate in front of posterior angles which are obtuse; obscurely rugose at base. *Elytra*: striae strongly punctured in basal half, punctures separated by their own width; intervals strongly convex in basal



Figure 3.—Hawaiian *Bembidion* species. Top row, left to right: *B. pacificum* Blackburn; *B. rude* (Sharp), paratype; *B. teres* Blackburn. Bottom row, left to right: *B. fulgens* (Sharp), holotype; *B. corticarium* (Sharp), holotype; *B. perkinsi* (Sharp).

half, the third with two setiferous punctures; shoulders not entirely rounded off. Hind wings variable, fully developed or reduced.

Molokai: 4000 ft. (*Perkins*). Maui: Haleakala, 5000 ft. (*Perkins*); Lahaina (*Koebele*); West Maui (*Koebele*). Kauai: Kahouluamanu, Waimea Mountains (*Perkins*). 53 examples.

Sharp (Fauna Hawaiiensis, 1903, p. 281) has discussed the variation in wing size in detail. He suspected that *Bembidion molokaiense* and *Nesocidium lacticulum* were forms of the same species but hesitated to unite them as he had separated the genus *Nesocidium* on the abbreviated wings. Wing dimorphism is, however, known in other beetles. Miss Dorothy Jackson (Trans. Royal Soc. Edinburgh, 55 [III]: 665, 1928) has shown that in the weevil *Sitona hispidula*, the reduced wing is recessive to the normal wing in breeding experiments. In the same work many other examples of wing-dimorphism are given. Further, the two forms of *Bembidion molokaiense* are found together in the same localities and often in the same colonies. In view of these facts, I have no hesitation in establishing the synonymy.

The differences between *N. lahainense* and *N. lacticulum* are very slight and are well within the range of variation. The hind-wings of *N. lahainense* are reduced, 0.8 mm. in length, again within the range of variation of wing length (0.4 mm.-1.2 mm.) observed by Sharp in *N. lacticulum*.

***Bembidion (Lopha) ignicola* Blackburn (figs. 1a, 4).**

Bembidion ignicola Blackburn, Ent. Mon. Mag. 16: 109, 1879.

Bembidion (Emphanes) ignicola (Blackburn) Sharp, Fauna Hawaiiensis 3: 279, 1903.

Length: 2.70 mm. *Colour*: aeneous-black, mouthparts, antennae and legs reddish brown. *Pronotum*: (length 0.64 mm., greatest width 0.79 mm.; width at base 0.53 mm.) not quite so strongly constricted at base as in *B. molokaiense*; sides straight, not sinuate before posterior angles which are obtuse; base rough. *Elytra*: striae very strongly punctured in their basal halves, punctures separated by less than their own width; intervals strongly convex in basal half, third with two setiferous punctures; shoulders not completely rounded off.

Hawaii: Kilauea (*Blackburn*), one male.

***Bembidion atomarium* (Sharp), new combination (fig. 4).**

Nesocidium atomarium Sharp, Fauna Hawaiiensis 3: 284, 1903.

Nesocidium scydmaenoides Sharp, loc. cit., p. 284, new synonym.

Length: 2.8 mm. *Colour*: head, pronotum and elytra shining black; mouthparts, antennae and legs reddish brown. *Pronotum*: constricted at base, sides slightly sinuate in front of posterior angles which are obtuse but sharp. *Elytra*: with intervals moderately convex, third usually with one setiferous puncture situated at about one-third of length from base; striae in basal half with strong but widely spaced punctures; shoulders completely rounded off. Microsculpture absent.

Oahu: mountains near Honolulu (*Koebele*); back of Mt. Tantalus on *Pipturus* (*Perkins*), one male, one female.

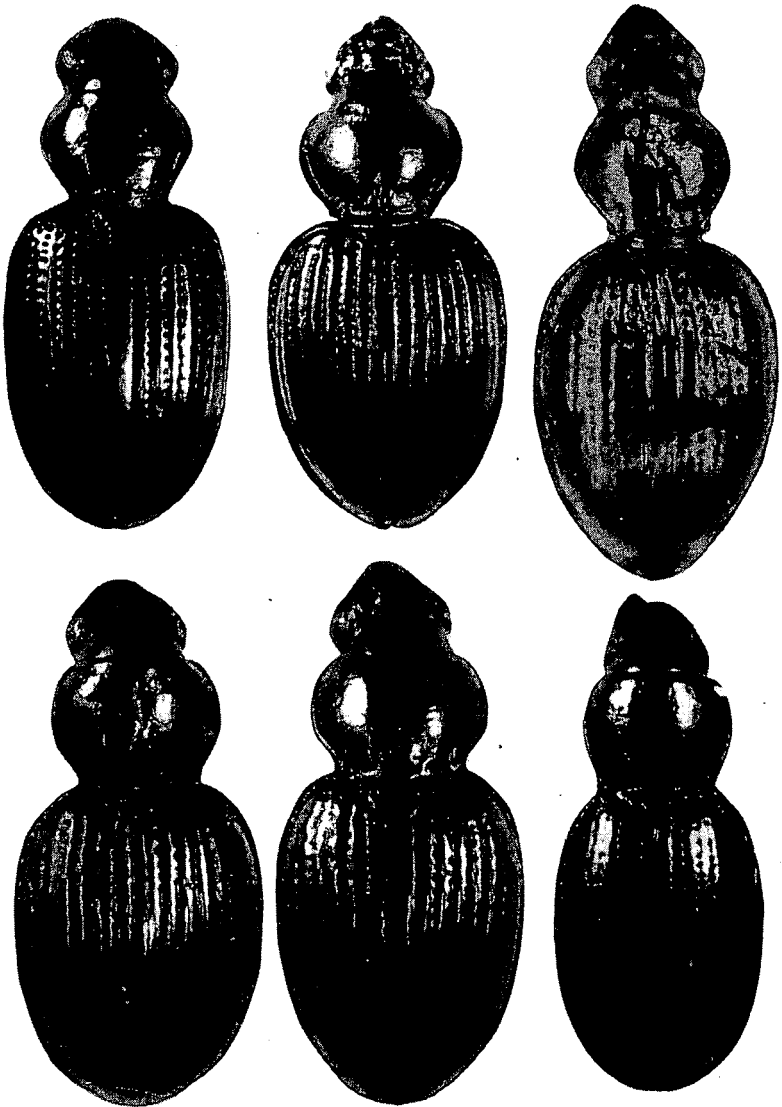


Figure 4.—Hawaiian *Bembidion* species. Top row, left to right: *B. ignicola* Blackburn; *B. admirandum* (Sharp); *B. atomarium* (Sharp). Bottom row, left to right: *B. munroi* (Sharp), holotype; *B. munroi brevicolle* (Sharp), holotype; *B. (Nesomicrops) coecus* (Sharp), holotype.

Bembidion admirandum (Sharp), *new combination* (fig. 4).

Metrocidium admirandum Sharp, Fauna Hawaiiensis 3: 286, 1903.

Length: 3.9 mm. *Colour*: head and pronotum dark reddish brown, mouthparts including labrum paler; antennae and legs reddish brown; elytra dark reddish brown on disc, paler at sides and apex; epipleura pale brown; ventral surface dark brown. *Pronotum*: ratio base width to greatest width to apex width to middle length, equals 1 to 1.51 to 1.09 to 1.21; sides broadly explanate and slightly reflexed; sides sinuate before posterior angles which are obtuse but sharp pointed; median line finely impressed except near base where it is expanded into a fairly broad depression; base with a transverse groove parallel to posterior margin, and about five punctures on each side; posterior setiferous punctures only are present. *Elytra*: striae strongly impressed throughout most of their length, becoming faint near apex, quite strongly punctured in basal half, punctures becoming fainter towards apex; intervals strongly convex, surface shining, without microsculpture.

Kauai: high plateau, August 1896 (*Perkins*). Holotype only.

Bembidion munroi (Sharp), *new combination* (figs. 1b, 4).

Atelidium munroi Sharp, Fauna Hawaiiensis 3: 285, pl. 7, fig. 22, 1903.

Length: 2.8-3.0 mm. *Colour*: head, pronotum and disc of elytra piceous to black, slightly aeneous; mouthparts and antennae dark brown; legs reddish brown; elytra with shoulders, sides (intervals 7-9) and apex yellowish brown; ventral surface piceous except sides of abdomen and elytral epipleura which are yellowish brown. *Head*: rather truncate, frontal grooves deeply impressed. *Pronotum*: strongly convex, lateral margins narrowly reflexed; sides strongly sinuate in front of posterior angles which are obtuse but sharp pointed; middle line finely impressed, becoming wider and deeper at base; base with a transverse groove parallel to basal margin, groove marked by a few faint punctures; lateral depressions deep, longitudinal, slightly curved; base with a slight depression on each side of mid-line, in front of transverse groove; setiferous punctures present at posterior angles. *Elytra*: striae clearly impressed and punctured in basal half, both striae and punctures becoming fainter towards apex, disappearing entirely (except stria one) close to apex; intervals moderately convex. Microsculpture absent. Hind wings vestigial.

Kauai: Waimea, 4000 ft., May, June 1894 (*Perkins*), ten examples.

Bembidion munroi variety *brevicolle* (Sharp), *new combination* (fig. 4).

Metrocidium brevicolle Sharp, Fauna Hawaiiensis 3: 285, 1903.

This form differs from *B. munroi* s. str. only in the absence of the setiferous punctures of the posterior angles of the pronotum, and in the very slightly narrower reflexed margins of the pronotum. The colour of the 3 examples available is rather immature, but shows the pale sides of the elytra of *B. munroi*. These examples were taken at the same time and in the same place as those of *B. munroi*, and cannot therefore be regarded as a subspecies. They probably represent a mutant which interbreeds with the normal stock. Such forms are common in other Hawaiian Carabidae.

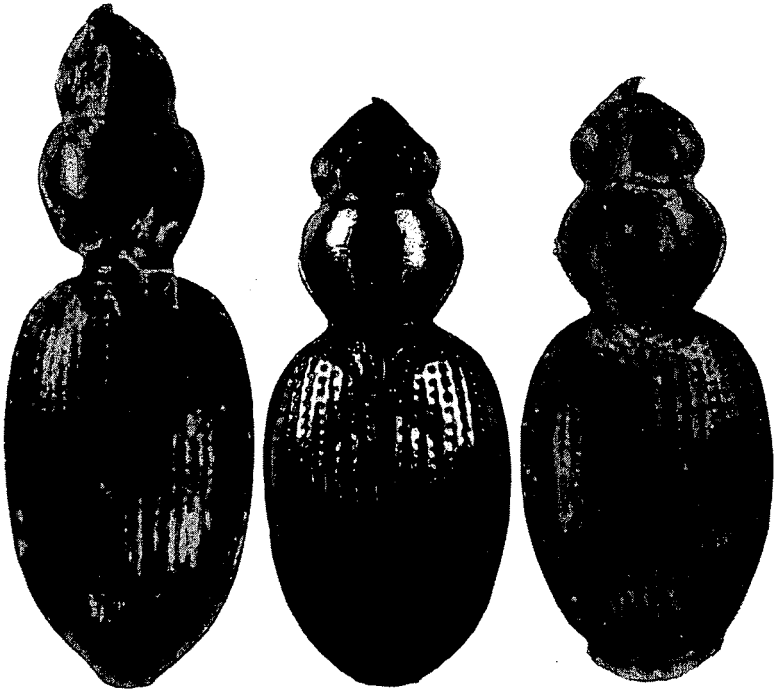


Figure 5.—Hawaiian *Bembidion* species: *B. (Nesomicrops) kauaiensis* (Sharp), holotype (left); *B. smaragdinum* (Sharp), holotype (middle); *B. koebelei* (Sharp), (right).

***Bembidion koebelei* (Sharp), new combination (fig. 5).**

Nesocidium koebelei Sharp, Fauna Hawaiiensis 3: 282, 1903.

Length: 2.7 mm. *Colour*: aeneous-black; appendages reddish brown. Eyes prominent (see fig. 5). *Pronotum*: with sides very slightly sinuate before posterior angles which are obtuse. *Elytra*: ovoid, shoulders completely rounded off; striae moderately impressed and punctured in basal half, punctures separated by two or three times their own width. Intervals slightly convex, third with two setiferous punctures.

Oahu: mountains near Honolulu, 2000-3000 ft. (*Koebele*).

***Bembidion smaragdinum* (Sharp), new combination (fig. 5).**

Nesocidium smaragdinum Sharp, Fauna Hawaiiensis, 3: 282, 1903.

Length: 3.1 mm. *Colour*: bright metallic green, appendages reddish brown. Very close to *B. koebelei* (Sharp), but with pronotum slightly more transverse, striae deeper and setiferous punctures on third elytral interval much more strongly impressed.

Molokai: mountains, 4500 ft. (*Perkins*).

Bembidion auratum (Perkins), *new combination*.*Nesocidium auratum* Perkins, Ent. Mon. Mag. 53: 250, 1917.

Colour: shining golden green; antennae reddish at base; legs piceous-black. *Pronotum*: roughened or irregularly sculptured at base. Closely related to *B. smaragdinum* (Sharp), but distinguished on "the comparatively feeble striation of the elytra with rows of finer punctures, which in general are not so closely placed in the rows."

Hawaii: Kilauea.

I have seen no examples of this species.

Subgenus NESOMICROPS (Sharp), *new combination*

Nesomicrops Sharp, Fauna Hawaiiensis 3: 286, 1903. Jeannel, Soc. Ent. France, Livre du Centenaire, p. 169, 1932. Zimmerman, Proc. Hawaiian Ent. Soc. 10: 133, 1938.

Macranillus Sharp, Fauna Hawaiiensis 3: 286, 1903, *new synonym*.Type of subgenus: *Nesomicrops kauaiensis* Sharp.

The differences between *Nesomicrops* and *Macranillus* cannot possibly be considered of sufficient importance to justify their inclusion in different subgenera, still less in different genera. The synonymy was suggested by Jeannel.

It is evident that the two species of *Nesomicrops* are allied to *Bembidion corticarium* (Sharp).

Bembidion (Nesomicrops) kauaiensis (Sharp), *new combination* (figs. 1c, 5).*Nesomicrops kauaiensis* Sharp, Fauna Hawaiiensis 3: 286, 1903.

Length: 2.8-3.1 mm. *Colour*: reddish brown; mouthparts, antennae and legs testaceous. *Head*: with eyes greatly reduced and almost flat; frontal grooves short and weakly impressed. *Pronotum*: with sides slightly sinuate in front of posterior angles which are slightly obtuse, but sharply pointed; base rather rough; two setiferous punctures on each lateral margin. *Elytra*: oval, widest in middle, tapering apically; striae feebly impressed and punctured, more strongly so towards suture; intervals slightly convex, third with three setiferous punctures, apical one of which is very indistinct. Surface of head, pronotum, and especially elytra with distinct isodiametric microsculpture.

Kauai: high plateau, August 1890 (*Perkins*), two females. "Found under deeply embedded rocks" (*Zimmerman*).

Bembidion (Nesomicrops) coecus (Sharp), *new combination* (figs. 1d, 4).*Macranillus coecus* Sharp, Fauna Hawaiiensis 3: 287, 1903.

Length: 2.5 mm. *Colour*: entirely reddish brown. *Head*: with eyes vestigial, pale in color and slightly convex, frontal grooves short and weakly impressed. *Pronotum*: rather broader than in *B. kauaiensis*, each side bearing two setiferous punctures; slightly sinuate in front of posterior angles which are square. *Elytra*: broader than in *B. kauaiensis*, tapering less towards apex; striae feebly impressed especially towards margins of elytra, not attaining either base or apex; punctured somewhat irregularly; intervals slightly convex, third with two setiferous punctures. Surface of head and especially of elytra with a coarse isodiametric microsculpture.

Kauai: high plateau, August 1896, (*Perkins*).