

Notes on the Elaterid Genus *Eopenthes*, Sharp (Coleoptera)¹

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The endemic Hawaiian genus *Eopenthes* (subfamily Ampedinae of the coleopterous family Elateridae) is distinguished from the rest of that subfamily by having the sides of the mesosternal cavity perpendicular, or nearly so. The genus was erected by Sharp (2)² to include six species described in 1885 (2), three by Blackburn and three by himself, and further included *Elater humeralis* described earlier by Karsch (1). In 1908 Sharp (6) described 26 more species. It is the present writer's opinion that of the species recognized by Sharp, no more than 31 are valid. The types of all the *Eopenthes* except one, are in the British Museum of Natural History; *E. humeralis* (Karsch), I am informed by Dr. J. W. Machatschke, is in the Zoological Museum in Berlin. The type of the genus is *Eopenthes basalis* Sharp designated as such by Hyslop in 1921 (3).

Eopenthes are found in the native mountain forests where the adults are usually swept from vegetation. Their larvae feed in decaying wood (4), and are presumably predaceous on other insects.

Perkins (4: cxxx) wrote: "*Eopenthes* is an endemic genus with 33 described species, many of which are rare and imperfectly known, the species being extremely hard to distinguish. Some have a constant colour pattern, while others are very variable. In the latter case individuals of one species may be of two or three quite different patterns of colour, these same colours being of specific value in other species and not varying. These beetles are remarkable amongst the Hawaiian Coleoptera for several reasons. They are almost entirely summer insects or at least do not occur between November and March. They are almost the only native beetles found visiting flowers for the sake of the nectar, being especially fond of the blossoms of *Metrosideros*. They are also largely of diurnal habits. Unfortunately many of them appear to be rare or this may be

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²Numbers in parentheses refer to the bibliography at the end of this article.

partly due to their comparatively short season . . ." Identification of *Eopenthes* in Hawaii has been handicapped by the extreme rarity in local collections of all but a few species (nine of the 33 named forms were described from uniques), and by their confusing variability in coloration. Many of the original descriptions were brief, and often are more comparative than descriptive.

Little specific help is found in the characters of the male aedeagus, although differences in the relative length and breadth of that organ are discernible in some species. The aedeagus is of the tripartite type universal among the Elateroidea (fig. 1, A). In *Eopenthes* it is characterized as follows: (1) the median lobe is longer than the lateral lobes, and is narrowed toward the apex to form a more or less acute tip; (2) the lateral lobes have a "shoulder" at about the middle of their outer margin; above the shoulder they are roughly parallel-sided, with the outer margin rounded at the apex, and the inner ending in a definite angle. The greatest departure from this pattern is found in the aedeagus of *Eopenthes muticus* Sharp (fig. 1, B) in which the outer margin of the lateral lobes is strongly arcuate above the shoulder, and the lobes themselves more strongly produced at the tip.

Sharp (6: 370) published a key to separate the species into four presumably related groups and one individual species, to which he referred by numbers. The present paper gives keys to Sharp's species groups. In treating his largest group (species 6-28) the species have been segregated by island before attempting further separation on morphological differences or on color. So far as is known, all but one of the species of *Eopenthes* are restricted to a single island; the exception is *E. caeruleus* Sharp, taken on both Molokai and Lanai. Of the species recognized by Sharp, six are known from Kauai, 13 from Oahu, six from Molokai, and three each from Lanai, Maui and Hawaii. Sharp's key:

- a Color metallicSpecies 1 and 2
- a' Color not metallic
 - b Prosternal process not bent upward behind the front coxaeSpecies 3-5
 - b' Prosternal process bent upward behind the front coxae
 - c Tarsi notably thickened; fourth joint of hind feet not minute
 - d Prosternal process before the apex projecting as a sharp denticle Species 6-28
 - d' Prosternal process before the apex not denticularSpecies 29
 - c' Tarsi thickened, fourth joint of feet minuteSpecies 30-33

(Line c' could more properly read: "Tarsi thickened, but not notably so", etc.)

Sharp's numbers refer to the following:

- | | |
|---|---|
| 1 <i>caeruleus</i> Sharp (6: 370) Lanai;
Molokai | 18 <i>mauiensis</i> Sharp (6: 376) Maui |
| 2 <i>auratus</i> Sharp (6: 371) Molokai | 19 <i>unicolor</i> Sharp (6: 377) Kauai |
| 3 <i>basalis</i> Sharp (2: 153) Oahu | 20 <i>funebri</i> Sharp (6: 377) Kauai |
| 4 <i>longicollis</i> Sharp (6: 371) Kauai | 21 <i>plebeius</i> Sharp (6: 377) Lanai |
| 5 <i>humeralis</i> (Karsch) (1: 5) Maui | 22 <i>arduus</i> Sharp (6: 378) Oahu |
| 6 <i>obscurus</i> , Sharp (2:154) Oahu | 23 <i>antennatus</i> Sharp (6: 378) Oahu |
| 7 <i>kauaiensis</i> Sharp (6: 373) Kauai | 24 <i>oahuensis</i> Sharp (6: 378) Oahu |
| 8 <i>germanus</i> Sharp (6: 373) Oahu | 25 <i>varians</i> Sharp (6: 379) Molokai |
| 6 <i>obscurus</i> Sharp (2:154) Oahu | 26 <i>satelles</i> Blackburn (2: 155) Lanai |
| 10 <i>politus</i> Sharp (6: 373) Maui | 27 <i>tinctus</i> Sharp (6: 379) Hawaii |
| 11 <i>deceptor</i> Sharp (6: 374) Molokai | 28 <i>ambiguus</i> Blackburn (2: 155) Oahu |
| 12 <i>perkinsi</i> Sharp (6: 374) Oahu | 29 <i>muticus</i> Sharp (6: 380) Kauai |
| 13 <i>divisus</i> Sharp (6: 374) Oahu | 30 <i>debilis</i> Sharp (2: 154) Oahu |
| 14 <i>konae</i> Blackburn (2: 154) Hawaii | 31 <i>parvulus</i> Sharp (6: 381) Oahu |
| 15 <i>cognatus</i> Sharp (6: 375) Hawaii | 32 <i>marginatus</i> Sharp (6: 381) Oahu |
| 16 <i>celatus</i> Sharp (6: 376) Molokai | 33 <i>tarsalis</i> Sharp (6: 381) Kauai |
| 17 <i>gracilis</i> Sharp (6: 376) Molokai | |

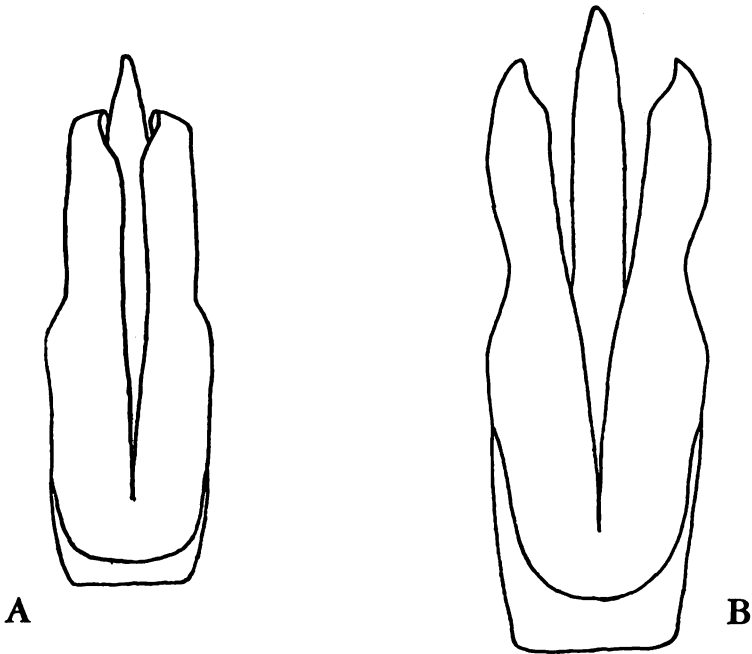


Figure 1. A, Aedeagus of *Eopenthes mauiensis* Sharp, type (British Museum), Haleakala, Maui, 5000 ft., Perkins, May 1896; typical form of nearly all species of *Eopenthes*.

B, Aedeagus of *Eopenthes muticus* Sharp, type (British Museum), High plateau, Kauai, Perkins, August 1896; the most aberrant form of aedeagus in the genus.

(Both figures are greatly enlarged in approximately the same degree)

SPECIES 1-2

caeruleus, auratus

The color differences implied by their names are sufficient to separate these species. *E. auratus* was described from a unique male taken at 4000 ft. on Molokai. *E. caeruleus* is the only member of the genus known from more than a single island; it occurs on Molokai as well as on Lanai.

SPECIES 3-5

basalis, longicollis, humeralis

1. Antennae black except for segments 1 and 2 (and sometimes 3) which are rufous; elytra strongly spinose (Oahu).....(3) **basalis**
Antennae wholly black..... 2
2. Dorsum uniformly black, or with base of elytra briefly rufous; elytra strongly spinose (Kauai).....(4) **longicollis**
Dorsum blackish, with basal one-fourth to one-third of elytra rufous; elytra finely mucronate (Maui).....(5) **humeralis**

E. basalis is found on Tantalus and in other parts of the Koolau Range on Oahu; *longicollis* at from 2000-3000 ft. on Kauai; and *humeralis* at 3000 ft. on Haleakala, Maui.

SPECIES 6-28

KAUAI SPECIES

kauaiensis, unicolor, funebris

1. Apex of elytra neither spinose nor mucronate; antennae and legs blackish; segment 4 of anterior tarsus nearly as long as 3(19) **unicolor**
Apex of elytra spinose; segment 4 of anterior tarus distinctly shorter than 3..... 2
2. Legs more or less uniformly blackish.....(20) **funebris**
Legs rufous with tarsi dusky.....(7) **kauaiensis**

Only females of *kauaiensis* are known, while *funebris* and *unicolor* are known only from males. All three occur at from 3000 to 4000 ft. on the high plateau above Waimea. Each is represented in the British Museum by two specimens.

The second specimen of *kauaiensis* is labeled "var." (probably by Sharp), and differs from the type female as follows:

kauaiensis type female

1. Hind angles of prothorax moderately acute.
2. Scutellum rather robust; widest across middle, thence narrowed to apex.

kauaiensis "var." female

1. Hind angles extremely acute and fine.
2. Scutellum more slender; narrowed from anterior margin to apex.

The variety of *kauaiensis* agrees better with *funebri*s than with the type of *kauaiensis*. It may be the female of *funebri*s despite color differences in the legs.

OAHU SPECIES

*obscurus, perkinsi, antennatus,
germanus, divisus, oahuensis,
pallipes, arduus, ambiguus*

1. Pronotum and elytra (except suture) mahogany colored; head and elytral suture black..... (12) **perkinsi**
Not so colored..... 2
2. Elytra yellowish on basal one-half or more, black an apex, the division between the colors well-defined..... (13) **divisus**
Not so colored..... 3
3. Dorsum uniformly blackish or dark fuscous except for base of elytra which is flavous..... (24) **oahuensis**
Not so colored..... 4
4. Apex of elytra finely but definitely spinose..... 6
Apex of elytra briefly, weakly spinose..... 5
5. Antennal segment 3 slightly longer than 2; interval 3 of elytra markedly elevated at base; sides of prothorax more arcuate than in *obscurus*..... (8) **germanus**
Antennal segment 3 not longer than 2; interval 3 of elytra only slightly elevated near base; sides of prothorax narrowed forward in straight line from base of hind angles..... (6) **obscurus**
6. Color generally reddish to ochraceous; head, anterior margin and disc of pronotum, and sometimes sides and suture of elytra, black..... (28) **ambiguus**
Color piceous black or brown..... 7
7. Uniformly piceous black; pronotum strongly convex behind; hind angles of prothorax definitely divergent from outline of sides..... (9) **pallipes**
Brown or brownish; pronotum moderately convex behind; hind angles of prothorax only weakly divergent at most..... 8

8. Brown, head and anterior part of pronotum blackish; prothorax more arcuate on sides, less convergent anteriorly, and hind angles more weakly divergent than in *antennatus* (7.5–8.5 mm.)

----- (22) *arduus*

Reddish brown, head and disc of pronotum blackish; prothorax more arcuate on sides, less convergent anteriorly, and hind angles more weakly divergent than in *antennatus* (7.5–8.5 mm.)

----- (23) *antennatus*

E. germanus is known only from the unique female in the British Museum, and comparison with *obscurus* of the outline of the pronotum is based on females of both species; comparison of prothoracic characters in the case of *antennatus* and *arduus* is based on males, inasmuch as only males of the latter are known. Clear separation of *antennatus* and *arduus* is difficult. As described, *arduus* is somewhat smaller and less depressed than *antennatus*, and has the sides more arcuate and less strongly convergent in front. In addition, the hind prothoracic angles diverge less perceptibly from the outline of the sides in *ardus* than in *antennatus*. No definite aedeagal differences serve to separate the two.

Sharp (6:378) compares *ardus* and *ambiguus* as follows: "it is considerably larger and broader than *E. ambiguus*, and the coloration though variable in both appears never to quite agree: the feet are not black in *E. arduus*, and the thorax is not red with a large black patch on the middle, but is either nearly red or nearly black." The prothorax of *ambiguus* in the British Museum appeared to me to be basically yellowish instead of reddish, but the colors may have faded.

E. ambiguus was described from a single specimen taken by sweeping at the head of Palolo Valley, Oahu at 2000 ft.; the type is a male bearing a coded label indicating that it was from the Koolau Range, Oahu.

E. pallipes, known only from the unique female in the British Museum, is distinct from the other species in this group, but Sharp (6: 373) suggested that it so closely resembles *E. cognatus* from the island of Hawaii that the validity of the Oahu species is doubtful. From *antennatus*, *pallipes* can be distinguished (comparison made of females) by the greater length of the prothorax, compared with its width.

Field data on most of these Oahu species are meager. *E. divisus* was beaten from "ohia" (*Metrosideros*) blossoms on the ridge between Manoa and Palolo; *obscurus* and *perkinsi* were taken at elevations of from 2000 to 3000 ft. in the mountains near Honolulu.

MOLOKAI SPECIES

deceptor, *gracilis*,
celatus, *varians*

1. Punctuation on disc of pronotum strong, close-set, separated by spaces equal to about the diameter of the punctures.....(25) **varians**
Punctuation finer, sparser, punctures separated by at least twice their diameter..... 2
2. Basal slope of pronotum with sharply incised median groove.....(11) **deceptor**
Median groove on basal slope wide or vague, not sharply incised..... 3
3. Basal slope of pronotum abrupt, widely grooved; femora rufous, rest of legs blackish.....(17) **gracilis**
Basal slope gently, vaguely grooved at most; coloration of legs uniform.....(16) **celatus**

E. deceptor is known only from the unique female, and *celatus* from two males in the British Museum. Of *celatus*, Sharp (6: 376) wrote that ". . . it appears to be most like *E. konaë*, but the elytra are not spinose at the tip, and the antennae and tarsi are rather more elongate . . . it agrees in most other respects with *E. konaë*." *E. gracilis* also is said to be extremely close to *konaë*. Specimens of *varians* have been taken at 4000 ft. in the Molokai mountains.

LANAI SPECIES

plebeius, satelles

- Insects of moderate size (9–9.75 mm.); pubescence coarse on pronotum; head brown to obscure, not definitely black.....(21) **plebeius**
Smaller species (7–7.75 mm.); pubescence on pronotum moderately coarse; head definitely black.....(20) **satelles**

Only males of *plebeius* are known. The original description of *E. satelles* (2: 155) is initialed "D.S.", but from the context was obviously written by Blackburn; later (6: 379) it was credited to Blackburn by Sharp. The probable type of *satelles* is a female (7 mm. long) in the British Museum, collected at Koele, Lanai in July at 2000 ft. while sweeping ferns.

MAUI SPECIES

mauiensis, politus

- Elytra finely spinose at tip; legs yellowish with tarsi entirely, tibiae partially or entirely, blackish.....(18) **mauiensis**
Elytra not spinose at tip; legs uniformly yellowish.....(10) **politus**

E. politus is known only from the unique female in the British Museum. Both sexes of *mauiensis* are present there, as well as a third specimen labeled by Sharp: "*E. mauiensis* var. *nigripes* D.S.", the legs of which are entirely black. Both *politus* and *mauiensis* have been taken on Haleakala at 5000 ft.

HAWAII SPECIES

cognatus, konae, tinctus

1. Hind angles of prothorax prolonged and very acute; interval 3 of elytra not prominent toward base.....(27) **tinctus**
Hind angles only moderately acute; interval 3 of elytra prominent toward base..... 2
2. Pubescence brownish, rather long on pronotum; pronotal punctation somewhat coarser, and body more robust than in *cognatus*(14) **konae**
Pubescence blackish, not remarkably long; pronotal punctation finer and body more slender than in *konae* (15) **cognatus**

The probable type of *E. konae* is a male (8 mm. long) labeled *Eopenthes konae* Blackb., and with a symbol on the mounting card identifying it as from the island of Hawaii. According to Blackburn, he had one specimen, taken in flight at Kona, at an elevation of 5000 ft. There are over 200 specimens under this name in the British Museum, 75 of them labeled as *konae* or variety. Perkins (5: cxxx) remarked that *konae* ". . . a very variable species, is very abundant and widely distributed on Hawaii and is found in all sorts of situations, even under stones."

Six specimens of *E. cognatus* are in the British Museum: a type male, a type female; a male and a female "Ind. type D.S." (typical individuals); and two males labeled "var." One of these last has uniformly blackish legs. The basal prominence on the third intervals of the elytra, in both *konae* and *cognatus*, is more noticeable because of the depressed fourth interval. I not only concur with Sharp's remark (6: 376) that *cognatus* is somewhat doubtfully distinct from *konae*, I consider them conspecific.

E. tinctus is known only from the unique male in the British Museum.

SPECIES 29

E. muticus, described from a male taken at 4000 ft. on the high plateau of Kauai, is the only species in the genus to combine the following characters: non-metallic in color; mucro bent upward behind the fore coxae and not denticulate at its apex; tarsi notably thickened, segment 4 of the hind tarsi not especially small. Only males are known.

This species exhibits the greatest deviation from the typical *Eopenthes* form of aedeagus. The outer margin of the lateral lobes is strongly arcuate between shoulder and apex; the tip of each is more or less acutely produced (fig. 1, B).

SPECIES 30-33

debilis, marginatus,
parvulus, tarsalis

- | | | |
|--|------|-------------------|
| 1. Tarsi of fore legs notably thickened (Kauai)..... | (33) | tarsalis |
| Tarsi thickened but not notably dilated (Oahu)..... | | 2 |
| 2. Elytral striations strongly marked..... | (30) | debilis |
| Striations weaker | | 3 |
| 3. Brown insects (only females known)..... | (31) | parvulus |
| Black and yellowish insects (only males known)..... | (32) | marginatus |

E. tarsalis is known only from the unique female collected in July at 3000 ft. on Kauai. The type of *debilis* is a female, taken sweeping ferns on Oahu at 2500 ft. in the Waianae Mountains.

Among museum material I have seen in Hawaii and elsewhere, *parvulus* specimens are invariably females, and *marginatus* always males. Field populations occurring together on *Scaevola* blossoms in the Oahu mountains likewise consist of female *parvulus* and male *marginatus* (7). Sharp's suggestion (6: 381) that the two constitute a single sexually dimorphic species is undoubtedly true, and the name *parvulus* has positional page priority over *marginatus*.

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