

**The Nearctic Species of the Genus**

***Leistus* Frölich**

(Coleoptera : Carabidae)

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INTRODUCTION

The nebrine genus *Leistus* Frölich contains many species in the Palearctic region, but heretofore only two North American species have been recognized, and one of these from only the female type in the collection of Thomas Lincoln Casey (USNM). Lindroth mentions these species in his "Ground-Beetles of Canada and Alaska" (1961). In 1965, while visiting the California Academy of Sciences, I came across 88 specimens of *Leistus longipennis* Casey that Van Dyke had collected, but never reported. During a visit previous to my own, Lindroth had missed these specimens because they were not with the carabids, and I discovered them by accident only. While studying this

series, I noticed two types of male genitalia occurred. Further investigation satisfied me that this series consisted of specimens of two species, one of which was undescribed. In this paper the recognized species are redescribed, one new species is described, the male genitalia of all three species are figured, and a key is given to separate the species.

The male genitalia of Nearctic and Palearctic forms are grossly different in form. On the basis of this fact a new subgenus of *Leistus* is proposed to contain the North American forms. In the past, other authors (Reitter 1885, 1905, Daniel 1903, and Bänninger 1925) have erected various subgenera on the basis of characters such as presence or absence of wings, and presence or absence of a posterolateral seta on the pronotum. In a forthcoming paper I will discuss the classification of *Leistus* on a world basis.

#### METHODS AND MATERIALS

The methods and species criteria used here are those which I have described in considerable detail elsewhere (Erwin 1965, and Erwin 1970).

The materials used here are specimens borrowed from, or seen in, the California Academy of Sciences, San Francisco (CAS), the Museum of Comparative Zoology, Cambridge (MCZ), and the United States National Collection (USNM). One specimen, the holotype of *L. madmeridianus* Erwin, was loaned to me by my colleague at San Jose State College in 1965, Richard D. Spadoni.

#### LEISTUS Frölich

The type species is the European *Carabus ferrugineus* Linné, 1758: 415. The following combination of characteristics is diagnostic of the genus: mandibles moderately to broadly explanate; scrobes unisetose; ligula trifid at apex; cardines, stipites, base of mentum at sides, and submentum strongly spinose, spines arranged as circular cage; palpi extremely slender and elongate; head constricted behind eyes; lateral thoracic setae present; venter at sides punctate from head to first or second abdominal sternum.

#### Neoleistus Erwin, new subgenus

TYPE SPECIES.—Here designated, *Leistus ferruginosus* Mannerheim, 1843: 187. The following combination of characteristics is diagnostic of this subgenus: posterior lateral setae of pronotum absent; sides of pronotum straight before square hind angles; third antennal article shorter than fifth; mandibles broadly explanate; ligula with ventral bisetose cone posterior to apex; second abdominal sternum not punctate; male genitalia with median lobe bipartite, apex extended considerably beyond apical orifice.

#### KEY TO THE SPECIES OF NEOLEISTUS

1. Humeri prominent (Fig. 2); hind wings fully developed; pronotum narrower than humeri just behind scutellum ..... *ferruginosus* Mannerheim  
Humeri strongly sloped (Figs. 1, 3); hind wings reduced outside stigma;  
pronotum as wide as or wider than humeri ..... 2
2. Pronotum as wide as humeri just behind scutellum; male median lobe as in Fig. 4 ..... *longipennis* Casey  
Pronotum wider than humeri just behind scutellum; male median lobe as in Fig. 6 ..... *madmeridianus* Erwin, n. sp.

#### LEISTUS FERRUGINOSUS Mannerheim

(Figs. 2, 5, 7)

*Leistus ferruginosus* Mannerheim, 1843: 187. Lectotype, designated by Lindroth, 1961: 56, in University Museum, Helsinki. Type locality.—Sitka, Alaska, as originally given by Mannerheim.

*Leistus ferrugineus* Dejean, 1831: 569. Junior homonym of *Carabus ferrugineus* Linné 1758: 415. Lindroth 1961: 56.

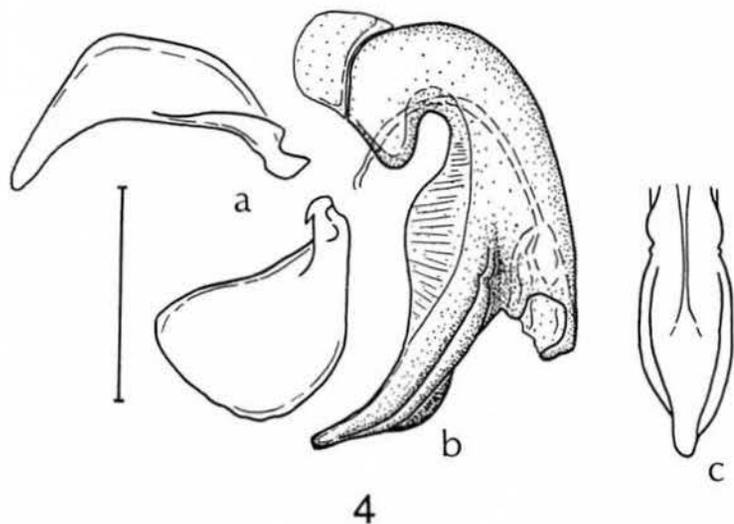
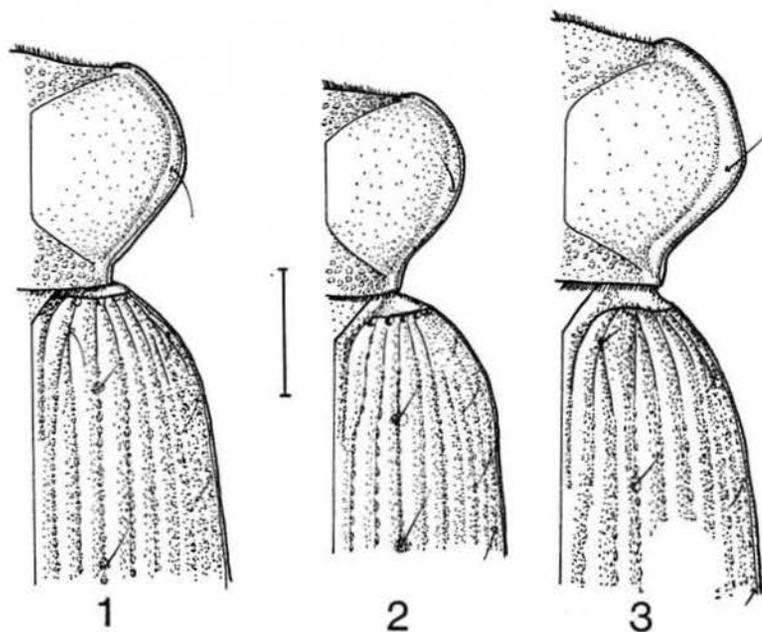
*Leistus nigropiceus* Casey, 1913: 45. Holotype, a female, in USNM, number 46,843. Type locality.—Metlakatla, British Columbia, as originally given by Casey. Lindroth 1961: 56.

DIAGNOSTIC COMBINATION.—The almost square humeri, narrow pronotum, and short elytra separate these beetles from those of the following two species.

DESCRIPTION.—Medium-sized beetles, 8.0 to 9.0 mm. *Color*: Rufopiceous to testaceous, elytra often slightly iridescent; legs, antennae and venter usually paler. *Microsculpture*: Nearly isodiametric on head, more transversely stretched on disc of pronotum and elytra. *Macrosulpture*: Anterior and posterior transverse impressions of pronotum and elytral striae punctate. The following punctate: head at sides, prosternum at sides, proepimera, mesepisterna, mesepimera, metepisterna; metasternum at sides, and abdominal sternum 1 (and in some specimens abdominal sternum 2) at sides. *Head*: Frontal furrows suggested, continuous on clypeus. Antennal scape elongate, cylindrical. Mandibles broadly explanate, seta present in scrobe. Ligula tripartite at apex with median, ventral, setiferous keel. Mentum and submentum strongly setiferous, setae arranged as ring around periphery of venter of head "collembola cage," see *Life History*). *Prothorax*: Pronotum (Fig. 2) narrower than elytra across humeri; side margins narrowly reflexed, straight just before hind angles. *Pterothorax*: Hind wings fully developed. Elytral humeri prominent, arcuate. *Genitalia*: Male (Fig. 5): Median lobe with apex extended far beyond apical orifice. Apex broad, tapered to acutely rounded point. Venter of shaft with median keel, nearly straight in lateral aspect. Basal bend strongly arcuate, basal keel small. Internal sac without sclerites, but apically with small membranous papillae. Female stylus as in Fig. 8. Twenty specimens of each sex investigated.

VARIATION.—The number of setiferous punctures in the third stria of the elytra varies from two to five. The Alaskan and British Columbian specimens I have seen are at the lower end of the size range, while the Washington and Oregon ones are at the higher end.

FLIGHT.—The flight of these beetles has not been recorded.



ETYMOLOGY.—Latin, *ferrugineous* = iron red, referring probably to the overall color of these beetles, although they are more piceous than ferrugineous.

LIFE HISTORY.—I have seen specimens collected from May to August and one teneral adult from 11 June 1936. The adults collected in May were not teneral and were fully colored. It is possible that adults overwinter, but see also Lindroth, 1961: 57. According to Howard Frank (per. comm.) Palearctic species have members which feed on Collembola using their peculiar mouth parts as a cage (previously unreported in print).

DISTRIBUTION.—(Fig. 7). The range of this species extends from Alaska south to northern California, but apparently does not overlap the range of the following species. Eastward it extends to Jasper, Alberta and Revelstoke, British Columbia. I have seen 143 from the following localities: British Columbia: (Garibaldi) MCZ, (Metlakatla) MCZ, (Mountains between Hope and Okanogan) MCZ, (Nanaimo) CAS, (Sidney) MCZ, (Stanley) CAS, (Steelhead) CAS, (Vancouver Island) CAS, (Victoria) MCZ, (Yale) MCZ. Alaska: (Elmendorf, Anchorage) MCZ, (Seward) CAS, (Wrangle) CAS, (Yakatoga Beach) CAS. California: MCZ. Oregon: (Canon Beach) CAS, (Dilley) CAS, (Florence) CAS, (Marshfield) CAS, (Olney) CAS, (Waldport) CAS. Washington: (Crescent Lake) CAS, (Fairmont) MCZ, (Humptulipa) CAS, (Longmire) CAS, (Monroe) CAS, (Mt. Bonaparte) MCZ, (Northbend) CAS, MCZ, (Olympia) MCZ, (Port Angeles) CAS, (Seattle) CAS, (Tacoma) MCZ, (The Forks), CAS. See Lindroth (1961) for additional records.

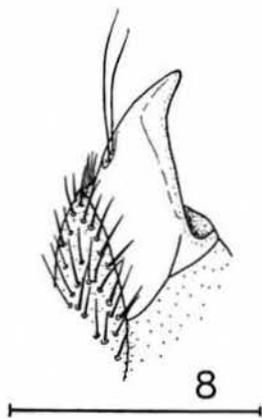
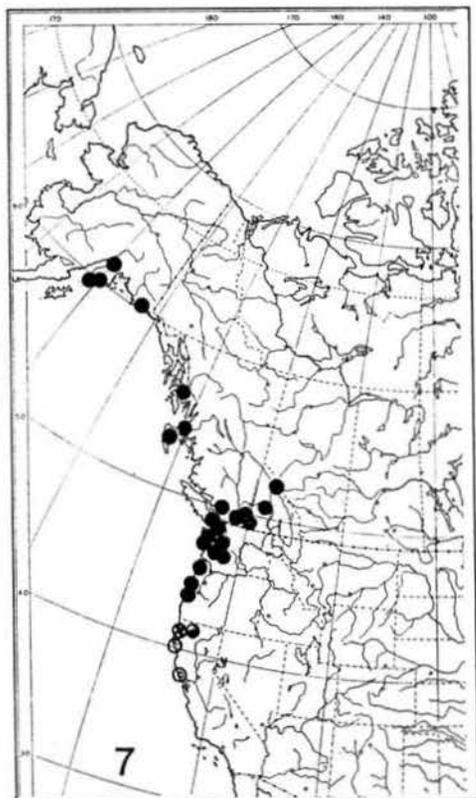
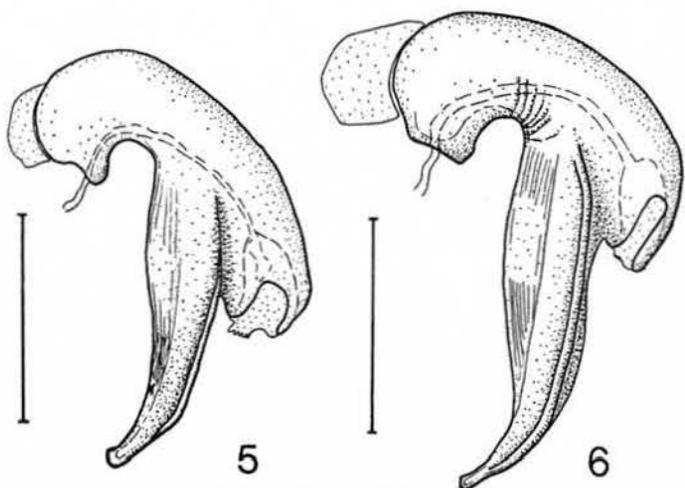
#### LEISTUS LONGIPENNIS Casey

(Figs. 1, 4, 7)

*Leistus longipennis* Casey, 1920: 148. Holotype, a female, in USNM, number 46,842. Type locality.—Humboldt County, California as originally given by Casey.

DIAGNOSTIC COMBINATION.—The sloped humeri, wide pronotum, spatulate elytra, and truncate wings separate these beetles readily from those of the preceding species, but only male genitalic differences are reliable for positive separation

FIGS. 1-3. Pronotum and basal part of elytron, right side, dorsal aspect. FIG. 1. *Leistus longipennis* Casey, male, Orick, California. FIG. 2. *L. ferruginosus* Mannerheim, male, Crescent Lake, Washington. FIG. 3. *L. madmeridianus* Erwin, male, Jacoby Creek, California. FIG. 4. Male genitalia of *L. longipennis* Casey, a. parameres, b. left lateral aspect of median lobe, c. ventral aspect of apex, Prairie Creek, California.



from male members of the following species. After comparing numerous specimens one recognizes that the pronota of *L. longipennis* specimens are narrower than the pronota of specimens of the following species.

**DESCRIPTION.**—Medium-sized beetles, 8.5 to 10.2 mm. *Color, Microsculpture, Macrosulpture, and Head:* As in *L. ferruginosus*. *Prothorax:* Pronotum (Fig. 1) wider than *L. ferruginosus*, slightly wider or subequal to width across humeri just behind scutellum; side margins more broadly explanate, straightened for longer distance just before hind angles than in *L. ferruginosus*. *Pterothorax:* Hind wings truncate posterior to stigma. Elytral humeri sloped; elytra long and spatulate, widened about apical third. *Genitalia:* Male (Fig. 4): Median lobe more strongly arcuate than *L. ferruginosus*, with ventral keel more prominent, and basal keel higher. Female (as in Fig. 8). Ten males and twenty females investigated.

**VARIATION.**—Elytral punctation varies as described for *L. ferruginosus*. There does not appear to be any geographic size difference in the sample before me as in the preceding species.

**FLIGHT.**—It is doubtful that these beetles can fly.

**ETYMOLOGY.**—Latin, *longus* = long or lengthy, *pennis* = wing; referring to the long spatulate elytra of these beetles.

**LIFE HISTORY.**—I have seen specimens collected in June and July. The June specimens average paler than those collected in July, but no markedly teneral adults have been seen.

**DISTRIBUTION.**—(Fig. 7). The known range of this species is limited to the extreme northwestern tip of Humboldt County, California. I have seen 88 specimens from the following localities: California: Humboldt County CAS, MCZ, USNM, (Deer Lodge, near Trinidad) CAS, (Orick) CAS, (Prairie Creek) CAS, MCZ.

#### *Leistus madmeridianus* Erwin, new species

(Figs. 3, 6, 7, 8)

**TYPE LOCALITY.**—JACOBY CREEK, 5.0 MILES SOUTHEAST OF ARCATA, HUMBOLDT COUNTY, CALIFORNIA.

**TYPE SPECIMENS.**—The *holotype male* and allotype are in CAS. The holotype was collected at the type locality by R. D. Spadoni on 23 June

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FIGS. 5-6. Male genitalia, left lateral aspect. FIG. 6. *L. madmeridianus* Erwin, Eureka, California. FIG. 5. *L. ferruginosus* Mannerheim, Vancouver Island, British Columbia, Canada. FIG. 7. Distribution map of Nearctic *Leistus* spp. Solid circles represent *L. ferruginosus* Mannerheim. Half-filled circle represents state locality only of *L. ferruginosus* Mannerheim. Open circles represent *L. madmeridianus* Erwin. Circle with a cross in middle represents *L. longipennis* Casey. FIG. 8. left female stylus of *L. madmeridianus* Erwin, ventral aspect, Eureka, California.

1965. The allotype was collected 7 July 1937 by E. C. Van Dyke. Three paratypes, all males, collected on various dates in various localities are herewith designated. One is in CAS, MCZ, and my personal collection.

**DIAGNOSTIC COMBINATION.**—The wide pronotum, wider than the elytral humeri just behind the scutellum, separates these beetles from members of the two preceding species.

**DESCRIPTION.**—Medium-sized beetles, 8.7 mm to 10.0 mm. *Color, Microsculpture, Macrosculpture, and Head:* As in *L. ferruginosus*. *Prothorax:* Pronotum (Fig. 3) broad, wider than elytra across humeri just behind scutellum; side margins more widely reflexed than *L. longipennis*; straight just before hind angles as in *L. longipennis*. *Pterothorax:* Hind wings truncate posterior to stigma. Elytral humeri sloped; elytra long and spatulate, widened about apical third. *Genitalia:* Male (Fig. 6): Median lobe similar to *L. ferruginosus*, except apex beyond apical orifice longer. Shaft straighter than in two preceding species. Female (Fig. 8): Stylus trigonal; with two ventral setae. Membranes at base densely setiferous. Three males and two females investigated.

**VARIATION.**—Too few specimens are known to evaluate variation.

**FLIGHT.**—It is doubtful that these beetles can fly.

**ETYMOLOGY.**—Latin, *meridianus* = southward; Mad, from the Mad River; referring to the present known distribution of these beetles south of the Mad River.

**LIFE HISTORY.**—Teneral specimens were collected in June and July. The other specimens seen were not labelled with date of collection.

**DISTRIBUTION.**—(Fig. 7). The known range of this species extends from the Point Reyes Peninsula of California to the type locality in Humboldt County, California, just south of the Mad River. I have seen five specimens from the following localities: California: Humboldt County CAS, (Jacoby Creek, 5.0 miles southwest of Arcata) CAS; Marin County (Point Reyes) CAS.

#### DISCUSSION

Because a more detailed discussion on the phylogeny and zoogeography will be forthcoming in a paper on *Leistus* classification, a few words here will suffice. The Nearctic *Leistus* are no doubt a monophyletic group that has entered the New World via "Beringia." They probably entered with the widespread arctotertiary forests in the early Tertiary and have been restricted to the remnants of these forests until now. Two of these species are confined to the "redwood belt" of northern California, while the third species is more widespread, but still confined to the more moist coastal forests of the northwestern United States, British Columbia, and Alaska. The small local popula-

tions of *L. longipennis* and *L. madmeridianus* could either be all that is left of more widespread populations (restricted along with the restricted redwoods) or small peripheral populations of *L. ferruginosus* which have become isolated, brachypterous, and have undergone speciation.

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