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The Species of the Subgenus *Leptoferonia* Casey (Coleoptera: Carabidae: *Pterostichus*)

By Hilary A. Hacker [1]

The purpose of this paper is to facilitate identification of the species in the subgenus *Leptoferonia* Casey of the genus *Pterostichus* Bonelli. As currently defined, the subgenus may be an artificial grouping of species. After the subgenus *Hypherpes* Chaudoir has been revised, it may be possible to clarify the relationships between the two subgenera and between the species within *Leptoferonia*. The subgenus *Leptoferonia* is composed of 21 species that occur from British Columbia south through California and east to Montana. Seven new species and three new subspecies are described.

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[1] 235 Randall Street, San Francisco, California 94131.

Material and Methods

MATERIAL.—This study is based upon approximately 2400 preserved specimens of the subgenus *Leptoferonia*. Most of the Oregon and California material was collected by the author between 1959 and 1965. Specimens were collected by hand from under branches and logs in forested areas. An effort was made to collect as many specimens as possible from areas where subspecies or species meet or overlap. This was often impossible since so much forest had been cut down. All specimens of subgenus *Leptoferonia* known to me, except for some specimens of *P. inanis* Horn from Oregon, are included in this study. Approximately 300 specimens from related subgenera also were examined.

TAXONOMIC TREATMENT.—Two similar forms were regarded as distinct species if their geographical ranges overlapped and there was no evidence of intergradation in morphological characteristics. In many cases, the ranges of two similar forms are not known to overlap, perhaps because of insufficient collecting. In these cases, the forms were considered to be separate species if the differences between them were indicated by more than two characteristics and not just a matter of degree. Two forms were regarded as conspecific if there were morphologically intermediate specimens in their relatively narrow area of contact. They also were regarded as conspecific if no intermediates were known, no specimens were collected from intermediate areas, and the differences between the two were a matter of degree only. The forms or geographical populations of species exhibiting broad clinal variation were discussed but not named. The forms in insufficiently studied species, such as *P. inanis* Horn, were not named; later they may prove to merit the rank of subspecies.

METHODS.—Examinations and measurements, except body length, were made at $\times$ 60. A 10 $\times$ 1/100 ocular micrometer was used in making measurements. Drawings were made using an ocular grid. The external morphology of the aedeagus was examined in all males. The aedeagus can be teased out of relaxed specimens with a pin without much danger of breakage. The internal sac of the median lobe of the aedeagus was examined in relatively few specimens. The drawings in figures 1–26 of the everted sac are rough sketches and do not indicate the exact shape or location of the lobes, microtrichiate areas, etc. The aedeagi were treated with warm 10 percent potassium hydroxide prior to everting the sac. The autopsy sign (!) indicates that the holotype, excluding the internal sac of the aedeagus, was examined. Those types not seen by me in person were examined for me according to a list of characteristics and compared to specimens from my collection. All new holotypes and allotypes have been de-

posited in the United States National Museum in Washington, D.C. (USNM). Paratypes are in the collections of the California Academy of Sciences, San Francisco (CAS); of the Fenders, McMinnville, Oreg.; of the Museum of Comparative Zoology, Cambridge, Mass. (MCZ); of the USNM; of the University of Washington, Seattle (UW); and of the author.

Measurements (tables 1–4).—Width of head: Maximum width through eyes or through genae in those with very small eyes.

Width of pronotum between anterior angles: Distance between tips of angles.

Width of base of pronotum: Distance between tips of angles except in *inopinus* Casey, *infernalis* Hatch, *pumilus* Casey, *fenyesi* Csiki, and *cochlearis*, new species. In these species it is the distance through the posterior pair of setiferous punctures.

Width of pronotum: Maximum width.

Length of pronotum: Length along midline, not necessarily the maximum length.

Width of elytral humeri: Distance between humeral dentations.

Width of elytra: Maximum width across both elytra together.

Length of body: Distance from tips of mandibles to elytral apices, to the nearest 0.5 mm, viewed dorsally without magnification.

Characteristics of Taxonomic Importance in *Leptoferonia*

Color.—Piceous is used to mean dark brown. Rufous means a light reddish brown. I do not consider any of the *Leptoferonia* to be a true black color. Some specimens that I consider to be dark piceous have been called black by other authors.

Microsculpture.—The term microreticulate refers to fine lines forming a honeycomb or scalelike pattern. Microstrigulose refers to nonanastomosing lines, which are usually transverse. Micropunctures, or fine punctures, are invisible at magnifications lower than about × 60. Specimens often must be cleaned by being brushed with carbon tetrachloride in order to observe the microsculpture.

Head.—In some species, such as *inopinus*, the eyes are large and protruding as is usual in the subgenus *Hypherpes*. They do not cover the entire genae in either subgenus. In several species the eyes are smaller and flattened. The frontal impressions are long and sharply impressed in most species. In a few, such as *sphodrinus* LeConte, they are shallow and short. The term "forming an angle of 45°" means that lines drawn through the two impressions would intersect at an angle of 45°.

Pronotum.—There are usually two pairs of lateral setiferous punctures; the anterior pair is before the middle, and the posterior

pair is normally at the hind angles. In the *inopinus* and *fenyesi* groups, the posterior pair is forward, and the hind angles often are rounded. This condition also occurs in *sphodrinus*, which otherwise seems unrelated to the five species in those two groups. In *termitiformis* Van Dyke the posterior pair of setae has been lost.

PLEURAL AND STERNAL SCLERITES OF THE THORAX.—The presence of a margin around the posterior part of the prosternum was used as a diagnostic characteristic by earlier authors. It seems to be a variable character in many species. Many *Leptoferonia* have coarse punctures on the concave area of the mesepisternum. In some there are also punctures on the rest of the mesepisternum and on adjacent sclerites.

ELYTRON.—The humeral dentation was viewed dorsally from above the elytral apices. From this angle at × 60 the humerus appears dentate in some species that previous authors reported to have edentate humeri. The term scutellar puncture refers to the puncture on the disc near the scutellum, on the scutellar or second stria. The setiferous punctures on the eight stria can be divided into three series in *Leptoferonia*. In subgenus *Hypherpes* there are usually more punctures, and they tend to be more evenly spaced. In *Leptoferonia* the anterior series consists of six punctures; the sixth is sometimes detached from the others. Some species have a single intermediate puncture bearing a short seta located about halfway between the anterior and posterior series. The posterior series consists of up to eight punctures (except nine in *sphodrinus*). There are one or two setiferous punctures at the posterior end of the seventh stria (except three in *sphodrinus*). The setae are of three lengths (see figs. 27–31) and very fragile. The elytral apices are slightly more blunt in females of all species than in males.

LEGS.—In most species the legs are fairly stout, and the hind trochanter is about half the length of the hind femur. In *beyeri* Van Dyke, *falli* Van Dyke, and *termitiformis* Van Dyke, the legs are relatively slender. In the latter two, the hind trochanter is smaller, being only about one-third the length of the hind femur. Specimens of *P.* (*Hypherpes*) *gracilior* LeConte also have slender legs and short hind trochanters. The hind trochanter is pointed in several species. In some male specimens of *inanis* the hind trochanter is also very attenuate. The legs of females are somewhat less robust than those of males. The inner margin of the tibia of the middle leg has raised areas in the males. These are well developed in *angustus* Dejean, giving the margin a saw-toothed appearance. In females these areas are much reduced or absent. There are four setae on the outer side of the femur of the middle leg. Some species have setae, generally three pairs, along the ventrolateral margins of the last article of all

tarsi. In others these setae are absent on all tarsi. One pair of long dorsal setae is always present on the last article (*termitiformis* has three pairs). There are probably other differences among species in the setae on the legs, but these have not been investigated. The tarsi of the front legs are expanded in the males and narrow in females.

Sixth abdominal sternum of male.—In the traditional system the last visible sternum, which bears the anal setae, is designated as the sixth sternum. In *Leptoferonia* all males have a single pair of anal setae, and females have two pairs. In the males of some species, the apical portion of the sternum is thickened. The thickening usually gives rise to a transverse lobe or carina on the ventral surface of the sternum either before the apical marginal impression or at the edge. An unnamed species, which may belong in the subgenus *Anilloferonia* Van Dyke, has a similar modification of its sixth sternum. In most other subgenera of *Pterostichus*, carinae, when present, are longitudinal rather than transverse and do not reach the apical edge.

Male genitalia.—The descriptions of the right paramere refer to the distal portion which is not surrounded by membranes. In subgenus *Hypherpes* a short, small, right paramere seems to be the rule; the exact shape varies. In some *Leptoferonia* and in some other subgenera of *Pterostichus* the right paramere is elongate. In *Hypherpes* there is frequently a ridge or lobe on the right side of the ventral surface of the median lobe. This lobe occurs in many *Leptoferonia*. In some it extends diagonally across the ventral surface. In *pumilus* the isolated tooth in the middle of the ventral surface appears to be derived from this lobe. In *Hypherpes* the central area of the distal third of the ventral surface generally is less heavily sclerotized than the adjacent areas. Sometimes the boundary between the left side and tip and the lightly sclerotized area is sharp and there is a clear break between the tip and the shaft on the right side. In some *Leptoferonia* the lightly sclerotized area is demarcated clearly and forms a diagonal membranous strip separating the tip and left side from the remainder of the shaft. This condition also occurs in the subgenus *Pseudoferonina* Ball (1965, p. 107). It can be seen clearly only in material that has been cleared in potassium hydroxide and that is immersed in liquid. Sometimes the tooth in the internal sac of the median lobe is a prominent, dark plate that is curved and tapers to a point at one end, resembling a canine tooth. Sometimes the tooth is small, lightly sclerotized, and obscured by the lips of the gonopore. Sometimes it is absent or replaced by a lobed structure. In the *Hypherpes* known to me, a large and heavily sclerotized tooth is always present.

Subgenus *Leptoferonia* Casey

Leptoferonia Casey, 1918, pp. 321, 336–338.—Leng, 1920, p. 56.
Pterostichus (*Leptoferonia*) Casey.—Van Dyke, 1925, pp. 72–75.—Csiki, 1930, p. 582.—Hatch, 1936, pp. 702–706; 1953, pp. 105, 111–113.—Ball, 1960, pp. 77, 124.—Lindroth, 1966, pp. 469–472.

TYPE-SPECIES OF SUBGENUS.—*Feronia angusta* Dejean, designated by Casey, 1918.

DIAGNOSTIC CHARACTERISTICS OF *Leptoferonia*.—Members of the subgenus *Leptoferonia* have the characteristics of the tribe Pterostichini and the genus *Pterostichus* as listed by Ball (1960, pp. 63, 77; 1966, p. 13). The species of subgenus *Leptoferonia* share the following characteristics with the subgenera *Anilloferonia* and *Hypherpes*: elytra sealed together; no setiferous punctures on the third or fifth stria of the elytra; metepisternum with anterior margin as long as lateral margin; first and second segments of middle and hind tarsi with a longitudinal ridge on outer side. Specimens of *Leptoferonia* differ from those of *Anilloferonia* in having pigmented and at least somewhat larger eyes. There has never been a satisfactory characteristic for separating *Leptoferonia* from *Hypherpes*. The species of *Leptoferonia* usually are smaller and often paler in color. The maximum length in *Leptoferonia* is about 12.5 mm, and the minimum length in *Hypherpes* is about 8 mm. Specimens of *Leptoferonia* are sometimes more cylindrical or more ventricose and six species lack the elytral scutellar puncture. With the exception of *sphodrinus*, the species of *Leptoferonia* have a maximum of 17 setiferous punctures on the margin of the elytron; in *Hypherpes* there are frequently more. Usually *Leptoferonia* are either 9 mm or less in length, or, if between 9 and 12.5 mm, then the head is unusually large or the body form cylindrical or ventricose. *Hypherpes* do not have large heads and those with lengths less than 12 mm generally are not cylindrical or ventricose. I have used the subgeneric name *Leptoferonia* in the sense of previous authors, except that I have excluded *horni* LeConte. *Pterostichus horni* LeConte (1873, p. 313) probably should be placed in the subgenus *Hypherpes* and may be the same as *P. gracilior* LeConte. *Pterostichus arizonicus* Schaeffer is a member of the subgenus *Ithytolus* (fide Darlington, 1936) and not a *Leptoferonia*, as some authors have supposed.

NOTES ON ECOLOGY.—Most *Leptoferonia* are members of the Vancouveran fauna (see Hatch, 1953, pp. 20–24 and Van Dyke, 1919). In Oregon, at least, adults can be found the year around, even under permanent winter snow. Frequently they are the most common ground beetles in coniferous forests. I am unfamiliar with the larval and pupal stages. Adults can be found under branches and logs on the forest floor. Sometimes they are inside rotten logs

or in the duff. In drier areas they are more abundant near streams than on the dry slopes. Teneral specimens have been collected from May through October. Copulation is known to occur in the fall. The lighter color and small eyes of some species probably are a result of burrowing habits. This is analogous to the loss of pigmentation and eyes in cave-dwelling animals.

Relationships to other subgenera.—The subgenus *Leptoferonia* shares similarities with the subgenera *Hypherpes* and *Anilloferonia*. The meaning of these similarities is not clear because the three groups have not been accurately defined, and accurate definition depends, above all, on a careful revision of *Hypherpes*. The numerous similarities shared by these subgenera, however, are best interpreted as an indication of close relationship.

It is tempting to say that *Leptoferonia* occupies a position intermediate to *Hypherpes* and *Anilloferonia*. The species are generally intermediate in size, color, and number of elytral setae. At present it is best not to interpret the sequence *Hypherpes-Leptoferonia-Anilloferonia* as a phyletic one because the similarities between the latter two may be a result of convergent evolution, and some of the apparent similarities between *Hypherpes* and *Leptoferonia* may be the result of incorrect classifications. All specimens of *Hypherpes* known to me have a short right paramere. If the elongate right paramere of some *Leptoferonia* and some of the other pterostichines is a holdover from the ancestral type, then those species of *Leptoferonia* probably are not derived from *Hypherpes*.

Species groups.—Thirteen of the species can be arranged into four groups of from two to six species each. These groups consist of species that share several morphological characters and appear to be closely related. They are the *inopinus*, *fenyesi*, *fuchsi*, and *hatchi* groups, which are characterized in their appropriate places in the text.

I have relied heavily upon the structure of the aedeagus in separating populations as species or subspecies. Its structure seems to be stable within each taxon described herein. The aedeagi of all 24 species and subspecies are illustrated in figures 1–26. In the key I have used only male characteristics in some of the couplets when other characteristics are difficult to treat objectively. Reference to the distribution maps should help an investigator if he has only females from a given locality.

Key to Species and Subspecies of *Leptoferonia* Casey

1. Pronotum with posterior pair of setiferous punctures 2
   Pronotum without posterior pair of setiferous punctures.
   24. **termitiformis** Van Dyke

2(1). Elytron with scutellar setiferous puncture 3
   Elytron without scutellar setiferous puncture 18

3(2). Pronotum with posterior setiferous puncture far forward from posterior angle (fig. 27) 4
Pronotum with posterior setiferous puncture at posterior angle (figs. 29, 30, 31) 11

4(3). Head with frontal impressions sharply impressed; eight or fewer setiferous punctures in posterior series on eight stria of elytron 5
Head with frontal impressions shallow; nine setiferous punctures in posterior series on eighth stria of elytron . . 21. **sphodrinus** LeConte

5(4). Head with frontal impressions diverging posteriorly; if entire dorsum microreticulate, right paramere short 6
Head with frontal impressions recurved posteriorly; entire dorsum strongly microreticulate; right paramere elongate. 1. **inopinus** Casey

6(5). Pronotum with hind angles obsolete; sides of pronotum entirely arcuate 7
Pronotum with hind angles distinct 9

7(6). Male with sixth abdominal sternum weakly lobed; median lobe of aedeagus narrower, tip more prominent (figs. 5, 6) 8
Male with sixth abdominal sternum more strongly lobed; median lobe broader and tip rounded (fig. 7) . . . . . 7. **cochlearis,** new species

8(7). Male with median lobe with tip blunter (fig. 5).
5. **fenyesi fenyesi** sensu stricto Csiki
Male with median lobe with tip narrower (fig. 6).
6. **fenyesi fenderi,** new subspecies

9(6). Mesepisternum with numerous distinct punctures 10
Mesepisternum without punctures, or at most with a few shallow punctures on concave portion . . . . . 4. **infernalis** Hatch

10(9). Pronotum with sides before hind angles strongly sinuate.
2. **pumilus pumilus** sensu stricto Casey
Pronotum with sides before angles from slightly sinuate to slightly arcuate . . . . . 3. **pumilus willamettensis,** new subspecies

11(3). Hind trochanter long, about half the length of hind femur; body length less than 9 mm 12
Hind trochanter short, about a third the length of hind femur; body length greater than 9 mm . . . . . 20. **falli** Van Dyke

12(11). Hind trochanter blunt at tip; pronotum without outer pair of longitudinal impressions 13
Hind trochanter slightly pointed at tip; pronotum usually with outer pair of longitudinal impressions present . . . 14. **angustus** Dejean

13(12). Tarsus with last article with setae on ventrolateral margins 14
Tarsus with last article without setae on ventrolateral margins . . . 15

14(13). Male with sixth abdominal sternum with tubercules relatively small and sharp; inhabits Marin County, Calif . . 9. **marinensis,** new species
Male with sixth sternum with tubercules relatively large and blunt; inhabits southern Humboldt and northwestern Mendocino Counties, Calif . . . . . 11. **mattolensis,** new species

15(13). Male with sixth abdominal sternum without prominent lobe at apical margin 16
Male with sixth sternum with long, narrow, truncate lobe at apical margin (fig. 10); frontal impressions forming angle of less than 80° . . . . . 10. **lobatus,** new species

16(15). Head with frontal impressions not recurved, forming an angle of less than 80° 17

Head with frontal impressions recurved posteriorly, forming an angle of about 80° . . . . . 8. **fuchsi** Casey

17(16). Male with right paramere not sharply angulate in lateral view, narrowed laterally in about middle (fig. 12) . . . . 12. **trinitensis,** new species

Male with right paramere sharply angulate in lateral view, not abruptly narrowed laterally (fig. 13) . . . . . 13. **humilis** Casey

18(2). Hind trochanter blunt at tip 19

Hind trochanter pointed at tip; body form subparallel 23

19(18). Head not unusually large, ratio of head width to pronotum width less than 0.75 20

Head unusually large, ratio of head width to pronotum width greater than 0.75 . . . . . 19. **beyeri** Van Dyke

20(19). Tarsus with last article without setae on ventrolateral margins; frontal impression forming angle of about 45°. 21

Tarsus with last article with setae on ventrolateral margins; head with frontal impressions forming angle of more than 45°.

22. **idahoae** Csiki

21(20). Male with median lobe of aedeagus not concave on ventral surface, tip very long and spatulate (figs. 16, 17) 22

Male with median lobe deeply concave on ventral surface, tip short (fig. 15) . . . . . 15. **hatchi,** new species

22(21). Male with right paramere of aedeagus long and crescent shaped (fig. 16) 16. **stapedius,** new species

Male with right paramere shorter, not crescent shaped (fig. 17).

17. **stapedius yosemitensis,** new subspecies

23(18). Eyes not especially small, head not unusually large, ratio of head width to pronotal width less than 0.80 24

Eyes very small; head unusually large, ratio of head width to pronotal width greater than 0.80 (fig. 29) . . . . . 18. **caligans** Horn

24(23). Hind trochanter slightly pointed and never attenuate; inhabits California coastal ranges . . . . . 14. **angustus** Dejean

Hind trochanter strongly pointed and often attenuate; inhabits Sierra Nevada and Cascade ranges . . . . . 23. **inanis** Horn

The *inopinus* Group

FIGURE 40

This group includes *inopinus, pumilus,* and *infernalis.* They have a ventricose body form and inhabit adjacent and slightly overlapping areas. They share the following characteristics.

COLOR OF BODY.—Piceous.

HEAD.—Eyes normally large and prominent.

PRONOTUM.—Sides arcuate in middle, from arcuate to sinuate and diverging in basal third; posterior pair of setiferous punctures forward from hind angles; outer pair of longitudinal impressions absent; base weakly bisinuate.

ELYTRON.—Humerus somewhat rounded; humeral dentation small or absent; scutellar stria and puncture present.

LEGS.—Hind trochanter blunt and about half the length of hind femur; setae present on ventrolateral margins of last article of tarsus.

Sixth abdominal sternum of male.—Apical edge thickened; lobe on ventral surface at edge; one or two impressions on face.

Aedeagus.—Right paramere elongate; lobe present, beneath and parallel to long distal portion. Median lobe narrowed distally; tip short; lightly sclerotized strip across distal portion. Internal sac with two adjacent, sclerotized, flexible lobes, one surrounding gonopore, other more or less mushroom shaped.

Length of body.—7 to 10 mm.

1. *Pterostichus* (*Leptoferonia*) *inopinus* (Casey)

Figures 1, 32, 40

Leptoferonia inopina Casey, 1918, p. 338.—Leng, 1920, p. 56.

Pterostichus inopinus (Casey).—Van Dyke, 1925, p. 75.—Csiki, 1930, p. 582.—Hatch, 1953, p. 112.

Pterostichus (*Leptoferonia*) *fenyesi*.—Hatch, 1936, p. 704 [in part; not Csiki, 1930, p. 582]. [New synonymy.]

Species description.—Same as description of *inopinus* group plus the following.

Head.—Frontal impressions forming an angle greater than 45°, converging posteriorly; area on inner side of impressions distinctly flattened; microreticulate.

Pronotum.—Sides from slightly arcuate to slightly sinuate in vicinity of posterior setiferous punctures, in former case hind angles less distinct; transverse basal impression complete in about 25 specimens, reaching only to longitudinal basal impressions in about 25 specimens, intermediate in 210; single pair of longitudinal impressions not deep, usually not reaching basal margin; disc microreticulate.

Elytron.—Humeral dentation small, sometimes acute; setiferous punctures on eighth stria consisting of six in anterior series, sixth frequently detached, none intermediate, seven in posterior series; two setae at posterior end of seventh stria; microreticulate.

Ventral surface.—Coarse punctures confined to mesepisternum; prosternal tip completely margined in only about 60 specimens.

Sixth abdominal sternum of male (fig. 1).—Large, truncate, ventrally curved lobe at edge; face with two impressions separated by curved carina, right impression larger than left.

Aedeagus (fig. 1).—Right paramere with lobe beneath distal portion small, evenly arcuate; nearly cylindrical distal portion very long, with 90° bend near tip. Median lobe with tip shallow and blunt; lobe on right side large, its highest part a ridge down inner side.

Length of body.—7.0 to 8.5 mm.

Variation.—Specimens from south of about the middle of Douglas County, Oreg., have a variable second bend in the right paramere of the aedeagus. Specimens from the coast are uniformly small; the minimum length of noncoastal specimens is 7.5 mm.

HOLOTYPE.—Male, USNM!

TYPE-LOCALITY.—Golden, Josephine County, Oreg. (T. 33 S, R. 5 W, Willamette meridian, elevation approximately 1600 feet).

SPECIMENS EXAMINED.—266.

DISTRIBUTION. (fig. 32).—This species occurs in the central and southern parts of western Oregon and extreme northwestern California. It occurs from elevations of sea level to 4500 feet in the north and probably higher in the south. Two specimens in the University of Washington collection are labelled "Toppenish [Yakima County], Wash.," which is probably an error.

REMARKS.—Hatch's (1936) description of *"fenyesi"* consists, at least in part, of specimens of *inopinus*. The holotype of *ovicollis* Schaeffer is not conspecific with the holotype of *inopinus* Casey. The species *inopinus* can be distinguished from the other members of the *inopinus* group on the basis of the aedeagus, or the divergent and recurved frontal impressions on the head, or the entirely microreticulate dorsum. Externally *inopinus* and the two species of the *fenyesi* group are similar. In *inopinus* the hind angles of the pronotum are usually more prominent, the posterior setiferous punctures on the pronotum not quite so far forward, and the elytral humeri less rounded.

Pterostichus (*Leptoferonia*) *pumilus* Casey

FIGURE 40

This species comprises a group of populations classified herein as two subspecies: the more northern *pumilus pumilus* Casey, and *pumilus willamettensis*, new subspecies. Those characteristics common to all specimens of *pumilus* are listed below.

SPECIES DESCRIPTION.—Characters of the *inopinus* group plus the following.

HEAD.—Frontal impression sharp, curved, forming an angle of about 45°, divergent posteriorly; small triangular depressed area on front between impressions; microstrigulose.

PRONOTUM.—Sides arcuate in anterior two-thirds, from strongly sinuate to slightly arcuate in vicinity of posterior setiferous punctures; single pair of longitudinal impressions deepest in middle, weakly reaching to complete basal transverse impression; area between longitudinal impression and side margin tumid except in area immediately adjacent to angle; midline sharp, not reaching either edge; disc microstrigulose or partly microreticulate.

ELYTRON.—Humeral dentation small; setiferous punctures on eighth stria consisting of six in anterior series, one intermediate, eight in posterior series; two setae at posterior end of seventh stria; microreticulate.

SIXTH ABDOMINAL STERNUM OF MALE (figs. 2, 3).—Face of sternum with one large impression to right of center.

2. *Pterostichus* (*Leptoferonia*) *pumilus pumilus* Casey

FIGURES 2, 33

Pterostichus longicollis LeConte, 1852, p. 239 [not Duftschmid, 1812, p. 180; not Motschulsky, 1859, p. 147; not Casey, 1924, p. 75]; 1857, p. 8; 1863b, p. 10; 1869, p. 370; 1873, p. 313.—Schaupp, 1882, p. 41.—Casey, 1913, p. 129.—Van Dyke, 1925, p. 75 [fide synonymy of *pumilus*].—Leech, 1935, p. 121.—Hatch, 1936, p. 703.

Leptoferonia longicollis (LeConte).—Casey, 1918, p. 337.—Leng, 1920, p. 56.

Pterostichus pumilis Casey, 1913, p. 127.—Csiki, 1930, p. 582.—Van Dyke, 1925, p. 75.—Hatch, 1953, p. 112.

Pterostichus pumilus.—Casey, 1914, p. 356.—Lindroth, 1966, p. 471.

Leptoferonia pumilus (Casey).—Casey, 1918, p. 337.—Leng, 1920, p. 56.

Micromaeseus longicollis.—Casey, 1924, p. 75 [not LeConte, 1852, p. 239].—Leng and Mutchler, 1927, p. 10.—Hatch, 1953, p. 112 [fide synonymy of *pumilus*].

Feroniens oregona Chaudoir, 1868, p. 335 [fide LeConte, 1873, p. 304].

Pterostichus oregonus (Chaudoir).—Csiki, 1930, p. 712 [not LeConte, 1861, p. 339].—Lindroth, 1966, p. 471.

Pterostichus (*Leptoferonia*) *oregonis*.—Csiki, 1930, p. 582 [new name for *longicollis* LeConte].—Leng and Mutchler, 1933, p. 12.—Hatch, 1936, p. 703; 1953, p. 112.

The characteristics below are found in *pumilus pumilus* sensu stricto in addition to the characteristics listed above that are common to all specimens of *pumilus*.

PRONOTUM.—Sides sinuate in vicinity of posterior setiferous punctures, then diverging; hind angles acute.

ELYTRON.—Humeral dentation often acute.

AEDEAGUS (fig. 2).—Right paramere with lobe beneath and parallel to elongate distal portion not evenly rounded, notched in middle. Median lobe with a weak swelling or small tubercule in about middle of ventral surface; impression on right side at about middle; no lobe on right side.

LENGTH OF BODY.—7.0 to 9.0 mm.

VARIATION.—The above description of the reduced tooth on the median lobe of the aedeagus applies to specimens from the Cascade Mountains of Oregon and southern Washington. The holotype of *pumilus* has only a weak swelling. Figure 2 shows the tooth typical of the other Washington and British Columbia specimens examined, viz., long, narrow, and trough shaped. Specimens from the northern part of the Willamette Valley have a shorter and thicker tooth. Specimens from the Oregon Coast Range have teeth ranging from the northern Willamette Valley form to a weak swelling. Six males in the Fender collection, all labelled "Tillamook," show the complete range.

HOLOTYPES.—*Pterostichus pumilus* Casey, male, USNM!; *P. longicollis* LeConte, female, MCZ!; *Micromaeseus longicollis* Casey, male, not seen; *Feroniens oregona* Chaudoir, female, apparently lost (fide Lindroth, 1966, p. 471).

TYPE-LOCALITIES.—*Pterostichus pumilus*, Clackamas County, Oreg.; *P. longicollis* LeConte, "Oregon," which includes the present states of Oregon and Washington; *Micromaesus longicollis* Casey, Seattle, Wash.; *Feroniens oregona* Chaudoir, presumably Oregon.

SPECIMENS EXAMINED.—397.

DISTRIBUTION (fig. 33 for part).—The typical subspecies, *pumilus pumilus* sensu stricto, occurs at least as far north as the city of Vancouver and southwestern Vancouver Island in British Columbia. It has been collected as far south as Green Peter Mountain, Linn County, in the Oregon Cascades, and Buell, Polk County, in the Oregon Coast Range. It occurs from sea level to 4000 feet elevation.

REMARKS.—Casey intentionally changed the spelling of *pumilis* to *pumilus*. He described the type of *pumilus* as having an unusually small labrum. This is probably because it is pushed back beneath the clypeus. Specimens I have seen differ from his description on several other points, such as: color piceous, not "deep black"; humeral denticle not "wholly obsolete"; elytral striae not "punctate." The female in MCZ assumed to be the holotype of LeConte's *longicollis* has many distinct punctures on the mesepisternum. This is the most reliable characteristic I know to distinguish females of *pumilus pumilus* from those of the southern form of *infernalis*. The microsculpture of *pumilus* is slightly stronger than in *infernalis* and weaker than in *inopinus*. The frontal impressions of *pumilus* form an angle of about 45° rather than the wider angle found in *inopinus*, *fenyesi*, and *cochlearis*.

3. *Peterostichus* (*Leptoferonia*) *pumilus willamettensis*, new subspecies

FIGURES 3, 27, 33, 40

HOLOTYPE MALE.—Same as description of *pumilus* plus the following.

PRONOTUM.—Sides only slightly sinuate near posterior setiferous punctures, then oblique and converging before subrectangular hind angles; posterior pair of setiferous punctures somewhat farther forward than in typical subspecies.

ELYTRON.—Humeral tooth small, not acute.

VENTRAL SURFACE.—Punctures on mesepisternum less numerous than in *pumilus pumilus* sensu stricto.

AEDEAGUS (fig. 3).—Right paramere with basal lobe evenly rounded; distal portion longer and narrower in middle than in typical subspecies. Median lobe with tooth on ventral surface broad, thick, blunt, subtruncate; small lobe present on right side near tooth.

LENGTH OF BODY.—9.0 mm.

ALLOTYPE FEMALE.—Same as holotype except for usual female characteristics; length of body 8.5 mm.

VARIATION.—Other specimens range in length from 8 to 10 mm. In some, the sinuation before the hind angles is absent and the sides are entirely, though weakly, arcuate; in others it is very distinct and the sides are subparallel before the angles.

TYPE.—USNM 69599.

TYPE-LOCALITY.—Five miles north of Mabel, Linn County, Oreg.

SPECIMENS EXAMINED.—181.

DISTRIBUTION (fig. 33).—Holotype male, allotype female, hills east of the Willamette Valley 5 miles north of Mabel, T. 15 S, R. 1 W, sec. 4, Willamette meridian, elev. 700 ft., Linn County, Oreg., Jan. 29, 1960, H. A. Hacker. Also the following paratypes: 13 males, 5 females, same data as holotype; 2 males, 3 females, 2 miles north of Mabel, T. 15 S, R. 1 W, sec. 28, elev. 900 ft.; 1 male, 4 females, 3 miles southeast of Crawfordsville, T. 14 S, R. 1 W, sec. 29, elev. 600 ft.; 6 males, 5 females, 2 miles south of Coberg, T. 17 S, R. 3 W, sec. 9, elev. 400 ft.

A few colonies of *pumilus willamettensis* still occur in the Willamette Valley itself, but the subspecies is more common in the surrounding foothills. It occurs in woods of *Pseudotsuga menziesii* (Mirb.) Franco with some *Quercus garryana* Douglas or *Tsuga heterophylla* (Ref.) Sargent and to an elevation of 900 feet.

REMARKS.—This subspecies has been confused with specimens of *inopinus* and the northern form of *infernalis* in some collections. It can be distinguished from the former by the frontal impressions and from the latter by the punctate mesepisternum. Intermediates between *pumilus pumilus* sensu stricto and *pumilus willamettensis* have been collected from McMinnville, Yamhill County, in six localities in and near the Eola Hills, Polk County, and two miles northwest of Tangent, Linn County. These 43 specimens differ from *pumilus willamettensis* in the following: sides of the pronotum more definitely sinuate; tooth on median lobe longer and lobe reduced or absent on right side; right paramere broader; elytral humeri more strongly dentate.

4. Pterostichus (Leptoferonia) infernalis Hatch

FIGURES 4, 34, 40

Pterostichus (Leptoferonia) infernalis Hatch, 1936, p. 704, 706; 1953, p. 112.

SPECIES DESCRIPTION.—Same as description of *inopinus* group plus the following.

HEAD.—Frontal impressions sharply impressed, curved, forming an angle of about 45°, divergent posteriorly; usually a faint triangular depressed area on front; microstrigulose or microreticulate.

PRONOTUM.—Sides from sinuate to slightly arcuate in vicinity of posterior setiferous punctures; hind angles from acute to subrectangular; base usually weakly bisinuate, sometimes arcuate with hind angles more prominent; basal transverse margin always complete; single pair of curving longitudinal impressoins sharply impressed; faintly microstrigulose.

ELYTRON.—Humerus from edentate to weakly dentate; setiferous punctures on eighth stria consisting of six in anterior, one intermediate, and eight in posterior series; two setae at posterior end of seventh stria; faintly microstrigulose.

VENTRAL SURFACE.—No coarse punctures, or rarely with a few faint sparse punctures or rugosity on mesepisternum.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 4).—Lobe on apical margin "rolled back" forward, giving an emarginate appearance when viewed ventrally; small impression on face on right side.

AEDEAGUS (fig. 4).—Right paramere with large inward-directed lobe on basal portion; long lobe beneath distal portion; sinuate distal portion cylindrical except at tip; median lobe with lobe present on right side.

LENGTH OF BODY.—7.0 to 9.0 mm.

VARIATION.—There are two characteristics that show clinal variation. Specimens of the northern form, from north of about Waldport, Lincoln County, Oreg., have the sides of the pronotum slightly arcuate or oblique before the hind angles and the elytral humeri are edentate. In specimens of the southern form, from south of about Coos Bay, Coos County, the sides of the pronotum are distinctly sinuate toward the posterior pair of setiferous punctures, then subparallel or diverging to the more prominent hind angles. The elytral humerus is distinctly, though not strongly, dentate. In the area between Coos Bay and Waldport, specimens are intermediate in these two characteristics. Since the changes in the two characteristics are gradual, these three categories are arbitrary. There does not appear to be geographical variation in any other character; the structure of the aedeagus, including internal sac, appears to be constant.

HOLOTYPE.—Male, UW!

TYPE-LOCALITY.—Devil's Lake, Lincoln County, Oreg.

SPECIMENS EXAMINED.—432.

DISTRIBUTION (fig. 34).—This species has been collected from Netarts, Tillamook County, Oreg., south to two miles south of Smith River, Del Norte County, Calif. In the north it occurs as far east as the eastern slopes of the Coast Range. In the south it is restricted probably to areas nearer the coast. It is often abundant and has been found to the elevation of 3700 feet.

REMARKS.—*Pterostichus inopinus* and *P. pumilus willamettensis* have been confused with northern specimens of *infernalis*. Externally they can be distinguished readily by their dentate humeri and punctate mesepisterna. Southern form specimens of *infernalis* externally are nearly identical with *pumilus pumilus;* females can be identified on the basis of the punctures on the mesepisternum.

The *fenyesi* Group

This group includes two species, *fenyesi* Csiki and *cochlearis*, new species. The *fenyesi* and *inopinus* groups are similar except for some of the aedeagal characteristics. They occupy adjacent and slightly overlapping areas. The following characteristics are shared by both species of the *fenyesi* group.

COLOR OF BODY.—Piceous.

HEAD.—Eyes normally large and prominent; sharp frontal impressions forming an angle greater than 45°, diverging posteriorly; microreticulate.

PRONOTUM.—Sides entirely arcuate; hind angles obsolete; posterior pair of setiferous punctures far forward, about even with middle of longitudinal impressions; outer pair of longitudinal impressions absent; base weakly bisinuate; basal transverse impression complete; area between sharply impressed longitudinal impressions and lateral gutter tumid; disc microstrigulose and partly microreticulate.

ELYTRON.—Humerus very rounded; humeral dentation small, at most, subrectangular; scutellar stria present though sometimes short; scutellar puncture present; eighth stria with six anterior setiferous punctures, one intermediate, usually seven in posterior series; two setae at posterior end of seventh stria; microreticulate.

VENTRAL SURFACE.—Coarse punctures confined to mesepisternum; tip of prosternum usually completely margined.

LEGS.—Hind trochanter blunt and about half the length of hind femur; setae present on ventrolateral margins of last article of tarsus.

SIXTH ABDOMINAL STERNUM OF MALE.—Apical edge thickened; lobe small or obsolete.

AEDEAGUS.—Right paramere not elongate, somewhat enlarged. Median lobe with raised area where left paramere rests. Internal sac with small, lightly sclerotized tooth and adjacent lobe.

LENGTH OF BODY.—6.0 to 8.5 mm.

REMARKS.—The two species in this group are related closely. The primary differences between the two are found in the aedeagi although there are also small differences in the shape and midline of the pronotum and in the lobe on the male sixth abdominal sternum. *Pterostichus fenyesi* can be divided into two forms on the basis of aedeagal and pronotal characteristics. I have named them subspecies. Unfor-

tunately, the holotype of *P. ovicollis* Schaeffer, renamed *P. fenyesi* by Csiki, is a female from "California." The ratio of its pronotal length to width is 0.93, and its pronotal midline is incised sharply, with the result that it probably is not the same as the population described as *P. cochlearis*. It is more likely that it belongs to the northern subspecies of *P. fenyesi;* hence, that subspecies has been designated as *P. fenyesi fenyesi* sensu stricto.

Pterostichus (*Leptoferonia*) *fenyesi* Csiki

SPECIES DESCRIPTION.—Same as the *fenyesi* group description plus the following.

PRONOTUM.—Midline sharply incised, area adjacent to midline relatively flat.

SIXTH ABDOMINAL STERNUM OF MALE.—Lobe very small or obsolete.

AEDEAGUS.—Right paramere not bulbous. Median lobe noticeably twisted, not as broad as in *cochlearis;* tip narrower and more definitely directed to left; ventral surface and right side meeting abruptly, forming a low ridge.

5. *Pterostichus* (*Leptoferonia*) *fenyesi fenyesi* Csiki

FIGURES 5, 35

Pterostichus ovicollis Schaeffer, 1910, p. 393 [not Motschulsky, 1865, p. 265; not Reitter, 1884, p. 40].—Casey, 1913, p. 129.—Van Dyke, 1925, p. 75.—Leng and Mutchler, 1933, p. 12.—Hatch, 1936, p. 70.

Leptoferonia ovicollis (Schaeffer).—Casey, 1918, p. 337.—Leng, 1920, p. 56.

Pterostichus (*Leptoferonia*) *fenyesi* Csiki, 1930, p. 582 [new name for *ovicollis* Schaeffer].—Leng and Mutchler, 1933, p. 12.—Hatch, 1936, p. 704; 1953, p. 112.

SUBSPECIES DESCRIPTION.—The characteristics below are found in *fenyesi fenyesi* sensu stricto in addition to the characters listed above for *P. fenyesi* and the *fenyesi* group.

PRONOTUM.—Ratio of pronotal length to width 0.93–1.00, median 0.97, in males; ratio 0.92–0.98, median 0.94, in females.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 5).—Lobe small but evident.

AEDEAGUS (fig. 5).—Right paramere cone shaped. Median lobe with tip rounded and directed to left; ventral surface concave, then convex just before tip; ventral surface and right side meeting rather sharply.

HOLOTYPE.—*Pterostichus ovicollis* Schaeffer, female, USNM!

TYPE-LOCALITY.—California, probably from Humboldt County and possibly from north or east of the Eel River.

SPECIMENS EXAMINED.—36.

DISTRIBUTION (fig. 35).—This subspecies has been collected from Child's Hill Prairie, T. 9 N, R. 2 E, Humboldt meridian, south to

nine miles northwest of Blocksburg, Humboldt County, Calif., and to the elevation of 2200 feet.

REMARKS.—Hatch's (1936) description of *"fenyesi"* is a composite drawn from specimens of *inopinus* and *cochlearis*. The name *fenyesi* is not a synonym of the name *infernalis*.

6. *Pterostichus (Leptoferonia) fenyesi fenderi*, new subspecies

FIGURES 6, 35

HOLOTYPE MALE.—Same as description of *fenyesi* and the *fenyesi* group, plus the following.

PRONOTUM.—Sides more arcuate than in *fenyesi fenyesi;* ratio of length to width 0.91.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 6).—Apical edge thickened, but lobe nearly obsolete.

AEDEAGUS (fig. 6).—Compared with *fenyesi fenyesi* sensu stricto, right paramere smaller, narrower, not so evenly tapering at tip. Median lobe with ventral surface more concave; ventral surface and right side meeting more abruptly to form a low carina that extends to middle of base of ventral surface; in lateral view, right side bisinuate; tip sharper. Internal sac apparently identical.

LENGTH OF BODY.—7.0 mm.

ALLOTYPE FEMALE.—Same as male except ratio of pronotal length to width 0.90, and usual female differences.

VARIATION.—The 19 other specimens measured have the pronotal ratio 0.88–0.92, median 0.91, in males; ratio 0.85–0.94, median 0.89, in females. Length of body 6.0 to 7.5 mm.

TYPE.—USNM 69600.

TYPE-LOCALITY.—Two miles northwest of Petrolia, Humboldt County, Calif.

SPECIMENS EXAMINED.—21.

DISTRIBUTION (fig. 35).—Holotype, male, and allotype, female, 2 miles northwest of Petrolia, T. 1 S, R. 2 W, Humboldt meridian, elev. 200 ft., Humboldt County, Calif., Jan. 26, 1962, H. A. Hacker. Also the following paratypes: 2 males, 2 females, same data as holotype; 1 male, 1 female, 1 mile south of Capetown, T. 1 N, R. 3 W, elev. 500 ft.; 1 male, 2 females, 9 miles southwest of Ferndale, T. 2 N, R. 2 W, elev. 1100 ft.; 1 male, 1 female, 7 miles southwest of Ferndale, T. 2 N, R. 2 W, elev. 1400 ft. Eight other specimens came from localities farther to the south; only a single female is known from the southernmost locality, Russian Gulch, Mendocino County.

REMARKS.—The differences between this subspecies and *fenyesi fenyesi* sensu stricto are differences in degree rather than in kind. The sample examined was not large, only 57 specimens of the two

subspecies, of which 29 were males. The characteristics separating the two do not seem to undergo clinal variation within the two groups. The two groups are not known to overlap or to intergrade in morphological characteristics along their common boundary (see fig. 35). Not many specimens are known from the boundary area, but it does seem likely that no more than a small area of intergrading might exist. When more specimens have been collected from the boundary area, the status of the two groups will be resolved. I think it is safe to consider the two populations to be at least separate subspecies.

I take pleasure in naming this subspecies for Mr. Kenneth M. Fender.

7. *Pterostichus* (*Leptoferonia*) *cochlearis*, new species

FIGURES 7, 35

HOLOTYPE MALE.—Same as the description of *fenyesi* group plus the following.

PRONOTUM.—Midline not abruptly impressed, surface adjacent to midline tumid; ratio of pronotal length to width 0.93.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 7).—Apical margin thickened and produced into well-defined and ventrally directed lobe.

AEDEAGUS (fig. 7).—Right paramere relatively large and bulbous. Median lobe broad; ventral surface slightly concave; right side and ventral surface not meeting sharply; tip blunt, rounded, not directed to left; internal sac with sclerotized lobe and tooth not the same shapes as in *fenyesi*.

LENGTH OF BODY.—8.0 mm.

ALLOTYPE FEMALE.—Same as holotype except pronotal ratio 0.88, and usual female differences.

VARIATION.—The 75 other specimens measured have the pronotal ratio 0.86–0.96, median 0.91, in the males; 0.84–0.92, median 0.89, in the females. Length 7.0 to 8.5 mm. In Oregon males, the lobe of the sixth sternum tends to be defined less abruptly and to be slightly emarginate in the middle. Variation in the pronotal ratio does not seem to be clinal.

TYPE.—USNM 69601.

TYPE-LOCALITY.—Weitchpec-Orick Road, Humboldt County, Calif.

SPECIMENS EXAMINED.—83.

DISTRIBUTION (fig. 35).—Holotype, male, and allotype, female, Weitchpec-Orick Road, T. 11 N, R. 1 E, sec. 36, Humboldt meridian, elev. 1400 ft., Humboldt County, Calif., Sept. 2, 1959, H. A. Hacker. Also the following paratypes: 7 males, 2 females, same data as holotype; 3 males, 3 females, Weitchpec-Orick Road, T. 10 N, R. 2 E, sec. 18, elev. 2000 ft.; 3 males, 3 females, Prairie Creek Redwoods State Park, T. 12 N, R. 1 E, Humboldt County, Calif. Sixty additional

specimens were examined from Gold Beach, Curry County, Oreg., south to Patrick's Point, Humboldt County, Calif. and to the elevation of 2000 ft.

Remarks.—This species has been separated from *fenyesi* primarily on the basis of the aedeagal characteristics. The differences between *cochlearis* and *fenyesi fenyesi* appear to be greater than the differences between *fenyesi fenyesi* and *fenyesi fenderi*. The median lobe, including the internal sac, is clearly different. More than half the specimens of *cochlearis* can be separated from all known specimens of *fenyesi fenyesi* on the basis of the pronotal ratio. Four specimens of *fenyesi fenyesi* were collected seven miles from the nearest specimens of *cochlearis*. I do not know if actual overlapping of their ranges occurs. No intermediate males are known. The name *cochlearis* refers to the spoonlike shape of the median lobe of the aedeagus.

The *fuchsi* Group

Figure 41

This group includes *fuchsi* Schaeffer; *marinensis*, new species; *lobatus*, new species; *mattolensis*, new species; *trinitensis*, new species; and *humilis* Casey. These species are very similar and probably are closely related. The most distinctive differences among the six are found in the male aedeagus and sixth abdominal sternum. The shape of the pronotum also differs among the six, but it is difficult to distinguish the taxa on this basis alone unless one has a series for comparison. The characteristics below are common to all six species.

Color of body.—Rufous or piceous.

Head.—Eyes normally large and prominent; trace of triangular impression on front; microreticulate.

Pronotum.—Posterior pair of setiferous punctures at subrectangular hind angles; outer pair of longitudinal impressions absent; basal transverse impression complete; base bisinuate; disc partly microreticulate.

Elytron.—Scutellar stria and puncture present; setiferous punctures on eighth stria consisting of six anterior, one intermediate, eight or occasionally seven, in posterior series; two setae at posterior end of seventh stria; intervals usually somewhat convex; striae inpunctate; microreticulate.

Ventral surface.—Coarse punctures on mesepisternum; scattered punctures on metepisternum and sides of metasternum.

Legs.—Hind trochanter blunt, about half the length of hind femur.

Sixth abdominal sternum of male.—Apical edge thickened; tubercules and/or carina or lobe before apical margin.

AEDEAGUS.—Right paramere elongate. Median lobe with ventral surface with unsclerotized area on left side and diagonal, lightly sclerotized strip. Internal sac with large microtrichiate lobe below gonopore; usually small, weakly sclerotized tooth in gonopore.

LENGTH OF BODY.—6.0 to 9.0 mm.

REMARKS.—Distribution data are not as complete for members of the *fuchsi* group (see figs. 36, 37, 41) as for members of the *inopinus* group in Oregon. The range of *lobatus* is known to overlap the ranges of its two neighbors. There is geographical variation in the right paramere of *lobatus* (see fig. 10), but no other character shows any evidence of possible interbreeding. Since *lobatus* does overlap, apparently without interbreeding, it should definitely have species rank. Four of the other species presumably come into contact with each other in three areas in Humboldt and Mendocino Counties. Unfortunately, no specimens are known from these three areas, and so there is no direct evidence that the species come into contact or overlap without interbreeding. The gaps are small, however; only five or 10 miles separate the known ranges of *trinitensis*, *mattolensis*, and *humilis* in some places. If there are intermediate individuals, one would have expected a few among the approximately 170 males examined of *trinitensis*, *humilis*, *mattolensis*, and *fuchsi*. Instead, the structure of the aedeagus seems to be constant within each population and different among the six; hence, all six taxa have been given species rank. The six species inhabit California north of San Francisco Bay, within about 50 miles of the coast, and extreme southwestern Oregon. Five of the species live essentially within the redwood belt. The sixth, *trinitensis*, lives to the east of the redwoods.

8. *Pterostichus* (*Leptoferonia*) *fuchsi* Schaeffer

FIGURES 8, 36, 41

Pterostichus fuchsi Schaeffer, 1910, p. 392.—Casey, 1913, p. 128.—Van Dyke, 1925, p. 75.—Csiki, 1930, p. 582.—Hatch, 1936, p. 704.

Leptoferonia fuchsi (Schaeffer).—Casey, 1918, p. 337.—Leng, 1920, p. 56.

Leptoferonia fugax Casey, 1918, p. 337 [not Morawitz, 1862, p. 212].—Leng, 1920, p. 56.

Pterostichus fugax (Casey).—Van Dyke, 1925, p. 75 [fide synonymy of *fuchsi*].

Pterostichus fugiens Csiki, 1930, p. 582 [new name for *Leptoferonia fugax* Casey].—Leng and Mutchler, 1933, p. 12.

Pterostichus fugens [sic].—Hatch, 1936, p. 704 [misspelling of *fugiens* Csiki].

SPECIES DESCRIPTION.—Characteristics of *fuchsi* group plus the following.

HEAD.—Frontal impressions nearly straight except noticeably recurved posteriorly, divergent, forming an angle of approximately 80°.

PRONOTUM.—Sides arcuate, then oblique or slightly sinuate for a short distance before hind angles; single pair of longitudinal impres-

sions shorter and shallower than in *inopinus* group; area lateral to impressions slightly convex.

ELYTRON.—Humerus strongly dentate.

LEGS.—Male hind femur robust, obtusely angulate along lower posterior margin, or occasionally tuberculate; no setae on ventrolateral margins of last article of tarsus.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 8).—Three tubercules present before apical margin; the right small and blunt, sometimes connected with middle tubercule by low carina; middle large and blunt; left tubercule of equal size, more abruptly defined; apical edge between left and middle tubercules slightly emarginate; usually vague impression in vicinity of right tubercule.

AEDEAGUS (fig. 8).—Right paramere with basal portion bulbous, then abruptly narrowed in about middle. Median lobe with tip rather broad; ventral surface with small unsclerotized area on left side.

LENGTH OF BODY.—6.5 to 8 mm.

TYPES.—*Pterostichus fuchsi*, male, USNM!; *Leptoferonia fugax*, male, USNM!

TYPE-LOCALITIES.—California, presumably Sonoma or Mendocino County.

SPECIMENS EXAMINED.—68.

DISTRIBUTION (fig. 36).—Specimens were collected from Russian River, Sonoma County, north to eight miles west of Willits, Mendocino County, Calif., and to an elevation of 900 feet.

REMARKS.—The holotype male of *fugax* Casey definitely belongs to the taxon described above. Judging primarily by the frontal impressions of the head (tarsal setae not examined) the holotype of *fuchsi* belongs to this taxon also, rather than to the taxon described as *marinensis*, new species.

9. *Pterostichus (Leptoferonia) marinensis*, new species

FIGURES 9, 36, 41

HOLOTYPE MALE.—Characteristics of *fuchsi* group plus the following.

HEAD.—Frontal impressions slightly curved, not noticeably recurved at posterior ends, not nearly as divergent as in *fuchsi*, forming an angle of about 45°.

PRONOTUM.—Sides at middle less arcuate than in *fuchsi;* sides arcuate in basal third to immediately before hind angles; basal transverse impression faint towards middle; longitudinal impressions slightly shallower and shorter than in *fuchsi*.

ELYTRON.—Humerus strongly dentate.

LEGS.—Hind femur robust but not obtusely angulate; small setae present on ventrolateral margins of last article of tarsus.

Sixth abdominal sternum of male (fig. 9).—Low carina before evenly arcuate apical edge; two sharp tubercules at ends of carina; no distinct impression on face.

Aedeagus (fig. 9).—Right paramere gradually tapering; a slight bend at about middle. Median lobe with ventral surface flat; unsclerotized area on left side larger than in *fuchsi;* distal portion and tip narrower than *fuchsi* and curved to left. Internal sac with lips of gonopore weakly sclerotized, but apparently no tooth present.

Length of body.—7.5 mm.

Allotype female.—Same as holotype except for usual female differences; hind femur noticeably less robust; length of body 7.0 mm.

Type.—USNM 69602.

Type-locality.—Two miles northwest of Pan Toll Camp, Marin County, Calif.

Specimens examined.—78.

Distribution (fig. 36).—Holotype, male, allotype, female, 2 miles northwest of Pan Toll Camp, west slope of Mount Tamalpais, elev. 1700 ft., Marin County, Calif., July 11, 1965, H. A. Hacker. Also the following paratypes: 10 males, 6 females, same data as holotype; 3 males, 1 female, same data as holotype except Feb. 4, 1961; 4 males, 3 females, 3 miles northwest of Pan Toll Camp. Fifty other specimens were collected from other localities in the southern half of Marin County.

Remarks.—Aside from male characteristics, the frontal impressions of the head and the tarsal setae provide the most distinctive differences between *marinensis* and *fuchsi.* There is not much forested land in the northern half of Marin County; *marinensis* and *fuchsi* currently may not be in contact with each other.

10. *Pterostichus* (*Leptoferonia*) *lobatus,* new species

Figures 10, 37, 41

Holotype male.—Characteristics of *fuchsi* group plus the following.

Head.—Frontal impressions slightly curved, not noticeably recurved at posterior ends, forming an angle of about 45°.

Pronotum.—Sides arcuate in middle, oblique, then sinuate immediately before hind angles; longitudinal impressions longer and more sharply impressed than in *fuchsi.*

Elytron.—Side arcuate; humerus sloping and not strongly dentate; intervals slightly convex; only faintly microreticulate.

Legs.—Hind femur somewhat robust, not obtusely angulate; no setae on ventrolateral margins of last article of tarsus.

Sixth abdominal sternum of male (fig. 10).—A long, narrow, abruptly truncate lobe extending beyond edge, directed downward;

low tubercules merging into base of lobe; vague impression in vicinity of right anal seta.

AEDEAGUS (fig. 10).—Right paramere not elbowed, narrowed in about middle. Median lobe twisted about 45°; distal portion and tip narrow, curved to left; right side of basal portion forming a sharp carina that extends partly across ventral surface toward large unsclerotized area.

LENGTH OF BODY.—7.0 mm.

ALLOTYPE FEMALE.—Same as above description of holotype except for usual female differences.

VARIATION.—Some of the other specimens examined differ from the above description in having the elytral intervals flat. The right paramere of the aedeagus is broad and then abruptly narrowed in the distal third in southern specimens; it is narrowed more gradually closer to the base in more northern specimens. Length of body ranges from 6.5 to 8.0 mm.

TYPE.—USNM 69603.

TYPE-LOCALITY.—Three miles south of Rockport, Mendocino County, Calif.

SPECIMENS EXAMINED.—29.

DISTRIBUTION (fig. 37).—Holotype, male, and allotype, female, 3 miles south of Rockport, T. 22 N, R. 18 W, Mount Diablo meridian, elev. 800 ft., Mendocino County, Calif., Mar. 22, 1964, H. A. Hacker. Also the following paratypes: 1 male, Rockport, elev. 100 ft.; 2 males, 1 mile north of Rockport, elev. 100 ft.; 1 male, 1 female, 4 miles north of Rockport, elev. 400 ft.; 3 males, 4 females, 1 mile south of Caspar, T. 17 N, R. 17 W, elev. 100 ft., Mendocino County. Other specimens were collected from the mouth of the Navarro River north to the Rockport area. Twelve specimens were found seven miles southwest of Ferndale, Humboldt County, elevation 1400 feet, about 60 miles from Rockport.

REMARKS.—The range of this species overlaps the ranges of *fuchsi* to the south and of *mattolensis* to the north. The Ferndale specimens apparently do not differ from the Rockport area specimens. If they are not a recent introduction, it is surprising that no specimens of *lobatus* were found among the 50 specimens of *Leptoferonia* collected near the coast between Ferndale and Rockport. The name refers to the lobe on the male sixth abdominal sternum.

11. *Pterostichus* (*Leptoferonia*) *mattolensis*, new species

FIGURES 11, 37, 41

HOLOTYPE MALE.—Characteristics of *fuchsi* group plus the following.

HEAD.—Frontal impressions nearly straight and not recurved posteriorly, forming an angle somewhat less than 80°.

PRONOTUM.—Sides arcuate in middle, oblique posteriorly, sinuate immediately before hind angles; anterior angles more prominent than in *fuchsi*.

LEGS.—Hind femur robust but not obtusely angulate; small setae present on ventrolateral margins of last article of tarsus.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 11).—Two large blunt tubercules, left somewhat larger; no carina or third tubercule between.

AEDEAGUS (fig. 11).—Right paramere bisinuate, of nearly equal width for entire length. Median lobe with large unsclerotized area on ventral surface.

LENGTH OF BODY.—8.0 mm.

ALLOTYPE FEMALE.—Same as holotype except for usual female differences; elytral humeri slightly more rounded; length of body 7.5 mm. Other specimens range in length from 7.5 to 9.0 mm.

TYPE.—USNM 69604.

TYPE-LOCALITY.—Four miles south of Honeydew, Humboldt County, Calif.

SPECIMENS EXAMINED.—81.

DISTRIBUTION (fig. 37).—Holotype, male, and allotype, female, 4 miles south of Honeydew, T. 3 S, R. 1 E, Humboldt meridian, elev. 1500 ft., Humboldt County, Calif., July 3, 1964, H. A. Hacker. Also the following paratypes: 1 male, 3 females, same data as holotype; 2 males, 1 female, 1 mile south of Honeydew, T. 3 S, R. 1 E, elev. 200 ft.; 3 males, 2 females, 3 miles northwest of Upper Mattole, T. 2 S, R. 1 W, elev. 100 ft.; 2 males, 3 females, 2 miles southeast of Petrolia, T. 2 S, R. 2 W, elev. 100 ft. Other specimens were collected from as far south as the Rockport area in Mendocino County, as far north as McCann, Humboldt County, and to an elevation of 2300 feet.

REMARKS.—This species resembles *fuchsi* more than it resembles *lobatus*. In addition to the male differences, it differs from *lobatus* in the following characteristics: shallower pronotal longitudinal impressions; larger elytral humeri; stronger elytral microsculpture; more robust metafemora; and a less bulbous body outline. Externally it differs from *marinensis* in the following: more nearly rectangular elytral humeri; sides of the pronotum oblique, rather than arcuate in the basal third; anterior and posterior angles more prominent; longitudinal impressions slightly sharper; and transverse impression strong. The name is derived from the Mattole River, near which the types were collected.

12. *Pterostichus* (*Leptoferonia*) *trinitensis*, new species

FIGURES 12, 37, 41

HOLOTYPE MALE.—Characteristics of *fuchsi* group plus the following.

HEAD.—Frontal impressions curving, forming an angle of somewhat less than 80°, not recurving posteriorly.

PRONOTUM.—Sides broadly sinuate, then parallel before rectangular hind angles; longitudinal impressions fairly sharp; base not strongly bisinuate, making hind angles more prominent than in other species of group.

ELYTRON.—Humeral tooth small.

LEGS.—Hind femur not obtusely angulate; no setae on ventrolateral margins of last article of tarsus.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 12).—Apical margin evenly rounded; strong carina joining the three tubercules; right tubercule nearly obsolete; middle and left tubercules only slightly prominent.

AEDEAGUS (fig. 12).—Right paramere broad, narrowed laterally in about middle; basal portion concave where left paramere rests against it. Median lobe stout, twisted, but not as abruptly as in *lobatus*; narrow tip curved to left; unsclerotized area large.

LENGTH OF BODY.—7.5 mm.

ALLOTYPE FEMALE.—Same as holotype except for usual female differences. Other specimens range in length from 7.0 to 9.0 mm.

TYPE.—USNM 69605.

TYPE-LOCALITY.—Eight miles northeast of Zenia, Trinity County, Calif.

SPECIMENS EXAMINED.—95.

DISTRIBUTION (fig. 37).—Holotype, male, and allotype, female, 8 miles northeast of Zenia, T. 2 S, R. 6 E, Humboldt meridian, elev. 3500 ft., Trinity County, Calif., July 1, 1964, H. A. Hacker. Also the following paratypes: 2 males, 3 females, same data as holotype; 3 males, 2 females, 16 miles northeast of Zenia, T. 2 S, R. 7 E, elev. 3400 ft.; 1 male, 1 female, 4 miles northeast of Zenia, elev. 4000 ft.; 1 male, 1 female, 3 miles northeast of Zenia; 4 males, 7 miles southeast of Zenia, T. 4 S, R. 6 E, elev. 3100 ft. Other specimens were collected from as far south as five miles south of Willits, Mendocino County, as far east as Plaskett Meadows, Glenn County, and from elevations between 300 and 6500 ft. This species is found to the east of the redwood belt in woods of *Pseudotsuga menziesii* (Mirb.) Franco with *Libocedrus decurrens* Torrey and *Pinus lambertiana* Douglas or various *Abies* at higher elevations. Specimens from eastern Mendocino and western Glenn Counties were collected too late to be shown on the distribution maps.

REMARKS.—The aedeagus of *trinitensis* resembles that of *lobatus* more closely than those of the other species in the *fuchsi* group. Otherwise *trinitensis* does not appear very similar to *lobatus*. It differs from *mattolensis* in the following pronotal characteristics: longitudinal impressions sharper, anterior angles less prominent, sides sinuate well before the prominent hind angles (rather like *pumilus willamettensis*).

13. *Pterostichus* (*Leptoferonia*) *humilis* Casey

FIGURES 13, 37, 41

Pterostichus humilis Casey, 1913, p. 128.—Van Dyke, 1925, p. 75.—Csiki, 1930, p. 582.—Hatch, 1936, p. 704.
Leptoferonia humilis (Casey).—Casey, 1918, p. 337.—Leng, 1920, p. 56.
Leptoferonia larvalis Casey, 1918, p. 337.—Leng, 1920, p. 56.
Pterostichus larvalis (Casey).—Van Dyke, 1925, p. 75 [fide synonymy of *humilis* Casey].—Csiki, 1930, p. 582.—Hatch, 1936, p. 704.

SPECIES DESCRIPTION.—Characteristics of *fuchsi* group plus the following.

HEAD.—Frontal impressions nearly straight, not recurved, forming an angle less than 80°.

PRONOTUM.—Sides evenly arcuate in middle, oblique in basal third, then sinuate immediately before hind angles; area lateral to shallow longitudinal impressions often flat.

ELYTRON.—Humerus and humeral tooth small; side more arcuate than in other species of group except *lobatus*.

VENTRAL SURFACE.—Coarse punctures essentially confined to mesepisternum.

LEGS.—Hind femur somewhat robust, not obtusely angulate; no setae on lateroventral margins of last article of tarsus.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 13).—Two tubercules small, joined by prominent curved carina; apical margin somewhat truncate between tubercules.

AEDEAGUS (fig. 13).—Right paramere sharply elbowed. Median lobe not twisted; unsclerotized area large, triangular.

LENGTH OF BODY.—6.0 to 8.0 mm.

TYPES.—*Pterostichus humilis*, male, USNM!; *Leptoferonia larvalis*, female, USNM!

TYPE-LOCALITIES.—Hoopa Valley, Humboldt County, Calif.

SPECIMENS EXAMINED.—151.

DISTRIBUTION (fig. 37).—From seven miles south of Gold Beach, Curry County, Oreg., south to Weott, Humboldt County, Calif., and to the elevation of 3100 feet. It is sympatric with *fenyesi* or *cochlearis* over most of its range.

Remarks.—Casey described his types of *humilis* and *larvalis* as testaceous; mature specimens are dark rufous. Aside from male characteristics, *humilis* can be distinguished from *mattolensis* by the following: elytral humeri smaller and more rounded, area lateral to longitudinal impressions on pronotum usually at least partly flat.

14. *Pterostichus* (*Leptoferonia*) *angustus* (Dejean)

Figures 14, 31, 38

Feronia angusta Dejean, 1828, p. 328.—LeConte, 1857, p. 8.
Pterostichus angustus (Dejean).—LeConte, 1852, p. 239; 1863a, p. 8; 1873, p. 303.—Schaeffer, 1910, p. 392.—Casey, 1913, p. 126.—Van Dyke, 1925, p. 75.—Csiki, 1930, p. 582.—Hatch, 1936, p. 704.
Leptoferonia angustus (Dejean).—Casey, 1918, p. 321, 337.—Leng, 1920, p. 56.
Pterostichus linearis LeConte, 1852, p. 239; 1873, p. 303 [fide synonymy of *angustus* Dejean].—Casey, 1913, p. 126.—Csiki, 1930, p. 582.
Pterostichus crucialis Casey, 1913, p. 126.—Van Dyke, 1925, p. 75 [fide synonymy of *angustus* Dejean].—Csiki, 1930, p. 582.—Hatch, 1936, p. 704.
Leptoferonia crucialis (Casey).—Casey, 1918, p. 337.—Leng, 1920, p. 56.

Color of body.—Rufous.

Head.—Eyes smaller than in *inopinus* group, though longer than length of second antennal segment, not prominent; frontal impressions subparallel in basal half, then diverging; microreticulate.

Pronotum.—Sides in basal third broadly sinuate; hind angles slightly reflexed, rectangular; apical angles prominent, more so than in *hatchi;* posterior pair of setiferous punctures at angles; basal transverse impression weak or absent in middle; base bisinuate; inner pair of longitudinal impressions from distinctly impressed lines to shallow depressions; outer longitudinal impressions similarly variable, sometimes reaching basal margin, rarely absent; area between impressions and lateral margin slightly tumid; distinct midline often reaching basal margin; disc more convex than in *hatchi;* disc partly microreticulate.

Elytron.—Humerus strongly dentate; scutellar stria present; scutellar puncture present on both elytra in only a third of sample from north and east of San Francisco Bay; sides subparallel in middle third; setiferous punctures on eighth stria consisting of six anterior, no intermediate, six or occasionally five in posterior series; two setae at posterior end of seventh stria; microreticulate.

Ventral surface.—Sparse punctures on mesepisternum in specimens from south and east of San Francisco Bay, additional punctures on mesepisternum and metepisternum in others.

Legs.—Hind trochanter with tip pointed, about half the length of hind femur; hind femur not particularly robust; setae usually absent on ventrolateral margins of last article of tarsus in specimens from north of San Francisco Bay, present in southern specimens; males

with tibia of middle leg with about five tubercules along inner margin, giving a saw-toothed appearance.

SIXTH ABDOMINAL STERNUM (fig. 14).—Males with apical edge thickened; carina before truncate edge about straight, sometimes interrupted in middle; large impression to right of center on face. Females with apical margin subtruncate; often a small impression on face; a slight bulge or low carina before apical margin in *linearis* type and a few others.

AEDEAGUS (fig. 14).—Right paramere short, bulbous. Median lobe smaller in proportion to body than in most other *Leptoferonia;* twisted; basal portion with ridge where parameres meet when folded; tip small, shallow, barbed at right; lightly sclerotized strip present. Internal sac with small, lightly sclerotized tooth in gonopore.

LENGTH OF BODY.—7.0 to 8.5 mm.

VARIATION.—As noted above, specimens from north of San Francisco Bay show a tendency to lose the scutellar and tarsal setae. There is geographical variation among specimens from the southern part of this species' range. Thirteen specimens from the Carmel, Monterey County, area differ from more northern specimens as follows: eyes slightly larger; sides of pronotum more arcuate, then more strongly sinuate before hind angles; anterior angles not so prominent; pronotal impressions tend to be weaker; sides of elytra more arcuate; scutellar puncture always present on both elytra; carina on sixth sternum deeply interrupted and apical edge broadly emarginate in all seven males; average size larger. Specimens from Santa Cruz County exhibit these characteristics to a lesser degree; of 31 specimens, 28 have scutellar setae on both elytra. The aedeagus seems to be constant throughout the species' range.

TYPES.—*Feronia angusta* Dejean, apparently lost (see Lindroth, 1955, pp. 10–15); *Pterostichus linearis*, female, MCZ!; *P. crucialis*, male, USNM!

TYPE-LOCALITIES.—*Feronia angusta*, California; *P. linearis*, San Francisco, Calif.; *P. crucialis*, Santa Cruz Mountains, Calif.

SPECIMENS EXAMINED.—108.

DISTRIBUTION (fig. 38).—Specimens have been collected from five miles south of Carmel, Monterey County, north to Montgomery Woods State Park, Mendocino County, and east to Mount Diablo, Contra Costa County. This species is sympatric with *fuchsi* and *marinensis* in the northern part of its range. Three apparently normal males in the California Academy of Science bear the labels "Dunsmuir, Siskiyou County," and "Castella, Shasta County." If they are labelled correctly, this species should also be found in the eastern part of the Coast Range in Lake County and northward.

REMARKS.—Dejean's type-specimen probably was from the coats;

it was collected by Eschscholtz while he was on a sailing expedition. Dejean's description seems to fit the coastal species described above better than the Sierran *hatchi*, new species, or *stapedius*, new species. LeConte (1863a) and Chaudoir considered *linearis* LeConte to be a synonym of *angustus* Dejean. Hatch (1936) and Van Dyke confused this coastal species with the Sierran species. Hatch's (1936) description of "*angustus*" is drawn, at least in part, from specimens of *hatchi*.

The *hatchi* Group

The *hatchi* group includes two species, *Pterostichus hatchi*, new species, and *P. stapedius*, new species. The aedeagi of the two look very different superficially. *Pterostichus stapedius*, new species, also differs from *P. hatchi*, new species, in having the pronotum and elytra more convex and in having more numerous punctures on the ventral surface of the thorax. In the past, the two have been confused with the species that occurs in the California Coast Range and that is described in this paper as *angustus*. Dejean's *angusta* holotype apparently is lost. It was collected by Eschscholtz from "Californie" and probably was collected from the coast rather than from the Sierra Nevada in the interior, where *P. hatchi*, new species, and *P. stapedius*, new species, occur. Dejean's original description could apply to the Sierran species, however. The *hatchi* species group differs from the coastal species in several respects including a broader body outline and more protruding eyes. The members of the *hatchi* group share the characteristics listed below.

Color of body.—Dark rufous.

Head.—Eyes protruding, but smaller than in *inopinus* group; frontal impressions somewhat curved, diverging posteriorly; a faint triangular impression on front; microreticulate.

Pronotum.—Sides arcuate in middle, then broadly sinuate and subparallel, or slightly divergent, somewhat before rectangular hind angles; posterior pair of setiferous punctures at angles; base bisinuate; weak basal transverse impression absent between inner pair of longitudinal impressions; outer pair of impressions usually faint, sometimes deep and fairly long, sometimes absent; deep midline not reaching either margin; disc partly microreticulate; sometimes vague longitudinal wrinkles in vicinity of midline toward base.

Elytron.—Humerus nearly rectangular; humeral dentation large and acute; scutellar stria normally short, sometimes complete, sometimes absent; scutellar puncture absent; setiferous punctures on eighth stria consisting of six in anterior series, usually no intermediate, usually six in posterior series; two setae at posterior end of seventh stria; intervals convex except toward base; microreticulate.

LEGS.—Hind femur not robust; hind trochanter blunt and relatively short, slightly less than half the length of hind femur; no setae on ventrolateral margins of last article of tarsus; in males, tibia of middle leg with truncate tubercules along inner margin.

SIXTH ABDOMINAL STERNUM OF MALE.—Apical edge thickened; broad transverse lobe between anal setae reaching to edge of sternum; no well-defined impression on face.

AEDEAGUS.—Right paramere at least somewhat elongate. Internal sac with small, lightly sclerotized tooth in gonopore.

LENGTH OF BODY.—5.5 to 8.0 mm.

15. *Pterostichus* (*Leptoferonia*) *hatchi*, new species

FIGURES 15, 30, 39

Pterostichus (*Leptoferonia*) *angustus*.—Hatch, 1936, p. 704 [in part; not Dejean, 1828, p. 328]. [New synonymy.]

HOLOTYPE MALE.—Same as description of *hatchi* group plus the following.

HEAD.—Frontal impressions subparallel in anterior half.

PRONOTUM.—Sides slightly divergent before hind angles; area lateral to inner longitudinal impressions nearly flat except for short outer impressions.

ELYTRON.—Sixth puncture in anterior series on one side detached, no intermediate puncture on either side; striae impunctate.

VENTRAL SURFACE.—Mesepisternum, metepisternum, and sides of metasternum with coarse, deep punctures; shallow, sparse punctures on proepisternum; tip of prosternum partly margined.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 15).—Area in front of strong lobe concave, but no well-defined impression.

AEDEAGUS (fig. 15).—Right paramere elongate, curved, tapering gradually to point. Median lobe with deep concave area in about middle of ventral surface; right side and ventral surface meeting in sharp ridge adjacent to concavity; left side of ventral surface with small unsclerotized area; lightly sclerotized strip present; short tip tapering to sharp point; no raised area on basal portion where parameres rest.

LENGTH OF BODY.—8.0 mm.

ALLOTYPE FEMALE.—Same as above description of holotype except outer longitudinal impressions on pronotum absent and usual female differences; length of body 7.5 mm.

VARIATION.—Some of the other specimens, including some of the paratypes, differ from the holotype and allotype in one or more of the following characteristics, in addition to the characters of the *hatchi* group: pronotum with area between inner impression and

lateral margin sometimes convex; occasional vague shallow punctures present around longitudinal impressions. Elytron with scutellar stria complete; scutellar stria absent; only five punctures in posterior series on eighth stria; striae faintly punctate; length of body 6.0 to 8.0 mm. None of the variable characteristics seem to be geographical variations. The aedeagus appears to be constant throughout the range of this species.

TYPE.—USNM 69606.

TYPE-LOCALITY.—Two miles southwest of Ganns, Calaveras County, Calif.

SPECIMENS EXAMINED.—157.

DISTRIBUTION (fig. 39).—Holotype, male, and allotype, female, 2 miles southwest of Ganns, T. 6 N, R. 16 E, sec. 11, Mount Diablo meridian, elev. 6500 ft., Calaveras County, Calif., Sept. 7, 1964, H. A. Hacker. Also the following paratypes: 10 males, 5 females, same data as holotype; 4 males, 4 females, Ganns, elev. 6600 ft.; 11 males, 7 females, 1 mile west of Big Meadow Forest Service Camp, T. 7 N, R. 17 E, sec. 32, elev. 6700 ft. Other specimens were collected from Robb's Valley, T. 13 N, R. 14 E, El Dorado County, south to 1 mile southwest of Strawberry, T. 4 N, R. 18 E, Tuolumne County, and from elevations of 2800 to 6900 ft.

REMARKS.—I take pleasure in naming this species for Dr. Melville H. Hatch.

16. *Pterostichus* (*Leptoferonia*) *stapedius*, new species

FIGURES 16, 39

This species comprises two populations described herein as two subspecies: *P. stapedius stapedius*, the nominate new subspecies, and *P. stapedius yosemitensis*, new subspecies. This species differs from *P. hatchi*, new species, primarily in the structure of the aedeagus.

HOLOTYPE MALE.—Same as description of *hatchi* group plus the following.

HEAD.—Frontal impressions diverging for entire length, not parallel in anterior half; depression on front elongate but not widened posteriorly.

PRONOTUM.—Sides subparallel before hind angles; outer longitudinal impression absent on one side, vague on other; area between inner impression and lateral gutter mostly tumid; longitudinal wrinkles faint, no discal punctures; disc more convex than in *hatchi*.

ELYTRON.—Scutellar stria complete; striae subpunctate; surface more convex than in *hatchi*, especially noticeable toward base.

VENTRAL SURFACE.—Coarse punctures on sides of prosternum; punctures on thorax coarser and denser than in *hatchi*.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 16).—Lobe before apical margin slightly smaller than in *hatchi*.

AEDEAGUS (fig. 16).—Right paramere elongate, crescent shaped. Median lobe with ventral surface not concave; unsclerotized area not extending onto ventral surface; no diagonal strip; tip very elongate, broad, spatulate, in lateral view almost parallel to axis of basal portion.

LENGTH OF BODY.—7.0 mm.

ALLOTYPE FEMALE.—Same as above description of holotype except pronotum with scattered punctures around longitudinal impressions; elytron with only five punctures in posterior series; length 6.5 mm; and usual female differences.

VARIATION.—Some of the other specimens of *stapedius stapedius* differ from the holotype and allotype in the following: head with depression on front elongate posteriorly and then widening to form a faint anchor-shaped depression; pronotum with outer longitudinal impressions weak or absent, never long or deep, longitudinal wrinkles and coarse punctures usually evident at base of pronotum; elytron with striae rarely impunctate; length of body 5.5 to 7.5 mm.

TYPE.—USNM 69607.

TYPE-LOCALITY.—Beasore Meadows, Madera County, Calif.

SPECIMENS EXAMINED.—80.

DISTRIBUTION (fig. 39).—Holotype, male, and allotype, female, Beasore Meadows, T. 6 S, R. 23 E, sec. 5, Mount Diablo meridian, elev, 6700 ft., Madera County, Calif., May 30, 1965, H. A. Hacker. Also the following paratypes: 16 males, 12 females, same data as holotype: 3 males, 1 female, 2 miles east of Gordon's Cabins, T. 6 S, R. 23 E, sec. 3, elev. 6300 ft. Other specimens came from this area in Madera County, and from around Huntington Lake, Fresno County. Two males collected by Van Dyke in the California Academy of Sciences are from Illilouette Canyon, Yosemite Park, Mariposa County. This subspecies is known to occur from elevations of 6300 to 8000 feet. It also may occur farther south in Fresno County.

REMARKS.—In addition to aedeagal characteristics, the main differences between *hatchi* and *stapedius* are found in the convexity of the pronotum and elytra and in the punctures on the ventral surface. Superficially, the aedeagi appear very different. The extraordinary tip in *stapedius* may be just an elongation of the short tip in *hatchi*. Such a tip might require more support, and this may be why there is no lightly sclerotized strip present. The internal sacs of the aedeagi are similar.

The name *stapedius* means "stirrup" and refers to the shape of the median lobe of the aedeagus in lateral view.

280-501—68——3

17. *Pterostichus* (*Leptoferonia*) *stapedius yosemitensis*, new subspecies

FIGURES 17, 39

HOLOTYPE MALE.—Same as description of *stapedius* plus the following.

HEAD.—Frontal depression very faint.

PRONOTUM.—Outer longitudinal impressions weak; longitudinal wrinkles numerous.

AEDEAGUS (fig. 17).—Compared to *stapedius stapedius* right paramere thicker and shorter. Median lobe with basal portion more slender; tip longer, directed forward rather than parallel to axis of basal portion; extreme tip widened, directed to right. Internal sac not examined.

ALLOTYPE FEMALE.—Same as holotype except pronotum with longitudinal wrinkles less evident; a few faint punctures around longitudinal impressions; and usual female differences.

TYPE.—USNM 69608.

TYPE-LOCALITY.—One-half mile north of Crane Flat Ranger Station, Tuolumne County, Calif.

SPECIMENS EXAMINED.—5.

DISTRIBUTION (fig. 39).—Holotype, male, ½ mile north of Crane Flat Ranger Station, T. 2 S, R. 20 E, sec. 7, Mount Diablo meridian, elev. 6100 ft., Tuolumne County, Calif., Sept. 20, 1964, H. A. Hacker; allotype, female, Carlon Forest Service Camp, T. 1 S, R. 19 E, sec. 35, elev. 4300 ft., Sept. 19, 1964. Also the following paratypes: 1 male, 1 female, 2 miles northeast of Crane Flat Ranger Station, T. 2 S, R. 20 E, sec. 9, elev. 6800 ft.; 1 male, 2 miles south of Carlon Forest Service Camp, T. 2 S, R. 19 E, sec. 2, elev. 4500 ft. There is also part of a dead female from the type-locality. Two of the males are teneral, and the aedeagus of one collapsed on drying.

REMARKS.—The only differences between the two subspecies of *stapedius* seem to be in the aedeagus. Since this structure is stable within other subspecific populations in *Leptoferonia*, it seems advisable to depend on it in this case also. The nearest specimens of *stapedius stapedius* are from Illilouette Canyon, a distance of about 15 miles from Crane Flat. The paratypes have been deposited in the California Academy of Sciences.

18. *Pterostichus* (*Leptoferonia*) *caligans* Horn

FIGURES 18, 29, 38

Pterostichus caligans Horn, 1891, p. 33.—Casey, 1913, p. 126.—Van Dyke, 1919, p. 6; 1925, p. 75.—Csiki, 1930, p. 582.—Hatch, 1936, p. 705.
Leptoferonia caligans (Horn).—Casey, 1918, p. 337.—Leng, 1920, p. 56.

COLOR OF BODY.—Light rufous.

HEAD.—Head large in proportion to body; mandibles large, but not especially elongate or toothed; clypeus and labrum normal; frontal impressions fairly deep; occipital prominence normally large; groove above eye prominent; posterior pair of setiferous punctures farther removed from groove above eye than in other *Leptoferonia;* pigmented eyes very small, about as long as second antennal segment; disc with sparse, fine punctures, faintly microstrigulose.

PRONOTUM.—Narrow, widest just behind prominent anterior angles; posterior pair of setiferous punctures at rectangular or acute angles; transverse basal impression entirely absent; area between shallow inner longitudinal impression and lateral margin nearly flat; outer impression absent; disc flattened along midline, which is incised deeply; microsculpture same as head.

ELYTRON.—Humerus dentate; scutellar stria present; scutellar puncture absent; setiferous punctures on eighth stria consisting of six in anterior series, no intermediate, four or five in posterior series; only one seta on seventh stria; microreticulate.

VENTRAL SURFACE.—Mesepisternum with coarse punctures; metepisternum and sides of metasternum with sparser punctures; proepisternum and sides of prosternum with finer, sparser punctures.

LEGS.—Hind trochanter tapering to point, about half the length of hind femur, reaching nearly to setiferous puncture on femur in males; hind femur obtusely angulate along posterior margin in males; no setae on ventrolateral margins of last article of tarsus.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 18).—Unmodified.

AEDEAGUS (fig. 18).—Right paramere short. Median lobe flattened; tip evenly rounded; no lightly sclerotized strip; small lobe on right side of ventral surface. Internal sac without sclerotized tooth.

LENGTH OF BODY.—9.0 to 12.0 mm.

TYPE.—Not seen.

TYPE-LOCALITY.—"Sylvania" [Camp Meeker, Sonoma County], Calif.

SPECIMENS EXAMINED.—22.

DISTRIBUTION (fig. 38).—Most known specimens are from the Glen Ellen-St. Helena area with individual specimens from as far north as five miles west of Comptche, Mendocino County, Calif.

REMARKS.—The three species *caligans, beyeri,* and *falli* resemble each other in having large heads and mandibles and small eyes. They differ in a number of other characteristics, however; I doubt that they are closely related.

19. *Pterostichus* (*Leptoferonia*) *beyeri* Van Dyke

FIGURE 19

Pterostichus beyeri Van Dyke, 1925, p. 71.—Csiki, 1930, p. 711.—Leng and Mutchler, 1933, p. 12.—Hatch, 1936, p. 705; 1953, p. 112.

Pterostichus (*Leptoferonia*) *idahoensis* Hatch, 1936, p. 704, 706; 1953, p. 112 [fide synonymy of *beyeri*].

COLOR OF BODY.—Dark rufous.

HEAD.—Large in proportion to body; mandibles large, tips narrower than in *caligans;* frontal impressions obsolete; genae bulbous; eyes small, flattened, larger than in *caligans;* microreticulate.

PRONOTUM.—Narrow; sides feebly arcuate in anterior third, thence oblique except slightly sinuate before small rectangular hind angles; posterior pair of setiferous punctures at hind angles; when present, transverse basal impressions not extending between shallow inner longitudinal impressions; outer pair of impressions absent or very faint; midline shallow; microstrigulose.

ELYTRON.—Humerus subrectangular; humeral dentation small, acute; scutellar stria present; scutellar puncture absent; setiferous punctures on eighth stria consisting of six in anterior series, one intermediate; five to seven in posterior series; two setae at posterior end of seventh stria; microreticulate.

VENTRAL SURFACE.—A few coarse punctures on mesepisternum.

LEGS.—Hind trochanter blunt, about half the length of hind femur; hind femur robust; setae absent on ventrolateral margins of last article of tarsus.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 19).—Unmodified.

AEDEAGUS (fig. 19).—Right paramere short. Median lobe with ventral surface nearly flat; ventral surface and right side not meeting sharply; no lightly sclerotized strip; ridge on basal portion where parameres meet when folded; tip fairly long and narrow. Internal sac with prominent sclerotized tooth.

LENGTH OF BODY.—10.0 to 12.5 mm.

TYPES.—*Pterostichus beyeri,* male, CAS 1823!; *P. idahoensis,* not seen.

TYPE-LOCALITIES.—*Pterostichus beyeri,* Bitter Root Mountains, Montana. *P. idahoensis,* Pierce, Clearwater County, Idaho.

SPECIMENS EXAMINED.—3.

DISTRIBUTION.—Known form northern Idaho and extreme western Montana;

20. *Pterostichus* (*Leptoferonia*) *falli* Van Dyke

FIGURE 20

Pterostichus falli Van Dyke, 1925, p. 73.—Csiki, 1930, p. 712.—Leng and Mutchler, 1933, p. 12.—Hatch, 1936, p. 705.

COLOR OF BODY.—Light rufous.

HEAD.—Large in proportion to body; mandibles long; frontal impressions short and shallow; eyes fairly prominent, small but longer than second antennal segment; disc microstrigulose with fine sparse punctures.

PRONOTUM.—About as long as wide; sides feebly arcuate in middle, broadly sinuate before rectangular hind angles; anterior angles narrow and prominent; base proportionately narrower than in *caligans;* posterior pair of setiferous punctures at hind angles; basal transverse impression, when present, not reaching between shallow inner longitudinal impressions; outer impressions small; microsculpture as on head.

ELYTRON.—Humerus somewhat rounded; humeral dentation not large; sides subparallel; scutellar stria and scutellar puncture present; intervals nearly flat; setiferous punctures on eighth stria consisting of six in anterior series, one intermediate, seven or eight in posterior series; two setae at posterior end of seventh stria; microreticulate.

VENTRAL SURFACE.—A few coarse punctures on mesepisternum.

LEGS.—Hind trochanter blunt, short, about one-third the length of hind femur; legs slender, but not as slender as in *termitiformis;* setae present on ventrolateral margins of last article of tarsus.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 20).—Unmodified.

AEDEAGUS (fig. 20).—Right paramere small, flattened, tapering to point in lateral view. Median lobe with sharp carina extending from right side to middle of ventral surface; area adjacent to carina tumid; probably a lightly sclerotized strip present. Internal sac with prominent sclerotized tooth.

LENGTH.—9.0 to 11.0 mm.

TYPE.—*Pterostichus falli,* male, CAS 1824!

TYPE-LOCALITY.—Hills east of Hollywood, Los Angeles County, Calif.

SPECIMENS EXAMINED.—8.

DISTRIBUTION.—Known only from type-series collected by Van Dyke from hills east of Hollywood 50 years ago.

21. *Pterostichus* (*Leptoferonia*) *sphodrinus* LeConte

FIGURE 21

Pterostichus sphodrinus LeConte, 1863, p. 10.—Schaeffer, 1910, p. 393.—Casey, 1913, p. 129.—Leng, 1920, p. 56.—Darlington, 1931, p. 158.—Hatch, 1936, p. 704; 1953, p. 112.—Lindroth, 1966, p. 469.

Monoferonia idahoanus Casey, 1924, p. 78.—Leng and Mutchler, 1927, p. 10.—Darlington, 1931, p. 158 [fide synonymy of *sphodrinus*].—Hatch, 1936, p. 704; 1953, p. 112.

Monoferonia idahoensis [sic].—Leng, 1933, p. 78 [misspelling of *idahoanus* Casey].

COLOR OF BODY.—Dark piceous.

HEAD.—Eyes normally large and prominent; frontal impressions shallow, subparallel; microreticulate.

PRONOTUM.—Sides entirely arcuate before obtusely rounded hind angles; posterior pair of setiferous punctures forward, similar to *inopinus;* transverse basal impression incomplete; shallow inner longitudinal impressions not reaching base of pronotum; outer pair of impressions absent; partly microreticulate.

ELYTRON.—Humerus very rounded; humeral tooth small, not acute; scutellar stria and scutellar puncture present; eighth stria with six punctures in anterior series, one intermediate, nine in posterior series; three setae at posterior end of seventh stria; microreticulate.

VENTRAL SURFACE.—Coarse punctures on mesepisternum and metepisternum; a few punctures on proepisternum.

LEGS.—Hind trochanter blunt and about half the length of hind femur; legs relatively slender compared to *inopinus;* setae present on ventrolateral margins of last article of tarsus.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 21).—Unmodified except occasionally a small impression on face in about middle.

AEDEAGUS (fig. 21).—Right paramere short. Median lobe broad, sides subparallel in ventral view; ventral surface and right side meeting sharply; low carina present along right side of ventral surface; tip shallow, blunt; no lightly sclerotized strip. Internal sac with prominent sclerotized tooth.

LENGTH OF BODY.—9.0 to 11.5 mm.

TYPES.—*Pterostichus sphodrinus,* MCZ; *Monoferonia idahoanus,* USNM.

TYPE-LOCALITIES.—*Pterostichus sphodrinus,* "Nebraska," which probably includes Idaho and Montana (see Hatch, 1936, p. 704); *Monoferonia idahoanus,* Moscow Mountains, Idaho.

SPECIMENS EXAMINED.—20.

DISTRIBUTION.—Southeastern British Columbia, southern Alberta, northeastern Washington, northern Idaho, and probably northwestern Montana.

REMARKS.—Superficially, this species resembles the species in the *inopinus* group. This is due to the rounded elytral humeri, rounded pronotal hind angles, and the posterior pair of pronotal punctures being forward. The aedeagus and other characteristics show no similarity to those found in the *inopinus* group. Probably *sphodrinus* should be placed in the subgenus *Hypherpes.* Casey's (1924, p. 78) reference to "*osculans*" actually was to specimens of *sphodrinus.* Darlington (1931, p. 159) lists the original *osculans* as a synonym of *Monoferonia diligendus.*

22. *Pterostichus* (*Leptoferonia*) *idahoae* Csiki

FIGURE 22

Pterostichus elongatus Schaeffer, 1910, p. 391 [not Duftschmid, 1812, p. 128; not Chaudoir, 1859, p. 116].—Casey, 1913, p. 126.—Van Dyke, 1925, p. 75.—Csiki, 1930, p. 582.—Hatch, 1936, p. 705; 1953, p. 113.

Leptoferonia elongatus (Schaeffer).—Leng, 1920, p. 56.

Pterostichus (*Leptoferonia*) *idahoae* Csiki, 1930, p. 582 [new name for *P. elongatus* Schaeffer, which Csiki spelled as *elongatulus*].—Hatch, 1936, p. 705; 1953, p. 113.

Pterostichus (*Leptoferonia*) *idahoe* [sic].—Leng, 1933, p. 12 [misspelling of *idahoae* Csiki].

COLOR OF BODY.—Dark rufous.

HEAD.—Not unusually large; eyes normally large and prominent; frontal impressions shallow, divergent, forming an angle greater than 45°; microreticulate.

PRONOTUM.—Sides very arcuate in anterior two-thirds, then subparallel or slightly divergent before prominent hind angles; anterior angles not prominent; transverse basal impression incomplete; outer longitudinal impressions usually present; posterior pair of setiferous punctures at angles; microstrigulose.

ELYTRON.—Humerus somewhat rounded; humeral dentation small; scutellar stria faint or absent; scutellar puncture absent; surface convex, noticeably so toward base; setiferous punctures on eighth stria consisting of five in anterior series, intermediate present in about half the specimens examined, usually seven in posterior series; two setae at posterior end of seventh stria; microreticulate.

VENTRAL SURFACE.—Coarse punctures confined to mesepisternum.

LEGS.—Hind trochanter blunt and about half the length of hind femur; hind femur robust; setae present on ventrolateral margins of last article of tarsus.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 22).—Apical edge somewhat thickened; apical margin evenly arcuate; no carina; shallow impression on face.

AEDEAGUS (fig. 22).—Right paramere short. Median lobe small, ventral surface slightly concave; tip short, symmetrically rounded; probably lightly sclerotized strip present. Internal sac with sclerotized tooth.

LENGTH OF BODY.—8.5 to 9.5 mm.

TYPE.—Not examined.

TYPE-LOCALITY.—Moscow Mountains [Latah County], Idaho.

SPECIMENS EXAMINED.—20.

DISTRIBUTION.—Northern Idaho and western Montana.

REMARKS.—The names *Monoferonia idahoanus* Casey and *Pterostichus idahoensis* Hatch are synonyms of *P. sphodrinus* LeConte and *P. beyeri* Van Dyke, respectively, and do not apply to this species.

23. *Pterostichus* (*Leptoferonia*) *inanis* Horn

FIGURES 23, 24, 25

Pterostichus inanis Horn, 1891, p. 32.—Casey, 1913, p. 125.—Van Dyke, 1925, p. 75.—Csiki, 1930, p. 582.—Hatch, 1936, p. 705; 1953, p. 113.
Leptoferonia inanis (Horn).—Casey, 1918, p. 337.—Leng, 1920, p. 56.

COLOR OF BODY.—Piceous.

HEAD.—Eyes normally large and prominent; frontal impressions sharp, divergent, sometimes double posteriorly; disc faintly microreticulate, with sparse fine punctures.

PRONOTUM.—Sides arcuate in anterior two-thirds, oblique in basal third, sometimes slightly sinuate just before subrectangular hind angles; base bisinuate; basal transverse impression extending from outer impression to about inner impression; carina present between strong outer impression and lateral margin; area between inner and outer impressions tumid; microreticulate.

ELYTRON.—Humeral tooth usually not acute; scutellar stria usually complete, sometimes entirely absent; scutellar puncture absent; setiferous punctures on eighth stria consisting of six in anterior series, no intermediate, normally six, occasionally seven or eight, punctures in posterior series; one seta at posterior end of seventh stria; intervals usually convex; microreticulate.

VENTRAL SURFACE.—Coarse punctures confined to mesepisternum.

LEGS.—Hind trochanter long and evenly tapering to point, two-thirds the length of hind femur and usually reaching beyond the second setiferous puncture in males, somewhat shorter in females; setae present on ventrolateral margins of last article of tarsus.

SIXTH ABDOMINAL STERNUM OF MALE.—Unmodified.

AEDEAGUS (fig. 23).—Right paramere short. Median lobe stout; tip blunt and short; no well-defined strip. Internal sac with prominent sclerotized tooth.

LENGTH OF BODY.—9.5 to 11 mm.

VARIATION.—The above description and figure 23 are of Oregon specimens from Lane County northward. I have not seen the holotype; it probably is not from Oregon. This species occurs in at least four forms; perhaps after further study, some of them should be named subspecies or even full species.

Specimens from three localities in Siskiyou and Lassen Counties, Calif., have the same form of hind trochanter as Oregon specimens, but the median lobe of the aedeagus is slightly longer and narrower.

Specimens from nine localities from El Dorado County through central Tuolumne County, Calif., have the hind trochanter much more attenuate and longer. The median lobe of the aedeagus is definitely longer and more slender, and the tip is narrower and extends farther beyond the edge of the sac (see fig. 24). The elytral humeri are more strongly defined and the dentation larger and often acute.

Specimens from 15 localities, including two of the same localities in El Dorado County, Calif., show further differences. They are from El Dorado, Alpine, eastern Tuolumne, Madera, and Fresno Counties. They also have attenuate hind trochanters. The median lobe is stouter than in Oregon specimens and the tip is narrower (see fig. 25). The tip of the median lobe is more abruptly narrowed in northern specimens as compared to southern ones. The microreticulation on the head is stronger and the micropunctures less evident. The elytral striae are somewhat shallower, especially toward the apices. The elytral humeri are strong; the scutellar stria usually is absent. Occasionally, there are five punctures in the posterior series on the eighth stria, never more than six. The length is frequently less, ranging from 7.0 to 10.0 mm.

TYPE.—Not examined.

TYPE-LOCALITY.—Not known to me.

SPECIMENS EXAMINED.—112.

DISTRIBUTION.—The Cascade Range from British Columbia through Washington and Oregon and into northern California and the Sierra Nevada of California. Also recorded from Reno, Nev. In northern Oregon specimens have been found as low as 3000 feet; in Fresno County, Calif., as high as 9400 feet.

24. *Pterostichus* (*Leptoferonia*) *termitiformis* Van Dyke

FIGURES 26, 28, 33

Pterostichus termitiformis Van Dyke, 1925, p. 74.—Csiki, 1930, p. 713.—Leng and Mutchler, 1933, p. 12.—Hatch, 1936, p. 705; 1953, p. 113.

COLOR OF BODY.—Light rufous.

HEAD.—Large; eyes small, flat, about half length of first antennal segment; frontal impressions shallow; antennae long; mandibles long, distal half of left with two broad teeth; clypeus and labrum short; labrum broadly emarginate, not straight along apical margin; penultimate segment of maxillary palpus with four setae; faintly microstrigulose.

PRONOTUM.—Sides sinuate before rectangular hind angles; hind angles rather reflexed; posterior pair of setiferous punctures absent (one female has a non-occelate setiferous puncture on one side somewhat forward from angle); inner pair of longitudinal impressions shallow; outer impressions and transverse basal impression absent; faintly microstrigulose.

ELYTRON.—Humerus very rounded; humeral dentation obsolete; scutellar puncture present; usually no trace of scutellar stria; intervals nearly flat; setiferous punctures on eighth stria consisting of six in anterior series, usually no intermediate, usually seven in posterior series; two setae at posterior end of seventh stria; striae faint toward apices; microstrigulose.

VENTRAL SURFACE.—Scattered coarse punctures on thorax, density variable.

LEGS.—Hind trochanter blunt, short, about one-third the length of hind femur; legs long and slender; three pairs long setae present on ventrolateral margins and three pairs on dorsal surface of last article of tarsus.

SIXTH ABDOMINAL STERNUM OF MALE (fig. 26).—Unmodified.

AEDEAGUS (fig. 26).—Right paramere cylindrical, slightly elongate. Median lobe broad, almost symmetrical; no well-defined strip. Internal sac without sclerotized tooth.

LENGTH OF BODY.— 7.0 to 9.0 mm.

TYPE.—Male, CAS 1826!

TYPE-LOCALITY.—Marshfield [now Coos Bay], Coos County, Oreg.

SPECIMENS EXAMINED.—12.

DISTRIBUTION (fig. 33).—All specimens except one (Carpenterville, elevation 1700 feet) came from elevations near sea level. They were collected from a variety of habitats including a dense forest of *Picea sitchensis* (Bong.) Carr., sandy soil under bushes adjacent to the seabeach, sea dunes, and a stream, and in open woods of *Pseudotsuga menziesii* (Mirb.) Franco, *Arbutus menziesii* Pursh, and *Quercus* species.

REMARKS.—This species keys out to Agonini or Licini [sic] in Hatch (1953, p. 70) because of its short hind trochanters, emarginate labrum, and short clypeus. The teeth on the mandible and the setae on the maxillary palpus probably do not occur in any other species in the *Leptoferonia-Hypherpes-Anilloferonia* complex of *Pterostichus*. A new subgenus should be established for *termitiformis*.

Summary

The original purpose of this paper was to redescribe several species about which there had been some confusion. In the course of the study, 10 new forms were discovered. Seven of these are described as new species and three as new subspecies.

Sixteen species from western Oregon and California were the main subjects of study. The geographical ranges of these species are now fairly well known and are shown on distribution maps.

I have used the subgeneric name *Leptoferonia* in its traditional sense. I do not believe that all 21 species now included in the subgenus have a common immediate ancestor. Perhaps when the whole genus *Pterostichus* and especially the subgenus *Hypherpes* are revised, the subgenus *Leptoferonia* will be redefined to include fewer species.

Future studies of chromosomal karotypes, immature forms, and zoogeography may help to clarify the relationships within *Leptoferonia* and between *Leptoferonia* and *Hypherpes*.

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TABLE 1.—*Ratios of body proportions for seven species and subspecies in the subgenus* Leptoferonia (pronotal base measured through posterior setiferous puncture)

Species		Head width: pronotal width		Pronotal width: pronotal length		Pronotal base: pronotal width	
		range	median	range	median	range	median
inopinus	49 ♀	0. 69–0. 76	0. 72	0. 86–0. 97	0. 92	0. 71–0. 79	0. 75
	51 ♂	. 69– . 77	. 72	. 91– . 99	. 95	. 72– . 79	. 75
pumilus	37 ♀	. 68– . 77	. 72	. 86– . 98	. 92	. 66– . 77	. 73
pumilus	41 ♂	. 71– . 78	. 74	. 90–1. 00	. 96	. 70– . 76	. 73
pumilus	64 ♀	. 68– . 76	. 72	. 88–1. 00	. 93	. 71– . 79	. 75
willamettensis	71 ♂	. 70– . 76	. 72	. 91–1. 04	. 96	. 71– . 79	. 75
infernalis	25 ♀	. 66– . 75	. 70	. 89– . 96	. 93	. 78– . 85	. 81
northern	25 ♂	. 67– . 73	. 70	. 90–1. 00	. 96	. 77– . 83	. 80
infernalis	25 ♀	. 67– . 75	. 70	. 92–1. 00	. 98	. 71– . 78	. 74
southern	25 ♂	. 68– . 75	. 71	. 93–1. 00	. 97	. 70– . 80	. 74
fenyesi	11 ♀	. 71– . 74	. 73	. 92– . 98	. 94	. 80– . 84	. 81
fenyesi	24 ♂	. 71– . 76	. 74	. 93–1. 00	. 97	. 77– . 86	. 81
fenyesi	10 ♀	. 71– . 76	. 74	. 85– . 94	. 89	. 78– . 83	. 81
fenderi	11 ♂	. 72– . 77	. 74	. 88– . 92	. 91	. 79– . 84	. 81
cochlearis	32 ♀	. 68– . 75	. 72	. 84– . 92	. 89	. 76– . 83	. 80
	43 ♂	. 68– . 77	. 72	. 86– . 96	. 91	. 76– . 84	. 80

TABLE 2.—*Ratios of body proportions for nine species and subspecies in the subgenus* Leptoferonia

Species		Head width: pronotal width		Pronotal width: pronotal length		Pronotal base: pronotal width	
		range	median	range	median	range	median
fuchsi	29 ♀	0. 68–0. 74	0. 71	0. 92–0. 99	0. 94	0. 73–0. 83	0. 79
	36 ♂	. 66– . 73	. 71	. 90–1. 00	. 97	. 75– . 83	. 80
lobatus	17 ♀	. 67– . 72	. 71	. 85– . 91	. 89	. 75– . 79	. 77
	25 ♂	. 66– . 71	. 69	. 86– . 92	. 89	. 74– . 82	. 77
trinitensis	24 ♀	. 67– . 73	. 69	. 85– . 92	. 90	. 74– . 82	. 78
	33 ♂	. 65– . 72	. 69	. 87– . 95	. 90	. 75– . 82	. 78
humilis	33 ♀	. 66– . 71	. 68	. 87– . 95	. 90	. 76– . 83	. 80
	32 ♂	. 65– . 71	. 68	. 87– . 94	. 91	. 74– . 84	. 79
angustus	46 ♀	. 68– . 77	. 72	. 95–1. 08	1. 01	. 76– . 89	. 84
	52 ♂	. 67– . 76	. 72	. 97–1. 08	1. 04	. 77– . 89	. 84
hatchi	40 ♀	. 64– . 70	. 68	. 88– . 96	. 92	. 77– . 86	. 82
	60 ♂	. 64– . 72	. 68	. 90–1. 03	. 96	. 78– . 86	. 82
stapedius	33 ♀	. 65– . 70	. 67	. 86– . 96	. 90	. 78– . 83	. 81
stapedius	44 ♂	. 65– . 70	. 67	. 88– . 98	. 93	. 77– . 85	. 81
caligans	5 ♀	. 84– . 88	. 86	. 99–1. 06	1. 02	. 76– . 80	. 77
	4 ♂	. 85– . 88	. 87	1. 06–1. 08	1. 07	. 74– . 77	. 76
termitiformis	5 ♀	. 88– . 95	. 91	. 80– . 90	. 85	. 63– . 69	. 64
	3 ♂	. 91– . 94	. 92	. 85– . 86	. 86	. 62– . 64	. 63

TABLE 3.—*Ratios of body proportions for seven species and subspecies in the subgenus* Leptoferonia (pronotal base measured through posterior setiferous puncture)

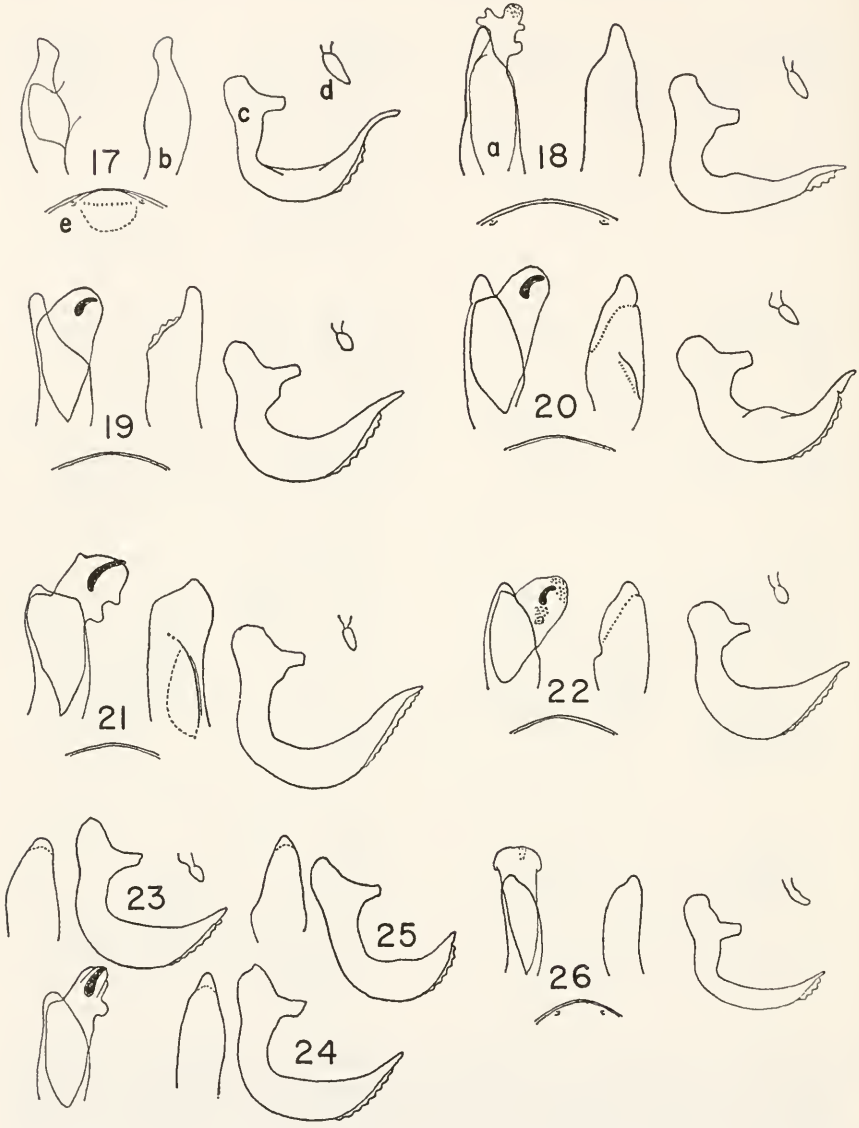
Species		Pronotal apex: pronotal base		Pronotal width: elytral width		Humeral width: elytral width	
		range	median	range	median	range	median
inopinus	49 ♀	0. 90–1. 02	0. 96	0. 77–0. 84	0. 80	0. 62–0. 68	0. 65
	51 ♂	. 90– . 98	. 95	. 79– . 87	. 82	. 63– . 69	. 66
pumilus	37 ♀	. 94–1. 06	1. 00	. 75– . 82	. 79	. 63– . 69	. 65
pumilus	41 ♂	. 93–1. 06	1. 00	. 76– . 83	. 79	. 64– . 71	. 66
pumilus	64 ♀	. 90–1. 02	. 97	. 76– . 84	. 80	. 61– . 69	. 66
willamettensis	71 ♂	. 91–1. 03	. 96	. 77– . 86	. 82	. 65– . 71	. 67
infernalis	25 ♀	. 83– . 92	. 88	. 76– . 83	. 79	. 64– . 68	. 66
northern	25 ♂	. 84– . 93	. 88	. 77– . 84	. 81	. 60– . 70	. 68
infernalis	25 ♀	. 91–1. 00	. 98	. 75– . 81	. 78	. 63– . 70	. 66
southern	25 ♂	. 90–1. 01	. 95	. 75– . 82	. 79	. 66– . 70	. 68
fenyesi	11 ♀	. 87– . 91	. 90	. 79– . 83	. 81	. 61– . 66	. 64
fenyesi	24 ♂	. 86– . 92	. 89	. 80– . 88	. 84	. 63– . 68	. 66
fenyesi	10 ♀	. 89– . 92	. 91	. 78– . 83	. 80	. 59– . 63	. 62
fenderi	11 ♂	. 87– . 94	. 90	. 79– . 85	. 84	. 62– . 68	. 65
cochlearis	32 ♀	. 87– . 98	. 90	. 77– . 85	. 81	. 58– . 66	. 61
	43 ♂	. 86– . 96	. 91	. 79– . 86	. 82	. 59– . 65	. 63

TABLE 4.—*Ratios of body proportions for nine species and subspecies in the subgenus* Leptoferonia

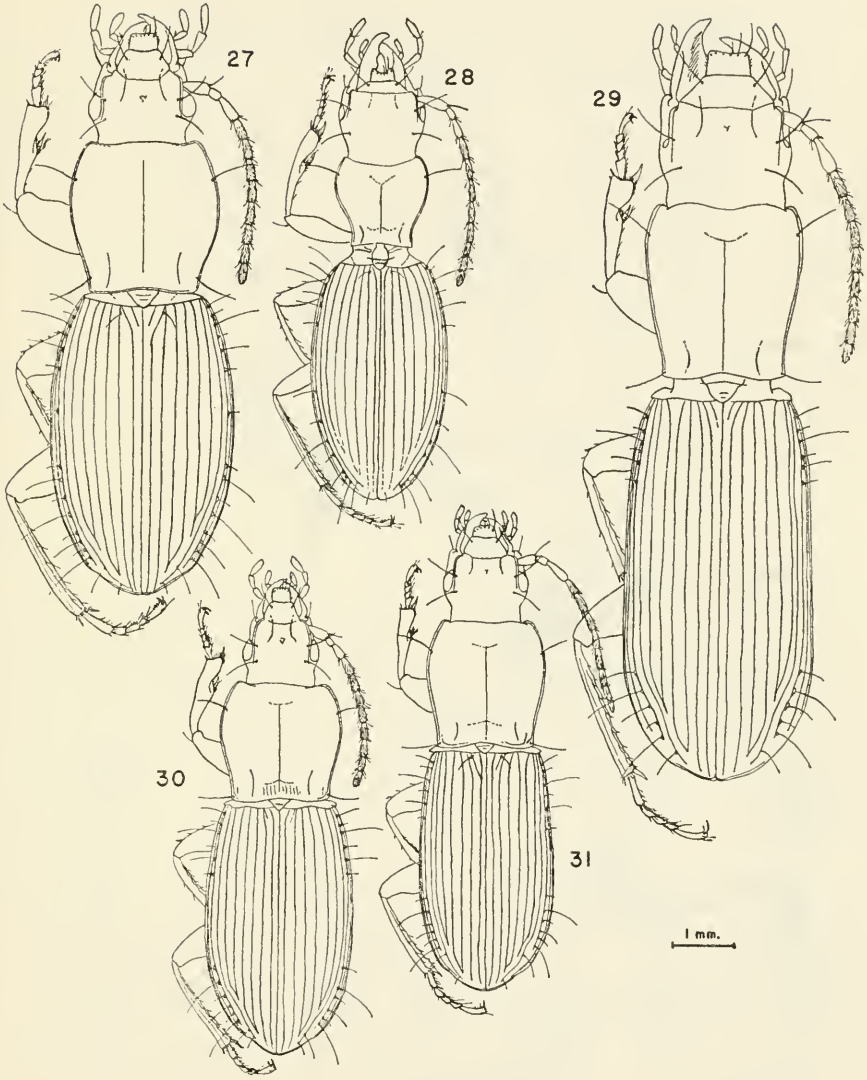
Species		Pronotal apex: pronotal base		Pronotal width: elytral width		Humeral width: elytral width	
		range	median	range	median	range	median
fuchsi	29 ♀	0. 85–0. 94	0. 90	0. 76–0. 83	0. 79	0. 67–0. 72	0. 70
	36 ♂	. 84– . 94	. 89	. 78– . 87	. 81	. 69– . 74	. 71
lobatus	17 ♀	. 91– . 95	. 93	. 73– . 77	. 74	. 61– . 67	. 64
	25 ♂	. 85– . 96	. 90	. 72– . 79	. 76	. 62– . 70	. 65
trinitensis	24 ♀	. 83– . 96	. 90	. 73– . 80	. 76	. 64– . 70	. 67
	33 ♂	. 86– . 96	. 90	. 73– . 81	. 77	. 64– . 72	. 68
humilis	33 ♀	. 85– . 94	. 88	. 73– . 79	. 77	. 64– . 72	. 68
	32 ♂	. 83– . 91	. 88	. 75– . 82	. 78	. 66– . 71	. 69
angustus	46 ♀	. 81– . 96	. 87	. 79– . 90	. 85	. 72– . 85	. 80
	52 ♂	. 80– . 95	. 87	. 81– . 91	. 86	. 73– . 86	. 80
hatchi	40 ♀	. 82– . 93	. 88	. 75– . 83	. 80	. 71– . 80	. 75
	60 ♂	. 84– . 92	. 88	. 76– . 86	. 80	. 72– . 82	. 76
stapedius	33 ♀	. 87– . 95	. 91	. 76– . 83	. 80	. 70– . 77	. 74
stapedius	44 ♂	. 85– . 96	. 91	. 76– . 84	. 81	. 73– . 78	. 75
caligans	5 ♀	1. 05–1. 08	1. 06	. 79– . 86	. 84	. 75– . 78	. 76
	4 ♂	1. 09–1. 15	1. 12	. 84– . 86	. 85	. 76– . 78	. 77
termitiformis	5 ♀	1. 16–1. 29	1. 20	. 73– . 77	. 76	. 58– . 63	. 61
	3 ♂	1. 24–1. 29	1. 28	. 75– . 78	. 76	. 59– . 62	. 59

FIGURES 1–8.—1, *Pterostichus* (*Leptoferonia*) *inopinus* (Casey); 2, *P. pumilus pumilus* Casey; 3, *P. pumilus willamettensis*, new subspecies; 4, *P. infernalis* Hatch; 5, *P. fenyesi fenyesi* Csiki; 6, *P. fenyesi fenderi*, new subspecies; 7, *P. cochlearis*, new species; 8, *P. fuchsi* Schaeffer. (a=everted sac of aedeagus; b=median lobe,ventral view; c=median lobe, lateral view; d=right paramere, lateral view; e=sixth abdominal sternum of male.)

FIGURES 9–16.—9, *Pterostichus* (*Leptoferonia*) *marinensis*, new species; 10, *P. lobatus*, new species; 11, *P. mattolensis*, new species; 12, *P. trinitensis*, new species; 13, *P. humilis* Casey; 14, *P. angustus* (Dejean); 15, *P. hatchi*, new species; 16, *P. stapedius*, new species. (See figs. 1–8 for key to letters.)



FIGURES 17–26.—17, *Pterostichus* (*Leptoferonia*) *stapedius yosemitensis*, new subspecies; 18, *P. caligans* Horn; 19, *P. beyeri* Van Dyke; 20, *P. falli* Van Dyke; 21, *P. sphodrinus* LeConte; 22, *P. idahoae* Csiki; 23, *P. inanis* Horn, northwestern Oregon; 24, *P. inanis*, El Dorado County, Calif.; 25, *P. inanis*, Fresno County, Calif.; 26, *P. termitiformis* Van Dyke. (See figs. 1–8 for key to letters.)



FIGURES 27–31.—27, *Pterostichus* (*Leptoferonia*) *pumilus willamettensis*, new subspecies; 28, *P. termitiformis* Van Dyke; 29, *P. caligans* Horn; 30, *P. hatchi*, new species; 31, *P. angustus* (Dejean).

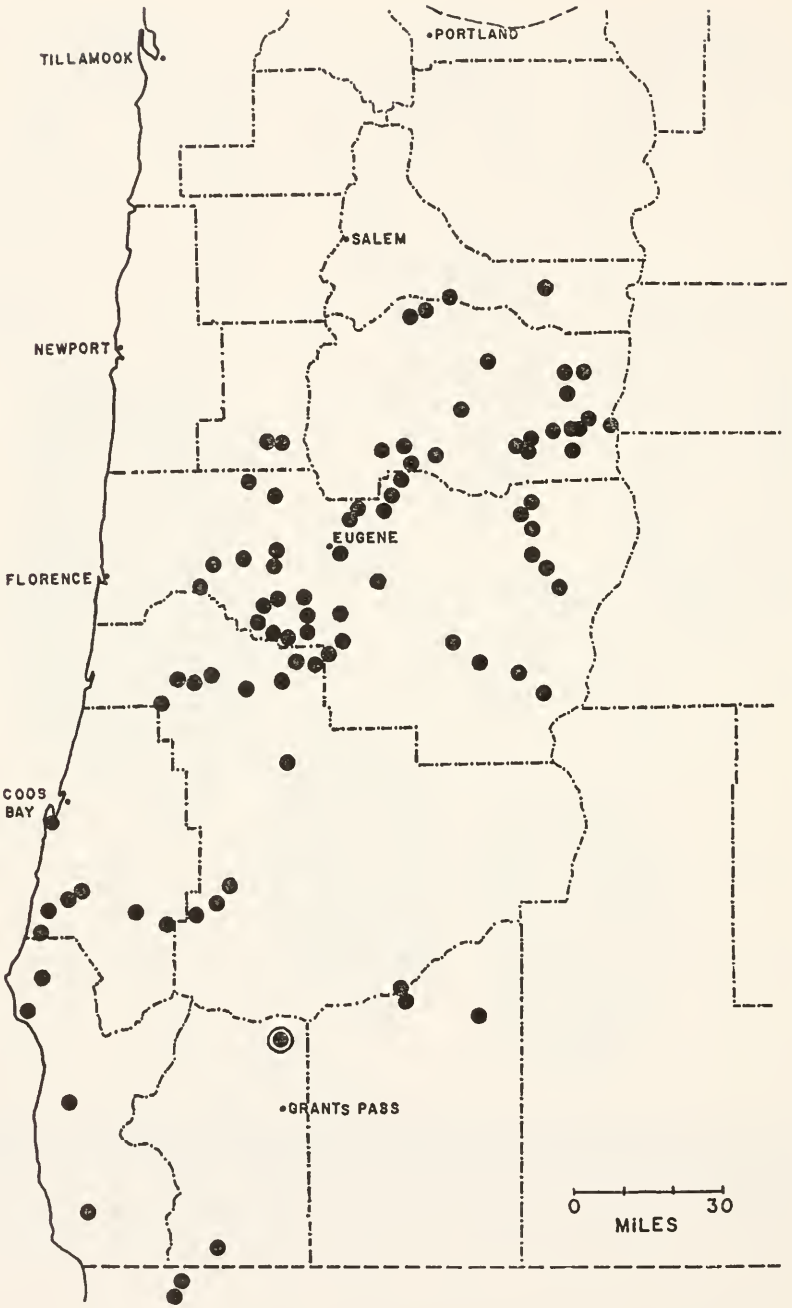


FIGURE 32.—Distribution of species of *Leptoferonia* in western Oregon.
● *Pterostichus* (*Leptoferonia*) *inopinus* Casey
Type-locality encircled

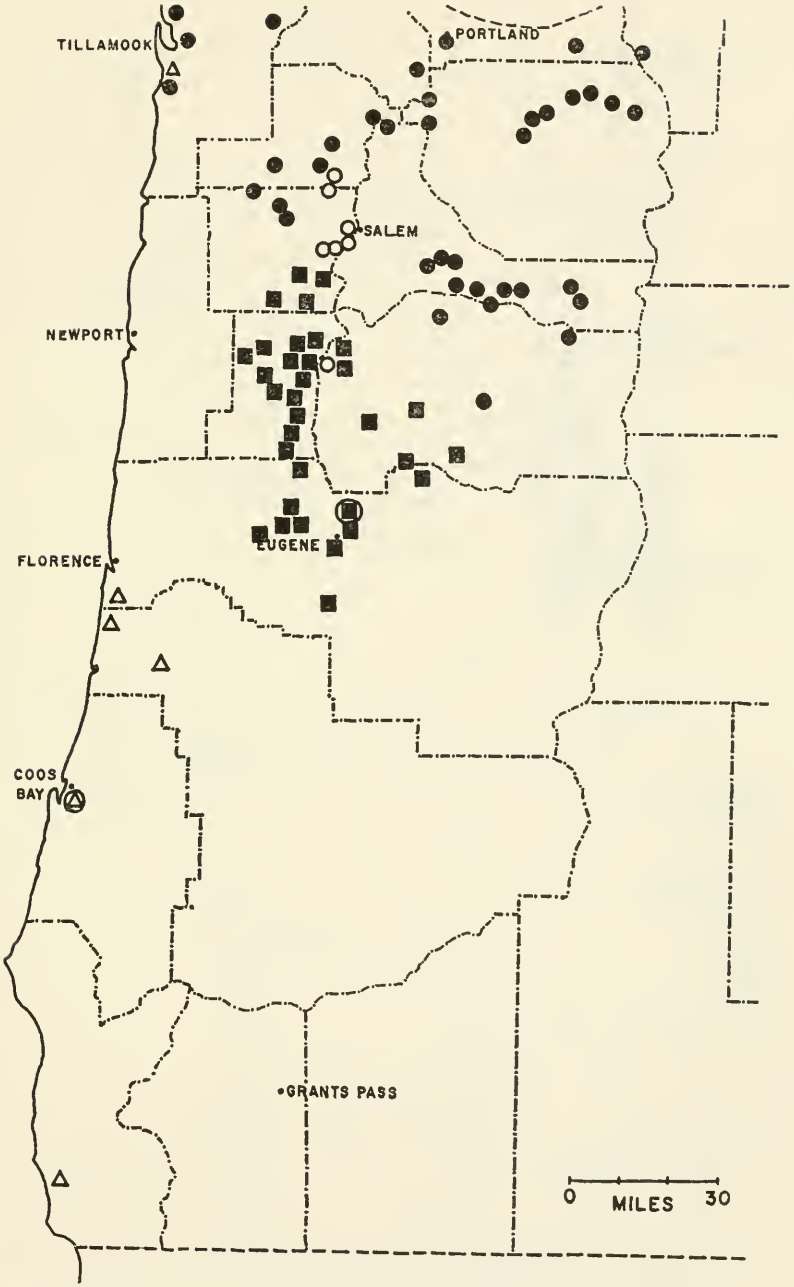


FIGURE 33.—Distribution of species of *Leptoferonia* in western Oregon.
△ *Pterostichus* (*Leptoferonia*) *termitiformis* Van Dyke ● *P. pumilus pumilus* Casey
■ *P. pumilus willamettensis*, new subspecies ○ *P. pumilus* intermediates between *willamettensis* and *pumilus* sensu stricto
Type-localities encircled

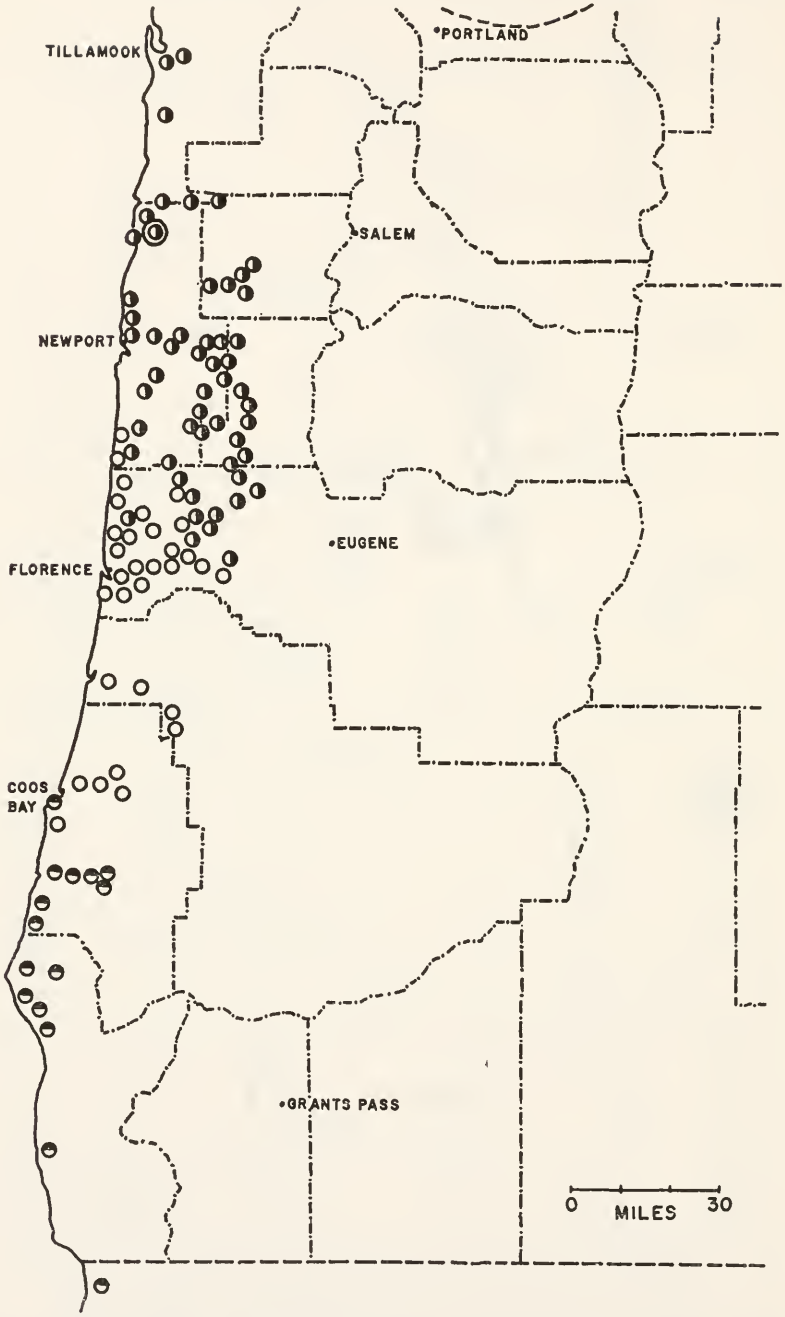


FIGURE 34.—Distribution of species of *Leptoferonia* in western Oregon.
◑ *Pterostichus* (*Leptoferonia*) *infernalis* Hatch, northern form
◓ *P. infernalis*, southern form ○ *P. infernalis*, middle form
Type-locality encircled

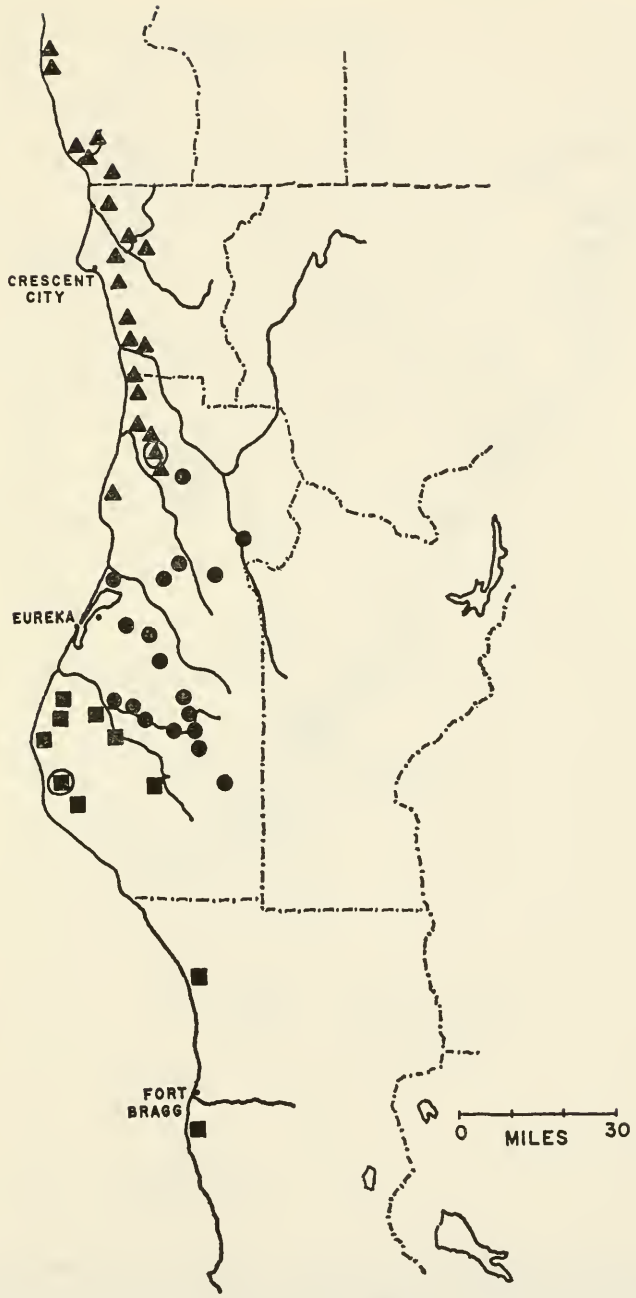


FIGURE 35.—Distribution of species of *Leptoferonia* in northwestern California.
▲ *Pterostichus* (*Leptoferonia*) *cochlearis*, new species ● *P. fenyesi fenyesi* Csiki
■ *P. fenyesi fenderi*, new subspecies
Type-localities encircled

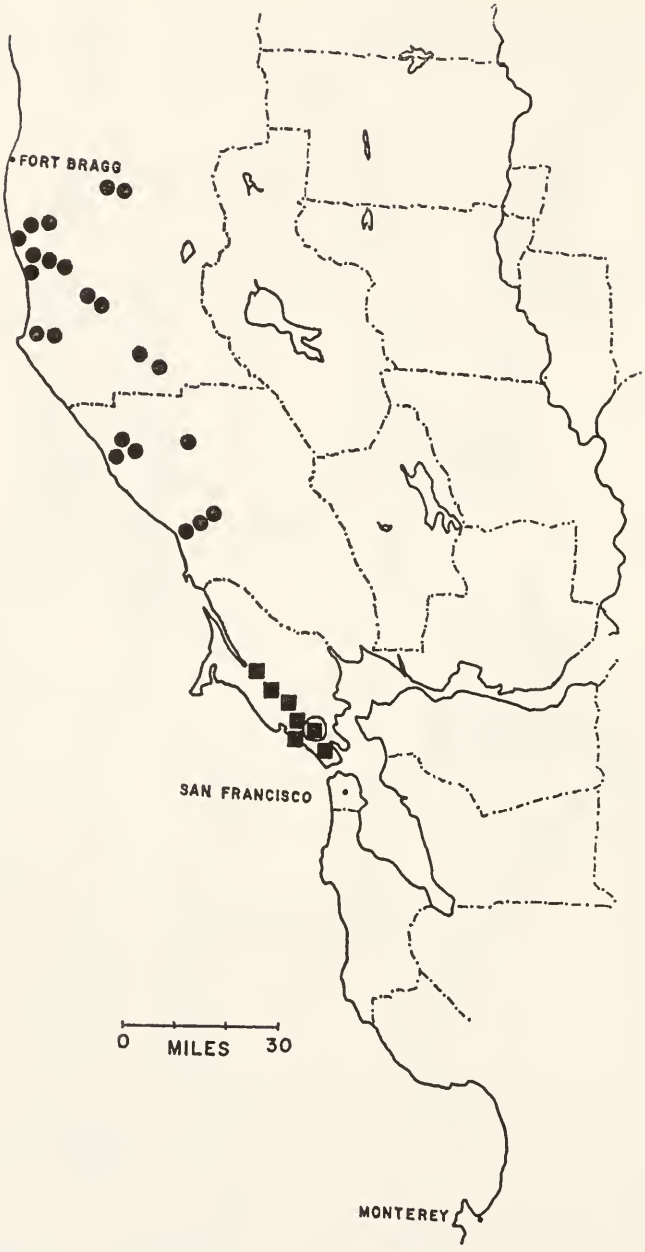


FIGURE 36.—Distribution of species of *Leptoferonia* in central western California.
● *Pterostichus* (*Leptoferonia*) *fuchsi* Schaeffer ■ *P. marinensis*, new species
Type-locality encircled

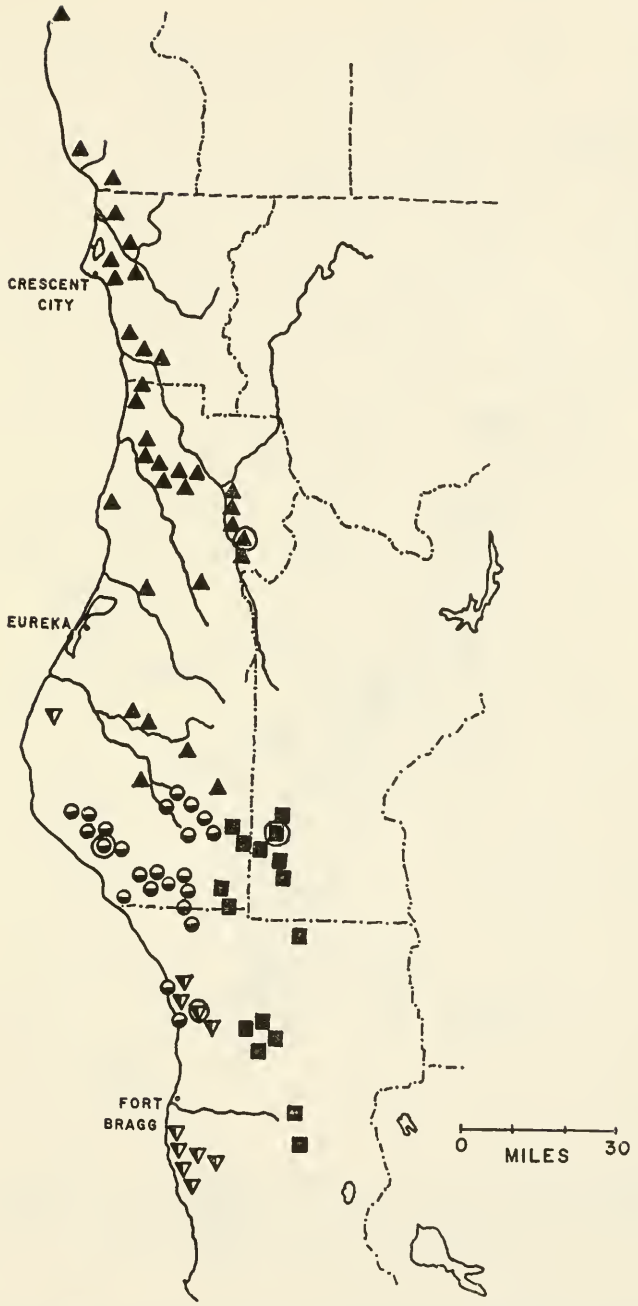


FIGURE 37.—Distribution of species of *Leptoferonia* in northwestern California.
▲ *Pterostichus* (*Leptoferonia*) *humilis* Casey ◒ *P. mattolensis*, new species
■ *P. trinitensis*, new species ▽ *P. lobatus*, new species
Type-localities encircled

FIGURE 38.—Distribution of species of *Leptoferonia* in central western California.
● *Pterostichus* (*Leptoferonia*) *angustus* (Dejean) ■ *P. caligans* Horn
Type-locality encircled

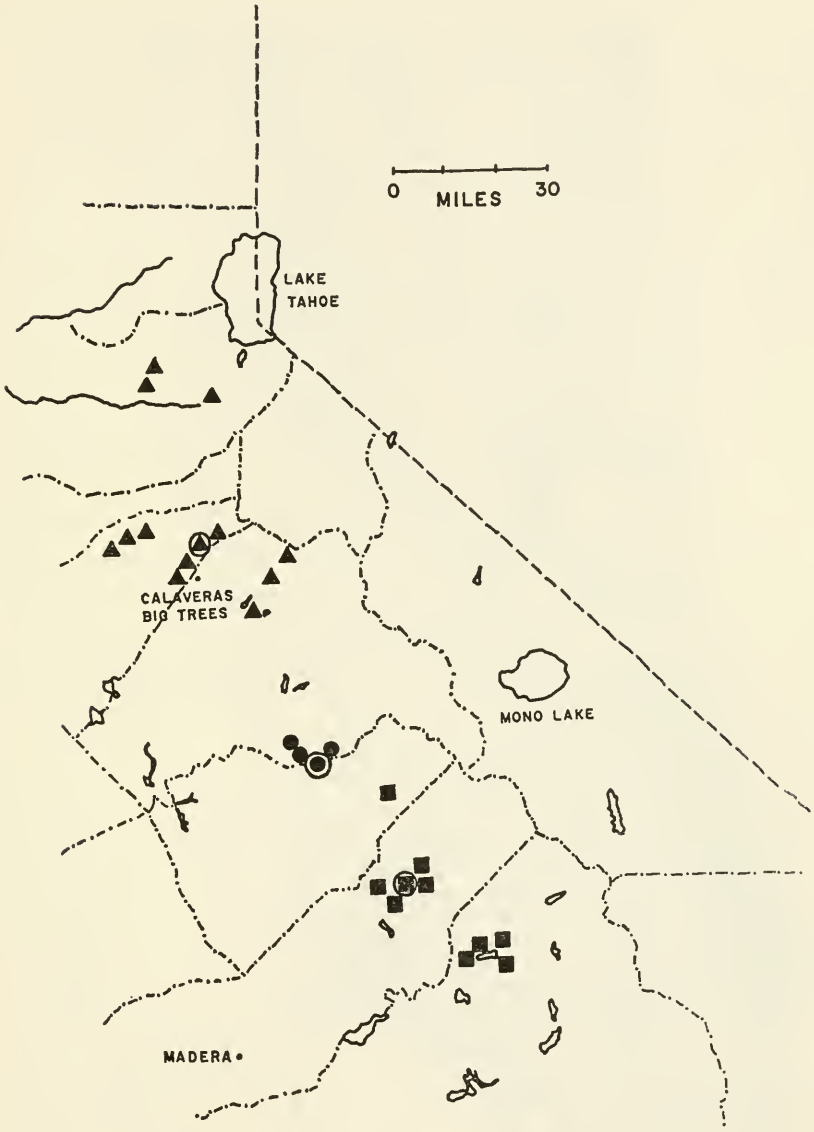


FIGURE 39.—Distribution of species of *Leptoferonia* in central eastern California.
▲ *Pierostichus* (*Leptoferonia*) *hatchi*, new species ■ *P. stapedius*, new species
● *P. stapedius yosemitensis*, new subspecies
Type-localities encircled

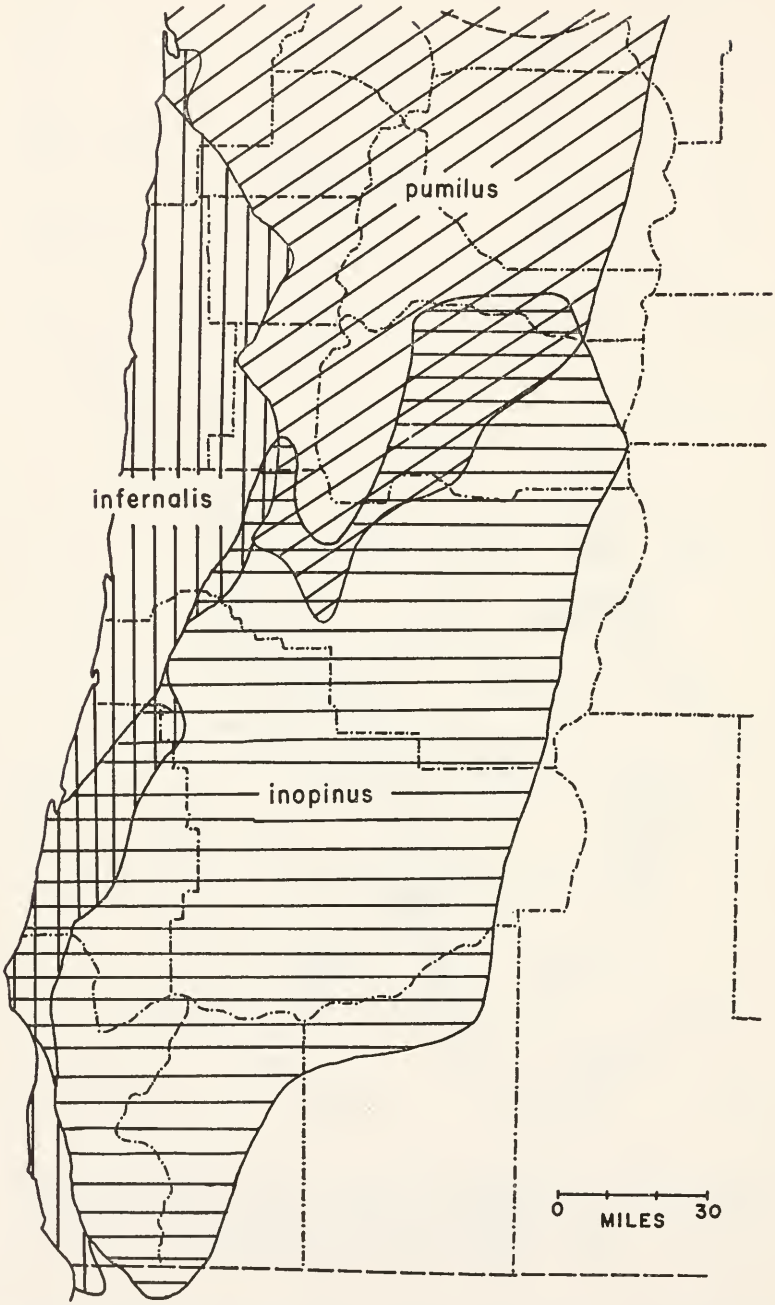


FIGURE 40.—Approximate distribution of species of *inopinus* group in western Oregon.

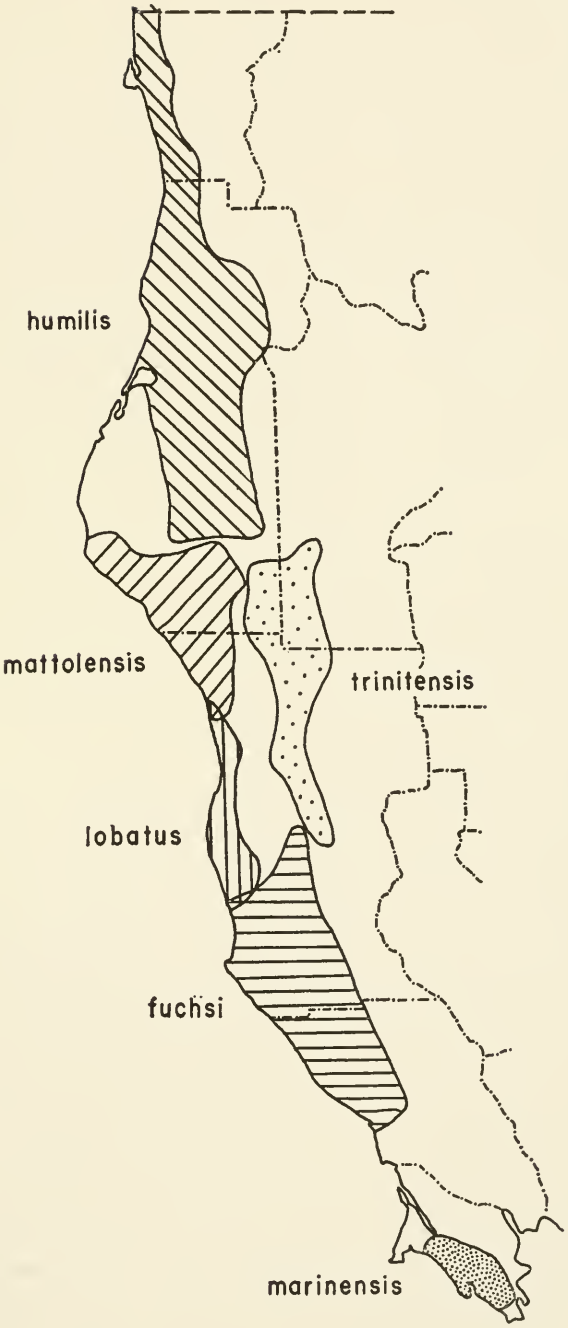


FIGURE 41.—Approximate distribution of species of *fuchsi* group in northwestern California.

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