# REVISION AND PHYLOGENY OF *ZALOBIUS*, *ASEMOBIUS*, AND *NANOBIUS*, NEW GENUS (COLEOPTERA, STAPHYLINIDAE, PIESTINAE)

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LEE H. HERMAN, JR.
*Curator, Department of Entomology*
*The American Museum of Natural History*

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## ABSTRACT

*Zalobius* and *Asemobius* are redescribed, *Nanobius* is newly described and their phylogeny and taxonomic position are discussed. One new species, *nancyae*, is described in *Zalobius*, and *serricollis*, formerly in *Zalobius*, is placed in the new genus *Nanobius*. The four species of the three genera are keyed, described, and illustrated.

The current subfamilial assignment of the genera is concluded to be unsatisfactory but the genera share no detected derived characters with other subfamilies that permit reassignment. Cladistic analysis indicates that the two species of *Zalobius* form the sister group of *Asemobius caelatus*, that *Nanobius serricollis* is the sister species of a group containing all three, and that the four species share at least six apomorphic character states. Alternative phylogenetic schemes are discussed.

The four species live in the temperate, montane areas of the western United States and Canada.

# INTRODUCTION

*Zalobius* is a heterogeneous assemblage regarded as related to *Asemobius* since the latter was described by Horn (1895). The three species of the two genera all are highly distinctive. So few specimens of the only known species of *Asemobius* have been collected that the anatomy of this animal has been virtually unexamined. Characters to support the assumed relationship of the genera have never been proposed and the subfamilial position, although rarely discussed in print, is questionable. Discovery of the first new species of *Zalobius* in more than 100 years and collection of the first series of *Asemobius caelatus* prompted me to investigate the phylogeny, distribution, and habitat of the species, and the subfamilial position of the genera.

## ACKNOWLEDGMENTS AND ABBREVIATIONS

Material used in this study was borrowed from the institutions listed below. Abbreviations preceding the names of each institution are used in the text to indicate the location of specimens. The name of the person who lent the material follows each institution name. I gratefully acknowledge their assistance. Special thanks go to John Lawrence, who lent me the types of the species described by LeConte and Horn, to Milton Campbell who allowed me to dismember completely a specimen of the rare *Asemobius caelatus*, to Alfred Newton for discussing with me aspects of the phylogeny, and to Kenneth Fender for the gift of specimens.

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## TAXONOMIC HISTORY

LeConte (1874) described *Zalobius* including only *spinicollis*, but a year later added the very dissimilar *serricollis*. The genus was placed in the Coprophilini of the Oxytelinae (which at the time were a subtribe and tribe respectively of the Oxytelinae *sensu lato*), a placement followed by subsequent authors (Eichelbaum, 1909; Bernhauer and Schubert, 1911; Leng, 1920; Hatch, 1957; Arnett, 1963). Horn (1895) described *Asemobius* with one species and considered it to be related to *Zalobius* but gave no characters to support his opinion.

After Blackwelder (1936, 1943) elevated various tribes of the Oxytelinae (*sensu lato*) to subfamilial status, Moore (1963) moved *Zalobius* and *Asemobius* from the Oxytelinae (*sensu stricto*) to the Piestinae because the procoxae are small and globose. Recently, the genera (Moore and Legner, 1973) and species (Hatch, 1957) were redescribed.

## DISTRIBUTION AND HABITAT

*Zalobius* is known from southern British Columbia south to central California (fig. 16). I have examined one specimen from Banff National Park, Alberta, but the locality seems incongruous. Generally, *spinicollis* is found in the coastal mountains and *nancyae* in the interior mountains, such as the Cascades and Sierra Nevadas.

The species have been collected at elevations from 100 (*spinicollis*) to 8000 feet (*nancyae*). Both are associated with the edge of streams, where most specimens are found in pine needles, mud, and debris (*nancyae*), or wet moss (*spinicollis*).

*Nanobius serricollis* is found from southern British Columbia to southern California (fig. 67) in both the coastal and interior mountains, where it has been collected from sea level to at least 3100 feet elevation. It is found frequently in leaf litter but has been taken occasionally in other situations. However, I collected the longest series from the cavities produced by pulling out clumps of grass growing near a stream. Extraction of the contents of the digestive tract indicates the species feeds on other animals.

Little is known about *Asemobius caelatus.* Of the four collections available, one gives only California as the locality; the other three, with more explicit data, are in Washington and southern British Columbia (fig. 67). Habitat data for *caelatus* have been recorded only once, when Milton Campbell and Aleš Smetana collected the only known series from flood debris.

## WING LENGTH

Both species of *Zalobius* are polymorphic for length of the metathoracic (flying) wings. In both the wing length varies from as long as or longer than the abdomen to about 70, 50, or 30 percent of the abdominal length. For *nancyae* the wings are short at high elevations and long at lower ones, but for *spinicollis* the wing polymorphism is not as obviously correlated (see Variation under *nancyae* and *spinicollis*).

*Nanobius serricollis* and *Asemobius caelatus* both have normally developed wings.

## SUBFAMILIAL POSITION

*Asemobius* and *Zalobius* (including *Nanobius*) are presently classified in the Piestinae because they have "globose" procoxae and abdominal parasternites and paratergites, both of which are characters used to separate the Piestinae from other subfamilies. Globose procoxae are difficult to define but signify procoxae largely covered by the prothorax. The genera currently included in the Piestinae are diverse, share few apomorphic characters, include forms with structurally dissimilar globose procoxae and probably do not represent a monophyletic assemblage. Redefinition of the Piestinae, although a problem, is beyond the scope of this paper. *Zalobius*, *Nanobius*, and *Asemobius* cannot be included in the Piestinae using apomorphic character states but they are similarly difficult to place elsewhere. This is evident from the following list of apomorphic characters found in other tribes and subfamilies but which are represented by plesiomorphic states in these three genera. The taxa with the derived condition are given below in parentheses following the character states.

*Zalobius*, *Asemobius*, and *Nanobius* lack:

a. ocelli and the lobed glandular exit of sternum VIII (Omaliinae, Proteininae)
b. well-developed, prominent grooves on the mesial surface of the procoxae (Piestinae, Osoriinae)
c. protibial antennal cleaners composed of transverse rows of closely set setae (Paederinae, Staphylininae: Xantholinini)
d. a well-developed second abdominal sternite that is separated from the third (Oxytelinae)
e. external openings for abdominal glands on tergum IX (Oxytelinae, Pseudopsinae)

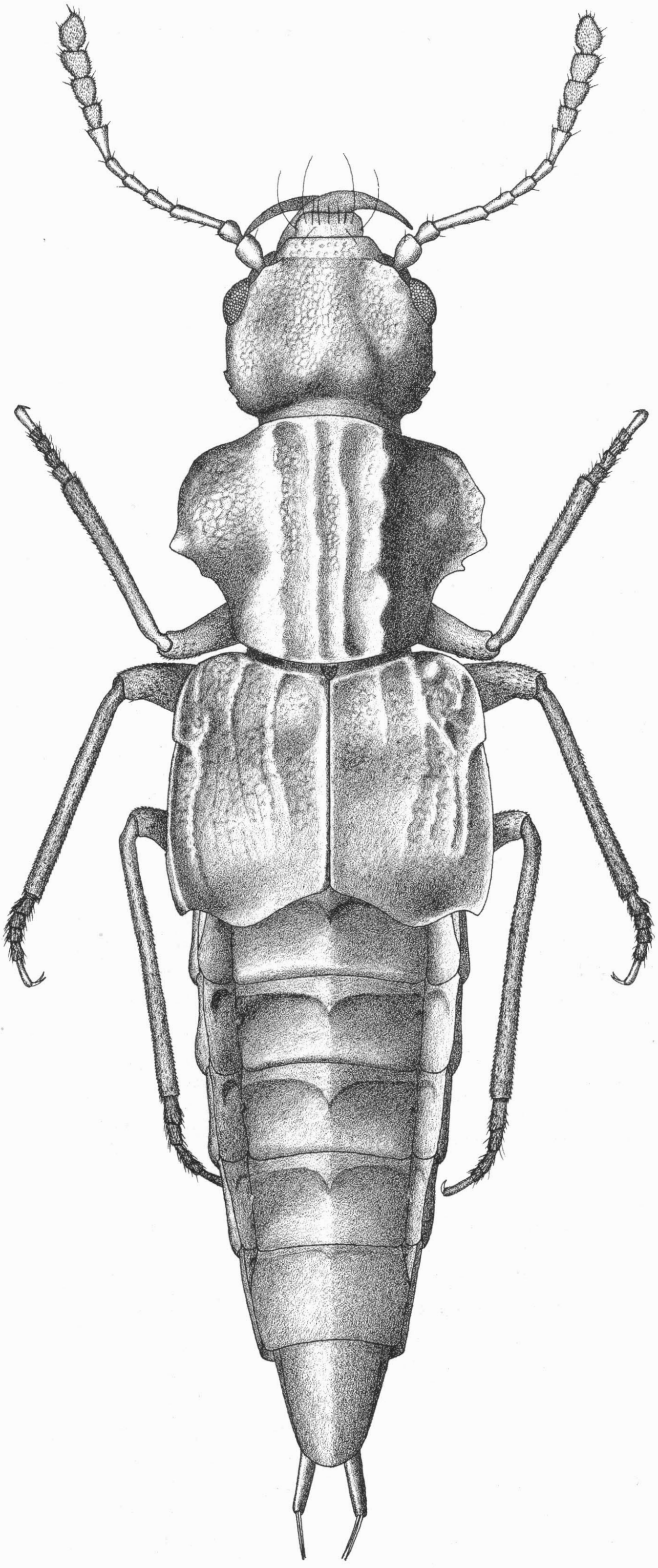


FIG. 1. *Zalobius nancyae.*

f. the enlarged securiform fourth segment of the maxillary palpus (Paederinae: Pinophilini)
g. bulbous eyes (Megalopinae, Steninae)
h. an extrusible labium (Steninae)
i. a bulbous eleventh antennomere and bicornute labrum (Megalopinae)
j. bipartite parameres (Aleocharinae, Trichopseniinae, Hypocyphtinae)
k. clasper-like development of segment VIII of the male that is incorporated into the male genitalia (Habrocerinae except *Habrocerus magnus*)
l. sclerites on the ventral surface between the neck and prosternum (Staphylininae: most Xantholinini)
m. approximate antennal insertions and narrow labrum (Staphylininae: Xantholinini, including *Diochus* and *Platyprosopus*)
n. highly flexible prothoracic–mesothoracic articulation (Staphylininae)
o. a strongly serrate anterior labral margin (Euaesthetinae, except *Edaphus*)
p. a nine-segmented antenna, the ninth of which is enlarged (Micropeplinae)
q. the longitudinal *row* of wing-folding spicules on the abdominal terga (those Phloeocharinae with fully developed flying wings, including *Charhyphus* but excluding *Derops* and *Rimulincola*)
r. the lobe on the anterior margin of sternite VII (*Rimulincola* and *Derops*)
s. enlarged, triangular mesothoracic peritremes (Trichophyinae, Proteininae), which are separated by a small triangular sclerite (*Habrocerus magnus*, Tachyporinae: Tachyporini)
t. deeply and multiply emarginate eighth abdominal terga and sterna (Tachyporinae: Tachyporini)
u. deep pitlike tentorial maculae on the dorsum of the head (Leptotyphlinae, Euaesthetinae: *Edaphus*)
v. modification of the lateral portion of tergum IX into long, often cylindrical, processes in both sexes (Staphylininae: Quediini, Staphylinini, Amblyopinini, Paederinae: Procirrina, some Paederini)

*Zalobius*, *Asemobius*, and *Nanobius* have:
a. abdominal laterosclerites (Osoriinae: Eleusini) and separated, not fused, terga and sternites of each segment (remainder of Osoriinae, some Steninae, some Tachyporinae, Paederinae: Procirrina, some Paederini, Cylindroxystini, Euaesthetinae: Stenaesthetini)
b. the basolateral edges of sternum VIII separated, not fused dorsally (Lispinini)
c. procoxal cavities that are open posteriorly, not closed by the post-procoxal lobes of the prohypomeron (Leptochirini), by lateral expansion of the prosternal furcasternum (Paederinae: Stilicopsina, Astenina, Echiasterina, Aleocharinae: Falagriini), or by enlargement of the mesothoracic peritreme (*Habrocerus magnus*, Tachyporinae: Tachyporini, Staphylininae: some Quediini, Paederinae: Dolicaonina, Pinophilini, Aleocharinae: Falagriini)
d. the prohypomeron well-developed posteriorly, rather than nearly lacking it (Staphylininae, Tachyporinae: Bolitobiini, Habrocerinae except *Habrocerus magnus*)
e. the postprocoxal lobe fused to the remainder of the prohypomeron, rather than separated (Olisthaerinae)
f. the elytral epipleural ridge (most Paederinae, Osoriinae: Eleusini, some Oxytelinae, Staphylininae)
g. a mandibular prostheca (some Paederinae, some Omaliinae, Euaesthetinae, Megalopinae, Steninae)
h. freely movable elytra instead of elytra that are fused immovably to the mesothoracic base (Leptotyphlinae)

Since *Zalobius* and *Asemobius* have most recently been included in the Piestinae (Moore and Legner, 1973) a discussion of some apomorphic character states of that subfamily is in order.

The occurrence of the extraordinarily and uniquely developed groove on the mesial surface of the procoxae into which the spiniform prosternal process fits (forming a tongue and groove) in the Piestinae and the Osoriinae suggests that they are sister taxa. The Osoriinae can be further defined by the apomorphic cylindrical abdomen that lacks paratergites and parasternites and in which the tergum and sternum are fused (*Eleusis* and *Renardia*, which lack the prothoracic groove and tongue and the cylindrical abdomen with fused terga and sterna, are the only exceptions and may ultimately be placed elsewhere in the family). The genera in the Piestinae, however, share no apomorphic characters that separate them from the Osoriinae; they simply remain after the Osoriinae have been excluded.

*Zalobius*, *Nanobius*, and *Asemobius* have a moderately developed carina on the mesial procoxal surface (as is the case in Megalopinae, Euaesthetinae, Steninae, Olisthaerinae, *Leucotachinus*, and *Rimulincola*) which is plesiomorphic compared to the strong modification in the Piestinae and Osoriinae, and should probably be excluded from the Piestinae. I cannot, however, propose a reasonable alternative to their present position, nor can I find a genus or group of genera within the Piestinae which is the sister group of *Zalobius*, *Nanobius*, and *Asemobius*.

The three genera superficially resemble *Pseudopsis* because of the carinate dorsal surface, thereby suggesting a sister-group relationship. However, *Zalobius*, *Asemobius*, and *Nanobius* lack large abdominal glands that exit at the base of tergum IX. This derived character state, present in and regarded as supporting the sister-group relationship of *Pseudopsis* (Pseudopsinae) and Oxytelinae (Herman, 1975), has not been detected in other taxa. Glands are found in other groups but the external openings are not in the same places. One near exception is the glands of the Staphylininae which, however, exit in the intersegmental membrane between terga VIII and IX. Furthermore, the glands of the Staphylininae are eversible, a feature not found in other taxa. Even if the glands and the position of their external openings in the Staphylininae, Oxytelinae, and Pseudopsinae were regarded as homologous, then a case for their being apomorphic could still be made because of their rarity in the family. Because *Zalobius*, *Asemobius*, and *Nanobius* lack this relatively rare character state, it is difficult to support a relationship with *Pseudopsis*.

On the other hand, in addition to the carinate body, *Zalobius*, *Asemobius*, and *Nanobius* share with *Pseudopsis* the presence of epipharyngeal globosetae and the dorsally fused ninth tergum. The apparent rarity of globosetae in the family, which are also found in *Rimulincola* (in Phleocharinae but actually of uncertain position) suggests that their presence is derived. However, since pegsetae and globosetae, with which they are frequently interspersed, are sometimes difficult to distinguish even with a compound microscope, they may be more widespread than is currently realized thereby requiring reappraisal of their polarity.

*Zalobius*, *Nanobius*, and *Asemobius* share with at least *Pseudopsis*, *Olisthaerus*, *Charhyphus*, *Habrocerus magnus*, Bolitobiini (Tachyporinae), most Paederinae, *Megalopinus*, Euaesthetini (Euaesthetinae), Gymnusini (Aleocharinae), Steninae, and the males of both the Silphinae (Silphidae; Blackburn, 1936) and the Omaliinae the dorsally fused tergum IX, which I have regarded as plesiomorphic (Herman, 1975) but which colleagues recently have suggested to be apomorphic based on studies of other staphylinids and Staphylinoidea (Hammond, 1975; Al Newton, personal commun.). If the fused ninth tergum is derived, it has arisen independently too frequently to be useful in determining the position of *Zalobius*, *Asemobius*, and *Nanobius* without corroborating characters.

If the Pseudopsinae and Oxytelinae are considered sister groups because they share the abdominal gland character state, then the carinate body and presence of epipharyngeal globosetae are independently derived. If Pseudopsinae is considered the sister taxon of *Zalobius*, *Asemobius*, and *Nanobius* because they share the epipharyngeal globosetae and carinate body, then the gland character state is a parallelism. The second alternative is the more parsimonious hypothesis and would be supported further if the dorsally fused ninth tergum were regarded as apomorphic rather than plesiomorphic. However, until more studies have more firmly established the polarity of the gland, setae, and tergal character states, the sister group of *Zalobius*, *Asemobius*, and *Nanobius* should not yet be considered as supportably demonstrated.

## CLADISTIC ANALYSIS

The sister group and therefore subfamilial position of *Zalobius*, *Asemobius*, and *Nanobius* are unresolved. Nonetheless, a discussion of the phylogeny of the taxa is valuable to stimulate criticism and allow us to progress in our understanding of relationships within the staphylinids.

The polarity of the characters is discussed first, followed by the relationships of the genera.

Because their sister group is not known, the polarity of the character states in *Asemobius*, *Nanobius*, and *Zalobius* must be determined by

TABLE 1
**Relative Plesiomorphy and Apomorphy of Characters**

| | Plesiomorphic | | Apomorphic |
|---|---|---|---|
| 1. | Antennomere seven similar to eight in size, shape, pubescence and surface sculpture (figs. 48, 96) | 1. | Antennomere seven conical, elongate, sparsely pubescent, and with shining surface and weak sculpturing (figs. 1, 68, 94) |
| 2. | Subocular carina absent (figs. 20, 46) | 2. | Subocular carina present (figs. 70, 71) |
| 3. | Gula without carina (fig. 71) | 3. | Gula carinate (figs. 21, 44) |
| 4. | Head without basal, dorsal carinae (figs. 1, 69) | 4. | Head with basal, dorsal carinae (fig. 45) |
| 5. | Epistomal carina absent, replaced by impression (fig. 45) | 5. | Epistomal carina present (figs. 1, 69) |
| 6. | Epipharynx without globosetae | 6. | Epipharynx with globosetae present (figs. 17, 52, 74) |
| 7. | Epipharynx without globosetae | 7. | Epipharyngeal globosetae present as median patch (figs. 52, 74) |
| 8. | Epipharynx without globosetae | 8. | Epipharyngeal globosetae present as transverse row on anterior edge (fig. 17) |
| 9. | Labrum without peglike setae on anterior margin (figs. 49, 75) | 9. | Labrum with row of peglike setae on anterior margin (figs. 17, 18, 19) |
| 10. | Labium without midlongitudinal carina (figs. 51, 84) | 10. | Labium with midlongitudinal carina (fig. 23) |
| 11. | Neck not distinguised from head dorsally (fig. 70) | 11. | Neck distinguished dorsally by transverse impression (figs. 21, 45, 46) |
| 12. | Pronotum without deep pits (figs. 1, 69) | 12. | Pronotum with deep pits near interior and posterior margins (fig. 45) |
| 13. | Pronotum and elytra without carinae or costae | 13. | Pronotum and elytra costate and/or carinate (figs. 1, 29, 45, 69) |
| 14. | Elytra with posterior margin entire | 14. | Elytra with posterior margin deeply incised (figs. 1, 29, 45, 69) |

TABLE 1 – (*Continued*)

| Plesiomorphic | Apomorphic |
|---|---|
| 15. Setae of head, pronotum, and elytra unmodified | 15. Setae of head, pronotum, and elytra scalelike (figs. 91, 92) |
| 16. Setae of head, pronotum, and elytra unmodified | 16. Setae of head, pronotum, and elytra clubbed (fig. 95) |
| 17. Punctation of head and pronotum punctiform | 17. Punctation of head and pronotum reticulate (figs. 1, 45, 69) |
| 18. Setae large, visible with dissecting microscope | 18. Setae small, visible with compound microscope (fig. 95) |
| 19. Abdominal terga without carinae (fig. 83) | 19. Abdominal terga carinate (figs. 1, 57) |
| 20. Abdominal terga without carinae | 20. Abdominal terga each with one median carina (fig. 1) |
| 21. Abdominal terga without carinae | 21. Abdominal terga with many carinae (fig. 57) |
| 22. Abdominal tergum VIII with unmodified posterior margin (fig. 1) | 22. Abdominal tergum VIII with median posterior process on posterior margin (figs. 35-39) |
| 23. Abdominal tergum VIII with unmodified posterior margin | 23. Abdominal tergum VIII with posterior margin bi-emarginate (fig. 61) |
| 24. Intergonopodal sclerite absent (fig. 64) | 24. Intergonopodal sclerite present in females (figs. 12, 87) |
| 25. Stylus present (figs. 64, 65, 87) | 25. Stylus absent (figs. 11, 12, 13) |
| 26. Tergum IX of male with lateral portion compressed and triangular in lateral view, and reaching only to apex of tergum X (figs. 60, 62, 86, 89) | 26. Tergum IX of male with lateral portion cylindrical and elongate (figs. 10, 14, 40, 41) |
| 27. Aedeagus without U-shaped basal sclerite (fig. 66) | 27. Aedeagus with U-shaped basal sclerite present (figs. 9, 34, 88) |
| 28. U-shaped aedeagal sclerite not separated basally (figs. 9, 88) | 28. U-shaped aedeagal sclerite divided basally at middle (fig. 34) |
| 29. Dorsum of head, pronotum, and elytra clean, without accumulations of mud and debris | 29. Dorsum of head, pronotum and elytra with accumulations of mud and debris |
| 30. Prohypomeron unmodified | 30. Prohypomeron with microporous depression (figs. 99-102, 104-108) |

outgroup comparison with staphylinids in general. The vast number of taxa in the family not only makes this approach difficult but also makes it inevitable that the presence of some character states in other groups will be overlooked. However, I hope that any character states here hypothesized to be derived and eventually found elsewhere will either be sufficiently rare so that they can be regarded as independently derived or will lead to better hypotheses of relationships than I present. Character states discussed in the following paragraphs are unique or occur rarely and are considered to be apomorphic. The number between parentheses refers to the characters in table 1 and in the cladograms of figures 2, 3 and 4. Illustrations of characters discussed in the following paragraphs can be found by referring to the figure numbers beside the characters in table 1.

The modified seventh antennomere (1) occurs uniquely in *Zalobius* and *Asemobius.*

Subocular carinae (2) are also found in at least *Pseudopsis*, Tachyporinae (Bolitobiini), and some Staphylininae.

The carinate gula (3) has not been found in other groups. Its manifestation in two different states, one in *Zalobius* and the other in *Nanobius*, may represent independent conditions.

The basally carinate head (4) can be found in some of the same groups mentioned in the paragraph dealing with character 13 but the particular configuration in *Nanobius* may be unique.

The epistomal carina (5) has been found only in *Zalobius* and *Asemobius.*

The presence of epipharyngeal globosetae (6) is apomorphic but the arrangement as a small median patch (7) might better be regarded as plesiomorphic compared with a transverse row (8) rather than as two independently apomorphic conditions (see also discussion of these setae under Subfamilial Position).

The row of peglike setae on the anterior margin of the labrum (9) and the midlongitudinal labial carina (10) are unique in these three genera.

The presence and absence of a neck are both widespread in the family and both occur in most subfamilies. I tentatively consider the dorsally distinguished neck (11) to be derived.

The transverse rows of deep pits (12) on the anterior and posterior regions of the pronotum are unique in *Nanobius*.

Taxa with prominent carinae and costae on the pronotum and the elytra (13) are scattered throughout the family in such groups as Pseudopsinae, Paederinae (*Myrmecosaurus*), Osoriinae (*Aneucamptus*, *Rhopalopherus*, *Thoracophorus*), Micropeplinae, and Piestinae (*Eupiestus*, some *Piestus*). A carinate or costate body may be found elsewhere but most staphylinids have a smooth or moderately grooved body.

The incision of the apicolateral angle of the posterior margin of the elytra (14) is considered apomorphic here, not because it is unique in the family, but because of the degree to which it is developed in *Zalobius*, *Asemobius*, and *Nanobius*. An incision is also found among the Aleocharinae (Hammond, 1975) but there it is a shallow-to-deep sinuation of the margin. In other subfamilies the incision is absent or obsoletely developed. Most staphylinids have a truncate or broadly rounded posterior elytral margin.

The scalelike setae (15) of *Zalobius* have not been found in other groups. However, similar setae, which are actually partially campanulate, occur in *Pseudopsis minuta* (Herman, 1975, figs. 14, 15).

Clubbed setae (16) have been recorded elsewhere in the family (see *Pseudopsis*) but are rare.

The reticulately punctate body (17) is found in the Omaliinae (Coryphiini) and Paederinae (several subtribes), but is uncommon in the family. Most staphylinids have a relatively smooth body or if punctate, the punctures are distinct, and small to large but do not form a reticulate pattern.

Microscopic setae (18) may occur elsewhere in the family but are rare.

The presence of abdominal carinae (19), which are present in some of the taxa listed with character 13, seems derived but the two different conditions found in *Nanobius* and in *Zalobius* may not be homologous. In one case, the carinae are numerous and irregular in length and shape (21) whereas in the other they are regular in length and shape and there is only one per segment (20).

The posteriorly produced (22) or biemarginate (23) eighth tergal margin have not been found elsewhere.

The intergonopodal sclerite (24) of the female, the presence of which I regard to be derived, is found in *Asemobius* and *Zalobius*, some Tachyporinae (Bolitobiini), some Omaliinae, some Piestinae (*Nodynus*), and some Staphylininae (*Othius*) and according to Tanner (1927, as sternite X) in some Carabidae, Scarabaeidae, Cebrionidae, Dascillidae, and some agyrtine Silphidae (Al Newton, personal commun.). However, since the sclerite is found in some other Coleoptera its presence in the Staphylinidae may actually be plesiomorphic.

The loss of a stylus (25) is derived, has occurred repeatedly in the family and therefore its utility for cladistic analysis is limited.

The females of *Zalobius spinicollis* and *Z. nancyae* have a pair of cylindrical, elongate, heavily sclerotized coxites extending beyond the eighth abdominal segment. Entirely similar looking structures are seen in the males of the same species but are cylindrical elongations of the lateral sides of tergum IX (26). This modification of segment IX in *Zalobius* is regarded as derived because it is rare in the family. Similarly elongate, cylindrical modifications of tergum IX are found in Staphylininae (Staphylinini, Quediini, and Amblyopinini), where they were misinterpreted by Blackwelder (1936) as valvulae, and in the Procirrina and *Astenus* of the Paederinae. In the Staphylininae these elongate parts of IX are separated medially and appear as two distinct sclerites, perhaps attached by a narrow, transverse sclerite, but in the Procirrina and *Astenus* are connected medially by the broad median portion of tergum IX.

The U-shaped aedeagal sclerite (27) shared by *Asemobius* and *Zalobius* is also found in most [all?] Omaliinae, some Paederinae (*Ochthephilum*), some Pseudopsinae, and the Micropeplinae and is regarded here as derived. If, as has been suggested (Al Newton, personal commun.), it is homologous with the basal piece of the Silphidae (Sharp and Muir, 1912; Blackburn, 1936) and the Leiodidae (Crowson, 1955), then its presence may have to be considered as plesiomorphic. However, its rare occurrence as a divided sclerite (28) is apomorphic (see *Pseudopsis minuta* and *Zalobius*).

The accumulation of mud and debris on the dorsal surface (29) and the microporous depressions of the prohypomeron (30) have not been found in other groups.

Based on the preceding characters *Zalobius spinicollis*, *Zalobius nancyae*, *Nanobius serricollis*, and *Asemobius caelatus* form a monophyletic, although heterogeneous, group (figs. 2, 3, 4) sharing the presence of epipharyngeal globosetae (6), incised posterior elytral margin (14), costae and carinae on the dorsal surface of the body (13), reticulate punctation of the body (17), the habit of accumulating mud and debris on the dorsal surface of the head, prothorax, and elytra (29), and the microporous depression on the prohypomeron (30).

From here there are three plausible hypotheses which, in the order of discussion, have 4 (fig. 2), 5 (fig. 3), and 7 (fig. 4) multiply derived character states.

In each of the cladograms *spinicollis* and *nancyae* are sister species sharing the presence of the transverse row of epipharyngeal globosetae (8), row of peglike setae on the anterior labral margin (9), carinate labium (10), scalelike setae on the head, pronotum and elytra (15), abdominal terga with one median carina (20), absence of the stylus (25), and elongate, cylindrical lateral portion of tergum IX of the males (26). To regard either of these species as being more closely related to either *serricollis* or *caelatus* would necessitate multiple derivation of seven character states.

In the first cladogram (fig. 2), *caelatus* is the sister species of *spinicollis-nancyae*, sharing the conical, sparsely pubescent, elongate seventh antennomere (1), the epistomal carina (5), the presence in the female of an intergonopodal sclerite (24), and in the male of the U-shaped aedeagal sclerite (27). The remaining species, *serricollis*, is the sister species of all the others.

In the second cladogram (fig. 3), *serricollis* is the sister species of *spinicollis-nancyae*, sharing the dorsally distinct neck (11), carinate gula (3) and carinate abdominal terga (19). Their sister species is *caelatus*.

The cladogram of figure 4 presents *serricollis* and *caelatus*, sharing only the median patch of epipharyngeal globosetae (7), as the sister group of *spinicollis-nancyae*.

The autapomorphic states (2, 4, 12, 16, 18, 21, 22, 23, 28) can be eliminated from further

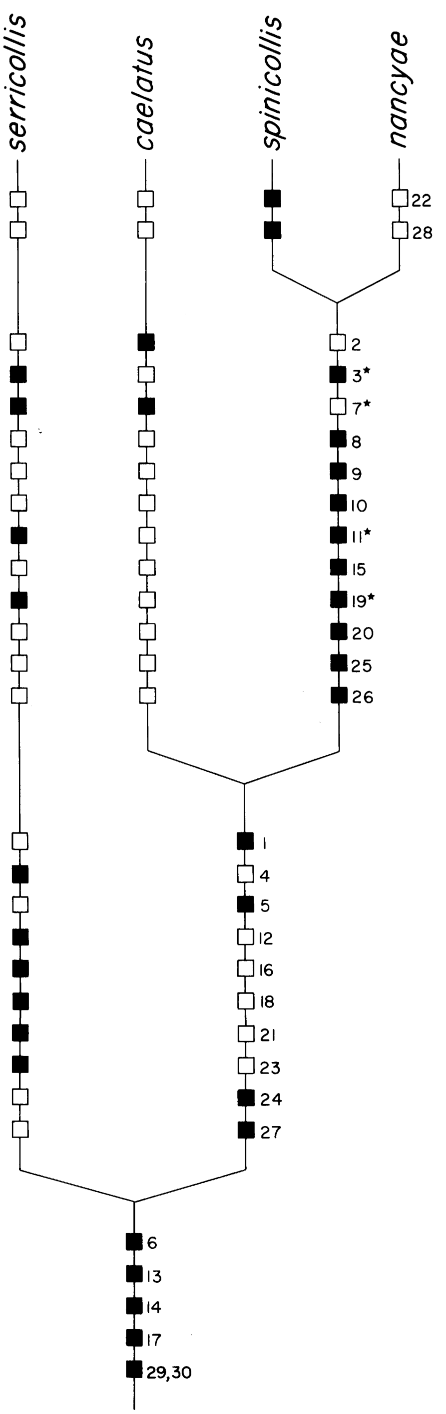



FIG. 2. Proposed phylogeny of *Zalobius*, *Nanobius*, and *Asemobius*. Numbers refer to characters in table 1. Black squares indicate apomorphic condition and white squares its plesiomorphic homologue. Numbers with star indicate independently derived character states.

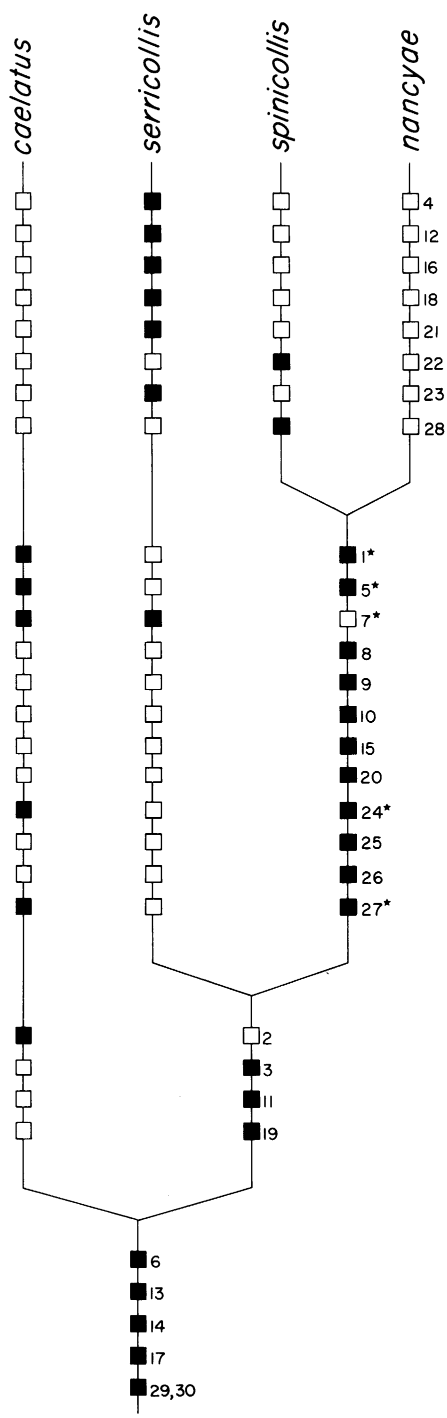



FIG. 3. An alternative phylogeny of *Zalobius*, *Nanobius*, and *Asemobius*. Numbers refer to characters in table 1. Black squares indicate apomorphic condition and white squares its plesiomorphic homologue. Numbers with star indicate independently derived character states.

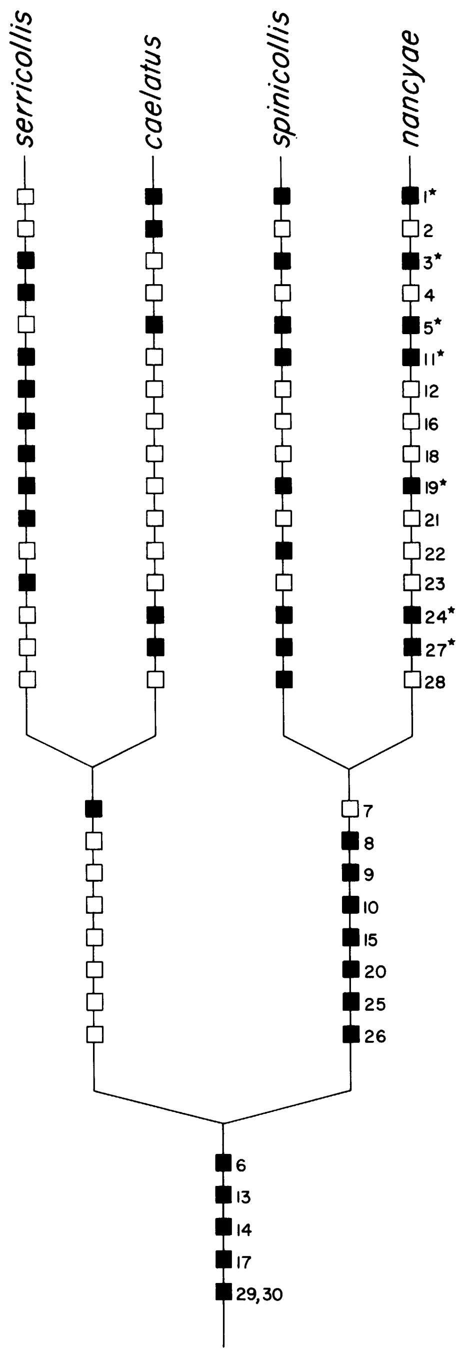



FIG. 4. An alternative phylogeny of *Zalobius*, *Nanobius*, and *Asemobius*. Numbers refer to characters in table 1. Black squares indicate apomorphic condition and white squares its plesiomorphic homologue. Numbers with star indicate independently derived character states.

consideration. In the first cladogram (fig. 2) of the states that remain, all are derived once except four, the carinate gula (3), the median patch of epipharyngeal globosetae (7), the dorsally distinct neck (11), and carinate abdominal terga (19), which appear twice. In the second cladogram (fig. 3) five character states, the modified seventh antennomere (1), the epistomal carina (5), the median patch of epipharyngeal globosetae (7), the intergonopodal sclerite of the female (24), and the basal U-shaped aedeagal sclerite (27), arose twice. In the third scheme, seven characters (1, 3, 5, 11, 19, 24, 27) arose twice.

The cladogram of figure 2 is the most parsimonious with only four characters derived more than once. However, if the characters (3, 7, 19, 24, 27) about which problems were expressed in the analysis of characters (see beginning of this section) are eliminated from the cladograms, then several alterations occur.

Starting with the most parsimonious hypothesis (fig. 2), elimination of these characters leaves only two (1, 5) to support the *caelatus-spinicollis-nancyae* lineage and removes all except one (11) multiply derived character, which is only tentatively regarded as derived. In figure 3, two independently derived character states remain (1, 5) but only character 11 supports the *serricollis-spinicollis-nancyae* line. In the third case (fig. 4) only three characters arise twice but support for the *serricollis-caelatus* lineage is lost.

The cladogram of figure 2 remains the most parsimonious.

## TAXONOMIC CONCLUSIONS

If we accept the most parsimonious (fig. 2) hypothesis of phylogenetic relationships, then taxonomic changes are required.

First, *spinicollis*, the type species of *Zalobius*, and *nancyae* are clearly related so that even if all other species are excluded *Zalobius* would include these two. Second, if *serricollis* continues to be regarded as a member of *Zalobius*, then *caelatus* must also be included since it is the sister species of *spinicollis-nancyae.* On the other hand, if *caelatus*, the type species of *Asemobius*, is still recognized as a separate genus, then *serricollis* must also be considered a separate genus rather than be included, as it presently is, in *Zalobius.*

To bring attention to the numerous differences among *serricollis*, *spinicollis*, and *caelatus*, and to reduce the heterogeneity of *Zalobius*, I propose that *serricollis* be removed from *Zalobius* and reassigned to a new genus, *Nanobius*. Although it would be more desirable to reduce rather than to increase the number of genera, in this case, to synonymize *Zalobius* and *Asemobius* would not only increase the diversity of *Zalobius*, but also mask the strong differences among the species.

## KEY TO THE SPECIES OF *ZALOBIUS*, *NANOBIUS*, AND *ASEMOBIUS*

1. Head with suborbital carina (figs. 70, 71); abdominal terga without longitudinal, basal carinae (fig. 83) . . . . . (*Asemobius*) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . *caelatus*
   Head without suborbital carina (figs. 20, 21, 44, 46); abdominal terga III to VI each with one or more longitudinal, basal carinae (figs. 1, 57) . . . . . . . . . . . . . . . . . . . . 2
2. (1). Antennomere 7 sculptured, opaque, densely pubescent, and similar in length and shape to article 8 (figs. 48, 96); abdominal terga III to VI with more than one basal, longitudinal carina . . . . (*Nanobius*) . . . . . . . . . . . . . . . . . . . . . . *serricollis*
   Antennomere 7 smooth, shining, sparsely pubescent, cone-shaped and longer than article 8 (figs. 1, 26, 94); abdominal terga III to VI each with one basal, longitudinal carina (fig. 1) . . . (*Zalobius*) . . . . . . . . . 3
3. (2). Tergum VIII with posterior margin medially produced (figs. 35-39) . . . *spinicollis*
   Tergum VIII with posterior margin rounded (fig. 7). . . . . . . . . . . . . . . . . . . *nancyae*

## *Zalobius* LeConte

Figures 1, 5-43, 91-94, 104-106

*Zalobius* LeConte, 1874, p. 49; 1875, p. 170. Fauvel, 1878, pp. 255, 257. Horn, 1895, pp. 236, 237, 239, pl. XX. Fall, 1901, p. 77. Eichelbaum, 1909, p. 121. Bernhauer and Schubert, 1911, p. 88. Leng, 1920, p. 95. Hatch, 1957, pp. 85, 87, 88, pl. XII. Arnett, 1963, pp. 238, 255. Moore, 1963, p. 47. Moore and Legner, 1973, pp. 118, 129-131; 1974, p. 556; 1975, p. 165.

*Type species*. *Zalobius spinicollis* LeConte, by monotypy.

*Diagnosis*: *Zalobius* may be separated from all genera of the Piestinae except *Nanobius* and *Asemobius* by the incision of the posterior elytral margin (figs. 1, 29), the costate pronotum (fig. 1), the spiniform processes (figs. 1, 5, 6, 31) of the lateral pronotal margin, and the presence of globosetae on the epipharynx (fig. 17). *Zalobius* can be separated from *Asemobius* by the shallower incision of the posterior margin of the elytra (figs. 1, 29), the absence of subocular carinae (figs. 20, 21), and presence of a median longitudinal carina on abdominal terga III to VI (fig. 1). The discussion above under Subfamilial Position will separate *Zalobius* from genera of other subfamilies.

*Description*. Length 3.5 to 7.00 mm. Body moderately broad, moderately flattened, and strongly sculptured with punctation and carinae and costae (fig. 1).

Head strongly punctured and without carinae; setae short. Labrum (fig. 18) with anterior margin truncate or slightly sinuate, and without enlarged, exposed epipharyngeal lobes; dorsal surface with long setae. Epipharynx (fig. 17) with globosetae at anterior margin. Anteclypeus (fig. 1) large and apparently permitting extrusion of labrum. Supra-antennal ridge (fig. 1) low and poorly developed. Epistomal suture evident externally as ridge (fig. 1) but absent internally. Neck (figs. 20, 21) distinguished from head laterally, ventrally and dorsally. Mandibles (fig. 24) symmetrical, bidentate, long and slender; mola absent; and prostheca present; lateral surface with row of setae and with carina of basal half of ventral edge present and that of dorsal edge absent. Maxillary palpus (fig. 22) four segmented; fourth segment stout and elongate with irregularly arranged chorodonal organ (fig. 25). Labium as in figure 23; palpus three-segmented. Hypopharynx (fig. 27) with two anterior lobes, with row of stout setae extending from lobe onto disk and with numerous cuticular processes. Gular sutures (fig. 21) moderately widely separated and divergent posteriorly and anteriorly; gula with median carina; submentum and gula not separated by submental suture.

Pronotal lateral margin spinose (figs. 1, 5, 6, 31); pronotal dorsal surface costate and broadly elevated medially. Protergosternal suture present (fig. 28). Prohypomeron with shallow depression anteriorly (figs. 104-106). Procoxal fissure narrowly open (fig. 28). Postprocoxal lobe present.

Procoxae with shallow groove on mesial surface (as in figs. 58, 59). Prosternal process cariniform (fig. 28).

Scutellum with apex slightly exposed from under pronotum. Elytra with carinae (figs. 1, 29) and with poorly developed rows of punctures; epipleural ridge present. Mesocoxae (fig. 32) contiguous.

Tibiae without rows of spines. Tarsal formula 5-5-5.

Abdominal segments III to VI each with well-developed paratergite and with parasternite present and narrow or small (fig. 30) to absent; segment VII with one pair of laterotergites; paratergites III to VI with basal impression (figs. 1, 30); terga III to VI with one basal, longitudinal carina (fig. 1). Sternal sclerites of segment I present (fig. 33) and medially divided. Sternite II reduced and fused to III (fig. 33). Sternites II and III with median, longitudinal carina (fig. 33).

Tergum IX fused dorsally at basal (figs. 13, 40). Tergum X triangulate (figs. 13, 40) with obtusely pointed apex.

Aedeagus (fig. 34) trilobed. Parameres long and slender. Median lobe with (figs. 9, 34) sclerite surrounding basal orifice.

Female. Tergum IX with ventromesial edge lobed (fig. 12). Stylus absent (figs. 11-13). Coxites cylindrical (figs. 11-13). Valvifer moderately large (figs. 11, 12). Midventral intergonopodal sclerite present (fig. 12).

**Zalobius nancyae**, new species
Figures 1, 5-16

*Holotype.* California: Sierra County: 14 mi. E Sierra City, Yuba Pass, 6700 feet elevation, June 26, 28, 1976, collected in mud at edge of a spring-fed stream, L. and N. Herman.

*Paratypes.* 60 specimens. CALIFORNIA: *Alpine County*: 26.5 mi. NE Strawberry (Tuolumne Co.), near Clark Fork River, 6400 feet elevation, July 15, 1976, from moss-covered stick in small stream, L. and N. Herman (1 AMNH). *Amador County*: 1.3 mi. W Pine Grove, 2200 feet elevation, May 19, 1976, flood debris, forest stream, A. Newton, M. Thayer (4 MCZ). *Eldorado County*: 3 mi. E Kyburz, 5500 feet elevation, August 16, 1969, A. Smetana (4 AMNH; 20 CNC). *Fresno County*: Sequoia National Forest, 3 mi. W Cedar Grove, 4400 feet elevation, May 14, 1976, flood debris, forest stream, A. Newton, M. Thayer (4 MCZ); Sierra National Forest, Tamarack Ridge, 3.4, 5.1 mi. SE Highway 168, 7400-7500 feet elevation, May 16, 1976, wet debris, forest stream, A. Newton, M. Thayer (4 MCZ); Sierra National Forest, 30 mi. N Kaiser Pass, 8000 feet elevation, May 15, 1976, A. Newton, M. Thayer (1 MCZ). *Madera County*: Chiquito Creek, 4100 feet elevation, June 27, 1920, H. Dietrich (3 CU); Northfork, March 30, 1920, H. Dietrich (1 CU); Sugar Pine, A. Fenyes (5 CAS). *Sierra County*: same data as holotype (6 AMNH). *Tulare County*: Sequoia National Park, 9.2 mi. S Kaweah Camp, 3200 feet elevation, May 13, 1976, wet debris, forest stream, A. Newton, M. Thayer (1 MCZ); Sequoia Park, Tokopah Valley, 6500-7000 feet elevation, July 22, 1927, H. Notman (1 SIM).

OREGON: *Grant County*: Mount Vernon, July 4, 1961, K. Fender (1 KF). *Jackson County*: Highway 140, Little Butte Creek, June 23, 1974, A. and D. Smetana (1 CNC). *Klamath County*: 13 mi. NE Bly, Deming Creek, July 4, 1974, J. Schuh (1 JS). Gearhart Mountain, 6500-7200 feet elevation, June 23, 1974, A. and D. Smetana (1 CNC). *Wheeler County*: 10 mi. NNE Spray, Northeast Fork Deadhorse Creek, 3178 feet elevation, July 6, 1964, H. B. Leech (1 CAS).

*Diagnosis*: In addition to the characters in the key, *nancyae* is distinguishable from *serricollis* and *caelatus* by the form of the pronotum (figs. 1, 5, 6), the long slender mandibles (as in fig. 24), the long cylindrical coxites of the female (figs. 11, 12, 13) and the long, cylindrical lateral posteriorly directed processes of tergum IX of the male (figs. 10, 14). *Zalobius nancyae* is most easily and consistently separated from *spinicollis* by the rounded (figs. 1, 7), as opposed to the produced (figs. 35-39) posterior margin of tergum VIII. The two lateral elytral carinae of *nancyae* usually meet near the middle of the lateral elytral margin with the carina that begins at the humeral angle turning medially (fig. 1). The three lateral carinae of *spinicollis* do not meet (fig. 29). The lateral pronotal margin of *nancyae* usually has two or three processes (figs. 1, 5) and that of *spinicollis* only one (fig. 31).

*Description.* Length 4.5 to 6.5 mm.

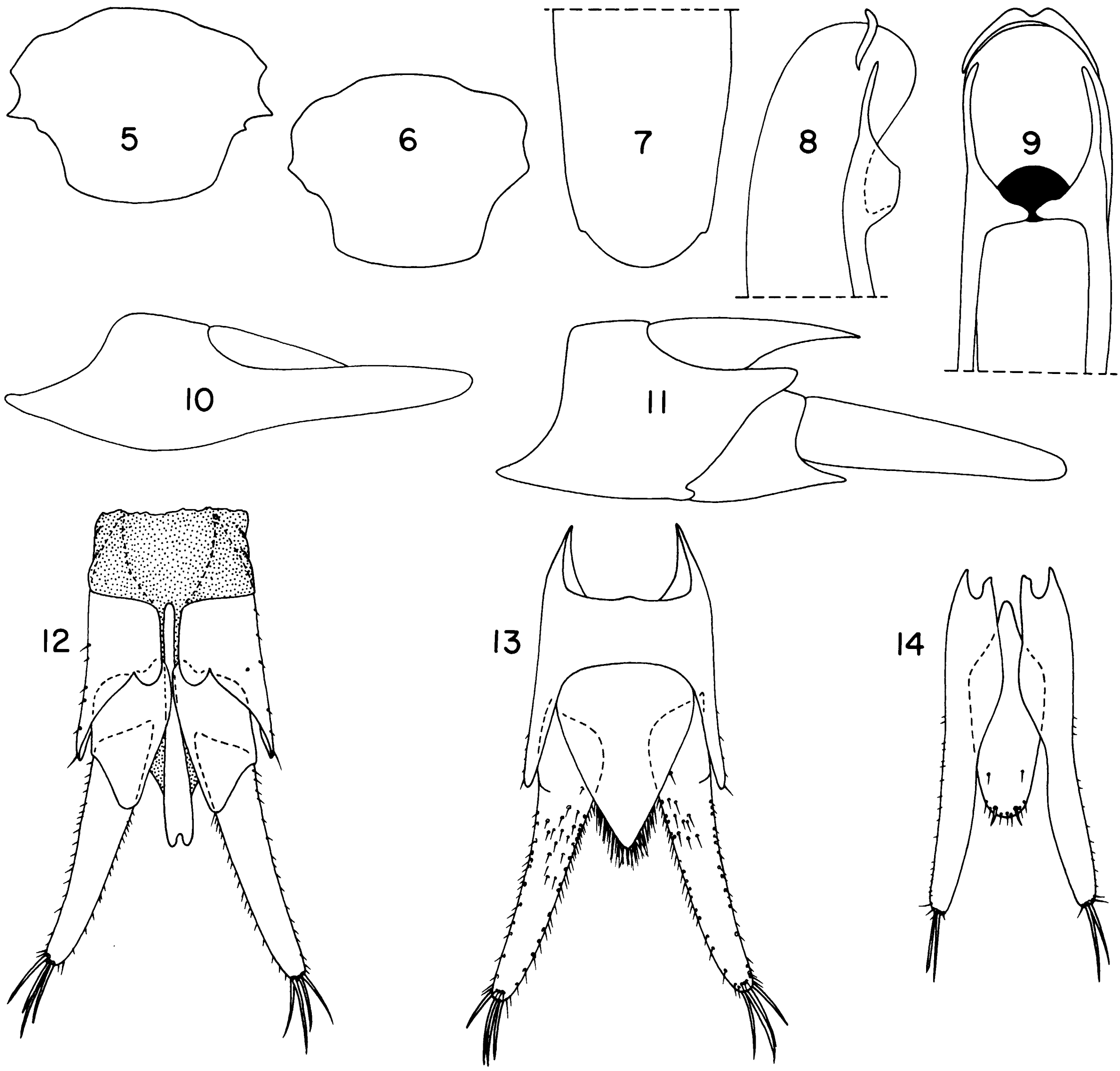
Color reddish brown.

Form moderately broad, tapered posteriorly, head, pronotum and elytra strongly sculptured; pronotum costate; elytra costate and carinate.

Head strongly sculptured dorsally with reticulate punctation (fig. 1). Setae short, apically expanded and scalelike (as in figs. 91, 92). Dorsum with median region broadly raised, raised portion with median impression at base (fig. 1). Neck (figs. 1, 20) moderately broad, at widest slightly more than half as wide as head measured across eyes. Clypeus distinguished from dorsum externally by transverse ridges (fig. 1). Clypeus shining with dense punctation and one lateral seta and another near middle. Eye occupying about one-quarter of head measured from anterior margin of clypeus to posterior margin of head. Head without circumocular carinae (as in figs. 20, 21). Lateral side of head with strongly reticulate punctation. Venter of head moderately strongly punctate. Gular sutures (as in fig. 21) moderately widely separated, most approximate medially, divergent anteriorly and posteriorly. Gula medially with carina slightly mesiad of and parallel to gular sutures (as in fig. 21). Labrum with anterior margin entire and with row of peglike setae on anterior margin (as in figs. 18, 19). Epipharynx with row of globosetae near anterior margin (as in fig. 17). Mandibular denticles slender and acute, basal one short, apical one long; prostheca membranous and digitate apically (as in fig. 24). Hypopharynx (as in fig. 27) bilobed with suggestion of small lateral lobe; lobes large, with numerous cuticular processes and with row of setae near apex. Mentum with midlongitudinal carina (as in fig. 23). Antennomeres (figs. 1, 26) 1 to 7 shining, with obsolete sculpturing and sparse pubescence; antennomeres 1 and 2 stout, 3 to 7 slender, 8 to 11 opaque, densely pubescent, strongly sculptured and slightly enlarged (as in figs. 26, 94); antennomere 3 longest; antennomere 7 strongly expanded apically and with ring of setae near apex, basal six articles with flattened, apically blunt setae (as in figs. 26, 93).

Prothorax (figs. 1, 5, 6) moderately broad, wider than long, and with lateral portion explanate; lateral margin strongly rounded from anterior margin to laterally directed processes near middle then strongly constricted and convergent to base; lateral margin with three laterally directed processes (figs. 1, 5), occasionally with two processes (figs. 1, 6) and frequently with more processes on one side than other (figs. 1, 6), processes of variable size, generally with small one distad of transversely drawn midline, large one at or near transversely drawn midline, and small one proximad of transversely drawn midline, basal process frequently poorly developed and occasionally absent; lateral margin and lateral portion of anterior margin reflexed; anterior margin without denticles; dorsal surface with deep depression near basal third of lateral portion, strongly sculptured with coarse reticulate punctation (fig. 1); setae short, apically expanded, and scalelike (as in fig. 92); median half of notum broadly raised, with four costae, with depression laterad of middle near anterior margin, median two costae distinct for entire length, lateral two costae distinct anteriorly and posteriorly and poorly developed near middle. Prohypomeron glabrous anteriorly but for broad shallow depression with weakly sculptured surface, depression margined posterodorsally by small costa (as in figs. 104-106); postprocoxal lobe punctate. Prosternum coarsely punctate and without midlongitudinal carina or costa.

Elytron (fig. 1) with variably eight to 10 anastomosing, poorly defined rows of punctures, with occasionally five, but usually six carinae of varying length present as follows: first carina at lateral margin beginning midway between humeral angle and posterior angle and extending to posterior angle, second and third carinae beginning at humeral angle and bifurcating almost immediately with inner one (third) stopping almost immediately then beginning again more posteriorly or becoming weak then continuing more strongly posteriorly and outer one (second) continuing along lateral margin to near midway between humeral angle and posterior angle, then abruptly and sharply turning mesially (at times anastomosing with first lateral carina) then turning posteriorly and continuing more or less parallel to first lateral carina (two turns of second carina occasionally absent or poorly developed in which case carina curving gradually from humeral angle to near midpoint then onto dorsal surface and parallel to first lateral carina), fourth carina beginning on dorsal surface near humeral angle and continuing posteriorly, fifth carina beginning near base about halfway between elytral lateral margin and scutellum and continuing posteriorly as moderately well-developed carina or becoming




FIGS. 5-14. *Zalobius nancyae.* 5. Pronotal Variation. 6. Pronotal Variation. 7. Tergum VIII, apical half. 8. Aedeagus, lateral view, basal portion. 9. Aedeagus, ventral view, basal portion. 10. Abdominal segments IX and X, male, lateral view. 11. Abdominal segments IX and X, female, lateral view. 12. Abdominal segment IX, female, ventral view. 13. Abdominal segments IX and X, female, dorsal view. 14. Abdominal segment IX, male, ventral view.

weak to obsolete medially and well-developed anteriorly and posteriorly, sixth carina, often obsolete, beginning near base about halfway between elytral suture and fifth carina and continuing posteriorly but becoming progressively more poorly developed, carinae 1 and 5 consistently reaching or nearly reaching posterior elytral margin, fourth carina frequently broken medially and anastomosing with third but with posterior portion continuing or at times branching from third near midpoint; epipleural ridge ventrad of lateral edge of elytron; elytral surface broadly and shallowly depressed medially and with moderately deep lateroapical depression; posterior margin strongly sinuate and with broad lateral incision (fig. 1). Elytral setae short, apically expanded and scalelike (as in fig. 91). Elytra slightly longer than pronotum to about one-third longer (as measured from posterior margin of scutellum to posterior margin of elytra). Mesosternum (as in fig. 32) with midlongitudinal carina and with weakly carinate, weakly defined mesosternopleural suture; surface with scattered punctures and dense microgranulate sculpturing; anterior margin of mesosternum with median, rounded lobe; collar of anterior edge of mesosternum with small, median emargination of posterior margin. Metathoracic wings short to long, when extended, reaching to only slightly beyond elytral apex to beyond abdominal apex.

Legs long and slender.

Abdomen strongly tapered apically (fig. 1). Segment III with large mesial paratergite and small, slender lateral paratergite, segments IV and V each with large mesial paratergite and minute, oval lateral paratergite (as in fig. 30), segments VI and VII each with one paratergite. Terga III to VI (fig. 1) each with apically tapering, short, basal, midlongitudinal carina. Tergum VIII with rounded, unmodified posterior margin (fig. 7).

Male. Sternum VIII with rounded, unmodified posterior margin. Tergum IX with cylindrical and elongate lateroapical lobes (figs. 10, 14) extending much beyond posterior margin of tergum X; anteroventral and anterodorsal margins each with slender strut (fig. 14). Sternum IX (fig. 14) strongly tapered anteriorly and moderately tapered posteriorly; posterior edge with a few setae; posterior margin rounded.

Aedeagus (figs. 8, 9) with U-shaped sclerite surrounding basal foramen. Median lobe long and slender. Parameres long and slender and with a few scattered setae (as in figs. 34, 42).

Female. Tergum IX with lateroapical lobes (figs. 11-13) compressed laterally, triangular in lateral view, and short. Coxite stout, long, cylindrical, and with scattered pubescence (fig. 13). Midventral intergonopodal sclerite present, elongate, anteriorly tapered and apically emarginate (fig. 12); surface without pubescence.

*Variation. Zalobius nancyae* has individually variable pronotal lateral margins and elytral carinae and altitudinally correlated, variable metathoracic wing and elytral length.

The pronotal lateral margin usually has three processes (fig. 5), a large median one and a small one on each side of the median process. If one is missing, most frequently it is that behind the median process (fig. 6); rarely is the anterior process strongly reduced or absent, and then only on one side. About a third of the specimens examined lacked the posterior process on one or both sides. Fifteen percent lacked the posterior processes entirely and the other 17 percent were missing one. The loss of the process is unrelated to sex, locality, or altitude and is probably individual variation.

Also apparently variable individually are the length, position, distinctness, and (occasionally) presence or absence of the elytral carinae.

On the other hand, variation of the length of the elytra and metathoracic wings correlates with altitude (fig. 15). Individuals with long, functional metathoracic wings are found at lower elevations than those with brachypterous or micropterous wings. The long wing form, with wings as long as or longer than the abdomen, was found at elevations of 2200 to 3200 feet. A brachypterous form with wings extending to the end of tergum VI or VII (about 50 to 70% of the abdomen) was found at 4000, 4400, and 6500 feet. Micropterous individuals with wings reaching the end of tergum III, IV, or V or about 18 to 40 percent of the abdomen were found from 4100 to 8000 feet. The elytral length is positively correlated with the metathoracic wing length.

The samples cited in figure 15 were taken in different areas, by different collectors, on different dates for each elevation, but the correlation should remain regardless of where or when *nancyae* is collected. That is, the long wing form should be found at a lower elevation than the short wing form in any given region.

*Habitat and Distribution.* The species is known only from the Sierra Nevada Mountains in California north into Oregon in the Cascade Mountains, on Gearhart Mountain, and in north central Oregon in the mountains of Wheeler and Grant counties (fig. 16). Collections have been made at elevations from 2200 feet to 8000 feet. Specimens have been found in wet debris near forest streams, under moss on sticks protruding from small streams, and in mud and debris at the edge of a small stream. This latter habitat was at the edge of a spring-fed stream flowing through a dense thicket of alder bushes about 50 yards from the origin of the spring. The longest series

(24 specimens) was collected at 5500 feet elevation from small piles of soaking wet, black, coniferous needles accumulated at the edges of a small creek (Aleš Smetana, personal commun).

*Discussion. Zalobius nancyae* and *spinicollis*, which differ by few characters, have allopatric ranges; one is in the interior mountains, the other in the coastal mountains.

The closest approach the species make to one another is in northern California where *spinicollis* was found at Paradise, Butte County, which is 5700 feet lower and only 58 miles (by air) from the site in Sierra County where *nancyae* was collected. Both are found at the edge of streams where *spinicollis* is generally in wet moss and *nancyae* in mud and debris. Although the anatomical, distributional, and habitat differences do not present an unequivocal test of the reproductive potential between the two forms it does suggest that the species are adapted to different conditions and that they probably do not interbreed. Further collections in the region of Butte, Sierra, Plumas, and Yuba counties from 2000 to 3000 feet elevation might uncover sympatric populations of the two forms.

*Etymology.* This elegant beetle is named for my wife, Nancy, who accompanied and helped me in the field when the species was collected.

*Zalobius spinicollis* LeConte
Figures 16-43, 91-94, 104-106

*Zalobius spinicollis* LeConte, 1874, p. 49. Fauvel, 1878, p. 259. Horn, 1895, p. 237, pl. XX. Fall, 1901, p. 77. Bernhauer and Schubert, 1911, p. 88. Leng, 1920, p. 95. Hatch, 1957, pp. 87-88. Moore and Legner, 1973, p. 131; 1975, p. 165. (Type locality: Vancouver Island. Lectotype here designated as the specimen of four syntypes with the labels "Type 6580", and "*Zalobius spinicollis* Lec." and my lectotype label, in the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, type examined.)

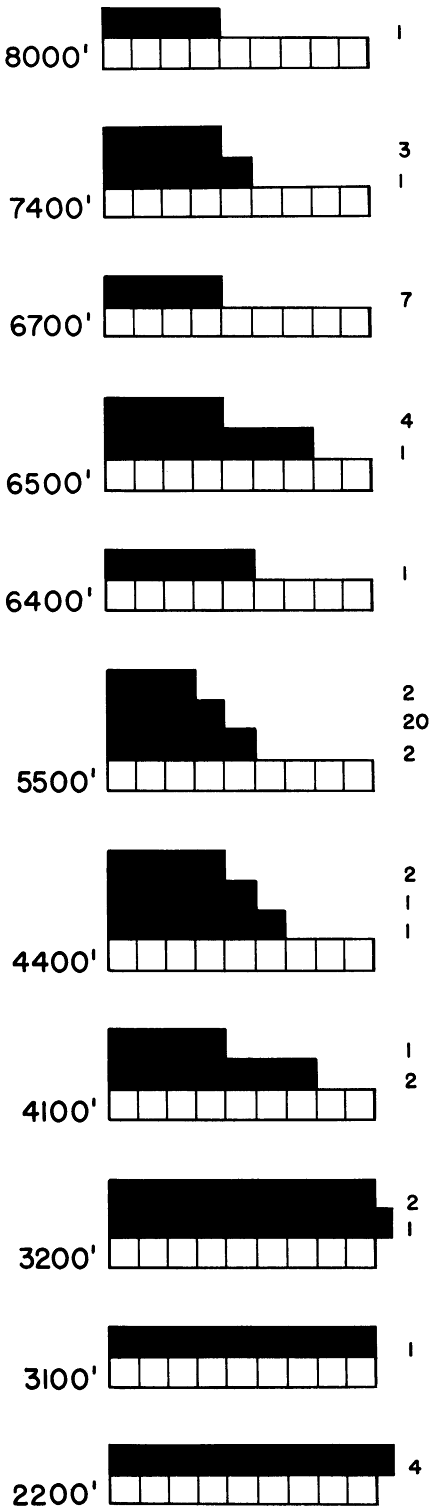



FIG. 15. Diagrammatic representation of the variation of the metathoracic wing length (black bars) of *Zalobius nancyae* compared with abdominal segments I to IX (row of squares). Numbers on left refer to elevation in feet of each sample. Numbers on right refer to number of specimens with given wing length.

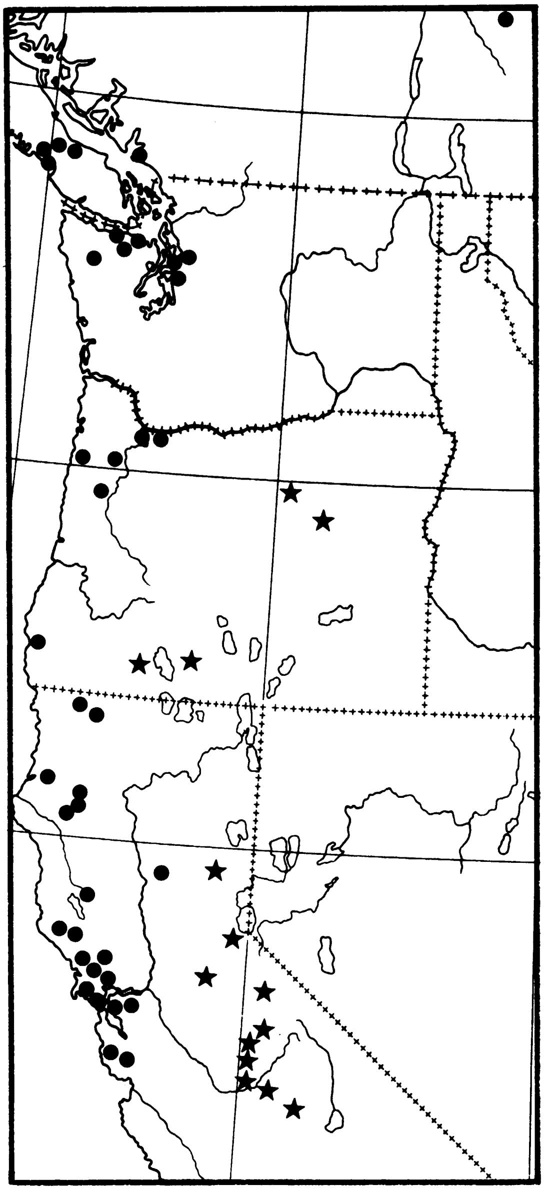


FIG. 16. Western United States and Canada. Distribution of *Zalobius nancyae* (stars) and *Zalobius spinicollis* (dots).

*Diagnosis. Zalobius spinicollis* may be distinguished from the species of *Zalobius*, *Nanobius*, or *Asemobius* by the characters given in the key and the diagnoses of the other species.

*Description.* As described for *nancyae* except as follows:

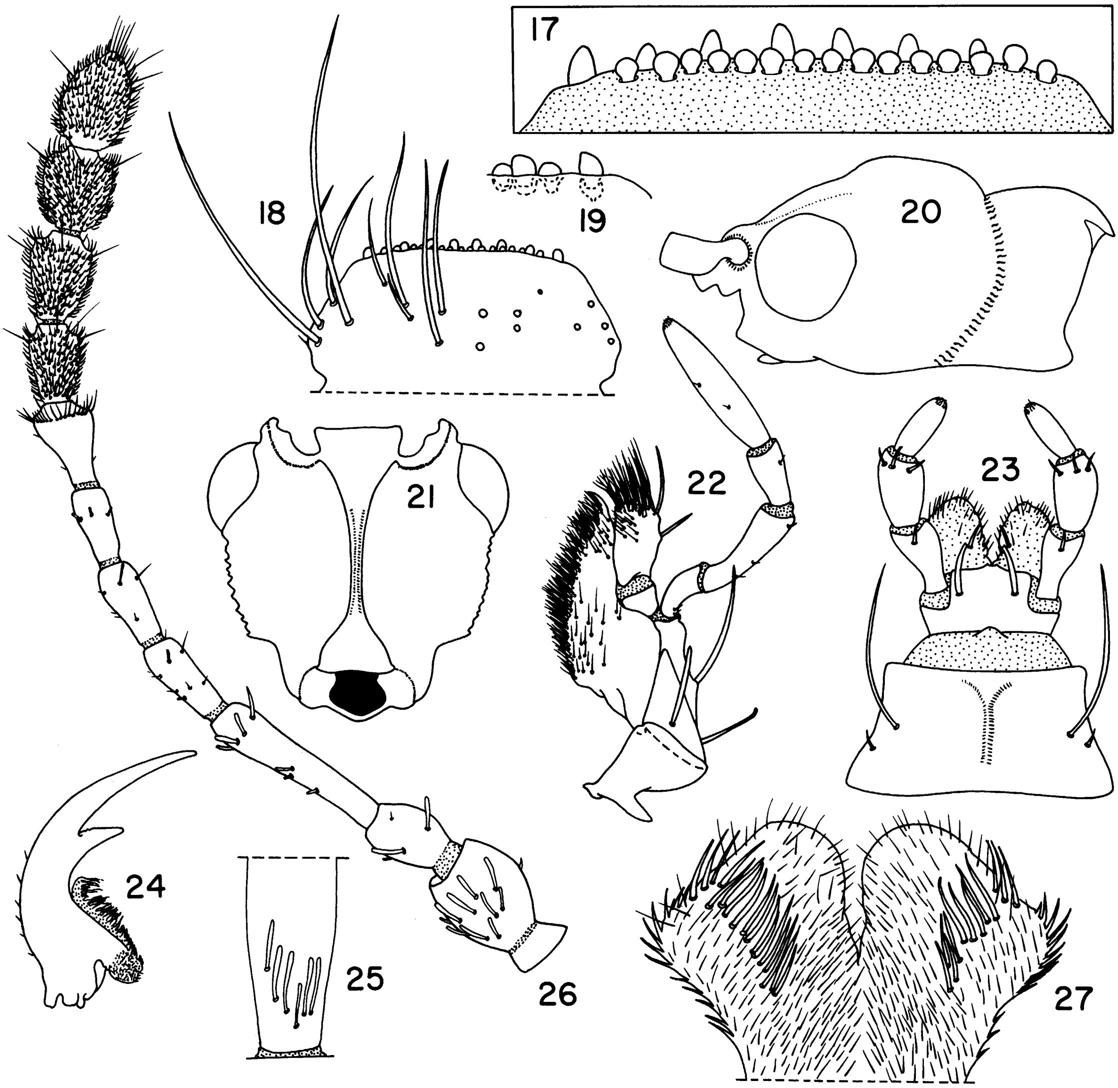
Length 4.5 to 7.0 mm. Clypeal punctation sparse.

Pronotal lateral margin (fig. 31) broadly rounded from anterior angle to large, laterally directed process at middle of lateral margin, then strongly convergent to base; lateral margin occasionally with weakly developed process anterior to large one at middle and when present often only on one side. Elytra (fig. 29) usually with five carinae, occasionally with one or two poorly developed additional ones; lateral region with three prominent, more or less parallel carinae, one beginning at humeral angle and stopping before middle, second carina beginning about near lateral margin about one-fifth from humeral angle and continuing posteriorly to depression at posterolateral margin, third carina beginning near lateral margin at about middle and continuing posteriorly to margin of latero-posterior incision of posterior margin; fourth carina beginning near middle of anterior margin and continuing to posterior margin, carina weakly to moderately developed for most of length to about posterior third where carina is more strongly developed; fifth carina beginning about one-third from elytral suture and continuing posteriorly to near margin, carina strongly developed anteriorly and usually weakly developed posteriorly. Abdominal tergum VIII produced medially into tapering, apically rounded process; length and width of process variable (figs. 35-39).

Aedeagus with U-shaped sclerite surrounding basal foramen separated medially (fig. 34).

*Variation.* The length of the metathoracic wings (fig. 43) varies from longer than the abdomen to about half the length of the abdomen. Individuals with wings as long as or longer than the abdomen were found at 600, 1900, and 3000 feet elevation and respectively in Humboldt, Napa, and Trinity Counties of California. Specimens with wings 40 to 60 percent the length of the abdomen were found at all localities and elevations sampled for wing length except the Trinity County locality at 3000 feet. Wing length in *spinicollis* is not obviously correlated with elevation, distribution, or season.

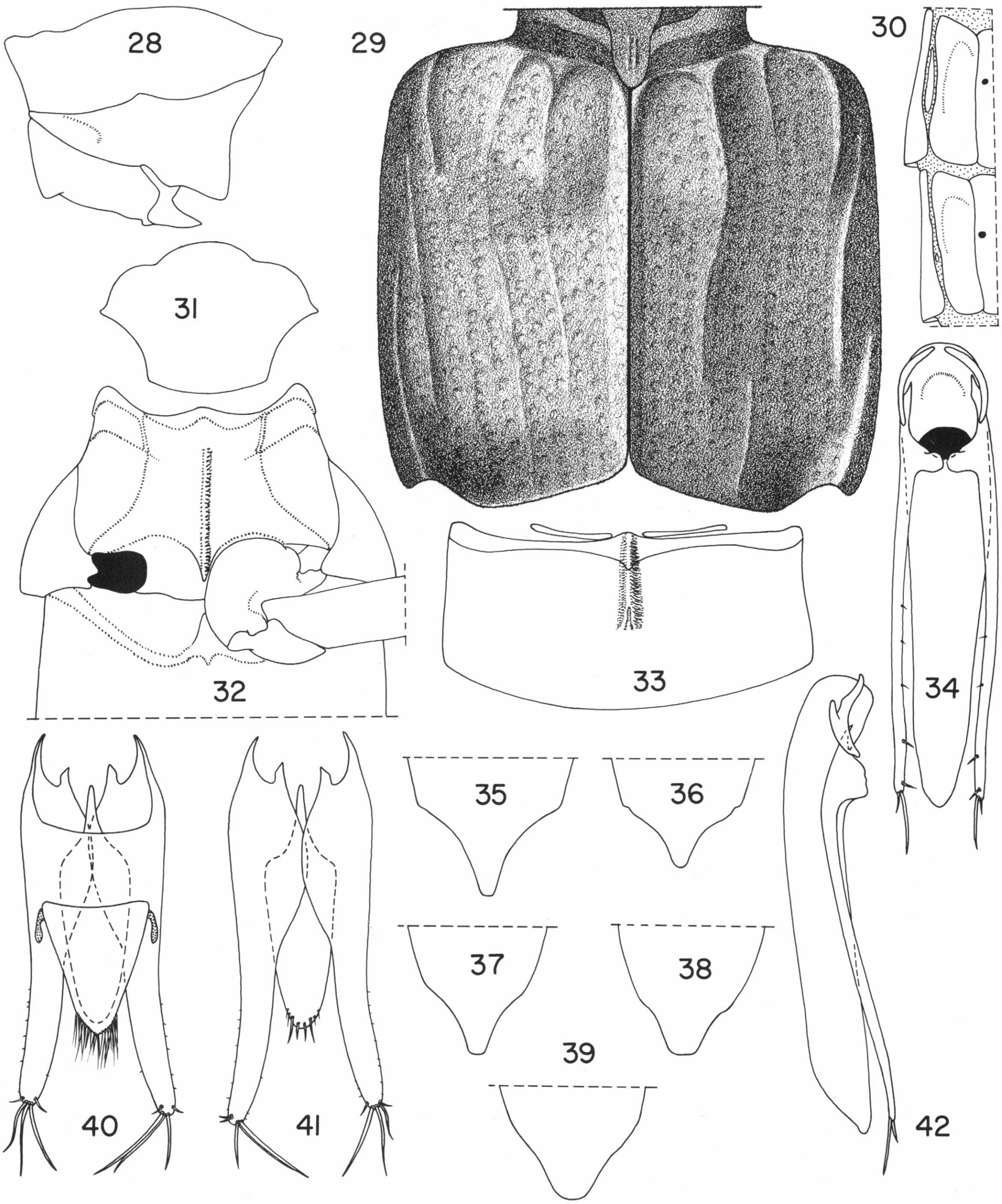
*Habitat and Distribution.* With the exception of two records of one specimen each, one from Banff National Park, Alberta, and the other from Paradise, California, *spinicollis* occurs in the coastal mountains from Vancouver Island, British




FIGS. 17-27. *Zalobius spinicollis*. 17. Epipharynx, anterior margin, ventral surface. 18. Labrum, dorsal view. 19. Labrum, enlargement of right side of anterior margin, dorsal view. 20. Head, lateral view. 21. Head, ventral view. 22. Maxilla. 23. Labium. 24. Left mandible. 25. Base of fourth maxillary palpus showing chordotonal (?) organ. 26. Antenna. 27. Hypopharynx, dorsal view.

Columbia, to just south of San Francisco, California, in the Santa Cruz Mountains (fig. 16). It has been collected at elevations from 100 to 3300 feet in the coastal mountains and from 6400 to 7000 feet in Alberta. If the Alberta record is accurate the species may be found in the mountains of British Columbia with further collecting. The elevation at which the Alberta specimen was collected is puzzling; it is not only farther north and east than other records, it was taken at least 3100 feet higher than any other specimen.

Except for the collection from Paradise, California, *spinicollis* is unknown in the Sierra Nevada mountain range of California. Paradise is at about 900 feet elevation, about 1300 feet lower




FIGS. 28-42. *Zalobius spinicollis*. 28. Prothorax, lateral view. 29. Elytra, dorsal view. 30. Abdominal parasternites and paratergites of left side of segments III and IV, dorsal view. 31. Pronotum, dorsal view. 32. Mesothorax and basal portion of metathorax, ventral view. 33. Sternites I (?), II, and III, ventral view. 34. Aedeagus, ventral view. 35-39. Variation of tergum VIII. 40. Segments IX and X, male, dorsal view. 41. Segment IX, male, ventral view. 42. Aedeagus, lateral view.


FIG. 43. Diagrammatic representation of the variation of the metathoracic wing length (black bars) of *Zalobius spinicollis* compared with abdominal segments I to IX (row of squares). Numbers on left refer to elevation in feet of each sample. Numbers on right refer to number of specimens with given wing length; where separated by a comma, specimens are from same elevation but at different localities.

than the lowest known locality for *nancyae*. If the Paradise record is correct and *spinicollis* does occur in the Sierra Nevada, then it might be found at lower elevations than *nancyae* and might be found at low elevations throughout the foothills of the eastern side of the coastal range and foothills of the northern portion of the western side of the Sierras.

The species has been collected from wet moss on "weeping" rock walls or on rocks in small streams and from flood debris on the edge of small streams. Milton Campbell (personal commun.) informs me that he has collected the species consistently in the mud and debris at the base of weeping rock walls.

*Material Examined.* 298 specimens.

Canada: ALBERTA: Banff National Park, Consolation Lake, June 15, 1968, 6400 to 7000 feet elevation, M. Campbell and A. Smetana (1 CNC). BRITISH COLUMBIA: *Vancouver Island*: (Type Series, MCZ); July 13 (7 MCZ); Stamp Falls Provincial Park, 8 mi. NW Alberni, May 26, 1968, sifting deciduous leaf litter, M. Campbell and A. Smetana (4 CNC); Macmillan Provincial Park, 10 mi. E Alberni, May 26, 1968, from moss near stream, M. Campbell and A. Smetana (13 CNC; 1 FMNH); Macmillan Provincial Park, 2 mi. E Alberni, May 26, 1968, M. Campbell and A. Smetana (1 CNC); Tofino, June 20, 1950, A. Guppy (1 UW); Pacific Rim National Park, Michigan Creek, June 13, 1975, sifting rocks, moss and litter at base of "dripping" cliff, J. M. and B. A. Campbell (8 CNC). Vancouver, Stanley Park, May 22-28, 1968, M. Campbell and A. Smetana (2 CNC).

United States: CALIFORNIA: (2 AMNH, 1 MCZ, 10 USNM); Tocaloma, May 4, 1968, from leaf litter under California Bay Tree in very dry conditions, M. Campbell and A. Smetana (1 CNC); Santa Cruz Mountains (2 USNM, 2 CAS); Sylvania, August, Ricksecker (4 CAS, 2 CU, 1 MCZ), August 8, 1896 (3 MCZ). *Alameda County*: November (1 USNM)[1]; Berkeley, Strawberry Canyon, December 28, 1948, 100 feet elevation, H. P. Chandler (1 CAS); Berkeley, July 4, 1962,

[1] This specimen is a composite formed by gluing the head and thorax of *spinicollis* to the abdomen of *nancyae*.

under rock near stream, J. Doyen (2 UCB); hills behind Oakland, June 7, 1908 (23 CAS). *Butte County*: Paradise, August 19, 1947, D. Giuliani, (1 CAS). *Contra Costa County*: 3 mi. N of road to Hoopa, Redwood Creek, Redwood Valley, August 12, 1970, 650 feet elevation, H. Leech (9 CAS). *Lake County*: Bartlett Springs, June 4, 1923 (1 CAS, 4 USNM). *Marin County*: (1 CAS, 1 USNM); Mill Valley, May 6, 1968, from leaf litter of California Bay Tree, M. Campbell and A. Smetana (1 CNC), June 4, 1915 (2 CAS); Lake Lagunitas, October 18, 1919 (1 CAS); Mount Tamalpais, September 3, 1907 (1 CAS); Muir Woods, September 6, 1908 (2 CAS), October 18, 1907 (1 CAS). *Mendocino County*: Redwood State Park, Mill Creek, W of Maillard, September 6, 1964, H. Leech (6 CAS); Tan Oak Lodge, July 26, 1938 (1 CAS). *Napa County*: 10.1 mi. N Calistoga, May 21, 1976, 1900 feet elevation, flood debris and along edge of stream, A. Newton and M. Thayer (8 MCZ). *Santa Cruz County*: (7 USNM); Redwood Park, August 9, 1923, J. O. Martin (7 CAS), August 10, 1918 (1 CAS). *Shasta County*: Hell Creek, about 30 meters upstream of junction with Clear Creek, August 25, 1972, 1024 meters elevation (3360 ft.), H. Leech (1 CAS). *Siskiyou County*: 5.4 mi. SE Seiad Valley, O'Neil Creek, July 3-4, 1976, 1500 feet elevation, from wet moss on rocks in stream, L. and N. Herman (1 AMNH), from moss on "weeping" rock water of stream cut, L. and N. Herman (5 AMNH); Sacramento River, south fork, September 9, 1953, 3200 feet elevation, H. P. Chandler (1 CAS, 1 CNC); 11.5 mi. NE Happy Camp, Tims Creek, August 15, 1966, H. Leech (1 CAS). *Sonoma County*: (16 CAS, 2 MCZ); Guerneville, August 18, 1908 (3 CU, 1 MCZ); Duncan Mills, July 18, 1908, Blaisdell (3 MCZ, 1 FMNH, 47 CAS, 2 USNM); Santa Rosa, July 14, 1893 (1 FMNH); Rio Nido, July 31, 1947, D. Giuliani (1 CAS); Sonoma, October 6, 1948, D. Giuliani (1 CAS), Hubbard and Schwarz (4 USNM); Falkner Pk., Anderson Valley, October 14, 1954, J. R. Helfer (UCB). *Trinity County*: South Fork Van Horn Creek, 2 mi. from mouth at Upper Mad River, August 9, 1970, from moss-edged rocks in pools in running stream, H. Leech (6 CAS); 4 mi. W Forest Glen, July 1, 1975, 3300 feet elevation, flood debris along forest stream, A. Newton and M. Thayer (1 MCZ). OREGON: *Benton County*: 9 mi. N Corvallis, Berry Creek; May 2, 1959 (1 CNC). *Curry County*: Humbug Mountain State Park, July 6-7, 1975, flood debris along stream, A. Newton and M. Thayer (2 MCZ). *Yamhill County*: Peavine Ridge, near McMinnville, April 11, 1957 (1 ex.), September 12, 1957 (2 ex.), October 29, 1957 (2 ex.), K. Fender (5 AMNH). *Multnomah County*: Portland, May 22, Hubbard and Schwarz (2 USNM); Wahkeena Falls, June 30, 1957, K. Fender (4 AMNH). *Tillamook County*: Little Nestucca River, September 18-25, 1955, wet moss, K. Fender (6 AMNH, 6 KF). WASHINGTON: *Clallam County*: Olympic National Park, Olympic Hot Springs, August 4, 1973, 2300 feet elevation, A., Z., and D. Smetana (3 CNC); 6 mi. Olympic National Park, Olympic Hot Springs, Boulder Creek, July 29, 1973, 2200-2500 feet elevation, A. Z., and D. Smetana (3 CNC); 6 mi. E Joyce, May 12, 1968, from leaf litter along stream at base of bluff, M. Campbell and A. Smetana (2 CNC); 10 and 12 mi. S Sequim, May 12, 1968, moss along edge of small stream, M. Campbell and A. Smetana (3 CNC). *Jefferson County*: Olympic National Park, Hoh Ranger Station, May 13, 1968, moss along edge of small stream, 600 feet elevation, M. Campbell and A. Smetana (2 CNC). *King County*: Green River Gorge, May 16, 1930, M. H. Hatch (1 UW); Seattle, May 30, 1896 (1 UW). *Snohomish County*: Monroe, July 4-14, 1905, 3178 feet elevation, Van Dyke (1 CAS).

## *NANOBIUS*, NEW GENUS

Figures 44-67, 95-103

*Type Species. Nanobius serricollis* (LeConte), transferred from *Zalobius* and designated here.

*Diagnosis*: *Nanobius* can be separated from all other Piestinae, including *Zalobius* and *Asemobius*, by the deep incision of the posterior elytral margin (fig. 45), the carinate head, pronotum, and elytra (fig. 45), the numerous carinae on the abdominal terga (fig. 57), and the short broad mandibles (figs. 47, 50).

*Description.* Length 3.5 to 5.0 mm. Body (fig. 45) moderately broad, slightly flattened and strongly sculptured with punctation and carinae.

Head (fig. 45) strongly punctured and carinate; setae minute. Labrum (fig. 49) with anterior margin sinuate and without enlarged, exposed, epipharyngeal lobes; dorsal surface with long setae. Epipharynx (fig. 52) with globosetae near anterior margin. Anteclypeus (fig. 45) large and apparently permitting extrusion of labrum. Supra-antennal ridge carinate. Epistomal suture evident externally as shallow impression (fig. 45) but absent internally. Neck (figs. 45, 46) distinguished from head laterally, ventrally, and dorsally. Mandibles (figs. 47, 50) asymmetrical, bidentate, short, and broad mola present; prostheca present or absent; lateral surface with row of setae and with carina on basal half of both dorsal and ventral edge. Maxillary palpus four-segmented; fourth segment stout and elongate. Labium as in figure 51; palpus three-segmented. Prementum divided into three sclerites, median sclerite small (fig. 51). Hypopharynx (figs. 53, 97, 98) with six anterior lobes, with row of stout setae extending from middle lobe onto disk and with numerous cuticular processes. Gular sutures (fig. 44) moderately widely separated and divergent posteriorly and anteriorly; gula with median carina; submentum and gula not separated by submental suture (fig. 44).

Pronotal lateral margin serrate (fig. 45); pronotal dorsal surface carinate and broadly elevated medially. Protergosternal suture present (fig. 55). Prohypomeron with shallow depression anteriorly (figs. 99-102). Procoxal fissure narrowly open (fig. 55). Postprocoxal lobe present. Procoxae with shallow groove on mesial surface (figs. 58, 59, 103). Prosternal process cariniform (fig. 55).

Scutellum with apex slightly exposed from under pronotum. Elytra (fig. 45) carinate and with distinct rows of punctures; epipleural ridge present. Mesocoxae narrowly separated (fig. 54).

Tibiae without rows of spines. Tarsal formula 5-5-5.

Abdominal segments III to VI each with well-developed paratergite and parasternite (fig. 56); segment VII with one pair of laterotergites; paratergites III to VI with basal impression (fig. 56); terga with basal carinae (fig. 56). Sternal sclerites of segment I present and medially divided (as in fig. 33). Sternite II reduced and fused to III. Sternites II and III with median longitudinal carina.

Tergum IX fused dorsally at base (fig. 62). Tergum X triangular and with obtusely pointed apex (fig. 62).

Aedeagus trilobed (fig. 66). Parameres long and slender. Median lobe without sclerite surrounding basal orifice.

Female. Tergum IX with ventromesial edge lobed (fig. 64). Stylus present (figs. 64, 65). Coxites slightly flattened. Valvifer moderately large (fig. 64). Midventral intergonopodal sclerite absent (fig. 64).

*Discussion. Nanobius serricollis* can be distinguished from *Zalobius spinicollis* and *Z. nancyae* by at least 30 characters and from *Asemobius caelatus* by at least 23.

*Etymology. Nanobius* is an arbitrary combination of letters.

*Nanobius serricollis* (LeConte),
New Combination
Figures 44-67, 95-103

*Zalobius serricollis* LeConte, 1875, p. 170. Fauvel, 1878, p. 260. Horn, 1895, p. 237. Fall, 1901, p. 77. Bernhauer and Schubert, 1911, p. 88. Leng, 1920, p. 95. Hatch, 1957, p. 87. Moore and Legner, 1973, p. 131; 1975, p. 165. (Type locality: Fort Tejon, California. LeConte [1875] gave Owens Valley, California as the type locality with Horn as the collector. Horn [1895] stated that he collected the specimen at Fort Tejon. Holotype in Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts. Type examined).

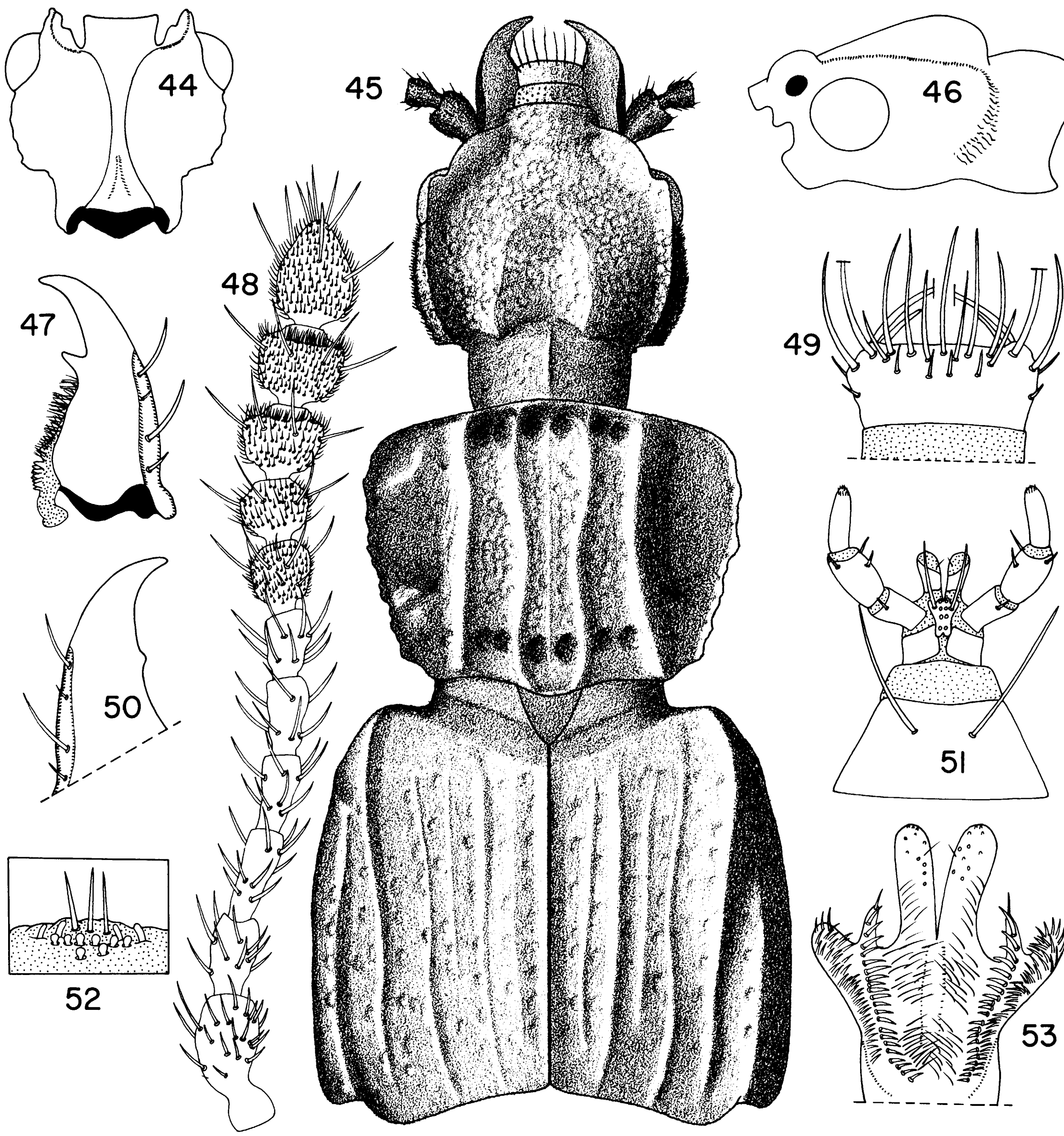
*Diagnosis.* This species is recognized easily by the row of longitudinal carinae along the base of abdominal terga III to VII (fig. 57), the bi-emarginate posterior margin of tergum VIII which also has an acute, median, posteriorly directed process (fig. 61), the four prominent longitudinal pronotal carinae (fig. 45), the two basal carinae on the dorsum of the head (fig. 45), the carina on the laterodorsal margin of the head (figs. 45, 46), and by the heavily sculptured seventh antennomere (fig. 96).

*Description.* Length 3.5 to 5.0 mm.

Color reddish brown.

Form moderately broad, tapered posteriorly, head, pronotum, and elytra strongly sculptured by punctures and carinae (fig. 45).

Head (fig. 45) strongly sculptured dorsally




FIGS. 44-53. *Nanobius serricollis*. 44. Head, ventral view. 45. Head, pronotum, and elytra, dorsal view. 46. Head, lateral view. 47. Right mandible. 48. Antenna. 49. Labrum, dorsal view. 50. Left mandible, apical portion. 51. Labium, ventral view. 52. Epipharynx, median portion of anterior margin, ventral view. 53. Hypopharynx, dorsal view.

with reticulate punctation. Setae extremely short (visible with compound microscope) and clubbed apically (fig. 95). Dorsum (fig. 45) broadly raised medially, raised portion with basal, medio-anteriorly directed carina on each side of midline; lateral side (figs. 45, 46) with longitudinal carina, carina lobed above eye and continuous with reflexed, cariniform supra-antennal shelf. Neck (fig. 45) moderately broad, at widest slightly more than half as wide as head at widest point. Clypeus distinguished from dorsum externally by curved depression (fig. 45). Clypeus densely and coarsely punctate with one lateral seta and one near middle. Eye occupying about one-quarter of head measured from anterior margin of clypeus to posterior margin of head. Head without subocular or postocular carina but with supraocular carina (fig. 45). Lateral side of head with strongly reticulate punctation. Venter of head strongly punctate. Labrum with slightly sinuous anterior margin and without peglike setae on anterior margin (fig. 49). Epipharynx with small patch of globosetae at middle near anterior margin (fig. 52). Left mandible (fig. 50) with small, blunt denticle near middle; right mandible (fig. 47) with moderately long, acute denticle near middle; prostheca absent from left mandible (fig. 50) and present on right (fig. 47) and entirely connected to median edge. Hypopharynx (figs. 53, 97, 98) with two median and four lateral lobes; median lobe long, moderately broad, and with scattered cuticular processes and sensory structures; inner lateral lobe slender and moderately long; outer lateral lobe moderately long, moderately stout and with numerous cuticular processes that continue onto lateral portion of hypopharynx laterad of spinous row; disk with numerous, long cuticular processes and midlongitudinal groove. Mentum slightly convex, without midlongitudinal carina. Antennomeres (fig. 48) 1 to 6 shining, with obsolete sculpturing and sparse pubescence; antennomeres 1 stout, 2 to 6 moderately stout, 7 to 11 opaque, densely pubescent, strongly sculptured and slightly enlarged; antennomere 3 only slightly longer than 2 or 4, segment 1 longest; antennomere 7 of approximately same shape as 8, and densely pubescent (fig. 96); setae unmodified.

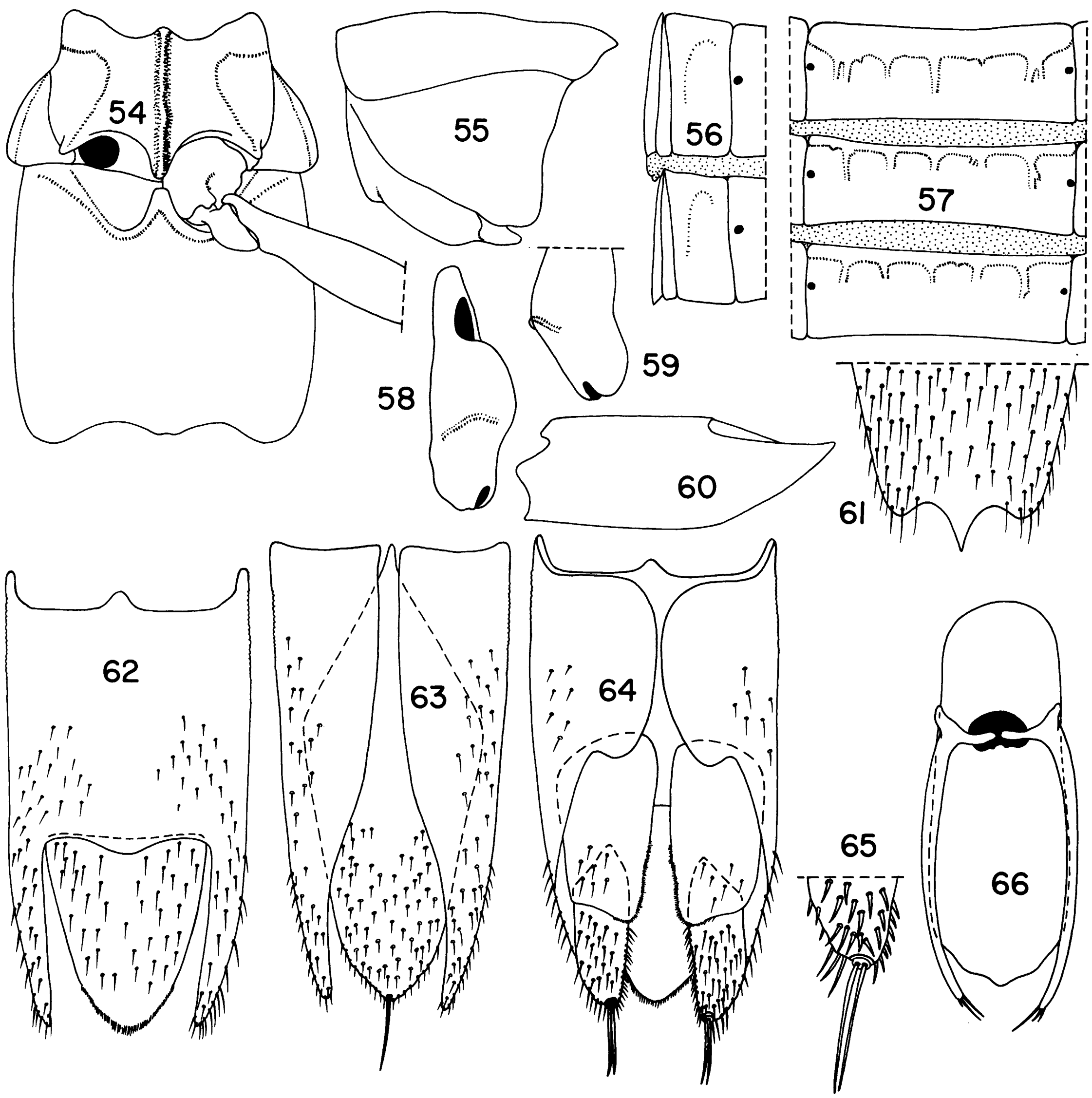
Prothorax (fig. 45) moderately broad, wider than long, and with lateral portion explanate; lateral margin strongly serrate and broadly curved from anterior to posterior margin, serration variable and processes of variable size; lateral margin and lateral portion of anterior margin reflexed; anterior margin without denticles; dorsal surface with deep depression near basal third of lateral portion and sculptured with coarse punctation; anterior and basal regions of pronotum each with transverse row of 10 punctiform depressions; setae minute and apically clubbed (fig. 95); median two-thirds of notum broadly raised, with four well-developed, sinuous, longitudinal carinae. Prohypomeran glabrous anteriorly but for shallow unmargined depression with sculptured surface; postprocoxal lobe punctate. Prosternum coarsely punctate and without midlongitudinal carina or costa.

Elytron (fig. 45) with seven longitudinal, parallel carinae, including cariniform epipleural ridge at lateral edge of elytron; beginning at lateral edge first (epipleural ridge), second, third, and sixth carinae most prominently developed; carinae reaching or nearly reaching posterior margin; rows of punctures present between carinae; epipleural ridge present on lateral margin of dorsal surface; posterior margin strongly sinuate and with moderately broad, moderately deep, lateral incision (fig. 45). Elytral setae (fig. 95) short and apically clubbed. Elytra about one-fifth longer than pronotum. Mesosternum (fig. 54) with moderately well-developed midlongitudinal carina and with weakly carinate mesosternopleural suture; surface coarsely punctate; anterior margin of mesosternum lobed medially; collar of anterior edge of mesosternum absent medially. Metathoracic wings fully developed.

Legs long and slender.

Abdomen slightly tapered for most of length, and strongly tapered from about apical third. Segments III (fig. 56) to VI with large mesial paratergites and narrow lateral paratergites. Terga III (fig. 57) to VI each with row of short, longitudinal, basal carinae of varying length. Tergum VIII (fig. 61) bi-emarginate thereby producing two lateral and one median posteriorly directed processes, lateral process rounded apically, median process acute.

Male. Sternum VIII with flat to obsoletely emarginate posterior margin medially and with small emargination near lateral edge. Tergum IX (fig. 62) with lateroapical lobes laterally compressed and, in lateral view, triangular (fig. 60) and extending to or slightly beyond posterior margin of tergum X; anterodorsal margin with short, rounded, small median process. Sternum IX (fig. 63) strongly tapered anteriorly and moderately tapered posteriorly; posterior margin with row of small setae and with one long, stout median seta; posterior margin rounded to slightly, obtusely pointed.




FIGS. 54-66. *Nanobius serricollis.* 54. Pterothorax, ventral view. 55. Prothorax, lateral view. 56. Abdominal parasternites and paratergites of left side of segments III and IV, dorsal view. 57. Abdominal terga II-IV, dorsal view. 58. Procoxa, mesial surface. 59. Procoxa, apical portion, anterior surface. 60. Abdominal segments IX and X, lateral view. 61. Tergum VIII, apical portion. 62. Abdominal segments IX and X, dorsal view. 63. Abdominal segment IX, male, ventral view. 64. Abdominal segment IX, female, ventral view. 65. Enlargement of stylus and apex of coxite, female. 66. Aedeagus, ventral view.

Aedeagus (fig. 66) without U-shaped sclerite surrounding basal foramen. Median lobe broad, moderately long, and obtusely pointed apically. Parameres with several apical setae.

Female. Sternum VIII with posterior margin rounded medially and moderately emarginate near lateral edge. Tergum IX (fig. 62) with latero-apical lobes compressed laterally, and, in lateral view, triangular (fig. 60) and extending to or slightly beyond posterior margin of tergum X; anterodorsal margin with small, rounded median lobe. Stylus short, button-like (figs. 64, 65). Coxite short, broad, slightly flattened and densely pubescent (fig. 64). Midventral intergonopodal sclerite absent (fig. 64).

*Variation.* Although *serricollis* is more widespread than the species of *Zalobius*, it exhibits less variation.

*Habitat and Distribution. Nanobius serricollis* occurs in the coastal and interior mountains from southern British Columbia and Vancouver Island south to southern California. Specimens have been taken occasionally near the coast and in the Panamint Mountains. The species has been collected from sea level to 3500 feet elevation (fig. 67).

The species has been collected in a variety of habitats but the common feature is probably the presence of moisture. In most cases, *serricollis* is found in leaf litter of various species of trees, the names of which have been included in the Material Examined. The longest series examined were taken from the roots of clumps of grasses along the shore of a stream and from the cavity produced by removing these clumps (40 specimens), Oregon Oak duff and moss (33 specimens), and Douglas Fir duff (27 specimens). Fifteen other collections were made, each of from 10 to 17 specimens, from leaf litter. Another 112 samples are represented by one to five specimens and, although primarily from leaf litter, were also found elsewhere. One specimen was associated with *Polyporus volvatus*, one was in a tree hole, seven specimens in three collections were found in moss, another one in a decaying stump, two specimens in two collections were in rotted hay and dung, and six specimens in three samples were taken from the nests of wood rats (*Neotoma* sp.).

*Material Examined.* 467 specimens.

Canada: BRITISH COLUMBIA: (1 FMNH) *Vancouver Island*: Victoria, June 1-2, Hubbard

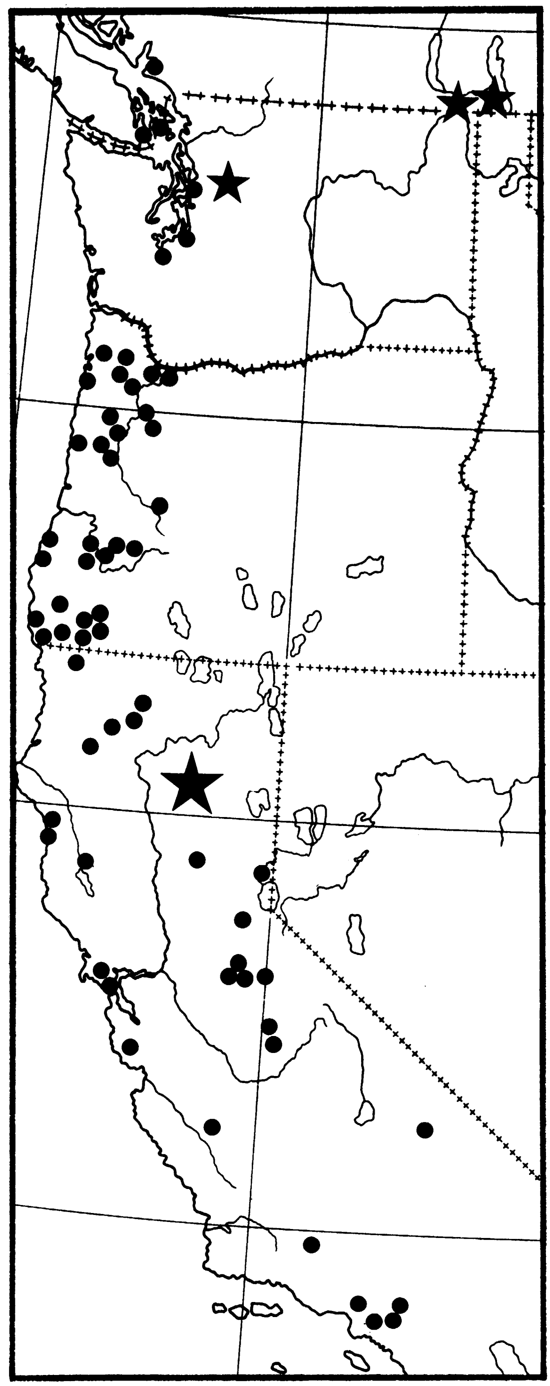


FIG. 67. Western United States and Canada. Distribution of *Nanobius serricollis* (dots) and *Asemobius caelatus* (stars). The large star in California indicates a state record only for *Asemobius.*

and Schwarz (4 USNM); Saanich, October 22, 1953, cedar litter, O. Peck (3 CNC). Brunswick, May 20, 1968, M. Campbell and A. Smetana (1 CNC).

United States: CALIFORNIA: (1 AMNH, 1 FMNH, 15 USNM); southern California (3 AMNH); San Bernardino Mountains (2 MCZ); Pomona Mountains, September (5 MCZ); Sierra Nevada (4 MCZ); Licking Fork Mokelumne River, June, 2900-3100 feet elevation, Blaisdell and Letcher (6 CAS). *Amador County*: 1 mi. W Pine Groove, June 24, 1975, leaf litter in mixed hardwood and conifer forest in ravine, A. Newton (4 MCZ); Tiger Creek, ENE Pioneer, June 26, 1975, 3500 feet elevation, old flood debris along stream, A. Newton and M. Thayer (1 MCZ), leaf litter in mixed conifer forest, A. Newton and M. Thayer (2 MCZ). *Butte County*: 6 mi. N Oroville, February 22, 1976, litter of *Pinus sabiniana*, J. Doyen (1 UCB). *Calaveras County*: 3 mi. NE Glencoe, June 25, 1975, 2000 feet elevation, litter in oak-conifer forest away from stream, A. Newton (1 MCZ); 3 mi. NE West Point, May 20, 1976, litter in mixed hardwood *Pinus*, *Libocedrus*, *Abies* forest, A. Newton and M. Thayer (4 MCZ). *El Dorado County*: Riverton, August 30, 3000 feet elevation, H. E. Hinton (3 AMNH). *Humboldt County*: Bair's Ranch, Redwood Creek, June 12, H. S. Barber (8 USNM, 1 FMNH). [*Inyo County*]: Panamint Mountains (1 USNM). *Kern County*: Fort Tejon, G. Horn (1 MCZ). *Lake County*: 7 miles N Upper Lake, Deer Valley Camp, October 25, 1967, from *Polyporus volvatus*, P. A. Rude (1 UCB). *Los Angeles County*: Pasadena, April (6 CAS, 1 CU); Pomona (1 MCZ). *Madera County*: Bass Lake, June (3 CAS), July (1 CNC); Sugar Pine (2 CAS). *Marin County*: (1 USNM) Muir Woods, September 6, 1908 (2 CAS); S. P. Taylor State Park, November 1, 1953, Schuster and Marsh (2 UCB); Alpine Lake, June 18, 1953, McNeil and Schuster (1 UCB); Mill Valley, March 1 (3 ex.), May 3 (3 ex.), May 27 (1 ex.), May 30 (1 ex.), June 3 (1 ex.), June 9 (1 ex.), June 14 (1 ex.), July 9 (3 ex.), forest duff, H. Leech (13 CAS, 1 CNC), June 14, 1952, debris from old *Neotoma* nest, H. Leech (2 CNC); east slope of Mount Tamalpais, May 14, 1952, redwood stump hole, H. S. Dybas (1 FMNH). *Mendocino County*: Mendocino, August 17, 1954 (2 ex.), January 20-22, 1955 (5 ex.), Helfer (7 CNC); Fort Bragg, August 3, 1954, Helfer (1 CNC). *Monterey County*: 19.4 mi. E San Lucas, *Heteromeles* duff (1 UCR); Jamesburg, September 12, 1957, I. Moore (2 CNC). *Placer County*: 4 mi. S Truckee, Truckee River, May 5, 1968, M. Campbell and A. Smetana (1 CNC). *Riverside County*: Millard Canyon, May 1, 1971, *Quercus* duff, J. Pinto (1 UCR); Riv[erside], May (2 MCZ). *Santa Clara County*: Mount Madonna State Park, November 7, 1959, J. R. Powers (1 MCZ). *Santa Cruz County*: Ben Lomond, July 5, 1953 (2 ex.), June 21, 1953, *Pseudotsuga taxifolia*, *Sequoia* (10 ex.), McNeil (15 UCB). *Shasta County*: 8 mi. S Dunsmuir, July 11, 1954, Gilbert and Schuster (2 UCB); Castle Crag, July (1 UCB). *Siskiyou County*: (2 CAS); 1 mi. S Dunsmuir, November 23, 1954, Gilbert and Schuster (5 UCB); 5.4 mi. SE Seiad Valley O'Neil Creek, July 2-3, 1976, 1500 feet elevation, from moist leaf litter at edge of stream and in hollows near stream that capture flood overflow; L. and N. Herman (24 AMNH), from wet moss, L. and N. Herman (1 AMNH). *Trinity County*: Carrville, June 26, 1913 (1 CAS); Little French Creek at route 299, about 4 mi. NW Big Bar, July 25, 1968, H. Leech (1 CAS). *Tuolumne* County: Strawberry, June 20, 1953, J. G. Rozen (12 UCB). OREGON: *Benton County*: Corvallis, November 14, 1950 (6 ex.), November 26, 1950 fir needles (3 ex.), May 21, 1952, wood rat nest (3 ex.), V. Roth (1 AMNH, 5 FMNH, 6 UW); William Finley National Wildlife Refuge, June 13, 1972, L. Russell (2 UCR). *Clackamas County*: 1 mi. S Barton, South Baker Ferry Road, Eden Road near Barton Park, April 22, 1972, rotted wood and leaves (4 ex.), oak, bark, moss (4 ex.), E. M. Benedict (8 CNC); 3 mi. from Carver on South Baker Road, Gerber Road, April 22, 1972, Western Red Cedar duff, E. M. Benedict (14 CNC). *Coos County*: Charleston, September, 1947, decayed stump, I. Newell (1 DM); 1 mi. W Bandon, Bandon Beach, May 18, 1973, duff of Sitka Spruce, E. M. Benedict (3 CNC). *Curry County*: Gold Beach, May 11, 1955, duff of Douglas Fir, J. Capizzi (27 UW); 13 mi. E Gold Beach on road to Agness, March 10, 1972, 600 feet elevation, oak duff, E. M. Benedict (3 CNC); 9 mi. N, 12 mi. E Brookings, Siskiyou National Forest, August 24, 1973, Canyon Live Oak duff, E. M. Benedict (1 CNC); 3 mi. from Shasta, on Gold Beach to Agness Road, Siskiyou National Forest along Rogue River, March 10, 1972, E. M. Benedict (5 CNC). *Douglas County*: between Melrose and Umpqua near Cleveland Hill Cemetery road, February 7, 1972, 500 feet elevation, Oak, Madrone, Incense Cedar duff, E. M. Benedict (14 CNC); 6.5 mi. NE Idleyld Park, Rock Creek Road opposite Rock Creek Park, April 1, 1972, 1200 feet elevation, Chinquapin duff, E. M. Benedict (8 CNC); 13 mi. NW Umpqua, 0.5 mi. above Umpqua River, February 7, 1972, 400 feet elevation, California Oak duff and moss, E. M. Benedict (5 CNC); 13 mi. NW Umpqua, along Umpqua river, February 7, 1972, 300 feet elevation, pack rat nest, E. M. Benedict (1 CNC); 4 mi. W Glide, April 1, 1972, 700 feet elevation, Black Oak and Douglas Fir debris, E. M. Benedict (3 CNC); 8 mi. S, 17 mi. E Steamboat, Umpqua National Forest road 2734, October 21, 1972, 3300 feet elevation, E. M. Benedict (3 CNC); 9 mi. S, 15 mi. E Steamboat, Umpqua National Forest road 2600, October 21, 1972, 3000 feet elevation, coniferous and *Rhododendron* duff, E. M. Benedict (2 CNC); "V. T." Jackson County Wayside, April 1, 1972, 600 feet elevation, Big Leaf Maple duff, E. M. Benedict (1 CNC). *Jackson County*: 10 mi. NW Central Point, January 22, 1972, Ponderosa Pine duff and litter, E. M. Benedict (1 CNC); 15 mi. SW Ruch, Upper Applegate Road, November 13, 1971, 1800 feet elevation, oak and coniferous duff, E. M. Benedict (3 CNC); 3 mi. E Eagle Point, Kanutchan Creek, January 22, 1972, 1400 feet elevation, Madrone, oak, and Incense Cedar duff, E. M. Benedict (1 CNC); 6 mi. E, 3 mi. N Gold Hill, 0.25 mi. E junction Table Rock Road and Oregon 234, January 22, 1972, 1200 feet elevation, E. M. Benedict (1 CNC); Squaw Lake Road, 5 mi. E Copper, May 19, 1962, K. Fender (1 AMNH); 19 mi. SE Eagle Point, South Fork Little Butte Creek, August 5, 1969, from cavities produced by removing clumps of grass from near stream's edge, L. Herman (40 AMNH). *Josephine County*: 4.5 mi. N Galice, Rogue River Canyon, April 8, 1972, 600 feet elevation, Big Leaf Maple and Canyon Live Oak litter, E. M. Benedict (5 CNC); 4 mi. N Oregon Caves National Monument, Cave Creek Campground, March 3, 1973, 3000 feet elevation, oak and Douglas Fir litter, E. M. Benedict (2 CNC). *Lane County*: 4 mi. NE Cheshire, Cox Butte Road, December 4, 1971, 400 feet elevation, oak duff and soil, E. M. Benedict (12 CNC); 6 mi. S, 1 mi. E Oakridge, Packard Creek Campground, March 4, 1972, 1500 feet elevation, Oregon Oak duff ( 3 CNC). *Lincoln County*: 5 mi. W Waldport, Driftwood State Park, May 5, 1973, sea level, Manzanita duff, E. M. Benedict (3 CNC); Waldport, near information center, May 5, 1973, sea level, pine duff on shore, E. M. Benedict (4 CNC). *Marion County*: Salem, April 27, 1955, V. Roth (17 UW); 5 mi. N Sublimity, Silverton to Sublimity Road, September 17, 1973, 700 feet elevation, Oregon White Oak duff, E. M. Benedict (7 CNC). *Polk County*: near Bethel, June 1, 1955, oak and fir duff, V. Roth (2 UW); 2.2 mi. W Falls City, June 11, 1973, 800 feet elevation, E. M. Benedict (1 CNC). *Tillamook County*: Woods, October 23, 1955, salal and huckleberry litter, K. Fender (1 KF); 4.5 mi. NW Lee's Camp, Elk Creek State Forest Campground, November 4, 1972, 900 feet elevation, Red Alder duff, E. M. Benedict (3 CNC). *Washington County*: 2 mi. S Timber, December 1, 1948, conifer and brush litter, I. Newell (1 DM); 0.25 mi. E Sherwood, January 1, 1972, 200 feet elevation, rotted hay and dung, E. M. Benedict (1 UW). *Yamhill County*: Peavine Ridge, near McMinnville, June 10, 1955, K. Fender (3 KF); High Heaven, June 3, 1957, K. Fender (1 KF); McMinnville, April 7 (1 ex.), September 6 (1 ex.), December (2 ex.), K. Fender (5 UW); 2 mi. S Carlton, January 1, 1972, 200 feet elevation, Oregon Oak duff and moss (33 ex.), hay and dung (1 ex.), E. M. Benedict (34 CNC). WASHINGTON: *King County*: Seattle, March (3 UW); Seattle, Carkeek Park, June 20, 1955, soil, litter, D. W. Boddy (1 UW). *Pierce County*: Tacoma (1 USNM). *San Juan County*: San Juan Island, Friday Harbor, July 7, moss on ground in Douglas Fir forest (1 ex.), June 18 (1 ex.), July 18 (1 ex.), M. W. Shackleford (2 CAS, 1 UW). *Thurston County*: 5 mi. S Tumwater, August 27, 1957, K. Fender (2 KF).

### *Asemobius* Horn
Figures 67-90, 107-108

*Asemobius* Horn, 1895, pp. 237, 238. Fall, 1901, p. 77. Eichelbaum, 1909, p. 121. Bernhauer and Schubert, 1911, p. 88. Leng, 1920, p. 95. Hatch, 1957, pp. 85-87, pl. XII. Arnett, 1963, pp. 238, 255. Moore, 1963, p. 47, Moore and Legner, 1973, pp. 117-119, 121; 1974, p. 556; 1975, p. 158.

*Type Species. Asemobius caelatus* Horn, by monotypy.

*Diagnosis. Asemobius* may be separated from *Zalobius* and *Nanobius* by the suborbital carina (figs. 70, 71), slightly more widely separated gular sutures (fig. 71), absence of a median gular carina, and absence of longitudinal carinae on the abdominal terga (fig. 83). It also differs by the neck which in *Asemobius* is distinguished from the head laterally and ventrally but not dorsally (fig. 70).

The above characters will distinguish *Asemobius* from other Piestinae and the discussion under Subfamilial Position separates it from other subfamilies.

*Description.* Length 4.0 to 4.5 mm. Body (fig. 69) moderately broad and moderately flattened, and strongly sculptured with punctation and carinae.

Head (fig. 69) with dorsum reticulately punctate. Labrum (fig. 75) with anterior margin sinuate and without enlarged, exposed epipharyngeal lobes; dorsal surface with long setae. Epipharynx with globosetae near anterior margin (fig. 74). Anteclypeus large and apparently permitted extrusion of labrum (fig. 69). Supra-antennal ridge carinate (fig. 68). Epistomal suture evident externally as ridge (fig. 69) but absent internally. Neck distinguished from head laterally and ventrally (fig. 71), dorsally neck continuous with dorsum of head, without transverse impression (fig. 70). Mandibles bidentate, asymmetrical, short, and broad, and with prostheca and mola present; mola fused to base; lateral surface with row of setae and with dorsal and ventral edge of basal half carinate (figs. 72, 73). Maxillary palpus four-segmented; fourth segment stout and elongate. Labium as in figure 84; palpus three-segmented. Prementum divided into three sclerites, median sclerite large (fig. 84). Hypopharynx (fig. 76) with four anterior lobes, with row of stout setae extending onto disk, and with numerous cuticular processes. Gular sutures widely separated and divergent posteriorly and anteriorly; gula without median carina; submentum and gula not separated by submental suture (fig. 71).

Pronotal lateral margin serrate; pronotal dorsal surface costate and broadly elevated medially (fig. 69). Protergosternal suture present (fig. 77). Prohypomeron with shallow depression anteriorly (figs. 107-108). Procoxal fissure narrowly open (fig. 77). Postprocoxal lobe present. Procoxae with shallow groove on mesial surface (figs. 80, 81). Prosternal process cariniform (fig. 77).

Scutellum with apex slightly exposed from under pronotum. Elytra (fig. 69) costate and well developed rows of punctures, epipleural ridge present. Mesocoxae continuous (fig. 78).

Tibiae without rows of spines. Tarsal formula 5-5-5.

Abdominal segments III to VII each with well-developed paratergite (fig. 79), parasternites absent; paratergites III to VI with basal impression; terga without basal, longitudinal carinae (fig. 83). Sternal sclerites of segment I present and medially divided (as in fig. 33). Sternite II reduced and fused to III. Sternites II and III with median longitudinal carina.

Tergum IX fused dorsally (fig. 86). Tergum X trianguloid (fig. 86).

Male. Aedeagus (fig. 88) trilobed. Parameres long and slender. Median lobe with U-shaped sclerite surrounding basal orifice (figs. 82, 88).

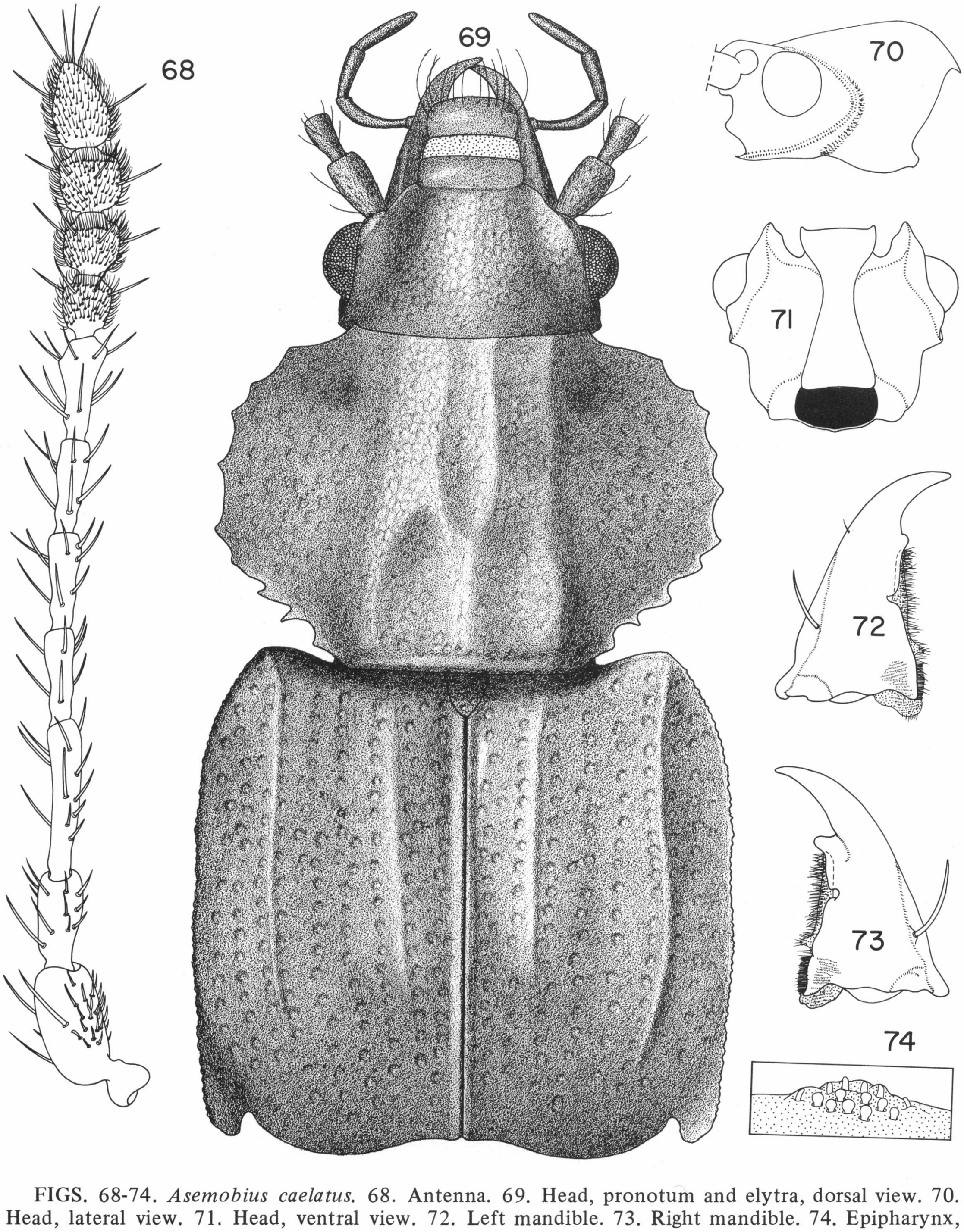
Female. Tergum IX with ventromesial edge lobed (fig. 87). Stylus present (fig. 87). Coxites cylindrical. Valvifer large (fig. 87). Midventral, intergonopodal sclerite present (fig. 87).

*Discussion.* The relative proximity of the gular sutures has been used in keys to separate *Asemobius* and *Zalobius* (including *serricollis* now in *Nanobius*) (Hatch, 1957, Arnett, 1963, Moore, 1963, Moore and Legner, 1973, 1974). In *Zalobius* the sutures have been said to be confluent but after clearing the head capsule it is evident that they are not but only appear to be.

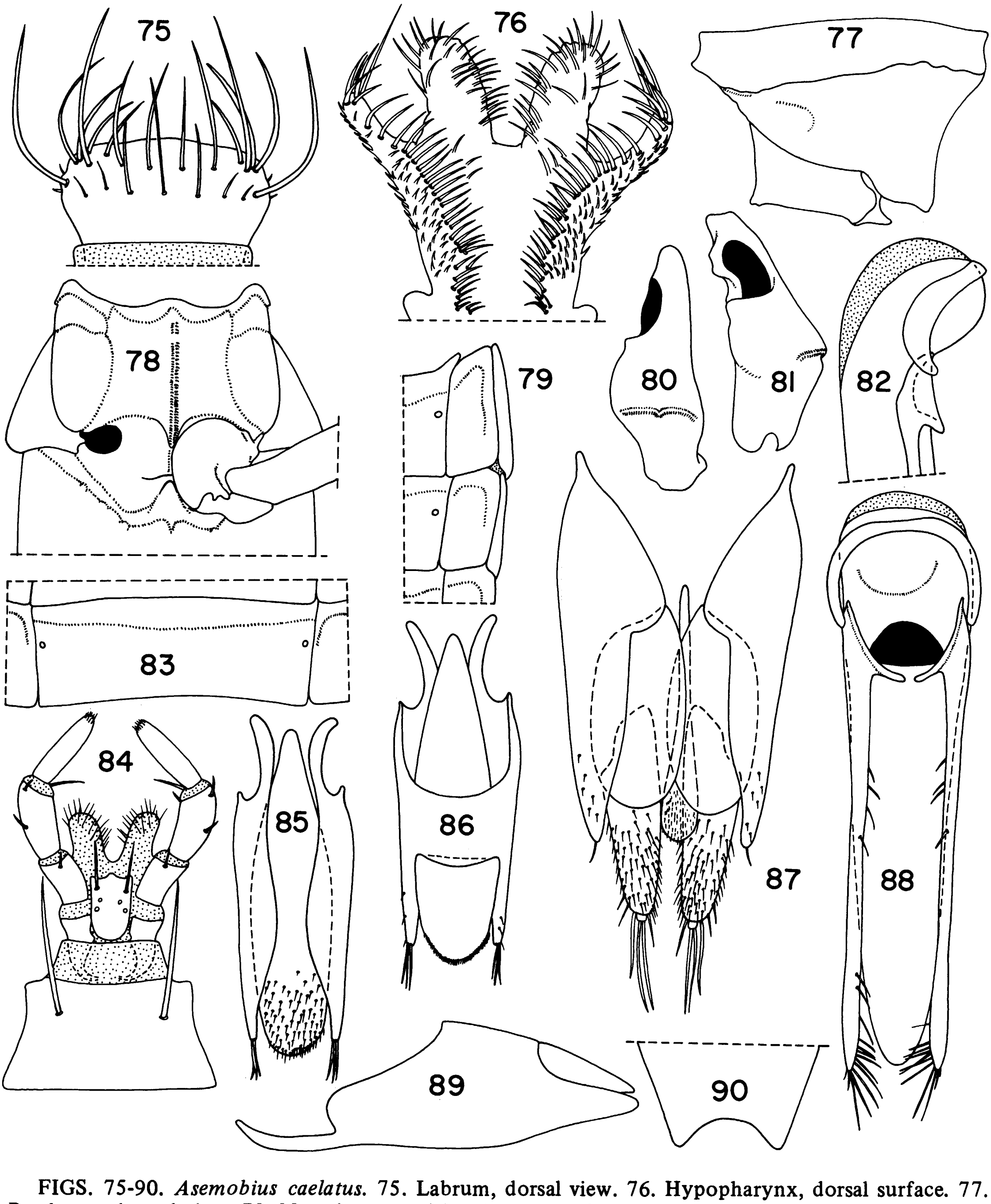
### *Asemobius caelatus* Horn
Figures 67-90, 107-108

*Asemobius caelatus* Horn, 1895, pp. 238, 239. Fall, 1901, p. 77. Eichelbaum, 1909, p. 121. Bernhauer and Schubert, 1911, p. 88. Leng, 1920, p. 95. Hatch, 1957, p. 87, pl. XII. Arnett, 1963, p. 255. Moore and Legner, 1973, pp. 117-119, 121; 1975, p. 158. (Type locality: California. Holotype in the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts; type examined).

*Diagnosis.* In addition to the characters in the key, *caelatus* may be distinguished by the subocular (figs. 70, 71) and postocular carina, the




FIGS. 68-74. *Asemobius caelatus.* 68. Antenna. 69. Head, pronotum and elytra, dorsal view. 70. Head, lateral view. 71. Head, ventral view. 72. Left mandible. 73. Right mandible. 74. Epipharynx, median portion of anterior margin, ventral view.




FIGS. 75-90. *Asemobius caelatus.* 75. Labrum, dorsal view. 76. Hypopharynx, dorsal surface. 77. Prothorax, lateral view. 78. Mesothorax and basal portion of metathorax, ventral view. 79. Abdominal paratergites of right side of segments II, III, and base of IV, dorsal view. 80. Procoxa, mesial surface. 81. Procoxa, anterior surface. 82. Aedeagus, basal portion, lateral view. 83. Abdominal terga III (apex) and IV, dorsal view. 84. Labium, ventral view. 85. Abdominal segment IX, male, ventral view. 86. Abdominal segments IX and X, dorsal view. 87. Abdominal segment IX, female, ventral view. 88. Aedeagus, ventral view. 89. Abdominal segments IX and X, lateral view. 90. Sternum VIII, male, apex.

deep incision of the posterior elytral margin (fig. 69), the absence of longitudinal carinae of the abdominal terga (fig. 83), the male's emarginate eighth sternum (fig. 90) as well as other characters presented in the description. The gular sutures (fig. 71) are more widely separated than for the other species and the neck (fig. 70) is not delimited dorsally.

*Description.* Length 4.0 to 4.5 mm. Form broad, tapered posteriorly; head, pronotum, and elytra strongly sculptured; pronotum and elytra costate.

Head strongly sculptured dorsally with reticulate punctation (fig. 69). Setae short, unmodified, and scattered. Dorsum with median region elevated; supra-antennal region carinate (fig. 69). Neck broad, at widest about three-fourths width of head measured across eyes. Clypeus distinguished from dorsum externally by transverse ridge (fig. 69); clypeus shining with scattered punctation and with two lateral setae, one of which is nearer middle. Eye occupying about one quarter of length of head measured from anterior margin of clypeus to posterior margin of head. Head with subocular (figs. 70, 71) and postocular carina (fig. 70); carina well developed and extending obsoletely to just above eye. Lateral portion of head with strong reticulate punctation. Venter of head moderately strongly punctate. Labrum with slightly sinuate anterior margin which lacks peglike setae on anterior edge (fig. 75). Epipharynx with small cluster of globosetae at middle of anterior portion (fig. 74). Mandibles (figs. 72, 73) with emargination near middle of median edge; left mandible (fig. 72) with small subapical denticle and moderately long apical denticle; right mandible (fig. 73) with large subapical denticle and long apical denticle; prostheca membranous and digitate apically (figs. 72, 73). Hypopharynx (fig. 76) with four anteriorly directed lobes; surface with row of setae extending from apex of lateral lobe toward base; surface with short cuticular processes on lateral portion and lateral lobes; median lobes with long cuticular processes. Mentum without carina (fig. 84). Antennomeres (fig. 68) 1 to 7 shining, with obsolete sculpturing and sparse pubescence; antennomeres 1 and 2 stout, 3 to 7 slender; antennomeres 8 to 11 opaque, densely pubescent, strongly sculptured and slightly enlarged; antennomere 3 longest; antennomere 7 strongly expanded apically and with ring of setae near base and apex; setae unmodified.

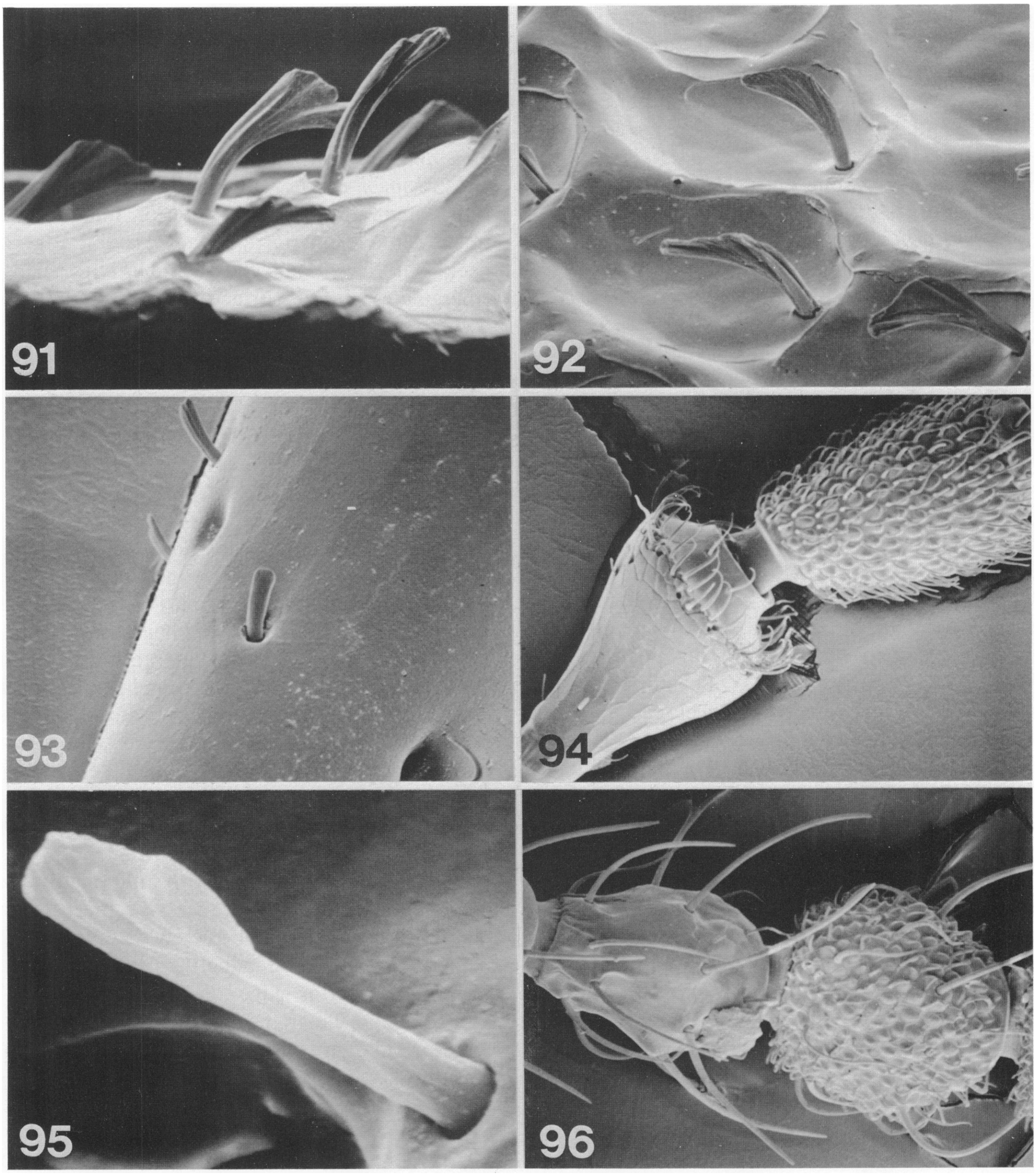
Prothorax (fig. 69) broad, wider than long, and with lateral portion strongly explanate; lateral margin strongly serrate, broadly rounded, and strongly convergent basally; teeth of serration large and variable; anterior margin with small denticle on portion above lateral edge of neck; anterior margin between denticles slightly emarginate; dorsal surface strongly sculptured with coarse punctation; setae short, scattered and unmodified. Median portion of notum broadly raised, with four low costae, shallow depression basally on each side of midline and one long shallow median depression on anterior half. Prohypomeron (figs. 107-108) glabrous anteriorly but for moderately large depression, depression with sculptured surface, dorsal edge of depression formed by carina; postprocoxal lobe punctate. Prosternum coarsely punctured and with midlongitudinal costa. Elytron (fig. 69) with 10 strongly punctate striae and two costae, one extending posteriorly from laterad of scutellum and other from humeral angle, and one carina at lateral margin formed by carinate epipleural ridge; posterior margin sinuate and with lateral portion deeply incised (fig. 69). Epipleural ridge large and carinate and forming serrulate lateral margin. Epipleuron coarsely punctate. Elytral setae short, scattered, and unmodified.

Mesosternum (fig. 78) with midlongitudinal carina, and with curved, carinate mesosternopleural suture; surface obsoletely sculptured and with a few, scattered punctures to impunctate; collar of anterior edge of mesosternum with small, median emargination of posterior margin, anterior margin with median, rounded lobe. Metathoracic wing fully developed.

Legs long and slender.

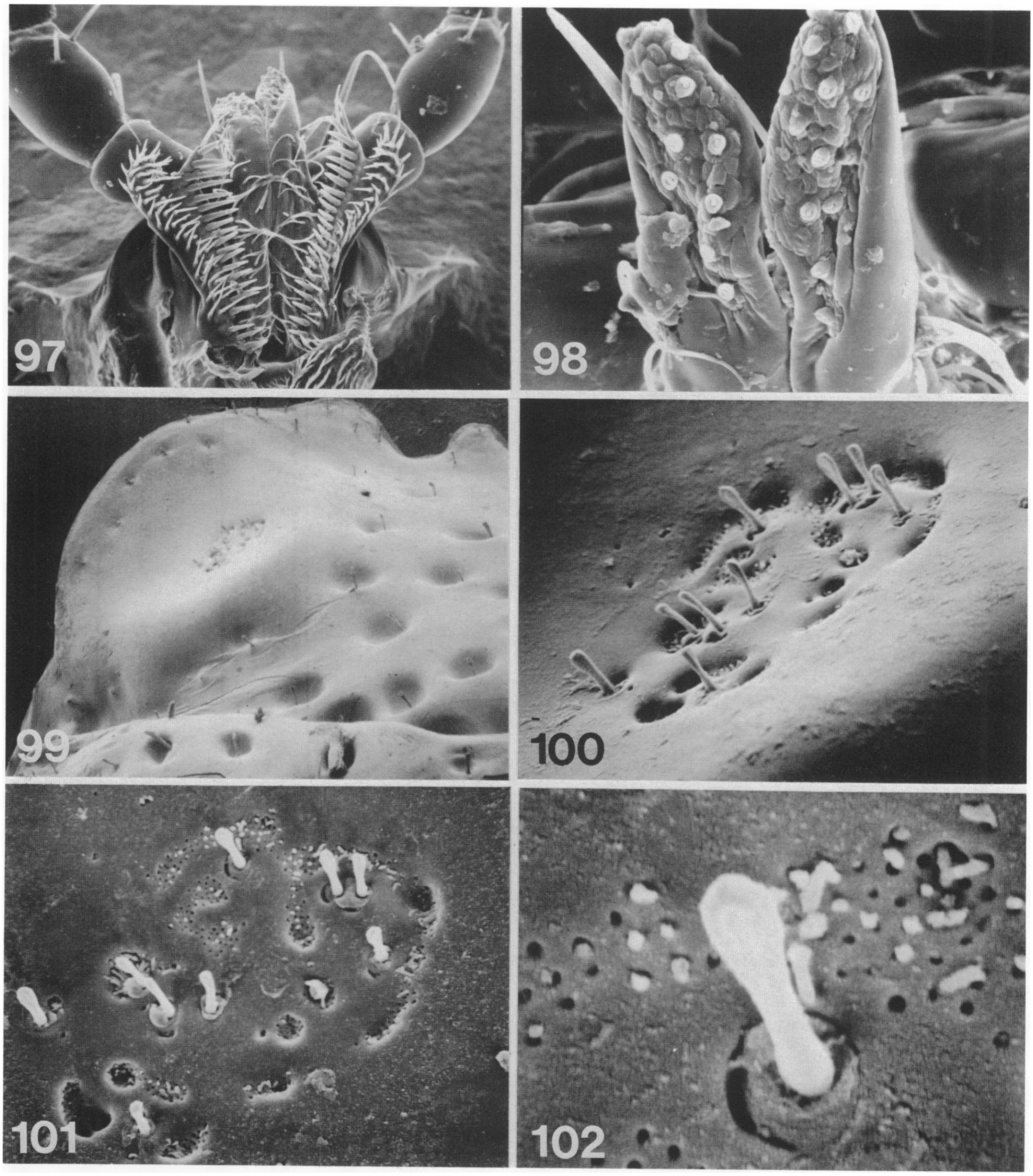
Abdomen strongly tapered posteriorly. Segments III to VII each with one pair of paratergites (fig. 79). Terga without basal, longitudinal carinae (fig. 83). Tergum VIII with rounded posterior margin.

Male. Sternum VIII (fig. 90) broadly and moderately deeply emarginate, surface with shallow, triangular depression extended anteriorly, depression tapered from emargination. Tergum IX (fig. 86) with lateroapical lobes compressed in




FIGS. 91-94. *Zalobius spinicollis.* 91. Modified setae on lateral edge of elytra, 800×. 92. Modified setae on pronotum, 800×. 93. Modified setae on antennomere 5, 1520×. 94. Antennomeres 7 and 8, 400×.

FIGS. 95-96. *Nanobius serricollis.* 95. Modified seta on elytron, 5200×. 96. Antennomeres 6 and 7, 400×.




FIGS. 97-102. *Nanobius serricollis.* 97. Hypopharynx, 360×. 98. Hypopharynx, median lobes, 1200×. 99. Prohypomeron, lateroventral view of depression near anterolateral margin, 210×. 100. Prohypomeron, lateroventral view, setae and micropores in depression, 1040×. 101. Prohypomeron, lateral view, setae and micropores in depression, 1040×. 102. Prohypomeron, seta, and micropores in depression, 5200×.

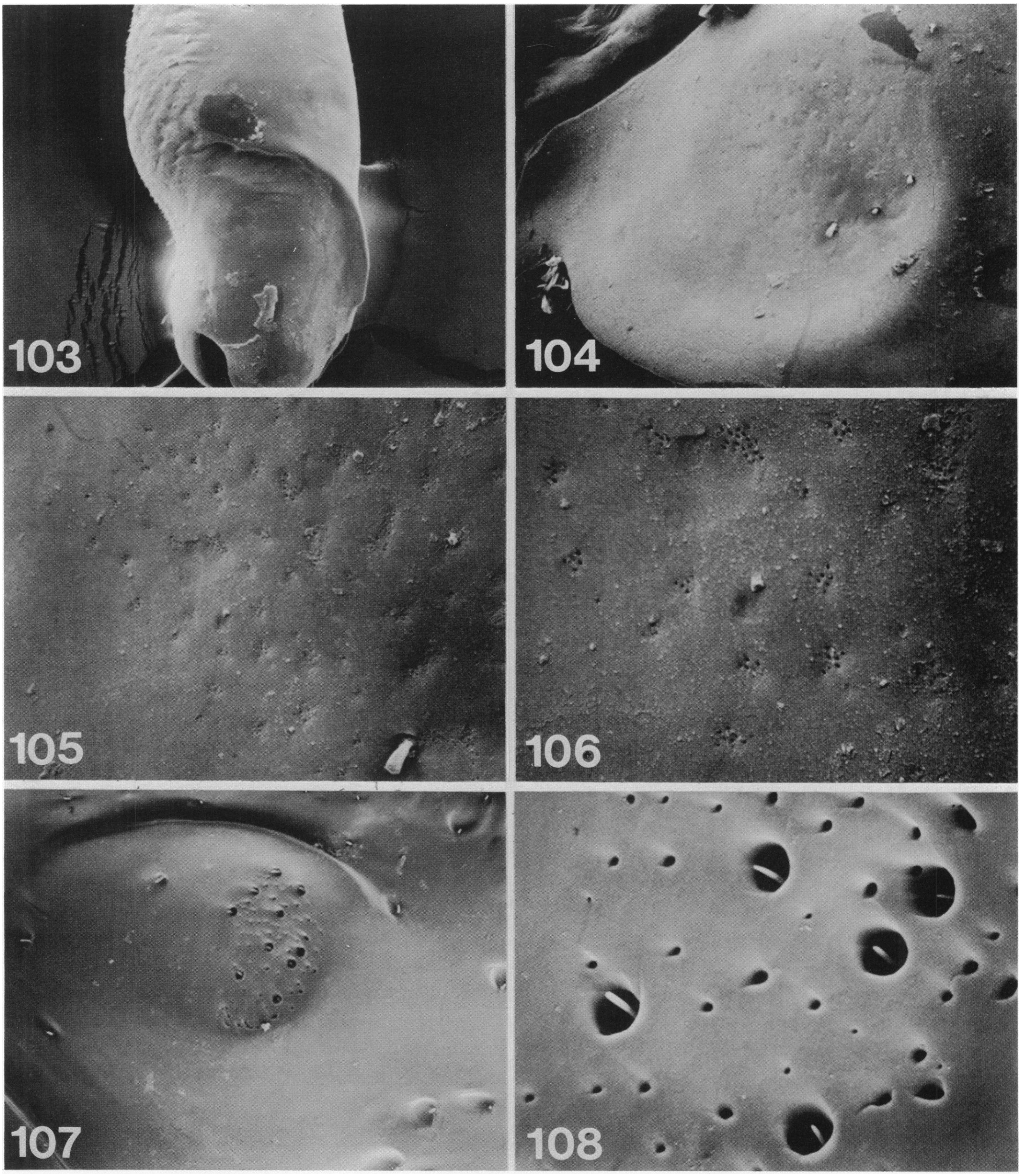



FIG. 103. *Nanobius serricollis*, procoxa, anterior view of ventral half, 210X.

FIGS. 104-106. *Zalobius spinicollis.* 104. Prohypomeron, lateral view of depression near anterolateral margin, 210X. 105. Prohypomeron, lateral view, seta, and micropores in depression, 520X. 106. Prohypomeron, lateral view, micropores in depression, 1040X.

FIGS. 107-108. *Asemobius caelatus.* 107. Prohypomeron, lateral view of depression near anterolateral margin, 190X. 108. Prohypomeron, lateral view, setae, and micropores in depression, 960X.

dorsal view, triangular (fig. 89) in lateral view and not extending beyond posterior margin of tergum X; anteroventral margin with slender curved struts. Sternum IX (fig. 85) strongly tapered anteriorly and moderately tapered posteriorly; posterior third pubescent; posterior margin rounded.

Aedeagus (figs. 82, 88) with U-shaped sclerite surrounding basal foramen. Median lobe long and slender. Parameres long, slender and with numerous setae.

Female. Tergum IX with lateroapical lobes compressed in dorsal view and triangular (fig. 89) in lateral view; stylus present and moderately large and with long setae (fig. 87). Coxite stout, cylindrical, and pubescent (fig. 87). Surface of intergonopodal sclerite pubescent on apical portion (fig. 87); apex rounded and entire.

*Variation.* The serration of the pronotal margins is variable and asymmetrical.

*Habitat and Distribution.* I have examined specimens from two localities in southern British Columbia, one in Washington and the type from an unknown locality in California (fig. 67).

The species has apparently been collected only four times and only once in series and with collection data. Milton Campbell and Aleš Smetana collected at least 13 specimens from debris (Campbell, in lett.) floating on a small, rain-swollen river in southern British Columbia. The debris was caught behind a log jam that had formed across the river and the specimens were collected by treading the floating mat under water forcing the beetles to the surface.

*Material Examined.* 15 specimens.

Canada: BRITISH COLUMBIA: 8 mi. W Creston, June 19, 1968, from river debris, M. Campbell and A. Smetana (2 AMNH, 9 CNC, 1 FMNH); 2 mi. S Salmo, June 9, 1968, from river debris, M. Campbell and A. Smetana (1 MCZ).

United States: CALIFORNIA: (1 Lectotype, MCZ). WASHINGTON: King County: Baring, July (1 CAS).

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