

11-1-1991

Revision of the Cumacean Family Leuconidae

Les Watling

University of Maine - Main, watling@maine.edu

Follow this and additional works at: https://digitalcommons.library.umaine.edu/sms_facpub

Repository Citation

Watling, Les, "Revision of the Cumacean Family Leuconidae" (1991). *Marine Sciences Faculty Scholarship*. 108.
https://digitalcommons.library.umaine.edu/sms_facpub/108

This Article is brought to you for free and open access by DigitalCommons@UMaine. It has been accepted for inclusion in Marine Sciences Faculty Scholarship by an authorized administrator of DigitalCommons@UMaine. For more information, please contact um.library.technical.services@maine.edu.

REVISION OF THE CUMACEAN FAMILY LEUCONIDAE

Les Watling

ABSTRACT

The family Leuconidae currently contains 99 species. With the exception of *Epileucon*, all genera in the family were established by 1907. All new species have been subsequently assigned to those genera, gradually producing genera distinguishable on the basis of single characters. In this paper *Epileucon* is reduced to a subgenus of *Leucon* as proposed by Băcescu (1988), and the species of *Leucon* are further apportioned among the subgenera *Leucon* Krøyer, *Macrauleucon*, new subgenus, *Crymoleucon*, new subgenus, and *Alytoleucon*, new subgenus. In addition, the new genera *Ommatoleucon*, *Austroleucon*, *Nippoleucon*, and *Bytholeucon* are proposed, and the genus *Coricumma* Watling and Breedy is added to this family. The new genus *Americumma*, with unclear family affiliations, is proposed for a species previously assigned to *Heteroleucon*. Complete diagnoses are provided for all genera and keys are given to all genera and species.

The Leuconidae is one of the oldest of all cumacean families, having been established by Sars in 1878 for the genera *Leucon* and *Eudorella*. *Eudorellopsis* was created by Sars in 1882 to accommodate two previously described species. Additional species from the North Atlantic and Mediterranean region gradually swelled the contents of these genera, due especially to the efforts of Sars (13 species). In the early 1900's, as material from various expeditions became available, many more new species were described. However, only a few belonged to the new genera described by Zimmer (*Pseudoleucon*) in 1903 and Calman (*Hemileucon*, *Heteroleucon*, and *Paraleucon*) in 1907. These genera accommodated all subsequent new species until Jones (1956) proposed *Epileucon*. The family presently contains 99 species assigned (occasionally with doubt) to those eight genera.

Bishop (1981a) described a number of new species which he assigned to *Epileucon*. He noted that the original diagnosis of *Epileucon* was based on a character ("absence of a serrated dorsal crest on the carapace of the female," Jones, 1956) that did not show stability even in the type species. However, based on an extensive examination of deep Atlantic leuconids, the genus was rediagnosed using a suite of characters, chief among them being the presence on pereonite 5 of at least one pair of anteriorly curved ventral teeth (Bishop, 1981a). All other characters were acknowledged by Bishop to occur also in some or several species of *Leucon*. Băcescu (1988) rejected the genus *Epi-*

leucon, suggesting that the characters proposed were not significant and did not define all species in the genus. Instead, he proposed that *Leucon* should be divided into the subgenera *Leucon* and *Epileucon*, recognizing that the species in this genus could be segregated into discrete groups. In the following account, several other subgenera are proposed, each of which are hypothesized to be a phylogenetic lineage within the genus.

With the exception of *Epileucon*, there have been no new genera created for the 60+ species described since 1907. For most of the shallow northern hemisphere species, this has not been a problem, since they fit quite comfortably into the genera established earlier for species from this region. For species from Asia and the South Pacific, Central America, and the deep sea, use of the established genera has been problematic. In several cases the generic diagnoses have been so stretched that only one or two characters continue to hold a genus together. Occasionally, the few members of a genus do not look even remotely alike. In this paper, several new genera are created in order to deal with these problems and all genera are rediagnosed.

KEY TO GENERA OF LEUCONIDAE

1. Distinct eye lens and/or pigment present 2
- Eyelobe without lens or pigment 3
2. Eyelobe extending to end of pseudorostrum, uropod endopod 2-articulate *Coricumma*
- Eyelobe not reaching end of pseudorostrum, uropod endopod uniaarticulate *Ommatoleucon*

3. Exopods on pereopods 1 and 2 only in ♂ and ♀ *Heteroleucon*
- Exopods on pereopods 1–3 in ♀ and 1–4 in ♂ 4
4. Uropod endopod uniarticulate 5
- Uropod endopod 2-articulate 6
5. Pereiopod 2 article 3 <one-fourth as long as wide; ♂ antenna 2 with seta brush on both anterior and posterior margins of peduncle article 5; ♂ without pleopods *Austroleucon*
- Pereiopod 2 article 3 half as long as wide; ♂ antenna 2 with seta brush only on anterior margin of peduncle articles 4 and 5; ♂ with 1 pair of pleopods *Paraleucon*
6. Efferent orifice anterior or anterodorsal 7
- Efferent orifice distinctly dorsal, pseudorostral lappets bent posteriad and directed dorsally 11
7. Pereiopod 2 article 3 nearly as long as wide *Hemileucon*
- Pereiopod 2 article 3 much shorter than wide or lost 8
8. Antenna 1 not geniculate or weakly geniculate 9
- Antenna 1 geniculate between peduncle articles 1 and 2 10
9. ♂ without pleopods, ♂ antenna 2 not reaching end of pereion *Nippoleucon*
- ♂ with 2 pairs of pleopods, ♂ antenna 2 extending along pleon *Leucon*
10. Uropod endopod and exopod subequal, anterolateral corner of carapace strongly angular *Bytholeucon*
- Uropod endopod much shorter than exopod, anterolateral corner of carapace obtuse *Pseudoleucon*
11. Antenna 1 geniculate between peduncle articles 1 and 2 *Eudorelopsis*
- Antenna 1 geniculate between peduncle articles 2 and 3 *Eudorella*

Leucon Krøyer, 1846

Fig. 1

Epileucon Jones, 1956.

Type Species. — *Cuma nasica* Krøyer, 1841.

Diagnosis (emended). — Pseudorostrum projecting anteriorly, usually slightly shorter in male; antenna 1 not geniculate; male antenna 2 with brush of setae on anterior margin of peduncle articles 4 and 5; male antenna 2 flagellum extending well along pleon; female with exopods on pereopods 1–3; male with exopods on pereopods 1–4; pereiopod 2 article 3 very short or lacking; uropod endopod 2-articulate; male with 2 pairs of pleopods.

KEY TO SUBGENERA OF *LEUCON*

1. Branchial siphon elongate, greatly exceeding pseudorostrum *Macrauloleucon*
- Branchial siphon of normal length, protruding

- only slightly beyond pseudorostrum 2
2. Pereionite 5 with ventral hook(s) *Epileucon*
- Pereionite 5 without ventral hook(s) 3
3. Antenna 1 accessory flagellum extending at least to midlength of main flagellum first article *Crymoleucon*
- Antenna 1 accessory flagellum short 4
4. Uropod endopod terminal seta fused to distal article *Alytoleucon*
- Uropod endopod terminal seta not fused to distal article *Leucon*

COMPONENT SUBGENERA OF THE GENUS *LEUCON*

Leucon Krøyer, 1846

Fig. 1a–c

Type Species. — *Cuma nasica* Krøyer, 1841.

Diagnosis. — Branchial siphon normal; antenna 1 accessory flagellum rudimentary; pereionite 5 without ventral teeth; uropod endopod terminal seta not fused to distal article.

Additional Species. — *L. (L.) acutirostris* Sars, 1865; *L. (L.) affinis* Fage, 1951; *L. (L.) americanus* Zimmer, 1943; *L. (L.) armatus* Given, 1961; *L. (L.) assimilis* Sars, 1887; *L. (L.) fulvus* Sars, 1865; *L. (L.) homorhynchus* Bishop, 1981b; *L. (L.) kobjakovae* Lomakina, 1955; *L. (L.) laticaudus* Lomakina, 1952; *L. (L.) magnadentatus* Given, 1961; *L. (L.) mediterraneus* Sars, 1879; *L. (L.) minor* Lomakina, 1955; *L. (L.) nasicooides* Liljeborg, 1855; *L. (L.) nathorsti* Ohlin, 1901; *L. (L.) panamensis* Jones, 1969; *L. (L.) profundus* Hansen, 1920; *L. (L.) robustus* Hansen, 1920; *L. (L.) serratus* Norman, 1879; *L. (L.) simanensis* Gamô, 1962; *L. (L.) subnasica* Given, 1961; *L. (L.) varians* Gamô, 1962.

KEY TO FEMALES OF *LEUCON* (*LEUCON*)

1. Uropod exopod clearly longer than endopod 2
- Uropod exopod shorter than or as long as endopod 7
2. Pereiopod 2 article 3 distinct 3
- Pereiopod 2 article 3 indistinct 5
3. Pseudorostral lobes upturned 4
- Pseudorostral lobes directed horizontally *americanus*
4. Carapace with about 10 dorsal serrations anteriorly *simanensis*
- Carapace with about 4 dorsal serrations anteriorly *variens*
5. Carapace with dorsal serrations extending onto posterior one-third 6
- Carapace with dorsal serrations only on anterior two-thirds *acutirostris*



Fig. 1. *Leucon (Leucon) nasica* (from Sars, 1900): a, carapace, side view; b, antenna 1; c, uropod. *Leucon (Epileucon) galathea* (from Bishop, 1981a): d, carapace, side view; e, pereionites 3-5 and pleonites 1 and 2; f, antenna 1; g, uropod. *Leucon (Macrauloleucon) spinulosus* (from Hansen, 1920): h, carapace and antenna 1; i, uropod. *Leucon (Crymoleucon) tener* (from Hansen, 1920): j, carapace and antenna 1; k, uropod. *Leucon (Alytoleucon) medius* (from Bishop, 1982): l, carapace, side view; m, antenna 1; n, uropod. (Drawings not to same scale.)

- | | |
|---|--|
| 6. Carapace with dorsolateral spines on frontal lobe <i>robustus</i> | - Pseudorostral lobes subquadrate (blunt) distally, carapace with dorsal serrations throughout length 13 |
| - Carapace without dorsolateral spines on frontal lobe <i>serratus</i> | 11. Pereiopod 1 basis with large serrations <i>magnadentata</i> |
| 7. Pereiopod 1 article 5 longer than article 6 8 | - Pereiopod 1 basis without large serrations 12 |
| - Pereiopod 1 articles 5 and 6 subequal in length 15 | 12. Pereiopod 1 basis with several plumose setae along margin <i>subnasica</i> |
| 8. Uropod endopod broadened <i>laticauda</i> | - Pereiopod 1 with few setae of any kind along margin <i>minor</i> |
| - Uropod endopod normally elongate 9 | 13. Uropod peduncle shorter than endopod <i>armatus</i> |
| 9. Pereiopod 2 article 3 present <i>panamensis</i> | - Uropod peduncle as long as endopod 14 |
| - Pereiopod 2 article 3 not present 10 | 14. Carapace and following pereionites strongly |
| 10. Pseudorostral lobes subtriangular to acute distally, carapace with dorsal serrations absent from posterior third 11 | |

- convex dorsally *nasicooides*
- Carapace and following pereionites not arched dorsally *kobjakovae*
- 15. Antenna 1 peduncle article 3 at least as long as main flagellum 16
- Antenna 1 peduncle article 3 shorter than main flagellum 19
- 16. Uropod exopod extending only to distal margin of endopod basal article *profundus*
- Uropod endopod extending beyond distal margin of endopod basal article 17
- 17. Carapace with dorsolateral tooth behind frontal lobe *nathorsti*
- Carapace without this tooth 18
- 18. Uropod exopod inner margin with numerous (>10) setae *nasicus*
- Uropod exopod inner margin lightly (<9) setose *affinis*
- 19. Uropod peduncle inner margin heavily setose along length *mediterraneus*
- Uropod peduncle inner margin sparsely setose 20
- 20. Pereiopod 2 article 4 with strong seta at distal corner *assimilis*
- Pereiopod 2 article 4 with at most 1 plumose seta at distal corner 21
- 21. Uropod exopod with dense cluster of long setae distally *homorhynchus*
- Uropod exopod sparsely setose distally *fulvus*

Epileucon Jones, 1956

Fig. 1d-g

Type Species.—*Epileucon galathea* Jones, 1956.

Diagnosis (emended).—Branchial siphon normal; antenna 1 accessory flagellum at least half length of main flagellum first article; pereionite 5 with at least 1 pair of ventral teeth or single midventral tooth; uropod endopod terminal seta not fused to distal article.

Additional Species.—*L. (E.) acclivis* (Bishop, 1981a); *L. (E.) bengalensis* Lomakina, 1967; *L. (E.) craterus* (Bishop, 1981a); *L. (E.) ensis* (Bishop, 1981a); *L. (E.) kalluropus* Stebbing, 1912; *L. (E.) latispina* Jones, 1963; *L. (E.) longirostris* Sars, 1871; *L. (E.) pusillus* (Bishop, 1981a); *L. (E.) socius* (Bishop, 1981a); *L. (E.) spiniventris* Hansen, 1920; *L. (E.) tenuirostris* Sars, 1887.

KEY TO FEMALES OF *LEUCON* (*EPILEUCON*)

(abbreviated and emended from Bishop, 1981a)

1. Pseudorostrum long (<0.5 times carapace length) 2

- Pseudorostrum relatively short (<<0.5 times carapace length) 3
- 2. Pseudorostral lobes distally subacute *tenuirostris*
- Pseudorostral lobes distally bluntly rounded *ensis*
- 3. Sternite of fifth pereionite with at least 4 spiniform teeth 4
- Sternite of fifth pereionite with 1 or 2 spiniform teeth 5
- 4. Peduncle of uropod with 3 or 4 setae on medial margin *galathea*
- Peduncle of uropod with 5-8 setae on medial margin *spiniventris*
- 5. Sternite of fifth pereionite with single midventral tooth *kalluropus*
- Sternite of fifth pereionite with paired teeth 6
- 6. Uropod exopod longer than endopod basal article 7
- Uropod exopod shorter than endopod basal article 10
- 7. Pereiopod 1 dactylus about one-half length of propodus 8
- Pereiopod 1 dactylus about two-thirds length of propodus 9
- 8. Carapace anteroventral corner with protruding tooth *bengalensis*
- Carapace anteroventral corner indistinct, marked by a sinus *latispina*
- 9. Pereiopod 2 dactylus with 3 or 4 plumose setae *acclivis*
- Pereiopod 2 dactylus with more than 6 plumose setae *socius*
- 10. Pereionite 4 pleural plate with ventrally directed tooth *pusillus*
- Pereionite 4 pleural plate ventrally rounded 11
- 11. Pereiopod 2 article 5 with several (>4) plumose setae *craterus*
- Pereiopod 2 article 5 with 1 or 2 plumose setae *longirostris*

Macrauloleucon, new subgenus

Fig. 1h, i

Type Species.—*Leucon spinulosus* Hansen 1920.

Etymology.—Combination of Greek *makros*, long, *aulos*, pipe tube, and *leucon*, the stem genus, referring to the unusually long branchial siphon exhibited by these species.

Diagnosis.—Branchial siphon greatly elongate; antenna 1 accessory flagellum extending beyond midlength of main flagellum first article; pereionite 5 without ventral teeth; uropod endopod terminal seta not fused with distal article.

Additional Species.—*L. (M.) siphonatus* Calman, 1905; *L. (M.) stenorhynchus* Gamô, 1988.

KEY TO SPECIES OF *LEUCON*
(*MACRAUOLEUCON*)

1. Pseudorostrum and frontal lobe with long spines 2
- Pseudorostrum with low spines, none on frontal lobe *siphonatus*
2. Pereionites 2 and 3 with dorsal and dorsolateral spines *spinulosus*
- Pereionites 2 and 3 without spines *stenorhynchus*

***Crymoleucon*, new subgenus**

Fig. 1j, k

Type Species. — *Leucon tener* Hansen, 1920.

Etymology. — From Greek *krymos*, icy cold, for the waters in which the members of this subgenus are found or appear to have been derived, and *leucon*, the stem genus.

Diagnosis. — Branchial siphon normal; antenna 1 accessory flagellum extending at least to midlength of main flagellum first article; pereionite 5 without ventral teeth; uropod endopod terminal seta not fused to distal article.

Additional Species. — *L. (C.) antarcticus* Zimmer, 1907; *L. (C.) bishopi* Băcescu, 1988; *L. (C.) dayae* Ledoyer, 1988; *L. (C.) heterostylis* Calman, 1907a; *L. (C.) inexcavatus* Ledoyer, 1977; *L. (C.) kerguelensis* Zimmer, 1908; *L. (C.) macrorhinus* Fage, 1951; *L. (C.) sagitta* Hansen, 1920; *L. (C.) septemdentatus* Zimmer, 1902; *L. (C.) serrulirostris* Ledoyer, 1988; *L. (C.) vanhoeffeni* Zimmer, 1907.

KEY TO FEMALES OF *LEUCON*
(*CRYMOLEUCON*)

1. Antenna 1 accessory flagellum extending well beyond main flagellum basal article 2
- Antenna 1 accessory flagellum equal in length or shorter than main flagellum basal article 4
2. Uropod exopod shorter than endopod basal article *heterostylis*
- Uropod exopod equal to or longer than endopod basal article 3
3. Antennal notch obsolete; carapace middorsal teeth not extending to posterior margin *inexcavatus*
- Antennal notch strong; carapace middorsal teeth continuous from eyelobe to posterior margin *antarcticus*
4. Pseudorostral lobes greatly elongated 5
- Pseudorostral lobes of normal length 7
5. Pereiopod 1 elongate, article 6 at least twice length of article 7; pseudorostrum with fringe of long setae 6
- Pereiopod 1 stout, article 6 slightly shorter than article 7; pseudorostrum without long fringe of setae *tener*

6. Carapace antennal notch defined ventrally by 2 large teeth *macrorhinus*
- Carapace antennal notch indistinct, anteroventral margin with very small serrations *serrulirostris*
7. Uropod exopod extending well beyond endopod *dayae*
- Uropod exopod equal to or shorter than endopod 8
8. Uropod exopod extending only to end of endopod basal article 9
- Uropod exopod at least equal to entire endopod (complex representing *sagitta*, *vanhoeffeni*, and *kerguelensis*)
9. Antennal notch strong; pereiopod 1 article 7 more than three-fourths length article 6 *septemdentatus*
- Antennal notch obsolescent; pereiopod 1 article 7 about one-half length article 6 *bishopi*

***Alytoleucon*, new subgenus**

Fig. 1l–n

Type Species. — *Leucon jonesi* Bishop, 1982.

Etymology. — From Greek *alytos*, continuous, unbroken, referring to the fused condition of the uropod endopod terminal seta, and *leucon*, the stem genus.

Diagnosis. — Branchial siphon normal; accessory flagellum rudimentary; pereionite 5 without ventral teeth; uropod endopod terminal seta fused to distal article.

Additional Species. — *L. (A.) medius* Bishop, 1982; *L. (A.) pallidus* Sars, 1865; *L. (A.) turgidulus* Bishop, 1982.

KEY TO SPECIES OF *LEUCON* (*ALYTOLEUCON*)

1. Pereiopod 1 compact, article 4 1.5 times length of article 3 *pallidus*
- Pereiopod 1 elongate, article 4 > 3 times length article 3 2
2. Pereiopod 1 exopod articles not reaching distal end of basis *turgidulus*
- Pereiopod 1 exopod articles extending beyond distal end of basis 3
3. Pereiopod 1 article 7 slightly shorter than article 6; pereiopod 3 articles 4 and 5 subequal *medius*
- Pereiopod 1 articles 6 and 7 subequal; pereiopod 3 article 5 > 4 *jonesi*

Remarks. — The genus *Epileucon* was originally created by Jones (1956) for the species *E. galathea*, which had the characters of the genus *Leucon*, but differed from all known species by the absence of a serrated dorsal crest. Bishop (1981a) noted that some specimens of *E. galathea* in fact possessed several small dorsal teeth or serrations on

the carapace. He stated "the supposed distinction between *Epileucon* and *Leucon* is therefore eroded" (p. 354). Bishop then redefined the genus *Epileucon*, using as the primary character the presence of ventral teeth on pereionite 5. In addition, many other characters were listed, the combination of which was considered to be unique to species of *Epileucon*. However, any one or more, but not all, of these characters could be found in some species of *Leucon*. Băcescu (1988) rejected the genus *Epileucon*, suggesting that the additional features provided by Bishop were not significant at the generic level and were not to be seen on all the species presumed to constitute the genus. Instead, he divided the species of *Leucon* into two subgenera, *Leucon* and *Epileucon*, depending on whether or not they possessed ventral teeth on pereionite 5. Bishop (1981a) reexamined several species and the details mentioned above regarding the presence or absence of ventral teeth are taken from his paper. On this basis, *L. bishopi* is moved out of the subgenus *Epileucon*. In this paper, other subgenera are proposed which reflect the common possession of selected features by groups of species of *Leucon*. In each case, it is not felt that these features are of sufficient significance to warrant the erection of new genera, but rather are hypothesized as representing evolutionary patterns within the genus. However, it is possible that the features used to diagnose each subgenus will be found to be homoplasious upon the discovery of additional species.

***Ommatoleucon*, new genus**

Fig. 2a–e

Type Species.—*Leucon ocellaris* Hale, 1945.

Etymology.—From Greek *ommatos*, eye, referring to the presence of a lens on the eyelobe, and *leucon*, the stem genus.

Diagnosis.—Pseudorostrum projecting anteriorly, slightly shortened in male; antenna 1 weakly geniculate between peduncle articles 1 and 2; male antenna 2 with brush of setae on anterior margin of peduncle articles 4 and 5; male antenna 2 flagellum extending well along pleon; female with exopods on pereopods 1–3; male with exopods on pereopods 1–4; pereopod 2 article 3 much shorter than wide in male, lost in

female; uropod endopod uniaarticulate; male with 2 pairs of pleopods; pigmented eye with single lens present in both sexes.

Additional Species.—No others.

Remarks.—The presence of a pigmented eye with a lens distinguishes this genus from all other members of the family. *Ommatoleucon ocellaris* was originally placed in the genus *Leucon* principally on the basis of its general body shape and the presence of two pairs of pleopods in the male. Its eye and the uniaarticulate uropod endopod also made it unique among the members of *Leucon*.

Hemileucon Calman, 1907

Fig. 2f–i

Type Species.—*Hemileucon uniplicatus* Calman, 1907a.

Diagnosis.—Pseudorostrum projecting anteriorly, shorter in male; antenna 1 geniculate between peduncle articles 1 and 2; male antenna 2 with brush of setae on anterior margin of peduncle articles 4 and 5; male antenna 2 flagellum not extending beyond pereion; female with exopods on pereopods 1–3; male with exopods on pereopods 1–4; pereopod 2 article 3 distinct; uropod endopod 2-articulate; male without pleopods.

Additional Species.—*H. comes* Calman, 1907a.

KEY TO THE SPECIES OF
HEMILEUCON

1. Carapace with lateral ridge extending forward from near posterior margin to beginning of pseudorostral lobes; pseudorostral lobes not upturned *uniplicatus*
- Carapace with oblique lateral ridge extending dorsoventrally; pseudorostrum upturned in ♀ *comes*

***Austroleucon*, new genus**

Fig. 2j–m

Type Species.—*Hemileucon levis* Hale, 1945. 1945.

Etymology.—*Austr-*, from Australia, and *leucon*, the stem genus.

Diagnosis.—Pseudorostrum projecting anteriorly, equal in male and female; antenna 1 slightly geniculate between peduncle articles 1 and 2; male antenna 2 with brush of setae on anterior margin of peduncle article 5 and posterior margins of peduncle articles 4 and 5; male antenna 2 flagellum

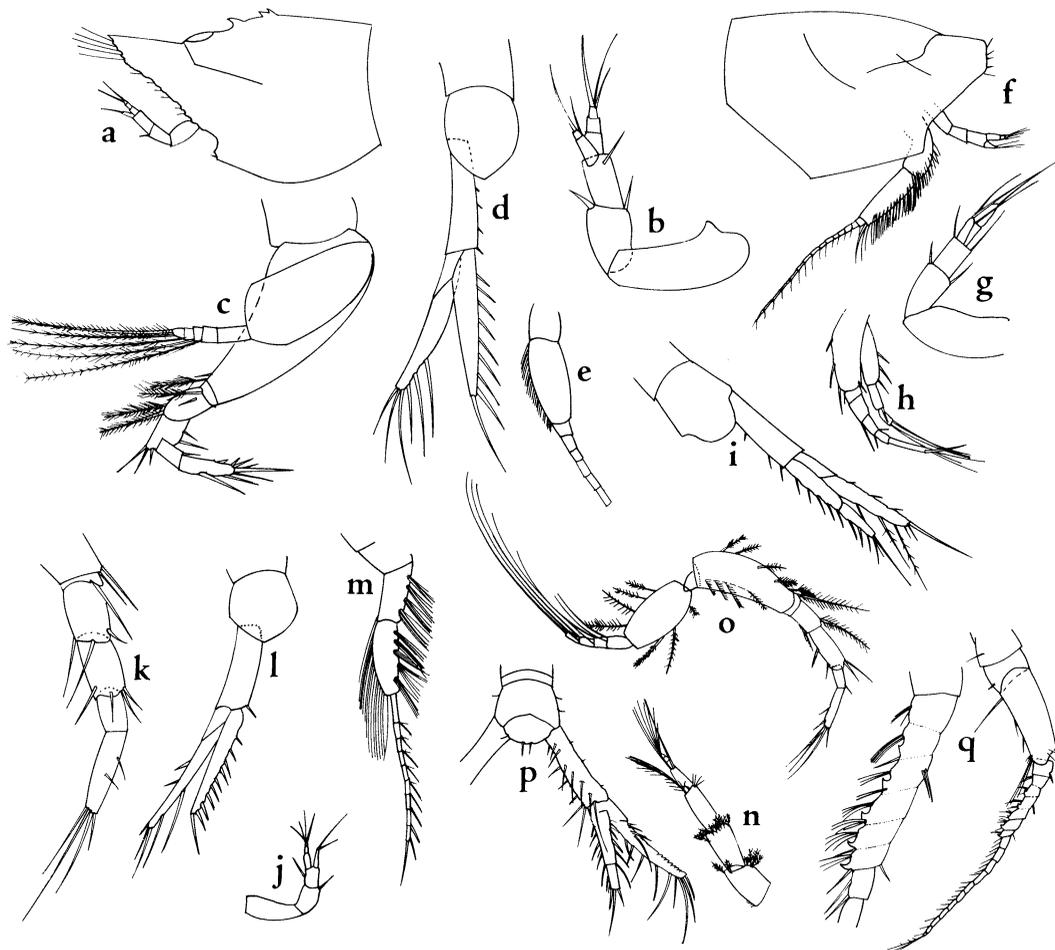


Fig. 2. *Ommatoleucon ocularis* (from Hale, 1945): a, carapace, side view; b, antenna 1; c, pereiopod 2; d, uropod; e, δ antenna 2 peduncle and proximal flagellar articles. *Hemileucon comes* (from Calman, 1907a): f, δ carapace, side view, and antenna 1 and 2; g, antenna 1; h, pereiopod 2; i, uropod. *Austroleucon levis* (from Hale, 1945): j, antenna 1; k, pereiopod 2; l, uropod; m, δ antenna 2. *Nippoleucon hinumensis* (from Gamô, 1967): n, antenna 1; o, pereiopod 2; p, uropod; q, δ antenna 2 with detail of basal flagellar structure. (Drawings not to same scale.)

not extending beyond pereion; female with exopods on pereiopods 1–3; male with exopods on pereiopods 1–4; pereiopod 2 article 3 much shorter than wide; uropod endopod uniarticulate; male without pleopods.

Additional Species.—No others.

Remarks.—*Austroleucon levis* was originally placed in the genus *Hemileucon* on the basis of its lack of pleopods and shortened antenna 2 flagellum. The form of antenna 2, however, differs from that seen in the species of *Hemileucon*. The latter have a typical male antenna 2 with a strong brush of setae on the anterior margin of peduncle articles 4 and 5. Such a setal orientation assures the

reception of sensory information while the male is swimming through the water. In *Austroleucon* the setal brush on the anterior margin of peduncle articles 4 and 5 is augmented by a strong brush on the posterior margin of peduncle article 5. A change in the function of antenna 2 during the mate pursuit process seems likely. Additionally, *Austroleucon* differs from *Hemileucon* by its possession of a uniarticulate uropod endopod.

***Nippoleucon*, new genus**

Fig. 2n–q

Type Species.—*Hemileucon enoshimensis* Gamô, 1967.

Etymology.—*Nippon*-, from Japan, and *leucon*, the stem genus.

Diagnosis.—Pseudorostrum projecting anteriorly, shorter in male; antenna 1 not geniculate; male antenna 2 without brush of setae on peduncle articles 4 and 5, peduncle article 5 subdivided by several annulations, each division with grasping tooth and setal bundle on posterior margin; male antenna 2 flagellum not extending beyond carapace posterior margin; female with exopods on pereopods 1–3; male with exopods on pereopods 1–4; pereopod 2 article 3 very short; uropod endopod 2-articulate; male without pleopods.

Additional Species.—*N. hinumensis* (Gamô, 1967).

Remarks.—The two species assigned to this genus were originally placed in the genus *Hemileucon*. Continuing the modification of the male antenna 2 seen in *Austroleucon*, in *Nippoleucon* the peduncular articles have become modified into grasping-like structures. The brush of setae is completely missing from peduncular articles 4 and 5; peduncle article 5 is ringed with several annulations, each subdivision bearing a recurved flexible tooth and a small cluster of setae; the flagellum is still present but consists of less than 12 articles.

KEY TO SPECIES OF *NIPPOLEUCON*

1. Uropod exopod inner margin with plumose setae; carapace and appendages generally devoid of scales *enoshimensis*
- Uropod exopod inner margin with long simple setae; carapace and appendages generally covered with scales *hinumensis*

Coricum Watling and Breedy, 1988

Type Species.—*Coricum nicoyensis* Watling and Breedy, 1988.

Diagnosis (emended).—Pseudorostrum projecting anteriorly, slightly shorter in male; antenna 1 not geniculate; male antenna 2 peduncular articles 4 and 5 without brush of setae, article 5 annulated and possessing grasping teeth; male antenna 2 flagellum absent; female with exopods only on pereopod 1; male with exopods only on pereopod 1; pereopod 2 article 3 lost; uropod endopod 2-articulate; male with 2 pairs of pleopods; carapace with distinct eyelobe

projecting anteriorly over pseudorostral lobes.

Additional Species.—No others.

Remarks.—Since this species seemed to have the characters of both the Bodotriinae and the Leuconidae, it was tentatively assigned to the former by Watling and Breedy (1988). However, many of the features it exhibits are the result of reductions and I have felt it necessary to reevaluate its placement. In particular, the number of exopods is reduced, the mandible has no molar, and there are only 6 articles in pereopod 3. On the basis of the presence of a strongly developed eyelobe and the reduced number of exopods, the genus was placed in the Bodotriinae. On the other hand, the number of pleopods, the lack of an internal process on the pleopod inner ramus, and truncate mandible (not elongate as originally described), could have justified its placement in the Leuconidae. While the strongly developed eyelobe remains a problem, and certainly necessitates a reevaluation of the characters defining the family, the high degree of similarity of the male antenna 2 grasping structure to that seen in *Nippoleucon* suggests strong affinities to the Leuconidae. A reduced male antenna 2 is seen in other families, for example, in the Lampropridae (e.g., *Lamprops* [see Sars, 1900]), and Bodotriidae Mancocuminae (*Spilocuma* Watling, 1977). In both *Lamprops* and *Spilocuma* the antennal modifications are on the anterior margin, whereas in *Nippoleucon* and *Coricum* the grasping structures are modifications of the posterior margin, suggesting that this function for the antennae has arisen independently.

Heteroleucon Calman, 1907a

Fig. 3a–d

Type Species.—*Heteroleucon akaroensis* Calman, 1907a.

Diagnosis.—Pseudorostrum projecting anterodorsally, shorter in male; antenna 1 weakly geniculate between peduncle articles 1 and 2; male antenna 2 with brush of setae on anterior margin of peduncle articles 4 and 5; male antenna 2 flagellum not extending beyond posterior margin of carapace; female with exopods on pereopods 1 and 2; male with exopods on pereopods 1

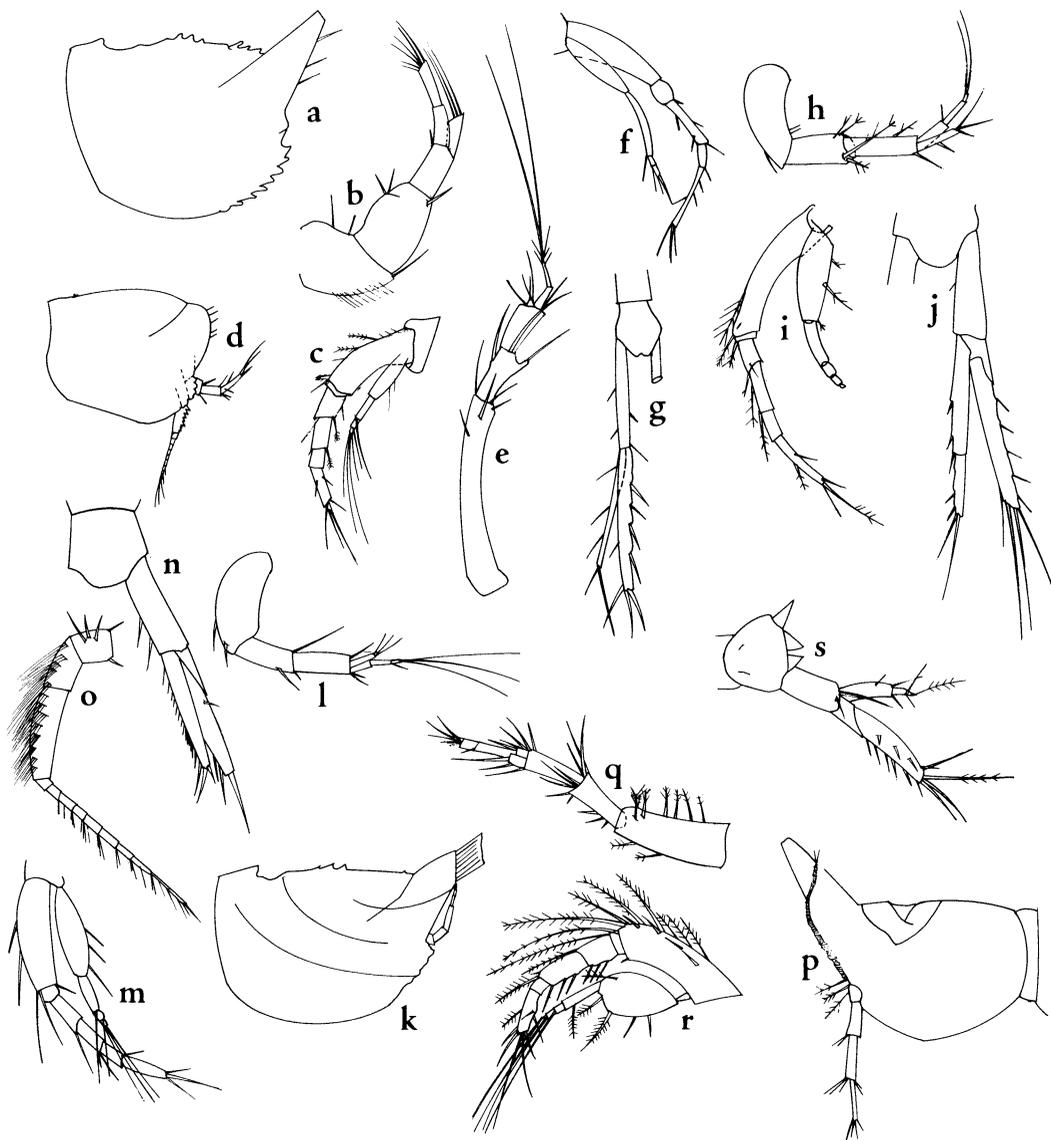


Fig. 3. *Heteroleucon akaroensis* (from Calman, 1907a): a, ♀ carapace, side view; b, antenna 1; c, pereopod 2; d, ♂ carapace, side view, and antennae 1 and 2. *Americuma heardi* (from Băcescu, 1979): e, antenna 1; f, pereopod 2; g, uropod. *Bytholeucon hiscens* (from Bishop, 1981b): h, antenna 1; i, pereopod 2; j, uropod. *Paraleucon suteri* (from Calman, 1907a): k, carapace, side view; l, antenna 1; m, pereopod 2; n, uropod; o, ♂ antenna 2. *Pseudoleucon japonicus* (from Gamô, 1964): p, carapace, side view; q, antenna 1; r, pereopod 2; s, uropod. (Drawings not to same scale.)

and 2; pereopod 2 article 3 short; uropod endopod uniarticulate; male without pleopods.

Additional Species.—No others.

Remarks.—A male from the Natural History Museum, London (BMNH.1907.viii.27.79), with fully developed antenna 2 was examined. The setal brush was seen to consist of setae arranged in five distinct rows

on article 4 and 6 rows on article 5. Each row extended only slightly from the anterior onto the lateral margin of the peduncle article and did not appear to be present on the medial margin.

***Bytholeucon*, new genus**

Fig. 3h–j

Type Species.—*Paraleucon* (?) *hiscens* Bishop, 1981b.

Etymology.—From Greek *bythos*, the depths of the sea, and *leucon*, the stem genus.

Diagnosis.—Pseudorostrum projecting anteriorly, slightly shorter in male; antenna 1 geniculate between peduncle articles 1 and 2; antenna 2 of mature male unknown but in immature male brush of seta seen developing on anterior margin of peduncle articles 4 and 5; antenna 2 flagellum elongate in immature male; female with exopods on pereopods 1–3; male with exopods on pereopods 1–4; pereopod 2 article 3 very short; uropod endopod distinctly 2-articulate; subadult male with (?)0 or 1 pair of pleopods.

Additional Species.—*B. ultraabyssalis* (Gamô, 1987).

Remarks.—*Bytholeucon hiscens* was tentatively assigned to *Paraleucon* by Bishop (1981b) on the basis of the late appearance of a single pair of pleopods in the one male known that is mature enough to show definitive characters. Besides the very great geographic and depth differences in the distribution of *Paraleucon suteri* (shallow waters of New Zealand) and the species of *Bytholeucon* (deep sea in the Atlantic and Pacific), the latter are distinguished also by the long antenna 2 flagellum in the male and short pereopod 2 article 3. When a mature male is found, the relationship of *Bytholeucon* to *Paraleucon* can be better assessed.

KEY TO SPECIES OF *BYTHOLEUCON*

1. Uropod peduncle shorter than basal article of endopod; basal article of pereopod 1 exopod with 2 separated spines *hiscens*
- Uropod peduncle longer than basal article of endopod; basal article of pereopod 1 exopod with 4 closely set spines *ultraabyssalis*

Paraleucon Calman, 1907a

Fig. 3k–o

Type Species.—*P. suteri* Calman, 1907a.

Diagnosis.—Pseudorostrum extending anteriorly, shorter in male; antenna 1 weakly geniculate between articles 1 and 2; male antenna 2 with brush of setae on anterior margin of peduncle articles 4 and 5; male antenna 2 flagellum short; female with exopods on pereopods 1–3; male with exopods on pereopods 1–4; pereopod 2 article 3 distinct, nearly as long as wide; uropod

endopod uniarticulate; male with 1 pair of pleopods.

Additional Species.—No others.

Remarks.—Specimens on slides 1907.viii.29.135 and 1907.viii.29.136 in the collection of the Natural History Museum, London, were examined. In neither case was it possible to see the slight crease that Calman suggested was present on the uropod endopod. Consequently, the uropod endopod must be considered to be uniarticulate.

Pseudoleucon Zimmer, 1903

Fig. 3p–s

Type Species.—*Pseudoleucon sorex* Zimmer, 1903.

Diagnosis.—Pseudorostrum extending anterodorsally, (male ?); antenna 1 geniculate between articles 1 and 2; (? male antenna 2 brush of setae on anterior margin of peduncle articles 4 and 5); (? male antenna 2 flagellum elongate); female with exopods on pereopods 1–3; male with exopods on pereopods 1–4; pereopod 2 article 3 narrow; uropod endopod 2-articulate; male with 2 pairs of pleopods.

Additional Species.—*P. japonicus* Gamô, 1964.

Remarks.—While both sexes are known for *P. sorex*, the male is incompletely described and needs to be reexamined.

KEY TO THE SPECIES OF *PSEUDOLEUCON*

1. Carapace with forwardly directed oblique ridge extending from dorsal margin to posterior limit of pseudorostral lobe *japonicus*
- Carapace without oblique ridge *sorex*

Eudorella Norman, 1867

Type Species.—*Eudora truncatula* Bate, 1856.

Diagnosis.—Pseudorostrum directed dorsally in both male and female; antenna 1 geniculate between peduncle articles 2 and 3; male antenna 2 with brush of setae on anterior margin of peduncle articles 4 and 5; male antenna 2 flagellum extending nearly to end of pleon; female with exopods on pereopods 1–3; male with exopods on pereopods 1–4; pereopod 2 article 3 lost; uropod endopod 2-articulate; male with 2 pairs of pleopods.

Additional Species.—*E. abyssi* Sars, 1887; *E. aequiremis* Hansen, 1920; *E. arctica* Hansen, 1920; *E. dentata* Lomakina, 1955; *E. emarginata* (Krøyer, 1846); *E. fallax* Zimmer, 1909; *E. gottliebi* Băcescu, 1961; *E. gracilior* Zimmer, 1907; *E. gracilis* Sars, 1871; *E. groenlandica* Zimmer, 1926; *E. hirsuta* (Sars, 1869); *E. hispida* Sars, 1871; *E. hurleyi* Jones, 1963; *E. intermedia* Hansen, 1920; *E. minor* Lomakina, 1952; *E. monodon* Calman, 1912; *E. nana* Sars, 1879; *E. pacifica* Hart, 1930; *E. parvula* Hansen, 1920; *E. pusilla* Sars, 1871; *E. rochfordi* Hale, 1945; *E. similis* Calman, 1907b; *E. sordida* Zimmer, 1907; *E. spitzbergensis* Zimmer, 1926; *E. splendida* Zimmer, 1902; *E. tridentata* Hart, 1930.

Remarks.—There are several pairs, or groups, of closely related species in this genus. While Băcescu (1988) considered *E. difficilis* Blake, 1929, to be a good species, Watling (1979) suggested it was probably synonymous with *E. pusilla*. Since the type of *E. difficilis* has been lost, this issue may never be fully resolved. My own collections from the type locality, however, have produced no specimens that differ from the *E. pusilla* collected elsewhere on the east coast of the United States. Other very closely related species pairs include: *E. gracilior* and *E. sordida* (from South Georgia); *E. groenlandica* and *E. spitzbergensis* (Greenland, and Kara and Laptev Seas, respectively); *E. gracilis* and *E. parvula* (Spitsbergen and the Davis Straits, respectively); *E. splendida* and *E. similis* (Antarctic and Subantarctic, respectively); and *E. pacifica* and *E. tridentata* (boreal Pacific). Several species appear to be very close to *E. truncatula*, namely, *E. intermedia* (Davis Strait to Bay of Biscay, 2,000–5,000 m), *E. gottliebi* (eastern Mediterranean, 49–238 m), and *E. nana* (Mediterranean, 37–300 m). The distributions of the latter three species lie well within the geographic range from which *E. truncatula* has been recorded. Clearly, there is a problem with closely related species in this genus. Since the variability in none of these species has been studied, the validity of the closely related species cannot be assessed.

KEY TO FEMALES OF *EUDORELLA*

1. Uropod endopod terminal seta articulated with distal article 2

- Uropod endopod terminal seta fused to terminal article 14
- 2. Uropod rami equal in length *aequiremis*
- Uropod exopod at least slightly shorter than endopod 3
- 3. Uropod exopod much shorter than endopod basal article 4
- Uropod exopod about as long as or longer than endopod basal article 6
- 4. Carapace anteroventral corner with strong downward pointing tooth above sinus *dentata*
- Carapace anteroventral corner with smooth or microdentate lobe above sinus 5
- 5. Pereiopod 1 article 6, 5–6 times as long as wide, antennule both flagella with naked margins *gracilior*¹
- Pereiopod 1 article 6, 2–3 times as long as wide, antennule accessory flagellum with plumose setae distally on margin *fallax*
- 6. Antennule accessory flagellum at least as long as main flagellum basal article 8
- Antennule accessory flagellum shorter than main flagellum basal article 7
- 7. Carapace pseudorostral lobes with many long setae; antennule accessory flagellum three-fourths length of main flagellum basal article *hirsuta*
- Carapace pseudorostral lobes with few short setae; antennule accessory flagellum less than one-half length main flagellum basal article *monodon*
- 8. Uropod exopod clearly longer than endopod basal article 9
- Uropod exopod only as long as endopod basal article 11
- 9. Uropod endopod terminal seta much longer than (>2 times) terminal article; pereiopod 2 dactyl with setae only on distal one-third *hurleyi*
- Uropod endopod terminal seta equal in length to terminal article; pereiopod 2 dactyl with setae on distal two-thirds 10
- 10. Uropod peduncle with long, slender terminal seta between insertion of endopod and exopod; exopod with at least 7 setae on inner margin in adult *groenlandica*²
- Uropod peduncle without long slender terminal seta; exopod with only 3 or 4 setae on inner margin in adult *gracilis*³
- 11. Antennule peduncle article 2 at least 1.5 times length article 3 12
- Antennule peduncle articles 2 and 3 subequal in length 13
- 12. Uropod exopod narrow, elongate, without submarginal setae, marginal setae plumose *abyssi*
- Uropod exopod slightly broadened, submarginal setae present, marginal setae not plumose *splendida*⁴
- 13. Antennule main flagellum basal article with plumose setae, pereiopod 2 article 5 subequal to article 4 *minor*
- Antennule main flagellum basal article naked on margins, pereiopod 2 article 5 about 1.5 times length article 4 *pacifica*⁵
- 14. Uropod exopod distinctly shorter than endopod basal article 15

- Uropod exopod about as long as or longer than endopod basal article 16
- 15. Antennule main flagellum with plumose setae on lateral margin; anteroventral corner of carapace with single large sinus; pereopod 2 terminal article with many more than 12 setae *emarginata*
- Antennule main flagellum naked; ventrolateral corner of carapace with 2 small sinuses; pereopod 2 terminal article with less than 12 setae *pusilla*
- 16. Uropod exopod extending to end of endopod distal article *arctica*
- Uropod exopod only slightly longer than endopod basal article 17
- 17. Body more or less beset with fine setae; pseudorostral lobes with numerous long setae; pereopod 2 article 5 about 1.5 times as long as article 4 *hispida*
- Body more or less free of fine setae; pseudorostral lobes without numerous long setae; pereopod 2 articles 4 and 5 subequal ... *truncatula*⁶
- 3. Carapace with single, nearly horizontal ridge; terminal seta of uropod endopod 2 times longer than distal article *resima*
- Carapace with 2 obliquely curving ridges; uropod endopod terminal seta as long as or shorter than distal article 4
- 4. Uropod exopod distal article expanded, widest midway along its length; endopod basal article nearly devoid of setae *derzhavini*
- Uropod exopod distal article of normal construction, gradually tapering distally; endopod basal article with lateral setae 5
- 5. Carapace with anterolateral horns; pleotelson terminally triangular 6
- Carapace without anterolateral horns; pleotelsonic somite broadly rounded posteriorly *biplicata*
- 6. Uropod endopod with few setae on inner margin, distal article with no marginal setae; pseudorostral lobes with especially long setae *ushakovi*
- Uropod endopod with setae along entire length of inner margin, including on distal article; pseudorostral lobes with few short setae *longirostris*

Notes: ¹ Includes *E. sordida*. ² Includes *E. spitzbergenensis*. ³ Includes *E. parvula*. ⁴ Includes *E. similis*. ⁵ Includes *E. tridentata*. ⁶ *E. intermedia*, *E. gottliebi*, and *E. nana* may all be variants of *E. truncatula*. The key also does not consider *E. rochfordi* as the details of its uropod endopod are not known.

Eudorellopsis Sars, 1882

Type Species.—*Leucon deformis* Krøyer, 1846.

Diagnosis.—Pseudorostrum directed dorsally in both male and female; antenna 1 geniculate between peduncle articles 1 and 2; male antenna 2 with brush of setae on anterior margin of peduncle articles 4 and 5; male antenna 2 flagellum extending well along pleon; female with exopods on pereopods 1–3; male with exopods on pereopods 1–4; pereopod 2 article 3 lost; uropod endopod 2-articulate; male with 2 pairs of pleopods.

Additional Species.—*E. biplicata* Calman, 1912; *E. derzhavini* Lomakina, 1952; *E. integra* (Smith, 1879); *E. longirostris* Given, 1961; *E. resima* Calman, 1907b; *E. uschakovi* Lomakina, 1955.

KEY TO FEMALES OF *EUDORELLOPSIS*

- 1. Carapace with lateral horizontal or oblique ridge 3
- Carapace without lateral ridge 2
- 2. Uropod exopod rectangular with no setae on outer margin; pseudorostral lobes extending somewhat forward, not strictly vertical; carapace more elongate, longer than high *integra*
- Uropod exopod tapering, with setae along outer margin; pseudorostral lobes strictly vertical; carapace boxlike, as long as high *deformis*

INCERTAE SEDIS

Americuma, new genus

Fig. 3e–g

Type Species.—*Heteroleucon heardi* Băcescu, 1979.

Etymology.—*Amer-*, from America, and *cuma*, the stem group.

Diagnosis.—Pseudorostrum projecting anterodorsally, branchial siphon long; antenna 1 not geniculate; female with exopods on pereopods 1 and 2; pereopod 2 article 3 distinct; uropod endopod uniarticulate; male unknown.

Additional Species.—No others.

Remarks.—This species, described from a manca, was originally assigned to the genus *Heteroleucon*. However, it differs from the only other species of *Heteroleucon*, *H. akaroensis* from New Zealand, in several important respects: its antenna 1 peduncle article 1 is very elongate, being as long as the remaining articles combined; it has a distinct, elongate pereopod 2 article 3; there is no antennal notch on the carapace; and article 3 of maxilliped 3 is greatly enlarged. Further, it was obtained half a world away and at considerably greater depth, thus requiring the relating of two species in a manner which would be almost unique among the Cumacea. There is no strong evidence that this species is, in fact, a member of the Leuconidae; it has been dealt with here as

a means of maintaining order within the genera of this family.

ACKNOWLEDGEMENTS

This study was conducted during the tenure of a Smithsonian Senior Postdoctoral Fellowship, for which the support of the Smithsonian Institution is greatly appreciated. I especially thank Dr. T. E. Bowman for critically reading an earlier version of this paper and for helping me to understand the broader concepts of taxonomy. The illustrations were prepared by S. Bund.

LITERATURE CITED

- Băcescu, M. 1961. Contribution à l'étude des Cumacés de la Méditerranée et particulièrement des côtes d'Israël.—Rapports et Procès-verbaux des Réunions de la C.I.E.S.M.M. 16: 495–502.
- . 1979. *Heteroleucon heardi* n. sp. from the Mexican Gulf.—Revue Roumaine de Biologie (série Biologie animale) 24: 95–97.
- . 1988. Cumacea I (Fam. Archaeocumatidae, Lamproidae, Bodotriidae, Leuconidae).—Crustaceorum Catalogus Part 7, Pp. 1–173. SPB Academic Publishing, The Hague, The Netherlands.
- Bate, C. S. 1856. On the British Diastylidae.—Annals and Magazine of Natural History (2)17: 449–465.
- Bishop, J. D. D. 1981a. A revised definition of the genus *Epileucon* Jones (Crustacea, Cumacea), with descriptions of species from the deep Atlantic.—Philosophical Transactions of the Royal Society of London (B) 291: 353–409.
- . 1981b. Two new leuconids (Peracarida, Cumacea) of widespread occurrence in the deep Atlantic.—Crustaceana 40: 144–159.
- . 1982. Three new species of the genus *Leucon* Krøyer, 1846 (Crustacea: Cumacea) from the continental slope off Surinam.—Zoological Journal of the Linnean Society 74: 345–357.
- Blake, C. H. 1929. New Crustacea from the Mount Desert region.—Biological Survey of the Mount Desert Region, Part 3, Pp. 1–34. Wistar Institute of Anatomy and Biology, Philadelphia, Pennsylvania.
- Calman, W. T. 1905. The marine fauna of the west coast of Ireland, Part IV, Cumacea.—Scientific Investigations of the Fisheries Branch, Ireland, 1904, Appendix No. I: 3–52.
- . 1907a. On new or rare Crustacea of the Order Cumacea from the collection of the Copenhagen Museum.—Transactions of the Zoological Society of London 18: 1–56.
- . 1907b. Crustacea. II—Cumacea.—National Antarctic Expedition 1901–1904, Natural History 2: 1–6.
- . 1912. The Crustacea of the Order Cumacea in the collection of the United States National Museum.—Proceedings of the United States National Museum 41: 604–674.
- Fage, L. 1951. Cumacés.—Faune de France 54: 1–136.
- Gamô, S. 1962. *Leucon simanensis* sp. nov. and *L. varians* sp. nov.—Zoological Magazine (Dobutsugaku Zasshi) 71: 256–261.
- . 1964. On three new species of Cumacea from the southern Sea of Japan.—Crustaceana 7: 241–253.
- . 1967. Studies on the Cumacea (Crustacea, Malacostraca) of Japan. Part 1.—Publications of the Seto Marine Biological Laboratory 15: 133–163.
- . 1987. Two new cumacean crustaceans, *Para-leucon? ultraabyssalis* sp. nov. and *Leptostylis? spinescens* sp. nov. from the Japan Trench.—Bulletin of the Biogeographical Society of Japan 42: 43–48.
- . 1988. A new abyssal cumacean crustacean, *Leucon stenorhynchus* sp. nov. (Leuconidae) from the Japan Trench.—Bulletin of the Biogeographical Society of Japan 43: 25–28.
- Given, R. R. 1961. The cumacean fauna of the Southern California continental shelf. No. 1, Family Leuconidae.—Bulletin of the Southern California Academy of Sciences 60: 129–146.
- Hale, H., 1945. Australian Cumacea, No. 10. The Family Leuconidae.—Transactions of the Royal Society of South Australia 69: 86–95.
- Hansen, H. 1920. Crustacea Malacostraca. IV.—Danish Ingolf-Expedition 3: 1–86.
- Hart, J. F. L. 1930. Some Cumacea of the Vancouver Island region.—Contributions to Canadian Biology and Fisheries 6: 25–40.
- Jones, N. S. 1956. Cumacea from the west coast of Africa.—Atlantide Report 4: 183–212.
- . 1963. The marine fauna of New Zealand: crustaceans of the Order Cumacea.—New Zealand Oceanographic Institute Memoir No. 23: 1–81.
- . 1969. The systematics and distribution of Cumacea from depths exceeding 200 meters.—Galathea Report. Scientific Results of the Danish Deep-Sea Expedition Round the World 1950–52, 10: 100–180.
- Krøyer, H. 1841. Fire nye arter af Slaegten Cuma.—Naturhistorisk Tidsskrift 3: 503–534.
- . 1846. Carcinologiske bidrag.—Naturhistorisk Tidsskrift, Ser. 2: 123–211.
- Ledoyer, M. 1977. Cumacés (Crustacea) des Iles Kerguelen recueillis par le N. O. "La Japonaise" en 1972 et 1974 et par le M. S. "Marion-Dufresne" en 1974.—Comité National Français des Recherches Antarctiques 42: 193–213.
- . 1988. Cumacés (Crustacea) profonds de la région de l'île de Mayotte, Canal de Mozambique, Océan Indien (Campagne Benthédi, 1977).—Mésogée (Bulletin du Muséum d'Histoire Naturelle de Marseille) 48: 131–172.
- Liljeborg, W. 1855. Om hafs-crustaceer vid Kullaberg i Skåne.—Öfversigt af Kongliga Vetenskaps-Akademiens Förhandlingar 12: 117–138.
- Lomakina, N. B. 1952. Novye interesnye v zoogeograficheskom otnoshenii nakhodki kumovykh rakov v dal'nevostochnykh moryakh. [New zoogeographically interesting findings of Cumacea in Far Eastern Seas.]—Zoologicheskii Zhurnal 30: 244–248. [In Russian.]
- . 1955. Kumovye raki (Cumacea) dal'nevostochnykh moryakh.—Trudy Zoologicheskogo Instituta Akademii Nauk S.S.S.R. 18: 112–165. [In Russian.]
- . 1967. Novye vedyi kumovye (Crustacea, Cumacea) iz sborov Sovetskoye Antarkticheskoi ekspeditsii (1956–1958) u yogo-vostochnoye Australii i v severnoye chasti Indiskogo okeana [New species of Cumacea collected by the Soviet Antarctic expedition at south-eastern Australia and in the north of the Indian Ocean].—Trudy Zoologicheskogo Instituta, Leningrad 43: 99–108.

- Norman, A. M. 1867. On the Crustacea, Echinodermata, Polypora, Actinozoa and Hydrozoa. Report of the committee appointed for the purpose of exploring the coasts of the Hebrides by means of the dredge.—Report of the British Association for the Advancement of Science 36: 193–206.
- . 1879. Crustacea Cumacea of the 'Lightning,' 'Porcupine,' and 'Valorous' Expeditions.—Annals and Magazine of Natural History (5)3: 54–73.
- Ohlin, A. 1901. Arctic Crustacea collected during the Swedish Arctic Expeditions 1898 and 1899 under the direction of Professor A. G. Nathorst. I. Lepidostrea, Isopoda, Cumacea.—Bihang till Kongliga Svenska Vetenskaps-Akademiens Handlingar 26: 1–54.
- Sars, G. O. 1865. Om den aberrante krebsdygruppe Cumacea og den nordiske arter.—Förhandlingar i Videnskabs-Selskabet i Christiania 1864: 128–208.
- . 1869. Undersögelser over Christianafjord dybvandsfauna.—Nyt Magazin for Naturvidenskaberne 11: 1–58.
- . 1871. Nya arter af Cumacea samlade under K. Svenska Korvetten Josephines Expedition i Atlantiska Oceanen ar 1869 af F. A. Smitt och A. Ljungman.—Öfversigt af Kongliga Vetenskaps-Akademiens Förhandlingar 1: 71–81.
- . 1878, 1879. Nye Bidrag til Kundskaben om Middelhavets Invertebratfauna. II. Middelhavets Cumaceer.—Archiv for Mathematik og Naturvidenskab 3: 461–512; 4: 1–144.
- . 1882. Oversigt af Norges Crustaceer med foreløbige bemaerkninger over de nye eller mindre bekjende Arter. 1.—Förhandlingar Videnskabs Selskabet Christiania 1882: 1–124.
- . 1887. Report on the Cumacea collected by H.M.S. Challenger during the years 1873–1876.—Report on the Scientific Results of the Voyage of the H.M.S. Challenger during the Years 1873–1876 under the Command of George S. Nares and Frank Tourle Thomson 19(55): 1–78.
- . 1900. Cumacea.—An account of the Crustacea of Norway 3: 1–115. Bergen Museum, Bergen, Norway.
- Smith, S. I. 1879. The stalk-eyed crustaceans of the Atlantic coast of North America, north of Cape Cod.—Transactions of the Connecticut Academy of Arts and Science 5: 27–136.
- Stebbing, T. R. R. 1912. The Sympoda.—Annals of the South Africa Museum 10: 129–176.
- Watling, L. 1977. Two new genera and a new subfamily of Bodotriidae (Crustacea: Cumacea) from eastern North America.—Proceedings of the Biological Society of Washington 89: 593–598.
- . 1979. Marine flora and fauna of the northeastern United States. Crustacea: Cumacea.—National Oceanic and Atmospheric Administration Technical Report, National Marine Fisheries Circular 423: 1–23.
- , and O. Breedy. 1988. A new cumacean (Crustacea) genus from beaches of Golfo de Nicoya, Costa Rica.—Revista Biología Tropica 36: 527–533.
- Zimmer, C. 1902. Cumaceen.—Ergebnisse der Hamburger Magalhaensischen Sammelreise, 1892/93, 2: 1–18.
- . 1903. Die Cumaceen des Museums für Naturkunde in Berlin.—Zoologische Jahrbücher, Abtheilung für Systematik, Geographie und Biologie der Thiere 18: 664–694.
- . 1907. California Crustacea of the Order Cumacea.—Proceedings of the United States National Museum 83: 423–439.
- . 1908. Die Cumaceen der "Deutschen Tiefsee-Expedition".—Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898–1899, 8: 158–196.
- . 1909. Die Cumaceen der Schwedischen Südpolarexpedition.—Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901–1903, 6: 1–31.
- . 1926. Northern and Arctic invertebrates in the collection of the Swedish State Museum (Riksmuseum).—Kungliga Svenska Vetenskaps-Akademiens Handlingar 3: 1–88.
- . 1943. Cumaceen des Stillen Ozeans.—Archiv für Naturgeschichte 12: 130–174.

RECEIVED: 20 MARCH 1991.

ACCEPTED: 28 May 1991.

Address: Department of Oceanography, Darling Marine Center, University of Maine, Walpole, Maine 04573.