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NEW EREBONASTERIDAE (COPEPODA) FROM VILKITZKY STRAIT IN THE ARCTIC AND FROM A PACIFIC HYDROTHERMAL VENT SITE (NORTHERN FIJI BASIN)

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ABSTRACT

A new genus of the poecilostomatoid family Erebonasteridae is described from Vilkitzky Strait in the Arctic, the channel connecting the Kara Sea and the Laptev Sea. Within the Erebonasteridae, *Nansennaster,* new genus, belongs to the *Centobnaster*-group. The new genus is characterized by the presence of only 2 setae on the mandibular palp, the fusion of the second and third antennal segments, the presence of a single copulatory pore, and the relatively short furca lacking seta I. A previously overlooked sexual dimorphism in *Centobnaster* is described, the males of this genus having a modified outer spine on the third endopodal segment of leg 3. *Amphicrossus tuerkayi,* new species, is described from a deep-sea hydrothermal vent site in the northern Fiji basin. The new species has retained some remarkable plesiomorphic characters, such as an incompletely fused genital double-somite in the female, and 2 setae representing the endopod of the maxilla. An identification key to all known genera and species of the Erebonasteridae is provided.

Poecilostomatoid copepods display a varying degree of association with fishes and invertebrate hosts. Within the Erebonasteridae Humes, 1987, *Tychidion guyanense* Humes, 1973, is associated with Vestimentifera, and *Erebonaster protentipes* Humes, 1987, with a *Nuculana*-like protobranch bivalve (Humes, 1973, 1987). Other members of the family have been recovered from sediment samples, and their possible hosts are unknown.

The family Erebonasteridae consists of seven species. Two species of *Amphicrossus* Huys, 1991, and the single species of *Erebonaster* are known from deep-sea hydrothermal vent sites and cold seeps, while *A. pacificus* Huys, 1991, is known from a depth of 155 m north of New Caledonia, where no hydrothermal activity was reported (Humes, 1987, 1989; Huys, 1991; Humes and Huys, 1992). *Tychidion guyanense* was obtained from washings of a vestimentiferan collected at a depth of 500 m on the continental slope off Guyana (Humes, 1973). Two species of *Centobnaster* Huys and Boxshall, 1990, are known from a bottom sample taken at 500 m depth off New Caledonia (Huys and Boxshall, 1990) and from several sites covering a depth range from 135–1,017 m in the Laptev Sea and Vilkitzky Strait in the Arctic (Martínez Arbizu, 1997).

During a study of the benthic copepod fauna of the eastern Arctic Seas a new genus and species of this remarkable family was discovered. The new species is described below and its phylogenetic position is discussed. A previously overlooked sexual dimorphism on the third swimming leg of *Centobnaster* is described, and additional records of Erebonasteridae, including the description of a new species of *Amphicrossus,* are reported.

MATERIALS AND METHODS

Meiobenthic samples were taken during the German-Russian expedition to the Arctic Ocean ARK–IX/4 (Aug.–Oct. 1993), on board the R/V *Polarstern,* using a Multicorer and a Giant Box Corer. The supernatant water of the Giant Box Corer was extracted using a silicone tube, filtered through a 40-m mesh sieve, and the residue, together with the first 5 cm of sediment from the Box Corer, was fixed in Formalin at a final concentration of 4%. Specimens were extracted by differential flotation using Levasil and transferred to glycerine for slide preparation. Drawings were made using a camera lucida on a Leitz Dialux phase-contrast microscope.

For SEM preparation, individuals were dehydrated through an ethanol series; and after CO_2 critical-point drying, were mounted on a stub and coated with gold.

Terminology is adopted from Huys and Boxshall (1991), except for the terminology related to phylogenetic systematics, which is used according to Hennig (1982), and the term "telson" which is used instead of "anal somite" following Schminke (1976).

The material is stored in the Copepod Collection of the AG Zoomorphologie, University of Oldenburg, Germany (UNIOL), the Senckenberg Museum in Frankfurt, Germany, and in The Natural History Museum in London, Great Britain (NHM).

DESCRIPTIONS

Family Erebonasteridae Humes, 1987

Nansennaster, new genus
Nansennaster innupta, new species

Diagnosis.—Erebonasteridae. Female: body cyclopiform. Urosome 4-segmented. Genital

double-somite with strong lateral projections and single medioventrally located copulatory pore. Furca short, with 6 setae (seta I lost); setae II, III, and VI composed of a proximal rigid part and a distal filiform part. Antennule 7-segmented. Antenna 3-segmented (second and third endopodal segments fused). Mandibular palp with 2 setae. Maxilla 2-segmented; first segment on inner margin with endite bearing 1 seta, second segment produced as stout claw, with 2 setae on inner margin and 2 unequal endopodal setae on outer margin. Fifth pair of legs located ventrally and joined by intercoxal sclerite.

Material.—Holotype: 1 ♀ dissected and mounted on 7 slides (collection number UNIOL 1997.32/1–1997.32/7) collected at a depth of 156 m in the Vilkitzky Strait, Arctic Ocean, German-Russian expedition ARK–IX/4, Station number 27/028, 26 August 1993, coordinates 78°01.99′N, 102°01.99′E. Paratypes: 1 ♀ mounted on one slide (coll. no. UNIOL 1997.33/1) and 1 ♀ preserved in 4% Formalin (coll. no. NHM 1997.1280).

Female.—Body cyclopiform (Figs. 1A, 4A, B), tapering posteriorly, dorsoventrally flattened, comprising 5-segmented ovoid prosome and small 4-segmented urosome (Fig. 4C). Prosome about 2.5 times longer than urosome. Body length from anterior rim of cephalosome to posterior margin of telson about 460 µm. Rostrum vestigial, fused to cephalosome. Nauplius eye not discernible. Tergites of pedigerous somites with rounded, posteriorly produced posterolateral angles.

Urosome comprising fifth pedigerous somite, genital double-somite, and 2 free abdominal somites. Well-developed pseudosomite between fifth pedigerous somite and genital double-somite (Fig. 3B, C). Hyaline frill of genital double-somite and succeeding somite finely serrate. Penultimate abdominal somite without sensilla. Genital double-somite comprising fused genital somite and first abdominal somite (Figs. 3B, C, 4C), with posteriorly directed rounded lateral outgrowths.

Furca (Fig. 2G) short, with 6 setae (seta I not discernible), setae II, III, and VI composed of a proximal rigid part with filiform distal part.

Antennule (Fig. 1B) short, 7-segmented. Armature formula beginning with proximal segment: 3, 11, 9, 2 + 1 aesthethasc, 2, 2 + 1 aesthetasc, and 7 + 1 aesthetasc. Antenna (Fig. 1C) with small praecoxal sclerite and 3-segmented ramus comprising undivided protopod (coxa-basis) and 2-segmented endopod. Coxa-basis with 1 inner seta and cluster of spinules at distal outer margin. First endopodal segment with 1 inner seta; second endopodal segment, comprising undivided (or fused) ancestral second and third segments, ornamented with clusters of spinules, with 3 setae at inner margin and 5 setae terminally.

Labrum (Fig. 4D) with row of small spinules on distal margin, and lateral notches interlocking maxillules (Fig. 4E, F). Mandible (Fig. 1D) with small 1-segmented palp bearing 2 setae; gnathobase elongate with 3 multicusped teeth and similarly formed, proximally located, multicusped spine. Maxillule (Fig. 1E) bilobate, armature consisting of group of 3 setae at inner margin (inner lobe), 1 seta inserting on tip of outer lobe, and 1 seta proximal to this lobe on outer margin. Maxilla (Fig. 1F) 2-segmented; first segment large with elongated endite at inner margin bearing 1 seta; second segment produced into stout claw with accessory small denticles on inner margin and 1 small and 1 larger seta, and on outer margin with 1 very long seta and 1 minute seta at its base. Maxilliped (Fig. 3A) 4-segmented, comprising syncoxa, basis, and 2-segmented endopod. Syncoxa with 2 setae at inner margin; basis with row of spinules along inner margin and 2 setae, one inserting at distal inner corner; first endopodal segment asetose; second endopodal segment produced into strong claw, with 1 robust seta on posterior margin and 2 small setae on anterior margin proximally.

Legs 1–4 with 3-segmented rami (Fig. 2A–E). Armature formula as follows:

	coxa	basis	endopod	exopod
leg 1	0-1	1-I	0-1; 0-1; I,II,3	I-0, I-1; III,I,4
leg 2	0-1	1-0	0-1; 0-2; I,II,3	I-0, I-1; III,I,5
leg 3	0-1	1-0	0-1; 0-2; I,II,I,2	I-0; I-1; III,I,5
leg 4	0-1	1-0	0-1; 0-2; I,II,I,1	I-0; I-1; II,I,5

Fifth leg (Fig. 2F) uniramous, with well-developed, ventrally located intercoxal sclerite, undivided protopod bearing an outer (basal) seta, and 1-segmented exopod bearing 3 strongly serrate spines and 1 small seta.

Sixth leg (Fig. 3B) consisting of laterally located plate covering gonopore, bearing very long outer seta, 1 minute seta posterior to it, and stout spinelike process.

Single copulatory pore located on midventral surface of genital somite (Fig. 3C).

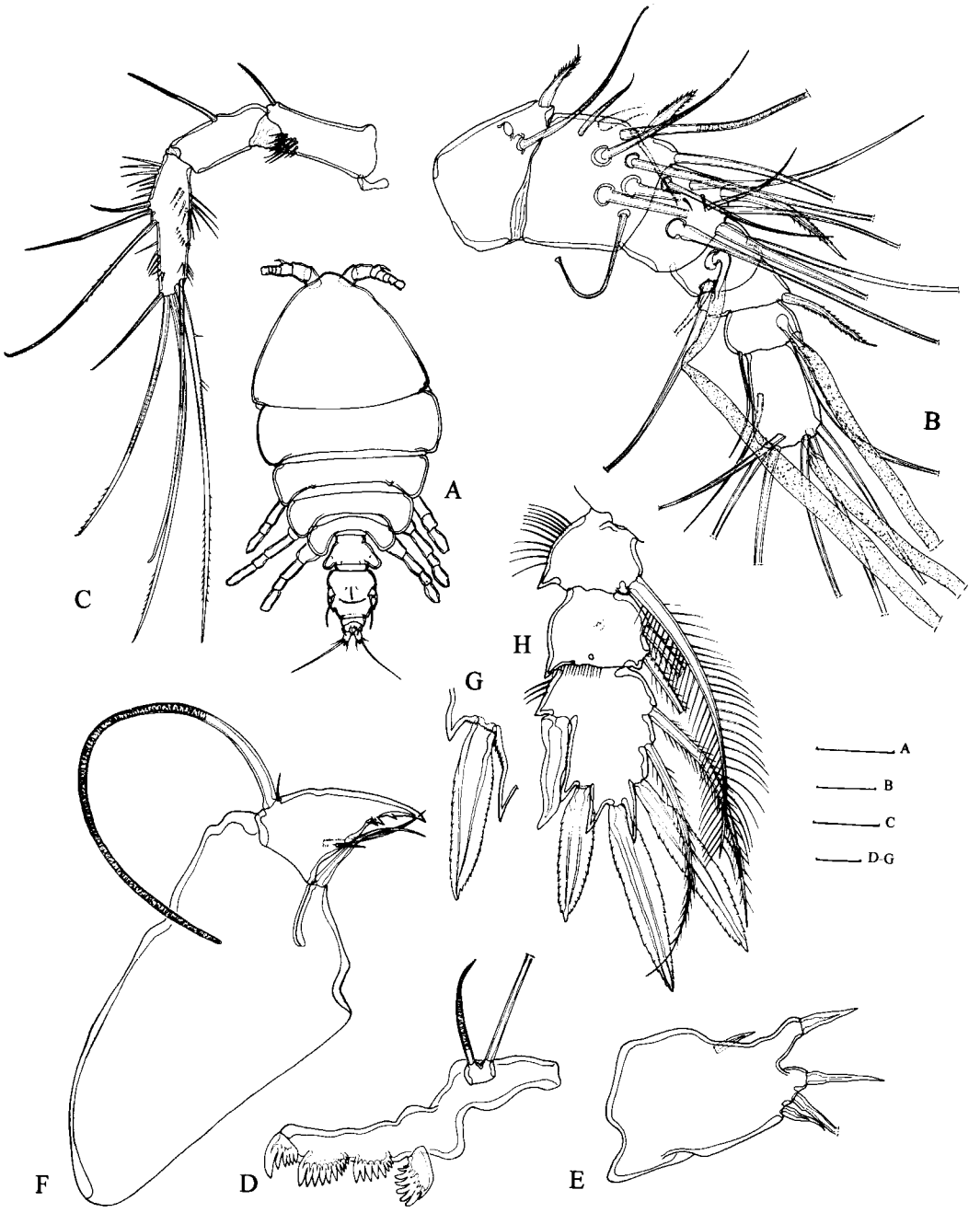


Fig. 1. *Nansennaster innupta*, new genus, new species. A, habitus, dorsal view; B, antennule; C, antenna; D, mandible; E, maxillule; F, maxilla. *Centobnaster severnicus* Martínez Arbizu, 1997. G, same spine in female; H, male endopod of leg 3 showing modified outer spine. Scale bars, A = 100 µm; B, C = 20 µm; D–G = 10 µm.

Male.—Unknown.

Etymology.—The new genus is named after the Norwegian zoologist Fridjof Nansen (1861–1930), and the suffix *naster* (inhabitant) which forms part of the family name Erebonasteridae. At the time we took the samples yielding the new genus, we commemorated the centenary of the beginning of Nansen's transpolar drift expedition in the Laptev Sea. The specific

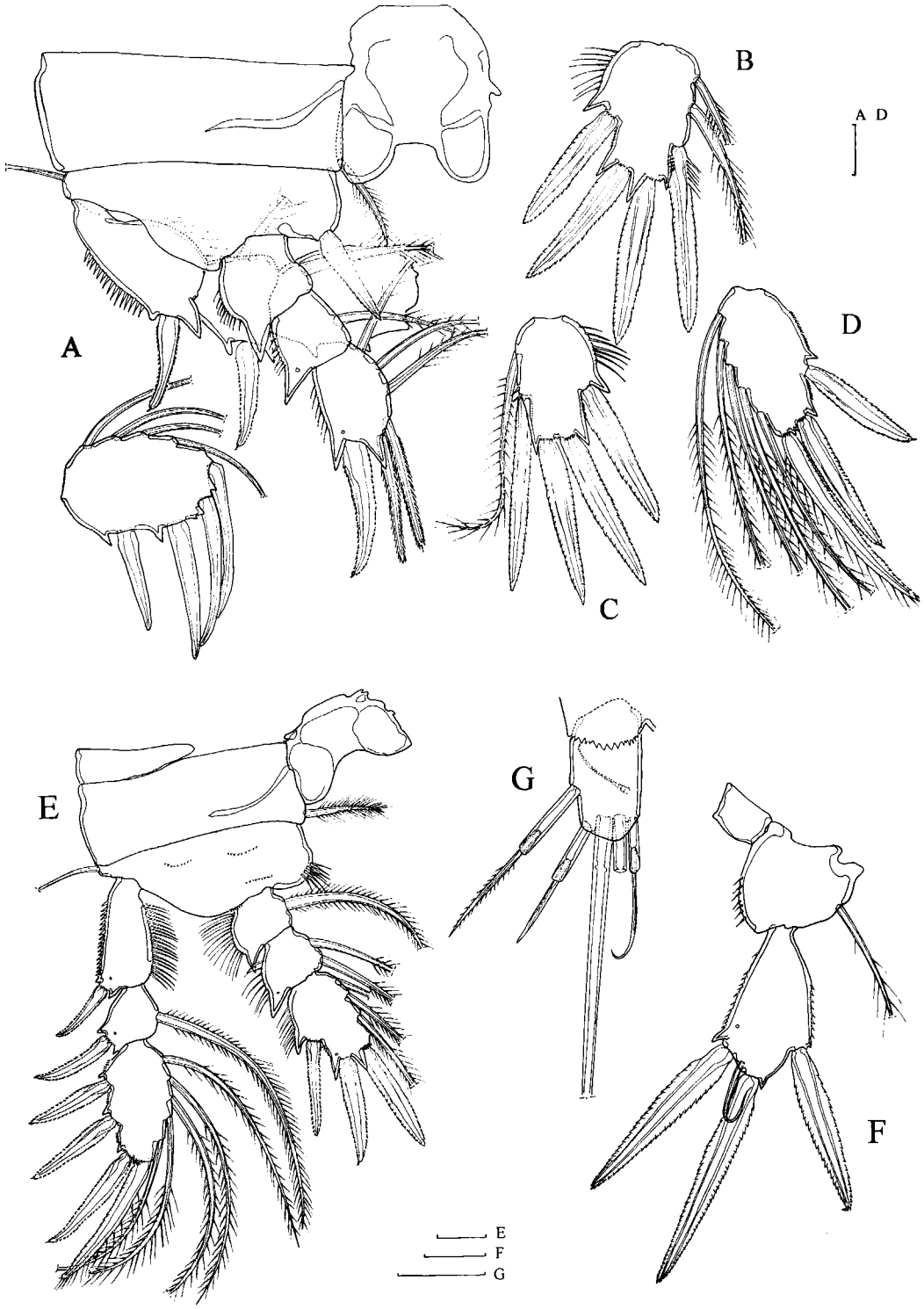


Fig. 2. *Nansennaster innupta*, new genus, new species. A, leg 1 and dislocated third exopodal segment; B, third endopodal segment of leg 3; C, third endopodal segment of leg 4; D, third exopodal segment of leg 4; E, leg 2; F, leg 5; G, furca, ventral view. Scale bars = 20 μm.

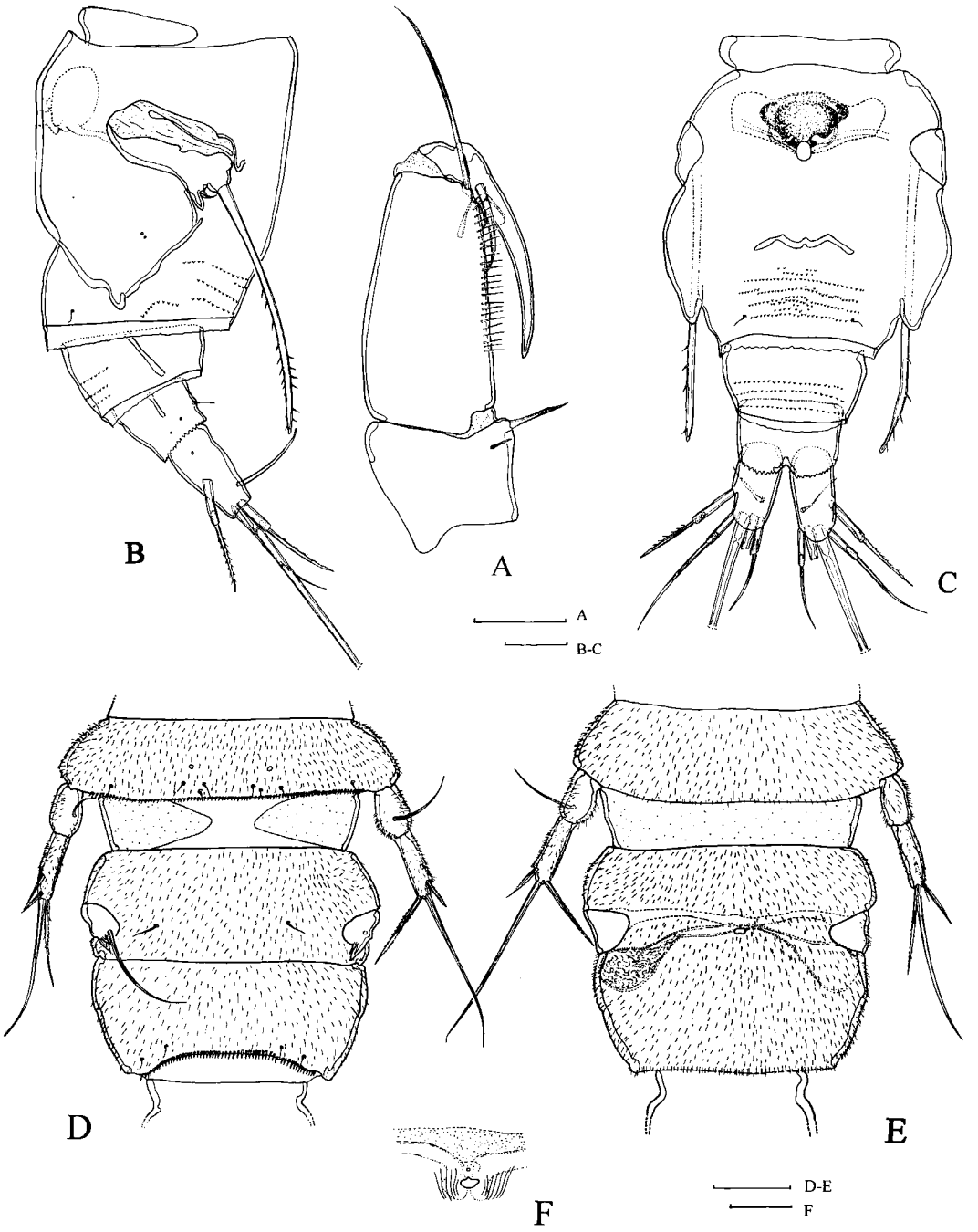
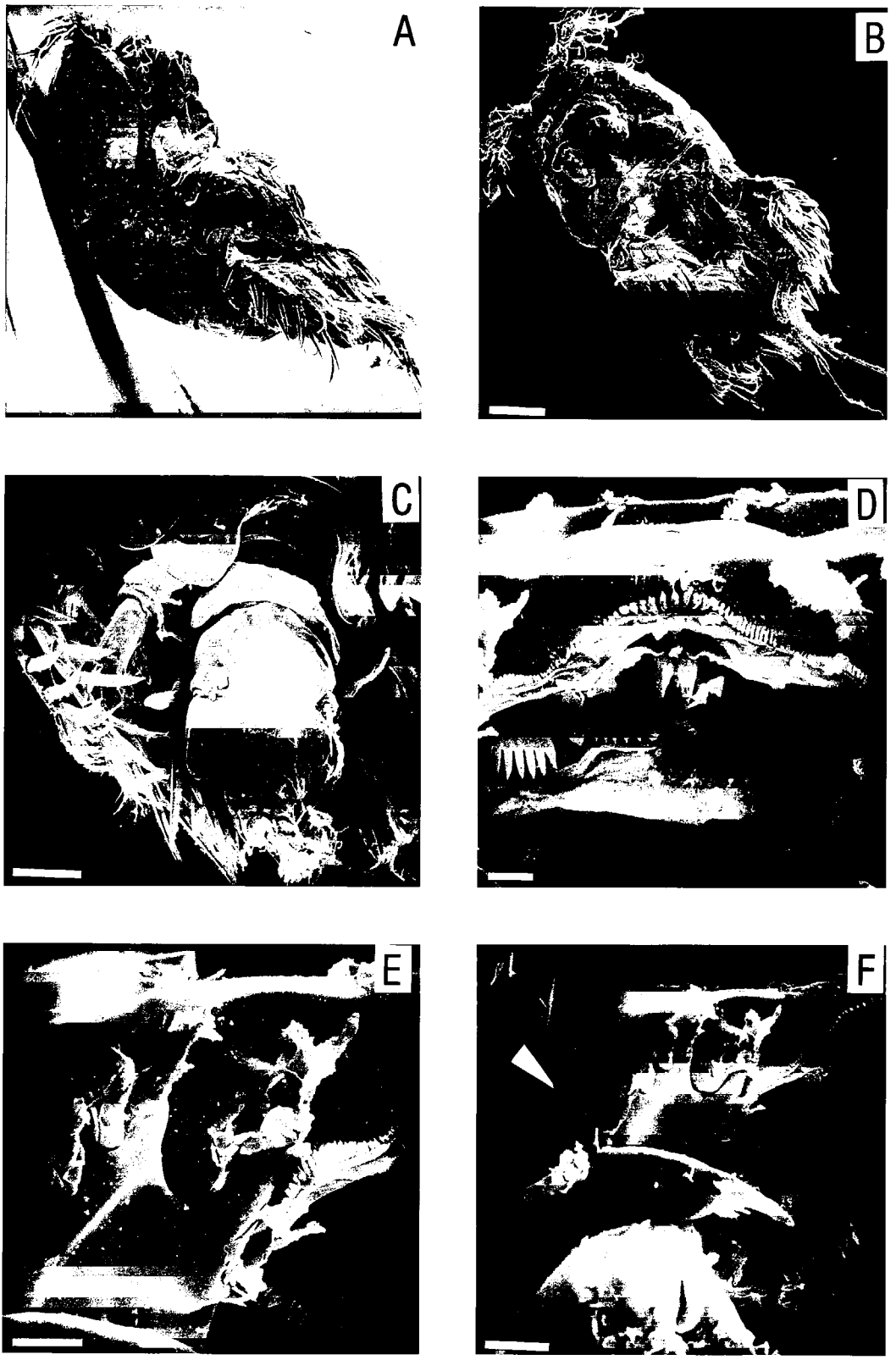


Fig. 3. *Nansennaster innupta,* new genus, new species. A, maxilliped; B, urosome, lateral view; C, urosome, ventral view. *Amphicrossus tuerkayi,* new species. D, genital double-somite and fifth pedigerous somite, dorsal view; E, same in ventral view, seminal receptacles dotted, spermatozoa drawn on right side only; F, detail of copulatory pore. Scale bars, A–C = 20 μm; D, E = 50 μm; F = 10 μm.

name *innupta* means not married, and makes reference to the fact that males of this species are still unknown.

Remarks.—Within the Erebonasteridae, *Nansennaster,* new genus, belongs to the *Centobnaster*-group as defined by Martínez Arbizu (1997). The modification of furcal setae II, III, and VI into composite setae is a synapomorphy of this group, including until now *Centobnaster* and *Tychidion.*

The maxillule of *Nansennaster innupta,*



new species, is a bilobate plate, and in situ it interlocks with a notch on the labrum (Fig. 7E, F). This peculiar feature has already been described for *Centobnaster* and *Tychidion,* so that its presence can be considered an additional synapomorphy of the *Centobnaster*-group. The connection between maxillules and labrum seems to enclose a semicircular area around the mouth, possibly acting as a sucker involved in feeding or attaching to a host.

Nansennaster can be distinguished from the other genera of the *Centobnaster*-group by the presence of only 2 setae on the mandibular palp, while 4 setae are present in *Tychidion* and 3 in *Centobnaster.* The elongate mandibular gnathobase differs in this regard from that of the other genera. The condition of the maxilla is also remarkable in having retained a well-developed endite on its first segment (probably syncoxa), while only an isolated seta inserting directly on the surface of this segment has previously been reported within the Erebonasteridae. *Centobnaster* and *Tychidion* have the second maxillary segment (probably allobasis) produced into several spinous processes distally, while the main spinous process in *Nansennaster* is ornamented with minute denticles only. In contrast to other members of the group, which possess paired copulatory pores, *Nansennaster* has only a single midventral pore. The shortness of the furca in the new genus is also remarkable. It is at most twice as long as broad, while the furca is elongate, and several times longer than wide in other Erebonasteridae. Another peculiarity is the absence of furcal seta I, which is present in *Tychidion* and *Centobnaster.*

The new species cannot be included in the genus *Centobnaster,* since it lacks all of its apomorphies, namely: (i) seta on first antennal endopodal segment reduced in size and transposed to posterior surface, this seta being well developed and located at inner margin in *Nansennaster, Erebonaster,* and *Amphicrossus,* while it is absent in *Tychidion*; (ii) labrum with strong median spinous process on distal margin; all other erebonasterid genera having a continuous row of small denticles; (iii) inner basal spine of first leg transformed into short curved claw, all other genera having elongate serrate spine; and (iv) presence of only 5 setae on third endopodal segment of leg 1, but 6 setae present in *Nansennaster* as well as in *Tychidion.*

These autapomorphies of *Centobnaster* form a robust suite of characters allowing for the unequivocal assignment to this genus of a third stage copepodid collected at a depth of 5,102 m in the North Atlantic Ocean (coordinates 23°10′N, 24°26′W), and of one male and one female third stage copepodids collected at a depth of 2,995 m in the northern Barents Sea (coordinates 82°45.83′N, 40°14.54′E). The specimen from the Atlantic deep sea displays a mandibular gnathobase very similar to that of *C. severnicus* Martínez Arbizu, 1997. However, the correct specific identity has to await the discovery of adult specimens. The specimens from the Barents Sea seem to belong to a new species, because they display two strong processes on the inner margin of the claw of the maxilla instead of only one in *C. severnicus* and *C. humesi* Huys and Boxshall, and show additional differences in the structure of the mandibular gnathobase.

As stated above, the setal number of the mandibular palp in the ground pattern of the Erebonasteridae (and of the whole of Poecilostomatoida) is four. *Centobnaster* has only three setae on this appendage, while *Nansennaster* has two. One may assume that this reflects a transformation series in the reduction of the armature of the mandibular palp within the Erebonasteridae, passing from four setae (in *Tychidion*) to three setae (in *Centobnaster*) to two setae (in *Nansennaster*), inferring a close relationship between *Centobnaster* and *Nansennaster.* On the other hand, *Nansennaster* shares with *Tychidion* the fusion of ancestral antennal endopodal segments 2 and 3 into a single compound segment, raising the possibility of a closer relationship of *Nansennaster* with *Tychidion.* As far as I can see, all other characters shared between *Nansennaster* and either of these genera are symplesiomorphies. The condition of the urosome, which has one fewer abdominal somite in the female (Huys

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Fig. 4. *Nansennaster innupta,* new genus, new species. A, habitus, lateral view; B, habitus, ventral view; C, urosome, dorsal view; D, labrum and mandibular blades; E, close-up of maxillule interlocking with notch of labrum; F, same at lower magnification, mandibular palp arrowed. Scale bars, A, B = 100 μm; C = 20 μm; D, E = 5 μm; F = 10 μm.

and Boxshall, 1990) is another striking character linking *Nansennaster* and *Centobnaster.* This character, however, does not belong to the ground pattern of *Centobnaster,* since *C. severnicus* has retained a urosome consisting of a genital double-somite and 3 additional abdominal somites. Therefore, since this character cannot be used to demonstrate a closer relationship between *Nansennaster* and *Centobnaster,* it must be interpreted as a case of convergent evolution in *N. innupta* and in *C. humesi.*

Reexamination of the type material of *Centobnaster severnicus* Martínez Arbizu, 1997 revealed sexual dimorphism on leg 3 which was overlooked in the original description. Males of this species have a modified outer spine on the third endopodal segment of this leg (Fig. 1H, G). Unfortunately, the present state of knowledge (males of *C. humesi, Tychidion,* and *Nansennaster* are unknown) does not allow the determination of the phylogenetic significance of this character. This sexual dimorphism may represent an autapomorphy of *Centobnaster,* or of the whole *Centobnaster*-group. It may also be a synapomorphy of *Centobnaster* and either *Tychidion* or *Nansennaster.*

The discovery of more males of the undoubtedly speciose family Erebonasteridae would greatly help in elucidating the phylogenetic relationships within the family, including the proper assessment of the position of *Nansennaster.*

Amphicrossus tuerkayi, new species

Material.—Holotype: 1 ♀ dissected and mounted on 5 slides (coll. no. UNIOL 1997.30/1–1997.30/5); allotype: 1 ♂ dissected and mounted on 4 slides (coll. no. UNIOL 1997.31/1–1997.31/4), paratypes: 2 ♂♂ and 4 ♀♀ preserved in 4% Formalin in the Senckenberg Museum (SMF 24525) in Frankfurt, Germany. Material collected in the vicinity of an active hydrothermal vent site in the northern Fiji Basin at 1,984-m depth (coordinates 16°59.44′S, 173°54.82′E) during the German expedition SO99 on board the R/V *Sonne.*

Since *Amphicrossus pacificus* has recently been described in great detail by Huys (1991), only a short description of the diagnostic characters of the new species is required here. If not stated otherwise, the new species agrees in every detail with *A. pacificus* Huys, 1991.

Female.—Habitus as for other species of the genus. Body comprising cephalosome, 5 prosomites, 3 urosomites, and telson. Well-developed pseudosomite present between last thoracic somite and somite bearing leg 5 (Fig. 3D, E). Body length from proximal tip of rostrum to distal rim of telson 1.3 mm (including furca 1.51 mm). Whole body surface, including furca, ornamented with dense pattern of spinules, similar in arrangement to that of *A. pacificus.* Genital double-somite subdivided on dorsal surface (Fig. 3D), representing original separation of last thoracic and first abdominal somites. Single copulatory pore (Fig. 3F) located medially on ventral surface, seminal receptacles (filled with spermatozoa in holotype) located laterally in proximal half of former first abdominal somite (Fig. 3E). Furca (Fig. 6G) elongate, about 7 times longer than median width, and somewhat longer than telson. With 7 setae: seta I minute located at proximal one-sixth of furcal length on outer margin, slightly transposed to dorsal surface; seta II long, located on outer margin of furca and inserting on a peduncle; seta III lost in holotype as well as in every specimen of type series, insertion hole located subterminally on outer dorsal surface; setae IV, V, and VI located terminally; seta VII located subterminally on inner dorsal margin.

Antennule as in *A. pacificus,* with exception of second antennular segment bearing only 15 instead of 16 setae. Antenna as in *A. pacificus.*

Labrum with row of lateral teeth and rounded median spinulose process on anterior surface ornamented with long spinules. Mandible (Fig. 5C) small, gnathobase with 3 serrate blades and small uniserrate seta proximally at outer margin; with 1-segmented palp bearing 4 setae. Maxillule (Fig. 5D) small lobe bearing outer cluster of 1 bare and 2 pinnate setae and inner cluster of 2 bare setae. Maxilla (Fig. 5E) 2-segmented, first segment (syncoxa) long, with rows of large spinules on outer surface and 1 seta on inner margin; second segment (allobasis) produced into strong claw with accessory strong spinous process on inner margin, and 2 endopodal setae proximally on outer margin. Maxilliped (Fig. 5A) 4-segmented; syncoxa with 2 setae of unequal length at inner margin; basis with dense spinular ornamentation and 2 setae, longest arising from small protuberance distally; first endopodal segment bare; second endopodal segment produced into strong claw with 1 long bare seta proximally on posterior surface and strong but short spinous pro-

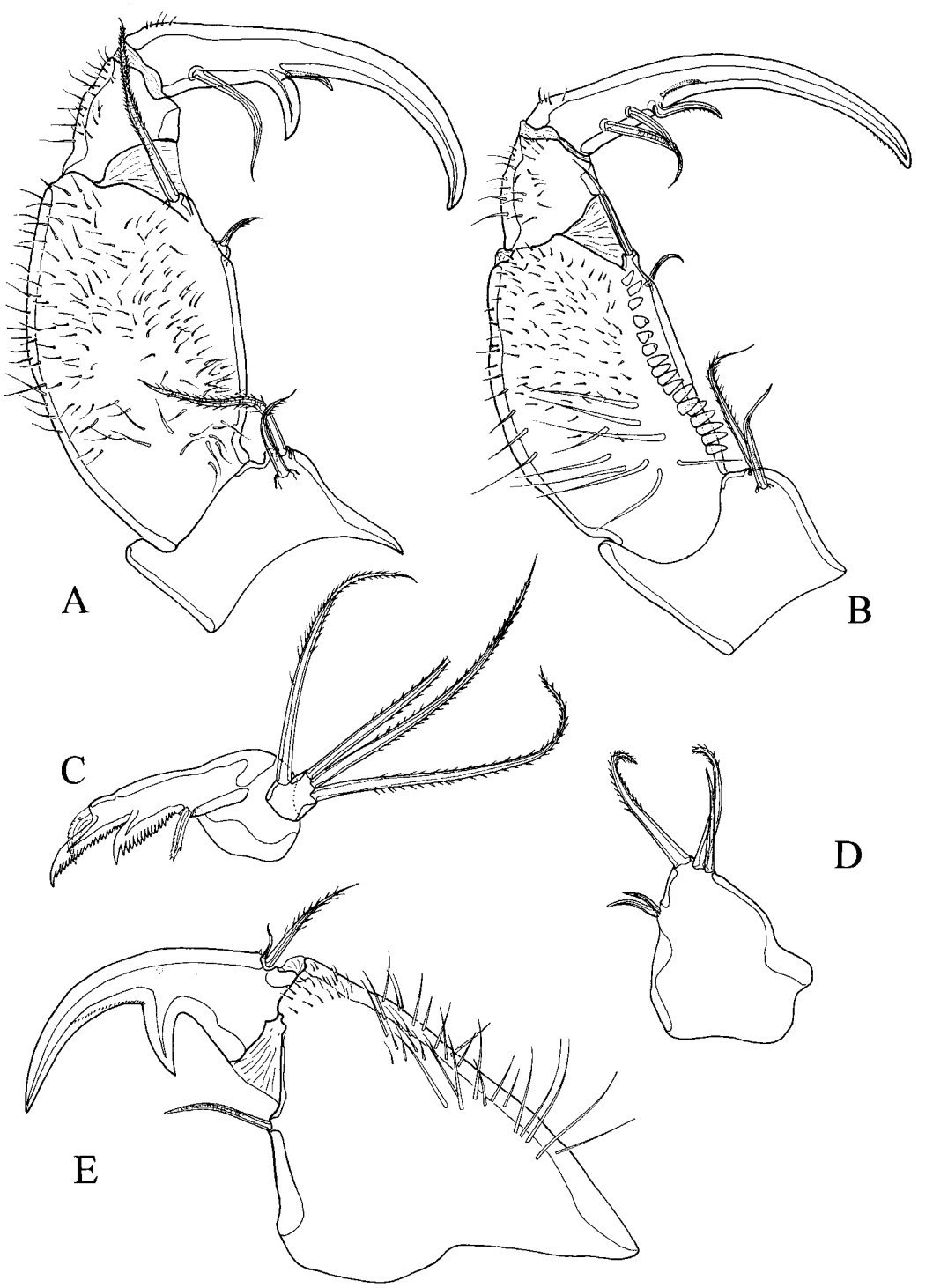

Fig. 5. *Amphicrossus tuerkayi,* new species. A, female maxilliped; B, male maxilliped; C–E, female; C, mandible; D, maxillule; E, maxilla. Scale bar = 50 μm.

cess distally to it on inner margin, flanked by small seta inserting on anterior margin.

Legs 1–4 with 3-segmented rami. Ornamentation and setation as in *A. pacificus*. Setal and spine formula as follows:

	coxa	basis	exopod	endopod
Leg 1	0-1	1-I	I-0; I-1, III,I,4	0-1; 0-1; I,II,3
Leg 2	0-1	1-0	I-0; I-1; III,I,5	0-1; 0-2; I,II,3
Leg 3	0-1	1-0	I-0; I-1; III,I,5	0-1; 0-2; I,II,I,2
Leg 4	0-1	1-0	I-0; I-1; II,I,4	0-1; 0-2; I,II,I,1

Leg 1 differing from that of *A. pacificus* in shape of inner basal spine (Fig. 6A), not bifid at tip in new species and slightly curved inward. In addition, intercoxal plate of new species lacking clusters of strong spinules present on anterior surface in *A. pacificus*, but with row of slender long spinules along caudal rim. Same applying to intercoxal sclerite of leg 2. Intercoxal sclerites of legs 3 and 4 without spinules.

Leg 5 (Fig. 3D, E) 2-segmented, displaced to lateral margin of somite; without intercoxal sclerite, consisting of undivided protopod with 1 outer basal seta and exopod bearing, as typical for poecilostomatoids, 3 spines and 1 terminal long slender seta. Exopod reaching anterior rim of leg 6.

Leg 6 (Fig. 3D) consisting of plate covering gonopore located laterally in first half of genital double-somite, having 1 long seta and 2 spinous processes.

Male.—Body comprising cephalosome, 5 prosomites, 3 urosomites, and telson. Last thoracic somite and first abdominal somites completely separated. Body length from anterior tip of rostrum to posterior rim of telson 1.05 mm (length including furca 1.2 mm).

Sexual dimorphism in following characters. Antennule with additional aesthetasc on second segment. Maxilliped (Fig. 5B), basis with row of short robust spinules on inner margin, second endopodal segment with 2 setae inserting on posterior margin proximally, distally to them digitiform seta inserting on inner margin (probably homologous to spinous process of female) and additional seta on anterior margin. Inner basal spine of leg 1 (Fig. 6B) more strongly curved inward than in female. Leg 2, distal outer margin of third endopodal segment produced into strong outwardly curved spinous process (Fig. 6C). Leg 3, distal outer margin of third segment with pronounced process (Fig. 6E). Leg 6, ventrolateral plate covering gonopore, with 2 setae and 1 spinous process.

Etymology.—The species is dedicated to Dr. Michael Türkay, Senckenberg Museum in Frankfurt am Main, Germany, who kindly made this material available.

Remarks.—Three species of *Amphicrossus* have been described previously, namely, *A. spinulosus* (Humes, 1989) from a deep-sea cold seep at the West Florida Escarpment, *A. pacificus* Huys, 1991, from off New Caledonia, and *A. altalis* Humes and Huys, 1992, from a deep-sea hydrothermal vent site off British Columbia. *Amphicrossus tuerkayi* differs from its congeners at first sight by its relatively small size. Although 1.51 mm (female) is a large size for a free-living copepod, it is almost 1 mm less than the body length of the other species of the genus, which, in the sequence as mentioned above, measure 2.49, 2.26, and 2.44 mm in length, respectively. *Amphicrossus tuerkayi* is the only species of the genus retaining a bisetose maxillary endopod (all other species having only 1 seta). Moreover, *A. tuerkayi* is the only known species in the Erebonasteridae retaining an incompletely fused genital double-somite, being subdivided along the dorsal surface. Therefore, a completely fused genital double-somite can no longer be considered a potential synapomorphy of Erebonasteridae, but only of the *Centobnaster*-group. The *Erebonaster*-group has retained in its ground pattern an incompletely fused double-somite.

The location of the seminal receptacles in the new species is exactly the same as in *Erebonaster protentipes* (see Huys and Boxshall, 1991, fig. 2.10.16 E). Since seminal receptacles are not sclerotized; their walls are difficult, if not impossible, to discern when they are empty. Their contents can be observed only with good optics. Traditionally, some of the strongly sclerotized ducts are referred to as seminal receptacles. Moura and Pottek (1998) pointed to this historical confusion when studying the female genital area in cylindropsyllid harpacticoids. Since the position and nature of the real seminal receptacles are almost identical in harpacticoids and erebonasterids, one may speculate that this represents the condition in the ground pattern of at least podoplean orders.

The setation of swimming legs is, together with that in *A. pacificus*, the most primitive

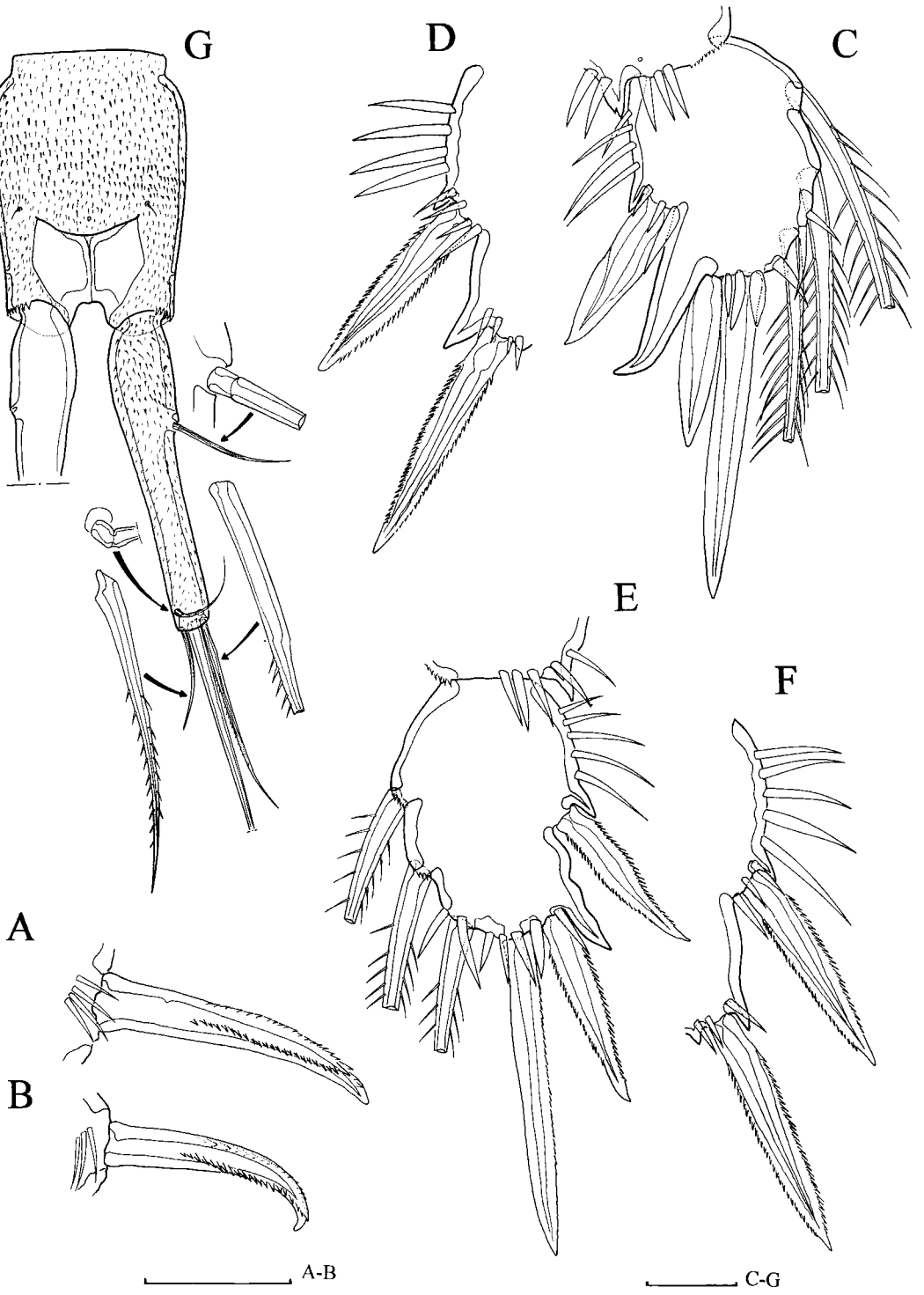

Fig. 6. *Amphicrossus tuerkayi,* new species. A, basal spine of female leg 1; B, basal spine of male leg 1; C, third endopodal segment of male leg 2; D, third endopodal segment of female leg 2; E, third endopodal segment of male leg 3; F, third endopodal segment of female leg 3; G, telson and furca of female, with details of insertion of some setae. Scale bars = 25 μm.

within the genus, having retained an armature formula of II,I,4 on the third exopodal segment of leg 1 and III,I,5 on the homologous segment of leg 2, instead of II,I,3 and III,I,4, respectively, in *A. altalis* and *A. spinulosus.*

The presence of a strongly developed accessory process on the inner margin of the female maxillipedal claw is remarkable. Although processes at this site have been reported previously (Humes, 1989; Huys, 1991; Humes and Huys, 1992), they seem to be smaller than that of the new species. The process in *A. tuerkayi* resembles that present at this site in species of the genus *Centobnaster* (Huys and Boxshall, 1990; Martínez Arbizu, 1997). One may conclude that this character represents a synapomorphy linking *Centobnaster* and *Amphicrossus,* and consequently undermining the monophyletic status of the *Centobnaster*-group. However, accepting this would force us to assume that the presence of composite setae on the furca and the insertion of the maxillule on a notch of the labrum are symplesiomorphies for the Erebonasteridae, and that the absence of these characters in *Amphicrossus* and *Erebonaster* represents the apomorphic condition. At the moment this alternative seems to be the less parsimonious one.

Key to Genera and Species of the Erebonasteridae

1. Antennule 7-segmented in both sexes. Furcal setae II, III, and IV composed of proximal rigid part with distal filiform part. Maxillule bilobate, interlocking on notch with labrum. Fifth legs ventrally located and with well-developed intercoxal sclerite. Males with 3 abdominal somites + telson. No sexual dimorphism on third endopodal segment of leg 2. 2
– Antennule 6-segmented in both sexes. No composite setae on furca. Maxillule not interlocking on notch with labrum. Fifth legs located laterally, without intercoxal sclerite. Males with 2 abdominal somites + telson. Outer distal margin of third endopodal segment of leg 2 produced into strong process. 5
2. Seta on first antennal endopodal segment displaced to posterior surface. Labrum with strong median spinous process. Female maxilliped with robust accessory process on inner margin of claw on second endopodal segment. Inner basal spine of leg 1 transformed into short curved claw. Only 5 setae/spines on third endopodal segment of leg 1. Antennal endopod 3-segmented. Mandibular palp with 3 setae. 3
– Labrum with continuous row of spinules. Female maxilliped without accessory process on claw. Inner basal spine of leg 1 elongate. Third endopodal segment of leg 1 with 6 setae/spines, antennal endopod 2-segmented (fusion of ancestral segments 2 + 3). 4
3. Female with only 1 free postgenital abdominal somite + telson. Hyaline frills on urosome plain. .... *Centobnaster humesi* Huys and Boxshall, 1990
– Female with 2 free postgenital abdominal somites + telson. Hyaline frills on urosome deeply serrated. .... *Centobnaster severnicus* Martínez Arbizu, 1997
4. First antennal endopodal segment without outer seta. Mandibular palp with 4 setae. Maxillipedal basis ornamented with dense area of fine spinules on inner margin. Female with 2 free postgenital abdominal somites + telson. Furcal seta I present. Furca about 4 times longer than wide. Hyaline frills on urosome deeply serrated. .... *Tychidion guyanense* Humes, 1973
– First antennal endopodal segment with outer seta. Mandibular palp with 2 setae. Maxillipedal basis ornamented with single longitudinal row of spinules on inner margin. Female with only 1 free postgenital abdominal somite + telson. Furcal seta I absent. Furca short, about 2 times longer than wide. Hyaline frills on urosome finely serrated. .... *Nansennaster innupta,* new genus, new species
5. Body surface ornamented with a dense mat of spinules. Tergites of somites bearing legs 2–4 not expanded posteriorly. Armature formula of third exopodal segment of leg 4 being II,I,4. 6
– Body surface smooth. Tergites of somites bearing legs 2–4 expanded posteriorly. Armature formula of third exopodal segment of leg 4 being II,I,3. ..... *Erebonaster protentipes* Humes, 1987
6. Setation formula of third exopodal segment of leg 1 being II,I,4 and on homologous segment of leg 2 being III,I,5. 7
– Setation formula of third exopodal segment of leg 1 being II,I,3 and on homologous segment of leg 2 being III,I,4. 8
7. Body length of female including furca about 1.51 mm. Second antennular segment with 15 setae. Endopod of maxilla represented by 2 setae. Maxillipedal claw with strong accessory process on inner margin. Genital double-somite subdivided along dorsal surface. Furcal seta I present. Fifth leg exopod extending to anterior rim of sixth leg. .... *A. tuerkayi,* new species
– Body length of female including furca about 2.26 mm. Second antennular segment with 16 setae. Endopod of maxilla represented by 1 seta. Maxillipedal claw with minute accessory process on inner margin. Genital double-somite not subdivided along dorsal surface. Furcal seta I absent. Fifth exopodal segment extending well beyond posterior rim of sixth leg. ..... *A. pacificus* Huys, 1990
8. Spinular body ornamentation restricted to antennule, genital somite, and lateral margins of cephalosome. Fifth leg without spinular ornamentation on surface. Fifth leg exopod about 2.7 times length of protopod, almost reaching to posterior rim of genital double-somite. Basal inner seta of female leg 1 not reaching to posterior rim of first endopodal segment. ..... *A. altalis* Humes and Huys, 1992
– Spinular ornamentation extending along whole body surface, antennular segments, and fifth legs. Fifth leg exopod about 1.4 times length of protopod, reaching to anterior rim of sixth legs. Inner basal spine of female leg 1 reaching to posterior rim of second endopodal segment. ... *A. spinulosus* (Humes, 1989)

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