

SYSTEMATIC STATUS OF *EUBRACHIELLA*,
A GENUS OF COPEPODA PARASITIC ON ANTARCTIC TELEOSTS

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Abstract: Studies on the newly collected materials of *Eubrachiella antarctica* (QUIDOR, 1906) from *Dissostichus eleginoides* near Heard Island (taken during the Australian National Antarctic Research Expedition) and *Eubrachiella gaini dorsituberculata* KABATA and GUSEV, 1977 from *Trematomus bernacchii* (taken from Lützw-Holm Bay, Antarctica, during the cruise of the 35th Japanese Antarctic Research Expedition) revealed the necessity of reconsideration of the systematic status of the genus and removing from it two nominal species: *Eubrachiella sublobulata* BARNARD, 1955 and *Eubrachiella mugilis* KABATA *et al.*, 1971. History and systematics of the genus *Eubrachiella* WILSON, 1915 are discussed in detail and a new diagnosis of the genus is proposed. With this new treatment, copepods of the genus *Eubrachiella* become more homogenous and, at the same time, show strong preference for parasitism on Antarctic fishes of the Bathyaconidae, Channichthyidae, and Nototheniidae.

1. Introduction

The first record of parasitic copepod from the Antarctic teleost fishes was made by QUIDOR (1906). The parasite, *Brachiella antarctica* QUIDOR, was taken from a cod icefish, *Dissostichus eleginoides* SMITT, during the “Expédition Antarctique Française (1903–1905)”. Seven years later QUIDOR (1913) reported another parasite, *Brachiella gaini* QUIDOR, from another cod icefish, *Trematomus* sp., taken at Port Lockroy, Antarctica during the “Deuxième Expédition Antarctique Française (1908–1910)”. Since the female of *B. antarctica* has no posterior process (modified caudal ramus) and the general appearance of its pygmy male differs greatly from a typical *Brachiella*, WILSON (1915) erected for it a new genus *Eubrachiella*. *Brachiella gaini* was also included in this genus by WILSON even though its male was unknown at the time.

Since WILSON’S (1915) creation of *Eubrachiella*, the genus received two new species (*E. sublobulata* BARNARD, 1955 and *E. mugilis* KABATA *et al.*, 1971) and a new subspecies (*Eubrachiella gaini dorsituberculata* KABATA and GUSEV, 1966), in addition to two more species transferred from *Brachiella* (*B. exigua* BRIAN, 1906 and *B. lophii* EDWARDS, 1840). The genus, as it stands now, is rather heterogeneous. For instance, the females of *E. exigua*, *E. lophii*, and *E. mugilis* carry a pair of, though small, posterior processes. Thus, the only basis for holding them together in the genus *Eubrachiella* is the unusual appearance of the pygmy male, which is characteristic in having the trunk

clearly differentiated from the cephalothorax and folded anteriorly until the posterior end points forward.

KABATA and GUSEV'S (1966) redescription of *E. gaini* is the first work that reveals the true morphology of the pygmy male of *Eubrachiella*. But, ironically, the male of *E. mugilis* described by KABATA *et al.* (1971) showed so much difference from the male of *E. gaini* that they can hardly be treated as congeneric. Nevertheless, due to the lack of information on the appendages of both sexes of the type species of the genus, *E. antarctica* (QUIDOR, 1906), it is impossible to solve this systematic problem at present. Thus, the newly recovered specimens of *E. antarctica* from the type host, *Dissostichus eleginoides* collected off Heard Island, are studied in detail with the hope to clear the systematic problem. Some new materials of *E. gaini dorsituberculata* obtained from a new host, *Trematomus bernacchii* BOULENGER, collected off Syowa Station, Antarctica, are also included in this attempt to resolve the systematic status of *Eubrachiella*. All specimens were recovered from the oral or branchial cavities of their hosts.

2. Redescription of *Eubrachiella antarctica*

Brachiella antarctica QUIDOR 1906: 30–32, pl. iii, figs. 45–48. *Eubrachiella antarctica* (QUIDOR).—WILSON 1915: 717, pl. xxviii, fig. P.—YAMAGUTI 1963: 259.—KOCK and MÖLLER 1977: 149–151, figs. 2–7.

Material examined: Forty-two females (5 with male attached) obtained from the oral cavities of 11 *Dissostichus eleginoides* SMITT collected off Heard Island (51°44'–53°30' S, 72°–78°00' E) in June, 1990 by R. WILLIAMS on marine science voyages of the Australian National Antarctic Research Expedition.

Female: Cephalothorax about as long as trunk, which is about as wide as long (Fig. 1A, B). Posterior margin of trunk bearing a short genital process but without traces of posterior processes (caudal ramus) (Fig. 4). Dorsal shield of head narrowed in midregion (Fig. 1C). Egg sac cigar-shaped; reaching 4/5 of body length. Antennule 4-segmented (Fig. 1D) and tipped with 7 unequal elements (Fig. 1E). Antenna (Fig. 1F) biramous; bulbous exopod bearing 2 papillose elements and distally with scale-like sclerites; endopod indistinctly 2-segmented, tipped with 4 unequal elements and a corrugated knob (Fig. 1G). Mandible (Fig. 1H) with dental formula of P1, P1, P1, B5. Maxillule (Fig. 1J) biramous; exopod small and tipped with a blunt knob and a short seta; endopod tipped with 2 large and 1 small papillae, each ending in a spine. Maxilla (Fig. 1I) short, less than half length of cephalothorax, and separated from each other. Maxilliped (Fig. 1K) 2-segmented; corpus bearing two patches of small denticles separated by myxa; subchela with basal seta and sparsely denticulated medial margin; distal barb slender; claw with auxiliary, basal tooth. Body length 3.78–6.97 mm.

Male: Body (Fig. 2A) with distinct furrow separating head from trunk, which is short and strongly bent forward. Caudal rami sunk into a pit and tipped with 3 elements (Fig. 2E). Antennule (Fig. 2B) 3-segmented and tipped with 7 unequal elements (Fig. 4). Antenna (Fig. 2C) biramous; exopod smaller than endopod, which is 2-segmented with both segments bearing a patch of denticles on medial surface; distal segment tipped with 3 spines. Mandible (Fig. 2D) with dental formula of P1, P1, S1, P1, S1, B4. Maxillule (Fig. 2F) biramous; exopod small and tipped with 2 small setae;

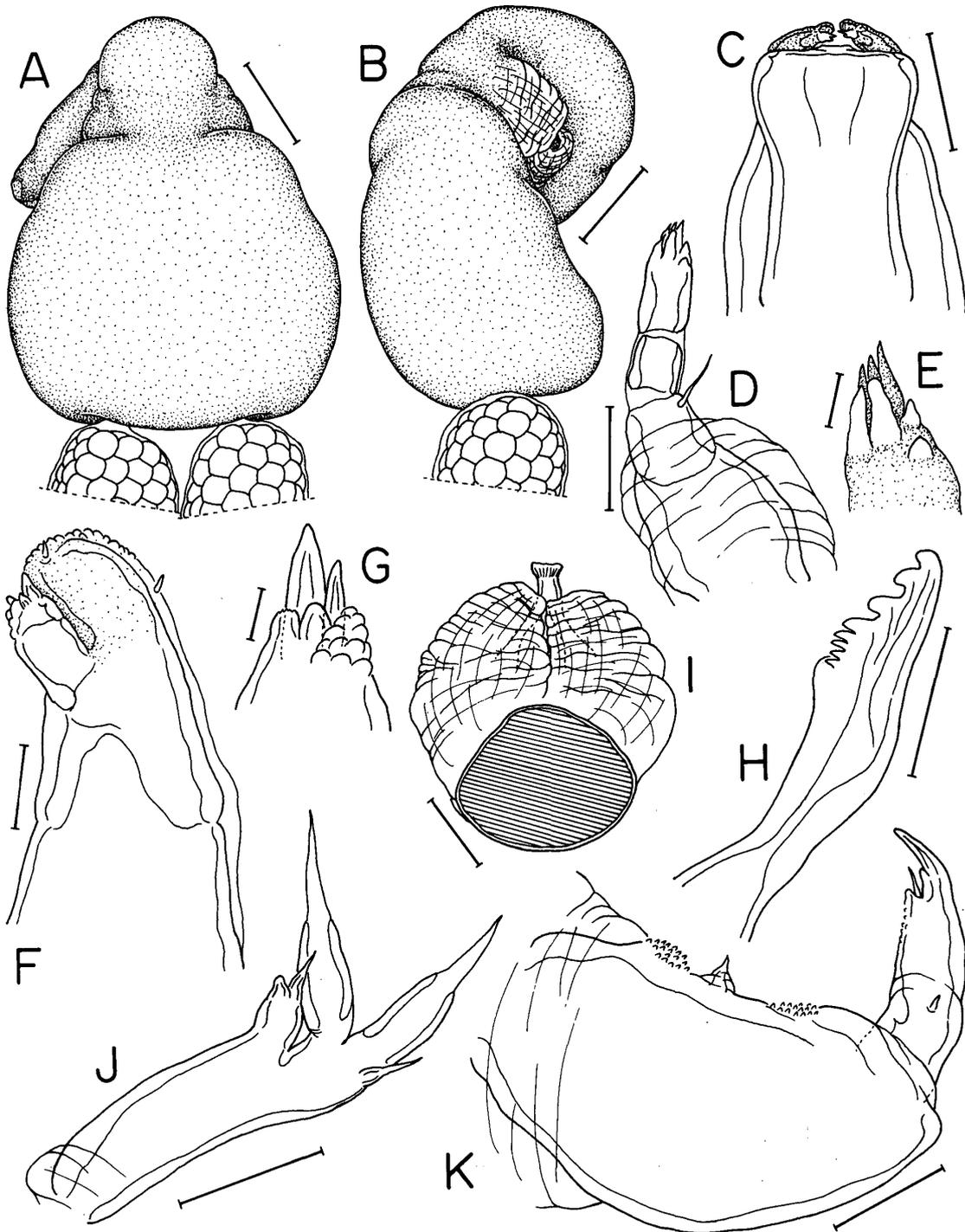


Fig. 1. *Eubrachiella antarctica* QUIDOR, female. A. habitus, dorsal; B. habitus, lateral; C. head, dorsal; D. antennule; E. tip of antennule; F. antenna; G. tip of endopod of antenna; H. mandible; I. maxilla; J. maxillule; K. maxilliped. Scale bars: 1 mm in A, B; 0.5 mm in C, I; 0.05 mm in D, F, H, J; 0.01 mm in E, G, K.

endopod tipped with 2 large papillose elements. Maxilla (Fig. 2G) 2-segmented; proximal segment large and squarish; distal segment a strongly recurved claw. Maxilliped (Fig. 2H) subchelate as in maxilla; but proximal segment stouter, with protruded inner-distal corner forming a pit to receive terminal recurved claw. Body length 1.06–

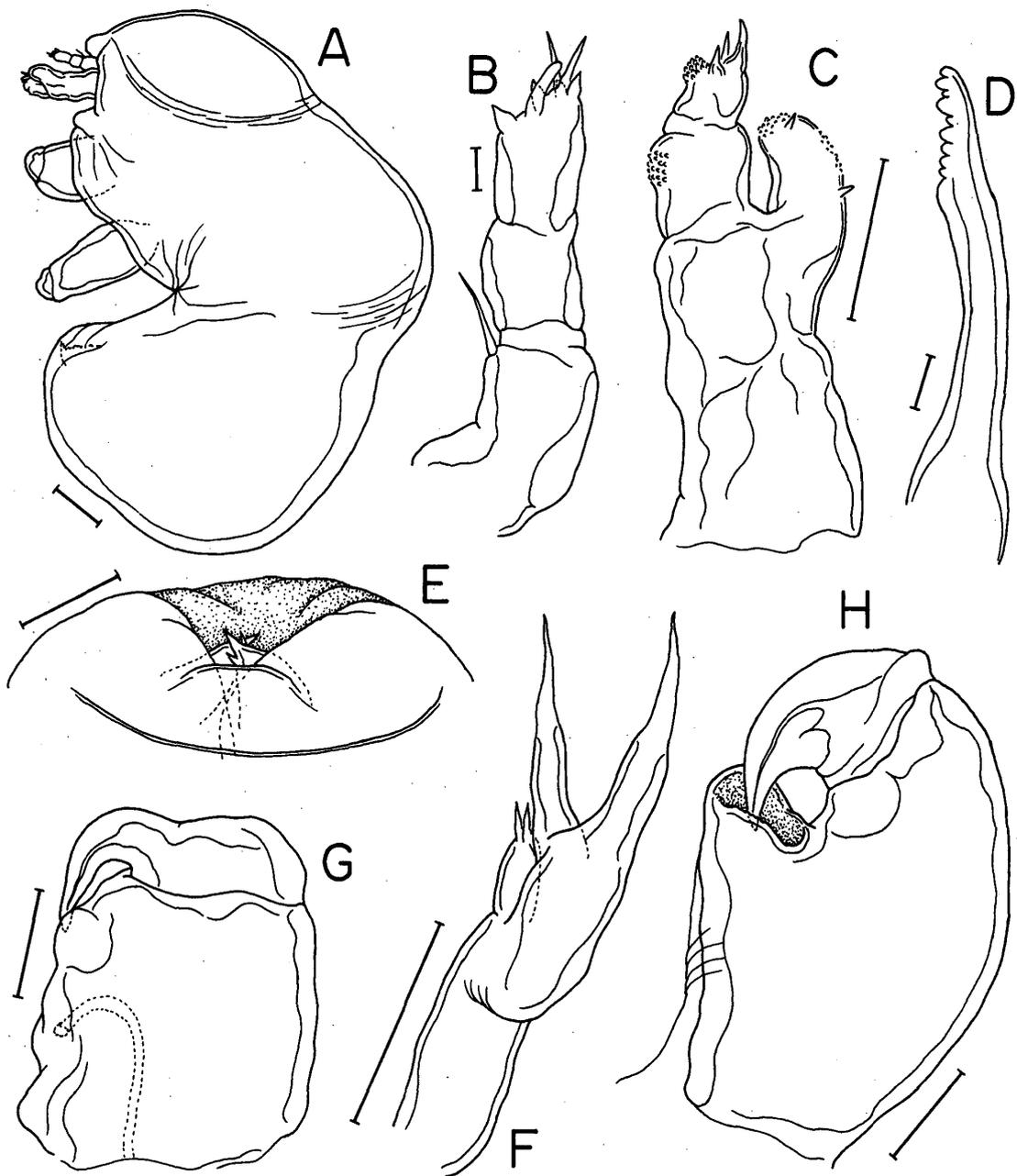


Fig. 2. *Eubrachiella antarctica* QUIDOR, male. A. habitus, lateral; B. antennule; C. antenna; D. mandible; E. posterior end of trunk; F. maxillule; G. maxilla; H. maxilliped. Scale bars: 0.1 mm in A; 0.01 mm in B, D; 0.05 mm in C, E, F, G, H.

1.13 mm.

3. Redescription of *Eubrachiella gaini dorsituberculata*

Eubrachiella gaini dorsituberculata KABATA and GUSEV 1966: 195, figs. 121–123.

Eubrachiella gaini (QUIDOR)(in part).—KABATA 1965: 13–14, pl. vi, figs. 53–64.

Material examined: Five females obtained from the branchial cavities of 3 *Trematomus bernacchii* BOULENGER collected from Lützow-Holm Bay, Antarctica at 68°55.1'S, 39°02.8' E, depth 150 m, on 5 January, 1994 during the 35th cruise of the Japanese

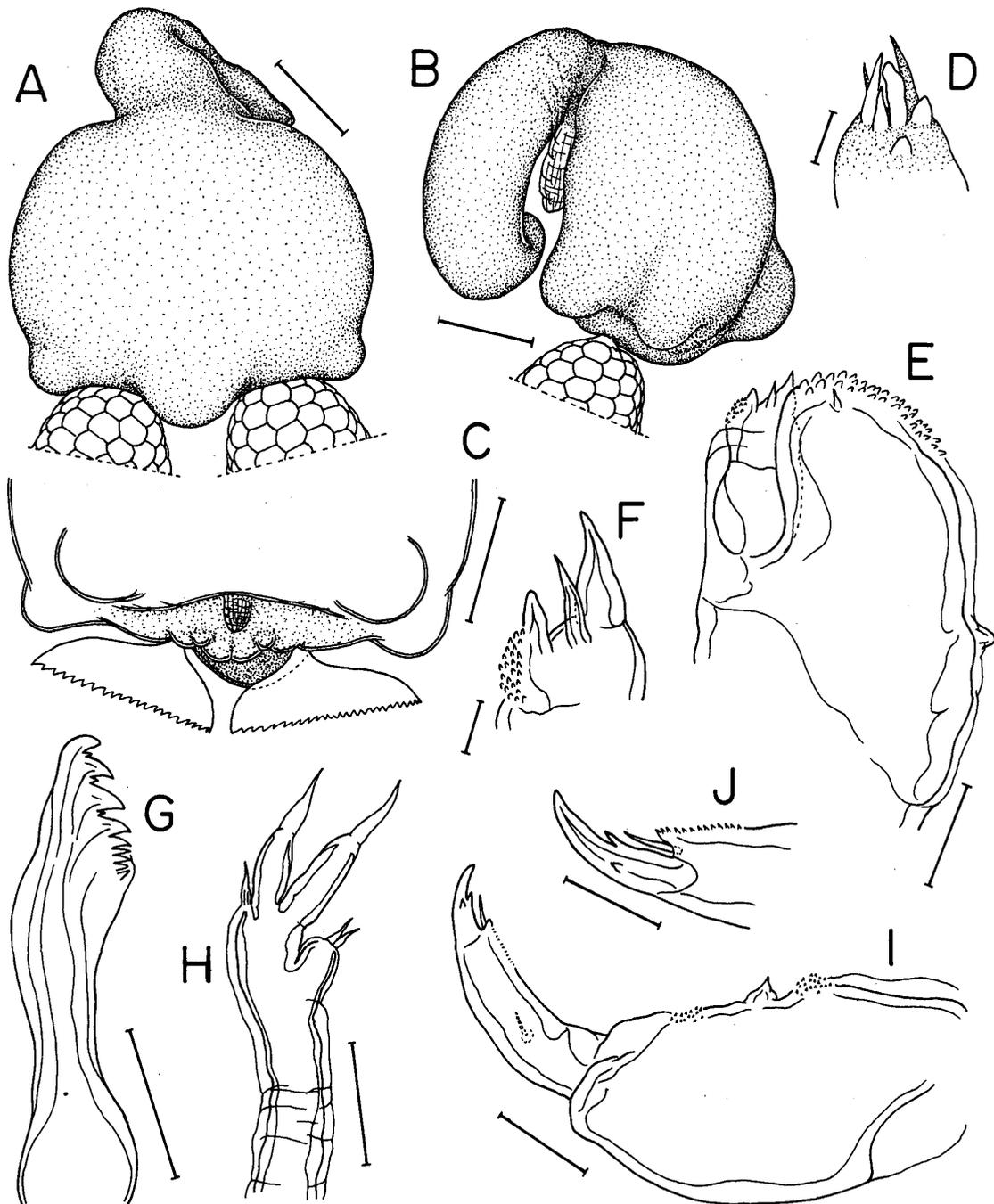


Fig. 3. *Eubrachiella gaini dorsituberculata* KABATA and GUSEV, female. A. habitus, dorsal; B. habitus, lateral; C. posterior end of trunk, ventral; D. tip of antennule; E. tip of antenna; F. tip of endopod of antenna; G. mandible; H. maxillule; I. maxilliped; J. tip of maxilliped. Scale bars: 1 mm in A, B, C; 0.01 mm in D, F; 0.05 mm in E, G, H, J; 0.1 mm in I.

Antarctic Research Expedition.

Female: Cephalothorax about as long as trunk, which is wider than long and bearing a broad, dorsal tubercle on posterior margin and 2 similar tubercles on posterolateral margin (Fig. 3A, B). Posterior surface of trunk carrying a small genital process and vestiges of posterior processes (Fig. 3C). Armature of tip of antennule (Fig. 3D) essentially as in *E. antarctica*. Endopod of antenna tipped with 1 large spine,

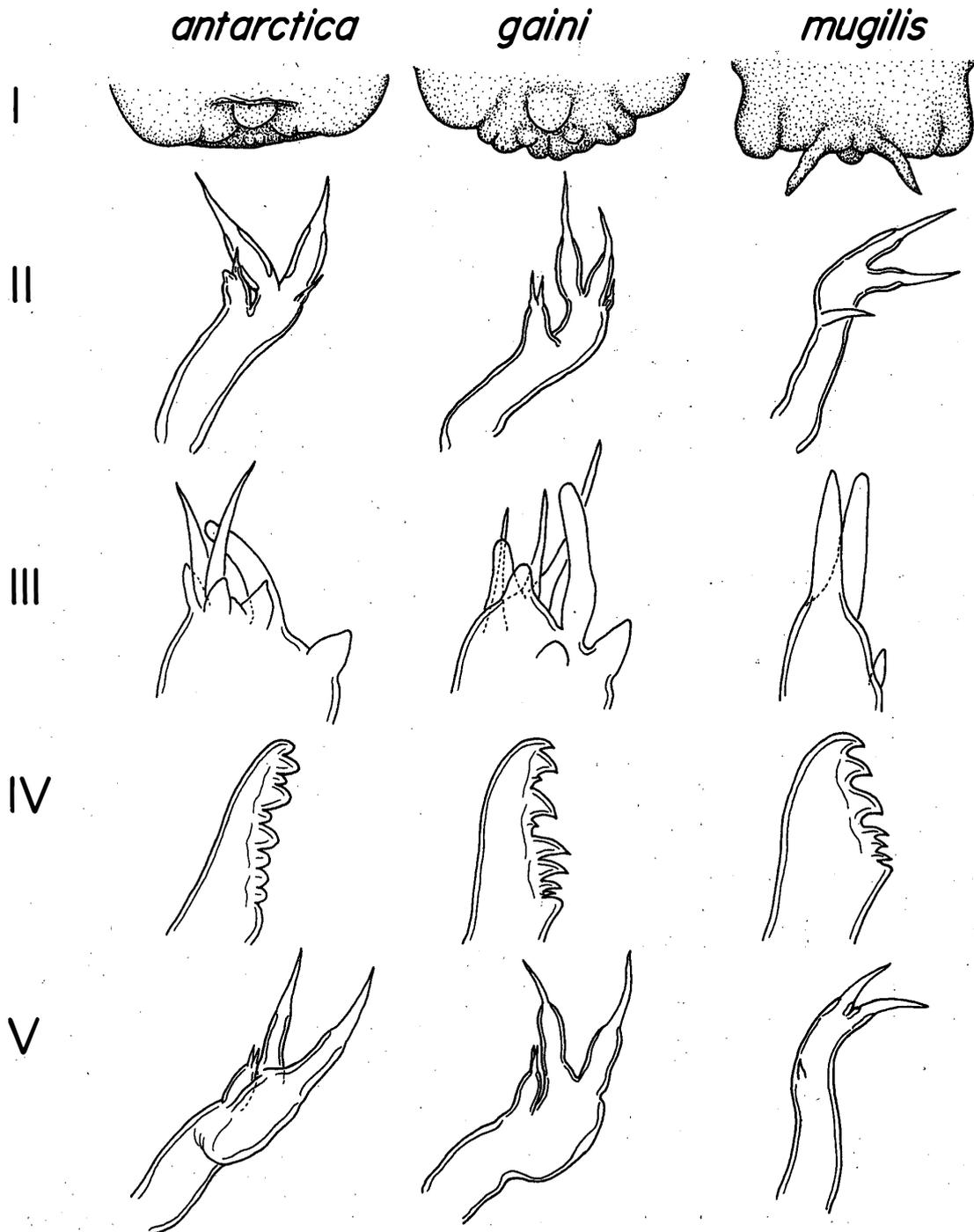


Fig. 4. Details of selected structures in three species of *Eubrachiella* prior to the present work: posterior end of female trunk (I), female maxillule (II), tip of male antennule (III), dentition of male mandible (IV), and male maxillule (V).

1 spine-like seta, and a denticulate lobe bearing a spine-like, blunt protrusion (Fig. 3E, F). Mandible (Fig. 3G) with dental formula of P1, S1, P1, S1, P1, S1, B6. Maxillule (Fig. 3H) biramous; exopod tipped with 2 small setae; endopod tipped with 2 large and 1 small pappilose elements. Maxilla as in *E. antarctica*. Maxilliped (Fig. 3I) 2-segmented; corpus bearing 2 patches of denticles separated by myxa; subchela with basal

seta and denticulated distomedial margin; distal barb slender and terminal claw with 2 auxiliary teeth (Fig. 3J). Body length 5.63–5.92 mm.

4. Reconsideration on the Systematic Status of *Eubrachiella*

When WILSON (1915) established *Eubrachiella* to accommodate *Brachiella antarctica* QUIDOR, he enumerated (on page 699) the following distinguishing features as the reason for his such action: “.....no posterior processes, the exopod of the second antennae is unsegmented, the second maxillae are entirely separate, and the male differs so much from *Brachiella*.....” WILSON’S inclusion of *Brachiella gaini* QUIDOR, 1912 in this new genus is perplexing, because the male was unknown at the time. However, this doubt was cleared by KABATA and GUSEV (1966) when they showed that *E. gaini* from Antarctica had a male of the *Eubrachiella*-type.

It appears that the transfer of *Brachiella lophii* EDWARDS, 1840 by YAMAGUTI (1963) and of *Brachiella exigua* BRIAN, 1906 by RADUJKOVIE and RAIBAUT (1989) into *Eubrachiella* were largely based on the general similarity of the male to *E. antarctica*. WILSON (1915) recognized 17 types of males in the Lernaepodidae with each type representing a genus. However, as more males of lernaepodids were made known, it became clear that WILSON was “overhasty in application of his rule about the morphology of the males” (KABATA, 1979, 348). According to KABATA’S (1979, 333–335) review of this matter, there are only three types of males and the males of *Brachiella*, *Eubrachiella*, and *Neobrachiella* are of the same type—Type A. Thus, in defining the lernaepodid genera, the general appearance of the pygmy male can not be considered alone without checking into the morphology of the appendages of both sexes. As a matter of fact, due to the presence of a pair of posterior processes in the female, *B. lophii* has been proposed by KABATA (1979) to be treated as a junior synonym of *Pseudocharopinus malleus* and *B. exigua* has been treated as a valid species of *Neobrachiella* by KABATA and HO (1981) and followed by CASTRO and BAEZA (1987).

With the above redescription of the type species of *Eubrachiella*, it is apparent that *E. mugilis* KABATA *et al.*, 1971 can no longer be kept in the genus. The female shows differences not only in the posterior processes, but also in the structure of the maxillule (Fig. 4I, II). The male shows even greater differences than the female in the structures of the antennule, mandible, and maxillule (Fig. 4II, IV, V). Accordingly, *mugilis* should be removed from *Eubrachiella* and placed in *Neobrachiella*. The taxonomic status of *Eubrachiella sublobulata* BARNARD, 1955 can not be determined at this point of time due to the lack of information on the appendages of both sexes. Nevertheless, information provided by BARNARD (1955), though scanty, seems to suggest that it is also acceptable to the genus *Neobrachiella*.

The amendment proposed in the foregoing leaves only two species (*antarctica*, *gaini*) and one subspecies (*gaini dorsituberculata*) in the genus *Eubrachiella*. It is interesting to point out that with this amendment, *Eubrachiella* becomes a genus of parasitic Copepoda occurring *only on the teleosts of Antarctic waters*. Table 1 shows the hosts and distribution of the members of the redefined *Eubrachiella*. Below is the new diagnosis for the genus:

Table 1. Hosts and distribution of the species of genus *Eubrachiella* redefined in the present study. Number in the parentheses after each locality referring to the following source of information: 1, from QUIDOR (1906); 2, from QUIDOR (1913); 3, from KABATA (1969); 4, from KABATA and GUSEV (1966); 5, from KOCK and MÖLLER (1977); 6, from SIEGEL (1980); 7, from KOCK et al. (1984); and 8, from present work.

Species	Hosts	Distribution
<i>antarctica</i>	<i>Chaenocephalus</i>	Antarctic Peninsula (5)(6)
	<i>aceratus</i> (LÖNNBERG)	South Georgia (6)
	<i>Champscephalus</i>	South Georgia and South Orkney
	<i>gunnari</i> (LÖNNBERG)	Island (5)(6)
	<i>Chionodraco</i>	Antarctic Peninsula and South
	<i>hamatus</i> (LÖNNBERG)	Orkney Island (5)(6)
	<i>Gobionotothen</i>	Antarctic Peninsula (5)
	<i>gibberifrons</i> (LÖNNBERG)	
	<i>Prionodraco</i>	Antarctic Peninsula (5)
	<i>evansii</i> REGAN	Weddell Sea (7)
	<i>Pseudochaenichthys</i>	South Georgia (5)
	<i>georgianus</i> NORMAN	
	<i>Dissostichus</i>	Antarctic Ocean (1)
	<i>elegionoides</i> SMITT	Burwood Bank and South Georgia (5) Heard Island (8)
	<i>Dissostichus</i>	Antarctic Peninsula (5)(6)
<i>mawsoni</i> NORMAN		
<i>gaini</i>	* <i>Chionodraco</i> sp.	Enderby Land (4)
	[? <i>hamatus</i> (LÖNNBERG)]	
	<i>Trematomus hansonii</i>	Fiord of Bungee Oasis (4)
	<i>hansonii</i> BOULENGER	
	<i>Trematomus scottii</i>	66° 46' S, 75° 00' E, 1975 m (3) off Princess Elizabeth Land (4)
<i>scottii</i> (BOULENGER)		
<i>Trematomus</i> sp.	Port Lockroy (2)	
<i>gaini dorsituberculata</i>	<i>Channichthys</i>	Heard Island (4)
	<i>rhinoceratus</i> RICHARDSON	
	<i>Trematomus</i>	Lützow-Holm Bay (8)
	<i>bernacchii</i> BOULENGER	

*KABATA and GUSEV (1966) reported finding of *E. gaini* on *Chaenodraco cathleenae* from Station 24 (near Enderby Land, Antarctica) of 'Ob' Expedition. However, according to T. IWAMI (Tokyo Kasei Gakuin University), the host is a species of *Chionodraco* and very likely of *hamatus* (LÖNNBERG).

Eubrachiella WILSON, 1915

Female: Cephalothorax cylindrical, about as long as trunk; with well developed dorsal shield. Trunk as long as, or longer than, wide; posteriorly with indistinctive genital process, with or without tubercles and vestiges of posterior processes (modified caudal rami). Antennule indistinctly 4-segmented, with well developed apical armature. Antenna with endopod smaller than exopod. Mandible with three or fewer secondary teeth. Maxillule with small, ventral exopod and two large and one small terminal papillae. Maxilla short, separate from its opposite member. Bulla with short manubrium and small circular anchor. Maxilliped subchelate; claw well developed, with secondary teeth.

Male: Cephalothorax longer than trunk, flat, oval in dorsal aspect; anteriorly with

well developed dorsal shield. Trunk separated from cephalothorax by transverse constriction behind maxillipeds; flexed anteriorly with posterior extremity pointed forward and carrying a pair of reduced caudal rami. Antennule as in female. Antenna prehensile, with well developed, 2-segmented endopod longer than exopod. Mandible as in female. Maxillule with small ventral exopod and two large terminal papillae. Maxilla and maxilliped subchelate. Thoracic legs absent.

Type species: Eubrachiella antarctica (QUIDOR, 1906).

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