Crustaceana 53 (1) 1987, E. J. Brill, Leiden

TWO NEW AMPHIPOD CRUSTACEANS FROM ANCHIHALINE CAVES IN BERMUDA[1])

BY

JAN H. STOCK

Institute of Taxonomic Zoology, University of Amsterdam, P.O. Box 20125, 1000 HC Amsterdam, The Netherlands

BORIS SKET

Institut za biologijo, Univerza, p.p. 141, 61001 Ljubljana, Yugoslavia

and

THOMAS M. ILIFFE

Bermuda Biological Station, Ferry Reach GE 01, Bermuda

INTRODUCTION

The two Amphipoda described in this paper are both rare in the anchihaline[2]) caves of the Walsingham area in Bermuda (see Sket & Iliffe, 1980).

The occurrence of a bogidiellid amphipod was already noted by Sket & Iliffe, l.c. The species in question was not described, but referred to as "*Bogidiella martini* Stock n. ssp." Recent sampling in Bermudian caves, during and after the International Symposium on Marine Caves (October 1984), has yielded some fresh specimens which form the basis for the following description. *B. martini*, from St. Martin in the Lesser Antilles, is indeed its closest relative, but the nature of the differenes is such that we prefer now to give the Bermudian material full specific rank.

The presence of an ingolfiellid was briefly mentioned by Sket, 1979, and by Sket & Iliffe, 1980. Only a single specimen was originally collected and no new material has been found during subsequent sampling. The presence of an ingolfiellid in Bermudian cave waters is interesting enough to justify the description of the species involved, even though it is based on a single female only.

The ingolfiellids are an old group with a curious distribution pattern (Stock, 1977): (1) some species are bathyal or abyssal; (2) many species occur in inland groundwaters of old continental masses (Europe, Africa, South America); (3) many species occur in coastal groundwaters and interstitial waters. In the West

---

[1]) Bermuda Biological Station, Contribution No. 1050.

[2]) For a discussion of the spelling "anchihaline" see this issue, p. 107.

Indies, ingolfiellids are absent, except for on the series of islands just off the South American mainland (Stock, 1979): Aruba, Curaçao, Bonaire, Margarita and Los Testigos. It has been assumed that they reached these islands somehow from the South American plate.

The absence of males makes a cladistic comparison of the Bermudian taxon impossible. However, the female morphology seems to point to close relationship with the above category 3, the coastal/interstitial group.

Description of the new taxa

Bogidiella (Antillogidiella) bermudensis n. sp. (figs. 1-26)

Material. — 1 ♀ (holotype), 1 ♂ (allotype), 1 ♀ (paratype). Walsingham Cave (grid reference $^{3}38958\ ^{35}79974$), in washings of gravelly sediments from the border of the great cave pool; chlorinity 17978 mg/l; 14 Oct. 1984. (ZMA Amph. 107.874).

2 ♀♀, same localty, in washings from gravelly sediments from the border of the pool, 20 Apr. 1979. Leg. T. Iliffe, in collection B. Sket.

1 ♀. Roadside Cave (grid ref. $^{3}3877\ ^{35}7982$), washed from coarse sediments on the border of the terminal cave pool; salinity at surface 1.8‰, at 1 m 20.62‰; 4 Oct. 1984 (ZMA).

Description. — Body length 1.5-2.0 mm (♀), 1.5 mm (♂). Blind, unpigmented.

First antenna (fig. 1) short, about 1/3 of the body length; segment 1 of pedunculus with 1 ventral spine; peduncle segment 2 about 2/3 of the length of segment 1; segment 3 slightly more than half as long as segment 2. Accessory flagellum (fig. 1, detail) 2-segmented; segment 1 long and slender. Flagellum 7-segmented, with very long aesthetes on segments 3, 5, and 6.

Second antenna (fig. 2) shorter than first; flagellum 5-segmented.

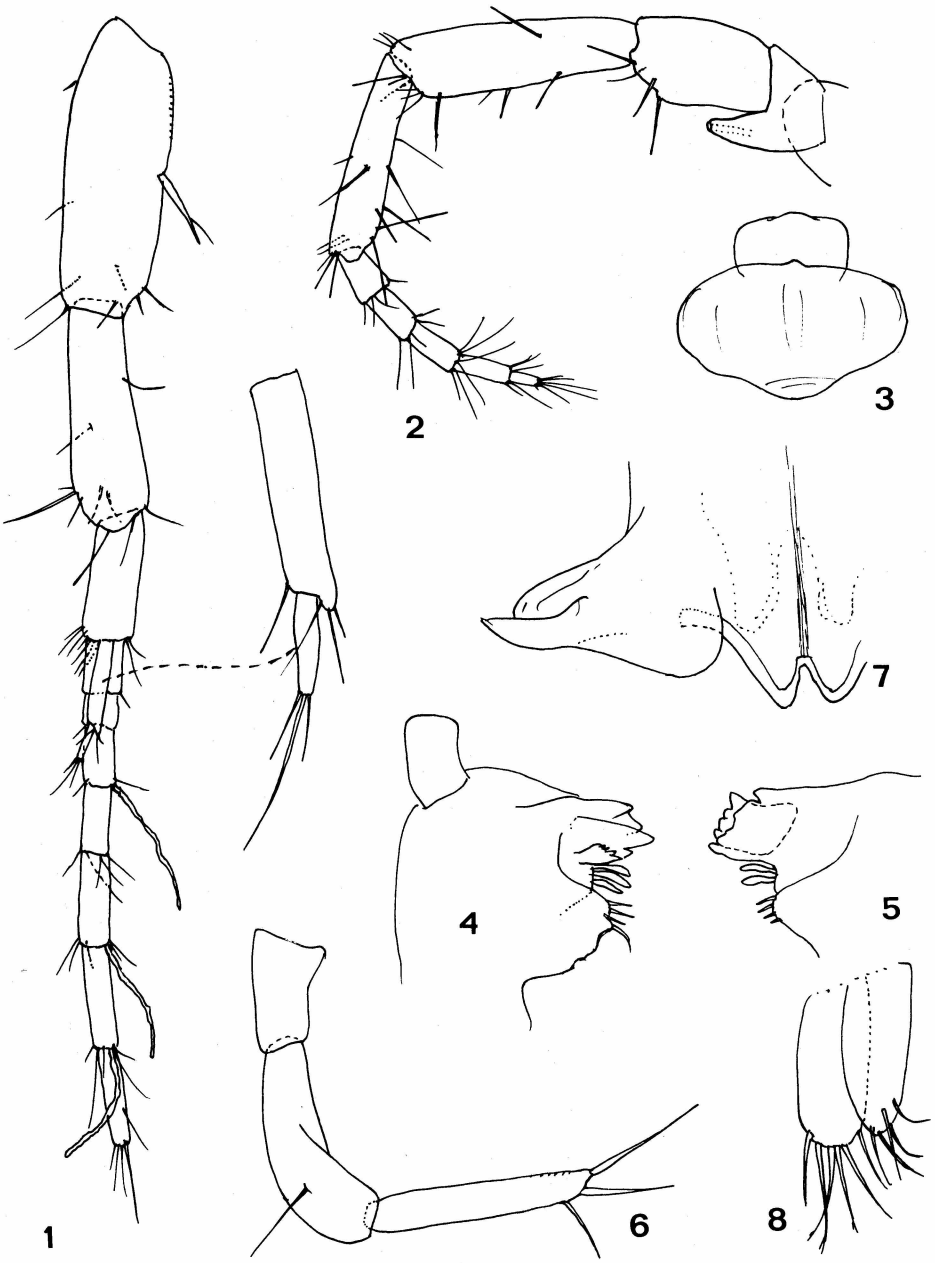
Mouthparts minute. Upper lip (fig. 3) very wide. Mandibles asymmetrical in pars incisiva: left lacinia small (fig. 4), right lacinia overreaching the incisor (fig. 5). Pars molaris reduced to a wide lobe bearing 4 spinules. Palp 3-segmented (fig. 6); segment 2 with 1 seta; segment 3 as long as 2, with 3 (sub)terminal setae.

Lower lip (fig. 7) with fused inner lobes, separated in the midline by a V-shaped incision. First maxilla (fig. 9) with 2-segmented palp; outer lobe with 7 spines, 3 of which finely denticulated, the remaining 4 with 2 medial teeth; inner lobe rounded, rather wide, with 2 distal setules. Second maxilla (fig. 8) consisting of 2 lobes, each with 5 or 6 distal setae.

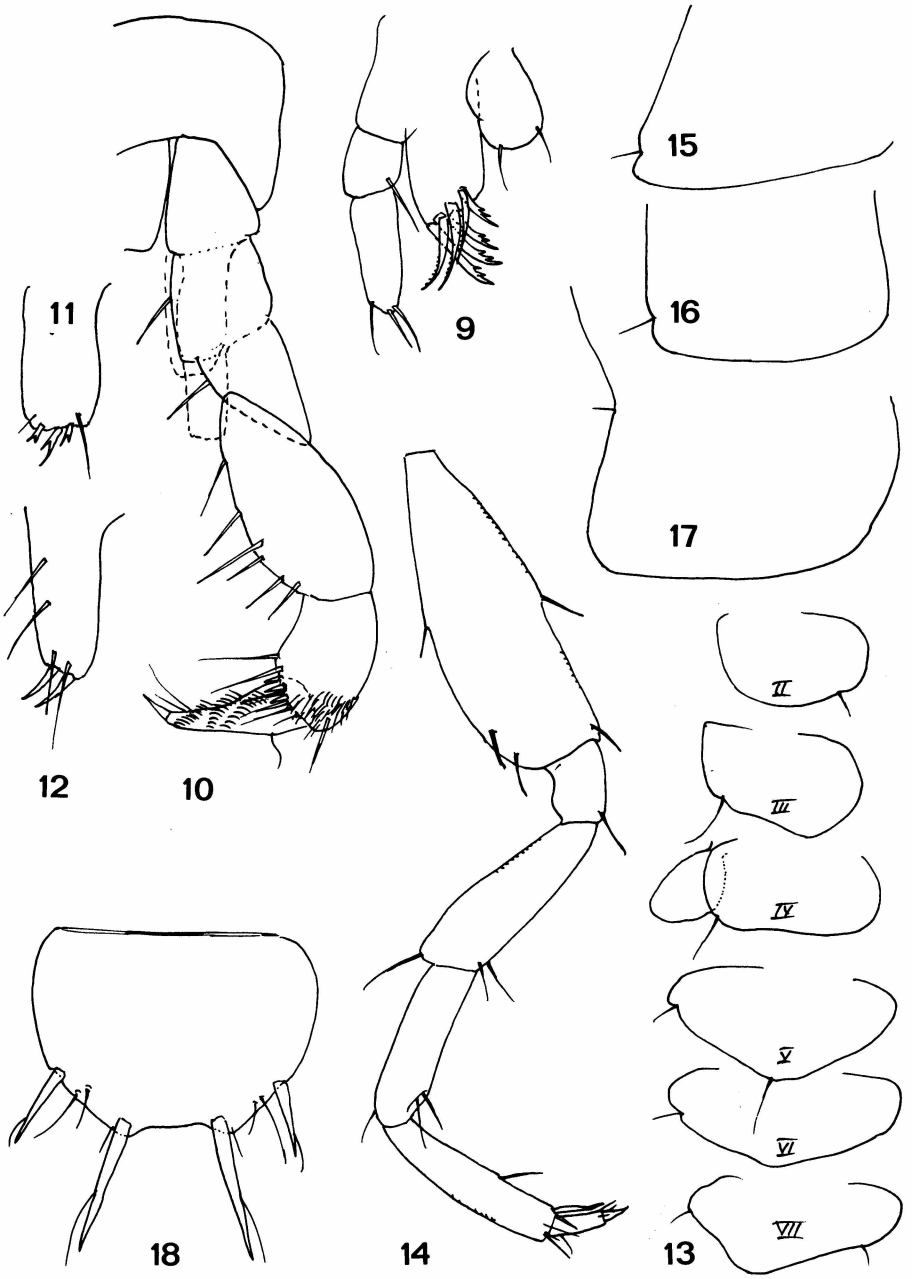
Maxilliped (fig. 10) with 4-segmented palp; segment 3 hardly swollen, claw long. Inner lobe short, with 3 distal, bifid spines (fig. 11). Outer lobe narrow, with 2 simple distal spines (fig. 12).

Coxal plates wider than long, armed with 1 or 2 setules, non-lobate (fig. 13).

First gnathopod (fig. 19): Basis with 1 long and 1 short seta on posterior margin, anterior margin with 1 short seta. Merus produced into an obtuse point, posterior margin with 2 patches of spinules. Carpus strongly produced into a sharp point. Propodus elongate-oval; palmar index (sensu Ruffo, 1973) 0.41; posterior margin with 2 spines; palmar margin with 5 setuliferous spines.



Figs. 1-8. *Bogidiella* (*Antillogidiella*) *bermudensis* n. sp. 1, first antenna, ♀ (scale AB) and its accessory flagellum (AD); 2, second antenna, ♀ (AB); 3, upper lip, ♂ (AC); 4, left mandible, ♂ (AD); 5, right mandible, ♂ (AD); 6, mandible palp, ♂ (AD); 7, lower lip, ♂ (AD); 8, second maxilla, ♂ (AD). Scales AB, AC and AD each represent 100 μm; scales above fig. 19.



Figs. 9-18. *Bogidiella* (*Antillogidiella*) *bermudensis* n. sp. 9, first maxilla, ♂ (scale AD); 10, maxilliped, ♂ (AC); 11, inner lobe of maxilliped, ♂ (AD); 12, outer lobe of maxilliped, ♂ (AD); 13, coxal plates II to VII, ♀, from the right (plate IV with coxal gill) (AB); 14, fourth pereiopod, ♀ (AB); 15, epimeral plate I, ♀, from the right (AB); 16, epimeral plate II, ♀, from the right (AB); 17, epimeral plate III, ♀, from the right (AB); 18, telson, ♀ (AD). Scales AB, AC and AD each represent 100 μm; scales above fig. 19.

Second gnathopod (fig. 20): Posterior margin of basis armed as in P1; anterior margin with 3 setules. Merus and carpus not produced. Propodus slightly smaller than in P1; posterior margin with 2 groups of setae; palmar angle indicated by 2 spines (1 long, 1 short); palmar index 0.42.

Third and fourth (fig. 14) pereiopods similar. Coxal gills small, on P4 through P6. Oostegites small, linear, on P2 through P5. Anterodistal propodal setae of P3 and P4 short, posterodistal propodal spine long. Fifth pereiopod (fig. 22) with a few setuliferous spines on merus, carpus and propodus. Claw slender. Posterodistal propodal seta long, no anterodistal spine. Sixth pereiopod similar in structure to, but almost 20% longer than, P5. Seventh pereiopod lacking in all specimens examined.

Epimeral plates 1 to 3 (figs. 15-17) with rounded posteroventral corner.

Pleopods 1, 2 (fig. 24) and 3 of ♀, and pleopods 1 and 3 of ♂ similar: pedunculus long, with 2 retinacula; exopodite 3-segmented, all segments slender, each segment with 2 long, plumose setae. Pleopod 2 ♂ (fig. 23) with sexual dimorphism in exopodite segment 2, which is shorter and armed with 1 inner plumose seta and 1 outer strong spine. Endopodite absent in all pleopods (♀, ♂).

Uropod 1 (fig. 21) with 2 dagger-shaped rami, each ramus with a medioventral setule; no distal armature. Endopodite slightly longer than exopodite.

Uropod 2 (fig. 25) with normal rami; each ramus distally with 3 spines. Uropod 3 equiramous (fig. 26), each ramus 1-segmented.

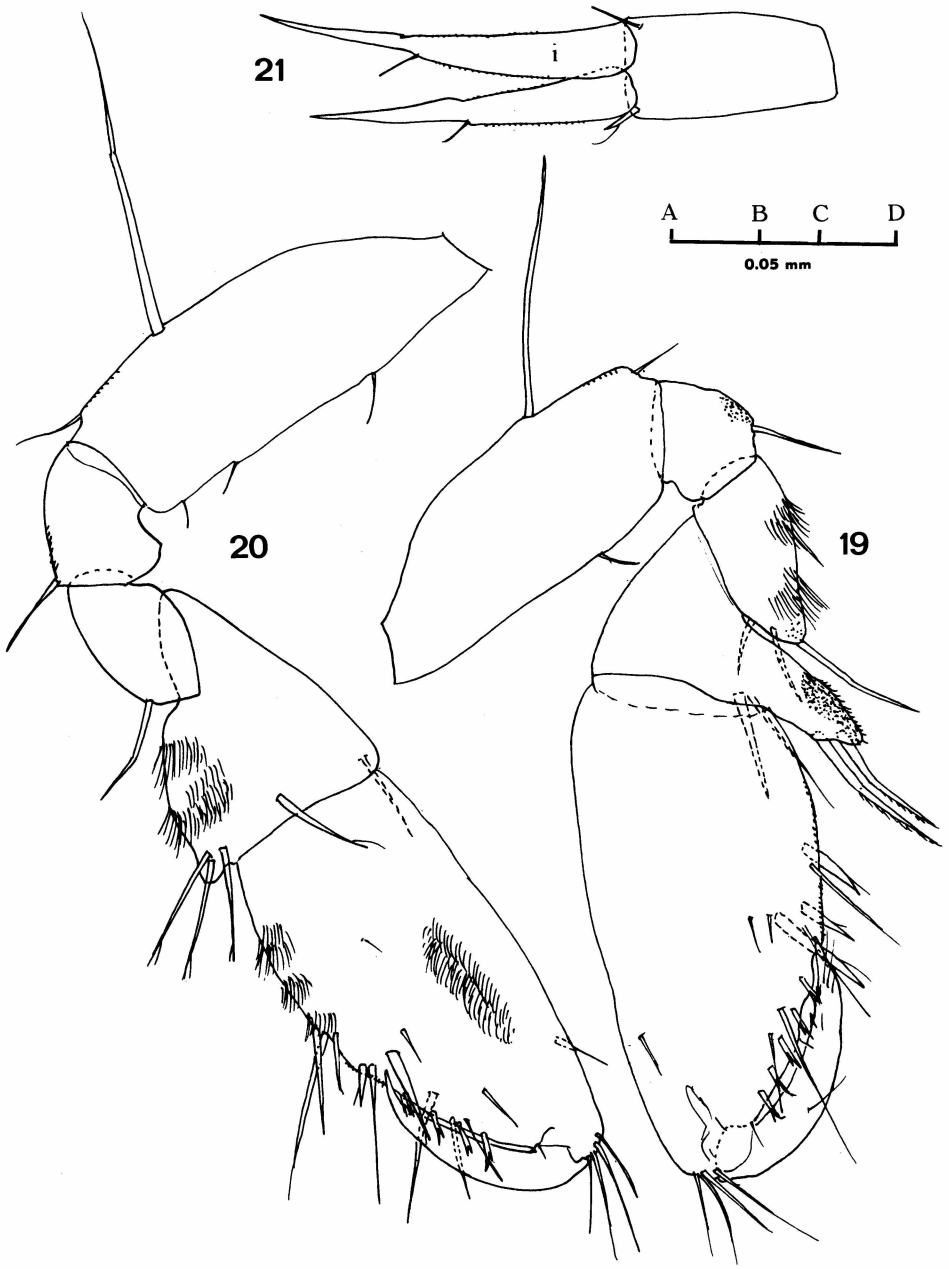
The single available male is damaged, lacking its uropods, so the diagnostic structure of the first ♂ uropod remains unknown.

Telson (fig. 18) wider than long, with very shallow distal emargination; 2 distal spines on either side.

No sexual dimorphism observed in the appendages, but for pleopod 2.

Discussion. — The first male uropod is one of the diagnostic features of the subgenus *Antillogidiella*. Since this appendage is broken off in the single available male, no absolute certainty can be obtained as to the (sub)generic status of the Bermudian specimens. The dagger-like structure of the rami of the first female uropod leaves only two possibilities open: *Antillogidiella* or *Actogidiella* (see Stock, 1981). In the latter, the second mandible palp segment is bulbous, in the former it is not. The Bermudian specimens, having a non-bulbous palp, have been attributed therefore provisionally to *Antillogidiella*.

Both *Antillogidiella* and *Actogidiella* were hitherto monospecific; both taxa are West Indian. From *Antillogidiella martini* Stock, 1978, known from wells on the island of St. Martin, the new species differs in the longer aesthetes on A1, a less slender third maxillipedal palp segment, the absence of additional spines on the propodus of P1♂, the presence of a long seta on the posterior margin of the basis of P1 and P2, the more slender distal exopodite article in pleopods 1 to 3, the absence of an endopodite in the male pleopods, and the shape and armature of the telson.



Figs. 19-21. *Bogidiella* (*Antillogidiella*) *bermudensis* n. sp. 19, first gnathopod, ♀ (scale AC); 20, second gnathopod, ♀ (AC); 21, first uropod, ♀ (i = inner ramus) (AC). Scale AC represents 100 μm.

From *Actogidiella cultrifera* Stock, 1981, a species from intertidal sands in Tortola, British Virgin Islands, the new species can be distinguished by a more slender second mandible palp segment, presence of a long distal propodal seta in P5 and P6, slender exopodite segments in pleopods 1 to 3, longer plumose setae on segments 1 and 2 of pleopod 1 ♂, and a wider telson, the distal armature of which consists of 2 + 2 spines.

Ingolfiella longipes n. sp. (figs. 27-45)

Material. — 1 ♀ (holotype). Bermuda, Walsingham Sink Cave (grid reference $^{3}38958$ $^{35}79974$); salinity at surface 17.008‰, at 1 m 32.096‰; Sep. 1978. (ZMA Amph. 107.880).

Description. — Body length (without antennae) 1.6 mm. Body very slender (fig. 27); each somite with 2 dorsal setules. Ocular lobe present.

First antenna (fig. 28) with long first peduncle segment; accessory flagellum 3-segmented; flagellum 4-segmented. Long aesthetes on flagellum segments 2, 3, and 4. Setae on all segments few and short.

Second antenna (fig. 29): peduncle segment 3 much longer than 4; segment 4 slightly longer than 5; flagellum 5-segmented.

Mandible not studied in detail.

First maxilla (fig. 30) with 2-segmented palp, distally with 2 setae only. Outer lobe with 3 setae and 3 spines, the latter armed with 2, 1, and 3 teeth, respectively. Inner lobe rounded, with 1 apical seta only.

Second maxilla (fig. 31): outer lobe with 5, inner lobe with 3 setae.

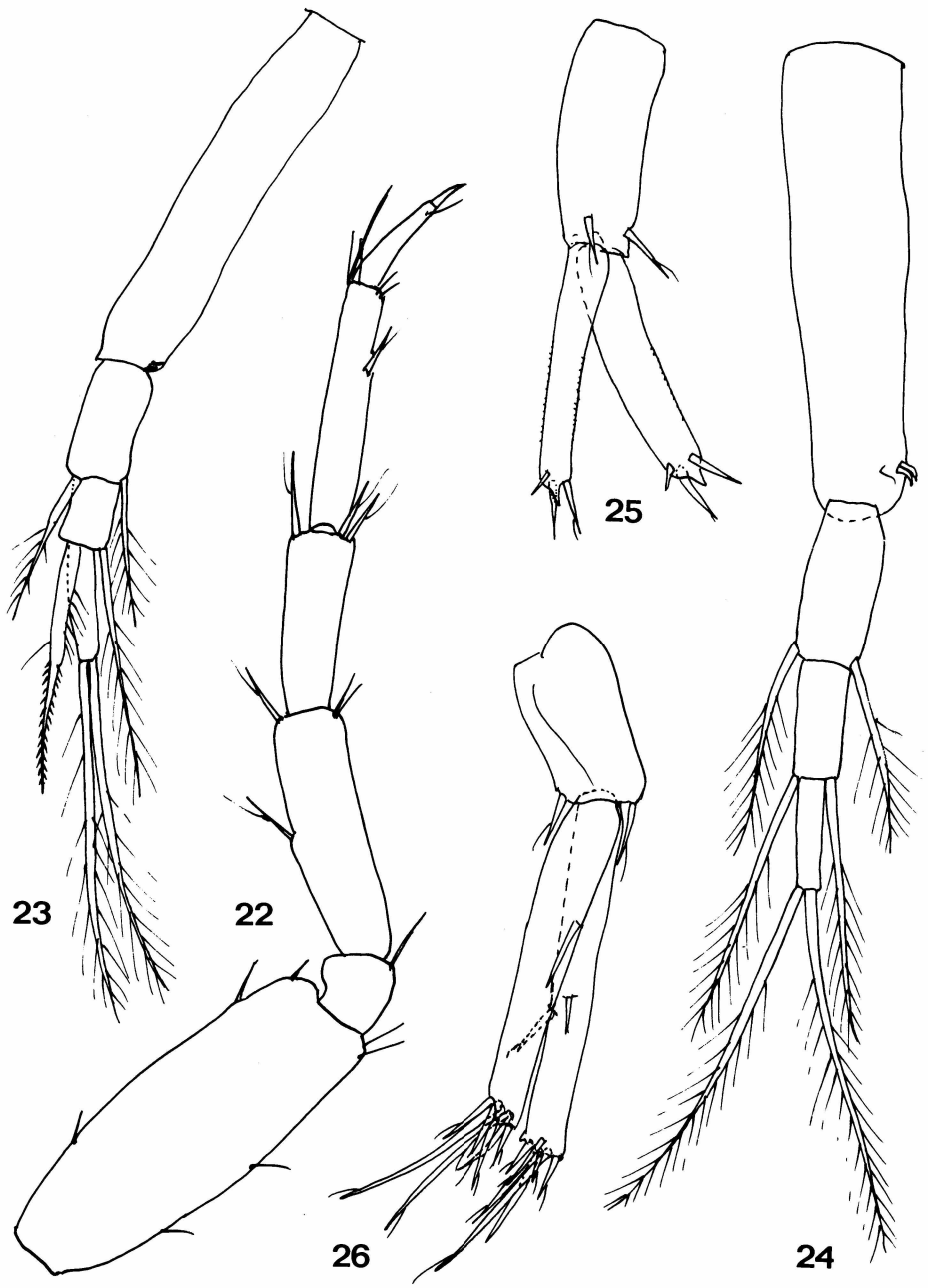
Maxilliped (fig. 32): endite small and narrow; palp segments 3 and 4 rather elongate.

First gnathopod (fig. 34) with very elongate and narrow carpus; palmar angle with 1 spine; three spiniform processes near palmar angle; dactylus with 4 teeth on inner margin.

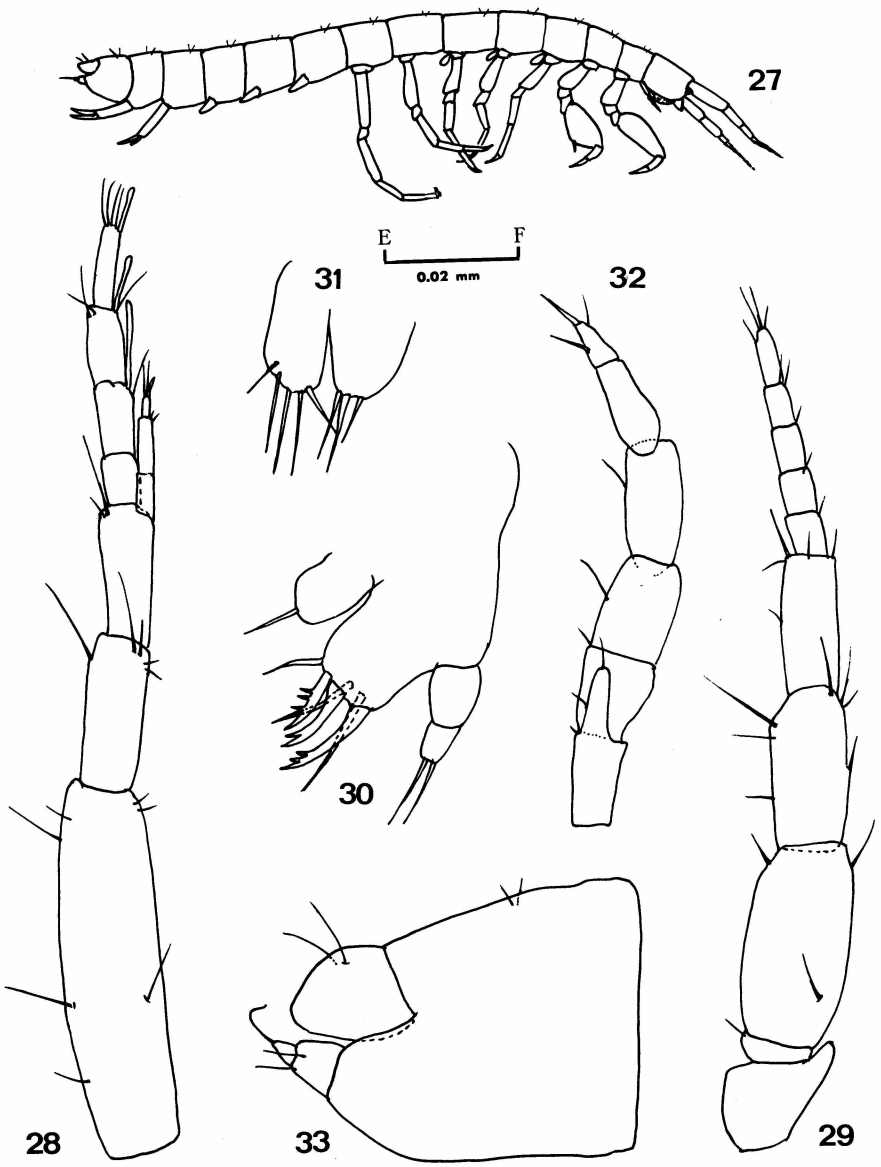
Second gnathopod (fig. 35): carpus more or less triangular; palmar angle with 1 strong spine and 1 spiniform process; palmar margin with 1 short, proximal spine and the usual 7 processes (fig. 36): process no. 1 inconpicuous, rounded, and separated by a large distance from process 2; processes 2 and 7 slightly larger than 3 to 6; dactylus with 4 teeth on inner margin.

Coxal gills small, slightly pedunculate (fig. 37). Oostegites short, narrow, armed with 2 spinules and 1 seta (fig. 37).

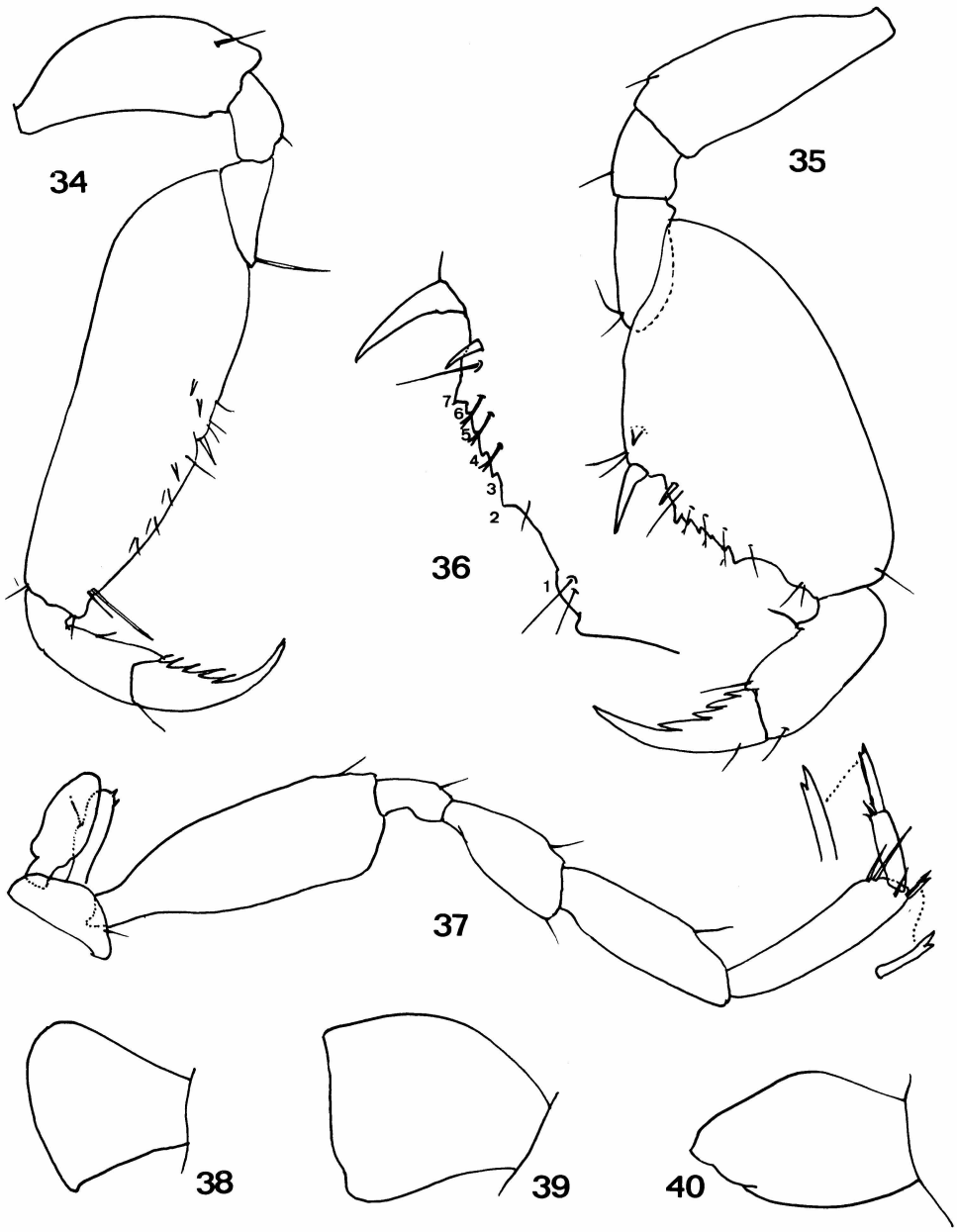
Third pereiopod (fig. 37) similar to the fourth. Fifth pereiopod (fig. 41) with swollen basis, merus and carpus elongate. Dactylus and ungulus short and heavy; ungulus bicuspidate. Sixth pereiopod (fig. 42) similar to the fifth, but slightly longer. Seventh pereiopod (fig. 43) much longer than the sixth. Basis not swollen; basis and merus very slender; carpus with 4 distal setae and 1 transformed (spoon-shaped, denticulated) element. Claw rather short; ungulus bicuspidate.



Figs. 22-26. *Bogidiella* (*Antillogidiella*) *bermudensis* n. sp. 22, fifth pereiopod, ♀ (scale AB); 23, second pleopod, ♂ (AC); 24, second pleopod, ♀ (AC); 25, second uropod, ♀ (AC); 26, third uropod, ♀ (AB). Scales AB and AC each represent 100 μm; scales above fig. 19.



Figs. 27-33. *Ingolfiella longipes* n. sp., ♀ holotype. 27, entire animal, from the left (actual size 1.6 mm); 28, first antenna (scale AC); 29, second antenna (AC); 30, first maxilla (EF); 31, second maxilla (EF); 32, maxilliped (AD); 33, third urosomite, third uropod, and telson, from the left (AC). Scales AC and AD (each 100 μm) above fig. 19. Scale EF (20 μm) below fig. 27.

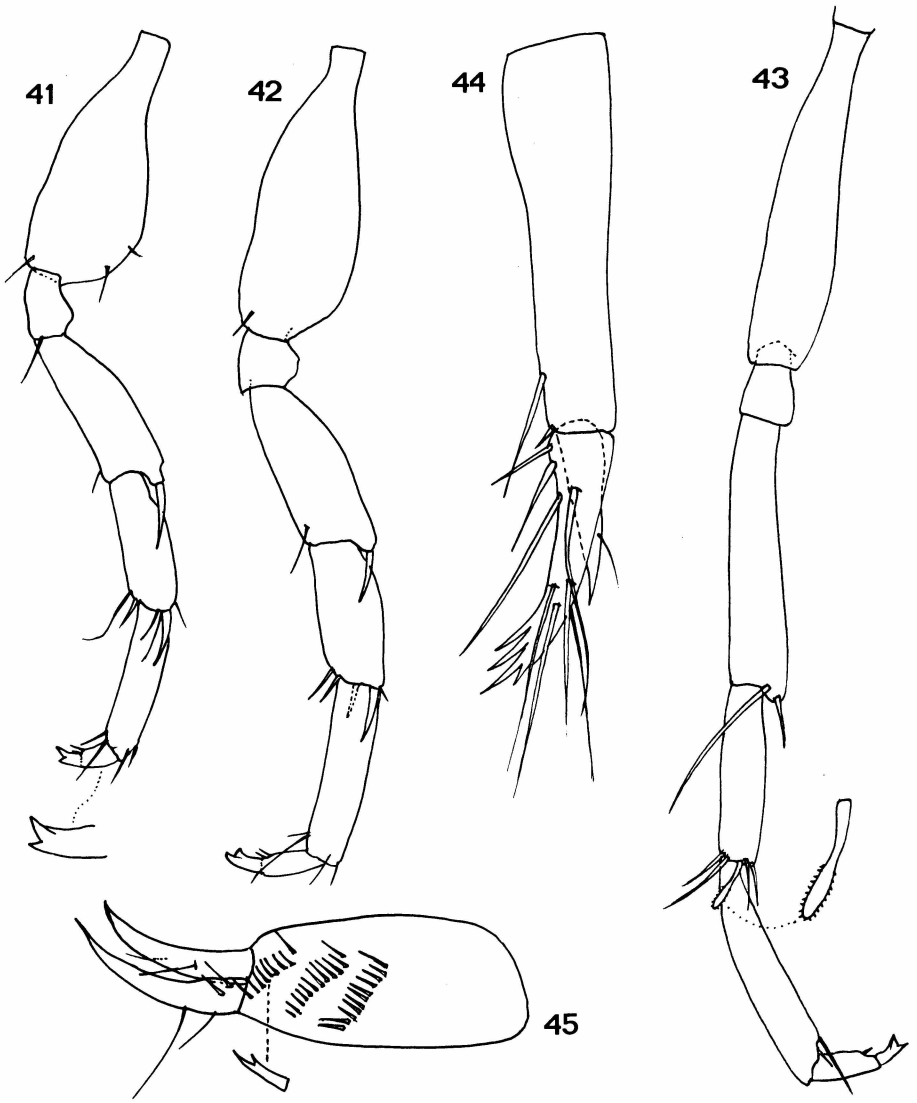


Figs. 34-40. *Ingolfiella longipes* n. sp., ♀ holotype. 34, first gnathopod (scale AC); 35, second gnathopod (AC); 36, palmar margin of second gnathopod (AD), the palmar teeth 1 to 7 are indicated; 37, third pereiopod (AC); 38, first pleopod (AD); 39, second pleopod (AD); 40, third pleopod (AD). Scales AC and AD (each 100 μm) above fig. 19.

Pleopods 1 and 2 (figs. 38, 39) roughly triangular, unarmed. Pleopod 3 (fig. 40) ovate, unarmed.

Uropod 1 (fig. 44) with narrow and slender pedunculus; exopodite over half as long as endopodite; exopodite armed with 2 setae, endopodite with several long setae and 3 long and slender distal teeth. Uropod 2 (fig. 45): pedunculus with 3 rows of 9-11 bifid spinules; rami subequal, each ramus with 2 setae. Uropod 3 (fig. 46) without pecularities.

Telson (fig. 46) rounded, fleshy, with 2 dorsal setules.



Figs. 41-45. *Ingolfiella longipes* n. sp., ♀ holotype. 41, fifth pereiopod (scale AC); 42, sixth pereiopod (AC); 43, seventh pereiopod (AC); 44, first uropod (AD); 45, second uropod (AC). Scales AC and AD (each 100 μm) above fig. 19.

Discussion. — In absence of the male, this species cannot be attributed with certainty to any particular subgenus of *Ingolfiella*, since the subgenera are mainly characterized by male features. It certainly does not belong to the subgenus *Ingolfiella* s. str. (diagnosed by the shape of the distal segments of gnathopod 2 in both sexes), nor to the subgenus *Balcanella* (diagnosed by symmetrical, spoon-shaped female pleopods). The remaining subgenera (*Hansenliella*, *Gevgeliella*, and *Trianguliella*) remain a possible seat for the new species.

Only 5 species in these three subgenera agree with the new species in having 4 teeth on the inner margin of the dactylus of gnathopods 1 and 2, viz. *I.* (*H.*) *britannica* Spooner, 1960, *I.* (*H.*) *ruffoi* Siewing, 1960, *I.* (*H.*) *kapuri* Coineau & Rao, 1972, *I.* (*H.*) *quadridentata* Stock, 1979, and *I.* (*T.*) *macedonica* S. Karaman, 1959. Of these, the species of *Hansenliella* are marine, that of *Trianguliella* is limnic.

From *I. britannica* (English Channel), the new species differs in the exopodite of uropod 1 (more than half as long as endopodite), in the short claws of P5 to P7, in the longer carpus of P5, and in the shorter terminal seta of uropod 3.

From *I. ruffoi* (Peru) it differs likewise in a longer exopodite of uropod 1, and in the presence of 3 articles (instead of 2) in the accessory flagellum of the first antenna.

From *I. kapuri* (Indian Ocean) it differs in the bicuspidate tip of the ungulus of P3 and P4 (tricuspidate in *I. kapuri*), and in the longer carpus of P7; the entire claw of P3 and P4 is also much shorter in the new species.

From *I. quadridentata*, the only West Indian species of the group of five (Curaçao), it differs in the bicuspidate ungulus of P3 and P4 (multidenticulate in *I. quadridentata*), in the longer exopodite of uropod 1, and in much more slender pereiopods 5 and 7.

The freshwater species, *I. macedonica* (Yugoslavia), has a more bulging carpus of P2, the carpus of P1 is less elongate, the ungulus of P5 is simple, and the pedunculus of uropod 2 bears 4 transverse rows of setae.

We are inclined to look for the closest relatives of the Bermudian form in the marine subgenus *Hansenliella*.

Etymology. — The specific name, *longipes*, alludes to the very elongate seventh pereiopod.

RÉSUMÉ

Description de deux rares Amphipodes des eaux souterraines anchihalines de la région de Walsingham, Bermudes: *Bogidiella* (*Antillogidiella*) *bermudensis* n. sp., et *Ingolfiella longipes* n. sp.

REFERENCES

Sket, B., 1979. Speleological investigations in Bermuda. Bermuda biol. Stat. Newsletter, **7** (2/3): 3.

SKET, B. & T. M. ILIFFE, 1980. Cave fauna of Bermuda. Int. Rev. ges. Hydrobiol., **65** (6): 871-882.

STOCK, J. H., 1977. The zoogeography of the crustacean suborder Ingolfiellidea with description of new West Indian taxa. Stud. Fauna Curaçao, **55** (178): 131-146.

——, 1979. New data on taxonomy and zoogeography of ingolfiellid Crustacea. Bijdr. Dierk., **49** (1): 81-96.

——, 1981. The taxonomy and zoogeography of the family Bogidiellidae (Crustacea, Amphipoda), with emphasis on the West Indian taxa. Bijdr. Dierk., **51** (2): 345-374.

Received for publication 17 June 1985.