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A NEW MEMBER OF THE FAMILY BOGIDIELLIDAE (CRUSTACEA, AMPHIPODA) FROM POIKILOHALINE WATERS OF MADEIRA

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With 19 figures

SUMMARY: *Bogidiella* (*Bogidiella*) *madeirae* n. sp. (Amphipoda, Bogidiellidae) is described from two localities in the intertidal zone of Madeira. The animals live under poikilohaline conditions where upwelling water causes lowered salinities at low tide, but which are covered by sea-water at high tide. The phenetically ecologically, and geographically closest relative appears to be *B.* (*B.*) *helenae* MATEUS & DE LOURDES MACIEL, 1967, from the mouth of the river Douro (Portugal).

SUMÁRIO: O autor descreve uma nova espécie *Bogidiella* (*B.*) *madeirae* n. sp. (Amphipoda, Bogidiellidae, encontrado em dois locais situados na zona intertidal, na Ilha da Madeira. *B. (B.) helenae* MATEUS & DE LOURDES MACIEL, 1967, descrita para a foz do Rio Douro (Portugal), parece ser a espécie mais próxima da aqui descrita pela primeira vez.

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INTRODUCTION

During two visits to Madeira, in 1991 and 1992, a number of stygofaunal samples were taken in loose sediments (sand and gravel) of the intertidal zone, with the aid of a Bou-Rouch biophreatical pump (see BOU, 1975). In two localities with poikilohaline conditions (waters of low salinity welling up at low tide in the littoral zone) a new species of the amphipod family Bogidiellidae was found, which is described in the present paper. No members of this family were previously reported from Madeira, or for that matter from the Azores, but several species are known from some other Macaronesian islands, in the Canary and Cape Verde archipelagoes.

Genus *Bogidiella* Hertzog, 1933
Subgenus *Bogidiella* s. str.
Bogidiella (B.) madeirae n. sp.

Material. - 1 female (holotype), 1 male (allotype), 54 paratypes (mostly females). Madeira Stn. 92-22: Machico, at low tide on the beach below the discharge of the Fonte de São Roque (a freshwater spring at high tide level); UTM coordinates $CB^{3}3495 \times {}^{36}2070$; in coarse sand and boulders, 70 cm below the substrate surface; 25 Apr. 1992; salinity at low tide 19 p. p. t. , at high tide immersed by sea-water. Accompanying stygofauna: Amphipoda (*Pseudoniphargus* n. sp., *Chaetogammarus* sp.) The type specimens are preserved in the Zoölogisch Museum Amsterdam, cat. nr. ZMA Amph. 200.227, but for 10 paratypes in the Museu Municipal do Funchal, cat. nr. MMF25324.

24 specimens (paratypes) Madeira Stns. 91-546, 92-16 and 92-17: Lugar de Baixo (= E. of Ponta do Sol), near banana packing factory; UTM coordinates $CB^{3}0457 \times {}^{36}1725$; a bar of sand, gravel and boulders closes off a brackish lagoon from the sea; the lagoon water percolates through the bar and emerges in a resurgence in a small pool at the seaward slope of the bar; the salinity fluctuates between 17 and 33 p. p. t., depending on the tides; the samples were taken between 40 and 70 cm below the substrate surface; 17 Oct. 1991 and 24 Apr. 1992. Accompanying stygofauna: Microparasellidae (Isopoda), *Ingolfiella* n. sp. (Amphipoda), Oligochaeta, *Caecum* (Gastropoda). ZMA Amph. 200.228.

Description.- Blind, colourless. Body length of females 1.7-2.3 mm, of males 1.7 mm. head lobes (Fig.1) rounded.

Female: Antenna 1 (Fig.1) with elongate peduncle segments. Flagellum 7-segmented; long aesthetascs on segments 2 to 7. Accessory flagellum 2-segmented, overreaching flagellum segment 1.

Antenna 2 (Fig.2) shorter than antenna 1. Peduncle segments 4 and 5 with some long setae. Flagellum 5-segmented; short aesthetasc on terminal segment.

Mandible (Fig.3) with 3-segmented palp, segment 1 unarmed, segment 2 with 2 ventral setae, segment 3 shorter than 2, with 5 (sub) terminal setae. Pars incisiva 3-dentate. pars molaris reduced in size, with molar seta. Left and right mandible identical, but for lacinia mobilis, which is 6-dentate left (Fig.3), multidentate right (Fig.4).

Maxilla 1 (Fig.5) with 2-segmented palp, distal segment with 4 setae. Outer lobe with 1 seta and 7 distal spines, 3 of which pluridentate, 3 unidentate, and 1 smooth. Inner lobe rounded, with 3 distal setae.

Maxilla 2 and maxilliped as in *B.* (*B.*) *helenae*.

Gnathopod 1 as shown in Fig.8; posterior margin of basis usually with 3 (rarely 4 or 5) long setae. Propodus ovate, with 3 long palmar angle spines. Palmar index 0.45.

Gnathopod 2 as shown in Fig.9; posterior margin of basis with 5 long setae. Propodus squarish. Palmar angle with 1 short and 1 long spine. Palmar index 0.30.

Pereiopod 3 (Fig. 14): Posterior margin of basis with 3 short setules-anterior margin with 3 setules; medial surface with 3 setules. Pereiopod 4 as pereiopod 3, but devoid of setules on medial surface of basis.

Pereiopod 5 (Fig. 15): Setules on posterior and anterior margins of basis not very long (shorter than in *B.* (*B.*) *helenae*). Pereiopod 6 (Fig. 16) longer than pereiopod 5; setules on basis not very long. Pereiopod 7 (Fig. 10) longer than pereiopod 6; posterior margin of basis with short spinules instead of setules; seta on ischium short; propodus with 5 long setae on anterior margin; claw slender.

Oostegites (Fig. 9) linear, with several long setae; present on gnathopod 2 and pereiopods 3 through 5. Coxal gills (Figs. 9 & 15) ovate, on gnathopod 2 and pereiopods 3 through 6. No lentiform organs on the legs.

Epimeral plates (Fig. 6) with rounded posteroventral corners; ventral margin smooth, posterior margin with 1 setule. Pleopods 1 and 2 (Figs. 17 & 18) similar in size and armature; peduncle smooth with 1 retinaculum on one side, and 2 retinacula on contralateral side; exopodites 3-segmented, each segment with 2 plumose setae (that on laterodistal corner of segment 1 shorter than the others); endopodites absent. Pleopod 3 (Fig.19) shorter than pleopods 1 or 2, but armature similar.

Uropod 1 (Fig. 11) with ventroproximal peduncular spine; exopodite slightly shorter than endopodite; dorsal margin of both rami smooth, distal margin with 4 spines. Uropod 2 (Fig. 12) shorter than uropod 1; dorsal margin of rami smooth, distal margin with 4 spines. Uropod 3 (Fig. 13) relatively short in comparison with other species; each ramus with 1 or 2 (groups of) central spines, and distal group of long to very long spines.

Telson (Fig. 7) about as long as wide, subquadrangular; no lateral armature, but for 2 minute sensorial setules; distal corners each with 2 spines of unequal length; distal margin with distinct, rather narrow, concavity.

Male: males are morphologically very similar to females (no sexual dimorphism in pleopods or uropods), but can be distinguished by the absence of oostegites and the presence

of penial papillae.

Remarks.- *Bogidiella madeirae* belongs to a group of species devoid of sexual dimorphism in legs, pleopods and uropods. Such species are classified with the subgenus *Bogidiella* s. str. (STOCK, 1981). To the subgenus belong, or probably belong, 38 species distributed over large parts of the temperate and tropical zones of the globe, mainly in fresh waters.

The present material is characterized by a combination of features shared by 5 other species only. These features are: telson with distinct distal emargination, pleopods devoid of endopodites, and absence of lentiform organs in the basis of the legs. The Madeiran taxon shares these features with *B.* (*B*) *broodbakkeri* STOCK, 1992 (from almost fresh waters of the Ryukyu islands, Japan), *helenae* MATEUS & de LOURDES MACIEL, 1967 (from mixohaline waters in the mouth of the river Douro, Portugal), *glacialis* S. L. KARAMAN, 1959 (from a freshwater spring at an altitude of 1900 m S. of Skoplje, Macedonia), *hispanica* STOCK & NOOTENBOOM, 1988 (from fresh waters in the provinces of Cuenca and Málaga, Spain), and *neotropica* RUFFO, 1952 (from fresh waters of Brazil, Venezuela and Tobago in the Antilles).

B. (*B.*) *broodbakkeri* and *B.* (*B.*) *hispanica* can be distinguished from *madeirae* by their much more slender pereiopods 5 to 7, the subequal segments 2 and 3 of the mandible palp, and a more reduced armature of the inner lobe of maxilla 1. *B.* (*B.*) *glacialis* is characterized by the sinuous (not evenly convex) posterior margin of the basis of pereiopods 4 to 7, and by a distal telson armature of I+I spines, instead of II+II. *B* (*B.*) *neotropica* lacks long setae on the basis of gnathopods 1 and 2, and possesses only 2 setae on the inner lobe of maxilla 1.

Perhaps the closest similarity exists between *B* (*B.*) *madeirae* and *B* (*B.*) *helenae*, the latter ably described by MATEUS & DE LOURDES MACIEL (1967). Moreover these two are the only species of the group not occurring in fresh waters, but in poikilohaline habitats. Morphological differences reside in (1) the mandible (pars incisiva 6-dentate in *helenae*, 3-dentate in *madeirae*; palp segments 2 and 3 subequal in *helenae*, 2>3 in *madeirae*; right lacinia mobilis 4-dentate in *helenae*, multidentate in *madeirae*); (2) the lower number of setae on the posterior margin of the basis in gnathopod 2 of *helenae*; (3) the inner lobe of maxilla 1, with 2 setae in *helenae*, 3 in *madeirae*; (4) the posterior margin of the basis of pereiopod 7, which bears long setae in *helenae*, short spines in *madeirae*; (5) the distal telson emargination which is wide and shallow in *helenae*, narrower and deeper in *madeirae*; (6) the distal telson armature consisting of I+I spines in *helenae*, II+II in *madeirae*.

The apparent affinity between *B.* (*B.*) *helenae* and *madeirae* is not surprising, because they are both geographically and ecologically the nearest representatives of the group of species to which they belong. In absence of good dispersal facilities of the members of *Bogidiella* (e.g. , no pelagic larval stages), it seems logical to assume that habitation of

Madeira started when the primordials of the island arose above sea level, or at least when they formed very shallow marine banks, located in an Atlantic Ocean still very much narrower than at present times, the distance between Portugal and Madeira being much shorter. A similar explanation explains the occurrence of members of the amphipod genus of *Pseudoniphargus* on Madeira, phenetically closely related to the Lusitanian species of the genus.

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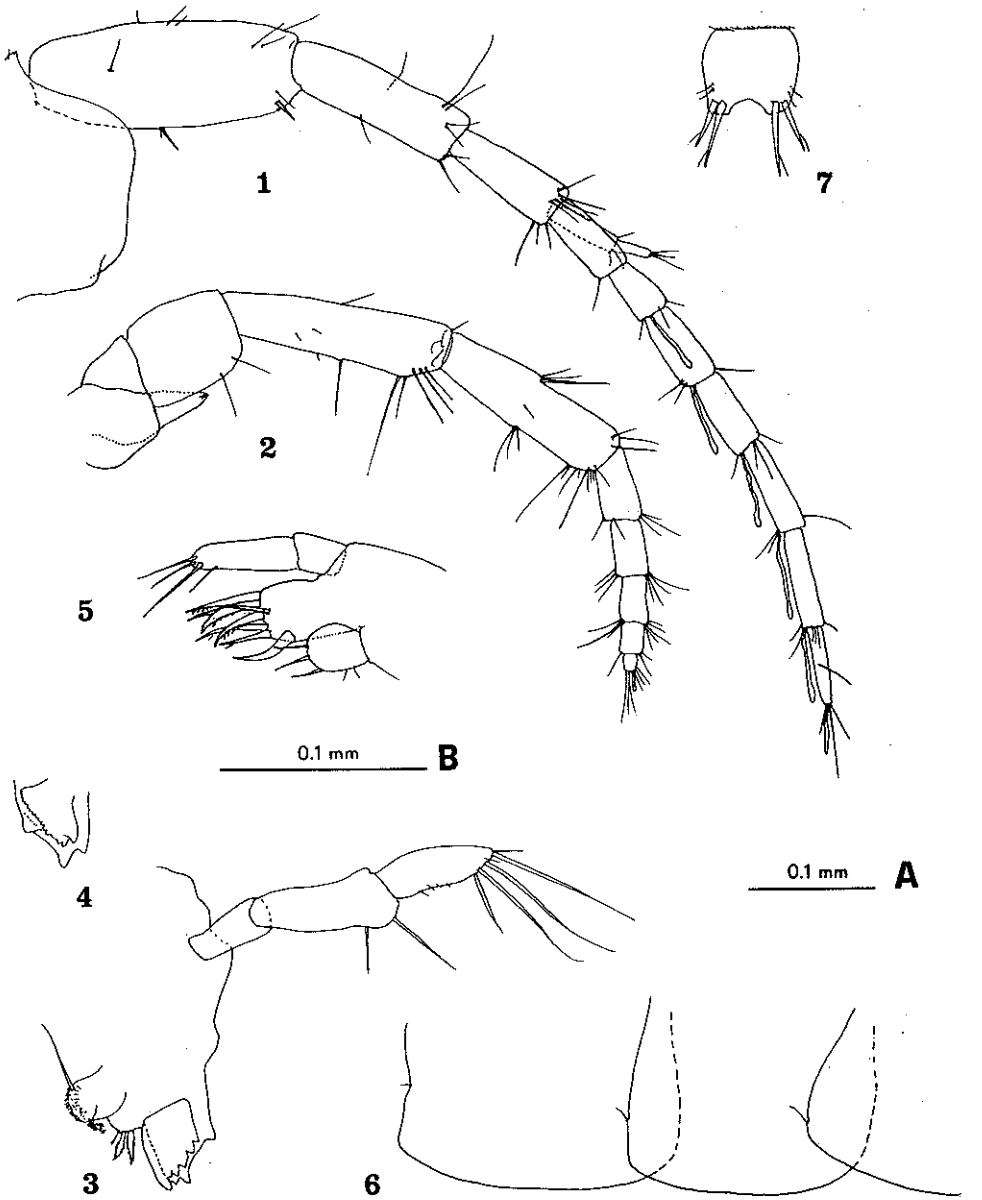
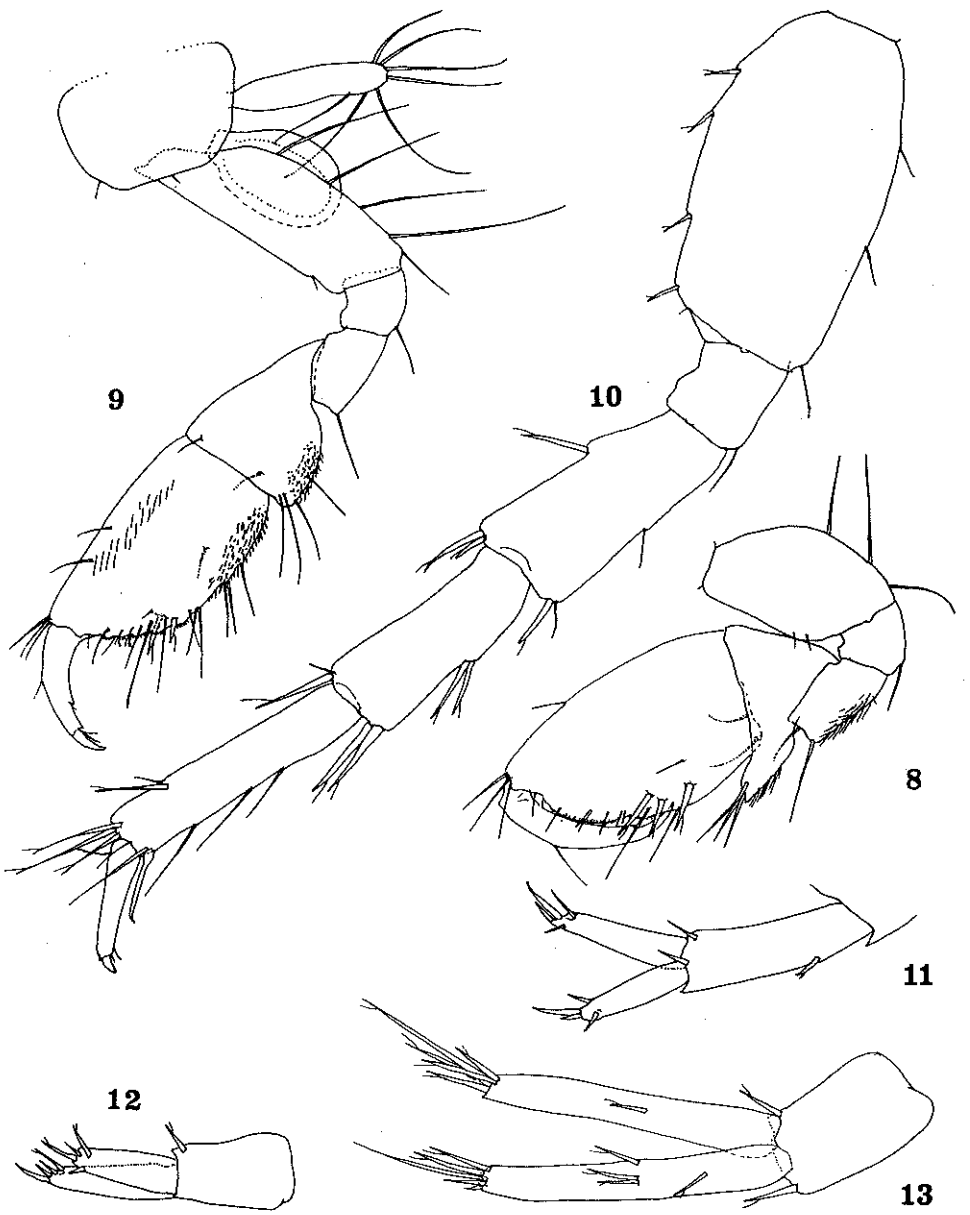
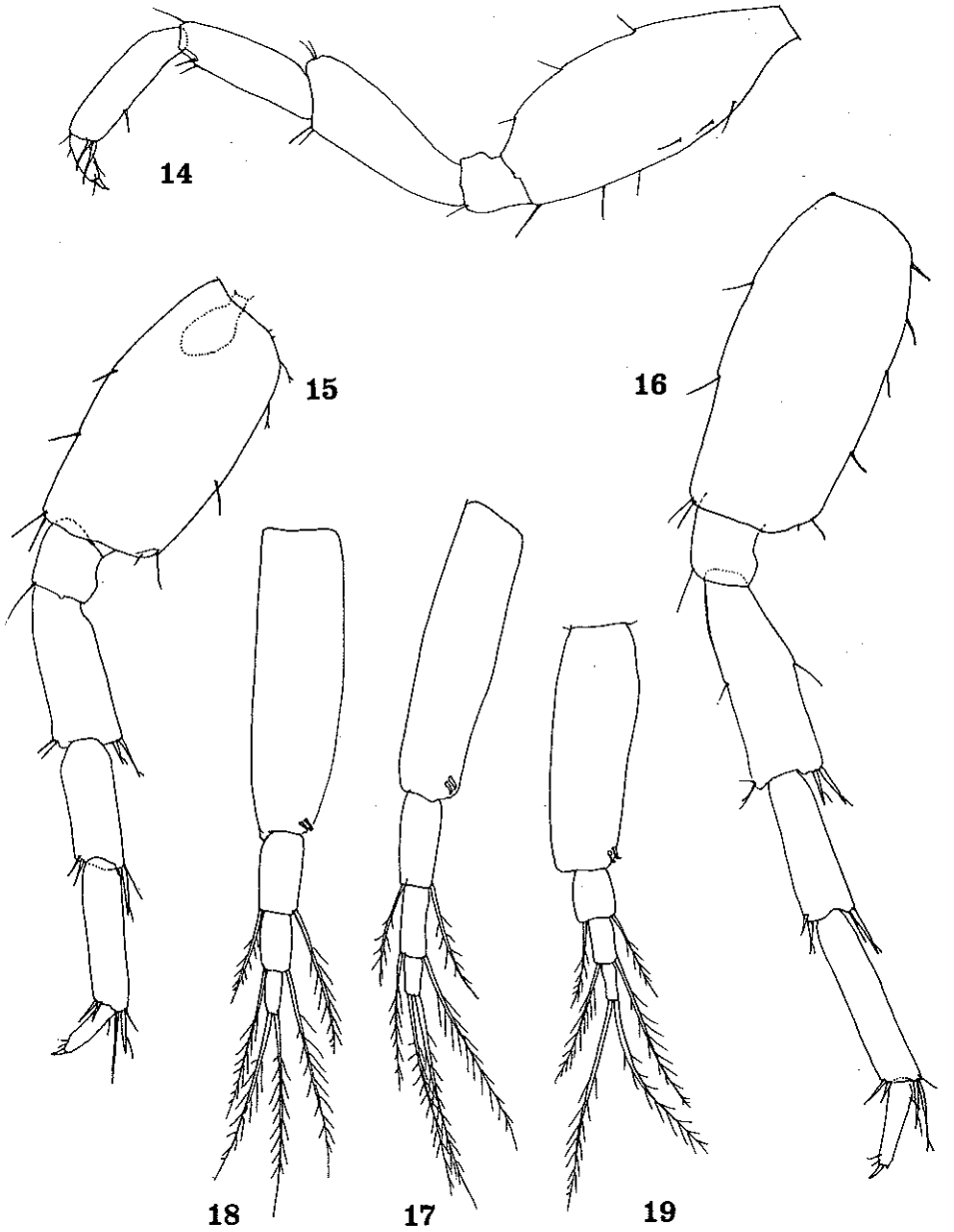


Figs. 1-7. *Bogidiella* (*B.*) *madeirae* n. sp., female: 1- lateral head lobe and antenna 1 (scale A); 2 - antenna 2 (A); 3 - left mandible (B); 4 - pars incisiva and lacinia mobilis of right mandible (B); 5 - maxilla 1 (B); 6 - epimeral plates 1 to 3 (A); 7 - telson (A).



Figs. 8-13. *Bogidiella* (*B.*) *madeirae* n. sp. female: 8 - gnathopod 1; 9 - gnathopod 2; 10 - pereiopod 7; 11 - uropod 1; 12 - uropod 2; 13 - uropod 3. All to scale A (scale above fig. 6).



Figs. 14-19. *Bogidiella* (*B.*) *madeirae* n. sp. female: 14 - pereiopod 3; 15 - pereiopod 5; 16 - pereiopod 6; 17 - pereiopod 1; 18 - pleopod 2; 19 - pleopod 3. All to scale A (scale above fig. 6).