BULLETIN

ZOÖLOGISCH MUSEUM

UNIVERSITEIT VAN AMSTERDAM

Vol. 11 No. 12 1988

STYGOFAUNA OF THE CANARY ISLANDS, 8
AMPHIPODA (CRUSTACEA) FROM INLAND GROUNDWATERS OF FUERTEVENTURA

Jan H **STOCK**

SUMMARY

New material of *Bogidiella* from Fuenteventura (Canary Islands) provided evidence that the specimens of the genus previously recorded from inland groundwaters belong to a species new to science: *B. (Stygogidiella) purpuriae*, closely related to the thalassostygobiont, *B. (S.) uniramosa* from Lanzarote.

New records of *Pygocrangonyx repens* are provided as well.

INTRODUCTION

In two previous papers (Stock & Rondé-Broekhuizen, 1986, 1987), one species of the amphipod genus *Pygocrangonyx* and three of the genus *Bogidiella* were described from the eastern Canary Islands. For *Pygocrangonyx*, a number of new records will be presented, confirming the idea that this genus is mainly limited to the oldest part of Fuenteventura. Within the genus *Bogidiella, B. (Stygogidiella) uniramosa*, is a thalassostygobiont from Lanzarote. A second species, *B. (Xystriogidiella) spathulata*, was recorded from a salty, anchihaline well in Fuerteventura. A third species of Bogidiella from inland groudnwaters of the same island was left undescribed, since in absence of males its subgeneric status could not be determined. New collections made in Fuerteventura in the spring of 1987, have yielded some males of the latter *Bogidiella* taxon. It is clear that this inland stygobiont belongs to the subgenus *Stygogidiella* and is closely related to the thassostygobiont from Lanzarote. It is described as a new species in the following section.

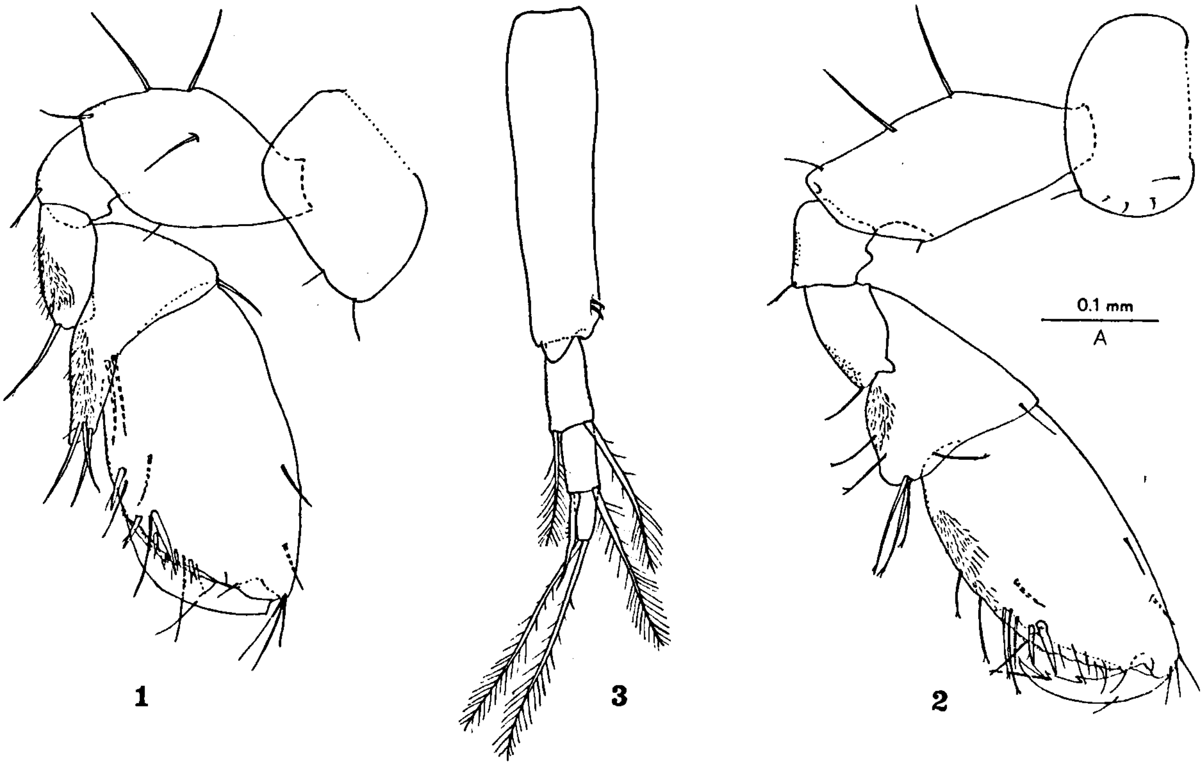
All specimens recorded in this paper have been deposited in the collections of the Zoölogisch Museum Amsterdam (ZMA).

Bogidiella (Stygogidiella) purpuriae n.sp.
Figs. 1-12

Bogidiella sp., Stock & Rondé-Broekhuizen, 1987: 455, figs. 15-18.

Material

In addition to the material listed as *Bogidiella* sp . by



Figs. 1-3. *Bogidiella (Stygogidiella) purpuriae* n.sp.: 1. gnathopod, ♀; 2, gnathopod 2, ♀; 3, pleopod 2, ♂ (all scale A).

Stock & Rondé-Broekhuizen, 1987, the following samples from Fuerteventura (fig. 17) have been examined:

Stn. 87-77. ♂ (holotype), 1 ♀ (allotype), 10 paratypes. Las Playas (E. of Gran Tarajal), covered well; UTM coordinates ES 59990 x 312315; water level at -8.5 m; water depth 0.2 m; 24.8°C; conducctivity 10.81 mS/cm (S = c. 6.8 ppt); altitude c. 20 m; 6 May 1987 (ZMA Amph. 108.293).

Stn. 87-69. 4 ♀, 1 ♂. Barranco de Betancuria, near Km. 34.5, open well with windpump; UTM coordinates ES 591955 x 314200; water level at -6 m, water depth 0.4 m; 22.7°C; conductivity 5.11 mS/cm (S = c. 3.1 ppt); altitude c. 200 m; 5 May 1987.

Stn. 87-78. 1 ♀, NW of Las Playas; open well; UTM coordinates ES 59925 x 312345; water level at -14 m; water depth 1 m; 24.1°C; conductivity 3.37 mS/cm (S = c. 2.0 ppt); altitude c. 30 m; 6 May 1987.

Stn. 87-102. 1 ♀. Head of barranco (= bed of temporary torrent) W of Tiscamanita; covered well; UTM coordinates ES 59265 x 313720; water level at -18 m; water depth 0.25 m; 22.8°C; conductivity 2.72 mS/cm (S = c. 1.6 ppt); altitude c. 300 m; 7 May 1987.

DESCRIPTION

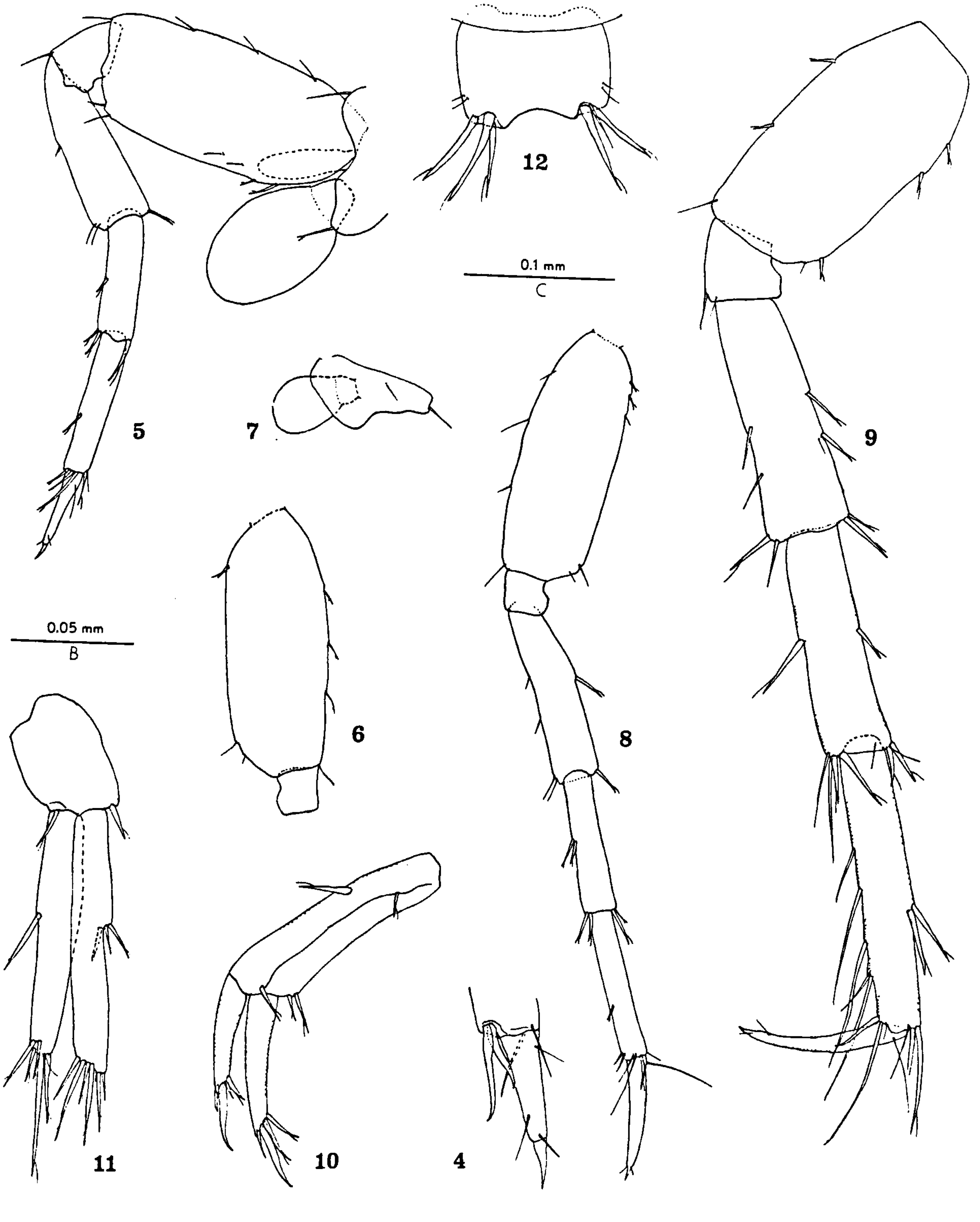
Females of this species have been described (as *Bogidiella* sp.) by Stock & Rondé-Broekhuizen, 1987, figs. 15-19. Here reference is made to these figures as "S & RB". For more morphological details, see also S & RB.

Body length up to 2.1 mm (♂) or 2.9 mm (♀). Females with setose oostegites measure 2.2 mm or more.

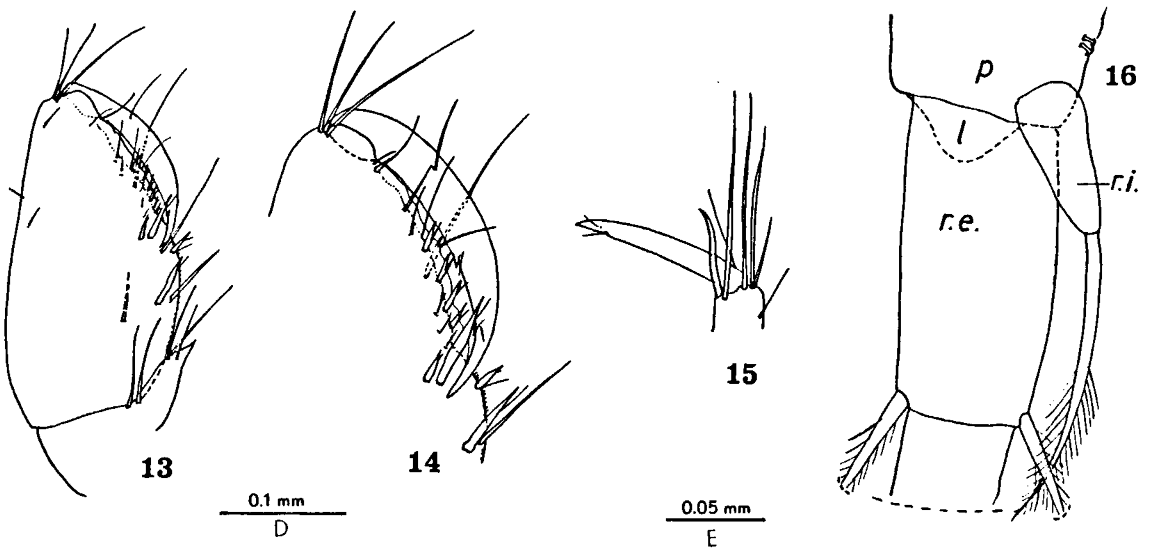
First antenna (S & RB, figs. 15a, 18a): flagellum of up to 15 segments; aesthetascs as long as corresponding flagellum segments; accessory flagellum 2- or 3- segmented (depending on age?), in largest specimens just overreaching tip of flagellum segment 2.

Second antenna (S & RB, fig. 18b) with 5-segmented flagellum.

Mouthparts: see S & RB, fig. 15b-g.



Figs. 4-12. *Bogidiella (Stygogidiella) purpuriae* n.sp. : 4, distal part of pereiopod 3, ♀ (scale B); 4, pereiopod 5, ♀ (A); 6, basis and ischium of pereiopod 5, ♂ (A); 7, coxal plate and gill of pereiopod 6, ♂ (A); 8, pereiopod 6, (A); 9, pereiopod 7, ♂ (A); 10, uropod 1, ♀ (A); 11, uropod 3, ♂ (A) 12, telson, ♀ (C).



Figs. 13-15. *Bogidiella (Stygogidiella) uniramosa* Stock & Rondé-Broekhuizen, 1987; fig. 16, *Bogidiella (Stygogidiella) virginalis* Stock, 1981: 13, distal part of gnathopod 1, ♀ (scale D); 14, palma of gnathopod 1, ♀ (E); 15, distal part of pereiopod 7, ♂ (D); 16, distal part of peduncle (*p*), proximal part of exopodite (*r.e.*), and endopodite (*r.i.*) of pleopod 1, ♀. The latero-distal peduncular lobe (*l*) is also shown.

Gnathopod 1 (S & RB, figs. 15h, 18f; this paper fig. 1) posterior margin of carpus with 3 (rarely 1 or 2) setae; free posterior margin of propodus with 1 spine; palmar angle with 2 spines; palmar index 0.34-0.35.

Gnathopod 2 (S & RB, fig. 16a; this paper fig. 2): posterior margin of carpus with few setae (1 or 2); 2 palmar angle spines; palmar index 0.34-0.37.

Pereiopods 3 and 4 (S & RB, fig. 16b): posterior margin of basis with 2-4 setules.

Pereiopod 5 (figs. 5, 6): posterior margin of basis with 1 or 2 proximal spinules and 2 distal setules, separated by a wide bald gap; longest distal propodal seta much shorter than claw.

Pereiopods 6 and 7 (figs. 7-9): posterior margin of basis bald between proximal group of 1-3 spinules and distal group of 1-2 spinules or setules; anterior margin of basis with 2-3 setules; longest distal propodal seta of P6 shorter than claw.

Second male pleopod (fig. 3): exopodite 3-segmented; segments 1 and 3 with 2 long, plumose setae; segment 2 with 1 long plumose seta on medial margin, and 1 slightly sinuous spine on lateral margin; endopodite absent.

Uropod 1 (fig. 10) with strong proximoventral peduncular spine; rami not sexually dimorphic; exopodite slightly shorter than endopodite; 4 distal endopodite spines, longest about one-third longer than next longest.

Uropod 2 (S & RB, figs. 16f, 19f) without sexual dimorphism.

Uropod 3 (fig. 11): lateral margin of exopodite and medial margin of endopodite with 1 group of spines only.

Telson (fig. 12) wider than long; distal emargination wide, shallow, rounded; each distal lobe with 2 or 3 long spines (one spine sometimes replaced by setiform element), and 2 subdistal sensorial setules; no lateral armature.

Affinities

The new species is closely related to the thalassostygobiont member of the subgenus *Stygogidiella* known from Lanzarote: *B. (S.) uniramosa* Stock & Rondé-Broekhuizen, 1987, in having uniramous pleopods. For purposes of comparison, some new figures of *B. (S.) uniramosa* have been incorporated in the present paper (figs. 13-15). *B. purpuriae* differs from *B. uniramosa* as follows:

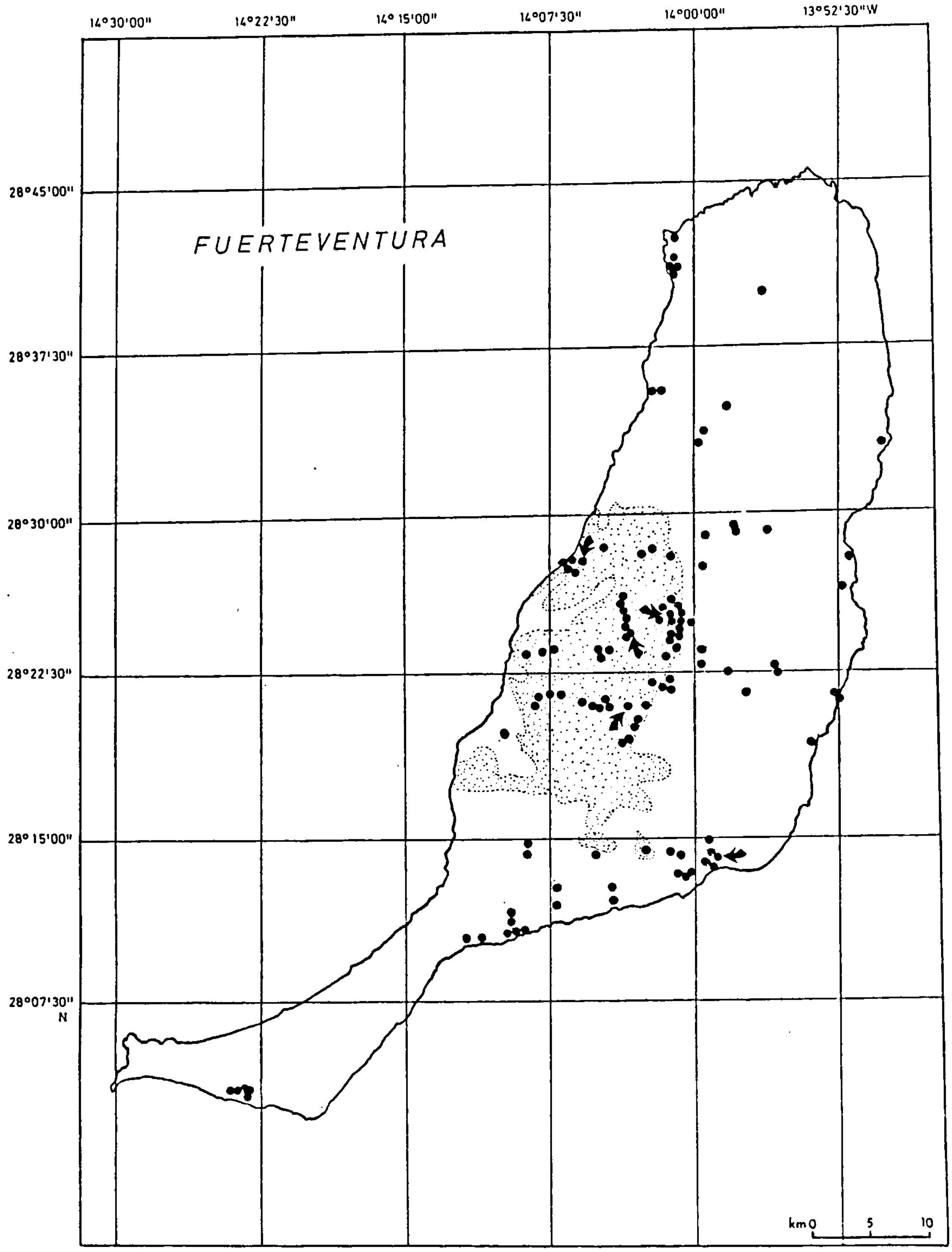


Fig. 17. Distribution of all stygofauna samples taken in Fuerteventura in 1985-1987 (dots) and localities in which *Bogidiella (Stygogidiella) purpuriae* was found (arrows). The extension of the basal complex zone (after Carracedo, 1980) is finely dotted.

(1) posterior margin of basis of Gn. 1 and 2 with fewer setae; (2) palmar index of Gn. 1 lower (0.45-0.46 in *uniramosa*); (3) only 2 palmar angle spines in Gn. 1 and 2 (3 in *uniramosa*); (4) posterior margin of basis of P5-P7 with unarmed central stretch (with 1 or more spinules in *uniramosa*); (5) longest distal propodal seta of P5 and P6 much shorter than claw (at least as long as claw in *uniramosa*); (6) the sigmoid disto-anterior spine on the propodus of P7 less than half as long as the claw (more than half as long in *uniramosa*); (7) longest distal endopodite spines of uropod 1 about one-third longer than next longest (more than twice as long in *uniramosa*); (8) margins of rami of uropod 3 with 1 group of spines only (at least 2 groups in *uniramosa*); (9) telson devoid of lateral spines (present in *uniramosa*).

The strong morphological resemblance of the limnostygobiont *B. purpuriae* n.sp. to the thalassostygobiont *B. uniramosa* makes it likely that the former evolved from the latter when Fuerteventura was built up from below sea-level to a subaerial island (actual altitude slightly over 800 m). Apart from active volcanic upbuilding activity, the island has also undergone tectonic uplift, as inferred from the presence of pillow lavas and sandstones with marine fossils, which have been found up to 175-200 feet (some 65 m) above the present sea-level (Krejci-Graf, 1961). Some of these marine deposits of Fuerteventura are of Cretaceous age (Stillman et al., 1975; Schmincke, 1976), but the major vertical movements in Fuerteventura age possibly from the early Tertiary (Schmincke, 1979).

The evolutionary origin of *B. uniramosa* is thought to be correlated with the opening of the Atlantic Ocean in the late Mesozoic (Stock & Rondé-Broekhuizen, 1987). According to the Regression Model (Stock, 1980), subsequent positive vertical movements of Fuerteventura can have caused the "stranding" of littoral populations of *uniramosa* -like ancestors, leading to the evolution of an inland stygobiont, *B. purpuriae*.

During our sampling programme, no other inland *Bogidiella* was found on any other island of the Canary archipelago. However, several anchihaline forms were observed, e.g. on Tenerife and Hierro.

Etymology
The island of Fuerteventura was named "Purpuria" by Pliny.

Distribution
See remarks under *Pygocrangonyx repens*.

REMARK ON THE PLEOPODAL ENDOPODITE OF *BOGIDIELLA*

Specimens of different species of *Bogidiella* which I have examined, show a swelling at the distal end of the peduncle of the pleopods. This swelling has been repeatedly interpreted as a rudimentary endopodite (e.g. Ruffo & Vigna, 1973, 1977). I feel, however, this interpretation is incorrect, because (1) the swelling is located laterodistally (and not mediodistally as it would be if it were an endopodal rudiment); and (2) taxa having a real endopodite, e.g., *Bogidiella (Stygogidiella) virginalis* Stock, 1981, also have the swelling (see fig. 16), consequently the latter cannot be homologous with the endopodite.

Pygocrangonyx repens Stock & Rondé-Broekhuizen, 1986

P. repens Stock & Rondé-Broekhuizen, 1986: 251-262, figs. 4-12.

Material
Stn. 87-59. 3 specimens. Open well just S of the ruins of the 16th century church of Betancuria; UTM coordinates ES 59250 x 314490; water level at -15 m; water depth 1.5 m; 20.8°C; conductivity 4.09 mS/cm (S = c. 2.4 ppt); altitude c. 400 m; 4 May 1987.

Stn. 87-61. 5 specimens. Open well in Barranco de Betancuria, 0.8 km S of Betancuria (road km 37); UTM coordinates ES 59215 x 314370; water level at -19 m; water depth 0.25 m; 19.9°C; conductivity 5.13 mS/cm (S = c. 3.1 ppt); altitude c. 360 m; 4 May 1987.

Stn. 87-64 (same station as Stn. 85-281 in Stock & Rondé-Broekhuizen, 1986). 7 specimens. Well of Finca 714, W of Llanos de la Concepción; corrected UTM coordinates ES 59483 x 315005; water level at -11 m; water depth 2 m; 20.8°C; conductivity 6.80 mS/cm (S = c. 4.2 ppt); altitude c. 220 m; 5 May 1987.

Stn. 87-65 (same station as Stn. 85-280 in Stock & Rondé-Broekhuizen, 1986). 9 specimens. Open well in Barranco del Cangrejo, with ruined windpump; UTM coordinates ES 58760 x 214910; water level at -5 m; water depth 4 m; 22.3°C; conductivity 9.26 mS/cm (S = c. 5.8 ppt); altitude c . 60 m; 5 May 1987.

Stn. 87-66. 7 specimens. Well (partly covered) near shacks in Barranco del Cangrejo, more seaward than previous station; UTM coordinates ES 58742 x 214805; water level at -4 m; water depth 9 m; 22.7°C; conductivity 10.51 mS/cm (S = c. 6.6 ppt); 5 May 1987.

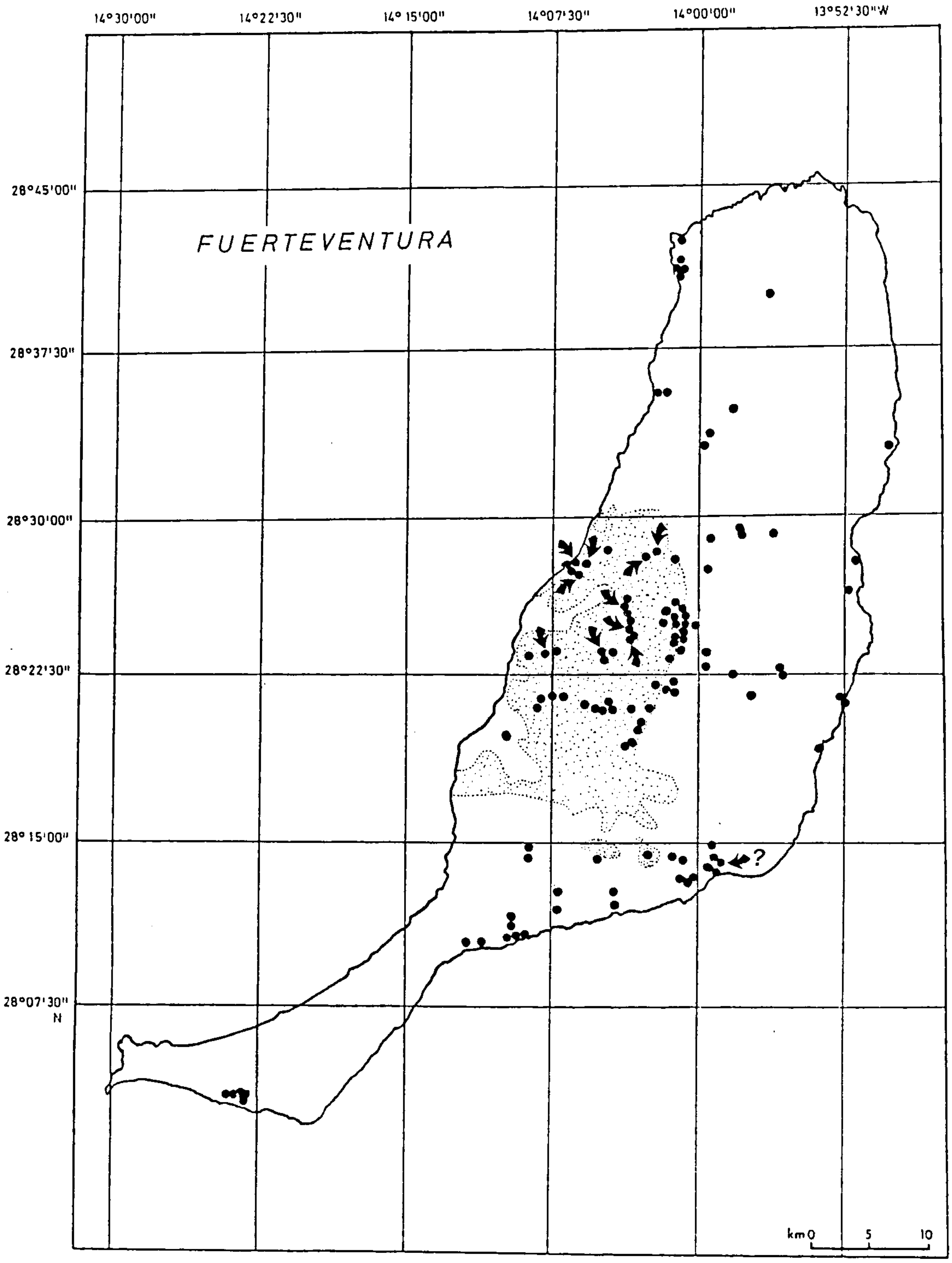


Fig. 18. Distribution of all stygofauna samples taken in Fuerteventura in 1985-1987 (dots) and localities in which *Pygocrangonyx repens* was found (arrows). One locality, marked with a question-mark, yielded a juvenile *?Pygocrangonyx* sp. Basal complex zone indicated as in previous figure.

Stn. 87-67. 1 specimen. Side-valley on left bank of Barranco del Crangejo. c. 400 m from the sea; small resurgence in otherwise dry bed; UTM coordinates ES 58735 x 314900; gravel, sand; 24.0°C; conductivity 7.35 mS/cm (S = c. 4.5 ppt); altitude c. 40 m; 5 May 1987.

Stn. 87-68. 12 specimens. Barranco del Cigarrón (=W of Llanos de la Concepción); well S of road; UTM coordinates ES 59277 x 315052; water level at -6 m; water depth 0.25 m; 21.7°C; conductivity 3.15 mS/cm (S = c. 1.9 ppt); altitude c. 240 m; 5 May 1987.

Stn. 87-69. 2 specimens. Barranco de Betancuria, at road km 34.5; open well with windpump; UTM coordinates ES 591955 x 314200; water level at -6 m; water depth 0.4 m; 22.7°C; conductivity 5.11 mS/cm; altitude c. 200 m; 5 May 1987.

Stn. 87-72. Barranco de Ajuy, c. 2 km from the sea; covered well; UTM coordinates ES 58475 x 314185; water level at -5 m; water depth 12 m; 25.9°C; conductivity 9.14 mS/cm (S = 5.7 ppt); altitude c. 70 m; 5 May 1987.

Live specimens are pale whitish or greyish, sometimes faintly orange, in colour.

REMARKS ON THE DISTRIBUTION OF *BOGIDIELLA PURPURIAE* AND OF *PYGOCRANGONYX REPENS*

These species are rather common in the groundwaters of the basal complex zone (= the oldest rocks of Fuerteventua) around Betancuria (figs. 17-18), and have been found in altitudes of up to 400 m above sea level.

A single juvenile amphipod which possibly can be attributed to the genus *Pygocrangonyx*, was found outside the basal complex zone, viz. at Stn. 87-76. The data for this station are as follows: covered well, at c. 300 m from the sea, in the hamlet Las Playas (= Las Playitas); UTM coordinates ES 59988 x 312295; 24.7°C; conductivity 7.27 mS/cm (S = 4.5 ppt); altitude c. 5 m; 6 May 1987. Further material from low altitude and coastal localities is needed to determine the taxonomic status of this material.

There is remarkable agreement between the distribution patterns of *Pygocrangonyx repens* and *Stygogidiella purpuriae* in Fuerteventura: both are concentrated in the basal complex zone of the island, but (if we include the record of an unidentifiable juvenile cited above) are also known from a small zone near Las Playas (= E of Gran Tarajal). This correspondence can hardly be accidental, the total number of samples taken in the island (N = 127, figs. 17-18) being sufficiently large to exclude coincidence.

ACKNOWLEDGEMENTS

The 1985 sampling in the Canary Islands was supported financially by a grant from the Treub Maatschappij, Utrecht; that of 1986/87 was made possible by the Comisión Asesora de Investigación Cientifica y Tecnica (CAICYT), Madrid, within the framework of a guest-professorship awarded to the author at the Departamento de Zoología, Universidad de la Laguna, Tenerife (Director Prof. Dr. M. Ibañez Genís).

REFERENCES

CARRACEDO-GOMES, J.C., 1980. Geología, clima e hidrología: 17-37.- In: Atlas basico de Canarias (Ed. Interinsular Canaria).

KREJCI-GRAF, K., 1961. Vertikal-Bewegungen der Makaronesen.- Geol. Rundschau, 51: 73-122.

RUFFO, S. & A. VIGNA TAGLIANTI, 1973. Three new subterranean Bogidiella from Mexico and Guatemala (Crustacea, Amphipoda).- In: Problemi attuali di Scienza e di Cultura, Sezione Missioni ed Esplorazioni, 1 (Accad. nazion. Lincei, 370): 105-133.

RUFFO, S. & A. VIGNA TAGLIANTI,1977. Secondo contributo alla conoscenza del genere Bogidiella in Messico e Guatemala (Crustacea, Amphipoda, Gammaridae).- In: Subterranean Fauna of Mexico, 3. (Accad. nazion. Lincei, 374): 125-172.

SCHMINCKE, H.-U., 1976. The geology of the Canary Islands.- In: G. Kunkel, ed. Biogeography and ecology of the Canary Islands: 67-184. (Junk, The Hague).

SCHMINKCE, H.-U., 1979. Age and crustal structure of the Canary Islands.- J. Geophys., 46: 217-224.

STILLMAN, C.J., J.M. FUSTER, M.J. BENNELL-BAKER, M. MUNOZ, J.D. SMEWING & J. SAGREDO, 1975. Basal complex of Fuerteventura (Canary Islands) is an oceanic complex with rift-system affinities.- Nature, 257: 469-471.

STOCK, J.H., 1980. Regression model evolution as exemplified by the genus Pseudoniphargus (Amphipoda).- Bijdr. Dierk., 50: 105-144.

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

STOCK, J.H. & B.L.M. RONDÉ-BROEKHUIZEN, 1986. Stygofauna of the Canary Islands, 1. A new species of Pygocrangonyx, amphipod genus with African affinites, from Fuerteventura.- Bijdr. Dierk., 56: 247-266.

STOCK, J.H. & B.L.M. RONDÉ-BROEKHUIZEN, 1987. Stygofauna of the Canary Islands, 3. The genus Bogidiella (Crustacea, Amphipoda).- Rev. Zool. afr., 101: 439-461.

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

Received: 21 December 1987.
Distributed: 15 April 1988