

# **SUBTERRANEAN BIOLOGY**

**Published by The International Society  
for Subterranean Biology**

## Discovery of a third stygobitic species of Gnathostenetroididae (Isopoda Asellota), and additional information on some other stygobitic isopods (Cirolanidae) from the Caribbean

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### ABSTRACT

*Neostenetroides magniezi*, sp. nov. (male, female) is described from an unusual subterranean aquatic habitat, possibly anchialin, on the island of Mayaguana, Bahamas. This 3<sup>rd</sup> described subterranean adapted species of a small family of Asellota, is compared with two previously described species from anchialine caves, respectively on San Salvador Island, Bahamas and on Cuba. Unpublished information (morphology, distribution) is made available for several Caribbean stygobiont Cirolanidae: *Metacirolana mayana*, *Bahalana geracei*, *B. abacoana*, *B. yagerae*, *Cirolana (C.) troglexuma*.

### RÉSUMÉ

*Neostenetroides magniezi*, sp. nov. est décrit (mâle, femelle) d'un curieux habitat, peut-être anchialin, de Mayaguana, Bahamas. Cette 3<sup>ème</sup> espèce stygobite connue d'une petite famille d'Asellota, est comparée avec les espèces congénériques déjà décrites d'une grotte anchialine de l'île San Salvador (Bahamas) et, respectivement, d'une grotte anchialine de Cuba. On présente des données inédites (morphologie, distribution) sur plusieurs espèces de Cirolanidae stygobites des Caraïbes: *Metacirolana mayana*, *Bahalana geracei*, *B. abacoana*, *B. yagerae*, *Cirolana (C.) troglexuma*.

Key words: Isopoda: Gnathostenetroididae, Cirolanidae; stygofauna; anchialine habitats; Bahamas.

*Neostenetroides magniezi*, sp. nov.

### Locality and material

The Bahamas, Mayaguana, Abraham Bay: "Cable landing well". 7 January 2007. Male holotype, 15 male paratypes (two of them completely dissected); female allotype, 16 female paratypes (three of them gravid; three completely dissected); 11 smaller – male or female – specimens not labeled as types. Sampled by T.M. Iliffe with plankton net. In the collections of the Zoological Museum of the University of Amsterdam.

### Description

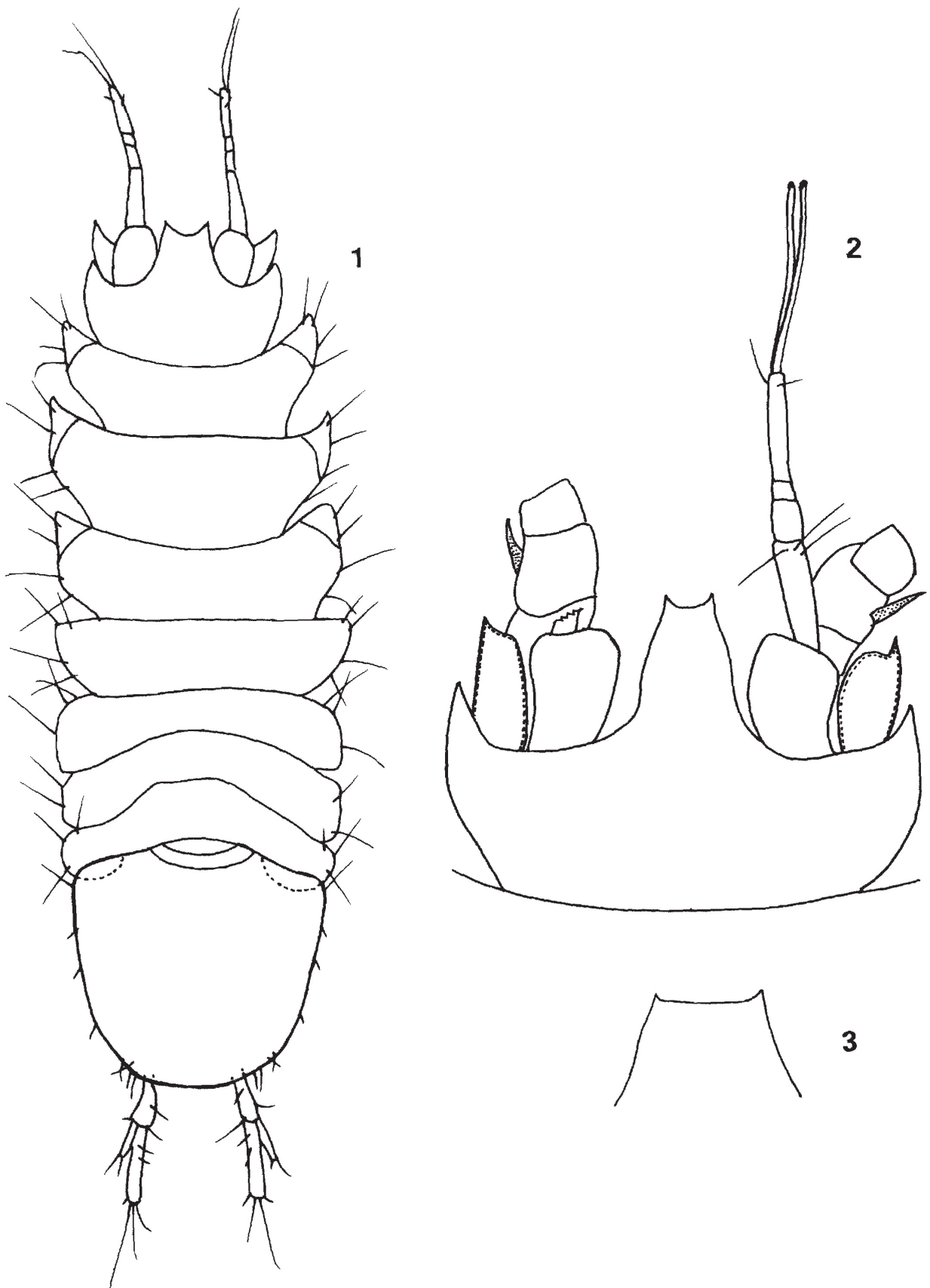
In this description, comparison will be mainly made with the type species of *Neostenetroides*: *N. stocki* Carpenter and Magniez, 1982, described (male, female) from Dixon Hill Lighthouse Cave, San Salvador island, Bahamas. At the end of this description, some additional comments are added concerning *N. schotteae* Ortiz, Lalana and Pérez, 1997, described from Cuba ("Cueva Ilona, Playa Girón, Provincia de Matanzas").

Completely depigmented and devoid of any trace of eyes. A very small species, like *N. stocki*: largest females

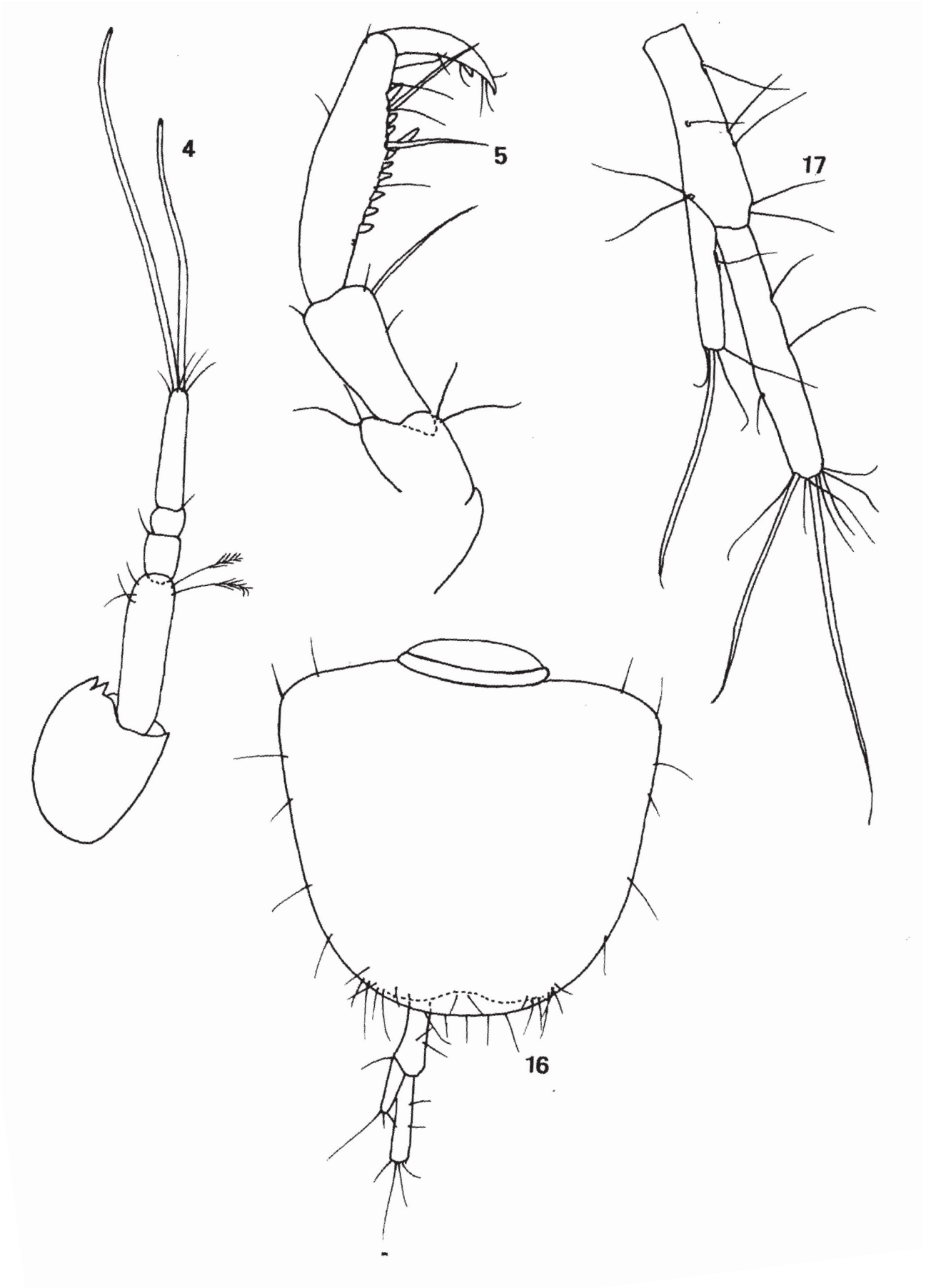
measure – from tip of rostrum to end of pleotelson – 1.9 mm, the largest males being about 1.4 mm long. Rather surprisingly, from the 3 gravid females, the smallest is only ca 1.5 mm, while the largest is 1.9 mm long.

Habitus (Fig. 1) like in *N. stocki*; the same is valid for the cephalon (Fig. 2) and for the pleon (Fig. 16).

Rostrum (Fig. 2) clearly distinct from that of *N. stocki*: it presents a slight apical depression with, on either side, a distinct point; even when the rostrum is crushed between slide and cover slide, these points remain distinct, although the depression disappears (Fig. 3). Antennula (Fig. 4) – described but not illustrated in *N. stocki* – differs in several respects from that of the species from San Salvador; in *N. stocki*, its articles 2 and 3 are described as "slender", article 4 being "very small"; in the new species, article 3 is only slightly smaller than article 4, and articles 3 and 4 have together clearly less than 1/2 of the length of article 2; moreover, whereas in *N. stocki* the two characteristically very long aesthetascs at the tip of the antennula are accompanied by "a long, simple seta", this is replaced in the new species by a small tuft of very short setae. Peduncle of A II apparently similar in the two species (the flagellum, extremely caduceous, remains unknown in the two species); the striking appendages with pointed apex illustrated in Fig. 2 laterally from the



Figs 1-3 - *Neostenetroides magniezi*, sp. nov., female. 1. Habitus; 2. Cephalon; 3. Another view of rostrum, crushed under cover slide.



Figs 4-5; 16-17 - *Neostenetroides magniezi*, sp. nov., female. 4. Antennula; 5. First pereiopod; 16. Pleon; 17. Left uropod.

basal article of A I are the lateral portions of the basal article of the A II peduncle.

Examination of the maxilliped has not resulted in finding significant differences; for instance, the coupling hooks are like those in *N. stocki*.

If the pereopods II- VII are similar in the two species, the first pereopod of the new species (Fig. 5), although having the same general slender shape as that of *N. stocki*, differs from it in an even more slender propodite on whose sternal border the row of minute setulae of *N. stocki* is replaced by a row of well developed tubercles; doubtless there is also difference in the chaetotaxy of the first pereopod of the two species.

Pleopods I (Fig. 6), III, and V of the male, and pleopods II (Fig. 11), III (Fig. 12), and V (Fig. 15) of the female are practically identical in the two species. A special mention has to be made for pleopod IV of *N. magniezi* sp. nov., identical in the two sexes (Fig. 10 – male –, and respectively 13-14 – female) and strongly differing from the description and illustration of this appendage for *N. stocki* (compare with fig. 5 in Carpenter and Magniez 1982); particularly striking is the curiously capitate shape of the distal article of the two branches, and especially that of the endopodite (which also lacks, in the several specimens examined, the “apical plumose seta” found in *N. stocki*); of course, extremely delicate, hyaline appendages like these are subject to shape alteration in preserved specimens; nevertheless, we believe that pleopods IV are really quite different in the two species.

Pleopod II (Figs 7-9) has a protopodite, a bi-articulated exopodite, and a first article of the endopodite, looking roughly similar to those found in *N. stocki* (although the protopodite and the 1<sup>st</sup> endopodite article are maybe even more elongate in the new species). The copulatory organ (2<sup>nd</sup> article of the endopodite) is radically different, much less complex than in *N. stocki*, and completely devoid of setation; it ends in a pair of sharp and rather long spines – at whose level the seminal duct opens – and its most conspicuous feature is a large round flap “hanging” from the distal half of the appendage.

The uropods were lacking from the two specimens on which *N. stocki* has been described, but they could be illustrated in *N. schotteae*. Although they are very caduceous, we have found them in many specimens of the new species (Fig. 17).

In three specimens, a marsupium is present, literally stuffed with pulli (as many as 8 in one of the specimens). It is for the first time that gravid females have been observed in a stygobitic gnathostenetroid.

In various specimens, numerous minute, parallelogramic/rhombic, dark brown crystals have been observed in body tissues.

Turning now to *N. schotteae*, comparison of its description (female only) with *N. stocki* and *N. magniezi* sp. nov. makes possible the following observations: the rostrum appears as in *N. stocki*; the small tuft of short setae at the root of the two apical aesthetascs of A I re-

sembles that in *N. magniezi*; the armature of the propodial sternal border of pereopod I differs from that in the other two species; pleopods IV are like those in *N. stocki*; the marginal setation of the pleotelson seems (?) to be more abundant than in the two species.

### Etymology

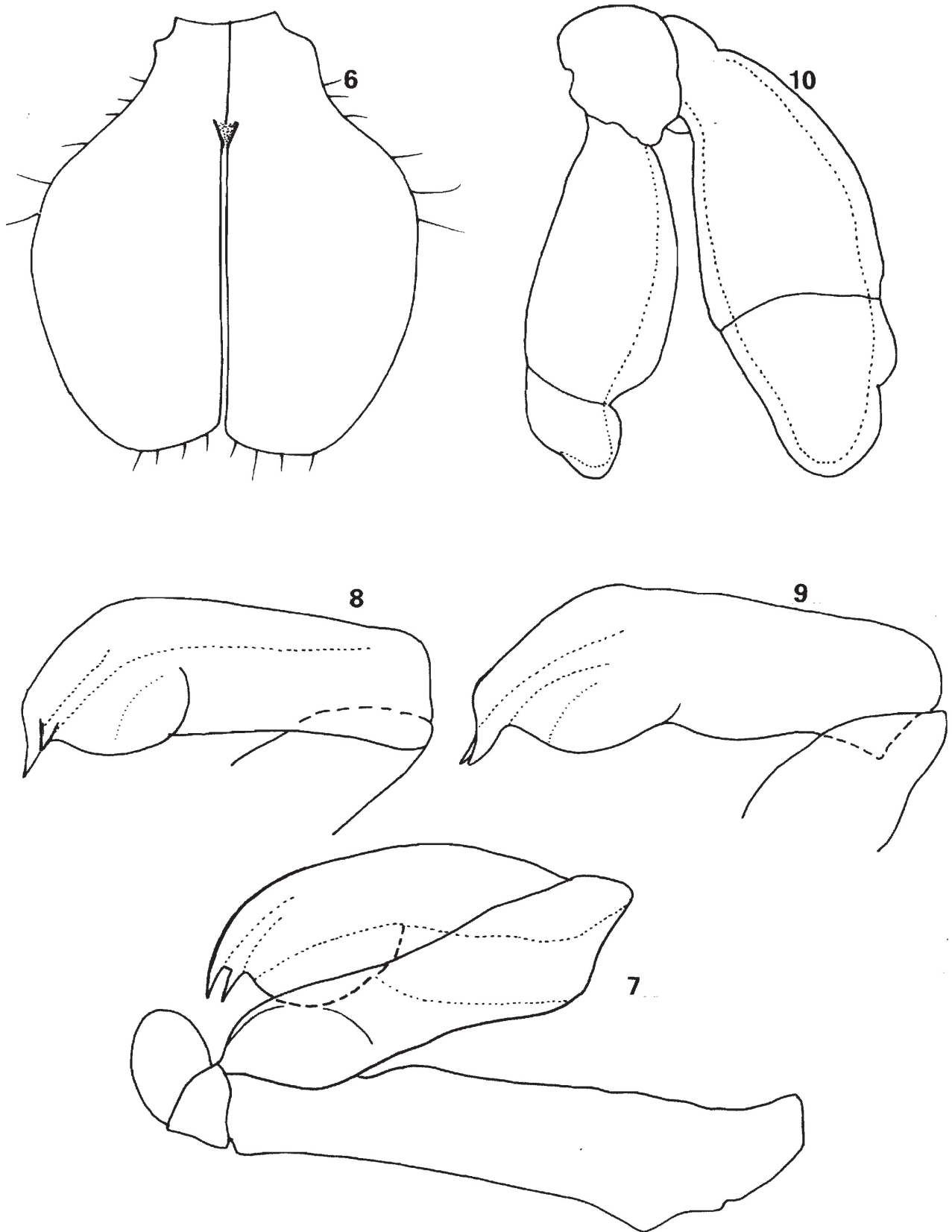
The species is named in honour of Dr. Guy Magniez, the well known specialist of Asellota, and co-descriptor of *Neostenetroides*, who has kindly answered several questions asked by L.B. about the new species.

### DISCUSSION

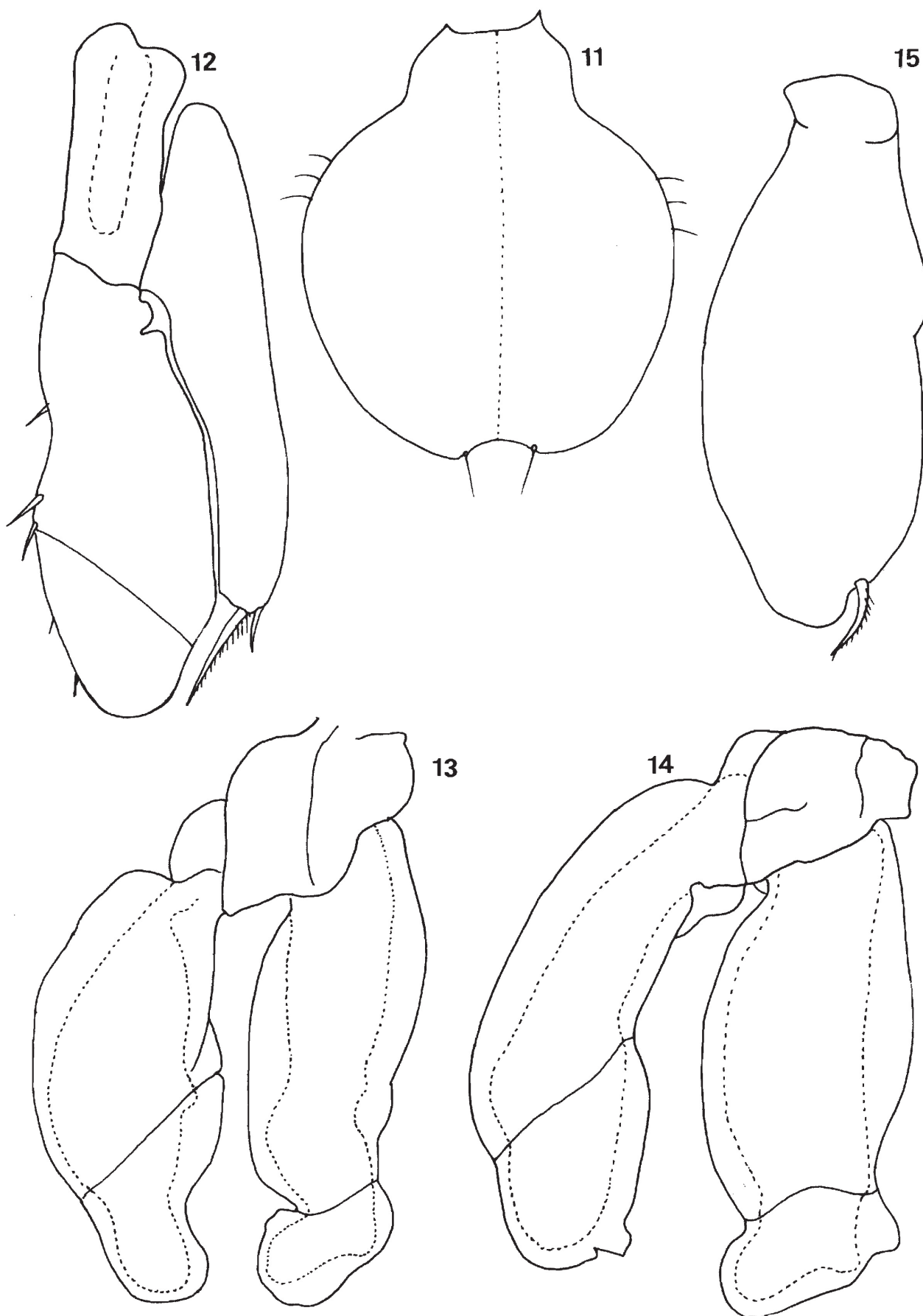
Gnathostenetroididae\* is a small family of Asellota that to date contains 13 species in 3 genera of marine (i.e., non-subterranean adapted) species, which have been described from many parts of the world, as well as two clearly stygobitic species of *Neostenetroides* Carpenter and Magniez, 1982, both from anchialine caves in the Caribbean, San Salvador island in the Bahamas, and Cuba. A 3<sup>rd</sup> species from Mayaguana in the Bahamas is herein described. This species is clearly distinct from *N. stocki* by characters of the rostrum, antennula, first pereopod, pleopod IV in both sexes, and copulatory organ of the male pleopod II. It can be also distinguished from *N. schotteae* by characters of the rostrum, A I, pereopod I, pleopod IV, and possibly by the lateral setation of the pleotelson.

The habitat where the new species has been discovered, and where a thriving population is present, is a rather odd one. “Cable landing well” is an artificial salt-water well cut in coastal beach limestone and located 50 m inland from the coast. It is enclosed in a small and now abandoned building, which allows the environment to be only very dimly illuminated. The well is 3 m deep but has only some 60 cm of tidally influenced marine water at the bottom. A buried submarine cable at one time entered through a small submerged hole at the side of the well, but the cable itself has apparently corroded away. Probably constructed in the early 1950’s, the site appears to have been unused for many years. Supposedly, this habitat can be considered as being an anchialine habitat. Other anchialine animals sampled here included one specimen of the cirrolanid isopod *Bahalana geraeci*, the hippolytid decapod *Barbouria cubensis*, and the calanoid copepod *Ridgewayia* sp., plus cyclopoid and harpacticoid copepods.

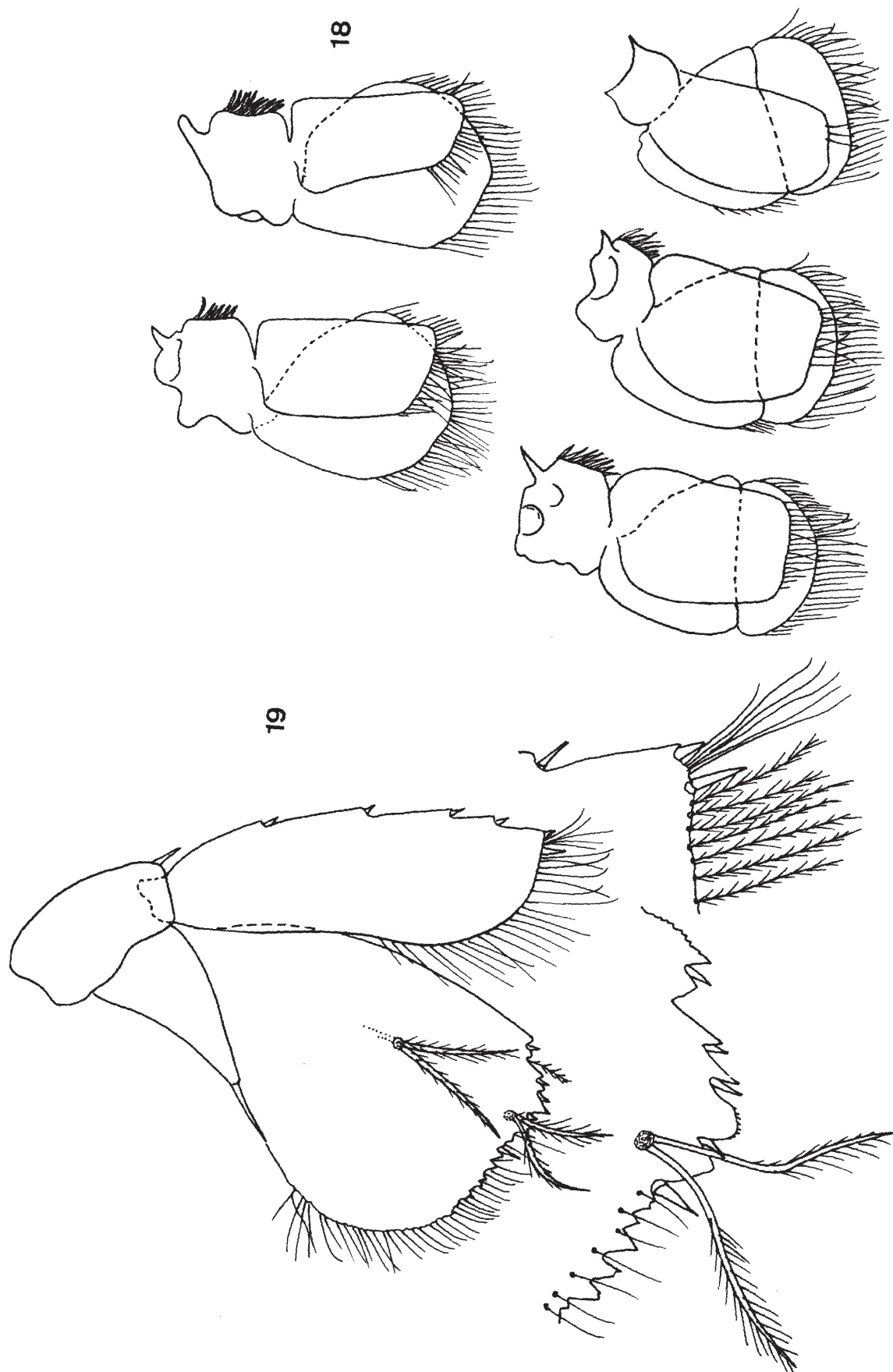
\* The history of this family name is well explained in Carpenter and Magniez (1982:203).



Figs 6-10 - *Neostenetroides magniezi*, sp. nov., male. 6. First pleopods; 7-9. Second pleopod (entire in fig. 7; only the copulatory organ in two other specimens, in figs 8-9); 10. Fourth pleopod.



Figs 11-15 - *Neostenetroides magniezi*, sp. nov., female. 11. Operculum (second pleopods); 12. Third pleopod; 13-14. Fourth pleopods of two specimens; 15. Fifth pleopod.



Figs 18-19 - *Bahalana abacoana* Botosaneanu and Iliffe, female. 18. The pleopods; 19. Right uropod, dorsal, with strongly magnified tips of the endo- and exopodite.



### Additional information on some stygobitic Cirolanidae

Study of specimens sampled mostly after publication of a synthesis on subterranean Cirolanidae of the peri-Caribbean and Mexican realm (Iliffe and Botosaneanu 2006) provides some new information as follows:

(1) *Metacirolana mayana* (Bowman, 1987). Study of the relatively numerous adult male specimens sampled on 8 July 2003 in Cenote Crustacea, Puerto Morelos, Quintana Roo, Mexico, and deposited in the Antipa Museum, Bucharest, points to a significant intrapopulation variability: very different size of various specimens; large specimens without penes; smaller, even very small specimens with well developed penes; penes not always as stout as illustrated in Botosaneanu and Iliffe 2002 (fig. 3).

(2) *Bahalana geracei* Carpenter, 1981. Study of a female specimen (length: 9.5 mm), deposited in the Zoological Museum of Amsterdam and sampled on 7 January 2007 from the "Cable landing well", Mayaguana, Bahamas, leads to the conclusion that *B. cardiopus* Notenboom, 1981 is a synonym of *B. geracei*: nov. syn. In Botosaneanu and Iliffe 1999:96 the statement was made that "... the only reliable character distinguishing *B. cardiopus* from *B. geracei* is: endopodites of pleopods III-V devoid of marginal setae". The specimen from Cable landing well, in all respects indisputably *B. geracei*, has the endopodites of pleopods III and IV setose (seven or eight marginal setae), only that of pleopod V being glabrous. This very variable pleopod setation does not allow distinction of two species. *Bahalana geracei* is thus documented from three islands of the Bahamas: San Salvador, Mayaguana, and Acklins.

(3) *Bahalana abacoana* has been described (Botosaneanu and Iliffe 2006) on the only (male) specimen then available, from Dan's Cave, Abaco (deposited in the IRSNB, Brussels). Because this specimen was partly damaged, it was not possible to obtain from it a reliable illustration of its pleopods and uropod. This information gap can now be filled: on 16 August 2006, one mature female specimen, ca 11 mm long and in good condition (in the Zoological Museum of Amsterdam) was sampled from 36 m water depth in the same cave as the holotype. For the pleopods (Fig. 18), the only interesting detail is the well developed prong in the proximal – internal angle of all protopodites. The uropod (Fig. 19) has a foliaceous exopodite with only four minute spines along its external margin; its endopodite has very short marginal setation, its distal margin is strongly denticulated, and the sensory apparatus on its dorsal face is composed of two pairs of finely ciliated setae from common alveolae, apical pair distinctly shorter than the proximal one.

(4) *Bahalana yagerae* (Carpenter, 1994). On 22 and 23 August 2006, several specimens of this species were sampled from two caves on Abaco: 2♀ and 1♂ from Sawmill Sink, and 2♀ from Dan's Cave. Abaco should be added to the list of Bahamian islands inhabited by this species and the co-existence of *B. yagerae* with *B.*

*abacoana* in the same cave should be added to the list of co-existing cirolanid species at one site (Iliffe and Botosaneanu 2006:18).

(5) *Cirolana (Cirolana) troglexuma* Botosaneanu and Iliffe, 1997. Diving exploration in 2007 of several anchialine caves on Eleuthera (Bahamas) has enabled sampling of a large number of adult female specimens of this species, previously known only from a few specimens caught from anchialine habitats of the Exumas. The complete absence of males from the relatively high number of specimens known at present (33, from 13 localities) seems to be good evidence for parthenogenesis in this species. To the best of our knowledge, this would be the first case of parthenogenesis in Cirolanidae (anyway in stygobitic Cirolanidae).

### ACKNOWLEDGEMENTS

This research was supported by grant number DEB 0315903 from the National Science Foundation Biodiversity Surveys and Inventories Program to T. Iliffe. Collection of specimens was done under Bahamas Department of Fisheries marine resource collection permit to T. Iliffe. We thank Mayaguana expedition team members Lara Hinderstein, Brett Gonzalez and Brian Kakuk.

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