Stygobitic isopod crustaceans, already described or new, from Bermuda, the Bahamas, and Mexico

by Lazare BOTOSANEANU & Thomas M. ILIFFE

Abstract

This is a new contribution to the knowledge of the isopod fauna of subterranean aquatic habitats in the Western Atlantic. Several species of stygobitic Cirrolanidae are recorded from new localities, Bahalana mayana (Ceratell and Yucatan Peninsula) is transferred to genus Metacirrolana; to support this transfer some additional illustration is provided; this is one of the few cases enabling sound speculation about the marine (epigean) ancestors of subterranean adapted cirroniids. A new species of Bahalana, the fourth in this stygobitic Bahamian endemic genus, is described from a cave in the Exumas; study of specimin in Bahalana by isolation in various fragments of the Bahamian Archipelago could be a rewarding project.

Key words: Isopoda: Cirrolanidae, Stenatoniida, Stygaihabitats, Bermuda, Bahamas, Mexico, taxonomy.

Résumé

Nouvelle contribution à la connaissance de la faune d'isopodes d'habitats aquatiques souterrains de l'Atlantique Ouest. Plusieurs espèces de cirroniids stygobites sont signalées de nouvelles localités. Bahalana mayana (Cerones et Yucatan) est transférée au genre Metacirrolana; à l'appui de ce transfert on présente un supplément d'illustration; il s'agit ici d'un des rares cas permettant une some speculation sur les anciêtres marins (épigenes) de cirroniids stygobites. Une nouvelle espèce de Bahalana, la quatrième de ce genre stygobite et endémique des Bahamas, est décrite d'une grotte des Exumas; l'étude de la spéciation dans ce genre, par isolation dans les divers fragments de l'archipel des Bahamas, pourrait être un projet prometteur.

Mots-clés: Isopodes: Cirrolanidae, Stenatoniidae, habitats de Stygai, Bermuda, Bahamas, Mexique, taxonomie.

Introduction

During exploration by diving, in almost all cases by the second author, of caves, "blue holes", or cenotes, 6 species of stygobitic isopods have been sampled during 2000 and 2001. For several species localities are new. Study of additional material of the Mexican cirroid described as Bahalana mayana allows transferring it to the mainly marine (epigean) genus Metacirrolana which thus appear to include two subterranean - adapted species. In the wetland endemic Bahamaian genus Bahalana, besides new localities for B. saygerae, we can give the description of a very distinct new species from a cave in one of the Exumas. All specimens mentioned in the present paper are kept in the Zoological Museum of the University of Amsterdam (ZMAN).

Systematic part

CIRROLANIDAE

Creaseriella anops (CHEASER, 1936)

One female of this Mexican species known from numerous caves or cenotes, has been sampled on 14.VII.2000 from Cerotene Carwash, Tulum, Quintana Roo, Yucatan (from water column in 15-20 m. depths). Another female has been caught on 21.III.2002 from Cerote Uciti, Cenonillo (from 6-70 m. water depths). A male has been sampled on 31.III.2002 from Cenote Covera, Dzilan de Bravo (from 15-27 m. water depths). Finally, specimens, mostly completely rolled into a ball, have been sampled on 3.PV.2002 from Bulya, Dzilan de Bravo (from 5-10 m. water depths). All new localities for the species, all in Yucatan, last two being caves on the northern (Gulf of Mexico) coast of the peninsula.

Metacirrolana mayana (BOWMAN, 1987)

Figs. 1-4

BOWMAN (1987) described as Bahalana mayana a stygobitic cirroid from two anchialine caves on Cozumel Island and the adjacent Yucatan Peninsula, comparing it with the two species described at that time in Bahalana CARPENTER, 1981. It became later clear that this species does not belong to this distinct Bahamian genus (CARPENTER, 1994: 174; BOTOSANEANU & ILIFFE, 1997: 93 - in this last publication an opinion, i.e. of Dr. N.L. BRUCE being quoted, according to which B. mayana is "... a straight forward eyeless Metacirrolana having all the characters of that genus"). Taking into account the fact that a stygobitic cirroid from an anchialine cave lake on Cabrera, Balearic Islands, had already been described in Metacirrolana (M. ponti: JAUME & GARCIA, 1992), and that comparison of its description with B. mayana strongly supported the idea of congenerity, this last species is here transferred to Metacirrolana NERSTRASZ.
1931. Besides the two localities in the original description, *Mecistocirrus mottii* (Bowman, 1987) had been recorded from two coves in Cozumel and in the Tulum area (Bottolungan & ILiffe, 1999). For the present publication specimens from the following Mexican localities have been examined: Quintana Roo, Puerto Morales, Cenote Aayin Aak, from water column and rock and sand bottom (fully marine waters) in 10-20 m. depths: 24.VIII.2000, 1♂, 7♀, 1 juvenile, Quintana Roo, Akumal, Cenote 77 steps, from water column in 0-23 m. depths: 25.VII.2000, 1♂; Isla Cozumel, Cenote Tres Priester: 9.XI.2001, 1♀ larger than all specimens in the original description; Isla Cozumel, Cenote Aeriolo: 9.XI.2001, 1 large ♂, 2 very small juvenile specimens. We can supplement here the illustration in the original de- scription with some relevant details. The robust pereiopod IV, left undescribed in Bowman (1987) is clearly of a type intermediate between the strongly raptorial PI-PII and the ambulatory PV-PIV. The pleon epimera I-IV are charac- terized by sharp "keels" perpendicularly directed downward and distally with sinuses. Appendix masculina has a charac- teristic shape in contrast with the extremely simple one in most stygobitic Cirolanidae and matching that found in M. pontii, the same being true for the relatively short and thick- est penes.

The case of the two described stygobitic species of *Mecistocirrus* is one of the very few enabling sound specula- tion about the question: what was the appearance of the marine ancestors of present-day subterranean-adapted Cirolanidae?

**Bahaha. yaguerae** (CARPENTER, 1994)

Specimens examined (all new localities): Andros Island, Conch Sound Blue Hole, from "New Rom" ca. 1 mile in from entrance, at 15 m., 7.VII.2001, 1♀ with at least 16 big eggs; Grand Bahama Island, Sweeting's Cay, Virgo Blue Hole, from 15-21 m. depths of large room, 2.XII.2001, 1♀, Grand Bahama Island, Sweeting's Cay, Sagittarius Blue Hole, from 18-25 m. depths, 3.XII.2001, one large ♀ and 3 smaller or very small specimens nevertheless fully devel- oped and with 6 pereiopods; Grand Bahama Island, Sweeting's Cay, Lucy's Cave, from 18.25 m. depths, 4.XII.2001, 1♀, 1♂. With the exception of Conch Sound which is an ocean blue hole, all other sites for *B. yaguerae* are inland, atolline caves.

It is possible that study of intraspecific variability in this spe- cies will lead to some results.

**Bahaha. examinata** n.sp.

Figs. 5-27

**MATERIAL EXAMINED**

Male holotype sampled on 25 July 2001 by Brian Kakuk from Oven Rock Cave, Great Guana Cay, Exumas, the Bahama (main passage at past old hat roost at 15 m. depth; at the location where the specimen was collected, water has fully marine salinity). In the ZMAM crustacean collection (Is. 205829).

**DESCRIPTION OF MALE HOLOTYPE**

A fragile animal, some appendages (especially PV-VII) eas- ily coming off. Length from rostrum tip to middle of pleotelson: 7 mm. Habitats: fig. 5. Completely depigmented, eyeless.

Cephalon very well individualized, only very feebly built in the large first peraeodal segment; lateral and posterior mar- gins gently rounded; anterior margins, converging towards a short but distinct rostrum, may appear slightly sinuate. Lamina frontalis narrow, elongate, ending in sharp point; clypeus with strongly obsolete lateral ends laterally outrunning the labrum but not descending along its sides. Pereonite I androcoel coxal plates; those of pereonites II- VII all very small, in contrast with those well developed of pleonites I-V (those of pleonite I long, sharply pointed re- maining ones stronger, all ending in points). Pleotelson roughly square, lateral margins feebly rounded, posterior margin maybe very feebly emarginate; this margin is clearly crenulate (not simply festooned), the denticles ir- regular, and between all of them one short plumose seta is inserted.

Antennula reaching at least the limit between pleonites II and III, 2nd peduncular article shorter than 1st, 3rd slightly longer than 1st and 2nd together, and with well individualized apical rostr, the remarkably long flagellum has no less than 30 arti- cles (1st one longer than following, last ones longer than those preceding); on each article – excepting only the five basal ones and the apical one – a slender aesthetasik with short peritome.

Antenna II reaching at least the end of pleon. Peduncle with 3 short, thick-set basal articles, article 4 more slender and as long as 1-3 together, article 5 even more slender and as long as 1-4 together, flagellum from about 34 articles. In both AI and AIS all the peduncular article has a shape probably re- lated to coupling.

The only fact worth a mention about the mandibles is the strong asymmetry of the two scies. Maxilla I lateral lobe with 12 glabrous spines, endite with two longer glabrous spines, endite in the median corner, one minute in the lateral one, and two with a fine seta. Maxilla II external lobe with 2 set- tae, medial lobe with 4 internal lobe with 5 glabrous setae and with 2 longest and internalmost ones-plumose. Maxilliped endive with either 3 or 4 plumose setae (the 4th one minute), and with one "coupling spine" (no hook).

The pereiopods III, although built on the very characteristic *Bahaha. pattern, show numerous structural or allo- morphic peculiarities distinguishing them from those of already de- scribed species. *The propodus of PI-II is distinctly shorter and narrower than that of PI or PI-II. The unguis of all three is much smaller, reduced to a minute, hyaline, distinctly limited cone. Internal margins of carpus, propodus, dactylus, as well as of several long projections, are finely but distinctly crenulate. On PI only merus is armed with a long internal projection (devoid of subdistal spines). On PI-I there are two projections of the merus (one short internal, one very long
Figs. 5-6. Bahalana examina, male holotype, habitus, and left side coxal plates in ventral view.
Figs. 7-10. *Bakulana eximina*, male holotype. 7. Cephalon and first pericranial segment, slightly different position than in fig. 5. 8. Lamina frontalis and chyopa-labrum, ventral. 9. Left uropod, dorsal. 10. Dorsal margin of pleonites, with even more strongly magnified detail.
Figs. 11-12. Buhalana exannua, male holotype. 11. Right AI, with more strongly magnified last flagellar articles. 12. Right AII peduncle.
external), whereas carpus has one short internal projection. PIII is armed with 4 projections: iscalum has one internal, slender and of medium size, merus one internal long and one external even longer, whereas the internal projection of carpus is the longest of all.

We have illustrated PIV and PVII: like PVI and PV1 in extreme contrast, from all points of view, with PIII.

Despite careful observation, no pedes have been found.

Plesopods (figs. 23-27). Euxopodites III-V distinctly and completely bipartite (an extremely faint bipartition line can be "guessed" for Pl. I-II). All endopodites with distal setae, abundant on Pl. I-II, and gradually less so on Pl. III-V. Of course, all setae of exo-and-eunopodites finely plumose. Appendix masculina basally inserted, longer than endopodite, only very slightly curved towards the pointed tip. Exopodite of about the same length as the pleotelson. Cephalopod roughly trapezoidal, énto-internally only very slightly produced. Exopodite shorter and narrower than endopodite (maximum width of ex. about 1/5 of maximum width of endp.); the exopodite is foliaceous, along external margin with 6 short spines at regular intervals, apically with short tuft of plumose setae and one spine, along distal third of internal margin with ca. 24 plumose setae. Endopodite with proximal half of internal margin abruptly oblique towards median line, distal half strongly dentateolate, apically with pair of small sinusæ; on dorsal surface 5 plumose setae - three of them bundled on a "sensory patch." (of course, all setae, short or long, along internal or distal margin are plumose).

AFFINITIES

Babculana examina n. sp. is the 4th described species in this Bahamian endemic genus. It is clearly distinct from B. geraci CARPENTER, 1984 (San Salvador), B. cardiopus NOTENBoom, 1981 (Mayaguana; Acklins; BOTOSANEANU & ILIFFE, 1999), and B. yagerae (CARPENTER, 1994) (Grand Bahama, Sweeting's Cay, Andros; present paper). It may be restricted to the Exumas. Speciulæ of Babculana in subterra- nean waters of the Bahama Archipelago seems to be an excit- ing study subject.

As shown by BOTOSANEANU & ILIFFE (1999) B. geracei and B. cardiopus are very closely related species; B. yagerae is in many respects very distinct from this pair. The same may be
Figs. 21–22. *Balalana examina*, male holotype, right pereiopods IV and, respectively, VII, with more strongly magnified unguis.
said about the new species which, nevertheless, seems to have more in common with *geracei* and *cardiopus* (and, maybe, more with *geracei* if a character like the presence of setation on PI. III-V endopodites is thrown in the balance). Maybe the most easily seen distinctive character of *B. examina* is the shape of its cephalon not built-in the 1st appendicular segment. But probably the most impressive one is its particularly long AI flagellum with its very rich equipment of chemoreceptor organs: the new species must be a very sensitive one! Among other characters enabling distinction from one or another of the described species – or from all of them – are: the strong contrast between pereiondal and pleonal coxal plates; the shape of the lateral ends of the clypeus; 3rd article of AI peduncle only as long as art. 1 and 2 together; many morphological details of pleopods I-III; the strongly pectinate unguis of PI-VIII; many details of the armature of spines and setae of the uropods; and also of the proportions of their coxa-endo- and exopodites.

**HABITAT**

*B. examina* inhabits a cave already known for its rich stygobitic fauna (details for O'Connell Rock Cave and its fauna i.a. in Botosaneanu & Iliffe, 1997: 81 and 1999: 94). De-serves mention the fact that another stygobitic ciroland *Cirulana (C.) tritangleia* Botosaneanu & Iliffe, 1997 has been described, and later re-discovered, from this cave.

*Yucatanana robustispina* Botosaneanu & Iliffe, 1999

A new locality for this remarkable Yucatan endemic is Cenote Kukulak, Mucuyche, where 7 specimens have been sampled on 21.VII.2000 from ledges along bedrock wall in 10 m. depth of a freshwater cave lake. Another one is Cenote Chivil-Hol Dos, Mucuyche, where 5 specimens (2♀, 2 manca, 1 juvenile) have been caught on 27.III.2002 (from 5-15 m. water depths). It seems that this species has quite restricted general distribution, with the various known localities apparently supporting important populations.
STENETRIIDAE

Stenus-bermudae iliffei KENSLER, 1994

From the type locality of this species (Walsingham Cave, Hamilton Parish, Bermuda) 3° 12.4 mm and as well as 2 juven-
le specimens (1.4 and 0.9 mm) have been sampled on
30.XI.2000 from water column in 3-20 m. depths between
Walsingham and Deep Blue entrances. The species has been
described and illustrated (KENSLER, 1994) with eyes “con-
sisting of 4 close-set ommatidia”, but it has not been possible
to detect them in our mature specimen (not to speak of the
immature ones).

Acknowledgements

Cave investigations in the Bahamas were supported by
grants to T. ILIFFE from the US National Science Foundation,
Biotic Surveys and inventories Program (NSF/DEB/910219)
and the Caribbean Marine Research Center of the National
Oceanic and Atmospheric Administration (NOAA). Speci-
mens were collected under a Marine Resource Collection
Permit issued by the Bahamian Department of Fisheries to T.
ILIFFE. Sincere appreciation is extended to Dan MALONE
and the crew of the MV Ocean Explorer for providing space on
their December 2001 Swinging Day (Bahamian cave diving
expedition. We thank cave divers Brian CARUK and German
YÁÑEZ MENDOZA for assistance with cave collections in the
Bahamas and Cozumel, respectively. This paper is a contri-
bution of the DIVERSITAS-EIOY project “Exploration and
Conservation of Anchialine Pools”.

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LAGEH BOTOSANEANU
Zoologisch Museum
University of Amsterdam
Plantage Middellaan 64
1018 DH Amsterdam
The Netherlands

THOMAS M. ILIFFE
Department of Marine Biology
Texas A & M University at
Galveston
Galveston, Texas 77553-1675
U.S.A.