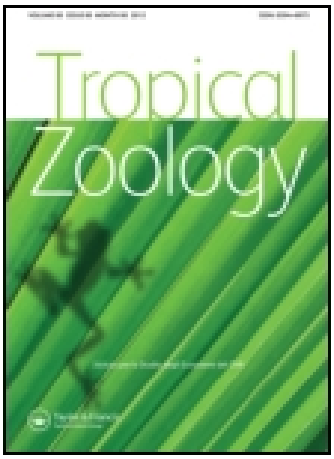

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Pongycarcinia xiphidiourus n. gen. n. sp., a new Brazilian Calabozoidae (Crustacea Isopoda)

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Pongycarcinia xiphidiourus n. gen. n. sp., a new Brazilian Calabozoidae (Crustacea Isopoda)

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The discovery of a second species of Calabozoidae, in a cave of an ancient karstic zone of the Bahia State (Brazil), provides new insights into the suborder Calabozoidea, described by VAN LIESHOUT in 1983 and represented until now by a single species *Calabozoa pellucida* Van Lieshout 1983 inhabiting the subterranean waters of Venezuela. The new finding expands the distribution range of the suborder and permits further studies to clarify its uncertain phylogeny. It also demonstrates a greater diversity of the isopod taxa in Brazilian subterranean waters than previously known. This suggests that a more detailed search would increase the chances of finding further interesting specimens of Crustacea in this region.

The belonging of the newly discovered specimens to a new genus and species *Pongycarcinia xiphidiourus* is justified by the presence of peculiar characters, such as the shape of the second male pleopod and of some structures of the stomach.

The two theories of the phylogeny of this isopod taxon, one linking it to the suborder Asellota through common ancestors, the other considering it more closely related to Oniscoidea, are discussed.

KEY WORDS: stygofauna, Calabozoidea, Brazil, new genus, new species.

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INTRODUCTION

The suborder Calabozoidea, described by VAN LIESHOUT in 1983, was represented until now by a single species *Calabozoa pellucida* Van Lieshout 1983, inhabiting the subterranean waters of Venezuela.

The phylogenetic position of this isopod taxon is controversial, with two main theories about its belonging. The first considers the suborder as nearer to Asellota than to any other isopod suborder (VAN LIESHOUT 1983) or as a sister group to Asellota sharing a common ancestor (WAEGELE 1989). The second considers it to be either a primitive aquatically-adapted Oniscoidea, an hypothesis rejected by TABACARU & DANIELOPOL (1999), or a sister group of this suborder (BRUSCA & WILSON 1991, TABACARU & PLATVOET 1997).

The recent discovery of a second species of Calabozoidea in a cave in Bahia State (Brazil) both expands the distribution area of the suborder and provides the opportunity for further studies to clarify its uncertain phylogeny.

TAXONOMY

Suborder Calabozoidea Van Lieshout 1983

Family Calabozoidae

Genus ***Pongycarcinia*** n. gen.

Diagnosis. Body dorsoventrally depressed. Pleonites I and II small, not reduced to sternal part. Mandibles without palp. Seven pairs of pereopods, none haptorial. Pleopods I and II present in both sexes, modified as copulatory organ in males. Pleopods III-V expanding laterally to pleotelson, similar biramous exopods with natatory functions. Uropods long, inserted laterally, exo- and endopodites fused.

Derivatio nominis. The generic name is composed of the word Pongyp = shy, elusive in Tupi-Karitiana, an indigenous Brazilian dialect, and the Greek word καρκινια = small shrimp.

Type species. *Pongycarcinia xiphidiourus* n. sp.

Pongycarcinia xiphidiourus n. sp. (Figs 1-4)

Material examined. Museu Zoologico Universitade São Paulo: holotypus, 1 ♂ (on 3 slides); allotypus 1 ♀ (on one slide). Museo Zoologico Università Firenze: paratypi 2 ♀♀, 1 ovigerous ♀ and 1 undet. (on 1 slide). 14/V/1998, Toga do Gonçalo, Campo Formoso, BA (10°30'41"S 40°53'39.8"W, 546 m a.s.l.), legit E. Trajano. Maximum observed length of one sexually undetermined specimen 3.10 mm. The material was in very bad condition, all pereopods and almost all pleopods being detached (on 2 slides). Zoologisch Museum Amsterdam: several specimens of *Calabozoa pellucida* Van Lieshout 1983 were examined for comparison, one mounted on a slide.

Fig. 1. — *Pongycarcinia xiphidiourus* n. sp., paratypus. Body of ovigerous female, ventral view.

Derivatio nominis. The specific name refers to the long, narrow shape of the uropods, from the Greek words ξιφιδιον = stylet, and ουρα = tail.

Description. Body dorsoventrally depressed, transparent whitish. Body length 2-3 times the thorax width; pleonites much smaller than pereonites in length and width; pleonites I and II very reduced, present at dorsal part. Cephalon oblong-trapezoidal, narrower than pereonite I. Eyes absent.

Antenna I with peduncle of 3 articles, the second one apically with 2 long plumose setae; flagellum of one article carries an aesthetasc. Antenna II with peduncle of 5 articles and a long flagellum with more than 10 articles. Mandibles without palp and pars molaris. The right mandible has a pars incisiva in two parts,

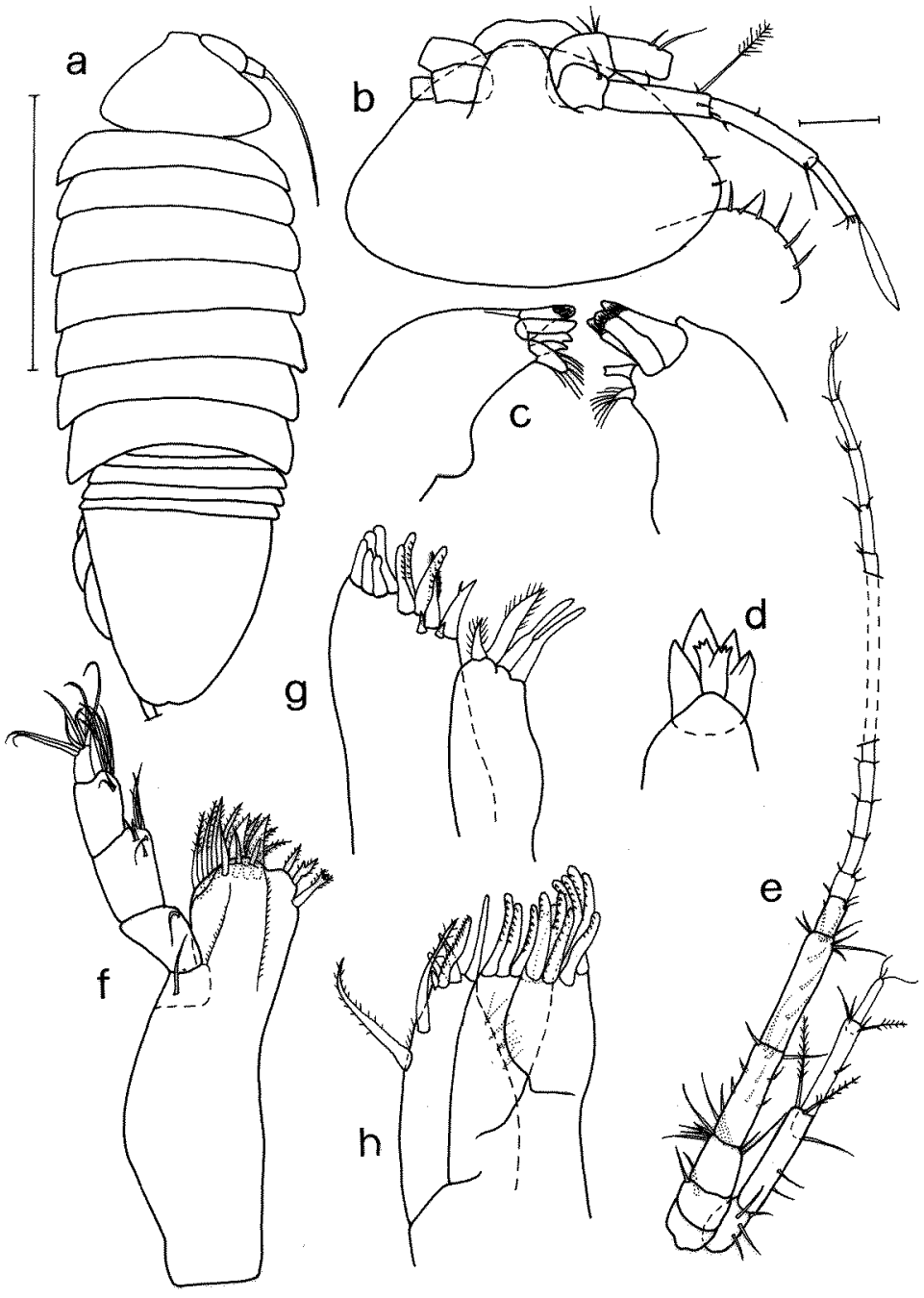

Fig. 2. – *Pongycarcinia xiphidiourus* n. sp. Hotypus: a, body in dorsal view (scale bar 1 mm); b, cephalon in dorsal view (scale bar 100 µm); c, manbible. Allotypus: d, left mandible without spine row in frontal view; e, antenna I–II. Paratypus: f, maxilliped; g, maxilla I; h, maxilla II.

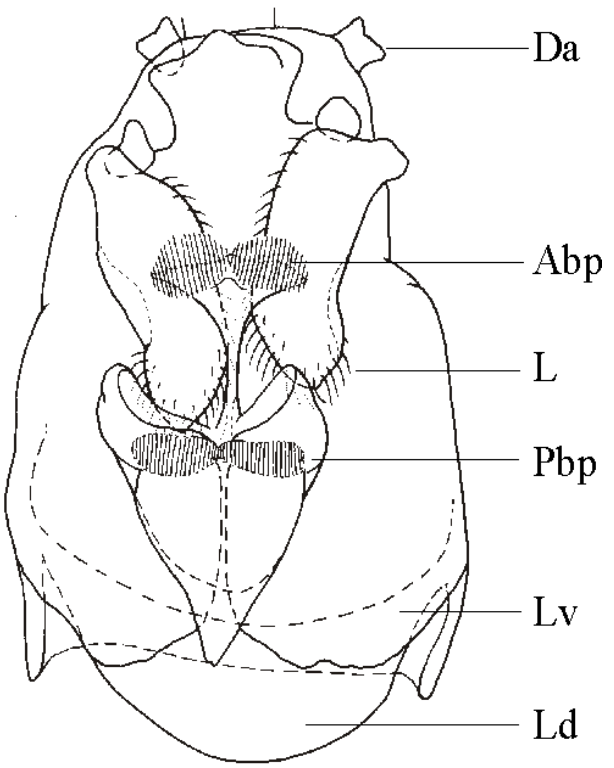

Fig. 3. — *Pongycarcinia xiphidiourus* n. sp., holotype. Stomach in ventral view. Da = dorsal apodema, Abp = clatri setarum anteriores, L = lateralia, Pbp = clatri setarum posteriores, Lv = lamellae ventralis, Ld = lamellae dorsalis.

each with 3-4 teeth, and the spine row reduced to a single pubescent subtriangular seta. The left mandible with pars incisiva with 4 teeth, a lacinia mobilis with denticulate bifid apex, and the spine row reduced as in the right mandible but even smaller. Maxilla I, endite distally with 2 inner, glabrous bottle-shaped setae and 2 outer robust plumose setae. The external seta not as long as the internal one; from lateral to medial the exite has 5 robust simple setae, 4 robust dentate setae and 1 robust simple seta with a median denticule on outer side; on the distal medial side there are also 2 stocky setae. Maxilla II, endite carries several plumose, serrate and simple setae; exite with medial and lateral rami carrying 6 and 8-9 serrate setae respectively. Maxilliped strongly three-dimensional with three distinct rows on the lateral distal part, respectively of 4 simple setae, 2 broad plumose setae and 7 plumose setae; medial part distally with 3 robust plumose setae, the two inner ones with a median denticule on outer side. Palp of maxilliped with first article fused with the basal part of the appendage, the other 4 articles with setae on distal medial corner.

Stomach with reduced and bifid dorsal apodemes, and well developed lamel-

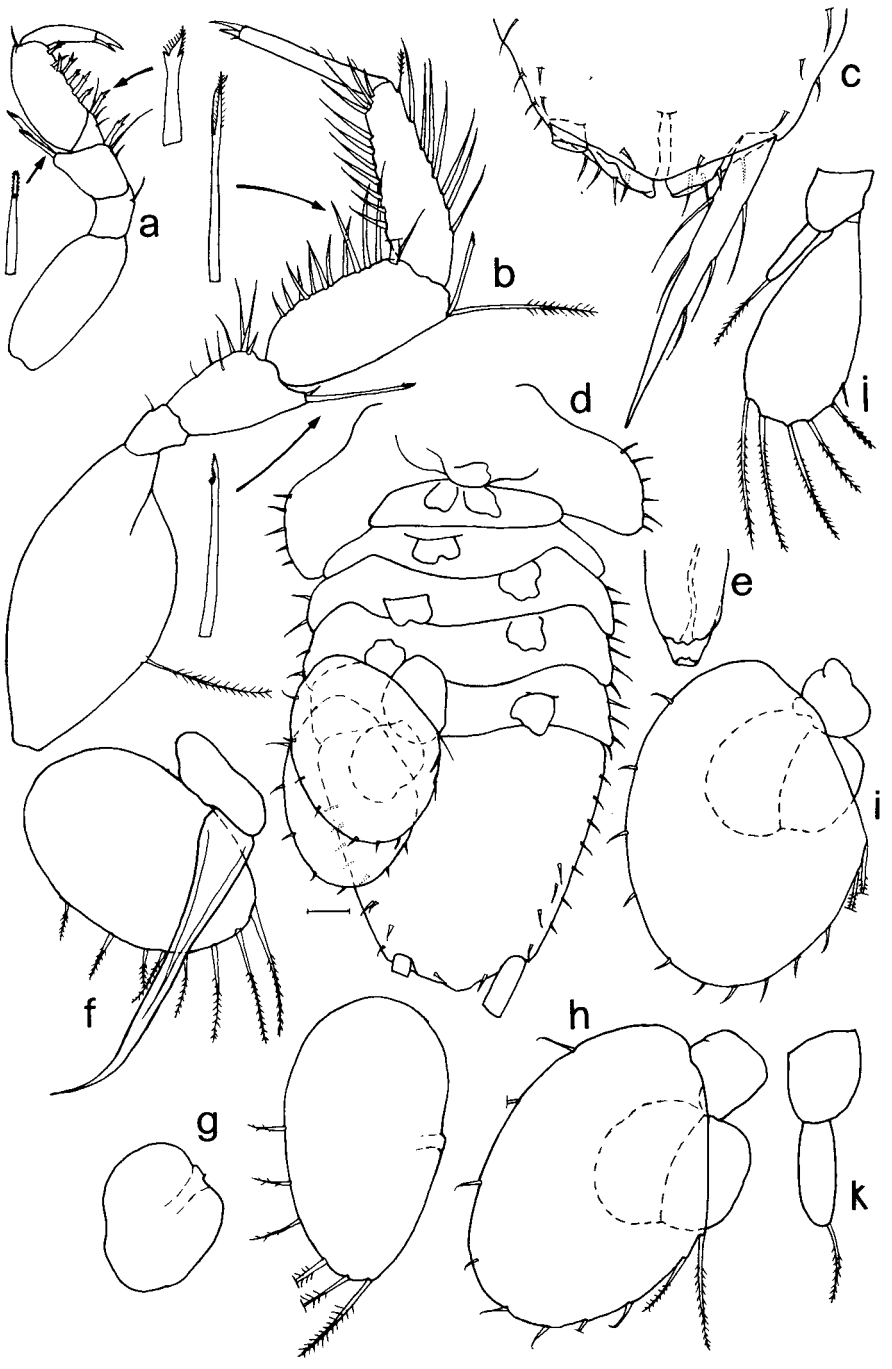

Fig. 4. — *Pongycarcinia xiphidiourus* n. sp. a, pereopod I; b, pereopod VI or VII. Holotypus: c, posterior part of pleon with uropod; d, pleotelson ventral view (scale bar 100 µm); e, genital papilla; f-i, male pleopods II-V. Allotypus: j-k, female pleopods I-II.

lae ventrales; anterior filtering apparatus (clatri setarum anteriores) consisting of a single triangular plaque; posterior filtering apparatus (clatri setarum posteriores) very near to posterior part of lateralia.

Pereopod I stocky, shorter than the others, in particular the carpus is very short with respect to the subsequent thoracic appendages; merus, carpus and propodus with distally dentate, proximally expanded setae on medial margin, merus bearing, on lateral apical margin, 2 long setae with a slightly hairy apical transverse cutting. Pereopods II-VII similar in appearance, although they cannot be identified exactly because they are detached in some specimens: basis with a long plumose seta on lateral margin; merus, carpus and propodus bearing on medial margin a long, apically plumose setae with a whip-shaped median hair; merus and carpus each bearing, on lateral distal corner, a long seta with a slightly hairy apical transverse cutting; propodus with several setae on external margin and an apical plumose seta on distal external corner; dactylus with only a few thin setae on lateral margin; apical unguis and accessory unguis with acute apex.

Pleopods I and II show strong sexual dimorphism. Male pleopod II with an ellipsoid exopod bearing 8 plumose setae on the external margin and with a very elongate endopod, about 2 times longer than exopod, with a spindle-shaped apex. Female pleopod I and II endopod narrow and elongate with a plumose seta on the apex; pleopod I exopod ellipsoid, 2-3 times longer than endopod with about 5-6 plumose setae on external margin. Pleopods III-V similar in both male and female. Pleopod III exopod ellipsoid with about 6 plumose setae on external margin, endopod about 1/2 the size of exopod. Pleopods IV and V similar, with exopod rounded-oval with 2 plumose setae on medial margin and 8-10 smaller simple setae on external margin, endopod about 1/3 the size of exopod with a transverse suture on the middle part.

Uropods inserted on lateral subterminal part of pleotelson, with indistinct endopodite or exopodite forming a styliform structure bearing only a few long setae.

A genital papilla is present on the male pereonite VII.

In the ovigerous female the eggs are on a single line anteriorly and on a double line posteriorly.

Remarks

The belonging of the newly discovered specimens to the suborder Calabozoidea is demonstrated by some of their morphological characters, such as the reduction of pleonites I and II, the large pleotelson with the uropods inserted laterally, the mandibles without palp.

Although the principal characters of the family Calabozoidae are present, some of the following differences (i-iv) justify the creation of a new genus within it.

(i) Pleonites I and II are very small, but not reduced to the sternal part as in *Calabozoa pellucida* (Fig. 3a).

(ii) The uropods are subterminal and partly incorporated in the pleotelson, with a single developed, styliform structure (Fig. 4c), whereas in *C. pellucida* the uropods are small and laterally inserted. Both genera have uropods consisting of a single piece, with rami and sympodite fused together, a unique apomorphy of the Calabozoidea (Brusca & Wilson 1991).

(iii) The morphology of the stomach (TABACARU & PLATVOET 1997) shows several differences in the two species. In particular, the Brazilian species (Fig. 3) has a generally narrower, more compact shape, a reduction of the dorsal apodemes and longer lamellae caudales, and a few shape differences in the anterior and posterior filter apparatus.

(iv) In the ovigerous female, the eggs are on a single line anteriorly and on a double line, as in *C. pellucida*, after the midline of the body (Fig. 1).

(v) In the adult male, pleopod II (Fig. 4f) has a long, modified, styliform endopod, but the exopod is broader than in *C. pellucida*. The only male specimen available does not have completely worn mandibles as in *C. pellucida*, and the pleopod I of this specimen was missing. Pleopod II shows an elongate endopod and the ellipsoid exopod is developed. This description resembles that of juvenile males of *C. pellucida*. The absence of other specimens of this new species only allows us to state that the examined specimen is either a male with unmetamorphosed mandible or a juvenile male with very developed pleopod II endopod.

(vi) In the female, pleopods I and II (Fig. 4j-k) are similar to those of *C. pellucida*, although both rami are differently developed in the two species. In the Brazilian species, the pleopod II exopod is absent, but this is probably due to the poor conservation of the material.

(vii) In *P. xiphidiourus*, pleopods IV and V (Fig. 4g-h) have shorter and more glabrous setae than those of *C. pellucida*. These pleopods are very expanded and are probably used for swimming, an observed behaviour (E. TRAJANO pers. communication).

(viii) The pereopods (Fig. 4b) have longer setae than those of *C. pellucida*.

(ix) In *P. xiphidiourus* the cephalon is smaller than the pleonites (Fig. 2a).

No other observations were possible because of the poor state of the few specimens available.

The new finding provides further insights into the whole suborder, whose diagnosis should be in our opinion slightly modified.

Suborder Calabozoidea Van Lieshout 1983

Diagnosis. Pleonites I and II very small, sometimes reduced to sternal part, pleonites III-V free, pleotelson large, composed of pleonite VI and telson. Pleopods I and II present in both sexes, modified non-branchial. Pleopods III-V branchial. Uropods lateral to subterminal, exo-, endo- and pro-podite fused.

DISCUSSION

VAN LIESHOUT (1983), giving great importance to the reduction of the first two pleonites and the modification of the relative pleopods, acknowledged a closer relationship between Calabozoidea and Asellota. WAEGELE (1994) agreed with VAN LIESHOUT adding that at most it could be foreseen a sister group relationship. Nonetheless, the morphology of pleopods I and II in the new species has the same pattern as that indicated by BRUSCA & WILSON (1991) between *C. pellucida* and the

Oniscoidea. In addition, we agree with TABACARU & DANIELOPOL (1999) on the importance attributed to the entire pleon morphology. Both the reduction of pleonites I and II and the free, well developed pleonites III-V should be considered synapomorphies between the suborders Calabozoidea and Oniscoidea, while in Asellota the pleotelson also comprises pleonites III-V. An exclusively morphological comparison of the newly discovered specimens with the characters of Oniscoidea and Asellota strengthens the theory that Calabozoidea are phylogenetically closer to Oniscoidea.

ECOLOGY

The water table inside the cave, is a very slow-moving one, with a depth varying from 0.5-1 m (depending on the time of year) to more than 3 m. Because the conduits to deeper parts of the cave are narrow, it was not possible to evaluate the real depth.

The shallower parts are soft-bottomed and easily become turbid, making observations and collection particularly difficult. The surface of the main water body is covered by calcite rafts and a thick layer of this calcite covers the bottom. The bottom and submerged walls are covered by a layer of silt and clay sediment, favouring proliferation of anaerobic bacteria. Gas bubbles are released when this sediment is disturbed. The water mean physico-chemical variables (pH 6.99; temperature 26.38 °C; dissolved xygen 1.06-2.49 mg l^{-1}; conductivity 1.47 mS cm^{-1}) are those typical of fresh water layer mainly originated by meteoric water.

The isopods could be seen by a snorkelling observer. They were slowly swimming in the water column, but never far (up to 20-30 cm) from the nearest substrate, usually walls with platforms covered by very thin sediment with organic matter. They did not seem to be disturbed when approached and possibly were not photophobic. However, it is also possible that they were originally on the substrate and then displaced or made to swim when approached (TRAJANO & BOCKMANN 2000). A visit paid in July 2001 by one of the authors (G. Messana), to the same cave, did not gave any result. No Calabozoidae could be seen neither swimming nor walking on the walls nor were found in the substrate.

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