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ATLANTASELLUS CAVERNICOLUS n. gen., n. sp. (ISOPODA ASELLOTA, ATLANTASELLIDAE n. fam.) FROM BERMUDA*

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SYNOPSIS — *The new taxon has been found in the anchialine pool in a cave of Bermuda. It is the only known marine counterpart of two families inhabiting continental waters. It differs from Asellidae and Stenasellidae by a sphaeromatoid habitus, missing ♀ pleopods II. and inarticulate pleopods III. The phylogenetic importance of some other characteristics has been discussed.*

IZVLEČEK — *ATLANTASELLUS CAVERNICOLUS* n. gen., n. sp. (ISOPODA ASELLOTA, ATLANTASELLIDAE n. fam.) Z BERMUDOV — *Novi takson smo našli v anhialinem tolmunu v jami na Bermudih. Je edini morski dvojnik družinama, ki naseljujeta le kontinentalne vode. Od pripadnikov družin Asellidae in Stenasellidae se razlikuje še po sferomatoidni postavi, nerazvitih II. ♀ pleopodih in nečlenjenih III. pleopodih. Obravnavan je filogenetski pomen nekaterih drugih značilnosti.*

Researching the cave fauna of the Bermuda Islands in the company of dr. Thomas I l i f f e we found a small, translucent and eyeless Asellote Isopod which appeared to be morphologically very distinct. The new taxon is occurring only in single specimens in the samples from the sea-water pool in the Walsingham Sink Cave, accompanied by some marine (even planctic!) and some subterranean (*Ingolfiella* sp., *Eriopisa* sp., *Bogidiella martini* ssp., e. g.) animals. In the first samples only females were present, so that we have to do with only a single male, which finally enabled us to find a right systematic position for the new taxon.

I am very grateful to T. Iliffe (Bermuda) who provided most samples; T. Wolff (Kobenhavn) provided me some missing literature and G. Magniez (Dijon) was kind enough to check the newness of the animal.

Systematic position. The body-shape of the new species, bound to volvation, is very common among marine Isopod groups (Scphaeromatidae, *Haploniscus* e. g.), but the shape of its pleopods is unique among them.

W o l f f (1962) divided Isopoda Asellota into 4 subtribes viz. superfamilies. The fifth one, added by S c h u l t z (1978) is of doubtful value, as the *Protallocoxa weddellensis* Schultz (1978) seems to be synonymous with a *Stenetrium* sp. It fits into that genus by all its features. The suture of the coxa I (viz. epimeron) is a feature which also in some other groups (Spheaeromatidae-Monolistrini e. g.) is occurring only sporadically.

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The new animal obviously doesn't belong to Stenetrioidea Hansen, Parastenetrioidea Amar of Paraselloidea Hansen resp., which are marine with few exceptions. In spite of being a marine animal it has an arrangement of pleopods of the Aselloidea G. O. Sars, which are completely (or almost) limnic. The male pleopods I and II are in their general appearance typically aselloid. As it differs from both the Asellidae Sars and Stenasellidae Dudich in the todays conception (Magniez 1974) by its body form, missing female pleopods II and inarticulate pleopods III, one has to establish a nem family for it. Provisionally, the diagnosis of the

Atlantasellidae n. fam. should include:

Aselloidea of the sphaeromatoid habitus. Male pleopods I 2-articulate, male pleopods II with a sympodite, small exopodite and a 1-articulate copulatory endopodite. The female pleopods I and II are missing. Pleopods III operculate but not fused, without articulation lines. Pleonites I and II free and well developed. Type: *Atlantasellus* n. gen.

Some important differences between the known families of Aselloidea and the new taxon:

	Asellidae	Stenasellidae	*Atlantasellus*
maxilla I, lob. int., terminal setae	at least 4	5 (at least 3 well developped)	only 1
maxillipedium, epipodit	developed	absent	developed
♀ pleopod II	developed	developed	absent
♂ pleopod II, endopodit	1 article	(usualy) 2 articles	1 article
pleopod III	articulate, 2 branches	articulate, 2 branches	inarticulated, endopodit absent
pleonites I—II	much reduced	± normal	normal
habitus	basically aselloide (sometimes elongate or peltate)	basically aselloide (usually elongate, sometimes peltate)	basically sphaeromatoide

Description

Atlantasellus gen. n.

Habitus sphaeromatoide, pleonites I—II developed. Antennae I flattened, short and extremely broad. Antennae II normal, short. Pereiopods I prehensile, walking legs with two claws on their dactyls. Female pleopods I—II missing. Male pleopods I not fused, sympodite very short and wide, distal article long and narrow. Exopodite of the male pleopode II biarticulate, but small. Copulatory endopodit uniarticulate. Uropods vestigial, inarticulate. Typus generis: *Atlantasellus cavernicolus* sp. n.

Atlantasellus cavernicolus sp. n.

Material: holotype — ♂ 1,1 mm — and 5 ♀♀ (1 postmanca), collected in Walsingham Sink Cave, Bermuda, by T. Iliffe and B. Sket, sept. 1978—apr. 1979.

The body is elongated, semi-cylindrical, transversally bendable; it is unpigmented and translucent. The head eyeless, large, its front margin forming three triangular processes with insertions of antennae I in between. Epimeral processes vertical, ± broadly rounded distally. Pleonites I—II free, a bit shorter than the pereionites, with normally developed epimera. Pleotelson elongated semicircular, its margins folded downwards, in the distal part inwards, with deep uropode insertions distally. The entire body dorsally and laterally very sparingly setose. The spermatozoids are much longer than gonopods.

Antenna I about half as long as the head, 5-articulate, widened, and flat. Its article 1 cup-shaped, the second wider than long. Four very long aesthetascs are inserted on the smaller flagellar articles. Setation poor, lateral borders partially adorned by a thin lamella.

Antenna II normally shaped and about twice as long as the first one, consisting of 8 articles. It is provided by groups of setae that may reach the length of the articles. Exopodit not visible.

Mandibula with an almost unserrated incissor process, its distal margin being only slightly concave. Lacinia mobilis fan-shaped, its distal margin serrated. The molar process seems to be replaced by a long brushlike process (divided distally into 4 setae). The palp long, the 2nd article being the longest. There is a regular row of 7 setae on the distal part of the 3rd article.

Maxilla I bearing a row of about 9 unequally long setae on its outer lobe. The inner lobe short, with a single long seta distally.

Maxilla II divided into three equally long parts. Both parts of the outer lobe bearing 2—3 long, serrated setae distally each, the inner lobe only one (to two).

Maxillipedium with a broad 2nd article and its endit. The palp not very thick, but widened by a narrow and thin marginal lamella. Two coupling hooks.

Pereiopods I prehensile, of a similar shape as in the Asellidae. The propus of a rounded-triangular shape, much longer than wide. Its palmar margin provided with 4 differently shaped spines. The most proximal one is smooth, the other ones with sharp lateral denticles. The 1st article (basis) long, the 2nd—3rd very short.

Pereiopods II—VII of similar shapes and leghts, only the 2nd is a little bit shorter than the 3rd—7th (length ratio 1 : 1,2), mostly because of its shorter basipodite. The legs are slender, sparingly setose. The 2nd—4th is bearing a somehow comb-shaped thick seta in the distal part of the dorsal margins of their 4th articles. The dactylus has two claws. All longer articles of cylindrical form.

Pleopod I with a very broad and short sympodite. The long and narrow distal article inserted in the median part of the sympodite, with two hairs in the distal part, one of them being very long and plumose.

Pleopod II of about the same length as the preceding one. Sympodite nearly cylindrical, of a greater length than width. The exopodit vestigial but apparently 2-articulate. The endopodite of a rather complicated structure. In its proximal part it is cylindrical, partly wrapped by a folded lamella. Its distal opening surrounded by a wide fault with an arrangement of setae and continuing into a distolateral split. A small, fingerlike process is developed subdistally. There are some groups of small setae along the free edge of the wrapping lamella. Proximally to the distal widening, on the outer surface there is a group of small hooks.

Pleopod III is stronger sclerotised and provided with a superficial sculpture, (very prominent) keels and edges. It is rounded triangular, in its proximal part being the widest. There are some setae at the distal end near the side margin. The endopodit is not developed.

Pleopod IV consisting of two subparallel and subequally wide branches. At least one articulation line in the distal part of the exopod is developed as well as an incision in the proximal part of the outer margin. The exopodit with 2, endopodit with 3 plumose setae on their distal borders.

Pleopod V consisting of only one, seemingly structureless plate.

Uropodes vestigial, ovoid, inserted deeply in the incisions of the distal end of the pleotelson. They are inarticulate and provided with several setae.

The female of the same length or slightly longer than the male, differing from it only by the presence of only 2 aesthetascs on the 4-articulated antenna I as well as by the absence of pleopods I—II. Oostegites seem to be undeveloped.

Habitat. (some details in Sket and Iliffe, in press).

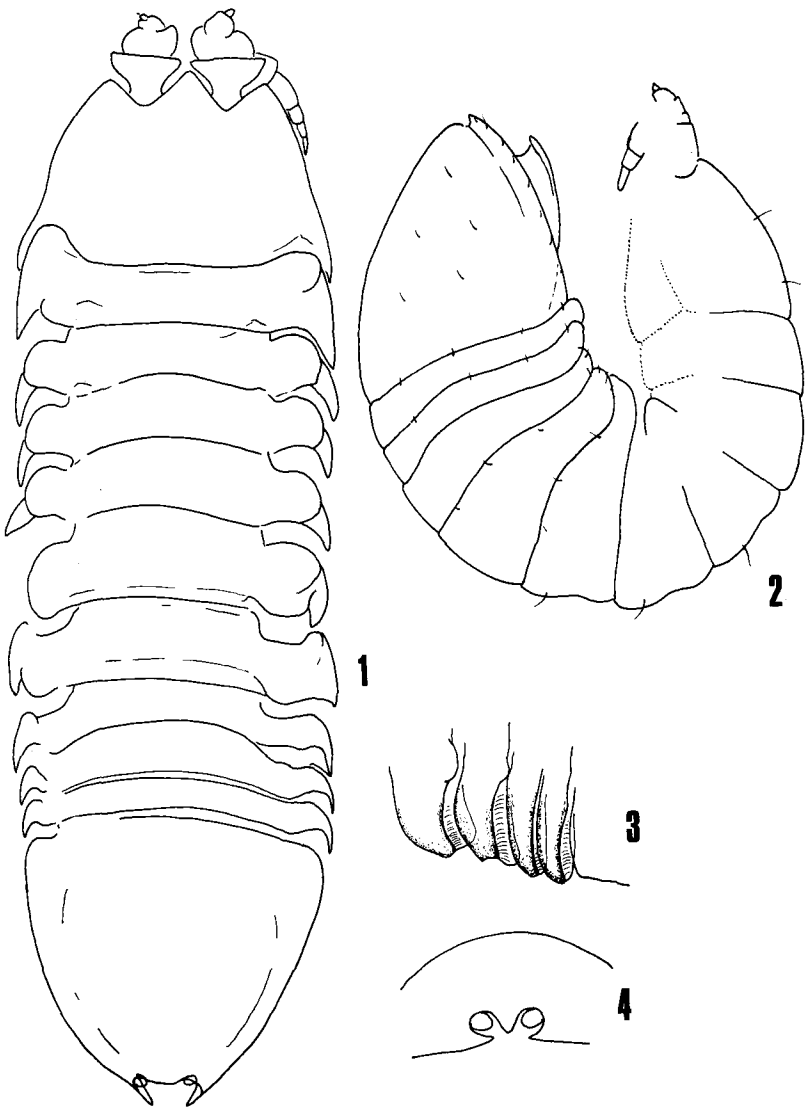
The animals have been caught on the steep bottom of the anchialine pool in the Walsingham Sink Cave. The salinity doesn't differ much from the marine one.

Accompanying fauna: *Caecum heladum, C. tornatum, C.* sp. (Gastropoda), *Laonice cirrata, Mesonerilla* sp. (Polychaeta), *Ridgewayia marki, Pseudocyclops* sp., Calanoida g. sp., *Paramphiascella robinsoni, Laophontidae* g. sp. (Copepoda), *Bairdia* sp. (Ostracoda), *Limnoria* sp. (Isopoda), *Eriopisa* sp. (nova, a single specimen), *Ingolfiella* sp. (nova, a single speciment, *Bogidiella martini* ssp. (nova) (Amphipoda) These are mostly marine animals, some of them even planctic, some others obviously interstitial. It is very doubtful, if the benthic habitat in the cave is normal for the *Atlantasellus;* it could be also a direct immigrant from abyssal or interstitial waters.

Phylogenetic evaluation of morphological characters.

Among others, the new taxon is characterised also by some features of an obviously adaptive character. But among them, at least the body shape, with the ability to volve, is phylogenetically a »heavy« sign. It appears often in the Isopoda but characterises usually the whole higher taxa (Sphaeromatidae, Haploniscidae e. g.). It is also less common in Asellota and has not been found until now in Aselloidea.

Well-developed and free fore pleonites are a primitive feature shared among Asellolidea by most Stenasellidae.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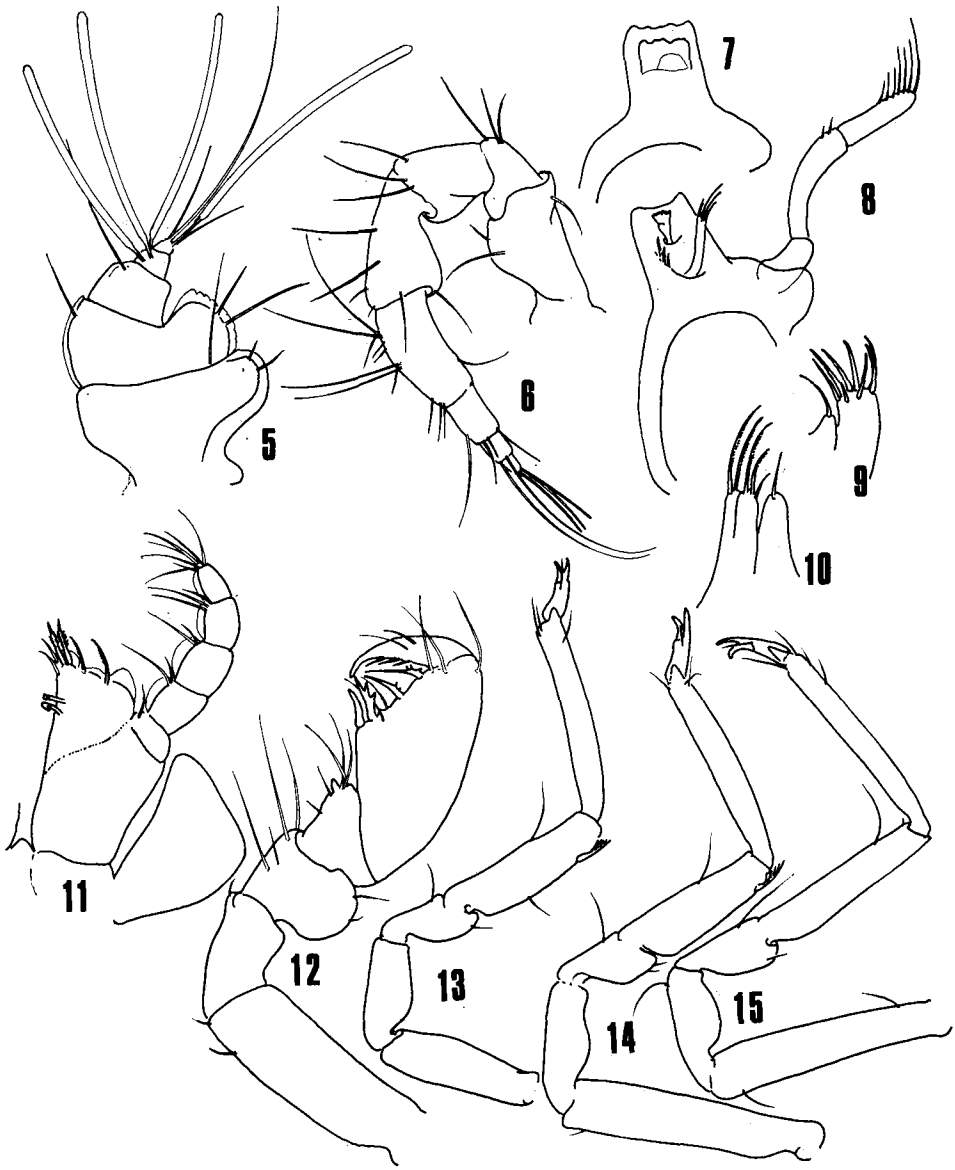
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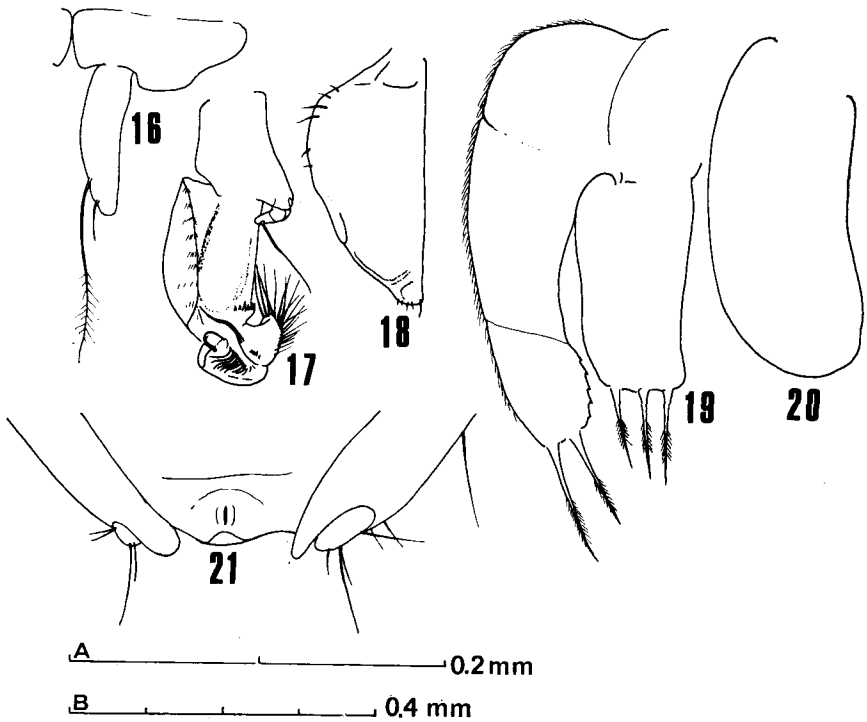

Fig. 1—21. *Atlantasellus cavernicolus* n. g., n. sp., Walsingham Sink Cave, Bermuda; holotype male of 1,1 mm (5—6, 9, 11—17) and a female (1—4, 7—8, 10, 18—21); Scale (merilo) *A* for 5—17 and 19—21, *B* for 1—3 and 18; 1—2 habitus, 3 epimera of pereionites VI and VII and pleonites I and II, 4 pleotelson from behind (free-hand sketch), 5—6 antena I and II, 7—8 mandibulae, 9—10 maxillae I and II, 11 maxillipedium, 12—15 pereiopodes I—III and VII, 16—17 ♂ pleop. I and II, 18—20 pleop. III—V (18 — scale B!), 21 the caudal end of the pleotelson from the ventral side

The unusual shape of the first antennae is also of an adaptive nature, functionally intended for volvation. It represents one of the possibilities for less disrupting the margins of the body.

It is difficult to evaluate some pecularities of the mouth parts, but it is very probable that they are of adaptive nature, too, being of direct importance in feeding. There is little variability in the mouth parts of the Asellidae and Stenasellidae, except for the reduction of the mandible palp in some japonese species (Matsumoto 1966) and the widening of the maxilla in some phreatic taxa from Yugoslavia (Sket 1965). But there is a great diversity in the structure of the mouth parts, in Paraselloidea (Wolf 1962), living under higher selective pressures in the marine environment.

The whole arrangement and shape of pereiopods is typical for the aselloid type, except for the cylindrical form of the articles, which have been widened and modified in locomotory more active limnic forms (apparently all Isopods capable of volvation are swimmers or comparatively slow walkers). The

dactyls in this superfamily have usually but one claw, but the inner spine may reach almost an appropriate length for being a second one (*Johanella* Monod, *Mexistenasellus* Cole et Minckley e. g.).

The absence of female pleopods II is no doubt an apomorphic character of a pretty high phylogenetic weight. Male pleopods I are typical of Aselloida by their structure and peculiar only by their proportions. The structure and shape of the gonopods is extremely diverse in the whole superfamily. By its general shape the one of *Atlantasellus* resembles the gonopod of any Asellide, except for the exopodite which is more reduced than in any other known species. The endopodite could fit very well into the wide spectrum of *Bragasellus* diversity.

The structure and sculpture of pleopods III is unique, without a counterpart in the Aselloidea (and Asellota ?). It represents the results of another phyletic way toward the effective covering of breathing pleopods (or the continuation of the way carried out by Asellidae and Stenasellidae).

The pleopods IV are different from those in most Aselloida, but similar to the pleopods in some Stenasellidae (*Stenasellus gjorgjevici* Racovitza e. g.). They are also similar to the first breathing pleopod (pleopod III) of most Janiroidea. A partial reduction of the hind (V) pleopods is sometimes associated with the diminution of the body (*Proasellus deminutus* group e. g.) and can be explained by a lover need of breathing surfaces.

The uropods are never as reduced in the Asellidae or Stenasellidae as they are in the *Atlantasellus*. Also this peculiarity may be functionally associated with volvation.

It can be concluded that the *Atlantasellus* represents an independent phyletic line of the Aselloidea, developed towards the sphaeromatoide »Lebensform«.

As well as the morphology of the *Atlantasellus*, its habitat is worth mentioning. All other Aselloida are known from fresh waters. Continental waters are a suitable refuge for old, conservative types, unable to compete in the sea with their »modern«, newly evolving relatives. The same is true of the caves and other »extreme« habitats. Thus it is not surprising that the only marine Aselloid has been found in a cave.

Povzetek

ATLANTASELLUS CAVERNICOLUS N. GEN., N. SP. (ISOPODA ASELLOTA, ATLANTASELLIDAE N. FAM.) Z BERMUDOV

Poleti 1978 sva z dr. T. Iliffejem začela na Bermudih raziskovati jamsko favno, omenjeni kolega je sam nadaljeval s terenskim delom. Odtlej smo iz zbranega materiala postopoma nabrali 5 samic, končno pa tudi samca nove, drobne in brezbarvne vrste izopodnih rakcev. V prispevku je podan natančnejši opis te zanimive živalce pod imenom *Atlantasellus cavernicolus*. Telesna dolžina znaša le dober milimeter, telo pa je oblikovano tako, da se lahko prepogne (zvije) v kroglici podobno tvorbo. *Atlantasellus* sicer nedvomno spada

v naddružino Aselloidea, vendar pa je njegova zgradba toliko svojevrstna, da smo morali ustanoviti novo družino Atlantasellidae. Pri tem je zanimivo, da gre za edinega (znanega) morskega zastopnika naddružine, saj sta obe preostali družini (Asellidae in Stenasellidae) izključno sladkovodni. Posebnost nove družine je tudi telesna oblika, predvsem pa značilnosti pleopodov, ki veljajo pri redu Asellota za zelo pomemben taksonomski znak.

Pri filogenetski oceni morfoloških značilnosti atlantasela se je pokazalo, da je večina njegovih posebnosti povezana s prilagoditvijo na zvijanje (npr. skrajašnje anten in uropodov, nespecializiranost pereiopodov), sicer pa ima nekaj plesiomorfnih (primitivnih; npr. dobro razviti spredni pleoniti) in nekaj apomorfnih (npr. redukcija nekaterih delov na pleopodih) znakov, katerih pomen je bolj splošnega značaja.

Rakca smo našli v jami Walsingham Sink Cave v anhialinem (z morjem povezanem) tolmunu. Slanost je povsem ali skoraj morska. Spremljevalno favno sestavljajo morske živali, med njimi tudi planktonske, vendar pa tudi nekaj takšnih, ki so prišle semkaj očitno iz intersticialne vode. Tudi med spremljevalno favno je več za znanost novih vrst.

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