



A new genus and a new species in the sea cucumber subfamily Colochirinae (Echinodermata: Holothuroidea: Dendrochirotida: Cucumariidae) in the Mediterranean Sea

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Abstract

A new genus *Hemiocnus* is here erected to accommodate the Mediterranean dendrochirotid sea cucumber *Cladodactyla syracusana* Grube, currently classified, with some doubt, in the cucumariid genus *Pseudocnella*. At the same time a new cucumariid species, *Hemiocnus rubrobrunneus*, is described from some Tunisian material, misidentified as *Pseudocnella syracusana* (Grube), received from the United States National Museum. The new genus appears most closely related to *Pseudocnella* than to any other genus within the Colochirinae. Although its body wall ossicles resemble those of *Pseudocnella* spp. it differs in that the two ventral-most tentacles are reduced and in the presence of rosettes in the tentacles. *P. syracusana* also cannot be classified in *Ocnus* because of the presence of multi-layered, fir-cone shaped plates in the body wall, often with one end denticulate; such ossicles are lacking in the type species of the latter genus. The new species, *Hemiocnus rubrobrunneus*, on the other hand, shows some resemblance to *H. syracusanus* in its characteristic buttons and incomplete baskets, differing in its softer body wall, lack of fir-cone-shaped plates and in the presence of rosettes and complete baskets in the body wall. There are also some resemblances of the new species to the Mediterranean species of *Ocnus* viz. *O. brunneus*, *O. planci* and *O. lacteus*, but the soft nature of the body wall, shallow quadrilocular instead of deep trilocular baskets, and the presence of large knobbed plates in the anal region precludes its inclusion in this genus.

Key words: *Ocnus*, *Hemiocnus*, *Pseudocnella*, Mediterranean, Tunisia

Introduction

During revision of the dendrochirotid genera *Pseudocnus* Panning and *Pseudocnella* Thandar, some materials were obtained on loan from various international institutions. The material from the United States National Museum (USNM) (Smithsonian Institution), apart from other specimens, included a jar containing three small, dark reddish-brown dendrochirotids labelled *Pseudocnella syracusana* (Grube), identified by Cynthia Ahearn. In addition, the materials received from the Zoologisches Museum of the Universität Hamburg, Germany, included a much larger, light brown specimen labelled *Pseudocnus syracusanus* (Grube, 1840). The small specimens from the USNM are soft, with a thin body wall, tube feet mostly restricted to the ambulacra in two distinct rows, with only few scattered in the dorsal interambulacra, while the larger specimen from the Hamburg Museum, is rigid with a thick body wall, and dorsal tube feet distributed in both ambulacra and interambulacra without any serial arrangement. This latter specimen also possesses some dorsal ‘papulae-like’ structures, reminiscent of species of *Pseudocnella*, which are lacking in the USNM material and in species of *Ocnus*.

Based on size, colour, thickness of body wall, tube feet distribution, presence/absence of ‘papulae-like’ outgrowths, and the form of the body wall ossicles, it became obvious that both materials are not conspecific. The specimen from the Hamburg Museum appears to be a true *Pseudocnella syracusana*, corresponding well with the descriptions of the species by Grube (1840) and subsequent authors including Sars (1857), Koehler (1921), Panning (1949), and Cherbonnier (1956) and those examined by one of us (AST) in the Natural History Museum,

London (NHMUK). Since *P. syracusana* has the two ventral-most tentacles reduced, its hesitant placement in *Pseudocnella* by Thandar (1987) was again questioned, since both Rowe and O'Loughlin (pers. com) independently believe that species with the two ventral-most tentacles reduced cannot be congeneric with those with equal tentacles. Their views are here upheld and supported. Since no other genus exists to accommodate *P. syracusana* a new genus, *Hemiocnus*, is here erected in the subfamily Colochirinae for this purpose. However, the specimens from the USNM appear to represent a new species, herein described as *Hemiocnus rubrobrunneus*. The southern African *Pseudocnella insolens* (Théel, 1886) is also transferred to the new genus (see Remarks below under *Hemiocnus*). Perhaps some other species currently standing in *Pseudocnus* or *Ocnus* can be referred to it but this is beyond the scope of this paper.

Materials and methods

The specimens were studied by both macro- and microscopic examinations, using conventional methods outlined by various authors. Ossicles were prepared as follows:

Small fragments of excised tissue (body wall, tube feet, tentacle and introvert) were placed in household bleach (hypochlorite solution) until the soft tissues dissolved and the ossicles separated. The excess fluid was decanted and any superfluous tissue discarded. The sediment (ossicles) were then washed in 2-3 changes of distilled water, viewed under the compound microscope and illustrated with the camera lucida. For scanning electron microscopy (SEM) the washed ossicles were rinsed in 2 changes of 70% ethanol and 2 changes of absolute alcohol. They were then transferred onto a clean specimen stub and allowed to dry, causing the ossicles to adhere onto the stub. The stubs were then coated in gold for 5–15 minutes using a Polaron SC500 Sputter-Coater, and then viewed and photographed using Jeol LEO SEM.

Taxonomy

Order Dendrochirotida Grube, 1840

Family Cucumariidae Ludwig, 1894

Subfamily Colochirinae Panning, 1949

Genus *Hemiocnus* n. gen.

Cladodactyla Grube, 1940:40 (*partim*).

Cucumaria Sars, 1857:123, Pl. 1 figs. 24–29. Théel, 1886:113; Koehler, 1921:155, fig. 106; Cherbonnier, 1956:20 (*partim*).

Ocnus Panning, 1949:438, fig. 33, 34 (*partim*).

Pseudocnus Panning, 1962:68, fig. 13, 14 (*partim*).

Pseudocnella Thandar, 1987:288, 289 (*partim*).

Diagnosis. A genus of Cucumariidae with tube feet scattered or confined to ambulacra. Tentacles 10, ventral-most two or a couple of others reduced. Calcareous ring simple, without posterior prolongations. Body wall deposits include large, complex, multi-layered, fir-cone-shaped plates often with one end denticulate, with denticles sometimes borne on a projecting handle-like structure, and knobbed plates/buttons; an external layer of cross-shaped, incomplete baskets also present, though not always identifiable in the type species. In the new species (described below) rosettes and complete baskets present in addition to incomplete baskets whereas large plates are restricted to the anal region of some specimens. Tube feet with rods or plate-like rods. Tentacle and introvert ossicles include rosettes in addition to rods and plate-like rods.

Type species. *Cladodactyla syracusana* Grube, 1840.

Other species included. *Pseudocnella insolens* (Théel, 1886); *H. rubrobrunneus* n. sp.

Etymology. Since this genus is close to *Ocnus* it takes its name from it.

Remarks. The new genus is diagnosed in the cucumariid subfamily Colochirinae because of the presence of baskets of some form in the body wall of all species assigned to it. The new genus resembles *Pseudocnella* Thandar, 1987 and *Ocnus* Forbes & Goodsir (in Forbes, 1841). However, Thandar (1987) transferred *Pseudocnus syracusanus* to *Pseudocnella* with some doubt because it shares some characters with each of the three species he assigned to this genus. It now appears that *Pseudocnella* is strictly a southern African genus in which the tentacles are of equal size and there are no buttons in the body wall. Hence *P. insolens* (Théel) with its one or two slightly reduced tentacles and the presence of buttons in the body wall in addition to plates and rosettes in the tentacles cannot be classified in *Pseudocnella*. Hence it is here transferred to the new genus. Thandar (1987) did comment that it is different from the other two species of *Pseudocnella*. Further, DNA sequencing of this latter species also throws it out of the *Pseudocnella* group but this research is still in progress. Now, also included in the new genus is *H. rubrobrunneus* because it shares with the type species similar incomplete baskets and buttons in the body wall but differs in the presence of also complete baskets and rosettes and the absence of large complex, fir-cone-shaped, multi-layered plates in most of the body wall. *Hemiocnus* resembles *Ocnus* in the 8+2 arrangement of tentacles and the presence of rosettes in the tentacles. However, the two genera are distinct in that *Hemiocnus*, like *Pseudocnella* and *Pseudocnus*, usually has in its body wall fir-cone-shaped plates often with one end denticulate while *Ocnus* lacks plates of this form altogether. Further the baskets of *Ocnus* are described as deep and basically tri-radiate/trilocular (Rowe & Gates 1995) and not shallow and quadrilocular as in the new species.

***Hemiocnus syracusanus* (Grube, 1840)**

(Figures 1 & 2)

Cladodactyla syracusana Grube, 1840:40.

Cucumaria syracusana Sars, 1857:123, Pl. 1 fig. 24–29; Théel, 1886:113; Koehler, 1921:155, fig. 106; Cherbonnier, 1956:20.

Ocnus syracusanus Panning, 1949:438, fig. 33, 34.

Pseudocnus syracusanus Panning, 1962:68, fig. 13, 14 (?).

Pseudocnella syracusana Thandar, 1987:288, 289.

Diagnosis (from Sars 1857, amended herein). Body sub-cylindrical, colour light-brown in alcohol. Dorsal tube feet in both radii and interradii. Tentacles 10, ventral-most two reduced. Calcareous ring simple, without posterior processes. Body wall thick, rigid. Ossicles of body wall comprise fir-cone-shaped plates, often denticulate at one end, and round, knobbed, often 4-holed buttons. Incomplete baskets may also occur as dichotomously branched rods, usually in association with bases of tube feet. Tube feet with rods; tentacles with rods and rosettes.

Material examined. Zoologisches Museum Hamburg, E2877, Zool. Stat. Europa, Italien, Neapel, 1 spec.; NHMUK, 1982.6.1.6-8, Shigmona, south of Haifa, Dr. Lewinsohn, 4 spec.

Description. This species is well known and hence only a brief description of the Hamburg specimen from Naples follows. Body curved, mouth and anus turned up; colour light brown in alcohol; length 56 mm, width in mid-body 19 mm. Tube feet in two rows ventrally, but scattered dorsally. Anal papillae present. Tentacles 10, ventral-most two reduced. Calcareous ring simple, without posterior prolongations, radials slightly notched posteriorly. Retractor muscles arise from longitudinal muscles at about half body length. Polian vesicle and stone canal not detected. Gonad of numerous, unbranched tubules. Respiratory trees highly branched.

Body wall ossicles comprise large, multi-layered, fir-cone-shaped knobbed plates, denticulate at one end; large knobbed, non-denticulate, round plates; smaller rounded, knobbed buttons/plates; and occasionally incomplete cross-shaped baskets appearing as dichotomously branched rods (Figure 1A) also present. Denticulate fir-cone-shaped plates 290–340 µm (Figure 2A); large knobbed round non-denticulate plates 150–210 µm (Figure 2B); small knobbed buttons/plates up to 120 µm, with 4–(8) holes (Figure 2C), holes up to 10 µm, knobs up to 30 µm; incomplete baskets typically like those of *Pseudocnella sinorbis* (Cherbonnier). Tube feet deposits include perforated rods (Figure 1B) and often also incomplete baskets; end-plates present. Tentacle deposits include rods (Figure 2D,E) and rosettes (Figure 1C), but latter not as numerous as in *H. rubrobrunneus* n. sp.

Distribution. Mediterranean Sea, Italy, off west coast of Africa.

Remarks. This species was described from the Mediterranean Sea by Grube (1840) as *Cladodactyla syracusana* but transferred to *Cucumaria* by Sars (1857). Théel (1886) followed Sars and accepted the species as *Cucumaria syracusana*, recording its distribution as the Mediterranean Sea and off west coast of Africa. Panning

(1949) transferred the species to *Ocnus*. Grube (1840), Sars (1857) and Théel (1886) did not describe the calcareous ring, but this was done by Panning (1949). Later Panning (1962) transferred the species to *Pseudocnus* with some reservation. Subsequent to this, Thandar (1987), in his revision of some southern African Cucumariids, erected a new genus *Pseudocnella* to accommodate three common southern African species and hesitantly also included in it *P. syracusanus*. The specimen from Hamburg Museum and those in the NHMUK, represent the true *syracusanus* as their characters match those recorded for this species by various authors. According to Thandar (1987) the genus *Pseudocnella* is characterized by 10 equal tentacles with only one species (*P. insolens*) having one or more reduced, but not necessarily the ventral-most two, and buttons in the body wall. In addition, all species possess, at least at some stage of their development, an external layer of incomplete baskets. Since *syracusanus* has an 8+2 arrangement of tentacles, often incomplete baskets in the body wall as well as buttons, it cannot be classified in *Pseudocnella*. It also not referable to *Ocnus* because of the presence of large knobbed, multi-layered, often denticulate plates and ‘papulae-like’ extensions dorsally and no complete baskets. The new genus is closer to *Pseudocnella* than it is to *Ocnus*.

Panning (1962) reported on 3 specimens from Naples, measuring 29 mm, 45 mm and 58 mm in length. His drawings of the ossicles in Figure 14 (a–i) matches both *H. syracusanus* and *H. rubrobrunneus* n. sp. here described, but his Figure 14 (c–e) appears to be of the small specimen since such ossicle types are not found in the body wall of a typical *H. syracusanus*. It is therefore suspected that Panning (1962) did not clearly distinguish between the two forms he had at hand. Any re-assignment of part of Panning’s (1962) material will require its re-examination, hence until Panning’s material is re-examined this is just a conjecture. Grube’s (1840) description of his *Cladodactyla syracusana* is rather vague but Sars (1857), as the first reviser, found baskets and multi-layered fir-cone-shaped plates in the body wall. His description of the plates comes very close to the larger specimen here described and so do the descriptions of Koehler (1921) and Cherbonnier (1956). Therefore, there is no doubt that the USNM and that from Hamburg are not conspecific.

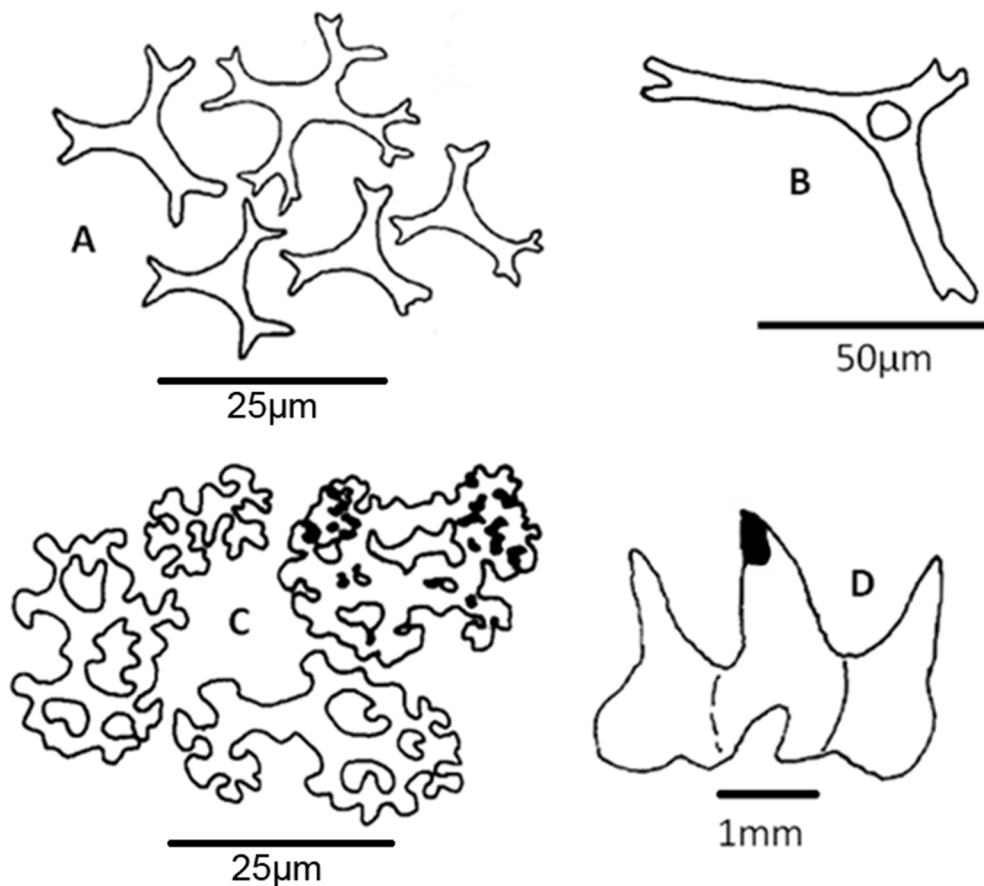


FIGURE 1. *Hemiocnus syracusanus*. A. Incomplete baskets from body wall; B. Rod from tube foot; C. Rosettes from tentacles; D. Calcareous ring .

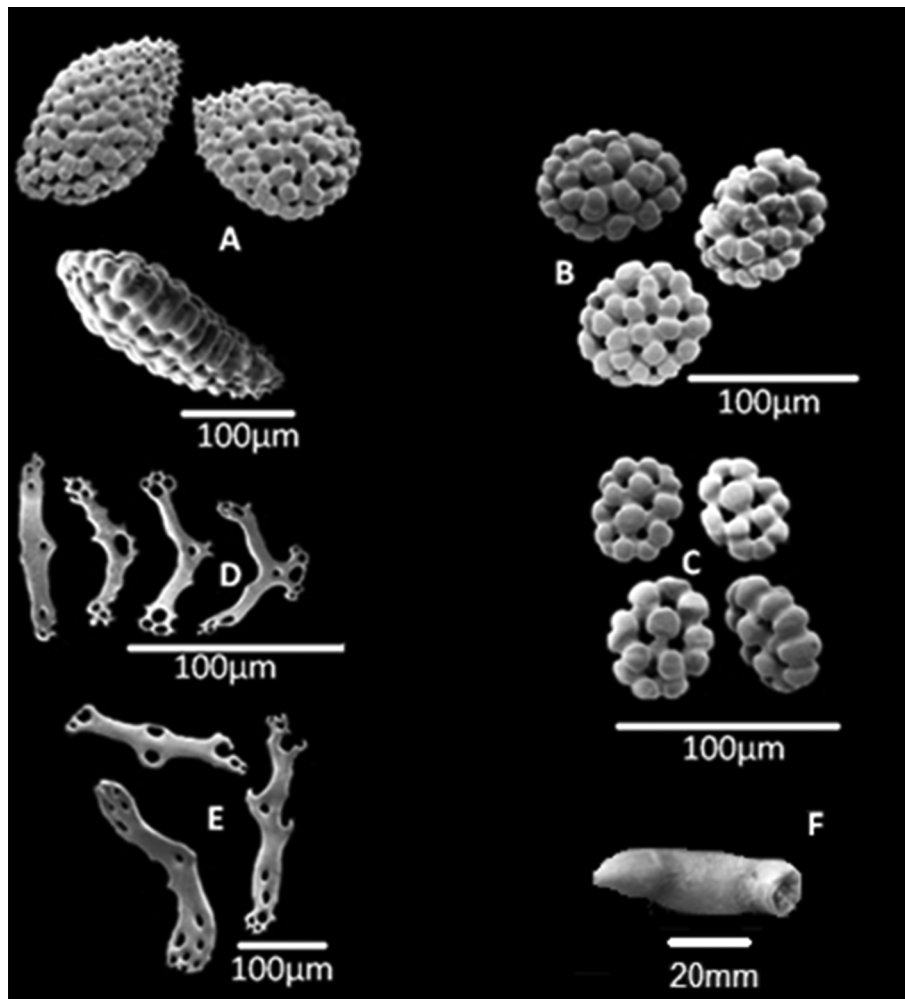


FIGURE 2. *Hemiocnus syracusanus*. A. Fir-cone-shaped plates from body wall; B. Large round plates from body wall; C. Buttons from body wall; D. Small rods from tentacles; E. Large rods from tentacles; F. Specimen entire.

***Hemiocnus rubrobrunneus* n.sp.**

(Figures 3–6)

Diagnosis. Species soft, flaccid; body subcylindrical to barrel-shaped; colour in alcohol dark reddish-brown in bright light. Length up to 32 mm. Mouth and anus terminal. Anal teeth/papillae absent. Tube feet short, mostly non-retractile, two rows per ambulacrum, few also scattered in dorsal interambulacra. Body wall ossicles comprise a layer of complete and incomplete baskets, accompanied by rosettes, in addition to small, rounded, knobbed plates. Large smooth to knobbed plates sometimes present in anal region. Tube feet deposits comprise baskets, rods and rosettes. Tentacles and introvert with rods and rosettes; knobbed, rounded plates also occur in introvert.

Etymology. The species is named for its reddish-brown colouration.

Material examined. Holotype: USNM (Smithsonian Institution), E22590, Jerba Island, between Houmt Sauq and Bordj Djillidj, Tunisia, 1 m., Jones, M.L. 1973; Paratypes, same data as holotype, 2 spec. (all specimens formerly determined as *Pseudocnella syracusana* by C. Gust (C. Ahearn), 1981).

Description of holotype. Form subcylindrical to barrel-shaped (Figure 4D), 29 mm in length, 13 mm in breadth in mid-body (paratypes 29 x 12 mm and 32 x 12 mm). Skin soft, colour in alcohol, a dark reddish brown in bright light. Mouth and anus terminal. Tube feet short, distributed in two distinct rows ventrally, and in somewhat zigzag rows dorsally with few also in dorsal interambulacra. Tentacles retracted, bushy, 10, ventral-most two reduced. Calcareous ring (Figure 6G) typically cucumariid, simple, without posterior prolongations, radial plates bifid anteriorly, all plates deeply notched posteriorly. Madreporite bean-shaped, stone canal short; Polian vesicle

single. Retractor muscles short, arising from longitudinal bands at about half body length from anterior end. Longitudinal muscles not paired. Respiratory trees well branched, about $\frac{3}{4}$ of body length from posterior end. Gonad in single tuft, tubules unbranched, partially full of developing eggs.

Body wall deposits consist of baskets and knobbed, perforated buttons/plates and rosettes. Buttons (70–100 μm) with mostly 4(–6) holes, rarely more, most about 100 μm , with 1–3 central knobs, rarely more (Figure 3A). Baskets numerous, both complete and incomplete (Figures 3B & D), incomplete baskets appearing as X- or Y-shaped simple, smooth deposits with dichotomous branchings, whereas complete baskets appear as shallow, flat cups with blunt spines around the rim. Rosettes appear as both open and closed types. Anal region with multilocular, smooth and/or knobbed plates (Figure 5). Tube feet deposits include rods, rosettes and baskets. Rods simple, mostly table-like, perforated at ends and with a spire-like medial extension (Figure 6C). Rosettes simple (Figure 3E), or developing into complex, opened ones (Figure 3F), and eventually into closed knobbed ones (Figure 3G). Baskets of tube feet complete and incomplete, similar to those of body wall. End-plates present, better developed ventrally. Tentacle and introvert ossicles include rosettes in addition to rods (Figures 4A, B&C; 6A,B,D & E); some simple knobbed rounded plates (Figure 6F) also observed in introvert.

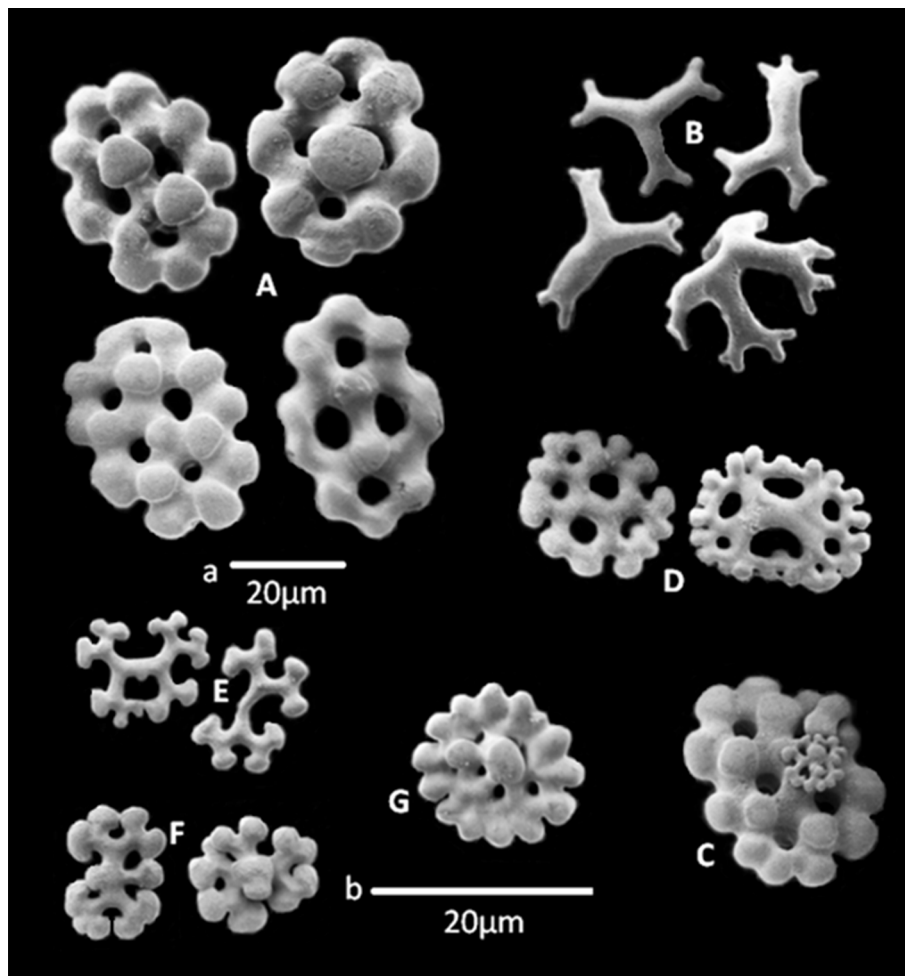


FIGURE 3. *Hemiocnus rubrobrunneus* n. sp. ossicles. A. Buttons from body wall; B. Incomplete baskets from body wall and tube feet; C. Basket on knobbed button; D. Complete baskets from tube feet; E. Simple open rosettes from body wall; F. Complex open rosettes from body wall; G. Closed rosette from body wall. (B, D, E, F & G = scale b; A & C = scale a).

Distribution. At present known only from Tunisia.

Habitat. Unknown.

Remarks. The 3 specimens from the USNM, labelled as *Pseudocnella syracusana*, are small (max. length 32 mm) and very distinct from the single specimen from the Hamburg Museum and those examined at NHMUK by AST, which are much larger (maximum length 56 mm) and identified as *Pseudocnus syracusanus*. The colour of the preserved USNM material, collected in 1973, is a dark reddish brown (Figure 2D), while that of the Hamburg

specimen, collected in 1982, is light brown (Figure 6F) similar to those at NHMUK. Both materials also differ in their size and tube feet distribution. The maximum length recorded for a true *P. syracusana* is 58 mm (by Panning 1962). While the Hamburg specimen is hard and has, in addition to scattered tube feet, distinct interradial ‘papulae-like’ extensions, reminiscent of those of *Pseudocnella* spp., the USNM specimens are soft, with tube feet restricted in two distinct rows per ambulacrum, especially ventrally, and lack ‘papulae-like’ structures of any sort. As far as ossicles are concerned the new species has in its body wall knobbed rounded plates and both complete and incomplete baskets whereas the Hamburg and NHMUK specimen have large fir-cone shaped plates in addition to round plates and a few cross-shaped incomplete baskets but the latter were absent in most specimens from NHMUK. The new species has also rosettes in the body wall and rods, rosettes and baskets in the tube feet. Hence, there is no doubt that both materials are not conspecific.

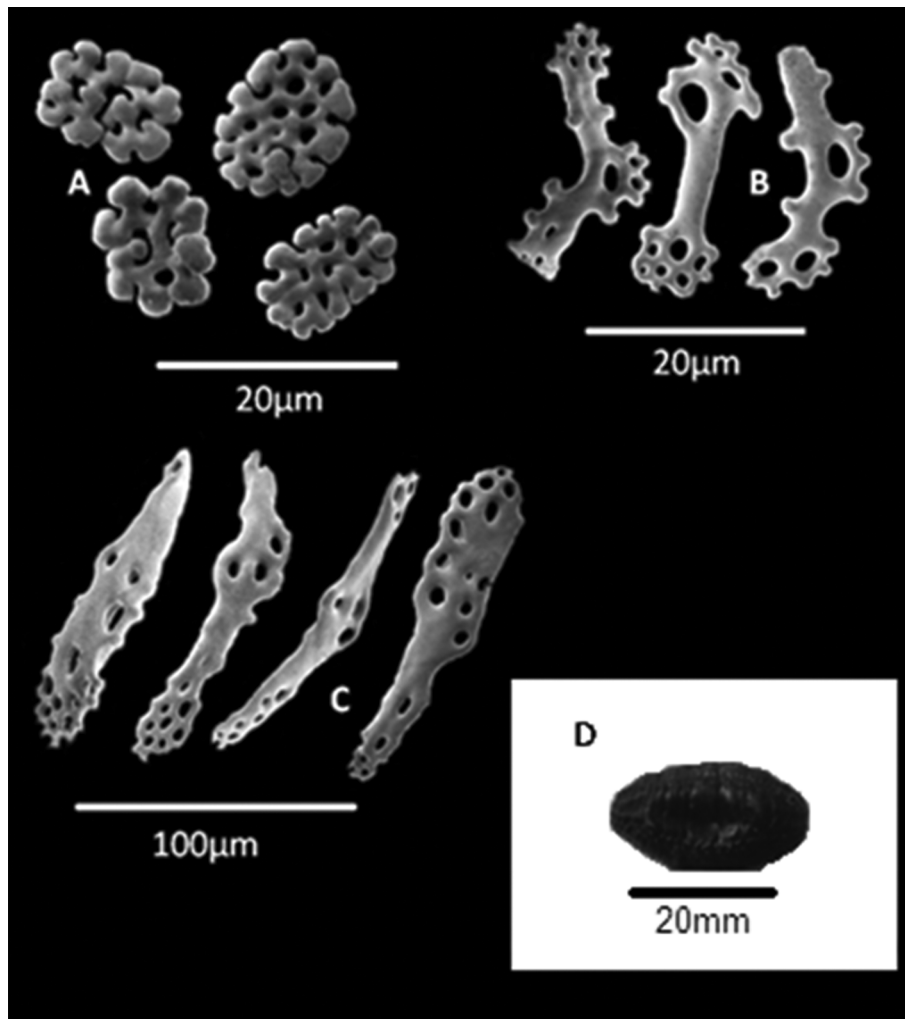


FIGURE 4. *Hemiocnus rubrobrunneus* n. sp. A. Rosettes from tentacles; B. Small rods from tentacles; C. Large rods from tentacles. D. Paratype (entire).

At first we were of the opinion that the locality of the species and form of the ossicles, except for the presence of quadrilocular baskets, clearly places the new species in the genus *Ocnus* and we described it as such in the manuscript. However, Dr Rowe who is most familiar with the Mediterranean holothuroids and especially the genus *Ocnus*, first reviewed the manuscript and is of the opinion that the baskets are not reminiscent of species of *Ocnus* and the incomplete ones suggest that the specimens perhaps represent juvenile of the preceding species or at best a new species within *Hemiocnus*. We contest the former viewpoint as the gonadal tubules of at least one specimen is in the process of maturity, the specimens lack the complex plates of *H. syracusanus* and those of the anal region of at least one specimen are rather simple, there are rosettes present together with complete baskets, and the colour and texture of the body wall are quite different. We therefore agree with Dr Rowe’s second point and here describe the new species in *Hemiocnus* as no other genus exists to accommodate it. It is possible that the Tunisian fauna is

quite different from that of the western Mediterranean as quite recently, Stohr (2015) (in *Echinoderm-l*) commented, with reference to the ophiuroids, that Tunisia is at the western border of the Levant and thus it has a somewhat different fauna from the northern and western Med. Hence this may also apply to other echinoderm groups.

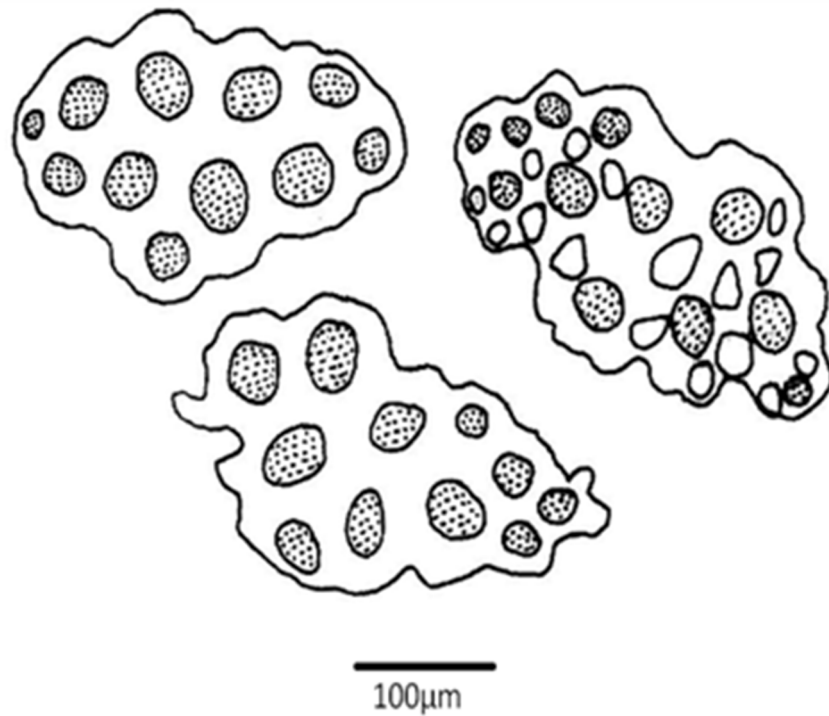


FIGURE 5. *Hemiocnus rubrobrunneus* n. sp. Plates from the anal region.

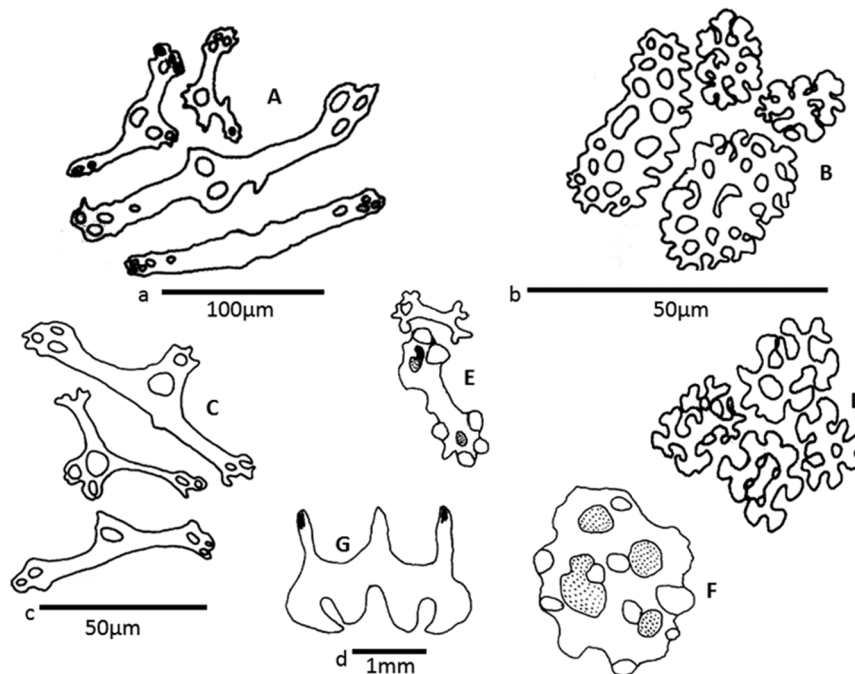


FIGURE 6. *Hemiocnus rubrobrunneus*. A. Rods from tentacles; B. Rosettes from tentacles; C. Rods from tube feet; D. Rosettes from introvert; E. Rods from introvert; F. Round knobbed button from introvert; G. Part of calcareous ring. A, D, E & F = scale a.

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