New combinations for two coronate polyp species (Atorellidae and Nausithoidae, Coronatae, Scyphozoa, Cnidaria)

André Carrara Morandini¹ and Gerhard Jarms²
¹ Departamento de Zoologia, Instituto de Ciências, Universidade de São Paulo, C.P. 11461, São Paulo, 05422-970, SP, Brazil (e-mail: acmorand@usp.br); ² Biozentrum Grindel und Zoologisches Museum, Universität Hamburg, Martin-Luther-King Platz 3, 20146 Hamburg, Germany

Keywords: Atorella, Nausithoe, polyp, scyphistoma, Stephanoscyphistoma, Stephanoscyphys, systematics, taxonomy

Abstract

Within the order Coronatae, six valid species remain known only by their polyp stage. The inability to relate them to any medusa genera of the group is a problem that remains to be solved in the order. With the examination of type specimens, we reassign the species Stephanoscyphistoma sibogae and S. striatlis to the genera Atorella and Nausithoe respectively.

Contents

Introduction ............................................. 117
Material and Methods ............................................. 117
Results and Discussion ............................................................. 118
Systematic accounts: new combinations ............................................. 118
General comments and Conclusions ............................................. 122
Acknowledgements ............................................. 122
References ............................................. 123

Introduction

The order Coronatae Vanhöffen, 1892 is considered a monophyletic group defined by the presence of a coronal furrow on the exumbrella, and the so-called pedalia of the medusae (which are radial thickenings of the jelly on the peripheral zone of the exumbrella between the coronal groove and the base of the marginal lappets) (Russell, 1970: 27; Cornelius, 1997: 120). But the most remarkable character of the coronates (and unique among the scyphozoans) is the two-layered periderm tube of their polyp stage (stephanoscyphistoma), which displays external sculpturing and internal cusps (Chapman and Werner, 1972).

An historical review of coronate medusa and their systematics is provided by Thiel (1936), and the knowledge of the polyp stage was reviewed by Jarms (1997). Research in the 1960s and 1970s showed that the so-called ‘Stephanoscyphys’ polyps produce medusae of the genera Atorella Vanhöffen, 1902, Linuche Eschscholtz, 1829 and Nausithoe Kölliker, 1853 (Werner, 1967; 1971; 1974; 1979). Based on the fact that ‘Stephanoscyphys’ polyps give rise to medusae referable to at least three other genera, and supported on recommendation of the ICZN (ICZN, 1999; Kraus, 2000), Jarms (1990, 1991) proposed the generic name Stephanoscyphistoma to accommodate species whose familial or generic assignment is uncertain, as in preserved polyps or old and inadequate descriptions.

The so far valid coronate species that remained known only by their polyp stages are: S. allmani (Kirkpatrick, 1890), S. bianconis (Thiel, 1936), S. corniformis (Komi, 1936), S. sibogae (Leloup, 1937), S. simplex (Kirkpatrick, 1890), S. striatlis (Vanhöffen, 1910).

In the present paper we focus on the solitary coronate species S. sibogae and S. striatlis, and propose new combinations for both.

Material and Methods

Observations reported here are based on reviews of original literature, and on examinations of preserved specimens of stephanoscyphistomae from the collections of the Museum für Naturkunde der Humboldt-Universität zu Berlin (ZMB), Berlin, Germany, and of the Zoological Museum, University of Amster-
Description of the lectotype. ZMA Coel. 2083 (Fig. 1). Solitary polyp (6.4 mm long), with light brown periderm tube, and small basal disc for attachment (0.56 mm). Formquotient at 2 mm height 0.2, at 5 mm height 0.14, and at the aperture 0.14. Tube surface with a pattern of transverse rings (5-7 rings/0.4 mm) with longitudinal striations, characteristic of Atorellidae. The tube has 7 whorls of internal cusps. The cusps are arranged in whorls of eight (four large perradial, and 4 smaller interradial ones). The outline of the internal cusps is broader than high.

We were unable to distinguish between the syntypes the type specimen figured by Leloup (1937, fig. 43 B') (Fig. 2), thus we designated a lectotype from them.

Description. Solitary polyps (0.3-5.6 mm long), with light brown periderm tube, and small basal disc for attachment (0.3-0.54 mm, n = 27). Formquotient at 2 mm height 0.16-0.25 (n = 10), at 5 mm height 0.14-0.196 (n = 2), and at the aperture 0.135-0.216 (n = 11). Tube surface with pattern of transverse rings (7-8 rings/0.4 mm), with longitudinal striations, characteristic of Atorellidae. The tubes have 3-6 whorls of internal cusps (n = 11). The cusps are arranged in whorls of eight (four large perradial, and 4 smaller interradial ones). SEM preparations of the internal whorls of cusps show that the 8 cusps present secondary teeth on their surface (Figs 2 and 3). The outline of the internal cusps is broader than high. The measurements of the tubes are shown in Tab. 1.

Paralelectotypes. ZMA Coel. 8969 [29 specimens, several tubes broken just above the basal disc, two taken out for SEM (ZMA Coel 2083A, 2083B)].

Type locality: Malayan Archipelago, north of Sumbawa, 794 m depth.

Collected by the “Siboga Expedition” on 06.iv. 1899.

Comments. The original description and illustrations (fig. 43) of *Stephanoscyphus siboga* by Leloup (1937) suggest that the species is referable to the genus *Atorella*. The attachment outlines of the internal cusps are oval, with their width greater than their height (Fig. 2). An examination of the syntypes of *S. siboga* confirmed this observation. The syntype series contained 30 solitary periderm tubes, one was designated as a lectotype, and two were cut and ex-
Fig. 1. *Atorella sibogae* (Leloup, 1937) comb. nov., lectotype (ZMA Coel. 2083). Scale = 2 mm.
Fig. 2. *Atorella sibogae* (Leloup, 1937) comb. nov., reproduced from the original (Leloup, 1937, fig. 43B', C, C').
Fig. 3. *Atorella sibogae* (Leloup, 1937) comb. nov. (ZMA Coel. 2083A), scanning electron micrograph of one of the whorls of internal cusps. Note the presence of secondary teeth on the surface of the 8 large ones.
Fig. 4. *Atorella sibogae* (Leloup, 1937) comb. nov. (ZMA Coel. 2083A), scanning electron micrograph of the outer surface of the tube. Note the presence of numerous rings.
Fig. 5. *Atorella vanhoeffeni* Bigelow, 1909 (ZMH C 10863), scanning electron micrograph of one whorl of internal cusps. Although the cusps are shrank, the margin of them is relatively smooth.
Fig. 6. *Atorella japonica* Kawaguti and Matsuno, 1981, redrawn from the original (Kawaguti and Matsuno, 1981, fig. 4).

...amined by SEM, and the morphology of the internal cusps was analysed.

The outer structure of the periderm tubes (Figs 1 and 4) clearly indicates that the species should be referred to the genus *Atorella* Vanhöffen, 1902.

Comparative data on the 3 species of the genus *Atorella* with known polyp stage are presented in Tab. 2. Based on the general morphology of the polyps it is not possible to separate *S. sibogae* from other *Atorella* species, but the morphology of the internal cusps and the presence of secondary teeth on their surface are unique among the *Atorella* polyps (see Figs 5 and 6). In the genus *Nausithoe* the presence of secondary teeth on the cusps surface is a distinguishing and unique character of the species *Nausithoe werneri* (Jarms, 1990, 1991).

From these results, we conclude that *S. sibogae* has to be grouped in the family Atorellidae and within the genus *Atorella*, and has to be referred to as *Atorella sibogae* comb. nov., due to the different morphology of the internal cusps.

The family Atorellidae includes six species:
The diagnosis of the family Atorrellidae is: *vunhoeffeni* n. sp. (polyp: Japan Sea, Pacific Ocean); A. *vunhoeffeili* Bigelow, 1928 (medusa: off Panama, Atlantic Ocean); A. *sihogae* Matsuno, 1967 (medusa: off Panama, Atlantic Ocean); A. *hirorundini* Bigelow, 1909 (medusa: off Panama, Atlantic Ocean); A. *octogonos* Matsuno, 1977 (medusa: off Panama, Atlantic Ocean); A. *octogonos* Octogonos Mills, Larson and Youngbluth, 1987 (medusa: Bahamas, Atlantic Ocean); A. *sibogae* (Leloup, 1937) comb. nov. (polyp: Malayan Archipelago, Indian Ocean); A. *subglobosa* Vanhöffen, 1902 (medusa: Eastern Africa and Malayan Archipelago, Indian Ocean; West of Canary Islands, Atlantic Ocean); and A. *vanhoeffeni* Bigelow, 1909 (medusa: off Panama, Pacific Ocean; polyp: Indian Ocean).

The diagnosis of the family Atorrellidae is: Coronatae medusae with six rhopalia; solitary polyps (*Stephanoscyphistoma*-like) with external sculputuring with transversal rings close to each other; outline of cusps from outside broader than high. The diagnosis of the genus *Atorella* is: Atorrellidae medusae with six tentacles; twelve marginal lappets; mouth with four lips; four, six or eight gonads; solitary Atorrellidae polyps with 8 internal cusps.

**Nausithoe striata** (Vanhöffen, 1910) comb. nov. Figs 7-9, Tab. 3


*Scyphistoma striatum* Vanhöffen, 1910: vii (mention).

*? Scyphistoma striatum*: Stechow, 1925: 391 (list mention), 518 (brief description), 546 (index mention).

*Stephanoscyphus striatus*: Leloup, 1937: 64 (description), 69 (key) [in part]. Kramp, 1951: 125 (brief description, doubt if it is a synonym of *S. simplex*). Kramp, 1959: 173 (mention).


Description of the holotype. ZMB CNI 14816 (1 specimen) (Fig. 7). Solitary polyp (8.4 mm long), with light brown periderm tube, and small basal disc for attachment (0.58 mm). The diameter just above the basal disc is 0.14 mm, at 2 mm height is 0.34 mm, at 5 mm height is 0.64 mm, and at the tube aperture is 0.96 mm. Formquotient at 2 mm height 0.17 at 5 mm height 0.128 and at the aperture 0.114. Tube surface with pattern of transverse rings (4-5 rings/0.4 mm) with longitudinal striations, characteristic of Nausithoidae. The tube has five whorls of internal cusps. The distal series has four cusps (two larger and 2 smaller ones) (Fig. 8). The outline of the internal cusps is higher than broad.

Type locality: Antarctic Ocean (65°S 85°E), 2450 m depth.

Collected by the “Deutsche Südpolar-Expedition” on 01.iii.1903.

Comments. Vanhöffen (1910: 280) described the solitary species Stephanoscyphus striatus, under the name Tubularia striata, based on material from 2450 m depth in the Antarctic Ocean. His account provided no detailed information on meaningful taxonomic characters. Nevertheless, the drawing he provided (Vanhöffen, 1910: 280, fig. 6) (Fig. 9) clearly reveals that it is a coronate polyp. Although Vanhöffen assigned it to a hydrozoan genus Tubularia, he classified it as scyphozoan in the introduction of his paper by using the name Scyphistoma in reference to it. Data from our examination of the holotype (ZMB CNI 14816) are presented in Tab. 3. Vanhöffen (1910) did not mention internal structures within the tube. Leloup (1937) followed Thiel (1936) in regarding S. striatus as a senior synonym of S. bianconis, and noted that Lo Bianco (1903) had not mentioned the presence of any whorls of cusps in his material. Accordingly, in his key to species (Leloup, 1937: 69), he grouped S. striatus and Nausithoe racemosa (which has also no cusps) as species lacking cusps. But in our examination of Vanhöffen’s type, however, we found 5 whorls having 4 cusps each (Fig. 8), with longitudinal attachment outlines (Tab. 3). A comparison with all other known solitary polyps of the genus Nausithoe (Tab. 3) shows clearly the differences in number of cusps per whorl. Besides that, no other coronate polyp is known from the Antarctic Ocean. Other characters of the tube (Formquotient) are similar to other species. With this finding in combination with the outer structure of the tube we can conclude that S. striatus should be referred to the genus Nausithoe Kölliker, 1853 (as Nausithoe striata comb. nov.) and to the family Nausithoidae.

With this new combination, out of ca. 20 species of the family Nausithoidae, fourteen have a known polyp stage: Nausithoe aurea Silveira and Morandini,
1997 (Southeastern Brazil, Atlantic Ocean); Nausithoe eumedusoides (Werner, 1974) (submarine caves, Mediterranean Sea); Nausithoe globifera Broch, 1914 (medusa: Northeastern Atlantic Ocean; polyp: Morocco coast, Atlantic Ocean); Nausithoe hagenbecki Jarms, 2001 (unknown locality, specimen from Hagenbeck Zoo Troparium, Hamburg); Nausithoe maculata Jarms, 1990 (Puerto Rico, Atlantic Ocean); Nausithoe marginata Kolliker, 1853 (Banyuls-sur-mer, Mediterranean Sea); Nausithoe planulophora (Werner, 1971) (submarine caves, Mediterranean Sea); Nausithoe punctata Kolliker, 1853 (supposed to be cosmopolitan); Nausithoe racemosa (Komai, 1935) (Japan, Pacific Ocean); Nausithoe sorbei Jarms, Tiemann and Prados, 2003 (Bay of Biscay, Azores, Atlantic Ocean); Nausithoe striata (Vanhoffen, 1910) comb. nov. (Antarctic Ocean); Nausithoe thieli Jarms, 1990 (Red Sea); Nausithoe werneri Jarms, 1990 (Morocco coast, Northeastern Atlantic Ocean); Thecoscyphus zibrowii Werner, 1984 (submarine caves, Mediterranean Sea).

The diagnosis of the family Nausithoidae is: Coronatae medusae with eight rhopalia (four per radial and four interradial); eight adradial tentacles; sixteen marginal lappets; without sac-like projections (pouches) on the subumbrella; solitary or colonial polyps (Stephanoscyphistoma-like) with external sculpturing with transversal rings somewhat distant from each other; outline of cusps, when present, from outside higher than broad. The diagnosis of the genus Nausithoe Kolliker, 1853 is: Nausithoidae medusae with eight adradial gonads, central stomach with four interradial septa which rang gastric filaments; solitary or colonial Nausithoidae polyps with varying number of internal cusps.

**General comments and Conclusions**

With our results on the morphology of the polyp stage we disagree with the suggestion of Mills et al. (1987) that the genus Atorella should be moved to the family Nausithoidae.

We believe that future examination of type specimens, or at least specimens from nearby the type localities, of the other Stephanoscyphistoma species will be a step towards increasing stability in the nomenclature and taxonomy of the coronates.

Stephanoscyphistoma sibogae (Leloup, 1937) is referred to the genus Atorella, as Atorella sibogae (Leloup, 1937) comb. nov.; and Stephanoscyphistoma striatus (Vanhoffen, 1910) is assigned to the genus Nausithoe, as Nausithoe striata (Vanhoffen, 1910) comb. nov. based on the morphology of the polyp stage.

**Acknowledgements**

This work was partly supported by Fundação de Amparo à Pesquisa do Estado de São Paulo (FA-PESP 99/05374-7, PhD scholarship to the first author) with a scholarship to ACM from “Pós-Graduação, Área Zoologia, IBUSP”, Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES/PROAP/Instituto de Biociências-USP),

*Table 3. Comparative table with the measurements of different species of the genus Nausithoe Kolliker, 1853 with known solitary polyp stages (N. aurea, N. eumedusoides, N. globifera, N. hagenbecki, N. maculata, N. marginata, N. planulophora, N. sorbei, N. striata comb. nov., N. thieli, N. werneri). For definitions of symbols, see Tab. 1; *“* = secondary teeth on cusps. Data from: Werner (1983), Jarms (1990; 1997; 2001), Jarms et al. (2002a; 2003), and Morandini and Silveira (2001).*
Universität Hamburg, and Alexander von Humboldt Foundation. We would like to thank Drs C. Lütter (ZMB), R.W.M. van Soest and Mrs E. Béglinger (ZMA) for invaluable support during contact, Museum visits and loans. We also thank R. Walter (Universität Hamburg) for preparing specimens for SEM. Dr D.R. Calder (ROM) and two anonymous referees are acknowledged for suggestions to improve the manuscript.

References


Received: 3 March 2004
Accepted: 8 September 2005