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A NEW SPECIES OF CORONATE SCYPHOMEDUSA FROM THE BAHAMAS, *ATORELLA OCTOGONOS*

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ABSTRACT

Atorella octogonos, a new species of coronate scyphomedusa from the Bahamas, is described based on material collected at approximately 500 m by the submersible JOHNSON-SEA LINK II. This medusa is distinct from other *Atorella* species in having eight gonads, whereas the other known species have four or six gonads. Consideration of this new material along with recent descriptions of *Atorella* polyps has lead us to conclude that the hexamerous symmetry of this genus was probably derived from a typically tetramerous nausithoid ancestor. Consequently, it is recommended that the genus *Atorella* be transferred to the family Nausithoidae, to which it appears to be most closely related.

The family Atorellidae (Class Scyphozoa, Order Coronata) is distinct from all other coronates in having hexamerous symmetry superimposed on the typical scyphozoan tetramerous symmetry. All atorellid medusae (this monotypic family represented only by the genus *Atorella*) have six tentacles, six rhopalia, and six pairs of lappets in addition to having a tetramerous manubrial system with four groups of gastric cirri.

Atorella medusae (three previously known species) are small, less than 25 mm in diameter, epipelagic or mesopelagic medusae that occur in tropical oceans. These medusae are rare, each species being known from only a few specimens. *Atorella* was placed in its own family upon discovery of the first specimen by Vanhöffen (1902), because of its unusual hexamerous symmetry. Bigelow, upon discovery of a second, and later a third species (1909; 1928), was still unable to relate *Atorella* to any other coronates because all other genera in the Coronatae have eight gonads, and the presence of four or six gonads in the *Atorella* species known at that time offered no information about possible phylogenetic relationships. In the present paper, we report a fourth species of *Atorella.* This species has, indeed, eight gonads, which may be the link that is needed to postulate derivation of this group from the Nausithoidae.

Werner (1966) has successfully reared young medusae of *Atorella vanhoeffeni* (to the stage of showing four developing gonadal rudiments as well as the characteristic capitate tentacle form) from a *Stephanoscyphus*-like polyp collected in the Indian Ocean off east Africa at 100–200 m. Matsuno (1981) described some of the microanatomy of another *Atorella* sp. polyp collected off Japan on a 40–60 m deep bottom. In both cases, *Atorella* polyps were very similar to the polyps known for species of *Nausithoe.* The hexamerous symmetry of *Atorella* medusae has been shown by Werner to develop during metamorphosis of the polyp into strobilating ephyrae. The polyp of the new *Atorella* species described herein is not known.

MATERIALS AND METHODS

The specimens were observed in situ and individually collected in one of several transparent acrylic cylinders mounted on the front of the manned submersible JOHNSON-SEA LINK II (fully described by Youngbluth, 1984). In situ photographs of the holotype specimen were taken with a 70 mm Hasselblad camera mounted in front of the submersible and operated by the pilot or observer from inside. The

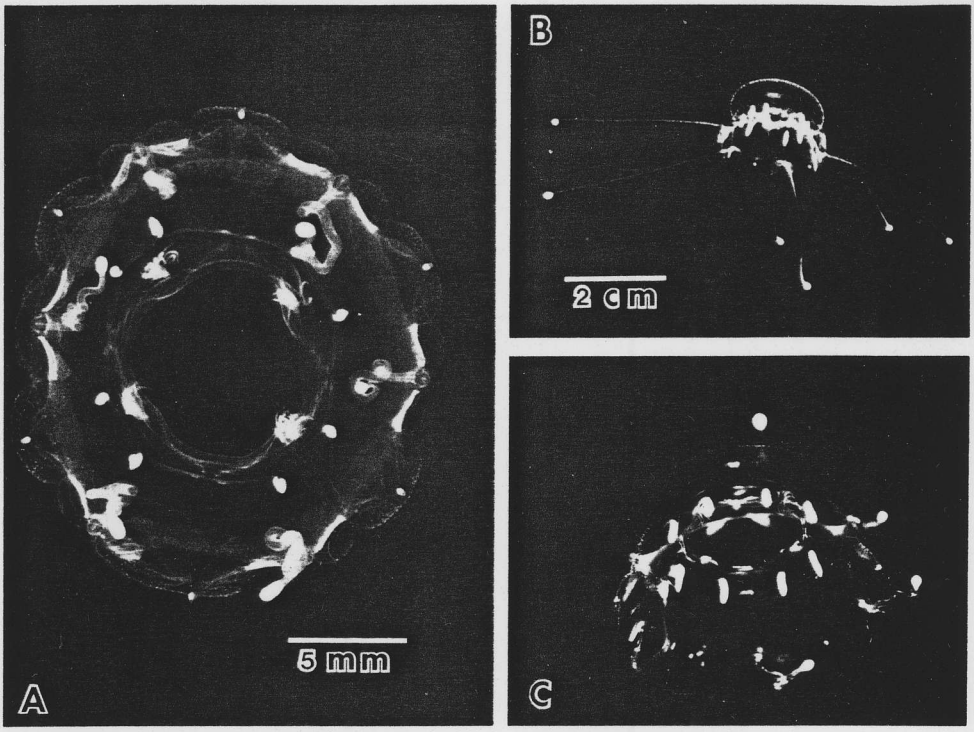

Figure 1. A. *Atorella octogonos,* holotype, oral view of preserved specimen, 20 mm bell diameter; B. *A. octogonos,* holotype, posture in life, photographed in situ at 480 m from the JOHNSON-SEA-LINK II (Note outward extension of tentacles); C. *A. octogonos,* paratype, side view of living specimen in aquarium, about 14 mm diameter (scale approximately same as for A).

paratype was maintained in the ship's laboratory for several days and was observed and photographed in a 5-liter aquarium.

RESULTS

Atorella octogonos new species

Diagnosis.—*Atorella* having 6 tentacles each with a clavate tip, 6 rhopalia, 8 fusiform gonads, and numerous exumbrellar nematocyst warts.

Type Material.—HOLOTYPE. Deposited in the U.S. National Museum of Natural History (Smithsonian Institution) USNM No. 75156. Collected at a depth of 480 m, west of Acklins Island in the Bahamas (22°49′N, 74°22′W) by M. Youngbluth from the submersible JOHNSON-SEA-LINK II on 11 October 1983. This specimen was immediately preserved in formalin and has preserved dimensions of 20 mm in bell diameter and 14 mm in bell height.

PARATYPE. USNM No. 75157. Collected at a depth of 540 m, just south of Great Abaco Island in the Bahamas (25°57.8′N, 77°22.08′W) by R. Gilmer from the submersible JOHNSON-SEA-LINK II on 24 October 1984. This specimen was held in the laboratory for 5 days before it was preserved in 5% formalin and has preserved dimensions of 14 mm in bell diameter and 8 mm in bell height.

Description of the Holotype.—Medusa 20 mm in bell diameter and 14 mm in bell height, with a deep coronal groove. Central disc with thick jelly, subspherical,

flattened in the oral-aboral plane. Exumbrella (both central disc and pedaliar region) densely sprinkled with numerous nematocyst warts, each about 0.1 mm diameter. Rhopalia six, in deep niches between lappets; lappets 12, rounded, broader than long. Tentacles six, each longer than the bell diameter in life, but shorter than bell diameter in fixed material, each with an opaque capitate tip densely covered with nematocysts. Coronal muscles weakly developed. Mouth short, circular, not obviously cruciform. Stomach with four groups of gastric cirri, each group arising from a gelatinous stalk bearing 20–30 filaments. Gonads eight, fusiform (0.5 mm × 2.0 mm), conduplicate axially, arranged in four near-interradial pairs, each pair abaxial to a group of gastric cirri. Gonads cream-tan, medusa otherwise colorless and transparent, and bearing no zooxanthellae.

Nematocysts.—Exumbrella: ? heterotrichous microbasic euryteles, 11 μm diameter, in groups of ~50 scattered over exumbrella.

Subumbrella: A-isorhizas (? or polyspiras), 10 × 30 μm.

Tentacles: A-isorhizas, 12 × 30 μm, at tip of tentacles.

Gastric cirri: ? heterotrichous microbasic euryteles, 7 × 10 μm.

Etymology.—The specific name *octogonos* is derived from the Greek okto (eight) and gonos (reproductive organ), in reference to its eight gonads.

Discussion

The genus *Atorella* is now represented by four species, all of which appear to be relatively rare. The species can be clearly separated into two groups on the basis of tentacle shape, *A. vanhoeffeni* and *A. octogonos* having capitate tentacles and *A. subglobosa* and *A. arcturi* having filiform tentacles. The presence or absence of exumbrellar nematocysts and the arrangement of gastric cirri further characterize these two groups (see key below). With so few specimens known, it is difficult to assess the extent of variation within each species, but gonad number and morphology and shape of the lappets are used in this paper to separate the four species in a dichotomous key given below, based on descriptions in the literature. [It should be noted that the illustration of *A. subglobosa* in Mayer (1910) is erroneous, and is, in fact, the drawing of *Pericolpa campana* of Maas (1903).]

Controversy has arisen in past discussions of *Atorella* species over the terminology of the arrangement of the anatomical structures. Because of the hexamerous arrangement of the tentacles and rhopalia in this genus, these structures will not necessarily correspond to the normal tetramerous terminology used for medusae (i.e., perradial, interradial, adradial). For example, in the holotype specimen of *Atorella octogonos,* two opposite tentacles are perradial, but the other four tentacles do not correspond to either a perradial or adradial position. The hexamerous symmetry of *Atorella* species allows only the approximate positions to be given in the usual tetramerous terminology.

Although its unique six-part symmetry has been the basis for placing the genus *Atorella* in its own family, this systematic arrangement may overlook closer affinities. Apart from its hexamerous anatomical arrangement, *Atorella* is morphologically very similar to *Nausithoe* and *Palephyra,* both in the family Nausithoidae. Assuming that the Nausithoidae has undergone radiation by a change of symmetry from a *Nausithoe*-like ancestor (with eight tentacles, eight rhopalia, and eight gonads) to the *Palephyra* form (with eight tentacles and eight rhopalia, but only four gonads), further evolution to *Atorella* (with six tentacles and six rhopalia, but four, six, or eight gonads) is not unlikely. Similarities between *Atorella* and *Nausithoe* polyps have been detailed by Werner (1966).

We suggest that the genus *Atorella* be moved to the Nausithoidae, with the

family Nausithoidae redefined as: "Coronatae with six or eight rhopalia, six or eight tentacles; four, six, or eight gonads; 12 or 16 marginal lappets and 12 or 16 simple radiating stomach pouches; without sac-like subumbrellar pouches; polyp *Stephanoscyphus*-like." In order to accommodate the species described in this paper, we revise the definition of the genus *Atorella* (as given by Kramp, 1961) to read: "Nausithoidae with six rhopalia, six tentacles, and 12 pedalia alternating with 12 lappets; ring muscle poorly developed; four, six, or eight gonads." A new dichotomous key to the species of *Atorella* is given below:

Key to the Species of *Atorella*

1a. Exumbrella with nematocyst warts; tentacles capitate; gastric cirri arranged in 4 groups, each group arising from a gelatinous stalk 2
1b. Exumbrella smooth, without nematocyst warts; tentacles filiform; gastric cirri mostly arranged in single rows, either along gelatinous ridges or on 4 triangular pads 3
2a. With 4 leaf-shaped gonads; lappets longer than they are broad; jelly thick, bell domed, broadening toward the coronal groove ..... *A. vanhoeffeni* Bigelow, 1909
2b. With 8 sausage-shaped gonads; lappets broader than they are long; jelly thick, bell dome subspherical, flattened in the oral-aboral plane ..... *A. octogonos* Mills et al., 1987
3a. With 4 or 6 gonads, variously shaped; lappets broader than they are long; jelly very thick, bell dome globular and sub-spherical, flattened in the oral-aboral plane; stomach and gastric cirri dark brown ..... *A. subglobosa* Vanhöffen, 1902
3b. With 6 gonads, variously shaped; lappets longer than they are broad; jelly fairly thin, bell dome broadening toward the coronal groove; colorless ..... *A. arcturi* Bigelow, 1928

The vertical distribution of most *Atorella* species has not been determined because most of the specimens have been collected with open nets. The only recorded specimen of *A. arcturi* was collected in the tropical Pacific (300–0 m) off Panama (Bigelow, 1928). *A. subglobosa* has been taken three times in deep open hauls (to 3000 m); off the east coast of Africa (Vanhöffen, 1902), in the Malayan Archipelago (Maas, 1903), and east of the Canary Islands (Ranson, 1945). *A. vanhoeffeni* has been taken at the surface near the Pacific coast of Panama (Bigelow, 1909), at depth of 100–600 m in the Pacific off California and Baja California (Alvariño, 1977), and at undisclosed depths in the Caribbean and the Gulf of Mexico (Alvariño, 1972). The two specimens of *Atorella octogonos* were collected at 480 and 540 m in the subtropical Atlantic Bahamas. *Atorella* medusae can apparently be either epipelagic or mesopelagic, but only *A. subglobosa* is characterized by the dark pigmentation typical of deepwater coronates such as *Atolla* and *Periphylla.*

Our in situ observations of *A. octogonos* allow us to predict that this species probably does not feed in the manner described by Larson (1979) for some other coronates, which hold their stiff tentacles above the bell and then flex these noncontractile tentacles inward toward the mouth when prey is captured. In contrast, the tentacles of *A. octogonos* are contractile and are held below or perpendicular to the bell margin. We expect that prey capture is accompanied by tentacle contraction, which would bring the prey to the mouth in a manner more similar to the semaeostome scyphomedusae than to other species of coronates. The lappets of *A. octogonos,* hinging from the corona, are probably used to close off the subumbrellar cavity during prey capture as described in the coronates *Nausithoe* and *Linuche* by Larson. The significance of the numerous exumbrellar nematocyst batteries during feeding cannot be surmised at this time.

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