BULLETIN OF MARINE SCIENCE, 28(3): 537–542, 1978

ATHORYBIA LUCIDA, A NEW SPECIES OF SIPHONOPHORE (PHYSONECTAE ATHORYBIIDAE) FROM THE NORTH ATLANTIC OCEAN

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ABSTRACT

Specimens of a transparent, bilaterally compressed species of *Athorybia* Eschscholtz, 1829 were collected by SCUBA divers in the upper 30 m of the subtropical North Atlantic Ocean. The colonies, which lacked nectophores, were enclosed in a bilaterally symmetric corona of bracts. The bracts, although budded apically, were not attached directly to the small pneumatophore and lacked the distinct longitudinal rows of nematocysts characteristic of previously reported species of *Athorybia*. Tentilla ended in a pair of terminal filaments but lacked a central ampulla; those of larger colonies presented dendritic processes which arose basally from the involucrum. The hyperiid amphipod *Thyropus similis* (Stephensen, 1925) was found associated with two-thirds of the specimens.

Siphonophores of the family Athorybiidae Huxley, 1859, are probably the most unusual and lovely of Physonectae. Bearing a corona of transparent protective bracts, they resemble inverted flowers when floating relaxed at the surface of the sea. These creatures are extremely fragile, and rarely remain intact when captured in plankton nets. Twenty-five nominal species of Athorybiidae have been described, but most of these descriptions were based on fragmented colonies preserved in plankton collections.

Most systematists agree with Totton (1954; synonymy enumerated in Totton, 1965, pp. 87 and 89) that 23 of these can be synonymized as either *Athorybia rosacea* (Forskal, 1775) or *Melophysa melo* (Quoy & Gaimard, 1827). Those remaining, *Athorybia ocellata* Haeckel, 1888 and *Rhodophysa corona* Haeckel, 1888 are *species inquirendae*, for the original descriptions were inadequate and the holotypes of both have been lost.

Eight living specimens of a species of Athorybiidae different from any of these previously reported species descriptions were collected in 1975 and 1976 by SCUBA divers in the northern Sargasso Sea. Because of its marked transparency, I have designated this new species *Athorybia lucida*.

Family ATHORYBIIDAE Huxley, 1859

Genus *Athorybia* Eschscholtz, 1829

Athorybia lucida new species
(Figs. 1–5, Table 1)

Holotype.—Colony collected by SCUBA divers 27 July 1976; preserved in 4% formaldehyde buffered with sodium borate. Catalog number 56784 in the collections of the U.S. National Museum of Natural History, Smithsonian Institution.

Locality-type.—0–30 m, northern Sargasso Sea (37°N, 65° W). Surface temperatures measured 23.2–26.0° C; surface salinity was about 36.9‰ (Table 1).

Description.—The stem (coenosome) of Athorybiidae is an ovate vesicle. Its apical (proximal or superior) portion includes the pneumatophore and bears the corona of bracts; its basal (distal or inferior) portion bears the series of gastrozooids, palpons, and gonodendra which bud from the median ventral surface. In *A. lucida*, the stem reached 15–20 mm in length and in each specimen was strongly compressed laterally. Because of this lateral compression, the pneumatophore appeared as a small medial swelling which measured less than 10% of the overall stem length (Figs. 1 and 2), in

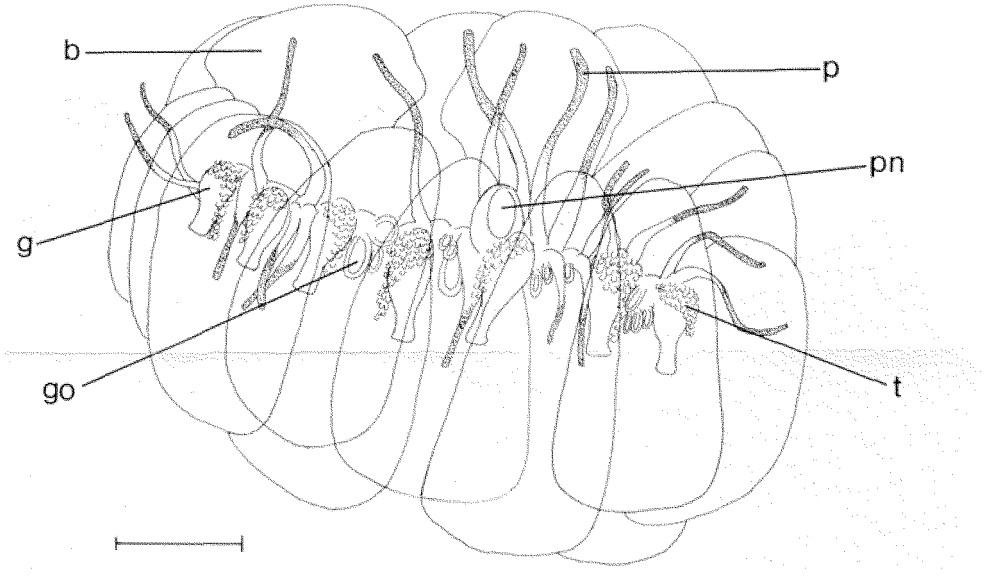

Figure 1. Schematic drawing of a colony of *A. lucida* with seven gastrozooids (g = gastrozooid; p = palpon; pn = pneumatophore; t = tentilla; go = gonophore; b = bract). Scale line is 4 mm.

marked contrast to the bulbous pneumatophore of *A. rosacea*, which comprises the entire apical part of the stem.

Like *A. rosacea*, this species never develops nectophores. Most of the living colonies of *A. lucida* had 40–70 bracts, which were attached along the elongated stem like the petals of a double rose, or other flower with numerous petals. Sexually mature colonies had 3–7 gastrozooids, each with a branched fishing tentacle, and 30–50 palpons.

PNEUMATOPHORE (Fig. 1): In life, the small transparent gas-filled float measured about 1.5 × 1 mm. Although none of the specimens were sacrificed for histologic sections, I could see no external evidence of an apical pore for release of float gas, nor did I observe that living colonies could release bubbles of gas among the bracts. Though appearing colorless to the naked eye, in three of eight specimens a faint apical fringe of red-orange pigment was visible on the pneumatophore at 40-fold magnification. In none of the specimens was the pneumatophore overgrown by a "hood" of bracteal lamellae.

BRACTS (Fig. 3A, 3B): The largest colonies had 60–70 bracts, each measuring 7–10 mm in length. Most buds of bracts were con-

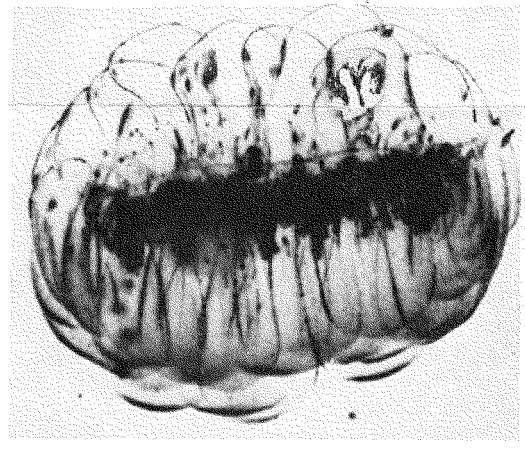

Figure 2. Living colony of *A. lucida* with seven gastrozooids, photographed at 20 m *in situ* in the northern Sargasso Sea.

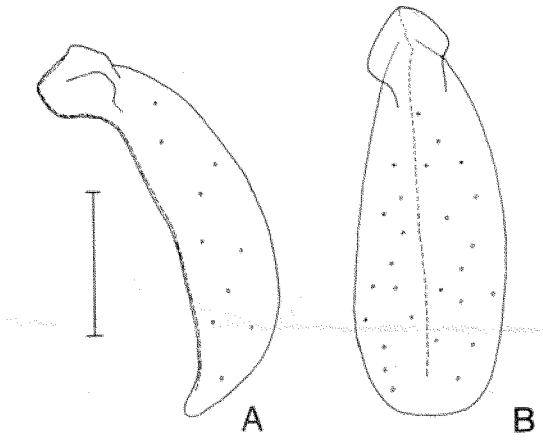

Figure 3. Camera lucida drawings of bracts of *A. lucida*: A = lateral view; B = dorsal view. Nematocysts are clustered in circular patches on the dorsal surface. Scale line is 3 mm.

centrated in two dorsal-lateral areas of the stem on either side of the pneumatophore.

Bracts were similar in shape to those of *A. rosacea*. They were convex dorsally and concave ventrally, with a short proximal keel and two rounded proximal lobes. There were no longitudinal ridges or distal serrations. Nematocysts occurred in 10–20 clusters randomly located on the dorsal surface, rather than in 4–6 well-defined rows as in *A. rosacea*. There were commonly between 15 and 25 nematocysts per cluster. The bracteal canal terminated blindly before reaching the distal tip of the bract.

TENTACLES (Figs. 4A, 4B, 5A, 5B): Each tentacle had 20–50 lateral branches, called tentilla. Proximally, each tentillum was enclosed in an involucrum. The cnidoband was folded in half and armed with two parallel rows of large penetrant nematocysts. A single red-orange pigment spot was sometimes present on the ventral surface of the cnidoband. Each tentillum terminated in two filaments armed with glutinant nematocysts. No nematocyst-free central ampulla was present.

Tentilla developed as stout, Y-shaped buds that were swollen proximally with nematocysts. Older tentilla presented nematocyst-free dendritic projections attached to the base of the involucrum, and their terminal filaments were often fused proximally. An exploded tentillum (Fig. 4B) resembled a curved club attached to a long, thin stalk.

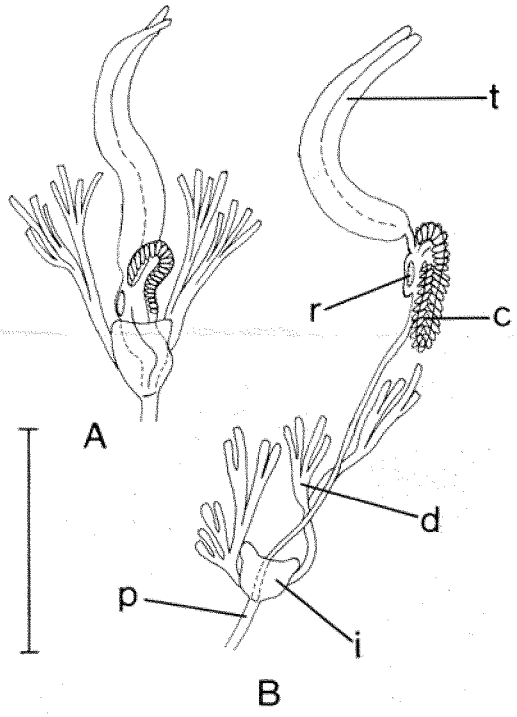

Figure 4. Camera lucida drawings of tentilla of *A. lucida*: A = undischarged; B = discharged (p = pedicle; i = involucrum; d = dendritic process; c = cnidoband; t = terminal filament; r = red-orange pigment spot). Scale line is 1 mm.

PALPONS: A series of palpons were budded from the stem at the base of each gastrozooid. The older palpons were covered distally with thickened, polygonal ectoderm and were armed at the tips with a cluster of penetrant nematocysts. No palpacles were observed.

GONOPHORES: The medusoid gonophores of *A. lucida* are indistinguishable from others of the family Athorybiidae. In *A. lucida*, both male and female gonophores were

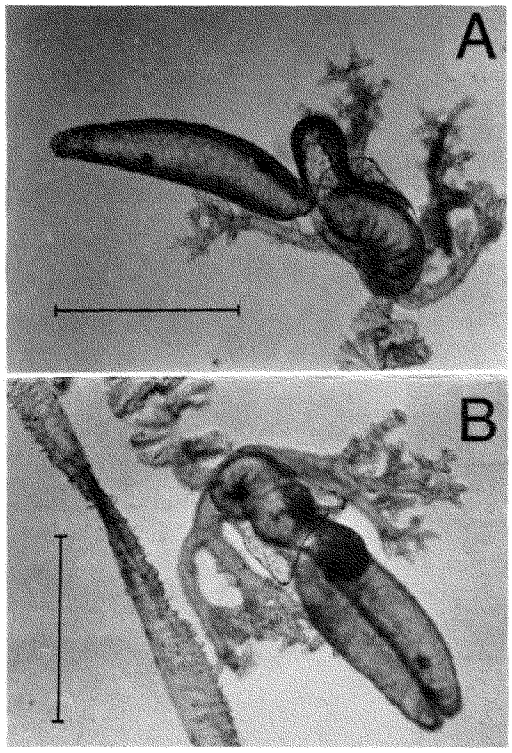

Figure 5. Tentilla of *A. lucida*, preserved in 4% formaldehyde. (A = lateral view; B = dorsal view). Scale line is 0.5 mm.

budded on the same specimen, on separate, grapelike gonodendra located basally on either side of each gastrozooid. The largest androphores measured 1.5–2 mm in length and had short pedicular canals. Gynophores measured less than 1 mm in length and had pedicular canals which extended about one-third of their overall length. The lateral radial canals of both types were straight. Figures and additional details of Athorybiidae gonophore morphology have been given by Kölliker (1853), Haeckel (1888), Bigelow (1911), and Totton (1965).

Field Notes on the Natural History of *A. lucida*

Although *A. lucida* lacks nectophores, it could effect a weak forward swimming stroke by simultaneously contracting the corona of bracts inward and downward. *In situ*, the living colony sank slowly when the bracts and tentacles were contracted. The tentacles were long in relation to body size. When relaxed, each could extend over 20 cm.

The hyperiid amphipod *Thyropus similis* (Stephensen, 1925) was living on five of the eight colonies when they were collected by divers; two siphonophores were multiply infested (Table 1). Like its host, *T. similis* is colorless and largely transparent. When it rests close to the stem of *A. lucida*, inside the corona of bracts, *T. similis* resembles a palpon or gastrozooid. These amphipods, and others of the genus *Thyropus*, sometimes consume parts of their siphonophore hosts if the two are confined in a small collection vessel (Harbison et al., 1977).

Table 1. Stations where *A. lucida* was collected

Date	Location	Surface Temperature	Surface Salinity	Numbers of *A. lucida*	Number and Kind of Associated Amphipods
30 May 1975	29°31′N 34°53′W	23.6°C	36.8‰	1	*Thyropus* sp., 14 juveniles (3.0–3.7 mm)
31 May 1975	29°33′N 39°00′W	23.2°C	36.8‰	1	*T. similis*, ♀ (5.3 mm)
2 June 1975	29°30′N 46°22′W	23.4°C	36.8‰	3	*T. similis*, 2 ♀ (4.5 & 4.9 mm) on one specimen and 1 ♀ (4.8 mm) on another
4 June 1975	29°30′N 54°30′W	24.0°C	36.9‰	1	*T. similis*, ♀ (6.2 mm)
6 August 1975	35°16′N 69°58′W	26.0°C	—	1	no amphipods
27 July 1976	37°N 65°W	26.2°C	—	1	no amphipods

Discussion

Forskal (1775) was the first to describe an Athorybiidae siphonophore, apparently from a Mediterranean specimen which had been studied alive, but he provided neither color notes nor details of its tentacles and bracts. His figure of *Physsophora rosacea* Forskal, 1775 was very diagrammatic, but it did show 4–5 longitudinal striations on the bracts (Forskal, 1776, Pl. 43, Fig. 8b). These striations, in my opinion, represent the discrete rows of nematocysts characteristic of all subsequently described species but unlike those of *A. lucida*.

A second specimen from the Mediterranean (Quoy and Gaimard, 1827) and one from the Pacific (Brandt, 1835) were both described as separate species, probably because Forskal's original description was so non-specific and his specimen unavailable for comparison. Quoy and Gaimard designated their specimen *Rhizophysa heliantha* (later called *Stephanomia helianthus*) and noted that it was reddish in color and had a large bulbous pneumatophore surrounded by bracts. The tentacles were tricornate, i.e., they terminated in two filaments and a nematocyst-free central ampulla. Brandt's (1835) *Anthophysa rosea* also had a large float surrounded by bracts and was red-purple in color. Tentacles were tricornate, he stated, "like those of *Agalma*" Eschscholtz, 1829.

These three characters, (1) a large pneumatophore partially overgrown by bracteal lamellae, (2) red-purple coloration, and (3) tricornate tentilla, were part of all subsequent descriptions of Athorybiidae species that lack nectophores (Lesson, 1843; Kölliker, 1853; Gegenbaur, 1859; Fewkes, 1888a, 1888b; Haeckel, 1888; Chun, 1897). The bulk of these proposed species were synonymized by Bigelow (1911) and Leloup (1941) on the basis of the fine structure of their tricornate tentilla. Those which had dendritic projections arising from some of the tentilla Leloup united as *Anthophysa rosea* Brandt, 1835. *Athorybia rosacea* (Forskal) Eschscholtz, 1829 was retained for colonies which had no dendritic processes. Totton (1954), who argued that the presence or absence of dendritic processes was not a specific character, combined the two genera and made *Athorybia* Eschscholtz, 1829 a monotypic genus for *A. rosacea* (Forskal, 1775).

Athorybia lucida differs markedly from *A. rosacea sensu* Totton, 1954 in each of the three preceding characters. Its pneumatophore is small and it is not overlapped by a "hood" of muscular lamellae. Coloration is absent, except for a faint area about the apex of the pneumatophore. The unique club-shaped tentilla, quite different from the tricornate ones of *A. rosacea*, are in fact unlike those of any previously described physonect siphonophores.

I have hand-collected 24 colonies of *A. rosacea* during the course of 171 open-ocean SCUBA dives to study siphonophores[1] and agree with Totton (1954) that tricornate dendritic tentilla culminate a developmental series which begins with tricornate simple tentilla. Tentilla of the six smallest of my eight specimens of *A. lucida* lacked dendritic processes, while dentritic branches were present on distal tentilla of the larger two colonies. The dendritic projections of *A. lucida* are more elaborate than those reported for *A. rosacea*, but both arise from the involucrum and are probably analogous structures.

Melophysa melo, the only other well-documented species of Athorybiidae, can be distinguished from *A. lucida* because the former has nectophores and heavy, rugose bracts (the best figures are those of Bigelow, 1931, in which he discusses *M. melo* as *Athorybia rosacea*). Each of the four to six nectophores present in living colonies of *M. melo* is not rudimentary, but measures about 1 cm in length and appears completely functional (personal observations). Even in specimens from which nectophores and bracts have become detached, *M. melo* can

[1] Biggs, D. C. (unpublished manuscript). Nutritional ecology of *Agalma okeni* and other siphonophores from the epipelagic western North Atlantic Ocean. Ph.D. thesis, M.I.T.-W.H.O.I. Joint Prgm. Biol. Oceanogr., May 1976. 141 pp.

be distinguished from *A. lucida* by the position of its pneumatophore, which is elevated above the stem on a short nectosome, and by its tricornate tentilla.

Acknowledgments

I would like to thank G. R. Harbison, L. P. Madin, and R. W. Gilmer for their aid in collecting specimens of *A. lucida*. E. J. Carpenter generously provided ship time for SCUBA diving during CHAIN Cruise 122, when six of the specimens were collected. R. G. Rowland took the photomicrographs in Figure 5. This is contribution 187 from the Marine Sciences Research Center.

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DATE ACCEPTED: May 9, 1977.

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