

Sipuncula (Peanut Worms) from Bocas del Toro, Panama

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ABSTRACT.—In a survey of sipunculan diversity in the Bocas del Toro (Panama) region, sipunculans were collected from 10 stations, ranging in depth from intertidal to 37 m. Nineteen species of adult sipunculans were collected. In addition, two types of pelagic sipunculan larvae were retrieved from plankton tows. Thirteen of the adult sipunculan species were inhabitants of hard substrate, either in crevices or burrowing into rocks. These included representatives of the genera *Antillesoma*, *Aspidosiphon*, *Golfingia*, *Nephasoma*, *Phascolosoma*, *Phascolion* and *Themiste*. An unidentified *Phascolion*, an unidentified *Aspidosiphon* and *Antillesoma antillarum* (the latter usually an inhabitant of rock crevices) were retrieved from gastropod shells. *Sipunculidae* sp., *Sipunculus* sp., *Phascolion* sp. and *Nephasoma* cf. *eremita* were recovered by trawling in soft mud. While the hard-substrate sipunculans are all well-known and widely distributed species, three of the four soft-substrate inhabitants were morphologically unusual and/or unexpected in tropical waters.

KEYWORDS.—Peanut worms, invertebrate, Caribbean, larvae, pelagosphere, diversity

INTRODUCTION

Sipuncula (common name: peanut worms) are exclusively marine worm-like animals. The body consists of an unsegmented trunk and a retractable introvert, usually with an array of tentacles at its distal end. Sipuncula are currently recognized as a phylum and seem to be most closely related to molluscs and/or annelids although sister group relationships have not yet been unambiguously resolved (Maxmen et al. 2003). With only ca. 150 recognized species; there is relatively low within-phylum diversity. Although Sipuncula are known from all major oceans, depths and climatic zones (Cutler 1994), tropical and subtropical shallow waters probably show the highest sipunculan diversity, often with a few species in very high abundance (Rice 1975; Rice et al. 1983, 1995). Despite high abundance, Sipuncula are often neglected in faunal surveys, mainly due to two facts: 1. They inhabit cryptic habitats and 2. Species identification can be challenging for non-experts. Sipunculans have been reported from sand and mud, crevices in or underneath rocks, within algal masses and sponges, mangrove and seagrass roots,

burrows in coral or other rocks and in a variety of abandoned mollusc shells, polychaete tubes and foraminiferan tests (Cutler 1994). One species has been reported from decaying whale bones (Gibbs 1987).

Many sipunculans have long-lived planktotrophic larvae, enabling them to disperse over long distances (Rice 1981). Larvae are morphologically diverse but only a few are currently identifiable to species (Fisher 1947; Hall and Scheltema 1966). This contribution is the first survey of sipunculan diversity including larvae and adults from Bocas del Toro, Panama.

MATERIALS AND METHODS

Sampling was conducted during the second Invertebrate Taxonomy workshop August 2-12, 2004 and by trawling from the *R/V Urraca* on Aug. 30, 2004. The adults collected during the invertebrate workshop were, with three exceptions, retrieved from coral rubble. Pieces of rubble were picked up by wading in the intertidal zone or, if deeper, by snorkeling or scuba diving. Sipuncula were removed either from crev-

ices underneath the rocks or from burrows inside the rock. The burrowing specimens were extracted by cracking the rocks with hammer and chisel and removing the worms with forceps. Abandoned gastropod shells were also examined for the presence of sipunculans. Larvae were retrieved from two plankton tows near the dock of the Smithsonian field station. For collecting stations, see Table 1 and Fig. 1. The samples collected during the *R/V Urraca* cruise were collected by trawling.

RESULTS

Nineteen species of adult Sipuncula and two types of planktonic larvae were collected in the Bocas del Toro area (Table 1).

Family Sipunculidae

Sipunculidae sp.

Trunk approximately 50 mm long and 10 mm wide. Body wall of trunk transparent with distinct longitudinal and circular muscle bands. Midsection of trunk with bulbous papillae or coelomic extensions, arranged regularly along the circular muscle bands and between the longitudinal muscle bands. Introvert approximately 10 mm and with numerous large, scale-like papillae pointing posteriorly. Large numbers of short tentacles.

Notes.—The organization of the body wall musculature places the species in the Sipunculidae but the texture of the body wall and the tentacles do not match the descriptions of any of the genera.

Sipunculus sp.

Only posterior fragment recovered. Body wall with longitudinal and circular musculature in bands. 28 longitudinal muscle bands.

Notes.—It is likely that the fragment belongs to one of the *Sipunculus* species reported from the Caribbean. The number of longitudinal muscle bands suggests that it is *S. nudus* or *S. robustus*.

Family Golfingiidae

Golfingia elongata (Keferstein, 1862): see Plate 1 (top) for description, distribution and notes.

Nephasoma cf. *eremita* (Sars, 1851)

Trunk 30–40 mm long, max. 5 mm wide, smooth. Introvert about as long as trunk and without hooks. Two introvert retractor muscles. Approximately 40 tentacles.

Notes.—The two specimens found match the descriptions of *N. eremita* given by Cutler (1994) and Stephen and Edmonds (1972) but the species has only been recorded from cold, deep water before. Its known distribution comprises the arctic and temperate North Atlantic as well as the Antarctic and Subantarctic below 80 m.

Nephasoma pellucidum (Keferstein, 1865)

Trunk up to 25 mm, introvert slightly shorter than trunk. Scattered hooks usually present. 20–30 tentacles. Body uniformly covered with papillae.

Distribution.—Widespread in the Indo-Pacific, western Atlantic and Caribbean; fairly common.

Family Phascolionidae

Phascolion (Isomya) gerardi Rice, 1993: see Plate 1 (2nd from top) for description, distribution and notes.

Phascolion (Isomya) sp.

Trunk 50 mm long, introvert longer than trunk. Body wall very thick, strongly wrinkled with large scattered papillae. Color tan with patchy black pigment, especially on introvert. No tentacles or hooks observed. Body wall musculature split into strongly anastomosing bands.

Notes.—Although the presence of only a single nephridium and the fusion of the retractor muscles into one dorsal and one ventral muscle of approximately equal strength place the single recovered specimen into *Phascolion (Isomya)*, the large size of the animal and the structure of the body wall are very unusual.

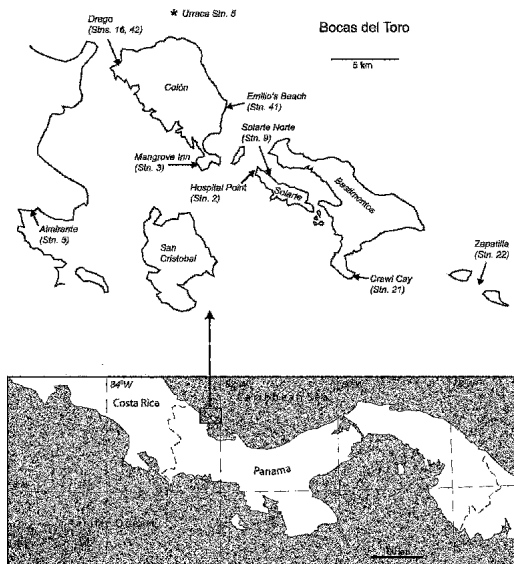


FIG. 1. Maps of Panama and of the Bocas del Toro area with collecting stations as in Table 1.
Phascolion (Lesenka) sp.

Small sipunculan (trunk 10 mm), recovered from a gastropod shell. The subgenus is characterized by the complete fusion of the four introvert retractor muscles. The only specimen recovered in Bocas del Toro bears abundant papillae on the base of the introvert and anterior trunk but no hardened holdfast papillae that are otherwise common in the shell-inhabiting representatives of this genus. Approximately 10 tentacles and scattered hooks on anterior introvert.

Family Themistidae

Themiste alutacea (Grübe and Oersted, 1858): see Plate 1 (3rd from top) for description, distribution and notes.

Family Aspidosiphonidae

Aspidosiphon elegans (Chamisso and Eysenhardt, 1851): Plate 1, bottom

Aspidosiphon (Paraspidosiphon) fischeri ten Broeke, 1925: Plate 2, top

Aspidosiphon (Paraspidosiphon) laevis de Quatrefages, 1865: Plate 2, 2nd from top

Aspidosiphon (Paraspidosiphon) parvulus Gerould, 1913: Plate 2, 3rd from top

Aspidosiphon (Paraspidosiphon) steenstrupii Diesing, 1859: Plate 2, bottom

Aspidosiphon sp.

Trunk 6 mm. Body wall transparent without obvious longitudinal muscle bands. Anal shield with longitudinal grooves, caudal shield with radial grooves. Hooks or tentacles not observed.

Notes.—The single specimen shared an abandoned gastropod shell with a pagurid. Although several *Aspidosiphon* species inhabit discarded gastropod shells, an association with hermit crabs has never been reported.

Lithacrosiphon cristatus (Sluiter, 1902): Plate 3, top

Family Phascolosomatidae

Antillesoma antillarum (Grübe and Oersted, 1858): Plate 3, 2nd from top

Phascolosoma nigrescens (Keferstein, 1865): Plate 3, 3rd from top

Phascolosoma perlucens (Baird, 1868): Plate 3, bottom

Larvae

Sipunculan pelagosphaera larvae can be relatively easily recognized by the following characteristics: 1. Retractable head, 2. A single transverse ciliary band (metatroch), 3. Head with a lower lip. Two larval types were collected from plankton tows in Bocas del Toro:

Small Transparent larva

This larval type is about 1 mm long, with a more or less spherical trunk and a strong constriction between the trunk and the head. The body wall is transparent and the body wall musculature is organized in bands, although not easily discernible. The larva corresponds to the "Type B" larva of Hall and Scheltema (1975) and to the "Smooth" larva type "A" of Jägersten (1963). The species is unknown.

Transverse Groove larva

This larval type varies in color from translucent yellow-tan to blue-green. It is 1-1.5 mm long with an elongated body and without a deep constriction between head and trunk. The body wall forms incomplete transverse grooves. This larval type corresponds to "Type E" by Hall and Scheltema (1975) and belongs to *Siphonosoma cumanense* (Rice, 1988).

DISCUSSION

The thirteen species that were retrieved from hard substrates are all well known and widespread in the Caribbean and beyond. The only unusual observation was the presence of a single individual of *Antillesoma antillarum* in a gastropod shell (Stn. 41, Table 1). The other two inhabitants of gastropod shells could not be identified to species, but the habitat is common for members of their respective genera. Of the four soft-substrate inhabiting species, only the occurrence of a *Sipunculus* was expected. The other three species were either morphologically unusual or outside of their known geographical range.

During the workshop, there was a sampling bias toward hard substrates. It is possible that more shallow-water sand-borrowing species are present in the area but have not been recovered. Attempts to retrieve sipunculans from sandy and muddy substrates around the Smithsonian dock and Mangrove Inn (Stn. 3) were fruitless. Sand-borrowing sipunculans usually occur in lower density than hard-substrate species, making collection efforts less efficient.

The presence of the Transverse Groove larva suggests that the common sand-borrowing *Siphonosoma cumanense* might be present in the area. However, the larvae might have originated in other parts of the Caribbean and might have drifted into the archipelago.

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