

SIPUNCULA: Discussion by Bruce Thompson

Sipunculans and echiurans are superficially similiar animals once grouped in Gephyra along with such oddities as Sternaspis (now in Polychaeta) and Chaetoderma (Mollusca). They are bilaterally symmetrical, unsegmented coelomate protostomes. Looked at in detail, they can be distinguished by the following characters:

Sipuncula	Echiura
* eversible, invaginated introvert which forms the animal's anterior end	* extensible proboscis attached to the anterior end, which cannot be retracted or invaginated
* mouth at distal end of introvert	* mouth on trunk at base of proboscis
* tentacles usually on or near mouth	* no tentacles present
* anus located dorsally near base of introvert	* anus at posterior extremity of body
* no setae (hooks or spines may be present)	* 1-2 ventral setae posterior to mouth; 1-2 anal rings of setae (in 2 genera)
* no anal vesicles present	* tubular or branched anal vesicles
* intestine tightly coiled around itself	* loosely convoluted intestine
* 1-2 nephridia	* 1-400 nephridia; nephrostomes & nephridiopores present
* no circulatory and respiratory system	* simple system with dorsal and ventral vessels

All sipunculans are marine. They inhabit burrows in soft sediments, among seagrass roots, live in protective niches in rocks, coral, or even in empty mollusc shells. One common species lives inside foraminiferan tests. The majority are detrital feeders. Burrowing forms probably ingest the sediment through which they move while nonburrowing species apparently use a mucus ciliary mechanism to trap particles. Golfingia procera (Mobius) is reported to be a temporary parasite on Aphrodite aculeata (Thorson), using its introvert to pierce the worm's body cavity and suck out fluid and soft tissues. Like echiurans, they must be preserved carefully to prevent contraction and distortion of the soft body structures.

There are approximately 320 species in 17 genera, with nearly half the species in the genera Golfingia and Phascolosoma. Golfingia, with 96 species, is the largest, probably the most primitive, and the most diverse genus. West coast systematics is in a confused state. Most species are very similiar with only minor differences such as length of papillae or type of hook to distinguish them, and are of small size, making dissection difficult.

Bruce has seen 14 species of sipunculans, taken from the over 1000 grab samples of the BLM benthic survey and from the BLM intertidal study done by UC Irvine. There are an additional 11 species recorded in the literature as occurring off southern California, plus 1 from Puget Sound, Washington.

Phylum Sipuncula

Family Sipunculidae

Sipunculus Linnaeus, 1766

Sipunculus nudus Linnaeus, 1766

Probably the best known and one of the most widely distributed species. Fisher (1952) reports it from Monterey Bay through Panama. In the BLM survey it was taken during the second year of sampling, from coarse sand and cobble substrate on top of Tanner Bank. It obtains a large size and has a pearly iridescent color. Apparently it was once abundant in Newport Bay, then wiped out by dredging except for a few individuals living in finer sediments in channels bottoms. It has also been collected recently from Anacapa Island.

Siphonosoma Spengel, 1912

* Siphonosoma ingens Fisher, 1950

Literature records are for Elkhorn Slough, Morro Bay and Newport Bay. It lives intertidally in sandy mud. This and S. nudus are very similiar in size and appearance. The most reliable way to distinguish them is by counting the number of longitudinal muscle bands: S. ingens has 20 to 25, S. nudus has 28 to 33.

Family Golfingiidae

Golfingia Lankester, 1885

Golfingia (Golfingia) margaritacea (Sars, 1851)

= Golfingia (Golfingia) margaritacea californiensis Fisher, 1950

Bruce has seen specimens from soft sediments on the southern California shelf and from the Gulf of Alaska. West coast records include Unalaska, the Aleutian Islands, Point Barrow, and Sitka, Alaska; Rat Island, British Columbia; Friday Harbor, Washington; Pacific Grove and Carmel Bay, California. It is bipolar and ranges from the intertidal to the subtidal. The animal is pale yellowish brown and the skin is opaque.

Golfingia (Golfingia) sp. A

A very distinctive new species taken by the BLM survey. It has a wide depth range, from 1800 meters to very shallow water.

* Golfingia (Mitosiphon) hespera (Chamberlain, 1919)

Fisher (1952) records this from Pacific Grove, California, to San Lucas Cove, Gulf of California. Some specimens were found on the outside of Mesochaetopterus tubes and commensal within Cerianthus tubes. It is bleached brown or yellow in color, usually translucent.

* Not found in the BLM survey; information taken from literature

Golfingia (Mitosiphon) trichocephala (Sluiter, 1902)

The introvert is very long, usually about 10 times the body length, and may or may not have hooks. The tentacles are small. The animals are opaque, brownish with a slight sheen. The posterior end comes to a definite point. It is found intertidally and subtidally with cerianthids; it has also been taken on the ridge area in coarse sediments.

Golfingia (Thysanocardia) catharinae (Grube, 1868)

The first occurrence of this tropical species was recorded by the BLM on the shallow mainland shelf. It is described as uniformly whitish-grey and slightly iridescent.

* Golfingia (Thysanocardia) procera (Möbius, 1875)

Fisher (1952) noted six specimens from Monterey Bay, found in 46-54 fathoms among coarse sand with shell and rocks.

* Golfingia (Thysanocardia) macginitiei Fisher, 1952

Reported only once, from among Zostera roots in Newport Bay.

* Golfingia (Thysanocardia) pugettensis Fisher, 1952

Reported from Puget Sound and San Juan Island, Washington. The skin is light to dark sepia (dull greyish brown).

Golfingia (Phascoloides) nr. bulbosa (Southern, 1913)

Probably a new species but comparison with true bulbosa specimens is needed for a definite identification. Locally it is a common species in muddy sediments, found from the mainland shelf to the bottom of the slope.

Golfingia (Phascoloides) minuta (Keferstein, 1863)

The most abundant sipunculan along the coast. It is a very small species (largest one seen was 10 mm) and the only protandrous hermaphrodite in the phylum. Along the mainland shelf the BLM survey found them aggregated in shallow water soft sediments, up to 75 or 80 in 1/16 sq. m. The densest concentration was on the backside of San Miguel Island, where cores came up with thousands of G. minuta living in the empty tests of an arenaceous foraminiferan, Astrorhiza sp. In the SCCWRP 60-Meter survey it was taken from the vicinity of Coal Oil Point, Santa Barbara, living in the tests of another foram, Rhabdammina abyssorum.

Golfingia (Phascoloides) pellucida (Keferstein, 1865)

One specimen was found during the survey.

* Golfingia (Phascoloides) eremita (Sars, 1851)

= Golfingia (Phascoloides) eremita californica Fisher, 1952

One record noted by Fisher, that of 10 specimens taken from 291-298 fathoms off San Nicholas Island. The color is described as olive-brown.

* Golfingia (Phascoloides) laetmophila Fisher, 1952

A single specimen was found off San Diego in green mud from 1059 fathoms.

Golfingia (Phascoloides) sp. C

This is a unique species taken from 1700 m. in the San Nicholas Basin. Although it was found at a single station, each of the eight replicates produced 5 or more specimens. There is a long introvert with a series of fine hooks, a long and tubular body with a characteristic constriction, and around the anus is colored bright gold.

Themiste Gray, 1828

Themiste dyscrita (Fisher, 1952)

Themiste pyroides (Chamberlain, 1919)

Both species occur intertidally and were frequently found in the UC Irvine material. Common on the mainland and the islands, the most animals were collected off Point Conception, Point Dume, and Palos Verdes. Fisher (1952) found pyroides from Coos Bay, Oregon, to San Quintin, Baja; dyscrita from Crescent City, California, to Point Conception. The systematics of this genus are very confused.

* Themiste hexadactyla (Sato, 1930)

Found only in Monterey Bay by Fisher (1952).

* Themiste perimeces (Fisher, 1928)

Distributed along the coast from Bodega Head to Venice, and both intertidally and in shallow water.

* Themiste zostericola (Chamberlain, 1919)

Fisher (1952) records this from Point Conception to Ensenada, and from Santa Rosa and San Clemente Islands.

Onchnesoma Koren & Danielssen, 1875

Onchnesoma sp. A

Bruce originally thought this was a Phascolion because of its habit of living tightly coiled in clam and gastropod shells. Juveniles are free-living. It reaches a size of 1 cm, and is found from 100 to 200 meters in soft mud.

Family Phascolosomatidae

Phascolosoma Leuckart, 1828

Phascolosoma agassizii Keferstein, 1867

A widely distributed intertidal species sometimes found in trawls as well. Its habitat varies from mussel beds and barnacle clusters to kelp holdfasts, preferably in very exposed areas. Reported from Kodiak Island, Alaska, to San Quintin, Baja.

Fisherana Stephen, 1965 (this may not be a valid genus)

* Fisherana capitata (Gerould, 1913)

This east coast species has been reported once from California.

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