

OPHIEULIMA (MOLLUSCA, PROSOBRANCHIA), A NEW GENUS OF OPHIUROID PARASITES

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SARSIA



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The genus *Ophieulima* is erected for *Stilifer minima* DALL, 1927, which has been found to be a parasite of the ophiuroid *Ophiactis abyssicola* (M. SARS). *O. minima* has planktotrophic larvae and occurs on both sides of the N. Atlantic. The sexes are separate and the female attaches the egg capsules on the shell of the male. The snail is attached by a snout-resembling organ to the aboral body wall of the host and introduces its proboscis into the body of the ophiuroid. The species of *Stilifer*, on the contrary, live in galls in the body wall of asteroids. They have a snout that is modified to a sac-like wrapping, covering most of the shell.

Le genre *Ophieulima* a été créé pour *Stilifer minima* DALL, 1927, qui a été découvert sous forme de parasite de l'Ophiure *Ophiactis abyssicola* (M. SARS). *O. minima* a une larve planctonique et est distribuée des deux côtés de l'océan Atlantique Nord. Les sexes sont séparés et la femelle attache les capsules ovigères à la coquille du mâle. Le gastéropode est attaché à la face dorsale de l'hôte par un organe en forme de 'tuyère' et introduit son proboscis à l'intérieur du corps de l'Ophiure. Les espèces du genre *Stilifer*, en revanche, vivent dans des galles dans la paroi du corps des astérides. Elles ont une 'tuyère' qui est modifiée en une sorte de sac enveloppant recouvrant en grande partie la coquille.

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INTRODUCTION

DALL (1927:73) briefly described *Stilifer minima* from a few shells that had been found in dredged bottom material from off S. Georgia. The description was based on empty shells and the generic assignment based on a superficial resemblance in the shell. Since then additional material has become available and this has enabled us to examine the gross morphology of the soft parts. This examination has led to the conclusion that *S. minima* can not be included in any described genus. Therefore we give a complete redescription of the species and erect a new genus for it.

REDESCRIPTION OF

STILIFER MINIMA DALL, 1927

Original description. DALL 1927:73

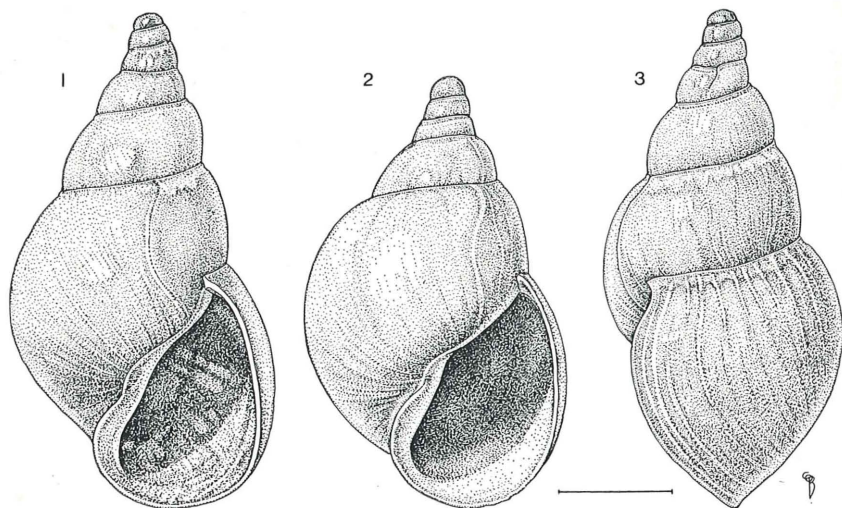
Type material. Holotype and 2 paratypes in U.S. National Museum of Natural History, Division of Mollusks, USNM 108 039.

Contribution No. 724 from the 'Centre Oceanologique de Bretagne'.

Type locality. 30°58' N, 79°38' W (off. S. Georgia, not 'off Fernandina, Florida' as referred to by DALL), 294 fathoms (538 m), 47.7° F (7.9° C), U.S. Fishery Commission station 2668 (1886) (SMITH 1889). Gray sand and broken coral.

Material examined. The type material and: 1 specimen, free in dredge, 'Thalassa' 1973, station Z 435, 48°39.7' N, 09°53.2' W, 1050 m (S of Ireland), sand and ooze with pieces of coral; 1 specimen attached dorsally on *Ophiactis abyssicola*, 'Jean Charcot', Campagne BIOGAS III, station 6, operation CV 32, 44°07.6 N, 04°15.8' W (inner part of Bay of Biscay), 1895 m; 2 specimens attached dorsally on *Ophiactis abyssicola*, 'Thor' Expedition 1905, 49°25' N, 12°20' W (SW of Ireland), 1270–1180 m (specimens mentioned by MORTENSEN 1933:50); 1 specimen, partly dissolved, from a still more dissolved specimen of *O. abyssicola*, 135–145 km SW of Vestmannaöyarne, S Iceland, 2140 m (specimen destroyed during examination). Distribution: Only known from the material examined.

Description (Figs 1–3). Shell rounded, inflated, fragile, colourless, and semitransparent. The larval shell is brownish, consists of about three very slightly convex whorls, and its height is 380 μ m. The 'Thalassa', 'Jean Charcot', and



Figs. 1-3. *Ohpieulima minima*, paratypes. Scale line 0.5 mm.

one of the 'Thor' specimens are males and have about two postlarval whorls; the types and the second 'Thor' specimen are females and have about three postlarval whorls. The whorls are convex. The surface of all specimens is corroded, but on some parts of the 'Thalassa' and 'Jean Charcot' specimens can be seen an extremely fine, irregular spiral sculpture of scratch-like striae at some less corroded spots. There is also an indistinct axial sculpture of growth lines and incremental scars. The aperture is large, rounded in its basal part and pointed above. The parietal wall and the columella form a slightly flexuous line. The inner lip is slightly twisted where it forms the columella, with an indistinct umbilical chink behind it. Seen from the side, the outer lip is slightly sinuated at the suture and evenly curved below, with its most projecting point situated just above the middle of this height.

Dimensions. Males 1-1.5 mm, females 2.5-3 mm high.

Anatomy. The 'Thalassa' and 'Thor' specimens were decalcified *in situ* on their host, serially sectioned into 6 μm sections and stained with Ehrlich's haematoxylin-eosin. Because of poor preservation, however, no detailed anatomical description of the snail (and the host) can be given.

Examination of the decalcified specimens reveals the following. The snail is attached to the aboral (dorsal) side of the host (Fig. 4) by a snout-

resembling structure, starting as a tube between the tentacles and ending in a 'tree-stump'-like part consisting of connective tissue and anchored by 'roots' in the dorsal body-wall of the host. The length of the 'snout' is about $\frac{1}{3}$ of the body length and its diameter about 60 μm . The animal has a reduced foot and a normal operculum, that fills most of the aperture.

A pair of tentacles is present, but no eyes can be seen. The male has a well developed penis, attached to the right of and behind the right tentacle. In the female the oviduct was easily distinguished through the mantle.

The 'Jean Charcot' specimen proved to be a male, 1.42 mm high, the 'Thor' specimens male and female, 1.0 and 2.5 mm high respectively.

The following could be determined from the sections (Fig. 5):

The organs used for feeding are 1) a long, slender acrembolic proboscis, 2) a slender oesophagus with a reduced buccal cavity with radular cartilages and buccal ganglia but no radula, 3) a reduced, small stomach with large openings to the digestive glands, and 4) possibly an intestine and rectum (not certainly identified).

The proboscis is strongly folded and glandular. In the 'Thor' male it was completely retracted, with the buccal cavity part of the oesophagus far back in the body cavity. The same female had its proboscis ending in the body cavity of the host, lateral to the stomach of the ophiuroid, but whether this is the normal feeding position

or if the proboscis had been partly retracted could not be ascertained. The position of the proboscis of the 'Jean Charcot' specimen could not be ascertained because the sections had been torn there. The oesophagus makes a loop through the nerve ring and continues posteriorly, to the stomach. The part anterior to the nerve ring is of almost the same diameter as the proboscis, the posterior part is a third of that diameter. No salivary glands were found.

The snout-like organ used to attach the snail to the host could not be studied in detail, but resembles closely that observed in a still undescribed parasite of *Ophiomusium armigerum* (LYMAN). It is not a true snout in the latter species, because it is innervated from the pedal ganglia, and thus, at least partly, of pedal origin. The innervation could not be studied in *S. minima*, but other structures were identical, indicating homology between this attachment organ of *S. minima* and the undescribed parasite of *O. armigerum*.

A large part of the body cavity is occupied by the anterior pedal gland, which opens via a short duct between the pro- and mesopodium. Also a well developed tube-shaped posterior pedal gland is present.

The male reproductive organs consist of a testis starting just posterior to the pallial cavity and occupying most of the spire, a winding vas deferens, and a large penis with an open seminal groove. The spermatozoa are about 20 μm long and do not have demarcated heads.

The female reproductive organs consist of a very large ovary, occupying most of the spire, an ovarian duct (without defined albumen gland), a seminal receptacle, and a large open pallial oviduct (capsule gland).

In the pallial cavity there is a well developed osphradium with a large osphradial ganglion at its posterior part and an intensely blue-staining hypobranchial gland. There is no gill.

A kidney is present but the sections were torn where the heart should have been.

Statocysts, pedal ganglia, cerebropleural- and suboesophageal ganglia were identified, close to each other.

Reproduction. The 'Jean Charcot' specimen carried one and the 'Thalassa' specimen three egg capsules, attached to the shell of the male. The capsules are round, with a simple, smooth wall and attached along a short part of its surface. Their diameter is 500–520 μm and they

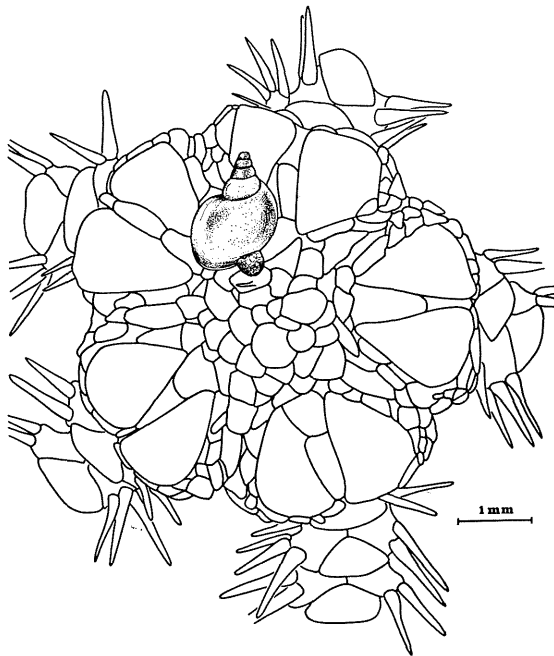


Fig. 4. *Ophieulima minima* in situ on its host, *Ophiactis abyssicola*. Two egg capsules have been removed to show the shape of the shell better, a third is attached at base of the the shell.

contain about 100 eggs each. The eggs were in different cleavage stages in the different capsules and the diameter of uncleaved eggs is about 70 μm . The size of the larval shell, compared with the size of the embryos in the capsules, clearly indicates planktotrophic development (cf. the excellent review by ROBERTSON 1976).

The presumed presence of a female attached beside the male 'Jean Charcot' specimen was indicated by a small spine-like protuberance close to the male, probably a torn-off 'snout'.

No distortion of the dorsal scales of the ophiuroid could be seen where the snails were attached.

DISCUSSION

DAL'S (1927) description of *Stilifer minima* is incomplete and unaccompanied by a figure; no later complement exists, and it was only by direct comparison with the type material that it was possible to identify the species. Three specimens are present in the type lot, one of which is indicated as holotype. By soaking the specimens in xylene (good method for making

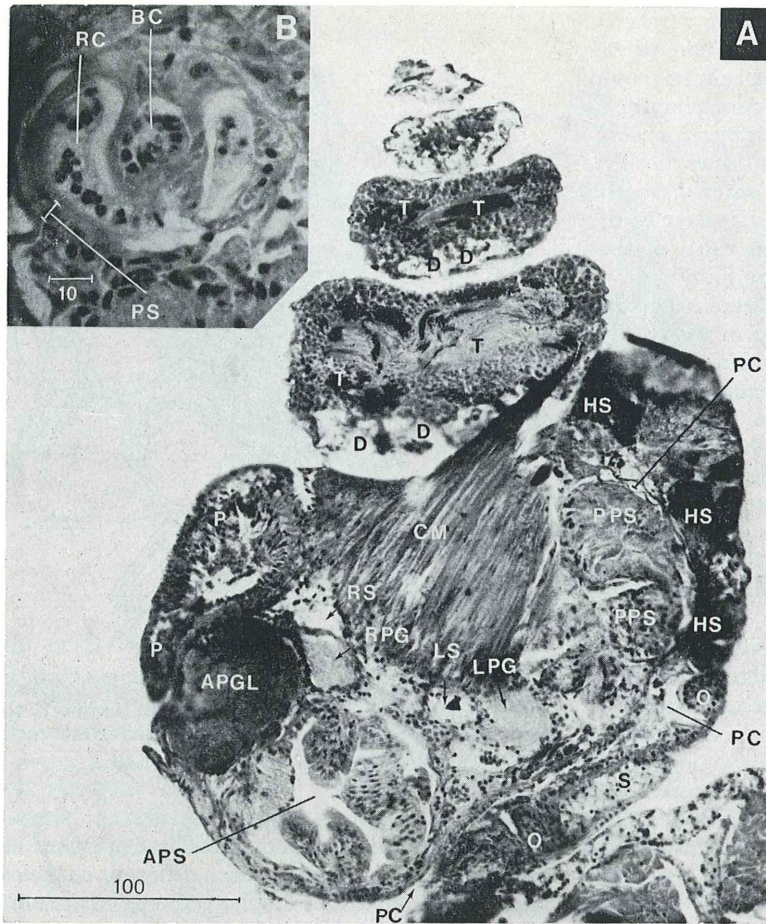


Fig. 5. *Ophiulima minima*. A. Cross section through animal. B. Cross section through retracted tip of proboscis. APGL anterior pedal gland. APS anterior part of proboscis. BC buccal cavity. CM columellar muscle. D digestive gland. HS secretion of hypobranchial gland. LPG left pedal ganglion. LS left statocyst, with statholith. O osphradium, anterior part to the left, posterior part to the right. P penis. PC pallial cavity. PPS posterior part of the proboscis where it turns in the rear part of the body cavity. PS proboscis sheath. RC Radular cartilage. RPG right pedal ganglion. RS right statocyst. S pallial skirt. T testis. Scale lines A 100 μm , B 10 μm .

thin shells transparent) it was possible to see retracted soft parts in one of the paratypes.

The identification of our material as *S. minima* is not unquestionable. The variation in shape of the three type specimens is great and our specimens are even broader than those in Fig. 2. None of DALL's specimens shows the spiral striation we found on uncorroded spots on our specimens, but the types are corroded over all their surfaces. Our two specimens with shells that could be used for comparison, from the Bay of Biscay, are both males, while the types, judging from their shells, are females, so a direct comparison of the shape of the postlarval shell is not possible. The shape of the larval shell and the profile of the outer lip (of which only the latter differs, and only in specimens with extreme sexual dimorphism) are identical. Therefore we have decided to regard our specimens as conspecific with *S. minima*.

Of interest to the question of conspecificity is the distribution and presence of suitable hosts. WARÉN (in press) considers eulimids to be rather host specific, most species occurring on a few related hosts, a few on a single host species, and a few occurring on related genera or families.

Ophiactis abyssicola is widespread and common in the bathyal parts of the northeast Atlantic (MORTENSEN 1933; CHERBONNIER & SIBUET 1972). It was found to be one of the dominant ophiuroids between 2000 and 3000 m depth in the Bay of Biscay during the BIOGAS cruises (LAUBIER & SIBUET 1979). The species is not known from the western Atlantic, but several other species of *Ophiactis* occur there, in the depths from which *S. minima* was described (CLARK 1915). The occurrence of suitable hosts is not indicative of conspecificity, but their absence could be considered indicative of the contrary.

DALL (1927) placed his species in *Stilifer*, without giving any reasons, a common habit of that time, but we find that position untenable. LÜTZEN (1972) restricted *Stilifer* for a group of eulimids living in galls in asterojids. This was confirmed by WARÉN (1980) who had examined several additional species. WARÉN also gave a list of all species that had been described in or referred to *Stilifer* and allocated most of these to other eulimid genera, but was unable to do this for *S. minima*, because no appropriate genus had been described. A list of all described eulimid genera is awaiting publication (WARÉN in press). Of these it is only species of *Ersilia* MONTEROSATO, 1872 that show any resemblance to *S. minima*, mainly by being ectoparasites on ophiuroids, by having fairly solid and twisted columellas and coloured larval shells. They differ, however, by having quite differently shaped shells, by not being permanently attached to the host, and by having a strongly coloured postlarval shell.

Therefore we will erect a new genus for *Stilifer minima*.

Ophieulima gen. n.

Type species. *Stilifer minima* DALL, 1927. (If it should prove that our material is specifically distinct from DALL's, we would prefer that our species be used as type species, if the anatomy and biology of *S. minima* still remain unknown.)

Diagnosis. Eulimids with a small, oligogyral, colourless, inflated postlarval shell, with a solid, twisted columella. Larval shell brownish. Foot and operculum present. Attached to the host, an ophiactid ophiuroid, by a snoutlike structure. Sexes separate with smaller males.

WARÉN (in press) summarizes all information available about snails parasitic on opiuroids. Four of these, *Eulima glabra* (DA COSTA), *E. bilineata* ALDER, *Ersilia stancyki* WARÉN, and *Vitreolina philippi* (BUCQUOY, DAUTZENBERG & DOLLFUS), are known from the Atlantic, a surprisingly small number considering the amount of work that has been done on the

ophiuroid fauna there. It can also be added that none of these species is very specialized for parasitism, but easily move from host to host. *O. minima* thus represents the first Atlantic example of a eulimid snail permanently attached to its host. A second species of this category is parasitic on *Ophiomusium armigerum* (cf. p. 105), but this small number of specialized species, compared with a least 40 species in the Pacific area, can not only be explained by lack of collecting.

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