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## *Scotothuria herringi*, a new genus and species of bathypelagic holothurians (Holothurioidea, Aspidochirota, Synallactidae)

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**Abstract.** A new bathypelagic holothurian, *Scotothuria herringi* gen. n., sp. n., is described. It agrees with *Galatheathuria* in the type of calcareous deposits but differs in having a continuous brim of fused podia round the body.

The description is based on three specimens taken by the RRS "Discovery" in the eastern North Atlantic. The first two specimens captured were included in a study on bioluminescence by Herring (1974), who stated that they emitted a blue-green light from a multitude of minute points all over the body wall. Herring referred the specimens to *Galatheathuria* Hansen & Madsen, based on a preliminary determination by the present author. However, a closer study of the two specimens, as well as of a third specimen received later on from Dr Herring, revealed that this material represented a distinct genus closely related to *Galatheathuria*.

*Scotothuria* gen. n.

**Diagnosis.** Synallactidae with dendritic tentacles and with the body surrounded by a continuous brim of partly fused podia. Calcareous deposits cross-shaped with arms ending in a cluster of spines and with a central apophysis ending in a hood of downward-bent hooks; spines otherwise arranged in regularly spaced rings along the length of the arms and the apophysis.

**Type-species:** *Scotothuria herringi* sp. n., below.

**Relationships.** The calcareous deposits of *Galatheathuria* and *Scotothuria* differ from those of other Synallactidae in lacking dichotomous ramifications

of the arms. This is a similarity to the deposits of the two elaspod families Psychropotidae and Elpidiidae (Hansen, 1975: 185). The absence of ramifications is probably a secondary feature attained independently in the Aspidochirota and Elaspoda. The terminal, spinous enlargement of the arms in *Scotothuria* and *Galatheathuria* indicates that the reduction of the ramifications is not quite complete in the Aspidochirota.

*Scotothuria* lacks the distinctive external feature of *Galatheathuria*, i.e. the division of the body into a main body with a lateral brim and a broad head region devoid of a brim. The skin structure in *Scotothuria herringi* is gelatinous, in contrast to the firm skin in *Galatheathuria aspera* Hansen & Madsen (the only known species of the genus). However, this character is not necessarily of generic importance.

Both genera have retractile, dendritic tentacles. Dendritic tentacles are also found in two other synallactid genera, *Pseudothuria* Koehler & Vaney, and *Dendrothuria* Koehler & Vaney, which both are rather similar to *Scotothuria* in external appearance. The deposits, present only in *D. megalopharynx* (Sluiter), are cross-shaped but are otherwise very different from those of *Galatheathuria* and *Scotothuria* as they have spatulate and perforated arm ends and lack the rings of spines and hooks. *Dendrothuria* is furthermore characterized by its greatly enlarged pharynx.

Dendritic tentacles are likely to be adaptations to pelagic life, which suggests that also the genera *Pseudothuria* and *Dendrothuria* are pelagic in habit.

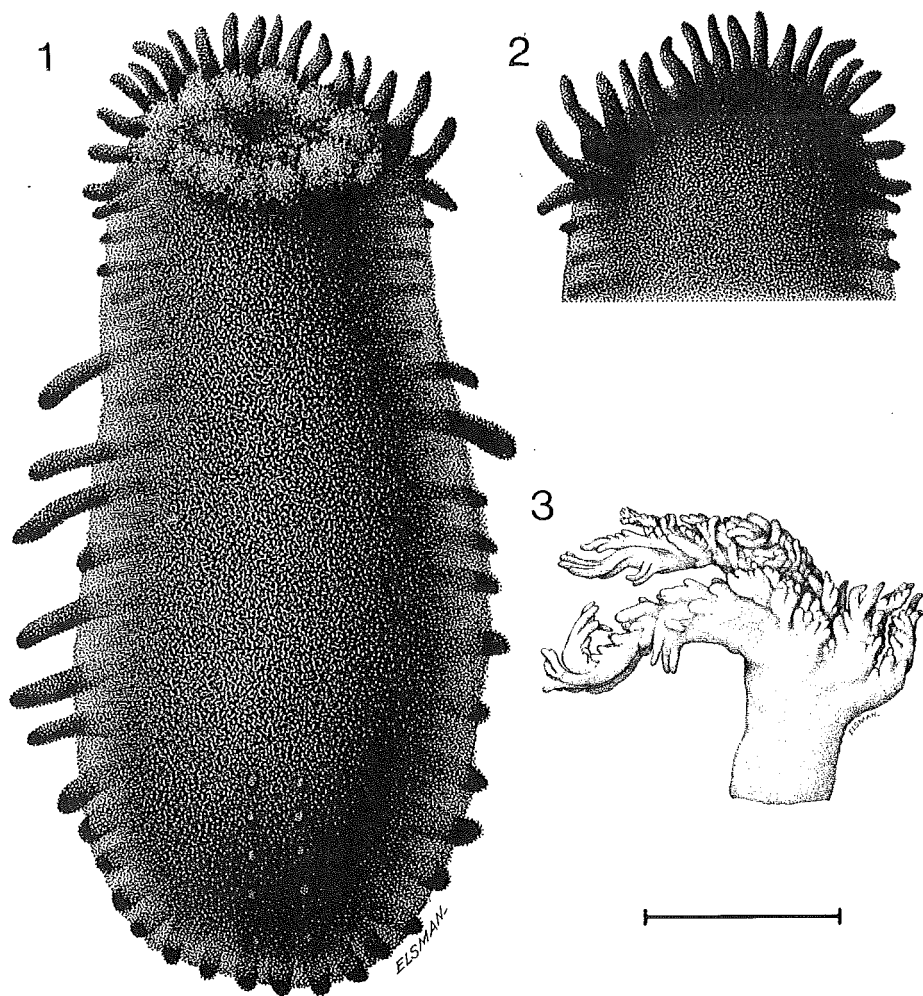
*Scotothuria herringi* sp. n.

Holotype, 55 mm. "Discovery" St. 7856, ser. 52, 29°57'N, 23°05'W, 5.iv, 1972, midwater trawl (RMT 8) fishing at a depth of 1250-1500 m (depth at station: 5161 m). — In the British Museum (Natural History), London.

Paratype 1, 85 mm. "Discovery" St. 7824, ser. 36, 11°03'N, 19°48'W, 9.iii.1972, midwater trawl (RMT 8) fishing at a depth of 1250-1500 m (depth at station: 2517 m). — In the Zoological Museum, University of Copenhagen.

Paratype 2, 48 mm. "Discovery" St. 9022, 30°12'N, 11°41'W, 19.viii.1976, midwater trawl (RMT 8) fishing less than 100 m from the bottom (depth at station: 2000-2200 m). — In the British Museum (Natural History), London.

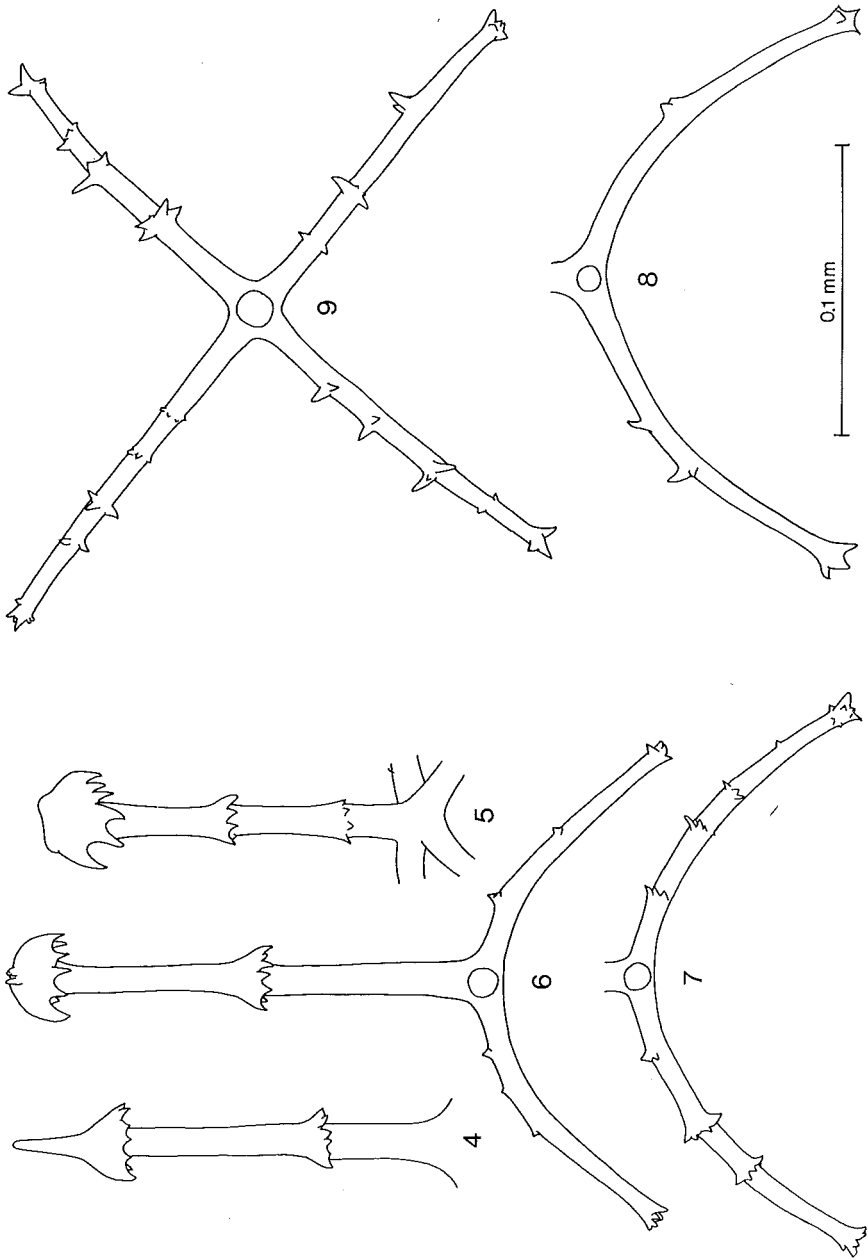
Description. All the specimens were uniformly deep violet at capture. Holotype and paratype 1 have subsequently faded into a light violet colour while the more newly captured paratype 2 has still preserved its original colour. The external morphology of the species (figs 1-2) was primarily concluded from paratype 2, of which a colour transparency was made immediately after capture. Unfortunately, paratype 2 has lost the calcareous deposits, but in external features it is very similar to the holotype.



Figs 1-3. *Scotothuria herringi* gen. n., sp. n. — 1) Ventral view of paratype 2 based in part on a colour transparency made of the freshly caught specimen; mid-ventral podia (not visible in paratype 2) drawn from the holotype. 2) Dorsal view of anterior end of paratype 2. 3) Tentacle from the holotype. Scale: 10 mm (figs 1-2) and 2 mm (fig. 3).

Tentacles (fig. 3). Discs varying in shape but always pronouncedly ramified. In most discs two externally directed ramifications are particularly large. Holotype and paratype 2 both have 18 fully extended tentacles. In paratype 1 all tentacles except three are retracted into the oral cavity.

Body wall with an outer gelatinous layer. However, after preservation the gelatinous layer becomes firm and opaque and the specimens undergo a con-



Figs 4-9. *Scotothuria herringi* gen. n., sp. n. Calcareous deposits. 4-8: holotype. 9: paratype 1.

siderable shrinkage. The body lengths stated above refer to the freshly preserved specimens.

Body brim particularly well developed in the head region where it consists of 18-20 podia with adjoining or fused bases. The remaining part of the brim is formed by the flattened margin of the body in which the ventrolateral podia are partially or wholly embedded. The colour transparency of the freshly caught paratype 2 shows a number of podia extending far out from the margin of the brim while others are completely retracted. There are approximately 20 podia on each side of the body.

Ventral podia. Five pairs of minute midventral podia are visible posteriorly in the holotype and about the same number seems to be present in paratype 1. No podia could be distinguished in the dark-coloured paratype 2.

Dorsal papillae not seen.

Anus dorsal, placed immediately above the brim.

Viscera. The body cavity in the dissected paratype 1 is on both sides of the mid-dorsal mesentery occupied by numerous, slightly branched testes tubules which nearly reach the posterior end of the cavity. The looped digestive tract includes a pharynx of normal size (the related genus *Dendrothuria* has a greatly enlarged pharynx). Respiratory trees are present but their full length was not ascertained.

Calcareous deposits (figs 4-9) cross-shaped with a single-columned central apophysis which usually exceeds the arms in length and robustness. The apophysis carries a distal hood of downward-bent hooks, placed 0.12-0.16 mm above the base of the apophysis, and in addition one (occasionally two) more proximal ring or cluster of spines. Some apophyses show a slender prolongation above the distal hood. The arms are 0.10-0.15 mm long and end in a cluster of spines. In addition they carry four (occasionally three or two) rings or groups of spines. Apart from the rings and groups of hooks and spines both arms and apophyses are quite smooth. Dorsal and ventral deposits are similar both in appearance and size.

Remarks on swimming in holothurians. Hansen & Madsen (1956) suggested that *Galatheathuria* swims by means of undulations of the lateral brim in the manner of the cuttlefish *Sepia*. This type of movement was actually observed in one of the specimens of *Scotothuria*, which immediately after capture showed slow waves of contraction down the lateral margins of the body (Herring, in litt.). The specimens of *Scotothuria* were taken at distances ranging from less than 100 m to more than 3000 m from the bottom. The genus may thus, like *Galatheathuria*, lead a true pelagic life.

The swimming performance in *Galatheathuria* and *Scotothuria* is different from the leech-like movements of the body used by a number of benthic holothurians when swimming over the bottom (Margolin, 1975).

Yet another type of swimming is performed by the elasipod *Peniagone diaphana* (Théel). This species has an elongated lens-shaped body not unlike *Galatheathuria* and *Scotothuria*. However, the tentacles are placed on a posteriorly directed oral tube and the podia are fused into a fan-shaped brim along the posterior margin of the body. Barnes et al. (1976) observed from a bathyscaphe assemblages of *Peniagone diaphana* orientated vertically in the water column near the bottom. A slow, simultaneous stroking of the expanded oral tentacles and the posterior fan of podia brings about a slow movement through the water and may at the same time aid in suspension feeding.

A number of other species of *Peniagone* (*gracilis* (Ludwig), *vitrea* Théel, *islandica* Deichmann, and *intermedia* Ludwig) show the same combination of a posteriorly directed oral tube and a fan-shaped brim of fused posterior podia. All these species are likely to swim in the same manner as *P. diaphana*.

The species is named after Dr Peter J. Herring, who has discovered bioluminescence in a variety of deep-sea holothurians.

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