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Peniagone-leander New Species, An Abyssal Benthopelagic Sea-Cucumber (Echinodermata, Holothuroidea) From The Eastern Central Pacific-Ocean

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PENIAGONE LEANDER NEW SPECIES, AN ABYSSAL BENTHOPELAGIC SEA CUCUMBER (ECHINODERMATA: HOLOTHUROIDEA) FROM THE EASTERN CENTRAL PACIFIC OCEAN

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ABSTRACT

Peniagone leander, new species, differs from other *Peniagone* species in possessing the combination of: an ovoid body, lateral ridges defining right and left margins of body, anterior veil (velum) with four projections, two pairs of anterior dorsal projections posterior to velum, four pairs of posterior ventral tube feet. The reddish-brown body reaches a length of approximately 30 cm. *P. leander* is the second species of the genus known to be benthopelagic. The species is fairly common where it occurs, dividing its time between actively swimming above the bottom and feeding on the sediment surface.

Due in large part to investigations by manned submersibles in recent years, deep-sea biologists have become increasingly aware of the importance of benthopelagic and bathypelagic holothurians in the general economy of the deep sea (Barnes et al., 1976; Pawson, 1976; 1982). Even at depths beyond the range of most manned submersibles, the ecological importance of these bizarre creatures has become known through the medium of seafloor photography. During the course of exploratory photography and videotape surveys of an area rich in manganese nodules in the Clarion-Clipperton Fracture Zone (Fig. 9), equatorial eastern Pacific, Deepsea Ventures Inc. (DVI) found that one of the most commonly encountered megafaunal elements was a new species of swimming sea cucumber, which we describe below.

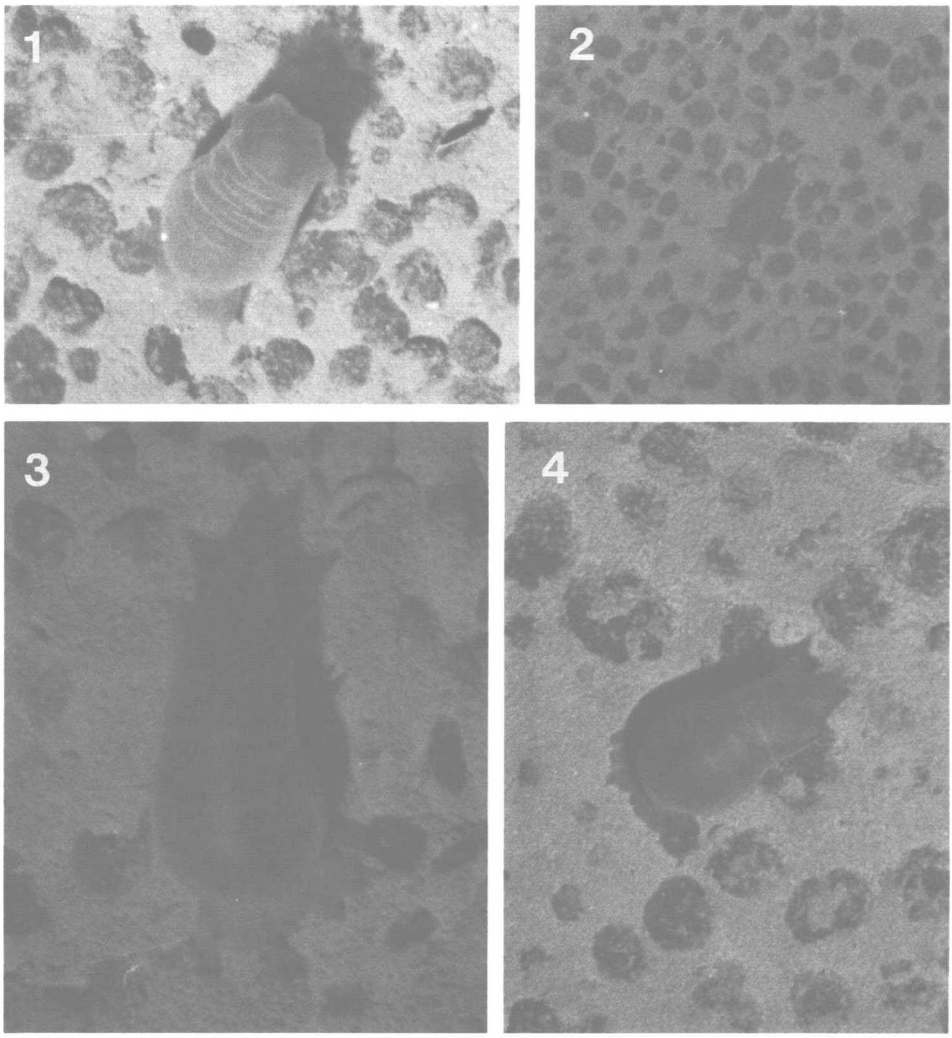
Order ELASIPODIDA
Family Elpidiidae Theel, 1879
Peniagone Theel, 1882

Diagnosis.—Dorsal papillae anteriorly placed, usually forming a velum. Body wall ossicles primary crosses, or cross-shaped. Calcareous ring consisting of five isolated pieces, each having a varying number of arms (from Hansen, 1975).

Remarks.—In his superb monograph of the elasipodan holothurians, Hansen (1975) included 30 species in the genus *Peniagone*. Of these, only *P. diaphana* (Theel) (=*Scotoanassa translucida* Herouard) was described as being capable of swimming. In general body form, the new species described here shares some features with *P. diaphana*.

Peniagone leander new species
Figures 1–8

Diagnosis.—Body ovoid, not flattened, reaching a total length of at least 30 cm. Velum broad, with four short projections, the central pair longer than the outer pair. Ventral tube feet are restricted to the posterior portion of the body, where they form a fringe composed of four pairs of feet, decreasing slightly in length towards the mid-ventral line. Two pairs of short, pointed, dorsolateral papillae lie just posterior to the velum. The mouth is situated at the end of a conspicuous



Figures 1–4. *Peniagone leander* new species. All figures show specimens on the seafloor, presumably ingesting sediment. Fig. 1. Note strong transverse constrictions on dorsal body surface. In this specimen, the anterior velum is only partially extended. Dark-colored objects on the seafloor are manganese nodules. Specimen photographed at 14°33'N, 126°02'W, depth 4,567 m. Fig. 2. A specimen with strongly expanded velum and posterior tube feet. 14°26'N, 126°00'W, 4,464 m. Fig. 3. A specimen with strongly expanded velum and tube feet. Total length, 25 cm. Note presence of a pair of right, anterolateral, pointed papillae, posterior to velum, indicated by a shadow on the seafloor. The presence of an additional posterior pair of much smaller papillae is also suggested by shadows. The fecal string in the top right of the photograph was made by another species of holothurian. 14°28'N, 126°01'W, 4,483 m. Fig. 4. A specimen with strongly expanded velum and posterior tube feet. Total length, 23 cm. 13°50'N, 126°01'W, 4,616 m.

mouth tube, surrounded by approximately ten tentacles which typically have a bilobed aboral margin. The body is brown to reddish-brown.

Etymology.—The species-name is used as a nominative in apposition. Leander, in Greek mythology, swam the Hellespont nightly to meet his beloved, Hero.

Eventually, Leander drowned in the Hellespont. Like Leander, this new species seems to need a solid substratum at times.

Material Examined.—None. The description given here is based upon numerous color and black-and-white photographs, some of which are included here (Figs. 1–8). In addition, black-and-white videotapes provided valuable information on swimming movements. Photographs and videotapes were taken in the Clarion-Clipperton Fracture Zone, eastern central Pacific, at a depth of approximately 4,400–5,000 meters. Detailed locality data are given in captions to Figures 1–8.

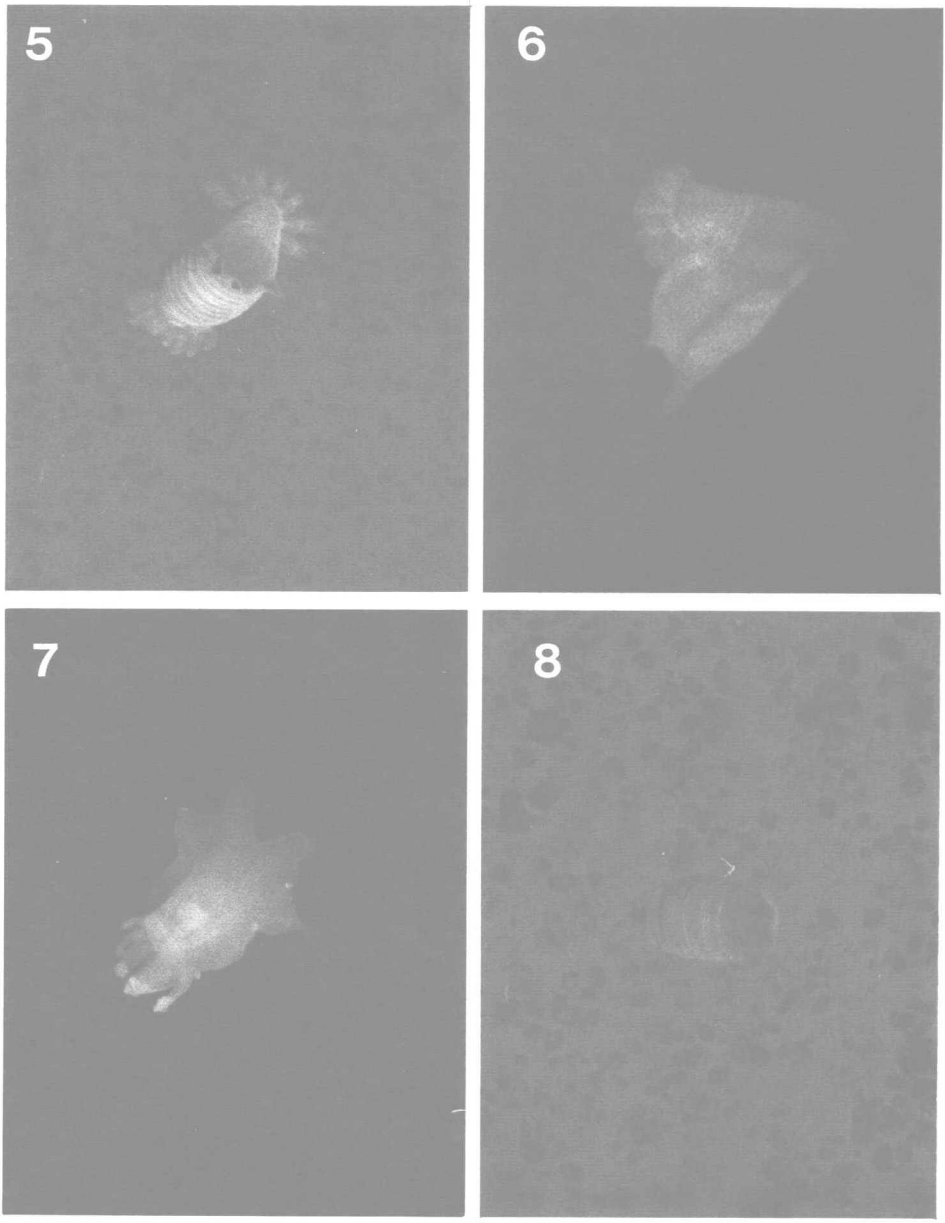
TYPE-SPECIMENS: It is customary to describe new species on the basis of one or more type-specimens. In the present case, only photographs and videotapes of the species exist. Colleagues at the Smithsonian Institution and elsewhere have been consulted, and virtually all agree that in this case, the species should be described as new on the basis of the photographs alone. The following list supports this reasoning: (1) The photographs show in detail the combination of characters required for recognition of the species as new. (2) Collections of megafauna from the study area do not include any specimens or fragments of specimens which might be construed as representing the new species described here. (3) Like most swimming holothurians, the present species is undoubtedly very fragile. In view of the great depth at which it occurs, it seems unlikely that any specimens will be collected in the near future by a manned submersible. Further, the invariable presence of highly abrasive manganese nodules in benthic samples generally from the study area preclude the possibility of collecting recognizable specimens by means of conventional shipboard sampling techniques.

Many years might elapse before recognizable specimens of the species are finally obtained. In the meantime, with increasing interest in ecology of this area of the Pacific Ocean, and in the biology of swimming sea cucumbers, it is necessary that this conspicuous faunal element be given a scientific name.

Description.—The body is more or less cylindrical to ovoid, most bulbous posteriorly (Figs. 3 and 4). Transverse lines or constrictions, perhaps corresponding to underlying muscle strands, are more or less conspicuous on the dorsal surface of the body (Figs. 1 and 5). Total length of the body, from anterior edge of the velum to the distal extremity of the posterior fringe of tube feet can range up to 30 cm. No specimens smaller than approximately 20 cm have been observed in photographs. A conspicuous ridge of tissue running from the anterior velum to the posterior tube feet defines each lateral margin of the body (Fig. 6).

The broad, short velum is composed of four fused anterior papillae (Figs. 3 and 7); the inner pair of papillae is longer than the outer pair. Posterior to the velum, two small, free, pointed papillae occur on both right and left dorsal radii (Fig. 3). These papillae are somewhat inconspicuous, their presence best indicated in Fig. 3 by shadows on the seafloor. Another two pairs of smaller papillae may be present towards the posterior end of the body (see Fig. 3). No other dorsal body wall projections have been observed. Ventrolateral tube feet form a posterior fringe, apparently confined to the posterior edge of the ventrum (Figs. 3 and 5). The size of the feet tends to decrease slightly towards the midventral line.

Mouth and tentacles are carried on a conspicuous mouth tube which tends to be oriented at right angles to the main axis of the body (Fig. 6). The tentacles are essentially cylindrical, the terminal discs bilobed on the aboral margin (Fig. 5). The total number of tentacles has yet to be determined, but there appear to be ten in some specimens (Figs. 6 and 7). In some photographs where specimens have expanded tentacles, it might be estimated that 12 or more tentacles are present (see Fig. 5).



Figures 5–8. *Peniagone leander* new species. All figures show specimens swimming. Fig. 5. A specimen in which the mouth tube and tentacles are being thrust downwards to provide lift; note expanded tentacles with bilobed aboral surfaces. Specimen photographed at 14°39′N, 125°49′W, depth 4,432 m. Fig. 6. A specimen in which the downward thrust of the mouth tube has been completed; note that tentacles are folded together. 14°33′N, 127°39′W, 4,654 m. Fig. 7. A specimen which is apparently in the same position as that in Figure 6, but viewed from a slightly different angle. 14°45′N, 125°48′W, 4,594 m. Fig. 8. An anterodorsal view of a specimen which has just completed the downward thrust of its mouth tube. 14°35′N, 126°02′W, 4,520 m.

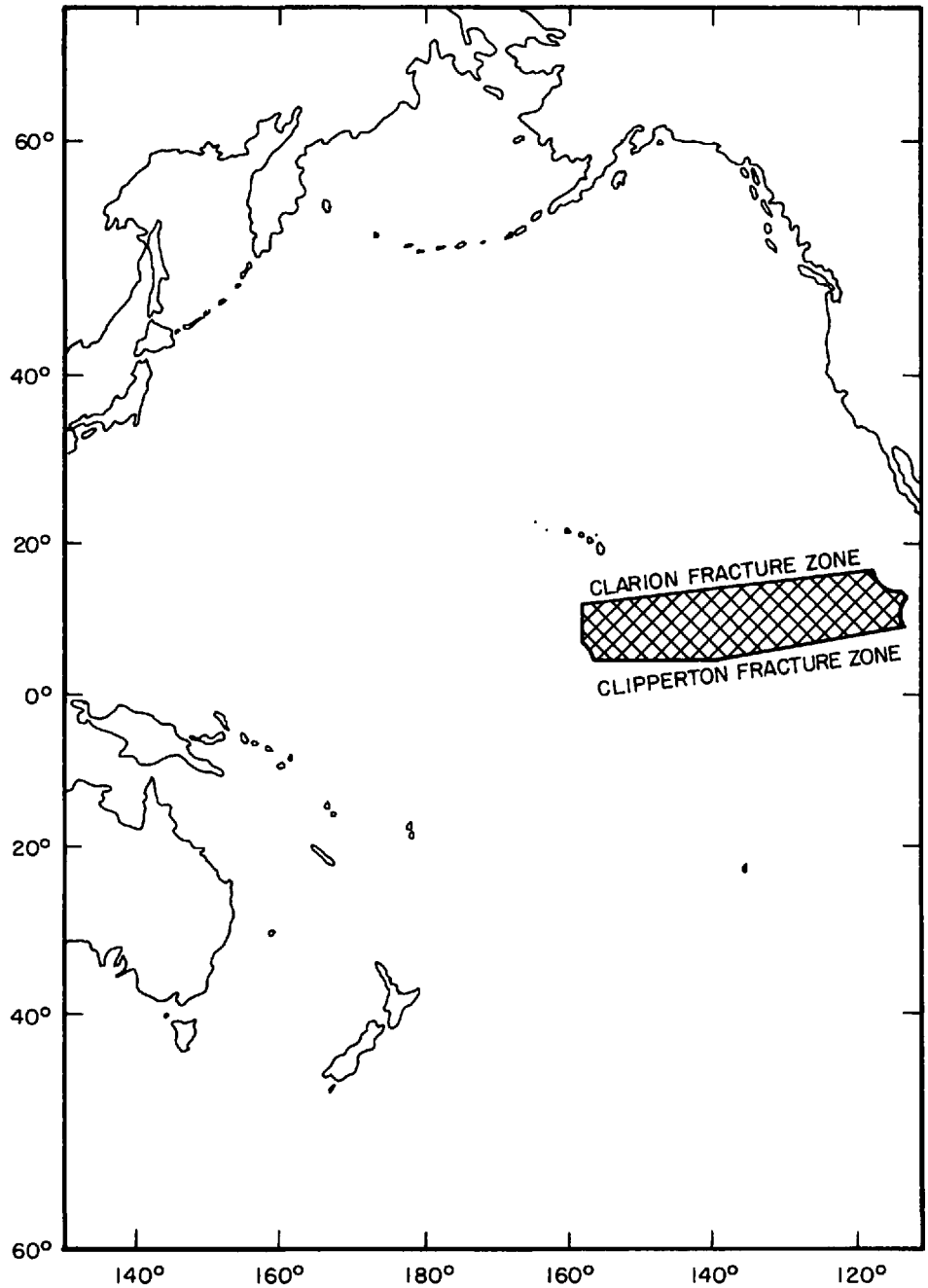


Figure 9. Outline map showing location of study area. *P. leander* has been photographed or videotaped at numerous stations within this area.

On the basis of color photographs, the color in life appears to be brown to reddish-brown. In most photographs the body wall is more or less opaque; however, in some specimens it is translucent or occasionally transparent, with the internal organs visible through the body wall.

Locomotion.—This species appears to "hang" in the water, with the antero-posterior axis (velum to anus) more or less vertical. It is presumed that *P. leander,* like some other swimming species, has a tendency to sink to the seafloor, and it moves upwards in the water by up-and-down flexing of the mouth tube (Figs. 5 and 6) in combination with, and perhaps in opposition to, undulation of the posterior tube feet. During downward motion of the mouth tube, the tentacles are usually expanded (Fig. 5) to provide a greater surface area for upward lift. When the mouth tube is moving upwards, the tentacles are passively folded together (Figs. 6 and 7). Some flexing of the body may also occur in combination with the tube feet and mouth tube movement. We believe this swimming movement does not assist in feeding, and that the animal derives virtually all of its sustenance from seafloor sediments. The anterior velum appears to play no active part in swimming movements, although when expanded it may tend to slow down the animal's rate of sinking.

Posture on the Seafloor.—When on the seafloor, presumably ingesting sediment, the animals always adopt the same posture. The oral tentacles are held in contact with the substratum, the mouth tube is more or less vertical, and the body is approximately parallel to the seafloor. The posterior tube feet are fanned out on or just above the sediment surface (Figs. 3 and 4). The velum is almost always directed anteriorly, in a plane parallel to the antero-posterior axis of the body (Figs. 3 and 4).

Living Habits.—Like most other swimming species (Pawson, 1976; 1982), this species spends a considerable amount of its time swimming, descending to the seafloor periodically to ingest sediment. Its living habits are perhaps similar to those of *Enypniastes* species (Pawson, 1976; 1982, and subsequent unpublished observations), which does not seem to venture more than 50 m or so above the seafloor; at least, the largest populations of this latter species appear to occur within 50 m of the seafloor. Approximately one-half of the photographs show *P. leander* on the seafloor, suggesting that this species may spend approximately one-half of its time there, and the other half actively swimming. When *P. leander* is on the seafloor, it presumably orients itself with its anterior end facing into the prevailing current, but this has yet to be established.

Remarks.—This large swimming sea cucumber falls within the genus *Peniagone* as defined by Hansen (1975). It resembles the other known swimming *Peniagone, P. diaphana* (Theel) in some respects, but differs in having a more inflated body, brownish coloration with a less transparent body wall, two (perhaps four) pairs of dorsal papillae posterior to the velum, and a much more conspicuous lateral ridge. Present specimens of *P. leander* are considerably larger than *P. diaphana,* which seems to reach a maximum length of approximately 10 cm. Dr. Bent Hansen (personal communication) has suggested that *P. leander* is of the same morphological type as *P. vitrea* Theel; in *P. vitrea* the body is more elongate, and the body wall is glassy in consistency and highly light-reflective, being packed with calcareous ossicles, features not evident in photographs of *P. leander.*

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