

SARCOTRETES LONGIROSTRIS N. SP. (COPEPODA: PENNELLIDAE) PARASITIC ON BLUEFIN DRIFTFISH (*PSENES PELLUCIDUS*) FROM THE STOMACHS OF SHORT-FINNED PILOT WHALES CAUGHT OFF JAPAN

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A B S T R A C T

A new species of pennellid (Pennellidae, Copepoda), *Sarcotretes longirostris* n. sp., is described based on specimens collected from bluefin driftfish (*Psenes pellucidus* Lütken) found in the stomach of short-finned pilot whale (*Globicephala macrorhynchus* Gray) caught in the western North Pacific off central Honshu, Japan. The new species differs from its congeners in the possession of 1) a long proboscis (longer than the cephalothorax); 2) a pair of blunt, lateral cephalothoracic processes (holdfast); and 3) a long neck that is distinctly longer than the trunk. This is the first species of copepod parasite reported from a representative of the genus *Psenes*.

INTRODUCTION

The short-finned pilot whale *Globicephala macrorhynchus* Gray, 1846 is widely distributed in the tropical and warm-temperate waters of the world ocean. Although squid are its major food, when these are not available some fish are consumed (Haley, 1986). Like other cetaceans, pilot whales generally swallow their food without chewing, and intact fish and squid can be found in the stomach. Because of this feeding mode it is possible to find intact mesoparasitic copepods in the stomach contents of pilot whales. Mesoparasitic copepods (sensu Kabata, 1979) insert the anterior part of their elongated body into the host and leave the remainder of the body hanging outside of the host.

During studies of pilot whales caught in the western North Pacific off central Honshu, Japan, Ohizumi et al. (2003) found bluefin driftfish *Psenes pellucidus* Lütken, 1880 in whale stomach contents. Close examination of the fish showed that they were infected with mesoparasitic copepods. Examination of the copepod parasites revealed that they represent a new species of *Sarcotretes*, a rare genus of family Pennellidae (Siphonostomatoida) whose species mostly infect mid- and deep-water benthic fishes (Boxshall and Halsey, 2004). This report describes the new parasitic copepod.

MATERIALS AND METHODS

The stomach contents of two short-finned pilot whales, caught on 15 June 1999 in the western North Pacific at 33°23'N, 135°36'E and 33°18'N, 135°48'E, were examined by Dr. Hiroshi Ohizumi. The pilot whale (99SS029) caught at the first aforementioned site was 4.58 m long and the whale (99SS033) from the latter site was 4.80 m long. Each whale stomach

contained two individuals of *Psenes pellucidus* that were infected with pennellids (Pennellidae). The standard lengths of the two fishes from the first whale were 43.2 cm (Fish No. 1) and 36.2 cm (Fish No. 2), and those of the other two fishes were 43.0 cm (Fish No. 3) and 45.0 cm (Fish No. 4).

Thirty-one female pennellids were obtained from the four hosts. They had the modified, anchor-like anterior portion of the cephalothorax inserted into the host's tissue. The site of insertion seemed to be random. The inserted portion of the parasite's body varied from as little as just the head (including the posterolateral processes) to as much as to the midpoint of the parasite's long neck. The numbers and sites of insertion on four examined host fishes were as follows:

Fish No. 1 carried six parasites in the posterior half of the body; one was inserted above the lateral line and the remaining five, below it.

Fish No. 2 carried two parasites in the middle part of the body above the lateral line.

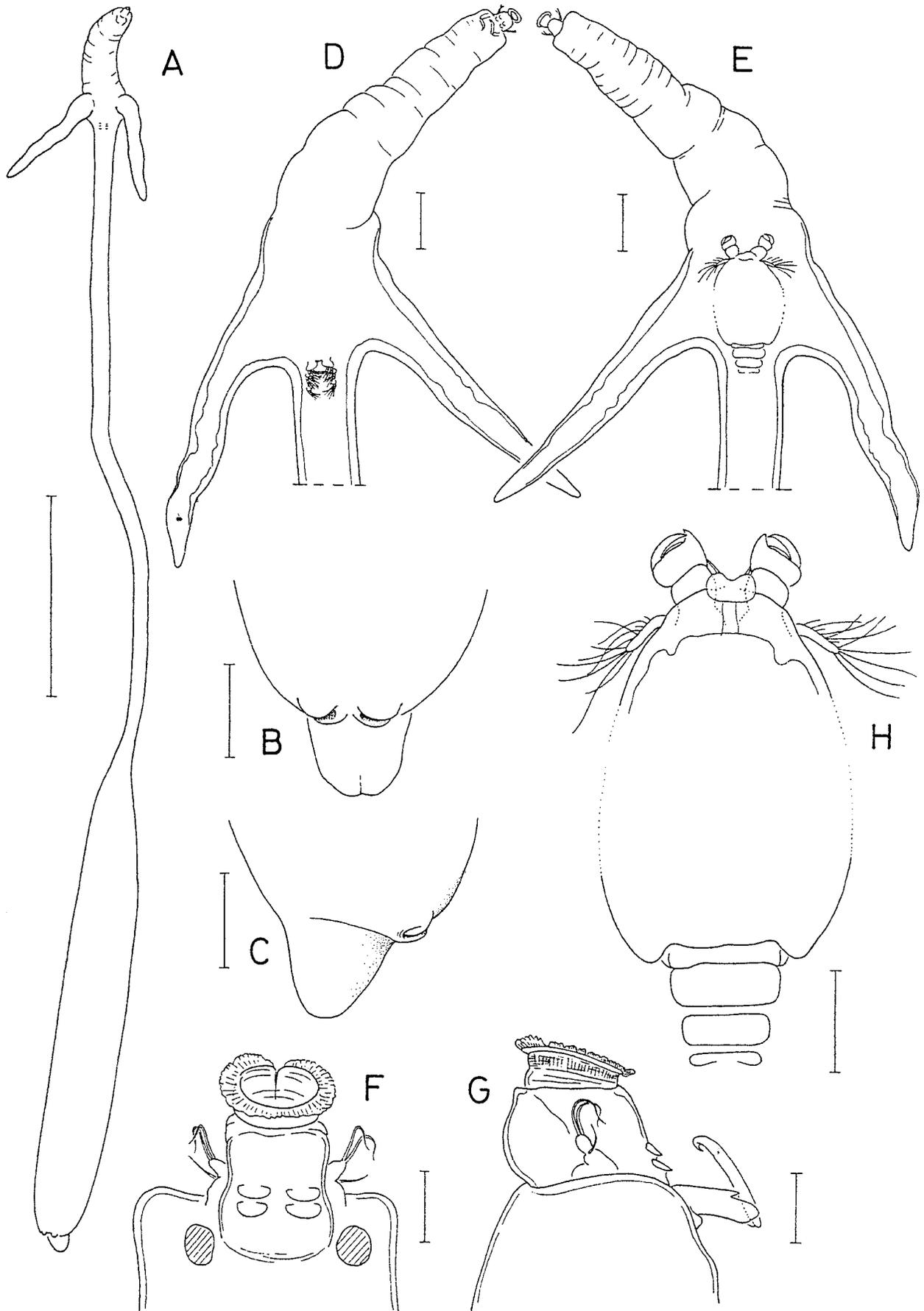
Fish No. 3 carried eight parasites scattered over the whole body; one was above the lateral line, five below the lateral line, and two at the base of the caudal fin.

Fish No. 4 carried 15 parasites scattered over the whole body; three were inserted into the belly near the pectoral fin and the remaining 12 were inserted into the hind part of the fish posterior to the anus, with three above and six below the lateral line, and three in the basal part of the caudal fin.

The parasites were dissected out of the host under a binocular dissecting microscope and preserved in 70% ethanol. To study the parasites, the preserved specimens were soaked in 85% lactic acid for 1 to 2 hours before their dissection under a binocular dissecting microscope. The dissected body parts and appendages of parasites were then examined under a compound microscope using the hanging-drop method devised by Humes and Gooding (1964). All drawings were made with the aid of a camera lucida.

The holotype (USNM 1086756, measuring 6.34 mm in length) and 6 paratypes (USNM 1086757) (from Fish No. 3) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Additionally, 14 paratypes (NSMT-Cr 16825) (from Fish No. 4) have been deposited in the National Science Museum in Tokyo. Two paratype specimens each from Fish No. 3 and Fish No. 4 were dissected to make the following description. These two dissected paratypes and the remaining

Fig. 1. *Sarcotretes longirostris* n. sp., female. A, habitus, ventral. B, posterior of body, ventral. C, posterior of body, lateral. D, anterior of body, ventral. E, anterior of body, dorsal. F, tip of proboscis with maxillae removed, ventral. G, tip of proboscis, lateral. H, vestige of cephalothorax, dorsal. Scale bars: 10 mm in A; 1 mm in B-E; 0.2 mm in F, G; 0.5 mm in H.



specimens are kept in the collection of one of us (IHK). The four fish hosts are kept in the collection of the National Research Institute of Far Seas Fisheries located in Ordo-Shimizu, Shizuoka, Japan.

SYSTEMATICS

Family Pennellidae Burmeister, 1834

Sarcotretes longirostris, new species

Figs. 1-2

Metamorphosed Adult Female.—Body (Fig. 1A) greatly elongated, divisible into holdfast-bearing head, thin and long neck, and cylindrical trunk. Total length 56.05 (41.4-74.4) mm (from tip of cephalothorax to end of abdomen) and trunk length 25.35 (17.9-31.4) mm (from enlarging end of neck to end of abdomen) based on measurements of 18 parasites. Head (Fig. 1D, E) with a pair of highly sclerotized lateral horns (holdfast) grown out of pre-metamorphosed prosome (cephalosome + metasome); in addition, oral area protruded forward as a flexible, cylindrical proboscis with oral cone (mouth tube) at its tip. Two pairs of small sclerites on ventral side of basal region of oral cone (Fig. 1F, G). Three pairs of thoracopods visible on posteroventral surface of head (Fig. 1D) and vestige of dorsal shield of prosome (Fig. 1H) visible on dorsal surface of head (Fig. 1E). Slender neck formed from elongation of posterior portion of pre-metamorphosed metasome combined with anterior portion of pre-metamorphosed urosome (5th pediger), about 1 mm in width throughout. Cylindrical trunk (Fig. 1A) formed from pre-metamorphosed posterior portion of urosome (genital complex + abdomen), 3.29 mm wide at widest part. Egg sac attachment areas (Fig. 1B) located subterminally on trunk. Abdomen (Fig. 1C) small, conical, and lacking caudal rami.

Rostral area (Fig. 2A) not well defined. Antennule (Fig. 2B) without distinct segmentation, carrying 18 short setae, nine long setae and one aesthetasc. Antenna (Fig. 2C) subchelate, consisting of two stout segments and uncinat segment with basal seta; second segment protruded at inner-distal corner into large, tooth-like process hollowed out to receive terminal process. Mandible (Fig. 2D) a highly sclerotized process with uneven, hyaline tip. Maxillule (Fig. 2E) bilobate; large inner lobe tipped with two naked setae and small outer lobe with one naked seta. Maxilla (Fig. 2F) two-segmented; proximal segment (lacertus) armed with strongly sclerotized tooth in middle region of lateral surface, distal segment (brachium) slender and tipped with large, spinulose hook-like process (calamus) and small lobe (canna) tipped with tuft of setules. Maxilliped absent.

Armature of rami of legs 1-3 (Fig. 2G-I) as follows (Roman numerals indicating spines, and Arabic numerals, setae):

	Exopod	Endopod
Leg 1	I-1; 1,1,5	0-1; 7
Leg 2	I-1; II,5	0-1; 7
Leg 3	0-0; II,4	(absent)

Coxa unarmed and basis with naked outer seta in all three legs. Legs 4, 5, and 6 absent.

Male.—Unknown.

Etymology.—The specific name is a combination of two Latin words, “*longus*” (= long) and “*rostrum*” (= bill, beak,

snout, or muzzle), referring to the unusually long proboscis in the head region with the oral cone at its tip.

DISCUSSION

Sarcotretes longirostris n. sp. from the bluefin driftfish is characterized by its: 1) greatly elongated body; 2) head region equipped with one holdfast, consisting of a single pair of non-branching processes; 3) longest part of the body – the neck – comprising the posterior portion of the metasome plus the anterior portion of the urosome (5th pediger); 4) oral area being protruded into a proboscis bearing the oral cone at its tip; and 5) possession of three pairs of thoracic legs. The possession of a long proboscis is perhaps the most remarkable of these five features.

When Boxshall (1986) conducted an analysis of evolution within the Pennellidae, *Metapeniculus* Castro and Baeza, 1985 was not included. However, according to the works of Castro and Baeza (1985, 1991) and Boxshall and Halsey (2004), it is a valid genus of the Pennellidae. Thus, *Metapeniculus* was included in our search for the identity of the present new pennellid.

The species of only three of the 20 valid pennellid genera have the oral area protruded into a proboscis like that of the present new species. These genera are: *Metapeniculus*, *Ophiolernaea* Shiino, 1958, and *Sarcotretes* Jungersen, 1911. The species of *Ophiolernaea* are known to possess four pairs of thoracopods and an extremely long proboscis, longer than the body proper (Shiino, 1958; Ho, 1966), so this genus is removed from further consideration. Lacking a cephalic holdfast and with the maxillae placed at the base of the proboscis (rather than at the base of the oral cone: Castro and Baeza, 1991), *Metapeniculus* also requires no further scrutiny. Thus, only *Sarcotretes* remained to be considered further. Based on Jungersen’s (1911) original definition as well as Wilson’s (1917) redefinition of this genus the new species can be assigned here without problem.

Sarcotretes has six nominal species, but according to Hogans (1988) and Boxshall (1989) only two of them, *S. scopeli* Jungersen, 1911 and *S. eristaliformis* (Brian, 1908), can be considered valid. These two species differ chiefly in their size and the relative length of the neck. *Sarcotretes eristaliformis* is considerably larger (44.5-58.0 mm) than *S. scopeli* (< 25 mm) and its neck is nearly as long as the trunk (less than 3/4 of the trunk length in *S. scopeli*). Having a large body (41.4-74.4 mm) with a thin neck longer than the trunk, the new species from the *Psenes pellucidus* appears to be closer to *S. eristaliformis*.

Sarcotretes eristaliformis was originally placed in *Lernaenicus* when Brian (1908) described it from an Atlantic deep-water benthic fish, *Bathypterois dubius* Vaillant, 1880. We concur with Hogans (1988) that “*Sarcotretes eristaliformis* (Brian, 1908)” reported by Kabata and Gusev (1966) from a *Bathylagus* sp. collected from the Antarctic is a synonym of *S. scopeli*. The details of the body parts and appendages were not given in Brian’s (1908) original description of *S. eristaliformis*, but comparison with Brian’s (1912) subsequent redescription shows that our specimens cannot be identified with it. Major discrepancies are found in the structure of the holdfast, relative length of the proboscis, and relative length of the neck. As shown in Fig. 1A, the

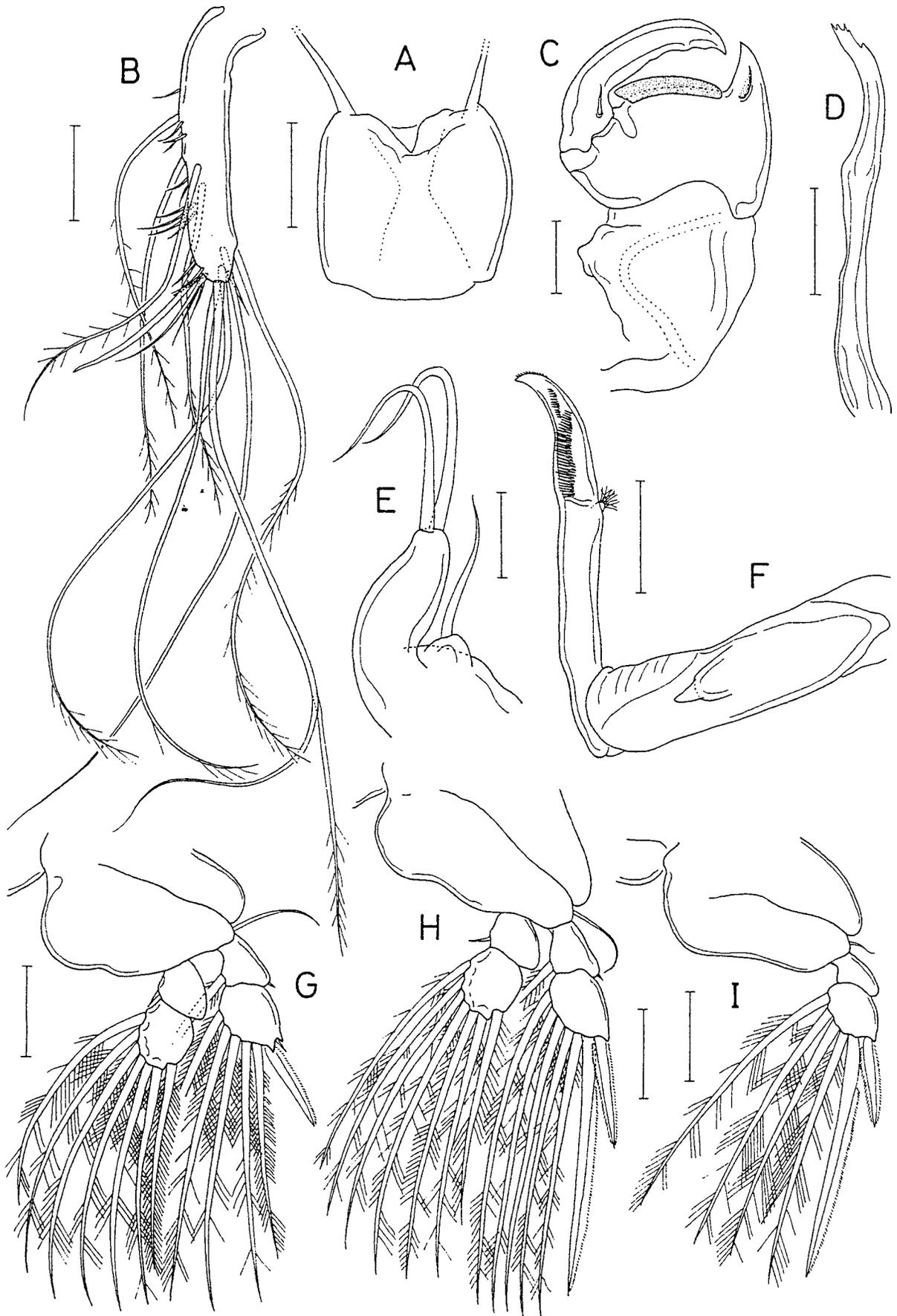


Fig. 2. *Sarcotretes longirostris* n. sp., female. A, rostrum, dorsal; B, antennule, dorsal; C, antenna, dorsal; D, mandible; E, maxillule; F, maxilla, lateral; G, leg 1, anterior; H, leg 2, anterior; I, leg 3, anterior. Scale bars: 0.1 mm in A-C, F-I; 0.05 mm in D, E.

holdfast of our new form has a pair of blunt cephalothoracic processes, the proboscis is longer than the head, and the neck (3.28 cm) is distinctly longer than the trunk (2.57 cm), comprising more than one-half of the total body length (6.30 cm). In contrast, in *S. eristaliformis* the holdfast consists of a pair of laterally expanded lobes abruptly tapering into small rods, the proboscis is shorter than the head, and the neck is not longer than the trunk. Accordingly, the pennellids obtained from the bluefin driftfish were recognized as a new species and named *Sacrotretes longirostris*.

Psenes pellucidus is a bathypelagic fish widely distributed in the Atlantic, Indian, and Pacific Oceans (Froese and Pauly, 2006). It has never been reported carrying a copepod parasite. Additionally, as far as we know, none of the six species of *Psenes* has been reported to be infected with a parasitic copepod. Although Pillai (1985) reported finding *Bomolochus multiceros* Pillai and Natarajan, 1977 on *Psenes indicus* (Day, 1871) caught off Trivandrum, India, according to Froese and Pauly (2006) *P. indicus* has been relegated to the synonym of *Ariomma indica* (Day, 1871). These two genera are not confamilial, while *Psenes* is a member of Nomeidae, *Ariomma* is a member of Ariommatidae.

ACKNOWLEDGEMENTS

We thank Dr. Hiroshi Ohizumi of the School of Marine Science and Technology, Tokai University, in Shizuoka, Japan, for his kindness in providing us with the infected bluefin driftfish. Dr. Z. Kabata and two other reviewers are also acknowledged for helps in the improvement of this paper. Completion of this study was supported by a fellowship from the Japan International Science and Technology Exchange Center (JISTEC) and a grant from the Paramitas Foundation to JSH.

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RECEIVED: 27 April 2006.

ACCEPTED: 21 June 2006.