

***Mytilidiphila*, a New Genus of Nautiliniellid Polychaetes
Living in the Mantle Cavity of Deep-sea Mytilid
Bivalves Collected from the Okinawa Trough**

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ABSTRACT—Nautiliniellid polychaetes living in the mantle cavity of deep-sea mytilid bivalves collected from the Minami-Ensei Knoll and the Iheya Ridge of the Okinawa Trough, were studied taxonomically. These polychaetes including two different species were unique in the family in having more than 20 simple hooks per parapodium. They were considered to belong to a single new genus, *Mytilidiphila*. *Mytilidiphila enseiensis* n. sp., found living in the mantle cavity of undescribed mytilid bivalves close to the genus *Adula*, has more than 35 simple hooks per parapodium on middle setigers. *Mytilidiphila okinawaensis* n. sp., found living in the mantle cavity of undescribed deep-sea mussels close to the genus *Bathymodiolus*, has also numerous simple hooks on each parapodium. However, the distal end of simple hook of *M. okinawaensis* is rounded and distinguishable from the pointed one of *M. enseiensis*.

INTRODUCTION

The deep-sea biological community at the Minami-Ensei Knoll of the Okinawa Trough was firstly studied by Japan Marine Science and Technology Center in 1988 and 1989 in a series of surveys using the deep towed camera system and the deep submergence research vehicle (DSRV) *Shinkai 2000* [2]. The community found at the Minami-Ensei Knoll were composed of typical hydrothermal vent organisms including vestimentiferans, mytilid bivalves, vesicomyid clams and lithodid crabs, some of which have been described as new to science [7, 8]. Many specimens of deep-sea mytilid bivalves also were sampled in our recent dives, and during measurement and dissection of these mussels on the research vessel *Natsushima*, we collected nautiliniellid worms living in their mantle cavity. Most nautiliniellid worms attached so stiffly to or penetrated so deeply into the gill filaments of the host mussels that we had to dissect the host tissue for collection.

The polychaete family Nautiliniellidae has included four genera and five species from both Pacific [4–6] and Atlantic Oceans [1]. These nautiliniellid polychaetes were found living in the mantle cavity of the deep-sea bivalves of hydrothermal vents and cold seeps. Concerned with their commensal or parasitic life, the nautiliniellid worms have simple-structured body with less developed prostomium, numerous similar segments, a few kinds of setae and pygidium lacking anal cirri. However the number of prostomial antennae, the presence of dorsal cirri and/or projected setae on the second segment, the parapodial structure and the setal composition show remarkable interspecific variability. These morphological characters are thus important for their classification at both generic and specific levels. In the previously known species, the Atlantic species, *Petrecca thyasira* Blake is unique in having modified parapodia with elongated notopodia and reduced tentacular segment without dorsal cirri nor setae [1]. The nautiliniellid polychaetes we collected from the Okinawa Trough also have reduced tentacular segment. However they differ from the Atlantic species in the parapodial structure. They also are distinct from the other

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nautiliniellid species in the setal composition. Consequently, a new genus and two new species are described in this study. The types are deposited in the National Science Museum, Tokyo (NSMT) and Japan Marine Science and Technology Center (JAMSTEC).

DESCRIPTION

Family Nautiliniellidae Miura & Laubier

Mytilidiphila, new genus

(Japanese name: Igaiyadorigokai-zoku, new)

Type species.—*Mytilidiphila enseiensis*, new species.

Gender.—Feminine.

Diagnosis.—Body long, vermiform, tapering posteriorly with numerous setigers, flattened ventrally and arched dorsally in cross-section. Prostomium short with a pair of antennae, without eyes. Second or tentacular segment well fused with prostomium, having ventral cirri and embedded neuroacacula, with or without setae. Parapodia subbiramous with dorsal and ventral cirri; notopodium supported by a single stout notoaciculum, without setae; neuropodia supported by a single stout neuroaciculum, with numerous simple, hooked setae. Pygidium cylindrical without appendages.

Remarks.—The family Nautiliniellidae is unique in the class Polychaeta, in the combination of one or two pairs of prostomial antennae, reduced tentacular segment, lack of palps, subbiramous parapodia and simple neuropodial hooks as well as the association with deep-sea bivalves [1, 4–6]. The genus *Mytilidiphila* also is referred to the

family, in having these morphological characters and ecological feature.

In the family, the genus *Natsushima* Miura & Laubier has additional simple bifurcate setae and differs from four other genera having only simple neuropodial hooks [5]. The four genera divided into two groups by the thickness of the notoacacula. The genera *Nautiliniella* Miura & Laubier and *Mytilidiphila* have the notoacacula as thick as the neuroacacula [4], while *Shinkai* Miura & Labuier and *Petrecca* Blake have slender notoacacula [1, 5]. The genus *Mytilidiphila* has only a pair of prostomial antennae and differs from *Nautiliniella* with two pairs. The genus *Mytilidiphila* also differs from all other genera of the family in having more than 20 simple hooks on a single parapodium at least in some setigers, instead of up to 10. In other point of view, each nautiliniellid genus is tend to be associated with a certain group of bivalves: *Shinkai* and *Nautiliniella* with *Calyptogena* spp., *Petrecca* with *Thyasira* sp., *Natsushima* with a solemyid bivalve, *Mytilidiphila* with mytilid bivalves.

Etymology.—The genus name is made by the combination of the family name of the host bivalves, Mytilidae, and a Latinized Greek suffix, *-phila*.

Mytilidiphila enseiensis, new species

(Japanese name: Ensei-igaiyadori, new)

(Fig. 1a–g)

Material.—Minami-Ensei Knoll, Okinawa Trough, DSRV *Shinkai 2000* Dive 616, 1 June 1992, 28° 23.5'N, 127° 38.5'E, 625 m, associated with undescribed deep-sea mytilid bivalves close to the genus

TABLE 1. Measurements of complete specimens of *Mytilidiphila enseiensis* n. sp.

No.	Body Length (mm)	Body Width (mm)	Number of Segments	Notes
2-1	20.8	1.3	121	Holotype
2-2	11.4	1.2	80	caudal end regenerated
2-3	14.1	1.2	81	
2-4	13.5	0.6	79	
2-5	27.8	1.5	164	Largest paratype (ovigerous)
5-1	8.5	1.2	54	caudal end regenerated
5-2	12.8	1.2	77	

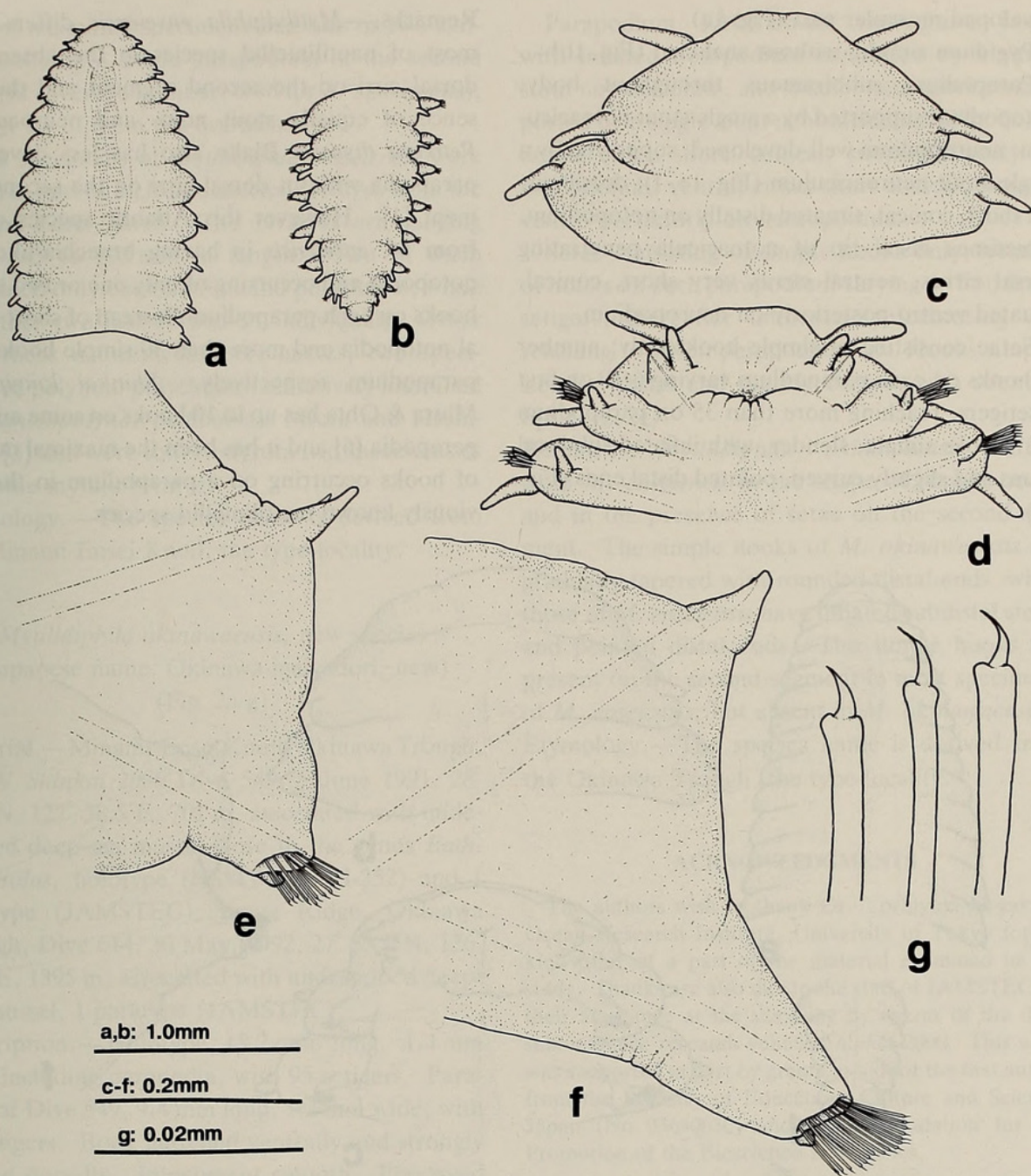


FIG. 1. *Mytilidiphila enseiensis* n. sp. (Holotype): a, Anterior end, dorsal view; b, Posterior end, dorsal view; c, Anterior end enlarged, dorsal view; d, Same, ventral view; e, Parapodium of the 11th segment (or parapodium 10), anterior view; f, Parapodium of the 27th segment (or parapodium 26), anterior view; g, Hooks.

Adula, holotype (NSMT Pol. H-351) and 36 paratypes (JAMSTEC).

Description.—Holotype 20.8 mm long, 1.3 mm wide including parapodia, with 121 setigers. Largest paratype ovigerous, 27.8 mm long, 1.5 mm wide, with 164 setigers (measurement of all complete specimens shown in Table 1). Body flattened ventrally and arched dorsally. Integument

smooth. Preserved specimen pale.

Prostomium short, with a pair of short cirriform antennae, without eyes (Fig. 1a, c, d). Second segment well fused with prostomium, defined by embedded acicula and ventral cirri as well as projected simple hooks (Fig. 1d). Mouth opening situated between prostomium and first fully developed setigerous segment. Foregut with well-

developed muscular part (Fig. 1a).

Pygidium simple, without anal cirri (Fig. 1b).

Parapodium subbiramous throughout body; notopodium supported by a single stout notoaciculum; neuropodium well-developed, supported by a single stout neuroaciculum (Fig. 1e, f); dorsal cirrus short, conical, situated distally on notopodium, sometimes distal tip of notoacacula penetrating dorsal cirrus; ventral cirrus very short, conical, situated ventro-posteriorly on neuropodium.

Setae consisting of simple hooks only; number of hooks on each parapodium varying 6-10 on first 3 setigers, reaching more than 35 on parapodium 26. Hooks simple, slender, with inflated subdistal stems and slightly curved, pointed distal ends (Fig. 1g).

Remarks.—*Mytilidiphila enseiensis* differs from most of nautiliniellid species in the absence of dorsal cirri on the second segment and the presence of equally stout noto- and neuroacacula. *Petrecca thyasira* Blake also has less developed parapodia without dorsal cirri on the second segment [1]. However this Atlantic species differs from *M. enseiensis* in having branchia-like long notopodia and occurring of only one or two simple hooks on each parapodium, instead of short conical notopodia and more than 30 simple hooks on a parapodium respectively. *Shinkai longipedata* Miura & Ohta has up to 10 hooks on some anterior parapodia [6] and it has been the maximal number of hooks occurring on a parapodium in the previously known nautiliniellid species.

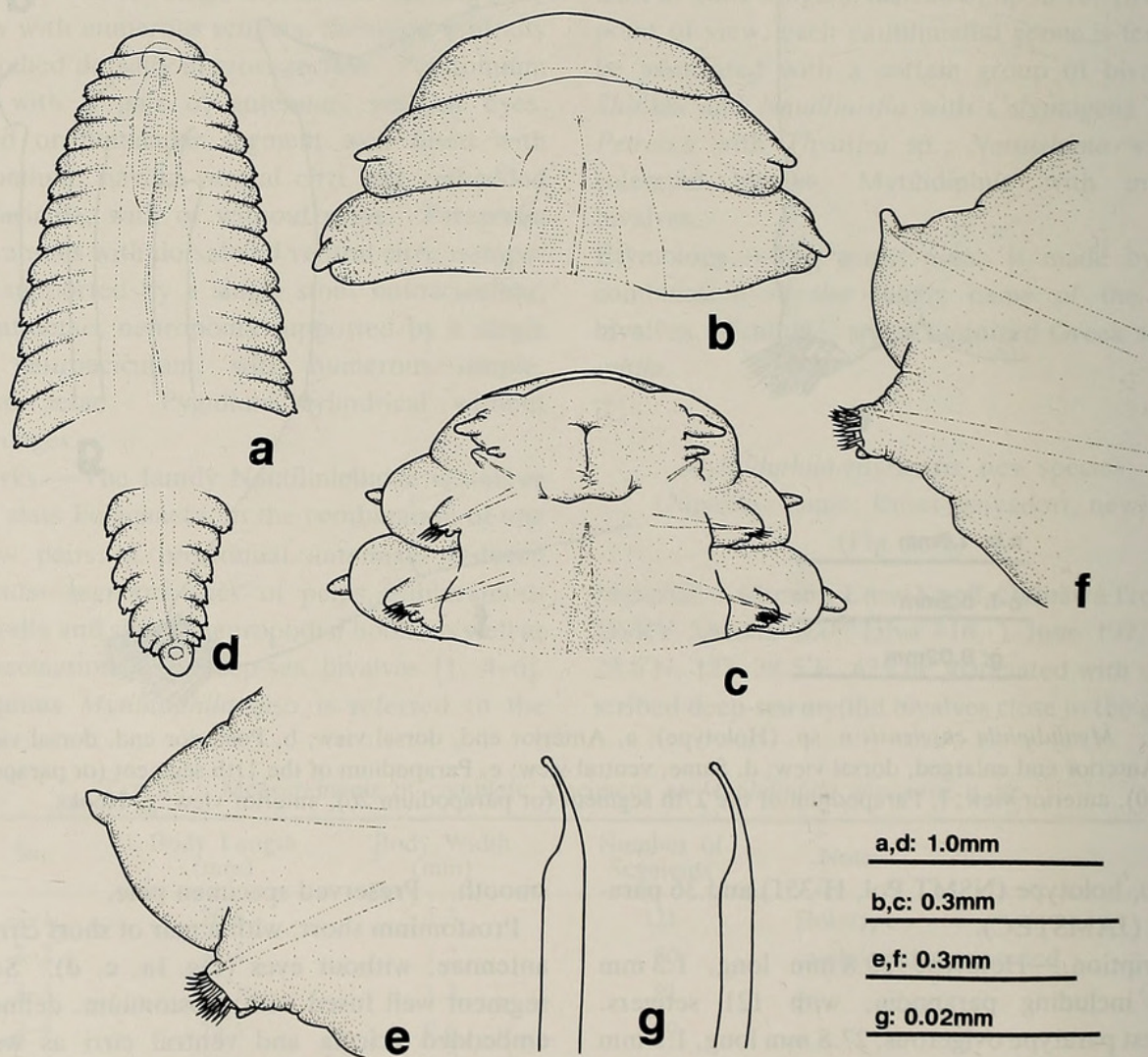


FIG. 2. *Mytilidiphila okinawaensis* n. sp. (Holotype): a, Anterior end, dorsal view; b, Same, enlarged, dorsal view; c, Same, ventral view; d, Posterior end, dorsal view; e, Parapodium of the 11th segment (or parapodium 10), anterior view; f, Parapodium of the 36th segment (or parapodium 35), anterior view; g, Hooks.

Most examined specimens had one or two simple hooks on a single parapodium of the second segment (average number: 0.96 for 37 specimens), though six of them did not have any.

The specimens of *Mytilidiphila enseiensis* were found to harbor all four dissected bivalves from the Minami-Ensei Knoll. The bivalves are ranging from 163 to 175 mm in length. Two of them contained only one nautiliniellid polychaete, while the other two had 16 and 21 individuals. Other than these nautiliniellid polychaetes, two specimens of polynoid polychaetes tentatively identified as *Branchipolynoe pettiboneae* Miura and Hashimoto [3] also were collected from two specimens of the same mytilid bivalve.

Etymology.—The species name is derived from the Minami-Ensei Knoll, the type-locality.

Mytilidiphila okinawaensis, new species
(Japanese name: Okinawa-igaiyadori, new)
(Fig. 2a-g)

Material.—Minami-Ensei Knoll, Okinawa Trough, DSRV *Shinkai 2000* Dive 549, 5 June 1991, 28° 23.5'N, 127° 38.5'E, 701 m, associated with undescribed deep-sea mussel close to the genus *Bathymodiolus*, holotype (NSMT Pol. H-352) and 1 paratype (JAMSTEC); Iheya Ridge, Okinawa Trough, Dive 614, 30 May, 1992, 27° 33.0'N, 126° 58.0'E, 1395 m, associated with undescribed deep-sea mussel, 1 paratype (JAMSTEC).

Description.—Holotype 15.2 mm long, 1.4 mm wide including parapodia, with 95 setigers. Paratype of Dive 549, 9.4 mm long, 1.2 mm wide, with 84 setigers. Body flattened ventrally and strongly arched dorsally. Integument smooth. Preserved specimen pale.

Prostomium short, ventrally with a pair of very short cirriform antennae, without eyes (Fig. 2a-c). Second or tentacular segment well fused with prostomium, achaetous, defined by embedded acicula and ventral cirri (Fig. 2c). Ventral cirri of tentacular segment inserted in front of neuropodium. Mouth opening situated between prostomium and first fully developed setigerous segment. Foregut with well-developed muscular part (Fig. 2a).

Pygidium rounded, without anal cirri (Fig. 2d).

Parapodium subbiramous throughout body, with inflated notopodium supported by a single stout notoaciculum, and smaller neuropodium supported by a single stout neuroaciculum (Fig. 2e, f); dorsal cirrus short, conical, situated distally on notopodium; ventral cirrus short conical, situated ventro-posteriorly on neuropodium.

Setae consisting of simple hooks only; number of hooks on each parapodium varying 4–7 on first 3 setigers, thereafter immediately increasing and reaching to 20 on parapodium 10. Hooks simple, slender; distal end slightly curved, with rounded tips (Fig. 2g).

Remarks.—*Mytilidiphila okinawaensis* differs from *M. enseiensis* in the shape of simple hooks and in the presence of setae on the second segment. The simple hooks of *M. okinawaensis* are gradually tapered with rounded distal ends, while those of *M. enseiensis* have inflated subdistal stems and pointed distal ends. The simple hooks are present on the second segment in most specimens of *M. enseiensis*, but absent in *M. okinawaensis*.

Etymology.—The species name is derived from the Okinawa Trough, the type-locality.

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