

A New Lophiid Anglerfish, *Lophiodes fimbriatus* from the Coastal Waters of Japan

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Abstract A new species of lophiid anglerfish, *Lophiodes fimbriatus*, is described. The holotype was captured from Wakayama and the paratype from Kuba-jima, Okinawa Prefecture. The present species is distinguished from its congeners by the combinations of the following characters: slender and branched tendrils present on both dorsal and ventral surfaces of the body, lightly pigmented illicium, simple vestigial esca, and paired tendrils on the third dorsal spine.

A remarkable specimen of lophiid anglerfish was captured in Wakayama, on the Pacific coast of central Japan. Another specimen was captured in Kuba-jima, Kerama Islands in Okinawa Prefecture by SCUBA divers. These specimens are unusual in having slender and branched tendrils on both dorsal and ventral surfaces of the body, and represent a new species.

Most measurement procedures were conducted according to Hubbs and Lagler (1974), but the

measurement procedures for head length (HL), head width, and frontal width follow Caruso (1981, 1983). The interorbital width and the lower jaw length were measured in the way defined below:

1. Interorbital width: distance between supra-orbital crests above the center of eye.

2. Lower jaw length: distance between dentary symphysis and the posterior tip of articular bone.

For the locations of spines and their terminologies, see Fig. 1.

Vertebral counts and pectoral fin ray counts were made from radiographs taken with soft X-ray equipment. Vertebral counts exclude the compound ural centra.

Histological preparations of the tendrils were made using standard paraffin procedures and were stained with hematoxylin-eosin Y stain series and also in alcian blue-PAS stain series. All the sections are 5 μ m thick.

Abbreviations for institutions are as follows: URM: the Department of Marine Sciences, University of the Ryukyus; ZUMT: the Department of Zoology, University Museum, University of Tokyo.

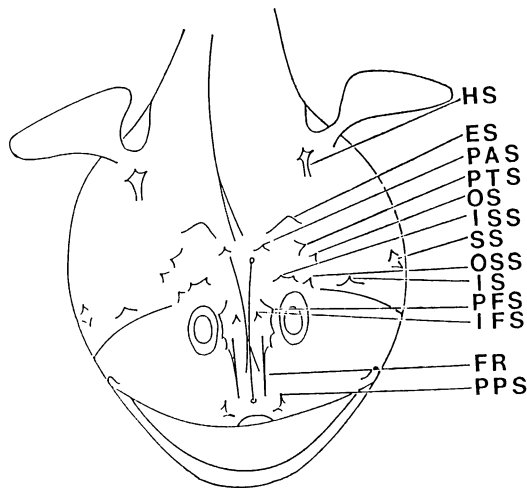


Fig. 1. Diagram showing the locations of spines and their terminologies of lophiid anglerfishes.

HS, humeral spine; ES, epiotic spine; PAS, parietal spine; PTS, pterotic spine; OS, opercular spine; ISS, inner sphenotic spine; SS, subopercular spine; OSS, outer sphenotic spine; IS, interopercular spine; PFS, posterior frontal spine; IFS, inner frontal spine; FR, frontal ridge; PPS, posterior palatine spine.

Lophiodes fimbriatus sp. nov.
(New Japanese name: Mino-anko)
(Fig. 2A)

Holotype. ZUMT 44066, 75 mm in standard length (SL), male, Wakayama, Pacific coast of central Japan. Date of capture unknown, probably between 1910 and 1920.

Paratype. URM-P 8222, 1 specimen, 61 mm SL, Kuba-jima, Kerama Islands, Okinawa Prefecture, 7–8 m depth, collected by SCUBA divers on 8 Aug. 1983.

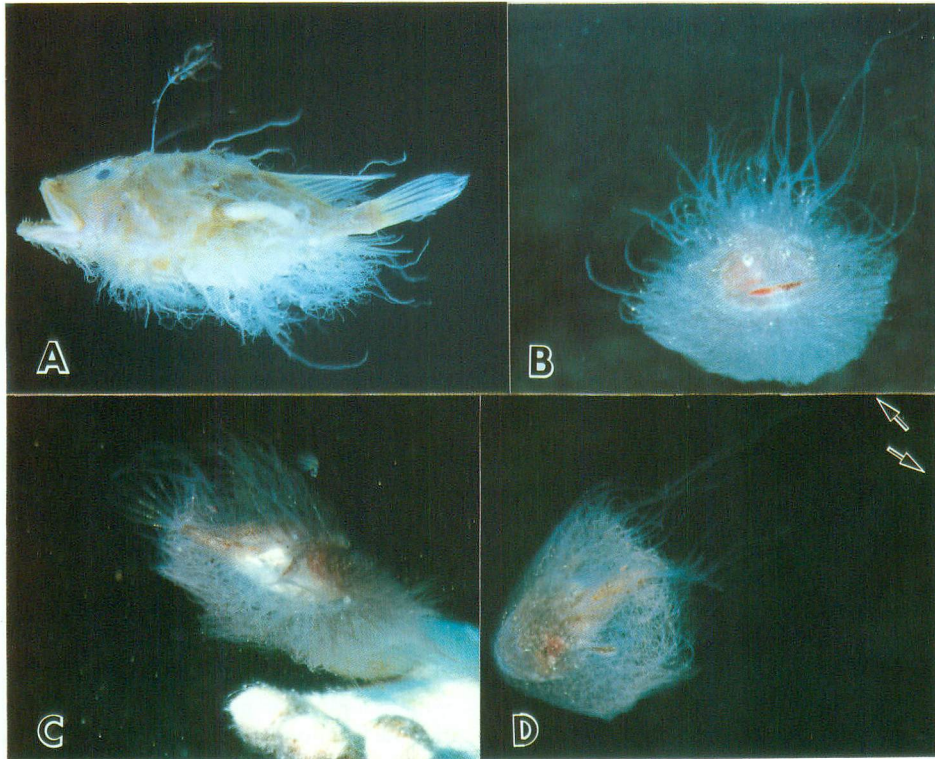


Fig. 2. Photographs of *Lophiodes fimbriatus* sp. nov. A, photograph of the holotype specimen, ZUMT 44066, 75 mm SL; B, front view of the paratype specimen URM-P 8222, 61 mm SL in swimming motion; C, side view of the paratype specimen; D, dorsal view of the paratype specimen; Arrow indicates the tip of the tendril. Photographs B, C, D, courtesy of Mr. Yoji Okata.

The specimen was placed in an aquarium soon after its capture, but died the next morning. After being placed in a freezer for over a month, it was preserved in 10% formalin. All the tendrills on the body and on the third dorsal spine had come off by then.

Diagnosis. Numerous slender and branched tendrills present on both dorsal and ventral surfaces of body (Fig. 2); esca vestigial (Fig. 3); paired elaborate tendrills present on third dorsal spine (Fig. 4); subopercular spine double; inner frontal spine present; humeral spine flat at tip; body white with some dark brown pigmentations when alive (Fig. 2).

Description of holotype. Counts and measurements are presented in Table 1. Head moderately depressed. Skin loose, balloon like and translucent. Gill opening extending in front of, below and behind the pectoral fin base. Illicium lightly pigmented, reaching beyond posterior frontal spine. Esca vestigial, slightly broader than illicium with a short cirrus on its tip (Fig. 3).

Second dorsal spine reaches origin of third dorsal spine. Single row of minute white spines present on anterior side of second dorsal spine; the spines recurved upwards. Third dorsal spine longest, reaching base of soft dorsal fin. Paired elaborate tendrills resembling trident of Poseidon present two thirds toward tip of third dorsal spine (Fig. 4); a paired darkly pigmented triangular blotch present on anterior side of basal part of second tendril from bottom on third dorsal spine. Fourth and fifth dorsal spines reduced, both reaching soft dorsal fin.

Anal fin begins at level of origin of sixth ray of soft dorsal fin. Pelvic fin slender and flat.

Frontal ridge, outer surface of maxillary and articular bones smooth, without any knobs. Palatine spines two, weak, and the posterior one straight. Inner frontal spine present. Supra-orbital crest with three ridges, each ridge ending in a knob forming frontal spine. Interorbital area moderately concave. Inner sphenotic spine straight.

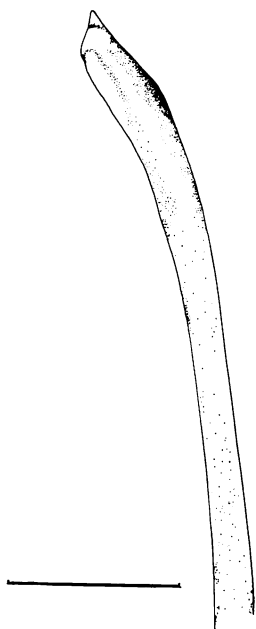


Fig. 3. Sketch of the esca of *Lophiodes fimbriatus* sp. nov., holotype, ZUMT 44066, 75 mm SL. Line indicates 1 mm.



Fig. 4. Sketch of the tendril on the third dorsal spine of *Lophiodes fimbriatus* sp. nov., holotype, ZUMT 44066, 75 mm SL. Line indicates 1 mm.

Pterotic spine weak. Parietal spine straight, strong. Humeral spine flat at tip. Subopercular spines two, inner one pointed toward body, outer one straight. Two spines on articular bone, one

Table 1. Counts and measurements of *Lophiodes fimbriatus* sp. nov. PPS, posterior palatine spine; PFS, posterior frontal spine; ISS, inner sphenotic spine; PTS, pterotic spine.

Catalogue No.	Holotype ZUMT 44066	Paratype URM-P 8222
Standard length (mm)	75	61
Total length (mm)	108	—
Counts		
Dorsal fin rays	II-I-II, 8	II-I-II, 9
Pectoral fin rays	23	21
Pelvic fin rays	8	5
Anal fin rays	6	6
Caudal fin rays	8	8
Vertebrae	18	18
Measurements expressed as % of SL		
Distance from snout to:		
3rd dorsal spine	46.8	29.5
4th dorsal spine	51.7	54.1
5th dorsal spine	57.7	—
Soft dorsal fin origin	63.8	67.2
Pelvic fin origin	43.4	47.5
Anus	78.7	75.4
Length of:		
Head	33.8	22.6
Illicium	22.6	24.6
2nd dorsal spine	23.9	24.6
3rd dorsal spine	37.9	47.5
4th dorsal spine	19.1	19.7
5th dorsal spine	8.0	14.8
Soft dorsal fin base	25.9	29.5
Anal fin base	15.2	13.1
Lower jaw	43.4	45.9
Caudal fin	37.3	—
Measurements expressed as % of HL		
Head width	70.9	55.6
Frontal width	31.1	28.3
Interorbital width	40.9	33.3
Distance between:		
PPS	50.8	40.7
PFS	45.3	39.0
ISS	68.5	55.6
PPS-PFS	52.8	40.7
PPS-ISS	68.5	55.6
PPS-PTS	86.2	70.4

anterior and one posterior to jaw joint.

Lateral line pores without any surrounding tendrils.

Slender and branched tendrils present on both dorsal and ventral surface of body. Tendrils on dorsal surface of body simple, fringed at tip (Fig.



Fig. 5. Sketch of the tendrils of *Lophiodes fimbriatus* sp. nov., holotype, ZUMT 44066, 75 mm SL. A, dorsal tendril; B, ventral tendril.

5A), fewer in number than ventral ones. Tendrils on ventral surface slender and branched (Fig. 5B), some ventral tendrils one and a half times the length of body (Fig. 2A). Basic structures of both dorsal and ventral tendrils do not differ significantly from each other. Section of branched part of ventral tendril (Fig. 6) shows a layer of epidermis and a pair of arteriole and venule running through its center. All the cell membranes are ruptured, releasing cytoplasm from cells.

Some short tendrils present around lower jaw.

Color in formalin: body, all fins, tongue, and inside of mouth tan. Pigmentations present on both dorsal and ventral tendrils. Ventral side of peritonium pale, dorsal side dusky.

Note. Histological preparation of the gonad revealed that the specimen is an immature male.

Description of paratype. Counts and measurements are presented in Table 1. Most morphological characters are identical to those of the holotype.

Tendrils missing completely from body, allow-

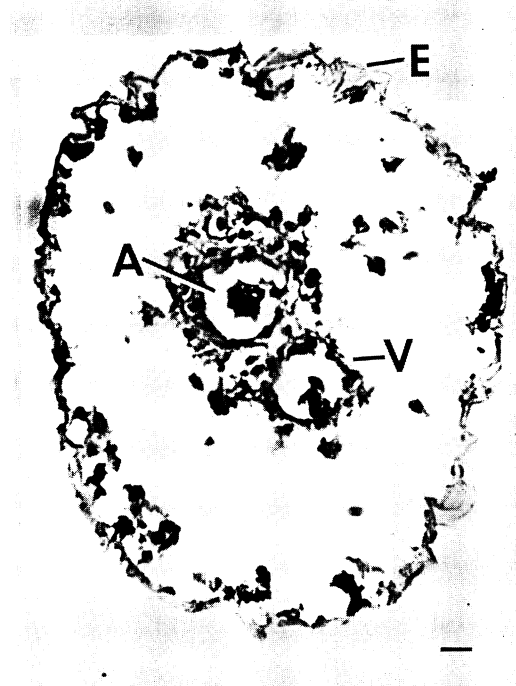


Fig. 6. Photograph of the section of a ventral tendril of *Lophiodes fimbriatus* sp. nov., holotype, ZUMT 44066, 75 mm SL. Section stained with alcian blue-PAS series stains. Section 5 μ m thick. A, arteriole; E, epidermis; V, venule. Line indicates 0.01 mm.

ing easier observation of body surface which revealed circular pigmentations on dorsal surface of body and numerous round indentations on ventral side of body.

Note. Underwater photographs in Fig. 2B-D were taken by SCUBA divers who caught the specimen. The specimen was at first swimming near the bottom, and eventually came up to the surface after being harassed by the divers. It swam slowly but was able to change its course rapidly.

We can observe in these photographs (Fig. 2B-D) that the body and the tendrils are white in color with some dark brown pigmentations. In Fig. 2C, the paired tendrils on the third dorsal spine are visible. The shapes of these tendrils agree well with those of the holotype (Fig. 4).

Judging from the dorsal view of the specimen in swimming motion (Fig. 2D), with the tendrils spreading out horizontally, the tendrils seem to

have enough elasticity to withstand the pressure caused by swimming.

Etymology. The name *fimbriatus* is from the Latin meaning fibrous, fringed, bordered with hairs, referring to the tendrils on the body of the species. The new Japanese name "mino-anko" is given for the tendrils on the body which make the fish look as though it is wearing a "mino", Japanese traditional rain gear. "Anko" means lophiid anglerfish in Japanese.

Discussion

The present new species belongs to the genus *Lophiodes* by the combinations of the following characters: two spines on the articular bone, one anterior and one posterior to the jaw joint; frontal ridge, the outer surface of maxillary and articular bones smooth, without knobs; gill opening extending in front of, below and behind the pectoral fin base; 18 vertebrae.

The present new species closely resembles *L. monodi* Le Danois in many morphological characters. The new species can be distinguished from *L. monodi* in having slender and branched tendrils on both dorsal and ventral surface of the body (tendrils present only on the dorsal surface of the body in *L. monodi*), a vestigial esca with a short cirrus on its tip (esca round and flat with some white portions at its base in *L. monodi*), a flat humeral spine (humeral spine triangular in cross section with four points on its tip in *L. monodi*), and by its white body with some dark brown pigmentations (color of body dark brown in *L. monodi*).

The tendrils present on both dorsal and ventral surface of the body may be adaptations to bathypelagic life, providing the fish with buoyancy by increasing its surface area and volume. These tendrils may also work as a protection against potential predators by mimicry. In the water the white tendrils may make the fish look bigger or even resemble a jellyfish.

It is interesting to note in Fig. 2C that the tendrils on the third dorsal spine stand out clearly among the tendrils originating from the dorsal surface of the body. These paired tendrils on the third dorsal spine might function as a lure to attract prey like the esca of other lophiid anglerfishes. This seems very likely because the esca of this species is vestigial without any specialized

shape or appendages.

The locations of the dark brown circular pigmentations on the dorsal surface and the round indentations on the ventral surface of the paratype specimen agree well with the locations of the origins of the tendrils of the holotype specimen. These marks seem to represent the locations of the origins of the tendrils of the paratype.

From the histological observation of the ventral tendril with the cell membranes ruptured and thus releasing all the cytoplasm from the cells, the holotype might have been frozen prior to its fixation in formalin. The stained parts in Fig. 6 other than the epidermis and the blood vessels, especially the darkly stained blotches, may be artificial substances which are often observed in the sections of specimens preserved in formalin for a long time.

Acknowledgments

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日本近海から得られたアンコウ科の 1 新種ミノアンコウ
Lophiodes fimbriatus

猿渡敏郎・望月賢二

日本近海から得られた 2 個体の標本を基に新種ミノアンコウ *Lophiodes fimbriatus* を記載した。本種は体の背面と腹面両方から分枝した細長い皮弁が出ていること、illicium に色素胞が点在していること、esca が痕跡的であること、第三遊離背鱗条に対をなす皮弁が複数存在していることから、同属の他種から容易に区別することが出来る。

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