

A New Species of Deepwater Worm-eel, *Muraenichthys profundorum* (Anguilliformes: Ophichthidae), from the Nazca Ridge

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Abstract A new species of deepwater eastern Pacific worm-eel, *Muraenichthys profundorum*, subgenus *Scolecenchelys*, is described from a specimen trawled at 310 m on the Nazca Ridge. It is the deepest capture of any known *Muraenichthys*. The new species is distinguished from its closest relatives in having more vertebrae and slightly different body and head morphometry. The distribution of eastern Pacific *Muraenichthys* is the result of eastward dispersal along the southeastern margin of the Indo-west Pacific Plate. Taxonomic actions concerning the species of *Muraenichthys* are reviewed.

Worm-eels of the genus *Muraenichthys* (family Ophichthidae, subfamily Myrophinae) are the most speciose of tropical Indo-Pacific myrophines and often the most common eel found in shallow water sand environments. There are approximately 23 currently recognized species known from the tropical, subtropical, and warm-temperate Indo-Pacific Ocean, and to that list we herein add the second southeastern Pacific species.

The genus *Muraenichthys* was last revised by McCosker (1970), following the earlier works of Schultz and Woods (1949) and Schultz et al. (1953). McCosker recognized 19 species and described the first New World species, *M. chilensis*. He identified distinct subgeneric lineages based on differences in head pores, dentition, snout shape, body depth, and the condition of the posterior nostril. His subsequent osteological study (1977) of *M. gymnopterus* and *M. macropterus* did not discover osteological differences adequate to allow generic recognition of the subgenera *Muraenichthys* and *Scolecenchelys*. Subsequent to McCosker's (1970) review, several new species have been described and other taxonomic actions taken. Scott (1975) described *M. lingowenah* from Tasmania (it apparently lies within the subgenus *Scolecenchelys*) and commented upon Tasmanian specimens of *M. breviceps*, *M. tasmaniensis*, and *M. australis*. McCosker (1979) described *M. puhiolo* (subgenus *Scolecenchelys*) from a deepwater collection made off Oahu, Hawaii, and took the following taxonomic actions: *M. breviceps* Günther was recognized as distinct from *M. macropterus*

Bleeker; *M. devisi* Fowler, *M. ogilbyi* Fowler, and *Aotea acus* Phillips were placed in the synonymy of *M. macropterus*; the assumed synonymies of *Echidna uniformis* Seale and *M. owstoni* Jordan and Snyder with *M. macropterus* were confirmed; and *M. cookei* Fowler was recognized to be distinct from *M. laticaudata* (Ogilby). Bauchot and Maugé (1980) described *M. erythraeensis* (subgenus *Scolecenchelys*) from the northern Red Sea and recorded *M. laticaudata* from the same area. Machida and Shiogaki (1990) described *M. borealis* from Honshu, Japan, a species closely related to *M. gymnotus* Bleeker, subgenus *Scolecenchelys*.

Measurements are straight-line, made either with a 300 mm ruler with 0.5 mm gradations (for total length [TL], standard length [SL], trunk length, and tail length) and recorded to the nearest 0.5 mm, or with dial calipers (all other measurements) and recorded to the nearest 0.1 mm. Body length comprises head and trunk lengths. Head length (HL) is measured from the snout tip to the posterodorsal margin of the gill opening; trunk length is taken from the end of the head to mid-anus. Vertebral counts (which include the hypural) are taken from radiographs. The holotype and only known specimen is deposited in the fish collection of the California Academy of Sciences (CAS), San Francisco. Other specimens examined are in the fish collections of: the Academy of Natural Sciences (ANSP), Philadelphia; the Australian Museum (I), Sydney; the Scripps Institution of Oceanography (SIO), San Diego; and the Western Australian Museum (P), Perth.

Muraenichthys Bleeker
(Japanese name: Mimizu-anago zoku)

Muraenichthys Bleeker 1853: 505 (type species *Muraenichthys gymnopterus* Bleeker 1853, by original designation).

Diagnosis. Body short to moderately elongate, tail generally longer than body. Dorsal fin arising from above mid-trunk to behind anus, confluent with anal fin. Pectoral fin absent. Anterior nostril tubular; posterior nostril either along edge of lip beneath a flap or opening into mouth. Gill opening mid lateral, a constricted hole.

Etymology. From the Greek *Muraena* (eel) and *ichthys* (fish), masculine.

Key to the eastern Pacific species of *Muraenichthys*

Tail 53–54% of total length; jaw 30–35% of head length; dorsal fin arises 36–45% head length behind anus; total vertebrae 146–159
.....*M. chilensis* McCosker, 1970
Tail 52% of total length; jaw 25% of head length; dorsal fin arises 50% head length behind anus; total vertebrae 162*M. profundorum* sp. nov.

Muraenichthys profundorum sp. nov.
(Figs. 1–3)

?*Muraenichthys chilensis* (nec McCosker): Parin et al., 1981: 10.

Muraenichthys chilensis (nec McCosker): Parin, 1990: 11; Parin, 1991: 674.

Holotype. CAS 48061, 334.3 mm TL, Nazca Ridge, 21°32'S, 81°39'W, R/V *Ikhthiandr* Station 78, dredged in 310 m by G. A. Golovan and N. P. Pakhorukov, 11 Nov. 1979.

Diagnosis. An elongate species of *Muraenichthys*, subgenus *Scolecenchelys*, with the following characters: tail 52% of TL; dorsal fin arising 1/2 HL behind anus; 3 preopercular pores; teeth slender, small, conical and uniserial; and total vertebrae 162, 75 predorsal and 68 preanal.

Description. (Based on the holotype and only known specimen; the left portion of its head was damaged during capture, all else is intact.)

Counts and measurements (in mm).—Total length 334.4, head length 29.3; trunk length 130; tail length 175; body depth at gill openings 5.5; body width at gill openings 5.3; body depth at anus 5.3; body width at anus 5.0; origin of dorsal fin 174.1; snout length 5.9; upper jaw length 7.3; eye diameter 1.5; interorbital distance 3.3. Total vertebrae 162; 68 preanal, 75 predorsal.

Body elongate, depth at gill openings 60.8 in TL, tapering and laterally compressed posteriorly. Head and trunk 2.1 and head 11.4 in TL. Snout moderately acute; a short median ventral groove extends from a line across center of anterior nostrils forward to midpoint of underside of snout. Lower jaw included, its tip reaching the anterior edge of the anterior nostrils. Anterior nostrils tubular, slightly shorter than eye diameter. Posterior nostril entirely inside upper lip, before anterior margin of the eye, opening inward, appearing externally as a flap. Eye diameter less than twice in interorbital distance. Interorbital region flat. Rictus of jaw slightly behind posterior margin of eye. Median fins low. Dorsal fin arises 1/2 head length behind the level of anus origin. Paired fins absent. Median fins confluent with caudal.

Head pores minute (Fig. 2). Single temporal and interorbital pores present. Two pores between anterior and posterior nostrils. Five pores along mandible, 3 overlying preopercle. Lateral-line pores difficult to discern posteriorly; 9 pores before right gill opening; approximately 130 pores along right side, 61 before the anus. Last lateral-line pore occurs about a head length before tail tip.

Teeth slender, small and conical, uniserial throughout (Fig. 3). The pattern is nearly identical to that of *M. chilensis* (cf. McCosker, 1970: fig. 4) except that there are fewer teeth. There are 5 intermaxillary teeth followed by a gap and 8 on vomer; 14 left and 13 right maxillary teeth, and 17 left and 20 right mandibular teeth, separated at symphysis.

Body coloration in isopropyl alcohol uniform tan, slightly darker on upper half due to small, closely-spaced punctations. Median fins pale. Eye dark blue.

Etymology. From the Latin *profundorum*, meaning “of the depths.”

Remarks. When first examined by the senior author, this specimen was cautiously assigned to *Muraenichthys chilensis* and published upon (Parin et

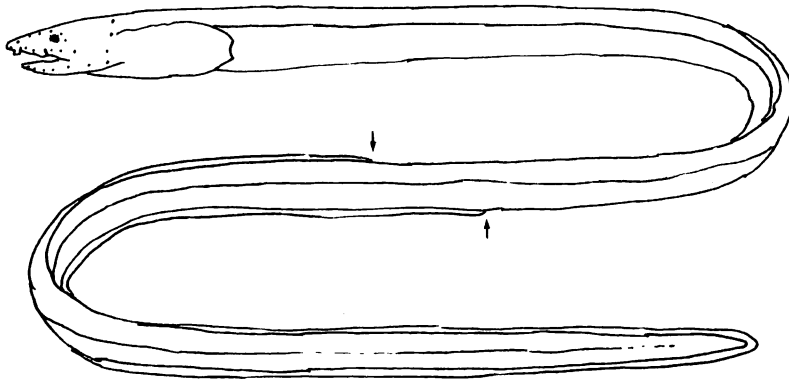


Fig. 1. Holotype of *Muraenichthys profundorum* sp. nov., CAS 48061, 334.4 mm TL. Arrows indicate the origins of the dorsal and anal fins. Some of the left portion of the head was damaged during capture; this illustration is therefore a reconstruction.

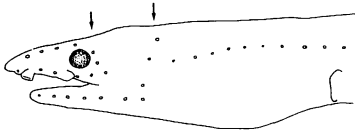


Fig. 2. Diagrammatic reconstructed drawing of head (right side reversed) of holotype of *Muraenichthys profundorum* sp. nov., CAS 48061, 334.4 mm TL. Arrows indicate the locations of the interorbital and temporal pores.

al., 1981; Parin, 1990, 1991). Subsequent examination of the specimen and a greater knowledge of the ichthyofauna of the Nazca Ridge convinces us that *M. profundorum* is indeed distinct. Its closest relatives are the shallowwater species *M. chilensis* McCosker and *M. australis* Macleay, from which it differs in having more vertebrae, a shorter trunk, a longer tail, and a smaller mouth. Although *M. profundorum* appears to be more slender than *M. chilensis* (body depth behind the gill openings is 18.8% of head length versus 24.4–27.0% [cf. McCosker, 1970], respectively), that may be an artifact of the condition of the single specimen. It differs from all other species of *Muraenichthys*, subgenus *Scolecenchelys*, on the basis of its uniserial dentition, dorsal fin location, and vertebral number.

The depth of capture (310 m) of the new species is extraordinary within *Muraenichthys*. Except for *M. puhioilo* McCosker (1979), a Hawaiian species known only from the holotype which was trapped in 275 m, most live in tidepools down to a few meters depth. The Nazca Ridge, at its shallowest, rises to

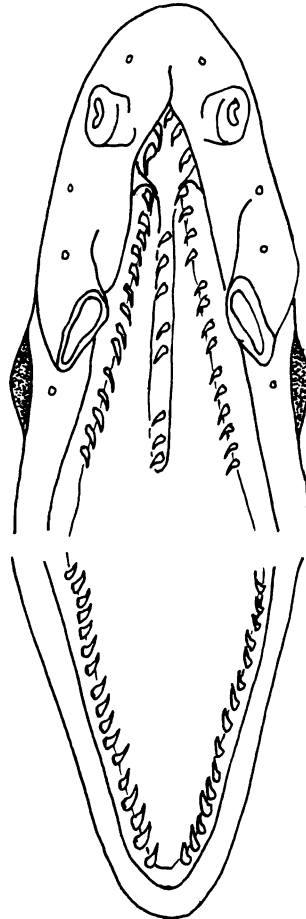


Fig. 3. Diagrammatic drawing of dentition of holotype of *Muraenichthys profundorum* sp. nov., CAS 48061, 334.4 mm TL.

within 225 m of the surface. The ridge forms the easternmost portion of the southwest-directed range extending from the Peru-Chile Trench in the vicinity of Nazca, Peru. The northeastern half of the ridge arises from more than 4500 m, reaching to within 2000–2900 m of the surface. The southeastern half of the ridge is considerably shallower, much of which is above 2000 m, and some of it rises to the shallow pinnacle where the new species was collected (see Sazonov and Iwamoto, 1992, for a map and extensive description). The location of capture was on the flattened upper plateau of an unnamed bank of the ridge. The substrate was mostly a light-grey porous limestone as well as sandy sediments. Captured along with the new species were argentinids, a gonostomatid, myctophids, a serrivomerid, a morid, an apogonid, spiny lobsters and crabs, evidence that the otter-trawl had contacted the bottom.

The origin of the New World species of *Muraenichthys*, like those of many Indo-Pacific genera from Juan Fernandez and San Felix islands and the Nazca Ridge, is most probably from the west. The pattern of marginal Indo-west Pacific groups dispersing southward to southern Australia and New Zealand, and the subsequent eastward dispersal of cold-adapted forms to the islands and seamounts off coastal Chile, is evidenced by numerous taxa (Springer, 1982), including decapod crustaceans (Holthuis and Siversten, 1967) and fishes such as *Pterygotrigla* and *Chelidonichthys* (Hubbs, 1959), *Gonorhynchus*, *Monocentris* and *Parapercis* (McCosker, 1971), and *Chromis* (Greenfield and Woods, 1980). Deepwater fishes and invertebrates demonstrate a similar pattern. Parin (1990, 1991) found much of the Nazca Ridge benthic ichthyofauna to be western Pacific, not eastern Pacific, in origin. The new species falls within Parin's (1991) largest group of Nazca and Sala y Gomez ridge species, those being "the endemics in the area between Easter Island in the west and San Felix-San Ambrosio and Juan Fernandez Islands in the east." Sazonov and Iwamoto (1992), studying macrourid grenadiers, similarly found that "despite the proximity of the Nazca Ridge to the mainland coast of Peru, the relationship of the fauna of the Nazca and Sala y Gomez ridges is clearly to the west, in the tropical central and western Pacific." This dispersal pattern is contrary however to that proposed by Robins (1991) for the dwarf sister species of *Ophidion* (family Ophidiidae) from Easter Island and the Marquesas, and Juan Fernandez and San Felix is-

lands, respectively. Robins (page 9) suggests that those species find their origin in the American fauna, to the east, where in fact species of many of the Indo-west Pacific genera have yet to become established (cf. Rosenblatt et al., 1972).

The new species finds its closest relative in the shallowwater *M. chilensis*, from which it differs in having more vertebrae (particularly preanal and predorsal vertebrae, cf. Böhlke, 1982), a derived character state within the genus. The new species would seem to be the result of previous dispersal from the west, arrival and adaptation to the eastern edge of the island chain, and the subsequent invasion of and adaptation to an abnormal, deepwater habitat for a species of *Muraenichthys*.

Other material examined. *Muraenichthys australis*: Syntypes, I 16266-0001, 3 (154–427 mm TL), from Australia, New South Wales, Sydney. P 13442-001, 13 (129–250 mm TL), from Western Australia, Rottnest Island. *Muraenichthys chilensis*: Holotype, SIO 65-645, 284 mm SL, from off Chile, NW side of Isla Juan Fernández. Paratypes, from Isla Juan Fernández: SIO 65-634, 58 (103–259 mm SL); CAS 48088, 10 (133–223 mm SL); ANSP 144097, 10 (156–183 mm SL). From off Isla San Felix: SIO 65-626, 5 (167–237 mm SL). (Most of the material examined of *M. chilensis* was not compared with the holotype of *M. profundorum*. Vertebral counts are based on 12 specimens from SIO 65-645.)

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ナスカ海嶺より得られた深海性ミミズアナゴ科魚類の1新種

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東部太平洋, ナスカ海嶺の310 mの深海よりトロール網によって得られた1個体の標本に基づき, ミミズアナゴ属 (*Scolecenchelys* 亜属) の1新種 *Muraenichthys profundorum* を記載した。本個体はミミズアナゴ属魚類としては最も深所から得られたものである。本種は近縁種とは背椎骨が多いこと, 計測形質がいくつかの部分でわずかに異なることによって区別される。東部太平洋産のミミズアナゴ属魚類の分布は本属魚類のインド・西太平洋プレート南東部縁辺に沿う東方分散の結果である。McCosker (1970) 以来のミミズアナゴ属魚類の種に関する分類学的な処理の再検討がなされた。