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A NEW GENUS AND TWO NEW SPECIES OF REMARKABLE PACIFIC WORM EELS (OPHICHTHIDAE, SUBFAMILY MYROPHINAE)

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ABSTRACT: *Glenoglossa wassi* gen. et sp.nov., described from Samoa, differs from all other myrophine ophichthids in its elongate tongue decorated with a lure, and in certain osteological and cephalic pore conditions. *Neenchelys daedalus* sp.nov., is described from midwater-captured juveniles and adults from off New Guinea and the central Pacific and represents the second known midwater worm eel; it differs from its congeners in its extreme elongation and vertebral number. The status of the species of *Pseudomyrophis* and *Neenchelys* is discussed. An analytical key to the genera of the ophichthid subfamily Myrophinae is provided.

INTRODUCTION

The snake eels and worm eels of the family Ophichthidae are the most diverse and inventive of true eels. The more than 220 species distributed among more than 53 genera inhabit all tropical and subtropical oceans and seas, and have invaded the intertidal zone, coral reefs, shallow substrates, and even the midwater realm. To this array of astounding evolutionary forays, I add two remarkable new western Pacific species, one representing a distinct new genus of worm eels, of the subfamily Myrophinae (sensu McCosker 1977). The first, *Glenoglossa wassi* gen. et sp.nov., is unique among eels in having modified its glossohyal into a lure, not unlike that of a uranoscopid stargazer or an antennariid. The other, *Neenchelys daedalus* sp.nov., represents a second, independent invasion of the midwater realm by an ophichthid.

MATERIALS AND METHODS

Measurements are straight-line, made either with a 300 mm ruler with 0.5 mm gradations (for total length [TL], trunk length, and tail length) 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; maximum body depth does not include the median fins. Vertebral counts, which include the hypural, were taken from radiographs. Stained and cleared specimens were prepared using the Taylor (1967) trypsin technique. Institutional abbreviations of material examined are explained in the Acknowledgments.

Analytical Key to the Genera of Ophichthidae, Subfamily Myrophinae

1a. All branchiostegal rays originate either in association with hyoid or before level of epihyal tips; free rays, when present, fewer than attached; tail tip a hard or fleshy finless point; gill opening midlateral to entirely ventral, unconstricted .... subfamily Ophichthinae

1b. Accessory branchiostegal rays originate behind ends of epihyal, free rays more numerous than attached; caudal fin rays conspicuous, confluent with dorsal and anal, tail tip flexible; gill openings midlateral, a constricted opening (subfamily Myrophinae) 2

2a. Anterior nostril non-tubular, posterior nostril before eye; eye large, ca. 6 times in head length; pectoral fin moderately developed .... *Benthenchelys* Fowler, 1934

2b. Anterior nostril tubular, posterior nostril either before eye, along upper lip, or within mouth; eye smaller, 10 or more in head; pectoral fin may be absent 3

3a. Posterior nostril before eye, above the lip and not covered by a flap; pectoral fin present, but may be reduced to a small, barely noticeable flap in posterodorsal corner of gill opening 4

3b. Posterior nostril labial, either within lip and opening into mouth, or along lip and covered by a flap; pectoral fin either present and well developed or absent 5

4a. Dorsal fin origin in anterior trunk region; snout conical; pectoral fin well developed, $\cong$ snout; third preoperculomandibular pore (pop[3]) absent .... *Neenchelys* Bamber, 1915

4b. Dorsal fin origin in posterior trunk region; snout broad, tumid; pectoral fin minute, $\leq$ eye; pop[3] present .... *Pseudomyrophis* Wade, 1946

5a. Pectoral fin well developed; pleural ribs absent behind 15th–20th vertebrae 6

5b. Pectoral fin absent; pleural ribs present on all trunk vertebrae 7

6a. Dorsal fin origin above or behind anus; maxilla stout, not tapering posteriorly, and abutting pterygoid; vomerine teeth absent .... *Ahlia* Jordan and Davis, 1891

6b. Dorsal fin origin anterior to mid-trunk region; maxilla thin and tapering posteriorly, not closely associated with pterygoid; vomerine teeth present .... *Myrophis* Lütken, 1851

7a. Tongue elongate, extending well beyond mouth and decorated with a fleshy appendage; inner edge of lips and palate decorated with fleshy lappets; teeth conical and uniserial .... *Glenoglossa* novum

7b. Tongue not elongate, not extending outside of mouth, lacking a fleshy appendage at its tip; inner edge of lips and palate smooth; teeth either conical or blunt, uniserial or multiserial 8

8a. A prominent median toothed groove on ventral side of snout, bordered by dermal folds, extends anteriorly to anterior nostrils; anterior nostrils elongated tubes equal to eye in length .... *Schismorhynchus* McCosker, 1970

8b. Ventral side of snout without a prominent median groove bordered by dermal folds; anterior nostrils less than eye in length 9

9a. Teeth absent on vomer, absent or embedded on intermaxillary, those on maxillary and dentary minute or villiform; dorsal fin origin behind anus .... *Schultzidia* Gosline, 1951

9b. Teeth present on intermaxillary, maxillary, dentary, and vomer; dorsal fin origin either before or behind anus .... *Muraenichthys* Bleeker, 1853

Glenoglossa McCosker, gen.nov.

Type-species.—*Glenoglossa wassi* McCosker, sp.nov.

Diagnosis.—Body moderately elongate, laterally compressed posteriorly; snout conical, grooved on underside; anterior nostril within a tube, posterior nostril within a short tube at outer edge of lip, directed ventrally; dorsal fin origin slightly before anus; pectoral fin absent; pop[3] absent; tongue elongate, extends beyond mouth, decorated with fleshy appendage; inner edge of lips and palate decorated with fleshy lappets; teeth conical, uniserial, absent on vomer; gill arches reduced, third hypobranchial and second infrapharyngobranchial absent, third and fourth upper pharyngobranchial tooth plates weakly fused; suspensorium nearly vertical, pterygoid slender

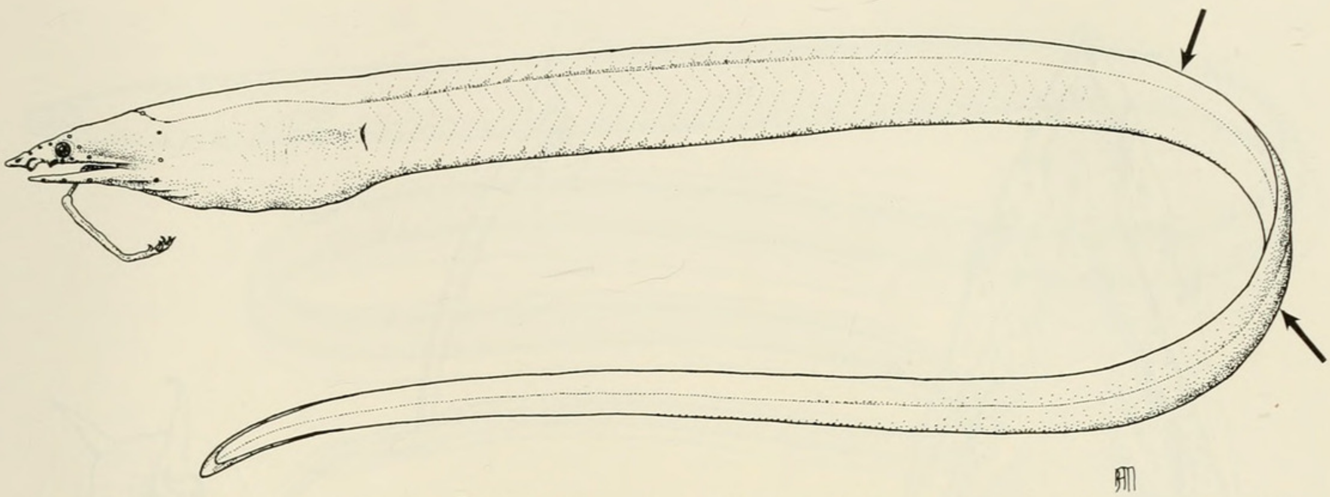


FIGURE 1. Holotype of *Glenoglossa wassi* McCosker, sp.nov., CAS 47049, 153.5 mm TL. Arrows indicate origin of dorsal and anal fins.

and reduced; cleithrum and supracleithrum reduced to thin slivers. Other characters those of the single species.

ETYMOLOGY.—From the Greek γλῆνοσ (*glenos*), a thing to stare at, and γλῶσσα (*glossa*, feminine), tongue.

Glenoglossa wassi McCosker, sp.nov.
(Figures 1–3)

HOLOTYPE.—CAS 47049, 153.5 mm TL, collected using rotenone over sand at base of large coral head, 40 m depth, Larsen Bay, Tutuila Island, American Samoa; R. Wass and G. Yamasaki, 18 Nov. 1975.

PARATYPE.—CAS 47048, 88.8 mm TL, collected using rotenone along sloping sand bottom at base of coral and lava cliff, 40 m depth, Steps Point, Tutuila Island, American Samoa; R. Wass and R. Lubbock, on 4 Mar. 1975. This specimen was cleared and stained.

COUNTS AND MEASUREMENTS.—The condition of the holotype is parenthetically followed by that of the paratype: TL 153.5(88.8); head length 20.8(12.8); trunk length 54.7(30.0); tail length 78.0(46.0); body depth at gill openings 5.6(3.7); body width at gill openings 3.0(1.9); origin of dorsal fin 67.1(39.6); snout length 3.5(2.3); upper jaw length 6.7(4.4); eye diameter 1.1(0.7); interorbital distance 2.0(1.0). Total vertebrae 127(126), preanal vertebrae 54(53).

DESCRIPTION.—Body moderately elongate, depth at gill oepnings 24–26.5 in TL, tapering and laterally compressed posteriorly. Head and trunk 2.03–2.07 and head 6.9–7.4 in TL. Snout acute; lower jaw included, tip slightly in advance of anterior nostril base. Anterior nostril tubular; posterior nostril at edge of lip, entirely outside of mouth, within small tube. Eye slightly in advance of midpoint of upper jaw. Gill opening mid-lateral, a constricted opening.

Median fins low, lying partially within a groove, meeting each other and extending noticeably beyond caudal tip. Dorsal fin arises less than a head length in advance of anus.

Head pores minute, difficult to discern. Single temporal and interorbital pores. Four pores along mandible. Two preoperculomandibular pores. Lateral line pores difficult to identify in preserved specimens; approximately 11 pores before the gill opening.

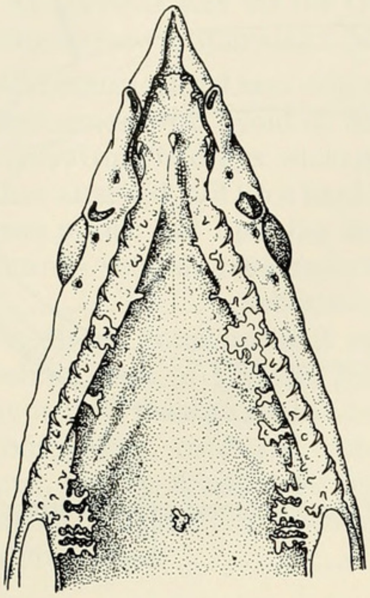
Tongue extends from mouth. A fleshy appendage, differing slightly in each specimen (Figs. 2–3), extends beyond the slender glossohyal. The inner edge of lips, floor of mouth, and palate flanked by fleshy tissue (Fig. 2).

Teeth small, conical, uniserial in jaws. An intermaxillary chevron of four teeth, followed by two medial teeth. Vomerine teeth absent. Nine teeth along maxilla, 14 along mandible.

Body color in isopropyl alcohol uniformly tan. Numerous, minute brown punctations in mouth, along head and dorsal body surface. Fins pale. Base of lure has a dark spot. Eyes dark blue. Color of paratype in life, recorded by R. Wass, "light greenish-yellow with tiny purple brown specks. Lure transparent with black 'eye.'"

ETYMOLOGY.—Named in honor of Richard C. Wass, collector of these and many other important fishes from Samoa.

REMARKS.—This myrophine is remarkable in the development of its tongue which, because of its length and appearance, serves as a lure to attract small fish. It is the only eel known to use



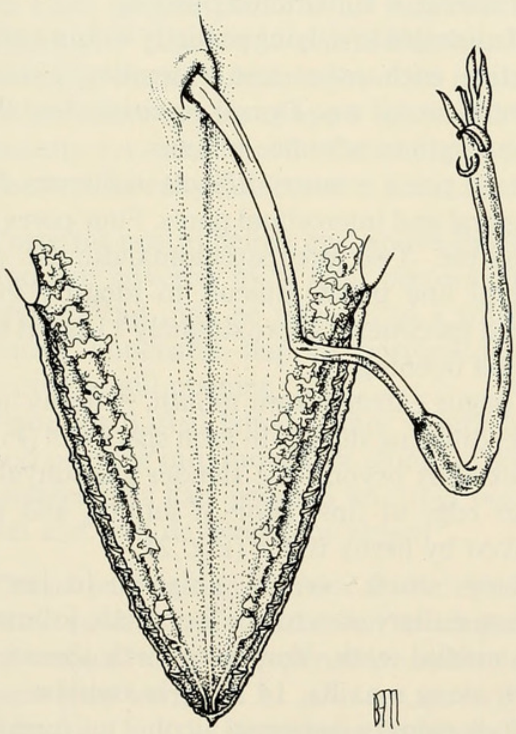


FIGURE 2. Open mouth of holotype of *Glenoglossa wassi* McCosker, sp.nov., CAS 47049.

such a feeding strategy, and is certainly no less remarkable than those of certain uranoscopids, ceratioids, or the alligator snapping turtle. The "eyes" and appendages of the lure would indicate that it resembles a small crustacean. In the stomach of the holotype was a partially digested goby-like fish nearly 2 cm in length. The other oral decoration provided by the fleshy labial lappets suggests that the eel lies buried in the sand with

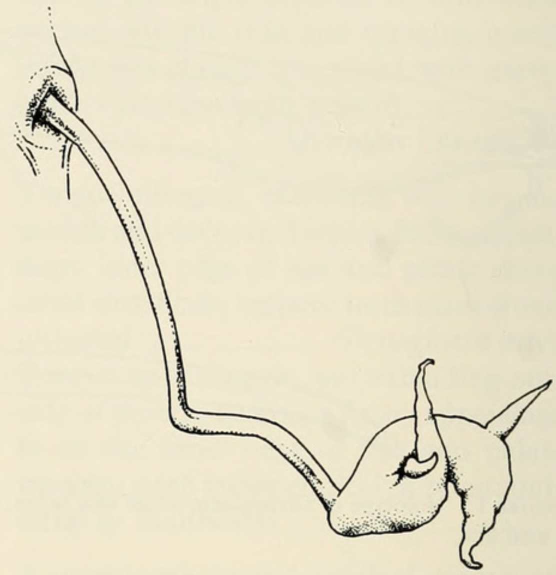


FIGURE 3. Tongue lure of paratype of *Glenoglossa wassi* McCosker, sp.nov., CAS 47048.

its head exposed, luring prey by flicking its glossohyal.

Glenoglossa wassi is most closely related to species of *Muraenichthys* and *Schismorhynchus*. It is easily separable from them on the basis of its tongue development, its absence of vomerine teeth, and certain other osteological characters. It is most like *Schismorhynchus* in its general facies, the development of its snout groove, reduced pterygoid, and gill arch reductions, conditions which probably relate to the feeding behavior of the species involved. It is clearly a specialized worm eel whose ancestry is in the sharp-snouted, conical-toothed species group of *Muraenichthys* (sensu McCosker 1977) that gave rise to *Schismorhynchus* and may have shared a common ancestor with it.

Neenchelys Bamber, 1915

TYPE-SPECIES.—*Neenchelys microtretus* Bamber, 1915.

DIAGNOSIS.—Body moderately to extremely elongate, laterally compressed behind head; tail much longer than head and trunk; snout conical, anterior nostril in a tube, posterior nostril an elongate slit entirely before eye; eye moderate; dorsal fin origin mid-trunk; pectoral fin moderately developed, girdle limited to reduced cleithrum and supracleithrum; gill opening reduced, a constricted hole; pop[3] absent; teeth few, conical and slender, uniserial on jaws and vomer; maxillary attachment at mid-vomer; gill arches reduced; suspensorium nearly vertical, slightly

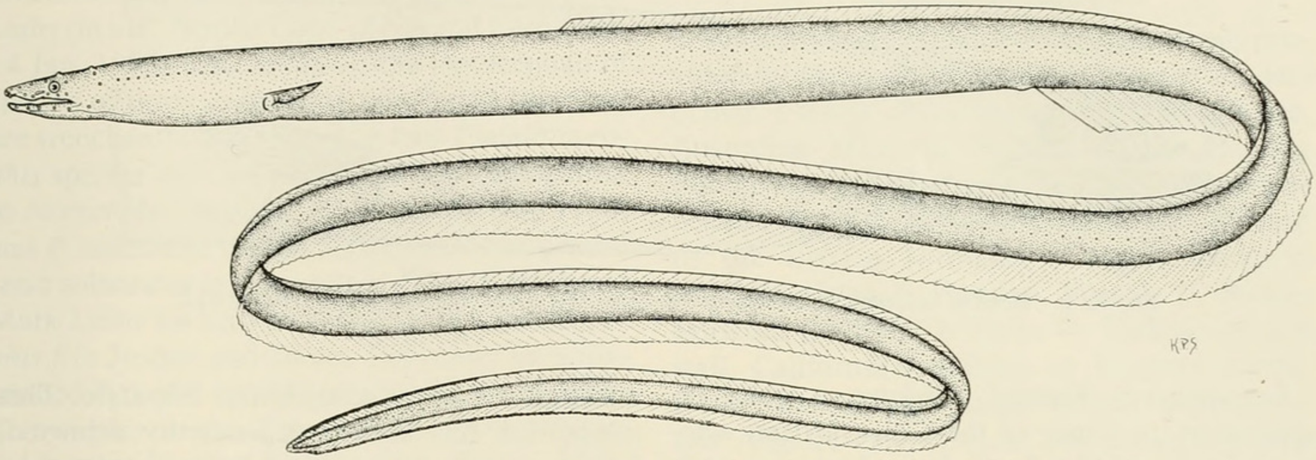


FIGURE 4. Holotype of *Neenchelys daedalus* McCosker, sp.nov., AMS I.19690-012, 341.5 mm TL.

inclined anteriorly; pterygoid slender and reduced; neurocranium rounded, lacking a crest; color uniform.

Neenchelys daedalus McCosker, sp.nov.
(Figures 4–5)

HOLOTYPE.—AMS I.19690-012 (field no. JP 69-29), held in trust for Papua New Guinea National Fish Collection, 341.5 mm TL, a female with eggs, captured in Astrolobe Bay, s of Madang, Papua New Guinea (5°24'S, 145°52.5'E), 6-ft Isaacs-Kidd midwater trawl (IKMT), 0–140 fms [0–256m] over a "rough peak 500+ fms" bottom, 1850–2100 h, 7 Oct. 1969. In that same collection were numerous myctophids, gonostomatids, and chauliodontids.

PARATYPE.—CAS 50708, 272.9 mm TL, collected with the holotype.

COUNTS AND MEASUREMENTS (in mm).—The condition of the holotype is parenthetically followed by that of the paratype: TL 341.5(272.9); head length 23.5(21.4); trunk length 65(53.5); tail length 253(198); body depth at gill openings 6.6(5.9); body width at gill openings 4.7(4.0); body depth at anus 6.2(5.0); body width at anus 4.2(3.5); origin of dorsal fin 49.5(42); length of pectoral fin 5.2(5.0); snout length 3.9(3.8); upper jaw length 6.2(5.2); eye diameter 1.2(1.2); interorbital distance 2.05(1.8). Total vertebrae 235(225); preanal vertebrae 59(58).

DESCRIPTION.—Body extremely elongate, depth at gill opening 46.3–51.7 in TL, tapering slightly and laterally compressed posteriorly. Tail much longer than head and trunk, 1.34–1.38 in TL. Head and trunk 3.64–3.86 and head 12.8–14.7 in TL. Snout moderately acute; lower jaw included, its tip extends to anterior base of anterior nostril. Top and sides of snout and edge of lower jaw covered with numerous small papillae (presumably sensory in function), slightly smaller than cephalic pores. Anterior nostril tubular, directed ca. 45° laterally, posterior nostril an elongate slit above upper lip, nearly as wide as orbit. Eye begins behind midpoint of jaw, moderate in size, 4.3–5.2 in jaw length. Gill openings low on side, each a constricted opening.

Pectoral fin well developed, nearly as long as gape. Median fins well developed and obvious, not lying in a groove as in most myrophines. Anal fin larger than dorsal, nearly as deep as body. Dorsal fin arises about mid-trunk, the predorsal distance 6.49–6.89 in TL.

Head pores small but apparent (Fig. 5). Single temporal and interorbital pores. Five mandibular pores, and two over preopercle. Two postorbital pores. Lateral line pores small but obvious; 14 on head, 61 before anal opening, not discernible in posterior tail region.

Teeth few, slender, conical, of moderate size for a myrophine. A single premaxillary tooth, flanked by a pair of retrorse teeth, followed by two medial teeth, then a pair of teeth, at which point the maxillae attach, each possessing 6–7 uniserial teeth. Vomer has three teeth that end about midway along toothed portion of maxilla. Lower jaw teeth uniserial, 17–18 on each side.

Gill arches reduced; first basibranchial absent, third and fourth infrapharyngobranchial tooth plates weakly fused. Branchiostegal rays numerous, unbranched; eight attached to hyoid (1 along the ceratohyal, 7 along the epihyal), 25 unattached, on each side.

Body color in isopropyl alcohol uniform tan, except belly which is dark brown to black. Fins colorless. Eye dark blue.

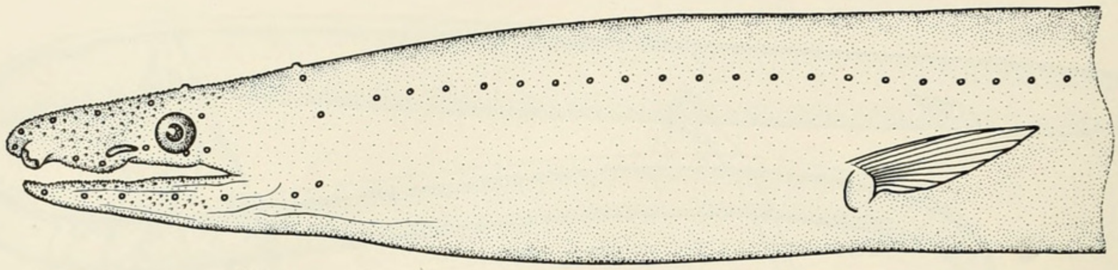


FIGURE 5. Head of holotype of *Neenchelys daedalus* McCosker, sp. nov., AMS I.19690-012.

ETYMOLOGY.—Named *daedalus,* a noun in apposition, in honor of the Greek artisan who escaped from his Earth-bound prison and ascended into heaven.

REMARKS.—All specimens of *Neenchelys daedalus* have come from midwater. It therefore seems likely that it is a midwater eel, although the possibility exists that juvenile and subadult specimens were merely transformed leptocephali that were captured just prior to settlement, and/or the adults were benthic eels that were captured en route to a surface spawning event. Both possibilities are unlikely in that the size range of the specimens is too great and their condition is too "uniform" to have been captured during transformation, and none appear to have retained larval conditions. Furthermore, the morphometric changes in eye size undergone by surface-migrating benthic myrophines, such as *Ahlia egmontis* (see Cohen and Dean 1970, and McCosker 1977), are absent. Further evidence for a midwater habitat is provided by the partially digested crustacean material in the gut of the cleared-and-stained specimen (which suggests that it had fed prior to capture and not while in the net) as well as the darkened vent and presence of sensory papillae on the snout.

The evidence thus suggests that *N. daedalus* is the second ophichthid known to have left the substrate to adopt a midwater life style. This adaptation has been independently achieved, however, in that its closest relatives are benthic, fossorial species. The other midwater ophichthid, *Benthenchelys cartieri* Fowler, lives pelagically at 100–250 m over deep water in the central Indo-Pacific (Castle 1972) and displays many similar adaptations, such as enlarged median fins, sensory papillae, an elongate tail, and slender teeth.

The new species is more similar in appearance, owing to its extreme elongation, to the Atlantic species of *Pseudomyrophis* than to its congeners. However, its osteology, pore condition, and fin size and placement are in agreement with *Neenchelys microtretus* Bamber, 1915, *N. buitendijki* Weber and de Beaufort, 1916, and the sketchily described *N. parvipectoralis* Chu, Wu, and Jin, 1981. Castle (1980) has illustrated the larvae of *Neenchelys* and commented upon their distribution. The new species may be separated from its congeners using the characters in Table 1.

In an earlier publication (McCosker 1977), I cautiously recognized the generic distinction between *Neenchelys* and *Pseudomyrophis.* My subsequent examination of additional osteological preparations of *Neenchelys* spp. and *Pseudomyrophis* spp. have further substantiated those

TABLE 1. VERTEBRAE AND BODY PROPORTIONS (in thousandths of TL) OF THE SPECIES OF *NEENCHELYS.*

	Head length	Tail length	Body depth	Total vertebrae
N. microtretus	114[1]	580	38[1]	151[2]
N. buitendijki	117–127[1]	565–643	31–51[1]	142–148[2]
N. parvipectoralis	~95[3]	~615[3]	~60[3]	—
N. daedalus	68–78	725–746	19–22	225–235

[1] From Nelson 1966.
[2] From Castle 1980.
[3] Calculated from Chu, Wu, and Jin 1981.

differences. In an independent study, Mark M. Leiby (in litt., Florida Dept. of Natural Resources, 14 Jan. 1982) has compared the leptocephali of species of those genera and concluded that they are trenchantly different. The two *Pseudomyrophis* species that are similar in body elongation to *Neenchelys daedalus, P. nimius* Böhlke, 1960, and *P. atlanticus* Blache, 1975, inhabit mud and sand substrates in deep water. Dean (1972) and Mark Leiby (in litt.) have concluded that *Myrophis frio* Jordan and Davis, 1891, and an undescribed Atlantic species are congeners of *Pseudomyrophis nimius.* Two species are known from the eastern Pacific: *P. micropinna* Wade, 1946, the type-species; and an undescribed species ranging from Costa Rica to Baja California.

Eleven other Pacific specimens, captured by midwater trawls, were tentatively identified as *Neenchelys daedalus.* They are all smaller specimens and appear identical in proportions to the new species. They differ considerably, however, in total vertebrae numbers: the holotype and paratype have 235 and 225, respectively, whereas eight of the others had 251–274 ($\bar{x}$ = 266.8) vertebrae. I am unable to account for such a large mean difference and broad range in vertebral number for conspecifics in such close geographical proximity, and therefore have not made them type-specimens.

Comparative Material.—*Neenchelys daedalus* (non-paratypes): AMS I.19707-017 (field no. JP 69-53), 5(172–187), Manus Island, Papua New Guinea, 4°15′S, 145°11′E, 6-ft IKMT, 0–125 m, over 750+ m depth, John E. Paxton aboard FRV Tagula, 0120–0320 h, 22 Oct. 1969. (Many gonostomatids and myctophids were captured in the same collection.) From the same collection: CAS 50709, 2(187–225); CAS 50710, 1(190, cleared and stained); and ANSP 149295, 2(175–185). SIO 77-171 1(144), Banda Sea, 105 km sw of Buru Is., 04°30.5′S, 125°34.6′E, 0–1500 m over 3600 m, Jim Coatsworth, 26 Aug. 1976.

Neenchelys buitendijki: ZMA.102.171, 1(218), syntype, "probably from Moluccos," Indonesia. UH uncat., 2(118–123, specimens dissected), Bombay City, India (specimens from Mohamed 1958, reported on by Nelson 1966).

Neenchelys microtretus: BMNH 1915.10.25.1, 1(183), holotype, Red Sea.

Pseudomyrophis micropinna: LACM 21557, 1(139), holotype, Isla Ladrones, Gulf of Chiriquí, Panama. SIO 60-72, head and trunk only, cleared and stained.

Pseudomyrophis nimius: USNM 186274, 1(319), holotype, Gulf of Mexico. ANSP 110150, 1(350, cleared and stained), Gulf of Mexico.

Pseudomyrophis atlanticus: MNHN 1971-40, 1(259) holotype, Pointe-Noire. MNHN 1971-41, 1(241), paratype, Pointe-Noire.

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