

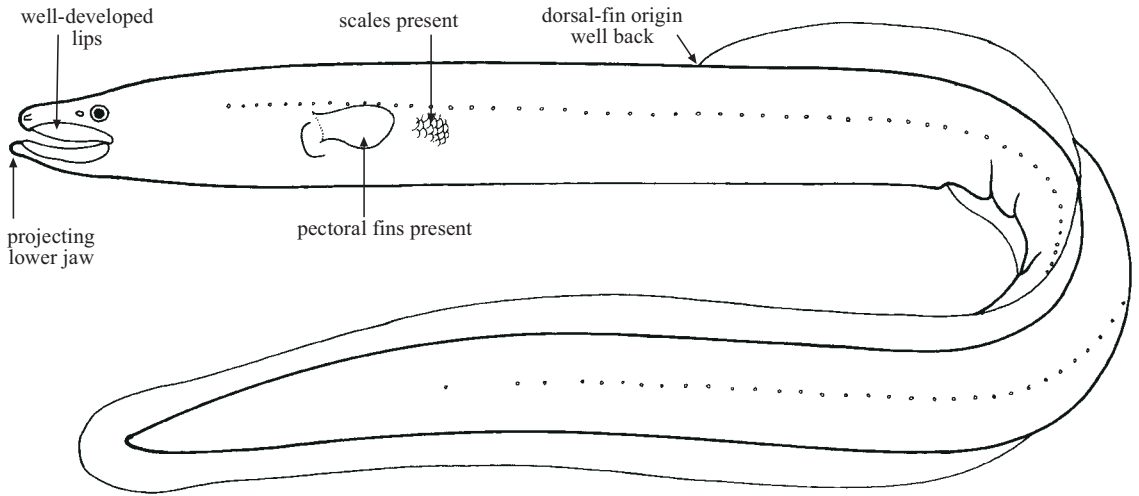
Order ANGUILLIFORMES

ANGUILLIDAE

Freshwater eels

by D.G. Smith

Diagnostic characters: Body moderately elongate, cylindrical in front and only moderately compressed along the tail. Eye well developed, moderately small in females and immatures, markedly enlarged in mature males. Snout rounded. Mouth moderately large, gape ending near rear margin of eye; **lower jaw projects beyond upper; well-developed fleshy flanges on upper and lower lips. Teeth small, granular, in narrow to broad bands on jaws and vomer.** Anterior nostril tubular, near tip of snout; posterior nostril a simple opening in front of eye at about mid-eye level. Dorsal and anal fins continuous around tail; **dorsal fin begins well behind pectoral fins, somewhat in front of or above anus;** pectoral fins well developed. **Small oval scales present, embedded in skin and arranged in a basket-weave pattern.** Lateral line complete. **Colour:** varies from yellowish green to brown or black; sexually mature individuals often bicoloured, black above and white below, with a bronze or silvery sheen.



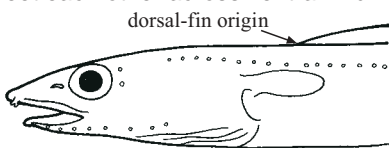
Habitat, biology, and fisheries: Anguillid eels spend most of their adult lives in fresh water or estuarine habitats. They are nocturnal, hiding by day and coming out at night to forage. They take almost any available food, mainly small, benthic invertebrates. They are extremely hardy and live in a wide variety of aquatic habitats. At maturity, they leave fresh water and enter the ocean to spawn. Some species migrate long distances to specific spawning areas. Freshwater eels are an important source of food in many parts of the world; several species are cultured artificially.

Remarks: The Anguillidae contains a single genus, *Anguilla*, with about 15 to 18 species worldwide. Eleven species have been recorded from the area. They are all similar in appearance and can be difficult to distinguish. Only a few of these species will be present in any one area, however, and this makes identification somewhat easier.

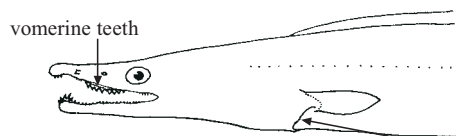
Similar families occurring in the area

Congridae: no scales (present in Anguillidae); lower jaw equal to, or shorter than upper (projects in Anguillidae); dorsal fin begins above or before pectoral-fin tips (further back in Anguillidae).

Muraenesocidae: no scales; mouth very large, extending to beyond eye (mouth in Anguillidae barely reaches rear margin of eye); vomerine teeth prominent, fang-like (very small in Anguillidae); gill openings nearly meet each other across ventral midline.



Congridae



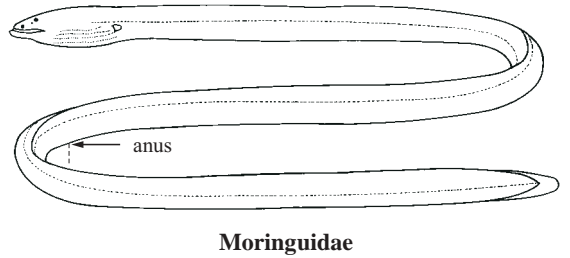
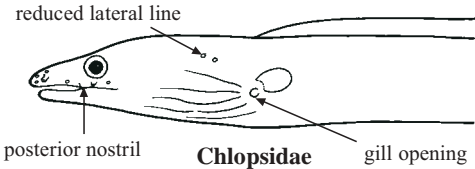
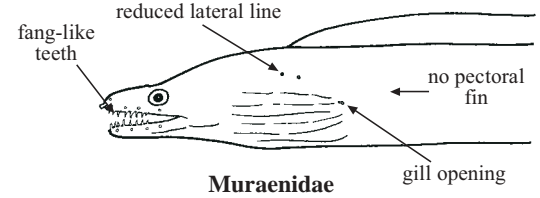
Muraenesocidae large gill opening

Ophichthidae: no scales; in most genera no caudal fin but tail tip a hard, burrowing point (caudal fin present in Anguillidae); posterior nostril usually inside mouth or in some way penetrating upper lip (a simple aperture in Anguillidae); throat swollen, supported by many branchiostegal rays overlapping in midline; a median supraorbital pore present.

Muraenidae: no scales; no pectoral fins (always present in Anguillidae); gill opening a small hole (a vertical slit in Anguillidae); teeth fang-like or molar-like (small and conical in Anguillidae); typically brightly banded, spotted or mottled.

Chlopsidae: gill opening a small hole (a vertical slit in Anguillidae); vomerine teeth (on roof of mouth) in 2 divergent rows (a broad to narrow band in Anguillidae); lateral-line system reduced (more conspicuous in Anguillidae); posterior nostril low on snout or flap-like; pectoral fins present or absent.

Moringuidae (*Moringua*): anus located far behind midlength.

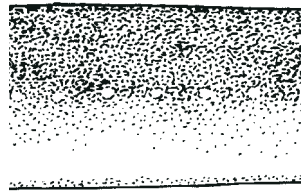


Key to the species of Anguillidae occurring in the area

- 1a. Colour marbled or mottled (Fig. 1a) → 2
- 1b. Colour plain (may be bicoloured, but not marbled or mottled) (Fig. 1b) → 6



a) *Anguilla celebesensis*



b) *Anguilla malgumora*

Fig. 1 detail of body surface (lateral view)

- 2a. Maxillary and mandibular teeth in broad, undivided bands (Fig. 2a) → 3
- 2b. Maxillary and mandibular teeth bi- or triserial, the middle series distinctly enlarged, often forming a cutting edge, inner and outer teeth much smaller, inner series usually separated from remainder of teeth by a narrow, edentulous groove (Fig. 2b) → 5

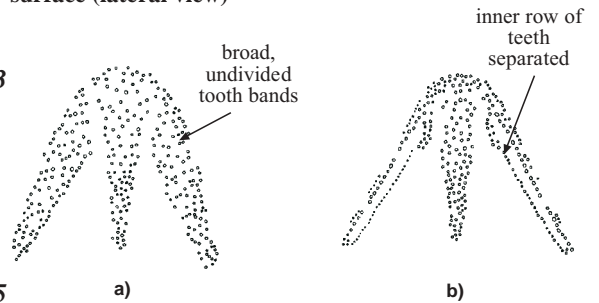


Fig. 2 tooth bands

- 3a. Vertebrae 110 to 114 *Anguilla megastoma* (in part)
(southern Oceania from the Solomon Islands to Pitcairn)
- 3b. Vertebrae 100 to 106 → 4
(known from the Philippines and Indonesia but not east of New Guinea)
- 4a. Distance between verticals through anus and dorsal-fin origin 6 to 12% of total length
. *Anguilla celebesensis*
(Philippines, Indonesia, and western New Guinea)
- 4b. Distance between verticals through anus and dorsal-fin origin 11 to 15% of total length
. *Anguilla interioris*
(known only from central and eastern New Guinea)
- 5a. Origin of dorsal fin closer to pectoral-fin base than to anus (Fig. 3) *Anguilla marmorata*
(in most parts of the area except Australia)
- 5b. Origin of dorsal fin closer to anus than to pectoral-fin base (Fig. 4) *Anguilla reinhardtii*
(eastern Australia and New Guinea)

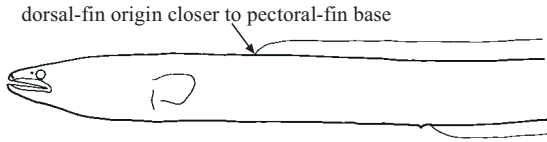


Fig. 3 *Anguilla marmorata*

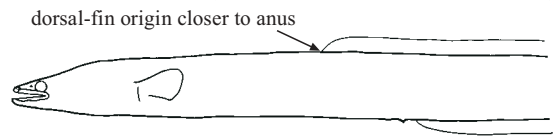


Fig. 4 *Anguilla reinhardtii*

- 6a. Distance between verticals through anus and origin of dorsal fin about 5 to 14% of total length (Fig. 5) → 7
- 6b. Distance between verticals through anus and origin of dorsal fin about 0 to 7% of total length (Fig. 6) → 9

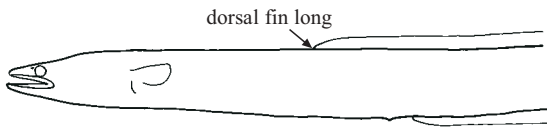


Fig. 5 *Anguilla malgumora*

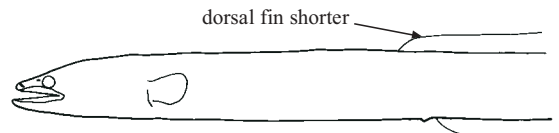


Fig. 6 *Anguilla obscura*

- 7a. Maxillary teeth in a broad band (Fig. 7a) *Anguilla megastoma*
(southern Oceania from the Solomon Islands to Pitcairn)
- 7b. Maxillary teeth in a narrow band (Fig. 7b) → 8
(Philippines and Indonesia)

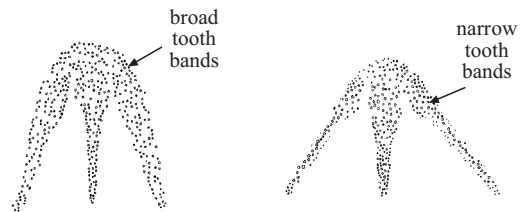


Fig. 7 upper tooth bands







- 8a. Vertebrae about 114 to 118 . . . *Anguilla japonica*
(in the area, found only in northern Luzon, Philippines)
- 8b. Vertebrae about 104 to 106 . *Anguilla malgumora*
(found only in Borneo)

- 9a. Vertebrae about 102 to 108 *Anguilla obscura*
(found in southern Oceania from New Guinea and eastern Australia to the Society Islands)
- 9b. Vertebrae 106 to 115 → 11
(found in Indonesia, Mariana Islands, Australia, and New Caledonia)

- 10a. Found in the Philippines, Indonesia, and probably the Mariana Islands *Anguilla bicolor*
- 10b. Found in temperate Australia, New Zealand, and New Caledonia *Anguilla australis*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Anguilla australis* Richardson, 1841
-  *Anguilla bicolor* McClelland, 1844
-  *Anguilla celebesensis* Kaup, 1856
-  *Anguilla interioris* Whitley, 1938^{1/}
-  *Anguilla japonica* Temminck and Schlegel, 1846
-  *Anguilla malgumora* Schlegel in Kaup, 1846^{2/}
-  *Anguilla marmorata* Quoy and Gaimard, 1824
-  *Anguilla megastoma* Kaup, 1856
-  *Anguilla obscura* Günther, 1871
-  *Anguilla reinhardtii* Steindachner, 1867

Reference

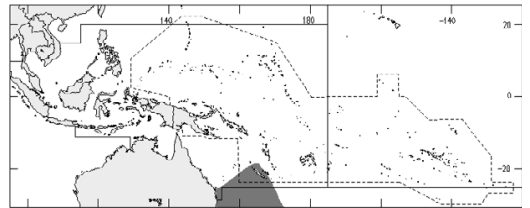
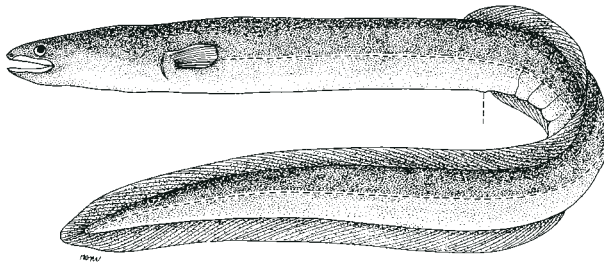
Ege, V. 1939. A revision of the genus *Anguilla* Shaw. A systematic, phylogenetic, and geographical study. *Dana Rept.*, (16):255 p.

Anguilla australis Richardson, 1841

ELU

En - Australian shortfinned eel; **Fr** - Anguille d'Australie; **Sp** - Anguila australiana.

Maximum length about 1 m. Common within its range and caught with various types of nets and traps, and hook-and-line; separate statistics not available. Found mainly to the south of the area, on the east coast of Australia and New Zealand, but extends north to New Caledonia. Museum records from Fiji and Tahiti are doubtful. Australian and New Zealand forms sometimes recognized as subspecies; the New Caledonian population belongs to the New Zealand form. Most easily confused with *Anguilla obscura*, which also occurs at New Caledonia; the number of vertebrae is the surest way to distinguish them.



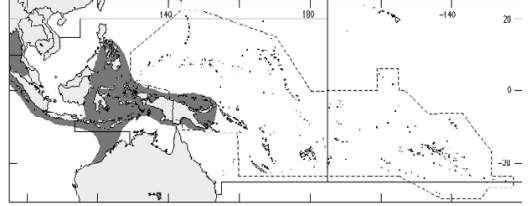
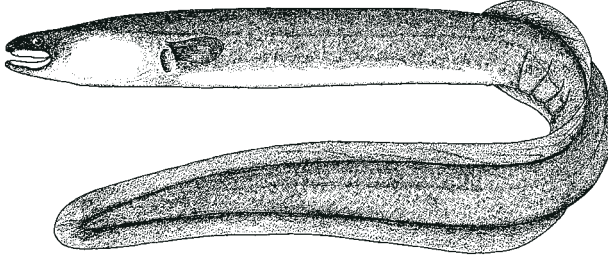
^{1/} G.R. Allen (1991, *Field Guide to the Freshwater Fishes of New Guinea*. Madang, Christensen Research Institute) synonymized this species with *Anguilla reinhardtii*. The number of prehemal vertebrae and the form of the dentition in *A. reinhardtii* differ from those reported in *A. interioris*, however, and it seems advisable to maintain *A. interioris* as a valid species until it can be conclusively demonstrated otherwise.

^{2/} Formerly known as *Anguilla borneensis*.

Anguilla bicolor McClelland, 1844

En - Indonesian shortfin eel; **Fr** - Anguille à nageoire courte; **Sp** - Anguila de aleta corta.

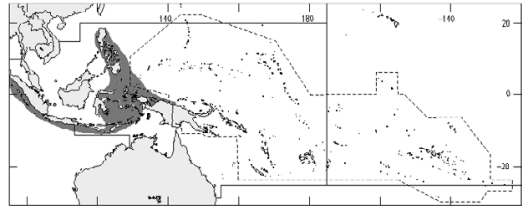
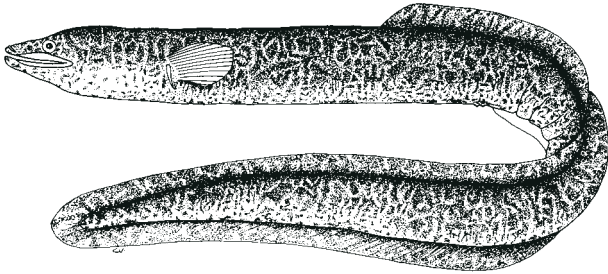
Maximum length about 1 m. Caught occasionally; separate statistics not available. Found from East Africa to the eastern tip of New Guinea, including the Philippines and Indonesia. Most easily confused with *Anguilla obscura*, which also occurs in New Guinea; the surest way to distinguish them is by the number of vertebrae.



Anguilla celebesensis Kaup, 1856

En - Indonesian mottled eel.

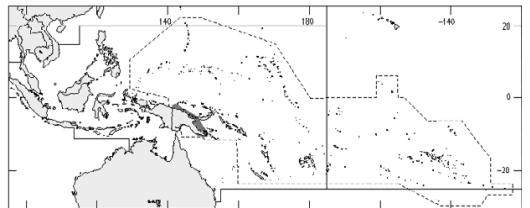
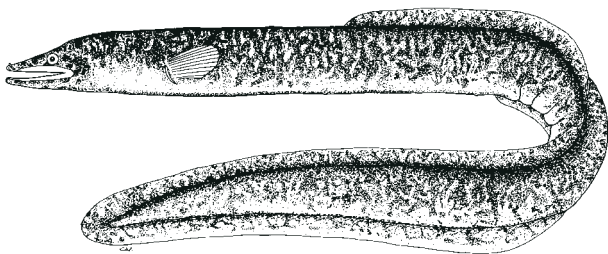
Maximum length about 1 m. Found in the Philippines and Indonesia as far as central New Guinea. Probably caught locally, but separate statistics not available. The variegated colour and broad, undivided tooth bands of this species are shared only with *Anguilla interioris* and *A. megastoma*. Its range adjoins that of *A. interioris* in central New Guinea; the relative length of the dorsal fin will separate most specimens (see key).



Anguilla interioris Whitley, 1938

En - New Guinea eel.

Maximum length about 80 cm. Probably caught locally, but separate statistics not available. Known only from the eastern half of the island of New Guinea. Most similar to *Anguilla celebesensis* and *A. megastoma*, although the ranges of these species are largely separate. It can be distinguished from *A. celebesensis* by the relative length of the dorsal fin and from *A. megastoma* by the number of vertebrae (see key).

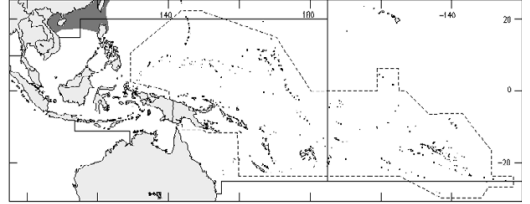
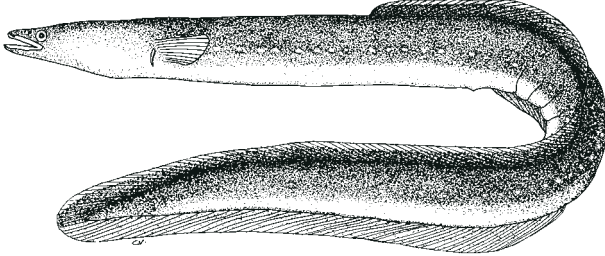


Anguilla japonica Temminck and Schlegel, 1846

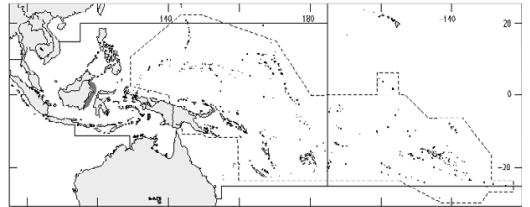
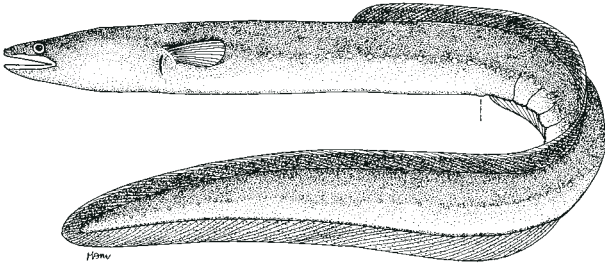
ELJ

En - Japanese eel; **Fr** - Anguille du Japon; **Sp** - Anguila japonesa.

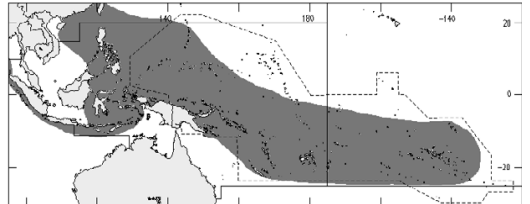
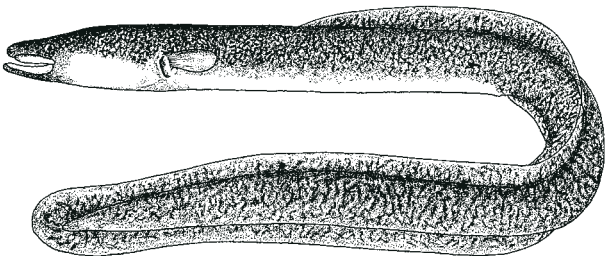
Maximum length about 1.5 m. Found mainly north of the area, occurs as a straggler in the northern Philippines. An important food fish in China and Japan, but too rare in this area to be utilized. *Anguilla malgumora* is the only other plain-coloured, long-finned species in the area, but it occurs only in Borneo. These 2 species are distinguished by the number of vertebrae (see key).

***Anguilla malgumora*** Schlegel in Kaup, 1856**En** - Indonesian longfinned eel.

Maximum length about 80 cm. Known only from the island of Borneo. Probably caught and consumed locally, but no separate statistics available. This is the only plain-coloured, long-finned eel found in the Indonesian area. A senior synonym of *Anguilla borneensis*.

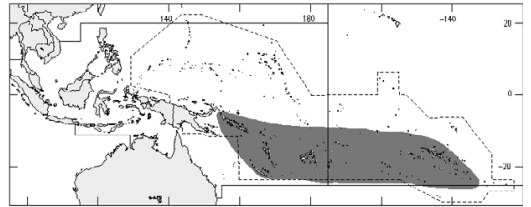
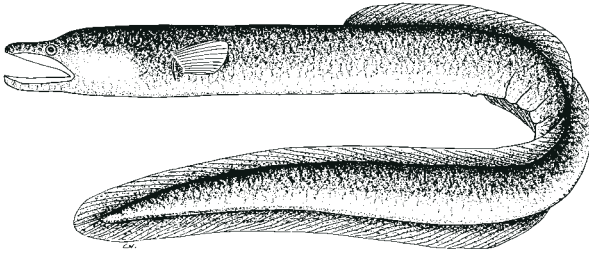
***Anguilla marmorata*** Quoy and Gaimard, 1824**En** - Giant mottled eel; **Fr** - Grande anguille marbrée; **Sp** - Anguilla moteada gigante.

Maximum length about 2 m. Widely distributed in the tropical Indo-West Pacific, from South Africa to the Society Islands. Caught locally, but separate statistics not available. Distinguished from all other species by the mottled colour and the long dorsal fin, which begins closer to the gill opening than to the anus.

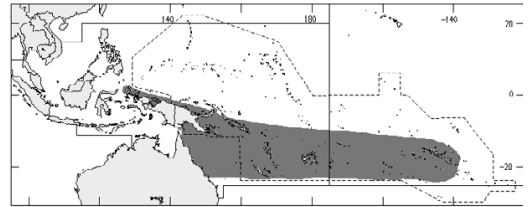
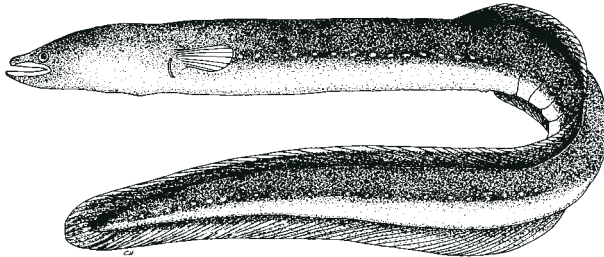


Anguilla megastoma* Kaup, 1856*En** - Polynesian longfinned eel.

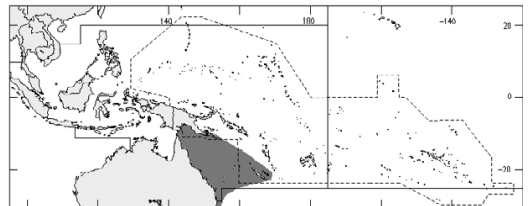
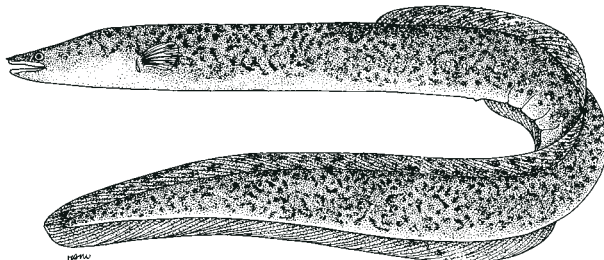
Maximum length about 1 m. Found in southern Oceania from the Solomon Islands to Pitcairn. Caught locally, but separate statistics not available. This is the only species that can be either variegated or plain in colour. Mottled individuals most closely resemble *Anguilla celebesensis* and *A. interioris* in having broad, undivided tooth bands, although the ranges of these species do not overlap that of *A. megastoma*. *A. megastoma* is distinguished from those 2 species by the greater number of vertebrae (see key). Plain-coloured individuals most closely resemble *A. japonica* and *A. malgumora*, but both those species are geographically distant. *A. obscura* is also plain coloured and occurs in much of the same area, but it has a shorter dorsal fin.

***Anguilla obscura* Günther, 1871****En** - Pacific shortfinned eel.

Maximum length about 80 cm. Found from western New Guinea and Queensland to the Society Islands. Caught locally but separate statistics not available. Most closely resembles *Anguilla australis* and *A. bicolor*, from which it can be distinguished with certainty only by the number of vertebrae (see key).

***Anguilla reinhardtii* Steindachner, 1867****En** - Australian longfinned eel.

Maximum length about 1.5 m. Found mainly on the east coast of Australia, but also occurs in New Caledonia. Caught locally but separate statistics not available. Characterized by mottled colour and tooth bands with an enlarged middle series and a separated inner series. The only other species within its range with these characters is *Anguilla marmorata*, but that species has a longer dorsal fin (see key).

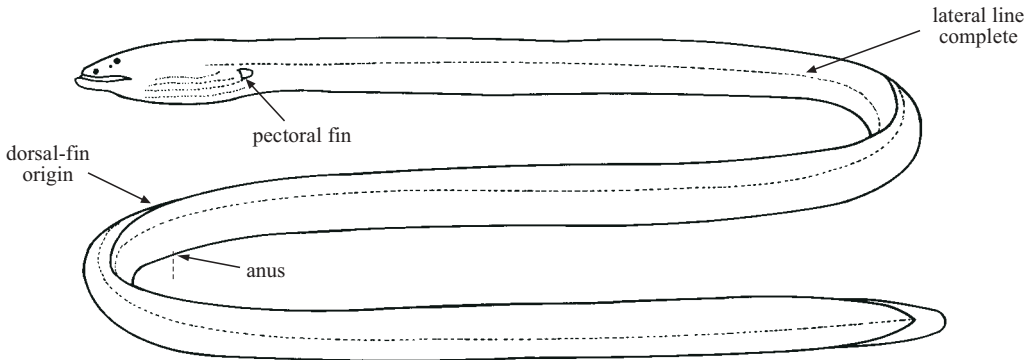


MORINGUIDAE

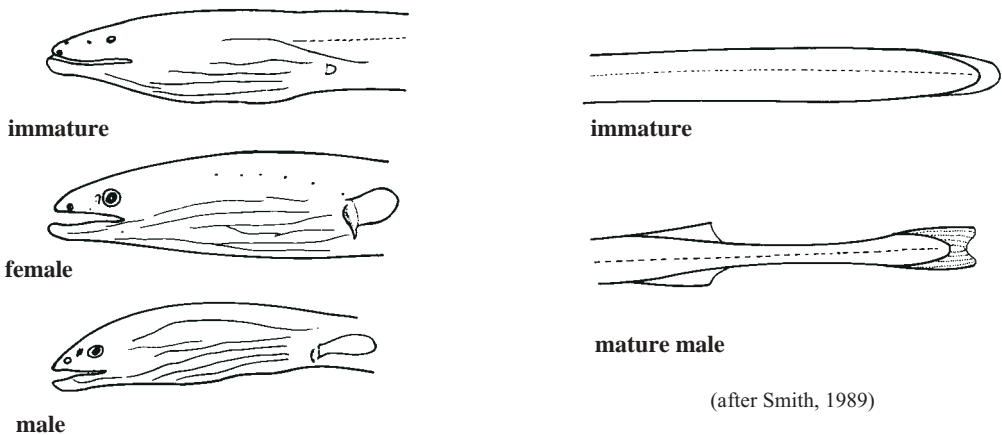
Spaghetti eels

by D.G. Smith

Diagnostic characters: Body moderately elongate to very elongate, cylindrical except near tip of tail; anus near or behind midlength; tip of tail soft, blunt. Eye reduced, except in mature *Moringua*. Snout not greatly prolonged. Mouth moderate, gape ending under or slightly behind eye; upper lip without an upturned flange; lower lip with or without a groove separating it from remainder of lower jaw. Teeth conical, small to moderately enlarged; in 1 or 2 series on jaws and vomer; intermaxillary teeth generally the largest, arranged in 2 longitudinal rows or in a semicircle. Anterior nostril with a low tube or without a tube; posterior nostril in front of eye. All fins present though sometimes reduced; dorsal and anal fins confluent with caudal fin; **dorsal fin begins far behind head, slightly before or well behind midlength**; anal fin begins at or distinctly behind anus. Scales absent. Lateral line on body complete or present only in front of anus; **on head, pores present only on lower jaw**. **Colour:** grey or yellow in life; mature adults often countershaded.



Moringua



(after Smith, 1989)

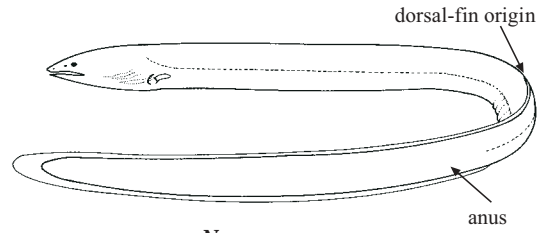
Habitat, biology, and fisheries: The Moringuidae contains 2 different looking genera. *Moringua* is much more common and the only moringuid likely to be seen in the area. It is much more elongate and changes greatly in form during its life. Immature individuals are worm-like, with reduced eyes and fins; they are yellow or red in life. At maturity, the eyes and pectoral fins enlarge, and the dorsal and anal fins expand near the tail to form a paddle-like tail fin. They become brown above and white below. These features are more strongly expressed in males than females, and females grow much larger than males. *Moringua* prefers clear water and sandy bottoms and is common on coral reefs. Immatures spend most if not all of their time buried in the sand and are seldom seen. Nevertheless, they are very common and probably play an important role in coral-reef ecology. Mature males and females emerge from the sand and swim near the surface, where they are sometimes taken by night light and dip net.

Neoconger is only moderately elongate, uniform grey in colour, with small eyes, and the snout projects beyond the lower jaw. Its lateral line is incomplete, ending at about the level of the anus. It lives in areas of mud or silty bottoms and seems to spend much of its time buried in the substratum. *Neoconger* is extremely rare in the Indo-West Pacific, so far known only from Australia and Fiji.

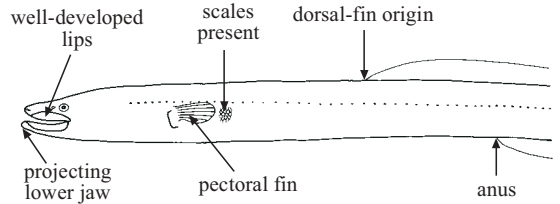
Similar families occurring in the area

Anguillidae: *Moringua* is distinguished from all other families except the Anguillidae by the protruding lower jaw. Anguillids have small, embedded scales; well developed fleshy flanges on the upper and lower lip; large eyes and pectoral fins at all stages of their life. The anus is located at or slightly in front of midlength, and the dorsal fin begins in front of the anus. *Moringua* lacks scales, the lips are without flanges, the anus is located well behind the midpoint of the body, and the dorsal fin begins approximately above the anus.

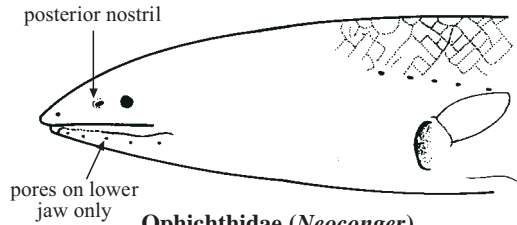
Ophichthidae: *Neoconger* is likely to be confused only with certain ophichthids. Most ophichthids lack a caudal fin and have the tip of the tail hard and pointed. Those ophichthids with a caudal fin (*Muraenichthys*, *Myrophis*, and *Neeenchelys*) have the posterior nostril below the middle of the eye (sometimes concealed in the upper lip) and have pores on the upper jaw; *Neoconger* has the posterior nostril at about mideye level and lacks pores on the upper jaw. Ophichthids also have more numerous branchiostegal rays.



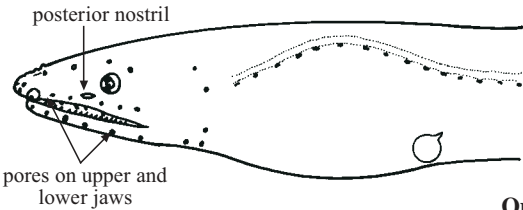
Neoconger



Anguillidae



Ophichthidae (*Neoconger*)



Ophichthidae

Key to the genera of Moringuidae

- 1a. Upper jaw projects beyond lower; dorsal fin begins slightly before level of anus; lateral line ends near level of anus *Neoconger*
- 1b. Lower jaw projects beyond upper; dorsal fin begins behind level of anus; lateral line complete *Moringua*

List of species

A single species of *Neoconger* is known from the area, *N. tuberculatus* (Castle, 1965). The species of *Moringua* have not yet been determined. Numerous names exist in the literature, but the actual number of species is probably small. There is 1 large species with a high vertebral count that is currently known as *Moringua javanica*. There is also 1 or several smaller species with lower vertebral counts. They all look alike, and until adequate studies are carried out we will not know how many species exist and what names should be applied to them.

References

Castle, P.H.J. 1968. *A contribution to a revision of the moringuid eels*. Special Publication Department of Ichthyology Rhodes University, South Africa, (3):29 p.

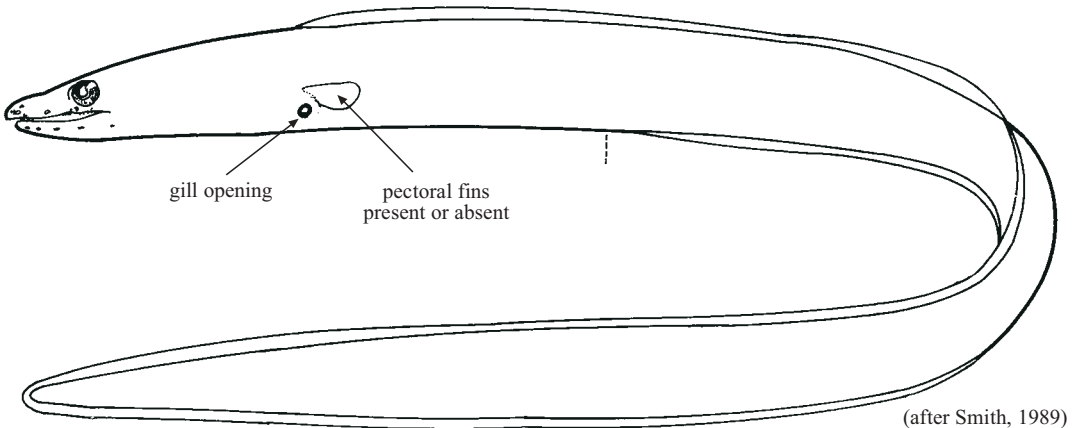
Smith, D.G. 1989. Family Moringuidae. In *Fishes of the Western North Atlantic, Part 9*, edited by E.B. Böhlke. *Mem. Sears Found. Mar. Res.*, 1(9):55-71.

CHLOPSIDAE

False morays

by D.G. Smith

Diagnostic characters: Body stout to moderately elongate, compressed, anus slightly before midbody. Eye well developed. Snout moderate to short, projecting slightly beyond tip of lower jaw. Upper lip without an upturned fleshy flange; lower lip with or without a downturned fleshy flange. Teeth small and conical or long and needle-like, in 2 to several series on jaws, and 1 or 2 long rows on vomer; large fangs never present. Anterior nostril in a short tube, near tip of snout; **posterior nostril located below mideye level, either on side of head above lip, on lip and covered with a flap, or opening inside mouth.** **Gill opening reduced to a small, round, pore-like opening.** Dorsal and anal fins well developed, confluent with caudal fin; dorsal fin begins over or slightly behind gill opening. Pectoral fins present or absent. Scales absent. **Lateral line incomplete, usually reduced to 1 or 2 pores at anterior end of canal, in front of pectoral fins.** **Colour:** variable, most often brown, and frequently countershaded with white ventrally. Some species with blotches, and some with a pale nuchal band or black anterior nostrils.



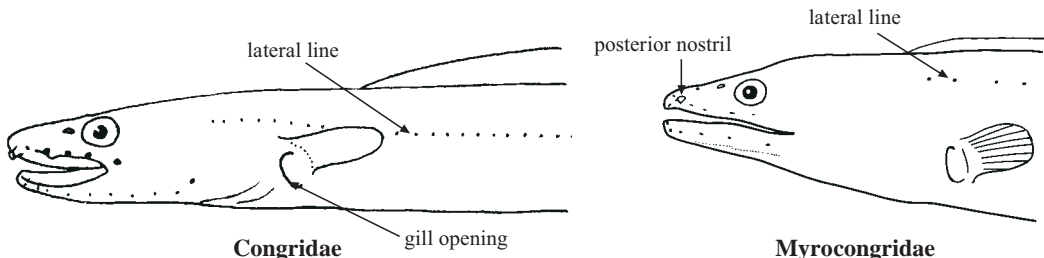
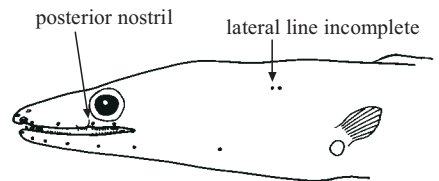
Habitat, biology, and fisheries: These are small eels with cryptic habits and are seldom seen. Most live on coral reefs, but some inhabit seagrass beds and others live among rock and rubble in somewhat deeper water. A few species are common, but most are quite rare.

Remarks: This family was formerly known as the Xenocongridae.

Similar families occurring in the area

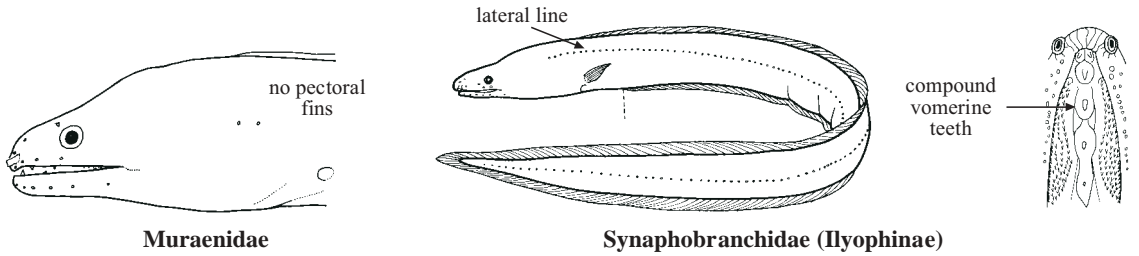
Congridae: those chlopsids with pectoral fins are most likely to be confused with congrids; juvenile *Conger cinereus*, in particular, are often mistaken for chlopsids. Congrids can immediately be distinguished by their complete lateral line and their larger gill opening. In addition, most congrids have the posterior nostril near mideye level.

Myrocongridae: also have an incomplete lateral line, but more than 2 pores.



Muraenidae: those chlopsids without pectoral fins closely resemble muraenids, hence the common name. Muraenids are easily distinguished by the position of the posterior nostril, high on the head, at or above the level of the top of the eye. Muraenids commonly have large fangs, which are absent in chlopsids.

Synaphobranchidae (subfamily Ilyophinae): some members resemble chlopsids, but Ilyophinae usually have more than 2 lateral-line pores, and most have large, compound vomerine teeth.



Key to the genera of Chlopsidae

- 1a. Pectoral fins absent → 2
- 1b. Pectoral fins present → 3
- 2a. Lower lip with a downturned flange (Fig. 1) *Chilorhinus*
- 2b. Lower lip without a downturned flange *Xenoconger*
- 3a. Teeth long and needle-like, vomerine teeth in 1 row (Fig. 2a) *Boehlkenchelys*
- 3b. Teeth not long and needle-like, vomerine teeth in 2 rows (Fig. 2b) *Kaupichthys*

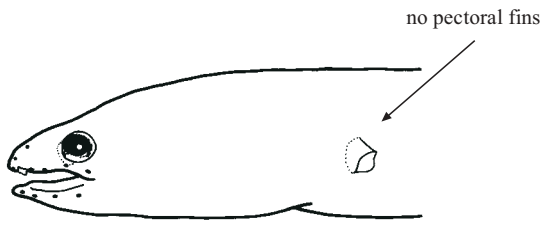


Fig. 1 *Chilorhinus*
(after Smith, 1989)

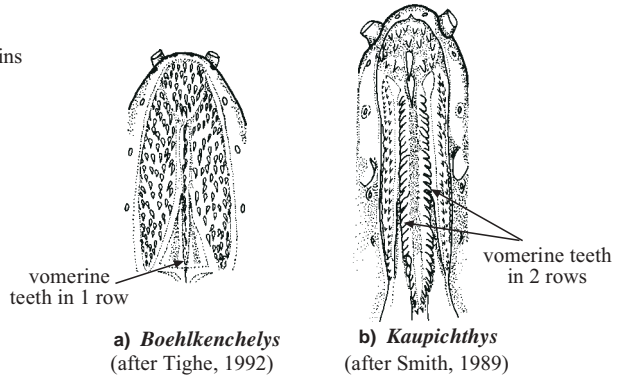


Fig. 2 roof of mouth

List of species occurring in the area

Note: this list is undoubtedly incomplete; the small size and cryptic habits of chlopsids make them difficult to collect, and more species probably exist than are currently recognized.

- Boehlkenchelys longidentata* Tighe, 1992
- Chilorhinus platyrhynchus* (Norman, 1922)
- Kaupichthys atronasus* Schultz, 1943
- Kaupichthys brachychirus* Schultz, 1953
- Kaupichthys diodontus* Schultz, 1943
- Xenoconger fryeri* Regan, 1912

References

Böhlke, J.E. 1956. A synopsis of the eels of the family Xenocongridae (including Chlopsidae and Chilorhinidae). *Proc. Acad. nat. Sci. Philad.*, 108:61-95.

Böhlke, J. E. and D. G. Smith. 1968. A new xenocongrid eel from the Bahamas, with notes on other species in the family. *Proc. Acad. nat. Sci. Philad.*, 120(2):25-43.

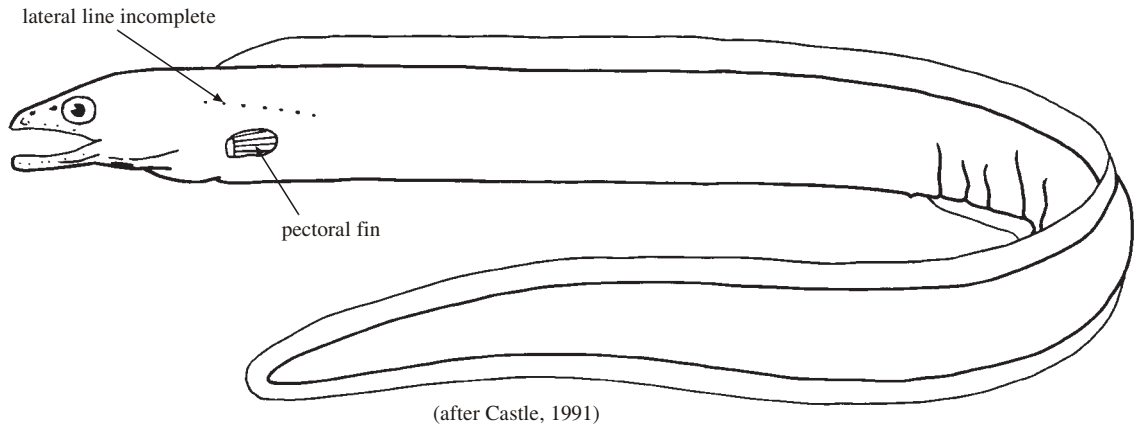
Tighe, K. A. 1992. *Boehlkenchelys longidentata*, a new genus and species of chlopsid eel (Teleostei: Anguilliformes) from the Indo-West Pacific region. *Proc. Biol. Soc. Wash.*, 105(1):19-22.

MYROCONGRIDAE

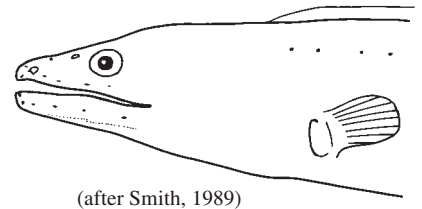
Thin morays

by D.G. Smith

Diagnostic characters: Body moderately elongate, strongly compressed; anus slightly anterior to midbody; tip of tail blunt, soft. Head stout, well muscled. Eye well developed. Snout somewhat depressed. Mouth moderately large, gape ends behind rear margin of eye; jaws nearly equal; no fleshy flanges on lips. Teeth numerous, moderate in size, sharp, in several rows on jaws; teeth on vomer in a long band of 1 to 3 rows. Anterior nostril tubular, just behind tip of snout; posterior nostril oval, with a low raised rim, located in front of upper part of eye. Dorsal and anal fins well developed, confluent around tail; dorsal fin originates in front of pectoral-fin base. **Pectoral fins well developed**, broadly rounded, their base spanning entire gill opening. Gill opening oblique, small but not greatly restricted or pore-like. Scales absent. **Lateral line on body incomplete, approximately 5 to 7 pores at front of canal, from slightly before to slightly behind pectoral fins;** pores present on upper and lower jaws and front of snout. **Colour:** preserved specimens light brown, without markings; in life, possibly yellow or reddish.



Habitat, biology, and fisheries: The Myrocongridae contains a single genus and as many as 4 species, occurring in both the Atlantic and Pacific. These eels are rarely collected and are known from only a few specimens. Nothing is known about their biology. One species, *Myroconger prolixus*, has recently been described from New Caledonia. Another species, *M. gracilis*, has been collected slightly north of the area on the Kyushu-Palau Ridge, but it could extend southward into the area.

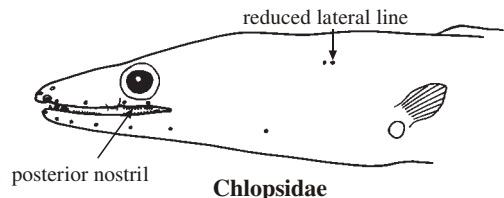
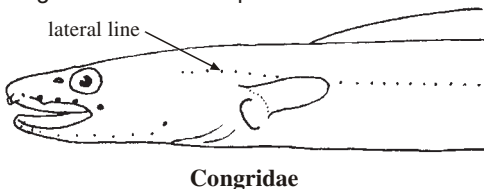


Similar families occurring in the area

Myroconger is most easily confused with the Congridae, Chlopsidae, and Muraenidae.

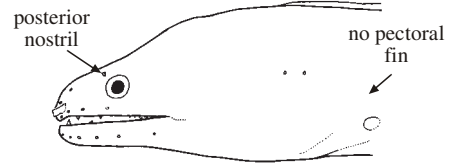
Congridae: congrids have a complete lateral line, and the base of the pectoral fins does not span the entire gill opening. In most congrids, the posterior nostril is at the level of the middle rather than the top of the eye.

Chlopsidae: chlopsids have an incomplete lateral line, but they usually have only 1 or 2 pores instead of 5 to 7; in addition, their posterior nostril is opposite the lower part of the eye or even on the lip, and the gill opening is restricted and pore-like.



Muraenidae: muraenids have the posterior nostril high on the head, but they lack pectoral fins.

Other eel families all have specialized characters that easily separate them from *Myroconger*.



Muraenidae

List of species occurring in the area

Myroconger prolixus Castle and Bearez, 1995

References

- Castle, P.H.J. 1991. First Indo-Pacific record of the eel family Myrocongridae, with the description of a new species of *Myroconger*. *Copeia*, 1991(1):148-150.
- Castle, P.H.J. and P. Bearez. 1995. Two new species of *Myroconger* (Anguilliformes, Myrocongridae) from the Pacific Ocean. *Cybium*, 19(3):211-222.
- Smith, D.G. 1989. Family Myrocongridae. In *Fishes of the Western North Atlantic, Part 9*, edited by E.B. Böhlke. *Mem. Sears Found. Mar. Res.*, 1(9):98-103.