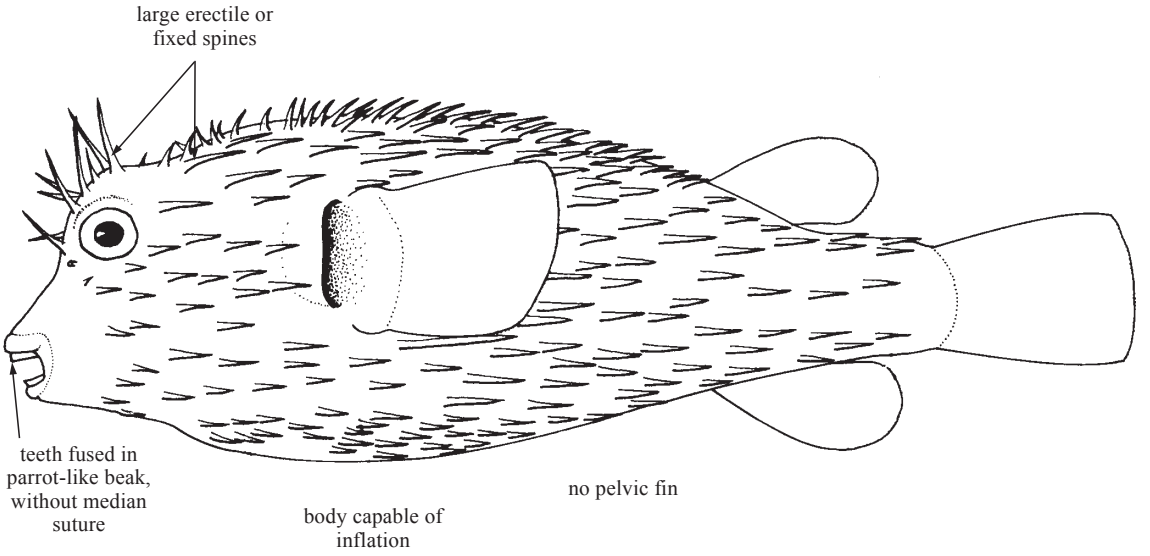
DIODONTIDAE

Porcupinefishes (burrfishes, spiny puffers)

by J.M. Leis, Australian Museum, Sydney, Australia

Diagnostic characters: Small to medium-sized fishes to 1 m in length, commonly 20 to 50 cm. **Body wide and capable of great inflation, covered with massive spines which may be quite long**; spines with large bases, or roots, under the skin; long spines usually erectile and 2-rooted, short spines fixed in erect position by their 3-rooted bases. Head broad and blunt; gill opening a relatively small, vertical slit immediately before pectoral-fin base; nasal organ usually in small tentacles located in front of large eyes; mouth large, wide, and terminal, **teeth fused to form a strong, beak-like crushing structure without a median suture dividing upper and lower jaws into left and right halves**. Dorsal and anal fins without spines, set far back on body, and like caudal fin, generally rounded; most fin rays branched; bases of fins often thick and fleshy; **no pelvic fins**. Lateral line inconspicuous. No normal scales. **Colour:** background colour light tan to brown, but grey not uncommon; usually overlain with dark brown to black spots, bars, and/or blotches; green overtones and yellowish spots may also be present. Undamaged spines covered with skin that continues colour pattern. Belly white, often with yellow overtone. A pelagic species is deep blue dorsally, and pelagic juveniles of other species may also be blue, but pelagic juveniles of at least 2 *Chilomycterus* species are yellow with dark, ring-shaped markings.



Habitat, biology, and fisheries: Most species are benthic around coral or rocky reefs, but some frequent sea grass beds and sand or mud bottoms to 100 m, and one species plus the juveniles of others are pelagic. They feed on hard-shelled benthic invertebrates that are crushed with powerful jaws. They inflate when disturbed and present a potential predator with a large, very spiny ball. Most or all spawn pelagic eggs and pass through a pelagic juvenile phase. Juveniles are commonly preyed upon by large, pelagic predators such as tunas and billfishes. The pelagic species may school, but the others are not known to school. Not normally eaten except perhaps as fishmeal, but often collected as bycatch in bottom trawls. Sometimes inflated and dried to be sold as curios. Thought to be poisonous, but some species eaten in Asia and the Pacific islands without ill effects.

Similar families occurring in the area

No other family has the following combination of characters: large spines on body; no pelvic fins; inflatable body; and teeth fused into a single beak-like unit in each jaw, without median suture dividing upper and lower jaws into right and left halves.

Key to the genera and species of Diodontidae occurring in the area

1a. All body spines erectile and 2-rooted (Fig. 1a) (except a few around gill opening or dorsal-fin base) . . . . . ***Diodon*** → ***6***

1b. Body spines fixed in an erect position and with 3 or 4 roots (Fig. 1b) . . . . . → ***2***

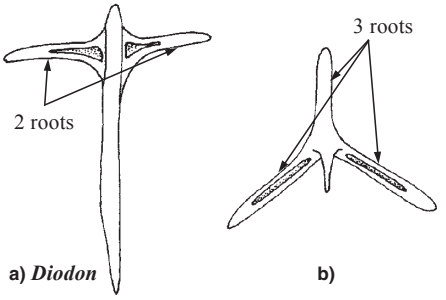


Fig. 1 body spines

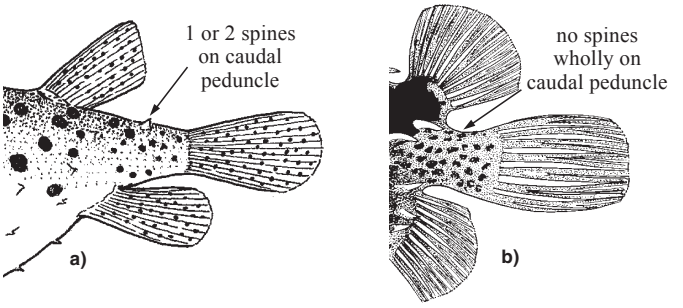


Fig. 2 lateral view of caudal region

2a. One or 2 small spines wholly on dorsal surface of caudal peduncle (Fig 2a); normally 10 caudal-fin rays; nasal organ of adults an open, ridged cup; adults with fins spotted; on top of head some spines with 4 roots (Fig. 3) . . . . . ***Chilomycterus reticulatus***

2b. No spines wholly on caudal peduncle (Fig. 2b); normally 9 caudal-fin rays; nasal organ of adults a short, hollow tentacle with 2 openings; fins of adults usually without spots; all spines with 3 roots . . . . . → ***3***

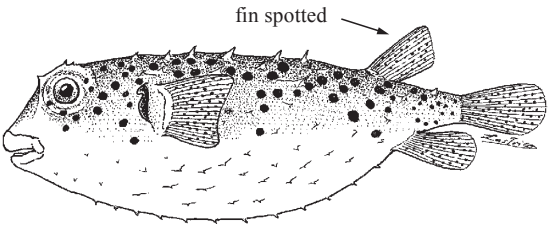


Fig. 3 ***Chilomycterus reticulatus***

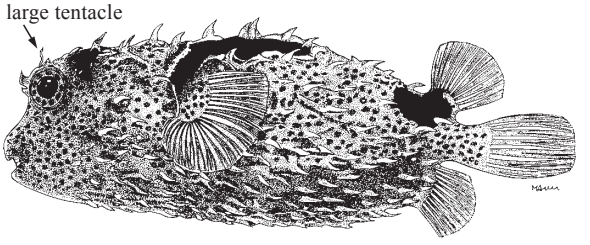


Fig. 4 ***Chilomycterus antennatus***

3a. A large (about equal to 1 eye diameter) tentacle above eye; colour pattern dominated by large blotches with small spots scattered on back and sides, spots on fins only basally, except on most or all of caudal fin from 10 to 15 cm standard length, and on other fins from 20 cm (Fig. 4) . . . . . ***Chilomycterus antennatus***

3b. Tentacles above eyes absent or small; no small spots on fins or on back or sides . . . . . → ***4***

4a. Network of hexagonal to circular black lines on back and sides (Fig. 5) . . . . . ***Chilomycterus antillarum***

4b. Black lines on back and sides absent, or if present, wavy or approximately parallel - not intersecting to form rings or polygons . . . . . → ***5***

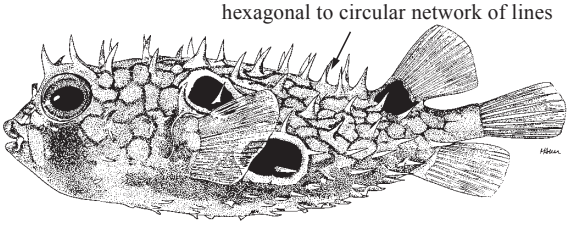


Fig. 5 ***Chilomycterus antillarum***

5a. No black lines on back and sides; background dark with diffuse lighter spots (Fig. 6) . . . . . ***Chilomycterus spinosus spinosus***

5b. Extensive series of dark brown to black parallel lines covering back and sides (Fig. 7) . . . . . ***Chilomycterus schoepfii***

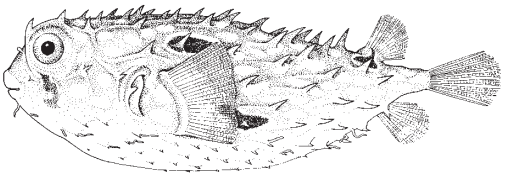


Fig. 6 ***Chilomycterus spinosus spinosus***

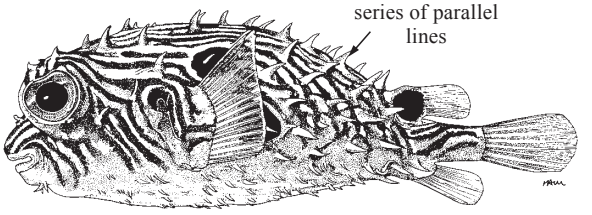


Fig. 7 ***Chilomycterus schoepfii***

6a. No spines wholly on caudal peduncle (Fig. 2b); body with several large, dark dorsal blotches; no small, dark spots on fins; 12 to 15 spines from lower jaw to anus (Fig. 8) . . . . . ***Diodon holocanthus***

6b. One or more small spines wholly on the dorsal surface of caudal peduncle (Fig. 2a); body without large dorsal blotches; all fins (anal sometimes excepted) heavily spotted; 10 to 19 spines from lower jaw to anus . . . . . → *7*

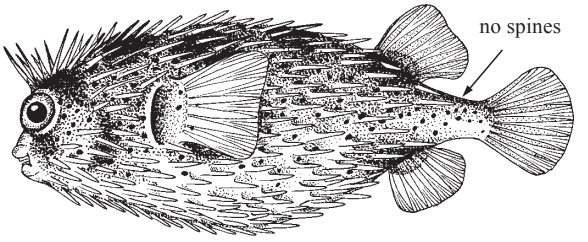


Fig. 8 ***Diodon holocanthus***

7a. Pectoral-fin soft rays 19 to 22; anal-fin soft rays 16 to 18; dorsal and anal fins somewhat pointed in adults; relatively streamlined, head width of adults 3.3 to 4.0 in standard length; 10 to 14 spines from lower jaw to anus; a wholly pelagic species coloured dark blue dorsally (Fig. 9) . . . . . ***Diodon eydouxii***

7b. Pectoral-fin soft rays 22 to 25 (rarely 21); anal-fin soft rays 14 to 16; dorsal and anal fins rounded in adults; relatively robust, head width of adults 2.4 to 3.3 in standard length; 14 to 19 spines from lower jaw to anus; juveniles (up to 20 cm) pelagic, adults demersal and coloured tan to brown (Fig. 10) . . . . . ***Diodon hystrix***

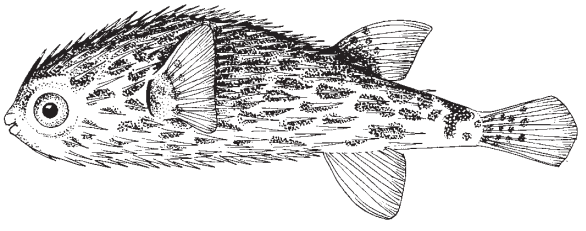


Fig. 9 ***Diodon eydouxii***

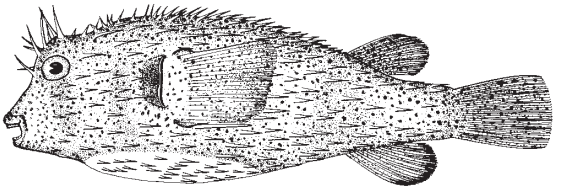


Fig. 10 ***Diodon hystrix***

List of species occurring in the area

The symbol is given when species accounts are included.

Chilomycterus antennatus (Cuvier, 1816).
Chilomycterus antillarum Jordan and Rutter, 1897.
Chilomycterus reticulatus (Linneaus, 1758) [=*C. atringa* or *atinga* (Linneaus, 1758)].
Chilomycterus schoepfii (Walbaum, 1792).
Chilomycterus spinosus spinosus (Linneaus, 1758).

Diodon eydouxii Brissout de Barneville, 1846.
Diodon holocanthus Linnaeus, 1758.
Diodon hystrix Linnaeus, 1758.

References

Leis, J.M. 1978. Systematics and zoogeography of the porcupine-fishes (*Diodon*, Diodontidae, Tetraodontiformes) with comments on egg and larval development. *U.S. Fish. Bull.,* 76(3):535-567.

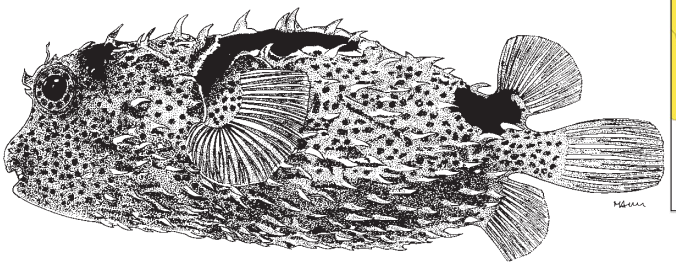
Leis, J.M. 1986. Family Diodontidae. In *Smith's Sea Fishes*, edited by M.M. Smith and P.C. Heemstra. McMillian South Africa, Johannesburg, pp 903-907.

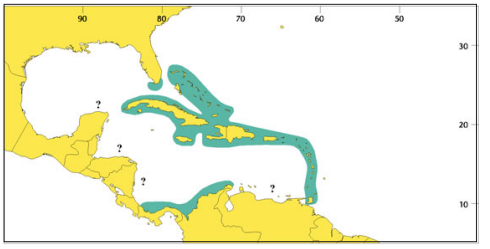
Paekpe, H.-J. 1999. *Bloch's fish collection in the Museum für Naturkunde der Humboldt Universität zu Berlin*. ARG Gantner Verlag KG, Liechtenstein, 216 p.

Chilomycterus antennatus (Cuvier, 1816)

En - Bridled burrfish.

No spines wholly on caudal peduncle; a single large tentacle over each eye; 3 or 4 large blotches on back and sides with many small black spots between blotches. Small spots onto base of all fins from about 5 cm standard length, and onto most or all of caudal fin from 10 to 15 cm, and onto other fins from 20 cm. Maximum standard length about 25 cm. Young pelagic to about 1 to 3 cm standard length, and recruit into seagrass beds. Adults in sea grasses and reefs to depths of 25 m. Solitary; feeds on hard-shelled invertebrates. Not usually marketed. Bahamas and Florida to Panama and Tobago, perhaps to western Africa. Reported occurrences in Brazil require confirmation.

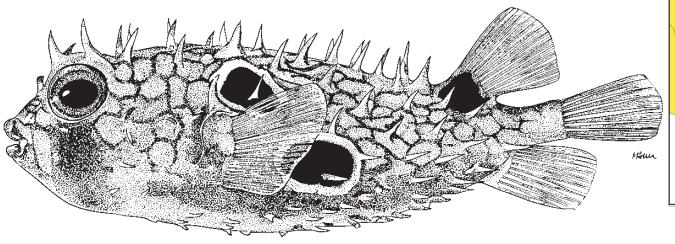


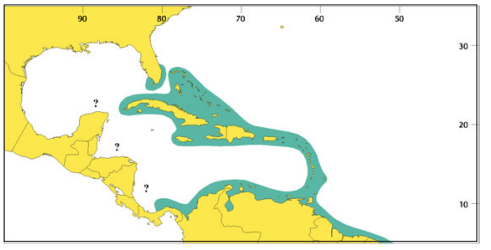


Chilomycterus antillarum Jordan and Rutter, 1897

En - Web burrfish.

No spines wholly on caudal peduncle; supraocular tentacles absent or much smaller than eyes; 5 to 7 large dark blotches on back and sides, with many reticulating dark lines forming rounded to polygonal patterns distributed over light background colour; no small dark spots either on body or fins. Maximum standard length about 25 cm. Young unknown. Adults on soft bottoms, to depths of 25 m. Solitary; feeds on hard-shelled invertebrates. Not usually marketed. Florida, Bahamas, and Cuba to Barbados and northern Brazil. *Diodon geometricus* Bloch and Schneider 1801 is a senior synonym of *Chilomycterus antillarum*, but it has not been used correctly for that species since 1870, except in Paepke's (1999) listing of Bloch's types. In contrast, *Ch. antillarum* has been nearly universally used for this species since its description in 1897. In the interests of stability, *Ch. antillarum* is retained.

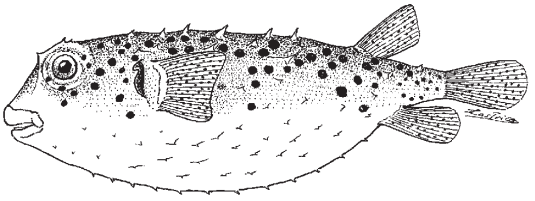


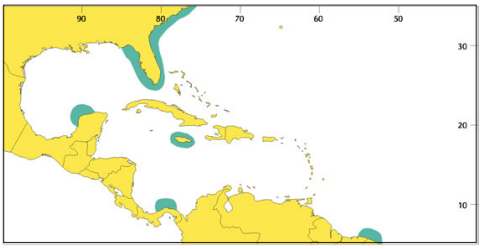


Chilomycterus reticulatus (Linnaeus, 1758)

En - Spotfin burrfish (AFS: Spotted burrfish).

Small spine dorsally on caudal peduncle; no tentacles over eyes; no large blotches, but small spots present on at least dorsal, caudal, and pectoral fins. Maximum standard length about 75 cm. Young pelagic to about 20 cm standard length, adults on reefs and soft bottoms to depths of 100 m; may occur deeper in tropics. Solitary; feeds on hard-shelled invertebrates. Not usually marketed. Circumtropical and subtropical, but occurrences patchy. *Chilomycterus atinga* (Linnaeus 1758) is often used for *Ch. reticulatus* (Linnaeus 1758). However, *atinga* (or *atringa* as originally spelled) is not unequivocally identifiable from the original description or its citations, whereas *Ch. reticulatus* is clearly identifiable from publications cited by Linnaeus. The spelling '*atinga*' is attributable to Bloch, 1785, but he was clearly referring to *Diodon hystrix*.

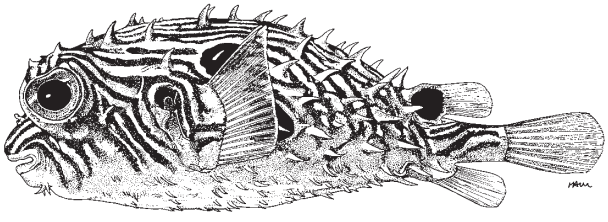


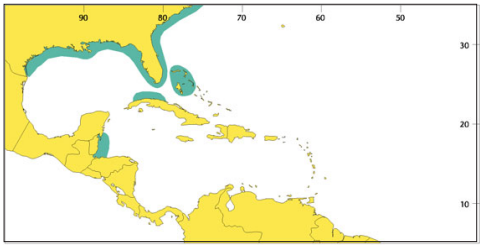


Chilomycterus schoepfii (Walbaum, 1792)

En - Striped burrfish.

No spines wholly on caudal peduncle; supraocular tentacles absent or much smaller than eyes; 5 to 7 large dark blotches on back and sides, with many, approximately parallel to obliquely intersecting dark lines distributed over light background colour; no small, dark spots either on body or fins. Maximum standard length about 28 cm. Young pelagic until about 1 to 2 cm. Relatively shallow-dwelling; adults on soft bottoms and seagrass beds, including estuaries. Solitary; feeds on hard-shelled invertebrates. Not usually marketed. Nova Scotia to Belize, Cuba, and the Bahamas. Reports of this species south of Belize require verification.

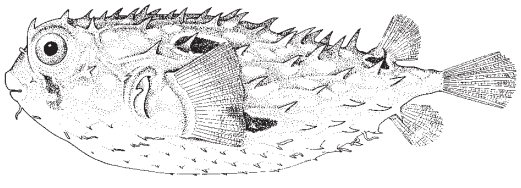


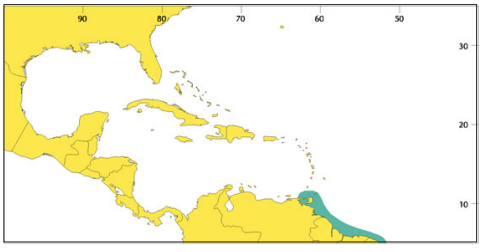


Chilomycterus spinosus spinosus (Linneaus, 1758)

En - Brown burrfish.

No spines wholly on caudal peduncle; supraocular tentacles absent or much smaller than eye; 3 large blotches on back and sides, but no small black spots interspersed; light, diffuse spots on brown background, no reticulations or parallel lines; no spots on fins. Maximum standard length about 22 cm. Young unknown; habitat unknown. Presumably feeds on hard-shelled invertebrates. Not usually marketed. Northern South America (Trinidad, Guyana, Suriname) to southern Brazil. Subspecies, *Chilomycterus spinosus mauretanicus* Le Danois, in Western Africa.

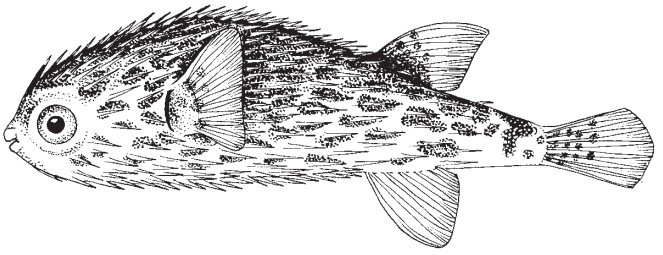


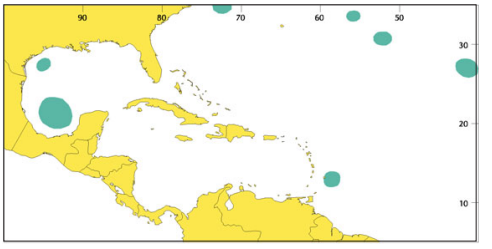


Diodon eydouxii Brissout de Barneville, 1846

En - Pelagic porcupinefish.

Relatively slender with pointed dorsal and anal fins, and a small spine dorsally wholly on the caudal peduncle. Blue dorsally. Maximum standard length about 25 cm. A pelagic, oceanic, surface, schooling species. Feeds on larger zooplankton and fish larvae. Not marketed. Circumtropical, pelagic, and probably throughout the area, although only scattered records to date.

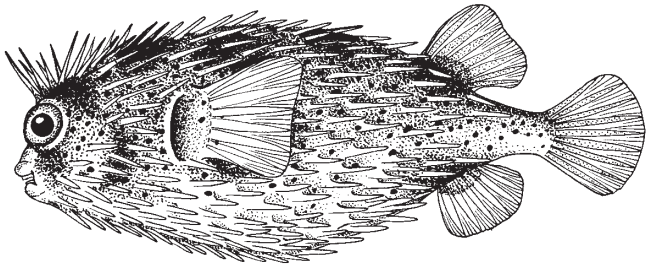


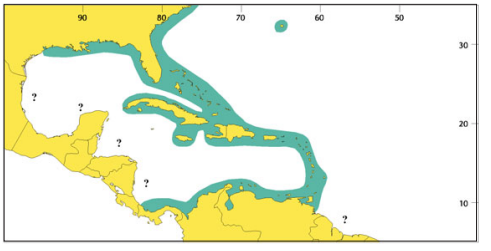


Diodon holocanthus Linnaeus, 1758

En - Long-spine porcupinefish (AFS: Balloonfish) **Fr** - Porc-épine ballon; **Sp** - Pejerizo balón.

Robust, with rounded dorsal and anal fins, and no spines wholly on the caudal peduncle. Light background colour with large dark blotches on back and sides and many small dark spots on body, not extending onto anything other than base of fins. Maximum standard length about 30 cm. Juveniles pelagic to about 6 to 9 cm; larger fish found in a variety of benthic habitats from shallow reefs to open, soft bottoms to at least 100 m. Usually solitary, a nocturnal fish feeding on hard-shelled invertebrates. Not usually marketed. Circumtropical.



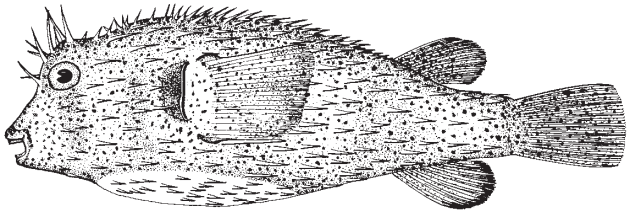


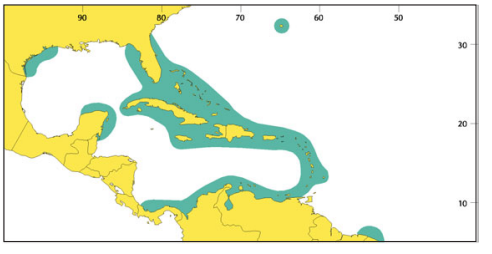
Diodon hystrix Linnaeus, 1758

DIY

En - Spot-fin porcupinefish (AFS: Porcupine fish); **Fr** - Porc-épine boubou; **Sp** - Pejerizo común.

Moderately robust, with rounded dorsal and anal fins, and 1 or 2 spines wholly on the caudal peduncle dorsally. Usually lacks large dorsal blotches, but has small dark spots on body that extend to cover most of the fins. Maximum standard length to about 75 cm. Juveniles pelagic to about 20 cm; larger fish on reefs to at least 50 m. Usually solitary, a nocturnal fish feeding on hard-shelled invertebrates. Not usually marketed. Circumtropical.



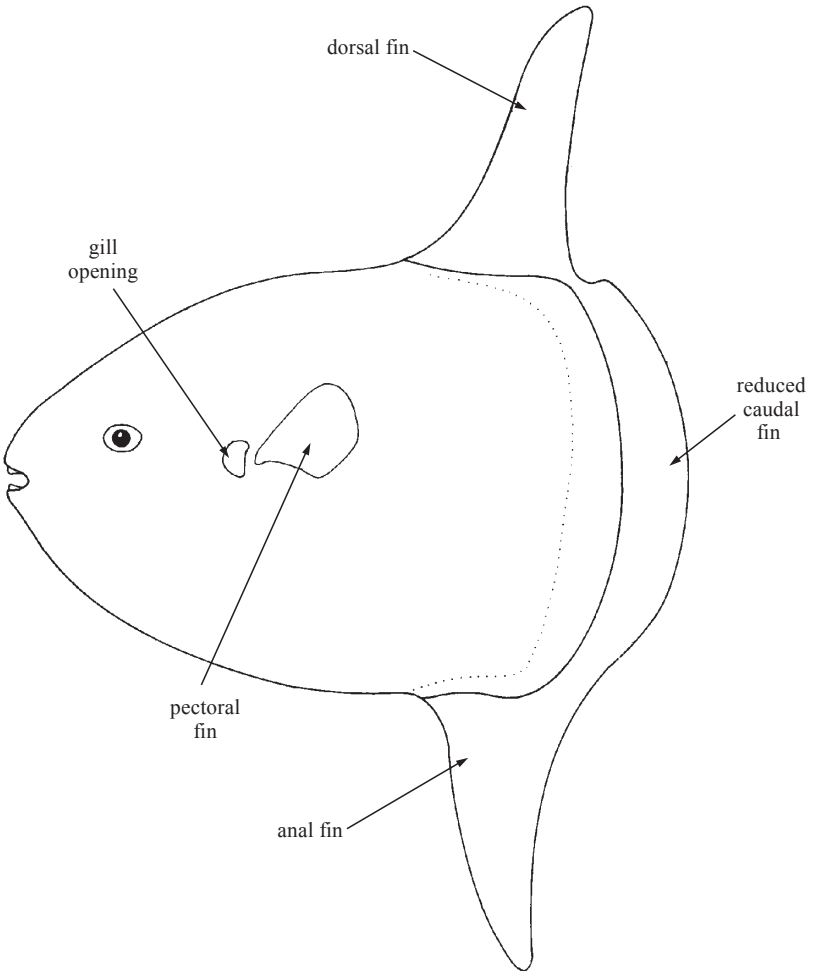


MOLIDAE

Molas (ocean sunfishes, headfishes)

by K. Matsuura, National Science Museum, Tokyo, Japan

Diagnostic characters: Large fishes reaching 3.5 m in length; **body short and deep or slightly elongate, strongly compressed, truncate, and without caudal peduncle or normal caudal fin**. Mouth small and usually terminal; teeth fused into a beak in each jaw without a median suture. Gill opening a short vertical slit in front of pectoral-fin base, branchiostegal rays hidden beneath the skin. **Dorsal and anal fins similar in shape, positioned far back on body; the posterior portions of each fin more or less continuous with the abbreviated caudal fin**; both fins with only 15 to 19 soft rays; **caudal fin reduced to a leathery fold with a scalloped trailing margin, immediately posterior to the bases of dorsal and anal fins**; pectoral fins small, located midside; **pelvic fins absent**. Skin of body leathery and thick, scales small, but basal plates in contact and close-fitting, sometimes hexagonal in shape. **Colour:** grey to dark bluish grey on back, grey-brown or brownish green on sides, with silvery reflections and dusky below, sides sometimes with small pale spots.



Habitat, biology, and fisheries: Molas are pelagic fishes, occurring in warm and tropical seas. They are frequently seen swimming lazily, or idling at the surface, occasionally partially on their side. They feed on jelly fishes, medusae, algae, brittle stars, larval eels, and sometimes larger fishes. Young fishes are observed along coastal areas, making schools; they feed on bottom invertebrates. Not generally used as foodfish. Only 3 species known throughout the world.

Similar families occurring in the area

No other fish family has the peculiar truncated-shaped body lacking caudal peduncle and normal caudal fin.

Key to the species of Molidae occurring in the area

1a. Body depth 1 to 1.5 times in length; lips normal; body with small, round scales; large fishes, reaching 1 m or more in length . . . . . → *2*

1b. Body depth 2 times or nearly so in length; lips funnel-like, forming a vertical slit when closed; body with adjoining scales frequently hexagonal in shape; smaller fishes, less than 80 cm in length (Fig. 1) . . . . . ***Ranzania laevis***

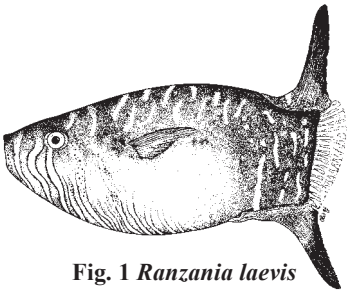


Fig. 1 ***Ranzania laevis***

2a. Body depth usually equal to length; caudal fin without posterior projection or tip (Fig. 2) . . . ***Mola mola***

2b. Body depth about 1.5 times in length; midpart of caudal fin posteriorly projected (Fig. 3) . . . . . ***Masturus lanceolatus***

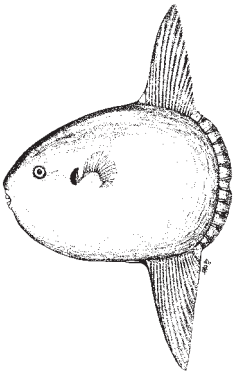


Fig. 2 ***Mola mola***

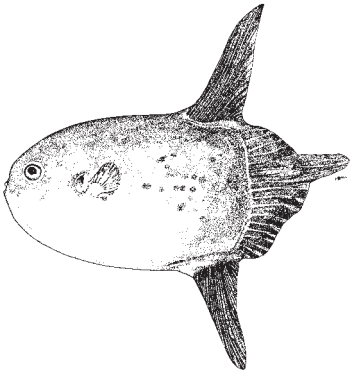


Fig. 3 ***Masturus lanceolatus***

List of species occurring in the area

Masturus lanceolatus (Liénard, 1840). To 2 m. North Carolina to Florida in W Atlantic, worldwide in temperate and tropical waters.

Mola mola (Linnaeus, 1758). To 3.5 m. Newfoundland to Argentina in W Atlantic, worldwide in temperate and tropical waters.

Ranzania laevis (Pennant, 1776). To 80 cm. Florida to Brazil in W Atlantic, worldwide in tropics.

Reference

Fraser-Brunner, A. 1951. The ocean sunfishes (family Molidae). *Bull. Brit. Mus. (Nat. Hist.), (Zool)*, 1(6):89-121.