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Synbranchiformes

(Swamp and spiny eels)

Class Actinopterygii
Order Synbranchiformes
Number of families 3

Photo: An African eel (*Mastacembelus* sp.) from Cameroon. (Photo by Mark Smith/Photo Researchers, Inc. Reproduced by permission.)



Evolution and systematics

No synbranchiform fossil is known. The Mastacembeloidei were removed from the Perciformes and added to the Synbranchiformes after a phylogenetic analysis by Johnson and Patterson. These authors consider the Synbranchiformes to be monophyletic and related to Mugiliformes, Atheriniformes, Gasterosteiformes, and Smegmamorformes.

There are two suborders: Synbranchoidei and Mastacembeloidei, or Opisthomi. The Synbranchoidei has one family, the Synbranchidae; four genera; and 15 species. The Mastacembeloidei has two families: Chaudhuriidae, with four genera and five species, and Mastacembelidae. The latter family is divided into two subfamilies, Mastacembelinae, with two genera and 25 species, and Afromastacembelinae, with two genera and 42 species). There are a total of 87 species.

Physical characteristics

These eel-like fishes range in size from 8 to 48 in (20–150 cm). Although they are eel-like, they are not related to true eels (Anguilliformes). The premaxillae are present as distinct bones. The gills are poorly developed, and their openings are usually single, small, and confluent across the breast. Oxygen is absorbed through the membranes of the throat or intestine. The dorsal and anal fins are low and continuous around the tail tip. Pelvic fins, if present, are small and located on the throat. Scales are either absent or very small. They lack a swim bladder.

Distribution

These fishes are distributed in tropical America, tropical Africa, southeastern and eastern Asia, East Indies, and Aus-

tralia. The three families each have a somewhat different distribution: The Synbranchidae are found in Mexico, Central and South America, West Africa (Liberia), Asia, and the Indo-Australian Archipelago. The Mastacembelidae are found in Africa and through Syria to the Malay Archipelago and China. The Chaudhuriidae are found in northeastern India through Thailand to Korea (including parts of Malaysia and Borneo).

Habitat

They usually are found in swamps, caves, and sluggish fresh and brackish waters. When found in pools, they typically are associated with leaf litter and mats of fine tree roots along the banks. Swamp eels are capable of overland excursions, and some can live out of water for extended periods of time. Some species are burrowers. Four species are found exclusively in caves: *Monopterus eapeni* and *M. roseni* from India, *Ophisternon candidum* from Australia, and *O. infernale* from Mexico. One species, *O. bengalense*, commonly occurs in coastal areas of southeastern Asia.

Behavior

Some species are considered air-breathing fishes because of their ability to breathe by highly vascularized buccopharyngeal pouches (pharynx modified for breathing air). They usually are active only at night.

Feeding ecology and diet

They feed on benthic invertebrates, especially larvae, and fishes.



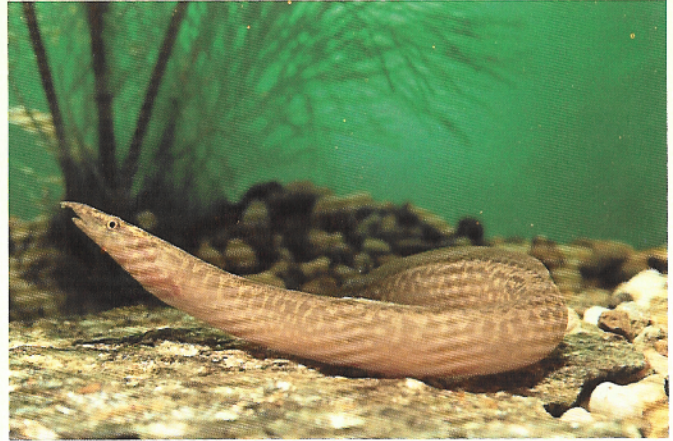
The zig-zag eel (*Mastacembelus armatus*) is found in the weedy stream beds of Southeast Asia, Sri Lanka, southern China, and Sumatra. (Photo by Hans Reinhard. Bruce Coleman, Inc. Reproduced by permission.)

Reproductive biology

At least some of the species of the family Synbranchidae, that is, *O. infernale*, are sexually dimorphic. Adult males grow a head hump, and males are larger than females. These fishes lay about 40 spherical eggs per clutch. The eggs measure between 0.05 and 0.06 in (1.2–1.5 mm) in diameter and have a pair of long filaments for adhesion to the substrate. Reproduction takes place during the wet season, which lasts for several months, during which females probably spawn more than once. Data acquired from studying juvenile growth and the length of representative individuals within a population suggests that they are a short-lived species that matures during the first year, with few individuals surviving to the second breeding season.

Conservation status

As of 2002, five species were listed by the IUCN as species of special concern: *Macrogathus aral* (the one-stripe spiny

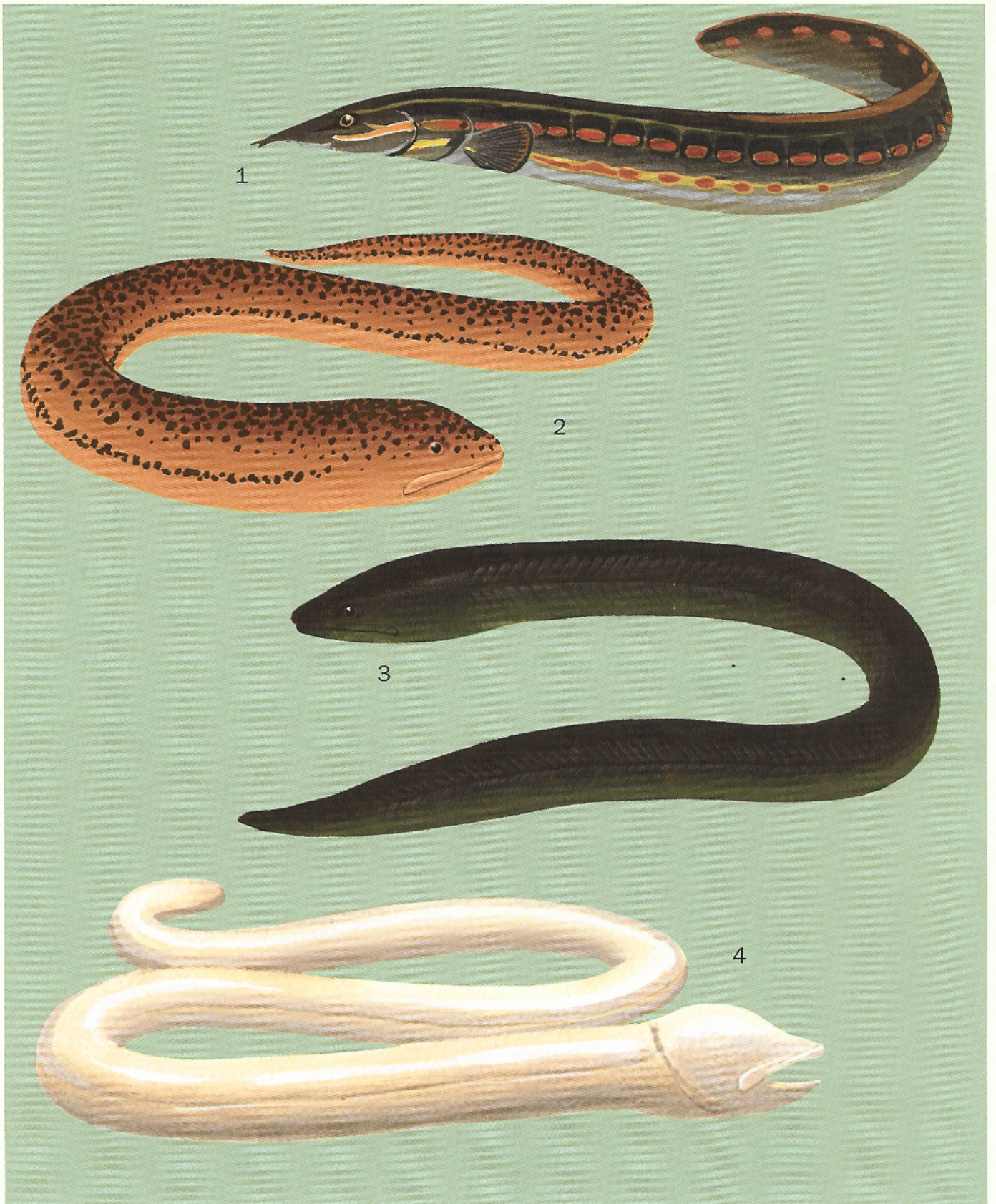


An undescribed spiny eel (*Mastacembelus* sp.) from Southeast Asia. (Photo by Animals Animals ©Dani/Jeske. Reproduced by permission.)

eel), *Monopterus boueti* (Liberian swamp eel), *Monopterus indicus* (Bombay swamp eel), and *Ophisternon candidum* (the blind cave eel) have been classified as Data Deficient, meaning that they require more study to determine their conservation status; *O. infernale* (blind swamp cave eel) is classified as Endangered.

Significance to humans

In some parts of Asia, swamp eels and one species of spiny eel, *Mastacembelus erythrotaenia*, are valued as food and sometimes are kept in ponds or rice fields. Except for a few mastacembelids, they are rarely seen in home aquaria.



1. Fire eel (*Mastacembelus erythrotaenia*); 2. Swamp eel (*Monopterus albus*); 3. Marbled swamp eel (*Synbranchus marmoratus*); 4. Blind cave eel (*Ophisternon candidum*). (Illustration by John Megahan)

Species accounts

Fire eel

Mastacembelus erythrotaenia

FAMILY

Mastacembelidae

TAXONOMY

Mastacembelus argus Bleeker, 1850, Moluccan Archipelago.

OTHER COMMON NAMES

German: Feueraal; Vietnamese: Cá chachlua.

PHYSICAL CHARACTERISTICS

Grows to 39.4 in (100 cm). Soft-rayed portions of the median fins and pectoral fin have a sharply defined white distal margin. The basal portion of the dorsal, anal, and caudal fins is dark and that of the pectoral fin is dark or has broad vertical bars. Head and anterior part of the body have longitudinal red and black bands; the rest of the body has red spots or elongated marks on a black background.

DISTRIBUTION

In Asia, from Thailand and Cambodia to Indonesia.

HABITAT

A large lowland floodplain species occurring in slow-moving rivers and inundated plains. Also found in streams and lakes.

BEHAVIOR

Under aquarium conditions individuals tend to spend daylight hours in a preferred shelter spot.

FEEDING ECOLOGY AND DIET

Feeds on benthic insect larvae, worms, and some plant material. Under aquarium conditions, specimens larger than 12 in

(30 cm) in total length become predatory, hunting and eating smaller fishes. Vulnerable to larger fish, water snakes, crocodilians, and fish-eating birds as well as fishermen.

REPRODUCTIVE BIOLOGY

Nothing is known of the reproductive biology of this species. Other mastacembelids are egg scatterers, depositing a few eggs at a time in fine-leaved aquatic plants.

CONSERVATION STATUS

Not listed by the IUCN. This species has become rare in recent years due to human consumption and overfishing.

SIGNIFICANCE TO HUMANS

Often seen in the aquarium trade. Bred in fish farms in Bangkok. ♦

Swamp eel

Monopterus albus

FAMILY

Synbranchidae

TAXONOMY

Muraena alba Zouiev, 1793, type locality not specified.

OTHER COMMON NAMES

Cantonese: Wong sin; English: Rice (paddy field) eel; German: Ostasiatischer Kiemenschlitzaal; Japanese: Ta-unagi; Javanese: Welut; Khmer: Antong; Laotian: Pa lai; Malay: Belut; Thai: Pla lai; Vietnamese: Con lu'ò'n, luon.

PHYSICAL CHARACTERISTICS

Grows to 39.4 in (100 cm). Eel-like body. It lacks scales and pectoral and pelvic fins. The dorsal, caudal, and anal fins are confluent and reduced to a skin fold. The gill openings merge into single slit underneath the head.

DISTRIBUTION

In India, China, Japan, Malaysia, and Indonesia. Probably also occurs in Bangladesh, Myanmar, and Thailand. Introduced populations in Florida, Georgia, and Hawaii in the United States.

HABITAT

It is a generalist that can be found in medium to large rivers, flooded fields, muddy ponds, swamps, canals and rice paddies; burrow in moist earth in dry season surviving for long periods without water.

BEHAVIOR

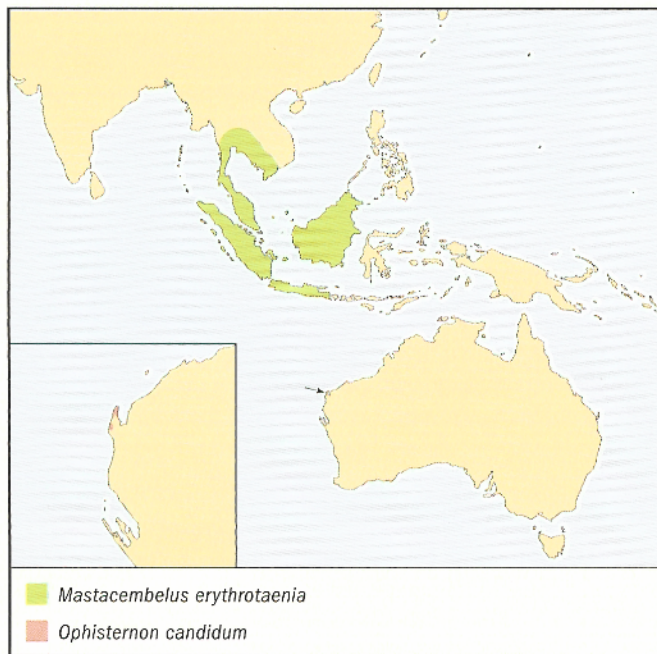
It burrows in moist earth at the beginning of the dry season, where it remains for long periods of time.

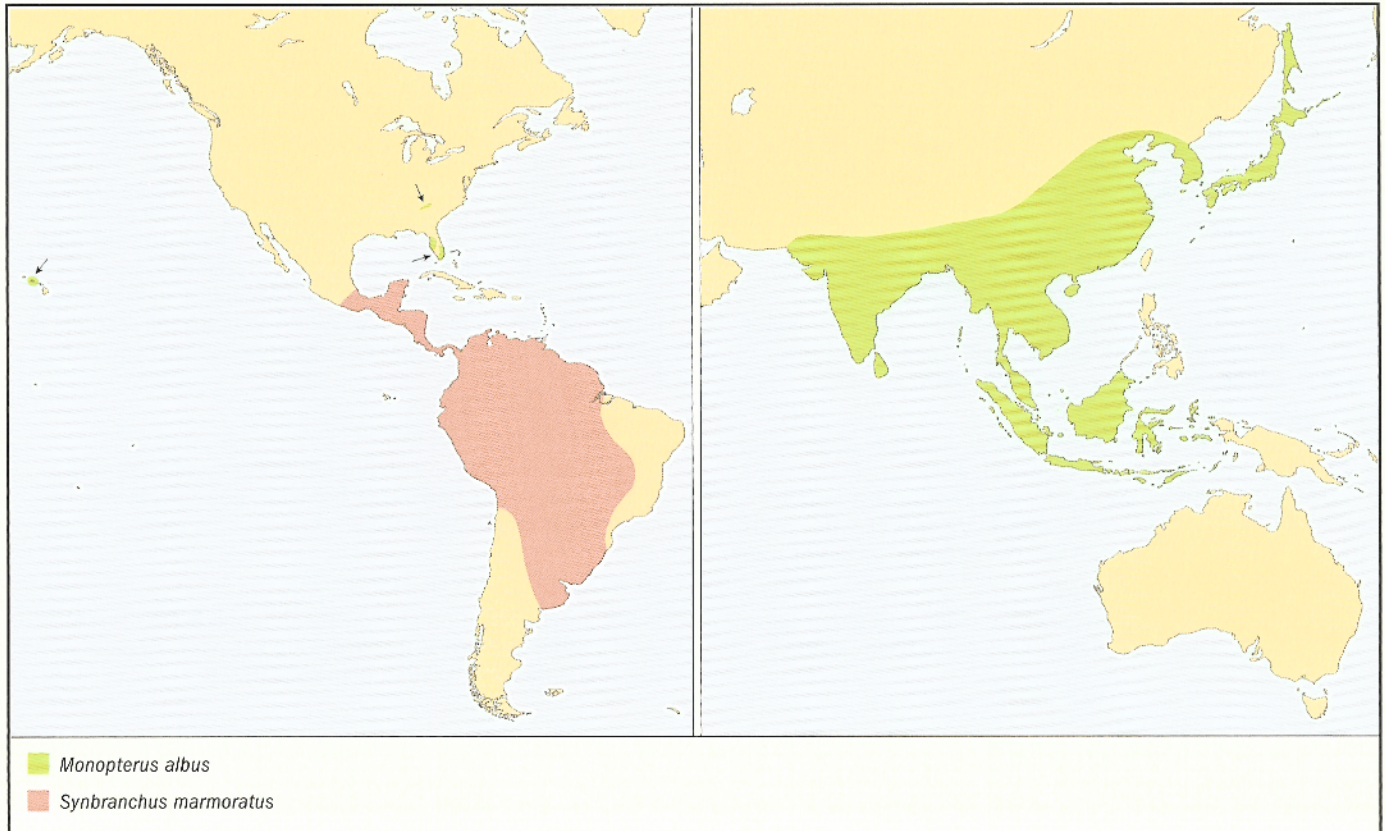
FEEDING ECOLOGY AND DIET

Feeds on detritus, plants, and small animals. Vulnerable to crocodilians, otters, and fish-eating birds.

REPRODUCTIVE BIOLOGY

External fertilization. Builds a bubble nest at the surface of the water near the shoreline. It is not known whether care is afforded to the eggs and fry. Spawning takes place in shallow





water. After spending part of their lives as females, some individuals undergo sex reversal, and change into males. Sex reversal is completed within eight to 30 weeks. All larger individuals are males.

CONSERVATION STATUS
Not listed by the IUCN.

SIGNIFICANCE TO HUMANS
Marketed fresh because of the good quality of its flesh. Stays alive for long periods of time as long as the skin is kept moist. Occasionally sold as an aquarium fish. ♦

Blind cave eel

Ophisternon candidum

FAMILY
Synbranchidae

TAXONOMY
Anommatophasma candidum Mees, 1962, Yardie Creek Station, North West Cape, Western Australia.

OTHER COMMON NAMES
Spanish: Anguila ciega.

PHYSICAL CHARACTERISTICS
Grows to 15.8 in (40 cm). These fishes have a very elongated, eel-like, and roundish body with no fins, except for a thin, rayless fin fold near and around the tip of the tail. The lateral line system is distinct and continues to near the tip of the tail. It is whitish in coloration, lacks externally visible eyes, and is scaleless.

DISTRIBUTION

This species used to be found in 11 locations (two now destroyed) in the western and northeastern coastal plain of the Cape Range Peninsula of Australia.

HABITAT
Inhabits wells, sinkholes, and caves and possibly also occurs in aquifers.

BEHAVIOR
No information is available.

FEEDING ECOLOGY AND DIET
This species feeds on invertebrates, both hypogean and epigean, that accidentally fall into its habitat. Due to its habitat, it is not subject to predation.

REPRODUCTIVE BIOLOGY
External fertilization. No additional information is available.

CONSERVATION STATUS
Listed as Data Deficient by the IUCN.

SIGNIFICANCE TO HUMANS
Of ecological and scientific interest only. ♦

Marbled swamp eel

Synbranchus marmoratus

FAMILY
Synbranchidae

TAXONOMY
Synbranchus marmoratus Bloch, 1795, Rio Negro, Brazil.

OTHER COMMON NAMES

English: Swamp eel; French: Anguille; German: Amerikanischer; Spanish: Anguila.

PHYSICAL CHARACTERISTICS

Grows to 50.1 in (150 cm). It has a long and cylindrical body, lacking pectoral and ventral fins and with vestigial dorsal and anal fins. The species has small eyes.

DISTRIBUTION

From Mexico to Central Argentina.

HABITAT

This species inhabits fresh and brackish waters in a variety of habitats, including streams, canals, drains, ponds, and rice fields. It can be seen in both clear and murky waters.

BEHAVIOR

This is a nocturnal fish usually found at the edge of the water. It can travel over land for considerable distances. It also burrows, especially during the dry season. During that time its metabolism is reduced considerably, but it still may flee if disturbed. After the first rains, it returns to larger bodies of water.

FEEDING ECOLOGY AND DIET

They feed on fish and invertebrates and are considered aggressive predators. They are vulnerable to crocodilians and fish-eating birds.

REPRODUCTIVE BIOLOGY

This is a species characterized by two unusual reproductive methods. In the first, many individuals undergo sequential hermaphroditism, where some fish function first as females and then as males, called terminal males. This condition is called protogyny, and species that have such individuals are called protogynous. Those individuals that are males from the beginning are called primary males. Some individuals remain juvenile females, a condition termed diandric. They have external fertilization and show some level of genetic variability, which is consistent with the fact that this is a generalist species with a broad distribution in the New World. No specific seasonal reproductive data or parental care information has been published.

CONSERVATION STATUS

Because of its broad distribution, it is not considered threatened. Owing to its burrowing behavior, however, it may be missed in many faunal surveys.

SIGNIFICANCE TO HUMANS

Is not infrequent in public aquaria although it does not make a good exhibit because of its burrowing behavior. Because of its size it is difficult to keep in home aquaria. ♦

Resources
Books

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