

Asian Swamp Eel – *Monopterus albus*

Significant adverse impacts have yet to be documented, but due to its predatory nature, the Asian swamp eel appears to have the potential for adverse environmental impacts in North America. There is concern, for example, that they may disrupt the Everglades National Park ecosystem.

Taxonomy

Phylum	▪ Chordata
Class	▪ Actinopterygii
Order	▪ Synbranchiformes
Family	▪ Synbranchidae

General Biology

Morphology

- Body is cylindrical with the tail compressed and tapering to a point (Fig. 1)
- Scaleless body
- Snout bluntly rounded (Fig. 2)
- Thick upper jaw may slightly overlap lower jaw (Fig. 3)
- Small eyes are covered with a layer of skin (Fig. 3)
- Lateral line is well defined
- Slate brown or greenish in color; ventral portion is lighter in color (often white, orange, or light brown) with darker spots along the sides
- Dorsal, caudal, and anal fins are diminished to skin fold in adults
- Length of up to 100 cm in US waters (average 25 – 40 cm), larger in native Asian range
- Males typically larger than females
- Gill opening is reduced to a single V-shaped slit located on the underside of the head which enables air bubbles to easily be trapped in the gill chamber

Behavior

- Nocturnal; rarely seen by humans
- Able to burrow to a depth of 1.5 m
- Capable of moving over dry land for short distances (Fig. 4)
- Able to relocate due to ability to travel in water or on land

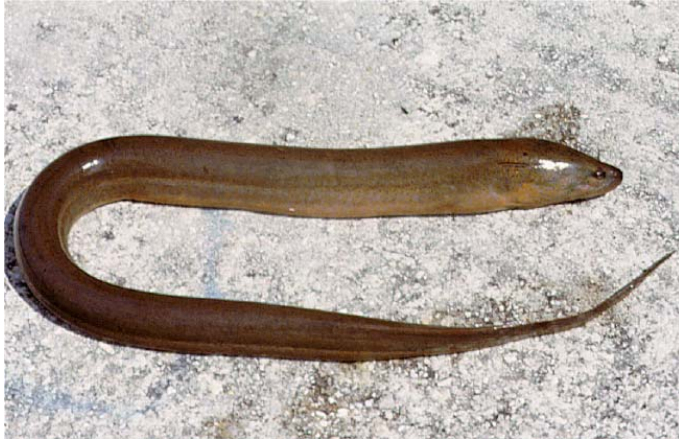


Fig. 1 The cylindrical and tapering shape of the Asian swamp eel.¹



Fig. 2 Nocturnal, the Asian swamp eel is rarely seen by humans.²



Fig. 3 Close-up of *Monopterus albus*. Note how the upper lip overlaps the lower.³



Fig. 4 The species is known to travel in packs (of 15 or more) over land.⁴

¹ http://nas.er.usgs.gov/fishes/accounts/synbranc/mo_albus.html

² http://news.nationalgeographic.com/news/2002/07/photogalleries/0702_alien2.html

³ http://www.columbia.edu/itc/cerc/danoff-burg/invasion_bio/inv_spp_summ/Monopterus_albus.html

⁴ <http://biology.usgs.gov/pr/newsrelease/1998/6-15eel4.tif>

Identification

Swamp eels are not true eels (order Anguilliformes). True eels have scales, dorsal, anal and caudal fins, and functioning pectoral fins. True eels have two gill openings and the gill membranes are not united. An obvious difference between the two groups is that anguilliform eels have distinctive, planktonic larvae that are thin, transparent, and can be quite large and leaf-like in appearance. As such, the Anguilliformes is a group of fish with largely ancestral characteristics and placed in the teleost infradivision Elopomorpha. Swamp eels have mostly derived characteristics and are placed in the infradivision Eutelostei and are percomorphs.

Distinguishing Characteristics

- Scaleless, elongated body with a tapering tail and blunt snout
- Teeth appear like bristles
- One V-shaped gill located beneath the head
- May be mistaken for native American eel (*Anguilla rostrata*), except that American eel have pectoral fins, rayed dorsal, anal and caudal fins, and scales (although embedded).
- May be mistaken for lamprey, but these latter fish have no jaws and have ovoid mouths; lampreys also have distinct dorsal and caudal fins and 7 gill openings on each side. (Fig. 5)

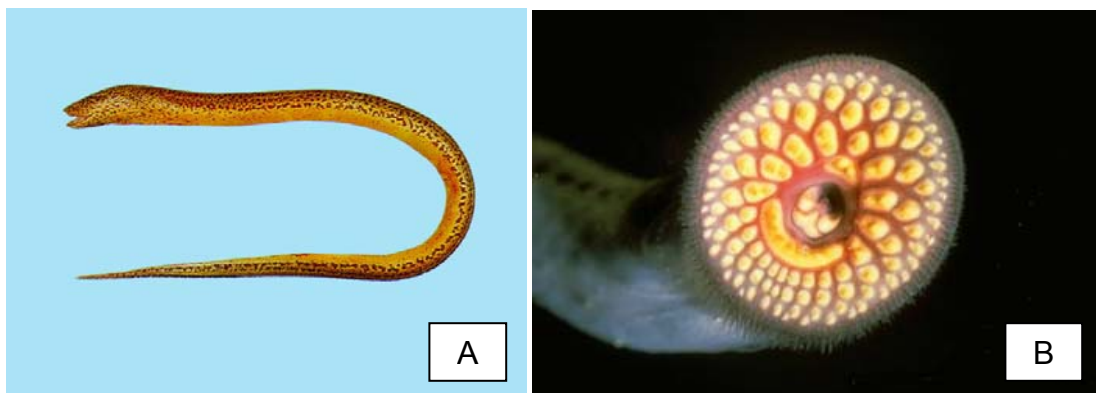


Fig. 5 The mouth of the Asian swamp eel (A)⁵ is V-shaped, not ovoid and disk-shaped as in the lamprey (B)⁶.

⁵ Adapted from <http://www.fishbase.org/Summary/SpeciesSummary.cfm?genusname=Monopterus&speciesname=albus>

⁶ Adapted from http://sgnis.org/publicat/slide/sl_s2.htm

Life Cycle

The life cycle of the Asian swamp eel takes place solely in freshwater.

- Juveniles**
 - All young are females
- Adults**
 - Begin as mature females
 - Some females develop into males; males can change back to females if female densities are low; change from one sex to the other can take up to a year
- Spawning**
 - Reproduction can occur throughout the year
 - Eggs are laid in bubble nests located in shallow waters
 - Bubble nests float at water's surface and are not attached to aquatic vegetation
 - Up to 1,000 eggs per female per spawning event

Habitat Characteristics

- Preferred Environment**
 - Wide variety of freshwater habitats: shallow wetlands, stagnant waters, marshes, streams, rivers, ditches, canals, lakes, reservoirs, and ponds
 - Depths of <3 m
- Temperature**
 - Appear to tolerate cold temperatures well (successfully established in areas where temperatures fall below freezing)
- Oxygen**
 - Able to tolerate wide range of water oxygen levels; if not using gills underwater, can obtain up to 25% of oxygen from air cutaneously
- Salinity**
 - Prefer freshwater habitats, but can tolerate brackish and saline conditions

Distribution

- Native Range**
 - Asia, from northern India and Burma to China
- North American Distribution**
 - See Fig. 6
- Probable Means of Introduction**
 - Aquarium release
 - Stocking as a food source
 - Escape from fish farms during flooding events

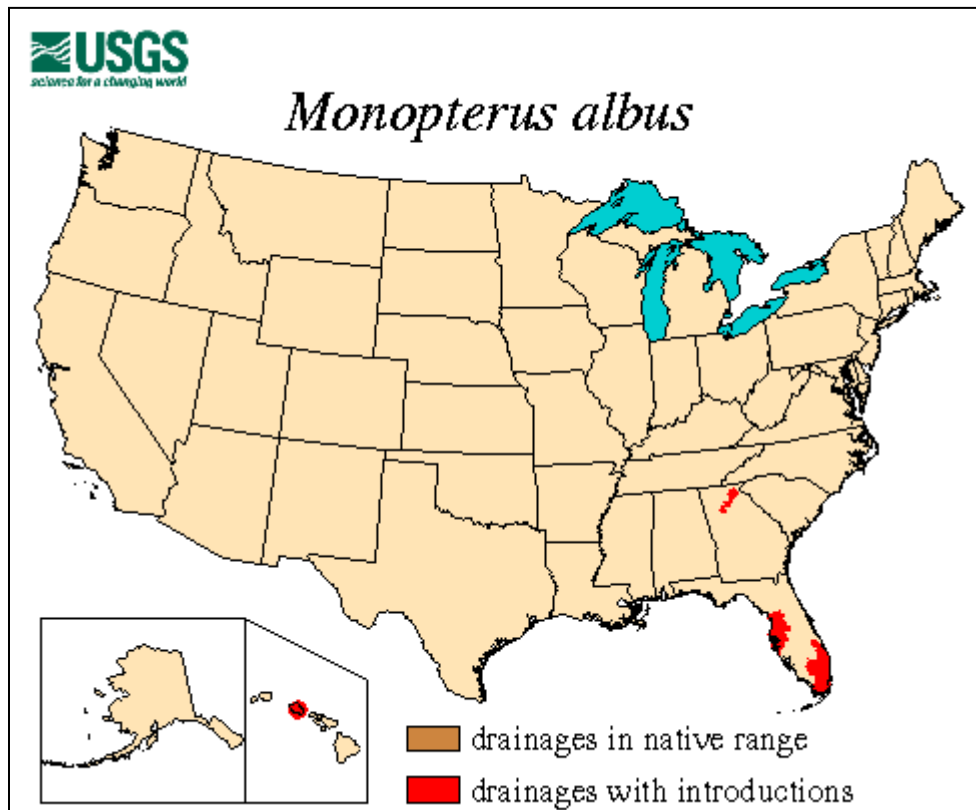


Fig. 6 Distribution of *Monopterus albus* in the United States⁷.

Diet

- Broad range of prey, including fish, shrimp, crayfish, frogs, turtle eggs, and aquatic invertebrates (e.g., worms and insects)

Impacts

Although the ecological impacts in North American waters are relatively unknown, the following impacts are documented in other regions of the world where they have become established:

Negative

- Competition may displace native aquatic species
- Accelerates the drying of shallow waterbodies (when the species is abundant) during periods of drought via their extensive borrow system, thereby causing additional risk to other aquatic organisms

Positive

- Used as food source in many Asian cultures

⁷ http://nas.er.usgs.gov/fishes/accounts/synbranc/mo_albus.html

Management

Control Measures

- Electroshocking devices used for collection (Fig. 7)
- Combination of electrical barriers (to deter movement), vegetation removal, and trapping may assist in limiting dispersal and are currently being evaluated

Prevention Techniques

- Prohibit release of bait into waterbody or transportation of bait from one waterbody to another (it is suspected that juveniles have been used as bait material)
- Prohibit the release of aquarium fish into local watersources
- Prohibit intentional stocking



Fig. 7 Eels collected by electroshocking. Because the species is nocturnal, it is rarely detected by humans.⁸

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⁸ http://sherpaguides.com/georgia/atlanta_urban_wildlife/rice_eel/

Web Sites

http://www.sherpaguides.com/georgia/atlanta_urban_wildlife/rice_eel/index.html

Sherpa Guide to the Asian Swamp Eel

<http://nas.er.usgs.gov/fishes/accounts/synbranc/mo-albus.html>

United States Geological Survey Nonindigenous Aquatic Species

<http://biology.usgs.gov/pr/newsrelease/2000/3-3.html>

United States Geological Survey Press Release

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