

PISCES (FISHES): AMBLYOPSIDAE

This freshwater family, in the Order Percopsiformes, is distributed in the southern and eastern (unglaciated) United States. It is characterized by the presence of a flattened head, a strongly protruding lower jaw, a jugular vent (anus), and small embedded cycloid scales, except on the head, which is naked. Individuals have rows of sensory papillae on the head, body, and tail. Their eyes range from small (microphthalmic) in the epigean and stygophilic species, to vestigial (remnant eye tissue under the skin) in the stygobitic ones. Stygobitic species are also characterized by: (1) depigmentation (they have a pinkish colour due to the blood vessels showing through the translucent skin, with only a few, mostly nonfunctional, melanophores); (2) low metabolism; (3) low fecundity; and (4) increased swimming efficiency, tactile receptivity, and longevity. The systematics of this family need revision since genetic studies have shown that they are much more complex than previously believed (Bergström *et al.*, 1995). The six species of this family demonstrate the transition from epigean (surface) to hypogean waters: *Chologaster cornuta* is epigean, *Forbesichthys agassizi* is a stygophile or facultative cavernicole, and *Typhlichthys subterraneus*, *Amblyopsis spelaea*, *Amblyopsis rosae*, and *Speoplatyrhinus poulsoni* are all stygobites, with increasing troglomorphy from *T. subterraneus* through to *S. poulsoni* in the sequence above (see Figure). Comparative characteristics are summarized in the Table. The family is most closely related to another Percopsiform, *Aphredoderus*, but it may merit its own order, the Amblyopsiformes.

Swamp fish, *Chologaster cornuta*. This species is characterized by being dorsally brown and ventrally creamy white, with three dark stripes on each side. It is found in swamps, ponds, ditches, and slow streams in the Atlantic Coastal Plain from southeast Virginia to central Georgia. It feeds mostly at night, on small crustaceans and aquatic insects. It spawns in March and April

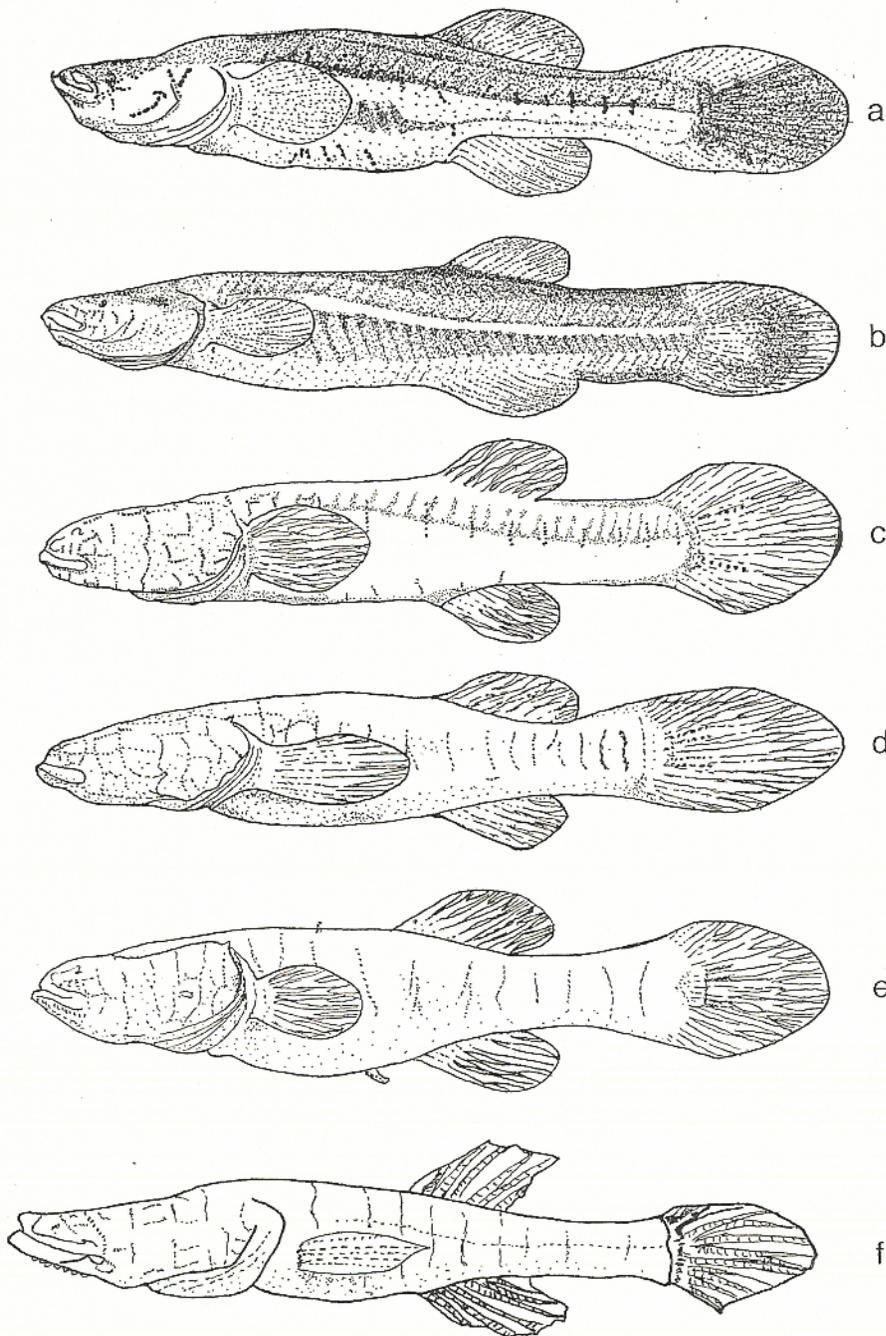
and may live up to two years. Although locally common, individuals are hard to spot because they are largely nocturnal and found in heavily vegetated waters.

Spring cavefish, *Forbesichthys agassizi*. This species is characterized by being dorsally dark brown to nearly black, grading to lighter brown laterally. It is ventrally cream-yellow, often with a thin yellow stripe along each side. It is found in central and western Kentucky (west to the Tennessee River) to southern central Tennessee and west across southern Illinois to southeastern Missouri. The Missouri population may have been isolated from the others for 2000 years when the Mississippi River changed its course. Individuals are active in springs at night (feeding on crustacea, insect larvae, and oligochaetes) and they usually retreat underground during the day. The few individuals which venture into the spring portions of their habitat hide under rocks or debris. They prefer highly oxygenated water, and show scotophilia (i.e. they respond to light by moving away from it), thigmotaxis (orienting themselves using clues in the substrate), and a wide range of temperature tolerance. Little is known of their breeding habits, but spawning probably takes place underground in the winter.

Southern cavefish, *Typhlichthys subterraneus*. This species is probably a mosaic of unrelated (paraphyletic) populations (Bergström *et al.*, 1995). It is found in the subterranean waters of two major disjunct ranges separated by the Mississippi River: the Ozark Plateau of central and southeastern Missouri and northeastern Arkansas, and the Cumberland and Interior Low plateaus of northwest Alabama, northwest Georgia, central Tennessee and Kentucky, and southern Indiana. It inhabits deep pools and streams, where individuals feed mostly on copepods. Breeding probably occurs in late spring in association with rising water levels and individuals are long-lived, slow-growing, and

Pisces (Fishes): Amblyopsidae: Summary information for amblyopsid species.

Species	Maximum size (standard length, SL, mm)	Eyes	Pigmentation	Number of rays in fins			Pelvic fins	Number of rows of papillae in the caudal fin
				Dorsal	Anal	Caudal		
<i>C. cornuta</i>	68	Microphthalmic	Yes	9-12	9-10	9-11	Absent	0-2 (branched)
<i>F. agassizii</i>	75	Microphthalmic	Yes	9-11	9-11	11-16	Absent	0-2 (branched)
<i>T. subterraneus</i>	75	Vestigial	No	7-10	7-10	10-15	Absent	0-2 (branched)
<i>A. spelaea</i>	110	Vestigial	No	9-11	8-11	11-13	Absent/reduced	4-6 (branched)
<i>A. rosae</i>	65	Vestigial	No	7-9	8	9-11	Absent	4-6 (branched)
<i>S. poulsoni</i>	72	No vestiges?	No	9-10	8-9	21-22	Absent	4 (unbranched)



Pisces (Fishes): Amblyopsidae: Drawings of (a) *Chologaster cornuta*, (b) *Forbesichthys agassizi*, (c) *Typhlichthys subterraneus*, (d) *Amblyopsis rosae*, (e) *Amblyopsis spelaea*, and (f) *Speoplatyrhinus poulsoni*. Drawing by John Ellis.

do not respond to light. It is classified as "Vulnerable" in the Red List of the International Union for the Conservation of Nature and Natural Resources (IUCN) (Romero, 1998b).

Ozark cavefish, *Amblyopsis rosae*. This species is made up of at least four genetically distinct populations (Bergström *et al.*, 1995), and is found in 41 sites occurring on the Springfield Plateau, in seven counties of three states: southwest Missouri (20 sites), northwest Arkansas (10 sites), and northeast Oklahoma (11 sites). The verified historic range was larger (Willis &

Brown, 1985). Individuals are found mostly in small cave streams with chert or rubble sediments, in pools over silt and sand sediments, and in karst windows or wells. Most of their diet is copepods but they also eat small salamanders, crayfish, isopods, amphipods, and young of their own species. Their breeding habits are not well understood, but they have an extended spawning season with a peak in late summer. They are classified as "Vulnerable" by IUCN and "Threatened" by the US Fish & Wildlife Service (USFWS) (Romero, 1998a).

Northern cavefish, *Amblyopsis spelaea*. This species is found in about 45 caves in Kentucky and about 17 caves in southern Indiana (Keith, 1988). The distribution may be limited by competition from the Southern Cavefish. Typical habitats are caves and subterranean passages in well-developed karst terrain where it is a top predator in both habitats (Poulson, 1963). Breeding occurs during high water from February to April. Females carry eggs in their gill cavities until hatching and then carry young until they lose their yolk sacs—a total period of four to five months. Young appear in late summer and early fall. They are scotophilic. This was the first stygobitic species of fish described in the scientific literature. It is classified as "Vulnerable" by the IUCN (Romero & Bennis, 1998).

Alabama cavefish, *Speoplatyrhinus poulsoni*. This species is characterized by its extremely elongated and anteriorly depressed head, which comprises one-third of the standard length in adults, with a laterally compressed snout and terminal mouth. It is found only in Key Cave, Lauderdale County, Alabama, on the north bank of the Tennessee River. Its habitat is not well understood but probably consists of phreatic groundwater. Its total population size is estimated to be less than 100 individuals, which would make it one of the most endangered fish species in the world. It is classified as "Critically Endangered" by the IUCN and "Endangered" by the USFWS (Romero, 1998c).

The classic studies of Poulson and co-workers have elucidated many aspects of the biology of this unique family, but much remains to be learned. However, all of the stygobitic species are threatened to some degree and it is vitally important that the need for conservation is taken into account in future studies.

ALDEMARO ROMERO

See also Adaptation: Morphological

Works Cited

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Further Reading

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