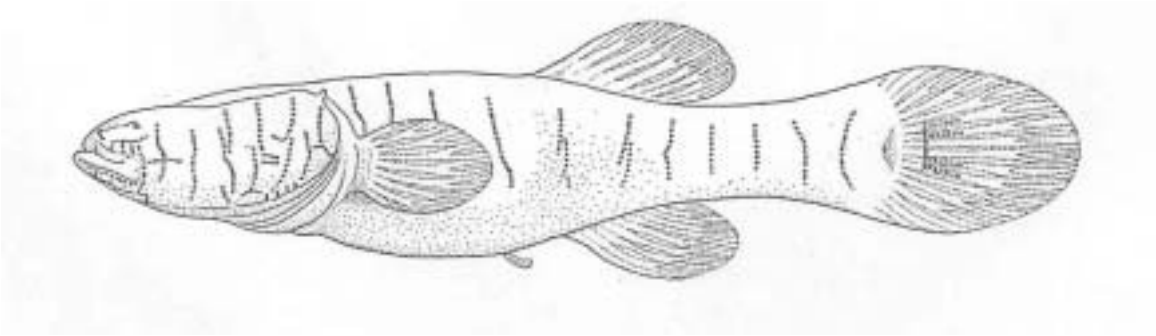
Conservation Assessment
for
Northern Cavefish (Amblyopsis spelaea)



Woods and Inger, 1957

USDA Forest Service, Eastern Region

October 2002

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This Conservation Assessment was prepared to compile the published and unpublished information on Amblyopsis spelaea. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject community and associated taxa, please contact the Eastern Region of the Forest Service Threatened and Endangered Species Program at 310 Wisconsin Avenue, Milwaukee, Wisconsin 53203.

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EXECUTIVE SUMMARY

The Northern cavefish is designated as a Regional Forester Sensitive Species on the Hoosier National Forest in the Eastern Region of the Forest Service. The purpose of this document is to provide the background information necessary to prepare a Conservation Strategy, which will include management actions to conserve the species.

The Northern cavefish is an eyeless, unpigmented troglobitic fish that occurs in southern Indiana and northcentral Kentucky. The most recent survey of this species revealed 65 records that could be reconfirmed, 44 in Indiana and 21 in Kentucky (Pearson and Boston, 1995). On the Hoosier National Forest Amblyopsis spelaea occurs in the Wesley Chapel Gulf Cave System, Springs Spring Cave and Henshaw Bend Cave (Lewis, 1994; Lewis, et al., 2002; and in progress). It has also been reported from Pioneer Mother's Spring and Dillon Cave (Black, 1994), but not confirmed from these sites (Pearson and Boston, 1995; Lewis, et al., 2002; and in progress).

NOMENCLATURE AND TAXONOMY

Classification: Class Osteichthyes
Order Percopsiformes
Family Amblyopsidae

Scientific name: Amblyopsis spelaea

Common name: Northern cavefish

Synonyms: Amblyopsis spelaeus

In a revision of the Family Amblyopsidae Amblyopsis spelaea was redescribed by Woods and Inger (1957).

DESCRIPTION OF SPECIES

Amblyopsis spelaea is an eyeless, unpigmented fish that was reported to reach a length of about 123 millimeters (Lovis, 1999).

LIFE HISTORY

The most substantive information on the ecology of Amblyopsis spelaea was published by Poulson (1963), from which the following information was abstracted (except as noted). Concerning feeding, Amblyopsis spelaea was reported to feed on all of the species commonly associated with it except flatworms. Fish smaller than 45 mm were found to primarily feed upon copepods, while fish larger than 45 mm primarily ate isopods and amphipods, along with juvenile crayfish and, occasionally, small cavefish.

Amblyopsis spelaea was reported to have a well defined yearly cycle. Breeding occurred from February through April. The females carried the eggs in their gill cavities until hatching, then carried the young until they lost their yolk sacs, totaling four or five months. The young appeared in the stream in late summer or early fall. First reproduction in Amblyopsis spelaea occurred at 36-48 months after birth. The oldest individuals ranged from 73-84 months in age. These ages were arrived upon by extrapolating age from scale formation. A more accurate study was conducted by Lovis (1999) involving mark and recapture. This data indicates a maximum age of at least 12-15 years and perhaps as much as 30-40 years.

HABITAT

Amblyopsis spelaea is an obligate cavernicole that typically occurs in cave streams (Woods and Inger, 1957; Pearson and Boston, 1995). Poulson (1963) expanded on this to say that this species could be found in cave streams with consolidated mud-rock substrates in shoals or silt-sand substrates in pools, but was more often found in caves with uniform silt-sand substrates.

DISTRIBUTION AND ABUNDANCE

The range of Amblyopsis spelaea as summarized by Keith (1988) consists of a band running between the Mammoth Cave area of central Kentucky north through Hardin, Breckinridge and Meade counties, then across the Ohio River in Harrison, Crawford, Washington, Orange and Lawrence counties in Indiana. The fish have not been found north of the East Fork of White River, Indiana, nor south or west of Mammoth Cave, Kentucky. Keith (1988) listed a total of 62 sites within this range, of which 45 were in Indiana and 17 in Kentucky. Pearson and Boston (1995) expanded this to 114 localities, 76 in Indiana and 38 in Kentucky. However, some of these sites had been destroyed, filled, were no longer accessible or were duplicate names for the same place. Of these 114 localities, since 1989, reliable records were available from 44 sites in Indiana and 21 in Kentucky.

Numbers of Amblyopsis spelaea observed in a single cave ranged from 1 - 220 (Keith, 1988), with the highest number being 515 in Penitentiary Cave, Breckinridge Co., Kentucky (Pearson and Boston, 1995).

Pearson and Boston (1995) proposed a conservative population estimate of 5602 Amblyopsis spelaea present in the known, enterable caves within its range. This was further extrapolated by a power of 10 (i.e., 56000) to encompass fish felt probably to be extant, but in phreatic conduits or undiscovered caves without entrances open to people.

RANGEWIDE STATUS

Global Rank: G3 vulnerable; The global rank of G3 is usually assigned to species that have been recorded from between 21-100 localities.

Indiana State Rank: S3 vulnerable; The state rank of S3 is typically assigned to species that have been recorded from between 21-100 localities.

POPULATION BIOLOGY AND VIABILITY

Poulson (1963) reported that with increasing cave adaptation among the species of the amblyopsid fish, the proportion of adult females that breed, decreased. This was seen in populations of Amblyopsis spelaea censused that were markedly skewed toward older age classes. There were no abrupt or regular decreases in numbers for year cohorts less than five, suggesting that mortality from disease or parasitism was low. Other than mortality due to senescence, Amblyopsis spelaea was noted to have no predators other than density dependent cannibalism.

POTENTIAL THREATS

This species is vulnerable to anything that threatens the base level groundwaters that the fish inhabit. Potential threats to Amblyopsis spelaea were discussed at length by Keith (1988) and Pearson and Boston (1995).

The Wesley Chapel Gulf Cave System is particularly susceptible to groundwater contamination since it is one of the most extensive cave systems in Indiana, almost all of which lies under privately owned land. Many opportunities for fecal contamination, including septic field waste, outhouses, barnyard feedlots and grazing pastures exist in the area (Harvey and Skeleton, 1968; Quinlan and Rowe, 1977, 1978; Lewis, 1993; Panno, et al 1996, 1997, 1998). Chemical contamination including pesticides, herbicides and fertilizers used for crops is undoubtedly occurring, also (Keith and Poulson, 1981; Panno, et al. 1998). Some degree of hazardous material threat exists due to the potential of accidental spills or deliberate dumping, including road salting (Quinlan and Rowe, 1977, 1978; Lewis, 1993, 1996).

Cave stream habitat alteration due to sedimentation is particularly threatened in the Lost River basin due to agricultural use of much of the land, although any other kind of development that disturbs ground cover offers the same potential problems. Sedimentation changes cave habitat by blocking recharge sites or altering flow volume and velocity. Observation of the obvious sediment load of brown floodwaters in Lost River attests to the magnitude of the sedimentation problem there. Furthermore, Keith (1988) reported pesticides and other harmful compounds like PCB's can adhere to clay and silt particles and be transported via sedimentation.

With the presence of humans in caves comes an increased risk of vandalism or littering of the habitat, disruption of habitat and trampling of fauna, introduction of microbial flora non-native to the cave or introduction of hazardous materials (e.g., spent carbide, batteries) (Elliott, 1998; Peck, 1969). The construction of roads or trails near cave entrances encourages entry. Entrance to the Wesley Chapel Gulf Cave is restricted due to the gating of two of the three entrances.

SUMMARY OF LAND OWNERSHIP AND EXISWTING HABITAT PROTECTION

In the Hoosier National Forest Amblyopsis spelaea is known from the Wesley Chapel Gulf Cave System, Wesley Chapel Gulf Special Area, Orange Co.; Pioneer Mother's Spring, Pioneer Mother's Special Area; Dillon and Springs Spring caves, Orange Co. A report of Amblyopsis from Henshaw Bend Cave, Lawrence Co. (Dunlap, personal communication) was confirmed during the bioinventory of caves of the Hoosier National Forest (Lewis, et al., in progress). The special areas noted above were designated due to their karst features and receive restrictive management to protect the ecosystems within them (USDA Forest Service, 2000).

Amblyopsis spelaea also occurs in caves at Wyandotte Caves State Recreation Area, Indiana; Bronson-Donaldson Cave System, Spring Mill State Park, Indiana; and in the Mammoth Cave System, Mammoth Cave National Park, Kentucky.

SUMMARY OF MANAGEMENT AND CONSERVATION ACTIVITIES

In addition to the bioinventory of caves of the Hoosier National Forest (Lewis, et al., 2002; and in progress), a survey and re-evaluation of Amblyopsis spelaea is also being conducted there (Pearson, in progress).

All cave and karst habitat located on the Hoosier National Forest are subject to standards and guidelines for caves and karst protection and management as outlined in the Hoosier National Forest Land and Resource Management Plan (Forest Plan) (USDA Forest Service, 1991). These standards and guidelines include the following:

> *Caves are protected and managed in accordance with the Federal Cave and Karst Resources Protection Act of 1988, Forest Service Manual 2353, Memorandums of Understanding between the forest service and the National Speleological Society, the Indiana Karst Conservancy, Inc., the Forest Cave Management Implementation Plan, and individual specific cave management plans.
>
> *Except where modified by an existing cave management prescription, vegetation within a 150-200 foot radius of cave entrances and infeeder drainages with slopes greater than 30 percent will generally not be cut. No surface disturbing activities will be conducted on any slopes steeper than 30 percent adjacent to cave entrances. Similar protection areas will be maintained around direct drainage

inputs such as sinkholes and swallow holes known to open into a cave's drainage system of any streams flowing into a known cave.

*Allow no sediment from erosion of access roads and drilling sites to wash into caves or karst features.

*Seismic surveys requiring explosives shall not be conducted directly over known cave passages or conduits.

*All caves will be managed as significant.

(USDA Forest Service, 1991)

The forest plan includes a cave and karst management implementation plan. This management plan places an emphasis on cave resource protection and mitigation. Understanding of the caves is established through mapping, bioinventory, cataloging of resources (e.g., archaeological, paleontological, speleothems, etc.), and estimating use levels and trends. Protection zones or other mitigation measures recommended by a management prescription will be established around caves entrances, sinkholes and swallowholes. Specific criteria will include consideration for protection of entrance and cave passage microclimate, animals inhabiting the cave, physical and chemical parameters and aesthetic values associated with the cave.

RESEARCH AND MONITORING

The sites where Amblyopsis occur in the Hoosier National Forest are currently being re-evaluated, including censusing of the populations (Pearson, in progress). A bioinventory of the caves of the Hoosier National Forest is also being conducted and has confirmed one new locality for this cavefish (Lewis, et al., 2002; and in progress).

RECOMMENDATIONS

Retain on list of Regional Forester Sensitive Species.

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