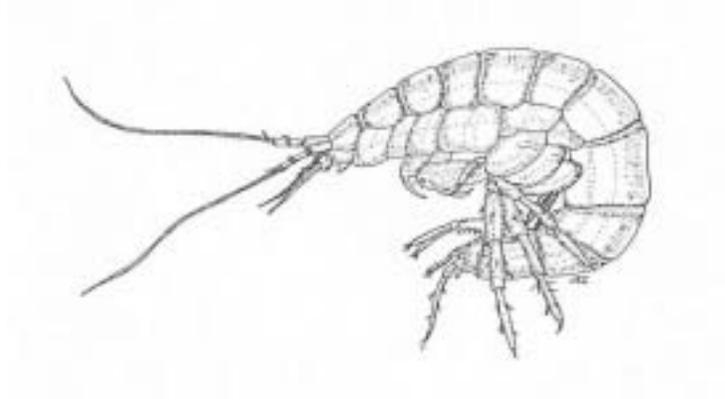


***Conservation Assessment  
for  
Subtle Cave Amphipod (*Stygobromus subtilis*)***



*(From Franz and Slifer, 1971)*

***USDA Forest Service, Eastern Region***

October 2002

Julian J. Lewis, Ph.D.  
J. Lewis & Associates, Biological Consulting  
217 W. Carter Avenue  
Clarksville, IN 47129  
[lewisbioconsult@aol.com](mailto:lewisbioconsult@aol.com)



*This Conservation Assessment was prepared to compile the published and unpublished information on Stygobromus subtilis. 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 taxon, please contact the Eastern Region of the Forest Service Threatened and Endangered Species Program at 310 Wisconsin Avenue, Milwaukee, Wisconsin 53203.*

**Table of Contents**

**EXECUTIVE SUMMARY ..... 4**  
**NOMENCLATURE AND TAXONOMY ..... 4**  
**DESCRIPTION OF SPECIES ..... 4**  
**LIFE HISTORY ..... 5**  
**HABITAT ..... 5**  
**DISTRIBUTION AND ABUNDANCE ..... 5**  
**RANGEWIDE STATUS ..... 5**  
**POPULATION BIOLOGY AND VIABILITY ..... 5**  
**POTENTIAL THREATS..... 6**  
**SUMMARY OF LAND OWNERSHIP AND EXISTING HABITAT  
PROTECTION..... 6**  
**PAST AND CURRENT MANAGEMENT AND CONSERVATION  
ACTIVITIES ..... 7**  
**RESEARCH AND MONITORING ..... 7**  
**RECOMMENDATIONS..... 7**  
**REFERENCES ..... 7**

## EXECUTIVE SUMMARY

The Subtle cave amphipod is designated as a Regional Forester Sensitive Species on the Shawnee 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, the latter which will include management actions to conserve the species.

The Subtle cave amphipod is a subterranean crustacean known from nine groundwater seeps and drip pools in caves of western Illinois and eastern Missouri.

## NOMENCLATURE AND TAXONOMY

**Classification:** Class Crustacea  
Order Amphipoda  
Family Crangonyctidae

**Scientific Name:** Stygobromus subtilis (Hubricht)

**Common Name:** Subtle cave amphipod

**Synonyms:** Apocrangonyx subtilis

This species was described by Hubricht (1943) from a small seep in a sandstone sinkhole just to the west of Bat (Toothless) Cave, Jackson Co., Illinois. Described as Apocrangonyx subtilis, the description included a page of illustrations as well as a written description that was adequate for the identification of the species. The members of the genus Apocrangonyx, including A. subtilis, were revised by Holsinger (1969). Holsinger redescribed the species, providing a much more detailed written description and two pages of illustrations. Karaman (1974) and Holsinger (1977) synonymized Apocrangonyx with Stygobromus, which changed the name to Stygobromus subtilis.

Stygobromus (and Apocrangonyx) was previously placed in the Family Gammaridae (Holsinger, 1972), but Bousfield (1973; 1977) and Holsinger (1977) subdivided this large, heterogeneous family into a number of smaller families. The proper placement of the genus Stygobromus is in the Family Crangonyctidae (Holsinger, 1977).

## DESCRIPTION OF SPECIES

This is a small, eyeless, unpigmented amphipod crustacean, the largest male being 5mm, largest female 4.5mm. Identification of this species requires laboratory dissection and examination of slide-mounted appendages under a compound microscope by a specialist in amphipod taxonomy.

## LIFE HISTORY

Holsinger (1969) noted that the largest collections were made in the spring (specifically April) of the year. He noted that of all collections (including a total of about 290 specimens) examined from April, May, October and November, only the April sampling revealed the presence of ovigerous females. Two of the three available collections made in April contained ovigerous females. A collection from the type-locality on 14 April 1940 of 51 males, 66 females and 1 juvenile, contained one ovigerous female (3.0 mm in length) carrying 5-7 eggs in the brood pouch. A collection of 70 specimens from a seep in Jersey Co., Illinois on 28 April, 1940 contained three ovigerous females. These females ranged in size from 3.0 – 3.75 mm and each had two large embryos in the brood pouch. Peck & Lewis (1978) noted that of the cave populations sampled, an ovigerous female had been found only in one locality (Bat Cave), leading them to speculate that this species usually reproduces in the confines of interstitial groundwaters.

## HABITAT

This species is known only from groundwater seeps and drip pools in caves. Peck & Lewis (1978) noted the affinity of this species for sandstone seeps. Evidence points to Stygobromus subtilis being an inhabitant of interstitial groundwater rather than caves. In Bat Cave, a small streamless cave formed near the sandstone/limestone contact, the amphipods occur in drip pools where they enter the cave from above. This is suggestive of an inhabitant of epikarstic groundwater.

## DISTRIBUTION AND ABUNDANCE

Stygobromus subtilis is known primarily from localities in western Illinois, from Union County north through the sinkhole plain karst of Monroe Co., into the Lincoln Hills in Jersey and Adams counties. The species has also been reported in one locality across the Mississippi River in adjacent Ste. Genevieve Co., Missouri.

## RANGEWIDE STATUS

**Global Rank:** G2 imperiled; The global rank of G2 is typically assigned to species that are known globally from between 6 and 20 localities. Peck & Lewis (1978) reported this species from nine locations.

**Illinois State Rank:** S2 imperiled; Similarly, the state rank of S2 includes species that are known from between 6 and 20 localities in Illinois. Of the nine localities from which this species is reported all but one are in Illinois.

## POPULATION BIOLOGY AND VIABILITY

Nothing is known of the population biology of this species other than what is stated above about the life history, all of which is inferential from collection data.

## POTENTIAL THREATS

The population of Stygobromus subtilis first sampled in the pit in Saltpeter Cave, Monroe Co., Illinois has been destroyed by vandalism suffered by the cave. Visitation to this well-known site is uncontrolled and vandalism occurs regularly. The pit in which the amphipods once occurred has been filled with trash (beer cans, bottles, refuse in general) and no aquatic habitat remains. The cave was again visited during a biological inventory of the caves of the area for The Nature Conservancy in 1999, but neither the amphipod nor its former habitat could be found.

The locality listed as “Giant City seeps” by Peck & Lewis actually consists of a number of seep springs from which Stygobromus subtilis was noted in both Giant City State Park and the Fern Rocks Nature Preserve. Although these localities in the state park and nature preserve theoretically provide a protected refuge for the species, a visit in 2001 to a small sandstone cave in Fern Rocks Nature Preserve where the amphipod was formerly seen revealed vandalism with Day-Glo spray paint and refuse. The amphipods were not found on that inspection of the seep spring, although a subterranean flatworm was present.

Due to the presence of Stygobromus subtilis occurring in the groundwater over a relatively broad area, it is susceptible to a wide variety of potential disturbances. Potential groundwater contaminants include (1) sewage or fecal contamination, including sewage plant effluent, septic field waste, campground outhouses, feedlots, grazing pastures or any other source of human or animal waste (Harvey and Skeleton, 1968; Quinlan and Rowe, 1977, 1978; Lewis, 1993; Panno, et al. 1996, 1997, 1998); (2) pesticides or herbicides used for crops, livestock, trails, roads or other applications; fertilizers used for crops or lawns (Keith and Poulson, 1981; Panno, et al. 1998); (3) hazardous material introductions via accidental spills or deliberate dumping, including road salting (Quinlan and Rowe, 1977, 1978; Lewis, 1993, 1996).

Numerous large stream impoundments occur in southern Illinois and may detrimentally affect the habitat of any groundwater species (Duchon and Lisowski, 1980; Keith, 1988). Quarrying occurs on lands immediately adjacent to the Shawnee National Forest and caves are known to have been affected by quarry activities (Bretz and Harris, 1961). Roadcut construction for highways passing through national forest land is a similar blasting activity and has the potential to locally destroy or seriously modify groundwater ecosystems.

## SUMMARY OF LAND OWNERSHIP AND EXISTING HABITAT PROTECTION

The localities at which Stygobromus subtilis occurs is a mosaic of state and privately owned lands. The sandstone caves and seeps at Giant City cited by Peck & Lewis (1978) consist of a cluster of habitats in Giant City State Park and the Fern Rocks Nature Preserve. The entrance to Bat (Toothless) Cave has been gated to protect the bat

population, although this site remains a privately owned property within the boundary of the Shawnee National Forest.

## **PAST AND CURRENT MANAGEMENT AND CONSERVATION ACTIVITIES**

Several of the known population sites of Stygobromus subtilis were recommended for conservation status by the Illinois Natural Areas Inventory, but this does not denote actual preservation of the sites. Management activities specific to the Subtle cave amphipod include the recognition and protection of caves and spring seeps where the animal is known to ensure the continued existence of the species (Shawnee National Forest, 1992). The forest plan guidelines state that all caves are to be managed in accordance with the Federal Cave Resources Protection Act of 1988. A management prescription for each cave will be developed that addresses management, maintenance and protection of the resource, as well as maintaining or enhancing vegetation around cave entrances. All caves on the Shawnee National Forest will be closed to recreational entry from August 31 through April 15 to protect migrating and hibernating bats.

## **RESEARCH AND MONITORING**

The most recent attempt to find this amphipod was the survey by Lewis et al. (1999) in which the former habitat of the species in Saltpeter Cave, Monroe County, Illinois was found to be destroyed. No monitoring specific to this species is currently being conducted.

## **RECOMMENDATIONS**

Retain on list of Regional Forester Sensitive Species.

## **REFERENCES**

- Bousfield, E. L. 1973. Shallow-Water Gammaridean Amphipoda of New England. Cornell University Press, Ithaca, NY, 312 pages.
- Bousfield, E. L. 1977. A new look at the systematics of Gammaroidean amphipods of the world. Proceedings of the 3<sup>rd</sup> International Colloquium on Gammarus and Niphargus, Schlitz, West Germany, 1975. Crustaceana (supplement), 4: 282-316.
- Bretz, J Harlen and Stanley E. Harris, Jr. 1961. Caves of Illinois. Illinois State Geological Report of Investigations 215, 87 pp.
- Crawford, N.C. 1985. Hydrologic hazards in karst terrane. U.S. Geological Survey Open File Report 85-677, 2 pages.

- Duchon, K. and E.A. Lisowski. 1980. Environmental assessment of Lock and Dam Six, Green River navigation project, on Mammoth Cave National Park. Cave Research Foundation, Dallas, Texas, 58 pages.
- Franz, Richard and Denis Slifer. 1971. Caves of Maryland. Maryland Geological Survey, Education Series 3, 120 pages.
- Harvey, S.J. and J. Skeleton. 1968. Hydrogeologic study of a waste-disposal problem in a karst area at Springfield, Missouri. U.S. Geological Survey Professional Paper 600-C: C217-C220.
- Holsinger, John R. 1969. The systematics of the North American subterranean amphipod genus Apocrangonyx (Gammaridae), with remarks on ecology and zoogeography. American Midland Naturalist, 81 (1): 1-28.
- Holsinger, John R. 1972. The freshwater amphipod crustaceans (Gammaridae) of North America. Biota of Freshwater Ecosystems, United States Environmental Protection Agency Identification Manual, 5: 89 pages.
- Holsinger, John R. 1977. A review of the systematics of the Holarctic amphipod family Crangonyctidae. Crustaceana, supplement 4, 244-281.
- Hubricht, Leslie. 1943. Studies on the Nearctic freshwater Amphipoda III. Notes on the freshwater Amphipoda of eastern United States, with descriptions of ten new species. American Midland Naturalist, 29 (3): 683-712.
- Karaman, G.S. 1974. Contribution to the knowledge of the Amphipoda: Revision of the genus Stygobromus Cope 1872 (Fam. Gammaridae) from North America. Glasnik Republičkog Zavoda Za Zastitu Prirode I Prirodnjackog Muzeja Titogradu, 7: 97-125
- Keith, J.H. 1988. Distribution of Northern cavefish, Amblyopsis spelaea DeKay, in Indiana and Kentucky and recommendations for its protection. Natural Areas Journal, 8 (2): 69-79.
- Keith, J.H. and T.L. Poulson. 1981. Broken-back syndrome in Amblyopsis spelaea, Donaldson-Twin Caves, Indiana. Cave Research Foundation 1979 Annual Report, 45-48.
- Lewis, Julian J. 1993. Life returns to Hidden River Cave: The rebirth of a destroyed cave system. National Speleological Society News, (June) 208-213.
- Lewis, Julian J. 1996. The devastation and recovery of caves affected by industrialization. Proceedings of the 1995 National Cave Management Symposium, October 25-28, 1995, Spring Mill State Park, Indiana: 214-227.

- Lewis, Julian J., Philip L. Moss and Diane L. Tecic. 1999. A conservation focused evaluation of the imperiled troglobitic fauna of the sinkhole plain karst of southwestern Illinois. Final report to The Nature Conservancy, 97 pages.
- Panno, S. V., I.G. Krapac, C.P. Weibel and J.D. Bade. 1996. Groundwater contamination in karst terrain of southwestern Illinois. Illinois Environmental Geology Series EG 151, Illinois State Geological Survey, 43 pages.
- Panno, S.V., C.P. Weibel, I.G. Krapac and E.C. Storment. 1997. Bacterial contamination of groundwater from private septic systems in Illinois' sinkhole plain: regulatory considerations. Pages 443-447 In B.F. Beck and J.B. Stephenson (eds.). The engineering geology and hydrology of karst terranes. Proceedings of the sixth multidisciplinary conference on sinkholes and the engineering and environmental impacts on karst. Spring, Missouri.
- Panno, S.V., W.R. Kelly, C.P. Weibel, I.G. Krapac, and S.L. Sargent. 1998. The effects of land use on water quality and agrichemical loading in the Fogelpole Cave groundwater basin, southwestern Illinois. Proceedings of the Illinois Groundwater Consortium Eighth Annual Conference, Research on agriculture chemicals in Illinois groundwater, 215-233.
- Peck, Stewart B. and Julian J. Lewis. 1978. Zoogeography and evolution of the subterranean invertebrate faunas of Illinois and southeastern Missouri. N.S.S. Bulletin, 40 (2): 39-63.
- Quinlan, J.F. and D.R. Rowe. 1977. Hydrology and water quality in the central Kentucky karst. University of Kentucky Water Resources Research Institute, Research Report 101, 93 pages.
- Quinlan, J.F. and D.R. Rowe. 1978. Hydrology and water quality in the central Kentucky karst: Phase II, Part A. Preliminary summary of the hydrogeology of the Mill Hole sub-basin of the Turnhole Spring groundwater basin. University of Kentucky Water Resources Research Institute, Research Report 109, 42 pages.
- Shawnee National Forest. 1992. Amended land and resource management plan. Shawnee National Forest. United States Department of Agriculture, Forest Service Eastern Region.