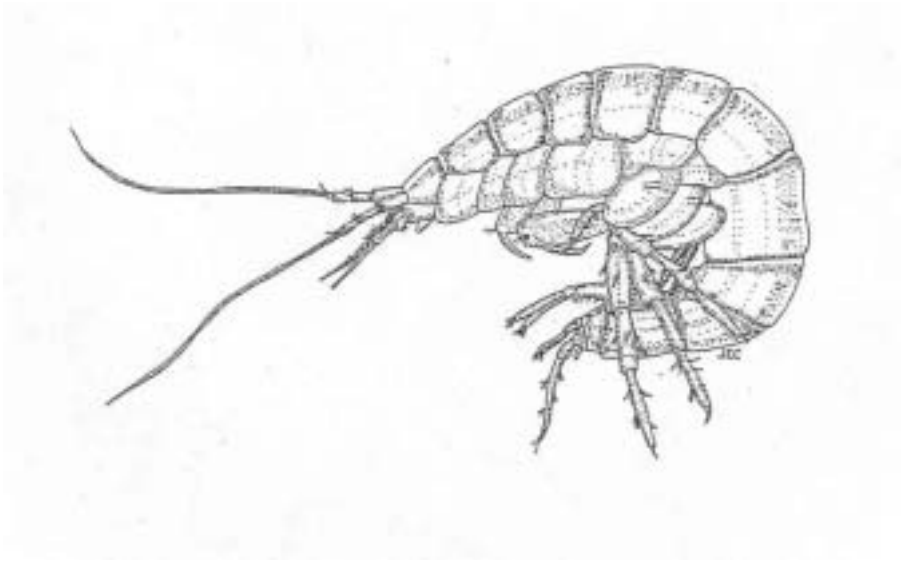
Conservation Assessment
for
Onondaga Cave Amphipod (Stygobromus onondagaensis)



(From Franz and Slifer, 1971)

USDA Forest Service, Eastern Region

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This Conservation Assessment was prepared to compile the published and unpublished information on Stygobromus onondagaensis. 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.

Table of Contents

EXECUTIVE SUMMARY

The Onondaga Cave amphipod is designated as a Regional Forester Sensitive Species on the Mark Twain 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.

NOMENCLATURE AND TAXONOMY

Classification: Class Crustacea
Order Amphipoda
Family Crangonyctidae

Scientific name: Stygobromus onondagaensis

Common name: Onondaga Cave amphipod

Synonyms: Crangonyx onondagaensis
Stygobromus n. sp.1, onondagaensis group (Gardner, 1986, in part)
Stygobromus n. sp.3, onondagaensis group (Gardner, 1986)

This species was described as Crangonyx onondagaensis by Hubricht and Mackin (1940). Hubricht (1943) listed it as Stygobromus onondagaensis.

Stygobromus 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).

The true identify of Stygobromus onondagaensis is confused by the presence of related undescribed species with over-lapping ranges. Hubricht and Mackin (1940) and Hubricht (1943) listed many records for Missouri that are in fact not Stygobromus onondagaensis, but one of the related undescribed species. Even Gardner's (1986) attempt to unravel this taxonomic mess in his checklist is confusing, as some of his "undescribed" taxa are actually synonyms of Stygobromus onondagaensis (see above). Holsinger (in progress) is revising the species of the genus Stygobromus in the central U.S. and that publication will definitively straighten out the systematics of Stygobromus onondagaensis.

DESCRIPTION OF SPECIES

Holsinger (1972) reported Stygobromus onondagaensis to be a small amphipod crustacean of subterranean facies, unpigmented and eyeless, reaching a length of about 6.0 millimeters, but rarely exceeding 5.0 millimeters. After being redescribed (Holsinger, in progress), Stygobromus onondagaensis will still be identified only by a specialist familiar with the systematics of the genus Stygobromus. Identification of this species requires dissection and examination of slide-mounted appendages at high power under a microscope.

LIFE HISTORY

Holsinger (1972) reported that ovigerous females of Stygobromus onondagaensis had been observed during the summer and fall months. Newly hatched young were approximately 1.5mm in length.

HABITAT

Holsinger (in progress) presents habitat data on 43 collections, of which 38 are from caves, 2 from wells, 2 from springs and 1 from a small surface stream, presumably spring fed. Although most of the localities are from springs, the presence of Stygobromus onondagaensis in wells suggests that it is an inhabitant of groundwaters rather than strictly a cave dweller.

DISTRIBUTION AND ABUNDANCE

Stygobromus onondagaensis as presently understood (Holsinger, in progress; Sutton, 1993) occurs in southern Missouri, northwestern Arkansas, northeastern Oklahoma and southeastern Kansas. This is basically an Ozark species that extends its range a significant distance to the west of the Ozarks into Oklahoma and Kansas.

RANGEWIDE STATUS

Global Rank: G3 vulnerable; The global rank of G3 is usually assigned to species that are known from between 21-100 localities. Stygobromus onondagaensis has been recorded by Holsinger (in progress) from 43 sites.

Missouri State Rank: S3 vulnerable; The state rank of S3 is similarly assigned to species that have been recorded from between 21-100 localities in Missouri. Holsinger (in progress) recognized Stygobromus onondagaensis from 35 collection sites in Missouri.

POPULATION BIOLOGY AND VIABILITY

Gardner (1986) observed Stygobromus onondagaensis in cave drip pools with the subterranean isopods Caecidotea fustis or Caecidotea antricola, as well as an unidentified flatworm probably of the genus Sphalloplana.

POTENTIAL THREATS

No threats to any specific sites inhabited by Stygobromus onondagaensis were reported by any reviewer of this assessment. Gardner (1986) reported that Stygobromus onondagaensis had been extirpated from the cotype localities in Onondaga Cave, i.e., pools in the Lily Pools and Wonder Room parts of the cave. This cave was a commercial cave at that time and the pools were used as wishing wells by the tourists. It is unknown if the amphipods were killed by copper poisoning from the pennies or the periodic cleaning of the pools to

retrieve the money. Stygobromus onondagaensis was, however, found in other parts of Onondaga Cave.

There are numerous potential threats that might reasonably occur on national forest land due to the presence of Stygobromus onondagaensis in the restricted cave and groundwater environment. These include problems caused by activities outside of forest owned properties that may be imported by surface runoff or groundwater flow. Potential 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).

Habitat alteration due to sedimentation is a pervasive threat potentially caused by logging, road or other construction, trail building, farming, or any other kind of development that disturbs groundcover. Sedimentation potentially changes cave habitat, blocks recharge sites, or alters flow volume and velocity. Keith (1988) reported that pesticides and other harmful compounds like PCB's can adhere to clay and silt particles and be transported via sedimentation.

There is a long history of mineral (e.g., zinc, lead) exploration and development in the southeastern and east central Ozarks and groundwater contamination is a potential threat. Dewatering of karst systems by well drawdown and mine pumping may also be a threat to groundwater species.

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 (Peck, 1969; Elliott, 1998). The construction of roads or trails near cave entrances encourages entry.

SUMMARY OF LAND OWNERSHIP AND EXISTING HABITAT PROTECTION

The following caves inhabited by this species are on the Mark Twain National Forest: Howell Co., Mud Spring Cave; Iron Co., Cave Hollow Cave; Oregon Co., Barrett Spring, Falling Spring, Thrasher Ford and Willow Tree caves; Ozark Co., Bat Cave; Phelps Co., Tree Root Cave; Shannon Co., Davis and Possum Trot Hollow caves; Washington Co., Brazil Pit and Camp Branch caves.

River Cave (Camden Co.) and Onondaga Cave (Crawford Co.) are in Missouri state parks. In addition, Thrasher Ford Cave is within the Eleven Point National Scenic

River corridor, where no vegetation management occurs other than at developed recreation sites. Bat Cave is within an area managed for semi-primitive non-motorized recreation. Only limited vegetation management occurs in this area.

Some of the caves on national forest land are protected from human visitation or habitat alteration simply by their physical condition and/or location. Barrett Spring Cave has an extremely small entrance that only an avid caver would attempt to enter. The entrance of Falling Spring Cave is about 25 feet up a sheer bluff. Thrasher Ford Cave is within the Eleven Point National Scenic River Corridor. It is about 60 feet up a very steep, rocky slope and the entrance is impossible to see during the summer when most visitors are on the river. Gray bat populations in this cave are regularly monitored and evidence of human visitors has been light the past several monitoring trips. Bat Cave is gated.

SUMMARY OF MANAGEMENT AND CONSERVATION ACTIVITIES

There are no species specific activities concerning Stygobromus onondagaensis.

Caves and springs located on the Mark Twain National Forest are subject to Forest Plan standards and guidelines for cave and spring protection and management. Perennial springs and spring branches will have a minimum 100 foot buffer zone within which any treatment will be modified on a case-by-case basis to: (1) meet state water quality standards and regulations, (2) comply with the riparian zone standards and guidelines identified under forest-wide 2500 (water and soil resource management) and 2600 (wildlife habitat management), (3) protect visual aspects, and (4) protect and enhance natural plant and animal communities. Similar guidelines exist for the management of seeps and fens.

Caves in the Mark Twain National Forest are recognized as specialized habitat areas and will be managed in accordance to the recommendations established by Gardner in 1982 in "An Inventory and Evaluation of Cave Resources of the Mark Twain National Forest". This includes the designation of an area of at least five acres centered on and completely surrounding a cave entrance for permanent old growth management. Insecticides and herbicides will not be used within the surface and known subsurface watersheds of caves utilized by the Indiana or Gray bats, Ozark cavefish, or any state endangered or rare species.

RESEARCH AND MONITORING

Many of the Missouri localities known for Stygobromus onondagaensis were discovered during the bioinventory project conducted by Gardner (1986). The Cave Research Foundation is conducting bioinventories of caves of the Mark Twain National Forest.

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 3rd International Colloquium on Gammarus and Niphargus, Schlitz, West Germany, 1975. Crustaceana (supplement), 4: 282-316.

Elliott, William R. 1998. Conservation of the North American cave and karst biota. Subterranean Biota (Ecosystems of the World). Elsevier Science. Electronic preprint at www.utexas.edu/depts/tnhc/.www/biospeleology/preprint.htm. 29 pages.

Gardner, James E. 1986. Invertebrate fauna of Missouri caves and springs. Missouri Department of Conservation, Natural History series 3, 72 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. 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. Proceedings of the 3rd International Colloquium on Gammarus and Niphargus, Schlitz, West Germany, 1975. Crustaceana (supplement), 4:244-281.

Holsinger, John R. in progress. Systematics of the subterranean amphipod genus Stygobromus (Crangonyctidae). Part III: species of the east-central and central United States.

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.

Hubricht, Leslie and J.G. Mackin. 1940. Descriptions of nine new species of freshwater amphipod crustaceans with notes and new localities for other species. American Midland Naturalist, 23: 187-218.

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.

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. 1969. Spent carbide – a poison to cave fauna. NSS Bulletin, 31(2): 53-54.

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.

Sutton, Michael R. 1993. Caves and cave wildlife in a mineral prospecting area, Oregon and Shannon counties, Missouri. Missouri Speleology, 33 (1-4): 138 pages.