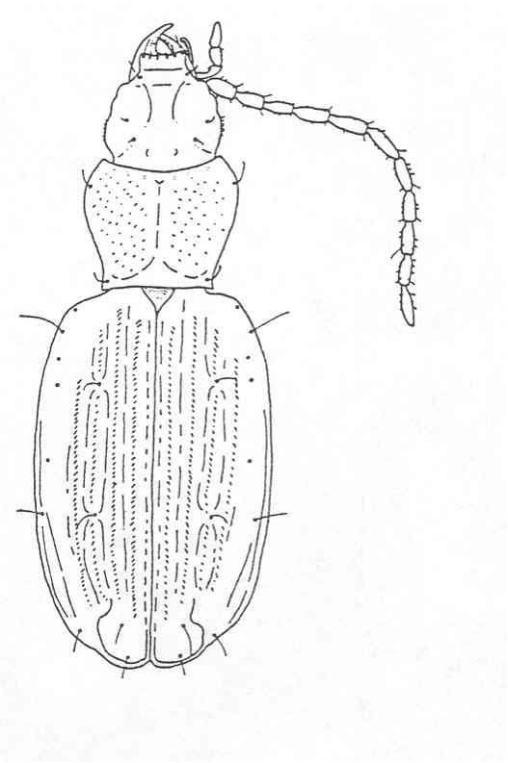
Conservation Assessment
For
Dry Fork Valley Cave Beetle (Pseudanophthalmus Montanus)



(From Barr, 1960)

USDA Forest Service, Eastern Region

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Julian J. Lewis, Ph.D.
J. Lewis & Associates, Biological Consulting
217 W. Carter Avenue
Clarksville, IN 47129
lewisbioconsult@aol.com

This Conservation Assessment was prepared to compile the published and unpublished information on Pseudanophthalmus montanus. 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 Dry Fork cave beetle is designated as a Regional Forester Sensitive Species on the Monongahela 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.

Pseudanophthalmus montanus is a rare cavernicolous ground beetle that has been found in 3 caves in Tucker County in eastern West Virginia.

NOMENCLATURE AND TAXONOMY

Classification: Class Insecta
Order Coleoptera
Family Carabidae

Scientific name: Pseudanophthalmus montanus

Common name: Dry Fork cave beetle

Synonyms: none

This species was described by Barr (1965) and has been taxonomically stable since that time.

DESCRIPTION OF SPECIES

This species is an eyeless, unpigmented (red) cave beetle. Identification of Pseudanophthalmus montanus requires dissection and microscopic examination of the genitalia by a specialist familiar in the taxonomy of the genus Pseudanophthalmus.

LIFE HISTORY

Nothing is known of the life history of Pseudanophthalmus montanus. However, Barr (personal communication, 2001) reported that in most of the troglobitic carabid beetles of eastern North America egg laying is timed for the fall, because food is generally more prevalent then. Larvae appear in the winter, pupae in the late winter and early spring, then tenerals start appearing in June and July. The beetles are almost all fully sclerotized by fall. Although this is a typical life history, the availability of food can change the cycle. The primary food source of Pseudanophthalmus is enchytraeid and tubificid worms found associated with cave mudbanks.

HABITAT

Pseudanophthalmus montanus is an obligate subterranean beetle and will be found only in caves. Although Holsinger, et al. (1976) reported nothing specific about the habitat of this beetle, in general Pseudanophthalmus beetles are inhabitants of riparian situations like mudbanks, gravel bars or beds of detritus.

DISTRIBUTION AND ABUNDANCE

This species was reported from Bennett, Cave Hollow-Arbogast and Lambert caves in Tucker County, West Virginia (Barr, 1965; Holsinger, Culver & Baroody, 1976).

RANGEWIDE STATUS

Global Rank: G1 critically imperiled; The global rank of G1 is assigned to species that are known from 1-5 localities. Pseudanophthalmus montanus has been reported from 3 caves.

West Virginia State Rank: S1 critically imperiled; The state rank of S1 is similarly assigned to species that are reported from 1-5 localities within the state. Pseudanophthalmus montanus is endemic to Tucker County, West Virginia.

POPULATION BIOLOGY AND VIABILITY

Holsinger, et al. (1976) reported that Pseudanophthalmus montanus was rare and restricted to a small range.

POTENTIAL THREATS

Due to the presence of Pseudanophthalmus montanus in the restricted cave environment, it is susceptible to a wide variety of disturbances (Elliott, 1998). Caves are underground drainage conduits for surface runoff, bringing in significant quantities of nutrients for cave communities. Unfortunately, contaminants may be introduced with equal ease, with devastating effects on cave animals. 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.

Impoundments may detrimentally affect cave species. Flooding makes terrestrial habitats unusable and creates changes in stream flow that in turn causes siltation and drastic modification of gravel riffle and pool habitats. Stream back-flooding is also another potential source of introduction of contaminants to cave ecosystems (Duchon and Lisowski, 1980; Keith, 1988).

Smoke is another potential source of airborne particulate contamination and hazardous material introduction to the cave environment. Many caves have active air currents that serve to inhale surface air from one entrance and exhale it from another. Potential smoke sources include campfires built in cave entrances, prescribed burns or trash disposal. Concerning the latter, not only may hazardous chemicals be carried into the cave environment, but the residue serves as another source of groundwater contamination.

Numerous caves have been affected by quarry activities prior to acquisition. Roadcut construction for highways passing through national forest land is a similar blasting activity and has the potential to destroy or seriously modify cave ecosystems. Indirect effects of blasting include potential destabilization of passages, collapse and destruction of stream passages, changes in water table levels and sediment transport (Keith, 1988).

Oil, gas or water exploration and development may encounter cave passages and introduce drilling mud and fluids into cave passages and streams. Brine produced by wells is extremely toxic, containing high concentrations of dissolved heavy metals, halides or hydrogen sulfide. These substances can enter cave ecosystems through breach of drilling pits, corrosion of inactive well casings, or during injection to increase production of adjacent wells (Quinlan and Rowe, 1978).

Cave ecosystems are unfortunately not immune to the introduction of exotic species. Out-competition of native cavernicoles by exotic facultative cavernicoles is becoming more common, with species such as the exotic milliped Oxidus gracilis affecting both terrestrial and aquatic habitats.

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). The construction of roads or trails near cave entrances encourages entry.

SUMMARY OF LAND OWNERSHIP AND EXISTING HABITAT PROTECTION

The Monongahela National Forest owns the Arbogast Entrance to the Cave Hollow-Arbogast Cave System.

SUMMARY OF MANAGEMENT AND CONSERVATION ACTIVITIES

There are no species specific activities relating to Pseudanophthalmus montanus.

The existing (1985) Monongahela Land and Resource Management Plan does not provide management direction for caves although they are being considered in the Forest Plan revision currently underway. A Forest Plan Amendment in progress for Threatened and Endangered Species will include management for the caves on the forest.

RESEARCH AND MONITORING

Much of what is known about Pseudanophthalmus montanus was gathered during the project of Holsinger, et al. (1976), in which data from 190 caves in 14 counties was gathered.

RECOMMENDATIONS

Retain on list of Regional Forester Sensitive Species.

REFERENCES

Barr, T.C., Jr. 1965. The Pseudanophthalmus of the Appalachian Valley. American Midland Naturalist, 73: 41-72.

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.

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.

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, J.R., R. Baroody and D.C. Culver. The invertebrate cave fauna of West Virginia. West Virginia Speleological Survey, Bulletin 7, 82 pages.

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.

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.