

CANDIDATE ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC AND COMMON NAME:

Pseudanophthalmus colemanensis Barr, Coleman Cave beetle

Pseudanophthalmus fowlerae Barr, Fowler=s Cave beetle

Pseudanophthalmus insularis Barr, Insular Cave beetle

Pseudanophthalmus tiresias Barr, Soothsayer Cave beetle

Pseudanophthalmus paulus Barr, Noblett=s cave beetle

Note: These species are discussed together due to their overlapping ranges and similarity of threats and status.

LEAD REGION: 4

INFORMATION CURRENT AS OF: March 7, 2003

STATUS/ACTION (Check all that apply):

New candidates

Continuing candidate

Non-petitioned

Petitioned - Date petition received: ____

90-day positive - FR date: ____

12-month warranted but precluded - FR date: ____

Is the petition requesting a reclassification of a listed species?

Listing priority change

Former LP: ____

New LP: ____

Latest date species first became a Candidate: _____

Candidate removal: Former LP: ____ (Check only one reason)

A - Taxon more abundant or widespread than previously believed or not subject to a degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

F - Range is no longer a U.S. territory.

M - Taxon mistakenly included in past notice of review.

N - Taxon may not meet the Act=s definition of A species.@

X - Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Insects - Carabidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE:

Pseudanophthalmus colemanensis, Coleman Cave beetle, Montgomery County, TN

Pseudanophthalmus fowlerae, Fowler=s Cave beetle, Clay County, TN

Pseudanophthalmus insularis, Insular Cave beetle, Davidson County, TN

Pseudanophthalmus tiresias, Soothsayer Cave beetle, DeKalb County, TN

Pseudanophthalmus paulus, Noblett=s cave beetle, Monroe County, TN

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE:

Pseudanophthalmus colemanensis, Coleman Cave beetle, Montgomery County, TN

Pseudanophthalmus fowlerae, Fowler=s Cave beetle, Clay County, TN

Pseudanophthalmus insularis, Insular Cave beetle, Davidson County, TN

Pseudanophthalmus tioresias, Soothsayer Cave beetle, DeKalb County, TN

Pseudanophthalmus paulus, Noblett=s cave beetle, Monroe County, TN

LEAD REGION CONTACT (Name, phone number): Richard Gooch, 404/679-7124

LEAD FIELD OFFICE CONTACT (Office, name, phone number): Asheville, North Carolina Field Office, Robert R. Currie, 828/258-3939, extension 224

SUPPORT FIELD OFFICE(S): Cookeville, Tennessee Field Office

BIOLOGICAL INFORMATION (Describe habitat, historic vs. current range, historic vs. current population estimates (# populations, #individuals/population), etc.):

Species Description

Cave beetles in the genus Pseudanophthalmus are fairly small, eyeless, reddish-brown insects. Like most other insects, they have six legs and a body that consists of a head, thorax, and abdomen. Body length is generally from 3.0 to 8.0 millimeters (mm) (0.12 to 0.32 inches), depending upon the species. The different species within the genus are differentiated by differences in the shape and size of the various body parts, especially the shape of the male appendages used during reproduction. Barr (1996) states that there are approximately 255 species in the genus Pseudanophthalmus. The insect genus Pseudanophthalmus is in the predatory ground beetle family Carabidae. Most members of this genus are cave dependent (trogllobites) and are not found outside the cave environment. All are predatory and feed upon small cave invertebrates such as spiders, mites, millipedes, and diplurans, while the larger Pseudanophthalmus species also feed on cave cricket eggs (Barr 1996). Members of this genus vary in rarity from fairly common, widespread species that are found in many caves to species that are extremely rare and restricted to only one cave or, at most, two caves.

Little detailed life history information is available for the rarest of the cave beetles that are considered here, but the generalized summary that follows is accurate for the more common and more easily studied species and is believed to also apply to the rarer species (Barr 1998). Cave beetles copulate in the fall, and the eggs are deposited in the cave soil during late fall. The eggs hatch and larvae appear in late fall through early winter. Pupation occurs in late winter to early summer with the adult beetles emerging in early summer (Barr 1996).

Habitat

The limestone caves in which these cave beetles are found provide a unique and fragile environment that supports a variety of species that have evolved to survive and reproduce under

the demanding conditions found in cave ecosystems. No photosynthesis takes place within the dark zone of a cave. Therefore, all organisms that are adapted to life within a cave are dependent upon energy from the surface. This energy can be in the form of leaf litter, woody debris or small bits of organic matter that is washed or falls into the cave, or guano deposited by cave-dependent bats that feed on the surface and return to the cave to roost (Barr 1996).

Status

Pseudanophthalmus colemanensis, the Coleman Cave beetle, was described by Barr (1959) based upon a few specimens collected by Barr in 1957, from Coleman Cave, Montgomery County, Tennessee. This is the only known site for the species. During a 1999 visit to the cave one specimen was observed by Barr and others (Barr 2001).

Pseudanophthalmus fowlerae, Fowler=s cave beetle, was described by Barr (1980) from 11 specimens collected from 1959 through 1965 from Sheals Cave, Clay County, Tennessee. The species is not known from any other caves. During a 1997 survey of the cave, Barr (1998) observed 3 specimens of P. inquistor, the inquirer cave beetle, however, Fowler=s cave beetle has not been observed or collected since 1965. Barr (2001) believes that it probably still exists in low numbers. The inquirer cave beetle is included in the 2002 Candidate Notice of Review.

Pseudanophthalmus insularis, the insular cave beetle, was described by Barr (1980) from 8 specimens collected in 1956 and 1957 from Baker Station Cave, Davidson County, Tennessee. Barr (2001) reports that the cave was searched in 1998 for this species and no additional specimens were found. Although the species has not been observed since 1957, Barr (2001) believes that it probably still exists in low numbers.

Pseudanophthalmus tireias, the soothsayer cave beetle, was described in 1959. At the time of the original description, this species was considered one of seven subspecies within a variable species complex. After further study of the group Barr (1980) elevated all seven of these subspecies to full species. This is the currently accepted taxonomic treatment of this group. The original description of this taxon was based upon six specimens collected from Indian Grave Point Cave, DeKalb County, Tennessee, in 1956. These specimens were collected near the cave=s entrance sink in an area that had high humidity, stable temperatures and a few fragments of rotten wood that had fallen into the sink (Barr 2001.) Four specimens were later collected from nearby Fox Cave (Barr, in lit. 1993). Three searches were conducted between 1997 and 1999, but no additional specimens of this species have been found. Despite the recent failures to find the species, Barr (2001) believes that the soothsayer cave beetle is still present in Indian Grave Point and Fox caves, in at least very low numbers.

Pseudanophthalmus paulus, Noblett=s Cave beetle, was described by Barr (1981) from two specimens collected in 1967, from Noblett=s Cave, Monroe County, Tennessee. Despite several searches conducted in this cave by Wallace (Barr 2001, Wallace 1989) and in other caves in the vicinity by Barr (2001), no additional specimens have been found. Barr (2001) believes that it probably still exists in low numbers. Noblett=s Cave is a small (about 500 feet long) muddy cave with a stream flowing through it.

THREATS (Describe threats in terms of the five factors in section 4 of the ESA providing specific, substantive information. If this is a removal of a species from candidate status or a change in listing priority, explain reasons for change):

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

Four of these five cave beetles (Coleman Cave beetle, Fowler=s Cave beetle, Insular cave beetle and Noblett=s Cave beetle) are currently known from only one cave. Only one, the Soothesayer cave beetle, is known to occur in two caves.

Their limited distributions make these species vulnerable to isolated events that would only have a minimal effect on the more wide-ranging members of the genus. Events such as toxic chemical spills, discharges of large amounts of polluted water, closure of entrances, alteration of entrances, or the creation of new entrances can have serious adverse impacts on these cave beetles and could result in their extinction (Barr 1996). Caves and the species that are completely dependent upon them (troglobites) receive the energy that forms the basis of the cave food chain from outside the cave. This energy can be in the form of bat guano deposited by cave-dependent bats, large or small woody debris washed or blown into the cave, or tiny bits of organic matter that is carried into the cave by water through small cracks in the rocks overlaying the cave (Barr 1996). Activities such as industrial, residential, commercial, or highway construction can, if not planned in a manner to protect caves, directly destroy caves or result in severe modification of the natural processes that maintain the sensitive biological systems they support. Examples of these types of threats can be seen with two current candidates (*P. caecus*, the Clifton Cave beetle, and *P. troglodytes*, the Louisville cave beetle), which have both had one of their two known caves destroyed due to construction-related activities. Pollution and chemical contamination can, under certain circumstances, result in the complete destruction of the unique life found within a cave impacted by these factors. Vandalism and trash dumping have affected some of the sites and all but the Coleman=s Cave are vulnerable to these activities. Loss or reduction of the supply of energy, such as may be occurring to the Coleman Cave beetle due to the alteration of an upper sinkhole cave entrance by past dumping and debris disposal can result in the loss or severe reduction of cave beetle populations (Barr 1996).

Many of these fragile caves have been adversely impacted. In 1957, Coleman Cave supported an endangered gray bat maternity colony. Either because of human disturbance of the colony during the maternity season or because of changes in cave microclimate caused by the closure of an upper level entrance to the cave, Coleman Cave no longer supports a maternity colony. The Nature Conservancy has developed a Cooperative Management Agreement with the owner of this cave and has taken active steps to protect the site from human disturbance. This action should reduce human disturbance at the cave and should benefit the gray bat. However, the blocked upper entrance to the cave may have changed cave temperatures and moisture levels in a manner that makes the site unsuitable for gray bat use. It may be necessary to restore this upper entrance before Coleman Cave will once again support a gray bat maternity colony. Guano deposited in caves by cave dependent bats, such as the endangered gray bat, often forms the basis of the food chain within cave. As noted above, higher trophic level species, like the Coleman Cave beetle and other predatory cave species, are indirectly dependent upon outside sources of organic matter such as bat guano. Until a dependable source of organic matter is provided to the Coleman Cave beetle population, either by reestablishment of the gray bat

colony or from some other sources this species is vulnerable to extinction. At Sheals Cave the site is in a rapidly expanding urban area and indirect impacts, such as chemical or other pollution, could significantly impact both the cave and the species the cave supports. A sinkhole that drains into the cave system is located away from the protected entrance and is near a highway. Chemical and other spills could easily enter the cave system through this sinkhole entrance. Alterations in the landscape associated with an expanding urban area are expected and could negatively affect the cave system that contains the inquirer cave beetle (Barr 1998, 2001). Baker Station Cave was once used as a domestic water supply but a nearby landfill and pollution from other sources has contaminated the water to the point that it is no longer potable. During the 1998 visit, severe pollution of springs and creeks in the vicinity of the cave was observed. Noblett=s Cave may suffer due to it=s proximity to an Interstate highway interchange. Dependence upon the surface makes caves and the life that is found within them vulnerable to actions that take place well outside and away from the cave. Protection of caves and cave dependent species must include both the physical environment in which the species are found and the surface components that provide the energy and clean water needed for survival.

B. Overutilization for commercial, recreational, scientific, or educational purposes.

All of these cave beetles occur at only one or two locations. Most populations are extremely small and careless collecting, whether for scientific or other purposes, could adversely affect them. These species have no known commercial value, however, the caves in which these species occur may be used for recreational purposes by spelunkers and by other recreationists.

C. Disease or predation.

Disease or predation is not known to be a significant problem for any of these species. However, since each species appears to exist with low numbers of individuals, mortality via either of these two factors may have a significant, negative impact on recruitment and long-term survival.

D. The inadequacy of existing regulatory mechanisms.

None of these species receives any official State or Federal protection. Coleman Cave is under a cooperative management agreement with the landowner. These species are not protected under Tennessee state law.

E. Other natural or manmade factors affecting its continued existence.

None are known at this time.

- a. Is listing still warranted? NA
- b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? NA
- c. Is a proposal to list the species as threatened or endangered in preparation? NA

d. If the answer to c. above is no, provide an explanation of why the action is still precluded:

LAND OWNERSHIP (Estimate proportion Federal/state/local government/private, identify non-private owners): All of the caves supporting these species are privately owned.

PRELISTING (Describe status of conservation agreements or other conservation activities):

In 1989 the Service developed a Volunteer Service Agreement with Richard Wallace, Knoxville, Tennessee, to conduct surveys for six rare cave beetles found in Eastern Tennessee and adjacent portions of Southwestern Virginia. Noblett's Cave beetle was one of the beetles examined by Mr. Wallace (Wallace 1989). Based upon the information provided in this report, the Service sent formal notification (July 1990) of a status review of five of these species to 51 individuals or organizations. Two letters were received in response to our notice. One was from the Tennessee Valley Authority's Natural Heritage Program stating that they had no new information on these species and the other was from Dr. Thomas Barr stating that there were at least 50 beetles within the genus Pseudanophthalmus that needed to be included in the status review. In response to this information the Service in cooperation with Kentucky Department of Fish and Wildlife Resources (KDFWR) funded a survey of 21 cave beetles. After completion of the surveys in Kentucky, the Service in cooperation with the Tennessee Wildlife Resources Agency funded a status survey for 27 rare cave beetles that occur in Tennessee or adjacent portions of Alabama or Georgia. Dr. Barr provided a final report on the Kentucky species in 1996 and a final report for the Tennessee project in 2001. In 1999, nine of the beetles included in the Kentucky report were elevated to candidate status.

While gathering the land ownership information needed for the final reports on these cooperatively funded projects (Barr 1996, 1998 and 2001), the landowners, when they could be contacted, were made aware of the presence of the rare cave beetles within caves on their land. Most owners were pleased to learn of the presence of a rare species within their caves and are expected to be willing to assist with any protection activities needed to protect and recover these cave beetles. The KDFWR and TWRA both actively participated in gathering the information presented in Barr (1996, 1998 and 2001) on the status of these species. It is anticipated that they will continue to support and participate in rare cave beetle protection. In 2001, the owners of Coleman Cave, The Nature Conservancy, TWRA, the Service and others entered into a Cooperative Management Agreement for the cave. Sheals Cave is currently protected by the landowner from any physical alterations that could adversely affect the species.

REFERENCES (Identify primary sources of information (e.g., status reports, petitions, journal publications, unpublished data from species experts) using formal citation format):

Barr, Thomas C. 1959. New cave beetles (Carabidae, Trechini) from Tennessee and Kentucky. *Journal Tennessee Academy of Science* 34:5-30.

Barr, Thomas C. 1980. New species groups of Pseudanophthalmus from the Central Basin of Tennessee (Coleoptera: Carabidae: Trechini). *Brimleyana* (3): 85-96.

- Barr, Thomas C. 1981. Pseudanophthalmus from Appalachian Caves (Coleoptera: Carabidae): The Engelhardti Complex. *Brimleyana* 5: 37-94.
- Barr, Thomas C. 1995. Kentucky Cave Beetles: Progress Report II. Unpublished Report to Kentucky Department of Fish and Wildlife Resources. Frankfort, Kentucky. 20 pp.
- Barr, Thomas C., 1996. Cave Beetle Status Survey and Prelisting Recovery Project. Unpublished Report to Kentucky Department of Fish and Wildlife Resources, Frankfort, Kentucky, and the U.S. Fish and Wildlife Service, Asheville, North Carolina. 63 pp.
- Barr, Thomas C. 1998. Study of Potentially Threatened or Endangered Species of Cave Beetles in Tennessee, Alabama and Georgia. Interim Progress Report to the Tennessee Wildlife Resources Commission. 11 pp.
- Barr, Thomas C. 2001. Cave Beetles in Tennessee, Alabama and Georgia, Potentially Threatened or Endangered Species of Pseudanophthalmus (Coleoptera: Carabidae). Final Report to U.S. DOI, Office of Endangered Species, and the Tennessee Wildlife Resources. 36 pp.
- Krekeler, C. H. 1973. Cave Beetles of the Genus Pseudanophthalmus (Coleoptera, Carabidae) from the Kentucky Bluegrass and Vicinity. *Feildiana* 62(4):35-83.
- Wallace, Richard L. 1989. Report on a Carabid Beetle Survey. Unpublished report to the U.S. Fish and Wildlife Service, Asheville, NC. 6 pp.

LISTING PRIORITY (place * after number)

THREAT

Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5 *
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11 **
		Subspecies/population	12

* Fowler=s Cave beetle, Insular Cave beetle, Soothsayer Cave beetle and Noblett=s cave beetle

** Coleman Cave beetle

Rationale for listing priority number:

Magnitude: All of these cave beetles are currently known from only one or two caves. Their limited distributions make these species vulnerable to isolated events that would only have a minimal effect on the more wide-ranging members of the genus. Events such as toxic chemical spills, discharges of large amounts of polluted water, closure of entrances, alteration of entrances, or the creation of new entrances can have serious adverse impacts on these cave beetles and could result in their extinction. No formal protection is currently provided to four of these five cave beetles and the magnitude of the threats they face is high. The fifth species (Coleman Cave beetle) currently receives some protection under a formal Cooperative Management Agreement, consequently, the threats it faces are more moderate.

Imminence: The treats faced by these species are significant, however, it is not anticipated that they will be subject to these threats in the immediate future (next 1-2 years).

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes to the candidate list, including listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all additions of species to the candidate list, annual retentions of candidates, removal of candidates, and listing priority changes.

Approve: Linda Kelsey March 14, 2003
Acting Regional Director, Fish and Wildlife Service Date

Concur: Steve Williams April 5, 2004
Director, Fish and Wildlife Service Date

Do not concur: _____ Date _____
Director, Fish and Wildlife Service

Director's Remarks:

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Date of annual review: March 2003

Conducted by: Robert Currie - Asheville, North Carolina FO

Comments:

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