

**Squirrel Chimney Cave Shrimp**  
**(*Palaemonetes cummingi*)**

**5-Year Review:**  
**Summary and Evaluation**

**U.S. Fish and Wildlife Service**  
**Southeast Region**  
**Jacksonville Ecological Services Field Office**  
**Jacksonville, Florida**

## **5-YEAR REVIEW**

### **Squirrel Chimney Cave Shrimp/*Palaemonetes cummingi***

#### **I. GENERAL INFORMATION**

**A. Methodology used to complete the review:** The U.S. Fish and Wildlife Service's Jacksonville Field Office completed this review of the Squirrel Chimney cave shrimp (*Palaemonetes cummingi*) (SCCS). All literature and documents used for this review are on file at the Jacksonville Field Office and are cited in the References section. We used published literature; technical reports; data and information on the internet; unpublished data; and personal communications with biologists and researchers. Public notice of this review was given in the *Federal Register* on April 26, 2007, with a 60-day public comment period. No public comments were received for this review. None of this review was contracted to outside parties. The draft of this document was distributed for peer review (see Appendix A) and comments received were addressed.

#### **B. Reviewers**

**Lead Region - Southeast Region:** Kelly Bibb, 404-679-7132

**Lead Field Office - Jacksonville, FL, Ecological Services:** Bill Brooks, 904-232-2580

#### **C. Background**

- 1. FR Notice citation announcing initiation of this review:** 72 FR 20866, April 26, 2007
- 2. Species status:** Unknown (2007 Recovery Data Call). The last surveys of the Squirrel Chimney were conducted between 1994 and 1996. Surveys of nearby cave systems were conducted in 1995 and 1996. There are no more than a dozen collections of the SCCS recorded since its discovery in 1953 and the most recent documentation was in 1973. The Squirrel Chimney is a sinkhole in Alachua County, Florida. It is in private ownership and maintained as an oak hammock and pine plantation. The area immediately surrounding the Squirrel Chimney is pasture, agriculture and planted pine plantation. With its close proximity to the City of Gainesville and Interstate 75, planned neighborhood developments are increasing to the east of the Squirrel Chimney. There is also a series of industrial mineral extraction pit mines located 3 miles to the west of Squirrel Chimney.
- 3. Recovery achieved:** 1 (0-25% recovery objectives achieved) (2007 Recovery Data Call)
- 4. Listing history:**  
Original listing  
FR notice: 55 FR 25588

Date listed: June 21, 1990  
Entity listed: species  
Classification: Threatened

**5. Associated rulemakings:** None

**6. Review history:**

Recovery Data Call – 2007, 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, and 1998.

The Service conducted a five-year review for the shrimp in 1991(56 FR 56882). In this review, the status of many species was simultaneously evaluated with no in-depth assessment of the five factors or threats as they pertain to the individual species. The notice stated that the Service was seeking any new or additional information reflecting the necessity of a change in the status of the species under review. The notice indicated that if significant data were available warranting a change in a species' classification, the Service would propose a rule to modify the species' status. No change in the shrimp's listing classification was found to be appropriate.

A *Federal Register* notice (63 FR 67618) of a 90-day finding on a petition to delist the species was published on December 8, 1998. The Service found that the petition did not present substantial scientific or commercial information indicating that delisting this species due to extinction may be warranted.

**7. Species' Recovery Priority Number at start of review (48 FR 43098):** 5c (the 5 indicates a high degree of threat and low recovery potential; the "c" reflects a high degree of conflict).

**8. Recovery Plan or Outline**

Recovery Plan: Exempted. On August 4, 1993, the Jacksonville Field Office determined that a recovery plan for the SCCS would not further the conservation of the species for the following reason: This species is only known from the Squirrel Chimney, a small sinkhole near Gainesville, Alachua County, Florida; and the site is privately owned. Preparation of a recovery plan would not further the conservation of the species.

Recovery Outline: On March 3, 2004, the Jacksonville Field Office drafted a Recovery Outline for the SCCS species file.

## **II. REVIEW ANALYSIS**

**A. Application of the 1996 Distinct Population Segment (DPS) policy**

1. **Is the species under review listed as a DPS?** No. The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population of a species of vertebrate wildlife. This definition limits listing DPS to only vertebrate species of fish and wildlife. Because the species under review is an invertebrate, and the DPS policy is not applicable, the application of the DPS policy to the species listing is not addressed further in this review.

**B. Recovery Criteria**

1. **Does the species have a final, approved recovery plan containing objective, measurable criteria?** No.

**C. Updated Information and Current Species Status**

**1. Biology and Habitat**

- a. **Abundance, population trends, demographic features, or demographic trends:** The SCCS was discovered in 1953 and described in 1954 (Chace 1954). This species is only known from the Squirrel Chimney near Gainesville, Alachua County, and is the only cave shrimp in Florida.

No more than a dozen collections of the SCCS have been made since its discovery in 1953; its last observation was in 1973 (Franz 1982). The most recent status surveys were conducted between 1994 and 1996 (Doonan 2001). The Squirrel Chimney was surveyed eight times; nearby Cherry Pits Cave, Herzog Cave and Hog Sink were each surveyed twice; and Bat Cave was surveyed once. No SCCS or evidence (e.g., shed exoskeletons) were collected or observed during these surveys. Other potentially occupied sites were identified but were not surveyed because either the land owner would not allow access, sites had become degraded and ephemeral, or sites could not be located (Doonan 2001). There have been no surveys of Squirrel Chimney in recent years. Opportunistic surveys of nearby cave systems have not documented the presence or evidence of SCCS (Paul Moler, Florida Fish and Wildlife Conservation Commission-retired, personal communication, 2007).

Based upon the aforementioned findings from the 1994-1996 surveys, no documentation of SCCS in recent years, and the discovery of a predatory fish species within the Squirrel Chimney, the redeye chub (*Notropis harperi*, a small predatory fish) (Morris and Butt 1992), the Florida Fish and Wildlife Conservation Commission petitioned the Service in 1997 to reconsider the federal listing of the SCCS due to its potential extinction. The Service found that the petition did not present substantial information indicating that delisting this species due to extinction was warranted. The Service based its finding on the inadequacy of the existing information. The status surveys did not include

a number of sink and cave systems within 5 miles that were ecologically similar to the Squirrel Chimney. These sinks and caves are all part of the Newberry Limestone Plain and characteristic of the karst (limestone) topography of this area and are likely interconnected through underground features (Williams et al. 1997, Doonan 2001). Such passageways may provide shelter and travel corridors for dispersal of the SCCS (USFWS 1998).

- b. Genetics, genetic variation, or trends in genetic variation:** None.
- c. Taxonomic classification or changes in nomenclature:** The Integrated Taxonomic Information System (2007) was checked while conducting this review. There are no proposed changes in the taxonomic classification or in nomenclature.
- d. Spatial distribution, trends in spatial distribution or historic range:** The SCCS is only known from the Squirrel Chimney. This small, deep sinkhole that leads to a flooded cave system formed within the Crystal River Formation of the Ocala Group limestone. This formation underlies the Newberry Limestone Plain and is characteristic of karst topography. This relatively flat karst plain has numerous sinks and caves and connections between underground features do occur. Caves in this area support a variety of terrestrial and aquatic habitats (Franz 1994b). Several of the sink and cave systems within 5 miles are ecologically similar to Squirrel Chimney. There are similar assemblages of cavern dwelling species in these nearby underground sites, but no SCCS have been documented. The discovery of the redeye chub (a small predatory fish capable of eating crustaceans the size of SCCS larvae) within the Squirrel Chimney system (Morris and Butt 1992) and its presence at other nearby underground sites indicate that fissures found at Squirrel Chimney may represent underwater connections to these other sites (Doonan 2001). The presence of the redeye chub may be one factor responsible for the apparent absence of the SCCS from the Squirrel Chimney system. However, this same evidence suggests that passageways to nearby cave systems could shelter SCCS and provide for their dispersal.
- e. Habitat ecosystem conditions:** The entrance to the Squirrel Chimney cave system is a steep to vertical sloped sink that leads to a shaft that is 3-6 ft wide and extends 14 m down to the water surface in the main cave (Doonan 2001). It is a typical vertical solution tube or shaft and thus referred to as a “chimney.” The main cave is approximately 22 m wide and 34 m long with 15 m of water at the deepest point. Below the water’s surface are bedding plane tunnels, ledges, a debris cone and an opening to an air chamber. Morris and Butt (1994) and Doonan (2001) provide a complete description of the Squirrel Chimney cave system. During the 1995 surveys of Squirrel Chimney, Doonan (2001) found that the water temperature remained constant at approximately 20° C; the water level was stable at approximately the same level recorded in 1992; and that the water chemistry/quality was good (met Florida standards for

drinking water; and was similar to samples collected in 1992). As described above, the Squirrel Chimney and other nearby cave systems support a variety of rare cave dwelling terrestrial and aquatic wildlife.

The Squirrel Chimney remains in private ownership and continues to be maintained as an oak hammock and pine plantation. The landscape immediately surrounding Squirrel Chimney appears to be stable and remains as a rural mixed-use area of pasture, agriculture and planted pine plantation. However, with its close proximity to the City of Gainesville and Interstate 75, the landscape appears to be changing with planned neighborhood developments increasing to the east of Squirrel Chimney. There are also several industrial mineral extraction pit mines within 3 miles. Other than an apparent drop in water levels between the 1970 surveys and 1990 surveys (Franz 1994a), there were no indications of any significant change in the physical environment at Squirrel Chimney (Doonan 2001).

## **2. Five-Factor Analysis**

- a. Present or threatened destruction, modification, or curtailment of its habitat or range:** The SCCS listing rule noted that potential residential development and changes in land use were the primary threats. As this species is known from only Squirrel Chimney, a small sinkhole that leads to a flooded cave system, any detrimental change to the sinkhole or the underlying aquifer has the potential to adversely affect or cause the extinction of the species. These factors continue as the primary threats to the SCCS today.
- b. Overutilization for commercial, recreational, scientific, or educational purposes:** The SCCS listing rule stated that this species is known from one site that could be seriously damaged by a single act of vandalism. This is still a threat today; however, we have included it under Factor E below. The population size of the SCCS is unknown but is likely very small and vulnerable to impacts from scientific or other collecting.
- c. Disease or predation:** The 1990 listing noted that disease and predation were not known to be affecting the SCCS. However, Morris and Butt (1992) documented the presence of a new fish species within the Squirrel Chimney, the redeye chub, a small predatory fish capable of eating crustaceans the size of SCCS larvae. In the 1997 petition to delist the SCCS due to extinction, the presence of the redeye chub was identified as a plausible explanation for the apparent absence and possible extinction of the SCCS from Squirrel Chimney. Therefore, predation has been identified as a new threat since listing.
- d. Inadequacy of existing regulatory mechanisms:** The listing rule noted that no existing regulatory mechanisms apply to the SCCS. Since there is no information on the SCCS's sensitivity to common pollutants, Federal water quality laws (e.g., Clean Water Act) and those laws administered by the State,

may or may not be protective of the SCCS, especially since limitations and monitoring of groundwater are not common regulatory practices.

The SCCS is listed by the State of Florida as a threatened species. Florida State Law (Chapter 68A-27.004, Florida Administrative Code) prohibits taking of individuals of state-listed threatened species, or parts thereof, except as authorized; however, the statute does not prohibit destruction or modification of habitat occupied by threatened species. Because the SCCS is listed by the State of Florida, these protective regulations apply to this species on State properties and private properties.

- e. **Other natural or manmade factors affecting its continued existence:** The listing rule noted that other natural or manmade factors were not known to be affecting the SCCS at the time of listing. However, natural droughts, as well as water withdrawals for human use, can impact cave water levels. Changes in land use in the recharge area can accelerate pollutants delivery to the aquifer system associated with the Squirrel Chimney system. Other potential threats include contaminant spills in the recharge area. Also, a single act of vandalism could seriously damage the only known site of occurrence.

#### D. Synthesis

The Squirrel Chimney cave shrimp, Florida's only cave shrimp, is known from one location, the Squirrel Chimney near Gainesville, Alachua County. The current status of the SCCS is unknown. There are no more than 12 records of this species dating from its discovery in 1953 to and its last collection in 1973. The last status survey of the Squirrel Chimney and several nearby cave systems (1994-1996) did not document the SCCS or find evidence of the SCCS. A 1992 survey documented the presence of a new fish species within the Squirrel Chimney, the redeye chub. This fish is a small predator capable of eating crustaceans the size of SCCS larvae and may explain the apparent absence of the SCCS from the Squirrel Chimney. In 1997, the Service was petitioned to reconsider the federal listing of the SCCS due to its potential extinction. The Service found that the petition did not present substantial information indicating that delisting this species due to extinction was warranted. The Service based its finding on the inadequacy of the existing information, as the status surveys did not include a number of sink and cave systems within 5 miles that are ecologically similar to the Squirrel Chimney. These sinks and caves are all characteristic of the karst topography of this area and are likely interconnected through underground features. These features likely provided the travel corridors that allowed the redeye chub to establish a population within the Squirrel Chimney. Such passageways could also provide shelter and travel corridors for dispersal of the SCCS (USFWS 1998).

The current status of the SCCS is unknown. Until an intensive survey of the Squirrel Chimney and all nearby ecologically similar cave systems is conducted, we will not know if the SCCS still occurs within this system of connected caves and underground passageways. Therefore, the Service recommends that the SCCS remain classified as

threatened until such a survey can be conducted.

### III. RESULTS

**A. Recommended Classification:** No change.

**B. New Recovery Priority Number:** No change.

### IV. RECOMMENDATIONS FOR FUTURE ACTIONS

Work with private landowners regarding the protection and conservation of the Squirrel Chimney and other nearby ecologically similar caves and sink systems.

Acquire or obtain a conservation easement on Squirrel Chimney and other nearby ecologically similar caves and sink systems.

Conduct an intensive survey to determine the status of the SCCS.

Evaluate and consider establishing a captive breeding program for the SCCS as a recovery tool if deemed appropriate after the recommended intensive survey.

Monitor groundwater quality and water levels of Squirrel Chimney and other nearby ecologically similar caves and sink systems.

Determine the origin (age, source and recharge area) of the Squirrel Chimney and other nearby ecologically similar caves and sink systems.

Use existing regulatory mechanisms to protect the SCCS and its groundwater habitat.

Develop educational and technical information materials essential for cave, sink and recharge area stewardship.

### V. REFERENCES

Chace, F.A., Jr. 1954. Two new subterranean shrimps (Decapoda: Caridae) from Florida and the West Indies, with a revised key to the American species. *Journal of the Washington Academy of Sciences* 44(10):318-324.

Dobkin, S. 1971. The larval development of *Palaemonetes cummingi*, Chace, 1954 (Decapoda, Palaemonidae), reared in the laboratory. *Crustaceana* 20 (3):285-297.

Doonan, T.J. 2001. Survey of Squirrel Chimney and other selected caves to determine the status of Squirrel Chimney cave shrimp (*Palaemonetes cummingi*). Final Performance Report. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida. 44 pp.



- Franz, R. 1982. Florida cave shrimp. Pages 108-109 in R. Franz, editor. Rare and Endangered Biota of Florida. Volume Six: Invertebrates. University Presses of Florida, Gainesville, Florida, USA.
- Franz, R. 1994a. Squirrel Chimney cave shrimp survey. Unpublished report to Florida Game and Fresh Water Fish Commission. 4 pp.
- Franz, R. 1994b. Squirrel Chimney cave shrimp *Palaemonetes cummingi* Chace. Pages 181-182 in M. Deyrup and R. Franz, editors. Rare and Endangered Biota of Florida, Volume 3 IV. Invertebrates. University Press of Florida, Gainesville, Florida, USA.
- Integrated Taxonomic Information System. 2007.  
[http://www.itis.gov/servlet/SingleRpt/SingleRpt?search\\_topic=TSN&search\\_value=180297](http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=180297).
- Morris, T. and P. Butt. 1992. A survey of the population of the Florida cave shrimp (*Palaemonetes cummingi*), other species, and the condition of the environment within the Squirrel Chimney cave system, Alachua County, Florida. Report to U.S. Fish and Wildlife Service, Karst Environmental Services, Inc. 10 pp.
- U.S. Fish and Wildlife Service. 1998. Endangered and threatened wildlife and plants; 90-day finding for a petition to delist the Squirrel Chimney cave shrimp. Federal Register 63(235):67618-67619.
- Williams K.E., D. Nicol, and A.F. Randazzo. 1977. The geology of the western part of Alachua County, Florida. Report of Investigations No. 85, Florida Bureau of Geology, Tallahassee, FL. 98 pp.

**U.S. FISH AND WILDLIFE SERVICE**  
**5-YEAR REVIEW of Squirrel Chimney Cave Shrimp (*Palaemonetes cummingsi*)**

Current Classification: Endangered

Recommendation resulting from the 5-Year Review: No change

Review Conducted By: Bill Brooks

**FIELD OFFICE APPROVAL:**

Lead Field Supervisor, Fish and Wildlife Service

Approve  Date 6/27/08

**REGIONAL OFFICE APPROVAL:**

Lead Regional Director, Fish and Wildlife Service

Approve  Date 6/28/08  
ACTING Assistant Regional Director  
Ecological Services

## APPENDIX A

### Summary of peer review for the 5-year review of the Squirrel Chimney Cave Shrimp (*Palaemonetes cummingi*)

- A. **Peer Review Method:** See B. below.
- B. **Peer Review Charge:** On April 18, 2008, the following letter and Guidance for Peer Reviewers of Five-Year Status Reviews were sent via e-mail to potential reviewers requesting comments on the 5-year review. Requests were sent to: Dr. Terry Doonan (Florida Fish and Wildlife Conservation Commission), Dr. Paul Moler (Florida Fish and Wildlife Conservation Commission, retired), Dr. Richard Franz (Florida Museum of Natural History), Mr. Thomas Morris (Karst Environmental Services), and Dr. Stephen J. Walsh (U.S. Geological Survey).

*We request your assistance in serving as a peer reviewer of the U.S. Fish and Wildlife Service (Service) 5-year status review of the endangered Squirrel Chimney cave shrimp (*Palaemonetes cummingi*). The 5-year review is required by section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 et seq.). A 5-year review is a periodic process conducted to ensure the listing classification of a species as threatened or endangered on the Federal List of Endangered and Threatened Wildlife and Plants is accurate. The initiation of the 5-year review for the Squirrel Chimney cave shrimp was announced in the Federal Register on April 26, 2007, and the public comment period closed on June 25, 2007. No public comments were received for this status review.*

*The enclosed draft of the status review has been prepared by the Service pursuant to the Act. In keeping with Service directives for maintaining a high level of scientific integrity in the official documents our agency produces, we are seeking your assistance as a peer reviewer for this draft. Guidance for peer reviewers is enclosed with this letter. If you are able to assist us, we request your comments be received in this office on or before May 21, 2008. Please send your comments to Bill Brooks at the address on this letter. You may fax your comments to (904)232-2404 or send comments by e-mail to [Billy\\_Brooks@fws.gov](mailto:Billy_Brooks@fws.gov).*

*We appreciate your assistance in helping to ensure our decisions continue to be based on the best available science. If you have any questions or need additional information, please contact Bill Brooks at (904) 232-2580 extension 120. Thank you for your assistance.*

*Sincerely yours,*

*David L. Hankla  
Field Supervisor*

*Enclosures*

***Guidance for Peer Reviewers of Five-Year Status Reviews***  
*U.S. Fish and Wildlife Service, North Florida Ecological Services Office*

*January 6, 2008*

*As a peer reviewer, you are asked to adhere to the following guidance to ensure your review complies with Service policy.*

*Peer reviewers should:*

- 1. Review all materials provided by the Service.*
- 2. Identify, review, and provide other relevant data apparently not used by the Service.*
- 3. Not provide recommendations on the Endangered Species Act (ESA) classification (e.g., endangered, threatened) of the species.*
- 4. Provide written comments on:*
  - Validity of any models, data, or analyses used or relied on in the review.*
  - Adequacy of the data (e.g., are the data sufficient to support the biological conclusions reached). If data are inadequate, identify additional data or studies that are needed to adequately justify biological conclusions.*
  - Oversights, omissions, and inconsistencies.*
  - Reasonableness of judgments made from the scientific evidence.*
  - Scientific uncertainties by ensuring that they are clearly identified and characterized, and that potential implications of uncertainties for the technical conclusions drawn are clear.*
  - Strengths and limitation of the overall product.*
- 5. Keep in mind the requirement that we must use the best available scientific data in determining the species' status. This does not mean we must have statistically significant data on population trends or data from all known populations.*

*All peer reviews and comments will be public documents, and portions may be incorporated verbatim into our final decision document with appropriate credit given to the author of the review.*

*Questions regarding this guidance, the peer review process, or other aspects of the Service's recovery planning process should be referred to Bill Brooks, U.S. Fish and Wildlife Service, at 904-232-2580 extension 120, email: [billy\\_brooks@fws.gov](mailto:billy_brooks@fws.gov).*

### **C. Summary of Peer Review Comments/Report**

A summary of peer review comments from the respondents is provided below. The complete set of comments is available at the Jacksonville Ecological Services Field Office, U.S. Fish and Wildlife Service,

The Service accepted all minor edits from peer reviewers. The Service also added a Future Action and two references that were recommended by peer reviewers. Overall, the reviewers agreed the draft document adequately characterized the known information on the status and threats to the SCCS. They all also agreed that there is a lack of new information and this adds to the uncertainty of the status of the SCCS. The following discussion is limited to the use of additional information that was provided.

*Dr. Terry Doonan, Florida Fish and Wildlife Conservation Commission:* Dr. Doonan commented that the review did a good job summarizing the known information and identifying points of uncertainty that exist. Dr. Doonan's main point was that the review was limited by the lack of data and specifically the absence of any recent data as a result of the fact that there have been no surveys since 1996.

*Dr. Paul Moler, Florida Fish and Wildlife Conservation Commission (retired):* Dr. Moler commented that no new information has been obtained since the last review conducted by the state of Florida in 1996. Dr. Moler provided several editorial comments and recommended adding two additional references.

*Dr. Stephen J. Walsh, U.S. Geological Survey:* Dr. Walsh provided several editorial comments. Dr. Walsh had very few comments but stated that it was as complete as possible and has addressed all the major points pertaining to this species. Dr. Walsh concurred with the Future Actions outlined in the review and specifically that additional surveys are warranted. Dr. Walsh recommended adding a new Future Action to consider establishing a captive breeding population as has been done recently with the Miami Cave crayfish (*Procambarus milleri*), one of Florida's rare troglobitic (i.e., cave dwelling) species.

**D. Response to Peer Review** – The Service agreed with all comments and suggestions provided by the peer reviewers. The draft five-year review was modified in accordance with the reviewers' suggestions.