THE CAVE CONSERVATIONIST

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The Cave Conservation and Management Section of the NSS

Feds: Listing of Salamander as Endangered Species Warranted But Higher Priorities Must Come First

Excerpts from lengthy *Federal Register* notice, Dec. 13, 2007 (pp. 71040-54):

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 12-month finding on a petition to list the Jollyville Plateau salamander (Eurycea tonkawae) as endangered and to designate critical habitat under the Endangered Species Act of 1973, as amended (Act). After review of all available scientific and commercial information, we find that listing the Jollyville Plateau salamander as threatened or endangered is warranted. Currently, however, listing of the Jollyville Plateau salamander is precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants. Upon publication of this 12-month petition finding, we will add Jollyville Plateau salamander to our candidate species list. We will develop a proposed rule to list this species as our priorities allow. We will make any determination on critical habitat during development of the proposed listing rule.

Taxonomy and Species Description

The Jollyville Plateau salamander was recently described as Eurycea tonkawae by Chippendale, et al. (2000, pp. 1-48), based on morphology and mitochondrial DNA tests. The Jollyville Plateau salamander is a neotenic (does not transform into a terrestrial form) member of the family Plethodontidae. As neotenic salamanders, they retain external gills and inhabit aquatic habitats (springs, spring-runs, and wet caves) throughout their lives (City of Austin (COA) 2001, p. 3). Water for the salamanders is provided by infiltration of surface water through the soil into the aquifer which discharges from springs as groundwater (Schram 1995, p. 91). Juvenile Jollyville Plateau salamanders are less than 1.5 inches (3.8 centimeters); adults are typically 1.5 to 2 inches (3.8-5 centimeters) long (COA 2001a, p. 5).

Those salamanders occurring in spring habitat have large, well-developed eyes; wide, yellowish heads; blunt, rounded snouts; dark greenish-brown bodies; and bright yellowish-orange tails (Chippendale, et al. 2000, pp. 33-34). Some cave forms of Jollyville Plateau salamanders exhibit cave-associated morphologies, such as eye reduction, flattening of the head, and dullness or loss of color (Chippendale, et al. 2000, p. 37). Genetic analysis suggests that Jollyville Plateau salamanders occurring in caves may actually be separate species from the surface-dwelling forms, but more study is needed to confirm this, because sample sizes from the caves were small (Chippendale, et al. 2000, pp. 36-37). For the purposes of this finding, we are considering all of the Jollyville Plateau salamanders described in Chippendale, et al. (2000, pp. 32-37) as one species.

Distribution

The Jollyville Plateau salamander occurs in the Jollyville Plateau and Brushy Creek areas of the Edwards Plateau in Travis and Williamson Counties, Texas (Chippendale, et al. 2000, pp. 35-36; Bowles, et al. 2006, p. 112; Sweet 1982, p. 433). Upon classification as a species, Jollyville Plateau salamanders were known from Brushy Creek and, within the Jollyville Plateau, from Bull Creek, Cypress Creek, Long Hollow Creek, Shoal Creek, and Walnut Creek drainages (Chippendale, et al. 2000, p. 36).

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Cave Conservation and Management Section of the National Speleological Society

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Study: Hybridization Partially Restores Vision in Cave Fish

NYU press release, Jan. 7, 2008:

Hybridizing blind cave fish from different cave populations can partially restore the vision of their offspring, biologists at New York University have found. The study suggests that genetic engineering can override, at least in part, half a million years of evolutionary change in one generation.

"Evolution has many ways to accomplish the same end result, which in the case of cave fish is blindness," said NYU Biology Professor Richard Borowsky, the study's lead author. "For this reason, the genes that are mutated in one population that lead to blindness are different in other, independently evolved populations. Thus, when you cross them, the genetic deficiencies in one lineage are compensated for by strengths in the other, and vice-versa."

The research, supported by grants from the National Science Foundation and the National Institutes of Health, appears in the most recent issue of the journal *Current Biology*.

The study examined four populations of blind cave fish, *Astyanax mexicanus*, which inhabit different caves in northeast Mexico. Blind for millennia, these fish evolved from eyed, surface fish. The researchers' genetic analysis showed that the evolutionary impairment of eye development, as well as the loss of pigmentation and other cave-related changes, resulted from mutations at multiple gene sites.

In order to gauge how genetic make-up could bring about the restoration of vision, the researchers created hybrids of the different cave fish populations. Among these various hybrids, they found that nearly 40 percent in some hybrid crosses could see.

"These fish are descended from ancestors that have been isolated in the dark for nearly one million years and most likely haven't had the capacity for vision for at least half that time," said Borowsky. "But by recombining the right genes through hybridization, you can partially restore vision. Not only are the structures of the eye restored to the point where they regain function, but all the connections to the brain for proper processing of information not used for that enormous length of time are restored."

Borowsky added that the findings could pave the way for greater understanding of human eyes.

"These genes that have had their function altered by mutation are the same genes that normally play important roles in the development and maintenance of the eye in humans as well as in fishes," he explained. "The cave fish system gives us an experimental model for learning about human eye development and diseases."

Reward for Information About Bat Killers

Excerpts from a posting at the BatCon website:

Vandals intentionally killed more than 100 endangered Indiana myotis (*Myotis sodalis*) at a state-owned cave in Kentucky. State and federal wildlife authorities are investigating and a reward fund launched by Bat Conservation International is offering at least $2,850 for information leading to the arrest and conviction of those involved.

The Kentucky Department of Fish & Wildlife Resources reports that vandals entered a cave at Carter Caves State Resort Park and attacked a hibernating colony of Indiana myotis with rocks on two occasions in late October [2007]. The specific cave involved in these incidents is not being identified to protect the remaining bats.

Anyone with information about the bat deaths should contact Special Agent Bob Snow of the U.S. Fish and Wildlife Service art (502) 582-5859.To contribute to the reward fund, please contact Traci.Hemberger@ky.gov. [Ed.: Also check out http://www.batreward.com/]

Delay on the Road to Endangered Species Listing (continued from page 1)

Since it was described, the Jollyville Plateau salamander has been documented within the Lake Creek watershed (COA 2006, p. 1).

Cave dwelling Jollyville Plateau salamanders are known from 1 cave in the Cypress Creek drainage and 12 caves in the Buttercup Creek cave system in the Brushy Creek drainage (Chippendale, et al. 2000, p. 49; Russell 1993, p. 21; Service 1999, p. 6; HNTB 2005, p. 60). While the entrances to these caves are located within particular watersheds, the subsurface waters could move in a different direction from the surface waters. For example, dyes injected into three of the Buttercup Creek caves later surfaced at one spring (proving subsurface connection of these caves) to the south in the Long Hollow Creek drainage (Hauwert and Warton 1997, pp. 11, 13), rather than to the east where Brushy Creek flows. No further subsurface flow studies have been completed in caves inhabited by Jollyville Plateau salamanders.

Habitat

The Jollyville Plateau salamander's spring-fed tributary habitat is typically characterized by a depth of less than 1 foot (0.3 meters) of cool, well oxygenated water (COA 2001a, p. 128; Bowles, et al. 2006, p. 118) supplied by the underlying Edwards Aquifer (Cole, et al. 1995, p. 33). Jollyville Plateau salamanders are typically found near springs or seep outflows, and are thought to require constant temperatures (Sweet 1982, pp. 433-434; Bowles, et al. 2006, p. 117). Salamander densities are higher in pools and riffles and in areas with rubble, cobble, or boulder substrates rather than on solid bedrock (COA 2001a, p. 128; Bowles, et al. 2006, pp. 114-116).

Surface-dwelling Jollyville Plateau salamanders also occur in subsurface habitat within the underground aquifer (COA 2001a, p. 65; Bowles, et al. 2006, p. 118). While no one has physically observed these salamanders in the aquifer, there are observations that support this behavior. For example, City of Austin biologists have observed Jollyville Plateau salamanders at spring sites where the springs and associated spring runs had previously ceased flowing, particularly during the 2006 drought, and the surrounding area dried (COA 2006, pp. 5-6). Additionally, City of Austin biologists have noted low counts for small juveniles followed by high counts for large (presumably older) juveniles at several monitoring sites, indicating small juveniles spent time within the subsurface habitat (COA 2001a, pp. 65-66).

Summary of Factors Affecting the Species

Section 4 of the Act (16 U.S.C. 1533) and the implementing regulations at 50 CFR 424 set forth procedures for adding species to the Federal List of Endangered and Threatened Wildlife. In making this finding, we summarize below information regarding the status and threats to this species in relation to the five factors in section 4(a)(1) of the Act. In making our 12-month finding, we considered all scientific and commercial information in our files, including information received during the comment period that ended April 16, 2006 (72 FR 6699).

This status review found threats to the Jollyville Plateau salamander related to Factors A, C, and D. The primary threat to the species is from habitat modification (Factor A) in the form of declining water quality due to the effects of current and future urban development. Other less significant threats to the species' habitat include declining water quantity in groundwater aquifers that support spring flows, direct habitat alterations from human disturbance, and habitat modification from nonnative feral pig activity. Some threats exist from predation by fish and infections of chytrid fungus on salamander appendages (Factor C), but neither of these

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Endangered Species Listing Delay (continued from page 4)

threats appears to result in a substantial negative response by the species overall. In addition, State regulations and local ordinances intended to protect water quality integrity are not currently adequate to prevent habitat degradation in the aquatic environments occupied by the salamander (Factor D).

Finding

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by this species. We reviewed the petition, available published and unpublished scientific and commercial information, and information submitted to us during the public comment period following the publication of our 90-day petition finding. This 12-month finding reflects and incorporates information we received during the public comment period, or obtained through consultation, literature research, and field visits, and responds to significant issues identified. We also consulted with recognized Jollyville Plateau salamander experts. On the basis of this review, we find that the listing of the Jollyville Plateau salamander is warranted, due to threats associated with habitat modification from urban development causing water quality degradation, and the inadequacy of existing regulatory mechanisms. However, listing of the Jollyville Plateau salamander is precluded at this time by pending proposals for other species with higher listing priorities and actions.

The threats to the Jollyville Plateau salamander support a finding that the species warrants listing as threatened or endangered throughout its range. The primary factor leading to our finding are threats described above under Factor A. The source of the habitat threats are from substantial levels of urban development that has occurred on a majority of watersheds draining to salamander habitats. For example 55 percent of the land draining to salamander habitat is already developed. This urbanization produces pollutants that have caused demonstrable declines in the water quality where salamanders live.

Preclusion and Expeditious Progress

Preclusion is a function of the listing priority of a species in relation to the resources that are available and competing demands for those resources. Thus, in any given fiscal year (FY), multiple factors dictate whether it will be possible to undertake work on a proposed listing regulation or whether promulgation of such a proposal is warranted but precluded by higher-priority listing actions.

We cannot spend more than is appropriated for the Listing Program without violating the Anti-Deficiency Act (see 31 U.S.C. 1341(a)(1)(A)). In addition, in FY 1998 and for each fiscal year since then, Congress has placed a statutory cap on funds which may be expended for the Listing Program, equal to the amount expressly appropriated for that purpose in that fiscal year. * * * Congress also put a critical habitat subcap in place in FY 2002 and has retained it each subsequent year to ensure that some funds are available for other work in the Listing Program. * * * In FY 2002 and each year until FY 2006, the Service has had to use virtually the entire critical habitat subcap to address court-mandated designations of critical habitat, and consequently none of the critica l habitat subcap funds have been available for other listing activities.

Thus, through the listing cap, the critical habitat subcap, and the amount of funds needed to address court-mandated critical habitat designations, Congress and the courts have in effect determined the amount of money available for other listing activities. Therefore, the funds in the listing cap, other than those needed to address court-mandated critical habitat for already listed species, set the limits on our determinations of preclusion and expeditious progress.

Short Scoops . . .

The Virginia State Corporation Commission (SCC) has approved a $60 million wind power project on the condition that the developer takes steps to protect bats and birds. According to the Dec. 21, 2007 *Richmond Times-Dispatch*, the developer, Highland New Wind, plans to build nineteen windmills about 150 miles northwest of Richmond. The SCC's order will require Highland to spend up to $150,000 for the project's first three years, and up to $100,000 or more each subsequent year, to monitor the windmills' effects on bats and birds. The developer also must spend $50,000 per year, and perhaps more, to minimize impacts on flying creatures, such as by shutting down the windmills during periods of peak bat or bird activity.

The famed cave paintings of the Lascaux caverns in France have been under attack by fungus. On January 2, the Canadian *CBC News* wrote that archaeological experts had begun applying a fungicide to stop the spread of black and gray mold in the caverns. The French government has closed the caves to everyone, including scientists, for three months. The government also will replace the ventilation system, thought to be a possible cause of the mold problem. A white fungus infested the caves in 2001 and 2002, but the government succeeded in controlling it.

According to a January 8 press release by the University of Bristol, new data reveal that the cave bear, rather than being a gentle giant, might have been as omnivorous as modern bears. For the past few decades, studies of the Pleistocene cave bears had concluded that the bears were largely vegetarian. These studies had looked at the cave bears' bones and teeth, and especially the nitrogen isotopes in their bone protein. New research at the Oase cave in Romania, a significant cave bear hibernation site, has yielded nitrogen isotope and other data showing that some cave bears ate both plants and animals, and competed for food with humans, lions, and wolves.

On January 17, *SFGate.com* reported that California has an estimated 47,000 abandoned mines, but no one knows the exact number. In the last two years, four people have died in these mines – two from falls, and two from asphyxiation due to fumes from a water pump they were using. The state has efforts underway to seal off access to most of the mines. In January, state workers installed a metal grate to keep people from falling into the Tesla mine while allowing bats the freedom to come and go.

Jewel Cave National Monument issued a press release on January 24, inviting members of the public to celebrate the Monument's 100th anniversary. On February 7, 1908, President Theodore Roosevelt established Jewel Cave National Monument as part of the National Park System under the authority of the 1906 Antiquities Act. The Monument designation was designed to protect what at the time was thought to be a small cave. One hundred years later, exploration has revealed Jewel Cave to be the second longest cave the world, with a current length of over 141 miles.

A new study suggests that heavy downpours of rain can trigger earthquakes in karst landscapes by increasing pressure within the underlying rock. The February 25 *New Scientist* wrote that in recent years, scientists had documented small earthquakes – too low in magnitude to be felt by humans – occurring after heavy rainfalls in certain European countries. The study by Steve Miller, a geologist at the University of Bonn, Germany, found that the amount of water needed to trigger tremors was greater than previously thought. Miller's study reanalyzed data from a 2002 event in Germany, where two clusters of tremors, all below 2.4 on the Richter scale, followed a rainfall of 100 liters of water per square meter of land. Miller claims that in karst landscapes, water pours into channels and caves, and the pressure of rain builds up inside the "pipes," creating an effect akin to that of a hydraulic jack.

The Cave Conservationist

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