United States Department of the Interior

FISH AND WILDLIFE SERVICE

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Witness Report: Pahrump Poolfish and Shoshone Ponds

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Taxonomy and Historic Distribution

The Pahrump poolfish (*Empetrichthys latos*, family Goodeidae) was discovered by Gilbert in 1893, but was identified as the Ash Meadows killifish (*E. merriami*). Miller (1948) later described the Pahrump poolfish as the Pahrump killifish (*E. l. latos*), which historically occupied an isolated spring (Manse Spring) on private property known as Manse Ranch in the Pahrump Valley of southern Nye County, Nevada. When describing the Pahump killifish (*E. l. latos*), Miller also identified two other subspecies occurring in isolated springs in Nye County, the Pahrump Ranch killifish (*E. l. pahrump*) inhabiting Pahrump Spring, and the Raycraft Ranch killifish (*E. l. concavus*) occurring in Raycraft Spring. Both of these subspecies were extirpated in the late 1950s as a result of mechanical habitat alteration and the desiccation of the springs from groundwater pumping, which was potentially exacerbated by introduced carp (*Cyprinus carpo*) (Miller 1948; Deacon and Williams 1984; Miller et al. 1989).

The only other recent (not existing only as a fossil) member of this genus, the Ash Meadows killifish (*E. merriami*), was documented by Gilbert (1893) and historically occupied numerous springs in nearby Ash Meadows, Nye County, Nevada. This species was last seen in 1948 and is believed to have gone extinct in the early 1950s, likely as a result of habitat alteration (including pumping of the springs), and competition with and predation by non-native species (Deacon and Nappe 1968; Soltz and Naiman 1978; Miller et al. 1989).

History

In 1975, the Pahrump poolfish were extirpated from their only known natural habitat, Manse Spring. This was primarily caused by the desiccation of the spring from groundwater pumping

for agricultural development. Competition and/or predation from nonnative goldfish (*Carassius auratus*) was also affecting the poolfish prior to the drying (Deacon et al. 1964; James Deacon, University of Nevada, Las Vegas, in litt. 1970; J. Deacon, pers.com. 2006). Anticipating the loss of Manse Spring population (Minckley and Deacon 1968), personnel from Federal and State agencies and academic institutions transplanted poolfish to several locations in Nevada, including: Los Latos Pool along the Colorado River, near Lake Mohave in June 1970 (J. Deacon, in litt. 1970), Corn Creek Springs on the Desert National Wildlife Refuge, Clark County in August 1971 (Dale Lockard, Service, in litt. 1971); and Shoshone Ponds Natural Area, White Pine County, a Bureau of Land Management (BLM) native fish sanctuary in March 1972 (D. Lockard, in litt. 1972; Mark Barber, BLM, in litt. 1987).

Shoshone ponds is a series of three small dug out artesian well-fed pools, one large spring-fed stock pool, and one artesian well outflow in Pinyon/Juniper habitat approximately 60 kilometers southeast of Ely, White Pine County, Nevada. The three small pools are fenced to exclude livestock, two of which contain poolfish while the third contains relict dace (*Relictus solitarius*). The stockpond and spring outflows also contain poolfish, at least on a seasonal basis. These ponds were selected in 1969 by the BLM due to their remote nature, ability for vehicular access, and water quality, and constructed by 1972, which included drilling of wells to supply the pools with warm water and placing tiles to prevent infiltration of cool water from the immediate subsurface.

The poolfish at Shoshone Ponds Natural Area were extirpated due to vandalism in 1974 when the water source was intentionally turned off. Modifications were made to the ponds' water system to try to prevent future vandalism and the poolfish were replaced in August 1976 with fish from Corn Creek Springs (after a 1 year stay at a University of Nevada, Las Vegas holding facility) (Leroy McLelland, Nevada Division of Fish and Game (NDFG), in litt. 1976; Logan 1977; M. Barber, in litt. 1987).

Listing Actions

On March 11, 1967, the Pahrump poolfish (as the Pahrump killifish) was listed as endangered under the Endangered Species Preservation Act of 1966. The species retained its endangered status with the passage of the Endangered Species Act of 1973. The Recovery Plan for this

species was completed in 1980. On September 22, 1993, the U.S. Fish and Wildlife Service proposed to reclassify the Pahrump poolfish from endangered to threatened status (58 FR 49279). On April 2, 2004, the Service published a withdrawal of this proposal due to the loss of the Corn Creek population (69 FR 17383-17386).

Habitat Requirements

Prior to its alteration, Manse Spring was a warm, alkaline spring and outflow stream that maintained a relatively constant temperature of 75.2° Fahrenheit (F) (24° Celsius (C)), with daily and annual fluctuations varying from only 74° to 77° F (23.3° to 25.0° C) (Miller 1948; Doug Selby, Service, in litt. 1976; Service 1980; Sigler and Sigler 1987). Miller (1948) described Manse Spring as: "about 50 feet wide at the head, 10 feet wide at the outlet, and 60 feet long. It is 1 to 6 feet deep and has a silt bottom. The water is crystal clear and chalky blue in a deep hole near the center of the spring...vegetation noted was thick water cress (*Nasturtium* sp.), *Chara*, green algae, and a fine-leaved *Potamogeton*. The shore is a low bank, bordered by cottonwood (*Populus* sp.) and willow, which will shade the pool. The current is moderate in the pool and swift in the outlet. About 50 yards above is a much smaller spring which flows into the head of the [main] pool... [the smaller spring] contained no fish life."

Despite the fact that the native habitat of the poolfish remained nearly constant at 75.2° F (24° C), the transplanted populations have demonstrated the ability to withstand a wider range of water temperatures. At Corn Creek Springs, poolfish survived in waters covered by ice at 39.2° F (4° C), conditions unlike those of Manse Spring (Selby 1977). At another site, the species withstood temperatures ranging from below 50.9° to 77° F (10.5° to 25° C) for 5 years (Selby 1977). A laboratory study by Selby (1977) identified temperature limits for the poolfish that varied from below 34.7° to 104° F (1.5 to 40° C).

Diet

Poolfish are opportunistic omnivores, eating a wide variety of available animal and plant material (Deacon et al. 1980; Nevada Division of Wildlife (NDOW) 1999; Hobbs et al. 2003, in prep.). Deacon et al. (1980) studied the diet of the poolfish at Manse Spring from 1961 to 1963, and found that debris (including sand) comprised 66.3 percent, insects, snails and other animal

items 31.5 percent, and plants 2.2 percent of the mean volume of their diet. A dietary study of transplanted populations in the early 1990s yielded similar results (NDOW 1999; Hobbs et al. 2003, in prep.): (1) at Corn Creek Springs, insects and other animal items represented 42.5 percent, debris 29.7 percent, and plant and algae parts 28.8 percent of the mean volume; (2) at Shoshone Ponds Natural Area, debris contributed 55.8 percent, plant and algae parts 28.8 percent, and animal parts 15.3 percent of the mean volume; and (3) at Spring Mountain Ranch State Park, debris constituted 56.5 percent, plant and algae parts 30.7 percent, and animal items 12.8 percent of the mean volume of their diet. Debris, such as sand or sticks, is generally coated with epiphytic bacteria or diatoms, providing nutrients to the fish. Deacon et al. (1980) suggested that larger zooplankton is an essential food source for the poolfish. Zooplankton are preyed on by the poolfish in open water, after the zooplankton leave the protection of algal mats. At Manse Spring, poolfish utilized all portions of the pool, with larger adults in the open, deeper waters and smaller adults and juveniles in shallow, vegetated areas (Deacon et al. 1980; Service 1980). Given the partitioning of habitat by age class, it is likely that different food resources are available to and consumed by adults and juveniles. Given this partitioning, loss or diminishment of specific habitat types may impact one or more age classes of the species, which could cascade at a population level and cause negative demographic changes.

Reproduction

Spawning at Manse Ranch occurred from January to July, with a peak in April of mature eggs in females 1.8 to 1.9 in (40 to 49 mm) in total length (D. Selby, in litt. 1976; Baugh et al. 1987). Development of poolfish eggs, likely deposited on aquatic vegetation, occurred over a period of 2 to 3 weeks (D. Selby, in litt. 1976). Transplanted populations have shown a delayed breeding period (late May to early June), possibly due to cooler water temperatures. One laboratory study of Pahrump poolfish reported that: (1) females measuring 1.8 in (46 mm) or more in length produced more eggs than smaller females; (2) the average number of eggs laid per female was 14, varying from 0 to 28; (3) adult poolfish did not protect the eggs or fry; (4) eggs hatched in 7 to 10 days at 75.2° F (24° C); (5) fry measured an average length of 0.24 in (6.2 mm) and within 112 days measured an average length of 0.83 in (21.1 mm); and (6) female juveniles grew faster than male juveniles (Baugh et al. 1987).

Recovery Implementation - Refugia

The Pahrump Killifish Recovery Plan (Recovery Plan) was published March 17, 1980 (Service 1980), which recommended the establishment of at least three populations of poolfish as a primary objective for the species' recovery efforts, preferably including a population at Manse Spring. The basis for this recommendation is that the species is less likely to be at risk simultaneously at three or more separate sites than at a single location. The Recovery Plan also stated that the species could be considered for reclassification to threatened status when each of three populations contained at least 500 adults for 3 years, and each habitat was free of immediate and potential threats. Poolfish could be considered for delisting if the three populations continued to exceed 500 individuals for an additional 3 years after reclassification.

Once established, all three transplanted populations of poolfish reproduced successfully and thrived in their new habitats, and data indicated that these transplanted populations had maintained a minimum of 500 individuals between 1986 and 1993 (NDOW 1988a, 1988b; Sjoberg 1989; Heinrich 1991a, 1991b, 1993). With the three populations stable and secure on Federal and State lands, the Service published a proposed rule to downlist the poolfish from endangered to threatened status on September 22, 1993 (58 FR 49279).

Two factors delayed this proposed rule: the Nevada Division of State Parks proposed renovation of the Spring Mountains State Park reservoir, and the loss of the population at Corn Creek. Modifications to the reservoir in 1995 were completed without adversely affecting the poolfish population. Based on information from annual surveys utilizing mark and recapture methods, as well as informal visual surveys, the population remains stable at the State Park, and is currently the largest population of poolfish, estimated at approximately 14,400 individuals in 2005 (NDOW, in litt. 1997, 2001b, 2001c, 2002a, 2002b; NDOW 1999, 2000, 2001, 2005a; Brian Hobbs, NDOW, pers. comm. 2002; Brian Hobbs, Nevada Department of Wildlife, pers. comm. 2003).

In 1998, the population of poolfish at Corn Creek Springs was lost to illegally introduced nonnative crayfish (NDOW 1999). A new, isolated refugium for the poolfish was built at Corn Creek Springs in 2002. Thirty adult poolfish from the State Park population were introduced into the refugium in June 2003 with visual surveys in July 2003 revealing eight young in the

refugium (NDOW, in litt. 2003a). Another 30 adult poolfish were added to the refugium from the State Park population in August 2003. Surveys consistently yielded 142 and 186 fish during 2004 and 2005 (NDOW, 2005b), and observations of many larval fish during June of 2006 suggest that there is a large rate of reproduction.

The third poolfish population at the Shoshone Ponds Natural Area historically remained stable since the 1980s with only natural population fluctuations affecting its status (NDOW, in litt. 2003b). However, surveys in 2003 indicated a significant decrease in the population to less than 1,000 individuals. The cause for the decline is unknown; however it was likely that the decline stemmed from degradation of the pond banks and sheet flows allowing for the dispersal of fish. This population increased, with surveys in July of 2004 estimating 3,374 individuals (95 percent confidence interval of 3,048 – 6,948 individuals) (NDOW, 2004). During 2005 surveys suggested that the population had declined to 2,760 individuals (95 percent confidence interval of 2,059 to 4,162 individuals)(NDOW, 2005c).

Threats

The most critical threat to the poolfish has historically been the destruction of habitat through groundwater withdrawals, as demonstrated by the desiccation of the only native habitat of the species. Adequate, reliable water sources are necessary to ensure that currently occupied ponds provide suitable habitat for the poolfish. Thus, long-term declines in spring flows due to groundwater pumping from areas surrounding existing poolfish habitat remains a potential threat to all the populations. Threats to water sources necessary for poolfish habitat have been minimized to the extent possible by the managing Federal and State agencies. For example, the US Fish and Wildlife Service has vested water rights at Corn Creek Springs that will help ensure the water supply. In addition, NDOW and Nevada Division of State Parks hold State appropriative water rights to the springs supporting the habitats at Shoshone Ponds Natural Area and the State Park, respectively.

Vandalism was historically a significant problem at Shoshone Ponds Natural Area. The initial introduction of poolfish to those ponds from Manse Spring was lost to vandalism in 1974 when the water source was intentionally turned off (M. Barber, in litt. 1987). Vandalism continues to be a minor threat to the poolfish in this location, given that public access to the site is not

monitored on a daily basis, but not to the extent that they face extirpation as there are several ponds (B. Hobbs, pers. comm. 2002), one which is springfed and difficult to divert.

The low numbers of poolfish in its isolated habitats naturally make it vulnerable to risks associated with small, restricted populations. The elements of risk that are amplified in very small populations or restricted habitats include: (1) various demographic effects (e.g., skewed sex ratios, high death rates or low birth rates); (2) the effects of genetic drift (random fluctuations in gene frequencies) and inbreeding (mating among close relatives); (3) natural catastrophes (floods, fires, droughts, etc.) at unforeseen intervals; and (4) deterioration in environmental quality (Shaffer 1987). Parasites also occur, and an undescribed blood nematode occurs in the Shoshone pond fish (Heckman, 1987). However, the poolfish were believed to have been isolated for over 20,000 years in the Pahrump Valley (Soltz and Naiman 1978), and this natural evolutionary factor is currently an insignificant threat when compared with the anthropogenic modification of its natural habitat, introductions of nonnative species in its transplanted habitats, and reduced and limited water supplies.

Importance of Shoshone Ponds

Once it was evident that Manse Spring was drying due to loss of groundwater, several sites were developed into refuges for the poolfish. These sites are subject to several risk factors, including structural failure, introduction of non-native species, and/or loss of resources such as water. Given potential threats, the Shoshone ponds are a critical component of the program to prevent extinction of the Pahrump poolfish since it is a proven site that holds a self-sustaining population. The other two sites, the Corn Creek location and Spring Mountain Ranch, are less reliable since they are wholly artificial and subject to failure (Corn Creek is essentially an artificial aquarium and Spring Mountain Ranch is in a floodplain and subject to dam failure). All other sites where poolfish have been placed, such as Latos Pool and the School Springs Refugia at the Amargosa Pupfish Station (now the Ash Meadows National Wildlife Refuge), have failed. It is also unclear if the Corn Creek population is a long-term self-sustaining population, as it has only recently been re-established and is still early in its successional process. The Shoshone ponds are the only refuges that have maintained thriving populations of poolfish since their inception and have a relatively low risk of failure from the aforementioned risk factors.

The total elimination of many native fish populations within springs throughout Nevada, including the previous population of poolfish at Corn Creek, underscores the importance of maintaining several predator-free populations. Given the remote nature of Shoshone ponds, and their relative small size, the risk of an introduction of an exotic species (i.e. game fish, mosquito control, or aquaria fish) is lessened. Spring Mountain Ranch is adjacent to a large urban population which increases the probability of an unwanted introduction.

Decreased habitat, either from encroachment of sediment or vegetation, as well as diminished spring flow, all increase the probability that impacts to the springs (including detriment of an age-specific resource as mentioned earlier) would cause greater harm to the poolfish. If a decrease in habitat area occurs, the threat to the population within Shoshone ponds is increased. If the Shoshone population is lost, and an unpredicted event happens at either one or both of the other refuges, such as disease or mechanical failure, there is a significantly greater probability of extinction. It is unclear how changes in water delivery and decreased spring flow would affect this species. It is not known if Shoshone ponds could maintain a sustainable population over the long term if flow is reduced; however, if the population mimics the Manse Spring population, it cannot. The BLM is taking positive steps to improve habitat at Shoshone Ponds for the poolfish by both increasing protection and integrating poolfish management with their Range Management program; however these actions do not consider potential decreases in springflow.

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