

Native Killifishes:
Cyprinodon from New Mexico

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by

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New Mexico has two species of pupfishes. *Cyprinodon pecosensis* is found in the Pecos River drainage of southeastern New Mexico and West Texas. *Cyprinodon tularosa* is found in the Tularosa Basin in south central New Mexico. A third species, found in irrigation canals along the state's Mexican border, near Columbus, was extirpated before it could be identified. Related specimens were collected in Chihuahua, México, and are in the California Academy of Sciences' fish collection.

*Cyprinodon pecosensis* (front cover, top two fish) lives in a variety of habitats along the Pecos River—salt springs, alkaline sinkholes, and desert streams. It is abundant in the backwaters, side pools, and gypsum sinkholes that are devoid of predatory fish. *C. pecosensis* occurs from Bitter Lakes Wildlife Refuge and Bottomless Lakes State Park near Roswell, south to the Texas border. A pure population of *C. pecosensis* can be found in Salt Creek, in Reeves County, Texas, and another in a gravel pit near Grandfalls, Texas. The range of *C. pecosensis* was more extensive in the recent past. A genetically distinct form of *C. pecosensis*—now extinct—occurred in Pupfish Spring near Laguna de la Sal, New Mexico, which is a closed basin. That population was estimated to have been isolated from the Pecos River for hundreds of thousands of years.

As with other pupfish, *C. pecosensis* exhibits a wide range of color patterns between males and females, as well as between breeding and nonbreeding males. The latter are gray-blue with iridescent blue on the back and

nape. The belly and cheeks are whitish, with the dorsal and anal fins black. The caudal fins are whitish with a black margin, while the pectorals are a pale yellow.

Females, juveniles, and non-breeding males are olivaceous on the back and sides, with a white belly. There are seven to nine dark bars on the sides that expand into blotches. Females have a dark crescent at the base of the caudal fin and a dark ocellus at the posterior base of the dorsal fin. Non-breeding males lose the ocellus but retain the female coloration when kept with larger males.

Depending on population densities, *C. pecosensis* exhibits two behavior patterns when spawning. When populations are high, males stake out and defend territories against all intruders, particularly rival males. Courtships are brief. In sparse populations, a dominant hierarchy is established, with longer pair bonding. Territories are established over rocky outcrops, scattered rocks, and mats of algae. Males mate with several females, with the most colorful males having a higher number of spawnings, compared with more drab individuals. As with most pupfish species, the fry grow rapidly. *C. pecosensis* reach a length of about one and half inches.

*C. pecosensis* is an omnivore which feeds on detritus, including diatoms and foraminifera. It is reported that the different sexes have different diets, perhaps because the males' territoriality limits their diet.

Threats to *C. pecosensis* include man's alteration of the environment due to dewatering, introduction of exotic species, and hybridization with the sheepshead topminnow,

*C. variegatus*. Hybrids between the two species occur in the Pecos River and Red Bluff Reservoir on the Texas Border. The hybrids are not illegal to keep, but have little value other than for curiosity's sake. Most Texas populations have been contaminated by *C. variegatus*.

*C. tularosa* (front cover, bottom two fish) occurs in several isolated springs and streams in the Tularosa Basin. This is a closed basin with no outside drainage. White Sands National Monument is the largest gypsum desert in the world. Winters are mild and summers are hot. The basin is bordered on the east by the Sacramento Mountains, and to the south and west by the San Andreas Mountains. All of the springs and streams this fish inhabits are located either on the White Sands Missile Range of the U.S. Army, or on Holloman Airforce base. Access to the populations is limited and the populations currently are stable.

Among the areas where this fish is found are Malpais Spring in Otero Count, Mound Spring in Lincoln county, as well as Salt Creek, Lost River, and Malone Draw in Sierra County. The Lost River and Malone Draw populations of *C. tularosa* are genetically similar to the Salt Creek population. It is assumed they are transplants from Salt Creek. Lost River flows through the White Sands National Monument and Holloman Airforce Base. The population found in Mound Spring is the most genetically dissimilar from the other populations of *C. tularosa*.

The springs and streams of the Tularosa Basin are highly alkaline and saline. The springs' salinities are fairly stable at around 4,000 mg/l. Both Salt Creek and Lost River have the highest fluctuations in salinity. Salt Creek varies between 2,000 mg/l to 27,000 mg/l. Lost River values are higher yet, starting at around 9,000 mg/l to a whopping 100,000 plus mg/l. The lowest salinity values occur during the summer monsoon season, which is the peak breeding season for *C. tularosa*.

This species is one of the handsomest pupfish I've seen. Breeding males are grayish-blue dorsally, with iridescent blue on the nape. The throat and chin are blue to yellow and there is an overall darkening of the body. Smaller males will show faint posterior bars. The abdomen is white to orange and the flanks also show a yellow cast. The dorsal and anal fins are yellow and orange with a dusky area close to the body. The paired

fins are yellow to orange. The caudal fin is light yellow with a black marginal band. Non-breeding males lack the black band in the tail. Non-breeding males lack the black tail band and non-breeding males, females, and juveniles are brownish to olivaceous, turning whitish to blue-gray on the sides. The sides also have several bars and blotches, with the fins being pale yellow, except for the dorsal and anal fins, which are whitish. The dorsal fin has a black ocellus on its posterior edge. The dorsal and anal fins are larger in the males than in the females.

Spawning begins around mid-April, peaks in July, and tapers off by mid-September. Males set up territories in shallow water. Females lay between 12 and 15 eggs during each spawning. Most females produce over 1,000 eggs in their lifetimes. Eggs are deposited in the substrate and in algae mats. The fry grow rapidly, with most being half grown in about 12 weeks. Full size of around one-and-a-half inches is reached in the first year. *C. tularosa* can live for up to five years, with three years being the average. As with other pupfishes, *C. tularosa* is omnivorous, feeding on insect larvae and other invertebrates, algae, and juvenile *C. tularosa*. Mosquito larvae are the mainstays of their diet.

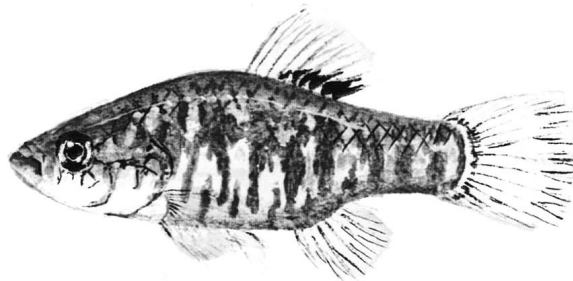
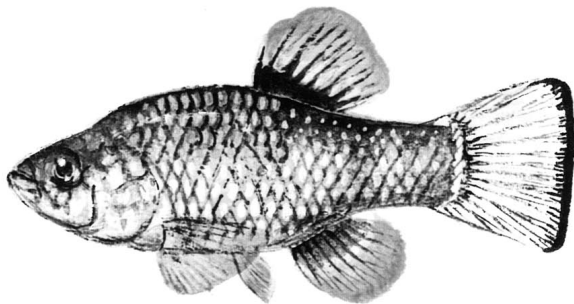
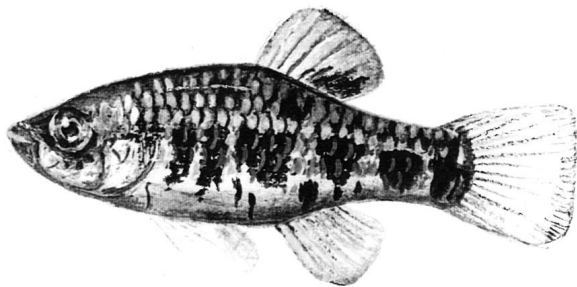
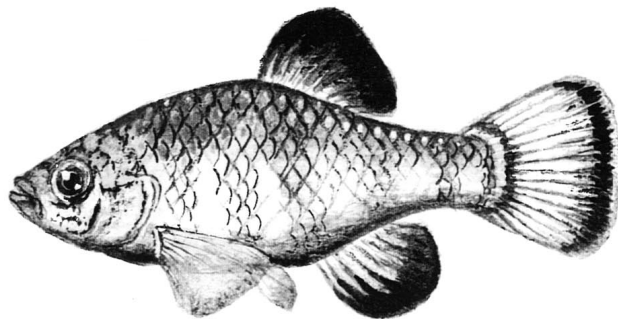
Both *C. pecosensis* and *C. tularosa* are classified as State endangered, group II, in New Mexico. The fish's habitat is stable, due to its location on Federal lands. The primary threat to its habitat comes from human activity, such as lowering the water table and the introduction of exotic species. The populations in Malpais and Mound springs are especially vulnerable, due to their small size. The habitats of *C. pecosensis* are more accessible to people and are therefore more vulnerable to alteration.

*C. pecosensis* can be observed in the wild at Bitter Lakes National Monument and Bottomless Lakes State Park, both located around ten miles east of Roswell, New Mexico. Access to *C. tularosa* habitats is by special permission of the U.S. Army.

## References

- Sublette, Hatch and Sublette. 1990. *The Fishes of New Mexico*. University of New Mexico Press.
- Propst, D. L. White Sands Pupfish Conservation Plan.
- Turner, P. R. Final Report on Contract Number DAA D07-84-M-2242.

Top two fish: *Cyprinodon pecosensis*, male and female. Bottom two fish: *Cyprinodon tularosa*, male and female (Lost River location). Painted by Ken McKeighen. See his article on page 13.



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