

## COLORADO PIKEMINNOW WITH A CHANNEL CATFISH LODGED IN ITS THROAT IN THE SAN JUAN RIVER, UTAH

DALE W. RYDEN\* AND JUDE R. SMITH

*United States Fish and Wildlife Service, Colorado River Fishery Project, Grand Junction, CO 81506 (DWR)**United States Fish and Wildlife Service, New Mexico Ecological Services Field Office, Albuquerque, NM 87113 (JRS)*

\*Correspondent: dale.ryden@fus.gov

Colorado pikeminnow (*Ptychocheilus lucius*) is a large cyprinid endemic to the Colorado River basin (Miller, 1961). It formerly was distributed widely in the mainstem Colorado River and its larger tributaries, including the San Juan River (Koster, 1960), from Colorado to the Gulf of Mexico (e.g., Miller, 1961). Dams, diversions, and other habitat modifications were the main factor in the extirpation of this species from the lower Colorado River basin (downstream of Lee's Ferry, Arizona; Minckley, 1973) and greatly reduced abundance in the upper Colorado River basin (upstream of Lee's Ferry) by the 1960s (Holden and Wick, 1982). Introduction of numerous nonnative fish species into the Colorado River basin also contributed to the decline of the Colorado pikeminnow and other native fish species (McAda, 1983; Pimental et al., 1985). Populations of Colorado pikeminnow remain in the Green, White, Yampa, Colorado, and San Juan rivers (Minckley and Carothers, 1979; Holden and Wick, 1982; Platania et al., 1991; Tyus, 1991; Ryden and Ahlm, 1996). Colorado pikeminnow was listed as endangered by the United States Fish and Wildlife Service in 1974 (Federal Register 39:1175, 1974) and is protected by all states in its historic range (Propst, 1999).

Colorado pikeminnow begin to feed on fish at 50 mm total length (TL; Vanicek and Kramer, 1969). Adult Colorado pikeminnow, which can achieve 948 TL in the San Juan River (Ryden and Ahlm, 1996), can take prey  $\frac{1}{2}$  to  $\frac{1}{2}$  their body length (Osmundson et al., 1998). Prior to the establishment of nonnative fishes, soft-rayed fishes were the only prey available to Colorado pikeminnow (Holden and Wick, 1982; Pimental et al., 1985). Establishment of nonnative, hard- and spiny-rayed fishes, including channel catfish, (*Ictalurus punctatus*), exposed Colorado pikeminnow to a potential choking hazard which was previously nonexistent. Anecdotal reports of Colorado

pikeminnow with channel catfish lodged in their throats (e.g., Vanicek and Kramer, 1969) were undocumented until 1983. McAda (1983) collected an adult Colorado pikeminnow (550 mm TL) from the Green River in 1974 with a channel catfish (120 mm TL) lodged in its throat. Three similar incidents subsequently were reported from the Green River in 1982 and 1983 (Pimental et al., 1985). Our collection of a juvenile Colorado pikeminnow with a channel catfish lodged in its mouth from the San Juan River offers a new perspective on this phenomenon, especially as it relates to recovery efforts for Colorado pikeminnow in the San Juan River.

On 1 October 1999, at approximately 1145 h while electrofishing at river kilometer (RK) 138.4, 12.1 km downstream of the bridge at Montezuma Creek, Utah, we collected a subadult Colorado pikeminnow (346 mm TL) with a channel catfish (111 mm TL) firmly lodged in its mouth anterior to the gills. The channel catfish was alive and struggling, with spines extended. The dorsal spine had penetrated the roof of the Colorado pikeminnow's mouth and had entered the right eye socket causing distention and hemorrhagic swelling. Both pectoral spines had penetrated the sides of the Colorado pikeminnow's mouth. The posterior end of the channel catfish, from just anterior to the adipose fin, protruded from the Colorado pikeminnow's mouth. A strip of flesh about 10 mm wide was worn from the body of the channel catfish, where the Colorado pikeminnow's mouth would normally close. We photographed the fishes, then removed the channel catfish from the Colorado pikeminnow's mouth by severing the spines and backing the fish out of the mouth. Both fish were weighed and measured. The channel catfish was removed from the river and the Colorado pikeminnow was released. Water temperature was not measured at the collection site, but was

11.9°C at RK 141.6 at 1015 h and 13.3°C at RK 136.8 at 1220 h.

McAda (1983) and Pimental et al. (1985) believed incidence of channel catfish lodging in the throats of Colorado pikeminnow was rare in the wild, and experiments (Pimental et al., 1985) indicated rejection of spined channel catfish by most hatchery-reared Colorado pikeminnow. In these experiments Colorado pikeminnow deprived of food for 5 days consumed spineless channel catfish with no apparent ill effects; however, when spined channel catfish were consumed by Colorado pikeminnow, they induced a violent reaction and were expelled (Pimental et al., 1985). Pimental et al. (1985) observed no permanent lodging of channel catfish in the mouth or throat of any Colorado pikeminnow during their experiments. These experiments did not replicate wild conditions. Colorado pikeminnow used were age 10+, hatchery-reared, and fed commercial trout feed and rainbow trout for many years before exposure to channel catfish.

The ability to safely consume or expel channel catfish in Pimental et al.'s (1985) experiments may simply have been a matter of size. The mean TL of Colorado pikeminnow used in Pimental et al.'s (1985) experiments was  $\leq 461$  mm (range 388 to 510 mm TL), but the mean predator-prey length ratio was 5.8:1 (channel catfish mean TL  $\leq 80$  mm, range 51 to 126 mm TL). The 4 wild Colorado pikeminnow collected in the Green River with channel catfish lodged in their throats generally were larger (mean TL = 540 mm, range 431 to 645 mm TL) than experimental fish, but had a smaller mean predator-prey length ratio of 4.4:1 due to the larger size of their intended prey (channel catfish mean TL = 125 mm, range 95 to 150 mm TL; McAda, 1983; Pimental et al., 1985). The Colorado pikeminnow collected from the San Juan River had a predator-prey length ratio of only 3.1:1. Given the relative size of the widest part of the channel catfish's pectoral girdle with spines extended compared to the gape size of the Colorado pikeminnow, it was impossible for the pikeminnow to open its mouth wide enough to expel the channel catfish. This suggests that as the predator-prey length ratio decreases, it becomes much more difficult (or in the case of the San Juan River fish, impossible) for Colorado pikeminnow to expel channel catfish

from their oral cavities once they attempt to consume them.

Since the 1970s, hundreds of individual Colorado pikeminnow have been collected throughout the upper Colorado River basin (e.g., Osmundson and Burnham, 1998) and only 4 (prior to this incident) have been reported with channel catfish lodged in their throats (McAda, 1983; Pimental et al., 1985). The number of Colorado pikeminnow that die with channel catfish lodged in their mouths or throats is unknown.

In 1996, mechanical removal (primarily by electrofishing, but hoop nets and baited trot lines were also used) of nonnative fishes from the San Juan River became an integral component of Colorado pikeminnow recovery efforts (J. E. Brooks, pers. comm.) Despite these removal efforts, channel catfish remain common and thus are a large proportion of available prey for both wild and stocked Colorado pikeminnow in the San Juan River. In the San Juan River, where Colorado pikeminnow are rare (Platania et al., 1991; Ryden and Ahlm, 1996) and nonnative channel catfish are ubiquitous, loss of even a single Colorado pikeminnow diminishes recovery potential. Lodging of channel catfish in the mouth or throat apparently becomes less of a hazard for Colorado pikeminnow as they grow and the predator-prey length ratio increases (Pimental et al., 1985); however, it is still a problem for young Colorado pikeminnow (particularly those  $< 500$  mm TL) and may reduce recruitment. Our observation provides support for continued suppression of nonnative channel catfish abundance as a necessary component for Colorado pikeminnow recovery in the San Juan River.

*Resumen*—*Ptychocheilus lucius* es un ciprínido en peligro de extinción endémico de la cuenca del Río Colorado, incluyendo el Río San Juan. La introducción de peces no nativos ha contribuido al declive de este depredador. El primero de octubre de 1999, un subadulto *P. lucius* (346 mm LT) fue recolectado en el Río San Juan en el estado Utah con un bagre de canal, *Ictalurus punctatus* (111 mm LT), atorado en la boca, anterior a las branquias. Esta es una proporción longitudinal depredador-presa de 3.1:1. Cuatro *P. lucius* con bagres atorados en la garganta, previamente recolectados en el

Río Verde, tuvieron una proporción depredador-presa promedio de 4.1:1. En experimentos en tanques, *P. lucius* con una proporción de depredador-presa promedio de 5.8:1 fueron capaces de expeler sin problemas o de consumir bagres de canal sin que el bague se les atorara en la boca o en la garganta. Parece que así como *P. lucius* crece y la longitud de la proporción depredador-presa se incrementa, la incidencia del bagre de canal atorados en su boca o garganta decrece. A pesar de que la incidencia de bagres de canal atorados en la boca o garganta de *P. lucius* puede ser relativamente rara en la naturaleza, puede evitar el reclutamiento de *P. lucius* en la población adulta. En el Río San Juan, donde *P. lucius* es raro y los bagres de canal son ubicuos, la pérdida de siquiera un solo *P. lucius* disminuye el potencial de recuperación para esta especie. La supresión de la abundancia del bague de canal no nativo puede contribuir a la recuperación de *P. lucius* en peligro de extinción en el Río San Juan.

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