

Biological Scientific Writing (BIOL 825)

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Editing Exercise #4

Working on your own, *print this proposal* to edit the following sentences based on course lectures.

Status of the Plains Minnow (*Hybognathus placitus*)

in the Smoky Hill River Basin of Kansas

Formerly one of the most abundant fishes in many streams in Kansas, the plains minnow (*Hybognathus placitus*) has declined dramatically in distribution and abundance (Cross and Moss 1987). The plains minnow is listed by the Kansas Department of Wildlife and Parks (KDWP) as a “species in need of conservation” (Kansas Administrative Regulation 115-15-2).

The plains minnow prefers perennial streams with shallow braided flow over broad beds of shifting sand, and it is tolerant of the annual fluctuations in streamflow and turbidity that were once more pronounced in larger plains streams (Cross 1967, Cross and Moss 1987). Their ventral mouth with its thin lower lip and long coiled gut suggest that they feed mainly on algae in the flocculent material that settles to the bottom in quiet areas of the stream (Cross 1967).

Lehtinen and Layzer (1988) report that the plains minnow spawns when one to two years old. Spawning behavior has not been observed, but the eggs are semi-buoyant and nonadhesive (Sliger 1967), and their presence in the flowing water during periods of increased flows suggests that they develop as they bounce along the stream bottom (Miller and Robison 1973).

Luttrell et al. (1993) provided documentation of fish communities in streams in the Arkansas River basin including information on the plains minnow. A similar survey was lacking for the Kansas River basin in northwestern Kansas. Thus the objective of my study was to assess the current status of the plains minnow within the Smoky Hill River basin including the Solomon and Saline river basins relative to historical data.

My hypothesis is that the plains minnow is absent from the Smoky Hill river basin because of its short lifespan, its inability to reproduce successfully in the low flows during the drought of the

1980s, and its inability to recolonize the region from downstream rivers since dams block upstream dispersal.

METHODS

Field crews from KDWP and Fort Hays State University (FHSU) sampled fishes using seines and electroshocking equipment at 30 sites in the Smoky Hill, Solomon, and Saline rivers during 1994 and 1995. Standard methodologies were used to preserve fish samples in 10% formaldehyde solution and then transferring them to 40% isopropanol before their identification. Voucher specimens were housed in the collection at the Sternberg Museum of Natural History, Fort Hays State University, Hays, Kansas.

In order to assess its historical distribution, plains minnow museum collection records were obtained from the University of Kansas Natural History Museum (KU), University of Michigan Museum of Zoology (UMMZ), and Sternberg Museum of Natural History (MHP). Additional records were obtained from the literature.

RESULTS

A total of 30 collections were made during 1994 and 1995 in the North Fork Solomon, South Fork Solomon, Solomon, Saline, and Smoky Hill rivers of northwestern Kansas. Only one sample included three young-of-the-year plains minnows (relative abundance of 0.6%) taken in July 1995 from the Smoky Hill River in southwestern Gove County (T15S, R31W, NW $\frac{1}{4}$ Sec. 4). The stream at this site was confined to a narrow streambed cut into the broader channel which was vegetated by willows and other phreatophytic vascular plants. Plains minnows also were collected here in 1978 (Collins 1981). With the reduced flows, however, this segment of the Smoky Hill River is no longer the braided stream thought to be utilized by the plains minnow for feeding and spawning habitat.

A map of the 1885-1969 and 1974-1995 distributions of the plains minnow in Kansas is provided in Figure 1. It was based on information from the 1994-1995 surveys, from records

summarized by Cross (1967), Cross et al. (1985), Eberle et al. (1986), Eberle et al. (1989), Haslouer et al. (1987), KDWP (1979*a*, 1979*b*), Luttrell et al. (1993), Summerfelt (1967), Stark (1990), and Wenke (1995), and from museum records. This data indicates that there has been a considerable reduction in both the distribution and abundance of this species within Kansas since the 1960s.

In the North and South Forks of the Solomon River, now impounded by Kirwin and Webster reservoirs respectively, the plains minnow has not been reported since the 1960s. Only one record exists for the plains minnow in the Solomon River, and it was collected before the construction of Glen Elder Dam (Waconda Reservoir): “Solomon River overflow”, Cloud County, south of Glasco, April 1942 (UMMZ 144885, 6 specimens).

The plains minnow was abundant in the upper Saline River (upstream from Wilson Reservoir) through the mid-1970's, but has not been taken since then (Wenke, FHSU, unpubl. observ.). It has not been reported from the lower Saline River (downstream from Wilson Dam).

In the Smoky Hill River, Summerfelt (1967) found the highest numbers of plains minnows during 1965-1966 at two of his 8 sites, one of which was in the upper Smoky Hill River (upstream from Cedar Bluff Reservoir) in western Trego County. Elsewhere in the upper Smoky Hill River basin, the species has been taken at only two sites since the 1960s. In 1975, KDWP (1979*b*) reports them from a site on the Smoky Hill River in Logan County south of Russell Springs. My field crew visited this site in August 1995, but it was completely overgrown by bulrushes and other aquatic plants. Plains minnows also were captured in southwestern Gove County in 1978 and again by us in 1995, as discussed above.

The plains minnow was less common in the middle Smoky Hill River between Cedar Bluff and Kanopolis reservoirs (Summerfelt 1967; Wenke, FHSU, unpubl. observ.); however 60 individuals were preserved from an April 1954 collection made south of Hays by Cross and Booth (KU 3246). Thus the plains minnow may still occur in the eastern portion of this reach. Eberle et al. (1986) captured them in the mouth of Big Creek on the Smoky Hill River in southwestern Russell

County on three occasions during 1983-1984, however, none were taken in this reach during 1994-1995.

Similar to the absence of the plains minnows in the Solomon and lower Saline rivers, the plains minnow has not been reported from the lower Smoky Hill River (downstream from Kanopolis Dam) in Saline and Dickinson counties, near the mouths of the Saline and Solomon rivers. Only two upstream records exist from McPherson County a short distance downstream from Kanopolis Dam, both collected before the dam was built (August 1926, UMMZ 122041, 122113, 18 specimens; July 1937, UMMZ 126920, 4 specimens). Plains minnows were abundant near the mouth of the Smoky Hill River in Geary County and in the Kansas River (Summerfelt 1967), but they are now rare (Cross and Moss 1987; Wenke et al. 1993; Wenke 1995; K. Shaw, KU, pers. comm.).

DISCUSSION

There are only three short stream reaches within the Smoky Hill River system where the plains minnow has been captured during the past 20 years, and in these areas they comprised only a very minor portion of the fish communities. These reaches are the upper Smoky Hill River (eastern Logan and western Gove counties), middle Smoky Hill River (Russell County), and the lower Smoky Hill River (Geary County). I believe that the plains minnow is extirpated from the Solomon River system and the Saline River, where it was once common.

Apparently, the plains minnow never was common or widespread in the Smoky Hill, Saline, or Solomon rivers in central Kansas (downstream from Kanopolis, Wilson, and Waconda reservoirs through Dickinson County). These stream reaches did not have the braided streamflow preferred by the plains minnow at any of the 10 sites I visited in 1995. The channels were narrow and deep, with nearly vertical banks.

The reasons for the rapid decline in plains minnow populations in the Smoky Hill River basin might be tied to changes in flow regimes of the rivers following construction of dams on each of the rivers. These dams were built from the late 1940s through the 1960s, when the plains minnow was still reasonably abundant in western Kansas. Streams also have reduced streamflows resulting

largely by groundwater withdrawals and surface diversions for irrigation. In terms of their effects on stream features, both dewatering and regulation of discharge by impoundments can reduce the high flows that scour the channel and maintain broad, braided streams with a loose, sandy substrate (Cross and Moss 1987). The success of the plains minnow has been tied to this type of habitat, with spawning being triggered by high flow events (Cross 1967; Miller and Robison 1973).

Around Salina, the bank material is more cohesive in the Smoky Hill River, as well as in the Solomon and lower Saline rivers. This greater bank stability causes the channels to be deep and meandered (sinuous) rather than shallow, wide, and straight with braided streamflow. Schumm (1963) notes this effect on channel morphology in the Kansas River basin and his values (Table 1) illustrate the different types of channels (straight, braided vs. meandered, sinuous) formed along the length of the river.

Table 1—Values for the percent silt-clay comprising the channel, sinuosity (length of stream/length of valley), and width-depth ratio of the channel for three stream reaches along the Smoky Hill and Kansas rivers (Schumm 1963).

	Smoky Hill River western Kansas	Smoky Hill River east of Salina	Kansas River at Topeka
Silt-clay	5%	20%	3%
Sinuosity	1.2	2.5	1.1
Width-depth ratio	85	10	45

The channel types seem to correlate well with the historical distribution of the plains minnow in the upper and lower segments of the basin with the sandy, braided streams, and the absence of the species from the center sections of the rivers.

The continued presence of a population of the plains minnow in the narrow channel of Smoky Hill River in southwestern Gove County does not fit this explanation for the disappearance of the species. It is possible, however, that this small stream still provides sufficient perennial flows to support reproduction and maintain areas where flocculent food material can accumulate.

The Republican River in Kansas also has retained a broad, sandy channel, and the plains minnow still occurs there (unpubl. observ.). The plains minnow also still occurs in the Missouri River and the lower reaches of its tributaries in northeastern Kansas, although hybridization with the western silvery minnow (*Hybognathus argyritus*) poses a problem at some localities (Stark et al. 1987).

MANAGEMENT RECOMMENDATIONS

The extirpation of the plains minnow from much of its former range in the Smoky Hill River basin in northwestern Kansas, coupled with its decline in abundance elsewhere in the state is cause for concern. Therefore, I believe protection of the plains minnow as a threatened species should be considered under the authority of the Kansas Nongame and Endangered Species Conservation Act (Kansas Annotated Statutes 32-957 to 32-963, 32-1009 to 32-1012, and 32-1033). No attempt was made during the preparation of this report, however, to fully ascertain the status of the plains minnow throughout its range in the Great Plains, and this would need to be considered during the state listing process.

Listing the plains minnow as a state threatened species would not be an isolated act of protection. Other native species are already protected as threatened or endangered species within several of the larger streams still inhabited by the plains minnow (Kansas Administrative Regulation 115-15-1). In the Kansas and Missouri rivers, these species are the chestnut lamprey (*Ichthyomyzon castaneus*), pallid sturgeon (*Sacphirhynchus albus*), sicklefin chub (*Macrhybopsis meeki*), sturgeon chub (*M. gelda*), flathead chub (*Platygobio gracilis*), and silverband shiner (*Notropis shumardi*). Of these only the flathead chub occurred in the Republican River, but it is now extirpated (Cross and Collins 1995). No currently protected species occurred in the same habitat occupied by the plains minnow in the Smoky Hill, Saline, or Solomon rivers, except for one record of the sturgeon chub at the mouth of the Smoky Hill River. In the Arkansas River basin, the currently protected riverine species are the peppered chub (*M. tetranema*), flathead chub, and Arkansas River shiner (*N. girardi*).

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