Exotic Piscivorous Fishes and Reduced Intermittence Affect Suckermouth Minnows in a Southeastern Wyoming Stream

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Key words: conservation, irrigation diversion, *Phenacobius mirabilis*, suckermouth minnow

Introduction

Suckermouth minnows (*Phenacobius mirabilis*) are widespread throughout the central United States and are most abundant in streams and rivers of the upper Mississippi and lower Ohio river basins (Lee et al. 1980, Pflieger 1997). Stream systems in southeastern Wyoming and eastern Colorado represent the western boundary for suckermouth minnows (Lee et al. 1980). Recent sampling in Wyoming, i.e., since 1990, has identified only two suckermouth minnow populations: one in the lower Laramie River and one in Horse Creek. In the Laramie River, suckermouth minnows are rare, but a relatively abundant population occurs in a segment of Horse Creek. We describe the current distribution of suckermouth minnows in the Horse Creek watershed and identify factors that could affect their status and conservation.

Horse Creek originates in the Laramie Mountains and meets the North Platte River near Lyman, Nebraska (Rahel and Hubert 1991). Like most streams and rivers in southeastern Wyoming, Horse Creek has experienced extensive water development. Over 30 small impoundments and 40 diversion structures have been constructed in the watershed to store and divert water from the creek (Jeffrey Geyer, Wyoming State Engineer's Office, personal communication). Water is also diverted from the North Platte River to Horse Creek via the Fort Laramie Canal (Fig. 1). Approximately 5 km upstream from the point where the Fort Laramie Canal supplements flows in Horse Creek, the Springer Diversion Dam (~1 m high) spans Horse Creek and diverts water to storage reservoirs in the watershed. Fish assemblage structure and habitat characteristics of Horse Creek prior to settlement by Europeans are unknown. However, Horse Creek was probably similar to other streams in the western Great Plains having dynamic channels with fine substrate, variable flow, i.e., flood, intermittence, and thermal regimes, and fish assemblages dominated by cyprinids and catostomids (Baxter and Stone 1995). Large-bodied piscivores, e.g., centrarchids, were absent from streams in eastern Wyoming due to unstable flows and substrates.

Personnel from the University of Wyoming and Wyoming Game and Fish Department collected fish from 100- to 300-m reaches during 1960-2001 using electrofishing or seining techniques (see Baxter and Stone 1995, Rahel and Hubert 1991, Patton 1997). Surveys indicated that suckermouth minnows are restricted to a 25-km-long segment of Horse Creek between the mouths of Bear and Dry creeks (Fig. 1, Table 1). Exotic salmonids and several common native cyprinids dominated upstream of reaches containing suckermouth minnows, fish assemblages in

[1] The Unit is jointly sponsored by the University of Wyoming, Wyoming Game and Fish Department, U.S. Geological Survey–Biological Resources Division, and Wildlife Management Institute.

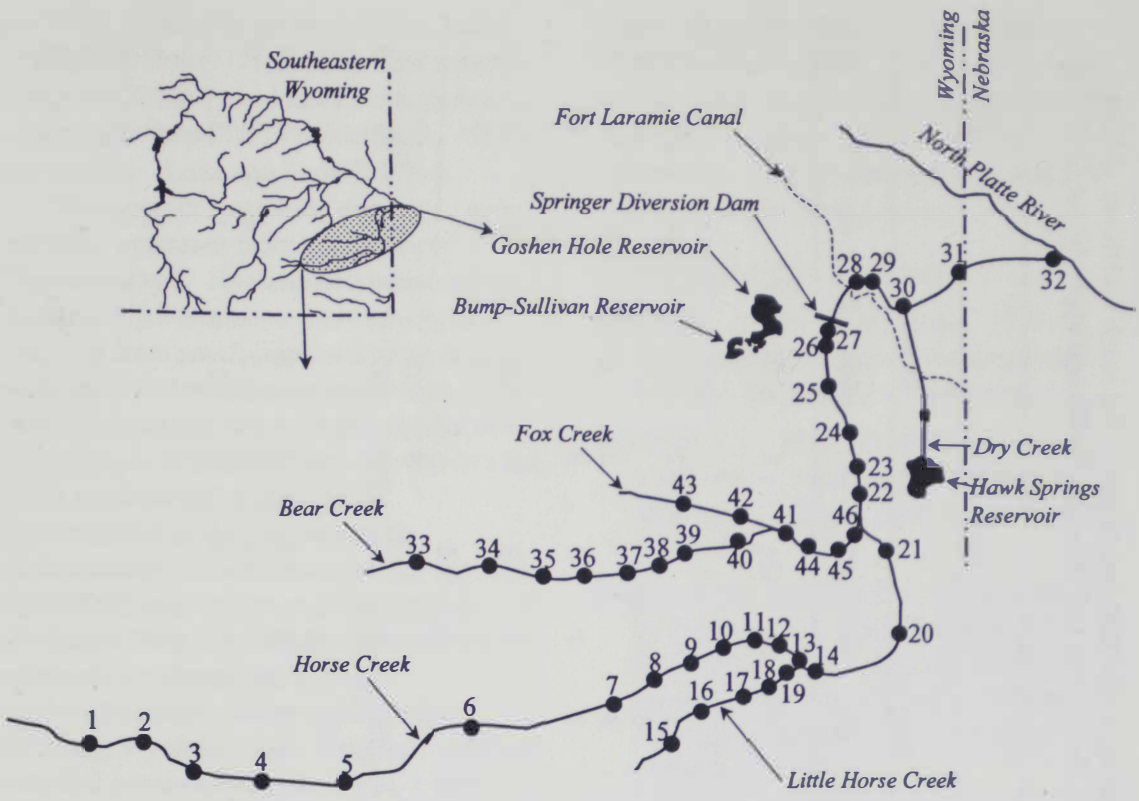

Figure 1. Location of stream reaches sampled in the Horse Creek drainage of Wyoming during 1960-2001.

Bear Creek and upper Horse Creek, i.e., reaches 1-21 (Table 1). In the stream segment where suckermouth minnows occurred, native cyprinids, stonecats, and plains killifish dominated fish assemblages. Conversely, reaches downstream of the suckermouth minnow segment of Horse Creek contained a variety of exotic piscivores including green sunfish, yellow perch, and largemouth bass.

Although these results do not identify specific mechanisms influencing suckermouth minnows, they suggest that water development and interactions with exotic piscivores have isolated the suckermouth minnow population in Horse Creek. We attributed absence of suckermouth minnows in upstream reaches, i.e., upstream of reach 22, to several factors. Water diversion structures are prevalent in lower Bear Creek and in the segment of Horse Creek between the mouths of Bear and Little Horse creeks (Fig. 1). Consequently, lower reaches of Bear Creek and most of Horse Creek between Bear and Little Horse creeks are frequently dewatered for most of the year. Exotic salmonids, e.g., brown trout, were common and often dominated fish assemblages in upstream reaches. Therefore, stream dessication, water diversion structures, and exotic piscivores likely limit upstream movement and persistence of suckermouth minnows in upstream reaches. Alternatively, the upstream distribution of suckermouth minnows may be limited by water temperature, as it is for other warm water species in Wyoming (Baxter and Stone 1995).

In downstream reaches, these data suggest that the distribution of suckermouth minnows was restricted by interactions with exotic piscivores. Suckermouth minnows were generally absent from reaches with introduced piscivores. Presence of a few suckermouth minnows in the two reaches immediately downstream of the Springer Diversion Dam likely resulted from downstream displacement from the abundant suckermouth minnow population

Table 1. Number of individuals sampled from specific reaches of lower Horse Creek during 1960-2001 (see Figure 1 for reach locations). Mean numbers of individual species sampled per reach and standard errors (in parentheses) for Bear Creek (i.e., reaches 35-46) and upper Horse Creek (i.e., reaches 1-19) are also provided.

		Bear Creek		Horse Creek												
			Upper									Lower				
Common name	Scientific name	35-46	1-19	20	21	22	23	24	25	26	27	28	29	30	31	32
Suckermouth minnow	*Phenacobius mirabilis*					10	2	2	10	124	3	1	5			
Brook trout	*Salvelinus fontinalis*	24 (9.9)	3 (2.0)													
Brown trout	*Salmo trutta*	5 (4.5)	7 (2.5)													
Creek chub	*Semotilus atromaculatus*	6 (2.4)	23 (11)	2	2		1	5			2	19	2	191	29	3
Longnose dace	*Rhinichthys cataractae*	6 (2.7)	15 (5.6)		27		2	6				1			3	1
White sucker	*Catostomus commersoni*	5 (1.8)	6 (2.1)				1	4			2	5		124	2	3
Johnny darter	*Etheostoma nigrum*	2 (0.7)	1 (0.6)		3	23	1	1	1	2	2				1	
Longnose sucker	*Catostomus catostomus*	1 (1.2)	20 (19.1)				3							11	3	
Bigmouth shiner	*Notropis dorsalis*	1 (0.3)	<0.5	3	3	2	1		2	2	15	15		10	3	
Fathead minnow	*Pimephales promelas*	<0.5	<0.5	1		3	3	10			1	1		6	3	
Central stoneroller	*Campostoma anomalum*	<0.5	<0.5	3		1		1	3	3						
Stonecat	*Noturus flavus*		1 (0.3)				32	1			2	26	3			
Sand shiner	*Notropis stramineus*	<0.5	<0.5	2	2	1	2	103	1		105	245	2		29	3
Common shiner	*Luxilus cornutus*	<0.5	<0.5				3									1
Brassy minnow	*Hybognathus hankinsoni*	<0.5		2	2				3				1			1
Plains killifish	*Fundulus zebrinus*					2	1	2	2	2	3	5	2		1	1
Common carp	*Cyprinus carpio*						3	1		3	5	5		5	3	3
Red shiner	*Cyprinella lutrensis*									3	10	11		1	3	
Black bullhead	*Ameiurus melas*										2	1				
Green sunfish	*Lepomis cyanellus*												1	3	3	2
Yellow perch	*Perca flavescens*												1	5	3	2
Largemouth bass	*Micropterus salmoides*															1
Quillback	*Carpiodes cyprinus*															3
Shorthead redhorse	*Moxostoma microlepidotum*															1

upstream. Similarly, plains killifish had a distribution nearly identical to suckermouth minnows (Table 1) and have been shown to be highly susceptible to predation by exotic centrarchids (Lohr and Fausch 1996).

No exotic centrarchids or percids were collected upstream from the Springer Diversion Dam. Exotic piscivores may be occasionally introduced from upstream resulting from small impoundments in the watershed, but exotic piscivores were only sampled from reaches with permanent flow. Therefore, it is unlikely they can survive the harsh environmental conditions characteristic of the segment with suckermouth minnows because the segment of Horse Creek upstream of the Springer Diversion Dam, i.e., where suckermouth minnows are abundant, becomes intermittent nearly every year (Gary Mehling, Wyoming State Engineer's Office, personal communication). Thus, water managers must allow enough water to enter the suckermouth minnow segment so that the stream does not become completely dewatered, while preventing permanent flow that allows exotic species to persist.

Although the ecological significance of suckermouth minnows in the western Great Plains is unknown, loss of any native species is considered detrimental to overall ecosystem function (Frissell 1993). The ecology and evolutionary history of suckermouth minnows in Horse Creek may be similar to many western Great Plains species. Exotic piscivores and reduced frequency of intermittence may be contributing to the decline of other native cyprinids throughout much of the western Great Plains and future research should focus on similar mechanisms causing declines of native fishes.

Acknowledgements

We thank Dirk Miller for assistance in obtaining fish assemblage information and Jeffrey Geyer and Gary Mehling for providing information on the irrigation system in Horse Creek. Carter Kruse and two anonymous reviewers provided helpful comments on an earlier draft of the manuscript. The Wyoming Game and Fish Department provided funding.

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Received 30 April 2003
Accepted 21 July 2003