Late Winter Distribution of Stonecats in the Missouri and Lower Sun Rivers, Upstream of Great Falls, Montana

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Abstract

Although stonecats (*Noturus flavus*) are native to the Missouri and Yellowstone river drainages in Montana, little is known about their distribution or population characteristics. Stonecats were first collected in the Missouri River near Craig, Montana in 1892. However, during extensive annual electrofishing surveys over the past 25 years in the same area, no stonecats had been collected. Hoop nets and cod traps were fished in the Missouri River during March 2005 and 2006, and slat traps were fished during March 2006 to target smaller fish. Stonecats were only collected in the most downstream 19 km of the Missouri River study reach. No stonecats were collected in cod traps. In 2005, mean hoop net catch rates were 2.8 stonecats/2-night period in the most downstream 19-km reach of the Missouri River, and no stonecats were collected in the 2006 Missouri River hoop nets. Slat trap catch rates in the 19-km reach of the Missouri River were 0.2 stonecats/2-night period in 2006. In 2006, hoop nets and slat traps were fished in the Sun River. Mean hoop net and slat trap catch rates in the Sun River were 4.8 and 6.5 stonecats/2-night period, respectively. Our results indicate that stonecats may be limited to the lower 19 km of the Missouri River (> 120-km downstream from the 1892 collection). We hypothesize that stonecat distribution has changed due to the cumulative effect of upstream reservoirs (Canyon Ferry, Hauser, and Holter) on the downstream water temperature regimens.

Key words: hoop net, *Noturus flavus*, stonecat, slat trap, upper Missouri River

Introduction

The native distribution of stonecats (*Noturus flavus*)—a small yellowish-brown catfish—extends in North America from southern Canada to the Prairie Region of the Midwestern U.S., and from the Rocky Mountains to the Hudson, Allegheny, and Mohawk basins in New York (Scott and Crossman 1973, Pflieger 1997). The Upper Missouri River in Montana represents the western edge of the stonecats distribution. In 1892 stonecats were documented in the Missouri River near Craig, Montana (Brown 1971). General distribution data exist for stonecats throughout the Missouri River Basin, but these records were typically the result of incidental samples (Montana Fish, Wildlife and Parks unpublished data). Therefore, little was known about specific populations, i.e., density, life history, size structure, of stonecats in Montana. In 2005 while conducting a project to determine burbot (*Lota lota*) distribution in a 152-km reach of the Missouri River (Horton and Strainer 2008), we collected adult stonecats in the most downstream reach of the study area. Therefore, objectives for this study were to test the effectiveness of hoop nets, slat traps, and cod traps for capturing stonecats and to determine stonecat distribution and population characteristics in a 152-km reach of the Missouri River upstream of Great Falls, Montana, and the lowermost 10.2-km of the Sun River in Northcentral Montana.

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Study Area

The study area was located in the Upper Missouri River Basin in Northcentral Montana (Fig. 1). Sampling was conducted on a 152-km reach of the Missouri River beginning at Holter Dam near Helena, Montana and proceeding downstream to Black Eagle Dam in Great Falls, Montana. Sampling was also conducted on the lowermost 10.5 km of the Sun River—a major tributary to the Upper Missouri River that enters from the west near Great Falls, Montana. Three reservoirs (Canyon Ferry, Hauser and Holter) impound the Missouri River immediately upstream from the study area. A variety of habitat changes occur along the 152-km reach. Influences from upstream dams on discharge and water-temperature diminish progressively downstream. Geological features laterally control much of the upper river channel, where stream gradient is highest. The river becomes highly sinuous downstream of the Dearborn River (~ 45km downstream of Holter Dam; Fig. 1) with smaller substrate, increased turbidity, and increased water depth.

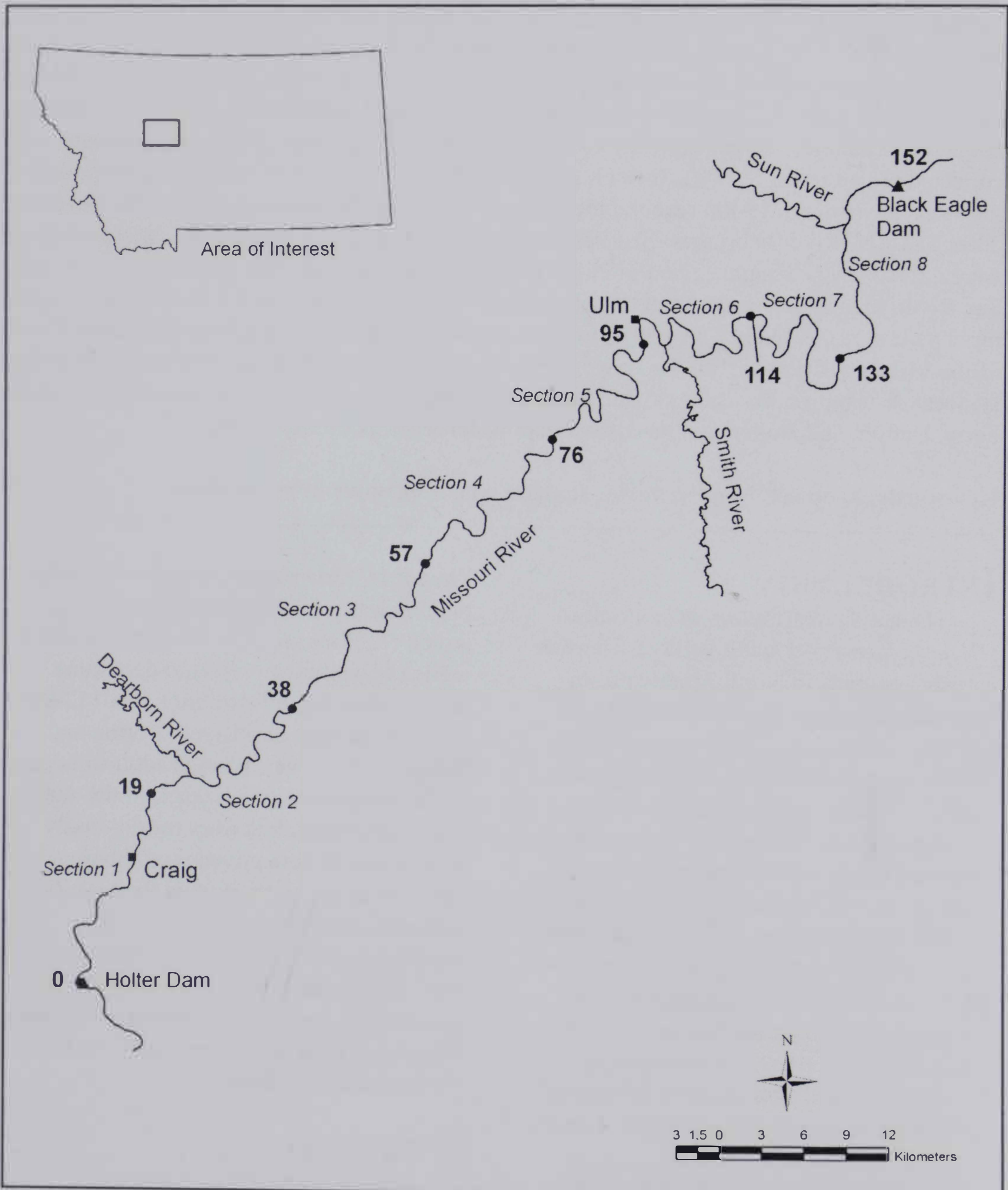

Figure 1. The study area on the Missouri River in northcentral Montana. Circles indicate reach boundaries with corresponding river kilometers downstream from Holter Dam.

Mehods

Hoop nets, cod traps, and slat traps were fished throughout the study area; we baited all gear types with previously frozen longnose suckers (*Catostomus catostomus*) and white suckers (*C. commersoni*), which are common non-game species in the study area. Hoop nets measured 3.05-m long, maximum hoop diameter was 61 cm, and mesh size was 2.5 cm (bar measure; Paragamian 2000). Cod trap frames were constructed from 1.3-cm rebar (Spence 2000). The bottom hoop diameter was 1.0 m, the top hoop diameter was 69 cm, and the trap height was 64-cm tall. Nylon mesh (1.3-cm bar measure) covered the structure, and a 25-cm wide oval-shaped throat entered the trap from the side. Wooden slat traps measured 61-cm long, 30-cm wide, and 30-cm tall. The slat trap opening was constructed from a sheet of plastic mesh (6-mm bar measure) that was formed into a funnel. The throat of the funnel measured 5.7 cm. The maximum distance between wooden slats was 1.6 cm.

In order to systematically and logistically sample the 152-km long study area on the Missouri River, we divided the study area into eight 19-km reaches. All sampling occurred during March, and the reach sampling order was randomly determined. Cod traps and hoop nets were fished in 2005 and 2006, and slat traps were fished in 2006 to target smaller fish. We set hoop nets on both sides of the river at ~ 2-km intervals throughout the Missouri River study area. Each hoop net was fished for one 2-night period. One cod trap was fished for three 2-night periods in each reach on the Missouri River. Cod traps were fished in backwater and eddy areas. Two slat traps were fished for three 2-night periods in each reach. During each 2-night period slat traps were fished in the same area on opposite sides of the river. Spacing between slat trap sets averaged ~ 5.9 km. The 10.5-km reach of the Sun River was only sampled during March 2006. Net spacing was similar to the Missouri River, but due to the narrower river width only one net or trap was fished at each location. We recorded length and weight on all fish. We used a Kolmogorov-Smirnov two-sample test to detect differences in length distributions between stonecats captured in hoop nets and slat traps.

Results

The 2005 mean water temperature in the Missouri River during the study was 3.1 ºC (SE 0.04), compared to 2 ºC (SE 0.08) in 2006. For comparison, the mean water temperature in the lower Sun River was 5.9 ºC, during the sampling period in 2006. A total of 93 stonecats were captured; 79 were collected in hoop nets, 14 in slat traps, and no stonecats were collected in cod traps. Hoop nets were fished for nearly 300 2-night periods, and cod and slat trap effort, individually, was approximately 50 2-night periods. In the Missouri River stonecats were collected only in the most downstream 19 km of the study area (herein referred to as the Great Falls reach). In addition, stonecats were only collected in Missouri River hoop net sets during 2005. Hoop net catch rates ranged from 0 to 33 per 2-night period (Table 1). In 2005, the mean hoop net catch rate was 2.8 stonecats per 2-night period, in the Great Falls reach. In the entire Missouri River study area the mean slat trap catch rate was 0.17 (SE = 0.17) stonecats per 2-night period, because only one stonecat was captured in one set. In the Sun River, the mean hoop net catch rate was 4.8 (SE =2.9; catch ranged from 0 to 19) stonecats per 2-night period. The mean slat trap catch rate was 6.5 (SE = 2.5; catch ranged from 4 to 9) stonecats per 2-night period. Mean length of all stonecats collected in the Missouri River was 220 mm (SE = 2.4; length ranged from 180 to 251 mm) compared to 227 mm (3.5 = SE; length ranged from 178 to 290 mm) in the Sun River. The length distributions of stonecats captured with hoop nets and slat traps were not significantly different (KSa = 0.98; $P >$ KSa = 0.2896; Fig. 2).

Discussion

In 2005 we collected 50 stonecats in the Missouri River; however, only one stonecat was collected during the 2006 season. Differences in water temperature between

Table 1. Mean, standard error (SE), minimum, and maximum catch rates (number/2-night period), by site [Missouri River (MOR) and Sun River (SUNR)], gear type and year.

Catch Rate Site	Gear	Year	Mean	SE	Minimum	Maximum
MOR	Hoop net	2005	0.4	0.2	0.0	33.0
		2006	0.0	0.0	0.0	0.0
	Slat trap	2006	0.2	2.9	0.0	1.0
SUNR	Hoop net	2006	4.8	2.9	0.0	19.0
	Slat trap	2006	6.5	2.5	4.0	9.0

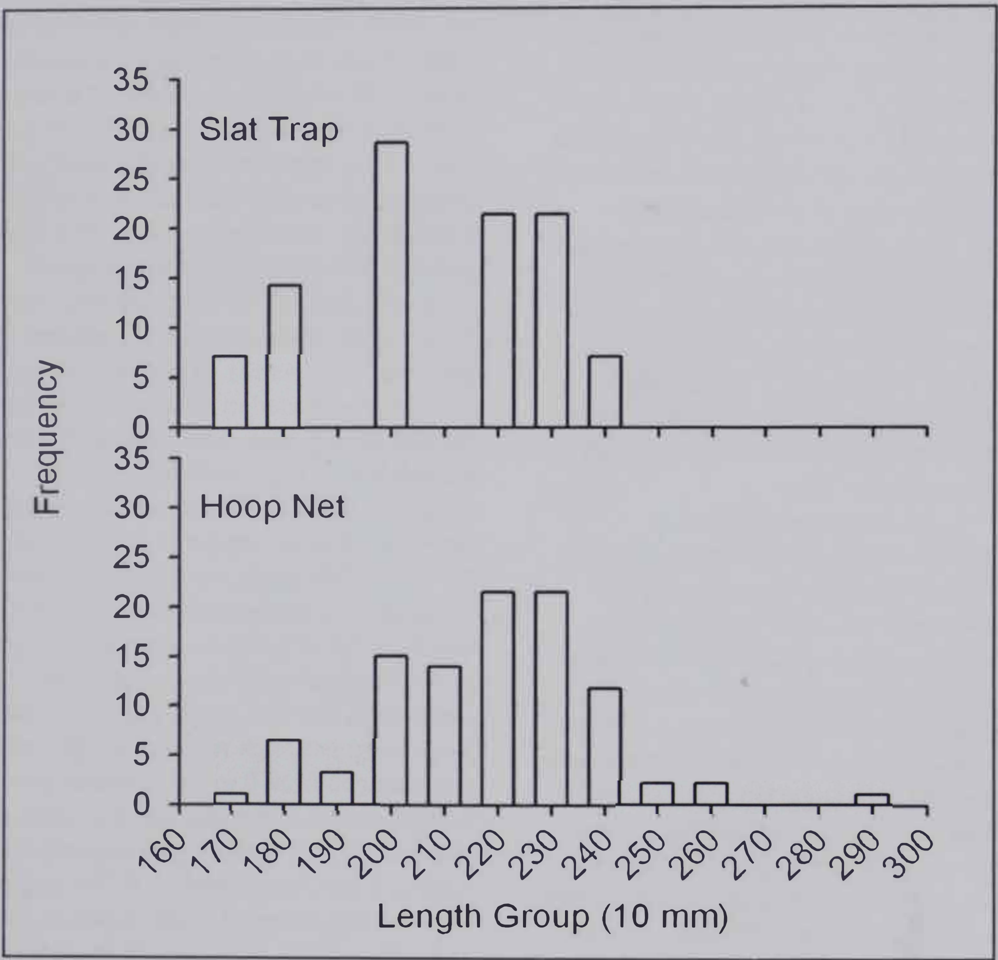

Figure 2. Length frequency distribution of stonecats captured in hoop nets and slat traps, all reaches and years combined.

years may have reduced the catch in 2006. In addition the 2006 mean water temperature in the Sun River was greater than mean water temperatures in the Missouri River in 2006, and may have resulted in a higher stonecat capture rate. Coker et al. (2001) classify stonecats thermal preference as "warm" since they prefer temperatures > 25 °C. In fact, spawning occurs when water temperatures exceed 27 ºC in some areas (Scott and Crossman 1973, Walsh and Burr 1985). Catch rates in our study may have been higher if sampling was conducted in a warmer season when stonecats are more active.

We are unaware of literature that describes sampling stonecat populations in large-river systems. In our study, baited hoop nets and slat traps proved effective for sampling stonecats in the Missouri and Sun rivers. In addition, stonecats collected in this study were large individuals; generally longer than lengths reported in the literature. For example, Brown (1971) reported sizes from 76 to 177 mm, with some specimens reaching 305-mm TL. Other published length ranges rarely reached the length of our smallest stonecats (Trautman 1981, Etnier and Starnes 1993, Jenkins and Burkhead 1993). Sampling stonecats in other parts of their range—where growth rates and population size structure may be different —may require gear with smaller mesh (or slat gaps) than those we used. It is unknown why smaller stonecats were not captured during our study. Possible explanations suggest that hoop net mesh size or slat trap gaps were too large, or no small stonecats were present. Length distributions of stonecats captured by hoop nets and slat traps in this study were not significantly different despite differences in mesh size and slat gap openings between the gears.

Stonecats may disappear from streams that are impounded (Scott and Crossman 1973). Pre-impoundment records documented stonecats in the Missouri River near Craig, Montana, located in the upstream portion (~9 km downstream from Holter Dam) of the 152-km long study area (Brown 1971); however, during this study stonecats were only caught in the most downstream 19 km of the Missouri River study area. More than 110 km separates these two areas. Moreover, Montana Fish, Wildlife and Parks has conducted biannual (Spring and Fall) electrofishing surveys since the early 1980s in the areas near Craig and Cascade (~ 9 km and 43 km downstream from Holter Dam, respectively), Montana, but no stonecats have been documented during these efforts (MFWP unpublished data). In comparison, identical electrofishing sampling efforts in the Missouri River downstream from Great Falls commonly result in the capture of stonecats (P. D. Hamlin, Montana Fish, Wildlife and Parks, personal communications). Based on our results, we hypothesize that stonecat distributions have changed since the late 1800s due to the thermal influence of the three large reservoirs (Canyon Ferry, Hauser, and Holter Reservoirs) immediately upstream from our study area. In 2004 and 2005, July and August daily water temperatures upstream from Canyon Ferry Reservoir averaged 20.6 ºC (measured at U. S. Geological Survey [USGS] gauging station 06054500), compared to 17.8 ºC and 16.9 ºC (measured at USGS gauging station 06066500) downstream from Holter Dam, respectively (USGS, unpublished data). Furthermore in the river upstream from Canyon Ferry Reservoir, water temperature reached 25.0 ºC during 4 days in 2004, but maximum daily water temperatures for the river downstream from Holter Dam only reached 20.0 ºC in 2004 and 19.5 ºC in 2005. The effect of large water-storage impoundments on downstream physical habitat and biological communities, i.e., the Serial Discontinuity Concept, has been well developed in the primary literature (Ward and Stanford 1983, 1995). We hypothesize that water temperature changes caused by upstream reservoirs may have limited distribution of stonecats to the lower 19-km of the study area.

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