



The fishery for paddlefish at Intake, Montana, during 1973 and 1974  
by Bruce John Rehwinkel

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE  
in Fish and Wildlife Management  
Montana State University  
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**Abstract:**

Stratified estimates of fishing intensity and harvest of paddlefish in the Yellowstone River at Intake, Montana were made during 1973 and 1974. An estimated 25.9 and 46.3 percent of the fishermen were contacted during 1973 and 1974, respectively. The fishery sustained an estimated 2386 fisherman days of use in 1973 and 3363 days in 1974. The seasonally pooled catch rates were 0.45 and 0.39 fish per hour in 1973 and 1974, respectively. The estimated total number of fish caught was 4544 in 1973 and 4359 in 1974. The weight of fish removed was estimated to be 44.78 and 39.23 metric tons in 1973 and 1974, respectively. The ratio of males to females in the run was estimated to be approximately 2:1 during 1973 and 1974. Males in the catch during 1974 averaged 0.889 kg more in weight, 6.4 cm greater in length, and the dominant age group was 1 year older than in 1964. Tag returns were 14.8 percent in 1974; however, only 8.2 and 9.5 percent of males and females were kept in 1974. It is concluded that the current rate of exploitation is not detrimental to the population.

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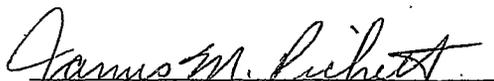
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## ABSTRACT

Stratified estimates of fishing intensity and harvest of paddlefish in the Yellowstone River at Intake, Montana were made during 1973 and 1974. An estimated 25.9 and 46.3 percent of the fishermen were contacted during 1973 and 1974, respectively. The fishery sustained an estimated 2386 fisherman days of use in 1973 and 3363 days in 1974. The seasonally pooled catch rates were 0.45 and 0.39 fish per hour in 1973 and 1974, respectively. The estimated total number of fish caught was 4544 in 1973 and 4359 in 1974. The weight of fish removed was estimated to be 44.78 and 39.23 metric tons in 1973 and 1974, respectively. The ratio of males to females in the run was estimated to be approximately 2:1 during 1973 and 1974. Males in the catch during 1974 averaged 0.889 kg more in weight, 6.4 cm greater in length, and the dominant age group was 1 year older than in 1964. Tag returns were 14.8 percent in 1974; however, only 8.2 and 9.5 percent of males and females were kept in 1974. It is concluded that the current rate of exploitation is not detrimental to the population.

## INTRODUCTION

Paddlefish, *Polyodon spathula* (Walbaum), were once abundant throughout much of the Mississippi drainage and its major tributaries (Coker, 1923; Hussakof, 1910; and Stockard, 1907). However, by a combination of destructive influences, they have now been restricted to only seven known spawning populations (Elser, personal communication). One population traverses the lower Yellowstone River, Montana.

Although a fishery for paddlefish existed in the lower reaches of the Yellowstone River in the early 1900's (Needham, 1968), little utilization was believed to have occurred until 1962 when a sizeable harvest was taken at Intake, Montana. In 1964 the first intensive study of paddlefish in Montana was undertaken to obtain information on this population (Robinson, 1966). Since 1966, personnel of the Montana Fish and Game Department have monitored the paddlefish harvest. Changes in the population structure since 1966 and a need to obtain current information on the run prior to the withdrawals of water from the Yellowstone River for the development of coal resources in southeastern Montana prompted the present study. The objectives of this study were to assess the status of the present fishery and obtain additional information on the life history of the paddlefish in the Yellowstone River. Field work was conducted from May to

September, 1973 and from April to September, 1974 at Intake,  
Montana.

## DESCRIPTION OF STUDY AREA

The Yellowstone River has its headwaters high in the mountains of Yellowstone National Park. It flows approximately 966 kilometers across Montana in a northeasterly direction to its confluence with the Missouri River in North Dakota. Its major tributaries are the Shields, Boulder, Stillwater, Clark Fork, Big Horn, Tongue and Powder Rivers; its drainage basin (U. S. Public Health Service, 1951) covers approximately 183,372 square kilometers.

The Yellowstone River is a free-flowing river, showing considerable changes in physical-chemical parameters with changes in flow. Bicarbonate concentrations vary from 247 mg/l at low flow to 122 mg/l at peak flow (U.S.G.S., 1973). Levels of hardness (Ca, Mg in mg/l ) and specific conductance (micromhos) were also higher when flows were reduced while turbidity levels peaked with high flows. The ranges and averages of selected parameters of the river are listed in Table 1. Information from U.S.G.S. indicated flows of the river at Sidney varied about fivefold with peak discharge occurring at about mid-June (Figure 1).

The study area was located on the lower Yellowstone River at Intake, Montana, 32.2 km downstream from Glendive (Figure 2). A large irrigation diversion dam is present which evidently acts as a partial barrier to the paddlefish migration, and concentrates the

TABLE 1. PHYSICAL AND CHEMICAL PROPERTIES OF THE YELLOWSTONE RIVER AT SIDNEY FROM OCTOBER 1972 THROUGH SEPTEMBER 1973 (DATA FROM U.S.G.S.)

	Range	Average
pH	7.6-8.3	8.03
Bicarbonate (mg/l)	122-247	187.08
Total Hardness (mg/l)	100-310	225.83
Specific Conductance (micromhos)	330-1090	720.67
Turbidity (ppm)	40-4400*	
Water Temperature	0.0-21.0°C	9.04

\*From April through July at Glendive Water Plant.

fish and makes "snag" fishing more productive than elsewhere. The Yellowstone River at this site is about 244 meters wide at high water, has a maximum depth of 3.05 meters and is very swift and turbulent. The river bed is composed of large boulders and gravel interspersed with sandy areas. Other fish taken at this location include sauger (*Stizostedion canadense*), walleye (*Stizostedion vitreum*), channel catfish (*Ictalurus punctatus*), burbot (*Lota lota*), shovelnose sturgeon (*Scaphirhynchus platorynchus*), and pallid sturgeon (*Scaphirhynchus albus*) (Brown, 1971).

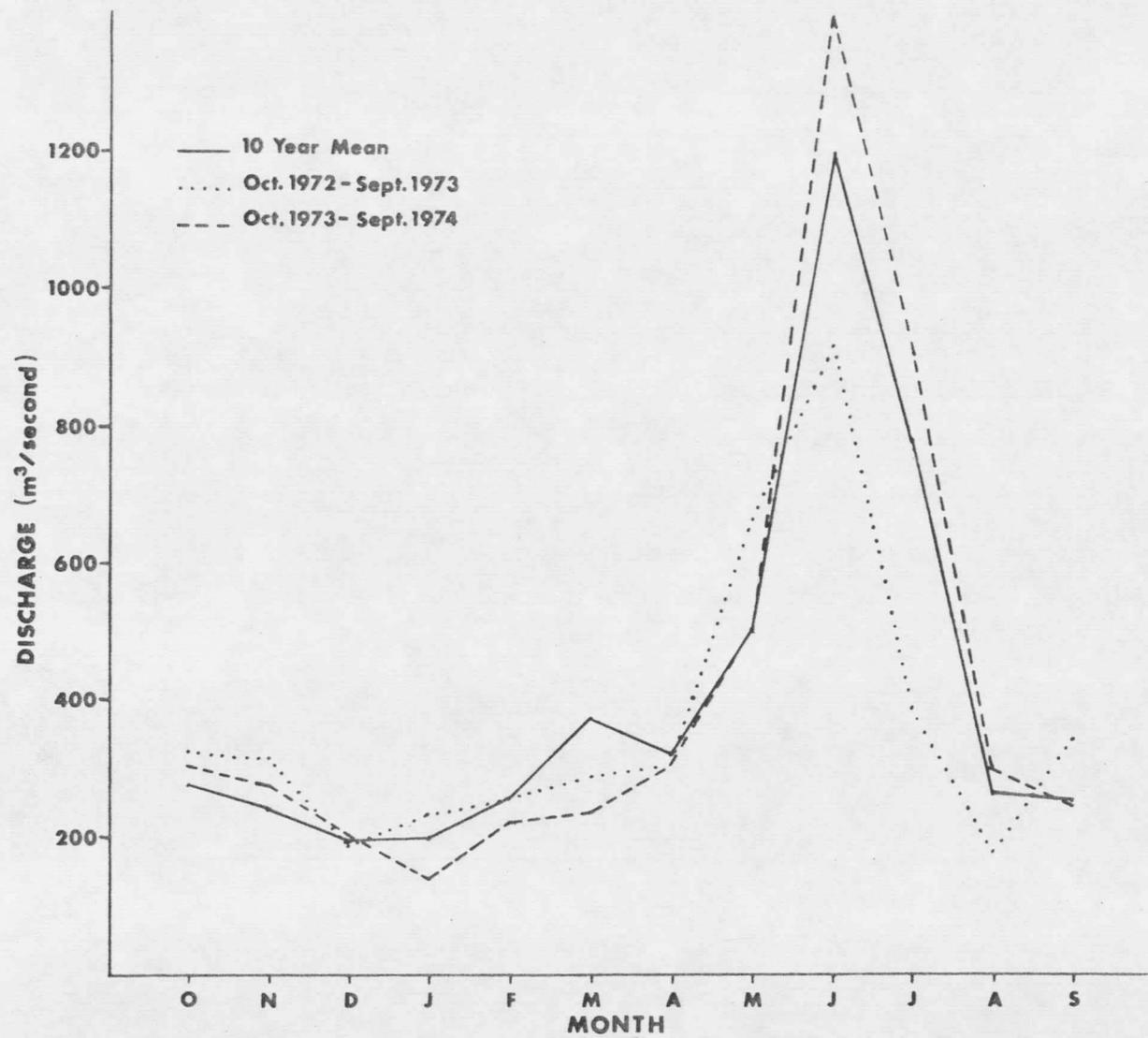


Figure 1. Mean monthly discharge of the Yellowstone River at Sidney, 1965-1974 (U.S.G.S. Data).

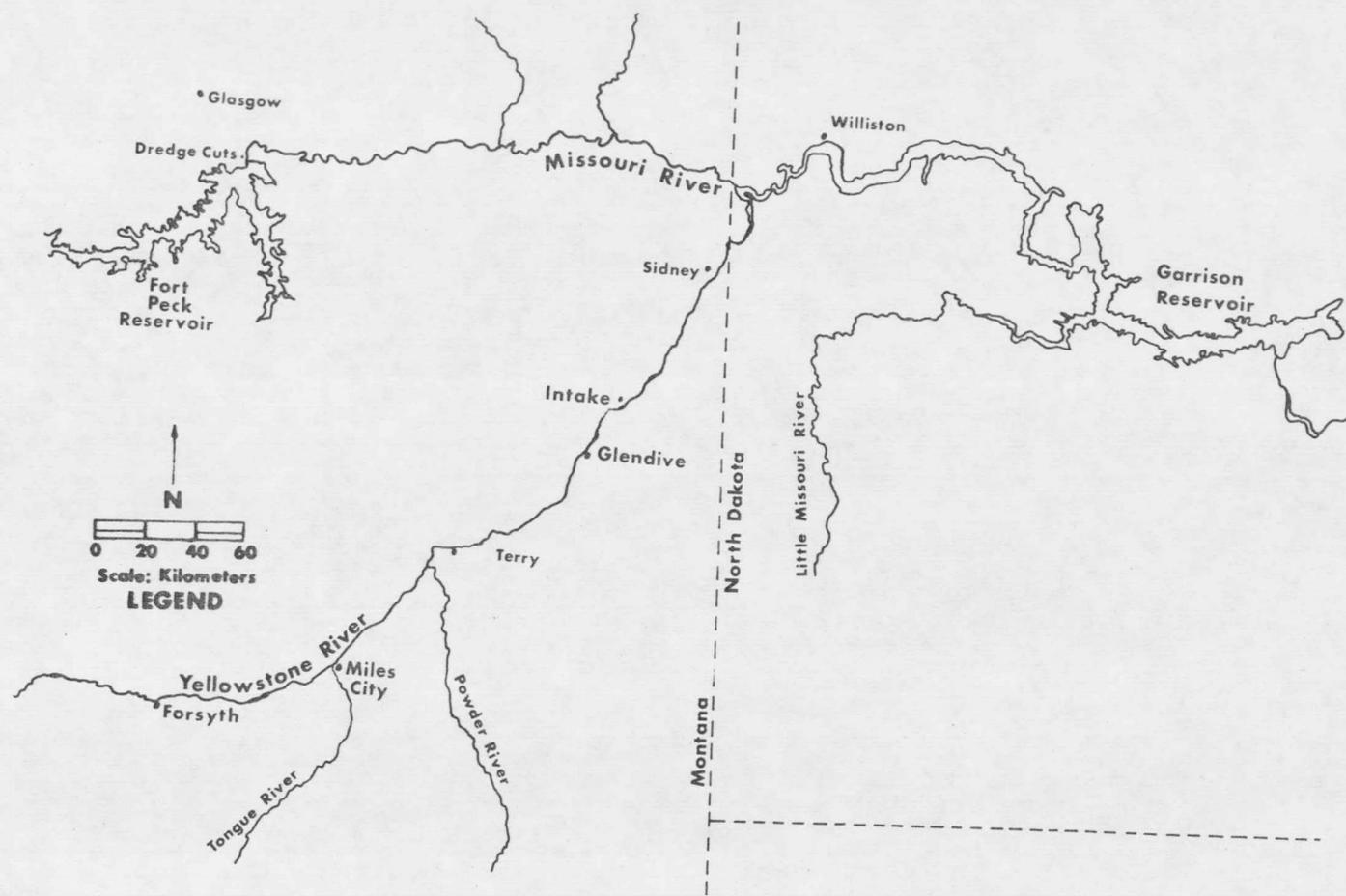


Figure 2. Map of the lower Yellowstone River showing the location of the study area.

## METHODS

A partial creel census was conducted at Intake from May 1 to July 8, 1973 and from April 25 to July 14, 1974. Each week was divided into two strata. The first stratum consisted of weekdays and the second stratum consisted of weekend days and holidays. Fishermen were censused on three randomly selected weekdays in each week and on all holidays and weekend days. Each fishing day was considered to extend from 5 A.M. to 10 P.M. Daily fishing intensity was determined by counting anglers at eight randomly selected hours from 6 A.M. to 9 P.M. on each census day. Only fishermen actually in the process of snag fishing or repairing tackle were counted.

As many fishermen as practical were interviewed on completion of their fishing day. All fishermen were interviewed individually. The residency, gender, times fishing began and ended, estimated time fished, side of river fished on, number of paddlefish caught, and number of paddlefish kept was obtained in each interview. The length of a fisherman trip, the catch rate, and the overall harvest were estimated from information obtained and analyzed using Formula's 5 through 32 from Spence (1970).

As many of the angler's fish as practical were examined. Weights were determined with a Chattiion spring balance calibrated to the nearest 1.0 pound. Total lengths were measured with a sliding double

yardstick calibrated in tenths of inches. Summary weights and lengths were then converted to metric values. Sex was determined by examination of the gonads. The ages of paddlefish were estimated from segments of their dentary bones prepared and sectioned in the manner described by Adams (1942).

Paddlefish in good condition caught by fishermen who did not wish to keep them, and by creel census personnel were tagged and released to obtain information on movement and harvest. Tags were numbered poultry bands placed on the jaw.

## RESULTS

### Information from Interviews

#### Coverage

Both count and interviews were made on 75.4 and 72.8 percent of the fishing days during 1973 and 1974, respectively (Table 2). Interviews, but not counts, were made on additional days in both years.

TABLE 2. STRATUM COVERAGE DURING THE STUDY.

Year Stratum	1973			1974		
	I	II	I & II	I	II	I & II
Number of Days in Season	47	22	69	55	26	81
Number of Days with Counts and Interviews	30	22	52	33	26	59
Number of Days with Interviews Only	2	0	2	16	0	16

The number of fishermen interviewed and the hours spent fishing are presented in Table 3. The length of the fisherman day in each stratum was calculated by dividing the sum of hours fished by the number of individuals fishing as obtained from interviews during the period. During 1973, length of the fisherman day with 95 percent confidence limits was 3.70 ( $\pm 0.27$ ) hours for Stratum I and 5.08 ( $\pm 0.35$ ) hours for Stratum II. The length of the fisherman day for the entire season was estimated by combining the weighted strata

TABLE 3. NUMBER OF INTERVIEWS AND HOURS FISHED.

Year Stratum	1973		1974	
	I	II	I	II
Number of Fishermen Interviewed	368	250	784	773
Sum of Hours Reported Spent Fishing (from interviews)	1359.75	1270.25	2416.50	2857.25

values. During 1973, the season estimate was 4.25 ( $\pm 0.22$ ) hours. In 1974 the length of the fisherman day for Strata I and II was 3.08 ( $\pm 0.16$ ) and 3.70 ( $\pm 0.16$ ) hours, respectively, and the season estimate was 3.32 ( $\pm 0.12$ ) hours.

#### Catch Rate

The catch rate for each stratum was determined by dividing the number of fish taken by the number of hours expended as reported in interviews of the period. For 1973, the estimated catch rate was 0.62 for fish per hour for Stratum I, 0.26 for Stratum II and 0.45 for the entire season. During 1974, it was 0.44 for Stratum I, 0.32 for Stratum II and 0.39 for the combined strata.

In his study of this paddlefish fishery, Robinson (1966) found catch rates of 2.93 and 1.77 fish per fisherman trip of unstated duration in 1964 and 1965, respectively. In this study, catch rates were 1.90 fish per fisherman trip of 4.25 hours in 1973 and 1.30 fish per fisherman trip of 3.32 hours in 1974.

Sufficient data were collected during 1974 to allow the calculation of a daily catch rate (Figure 3). The daily catch rate fluctuated significantly within short periods of time. Early May, late June and early July contained periods of higher catch rates than from May 15 through June 14.

Purkett (1963) suggested catch rates and possibly movements of paddlefish are related to flows. A correlation of the daily catch rate at Intake (Figure 3) and flows at Sidney during 1974 yield R value of 0.249. Because of the similarity in the shape of their curves, a correlation was run between daily catch rates and turbidity readings of the Yellowstone River at Glendive (Figure 4). The R value for this relationship was 0.611. However, correlating the daily catch rate versus the previous days turbidity increased the R value to 0.675. This suggests that turbidity is affecting movements and not the catchability of the fish directly.

From April 25 through May 29, 1974, when flows were below 560 cubic meters per second, catch rates on the Intake and Glendive sides of the river were 0.32 and 0.36 fish per hour, respectively. However, from May 29 through July 14, when flows exceeded 560 cubic meters per second, the catch rates on the Intake and Glendive sides were 0.217 and 0.540, respectively. The higher catch rate on the Glendive side appeared to be related to the presence of a large pool which developed there as a result of the higher discharge.





















































