

2006 Annual Report

Pallid Sturgeon Population Assessment and Associated Fish Community Monitoring for the Missouri River: Segment 13



Prepared for the U.S. Army Corps of Engineers – Missouri River Recovery Program

By:

Andrew Plauck, Nick Utrup, Wyatt Doyle, Patricia Herman and Tracy Hill

United States Fish and Wildlife Service
Columbia Fishery Resources Office
101 Park DeVille Dr, Suite A
Columbia, MO 65203

March 2007

EXECUTIVE SUMMARY

Seven pallid sturgeon were captured in segment 13 in 2006 by the Columbia FRO. Three of the pallid sturgeon were not hatchery tagged. Genetic analysis of the three unmarked fish will determine their origin. Four hatchery marked pallid sturgeon were captured, representing the four year classes (2001, 2002, 2003, 2004) stocked in segment 13 since 2001. Three of the fish were directly traceable to the Boonville, Missouri (RM 194) stocking location in segment 13.

One fish had an elastomere tag combination that was stocked at three locations (including Boonville). This fish had apparently lost a PIT tag, indicating 25% loss of PIT tags.

Approximately 21,000 pallid sturgeon have been stocked at Boonville, Missouri since 2002. Of those fish, approximately 13,000 of them were stocked as fingerlings in 2003. Six of the seven pallid sturgeon captures in segment 13 occurred in the 30 mile stretch of river encompassing the Boonville stocking location. Drifted 2.5 inch trammel nets captured one pallid sturgeon in 99 deployments. Gill nets captured two fish in 145 deployments. One inch trammel nets captured 2 fish in 102 deployments. Two pallid sturgeon were captured using wild gear (3 inch multi-filament gill net and green 1 inch trammel net) while attempting to capture broodstock or evaluate gears. All pallid sturgeon were captured during the sturgeon season in 2006. Catch rates for all gears declined in 2006 compared to the two previous years, with some gears not capturing any pallid sturgeon (otter trawl). No young of year or sub-stock sized pallid sturgeon were captured in segment 13 in 2006. Condition factors of the smaller stock length (330-629 mm) fish were higher on average than the larger quality sized pallid sturgeon (630-839). Stock size pallid sturgeon had an average condition of 0.895 while the quality size fish averaged 0.775. Growth rates of traceable pallid sturgeon ranged from 0.247 to 0.287 mm per day. The majority of pallid sturgeon captures occurred on inside bend macrohabitats (71%) and channel border mesohabitats (80%). The average pallid capture occurred in primarily sandy substrate, water velocity of 0.47 meters per second, turbidity of 163 NTU's and at a temperature of 14.9 °C.

Shovelnose sturgeon catch rates have declined since 2005 for all gear types in all seasons. In 2005, 4,113 shovelnose sturgeon were captured in segment 13 compared to 1,983 in 2006. Catch

rates for quality size shovelnose sturgeon (greater than 380 mm) decreased from 8.2 fish per net night in 2005 to 4.4 in 2006. Shovelnose sturgeon outnumbered pallid sturgeon 283 to 1.

Catch rates for the remaining target species allow biologists to analyze the changes in the Missouri River fish community. Sturgeon chubs were the least abundant of the three chub species. Sixty three sturgeon chubs were captured only with otter trawls. Thirty nine were captured during the sturgeon season and 24 during the fish community season. Sturgeon chub catch increased in 2006 during sturgeon season and remained similar to 2005 during fish community season. Sicklefin chubs showed a decline in numbers sampled (288 in 2006 vs. 796 in 2005). Sicklefin chub catch rates slightly decreased in 2006 during sturgeon season, but declined drastically in fish community season compared to the previous year. Speckled chubs were the most abundant chub species but also declined from the previous year (381 in 2006 vs. 536 in 2005). Between 2005 and 2006, speckled chub CPUE increased significantly during the sturgeon season, but declined during the fish community season. Thirty-nine sand shiners were captured during 2006, which is more than the previous two years combined (5 in 2005 and 28 in 2004). Segment 13 has never had high catch rates for *Hybognathus* spp. In 2006, 4 were captured in mini-fyke nets. Blue sucker catch rates increased in active gears (otter trawls and both size trammel nets) during sturgeon season, with a total catch of 115 blue suckers. Forty four-sauger were captured in 2006. This number is consistent with the number of sauger captured in 2005 (N=43). In total, 13,934 fish, comprised of 63 species, were captured in segment 13 during the 2006 sample year. Emerald shiners made up 18% of the catch (N=2,514). Three lake sturgeon were captured in gill nets.

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Introduction

Pallid sturgeon (*Scaphirhynchus albus*) have declined throughout the Missouri River since dam construction and inception of the Bank Stabilization and Navigation Project in 1912 (Carlson et al. 1985). Loss of habitat, reduced turbidity, increased velocity, loss of natural flows, reduction in forage, increased hybridization and inadequate reproduction and recruitment are factors contributing to the decline of the pallid sturgeon and other native species (Pflieger and Grace 1987). Since 1996, surveys conducted throughout the Missouri and Mississippi Rivers show an increase in hybridization and continued decline of pallid sturgeon relative abundance (Grady et al. 2001, Doyle and Starostka 2003, Doyle and Starostka 2004).

In an independent scientific evaluation of the condition and management of the Missouri River, the National Research Council (2002) concluded that altered flow and habitat conditions associated with current management practices on the Missouri River have resulted in an unhealthy river ecosystem. Similar conclusions presented in the U. S. Fish and Wildlife Service Biological Opinion recommended, in part, that the Army Corps of Engineers (COE) initiate modified flow regimes by 2003 to avoid jeopardizing three listed species (endangered pallid sturgeon and least tern; threatened piping plover) and begin restoring the river's ecological health. The COE is responsible for monitoring and evaluating biotic responses of the pallid sturgeon to operational and habitat changes on the Missouri River (USFWS 2000). Habitat restoration, higher spring and lower summer flows combined with adaptive management are recommended measures to restore pallid sturgeon populations on the Lower Missouri River. Adaptive management is an approach to natural resources management that promotes carefully designed management actions, monitoring and assessment of impacts and application of results and findings to subsequent policy and management strategies. Monitoring sturgeon populations will provide vital information needed to guide restoration of form and function (habitat and hydrology) in the Lower Missouri River.

In response to the 2000 Missouri River Biological Opinion, the COE is developing monitoring and restoration projects to avoid jeopardizing pallid sturgeon populations. As part of their Implementation Plan, the COE is working with the U. S. Fish and Wildlife Service (USFWS) and State Resource Agencies to develop and conduct a pallid sturgeon monitoring and assessment program. The objectives of this program are as follows:

1. Document annual results and long-term trends in pallid sturgeon population abundance and geographic distribution throughout the Missouri River System.
2. Document annual results and long-term trends of habitat use of wild pallid sturgeon and hatchery stocked pallid sturgeon by season and life stage.
3. Document population structure and dynamics of pallid sturgeon in the Missouri River System.
4. Evaluate annual results and long-term trends in native target species population abundance and geographic distribution throughout the Missouri River system.
5. Document annual results and long-term trends of habitat usage of the native target species by season and life stage.
6. Document annual results and long-term trends of all non-target species population abundance and geographic distribution throughout the Missouri River system, where sample size is greater than fifty individuals.

Study Area

Historically, the Missouri River was very wide and shallow, containing meandering channels with many islands and snags. Today, the Missouri River is maintained by the COE as a navigation channel for barges with high levies and armored banks to protect the adjacent farm land. Reveted banks and dikes line the river making it a self-scouring channel. Water velocities exceed 1.3 m/s in the main channel and drop to zero in pools that exist behind dike structures. Depths range from six meters in the main channel to 12 meters behind dikes. Turbidities can vary widely from over 1,000 NTU's in spring flood events to around 40 NTU's in the winter months. Substrates range from silt (behind dikes) to fine sand and gravel in the main channel and border habitats. Rock revetment lines the outside bend shoreline; whereas silt or sand banks dominate the inside bend shoreline. In low water, sand bars are visible on the insides of bends with water often carving secondary channels behind. Debris is often discharged from upstream tributaries and frequently gets lodged in sand bars

or on dike structures as water levels drop. The Grand and Osage Rivers are two large tributaries feeding the Lower Missouri River and enter the River nearly at the top and bottom of the study area, respectively. The Grand River flows through northern Missouri farm lands and deliver high silt inputs with warmer water to the Missouri River. The Osage River originates in the foothills of the Ozark mountains and feeds into the Lake of the Ozarks where the water is used to generate power at Bagnell Dam. Because it is a bottom release reservoir, cool and clear water travels the remaining 80 miles (with low sediment inputs) over coarse sand and gravel substrates until its confluence with the Missouri River. Other smaller floodplain tributaries deliver large silt loads from rain events and can quickly change water stage height. Spring floods rarely top the banks, however usually on an annual basis, the river flows through some breached levies onto refuge floodplain land.

Over the last two decades, the COE has made efforts to diversify habitats by notching dikes or creating “pilot channels” on the flood plain. In recent years, much emphasis has been given to these dike modification projects and many of the existing dikes in this reach of river have received some modifications. Notches are now deeper and wider than what previously existed and can change how water is diverted into the bank allowing erosion or deposition to occur at varying degrees. Dike types vary in design but in general, outside bends contain L-shaped dike pointing down stream while dikes on the inside bend are more wing shaped, projecting straight into the channel and slightly downstream. The subsequent habitats that exist behind these dikes vary widely and fish species may use them according to biologically different needs. In all, the river is much different than it used to be, though there are some remnant historical habitats that exist at different water stages. These remnant habitats are important biologically and this project aims to define and determine those most used by the pallid sturgeon

Methods

Sampling was conducted in accordance with Standard Operating Procedures established by a panel of representatives from various State and Federal agencies involved with pallid recovery on the Missouri River (Drobish, 2006). The sampling guidelines were meant to be

adaptive and have been modified to ensure sampling efficiency and scientific accuracy. Bag seines were removed from standard sampling this year due to their similarity of results with mini-fyke nets.

Sampling Site Selection and Description

Segment 13 starts at the confluence of the Grand River (RM 250.3) and ends at the confluence with the Osage River (RM 130.2; Figure 1a). Each segment represents a sampling replicate. Segments were divided into bends which are defined as the crossing of the thalweg from one bank to the other and back. Bends were randomly selected from each segment to be sampled with a suite of gears. Twelve bends were randomly selected prior to November 2005. These twelve bends were each sampled twice, once between 1 November 2005 and 30 June 2006 (referred to as sturgeon season) and once between 1 July 2006 and 31 October 2006 (referred to as fish community season). Additional bends were randomly selected so additional sampling could take place if the first randomly selected bends were finished. The river was categorized into distinct river components called Mesohabitats which exist within Macrohabitats (Appendix B). Each Mesohabitat was sampled twice within each Macrohabitat. When a diversity of habitats was not available, a minimum of eight samples were used to ensure some consistent level of effort per bend. For example, most active gear effort was applied to inside bend channel border habitat because this habitat was available at all water stages in all bends. Samples that occurred outside of the predetermined sampling protocol were given a “Wild” designation and not included in the master data analyses.

In segment 13, sampling was distributed among the following available habitats:

MACRO

CHXO (channel cross over)

ISB (inside bend)

OSB (outside bend),

CONF (confluence- area downstream of a tributary)

SCCS or SCCL (side channel connected small or large)

SCCN (side channel not connected)

TRMS or TRML (small or large tributary mouth)

TRIB (tributary)

MESO

CHNB (channel border- where depth is > 4 ft. to toe of thalweg)
POOL (scour hole)
ITIP (island tip- associated with SCCS or SCCL where the two water currents meet behind an island)
BARS (sand bar or shallow water habitat where depth is < 4 ft. meters)
TLWG (thalweg- main channel between channel borders conveying majority of water)

Sampling Gear

Gill nets were the most effective at capturing sturgeon of all gears combined and were the only gear used to target fish in colder water temperatures (<12.8°C degrees). Other gears were utilized above this temperature to avoid fish mortality. Gillnets (GN) were set in POOL habitat off of dikes or in CHNB habitat where the sand bar sloped down towards the main-channel. Gillnets were anchored upstream with a 20 pound grappling hook and back-anchored with a cement weight tied to a buoy. Gillnets were most effective when they settled on a steep slope tailing off a sand bar into the thalweg or a dike structure. Gillnets were ineffective when flood events occurred in tributaries upstream, which flush debris in the river that subsequently becomes entangled in the nets.

Otter trawls (OT or OT16) were pulled downstream with a jet powered stern trawler. Trawls were most effective on sand bars off the main channel, but could be used in some POOL habitat as a wild option. Trawls were not pulled on outside bend revetment or in the thalweg for safety reasons. Trawls frequently encountered snags, but a procedure was used to safely untangle the gear. An electronic sonar, capable of detecting woody debris, was used to detect snags and avoid many snags in daily operations.

Trammel nets (1 and 2.5inch bar mesh) were set by throwing out a buoy attached to the float line of the net, then deploying the net until the other end entered the water. The net was maintained off the bow with a 30 foot lead line. When the net began to bunch up in the middle or align parallel with the current, it was pulled back to a perpendicular position and an estimate of sampling distance lost was accounted for. Trammel nets were most effective in moderately shallow water (2.5 m) without an eddy effect. Snags occurred frequently, but

did not prevent effective sampling. The 2.5 inch trammel nets were only used in the sturgeon season to target larger spawning pallid sturgeon.

Mini-fyke nets and seines were the only gears used solely in the community season. These nets are more effective at capturing smaller fish, and seasonally, small fish are more abundant after the spawning season. Mini-fykes (MF) were set on mud bars behind dikes and on sand bars in the main-channel. Steep slopes and shallow sand bars may have affected the efficiency of this gear. In many cases, the gear was set close to the bank behind bars and the lead wing was not fully extended because of the steep slope of the bank. In contrast, on shallow sand bars there was not always enough lead to ensure the throat was in the water, especially when water levels were rising or falling. Mini-fykes could only be applied in emergent bar habitat and thus all bends did not receive similar amounts of effort.

Segment 13 sampling gear dimensions:

Otter trawl:	Innovative Nets Systems (Greg Faulkner) custom Skate design, # 9 Sapphire®, 1.5 inch stretch, 16ft wide and 30 inch boards
1 inch trammel net:	125 ft. X 6 ft. outer wall X 8 ft. inner wall; 1 inch bar X 8 inch bar panels
2.5 inch trammel net:	125 ft. X 6 ft. outer wall X 8 ft. inner wall; 2.5 inch bar X 8 inch bar panels
Mini- Fyke:	2 cab frames @ 4 ft. X 2 ft., two 2 ft. hoops, 15 ft. X 2 ft. lead, 1/8 th mesh
Gill net:	100 X 8 ft. with 25 ft. repeating 1.5, 2, 3 and 4 inch mesh panels, nets were sewn together making a 200 ft. net with two series of repeating panels

Data Collection and Analysis

Associated Environmental Data

GPS locations, temperature, and depth (beginning, mid-point and end for all gears except mini-fykes; where depth is measured at the opening/box) were taken for each sample. Additionally, substrate, turbidity and velocity samples were collected randomly for 25% of the Mesohabitat types within each Macrohabitat. Substrate samples were reported as an estimate of the percentage of silt/sand/gravel within each dredge sample. Water column velocity in meters per second (MPS) was measured at (bottom), 80% (8/10) and 20% (2/10) of the depth. All habitat data was collected when pallid sturgeon were encountered. In an attempt to determine if flow/water velocity can be visually estimated by a trained eye, an additional box was added to the data sheet. The data recorder recorded a value corresponding with a set of categories (0 = could not be estimated, 1 = Eddy, 2 = 0.0-0.3 m/s, 3 = 0.3-0.6 m/s, 4 = 0.6-0.9 m/s, 5 = >0.9 m/s).

Genetic Verification

Length measurements (mm) were collected on all fish and a sub-sample of target fish were weighed (g). A series of additional measurements were taken on pallids and their hybrids using Sheehan's index for verification (Sheehan et al. 1999). Sturgeon were called a hybrid when they were verified to be within the range of (- 0.50 to + 0.50) on the Sheehan's Character Index. Passive Integrated Transponder (PIT) tags were implanted under the dorsal fin of pallids, strong hybrids (< -0.5), and lake sturgeon. Additionally, fin clips were collected from pallid sturgeon and hybrids to be analyzed for genetic purity and digital images were taken for documentation. Pallid sturgeon captured in the spring, were implanted with sonic transmitters by USGS biologists for telemetry work. All pallids that were captured with no evidence of previously being tagged were considered to be of wild origin pending genetic verification.

Relative Condition

The relative condition of recaptured hatchery reared pallid sturgeon was calculated using $K_n = (W / W')$, where W is weight of the individual and W' is the length-specific mean weight predicted by the weight-length equation calculated for that population. Keenlyne and Evanson (1993) provided a weight-length regression [$\log_{10} W = -6.378 + 3.357 \log_{10} L$ ($r^2 = 80.9740$)] for pallid sturgeon throughout its range which was used to calculate a relative condition factor.

Relative Stock Densities

A length frequency index measures changes in fish population structure. Length categories based on the percentage of the largest known pallid sturgeon are as follows (Shuman et al. 2006): sub-stock fork length < 330mm (20%), stock fork length = 330-629mm (20-36%), quality fork length = 630-839mm (36-45%), preferred fork length = 840-1039mm (45- 59%), memorable fork length = 1040- 1269mm(59 – 74%) and trophy fork length > 1270mm (>74%). Length categories based on the percentage of the largest known shovelnose sturgeon are as follows (Quist et al. 1998): sub-stock fork length <250mm (20%), stock fork length = 250 – 379mm (20- 36%), quality fork length = 380 – 509mm (36 – 45%), preferred fork length = 510 – 639mm (45- 59%), memorable fork length = 640 – 809mm (59 -74%) and trophy fork length > 810mm (> 74%). Proportional Stock Density (PSD) is the proportion of fish of quality size in a stock. Relative Stock Density (RSD) is the proportion of fish of a size group in a stock.

Analyses

A sample target effort for each gear was defined as follows: 300 m drift (TN), 300 m tow (OT), and one overnight set (HN, MF). A minimum effort of 75m for TN and OT's was accepted in channel border habitat; because some areas have so much debris long drifts are not possible. Effort for seines could be determined using different

methods such as a half or full arc or pulling up-stream or down-stream, however our primary effort was in a rectangular parallel pull downstream, effort was calculated by multiplying the width of the net by distance pulled. Effort was calculated as catch per 100 m² for active gears (including seines) or per overnight set for passive gears. Samples that occurred outside of the “Standard” gear or habitat effort or samples that occurred in “Non-random” bends were excluded from CPUE calculations. These data were, however, included into length frequencies, relative condition and population structure calculations.

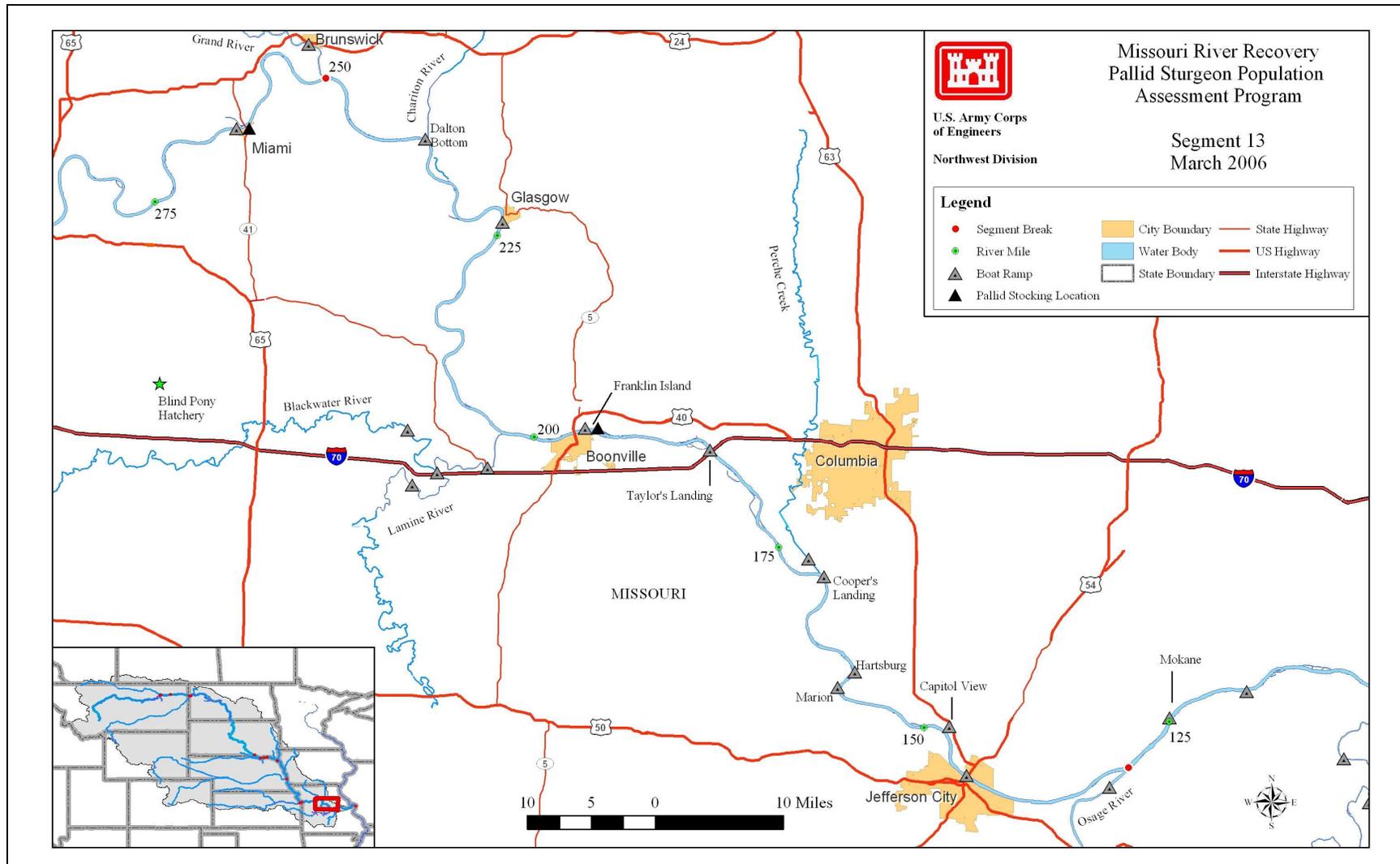


Figure 1a. Map of segment 13 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 13 encompasses the Missouri River from the Grand River confluence (River Mile 250.3) to the Osage River confluence (River Mile 132.6).

Results

Pallid Sturgeon

This section covers the following objectives from the pallid sturgeon monitoring and assessment program:

Objective 1. Document annual results and long-term trends in pallid sturgeon population abundance and geographic distribution throughout the Missouri River System.

Objective 2. Document annual results and long-term trends of habitat usage of wild pallid sturgeon and hatchery stocked pallid sturgeon by season and life stage.

Objective 3. Document population structure and dynamics of pallid sturgeon in the Missouri River System.

Seven pallid sturgeon were captured in the segment 13 by the Columbia FRO during 2006. Throughout the 120 miles of segment 13, thirteen bends were sampled with gill nets (145 net nights) while 12 bends were sampled with 1 inch trammel nets (102 deployments), 2.5 inch trammel nets (102 deployments), and otter trawls (96 deployments) during the sturgeon season (Table 1). Twelve bends were sampled during fish community season with mini-fyke nets (94 net nights), 1 inch trammel nets (96 deployments), and otter trawls (96 deployments, Table 1).

Pallid sturgeon have been stocked in segment 13 (Boonville, MO RM 194) since 2002, with some being uniquely identified with PIT tags, coded wire tags and elastomere combinations. Six of the seven captures occurred within the 30 mile reach of river (RM 175-205) which encompasses this stocking location (Figure 1b). Four of the seven pallid sturgeon captured in segment 13 were of known hatchery origin, retaining their hatchery implanted markings (Elastomere and PIT tags, Figure 9). Three unmarked fish were captured as well, one fish

was previously PIT tagged, but was not traceable from the hatchery database. Two pallid sturgeon were unmarked and presumed wild, pending genetic confirmation. Three of the four hatchery origin fish captured in segment 13 were directly traced to the Boonville stocking location, by PIT tag number. Another had an Elastomere combination that linked it to a 2003 stocking in Boonville, Bellevue (RM 601), or Mulberry (RM 775). The four hatchery origin pallid sturgeon represented four year classes of fish (2001 through 2004). The three directly traceable fish were healthy, showing condition (Kn) values ranging from 0.859 to 1.074 (Table 6). Growth of these three fish was consistent with previously reported rates in segment 13 (0.247-0.287 mm/day, Table 6, Utrup et al. 2006).

All of the pallid sturgeon collected from segment 13 during the 2006 sample year were captured during the sturgeon season. The majority of pallid sturgeon (N = 5; 71%) were captured in ISB macrohabitat relative to an average of 64% of the total effort being expended in that habitat during sturgeon season (Tables 13 and 15). Similarly, the majority of pallid sturgeon (N = 4; 80%) were captured in CHNB mesohabitat relative to an average of 81% of the total effort in that habitat (Tables 14 and 16). Similar to what was found by Utrup et al (2006), pallid sturgeon in ISB CHNB habitat (N = 4; 57%) were captured slightly deeper (2.8 m) than what was sampled on average (2.4 m), though in all cases pallid sturgeon were captured closer to the mean sample depth than the extremes (captured between 1.4 and 4.0 m whereas the sample mean was between 0.5 to 5.0 m; Table 3). This trend was similar for bottom velocity where pallid sturgeon were captured at a mean velocity of 0.47 m/s (0.10 – 0.88) with a sample mean of 0.32 m/s (0.0 – 1.40). The majority of pallid sturgeon (N = 5; 71%) were captured in water temperatures equal to or less than 16.0 °C. On average, all pallid sturgeon were captured at a water temperature of 14.9 °C (8.0-25.0) with an average sample temperature of 21.7 °C (1.4 – 32.0; Table 3). Average turbidity measurement for pallid sturgeon captures was 163 NTU's (27 to 295) with a mean turbidity per sample of 80.1 NTU's throughout the course of 2006 (10 – 966; Table 3).

The population structure, shown in Figure 8, illustrates the influence of recently propagated fish (smallest four fish). The three larger fish are larger than fish stocked in 2002 indicating that they could be or have lost their tag from a previous stocking (Table 6). The RSD values

indicate health of fish populations relative to reproductive potential and age of fish. The fact that few pallid sturgeon (2 quality size; Table 7) were seen at larger sizes suggests little opportunity exists for reproduction.

The average number of bends sampled in segment 13 decreased from 19 in 2005 to 13 during the 2006 sample year. Of the standard gears deployed in segment 13 during both seasons, multiple pallid sturgeon were only captured with 1 inch trammel nets (2 pallid sturgeon in 102 deployments) and gill nets (2 pallid sturgeon in 145 deployments; Table 1). Two and a half inch trammel nets captured one fish in 99 deployments (Table 1). Otter trawls did not capture any pallid sturgeon during sturgeon season. Pallid sturgeon were not captured during fish community season despite 96 otter trawls and 1 inch trammel nets being fished (Table 1).

Pallid sturgeon catch rates (CPUE) declined for each gear in 2006 (Figures 2, 3 and 5). Gill net CPUE decreased from 0.018 in 2005 to 0.010 in 2006 (Utrup et al. 2006; Figure 2), projecting that 100 net nights would be needed to capture a single pallid sturgeon. Otter trawl rates have dropped from 2004, when one in a hundred tows resulted in a pallid capture (Figure 2), to zero for 2006. Catch per unit effort for the 1 inch trammel net dropped from 0.014 in 2005 to 0.007 in 2006 (Utrup et al. 2006). Catch rates for the 2.5 inch trammel net were not as noticeable, falling from 0.006 in 2005 to 0.005 in 2006 (Utrup et al. 2006). Overall catch numbers in 2004 (N = 20) and 2005 (N = 29) were similar (Utrup et al. 2006, Doyle et al. 2005), however, in 2006, numbers drastically declined (N=7).

Table 1. Number of bends sampled, mean effort per bend (mean number of deployments), and total effort by macrohabitat (total number of deployments) for segment 13 on the Missouri River during fall through spring (sturgeon season) and summer (fish community season) in 2006. N-E indicates the habitat is non-existent in the segment.

Gear	Number of Bends	Mean Effort	Macrohabitat													
			BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Fall through Spring - Sturgeon Season																
1 Inch Trammel Net	12	8.50	N-E	26	0	N-E	N-E	67	0	3	6	0	0	0	0	0
2.5 Inch Trammel Net	12	8.25	N-E	25	0	N-E	N-E	63	0	6	5	0	0	0	0	0
Gill Net	13	11.15	N-E	34	0	N-E	N-E	81	21	7	0	0	0	2	0	0
Otter Trawl	12	8.00	N-E	24	2	N-E	N-E	58	0	2	10	0	0	0	0	0
Summer – Fish Community Season																
1 Inch Trammel Net	12	8.00	N-E	24	0	N-E	N-E	69	0	0	3	0	0	0	0	0
Mini-Fyke Net	12	7.83	N-E	23	0	N-E	N-E	35	2	0	27	0	0	0	7	0
Otter Trawl	12	8.00	N-E	25	0	N-E	N-E	65	0	3	3	0	0	0	0	0

Table 2. Number of bends sampled, mean effort per bend (mean number of deployments), and total effort by mesohabitat (total number of deployments) for segment 13 on the Missouri River during fall through spring (sturgeon season) and summer (fish community season) in 2006.

Gear	Number of bends	Mean Effort	Mesohabitat				
			BAR	POOL	CHNB	TLWG	ITIP
Fall through Spring – Sturgeon Season							
1 Inch Trammel Net	12	8.50	0	0	94	0	8
2.5 Inch Trammel Net	12	8.25	0	0	90	0	9
Gill Net	13	11.15	0	70	71	0	4
Otter Trawl	12	8.00	0	0	86	0	10
Summer – Fish Community Season							
1 Inch Trammel Net	12	8.00	0	0	93	0	3
Mini-Fyke Net	12	7.83	91	0	0	0	3
Otter Trawl	12	8.00	0	0	91	0	5

Segment 13 - Pallid Sturgeon Captures by River Mile

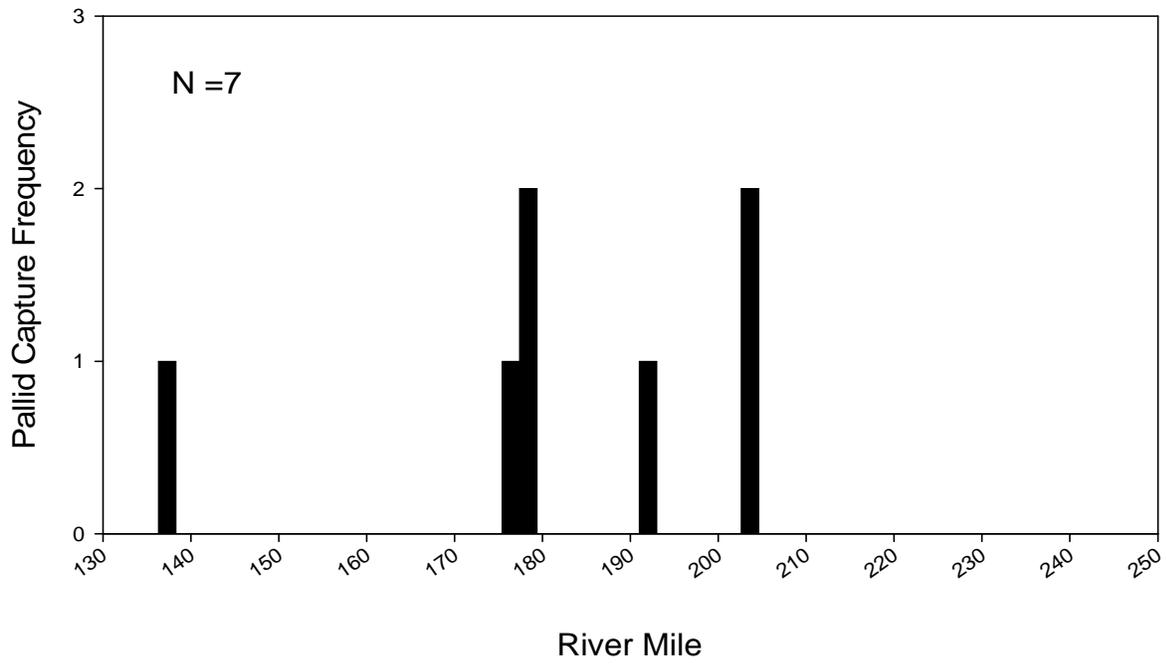


Figure 1b. Distribution of pallid sturgeon captures by river mile for segment 13 of the Missouri River during the 2006 sample year. Black bars represent pallid captures during Sturgeon Season and white bars during Fish Community Season. Figure included all pallid captures including non-random and wild samples.

Table 3. Pallid sturgeon (PDSG) capture summaries for all gears relative to habitat type and environmental variables on the Missouri River during 2006. Means (minimum and maximum) are presented. Habitat definitions and codes presented in Appendix B. N-E indicates the habitat is non-existent in the segment.

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Bottom Velocity (m/s) (Effort)	Bottom Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
BRAD		N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E
CHXO	BAR	0.6 (0.2-1.2)	-	0.10 (0-0.40)	-	27.2 (15.6-32.0)	-	82 (23-155)	-	-
	POOL	4.7 (1.5-9.9)	4.0 (3.5-4.5)	0.17 (0-0.88)	0.20 (0.20-0.20)	8.8 (1.9-17.9)	11.4 (9.6-13.1)	48 (10-295)	295 (295-295)	2
	CHNB	3.0 (1.2-8.7)	1.4 (1.4-1.4)	0.7 (0-1.30)	0.57 (0.57-0.57)	19.8 (1.5-30.0)	16.0 (16.0-16.0)	126 (30-873)	156 (156-156)	1
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
CONF	BAR	-	-	-	-	-	-	-	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	5.0 (4.7-5.3)	-	0 (0-0)	-	25.6 (25.6-25.7)	-	16 (16-16)	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
DEND		N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E
DRNG		N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E
ISB	BAR	0.5 (0.2-1.0)	-	0.06 (0.01-0.11)	-	26.5 (15.6-31.0)	-	47 (27-95)	-	-
	POOL	5.0 (1.4-11.2)	-	0.18 (0-0.76)	-	4.3 (1.4-12.1)	-	35 (18-102)	-	-
	CHNB	2.7 (0.5-6.0)	2.8 (1.2-4.2)	0.69 (0.05-1.40)	0.52 (0.10-0.88)	20.0 (1.5-30.5)	16.3 (8.0-25.0)	123 (23-966)	96 (27-187)	4
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-

Table 3 (continued).

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Bottom Velocity (m/s) (Effort)	Bottom Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
OSB	BAR	0.5 (0.3-0.7)	-	0 (0-0.01)	-	27.4 (26.5- 27.8)	-	76 (37-116)	-	-
	POOL	4.8 (1.6-8.0)	-	0.15 (0-0.52)	-	6.8 (2.0-13.1)	-	32 (23-41)	-	-
	CHNB	4.0 (2.0-8.0)	-	0.09 (0.01- 0.15)	-	12.9 (1.9- 17.7)	-	59 (19-191)	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
SCCL	BAR	-	-	-	-	-	-	-	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	2.3 (1.7-4.0)	-	0.46 (0.27- 0.65)	-	16.0 (1.4- 26.5)	-	192 (30-808)	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	2.7 (1.8-5.4)	-	0.59 (0.16- 0.95)	-	16.2 (1.5- 26.5)	-	102 (30-169)	-	-
SCCS	BAR	0.5 (0.2-1.2)	-	0.12 (0.03- 0.43)	-	27.6 (15.6- 31.0)	-	39 (19-65)	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	2.9 (0.3-4.3)	-	0.58 (0.10- 0.84)	-	20.7 (9.9- 29.3)	-	106 (36-240)	-	-
SCCN	BAR	-	-	-	-	-	-	-	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-

Table 3 (continued).

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Bottom Velocity (m/s) (Effort)	Bottom Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
TRIB	BAR	-	-	-	-	-	-	-	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
TRML	BAR	-	-	-	-	-	-	-	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	4.0 (2.7-5.4)	-	0.18 (0.18- 0.18)	-	7.2 (6.8-7.6)	-	19 (19-19)	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
TRMS	BAR	0.6 (0.5-0.6)	-	0.12 (0.01- 0.35)	-	30.3 (28.0- 32.0)	-	38 (15-55)	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
WILD	BAR	-	-	-	-	-	-	-	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-

Table 6. Mean fork length, weight, relative condition factor (Kn), and growth rates for hatchery-reared pallid sturgeon captures by year class at the time of stocking and recapture during 2006 from segment 13 of the Missouri River. Relative condition factor was calculated using the equation in Keenlyne and Evanson (1993). Standard error (+/- 2SE) was calculated where N>1 and is represented on second line of each year.

Year class	N	Stock Data			Recapture Data			Growth Data	
		Length (mm)	Weight (g)	Kn	Length (mm)	Weight (g)	Kn	Length (mm/d)	Weight (g/d)
2001	1	200	-	-	535	519	0.859	0.254	-
		-	-	-	-	-	-	-	-
2002	1	245	-	-	501	425	0.877	0.247	0.4
		-	-	-	-	-	-	-	-
2003	1	200	30	1.351	385	215	1.074	0.287	0.2
		-	-	-	-	-	-	-	-

Table 7. Incremental relative stock density (RSD)^a and relative condition factor (Kn) for all pallid sturgeon captured with all gear by a length category during 2006 in the Missouri River. Length categories^b determined using the methods proposed by Shuman et al. (2006). Relative condition factor was calculated using the equation in Keenlyne and Evanson (1993).

Length Category	N	RSD	Kn (+/- 2SE)
Sturgeon Season			
Sub-stock (0-199)	0	-	0
Sub-stock (200-329)	0	-	0
Stock	5	71	0.895 (0.128)
Quality	2	28	0.775 (0.099)
Preferred	0	-	0
Memorable	0	-	0
Trophy	0	-	0
Overall	7	-	0.855 (0.099)
Fish Community Season			
Sub-stock (0-199)	0	-	0
Sub-stock (200-329)	0	-	0
Stock	0	-	0
Quality	0	-	0
Preferred	0	-	0
Memorable	0	-	0
Trophy	0	-	0
Overall	0	-	0

^a RSD = (# of fish of a specified length class / # of fish \geq minimum stock length fish) * 100.

^b Length categories based on the percentage of the largest known pallid sturgeon: Sub-stock FL < 330 mm (20 %), Stock FL = 330 - 629 mm (20 - 36 %), Quality FL = 630 - 839 mm (36 - 45 %), Preferred FL = 840 - 1039 mm (45 - 59 %), Memorable FL = 1040 - 1269 mm (59 - 74 %), Trophy FL > 1270 mm (>74 %).

Segment 13 - Pallid Sturgeon / Sturgeon Season

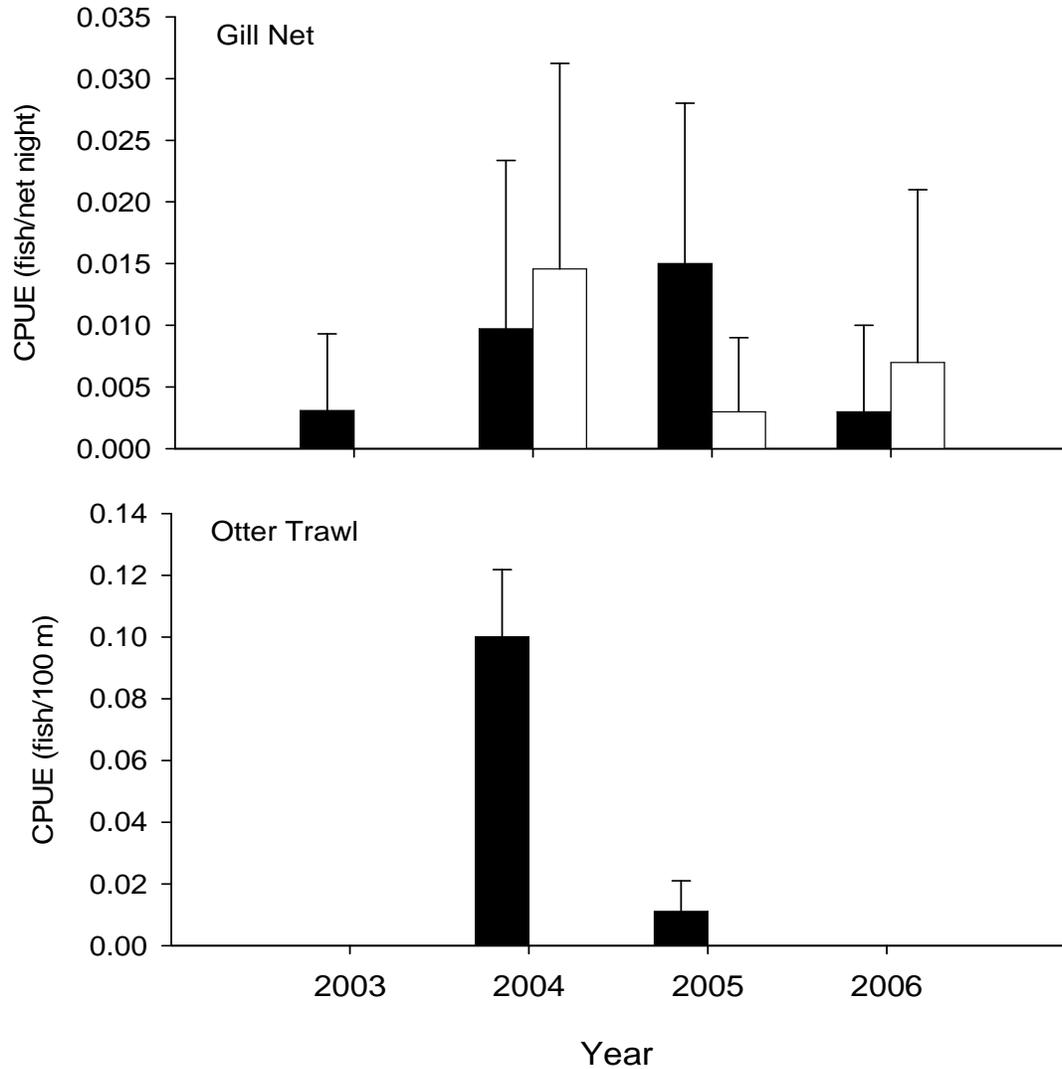


Figure 2. Mean annual catch-per-unit-effort (± 2 SE) of unknown origin (black bars) and hatchery reared (white bars) pallid sturgeon using gill nets and otter trawls in segment 13 of the Missouri River during sturgeon season 2003-2006.

Segment 13 - Pallid Sturgeon / Sturgeon Season

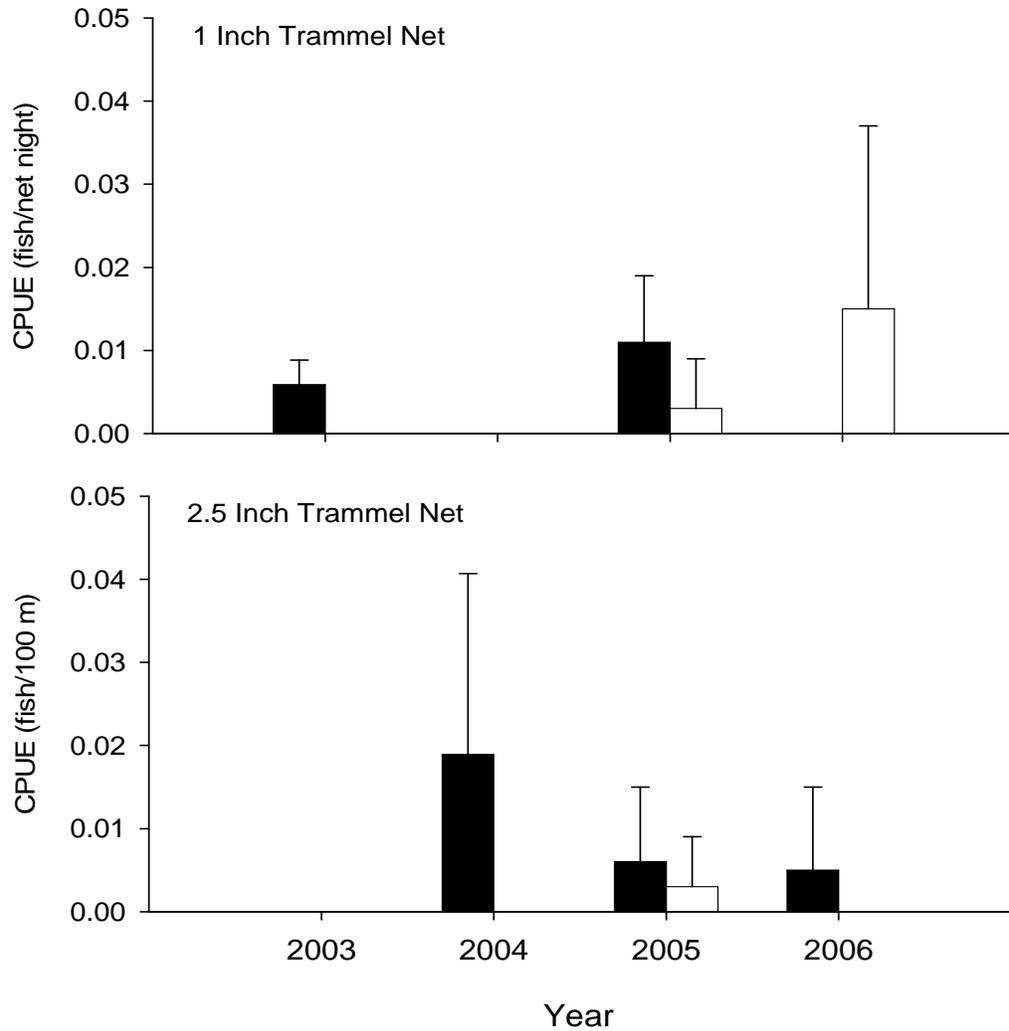


Figure 3. Mean annual catch-per-unit-effort (± 2 SE) of unknown origin (black bars) and hatchery reared (white bars) pallid sturgeon using 1 and 2.5 inch trammel nets in segment 13 of the Missouri River during sturgeon season 2003-2006.

Segment 13 - Pallid Sturgeon / Fish Community Season

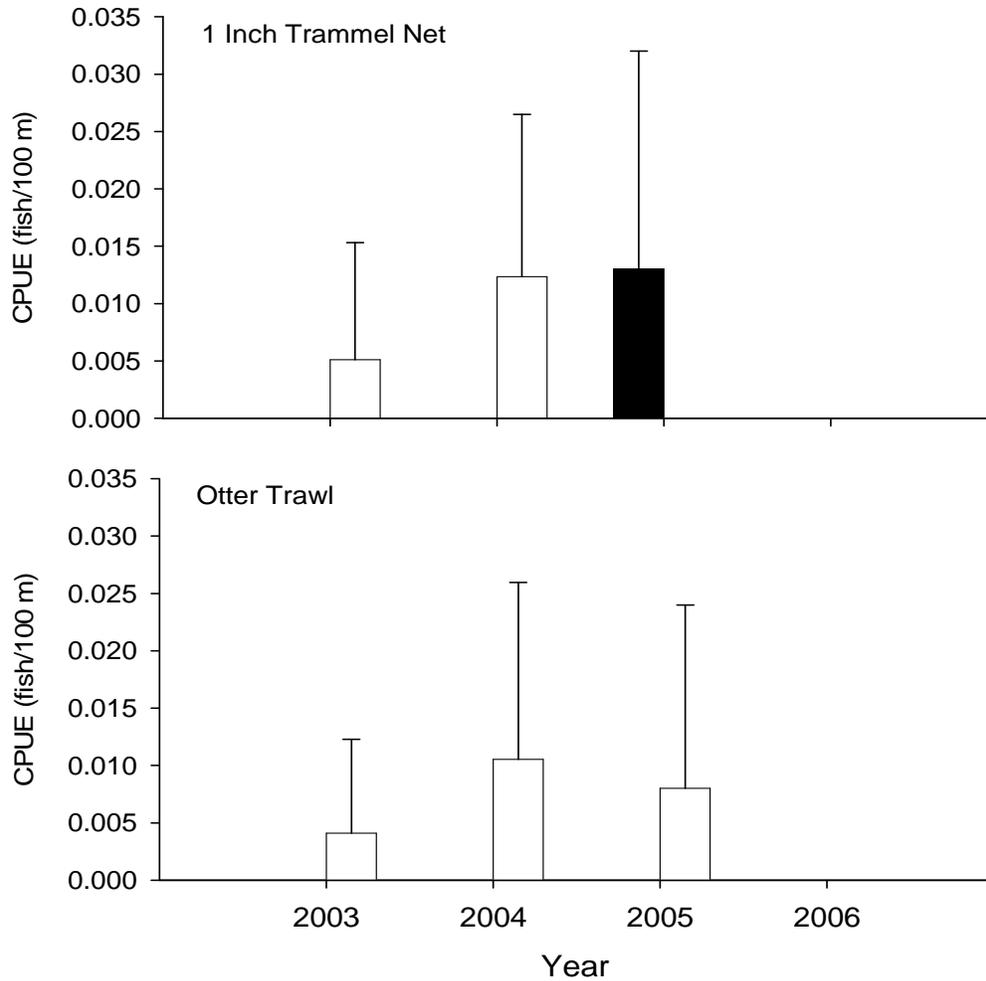


Figure 5. Mean annual catch-per-unit-effort (± 2 SE) of unknown origin (black bars) and hatchery reared (white bars) pallid sturgeon using 1 inch trammel nets and otter trawls in segment 13 of the Missouri River during fish community season 2003-2006.

Table 9. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	67	0	2	5	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	25	0	N-E	N-E	66	0	5	4	0	0	0	0	
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	24	0	N-E	N-E	56	14	5	0	0	0	1	0	
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	22	1	N-E	N-E	65	0	2	10	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	0	N-E	N-E	69	0	0	4	0	0	0	0	
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	24	0	N-E	N-E	37	2	0	29	0	0	0	7	
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	23	0	N-E	N-E	73	0	2	2	0	0	0	0	

Table 10. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
Gill Net	0	0	0	0	0	0
		0	47	3	50	0
Otter Trawl	0	0	0	0	0	0
		0	90	10	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	96	4	0	0
Mini-Fyke Net	0	0	0	0	0	0
		97	0	3	0	0
Otter Trawl	0	0	0	0	0	0
		0	96	4	0	0

Table 11. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	67	0	2	5	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	25	0	N-E	N-E	66	0	5	4	0	0	0	0	
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	24	0	N-E	N-E	56	14	5	0	0	0	1	0	
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	22	1	N-E	N-E	65	0	2	10	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	0	N-E	N-E	69	0	0	4	0	0	0	0	
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	24	0	N-E	N-E	37	2	0	29	0	0	7		
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	23	0	N-E	N-E	73	0	2	2	0	0	0		

Table 12. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
Gill Net	0	0	0	0	0	0
		0	47	3	50	0
Otter Trawl	0	0	0	0	0	0
		0	90	10	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	96	4	0	0
Mini-Fyke Net	0	0	0	0	0	0
		97	0	3	0	0
Otter Trawl	0	0	0	0	0	0
		0	96	4	0	0

Table 13. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	2	N-E	50	0	N-E	N-E	50	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	67	0	2	5	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	25	0	N-E	N-E	66	0	5	4	0	0	0	0	
Gill Net	2	N-E	50	0	N-E	N-E	50	0	0	0	0	0	0	0	
		N-E	24	0	N-E	N-E	56	14	5	0	0	0	1	0	
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	22	1	N-E	N-E	65	0	2	10	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	0	N-E	N-E	69	0	0	4	0	0	0	0	
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	24	0	N-E	N-E	37	2	0	29	0	0	7		
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	23	0	N-E	N-E	73	0	2	2	0	0	0		

Table 14. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	2	0	100	0	0	0
		0	93	7	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
Gill Net	2	0	50	0	50	0
		0	47	3	50	0
Otter Trawl	0	0	0	0	0	0
		0	90	10	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	96	4	0	0
Mini-Fyke Net	0	0	0	0	0	0
		97	0	3	0	0
Otter Trawl	0	0	0	0	0	0
		0	96	4	0	0

Table 15. Total number of quality size and greater (≥ 630 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	67	0	2	5	0	0	0	0	0
2.5 Inch Trammel Net	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	25	0	N-E	N-E	66	0	5	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	24	0	N-E	N-E	56	14	5	0	0	0	1	0	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	22	1	N-E	N-E	65	0	2	10	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	27	0	N-E	N-E	69	0	0	4	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	24	0	N-E	N-E	37	2	0	29	0	0	0	7	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	23	0	N-E	N-E	73	0	2	2	0	0	0	0	0

Table 16. Total number of quality size and greater (≥ 630 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
2.5 Inch Trammel Net	1	0	100	0	0	0
		0	93	7	0	0
Gill Net	0	0	0	0	0	0
		0	47	3	50	0
Otter Trawl	0	0	0	0	0	0
		0	90	10	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	96	4	0	0
Mini-Fyke Net	0	0	0	0	0	0
		97	0	3	0	0
Otter Trawl	0	0	0	0	0	0
		0	96	4	0	0

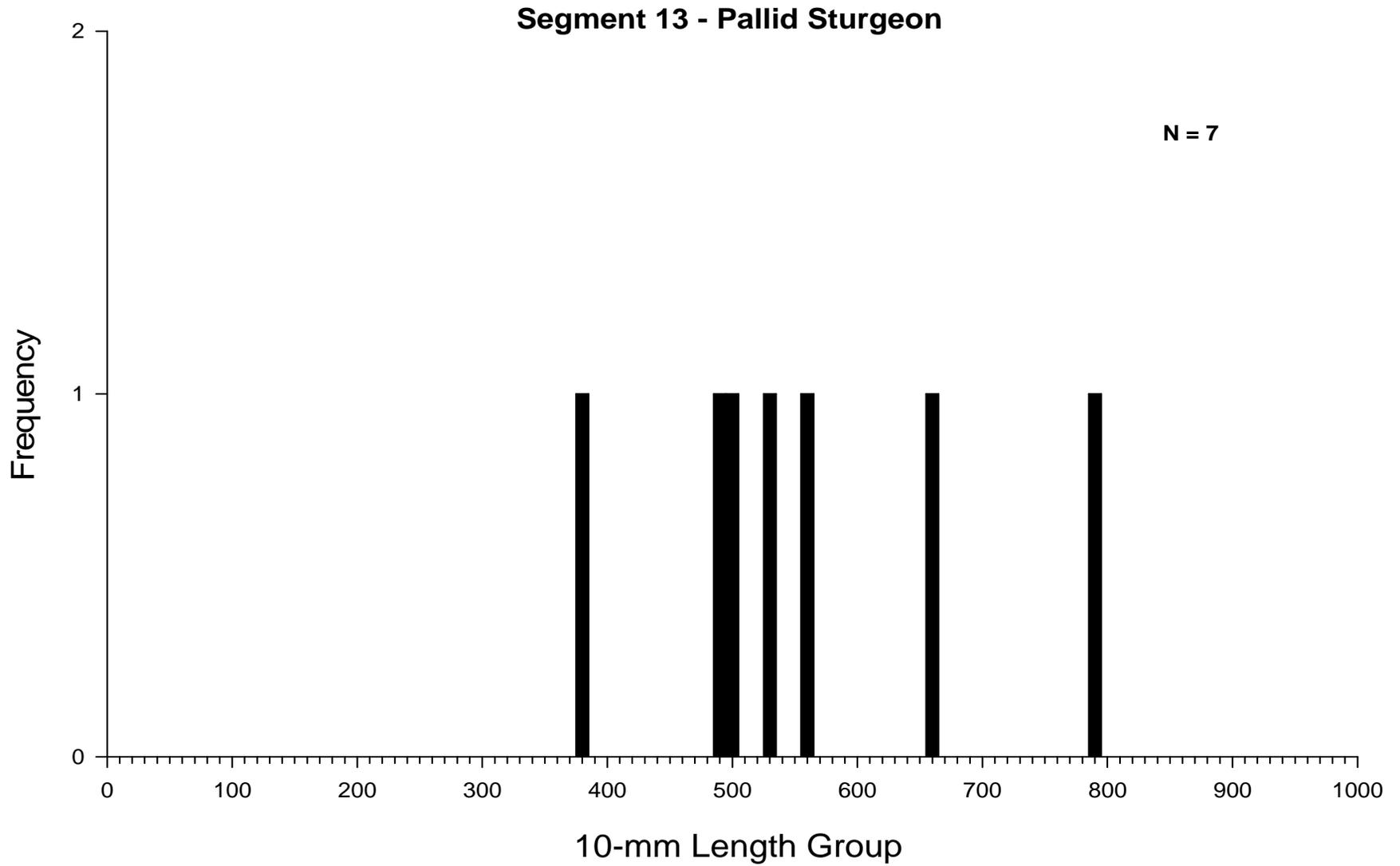


Figure 8. Length frequency of pallid sturgeon captured during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during the 2006 sample year including non-random and wild samples.

Segment 13 - Annual Pallid Sturgeon Capture History

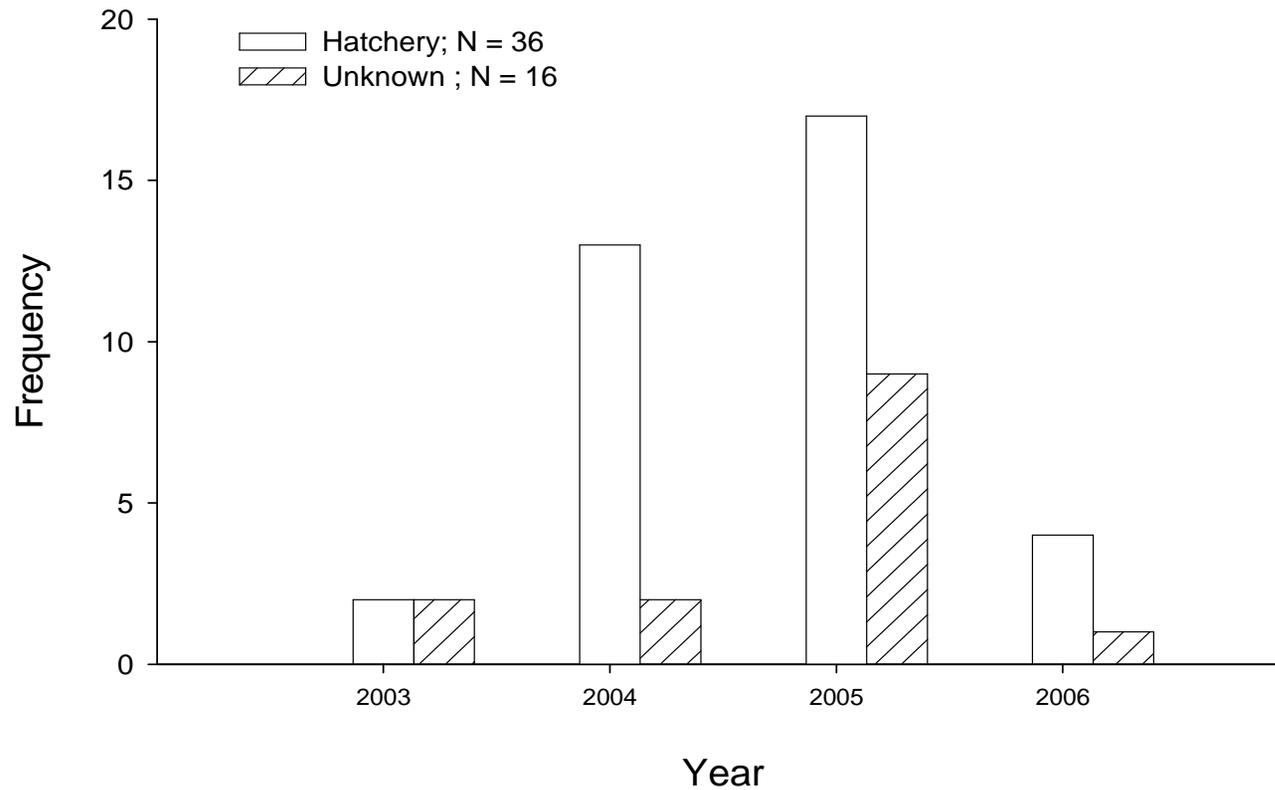


Figure 9. Annual capture history of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon captured in segment 13 of the Missouri River from 2003 to 2006. Figure is designed to compare overall pallid sturgeon captures from year to year and may be biased by variable effort between years.

Shovelnose X Pallid Sturgeon Hybrids

Four hybrid (pallid x shovelnose) sturgeon were captured in segment 13 in 2006. Three of the four hybrids (75%) were captured on ISB macrohabitat. Similarly, 71% of the pallid sturgeon captured were using the ISB macrohabitat. Hybrid sturgeon captures were equally distributed between CHNB and POOL mesohabitats. Hybrid sturgeon were captured on average at 5.1°C (3.5-9.6°C) compared to 14.9°C for the pallid sturgeon. The average depth at capture was 3.6 meters (2.5-4.6 meters) compared to 2.4 meters for pallid sturgeon. Hybrid sturgeon captures have been deeper than pallid sturgeon since Doyle et al. (2005) reported their findings for the 2004 sample year (Utrup et al. 2006). Water velocities at capture locations varied depending on mesohabitat, POOL captures had no measurable flow (0.00m/s) while CHNB captures were at an average of 0.54m/s. This is similar to the water velocities for the average pallid sturgeon capture (0.47 m/s). Since hybrid sturgeon occur at deeper depths, they may be more difficult to sample and therefore more abundant than our samples show. They also occur at the coldest temperatures when sampling is sometimes suspended due to ice flow.

In the past the ratio of pallid sturgeon to hybrid sturgeon was reported strictly as numbers captured. In 2006, these numbers were standardized by effort between each gear type (Table 16a). Gill nets provide the highest numbers of sturgeon captures and have data for all three years sampled. The ratio of hybrid sturgeon to shovelnose sturgeon captured in gill nets in 2006 was 1:264 compared to 1:462 in 2005 and 1:220 in 2004 (Table 16a). The ratio of pallid sturgeon to hybrid sturgeon captured in gill nets in 2006 is 1:2 compared to 1:2 in 2003 and 1:1 in 2004 (Table 16a). It is important to continue reporting the incidence of hybrid sturgeon captures, since hybrid sturgeon damage the genetic integrity of the both sturgeon species in the system. Tools for positive identification and potential removal of hybrid sturgeon should be considered within the recovery program.

Table 16a. Ratios of hybrid sturgeon to pallid and shovelnose sturgeon, standardized by effort, for samples collected from 2004 through 2006 in segment 13 of the Missouri River.

Year	Gill Net			1 Inch Trammel Net			Otter Trawl		
	Pallid: Shovelnose	Hybrid: Shovelnose	Pallid: Hybrid	Pallid: Shovelnose	Hybrid: Shovelnose	Pallid: Hybrid	Pallid: Shovelnose	Hybrid: Shovelnose	Pallid: Hybrid
2004	1 : 330	1 : 220	1 : 2	1 : 178	1 : 400	2 : 1	1 : 87	1 : 608	7 : 1
2005	1 : 462	1 : 462	1 : 1	1 : 125	N/A	N/A	1 : 98	1 : 197	2 : 1
2006	1 : 449	1 : 264	1 : 2	1 : 152	N/A	N/A	N/A	N/A	N/A

Targeted Native River Species

This section covers the following objectives from the pallid sturgeon monitoring and assessment program:

Objective 4. Document annual results and long-term trends in native target species population abundance and geographic distribution throughout the Missouri River System.

Objective 5. Document annual results and long-term trends of habitat usage of the target native species by season.

Shovelnose Sturgeon

Year comparisons, Gear evaluation, Habitat association, and Population structure

Catch per unit effort dropped for all gears in all seasons in 2006 (Figures 11,12 and 14). As in previous years, gill nets continue to catch the highest number of shovelnose sturgeon (N=1179; 59% of total catch; Tables 17-24; Utrup et al. 2006). The majority (98%) of fish caught in gill nets were of quality size (380 mm, Figure 23) or greater. Otter trawls were more successful at catching small, sub-stock size (less than 249 mm) shovelnose sturgeon (Table 18-22) during both fish community and sturgeon seasons. Only 64 sub-stock shovelnose sturgeon (less than 249mm) were captured in 2006 (Table 25), roughly half the number captured in 2005 (Utrup et al. 2006).

The majority of quality size and greater shovelnose sturgeon were captured in the ISB macrohabitat with all gears (Table 23), with a notable amount captured by gill nets in the CHXO habitat (36% of the total catch). Sixty-seven percent of the quality size and greater shovelnose sturgeon captured by gill nets were caught in the POOL mesohabitat, which is only sampled with gill nets (Table 24). The intermediate, stock size shovelnose sturgeon (250-379 mm), were captured more frequently in 1 inch trammel nets and otter trawls, also in the ISB macrohabitat (Table 21). Gill nets captured more stock size shovelnose sturgeon in POOL mesohabitats

(55%) compared to CHNB mesohabitats (45%) indicating a possible preference for the POOL mesohabitat by all size ranges of shovelnose sturgeon. Sub-stock length shovelnose sturgeon were captured primarily in the ISB macrohabitat (Tables 17 and 19) with the majority of captures occurring in the CHNB mesohabitat (Tables 18 and 20).

Shovelnose sturgeon between 50 mm to 790 mm were captured in segment 13, this length range is similar to ranges reported in previous years (Table 17; Utrup et al. 2006, Doyle et al. 2005, Doyle and Starostka 2004). Relative stock density of preferred size (RSD-P) shovelnose sturgeon was higher during sturgeon season (RSD-P = 68.8) than in fish community season (48.0). This difference is similar to previous years' results for segment 13, most likely being caused by a sampling bias toward large fish in the winter using gill nets (Utrup et al. 2006, Doyle et al. 2005, Doyle and Starostka 2004). Size structure of shovelnose sturgeon in segment 13 appears to be shifting to smaller sizes with the proportion of preferred size fish dropping from 86 (sturgeon season) and 71 (fish community season) in 2005 to 68 (sturgeon season) and 48 (fish community season; Table 25; Utrup et al. 2006). Relative weights were not reported in previous years. Shovelnose sturgeon relative weights decreased as the size range increased (Table 25). Relative weight increased from sturgeon season to fish community season, indicating better fitness in warmer water temperatures (Table 25).

Segment 13 - Shovelnose Sturgeon / Sturgeon Season

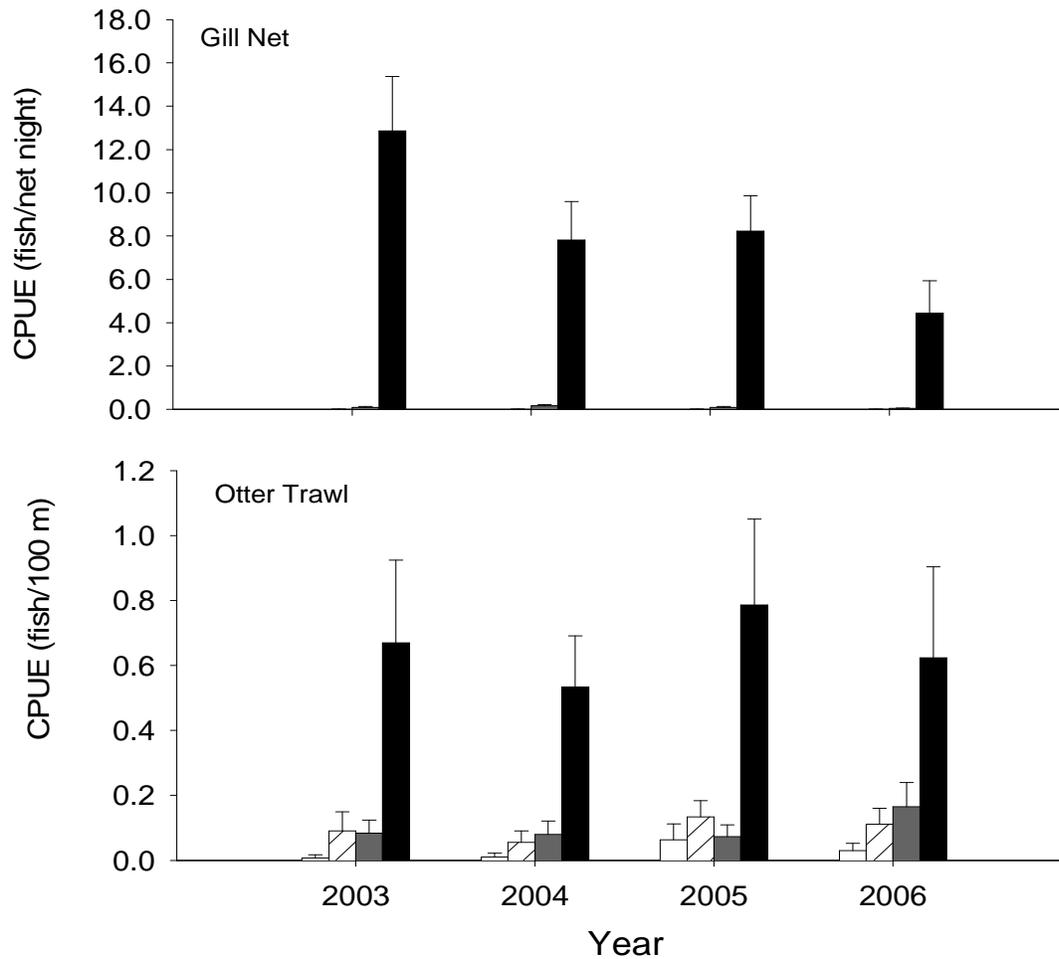


Figure 11. Mean annual catch-per-unit-effort (\pm 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched bars), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using gill nets and otter trawls in segment 13 of the Missouri River during sturgeon season 2003 - 2006.

Segment 13 - Shovelnose Sturgeon / Sturgeon Season

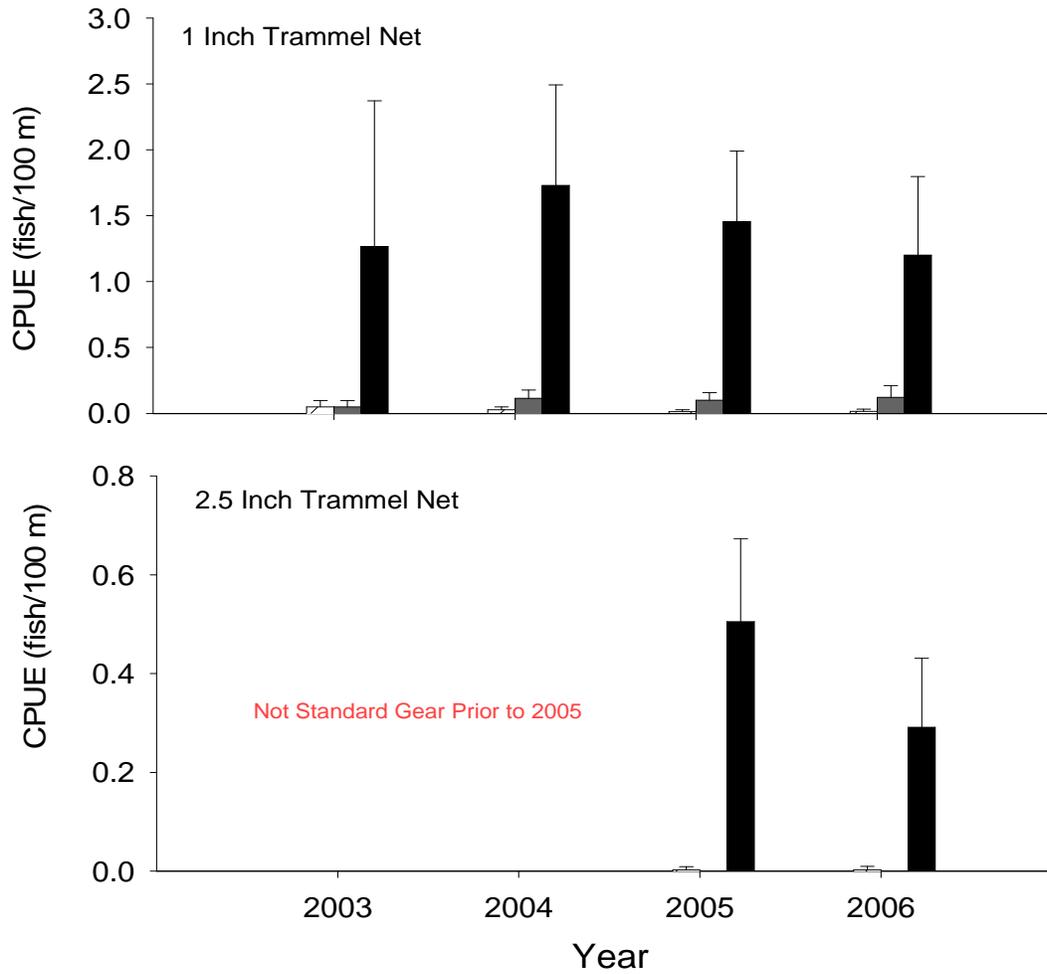


Figure 12. Mean annual catch-per-unit-effort (\pm 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched bars), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using 1 and 2.5 inch trammel nets in segment 13 of the Missouri River during sturgeon season 2003 - 2006.

Segment 13 - Shovelnose Sturgeon / Fish Community Season

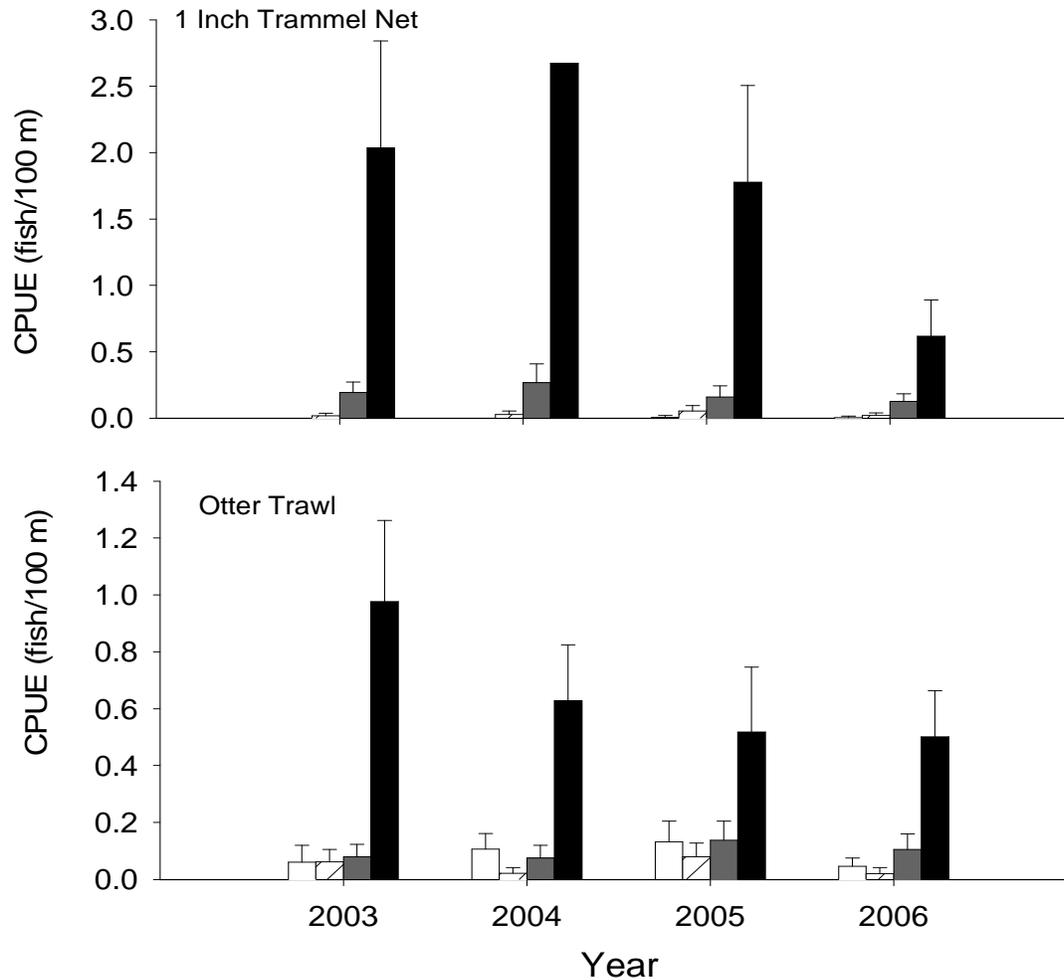


Figure 14. Mean annual catch-per-unit-effort (\pm 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched bars), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using 1 inch trammel nets and otter trawls in segment 13 of the Missouri River during fish community season 2003 - 2006.

Table 17. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	67	0	2	5	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	25	0	N-E	N-E	66	0	5	4	0	0	0	0	
Gill Net	8	N-E	0	0	N-E	N-E	75	0	0	25	0	0	0	0	
		N-E	24	0	N-E	N-E	56	14	5	0	0	0	1	0	
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	22	1	N-E	N-E	65	0	2	10	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	1	N-E	100	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	0	N-E	N-E	69	0	0	4	0	0	0	0	
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	24	0	N-E	N-E	37	2	0	29	0	0	7	0	
Otter Trawl	11	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0		
		N-E	23	0	N-E	N-E	73	0	2	2	0	0	0	0	

Table 18. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
Gill Net	0	0	0	0	0	0
		0	47	3	50	0
Otter Trawl	8	0	75	25	0	0
		0	90	10	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	1	0	100	0	0	0
		0	96	4	0	0
Mini-Fyke Net	0	0	0	0	0	0
		97	0	3	0	0
Otter Trawl	11	0	100	0	0	0
		0	96	4	0	0

Table 19. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	4	N-E	0	0	N-E	N-E	75	0	0	25	0	0	0	0	0
		N-E	26	0	N-E	N-E	67	0	2	5	0	0	0	0	0
2.5 Inch Trammel Net	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	25	0	N-E	N-E	66	0	5	4	0	0	0	0	0
Gill Net	2	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	24	0	N-E	N-E	56	14	5	0	0	0	1	0	0
Otter Trawl	28	N-E	14	0	N-E	N-E	75	0	0	11	0	0	0	0	0
		N-E	22	1	N-E	N-E	65	0	2	10	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	5	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	27	0	N-E	N-E	69	0	0	4	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	24	0	N-E	N-E	37	2	0	29	0	0	0	7	0
Otter Trawl	4	N-E	0	0	N-E	N-E	75	0	25	0	0	0	0	0	0
		N-E	23	0	N-E	N-E	73	0	2	2	0	0	0	0	0

Table 20. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	4	0	75	25	0	0
		0	93	7	0	0
2.5 Inch Trammel Net	1	0	100	0	0	0
		0	93	7	0	0
Gill Net	2	0	50	0	50	0
		0	47	3	50	0
Otter Trawl	28	0	89	11	0	0
		0	90	10	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	5	0	100	0	0	0
		0	96	4	0	0
Mini-Fyke Net	0	0	0	0	0	0
		97	0	3	0	0
Otter Trawl	4	0	75	25	0	0
		0	96	4	0	0

Table 21. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	24	N-E	4	0	N-E	N-E	92	0	0	4	0	0	0	0	0
		N-E	26	0	N-E	N-E	67	0	2	5	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	25	0	N-E	N-E	66	0	5	4	0	0	0	0	0
Gill Net	11	N-E	18	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	24	0	N-E	N-E	56	14	5	0	0	0	1	0	0
Otter Trawl	38	N-E	3	0	N-E	N-E	61	0	3	34	0	0	0	0	0
		N-E	22	1	N-E	N-E	65	0	2	10	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	26	N-E	23	0	N-E	N-E	62	0	0	15	0	0	0	0	0
		N-E	27	0	N-E	N-E	69	0	0	4	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	24	0	N-E	N-E	37	2	0	29	0	0	0	7	0
Otter Trawl	28	N-E	11	0	N-E	N-E	82	0	0	7	0	0	0	0	0
		N-E	23	0	N-E	N-E	73	0	2	2	0	0	0	0	0

Table 22. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	24	0	96	4	0	0
		0	93	7	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
Gill Net	11	0	45	0	55	0
		0	47	3	50	0
Otter Trawl	38	0	66	34	0	0
		0	90	10	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	26	0	85	15	0	0
		0	96	4	0	0
Mini-Fyke Net	0	0	0	0	0	0
		97	0	3	0	0
Otter Trawl	28	0	93	7	0	0
		0	96	4	0	0

Table 23. Total number of quality size and greater (≥ 380 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each year in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	232	N-E	5	0	N-E	N-E	92	0	1	2	0	0	0	0	0
		N-E	26	0	N-E	N-E	67	0	2	5	0	0	0	0	0
2.5 Inch Trammel Net	46	N-E	17	0	N-E	N-E	63	0	13	7	0	0	0	0	0
		N-E	25	0	N-E	N-E	66	0	5	4	0	0	0	0	0
Gill Net	1158	N-E	36	0	N-E	N-E	55	6	3	0	0	0	0	0	0
		N-E	24	0	N-E	N-E	56	14	5	0	0	0	1	0	0
Otter Trawl	133	N-E	15	2	N-E	N-E	67	0	0	16	0	0	0	0	0
		N-E	22	1	N-E	N-E	65	0	2	10	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	114	N-E	4	0	N-E	N-E	96	0	0	0	0	0	0	0	0
		N-E	27	0	N-E	N-E	69	0	0	4	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	24	0	N-E	N-E	37	2	0	29	0	0	0	7	0
Otter Trawl	109	N-E	13	0	N-E	N-E	84	0	2	1	0	0	0	0	0
		N-E	23	0	N-E	N-E	73	0	2	2	0	0	0	0	0

Table 24. Total number of quality size and greater (≥ 380 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	232	0	98	2	0	0
		0	93	7	0	0
2.5 Inch Trammel Net	46	0	85	15	0	0
		0	93	7	0	0
Gill Net	1158	0	31	2	67	0
		0	47	3	50	0
Otter Trawl	133	0	84	16	0	0
		0	90	10	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	114	0	100	0	0	0
		0	96	4	0	0
Mini-Fyke Net	0	0	0	0	0	0
		97	0	3	0	0
Otter Trawl	109	0	97	3	0	0
		0	96	4	0	0

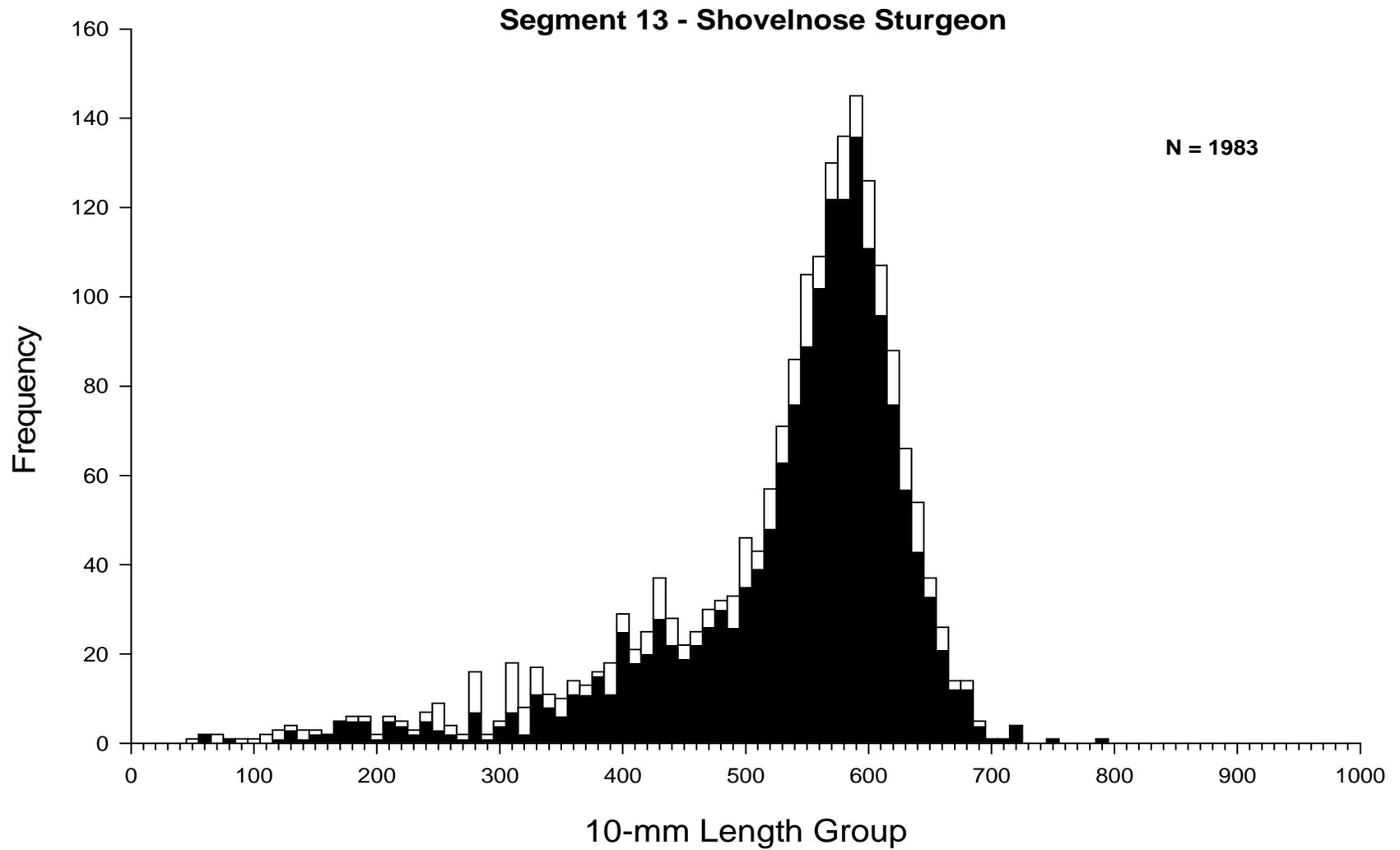


Figure 17. Length frequency of shovelnose sturgeon from fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during the 2006 sample year.

Table 25. Incremental relative stock density (RSD)^a and mean relative weight (Wr) by a length category for shovelnose sturgeon in segment 13 of the Missouri River captured during 2006. Length categories^b determined using methods proposed by Quist et al. (1998).

Length category	N	RSD	Wr (+/- 2SE)
Sturgeon Season			
Sub-stock (0-149 mm)	8	-	0
Sub-stock (150-249 mm)	35	-	149 (59.001)
Stock	73	4	87 (5.065)
Quality	291	18	88 (2.634)
Preferred	1129	69	85 (0.888)
Memorable	149	9	81 (3.27)
Trophy	0	-	0
Overall	1685	-	86 (1.181)
Fish Community Season			
Sub-stock (0-149 mm)	12	-	0
Sub-stock (150-249 mm)	9	-	113 (37.904)
Stock	54	19	99 (13.118)
Quality	64	23	93 (8.266)
Preferred	133	48	84 (2.204)
Memorable	26	9	78 (9.151)
Trophy	0	-	0
Overall	299		89 (3.483)

^a RSD = (# of fish of a specified length class / # of fish \geq minimum stock length fish) * 100.

^b Length categories based on the percentage of the largest known shovelnose sturgeon: Sub-stock FL < 250 mm (20 %), Stock FL = 250-379 mm (20 – 36 %), Quality FL = 380 – 509 mm (36 – 45 %), Preferred FL = 510 - 639 mm (45 – 59 %), Memorable FL = 640 – 809 mm (59 – 74 %), Trophy FL > 810 mm (>74 %).

Sturgeon Chub

Sixty three sturgeon chubs were captured in 2006, with the majority (N=39) being captured during the sturgeon season (Tables 26 and 27). This is an increase from previous years, with only 41 and 24 captured in 2005 and 2004 respectively (Utrup et al. 2006, Doyle et al. 2005). The most notable increase in sturgeon chub CPUE was during sturgeon season (Figure 18) with catch rates going from .0380 in 2005 to .1400 in 2006. Fish community season CPUE in 2006 was similar to previous years (Figure 19).

During both seasons, the majority (64% during sturgeon season and 71% during fish community season) of the sturgeon chubs were captured in the ISB macrohabitat (Table 26), where 65% and 73%, respectively, of the effort took place. The majority of sturgeon chubs (77% during sturgeon season and 100% during fish community season) were captured in the CHNB mesohabitat (Table 27), which the most sampled mesohabitat with OT16 (90% and 96% respectively).

Length frequency distributions (LFD) for 2005 (Utrup et al. 2006) and 2006 show more small sturgeon chubs (25-50mm) were captured in 2006 (figure 21) in both seasons, possibly indicating 2005 was a better year for sturgeon chub spawning and recruitment than 2004. Low numbers (N=41 in 2005 and N=63 in 2006) make any real LFD comparisons impossible.

Segment 13 - Sturgeon Chub / Sturgeon Season

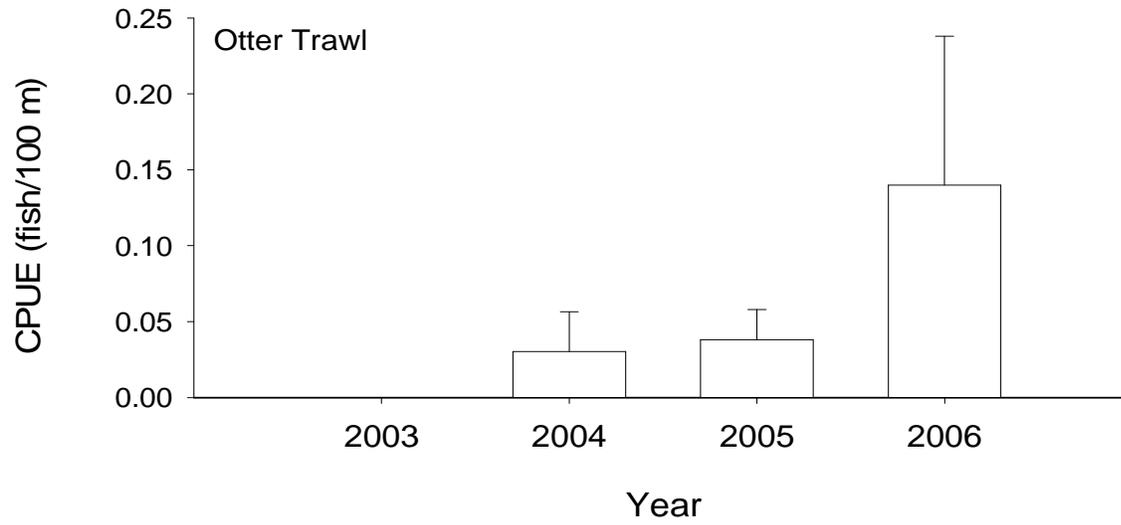


Figure 18. Mean annual catch-per-unit-effort ($\pm 2SE$) of sturgeon chub using otter trawls in segment 13 of the Missouri River during sturgeon season 2003-2006.

Segment 13 - Sturgeon Chub / Fish Community Season

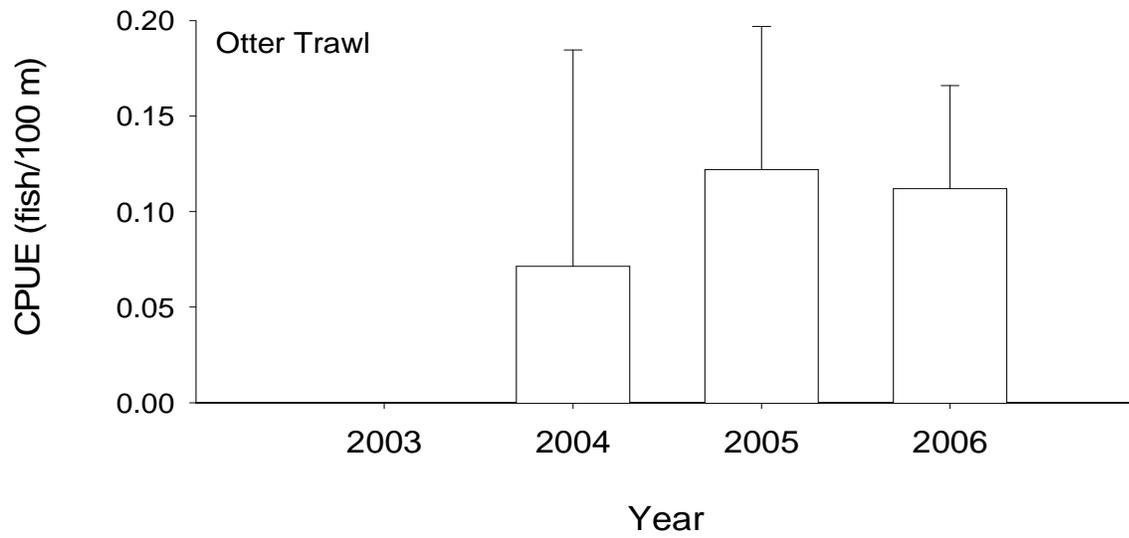


Figure 19. Mean annual catch-per-unit-effort (± 2 SE) of sturgeon chub using otter trawls in segment 13 of the Missouri River during fish community season 2003-2006.

Table 26. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	67	0	2	5	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	25	0	N-E	N-E	66	0	5	4	0	0	0	0	
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	24	0	N-E	N-E	56	14	5	0	0	0	1	0	
Otter Trawl	39	N-E	13	0	N-E	N-E	64	0	0	23	0	0	0	0	
		N-E	22	1	N-E	N-E	65	0	2	10	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	0	N-E	N-E	69	0	0	4	0	0	0	0	
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	24	0	N-E	N-E	37	2	0	29	0	0	0	7	
Otter Trawl	24	N-E	25	0	N-E	N-E	71	0	4	0	0	0	0	0	
		N-E	23	0	N-E	N-E	73	0	2	2	0	0	0	0	

Table 27. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
Gill Net	0	0	0	0	0	0
		0	47	3	50	0
Otter Trawl	39	0	77	23	0	0
		0	90	10	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	96	4	0	0
Mini-Fyke Net	0	0	0	0	0	0
		97	0	3	0	0
Otter Trawl	24	0	100	0	0	0
		0	96	4	0	0

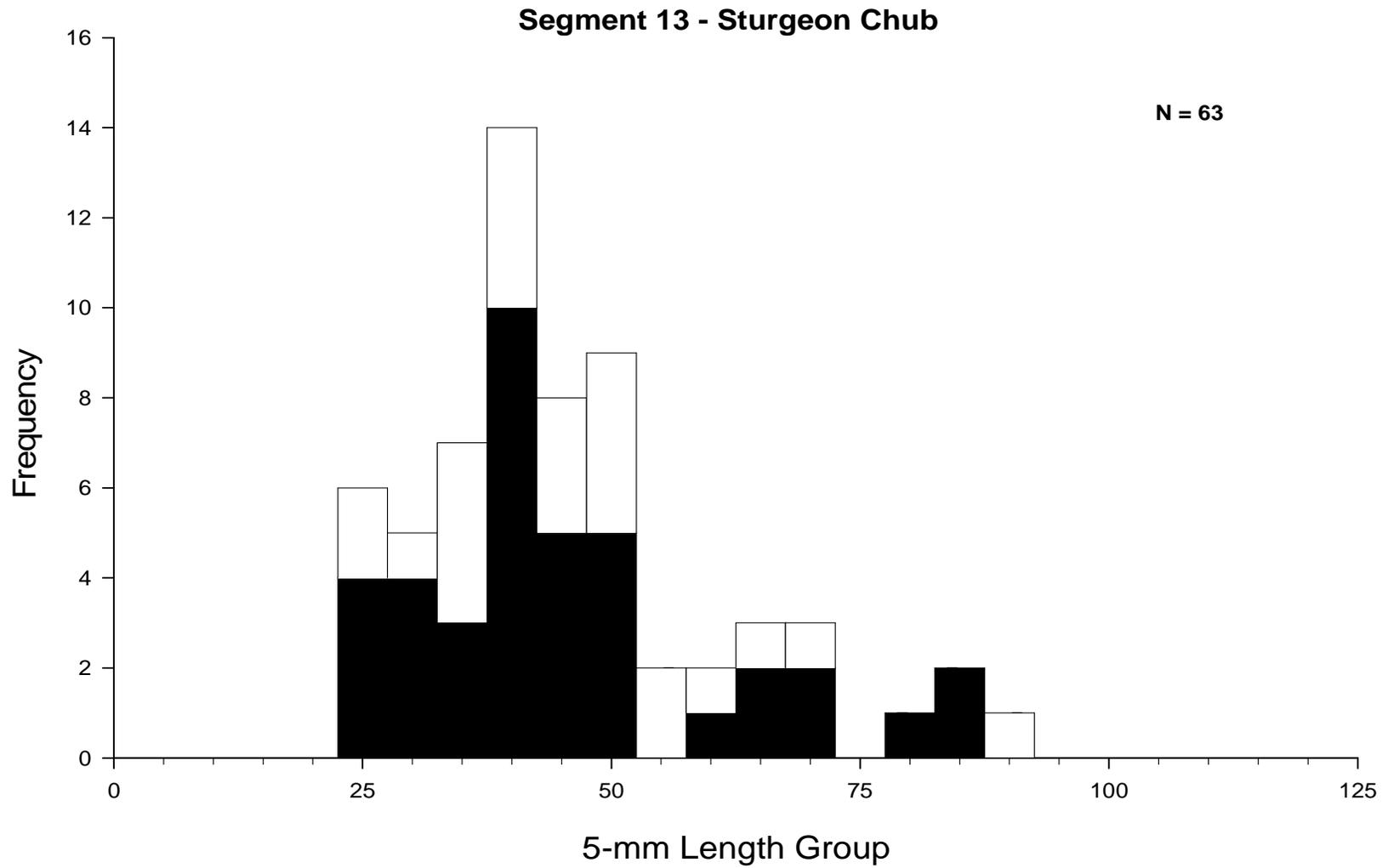


Figure 21. Length frequency of sturgeon chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during the 2006 sample year.

Sicklefin Chub

Numbers of sicklefin chubs dramatically declined in 2006 (N=288, Table 28 and 29) from previous years (N=740 in 2004 and N=796 in 2005, Utrup et al. 2006). Otter trawls were the most effective gear for sampling sicklefin chub, capturing over 99% of the fish in 2006 (mini-fyke nets captured 2 fish, Table 28 and 29). Capture rates were only slightly lower in 2006 than in 2005 (CPUE=0.8240 and CPUE=1.0890 respectively) during the sturgeon season (Figure 22). Catch per unit effort in 2006 (CPUE=0.8240) was higher than 2003 and 2004 (CPUE=0.1363 and CPUE=0.2437 respectively), indicating sicklefin chubs were extremely abundant in 2005 (Figure 22). Sicklefin chub capture during fish community season showed the same trends as sturgeon season, with a more dramatic drop in CPUE between 2005 and 2006 (CPUE=1.8350 and CPUE=0.3560 respectively, Figure 23). Catch per unit effort during 2006 fish community season was lower than any other year sampled (CPUE= 0.3560 compared to CPUE=0.4716 in 2003 and CPUE=0.9043 in 2004, Figure 23). Only 2 sicklefin chubs were captured in mini-fyke nets in 2006. Catch rates in the past have been high, but there is a high degree of variability in those numbers (2004 CPUE=1.6104, 2SE=2.6752, Figure 24).

During both seasons, the majority (64% during sturgeon season and 84% during fish community season) of the sturgeon chubs were captured in the ISB macrohabitat (Table 28), where 65% and 73%, respectively, of the effort took place. The majority of sturgeon chubs (82% during sturgeon season and 100% during fish community season) were captured in the CHNB mesohabitat (Table 29), which the most sampled mesohabitat with OT16 (90% and 96% respectively).

The most abundant length group captured during sturgeon season 2006 was the 50-55mm length group (Figure 25), which declined from the 60-65mm length group, most abundant in 2005 (Utrup et al. 2006). Overall, the size ranges are similar between 2005 and 2006 sturgeon seasons. Fish community season length frequency distribution looked much different in 2006, not showing a “peak” of YOY sicklefin chubs as in 2004 and 2005 (Figure 25, Utrup et al. 2006, Doyle et al. 2005). This lack of YOY catch most likely indicates sicklefin chubs spawning success was limited in 2006.

Segment 13 - Sicklefin Chub / Sturgeon Season

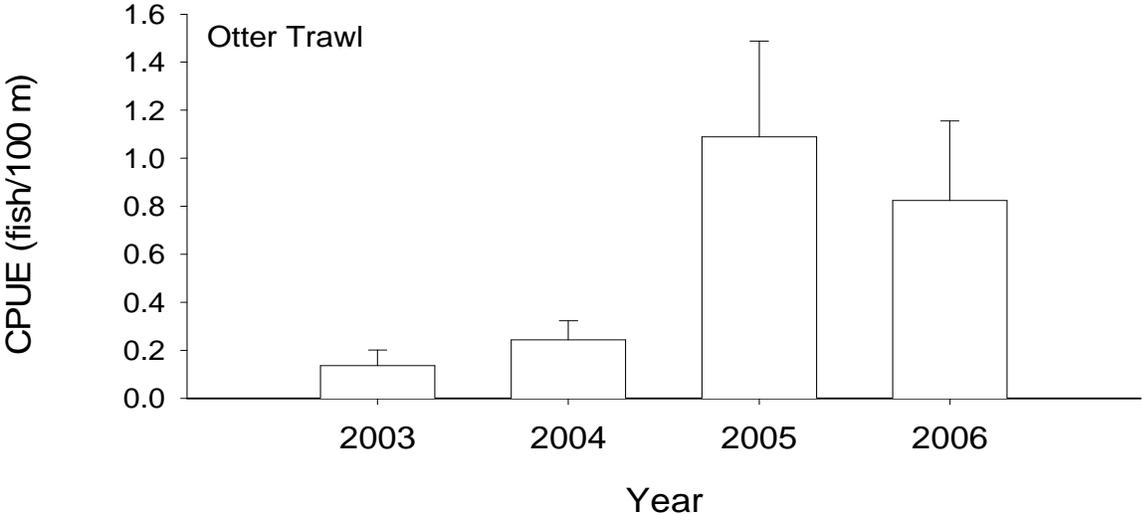


Figure 22. Mean annual catch-per-unit-effort (+/- 2SE) of sicklefin chub using otter trawls in segment 13 of the Missouri River during sturgeon season 2003-2006.

Segment 13 - Sicklefin Chub / Fish Community Season

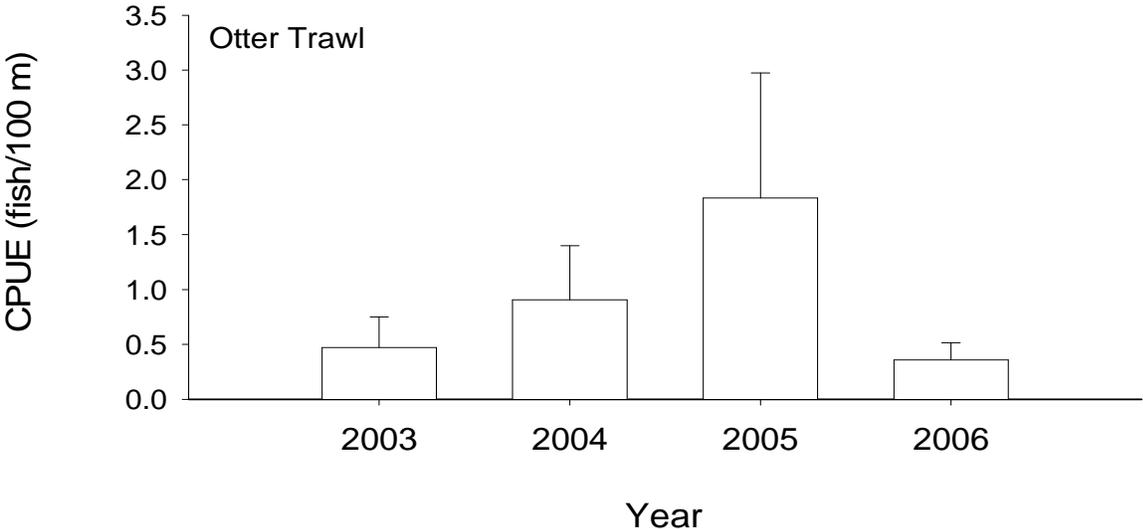


Figure 23. Mean annual catch-per-unit-effort (+/- 2SE) of sicklefin chub using otter trawls in segment 13 of the Missouri River during fish community season 2003-2006.

Segment 13 - Sicklefin Chub / Fish Community Season

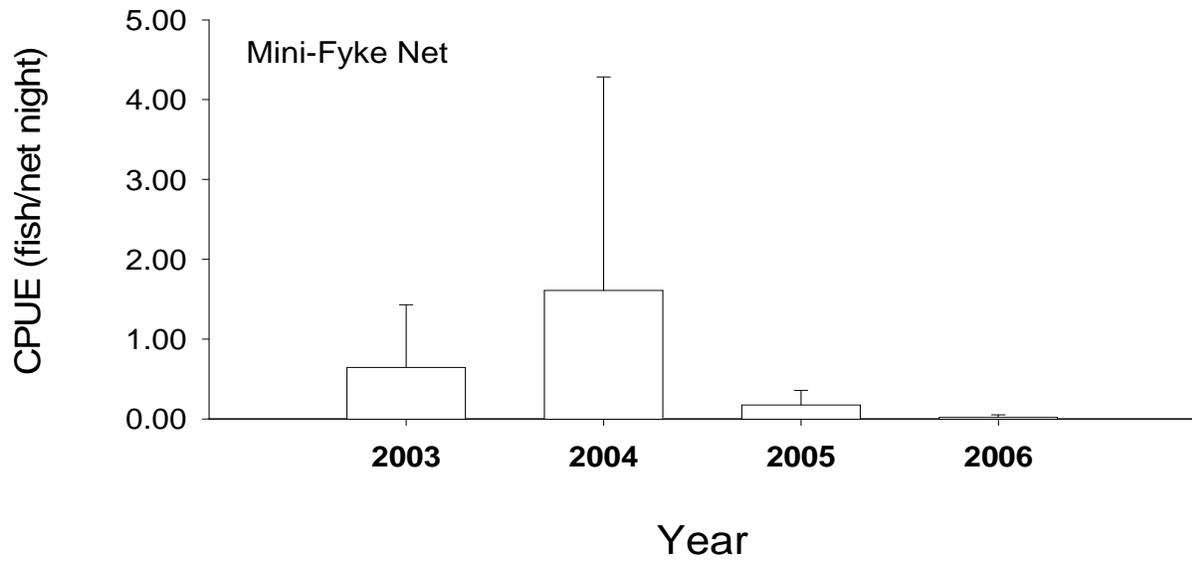


Figure 24. Mean annual catch-per-unit-effort (\pm 2SE) of sicklefin chub using mini-fyke nets in segment 13 of the Missouri River during fish community season 2003-2006.

Table 28. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	67	0	2	5	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	25	0	N-E	N-E	66	0	5	4	0	0	0	0	
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	24	0	N-E	N-E	56	14	5	0	0	0	1	0	
Otter Trawl	200	N-E	18	0	N-E	N-E	64	0	0	18	0	0	0	0	
		N-E	22	1	N-E	N-E	65	0	2	10	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	0	N-E	N-E	69	0	0	4	0	0	0	0	
Mini-Fyke Net	2	N-E	50	0	N-E	N-E	50	0	0	0	0	0	0		
		N-E	24	0	N-E	N-E	37	2	0	29	0	0	7		
Otter Trawl	86	N-E	16	0	N-E	N-E	84	0	0	0	0	0	0		
		N-E	23	0	N-E	N-E	73	0	2	2	0	0	0		

Table 29. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0 0	0 93	0 7	0 0	0 0
2.5 Inch Trammel Net	0	0 0	0 93	0 7	0 0	0 0
Gill Net	0	0 0	0 47	0 3	0 50	0 0
Otter Trawl	200	0 0	82 90	18 10	0 0	0 0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0 0	0 96	0 4	0 0	0 0
Mini-Fyke Net	2	100 97	0 0	0 3	0 0	0 0
Otter Trawl	86	0 0	100 96	0 4	0 0	0 0

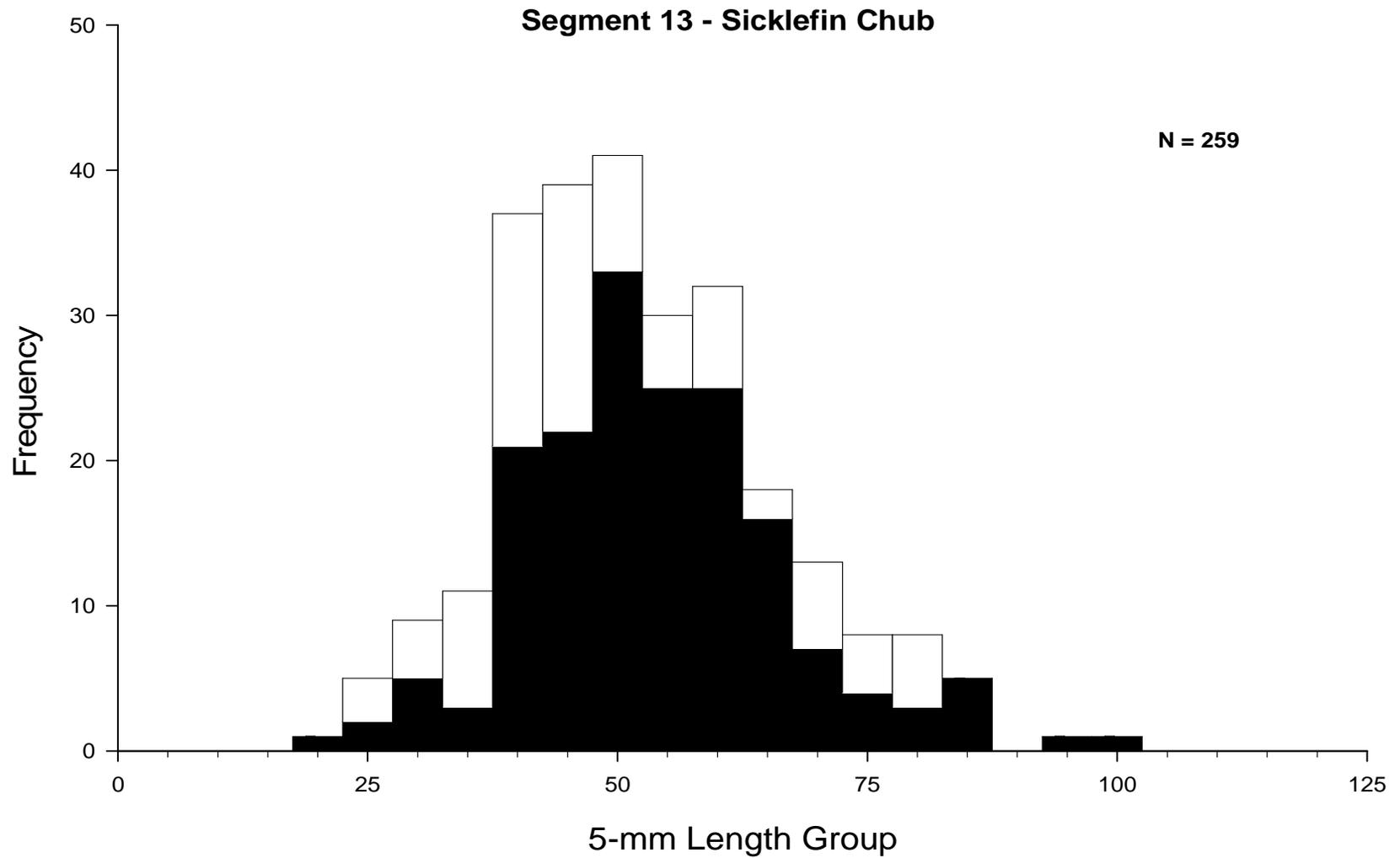


Figure 25. Length frequency of sicklefin chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during the 2006 sample year.

Speckled Chub

A total of 381 speckled chubs were captured in segment 13, which was 29% fewer than were captured during the 2005 sample year ($N = 536$; Utrup et al. 2006). The majority of speckled chubs were captured during the sturgeon season (75%; $N = 285$) versus fish community season (25%; $N = 96$; Table 30). Otter trawls were the most effective gear at capturing speckled chubs for both sturgeon and fish community seasons (making up 96% of the total catch) with mini-fyke nets only making up 4% of the total catch. Otter trawls were the only gear that captured speckled chubs during the sturgeon season with a CPUE of 1.31 fish per 100 m trawled. Catch-per-unit-effort with otter trawls during sturgeon season was much higher than for fish community season (CPUE = 0.43). Otter trawl CPUE for sturgeon season has increased by nearly 90% since 2003 (CPUE = 0.54 in 2003; 0.95 in 2004; 0.65 in 2005, and 1.31 in 2006; Figure 26). Otter trawl CPUE for fish community season has also increase since 2003 with a slight decrease from 2005 (Figure 27). Mini-fyke CPUE has decreased greatly since 2004 (CPUE = 5.89 in 2004; 1.94 in 2005; 0.18 in 2006; Figure 28). During sturgeon season, the majority of speckled chubs were captured in ISB macrohabitat (72% of the total catch relative to 64% of the total effort) and CHNB mesohabitat (97% of the total catch relative to 81% of the effort). During fish community season, the majority of speckled chubs were captured in ISB macrohabitat (61% of the total catch relative to 60% of the total effort; Table 30). The majority of speckled chubs captured during fish community season were in CHNB mesohabitat (80% of total catch relative to 64% of the total effort; Table 31).

Similar to other chub species, more large individuals were captured earlier in the sample year (i.e. during sturgeon season), whereas, smaller (YOY) speckled chubs were captured during fish community season (Figure 29). Pflieger (1997) noted that speckled chubs begin to spawn in early May and continue through the summer. Correspondingly, gravid adult speckled chubs have been captured in the spring (Jennifer Johnson,USFWS, personal communication) and are most likely actively spawning during the sturgeon season. According to Pflieger (1997), YOY speckled chubs attain lengths of about 25 to 60 mm in their first year of life. Because speckled chubs are short-lived (seldom living longer the one and a half years; Pflieger et al. 1997), much of the reproduction is accomplished by year old fish that subsequently die after spawning. Our results support Pflieger's observations, adult speckled chubs were sampled less frequently during the fish community season and YOY speckled chubs begin to appear at the same time (Figure

29). These are similar to the findings reported for 2005 (Utrup et al. 2006). It is evident, however, that not nearly as many YOY speckled cubs were captured during the fish community season in 2006 as compared to 2005, which may indicate a poor recruitment potential for 2007.

Segment 13 - Speckled Chub / Sturgeon Season

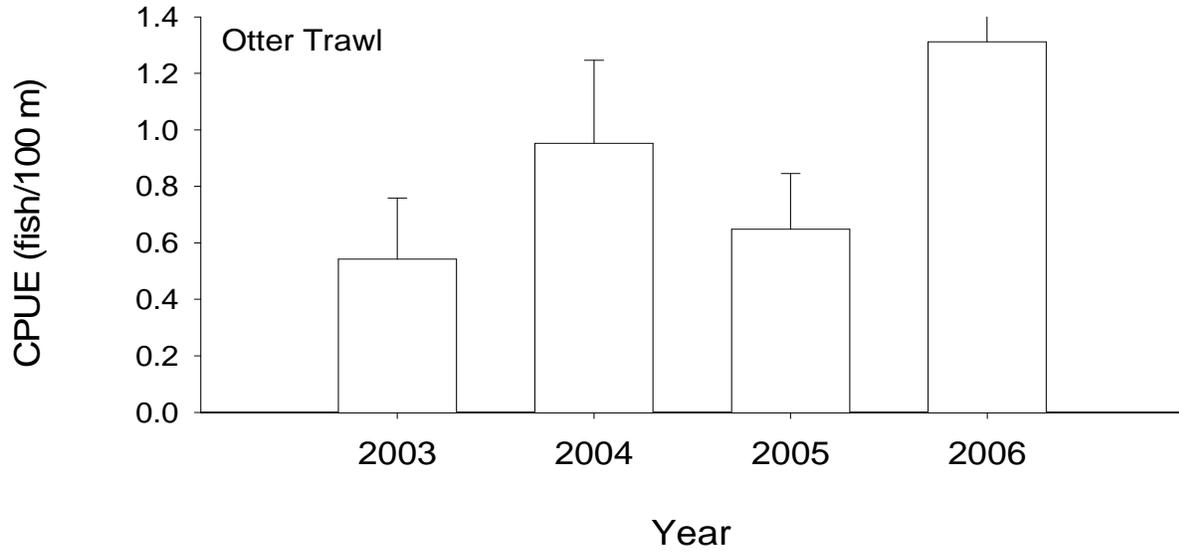


Figure 26. Mean annual catch-per-unit-effort ($\pm 2SE$) of speckled chub using otter trawls in segment 13 of the Missouri River during sturgeon season 2003 -2006.

Segment 13 - Speckled Chub / Fish Community Season

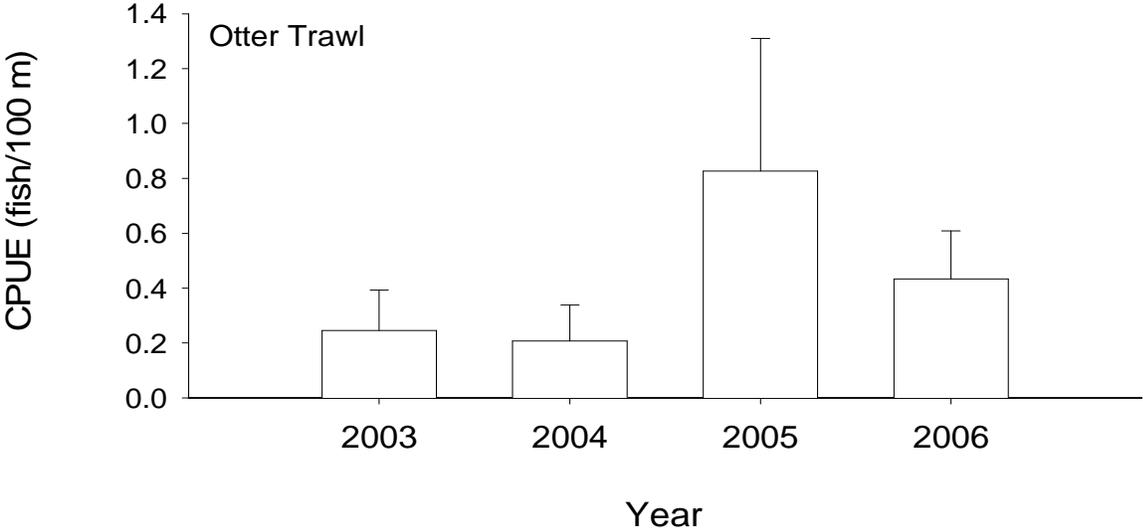


Figure 27. Mean annual catch-per-unit-effort (+/- 2SE) of speckled chub using otter trawls in segment 13 of the Missouri River during fish community season 2003 -2006.

Segment 13 - Speckled Chub / Fish Community Season

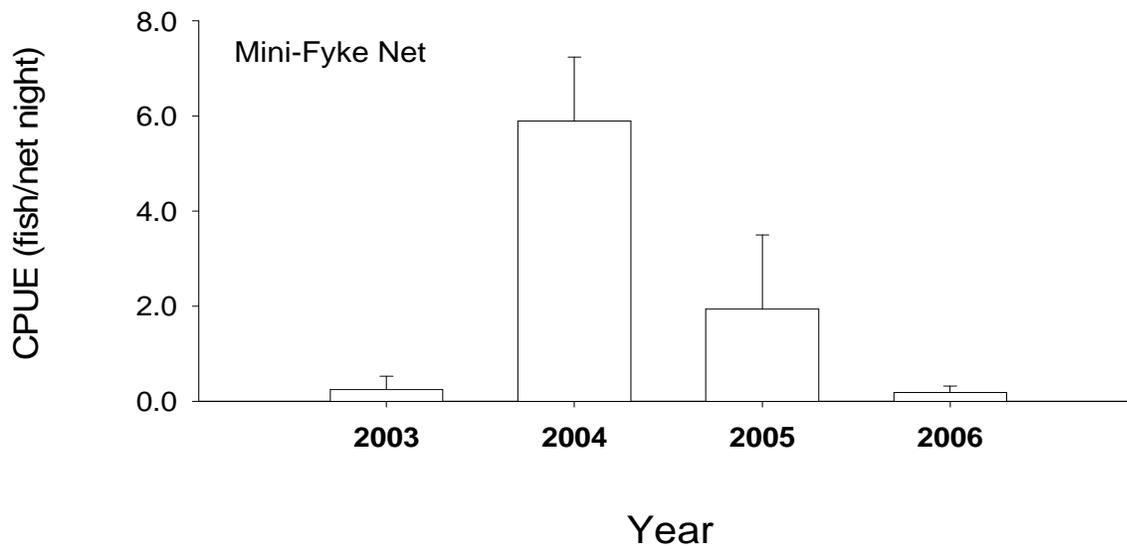


Figure 28. Mean annual catch-per-unit-effort ($\pm 2SE$) of speckled chub using mini-fyke nets in segment 13 of the Missouri River during fish community season 2003 -2006.

Table 30. Total number of speckled chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	67	0	2	5	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	25	0	N-E	N-E	66	0	5	4	0	0	0	0	
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	24	0	N-E	N-E	56	14	5	0	0	0	1	0	
Otter Trawl	285	N-E	25	0	N-E	N-E	72	0	0	3	0	0	0	0	
		N-E	22	1	N-E	N-E	65	0	2	10	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	0	N-E	N-E	69	0	0	4	0	0	0	0	
Mini-Fyke Net	17	N-E	29	0	N-E	N-E	29	0	0	41	0	0	0	0	
		N-E	24	0	N-E	N-E	37	2	0	29	0	0	0	7	
Otter Trawl	79	N-E	29	0	N-E	N-E	68	0	1	1	0	0	0	0	
		N-E	23	0	N-E	N-E	73	0	2	2	0	0	0	0	

Table 31. Total number of speckled chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
Gill Net	0	0	0	0	0	0
		0	47	3	50	0
Otter Trawl	285	0	97	3	0	0
		0	90	10	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	96	4	0	0
Mini-Fyke Net	17	82	0	18	0	0
		97	0	3	0	0
Otter Trawl	79	0	97	3	0	0
		0	96	4	0	0

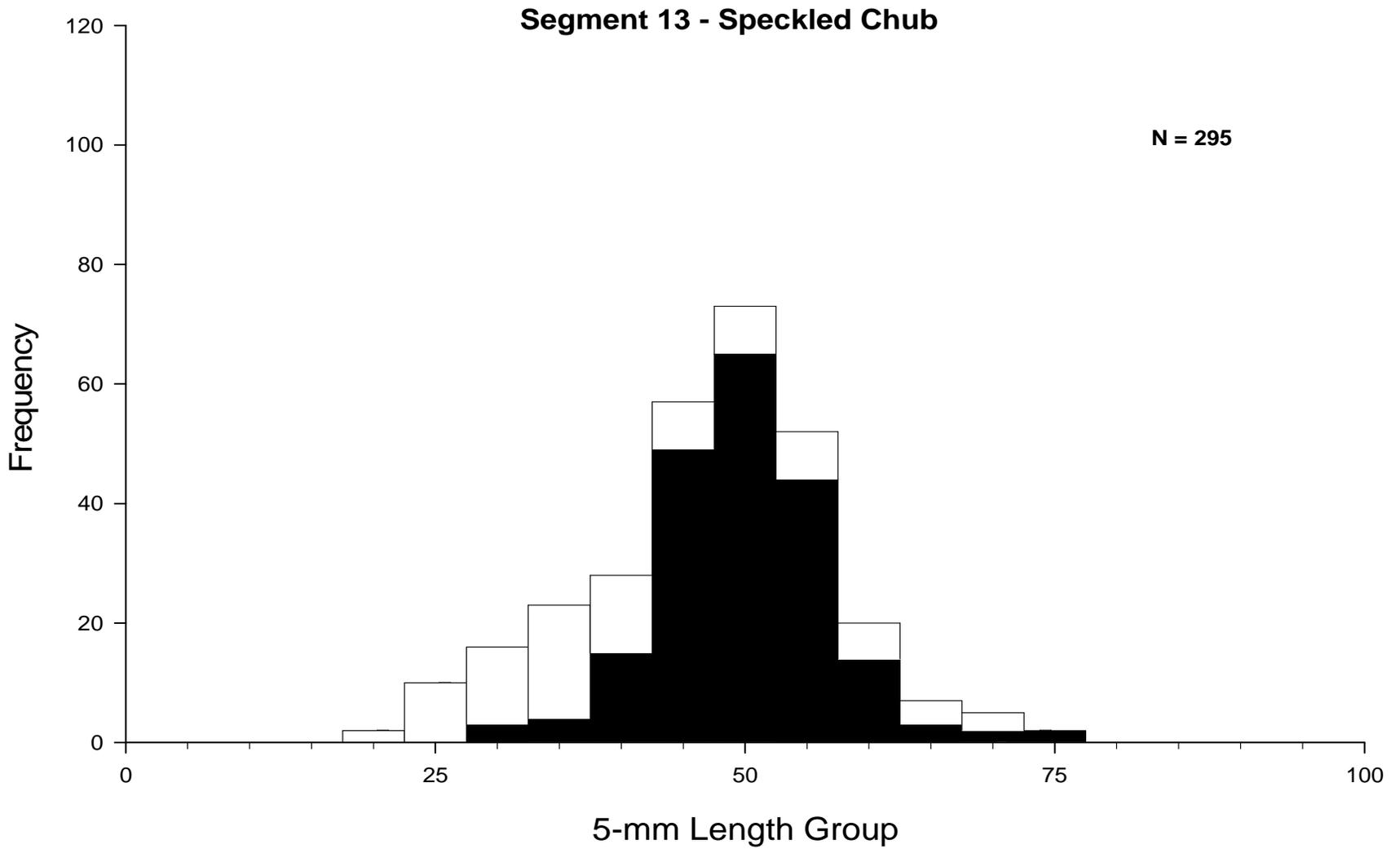


Figure 29. Length frequency of speckled chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during the 2006 sample year.

Sand Shiner

Thirty-nine sand shiners were captured during 2006, which is more than the previous two years combined (N=5 in 2005; Utrup et al. 2006 and N=28 in 2004; Doyle et al. 2005). Catch per unit effort for 2006 (CPUE=0.4150; Figure 32) was similar to 2004 (CPUE=0.3636). Sand shiners were not caught during sturgeon season (Tables 32 and 33).

While sporadic capture rates make it difficult to predict habitat preference, the majority (87%) of sand shiners were captured in CHXO macrohabitat (Table 32). This finding was consistent with results from the 2004, when Doyle et al. reported sand shiner CPUE as being the highest in CHXO macrohabitats. Sand shiners were only captured with mini-fyke nets, indicating they primarily, if not exclusively, use the BARS mesohabitat. Absence of sand shiners from trawl collections indicate a preference toward very shallow water (less than 1 meter). Doyle et al. (2005) suggest this species may only be vulnerable at night.

Again in 2006, low numbers of sand shiners make it nearly impossible to describe population trends based on length frequency (Figure 33). Length ranges from were similar to previous authors' reports from segment 13 (Utrup et al. 2006, Doyle et al. 2005, Doyle and Starostka 2004).

Segment 13 - Sand Shiner / Fish Community Season

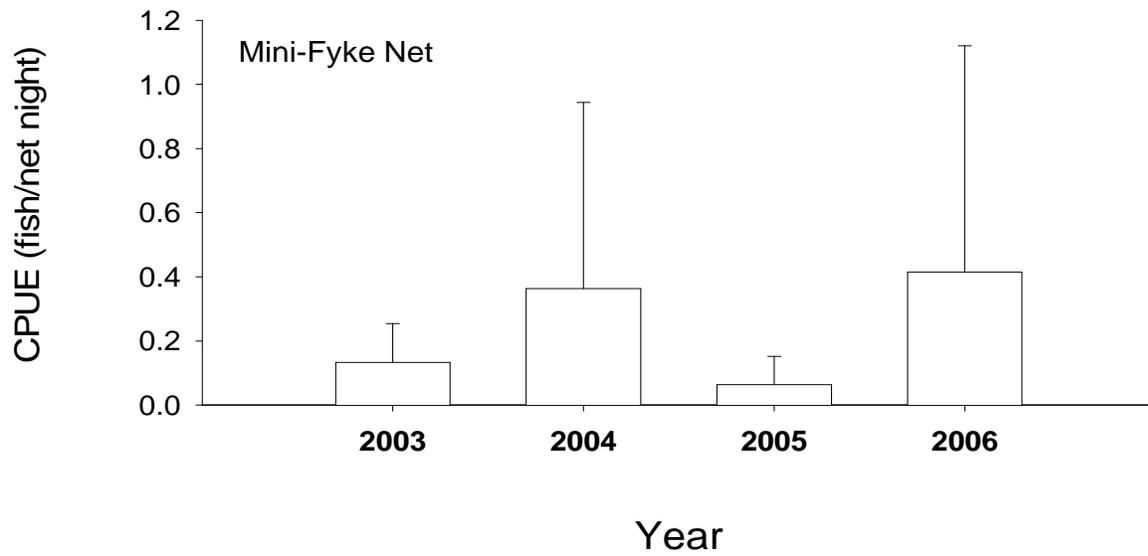


Figure 32. Mean annual catch-per-unit-effort ($\pm 2SE$) of sand shiner with mini-fyke nets in segment 13 of the Missouri River during fish community season 2003 - 2006.

Table 32. Total number of sand shiners captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	67	0	2	5	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	25	0	N-E	N-E	66	0	5	4	0	0	0	0	
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	24	0	N-E	N-E	56	14	5	0	0	0	1	0	
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	22	1	N-E	N-E	65	0	2	10	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	0	N-E	N-E	69	0	0	4	0	0	0	0	
Mini-Fyke Net	39	N-E	87	0	N-E	N-E	8	0	0	5	0	0	0	0	
		N-E	24	0	N-E	N-E	37	2	0	29	0	0	0	7	
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	23	0	N-E	N-E	73	0	2	2	0	0	0	0	

Table 33. Total number of sand shiners captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0 0	0 93	0 7	0 0	0 0
2.5 Inch Trammel Net	0	0 0	0 93	0 7	0 0	0 0
Gill Net	0	0 0	0 47	0 3	0 50	0 0
Otter Trawl	0	0 0	0 90	0 10	0 0	0 0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0 0	0 96	0 4	0 0	0 0
Mini-Fyke Net	39	100 97	0 0	0 3	0 0	0 0
Otter Trawl	0	0 0	0 96	0 4	0 0	0 0

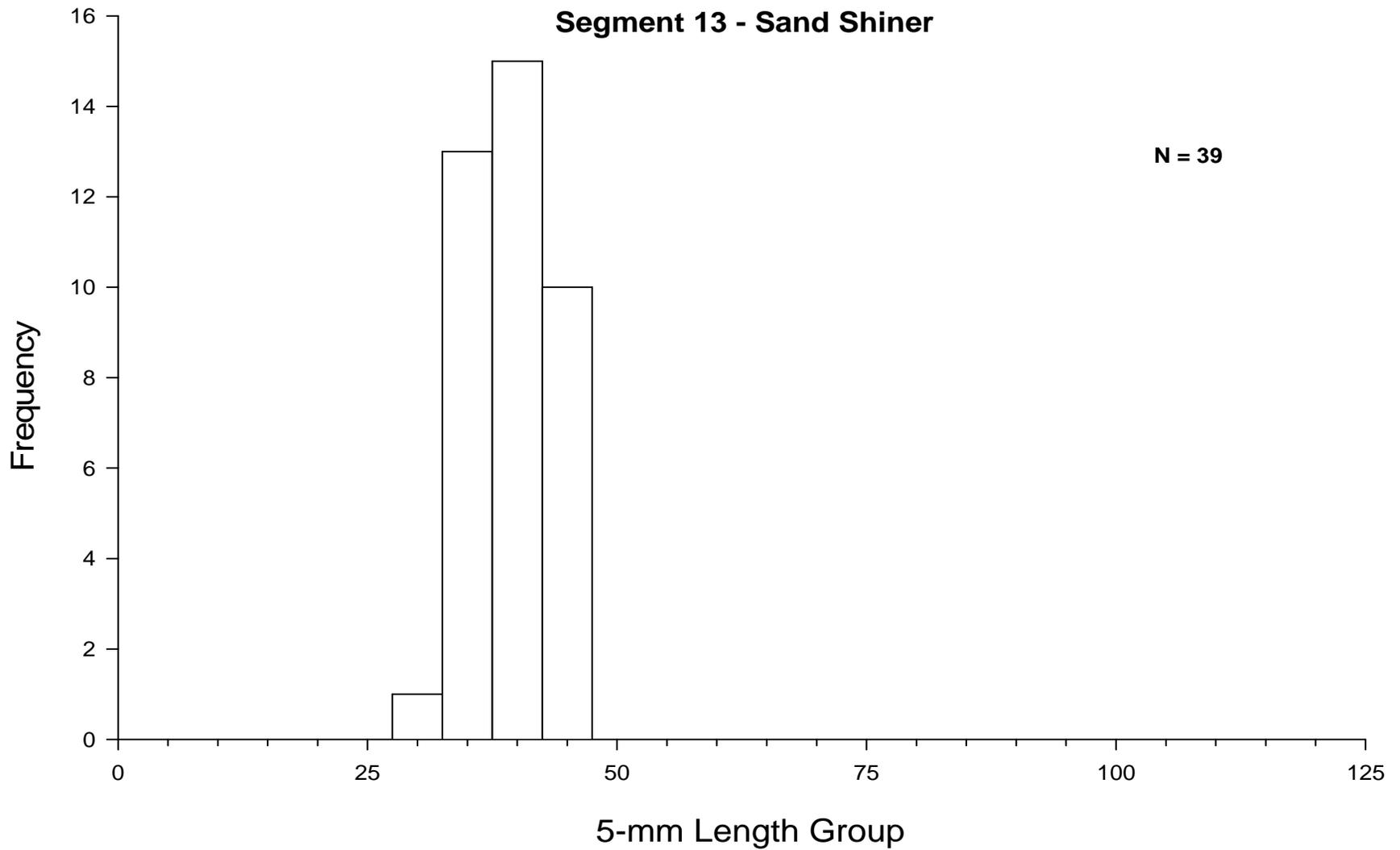


Figure 33. Length frequency of sand shiners during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during the 2006 sample year.

***Hybognathus* spp.**

Only 4 *Hybognathus* spp. were captured in 2006. All four were captured in mini-fyke nets during fish community season at a rate of 0.0430 fish per net night (Figure 34, Table 34). This was a decline in capture rate, mini-fyke nets captured 11 fish in 2005 with a capture rate of 0.1750 fish per net night (Figure 36; Utrup et al. 2006). Catch rate from the last four years are sporadic and no inferences into population trends can be made from them (Figure 34).

In 2006, three of the four *Hybognathus* spp. (75%) were captured in SCCS macrohabitat, a habitat in which only 29% of the effort was expended. Utilization of the SCCS habitat was also documented in segment 13 by Utrup et al. (2006) and Doyle et al. (2005). *Hybognathus* spp. are not commonly captured in otter trawls (one fish in sturgeon season 2003; Doyle and Starostka 2004) indicating that, like the sand shiner, they prefer shallow (less than 1 meter) water.

A length frequency distribution for such a small number of fish does not describe a population. *Hybognathus* spp. captured in 2006 were between 40 and 50 mm (Figure 37). Size ranges from two previous reports in segment 13 show a small number of 25 mm fish indicating reproduction may be occurring in this segment. Pflieger (1997) reports that this fish will grow to 100 mm, indicating a lack of older fish in this segment. Pflieger also states that fish over 40 mm are 1+ years old and are sexually mature.

Segment 13 - *Hybognathus* spp. / Fish Community Season

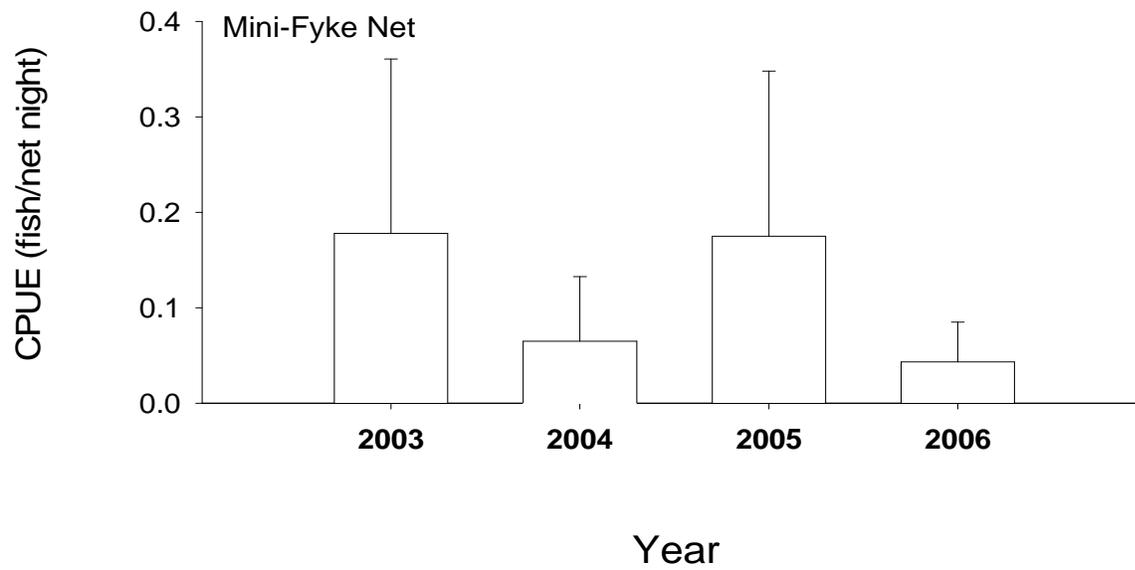


Figure 36. Mean annual catch-per-unit-effort ($\pm 2SE$) of *Hybognathus* spp. with mini-fyke nets in segment 13 of the Missouri River during fish community season 2003 - 2006.

Table 34. Total number of *Hybognathus* spp. captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	67	0	2	5	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	25	0	N-E	N-E	66	0	5	4	0	0	0	0	
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	24	0	N-E	N-E	56	14	5	0	0	0	1	0	
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	22	1	N-E	N-E	65	0	2	10	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	0	N-E	N-E	69	0	0	4	0	0	0	0	
Mini-Fyke Net	4	N-E	0	0	N-E	N-E	25	0	0	75	0	0	0	0	
		N-E	24	0	N-E	N-E	37	2	0	29	0	0	0	7	
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	23	0	N-E	N-E	73	0	2	2	0	0	0	0	

Table 35. Total number of *Hybognathus* spp. captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
Gill Net	0	0	0	0	0	0
		0	47	3	50	0
Otter Trawl	0	0	0	0	0	0
		0	90	10	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	96	4	0	0
Mini-Fyke Net	4	100	0	0	0	0
		97	0	3	0	0
Otter Trawl	0	0	0	0	0	0
		0	96	4	0	0

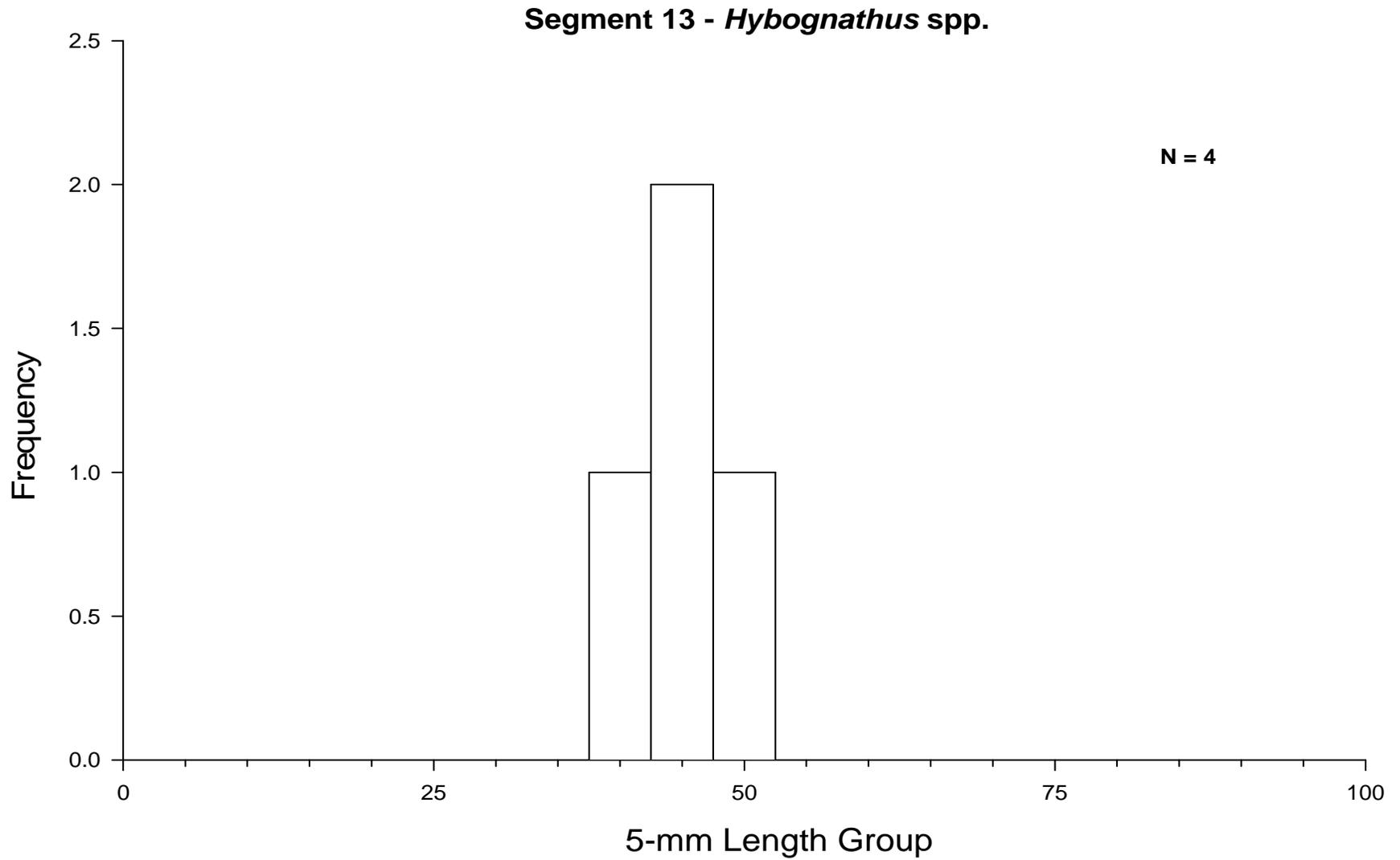


Figure 37. Length frequency of *Hybognathus* spp. caught during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during the 2006 sample year.

Blue Sucker

A total of 115 blue suckers were captured in 2006, very similar to the number collected in 2005 (N=118; Utrup et al. 2006). Although gill net catch rates for 2006 declined from 2005 (CPUE=0.0280 in 2006 and CPUE=0.0760 in 2005; Figure 38), no dramatic differences were noticed when comparing at the last four years. Sturgeon season data for otter trawls, 1 inch and 2.5 inch trammel nets all show increases every year (Figures 38 and 39). Fish community season data for otter trawls and 1 inch trammel nets are similar to the gill net data, not showing a distinct pattern in catch rates (Figure 41). Increasing catch rates during the last four sturgeon seasons indicate more blue suckers are moving through this segment each spring (Figures 38 and 39).

Blue suckers were captured most often in ISB macrohabitat (70% of the overall catch during sturgeon season and 81% during fish community season; Figure 36). Blue suckers were captured in the CHNB mesohabitat most frequently in both seasons (96% of the overall catch during sturgeon season and 91% during fish community season; Figure 37).

The majority of the blue suckers captured during both seasons were between 500 and 800 mm (Figure 44). This size range consists entirely of fish which should be sexually mature (Pflieger 1997). Two sub-adult/juvenile fish were captured this year, indicating a more recent spawn. Length frequency distributions from 2004 and 2005 show a similar size range of blue suckers in segment 13 with only a few small (less than 400mm fish; Utrup et al. 2006, Doyle et al. 2005). Absence of YOY blue suckers suggest segment 13 is not a major spawning area for blue suckers.

Segment 13 - Blue Sucker / Sturgeon Season

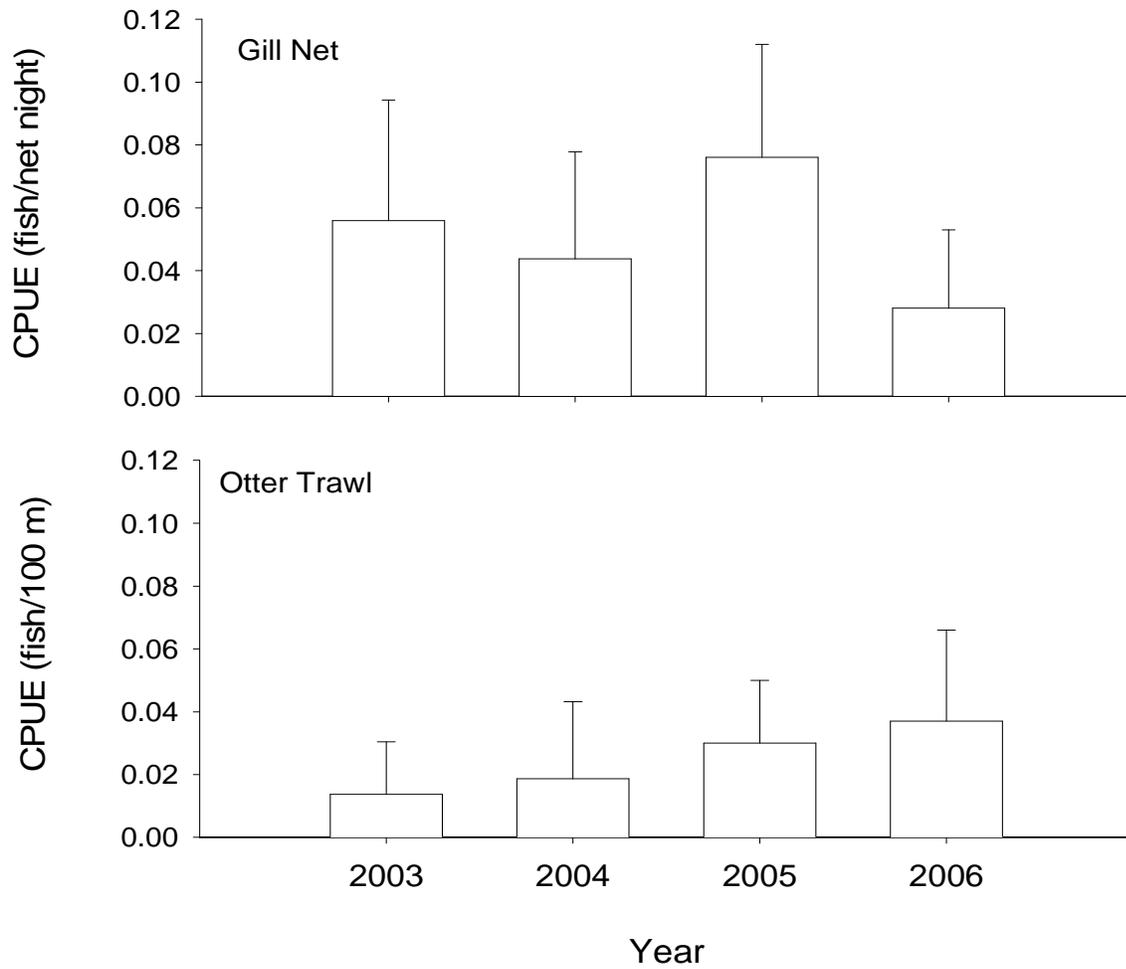


Figure 38. Mean annual catch-per-unit-effort (± 2 SE) of blue sucker with gill nets and otter trawls in segment 13 of the Missouri River during sturgeon season 2003 - 2006.

Segment 13 - Blue Sucker / Sturgeon Season

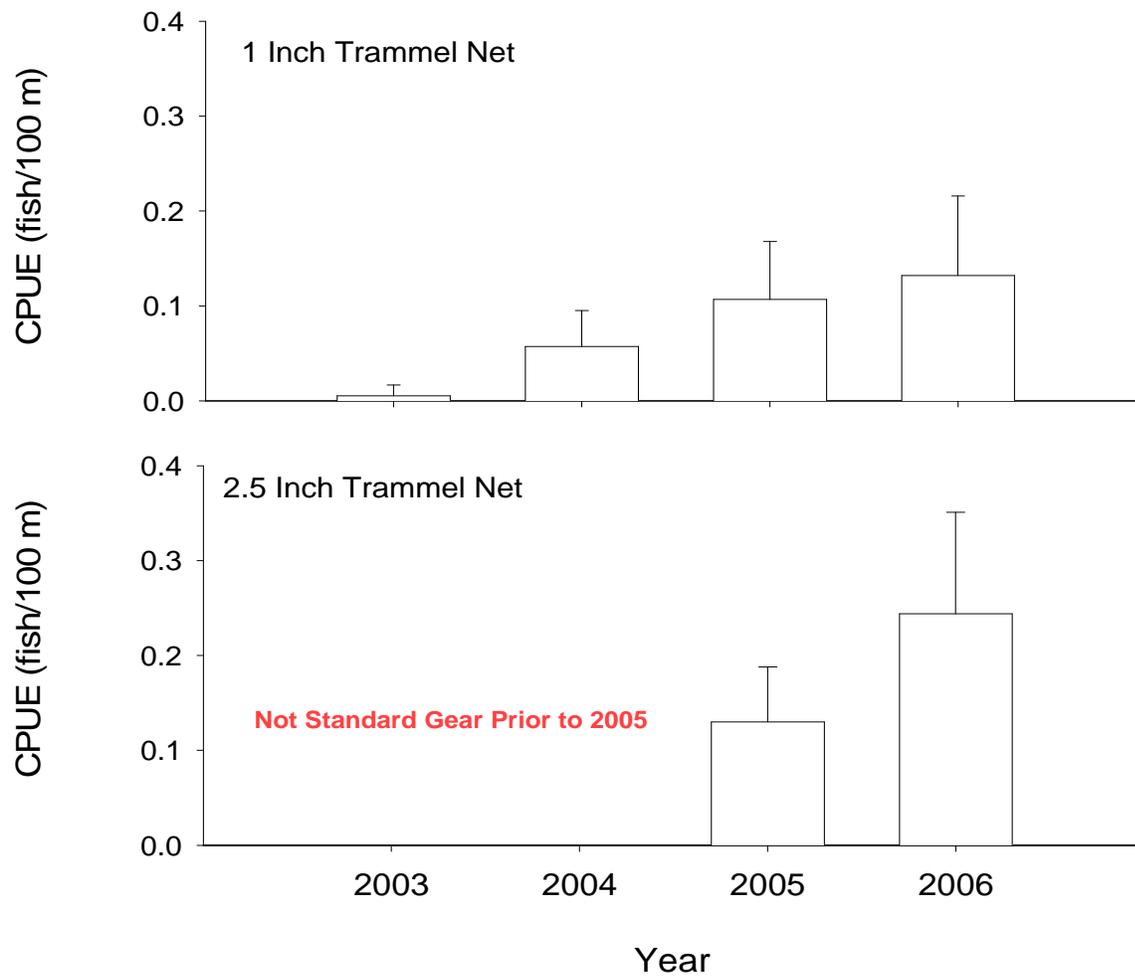


Figure 39. Mean annual catch-per-unit-effort ($\pm 2SE$) of blue sucker with 1 and 2.5 inch trammel nets in segment 13 of the Missouri River during sturgeon season 2003 - 2006.

Segment 13 - Blue Sucker / Fish Community Season

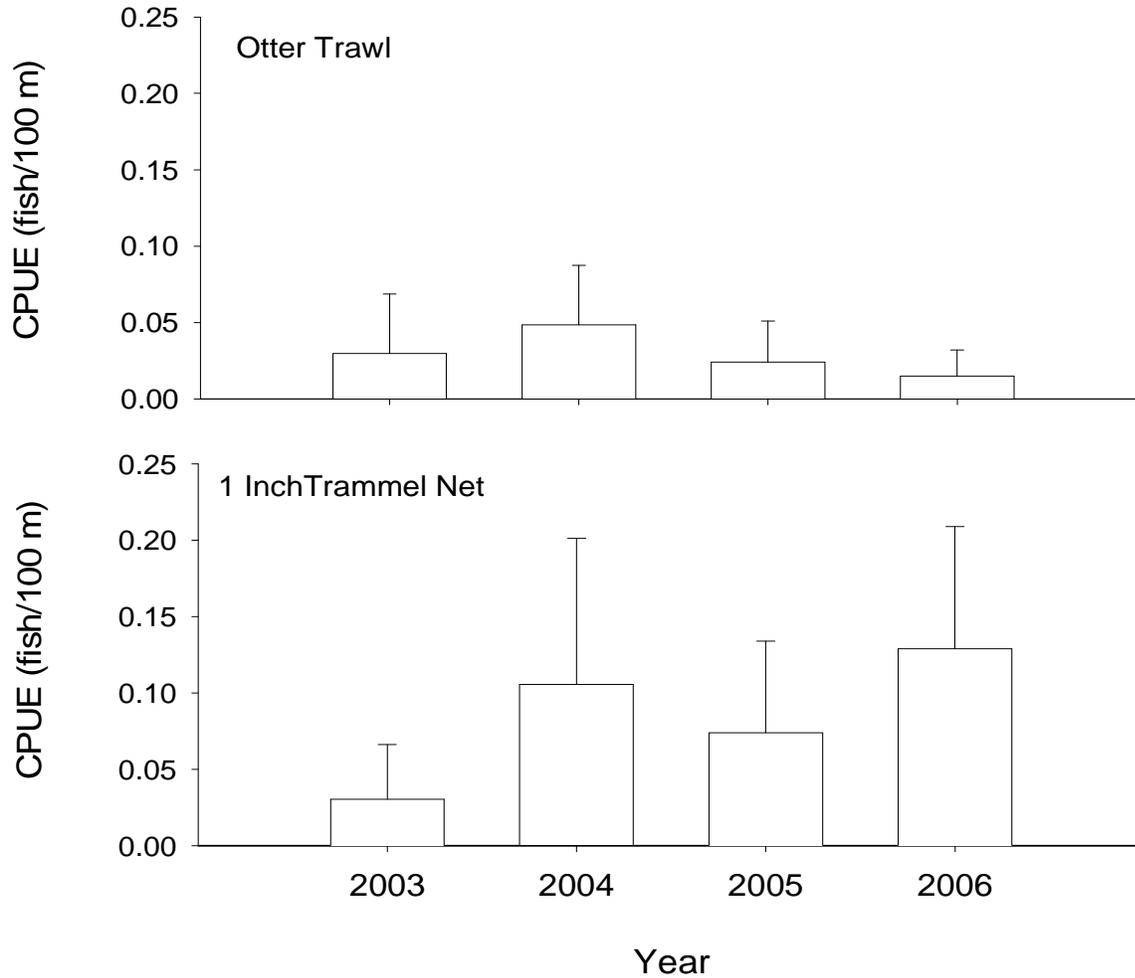


Figure 41. Mean annual catch-per-unit-effort (\pm 2SE) of blue sucker using otter trawls and 1 inch trammel nets in segment 13 of the Missouri River during fish community season 2003 - 2006.

Table 36. Total number of blue sucker captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	23	N-E	17	0	N-E	N-E	78	0	4	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	67	0	2	5	0	0	0	0	0
2.5 Inch Trammel Net	47	N-E	23	0	N-E	N-E	74	0	0	2	0	0	0	0	
		N-E	25	0	N-E	N-E	66	0	5	4	0	0	0	0	
Gill Net	5	N-E	20	0	N-E	N-E	60	20	0	0	0	0	0	0	
		N-E	24	0	N-E	N-E	56	14	5	0	0	0	1	0	
Otter Trawl	8	N-E	0	0	N-E	N-E	75	0	0	25	0	0	0	0	
		N-E	22	1	N-E	N-E	65	0	2	10	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	29	N-E	10	0	N-E	N-E	79	0	0	10	0	0	0	0	
		N-E	27	0	N-E	N-E	69	0	0	4	0	0	0	0	
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	24	0	N-E	N-E	37	2	0	29	0	0	0	7	
Otter Trawl	3	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	
		N-E	23	0	N-E	N-E	73	0	2	2	0	0	0	0	

Table 37. Total number of blue sucker captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	23	0	100	0	0	0
		0	93	7	0	0
2.5 Inch Trammel Net	47	0	98	2	0	0
		0	93	7	0	0
Gill Net	5	0	60	0	40	0
		0	47	3	50	0
Otter Trawl	8	0	75	25	0	0
		0	90	10	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	29	0	90	10	0	0
		0	96	4	0	0
Mini-Fyke Net	0	0	0	0	0	0
		97	0	3	0	0
Otter Trawl	3	0	100	0	0	0
		0	96	4	0	0

Segment 13 - Blue Sucker

N = 115

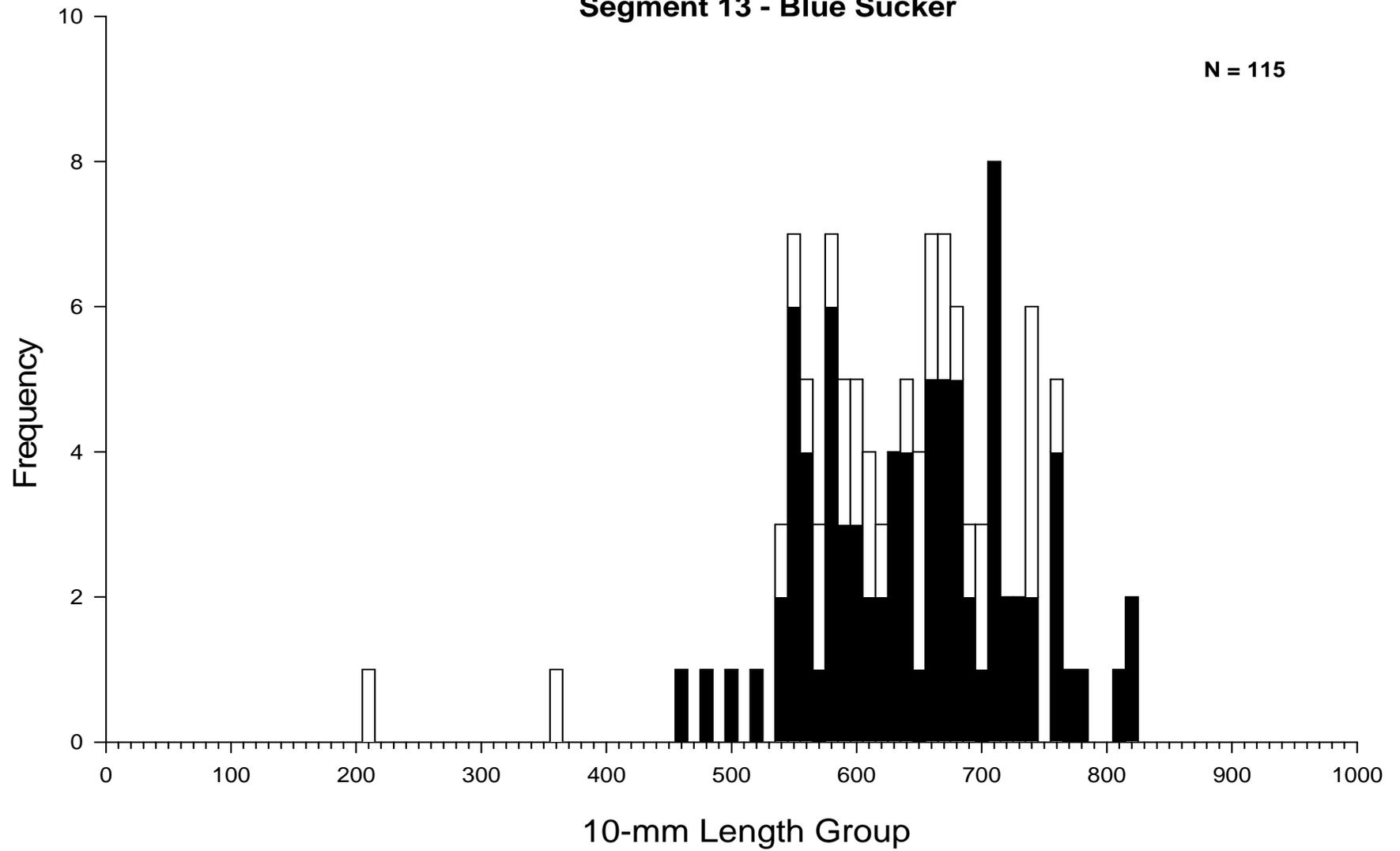


Figure 44. Length frequency of blue suckers during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during the 2006 sample year.

Sauger

A total of 44 sauger were captured in segment 13, similar to the number captured in 2005 (N = 43; Utrup et al. 2006). A majority of the sauger were captured during the sturgeon season (91%; N = 40; Tables 38-39). Gillnets were the most effective gear at capturing sauger (86% of the total catch; CPUE = 0.15; Table 38; Figure 45). For sturgeon season, gillnet CPUE has remained fairly constant since 2003 (CPUE = 0.18 in 2003, 0.14 in 2004, 0.12 in 2005, and 0.15 in 2006) with only one sauger being captured in 1 inch trammel nets (CPUE = 0.004; Figure 46; Table 38). Only 4 sauger were captured during fish community season; three in 1 inch trammel nets (CPUE = 0.02) and 1 in otter trawls (CPUE = 0.006). The majority of sauger captured in gillnets occurred in ISB macrohabitat (43% of the total catch relative to 64% of the effort), followed by CHXO macrohabitat (25% of the total catch relative to 24% of the effort; Table 38). In gill nets, sauger were captured mostly in POOL mesohabitat (53% of the catch relative to 13% of the total effort during sturgeon season) and primarily in CHNB habitat during fish community season (Tables 38-39).

There were too few sauger caught in segment 13 during the 2006 sample year to make inferences on the population structure. However, based on age structure described by Pflieger (1997), the majority of sauger captured in segment 13 were between 2 and 5 years old (280 mm to 450 mm; Figure 51).

Segment 13 - Sauger / Sturgeon Season

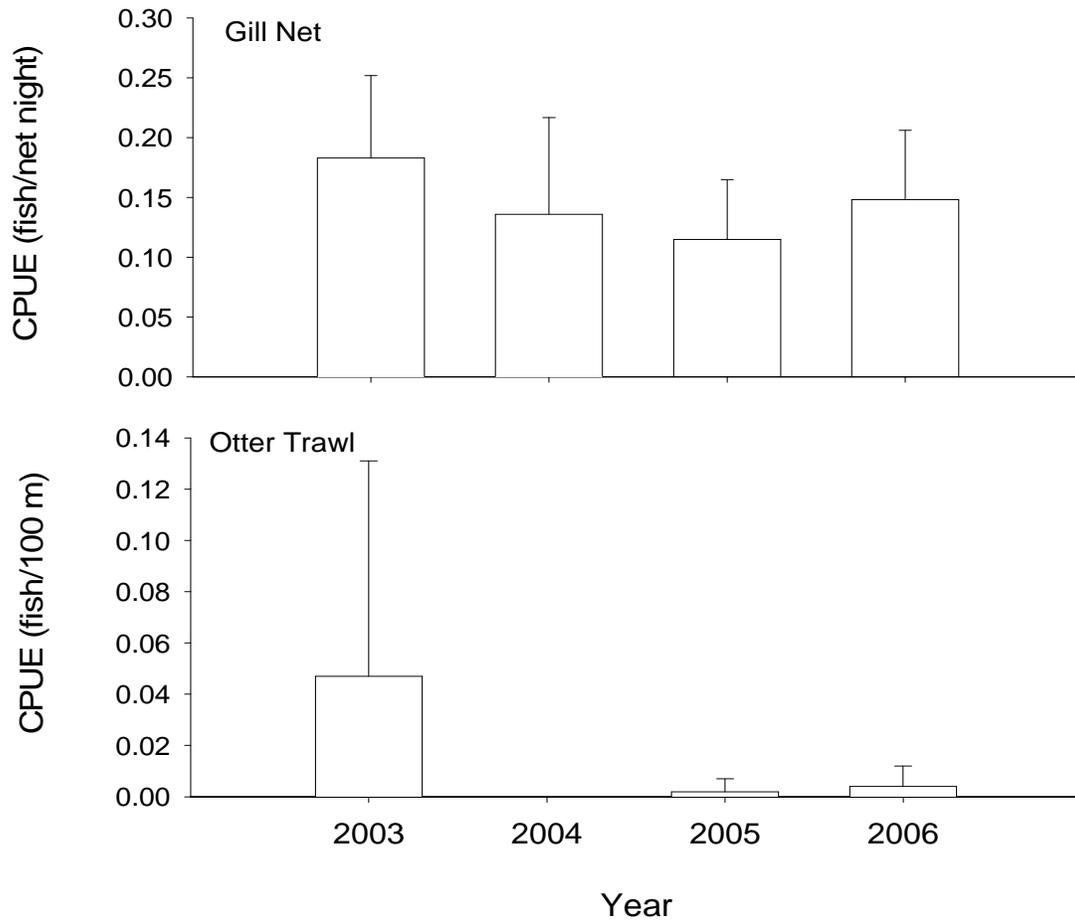


Figure 45. Mean annual catch-per-unit-effort (+/- 2SE) of sauger using gill nets and otter trawls in segment 13 of the Missouri River during sturgeon season 2003 - 2006.

Segment 13 - Sauger / Sturgeon Season

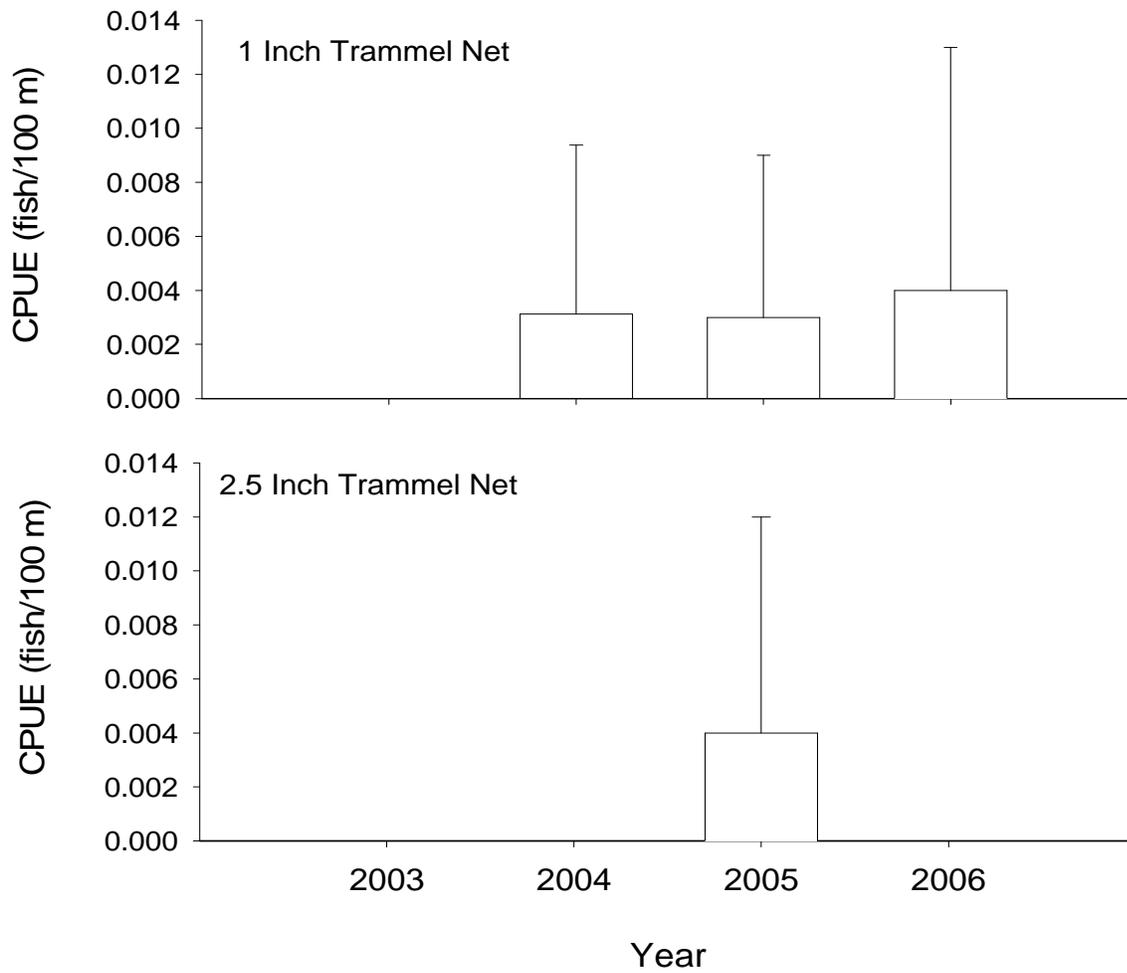


Figure 46. Mean annual catch-per-unit-effort ($\pm 2SE$) of sauger using 1 and 2.5 inch trammel nets in segment 13 of the Missouri River during sturgeon season 2003 - 2006.

Segment 13 - Sauger / Fish Community Season

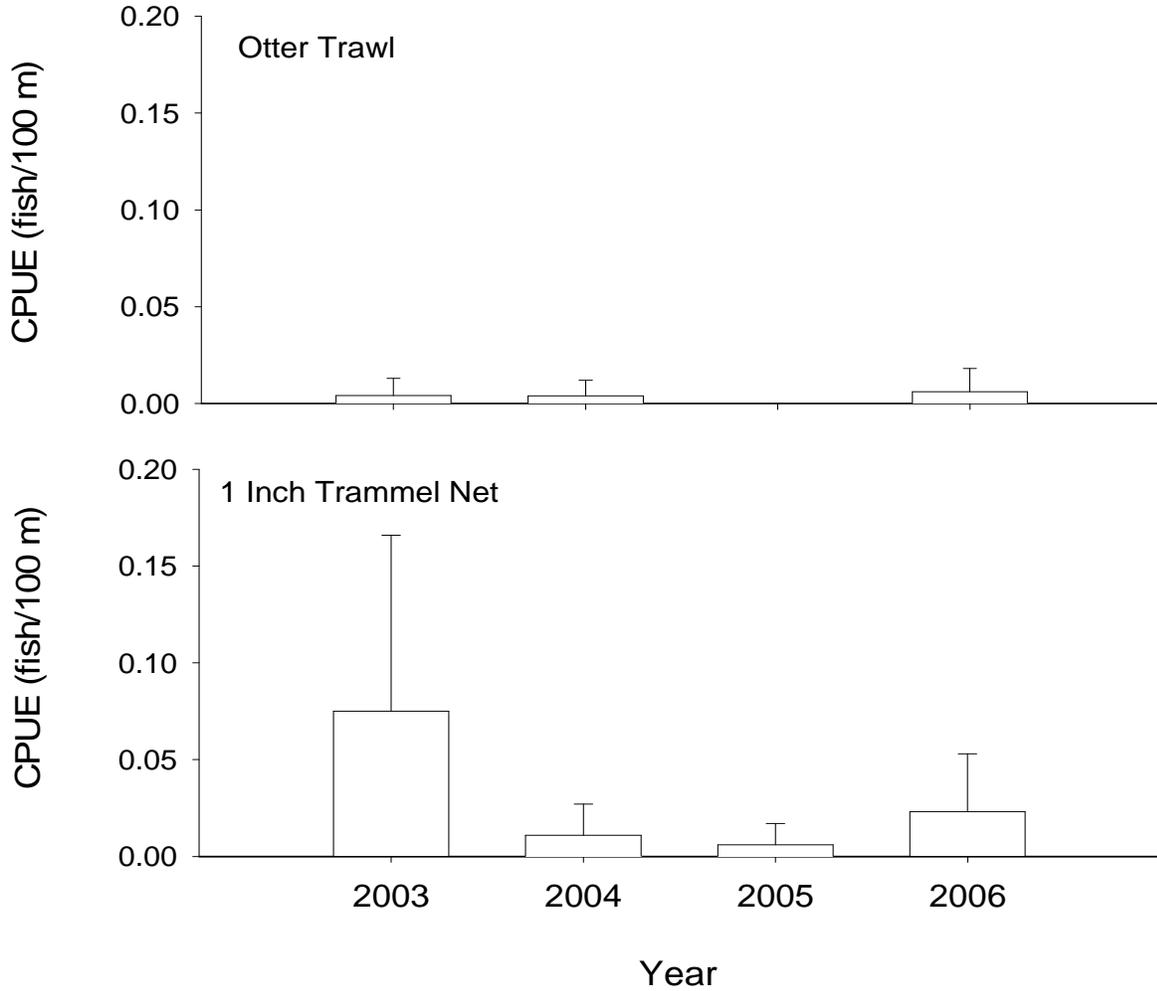


Figure 48. Mean annual catch-per-unit-effort (± 2 SE) of sauger using otter trawls and 1 inch trammel nets in segment 13 of the Missouri River during fish community season 2003 - 2006.

Table 38. Total number of sauger captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	1	N-E	100	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	67	0	2	5	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	25	0	N-E	N-E	66	0	5	4	0	0	0	0	
Gill Net	38	N-E	26	0	N-E	N-E	45	13	16	0	0	0	0	0	
		N-E	24	0	N-E	N-E	56	14	5	0	0	0	1	0	
Otter Trawl	1	N-E	100	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	22	1	N-E	N-E	65	0	2	10	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	3	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	
		N-E	27	0	N-E	N-E	69	0	0	4	0	0	0	0	
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	24	0	N-E	N-E	37	2	0	29	0	0	7	0	
Otter Trawl	1	N-E	100	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	23	0	N-E	N-E	73	0	2	2	0	0	0	0	

Table 39. Total number of saugers captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	1	0	100	0	0	0
		0	93	7	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	93	7	0	0
Gill Net	38	0	29	16	55	0
		0	47	3	50	0
Otter Trawl	1	0	100	0	0	0
		0	90	10	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	3	0	100	0	0	0
		0	96	4	0	0
Mini-Fyke Net	0	0	0	0	0	0
		97	0	3	0	0
Otter Trawl	1	0	100	0	0	0
		0	96	4	0	0

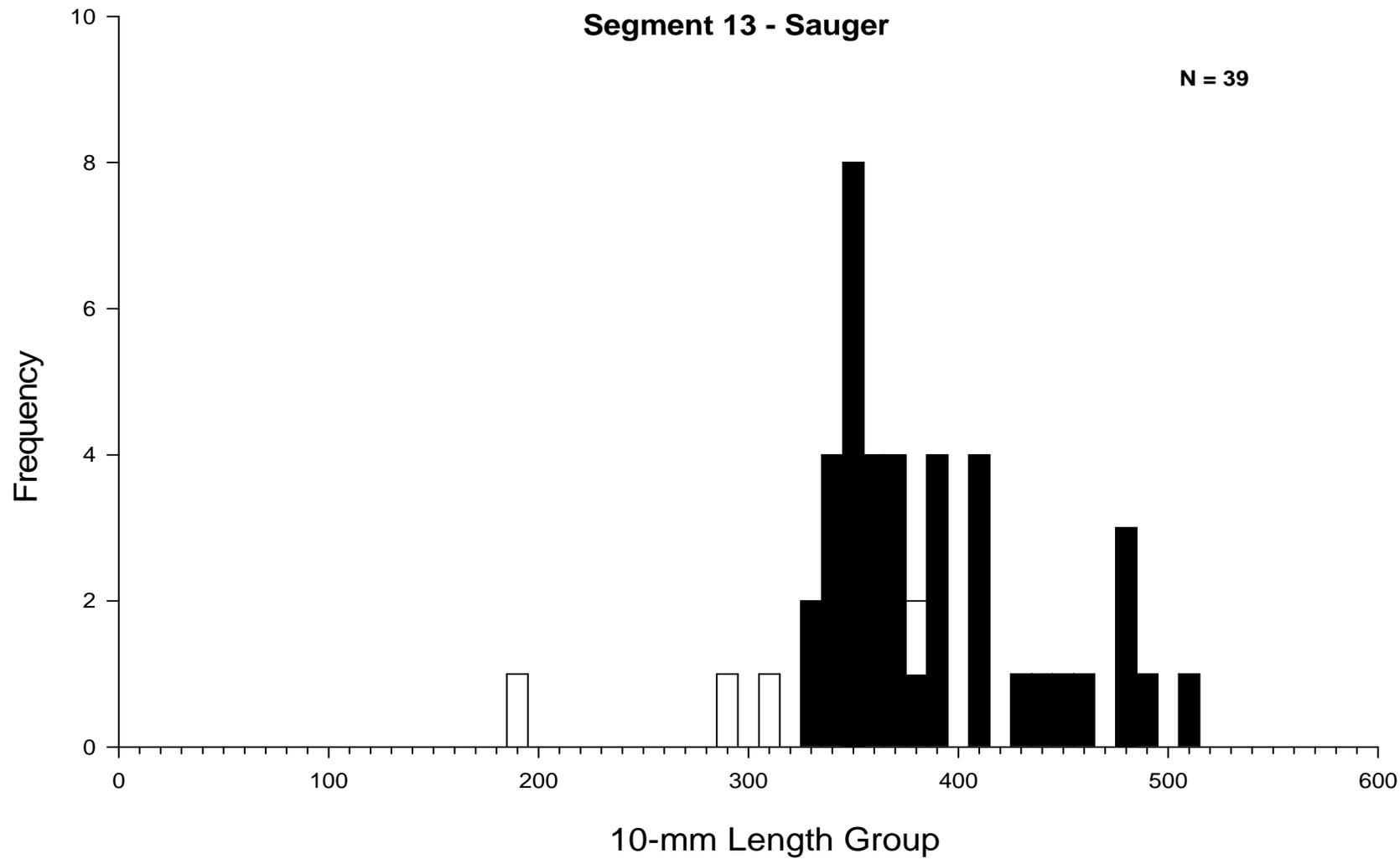


Figure 51. Length frequency of sauger during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during the 2006 sample year.

Missouri River Fish Community

This section covers the following objectives from the pallid sturgeon monitoring and assessment program:

Objective 6. Document annual results and long-term trends of all non-target species population abundance and geographic distribution throughout the Missouri River system, where sample size is greater than fifty individuals.

During the 2006 sample year, 13,934 fish were captured with random gear in randomly selected bends in segment 13 of the Missouri River. Standard gears captured 63 species with emerald shiners comprising the largest percentage of the total catch (18.0%; N = 2,514), followed by shovelnose sturgeon (14.2%; N = 1,983), red shiner (11.6%; N = 1,622), and river carpsucker (10.7%; N = 1,487). The nine target species accounted for 20.7% of the total catch with each contributing in the following order of abundance: shovelnose sturgeon (14.2%; N = 1,983), speckled chub (2.6%; N = 358), sicklefin chub (2.0%; N = 280), blue sucker (0.8%; N = 115), sturgeon chub (0.5%; N = 63), sauger (0.3%; N = 44), sand shiner (0.3%; N = 39), pallid sturgeon (0.03%; N = 5), and *Hybognathus* spp. (0.03%; N = 4). Eighteen species were captured fewer than five times during the entire sample year (Appendix F).

Gillnets captured 32 species and were most effective at capturing shovelnose sturgeon (51.6% of the catch; N = 1,171), with an average CPUE of 4.5 fish per net night. Blue catfish (9.3%; N = 212), goldeye (8.0%; N = 181), and shortnose gar (7.8%; N = 177) were the next most abundant fish species collected in gillnet samples (mean CPUE = 0.79, 0.67, and 0.78 fish per net/night respectively). Gillnets were only used during the sturgeon season.

One-inch trammel nets, fished during both seasons, captured 20 species with shovelnose sturgeon comprising the majority of the catch (67.2%; N = 406; mean overall CPUE = 1.07). Other large bodied fish, such as blue catfish (11.6%; N = 70; mean overall CPUE = 0.17) and blue suckers (8.6%; N = 52; mean CPUE = 0.13), were also captured effectively with 1-inch trammel nets (Appendix F and H). Two and a half inch-trammel nets, fished only in sturgeon season, captured 14. Unlike 1-inch trammel nets, two and a half inch trammel nets captured blue

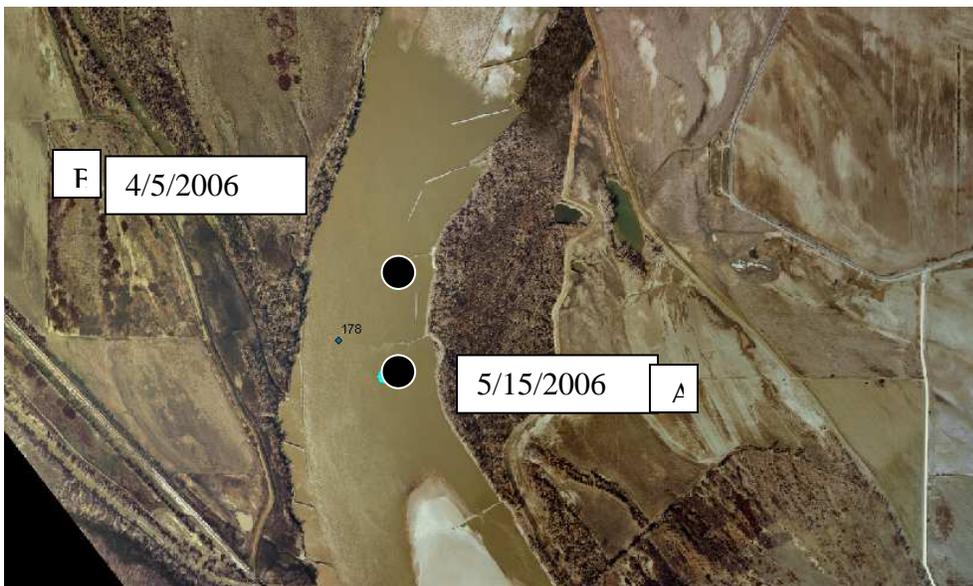
suckers and shovelnose sturgeon at almost the same rate (CPUE = 0.24 for blue suckers and 0.29 for shovelnose sturgeon). Blue sucker and shovelnose sturgeon were the two more abundant species captured with 2.5 inch trammel nets comprising 61.4% (30.7% each) of the total catch. Smallmouth buffalo and river carpsucker were the next two most abundant species in 2.5 inch trammel nets (13.0% and 8.5% of the total catch respectively).

Otter trawls captured 27 species of fish, most of which were small benthic fishes, which are not easily sampled with other gear types. Young-of-year channel (25.3%; N = 984; mean overall CPUE = 2.90) and blue catfish (19.5%; N = 756; mean CPUE = 1.98) were captured most frequently in otter trawl samples. Otter trawls were also very effective at capturing shovelnose sturgeon (9.2%; N = 359; mean overall CPUE = 0.80) and chub species in segment 13; speckled chub (8.8%; N = 341; mean CPUE = 0.87), sicklefin chub (7.2%; N = 278; mean CPUE = 0.59), and sturgeon chub (1.6%; N = 63; mean CPUE 0.13).

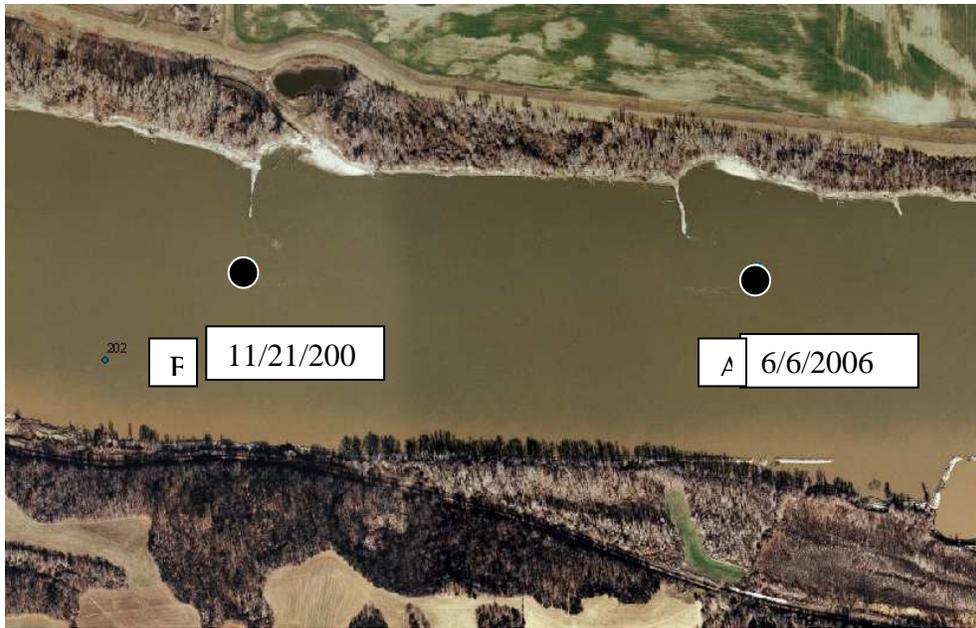
The fish community season is different because warm water temperatures and low water levels increase availability of fish and efficiency of sampling, especially in mini-fyke nets. This gear targets another group of fishes which are rarely detected with the other standard gear types. Mini-fyke nets captured 42 species of fish in segment 13 with almost all nets being dominated by cyprinid species such as emerald shiners (33.1% of the catch; N = 2,325; CPUE = 25.1 per net night) and red shiners (22.9% of the catch; N = 1,608; CPUE = 17.4 per net night). Of the 42 species captured by mini-fyke nets, 14 species were not captured with any other gear type. The most abundant of these were the green sunfish (N = 20), western mosquitofish (N = 13), creek chub (N = 12), and mimic shiner (N = 12). Mini-fyke nets also captured YOY common carp (N = 2), and silver carp (N = 2), which are life stages that are rarely captured with other gear types. Asian carp are still rarely captured at young life stages but, through observations in the field and through collections using other gear types from related projects (e.g., electrofishing and hoop nets); they seem to be increasing in abundance throughout the Lower Missouri River. Additional sampling gear and improved sampling techniques need to be further investigated to help document the population dynamics of this invasive exotic species.

Discussion

Of the seven pallid sturgeon that were captured, five were stock size and the other two were quality and above. Five of the seven pallid sturgeon captured were in standard gears and two were captured with wild gears that were used to target broodstock sized fish. Sub-stock size and YOY pallid sturgeon were not captured in segment 13 during 2006. In addition to the seven pallid sturgeon, four hybrid sturgeon were also captured in segment 13. While other authors have reported habitat preferences in segment 13 between stock and quality size sturgeon (Utrup et al. 2006, Doyle et al. 2005), 2006 captures were evenly distributed between POOL and CHNB mesohabitats. Temperature seemed to drive pallid sturgeon capture location more than fish length, with captures occurring in POOL mesohabitats (Maps 1b, 3) at lower temperatures and CHNB during warming temperatures (Maps 1a, 2a, 2b, 4, 5). This may also be a remnant of sampling bias, due the fact that active gears such as trammel nets and trawls are not fished when water temperatures are less than 10 °C. Three of the seven captures were on the eddy line (current seam) associated with a structure (Maps 1a, 2a, 3). This corresponds with telemetry data provided by USGS/CERC which shows that adult sturgeon move along the current seam as water temperature begins to rise, presumably to head upstream to spawn (Aaron Delonay, USGS, personal communication).



Map 1. Location of two pallid sturgeon captures on Bend 18 in segment 13.



Map 2. Location of two pallid sturgeon captures on Bend 30 in Segment 13.



Map 3. Location of a pallid sturgeon capture on Bend 25 in Segment 13.



Map 4. Location of a pallid sturgeon captured on Bend 4 of Segment 13. Water was 2.5-3.0 meters deep at time of capture.



Map 5. Location of a pallid sturgeon captured on Bend 17 in Segment 13.

Telemetry information provided by USGS/CERC shows that adult pallid sturgeon use deeper, swifter water than adult shovelnose. In past years, active gears such as trammel nets have been used to try and capture sonic telemetered shovelnose and pallid sturgeon. Through these exercises we have learned that sturgeon are not as vulnerable to active nets as once suspected. The nature of the bed-form in which sturgeon live consists of sand dunes over one meter high in various geometric forms. Additionally, drop-offs associated with dike structures prevent drifted gear from reaching the habitat utilized by sturgeon due to high flow and sharp angles. These substrate features also limit the efficacy of otter trawls in catching individually targeted sturgeon.

Notable Trends

Shovelnose sturgeon catch rates have declined since 2003. Gill net CPUE was over 12 fish per net night in 2003 and dropped to under 5 fish in 2006. Data for one inch trammel nets used during fish community season are the best indicator of change, because catch is not reflecting seasonal migratory behavior or winter aggregations. In 2003 and 2004 over 2 shovelnose sturgeon (quality size (380mm) or greater) were captured every 100 meters drifted. This number declined to 1.7 fish per 100 meters in 2005 and 0.6 in 2006. Another notable decline is the rarity of YOY shovelnose sturgeon in fish community season trawls. In 2004 and 2005, a YOY shovelnose sturgeon was captured every one thousand meters trawled (0.1 fish per 100 meters). In 2006, this number declined to one YOY shovelnose sturgeon every 2,500 meters (0.04 fish per 100 meters). Every other gear type shows a similar decline in CPUE in segment 13.

There may be several reasons for this decline ranging from drought like conditions in the recent past to the influence of commercial fishing. Low water levels may drive fish to areas where sampling does not occur (thalweg, small side channels, up tributaries, etc...). Commercial harvest of sturgeon in segment 13 is a legitimate concern. Belly scars (egg checks) from knife probes in shovelnose show that commercial fishermen are likely killing more fish than would be documented from harvest reports. Similar trends in shovelnose sturgeon decline are also observed in segment 14, which is downstream of segment 13 and ends at the Mississippi River (Utrup et al. 2007). Segment 14 most likely receives more pressure due to the number of commercial fishers on the Mississippi River who may come up the Missouri River. Anecdotal information from federal law enforcement officers indicates commercial fishers from other states (Tennessee and Arkansas) have already been observed fishing (legally and illegally) in the Mississippi River near the confluence. If the decline of shovelnose sturgeon is due to

commercial fishing, numbers will most likely continue to decline due to the rising prices of caviar. Documentation of a check scar on a pallid sturgeon in segment 14 suggests that commercial fishermen would likely harvest pallid sturgeon roe along with shovelnose sturgeon. Another possible explanation for lower numbers in 2006 may be biologists' bias towards sampling discrete microhabitats where pallid sturgeon are known to be found. Increased knowledge of pallid sturgeon habitat preference may influence capture rates of shovelnose sturgeon.

Catch rates for the three chub species (sturgeon, sicklefin, and speckled chubs) did not decline in segment 13 in 2006 as they did in segment 14 (Utrup et al. 2007). Sturgeon chub catch increased in 2006 during sturgeon season and remained similar to 2005 during fish community season. Between 2005 and 2006, speckled chub CPUE increased significantly during sturgeon season, but declined during fish community season. Sicklefin chub catch rates dropped slightly in 2006 during sturgeon season, but declined drastically in fish community season compared to the previous year. One year of decline is not enough evidence to predict the populations' status, however, sporadic catch rates of these three species may indicate sampling may not be effective at every season or water level. Environmental conditions such as low or high discharge during a critical time (spawning or extremely cold winter temperature) may cause declines in river species such as these. It may be important analyze environmental variables (discharge, temperature, duration and intensity of spring rises, etc...) in the Missouri River while monitoring these populations.

Blue sucker abundance seems to be increasing in segment 13. All three active gears show increases in the last four sturgeon seasons (2003-2006). Gill net data does not show a specific pattern and does not mirror the patterns found in the active gears. The discrepancy between the two gears indicates that blue suckers are not as consistently sampled with gill nets as they are with active gears. Sporadic catch rates during the fish community season indicate blue suckers spread out and may inhabit the TLWG mesohabitat which is not commonly fished. Lack of consistent catch rates in the fish community season may also indicate that segment 13 may not contain habitats consistently used by blue suckers throughout the summer and early fall.

During 2005 and 2006 Columbia FRO biologists deployed 1 inch trammel nets in overnight sets during sturgeon season gill netting in order to determine if one net size could catch the same numbers and sizes of sturgeon. Portions of the standard 1 inch trammel net (TN) were tied together to fish 200 feet of net (same length as the standard gill net). These nets were deployed in the same randomly selected bends in which gill nets were fished. Comparisons were made between nets fished in similar habitats (same macro, meso and micro habitats). Nineteen trammel nets captured 452 shovelnose sturgeon yielding a catch rate of 23.8 fish per net night whereas 32 standard gill nets were fished, capturing 532 (19 fish per net night). Not only did trammel nets catch more shovelnose sturgeon, they also caught a broader size range. Length frequencies of the compared nets are shown in Figure 52. Note the number of small (less than 400mm) shovelnose sturgeon.

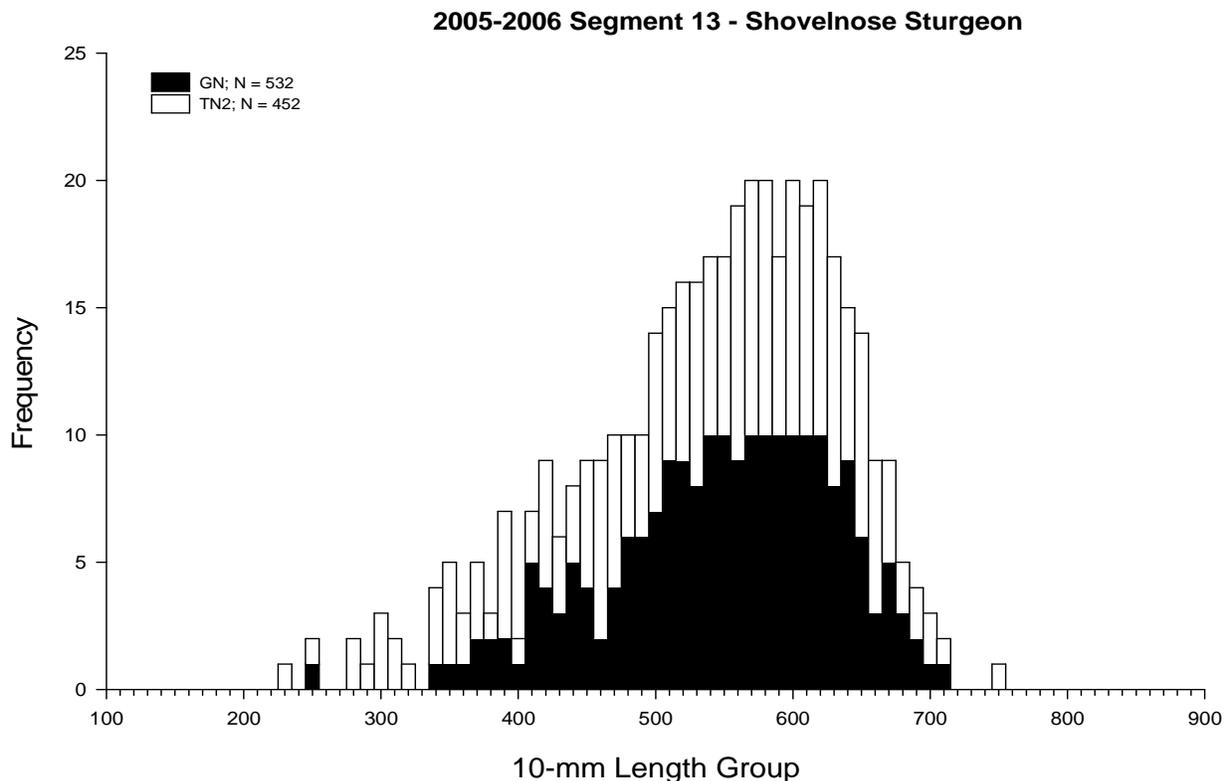


Figure 52. Length frequency of shovelnose sturgeon caught during fall through spring (sturgeon season) in 1 inch trammel nets (white bars) and gill nets (black bars) in segment 13 of the Missouri River during 2005-2006 sample seasons.

Acknowledgments

Special thanks to the staff of the Columbia Fishery Resources Office (Columbia FRO) for data collection, in the field and in the lab, scientific expertise in data interpretation, and dedication to the recovery of the federally endangered pallid sturgeon. The Columbia FRO has played a pivotal role in the ongoing effort to manage and protect the Missouri River and to promote the overall well being of its native fish fauna. Funding for this project was provided by the Army Corps of Engineers, Omaha District. Appreciation is extended to Yan Hong, Vince Travnicek, and the staff at the Missouri Department of Conservation's Chillicothe Office for maintaining the database and providing and summarizing the data for this report. Thanks to Mark Drobish for his flexibility and efforts in facilitating discussion and incorporating changes in the adaptive process of this project. Thanks to Mark Wildhaber for his contributions in project design and his willing service to help in the protocol development process. Craig Paukert has been providing data analyses that are becoming important tools as we continue to refine our sampling efforts. Aaron Delonay of USGS/CERC continues to be an asset to our sampling efforts; providing locations and general information regarding movements and habitat use of this elusive fish.

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APPENDICES

Appendix A. Phylogenetic list of Missouri River fishes with corresponding letter codes used in the long-term pallid sturgeon and associated fish community sampling program. The phylogeny follows that used by the American Fisheries Society, Common and Scientific Names of Fishes from the United States and Canada, 5th edition. Asterisks and bold type denote targeted native Missouri River species.

Scientific name	Common name	Letter Code
CLASS CEPHALASPIDOMORPHI-LAMPREYS		
ORDER PETROMYZONTIFORMES		
Petromyzontidae – lampreys		
<i>Ichthyomyzon castaneus</i>	Chestnut lamprey	CNLP
<i>Ichthyomyzon fossor</i>	Northern brook lamprey	NBLP
<i>Ichthyomyzon unicuspis</i>	Silver lamprey	SVLP
<i>Ichthyomyzon gagei</i>	Southern brook lamprey	SBLR
Petromyzontidae	Unidentified lamprey	ULY
Petromyzontidae larvae	Unidentified larval lamprey	LVLP
CLASS OSTEICHTHYES – BONY FISHES		
ORDER ACIPENSERIFORMES		
Acipenseridae – sturgeons		
<i>Acipenser fulvescens</i>	Lake sturgeon	LKSG
<i>Scaphirhynchus</i> spp.	Unidentified Scaphirhynchus	USG
<i>Scaphirhynchus albus</i>	Pallid sturgeon	PDSG*
<i>Scaphirhynchus platyrhynchus</i>	Shovelnose sturgeon	SNSG*
<i>S. albus</i> X <i>S. platyrhynchus</i>	Pallid-shovelnose hybrid	SNPD
Polyodontidae – paddlefishes		
<i>Polyodon spathula</i>	Paddlefish	PDFH
ORDER LEPISOSTEIFORMES		
Lepisosteidae – gars		
<i>Lepisosteus oculatus</i>	Spotted gar	STGR
<i>Lepisosteus osseus</i>	Longnose gar	LNGR
<i>Lepisosteus platostomus</i>	Shortnose gar	SNGR
ORDER AMMIFORMES		
Amiidae – bowfins		
<i>Amia calva</i>	Bowfin	BWFN
ORDER OSTEGLLOSSIFORMES		
Hiodontidae – mooneyes		
<i>Hiodon alosoides</i>	Goldeye	GDEY
<i>Hiodon tergisus</i>	Mooneye	MNEY
ORDER ANGUILLIFORMES		
Anguillidae – freshwater eels		
<i>Anguilla rostrata</i>	American eel	AMEL

Appendix A. (continued).

Scientific name	Common name	Letter Code
ORDER CLUPEIFORMES		
Clupeidae – herrings		
<i>Alosa alabame</i>	Alabama shad	ALSD
<i>Alosa chrysochloris</i>	Skipjack herring	SJHR
<i>Alosa pseudoharengus</i>	Alewife	ALWF
<i>Dorosoma cepedianum</i>	Gizzard shad	GZSD
<i>Dorosoma petenense</i>	Threadfin shad	TFSD
<i>D. cepedianum X D. petenense</i>	Gizzard-threadfin shad hybrid	GSTS
ORDER CYPRINIFORMES		
Cyprinidae – carps and minnows		
<i>Campostoma anomalum</i>	Central stoneroller	CLSR
<i>Campostoma oligolepis</i>	Largescale stoneroller	LSSR
<i>Carassius auratus</i>	Goldfish	GDFH
<i>Carassius auratus X Cyprinus carpio</i>	Goldfish-Common carp hybrid	GFCC
<i>Couesius plumbens</i>	Lake chub	LKCB
<i>Ctenopharyngodon idella</i>	Grass carp	GSCP
<i>Cyprinella lutrensis</i>	Red shiner	RDSN
<i>Cyprinella spiloptera</i>	Spotfin shiner	SFSN
<i>Cyprinus carpio</i>	Common carp	CARP
<i>Erimystax x-punctatus</i>	Gravel chub	GVCB
<i>Hybognathus argyritis</i>	Western silvery minnow	WSMN*
<i>Hybognathus hankinsoni</i>	Brassy minnow	BSMN
<i>Hybognathus nuchalis</i>	Mississippi silvery minnow	SVMW
<i>Hybognathus placitus</i>	Plains minnow	PNMW*
<i>Hybognathus spp.</i>	Unidentified Hybognathus	HBNS*
<i>Hypophthalmichthys molitrix</i>	Silver carp	SVCP
<i>Hypophthalmichthys nobilis</i>	Bighead carp	BHCP
<i>Luxilus chrysocephalus</i>	Striped shiner	SPSN
<i>Luxilus cornutus</i>	Common shiner	CMSN
<i>Luxilus zonatus</i>	Bleeding shiner	BDSN
<i>Lythrurus unbratilis</i>	Western redfin shiner	WRFS
<i>Macrhybopsis aestivalis</i>	Speckled chub	SKCB*
<i>Macrhybopsis gelida</i>	Sturgeon chub	SGCB*
<i>Macrhybopsis meeki</i>	Sicklefin chub	SFCB*
<i>Macrhybopsis storeriana</i>	Silver chub	SVCB
<i>M. aestivalis X M. gelida</i>	Speckled-Sturgeon chub hybrid	SPST
<i>M. gelida X M. meeki</i>	Sturgeon-Sicklefin chub hybrid	SCSC
<i>Macrhybopsis spp.</i>	Unidentified chub	UHY
<i>Margariscus margarita</i>	Pearl dace	PLDC
<i>Mylocheilus caurinus</i>	Peamouth	PEMT
<i>Nocomis biguttatus</i>	Hornyhead chub	HHCB
<i>Notemigonus crysoleucas</i>	Golden shiner	GDSN
<i>Notropis atherinoides</i>	Emerald shiner	ERSN
<i>Notropis blennioides</i>	River shiner	RVSN
<i>Notropis boops</i>	Bigeye shiner	BESN
<i>Notropis buechanani</i>	Ghost shiner	GTSN
<i>Notropis dorsalis</i>	Bigmouth shiner	BMSN
<i>Notropis greeniei</i>	Wedgespot shiner	WSSN

Appendix A. (continued).

Scientific name	Common name	Letter Code
Cyprinidae – carps and minnows		
<i>Notropis heterolepsis</i>	Blacknose shiner	BNSN
<i>Notropis hudsonius</i>	Spottail shiner	STSN
<i>Notropis nubilus</i>	Ozark minnow	OZMW
<i>Notropis rubellus</i>	Rosyface shiner	RYSN
<i>Notropis shumardi</i>	Silverband shiner	SBSN
<i>Notropis stilbius</i>	Silverstripe shiner	SSPS
<i>Notropis stramineus</i>	Sand shiner	SNSN*
<i>Notropis topeka</i>	Topeka shiner	TPSN
<i>Notropis volucellus</i>	Mimic shiner	MMSN
<i>Notropis wickliffi</i>	Channel shiner	CNSN
<i>Notropis</i> spp.	Unidentified shiner	UNO
<i>Opsopoeodus emiliae</i>	Pugnose minnow	PNMW
<i>Phenacobius mirabilis</i>	Suckermouth minnow	SMMW
<i>Phoxinus eos</i>	Northern redbelly dace	NRBD
<i>Phoxinus erythrogaster</i>	Southern redbelly dace	SRBD
<i>Phoxinus neogaeus</i>	Finescale dace	FSDC
<i>Pimephales notatus</i>	Bluntnose minnow	BNMW
<i>Pimephales promelas</i>	Fathead minnow	FHMW
<i>Pimephales vigilax</i>	Bullhead minnow	BHMW
<i>Platygobio gracilis</i>	Flathead chub	FHCB
<i>P. gracilis</i> X <i>M. meeki</i>	Flathead-sicklefin chub hybrid	FCSC
<i>Rhinichthys atratulus</i>	Blacknose dace	BNDC
<i>Rhinichthys cataractae</i>	Longnose dace	LNDC
<i>Richardsonius balteatus</i>	Redside shiner	RDSS
<i>Scardinius erythrophthalmus</i>	Rudd	RUDD
<i>Semotilus atromaculatus</i>	Creek chub	CKCB
	Unidentified Cyprinidae	UCY
	Unidentified Asian Carp	UAC
Catostomidae - suckers		
<i>Carpionodes carpio</i>	River carpsucker	RVCS
<i>Carpionodes cyprinus</i>	Quillback	QLBK
<i>Carpionodes velifer</i>	Highfin carpsucker	HFCS
<i>Carpionodes</i> spp.	Unidentified <i>Carpionodes</i>	UCS
<i>Catostomus catostomus</i>	Longnose sucker	LNSK
<i>Catostomus commersoni</i>	White sucker	WTSK
<i>Catostomus platyrhynchus</i>	Mountain sucker	MTSK
<i>Catostomus</i> spp.	Unidentified <i>Catostomus</i> spp.	UCA
<i>Cycleptus elongatus</i>	Blue sucker	BUSK*
<i>Hypentelium nigricans</i>	Northern hog sucker	NHSK
<i>Ictiobus bubalus</i>	Smallmouth buffalo	SMBF
<i>Ictiobus cyprinellus</i>	Bigmouth buffalo	BMBF
<i>Ictiobus niger</i>	Black buffalo	BKBF
<i>Ictiobus</i> spp.	Unidentified buffalo	UBF
<i>Minytrema melanops</i>	Spotted sucker	SPSK
<i>Moxostoma anisurum</i>	Silver redhorse	SVRH
<i>Moxostoma carinatum</i>	River redhorse	RVRH
<i>Moxostoma duquesnei</i>	Black redhorse	BKRH
<i>Moxostoma erythrurum</i>	Golden redhorse	GDRH
<i>Moxostoma macrolepidotum</i>	Shorthead redhorse	SHRH
<i>Moxostoma</i> spp.	Unidentified redhorse	URH

Appendix A. (continued).

Scientific name	Common name	Letter Code
Catostomidae - suckers	Unidentified Catostomidae	UCT
ORDER SILURIFORMES		
Ictaluridae – bullhead catfishes		
<i>Ameiurus melas</i>	Black bullhead	BKBH
<i>Ameiurus natalis</i>	Yellow bullhead	YLBH
<i>Ameiurus nebulosus</i>	Brown bullhead	BRBH
<i>Ameiurus</i> spp.	Unidentified bullhead	UBH
<i>Ictalurus furcatus</i>	Blue catfish	BLCF
<i>Ictalurus punctatus</i>	Channel catfish	CNCF
<i>I. furcatus</i> X <i>I. punctatus</i>	Blue-channel catfish hybrid	BCCC
<i>Ictalurus</i> spp.	Unidentified <i>Ictalurus</i> spp.	UCF
<i>Noturus exilis</i>	Slender madtom	SDMT
<i>Noturus flavus</i>	Stonecat	STCT
<i>Noturus gyrinus</i>	Tadpole madtom	TPMT
<i>Noturus nocturnus</i>	Freckled madtom	FKMT
<i>Pylodictis olivaris</i>	Flathead catfish	FHCF
ORDER SALMONIFORMES		
Esocidae - pikes		
<i>Esox americanus vermiculatus</i>	Grass pickerel	GSPK
<i>Esox lucius</i>	Northern pike	NTPK
<i>Esox masquinongy</i>	Muskellunge	MSKG
<i>E. lucius</i> X <i>E. masquinongy</i>	Tiger Muskellunge	TGMT
Umbridae - mudminnows		
<i>Umbra limi</i>	Central mudminnow	MDMN
Osmeridae - smelts		
<i>Osmerus mordax</i>	Rainbow smelt	RBST
Salmonidae - trouts		
<i>Coregonus artedi</i>	Lake herring or cisco	CSCO
<i>Coregonus clupeaformis</i>	Lake whitefish	LKWF
<i>Oncorhynchus aguabonita</i>	Golden trout	GDTT
<i>Oncorhynchus clarki</i>	Cutthroat trout	CTTT
<i>Oncorhynchus kisutch</i>	Coho salmon	CHSM
<i>Oncorhynchus mykiss</i>	Rainbow trout	RBTT
<i>Oncorhynchus nerka</i>	Sockeye salmon	SESM
<i>Oncorhynchus tshawytscha</i>	Chinook salmon	CNSM
<i>Prosopium cylindraceum</i>	Bonneville cisco	BVSC
<i>Prosopium williamsoni</i>	Mountain whitefish	MTWF
<i>Salmo trutta</i>	Brown trout	BNTT
<i>Salvelinus fontinalis</i>	Brook trout	BKTT
<i>Salvelinus namaycush</i>	Lake trout	LKTT
<i>Thymallus arcticus</i>	Arctic grayling	AMGL

Appendix A. (continued).

Scientific name	Common name	Letter Code
	ORDER PERCOPSIFORMES	
	Percopsidae – trout-perches	
<i>Percopsis omiscomaycus</i>	Trout-perch	TTPH
	ORDER GADIFORMES	
	Gadidae - cods	
<i>Lota lota</i>	Burbot	BRBT
	ORDER ATHERINIFORMES	
	Cyprinodontidae - killifishes	
<i>Fundulus catenatus</i>	Northern studfish	NTSF
<i>Fundulus diaphanus</i>	Banded killifish	BDKF
<i>Fundulus notatus</i>	Blackstripe topminnow	BSTM
<i>Fundulus olivaceus</i>	Blackspotted topminnow	BPTM
<i>Fundulus sciadicus</i>	Plains topminnow	PTMW
<i>Fundulus zebrinus</i>	Plains killifish	PKLF
	Poeciliidae - livebearers	
<i>Gambusia affinis</i>	Western mosquitofish	MQTF
	Atherinidae - silversides	
<i>Labidesthes sicculus</i>	Brook silverside	BKSS
	ORDER GASTEROSTEIFORMES	
	Gasterosteidae - sticklebacks	
<i>Culaea inconstans</i>	Brook stickleback	BKSB
	ORDER SCORPAENIFORMES	
	Cottidae - sculpins	
<i>Cottus bairdi</i>	Mottled sculpin	MDSP
<i>Cottus carolinae</i>	Banded sculpin	BDSP
	ORDER PERCIFORMES	
	Percichthyidae – temperate basses	
<i>Morone Americana</i>	White perch	WTPH
<i>Morone chrysops</i>	White bass	WTBS
<i>Morone mississippiensis</i>	Yellow bass	YWBS
<i>Morone saxatilis</i>	Striped bass	SDBS
<i>M. saxatilis X M. chrysops</i>	Striped-white bass hybrid	SBWB
	Centrarchidae - sunfishes	
<i>Ambloplites rupestris</i>	Rock bass	RKBS
<i>Archoplites interruptus</i>	Sacramento perch	SOPH
<i>Lepomis cyanellus</i>	Green sunfish	GNSF
<i>Lepomis gibbosus</i>	Pumpkinseed	PNSD
<i>Lepomis gulosus</i>	Warmouth	WRMH
<i>Lepomis humilis</i>	Orangespotted sunfish	OSSF
<i>Lepomis macrochirus</i>	Bluegill	BLGL
<i>Lepomis magalotis</i>	Longear sunfish	LESF
<i>Lepomis microlophus</i>	Redear sunfish	RESF
<i>L. cyanellus X L. macrochirus</i>	Green sunfish-bluegill hybrid	GSBG

Appendix A. (continued).

Scientific name	Common name	Letter Code
Centrarchidae - sunfishes		
<i>L. cyanellus</i> X <i>L. humilis</i>	Green-orangespotted sunfish hybrid	GSOS
<i>L. macrochirus</i> X <i>L. microlophus</i>	Bluegill-redear sunfish hybrid	BGRE
<i>Lepomis</i> spp.	Unidentified <i>Lepomis</i>	ULP
<i>Micropterus dolomieu</i>	Smallmouth bass	SMBS
<i>Micropterus punctulatus</i>	Spotted sunfish	STBS
<i>Micropterus salmoides</i>	Largemouth bass	LMBS
<i>Micropterus</i> spp.	Unidentified <i>Micropterus</i> spp.	UMC
<i>Pomoxis annularis</i>	White crappie	WTCP
<i>Pomoxis nigromaculatus</i>	Black crappie	BKCP
<i>Pomoxis</i> spp.	Unidentified crappie	UCP
<i>P. annularis</i> X <i>P. nigromaculatus</i>	White-black crappie hybrid	WCBC
Centrarchidae	Unidentified centrarchid	UCN
Percidae - perches		
<i>Ammocrypta asprella</i>	Crystal darter	CLDR
<i>Etheostoma blennioides</i>	Greenside darter	GSDR
<i>Etheostoma caeruleum</i>	Rainbow darter	RBDR
<i>Etheostoma exile</i>	Iowa darter	IODR
<i>Etheostoma flabellare</i>	Fantail darter	FTDR
<i>Etheostoma gracile</i>	Slough darter	SLDR
<i>Etheostoma microperca</i>	Least darter	LTDR
<i>Etheostoma nigrum</i>	Johnny darter	JYDR
<i>Etheostoma punctulatum</i>	Stippled darter	STPD
<i>Etheostoma spectabile</i>	Orangethroated darter	OTDR
<i>Etheostoma tetrazonum</i>	Missouri saddled darter	MSDR
<i>Etheostoma zonale</i>	Banded darter	BDDR
<i>Etheostoma</i> spp.	Unidentified <i>Etheostoma</i> spp.	UET
<i>Perca flavescens</i>	Yellow perch	YWPH
<i>Percina caprodes</i>	Logperch	LGPH
<i>Percina cymatotaenia</i>	Bluestripe darter	BTDR
<i>Percina evides</i>	Gilt darter	GLDR
<i>Percina maculata</i>	Blackside darter	BSDR
<i>Percina phoxocephala</i>	Slenderhead darter	SHDR
<i>Percina shumardi</i>	River darter	RRDR
<i>Percina</i> spp.	Unidentified <i>Percina</i> spp.	UPN
	Unidentified darter	UDR
<i>Sander canadense</i>	Sauger	SGER*
<i>Sander vitreus</i>	Walleye	WLEY
<i>S. canadense</i> X <i>S. vitreus</i>	Sauger-walleye hybrid/Saugeye	SGWE
<i>Sander</i> spp.	Unidentified <i>Sander</i> (formerly <i>Stizostedion</i>) spp.	UST
	Unidentified Percidae	UPC
Sciaenidae - drums		
<i>Aplodinotus grunniens</i>	Freshwater drum	FWDM
NON-TAXONOMIC CATEGORIES		
	Age-0/Young-of-year fish	YOYF
	Lab fish for identification	LAB
	No fish caught	NFSH
	Unidentified larval fish	LVFS
	Unidentified	UNID
	Net Malfunction (Did Not Fish)	NDNF

Appendix B. Definitions and codes used to classify standard Missouri River habitats in the long-term pallid sturgeon and associated fish community sampling program. Three habitat scales were used in the hierarchical habitat classification system: Macrohabitats, Mesohabitats, and Microhabitats.

Habitat	Scale	Definition	Code
Braided channel	Macro	An area of the river that contains multiple smaller channels and is lacking a readily identifiable main channel (typically associated with unchannelized sections)	BRAD
Main channel cross over	Macro	The inflection point of the thalweg where the thalweg crosses from one concave side of the river to the other concave side of the river, (i.e., transition zone from one-bend to the next bend). The upstream CHXO for a respective bend is the one sampled.	CHXO
Tributary confluence	Macro	Area immediately downstream, extending up to one bend in length, from a junction of a large tributary and the main river where this tributary has influence on the physical features of the main river	CONF
Dendric	Macro	An area of the river where the river transitions from meandering or braided channel to more of a treelike pattern with multiple channels (typically associated with unchannelized sections)	DEND
Deranged	Macro	An area of the river where the river transitions from a series of multiple channels into a meandering or braided channel (typically associated with unchannelized sections)	DRNG
Main channel inside bend	Macro	The convex side of a river bend	ISB
Main channel outside bend	Macro	The concave side of a river bend	OSB
Secondary channel-connected large	Macro	A side channel, open on upstream and downstream ends, with less flow than the main channel, large indicates this habitat can be sampled with trammel nets and trawls based on width and/or depths > 1.2 m	SCCL
Secondary channel-connected small	Macro	A side channel, open on upstream and downstream ends, with less flow than the main channel, small indicates this habitat cannot be sampled with trammel nets and trawls based on width and/or on depths < 1.2 m	SCCS
Secondary channel-non-connected	Macro	A side channel that is blocked at one end	SCCN
Tributary	Macro	Any river or stream flowing in the Missouri River	TRIB
Tributary large mouth	Macro	Mouth of entering tributary whose mean annual discharge is > 20 m ³ /s, and the sample area extends 300 m into the tributary	TRML
Tributary small mouth	Macro	Mouth of entering tributary whose mean annual discharge is < 20 m ³ /s, mouth width is > 6 m wide and the sample area extends 300 m into the tributary	TRMS
Wild	Macro	All habitats not covered in the previous habitat descriptions	WILD
Bars	Meso	Sandbar or shallow bank-line areas with depth < 1.2 m	BARS
Pools	Meso	Areas immediately downstream from sandbars, dikes, snags, or other obstructions with a formed scour hole > 1.2 m	POOL
Channel border	Meso	Area in the channelized river between the toe and the thalweg, area in the unchannelized river between the toe and the maximum depth	CHNB
Thalweg	Meso	Main channel between the channel borders conveying the majority of the flow	TLWG
Island tip	Meso	Area immediately downstream of a bar or island where two channels converge with water depths > 1.2 m	ITIP

Appendix C. List of standard and wild gears (type), their corresponding codes in the database, seasons deployed (Fall-Spring, Summer, or all), years used, and catch-per-unit-effort units for collection of Missouri River fishes in segment 13 for the long-term pallid sturgeon and associated fish community sampling program. Long-term monitoring began in 2003 for segment 13.

Gear	Code	Type	Season	Years	CPUE units
Trammel net – 1 inch inner mesh	TN	Standard	All	2003 - Present	fish/100 m drift
Trammel net – 2.5 inch inner mesh	TN25	Standard	Sturgeon	2005 - Present	fish/100 m drift
Gillnet – 4 meshes, small mesh set upstream	GN14	Standard	Sturgeon	2003 - Present	fish/net night
Gillnet – 4 meshes, large mesh set upstream	GN41	Standard	Sturgeon	2003 - Present	fish/net night
Gillnet – 8 meshes, small mesh set upstream	GN18	Standard	Sturgeon	2003 - Present	fish/net night
Gillnet – 8 meshes, large mesh set upstream	GN81	Standard	Sturgeon	2003 - Present	fish/net night
Otter trawl – 16 ft head rope	OT16	Standard	All	2003 - Present	fish/100 m trawled
Otter trawl – 16 ft SKT 4mm x 4mm HB2 MOR	OT01	Wild	Fish Comm.	2006 - Present	fish/100 m trawled
Push Trawl – 8 ft 4mm x 4mm	POT02	Wild	Fish Comm.	2006 - Present	fish/ m trawled
Beam trawl	BT	Standard*	All	2003 - 2004	fish/100 m trawled
Bag Seine – quarter arc method pulled upstream	BSQU	Wild	Fish Comm.	2003 - Present	fish/100 m ²
Bag Seine – quarter arc method pulled downstream	BSQD	Wild	Fish Comm.	2003 - Present	fish/100 m ²
Bag Seine – half arc method pulled upstream	BSHU	Wild	Fish Comm.	2003 - Present	fish/100 m ²
Bag Seine – half arc method pulled downstream	BSHD	Wild	Fish Comm.	2003 - Present	fish/100 m ²
Bag seine – rectangular method pulled upstream	BSRU	Wild	Fish Comm.	2003 - Present	fish/100 m ²
Bag seine – rectangular method pulled upstream	BSRD	Wild	Fish Comm.	2003 - Present	fish/100 m ²
Mini-fyke net	MF	Standard	Fish Comm.	2003 - Present	fish/net night

* Standard only in upper Missouri River segments

Appendix D. Stocking locations and codes for pallid sturgeon by Recovery Priority Management Area (RPMA) in the Missouri River Basin.

State(s)	RPMA	Site Name	Code	River	RM
MT	2	Above Intake	AIN	Yellowstone	70 +
MT	2	Intake	INT	Yellowstone	70.0
MT	2	Sidney	SID	Yellowstone	31.0
MT	2	Big Sky Bend	BSB	Yellowstone	17.0
ND	2	Fairview	FRV	Yellowstone	9.0
MT	2	Milk River	MLK	Milk	11.5
MT	2	Mouth of Milk	MOM	Missouri	1761.5
MT	2	Wolf Point	WFP	Missouri	1701.5
MT	2	Poplar	POP	Missouri	1649.5
MT	2	Brockton	BRK	Missouri	1678.0
MT	2	Culbertson	CBS	Missouri	1621.0
MT	2	Nohly Bridge	NOB	Missouri	1590.0
ND	2	Confluence	CON	Missouri	1581.5
SD/NE	3	Sunshine Bottom	SUN	Missouri	866.2
SD/NE	3	Verdel Boat Ramp	VER	Missouri	855.0
SD/NE	3	Standing Bear Bridge	STB	Missouri	845.0
SD/NE	3	Running Water	RNW	Missouri	840.1
SD/NE	4	St. Helena	STH	Missouri	799.0
SD/NE	4	Mullberry Bend	MUL	Missouri	775.0
NE/IA	4	Ponca State Park	PSP	Missouri	753.0
NE/IA	4	Sioux City	SIO	Missouri	732.6
NE/IA	4	Decatur	DCT	Missouri	691.0
NE/IA	4	Boyer Chute	BYC	Missouri	637.4
NE/IA	4	Bellevue	BEL	Missouri	601.4
NE/IA	4	Rulo	RLO	Missouri	497.9
NE/MO/KS	4	Kansas River	KSR	Missouri	367.5
NE	4	Platte River	PLR	Platte	5.0
KA/MO	4	Leavenworth	LVW	Missouri	397.0
MO	4	Parkville	PKV	Missouri	377.5
MO	4	Kansas City	KAC	Missouri	342.0
MO	4	Miami	MIA	Missouri	262.8
MO	4	Grand River	GDR	Missouri	250.0
MO	4	Boonville	BOO	Missouri	195.1
MO	4	Overton	OVT	Missouri	185.1
MO	4	Hartsburg	HAR	Missouri	160.0
MO	4	Jefferson City	JEF	Missouri	143.9
MO	4	Mokane	MOK	Missouri	124.7
MO	4	Hermann	HER	Missouri	97.6
MO	4	Washington	WAS	Missouri	68.5
MO	4	St. Charles	STC	Missouri	28.5

Appendix E. Juvenile and adult pallid sturgeon stocking summary for segment 13 of the Missouri River (RPMA 4)

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking ^a	Primary Mark	Secondary Mark
1994	St. Charles	837	1992	3/9/1994	2yo	Coded Wire	Dangler
1994	Washington	607	1992	3/9/1994	2yo	Coded Wire	Dangler
1994	Herman	988	1992	3/9/1994	2yo	Coded Wire	Dangler
1997	St. Charles	400	1997	10/15/1997	Fingerling	Coded Wire	Dangler
1997	Washington	400	1997	10/16/1997	Fingerling	Coded Wire	Dangler
1997	Herman	400	1997	10/17/1997	Fingerling	Coded Wire	Dangler
2002	Boonville	2531	2001	4/3/2002	Yearling	PIT Tag	Some Elastomer
2002	Boonville	165	1999	4/25/2002	3yo	PIT Tag	Elastomer
2003	Boonville	2852	2002	7/26/2003	Yearling	PIT Tag	
2003	Boonville	1770	2003	12/2/2003	Fingerling	Coded Wire	Some Elastomer
2004	Boonville	774	2003	7/8/2004	Yearling	PIT Tag	Elastomer
2004	Boonville	916	2003	7/30/2004	Yearling	PIT Tag	
2004	Boonville	9761	2004	9/10/2004	Fingerling	Coded Wire	Elastomer
2004	Boonville	2199	2004	10/8/2004	Fingerling	Coded Wire	Elastomer

^aAge of fish when stocked: Fry, Fingerling, Yearling, 1yo, 2yo, 3yo, etc...

Appendix F

Total catch, overall mean catch per unit effort [± 2 SE], and mean CPUE (fish/100 m) by Mesohabitat within a Macrohabitat for all species caught with each gear type during sturgeon season and fish community season for segment 13 of the Missouri River during the 2006 sample year. Species captured are listed alphabetically and their codes are presented in Appendix A. Asterisks with bold type indicate targeted native Missouri River species and habitat abbreviations are presented in Appendix B. Standard Error was not calculated when $N < 2$.

Appendix F1. Gill Net: overall season and segment summary. Lists CPUE (fish/net night) and 2 standard errors in brackets.

Species	Total Catch	Overall CPUE	CHXO		ISB		OSB		SCCL		TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	CHNB
BHCP	5	0.017	0.038	0.024	0.022	0.014	0	0	0	0	0
		[0.015]	[0.077]	[0.048]	[0.031]	[0.028]	[0]	[0]	[0]	[0]	[0]
BHMW	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BLCF	212	0.786	0.308	1.357	0.2	1.736	0.562	0.385	0	0.125	0
		[0.317]	[0.241]	[1.017]	[0.194]	[1.011]	[0.639]	[0.201]	[0]	[0.25]	[0]
BLGL	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BMBF	5	0.017	0	0.048	0	0.042	0	0	0	0	0
		[0.018]	[0]	[0.066]	[0]	[0.061]	[0]	[0]	[0]	[0]	[0]
BNMW	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BUSK	5	0.028	0	0.024	0.044	0.014	0.125	0	0	0	0
		[0.025]	[0]	[0.048]	[0.062]	[0.028]	[0.25]	[0]	[0]	[0]	[0]
CARP	26	0.093	0.038	0.238	0	0.153	0.25	0.038	0	0	0
		[0.064]	[0.077]	[0.245]	[0]	[0.198]	[0.267]	[0.077]	[0]	[0]	[0]
CKCB	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
CLSR	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNCF	33	0.138	0	0.19	0.044	0.194	0	0.231	0	0.125	1.75
		[0.074]	[0]	[0.146]	[0.053]	[0.23]	[0]	[0.183]	[0]	[0.25]	[0.5]
CNSN	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
ERSN	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
FHCF	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
FHMW	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
FSMT	1	0.003	0	0.024	0	0	0	0	0	0	0
		[0.007]	[0]	[0.048]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
FWDM	22	0.083	0.077	0.071	0	0.208	0	0.154	0	0	0
		[0.054]	[0.154]	[0.078]	[0]	[0.188]	[0]	[0.175]	[0]	[0]	[0]

Appendix F1 (continued).

Species	Total Catch	Overall CPUE	CHXO		ISB		OSB		SCCL		TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	CHNB
GDEY	182	0.666	0.231	1.643	0.167	0.778	0.75	0.538	0.167	2	1
		[0.262]	[0.332]	[1.368]	[0.206]	[0.407]	[0.982]	[0.487]	[0.333]	[2.273]	[2]
GDFH	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
GDRH	3	0.01	0.038	0	0	0	0	0.077	0	0	0
		[0.015]	[0.077]	[0]	[0]	[0]	[0]	[0.154]	[0]	[0]	[0]
GNSF	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
GSCP	16	0.059	0.038	0.048	0.022	0.083	0.125	0.115	0	0.125	0
		[0.032]	[0.077]	[0.066]	[0.044]	[0.075]	[0.25]	[0.122]	[0]	[0.25]	[0]
GTSN	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
GZSD	109	0.403	0.269	1.619	0.044	0.5	0.062	0.038	0	0	0
		[0.222]	[0.268]	[1.3]	[0.053]	[0.321]	[0.125]	[0.077]	[0]	[0]	[0]
HBNS	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
HFCS	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
JYDR	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
LKSG	3	0.014	0	0	0	0.056	0	0	0	0	0
		[0.017]	[0]	[0]	[0]	[0.066]	[0]	[0]	[0]	[0]	[0]
LMBS	2	0.007	0	0.024	0	0	0	0.038	0	0	0
		[0.01]	[0]	[0.048]	[0]	[0]	[0]	[0.077]	[0]	[0]	[0]
LNDR	61	0.217	0.385	0.786	0.022	0.139	0.062	0.231	0	0	0.25
		[0.149]	[0.411]	[0.938]	[0.031]	[0.124]	[0.125]	[0.243]	[0]	[0]	[0.5]
MMSN	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
MNEY	2	0.007	0	0	0	0.028	0	0	0	0	0
		[0.014]	[0]	[0]	[0]	[0.056]	[0]	[0]	[0]	[0]	[0]
MQTF	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
OSSF	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]

Appendix F1 (continued).

Species	Total Catch	Overall CPUE	CHXO		ISB		OSB		SCCL		TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	CHNB
PDFH	3	0.01	0	0	0	0.042	0	0	0	0	0
		[0.015]	[0]	[0]	[0]	[0.061]	[0]	[0]	[0]	[0]	[0]
PDSG	2	0.01	0	0.024	0.022	0	0	0	0	0	0
		[0.015]	[0]	[0.048]	[0.044]	[0]	[0]	[0]	[0]	[0]	[0]
QLBK	3	0.01	0	0.024	0	0.014	0	0	0	0.125	0
		[0.012]	[0]	[0.048]	[0]	[0.028]	[0]	[0]	[0]	[0.25]	[0]
RDSN	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
RVCS	79	0.286	0.038	0.929	0.044	0.208	0.25	0.577	0.167	0.25	0.5
		[0.115]	[0.077]	[0.54]	[0.062]	[0.171]	[0.5]	[0.478]	[0.333]	[0.5]	[1]
RVRH	1	0.003	0	0.024	0	0	0	0	0	0	0
		[0.007]	[0]	[0.048]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
RVSN	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SDBS	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SFCB	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SGCB	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SGER	38	0.148	0.154	0.167	0.067	0.181	0.25	0.115	0	0.75	0
		[0.058]	[0.208]	[0.126]	[0.06]	[0.107]	[0.327]	[0.166]	[0]	[1.19]	[0]
SHRH	19	0.069	0.038	0	0.033	0.069	0.25	0.231	0	0.125	0
		[0.035]	[0.077]	[0]	[0.038]	[0.071]	[0.327]	[0.183]	[0]	[0.25]	[0]
SJHR	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SKCB	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SMBF	36	0.131	0.192	0.214	0.056	0.194	0	0.192	0	0	0
		[0.055]	[0.213]	[0.213]	[0.057]	[0.134]	[0]	[0.18]	[0]	[0]	[0]
SMMW	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNGR	226	0.783	0.115	1.571	0	2.069	0.375	0.115	0	0	0
		[0.683]	[0.166]	[0.903]	[0]	[2.657]	[0.366]	[0.166]	[0]	[0]	[0]

Appendix F1 (continued).

Species	Total Catch	Overall CPUE	CHXO		ISB		OSB		SCCL		TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	CHNB
SNPD	4	0.017	0	0.024	0.022	0.028	0	0	0	0	0
		[0.018]	[0]	[0.048]	[0.031]	[0.056]	[0]	[0]	[0]	[0]	[0]
SNSG	1171	4.486	8.269	5.5	1.6	8.25	4.5	0.577	1.167	2.75	0.25
		[1.504]	[7.034]	[5.366]	[1.075]	[3.843]	[3.443]	[0.451]	[1.856]	[5.172]	[0.5]
SNSN	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
STBS	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SVCB	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SVCP	25	0.086	0	0.167	0	0.222	0	0.077	0	0	0
		[0.044]	[0]	[0.144]	[0]	[0.141]	[0]	[0.104]	[0]	[0]	[0]
UCA	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCF	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCN	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCS	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCT	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCY	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UIC	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
WLYE	1	0.007	0	0	0	0	0.125	0	0	0	0
		[0.014]	[0]	[0]	[0]	[0]	[0.25]	[0]	[0]	[0]	[0]
WTBS	1	0.003	0	0.024	0	0	0	0	0	0	0
		[0.007]	[0]	[0.048]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
WTCP	2	0.007	0	0	0	0.028	0	0	0	0	0
		[0.01]	[0]	[0]	[0]	[0.039]	[0]	[0]	[0]	[0]	[0]
WTSK	21	0.072	0	0.143	0	0.042	0	0.115	0.833	0.5	0
		[0.052]	[0]	[0.197]	[0]	[0.047]	[0]	[0.166]	[1.667]	[0.577]	[0]

Appendix F2. 1 Inch Trammel Net: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors in brackets.

Species	Total Catch	Overall CPUE	CHXO	ISB	SCCL		SCCS
			CHNB	CHNB	CHNB	ITIP	ITIP
BHCP	1	0.002	0	0.003	0	0	0
		[0.005]	[0]	[0.007]		[0]	[0]
BHMW	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
BLCF	70	0.17	0.108	0.199	1.333	0	0
		[0.062]	[0.071]	[0.085]		[0]	[0]
BLGL	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
BMBF	1	0.005	0	0.007	0	0	0
		[0.009]	[0]	[0.014]		[0]	[0]
BNMW	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
BUSK	52	0.131	0.098	0.137	1.333	0	0.111
		[0.058]	[0.08]	[0.077]		[0]	[0.157]
CARP	2	0.002	0.008	0	0	0	0
		[0.004]	[0.016]	[0]		[0]	[0]
CKCB	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
CLSR	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
CNCF	6	0.018	0	0.026	0	0	0
		[0.019]	[0]	[0.027]		[0]	[0]
CNSN	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
ERSN	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
FHCF	4	0.007	0	0.01	0	0	0
		[0.007]	[0]	[0.01]		[0]	[0]
FHMW	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
FSMT	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
FWDM	4	0.011	0.024	0.007	0	0	0
		[0.011]	[0.035]	[0.01]		[0]	[0]
GDEY	11	0.029	0.071	0.016	0	0	0
		[0.018]	[0.053]	[0.017]		[0]	[0]
GDFH	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	SCCL		SCCS
			CHNB	CHNB	CHNB	ITIP	ITIP
GDRH	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
GNSF	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
GSCP	2	0.004	0	0.005	0	0	0
		[0.005]	[0]	[0.008]		[0]	[0]
GTSN	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
GZSD	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
HBNS	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
HFCS	1	0.002	0.008	0	0	0	0
		[0.004]	[0.016]	[0]		[0]	[0]
JYDR	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
LKSG	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
LMBS	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
LNDR	10	0.023	0.018	0.027	0	0	0
		[0.019]	[0.036]	[0.024]		[0]	[0]
MMSN	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
MNEY	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
MQTF	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
OSSF	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
PDFH	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
PDSG	2	0.007	0.02	0.003	0	0	0
		[0.011]	[0.04]	[0.007]		[0]	[0]
QLBK	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
RDSN	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	SCCL		SCCS
			CHNB	CHNB	CHNB	ITIP	ITIP
RVCS	8	0.021	0.043	0.012	0	0	0.037
		[0.018]	[0.062]	[0.012]		[0]	[0.074]
RVRH	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
RVSN	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
SDBS	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
SFCB	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
SGCB	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
SGER	4	0.013	0.009	0.016	0	0	0
		[0.015]	[0.018]	[0.021]		[0]	[0]
SHRH	2	0.004	0	0.006	0	0	0
		[0.005]	[0]	[0.008]		[0]	[0]
SJHR	2	0.006	0	0.009	0	0	0
		[0.01]	[0]	[0.015]		[0]	[0]
SKCB	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
SMBF	15	0.041	0.007	0.058	0	0	0
		[0.029]	[0.013]	[0.042]		[0]	[0]
SMMW	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
SNGR	1	0.003	0	0.004	0	0	0
		[0.005]	[0]	[0.007]		[0]	[0]
SNPD	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
SNSG	406	1.065	0.292	1.382	2.667	0.278	0.632
		[0.363]	[0.193]	[0.516]		[0.556]	[0.433]
SNSN	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
STBS	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
SVCB	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
SVCP	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	SCCL		SCCS
			CHNB	CHNB	CHNB	ITIP	ITIP
		[0]	[0]	[0]		[0]	[0]
UCA	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
UCF	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
UCN	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
UCS	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
UCT	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
UCY	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
UHY	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
UIC	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
WLYE	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
WTBS	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
WTCP	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]
WTSK	0	0	0	0	0	0	0
		[0]	[0]	[0]		[0]	[0]

Appendix F3. 2.5 Inch Trammel Net: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors in brackets.

Species	Total Catch	Overall CPUE	CHXO	ISB	SCCL		SCCS
			CHNB	CHNB	CHNB	ITIP	ITIP
BHCP	3	0.016 [0.019]	0 [0]	0.006 [0.012]	0.355 [0.709]	0.119 [0.238]	0 [0]
BHMW	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
BLCF	1	0.007 [0.013]	0 [0]	0.01 [0.021]	0 [0]	0 [0]	0 [0]
BLGL	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
BMBF	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
BNMW	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
BUSK	47	0.244 [0.107]	0.204 [0.215]	0.282 [0.139]	0 [0]	0 [0]	0.25 [0.5]
CARP	4	0.022 [0.022]	0.042 [0.059]	0.017 [0.025]	0 [0]	0 [0]	0 [0]
CKCB	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
CLSR	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
CNCF	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
CNSN	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
ERSN	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
FHCF	2	0.009 [0.013]	0 [0]	0.015 [0.021]	0 [0]	0 [0]	0 [0]
FHMW	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
FSMT	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
FWDM	4	0.017 [0.017]	0.012 [0.025]	0.021 [0.024]	0 [0]	0 [0]	0 [0]
GDEY	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
GDFH	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]

Appendix F3 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	SCCL		SCCS
			CHNB	CHNB	CHNB	ITIP	ITIP
GDRH	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
GNSF	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
GSCP	4	0.031	0.102	0.008	0	0	0
		[0.046]	[0.179]	[0.016]	[0]	[0]	[0]
GTSN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
GZSD	1	0.008	0	0.013	0	0	0
		[0.017]	[0]	[0.026]	[0]	[0]	[0]
HBNS	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
HFCS	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
JYDR	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
LKSG	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
LMBS	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
LNGR	2	0.011	0.02	0.009	0	0	0
		[0.015]	[0.039]	[0.018]	[0]	[0]	[0]
MMSN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
MNEY	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
MQTF	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
OSSF	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
PDFH	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
PDSG	1	0.005	0	0.008	0	0	0
		[0.01]	[0]	[0.016]	[0]	[0]	[0]
QLBK	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
RDSN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]

Appendix F3 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	SCCL		SCCS
			CHNB	CHNB	CHNB	ITIP	ITIP
RVCS	13	0.063	0.081	0.03	0	0.119	0.372
		[0.044]	[0.098]	[0.036]	[0]	[0.238]	[0.499]
RVRH	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
RVSN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SDBS	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SFCB	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SGCB	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SGER	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SHRH	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SJHR	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SKCB	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SMBF	20	0.118	0.079	0.133	0.355	0	0.122
		[0.063]	[0.088]	[0.089]	[0.709]	[0]	[0.244]
SMMW	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SNGR	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SNPD	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SNSG	47	0.294	0.245	0.285	0.455	0.542	0.396
		[0.14]	[0.175]	[0.201]	[0.909]	[0.786]	[0.35]
SNSN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
STBS	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SVCB	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SVCP	4	0.02	0.013	0.016	0	0	0.133
		[0.021]	[0.027]	[0.023]	[0]	[0]	[0.267]

Appendix F3 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	SCCL		SCCS
			CHNB	CHNB	CHNB	ITIP	ITIP
UCA	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UCF	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UCN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UCS	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UCT	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UCY	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UHY	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UIC	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
WLYE	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
WTBS	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
WTCP	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
WTSK	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]

Appendix F4. Otter Trawl: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors in brackets.

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
BHCP	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
BHMW	27	0.078	0.305	0	0	0	0	0
		[0.145]	[0.567]	[0]	[0]	[0]	[0]	[0]
BLCF	767	1.984	1.924	0.607	2.191	0.921	1.75	0.735
		[0.606]	[0.938]	[0.037]	[0.862]	[1.412]	[3.5]	[0.633]
BLGL	7	0.02	0.079	0	0	0	0	0
		[0.041]	[0.159]	[0]	[0]	[0]	[0]	[0]
BMBF	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
BNMW	5	0.011	0.025	0	0.007	0	0	0
		[0.011]	[0.035]	[0]	[0.01]	[0]	[0]	[0]
BUSK	11	0.026	0	0	0.033	0	0	0.066
		[0.017]	[0]	[0]	[0.024]	[0]	[0]	[0.091]
CARP	4	0.009	0	0	0.011	0.152	0	0
		[0.01]	[0]	[0]	[0.013]	[0.303]	[0]	[0]
CKCB	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
CLSR	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNCF	1008	2.899	2.512	0	2.674	2.872	33.1	2.284
		[1.316]	[1.37]	[0]	[1.707]	[2.129]	[59.8]	[2.284]
CNSN	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
ERSN	189	0.927	0.033	0	1.433	0	0	0
		[1.669]	[0.054]	[0]	[2.605]	[0]	[0]	[0]
FHCF	10	0.027	0.006	0	0.018	0	0.75	0.081
		[0.023]	[0.013]	[0]	[0.019]	[0]	[1.5]	[0.162]
FHMW	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
FSMT	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
FWDM	456	1.373	1.204	4.669	1.008	5.647	5.05	3.413
		[0.814]	[1.134]	[8.162]	[1.07]	[5.867]	[6.9]	[4.372]
GDEY	36	0.099	0.131	0	0.102	0	0	0
		[0.075]	[0.096]	[0]	[0.111]	[0]	[0]	[0]
GDFH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
GDRH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
GNSF	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
GSCP	1	0.002	0.008	0	0	0	0	0
		[0.004]	[0.016]	[0]	[0]	[0]	[0]	[0]
GTSN	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
GZSD	3	0.007	0.013	0	0.005	0	0	0
		[0.009]	[0.026]	[0]	[0.011]	[0]	[0]	[0]
HBNS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
HFCS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
JYDR	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
LKSG	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
LMBS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
LNGR	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
MMSN	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
MNEY	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
MQTF	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
OSSF	16	0.046	0.181	0	0	0	0	0
		[0.093]	[0.363]	[0]	[0]	[0]	[0]	[0]
PDFH	4	0.007	0	0	0.011	0	0	0
		[0.011]	[0]	[0]	[0.017]	[0]	[0]	[0]
PDSG	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
QLBK	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
RDSN	14	0.031	0.028	0	0.031	0	0	0.051
		[0.026]	[0.043]	[0]	[0.035]	[0]	[0]	[0.103]

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
RVCS	48	0.148	0.117	0	0.089	0.152	4.1	0.239
		[0.113]	[0.122]	[0]	[0.131]	[0.303]	[1.8]	[0.479]
RVRH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
RVSN	5	0.009	0	0	0.014	0	0	0
		[0.014]	[0]	[0]	[0.022]	[0]	[0]	[0]
SDBS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SFCB	286	0.59	0.442	0	0.632	0.152	0	1.035
		[0.187]	[0.451]	[0]	[0.205]	[0.303]	[0]	[0.96]
SGCB	63	0.126	0.087	0	0.13	0.256	0	0.245
		[0.056]	[0.062]	[0]	[0.069]	[0.513]	[0]	[0.438]
SGER	2	0.005	0.019	0	0	0	0	0
		[0.007]	[0.028]	[0]	[0]	[0]	[0]	[0]
SHRH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SJHR	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SKCB	364	0.873	0.922	0	0.957	0	0.25	0.318
		[0.343]	[0.564]	[0]	[0.484]	[0]	[0.5]	[0.32]
SMBF	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SMMW	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNGR	1	0.003	0.011	0	0	0	0	0
		[0.006]	[0.023]	[0]	[0]	[0]	[0]	[0]
SNPD	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNSG	360	0.804	0.493	0.882	0.872	0.152	0.9	1.464
		[0.179]	[0.32]	[1.765]	[0.206]	[0.303]	[0.2]	[1.253]
SNSN	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
STBS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SVCB	226	0.539	0.605	0	0.582	0.256	0.25	0.068
		[0.302]	[0.409]	[0]	[0.441]	[0.513]	[0.5]	[0.137]
SVCP	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
UCA	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCF	17	0.046	0	0	0.027	0.175	0	0.382
		[0.052]	[0]	[0]	[0.028]	[0.351]	[0]	[0.716]
UCN	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCT	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCY	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UHY	23	0.065	0.175	0	0.006	0.805	0.25	0.023
		[0.079]	[0.299]	[0]	[0.008]	[0.825]	[0.5]	[0.047]
UIC	2	0.003	0	0	0.005	0	0	0
		[0.005]	[0]	[0]	[0.008]	[0]	[0]	[0]
WLYE	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
WTBS	6	0.009	0	0	0.014	0	0	0
		[0.015]	[0]	[0]	[0.023]	[0]	[0]	[0]
WTCP	4	0.012	0.045	0	0	0	0	0
		[0.023]	[0.091]	[0]	[0]	[0]	[0]	[0]
WTSK	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]

Appendix F6. Mini-fyke Net: overall season and segment summary. Lists CPUE (fish/net night) and 2 standard errors in brackets.

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCS		TRMS
			BARS	BARS	BARS	BARS	ITIP	BARS
BHCP	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
BHMW	706	7.511	14.609	5.143	0.5	2.833	0.667	17
		[4.43]	[13.756]	[4.347]	[1]	[2.564]	[1.333]	[30.36]
BLCF	3	0.032	0	0.057	0.5	0	0	0
		[0.047]	[0]	[0.114]	[1]	[0]	[0]	[0]
BLGL	35	0.372	0.87	0.114	0	0	0	1.571
		[0.277]	[0.827]	[0.109]	[0]	[0]	[0]	[2.304]
BMBF	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
BNMW	168	1.787	3.174	0.686	0	1.708	0.333	4.143
		[1.455]	[5.063]	[0.704]	[0]	[2.311]	[0.667]	[5.862]
BUSK	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
CARP	2	0.021	0.087	0	0	0	0	0
		[0.03]	[0.12]	[0]	[0]	[0]	[0]	[0]
CKCB	13	0.138	0.478	0.029	0	0.042	0	0
		[0.235]	[0.957]	[0.057]	[0]	[0.083]	[0]	[0]
CLSR	2	0.021	0	0	0	0.042	0	0.143
		[0.03]	[0]	[0]	[0]	[0.083]	[0]	[0.286]
CNCF	79	0.84	0.696	0.8	0	0.708	1.333	2
		[0.428]	[1.303]	[0.462]	[0]	[0.442]	[1.764]	[2.726]
CNSN	40	0.426	0	0.857	0	0.417	0	0
		[0.439]	[0]	[1.091]	[0]	[0.625]	[0]	[0]
ERSN	2360	25.106	39.217	20.4	1.5	8.625	139	16.714
		[11.64]	[28.771]	[18.226]	[3]	[6.337]	[148.786]	[11.561]
FHCF	2	0.021	0	0.057	0	0	0	0
		[0.03]	[0]	[0.08]	[0]	[0]	[0]	[0]
FHMW	7	0.074	0.13	0.086	0.5	0	0	0
		[0.092]	[0.261]	[0.171]	[1]	[0]	[0]	[0]
FSMT	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
FWDM	231	2.457	3	1.857	6.5	3.083	0	1.429
		[0.903]	[1.581]	[0.971]	[13]	[2.702]	[0]	[0.857]
GDEY	3	0.032	0	0.029	0	0.083	0	0
		[0.047]	[0]	[0.057]	[0]	[0.167]	[0]	[0]
GDFH	2	0.021	0	0.029	0	0	0	0.143
		[0.03]	[0]	[0.057]	[0]	[0]	[0]	[0.286]

Appendix F6 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCS		TRMS
			BARS	BARS	BARS	BARS	ITIP	BARS
GDRH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
GNSF	20	0.213	0.217	0.286	1.5	0.042	0	0.143
		[0.145]	[0.216]	[0.334]	[1]	[0.083]	[0]	[0.286]
GSCP	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
GTSN	1	0.011	0	0.029	0	0	0	0
		[0.021]	[0]	[0.057]	[0]	[0]	[0]	[0]
GZSD	25	0.266	0.391	0.114	0	0.25	0	0.857
		[0.182]	[0.449]	[0.229]	[0]	[0.301]	[0]	[1.19]
HBNS	4	0.043	0	0.029	0	0.125	0	0
		[0.042]	[0]	[0.057]	[0]	[0.138]	[0]	[0]
HFCS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
JYDR	1	0.011	0	0.029	0	0	0	0
		[0.021]	[0]	[0.057]	[0]	[0]	[0]	[0]
LKSG	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
LMBS	4	0.043	0.043	0.057	0.5	0	0	0
		[0.052]	[0.087]	[0.114]	[1]	[0]	[0]	[0]
LNGR	8	0.085	0.087	0.086	0	0.042	0.333	0.143
		[0.058]	[0.12]	[0.096]	[0]	[0.083]	[0.667]	[0.286]
MMSN	12	0.128	0.13	0.029	0	0.125	1.667	0
		[0.126]	[0.191]	[0.057]	[0]	[0.183]	[3.333]	[0]
MNEY	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
MQTF	13	0.138	0.087	0.143	0.5	0.083	0	0.429
		[0.094]	[0.12]	[0.12]	[1]	[0.167]	[0]	[0.857]
OSSF	38	0.404	0.348	0.771	1	0	0	0.143
		[0.43]	[0.428]	[1.112]	[2]	[0]	[0]	[0.286]
PDFH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
PDSG	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
QLBK	1	0.011	0	0	0	0	0	0.143
		[0.021]	[0]	[0]	[0]	[0]	[0]	[0.286]
RDSN	1631	17.351	15	19.829	11.5	18.458	11	13.286
		[7.351]	[9.076]	[17.053]	[5]	[11.824]	[16.371]	[8.671]

Appendix F6 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCS		TRMS
			BARS	BARS	BARS	BARS	ITIP	BARS
RVCS	1370	14.574	5.739	7.743	0.5	38.25	5.667	4.429
		[13.406]	[5.716]	[5.618]	[1]	[51.124]	[10.349]	[3.973]
RVRH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
RVSN	66	0.702	2.391	0.286	0	0.042	0	0
		[0.833]	[3.326]	[0.313]	[0]	[0.083]	[0]	[0]
SDBS	2	0.021	0.043	0	0	0	0	0.143
		[0.03]	[0.087]	[0]	[0]	[0]	[0]	[0.286]
SFCB	2	0.021	0.043	0.029	0	0	0	0
		[0.03]	[0.087]	[0.057]	[0]	[0]	[0]	[0]
SGCB	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SGER	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SHRH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SJHR	1	0.011	0.043	0	0	0	0	0
		[0.021]	[0.087]	[0]	[0]	[0]	[0]	[0]
SKCB	17	0.181	0.217	0.143	0	0.167	1	0
		[0.135]	[0.307]	[0.186]	[0]	[0.26]	[2]	[0]
SMBF	6	0.064	0	0	0	0.25	0	0
		[0.108]	[0]	[0]	[0]	[0.421]	[0]	[0]
SMMW	2	0.021	0	0	1	0	0	0
		[0.043]	[0]	[0]	[2]	[0]	[0]	[0]
SNGR	75	0.798	1.174	0.829	1	0.625	0	0.286
		[0.28]	[0.718]	[0.43]	[2]	[0.536]	[0]	[0.369]
SNPD	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNSG	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNSN	39	0.415	1.478	0.086	0	0.083	0	0
		[0.705]	[2.867]	[0.171]	[0]	[0.167]	[0]	[0]
STBS	1	0.011	0.043	0	0	0	0	0
		[0.021]	[0.087]	[0]	[0]	[0]	[0]	[0]
SVCB	26	0.277	0.348	0.286	0.5	0.125	0.667	0.286
		[0.143]	[0.298]	[0.302]	[1]	[0.138]	[0.667]	[0.369]
SVCP	2	0.021	0.043	0	0.5	0	0	0
		[0.03]	[0.087]	[0]	[1]	[0]	[0]	[0]

Appendix F6 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCS		TRMS
			BARS	BARS	BARS	BARS	ITIP	BARS
UCA	1	0.011	0	0	0	0	0	0.143
		[0.021]	[0]	[0]	[0]	[0]	[0]	[0.286]
UCF	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCN	1	0.011	0	0.029	0	0	0	0
		[0.021]	[0]	[0.057]	[0]	[0]	[0]	[0]
UCS	15	0.16	0.652	0	0	0	0	0
		[0.319]	[1.304]	[0]	[0]	[0]	[0]	[0]
UCT	6	0.064	0.043	0	0	0	1.333	0.143
		[0.066]	[0.087]	[0]	[0]	[0]	[1.333]	[0.286]
UCY	9	0.096	0.304	0.029	0	0	0	0.143
		[0.151]	[0.609]	[0.057]	[0]	[0]	[0]	[0.286]
UHY	3	0.032	0	0.086	0	0	0	0
		[0.047]	[0]	[0.126]	[0]	[0]	[0]	[0]
UIC	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
WLYE	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
WTBS	46	0.489	0.696	0.286	2.5	0.583	0.333	0
		[0.291]	[0.961]	[0.267]	[3]	[0.465]	[0.667]	[0]
WTCP	28	0.298	0.087	0.4	4.5	0.125	0	0
		[0.238]	[0.12]	[0.458]	[5]	[0.25]	[0]	[0]
WTSK	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]

Appendix G. Hatchery names, locations, and abbreviations.

Hatchery	State	Abbreviation
Blind Pony State Fish Hatchery	MO	BYP
Neosho National Fish Hatchery	MO	NEO
Gavins Point National Fish Hatchery	SD	GAV
Garrison Dam National Fish Hatchery	ND	GAR
Miles City State Fish Hatchery	MT	MCH
Blue Water State Fish Hatchery	MT	BLU
Bozeman Fish Technology Center	MT	BFT
Fort Peck State Fish Hatchery	MT	FPH

Appendix H. Alphabetic list of Missouri River fishes with total catch-per-unit-effort by gear type for sturgeon season (fall through spring) and fish community season (summer) during the 2006 sample year for segment 13 of the Missouri River. Species codes are located in Appendix A. Asterisks and bold type denote targeted native Missouri River species.

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)		
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl
ALSD							
ALWF							
AMEL							
AMGL							
BCCC							
BDDR							
BDKF							
BDSN							
BDSP							
BESN							
BHCP							
BHMW						7.511	0.156
BKBF							
BKBH							
BKCP	0.005	0.016	0.017				
BKRH							
BKSB							
BKSS							
BKTT							
BLCF	0.056	0.007	0.786	1.195	0.291	0.032	2.772
BLGL						0.372	0.041
BMBF			0.017		0.010		
BMSN							
BNDC							
BNMW				0.021		1.787	
BNSN							
BNTT							
BPTM							
BRBT							

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)		
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl
BSDR							
BSMN							
BSTM							
BTDR							
BUSK*	0.133	0.244	0.028	0.037	0.128		0.015
BVSC							
BWFN							
CARP		0.022	0.093	0.008	0.004	0.021	0.010
CHSM							
CKCB						0.138	
CLDR							
CLSR						0.021	
CMSN							
CNCF	0.010		0.138	2.327	0.026	0.840	3.470
CNLP							
CNSM							
CNSN						0.426	
CSCO							
CTTT							
ERSN				0.004		25.106	1.849
FCSC							
FHCB							
FHCF	0.003	0.009			0.010	0.021	0.053
FHMW						0.074	
FKMT			0.003				
FSDC							
FTDR							
FWDM	0.004	0.017	0.083	1.149	0.018	2.457	1.598
GDEY	0.024		0.666		0.034	0.032	0.198
GDFH						0.021	

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)		
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl
GDTT							
GFCC							
GLDR							
GDRH			0.010				
GN*?							
GNSF						0.213	
GSBG							
GSCP	0.007	0.031	0.059				0.004
GSDR							
GSOS							
GSPK							
GSTS							
GTSN						0.011	
GVCB							
GZSD		0.008	0.403	0.007		0.266	0.007
HBNS*						0.043	
HFCS					0.004		
HHCB							
IODR							
JYDR						0.011	
LESF							
LGPH							
LKCB							
LKSG			0.014				
LKTT							
LKWF							
LMBS			0.007			0.043	
LNDC							
LNGR	0.030	0.011	0.217		0.017	0.085	
LNSK							
GDRH							

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)		
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl
GDSN							
LSSR							
LTDR							
LVLP							
MDSP							
MMSN						0.128	
MNEY			0.007				
MQTF						0.138	
MSDR							
MSKG							
MTSK							
MTWF							
NBLP							
NHSK							
NRBD							
NTPK							
NTSF							
OSSF						0.404	0.093
OTDR							
OZMW							
PDFH			0.010	0.014			
PDSG*	0.015	0.005	0.010				
PEMT							
PKLF							
PLDC							
PNMW							
PNMW*							
PNSD							
PTMW							
QLBK			0.010			0.011	

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)		
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl
RBDR							
RBST							
RBTT							
RDSN				0.042		17.351	0.019
RDSS							
RKBS							
RRDR							
RUDD							
RVCS	0.017	0.063	0.286	0.035	0.025	14.574	0.262
RVRH			0.003				
RVSN						0.702	0.018
RYSN							
SBLR							
SBSN							
SBWB							
SCSC							
SDBS						0.021	
SDMT							
SESM							
SFCB*				0.824		0.021	0.356
SFSN							
SGCB*				0.140			0.112
SGER*	0.004		0.148	0.004	0.023		0.006
SGWE							
SHDR							
SHRH	0.004		0.069		0.004		
SJHR	0.009			0.000	0.003	0.011	
SKCB*				1.311		0.181	0.434
SLDR							
SMBF	0.042	0.118	0.131		0.041	0.064	

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)		
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl
SMBS							
SMMW						0.021	
SNGR	0.005		0.783			0.798	0.006
SNPD			0.017				
SNSG*	1.348	0.294	4.486	0.930	0.763		0.678
SNSN*						0.415	
SPSK							
SPSN							
SPST							
SRBD							
SSPS							
STBS						0.011	
STCT							
STGR							
STPD							
STSN							
SVCB				0.187		0.277	0.890
SVCP		0.020	0.086			0.021	
SVLP							
SVMW							
SVRH							
TFSD							
TPMT							
TPSN							
TTPH							
UAC							
UBF							
UCA						0.011	
UCF				0.072			0.020
UCN						0.011	
UCS						0.160	

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)		
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl
UCT						0.064	
UCY						0.096	
UDR							
UET							
UHY				0.042		0.032	0.088
ULP							
ULY							
UNO							
UPC							
UPN							
URH							
USG							
UST							
UIC							0.007
WLEY			0.007				
WRFS							
WRMH							
WSMN*							
WSSN							
WTBS			0.003			0.489	0.018
WTCP			0.007			0.298	0.023
WTPH							
WTSK			0.072				
YLBH							
YWBS							
YWPH							

Appendix I. Comprehensive list of bend numbers and bend river miles for segment 13 of the Missouri River comparing bend selection for both sturgeon season (ST) and fish community season (FC) between years from 2003 – 2006.

Bend Number	Bend River Mile	2003	2004	2005	2006
1	132.6	FC		ST	
2	134.7				
3	135.6	ST		FC	
4	137.3				ST, FC
5	138.7			ST	
6	142.0	FC		ST	
7	143.5		FC	FC	
8	145.9				
9	149.5	ST	FC		
10	151.6	ST			ST, FC
11	154.8			ST	
12	158.6		FC	ST	
13	162.1	FC			ST, FC
14	166.9	ST			
15	171.1		FC	ST	
16	174.3		ST	FC	
17	176.4		ST, FC		ST
18	178.4	ST	FC		ST, FC
19	180.3				ST, FC
20	181.6				ST, FC
21	183.3				
22	184.6		FC		
23	186.9	FC		ST	
24	189.1	FC		ST	
25	192.0	ST	FC		ST, FC
26	193.7	ST	FC		
27	197.1	ST			
28	199.6	ST			ST, FC
29	201.2	ST, FC			
30	203.6	ST	ST		ST, FC

Appendix I. (continued).

Bend Number	Bend River Mile	2003	2004	2005	2006
31	205.3			ST	
32	207.2	ST		FC	
33	209.1	ST			
34	210.9			ST, FC	
35	214.0	ST			ST, FC
36	217.5	FC			ST, FC
37	220.0	FC	ST		
38	222.3		ST, FC		
39	228.3		ST, FC	FC	
40	232.4				
41	234.3				
42	237.3			ST, FC	
43	239.5				
44	246.3				ST, FC
45	250.3				