

# 2007 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  
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## **EXECUTIVE SUMMARY**

Field crews from the Columbia NFWCO captured 11 pallid sturgeon with standard gears while sampling segment 13. Twenty seven more pallid sturgeon were captured with non-standard (wild) gears (trot lines and 3¼-in (83 mm) gill nets). Of all 38 pallid sturgeon captured in 2007, 31 were of hatchery origin, six were genetically confirmed wild fish, and one was unknown. At least one fish lost an elastomere tag, one lost a coded wire tag and one lost a PIT tag. Fish from stocking events in 2002, 2003, 2004, and 2005 have been recaptured in segment 13. Over 80,000 hatchery origin pallid sturgeon have been stocked in the lower Missouri River (below Gavin's Point Dam).

Standard gill nets captured three pallid sturgeon, standard drifted trammel nets captured six, and standard otter trawls captured two. Wild gears were sometimes set on non-random bends targeting pallid sturgeon. Seven pallid sturgeon were captured with wild 3 ¼ (83 mm) in gill nets, 18 were captured with baited trotlines, one was captured in an overnight-set of a 1-inch (25 mm) trammel net and one was captured with a non-standard trawl. Catch rates were similar to previous years, with the exception of the 2006 fish community season, when no pallid sturgeon were captured. The smallest wild pallid sturgeon captured was 536 mm, roughly the same size as a 2003 year class hatchery stocked pallid sturgeon.

Pallid sturgeon captured in 2007 were healthy with mean condition factors ranging from 0.847 to 0.905. Growth rates of stocked pallid sturgeon ranged from 0.192 to 0.240 mm per day. Pallid capture locations were similar to previous years, with the exception of reduced capture rates in the POOL mesohabitat. Pallid sturgeon were captured exclusively in the CHNB mesohabitat in 2007. Capture temperature ranged from 1.8 - 31.5° C. Mean capture depth was 2.7 m.

Pallid sturgeon were captured at a rate of 1 pallid to 207 shovelnose in standard samples. Two hybrid sturgeon were captured with a ratio of 5.5 pallid sturgeon to 1 hybrid and one hybrid sturgeon to 1,139 shovelnose.

Shovelnose sturgeon capture rates increased in 2007 from 2006 in all gears except sturgeon season otter trawling. While catch rates have declined from previous years (2003 through 2005), fish community trammel net catch doubled between 2006 and 2007. Gill nets captured 51.4% of the 2,277 shovelnose sturgeon, while otter trawls captured 7.7% during sturgeon season and 11.2% during fish community season, and drifted trammel nets captured 13.9% during sturgeon season and 15.8 % during fish community season. Three lake sturgeon were captured during standard sampling.

Fish community sampling allows biologists to track changes in the Missouri River's native fish population. Standard sampling captured 10,450 fish consisting of 53 species and one hybrid. Catch rates dropped for sicklefin chub by approximately 50%. Sturgeon chub catch was 4 times lower in 2007 than 2006. Overall catch rates for speckled chub were consistent with previous years. Catch rates for the three chub species have been variable throughout the 5 years of sampling. Only one sand shiner was captured in 2007 (over 30 times fewer than 2006). Catch rates for *Hybognathus* spp. were similar to previous years. Sand shiners and *Hybognathus* spp. have never been abundant in segment 13 samples. Eighty-two blue suckers were captured in segment 13 during 2007. Blue sucker catch rates have been similar between years, with a notable increase in catch during sturgeon season in 2006 and 2007. Fifty-one sauger were captured in 2007. Sauger catch rates in trammel nets during sturgeon season and otter trawls during fish community season were the highest they have been since the inception of this program. Nineteen silver carp, six grass carp, four bighead carp and fifty-eight common carp were also captured.

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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 shore-line; 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 2008). 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 in 2006 due to their similarity of results with mini-fyke nets. Sampling effort was increased in 2007 to increase statistical power. Prior to 2007, eight sub-samples were deployed on each bend. In 2007, active gears were deployed based on bend length, with longer bends receiving one more deployment for every 0.6 miles over 2.4 miles.

A new gear, the push trawl, was added for fish community sampling and is currently being evaluated as a possible replacement for (or supplement to) mini-fyke nets for small bodied fishes. Push trawls may reduce the cost associated with setting a gear overnight and having to retrieve it the next day. Specifications for the push trawl are below and further information can be found in Drobish (2008).

## **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 logistical sampling unit. Segments were divided into bends which are defined as the crossing of the thalweg from one bank to the other and back and are the statistical replicate. Bends were randomly selected from each segment to be sampled with a suite of gears. Twelve bends were randomly selected prior to November 2006. These twelve bends were each sampled twice, once between 1 November 2006 and 30 June 2007 (referred to as sturgeon season) and once between 1 July 2007 and 31 October 2007 (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.

Habitats were described in a hierarchical manner (Drobish 2008; Appendix B). The broadest habitat description, macrohabitat, described the general location of the sample within the bend (inside bend, outside bend, etc.). The mesohabitats described the sample within the macrohabitat (pool, channel border, etc.). The microhabitat was used to specifically characterize the sample related to features within the sample area (wing dikes, sandbars, etc.). If available, all macro and mesohabitat combinations were sampled. 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**

To avoid mortality, gill nets (GN) were only deployed when water temperatures were below 12.8°C. Gill nets were anchored upstream with a 20 pound grappling hook and back-anchored with a cement weight tied to a buoy. Gill nets were fished overnight with a minimum soak time of 12 hours and a maximum of 24 hours.

Otter trawls (OT or OT16) were pulled downstream with a jet powered stern trawler. Otter trawls were used in both sturgeon and fish community seasons. 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 and avoid many snags in daily operations.

Trammel nets were deployed perpendicular to the current and 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. An estimate of sampling distance lost was accounted for. Trammel nets were fished in moderately shallow water and away from

eddies which could tangle the net. Snags occurred frequently, but did not prevent effective sampling. The 2.5 inch trammel nets were dropped from standard sampling in 2007.

Mini-fyke nets were deployed during fish community 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.

Push trawls were added to the sampling protocol in 2007. Push trawls were fished in the same habitats as mini-fyke nets as well as in shallow (less than 1.4 m) open water habitats where a mini-fyke could not properly be fished (no emergent bar or steep drop-off). Data will be analyzed in the future to determine if this gear will be adopted as part of the standardized sampling protocol.

Segment 13 sampling gear dimensions:

<b>Otter trawl:</b>	Innovative Nets Systems (Greg Faulkner) custom Skate design, # 9 Sapphire®, 1.5 inch (38 mm) stretch mesh, 16 ft. (4.9 m) wide and 30 inch (0.76 m) boards
<b>1-inch trammel net:</b>	125 ft. (38.1 m) X 6 ft. (1.8 m) outer wall X 8 ft. (2.4 m) inner wall; 1-inch (25.4 mm) bar X 8 inch (203 mm) bar panels
<b>2.5 inch trammel net:</b>	125 ft. (38.1 m) X 6 ft. (1.8 m) outer wall X 8 ft. (2.4 m) inner wall; 2.5 inch (64 mm) bar X 8 inch (203 mm) bar panels
<b>Mini- Fyke:</b>	2 cab frames @ 4 ft. (1.2 m) X 2 ft. (0.6 m), two 2 ft. (0.6 m) hoops, 15 ft. (4.6 m) X 2 ft. (0.6 m) lead, 1/8 <sup>th</sup> in. (3.2 mm) mesh

- Gill net:** 100 (30.5 m) X 8 ft. (2.4 m) with 25 ft. (7.6 m) repeating 1.5 (38 mm), 2 (51 mm), 3 (76 mm) and 4 (102 mm) inch mesh panels, nets were sewn together making a 200 ft. (61 m) net with two series of repeating panels
- Push Trawl:** 8 ft. (2.4 m) wide, 6 ft. (1.8 m) long and 2 ft. (0.6 m) high trawl with 3/16 in. (4 mm) ACE mesh pushed from the bow of a jet-driven boat. Standard 30in. (0.76 m) boards are used.

## **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, turbidity and velocity samples were collected randomly from 25% of the Mesohabitat types within each Macrohabitat. 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 pallid sturgeon 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 pallid sturgeon, 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. 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 (Gabelhouse 1984).

### *Analyses*

A sample target effort for each gear was defined as follows: 300 m drift (TN), 300 m tow (OT), and one overnight set (GN, MF). Due to the large numbers of snags encountered, a minimum effort of 75 m was accepted for OT and TN in channel border habitat; because some areas have so much debris long drifts are not possible. Effort was calculated as catch per 100 m 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.

Several figures and tables have been omitted from this report in an effort to maintain consistency between years and segments. For example, if no pallid sturgeon were captured in mini-fyke nets, the figure showing CPUE of mini-fyke nets would be excluded from the pallid sturgeon discussion.

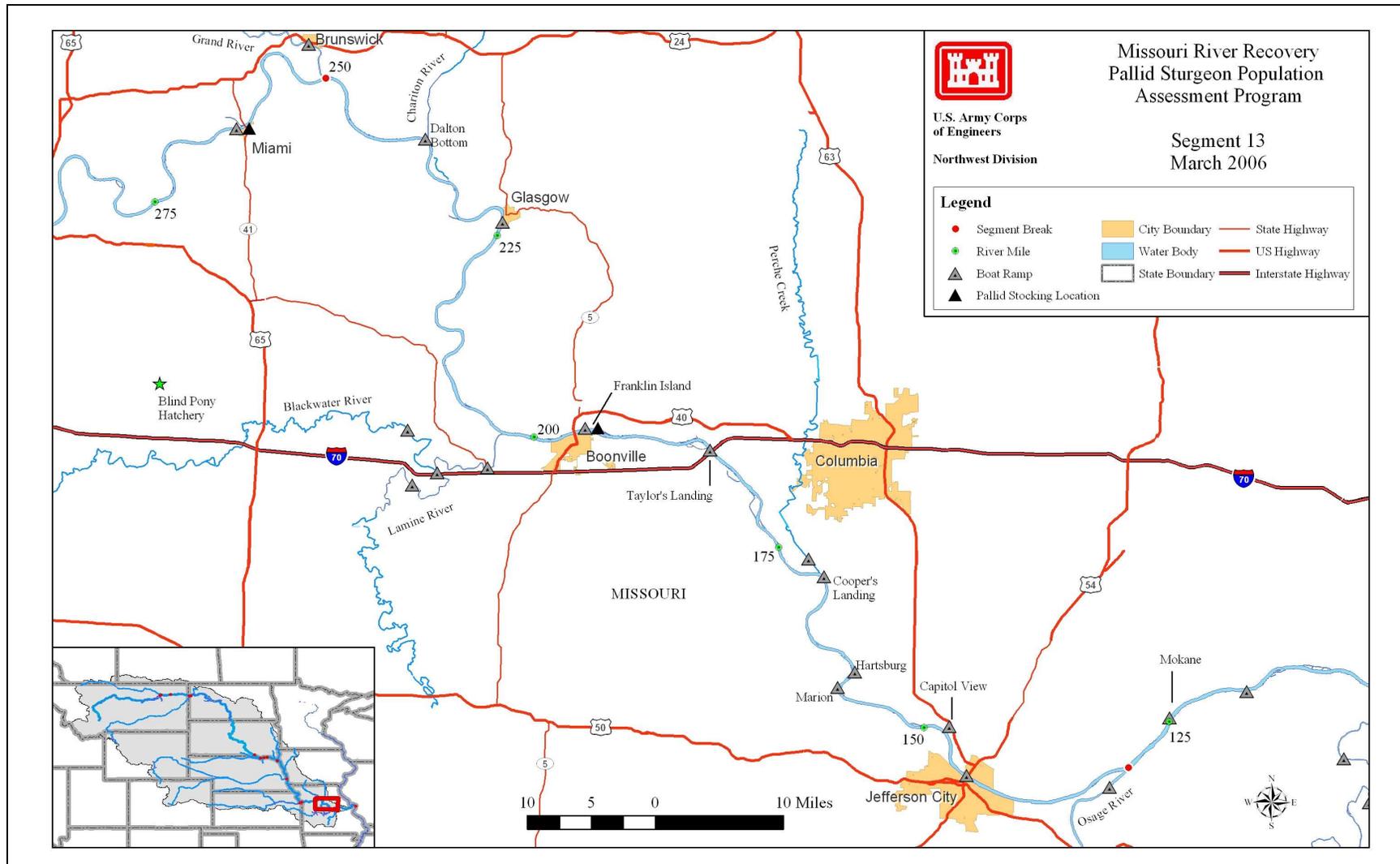


Figure 1a. Map of segment 13 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 13 encompasses the Missouri River from the Grand River confluence (River Mile 250.3) to the Osage River (River Mile 132.6).

# Results

## Pallid Sturgeon

This section covers the following objectives from the pallid sturgeon population 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.

Field crews from the Columbia NFWCO captured 11 pallid sturgeon with standard gears while sampling segment 13. All pallid sturgeon captured with standard gears were of hatchery origin. Eleven bends were sampled during each sturgeon season with gill nets (110 net nights), 1-inch Trammel nets (120 deployments), and otter trawls (116 deployments; Tables 1 and 2). Eleven bends were sampled during fish community season with mini-fyke nets (88 net nights), 1-inch trammel nets (130 deployments), and otter trawls (116 deployments; Tables 1 and 2). Sampling with wild gears and nonrandom bends yielded an additional 27 pallid sturgeon. Of the 38 pallid sturgeon captured in 2007, 31 were of hatchery origin and six were wild fish and one was unknown (pending genetic analysis). The wild fish captured in segment 13 range in size from 536 mm to 947 mm, indicating there may have been natural reproduction on several occasions in the Missouri or Mississippi Rivers. The capture of genetically confirmed, wild pallid sturgeon is of utmost importance to the recovery of this species.

Eight of the 11 pallid sturgeon were progeny of traceable stockings at Boonville, MO (RM 194). Two fish were marked with an elastomere combination that linked them to a 2004

stocking, however they had lost either CWT or PIT tag (both types of tags were used in 2004). Another fish had an elastomere combination from 2003 that was not directly traceable to a particular location (some were marked with PIT and some with CWT). Overall, six recaptures were from 2004 stockings, four from 2003, and one from 2002.

Growth rates and condition factors were calculated from recaptured pallid sturgeon (Table 6). Pallid sturgeon stocked in 2001 grew at a rate of 0.192 mm per day (SE = 0.020), reaching a mean length of 562 mm (SE = 40 mm) in 2007. Pallid sturgeon stocked in 2002 grew at a rate of 0.207 mm per day (SE = 0.021), reaching a mean length of 557 mm (SE = 38). Fish stocked in 2003 grew at a rate of 0.240 mm per day (2SE = 0.032) reaching a mean length of 511 mm in 2007 (SE = 18). All year classes were healthy at recapture with mean condition factors (Kn) from 0.847 to 0.905.

Pallid sturgeon were most frequently captured in the ISB macrohabitat (N = 8, 73%). Channel crossovers (CHXO) were the only other macrohabitat in which pallid sturgeon were captured (N = 3, 27%). All pallid sturgeon captures in segment 13 occurred in the CHNB mesohabitat. Mean capture depth was slightly deeper (2.8 m) during sturgeon season than fish community season (2.6 m). Bottom velocity varied from 0.63 m/s to 0.88 m/s and the means only differed by 0.01 m/s between seasons. Water temperature at time of capture varied from 1.8°C to 31.5°C, with a mean of 20.7°C. Average turbidity measurement for pallid sturgeon captures was 298 NTU's (36 to 1,260).

Additional sampling with wild gears and nonrandom bends yielded an additional 27 pallid sturgeon. These captures were used in the comparison of year classes (condition and growth rate; Table 6) and length frequency (Figure 8) in segment 13.

### ***Year comparisons, Gear evaluation and Habitat associations***

Catch rates increased slightly in 2007 for all gears except otter trawls during sturgeon season (ST) (Figures 22, 23, and 24). Gill nets captured 2 more fish in 2007 than in 2006 (N = 3 in 2007 and N = 1 in 2006). Otter trawls were ineffective during sturgeon season (Figure 2),

presumably due to high flows experienced during Spring 2007. Despite the high water, three pallid sturgeon were captured with trammel nets during the 2007 sturgeon season. Trammel net CPUE was slightly higher for sturgeon season in 2007 than 2006 (0.017 fish/100 m in 2007 and 0.015 fish/100 m in 2006; Figure 3). Pallid sturgeon capture rates for fish community season (FC) 2007 were similar to previous years with the exception of 2006 when no pallid sturgeon were captured during FC (Figure 5).

While pallid sturgeon catch did increase from the lower numbers we experienced in 2006, numbers are still too low to quantify the most effective sampling gear or season for segment 13. Scattered results from the first five years of monitoring suggest that a combination of gears are needed to sample a system of this size.

Pallid sturgeon were captured exclusively in the CHNB mesohabitat (Tables 14 and 16) during both seasons. Since 2003, the majority of pallid sturgeon captured by the standardized sampling program (88%, N = 51) in segment 13 have been in CHNB mesohabitats (Doyle and Starostka 2004, Doyle et al. 2005, Utrup et al. 2006 and Plauck et al. 2007). The majority of the pallid sturgeon captured since 2003 were sampled in the ISB macrohabitat (61%), while a notable 20% were capture in the less sampled CHXO macrohabitat. Since 2003, pallid sturgeon have been captured at depths ranging from 1.5 m to 9.5 m in segment 13. The average capture depth since 2003 is 3.1 m, very similar to the mean capture depth in 2007.

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 2007. 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
<b>Fall through Spring - Sturgeon Season</b>																
<b>1-inch Trammel Net</b>	11	10.91	N-E	21	N-E	N-E	N-E	97	0	2	0	0	N-E	0	0	N-E
<b>Gill Net</b>	11	10.00	N-E	25	N-E	N-E	N-E	67	16	2	0	0	N-E	0	0	N-E
<b>Otter Trawl</b>	11	10.55	N-E	16	N-E	N-E	N-E	90	2	6	2	0	N-E	0	0	N-E
<b>Summer – Fish Community Season</b>																
<b>1-inch Trammel Net</b>	11	11.82	N-E	26	N-E	N-E	N-E	102	0	1	1	0	N-E	0	0	N-E
<b>Mini-Fyke Net</b>	11	8.00	N-E	23	N-E	N-E	N-E	30	15	10	3	1	N-E	2	4	N-E
<b>Otter Trawl</b>	11	10.55	N-E	23	N-E	N-E	N-E	91	0	1	1	0	N-E	0	0	N-E

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 2007. N-E indicates the habitat is non-existent in the segment.

Gear	Number of bends	Mean Effort	Mesohabitat					
			BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Fall through Spring – Sturgeon Season</b>								
<b>1-inch Trammel Net</b>	11	10.91	0	115	N-E	1	4	N-E
<b>Gill Net</b>	11	10.00	0	55	N-E	1	54	N-E
<b>Otter Trawl</b>	11	10.55	0	112	N-E	4	0	N-E
<b>Summer – Fish Community Season</b>								
<b>1-inch Trammel Net</b>	11	11.82	1	128	N-E	1	0	N-E
<b>Mini-Fyke Net</b>	11	8.00	84	2	N-E	2	0	N-E
<b>Otter Trawl</b>	11	10.55	0	113	N-E	2	1	N-E

### Segment 13 - Pallid Sturgeon Captures by River Mile

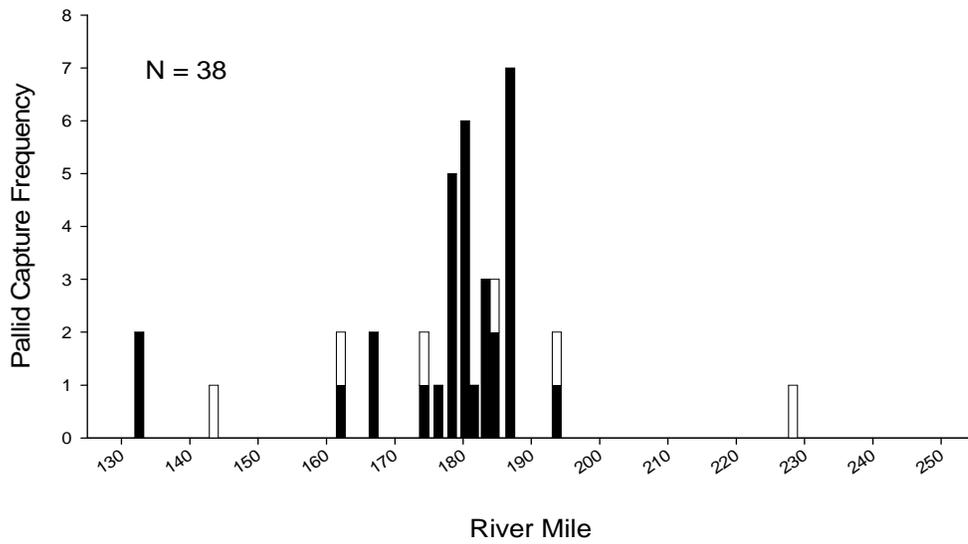


Figure 1b. Distribution of pallid sturgeon captures by river mile for segment 13 of the Missouri River during 2007. Black bars represent pallid captures during Sturgeon Season and white bars during Fish Community Season. Figure includes all pallid captures including non-random and wild samples.

Table 3. Pallid sturgeon (PDSG) capture summaries for all gears relative to habitat type and environmental variables on the Missouri River during 2007. 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	BAR									.
	CHNB									.
	DTWT									.
	ITIP									.
	POOL									.
	TLWG									.
CHXO	BAR	0.8 (0.3-4.0)		0.04 (0.00-0.33)		29.4 (24.0-31.2)		175 (39-1000)		.
	CHNB	3.7 (0.9-11.1)	4.0 (1.8-6.0)	0.57 (0.05-1.27)	0.72 (0.60-0.87)	21.7 (1.8-31.5)	20.2 (11.5-31.5)	269 (35-1202)	328 (63-788)	6
	DTWT									.
	ITIP									.
	POOL	5.5 (1.8-12.0)	5.2 (4.8-5.6)	0.43 (0.06-0.74)	0.54 (0.54-0.54)	11.8 (1.5-25.7)	12.2 (9.0-16.7)	393 (104-836)	731 (731-731)	4
	TLWG									.
CONF	BAR									.
	CHNB	7.1 (6.5-7.6)				13.5 (13.5-13.5)				.
	DTWT									.

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
	ITIP									.
	POOL									.
	TLWG									.
DEND	BAR									.
	CHNB									.
	DTWT									.
	ITIP									.
	POOL									.
	TLWG									.
DRNG	BAR									.
	CHNB									.
	DTWT									.
	ITIP									.
	POOL									.
	TLWG									.
ISB	BAR	0.6 (0.3-1.3)		0.11 (0.00-0.36)		29.1 (22.4-31.1)		199 (28-1026)		.
	CHNB	3.1 (0.4-9.0)	2.9 (1.6-5.8)	0.69 (0.18-2.55)	0.7 (0.48-0.88)	21.4 (1.5-31.6)	17.3 (1.8-31.2)	264 (20-1260)	434 (36-1260)	19
	DTWT									.

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
	ITIP	2.0 (2.0-2.0)				26.2 (26.2-26.2)				.
	POOL	5.1 (1.9-9.3)	5.0 (5.0-5.0)	0.36 (0.00-0.66)	0.66 (0.66-0.66)	10.1 (1.5-30.3)	2.4 (2.4-2.4)	329 (21-847)	21 (21-21)	1
	TLWG									.
OSB	BAR	0.7 (0.4-1.6)		0.02 (0.00-0.07)		29.5 (24.0-31.1)		168 (31-958)		.
	CHNB	5.1 (1.0-9.1)	5.6 (5.1-6.0)	0.21 (0.06-0.40)	0.22 (0.16-0.29)	13.5 (3.5-28.3)	7.2 (3.5-14.0)	440 (169-867)	346 (215-478)	3
	DTWT									.
	ITIP									.
	POOL	3.6 (1.0-6.6)		0.03 (0.00-0.04)		13.0 (1.5-24.0)		202 (91-415)		.
	TLWG	6.0 (6.0-6.0)				23.6 (23.6-23.6)				.
SCCL	BAR	0.5 (0.2-1.1)		0.15 (0.00-0.60)		29.7 (28.4-30.5)		39 (37-41)		.
	CHNB	2.5 (1.2-5.5)	2.0 (1.2-2.9)	1.07 (0.50-2.60)	0.80 (0.80-0.80)	12.9 (2.5-29.5)	11.8 (9.5-14.1)	299 (230-457)	295 (295-295)	2
	DTWT									.
	ITIP	2.5 (0.4-5.0)	2.8 (2.1-3.5)	0.83 (0.12-2.01)	0.46 (0.46-0.46)	13.5 (2.5-31.0)	7.8 (7.0-8.5)	322 (225-446)		3

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
	POOL	3.7 (2.3-7.1)				11.7 (7.0-16.8)		245 (245-245)		.
	TLWG									.
SCCS	BAR	0.7 (0.4-1.2)		0.10 (0.00-0.28)		30.5 (29.6-31.4)		154 (22-386)		.
	CHNB	1.5 (1.5-1.5)				30.0 (30.0-30.0)				.
	DTWT									.
	ITIP	3.3 (1.1-5.4)				23.5 (17.2-31.1)		109 (109-109)		.
	POOL	6.0 (6.0-6.0)				24.0 (24.0-24.0)				.
	TLWG									.
SCN	BAR	0.4 (0.4-0.4)		0.00 (0.00-0.00)		31.0 (31.0-31.0)		60 (60-60)		.
	CHNB									.
	DTWT									.
	ITIP									.
	POOL									.
	TLWG									.
TRIB	BAR									.

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
	CHNB									.
	DTWT									.
	ITIP									.
	POOL									.
	TLWG									.
TRML	BAR	0.5 (0.5-0.5)		0.03 (0.03-0.03)		27.4 (27.4-27.4)		41 (41-41)		.
	CHNB									.
	DTWT									.
	ITIP									.
	POOL									.
	TLWG									.
TRMS	BAR	0.7 (0.4-1.0)		0.01 (0.00-0.02)		30.2 (29.4-31.0)		116 (58-175)		.
	CHNB									.
	DTWT									.
	ITIP									.
	POOL					20.3 (20.3-20.3)				.
	TLWG									.
WILD	BAR									.

<b>Macro-</b>	<b>Meso-</b>	<b>Depth (m) (Effort)</b>	<b>Depth (m) (Catch)</b>	<b>Bottom Velocity (m/s) (Effort)</b>	<b>Bottom Velocity (m/s) (Catch)</b>	<b>Temp. °C (Effort)</b>	<b>Temp. °C (Catch)</b>	<b>Turbidity (ntu) (Effort)</b>	<b>Turbidity (ntu) (Catch)</b>	<b>Total Pallids caught</b>
	CHNB									.
	DTWT									.
	ITIP									.
	POOL									.
	TLWG									.

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 2007 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	4	218	.	.	562	614.0	0.847	0.192	.
		22	.	.	40	161.0	0.041	0.020	.
2002	9	290	118.2	1.377	557	622.8	0.905	0.207	0.383
		23	48.0	0.130	38	126.5	0.047	0.021	0.092
2003	8	254	76.7	1.468	511	445.1	0.854	0.240	0.366
		39	43.8	0.550	18	52.9	0.040	0.032	0.069
2004									
2005									
2006									

Table 7. Incremental relative stock density (RSD)<sup>a</sup> and relative condition factor (Kn) for all pallid sturgeon captured with all gear by a length category during 2007 in the Missouri River. Length categories<sup>b</sup> 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)
<b>Sturgeon Season</b>			
Sub-stock (0-199)	0	.	0
Sub-stock (200-329)	0	.	0
Stock	22	100	0.867 (0.027)
Quality	7	31	0.815 (0.169)
Preferred	3	9	0.872 (0.094)
Memorable	0	.	0
Trophy	0	.	0
Overall Kn	.	.	0.859 (0.034)
<b>Fish Community Season</b>			
Sub-stock (0-199)	0	.	0
Sub-stock (200-329)	0	.	0
Stock	5	100	0.801 (0.019)
Quality	1	17	0.851
Preferred	0	.	0
Memorable	0	.	0
Trophy	0	.	0
Overall Kn	.	.	0.811 (0.025)

<sup>a</sup> RSD = (# of fish of a specified length class / # of fish  $\geq$  minimum stock length fish) \* 100.

<sup>b</sup> 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  $\geq$  1270 mm (>74 %).

## Segment 13 - Pallid Sturgeon / Sturgeon Season

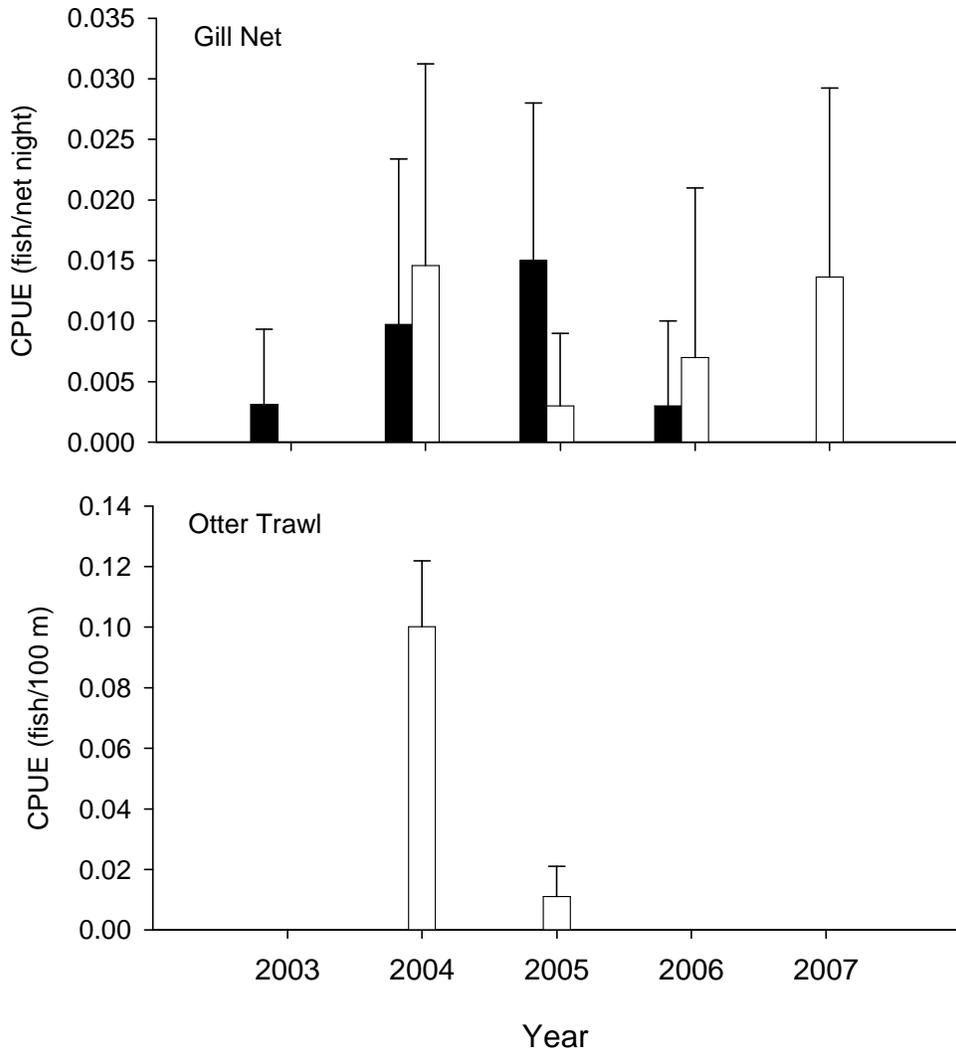


Figure 2. Mean annual catch-per-unit-effort ( $\pm 2$  SE) of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon using gill nets and otter trawls in segment 13 of the Missouri River during sturgeon season 2003-2007. Unknown origin pallid sturgeon are awaiting genetic verification.

### Segment 13 - Pallid Sturgeon / Sturgeon Season

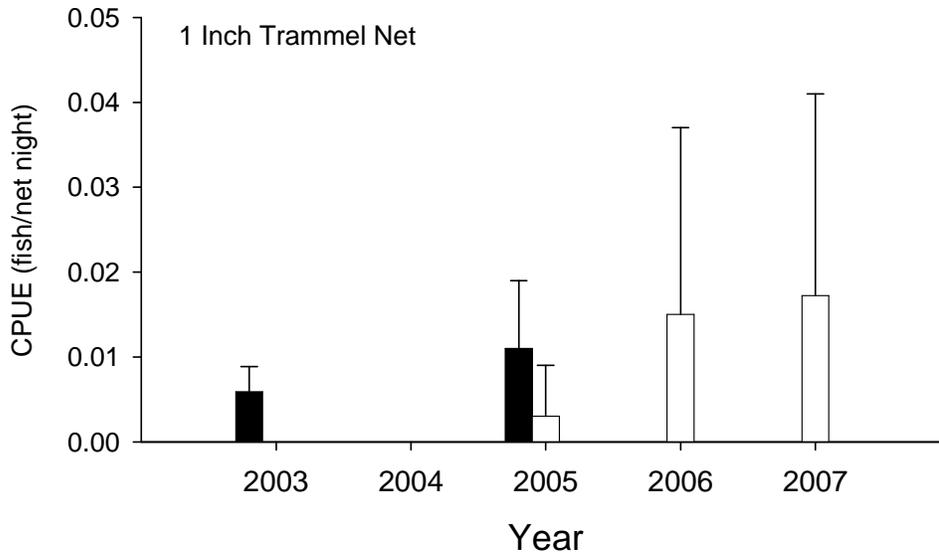


Figure 3. Mean annual catch-per-unit-effort ( $\pm 2$  SE) of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon using 1 trammel nets in segment 13 of the Missouri River during sturgeon season 2003-2007. Unknown origin pallid sturgeon are awaiting genetic verification.

### Segment 13 - Pallid Sturgeon / Fish Community Season

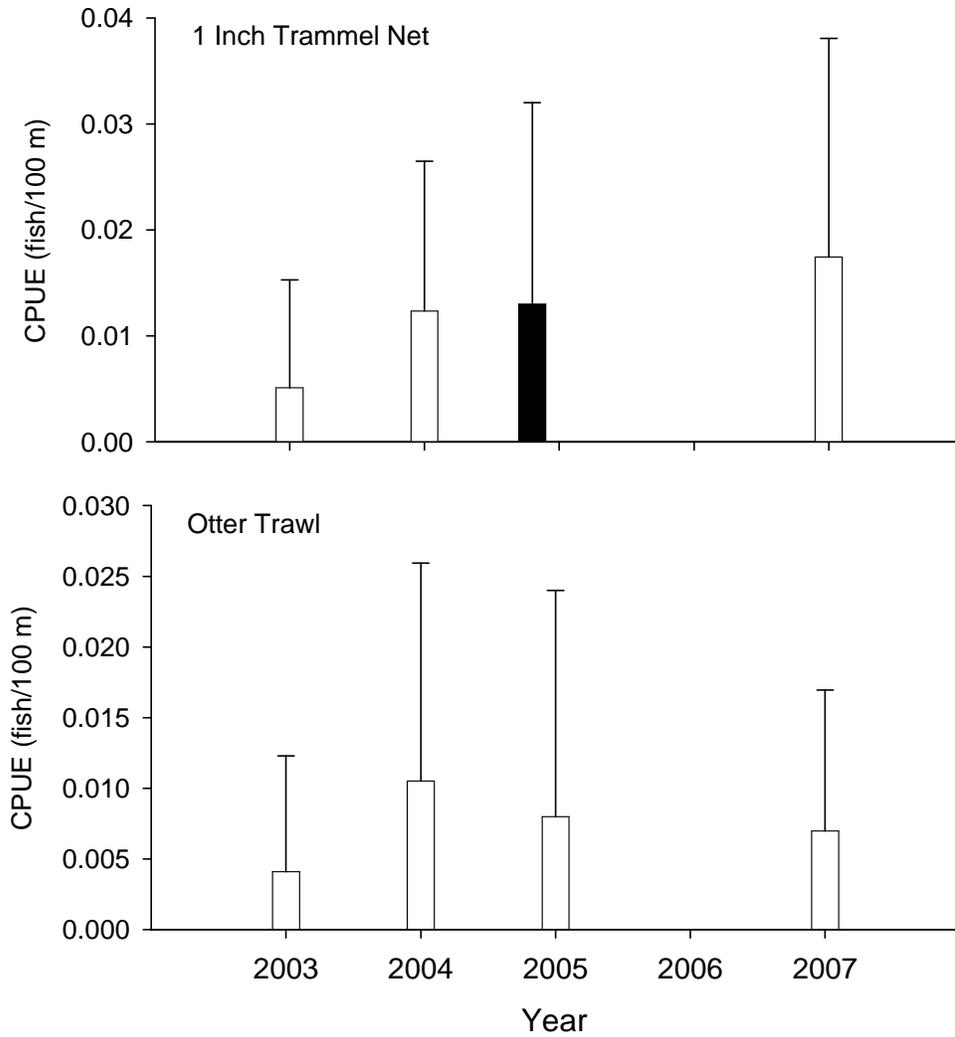


Figure 5. Mean annual catch-per-unit-effort ( $\pm 2$  SE) of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon using 1 inch trammel nets and otter trawls in segment 13 of the Missouri River during fish community season 2003-2007. Unknown origin pallid sturgeon are awaiting genetic verification.

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 2007. 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
<b>Sturgeon Season (Fall through Spring)</b>															
1-inch Trammel Net	0 .	0 0	0 16	0 0	0 0	0 0	0 82	0 0	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Gill Net	0 .	0 0	0 23	0 0	0 0	0 0	0 61	0 15	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Otter Trawl	0 .	0 0	0 11	0 0	0 0	0 0	0 81	0 1	0 5	0 1	0 0	0 0	0 0	0 0	0 0
<b>Fish Community Season (Summer)</b>															
1-inch Trammel Net	0 .	0 0	0 14	0 0	0 0	0 0	0 85	0 0	0 1	0 1	0 0	0 0	0 0	0 0	0 0
Mini-Fyke Net	0 .	0 0	0 26	0 0	0 0	0 0	0 34	0 17	0 11	0 3	0 1	0 0	0 2	0 5	0 0
Otter Trawl	0 .	0 0	0 17	0 0	0 0	0 0	0 81	0 0	0 1	0 1	0 0	0 0	0 0	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 2007. 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	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Sturgeon Season (Fall through Spring)</b>							
1-inch Trammel Net	0 .	0 0	0 96	0 0	0 0	0 4	0 0
Gill Net	0 .	0 0	0 50	0 0	0 1	0 49	0 0
Otter Trawl	0 .	0 0	0 97	0 0	0 3	0 0	0 0
<b>Fish Community Season (Summer)</b>							
1-inch Trammel Net	0 .	0 1	0 99	0 0	0 1	0 0	0 0
Mini-Fyke Net	0 .	0 95	0 2	0 0	0 2	0 0	0 0
Otter Trawl	0 .	0 0	0 98	0 0	0 1	0 1	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 2007. 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
<b>Sturgeon Season (Fall through Spring)</b>															
1-inch Trammel Net	0 .	0 0	0 16	0 0	0 0	0 0	0 82	0 0	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Gill Net	0 .	0 0	0 23	0 0	0 0	0 0	0 61	0 15	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Otter Trawl	0 .	0 0	0 11	0 0	0 0	0 0	0 81	0 1	0 5	0 1	0 0	0 0	0 0	0 0	0 0
<b>Fish Community Season (Summer)</b>															
1-inch Trammel Net	0 .	0 0	0 14	0 0	0 0	0 0	0 85	0 0	0 1	0 1	0 0	0 0	0 0	0 0	0 0
Mini-Fyke Net	0 .	0 0	0 26	0 0	0 0	0 0	0 34	0 17	0 11	0 3	0 1	0 0	0 2	0 5	0 0
Otter Trawl	0 .	0 0	0 17	0 0	0 0	0 0	0 81	0 0	0 1	0 1	0 0	0 0	0 0	0 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 2007. 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	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Sturgeon Season (Fall through Spring)</b>							
1-inch Trammel Net	0 .	0 0	0 96	0 0	0 0	0 4	0 0
Gill Net	0 .	0 0	0 50	0 0	0 1	0 49	0 0
Otter Trawl	0 .	0 0	0 97	0 0	0 3	0 0	0 0
<b>Fish Community Season (Summer)</b>							
1-inch Trammel Net	0 .	0 1	0 99	0 0	0 1	0 0	0 0
Mini-Fyke Net	0 .	0 95	0 2	0 0	0 2	0 0	0 0
Otter Trawl	0 .	0 0	0 98	0 0	0 1	0 1	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 2007. 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
<b>Sturgeon Season (Fall through Spring)</b>															
1-inch Trammel Net	3	0	33	0	0	0	67	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	82	0	2	0	0	0	0	0	0
Gill Net	3	0	0	0	0	0	100	0	0	0	0	0	0	0	0
	.	0	23	0	0	0	61	15	2	0	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	11	0	0	0	81	1	5	1	0	0	0	0	0
<b>Fish Community Season (Summer)</b>															
1-inch Trammel Net	2	0	50	0	0	0	50	0	0	0	0	0	0	0	0
	.	0	14	0	0	0	85	0	1	1	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	26	0	0	0	34	17	11	3	1	0	2	5	0
Otter Trawl	2	0	50	0	0	0	50	0	0	0	0	0	0	0	0
	.	0	17	0	0	0	81	0	1	1	0	0	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 2007. 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	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Sturgeon Season (Fall through Spring)</b>							
1-inch Trammel Net	3 .	0 0	100 96	0 0	0 0	0 4	0 0
Gill Net	3 .	0 0	100 50	0 0	0 1	0 49	0 0
Otter Trawl	0 .	0 0	0 97	0 0	0 3	0 0	0 0
<b>Fish Community Season (Summer)</b>							
1-inch Trammel Net	2 .	0 1	100 99	0 0	0 1	0 0	0 0
Mini-Fyke Net	0 .	0 95	0 2	0 0	0 2	0 0	0 0
Otter Trawl	2 .	0 0	100 98	0 0	0 1	0 1	0 0

Table 15. Total number of quality size and greater ( $\geq 630$  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 2007. 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
<b>Sturgeon Season (Fall through Spring)</b>															
1-inch Trammel Net	0 .	0 0	0 16	0 0	0 0	0 0	0 82	0 0	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Gill Net	0 .	0 0	0 23	0 0	0 0	0 0	0 61	0 15	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Otter Trawl	0 .	0 0	0 11	0 0	0 0	0 0	0 81	0 1	0 5	0 1	0 0	0 0	0 0	0 0	0 0
<b>Fish Community Season (Summer)</b>															
1-inch Trammel Net	1 .	0 0	0 14	0 0	0 0	0 0	100 85	0 0	0 1	0 1	0 0	0 0	0 0	0 0	0 0
Mini-Fyke Net	0 .	0 0	0 26	0 0	0 0	0 0	0 34	0 17	0 11	0 3	0 1	0 0	0 2	0 5	0 0
Otter Trawl	0 .	0 0	0 17	0 0	0 0	0 0	0 81	0 0	0 1	0 1	0 0	0 0	0 0	0 0	0 0

Table 16. Total number of quality size and greater ( $\geq 630$  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 2007. 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	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Sturgeon Season (Fall through Spring)</b>							
1-inch Trammel Net	0 .	0 0	0 96	0 0	0 0	0 4	0 0
Gill Net	0 .	0 0	0 50	0 0	0 1	0 49	0 0
Otter Trawl	0 .	0 0	0 97	0 0	0 3	0 0	0 0
<b>Fish Community Season (Summer)</b>							
1-inch Trammel Net	1 .	0 1	100 99	0 0	0 1	0 0	0 0
Mini-Fyke Net	0 .	0 95	0 2	0 0	0 2	0 0	0 0
Otter Trawl	0 .	0 0	0 98	0 0	0 1	0 1	0 0

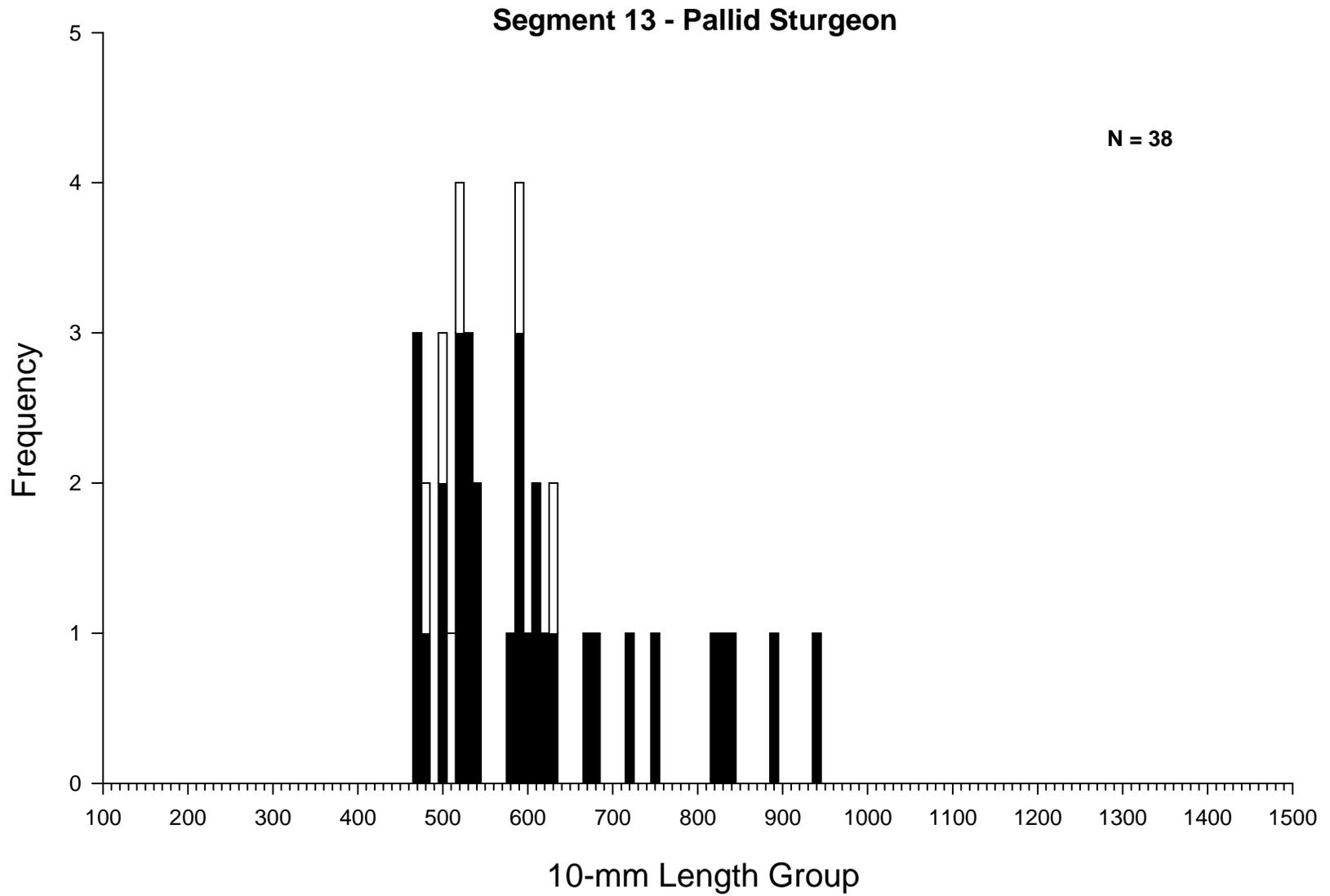


Figure 8. Length frequency of pallid sturgeon captured during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during 2007 including non-random and wild samples.

### Segment 13 - Annual Pallid Sturgeon Capture History

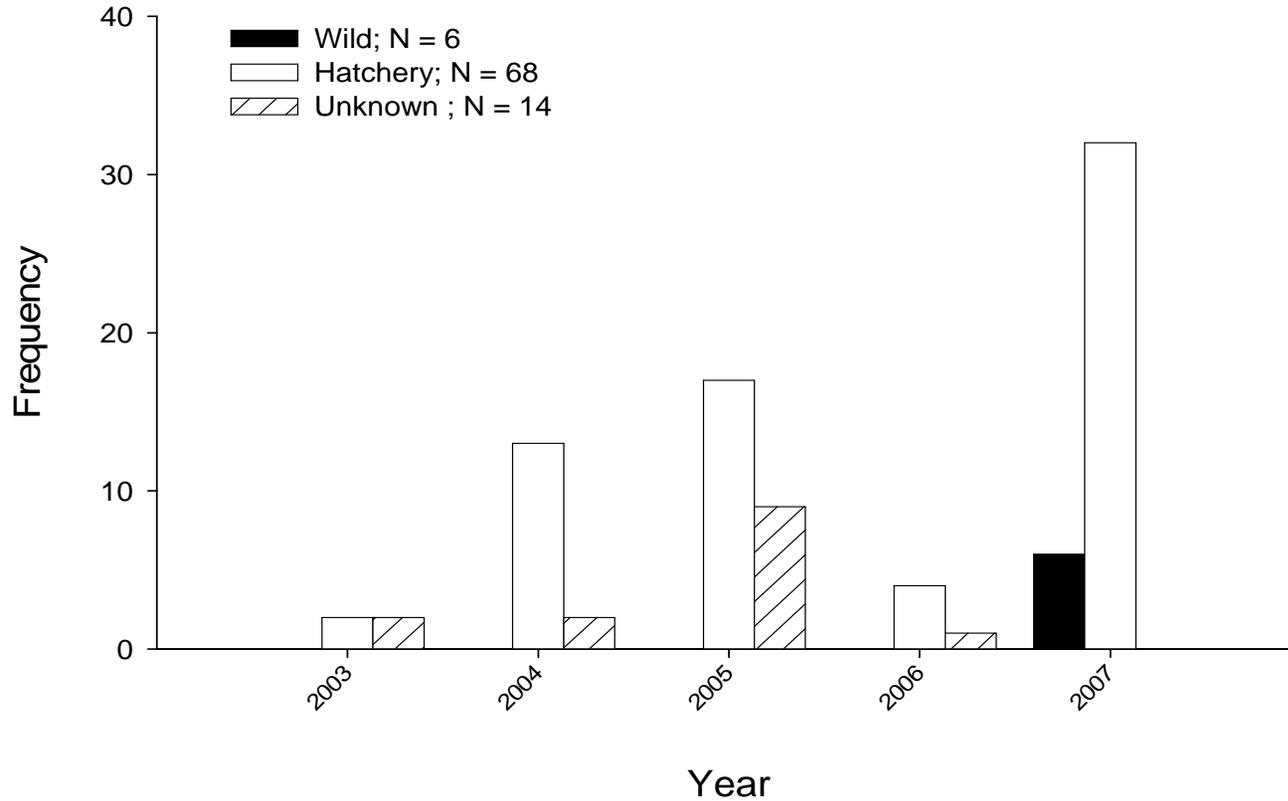


Figure 9. Annual capture history of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon collected in segment 13 of the Missouri River from 2003 to 2007. Figure is designed to compare overall pallid sturgeon captures from year to year and may be biased by variable effort between years.

## **Shovelnose X Pallid Sturgeon Hybrids**

Two hybrid sturgeon (pallid x shovelnose) were captured in segment 13 in 2007. In contrast to previous years, where hybrid sturgeon were found more frequently in POOL mesohabitats, both 2007 captures were found on the ISB macrohabitat and CHNB mesohabitat. One of these captures was deeper (5.1 m) than the mean pallid sturgeon capture (2.7 m) and one was shallower (1.6 m). Unlike previous years when captures occurred during cold water temperatures (Plauck et al. 2007), hybrid sturgeon captures occurred at 24° and 26°C in 2007.

In the past, the ratio of pallid sturgeon to hybrid sturgeon was reported strictly as numbers captured. In 2007, these numbers were standardized by effort between each gear type (Appendix J; Plauck et al. 2007). This allows for comparison of catch per unit effort between years. Gill nets provide the highest numbers of sturgeon captures and have data for all five years sampled. However, no hybrid sturgeon were captured in gill nets in segment 13 during 2007.

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 (Appendix J). 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 both sturgeon species in the system. Tools for positive identification and potential removal of hybrid sturgeon should be considered within the recovery program. Ratios of pallid to hybrid sturgeon captured in trammel nets (8.5 : 1) and otter trawls (1 : 1) are similar to previous years (Appendix J).

## 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

Gill nets captured more shovelnose sturgeon (1,170 of the 2,277 captured) than any other gear. Gill nets caught shovelnose sturgeon at a rate of 5.3 fish per net night (2SE = 1.312). The majority of shovelnose sturgeon captured in gill nets were of quality size (350 mm) or greater (96%; Table 23, Appendix K). Only 45 stock size (250 - 379 mm) and one sub-stock size (< 250 mm) shovelnose sturgeon were captured with gill nets (Tables 21 and 22). Gill net captures were most frequent (58%) in the ISB macrohabitat where 61% of the effort occurred (Table 23). It is important to note, 32% of shovelnose sturgeon gill net captures occurred in the less sampled (or geospatially limited) CHXO macrohabitat (23%; Table 23). Shovelnose sturgeon were captured more frequently (63%) in POOL mesohabitats (Table 24) despite equal effort in the CHNB and POOL mesohabitats.

Otter trawling during sturgeon season yielded 176 shovelnose sturgeon at a rate of approximately one adult fish (>350 mm) for every 200 meters trawled (Figure 11; 0.57 fish per 100 m, 2SE = 0.24). Catch rates for smaller fish were much lower (0.02-0.093 fish per 100 m; Figure 11). Otter trawl catch rates during fish community season were slightly higher than sturgeon season (0.602 fish per 100 m compared to 0.57 during sturgeon season). Trawling during fish community season captured 255 shovelnose sturgeon. Similar to gill nets, the majority (68 %) of the shovelnose sturgeon captured were larger fish (greater than 380 mm). Catch rates for smaller shovelnose sturgeon were higher during fish community season (0.08-0.13 fish per 100 m). Young of year (YOY) shovelnose sturgeon were captured 5 times more often in FC (0.133 fish per 100 m) than in ST (0.023 fish per 100 m; Figures 11 and 14). All trawls were conducted in the CHNB mesohabitat so habitat comparisons can only be made at the macrohabitat level. Young-of-year (less than 150 mm) shovelnose sturgeon were exclusively captured at ISB

macrohabitats (Table 17). Adult fish were spread out between habitat types, with the majority captured in the ISB macrohabitat (58% during ST and 89% FC; Table 21).

One inch trammel nets captured 317 shovelnose sturgeon during ST and 359 during FC. As with gill nets and otter trawls, trammel nets catch larger shovelnose sturgeon (> 380 mm; Tables 17 – 24). Catch rates were similar between FC (1.6 fish per 100 m, 2SE = 0.59) and ST (1.6 fish per 100 m, 2SE = 0.79). Trammel nets were primarily fished in the CHNB mesohabitat so no comparisons could be made between mesohabitats (Table 24). The majority of the adult (> 380 mm) shovelnose sturgeon captures (54% during ST and 77% during FC) occurred in the ISB macrohabitat where most of the effort occurred (82% during ST and 85% during FC; Table 23). Notable catches of adult shovelnose sturgeon (46% during ST and 21% during FC) occurred in the CHXO macrohabitat as well, where much less effort is expended (16% during ST and 14% during FC; Table 23).

#### *Year and gear comparisons*

With the exception of otter trawls during ST, catch rates were slightly higher for adult shovelnose sturgeon in 2007 than 2006 (Figures 11, 12, and 14). Gill net captures rose slightly from 4.4 fish per net night in 2006 (2SE = 1.49) to 5.1 fish per net night in 2007 (2SE = 1.28). These catch rates are lower than in previous years when catch rates were as high as 12.9 fish per net night (2003; Figure 11). Sturgeon season otter trawl catch rates were similar to previous years, with catch of 0.237 (fish per 100 m) falling in the middle of the 0.158 to 0.280 range of previous years (Figure 11). Trammel netting during ST yielded results similar to otter trawls, in that catch rates were similar to previous years (Figure 12). Catch rates for FC trammel netting during 2007 rose from 2006 when they were the lowest of all years (Figure 14). Catch rates for adult shovelnose sturgeon during FC otter trawling were slightly higher in 2007 than 2005 or 2006 (Figure 14).

Each of the three gears used to capture shovelnose sturgeon (GN, OT and TN) has a size range for which it is most effective. Otter trawls are the only gear that repeatedly captured sub-stock (YOY) shovelnose sturgeon (Table 18 and 19, Appendix K). Otter trawls and trammel nets captured 44 sub-stock (150-249 mm) shovelnose sturgeon during both seasons while gill nets only captured one in that length range (Table 19). All three gears captured shovelnose sturgeon in

the stock size range (250-379 mm; Appendix K). All three gears most frequently caught fish in the quality length group (Appendix K).

### *Habitat Use*

Higher catch rates in the POOL mesohabitat suggest a preference toward this type of habitat (Table 24, Appendix F1). This year's data, along with previous reports from this segment, suggest the POOL mesohabitat is an important habitat for shovelnose sturgeon during winter (Plauck et al. 2007). Shovelnose sturgeon were captured with gill nets in the CHNB mesohabitat during winter, suggesting the population may be somewhat motile, even in cold water temperatures (< 12.8°C, Table 24).

Channel crossover macrohabitats are a location in which shovelnose sturgeon are frequently captured. Channel crossovers are sampled less often because it is a physically smaller habitat and therefore requires fewer gear deployments. While this macrohabitat is sampled less frequently than the ISB or OSB macrohabitats, it still accounts for 37% of the adult shovelnose sturgeon captures (Table 24). Channel border set gill nets in the CHXO macrohabitat (CPUE = 6.778 fish per net night, 2SE = 6.817) capture adult shovelnose sturgeon with similar frequency to ISB POOL (CPUE = 7.0, 2SE = 2.82) and CHXO POOL (CPUE = 7.625, 2SE = 4.311). Seasonal habitat inferences may be distorted since data from winter and spring are combined into sturgeon season.

### *Population Structure*

The majority of shovelnose sturgeon captured were between 550 and 650 mm in length (Figure 17). The length frequency histogram presented in Figure 17 is similar to previous years (Plauck et al. 2007). Relative stock density during ST was higher than FC for quality (95 compared to 87), preferred (78 compared to 61), and memorable sizes (13 compared to 11, Table 25). Relative stock densities for all size categories were higher in 2007 than 2006, but not as high as in 2005 (Utrup et al. 2006, Plauck et al. 2007). All length groups of fish were in good condition with relative weights of 93 during ST and 101.4 during FC (Table 25). Relative weights were higher in 2007 than 2006 (2006 ST  $W_r$  = 86, 2006 FC  $W_r$  = 89). Previous authors from segment 13 have suggested that our estimates of population characteristics maybe skewed due to a gear bias toward larger fish (Plauck et al. 2007, Appendix K). Catch rates for YOY shovelnose sturgeon during FC were three times higher in 2007 than 2006 (Figure 14), indicating a successful spawn presumably due to high water events during spring 2007.

## Segment 13 - Shovelnose Sturgeon / Sturgeon Season

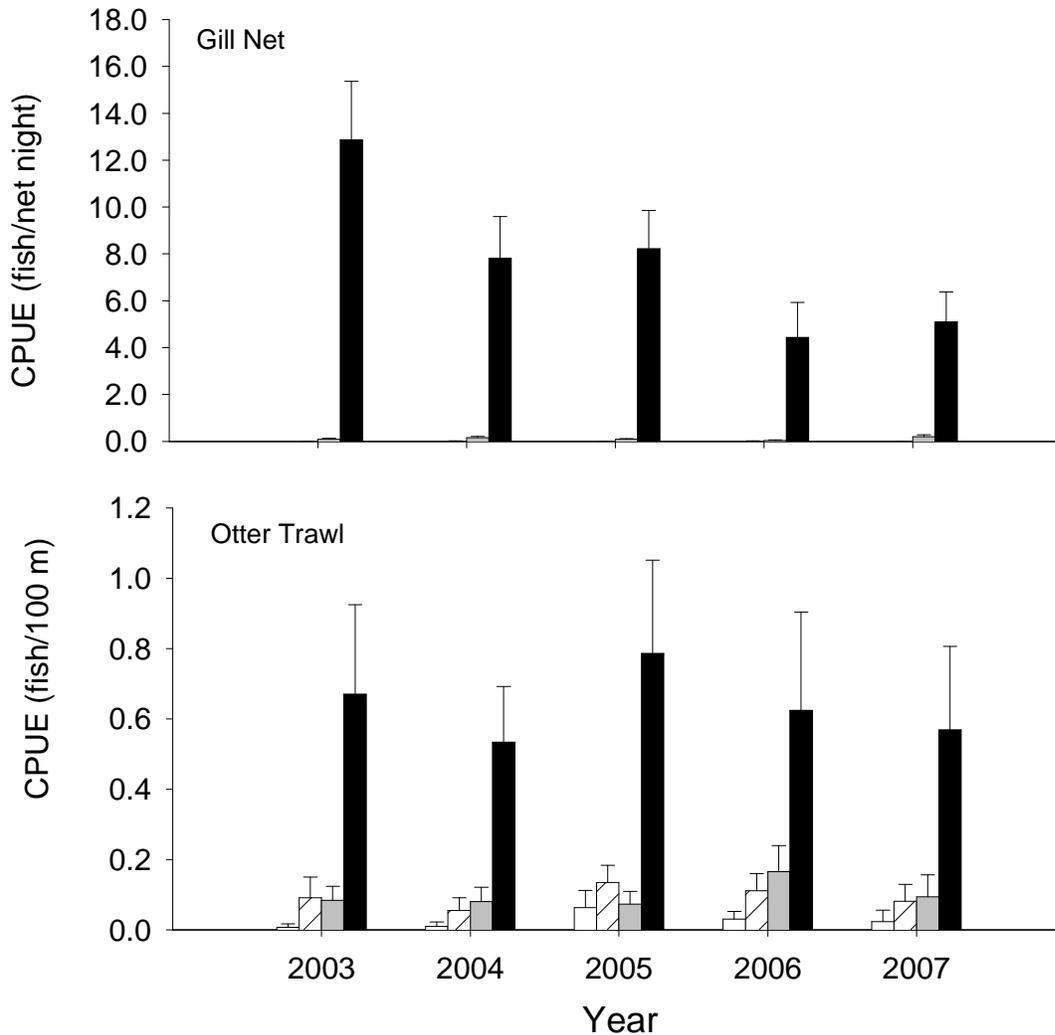


Figure 11. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using gill nets and otter trawls in segment 13 of the Missouri River during sturgeon season 2003 - 2007.

## Segment 13 - Shovelnose Sturgeon / Sturgeon Season

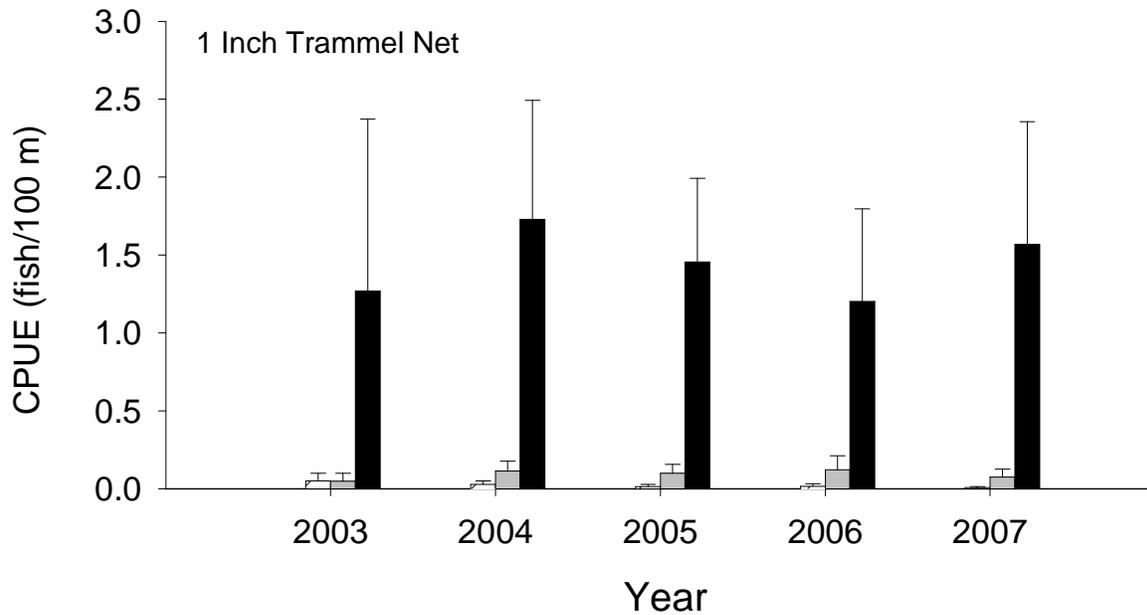


Figure 12. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249 mm; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using 1 inch trammel nets in segment 13 of the Missouri River during sturgeon season 2003 - 2007.

## Segment 13 - Shovelnose Sturgeon / Fish Community Season

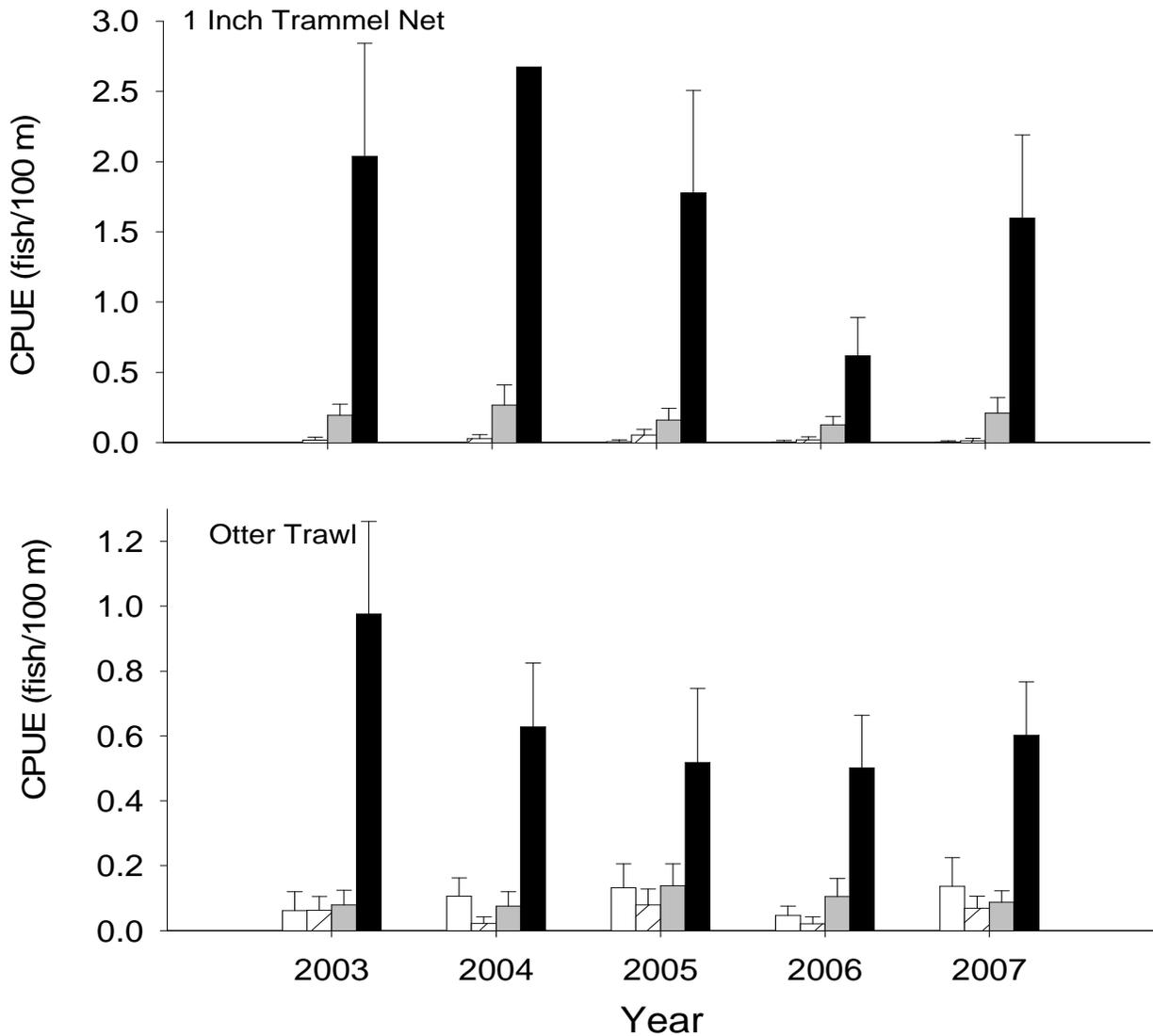


Figure 14. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using 1 inch trammel nets and otter trawls in segment 13 of the Missouri River during fish community season 2003 - 2007.

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 2007. 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
<b>Sturgeon Season (Fall through Spring)</b>															
1-inch Trammel Net	0 .	0 0	0 16	0 0	0 0	0 0	0 82	0 0	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Gill Net	0 .	0 0	0 23	0 0	0 0	0 0	0 61	0 15	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Otter Trawl	6 .	0 0	0 11	0 0	0 0	0 0	100 81	0 1	0 5	0 1	0 0	0 0	0 0	0 0	0 0
<b>Fish Community Season (Summer)</b>															
1-inch Trammel Net	1 .	0 0	0 14	0 0	0 0	0 0	100 85	0 0	0 1	0 1	0 0	0 0	0 0	0 0	0 0
Mini-Fyke Net	0 .	0 0	0 26	0 0	0 0	0 0	0 34	0 17	0 11	0 3	0 1	0 0	0 2	0 5	0 0
Otter Trawl	32 .	0 0	9 17	0 0	0 0	0 0	91 81	0 0	0 1	0 1	0 0	0 0	0 0	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 2007. 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	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Sturgeon Season (Fall through Spring)</b>							
1-inch Trammel Net	0 .	0 0	0 96	0 0	0 0	0 4	0 0
Gill Net	0 .	0 0	0 50	0 0	0 1	0 49	0 0
Otter Trawl	6 .	0 0	100 97	0 0	0 3	0 0	0 0
<b>Fish Community Season (Summer)</b>							
1-inch Trammel Net	1 .	0 1	100 99	0 0	0 1	0 0	0 0
Mini-Fyke Net	0 .	0 95	0 2	0 0	0 2	0 0	0 0
Otter Trawl	32 .	0 0	100 98	0 0	0 1	0 1	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 2007. 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
<b>Sturgeon Season (Fall through Spring)</b>															
1-inch Trammel Net	2	0	0	0	0	0	100	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	82	0	2	0	0	0	0	0	0
Gill Net	1	0	0	0	0	0	100	0	0	0	0	0	0	0	0
	.	0	23	0	0	0	61	15	2	0	0	0	0	0	0
Otter Trawl	18	0	17	0	0	0	50	0	22	11	0	0	0	0	0
	.	0	11	0	0	0	81	1	5	1	0	0	0	0	0
<b>Fish Community Season (Summer)</b>															
1-inch Trammel Net	3	0	33	0	0	0	67	0	0	0	0	0	0	0	0
	.	0	14	0	0	0	85	0	1	1	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	26	0	0	0	34	17	11	3	1	0	2	5	0
Otter Trawl	21	0	14	0	0	0	86	0	0	0	0	0	0	0	0
	.	0	17	0	0	0	81	0	1	1	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 2007. 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	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Sturgeon Season (Fall through Spring)</b>							
1-inch Trammel Net	2 .	0 0	100 96	0 0	0 0	0 4	0 0
Gill Net	1 .	0 0	0 50	0 0	0 1	100 49	0 0
Otter Trawl	18 .	0 0	83 97	0 0	17 3	0 0	0 0
<b>Fish Community Season (Summer)</b>							
1-inch Trammel Net	3 .	0 1	100 99	0 0	0 1	0 0	0 0
Mini-Fyke Net	0 .	0 95	0 2	0 0	0 2	0 0	0 0
Otter Trawl	21 .	0 0	100 98	0 0	0 1	0 1	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 2007. 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
<b>Sturgeon Season (Fall through Spring)</b>															
1-inch Trammel Net	13	0	46	0	0	0	54	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	82	0	2	0	0	0	0	0	0
Gill Net	45	0	16	0	0	0	71	13	0	0	0	0	0	0	0
	.	0	23	0	0	0	61	15	2	0	0	0	0	0	0
Otter Trawl	24	0	13	0	0	0	58	0	29	0	0	0	0	0	0
	.	0	11	0	0	0	81	1	5	1	0	0	0	0	0
<b>Fish Community Season (Summer)</b>															
1-inch Trammel Net	43	0	9	0	0	0	81	0	9	0	0	0	0	0	0
	.	0	14	0	0	0	85	0	1	1	0	0	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	26	0	0	0	34	17	11	3	1	0	2	5	0
Otter Trawl	28	0	7	0	0	0	89	0	0	4	0	0	0	0	0
	.	0	17	0	0	0	81	0	1	1	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 2007. 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	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Sturgeon Season (Fall through Spring)</b>							
1-inch Trammel Net	13	0	85	0	0	15	0
	.	0	96	0	0	4	0
Gill Net	45	0	47	0	0	53	0
	.	0	50	0	1	49	0
Otter Trawl	24	0	71	0	29	0	0
	.	0	97	0	3	0	0
<b>Fish Community Season (Summer)</b>							
1-inch Trammel Net	43	9	91	0	0	0	0
	.	1	99	0	1	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
	.	95	2	0	2	0	0
Otter Trawl	28	0	96	0	4	0	0
	.	0	98	0	1	1	0

Table 23. Total number of quality size and greater ( $\geq 380$  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 2007. 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
<b>Sturgeon Season (Fall through Spring)</b>															
1-inch Trammel Net	302	0	46	0	0	0	54	0	1	0	0	0	0	0	0
	.	0	16	0	0	0	82	0	2	0	0	0	0	0	0
Gill Net	1123	0	32	0	0	0	58	10	0	0	0	0	0	0	0
	.	0	23	0	0	0	61	15	2	0	0	0	0	0	0
Otter Trawl	128	0	20	0	0	0	60	0	20	0	0	0	0	0	0
	.	0	11	0	0	0	81	1	5	1	0	0	0	0	0
<b>Fish Community Season (Summer)</b>															
1-inch Trammel Net	312	0	21	0	0	0	77	0	2	0	0	0	0	0	0
	.	0	14	0	0	0	85	0	1	1	0	0	0	0	0
Mini-Fyke Net	1	0	100	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	26	0	0	0	34	17	11	3	1	0	2	5	0
Otter Trawl	174	0	22	0	0	0	75	0	1	2	0	0	0	0	0
	.	0	17	0	0	0	81	0	1	1	0	0	0	0	0

Table 24. Total number of quality size and greater ( $\geq 380$  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 2007. 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	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Sturgeon Season (Fall through Spring)</b>							
1-inch Trammel Net	302	0	96	0	0	4	0
	.	0	96	0	0	4	0
Gill Net	1123	0	37	0	0	63	0
	.	0	50	0	1	49	0
Otter Trawl	128	0	80	0	20	0	0
	.	0	97	0	3	0	0
<b>Fish Community Season (Summer)</b>							
1-inch Trammel Net	312	2	98	0	0	0	0
	.	1	99	0	1	0	0
Mini-Fyke Net	1	100	0	0	0	0	0
	.	95	2	0	2	0	0
Otter Trawl	174	0	96	0	3	1	0
	.	0	98	0	1	1	0

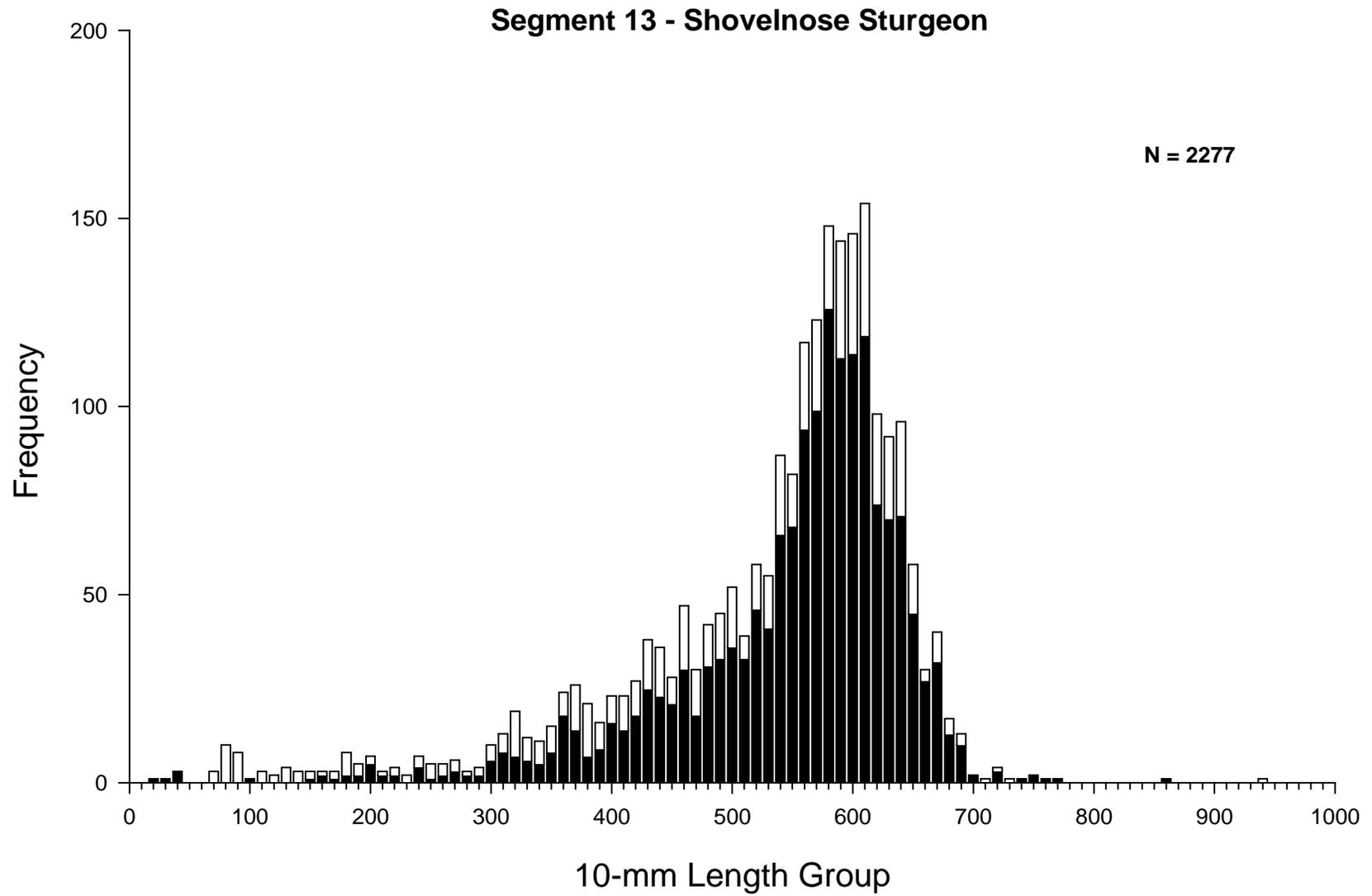


Figure 17. Length frequency of shovelnose sturgeon during fall through spring (sturgeon season, black bars) and summer (fish community season white bars) in segment 13 of the Missouri River during 2007.

Table 25. Incremental relative stock density (RSD)<sup>a</sup> and mean relative weight (Wr) by a length category for shovelnose sturgeon in segment 13 of the Missouri River captured during 2007. Length categories<sup>b</sup> determined using methods proposed by Quist et al. (1998).

<b>Length category</b>	<b>N</b>	<b>RSD</b>	<b>Wr (+/- 2SE)</b>
<b>Sturgeon Season</b>			
Sub-stock (0-149 mm)	6	.	.
Sub-stock (150-249 mm)	21	.	74.48 (61.83)
Stock	82	100	93.95 (5.899)
Quality	281	95	95.62 (2.823)
Preferred	1063	78	93.57 (1.052)
Memorable	208	13	86.43 (2.724)
Trophy	1	0	37.72
Overall Wr	.	.	92.97 (0.979)
<b>Fish Community Season</b>			
Sub-stock (0-149 mm)	33	.	.
Sub-stock (150-249 mm)	24	.	.
Stock	71	100	98.74 (14.66)
Quality	147	87	91.34 (4.045)
Preferred	280	61	87.86 (1.620)
Memorable	59	11	83.52 (3.642)
Trophy	1	0	.
Overall Wr	.	.	101.4 (20.49)

<sup>a</sup> RSD = (# of fish of a specified length class / # of fish  $\geq$  minimum stock length fish) \* 100.

<sup>b</sup> 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  $\geq$  810 mm (>74 %).

## **Sturgeon Chub**

Seven sturgeon chubs were captured during ST and seven were captured in FC during 2007 in segment 13 (Tables 26 and 27). Catch rates were over 4 times lower in 2007 than 2006 during both seasons (Figures 18 and 19). While catch declined from 2006, sturgeon chub capture rates during ST was similar to 2004 and 2005 (Figure 18). Fish community season catch rates for 2007 were similar to 2003, when catch rates were three times less than the catch at the next lowest year (0.02 fish per 100 m in 2003 and 2007 compared to .07 fish per 100 m in 2004; Figure 19).

All sturgeon chubs were captured in otter trawls indicating their affinity toward the CHNB mesohabitat (Tables 26 and 27). Lack of catch in mini-fyke nets indicates this species does not frequently inhabit the shallower BARS mesohabitat (Tables 26 and 27). Similar to previous years, sturgeon chubs were captured most frequently in the ISB macrohabitat during both seasons (Tables 26 and 27; Plauck et al. 2007).

Unlike previous years, larger sturgeon chubs (greater than 75 mm) were not captured in segment 13 (Figure 21; Plauck et al. 2007, Utrup et al. 2006). Captures for 2007 were between 30 and 75 mm (Figure 21). Low sample sizes and high variability in catch rates make between-year comparisons difficult. This species most likely has a highly variable reproductive capacity, dependant on environmental conditions.

## Segment 13 - Sturgeon Chub / Sturgeon Season

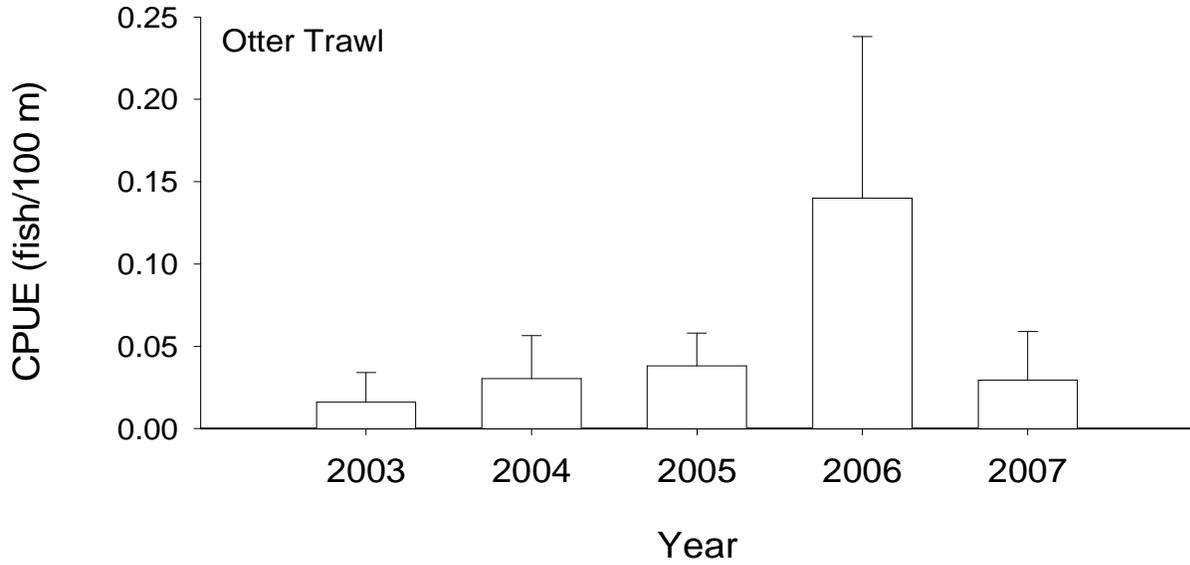


Figure 18. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sturgeon chub using otter trawls in segment 13 of the Missouri River during sturgeon season 2003 - 2007.

## Segment 13 - Sturgeon Chub / Fish Community Season

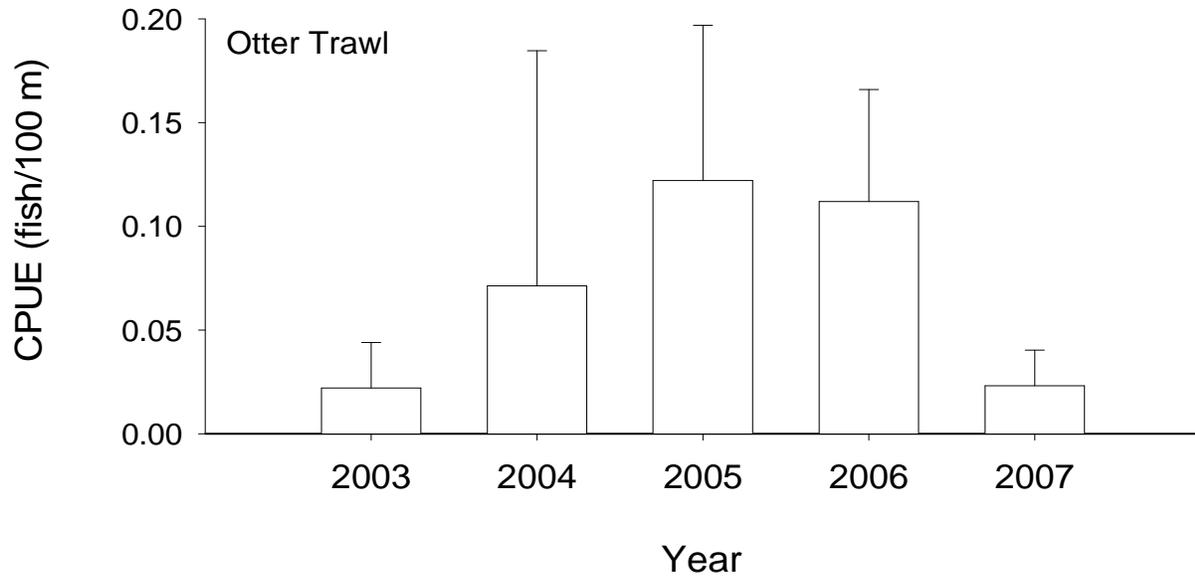


Figure 19. Mean annual catch-per-unit-effort ( $\pm 2$ SE) of sturgeon chub using otter trawls in segment 13 of the Missouri River during fish community season 2003-2007.

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 2007. 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
<b>Sturgeon Season (Fall through Spring)</b>															
1-inch Trammel Net	0 .	0 0	0 16	0 0	0 0	0 0	0 82	0 0	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Gill Net	0 .	0 0	0 23	0 0	0 0	0 0	0 61	0 15	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Otter Trawl	7 .	0 0	14 11	0 0	0 0	0 0	43 81	0 1	14 5	29 1	0 0	0 0	0 0	0 0	0 0
<b>Fish Community Season (Summer)</b>															
1-inch Trammel Net	0 .	0 0	0 14	0 0	0 0	0 0	0 85	0 0	0 1	0 1	0 0	0 0	0 0	0 0	0 0
Mini-Fyke Net	0 .	0 0	0 26	0 0	0 0	0 0	0 34	0 17	0 11	0 3	0 1	0 0	0 2	0 5	0 0
Otter Trawl	7 .	0 0	29 17	0 0	0 0	0 0	71 81	0 0	0 1	0 1	0 0	0 0	0 0	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 2007. 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	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Sturgeon Season (Fall through Spring)</b>							
1-inch Trammel Net	0 .	0 0	0 96	0 0	0 0	0 4	0 0
Gill Net	0 .	0 0	0 50	0 0	0 1	0 49	0 0
Otter Trawl	7 .	0 0	71 97	0 0	29 3	0 0	0 0
<b>Fish Community Season (Summer)</b>							
1-inch Trammel Net	0 .	0 1	0 99	0 0	0 1	0 0	0 0
Mini-Fyke Net	0 .	0 95	0 2	0 0	0 2	0 0	0 0
Otter Trawl	7 .	0 0	100 98	0 0	0 1	0 1	0 0

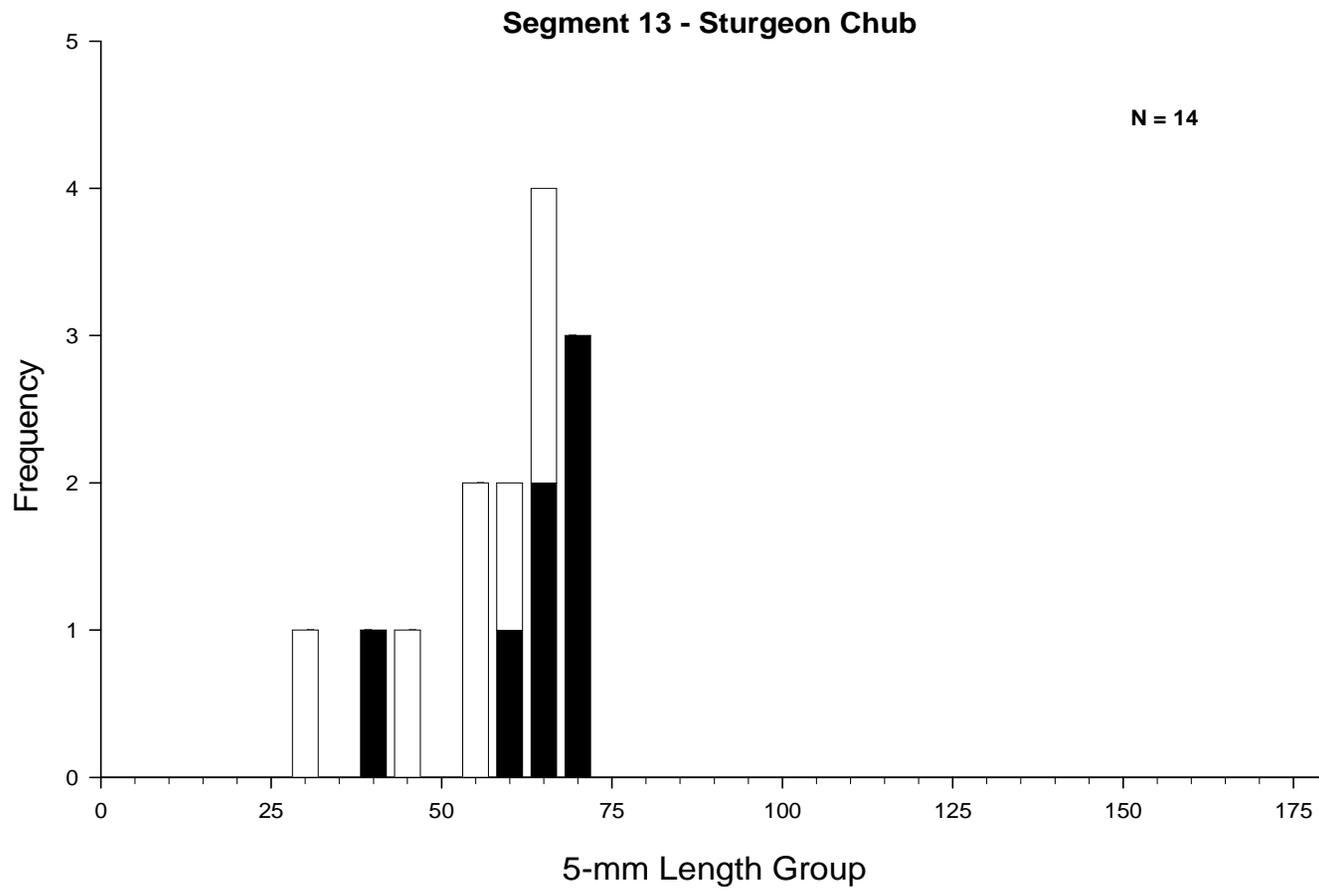


Figure 21. Length frequency of sturgeon chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during 2007.

## Sicklefin Chub

A total of 116 sicklefin chubs were captured in segment 13 in 2007 (Tables 28 and 29). Otter trawl catch rates during ST were lower in 2007 than the previous two years (0.227 fish per 100 m in 2007 compared to 1.089 and 0.824 in 2005 and 2006 respectively; Figure 22). Otter trawl catch rates during FC were the lowest since the beginning of this program in 2003 (Figure 23). Otter trawl catch rates between seasons were similar (0.227 during ST and 0.225 during FC, Figures 22 and 23). Catch rates for mini-fyke nets increased from 2005 and 2006 (0.175 fish per net night in 2005 and 0.021 fish per net night in 2006) to 0.239 fish per net night in 2007 (Figure 24). Catch rates for mini-fyke nets have been higher in the past but high variability was associated with those catch rates (2003 CPUE = 0.644, 2SE = 0.789 and 2004 CPUE = 1.610, 2SE = 2.675; Plauck et al. 2007).

Sicklefin chubs were captured in the ISB macrohabitat most frequently in both seasons (Table 28). While the ISB macrohabitat is sampled more frequently due to the abundance of this habitat type, it is important to note the 21% of the captures occurred in the CHXO macrohabitat (Table 28). The majority of the otter trawl effort took place in the CHNB mesohabitat (97% during ST and 98% during FC) which is where all but one of the sicklefin chubs were captured (one was captured on an ITIP in ST; Table 29).

Size range of sicklefin chubs during 2007 in segment 13 was similar to previous years (20 – 95 mm; Figure 25; Plauck et al. 2007). There were a higher number of small fish (< 50 mm) captured during sturgeon season in 2007 (Figure 25), indicating a late spawn in 2006 or an early spawn in 2007 (which would coincide with the high water events in early 2007). Length frequency distribution of sicklefin chubs also shows a distinct peak of small fish during FC, indicating a successful spawn in early 2007 (Figure 25). This spawn was not detected in 2006 as it had been in 2004 and 2005 (Plauck et al. 2007). There were peaks on the length frequency distribution at 40, 75 and 90 mm indicating a presence of three year classes. Age and growth data from segment 13 suggest these are one, two, and three year old fish (Herman et al. 2008a).

## Segment 13 - Sicklefin Chub / Sturgeon Season

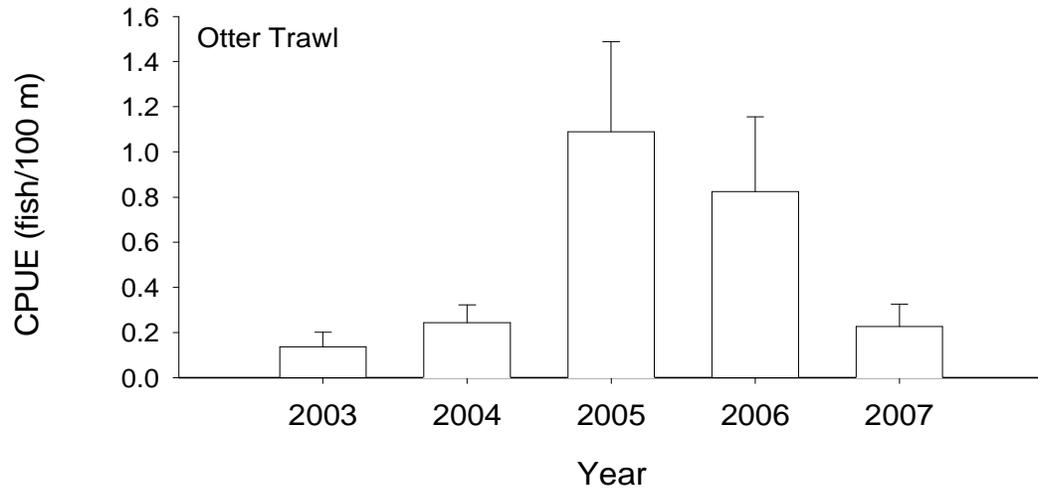


Figure 22. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sicklefin chub using otter trawls in segment 13 of the Missouri River during sturgeon season 2003-2007.

## Segment 13 - Sicklefin Chub / Fish Community Season

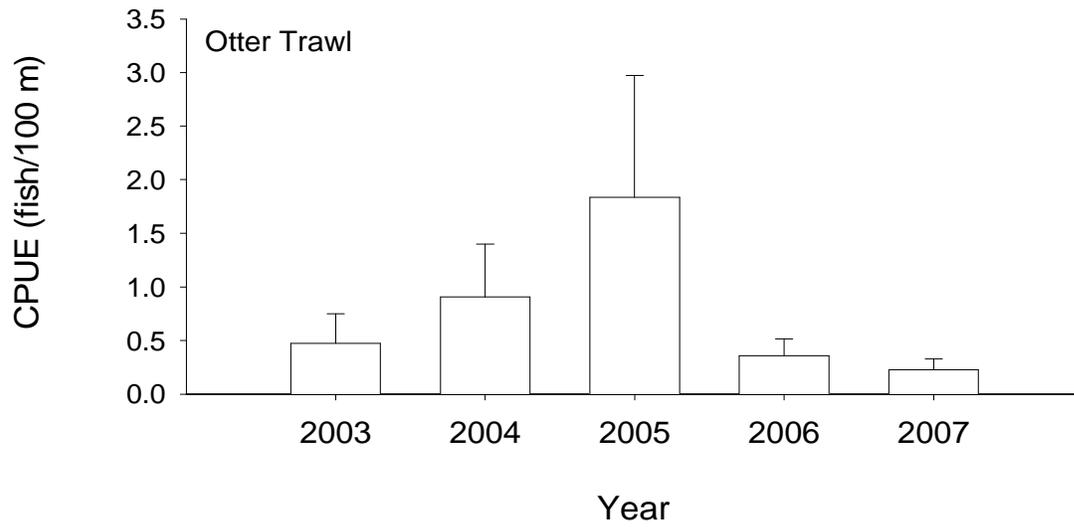


Figure 23. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sicklefin chub using otter trawls in segment 13 of the Missouri River during fish community season 2003-2007.

## Segment 13 - Sicklefin Chub / Fish Community Season

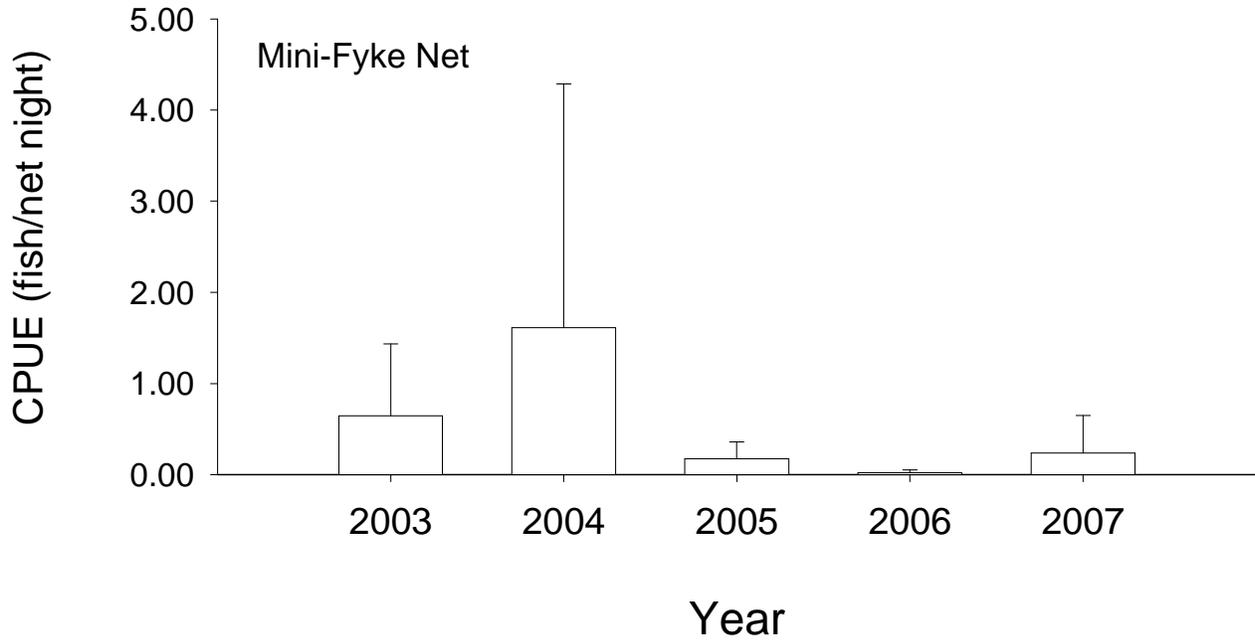


Figure 24. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sicklefin chub using mini-fyke nets in segment 13 of the Missouri River during fish community season 2003-2007.

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 2007. 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
<b>Sturgeon Season (Fall through Spring)</b>															
1-inch Trammel Net	0 .	0 0	0 16	0 0	0 0	0 0	0 82	0 0	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Gill Net	0 .	0 0	0 23	0 0	0 0	0 0	0 61	0 15	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Otter Trawl	56 .	0 0	5 11	0 0	0 0	0 0	91 81	0 1	2 5	2 1	0 0	0 0	0 0	0 0	0 0
<b>Fish Community Season (Summer)</b>															
1-inch Trammel Net	0 .	0 0	0 14	0 0	0 0	0 0	0 85	0 0	0 1	0 1	0 0	0 0	0 0	0 0	0 0
Mini-Fyke Net	21 .	0 0	0 26	0 0	0 0	0 0	90 34	10 17	0 11	0 3	0 1	0 0	0 2	0 5	0 0
Otter Trawl	53 .	0 0	21 17	0 0	0 0	0 0	79 81	0 0	0 1	0 1	0 0	0 0	0 0	0 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 2007. 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	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Sturgeon Season (Fall through Spring)</b>							
1-inch Trammel Net	0 .	0 0	0 96	0 0	0 0	0 4	0 0
Gill Net	0 .	0 0	0 50	0 0	0 1	0 49	0 0
Otter Trawl	56 .	0 0	98 97	0 0	2 3	0 0	0 0
<b>Fish Community Season (Summer)</b>							
1-inch Trammel Net	0 .	0 1	0 99	0 0	0 1	0 0	0 0
Mini-Fyke Net	21 .	100 95	0 2	0 0	0 2	0 0	0 0
Otter Trawl	53 .	0 0	100 98	0 0	0 1	0 1	0 0

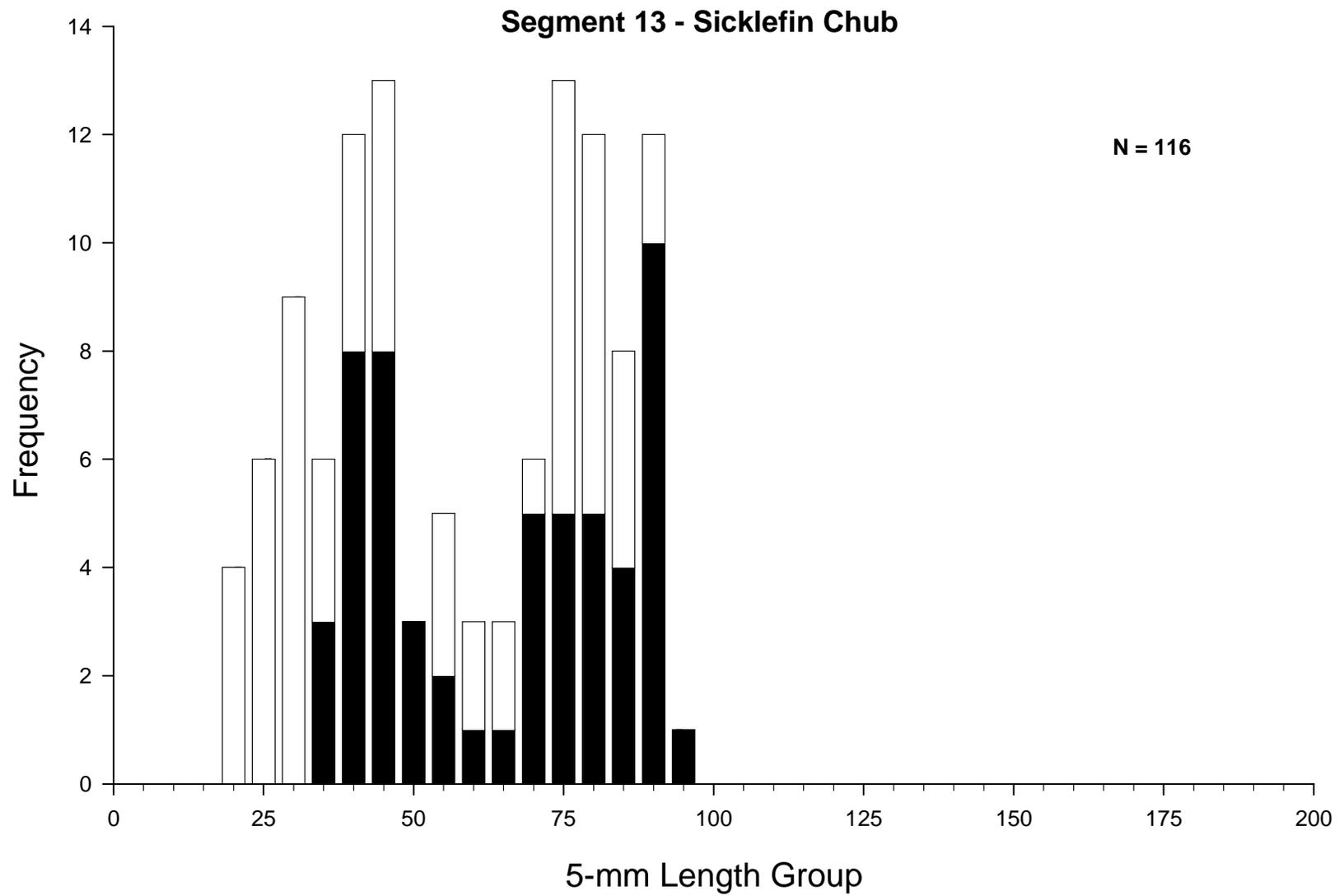


Figure 25. Length frequency of sicklefin chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during 2007.

## **Speckled Chub**

Three hundred twenty-four speckled chubs were captured in segment 13 during 2007. More than twice as many were captured during FC than during ST (N = 228 in FC compared to N = 103 during ST). In previous years, the majority of the speckled chub catch occurred during ST (Plauck et al. 2007). While otter trawl catch rates were lower than previous years during ST, FC catch rates were the highest they have been in the five years of available data (Figures 26 and 27). Mini-fyke net catch rate was the lowest it has been since 2003 (N = 9; Figure 28). High variability and inconsistencies in catch rates for both mini-fyke nets and otter trawls for this species suggests that catch may be associated with discharge or other environmental conditions and population size may fluctuate drastically from year to year.

Sturgeon season otter trawls captured the majority of the speckled chubs in the ISB macrohabitat (95%; Table 30). During FC, 25% percent of the catch occurred in the CHXO while only 17% of the effort occurred in the CHXO macrohabitat (Table 30). Seventy-four percent of the speckled chub captures occurred in the ISB macrohabitat, where the majority of the sampling occurs (Table 30). As in previous years, the majority of the speckled chub captures occurred in the CHNB mesohabitat (Plauck et al. 2007; Table 31).

Length range of speckled chubs was similar to previous years (20 – 80 mm; Figure 29; Plauck et al. 2007). The length frequency distribution of speckled chubs in segment 13 did not show distinct peaks, like the sicklefin chubs (Figure 29). The majority of the catch was in the 35 mm length group, indicating the majority of the speckled chubs were YOY or one year old fish (Herman et al. 2008b). Few larger fish in 2007 support the statement made by Plauck et al. (2007), who predicted poor recruitment of the 2006 year class. Hopefully, higher numbers of small speckled chubs in 2007 will result in higher catch rates in 2008.

### Segment 13 - Speckled Chub / Sturgeon Season

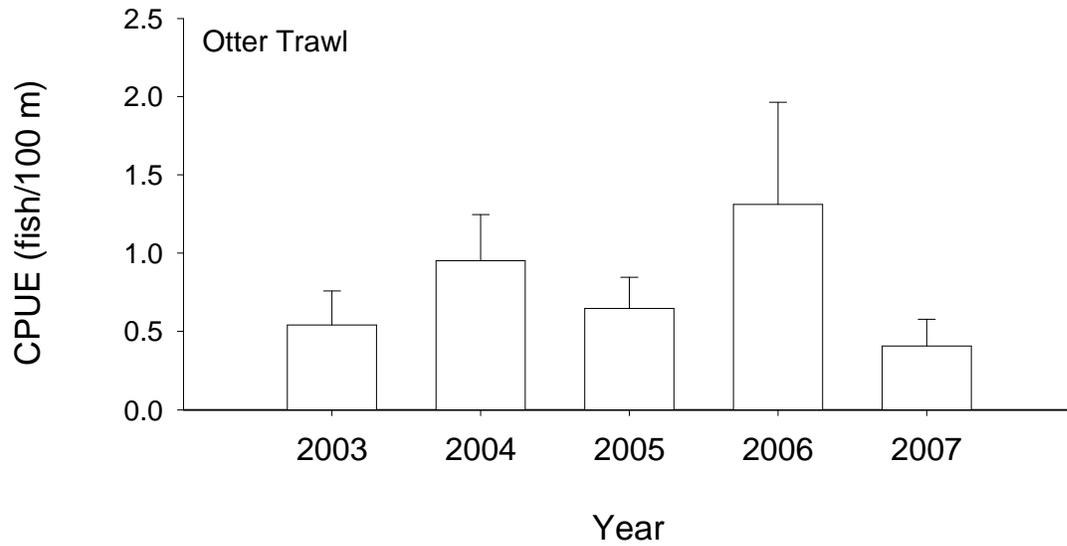


Figure 26. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of speckled chub using otter trawls in segment 13 of the Missouri River during sturgeon season 2003 -2007.

## Segment 13 - Speckled Chub / Fish Community Season

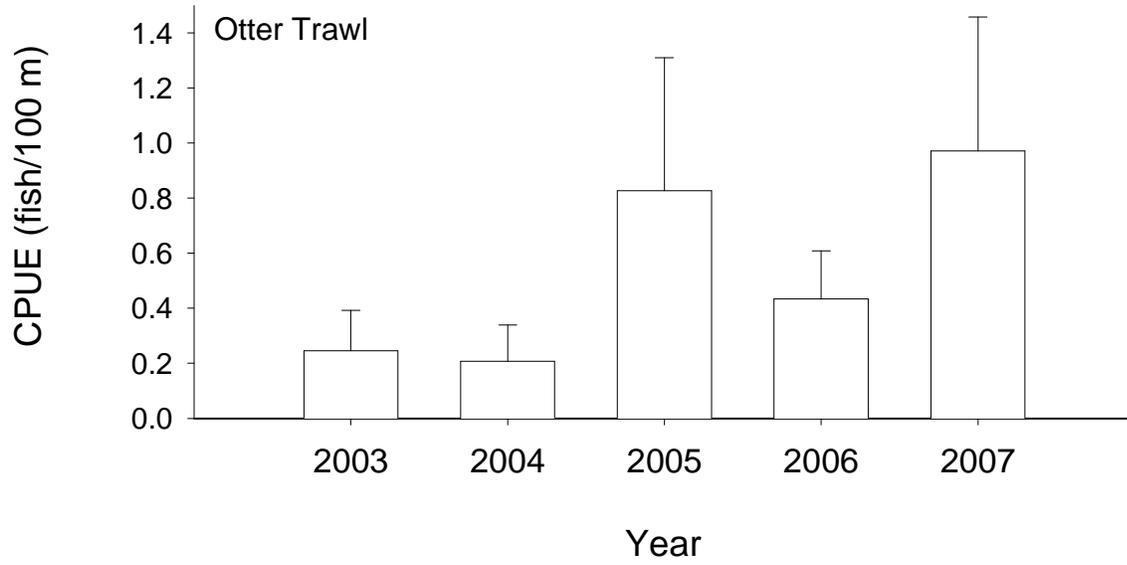


Figure 27. Mean annual catch-per-unit-effort ( $\pm 2$ SE) of speckled chub in segment 13 of the Missouri River during fish community season 2003 -2007.

## Segment 13 - Speckled Chub / Fish Community Season

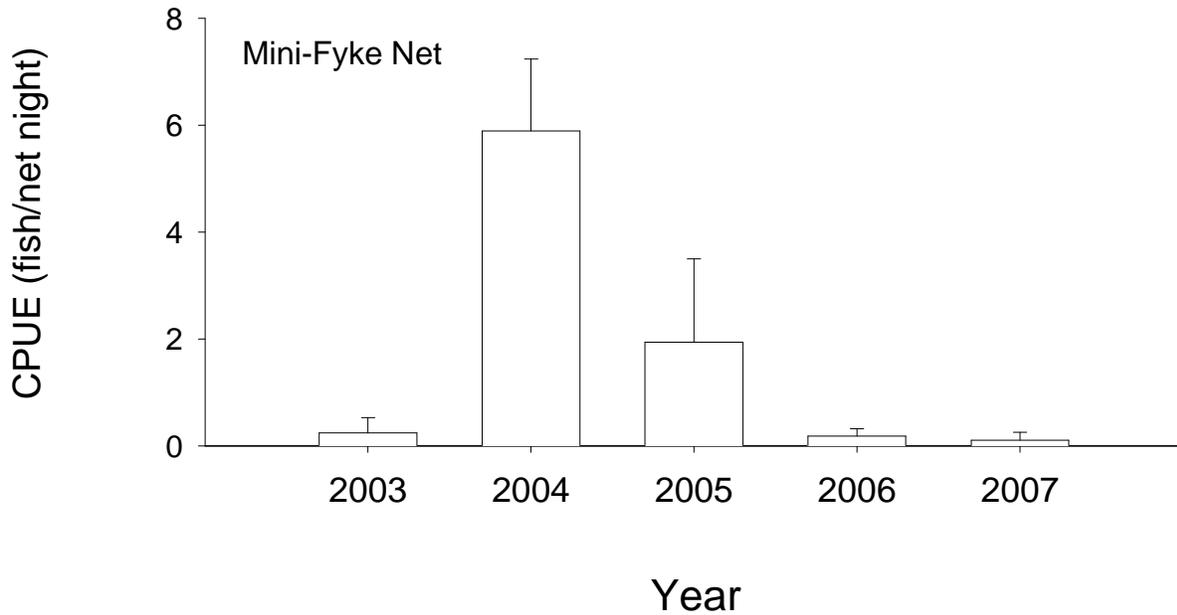


Figure 28. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of speckled chub using mini-fyke nets in segment 13 of the Missouri River during fish community season 2003 -2007.

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 2007. 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
<b>Sturgeon Season (Fall through Spring)</b>															
1-inch Trammel Net	0 .	0 0	0 16	0 0	0 0	0 0	0 82	0 0	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Gill Net	0 .	0 0	0 23	0 0	0 0	0 0	0 61	0 15	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Otter Trawl	103 .	0 0	1 11	0 0	0 0	0 0	95 81	0 1	1 5	3 1	0 0	0 0	0 0	0 0	0 0
<b>Fish Community Season (Summer)</b>															
1-inch Trammel Net	0 .	0 0	0 14	0 0	0 0	0 0	0 85	0 0	0 1	0 1	0 0	0 0	0 0	0 0	0 0
Mini-Fyke Net	9 .	0 0	67 26	0 0	0 0	0 0	33 34	0 17	0 11	0 3	0 1	0 0	0 2	0 5	0 0
Otter Trawl	228 .	0 0	25 17	0 0	0 0	0 0	74 81	0 0	0 1	0 1	0 0	0 0	0 0	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 2007. 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	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Sturgeon Season (Fall through Spring)</b>							
1-inch Trammel Net	0 .	0 0	0 96	0 0	0 0	0 4	0 0
Gill Net	0 .	0 0	0 50	0 0	0 1	0 49	0 0
Otter Trawl	103 .	0 0	97 97	0 0	3 3	0 0	0 0
<b>Fish Community Season (Summer)</b>							
1-inch Trammel Net	0 .	0 1	0 99	0 0	0 1	0 0	0 0
Mini-Fyke Net	9 .	100 95	0 2	0 0	0 2	0 0	0 0
Otter Trawl	228 .	0 0	100 98	0 0	0 1	0 1	0 0

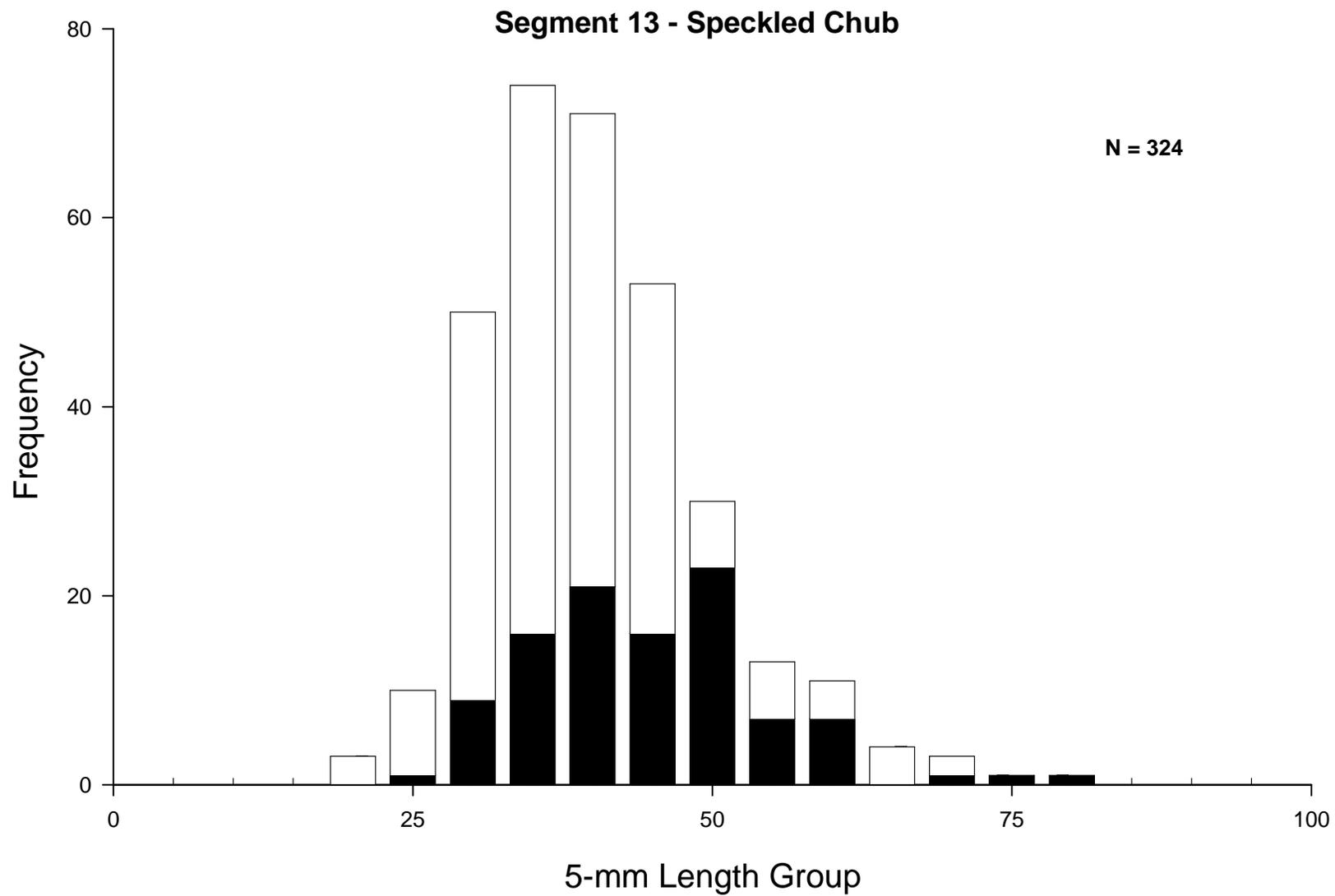


Figure 29. Length frequency of speckled chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during 2007.

## **Sand Shiner**

One sand shiner was captured in a mini-fyke net in 2007. Catch rates for sand shiners in segment 13 have been variable over the last five years ranging from 0.0114 fish per net night in 2007 to 0.4150 fish per net night in 2006 (Figure 32).

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.

## Segment 13 - Sand Shiner / Fish Community Season

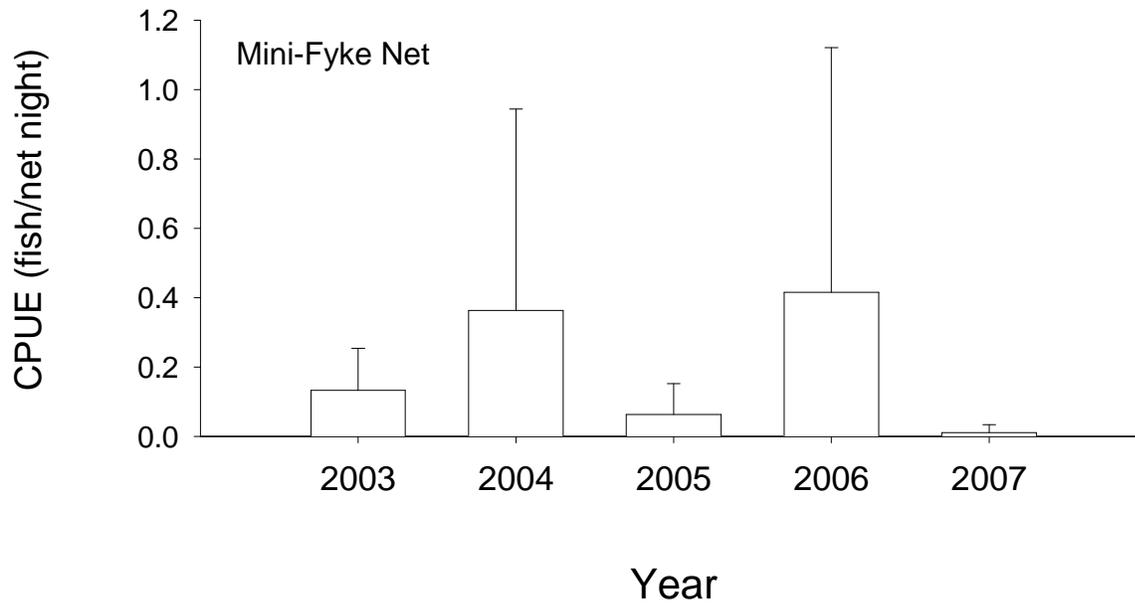


Figure 32. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sand shiner with mini-fyke nets in segment 13 of the Missouri River during fish community season 2003 - 2007.

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 2007. 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
<b>Sturgeon Season (Fall through Spring)</b>															
1-inch Trammel Net	0 .	0 0	0 16	0 0	0 0	0 0	0 82	0 0	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Gill Net	0 .	0 0	0 23	0 0	0 0	0 0	0 61	0 15	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Otter Trawl	0 .	0 0	0 11	0 0	0 0	0 0	0 81	0 1	0 5	0 1	0 0	0 0	0 0	0 0	0 0
<b>Fish Community Season (Summer)</b>															
1-inch Trammel Net	0 .	0 0	0 14	0 0	0 0	0 0	0 85	0 0	0 1	0 1	0 0	0 0	0 0	0 0	0 0
Mini-Fyke Net	1 .	0 0	0 26	0 0	0 0	0 0	100 34	0 17	0 11	0 3	0 1	0 0	0 2	0 5	0 0
Otter Trawl	0 .	0 0	0 17	0 0	0 0	0 0	0 81	0 0	0 1	0 1	0 0	0 0	0 0	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 2007. 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	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Sturgeon Season (Fall through Spring)</b>							
1-inch Trammel Net	0 .	0 0	0 96	0 0	0 0	0 4	0 0
Gill Net	0 .	0 0	0 50	0 0	0 1	0 49	0 0
Otter Trawl	0 .	0 0	0 97	0 0	0 3	0 0	0 0
<b>Fish Community Season (Summer)</b>							
1-inch Trammel Net	0 .	0 1	0 99	0 0	0 1	0 0	0 0
Mini-Fyke Net	1 .	100 95	0 2	0 0	0 2	0 0	0 0
Otter Trawl	0 .	0 0	0 98	0 0	0 1	0 1	0 0

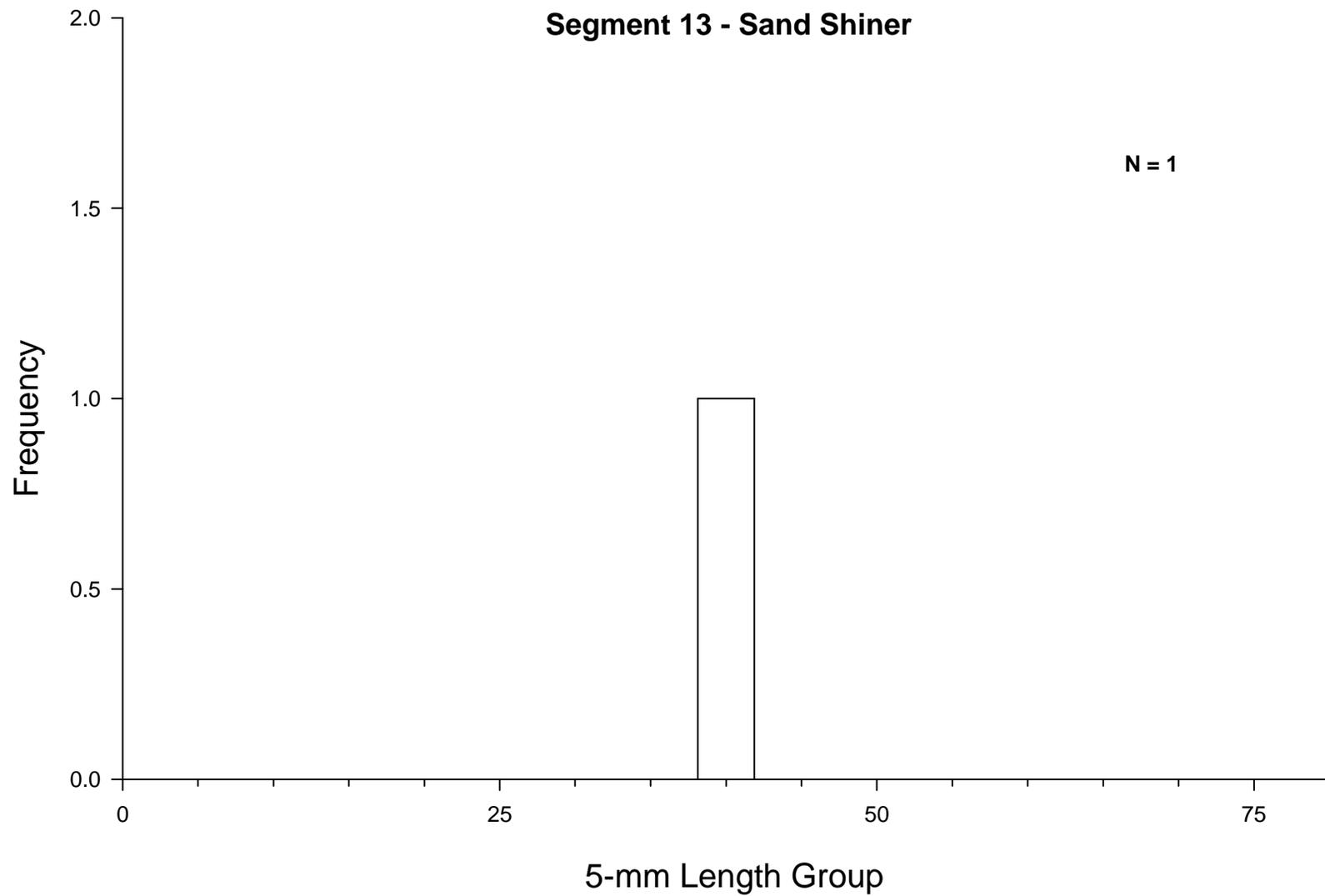


Figure 33. Length frequency of sand shiners during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during 2007.

### ***Hybognathus* spp.**

Only four *Hybognathus* spp. were captured in segment 13 in 2007. All four were captured in mini-fyke nets. Catch rate increased slightly from 0.043 fish per net night in 2006 to 0.068 in 2007 (Figure 36). Catch rates in 2003 and 2005 were substantially higher (0.178 and 0.175 respectively). As stated in previous segment 13 reports, catch rates from the last four years are sporadic and no inferences into population trends can be made (Plauck et al. 2007).

While catch numbers are low, lack of capture in trawls suggests this species occupies the BARS mesohabitat almost exclusively (Table 35; Plauck et al. 2007). Catch was distributed between ISB, OSB, and SCCL macrohabitats (Table 34). A length frequency distribution for such a small number of fish does not describe a population. *Hybognathus* spp. captured in 2007 were between 30 and 45 mm (Figure 37). Size ranges from previous reports in segment 13 show a small number of 25 mm fish indicating reproduction may be occurring in this segment. Pflieger (1997) reports 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, indicating that a few fish captured in 2007 may have been over one year old.

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

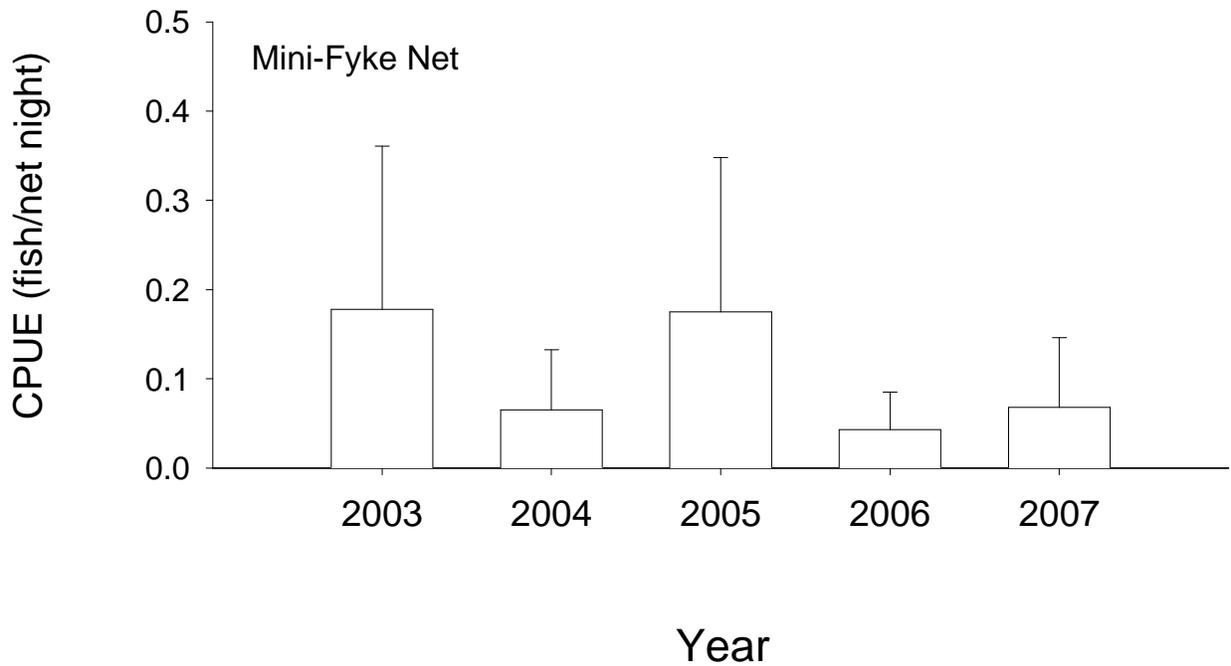


Figure 36. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of *Hybognathus* spp. with mini-fyke nets in segment 13 of the Missouri River during fish community season 2003 - 2007.

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 2007. 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
<b>Sturgeon Season (Fall through Spring)</b>															
1-inch Trammel Net	0 .	0 0	0 16	0 0	0 0	0 0	0 82	0 0	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Gill Net	0 .	0 0	0 23	0 0	0 0	0 0	0 61	0 15	0 2	0 0	0 0	0 0	0 0	0 0	0 0
Otter Trawl	0 .	0 0	0 11	0 0	0 0	0 0	0 81	0 1	0 5	0 1	0 0	0 0	0 0	0 0	0 0
<b>Fish Community Season (Summer)</b>															
1-inch Trammel Net	0 .	0 0	0 14	0 0	0 0	0 0	0 85	0 0	0 1	0 1	0 0	0 0	0 0	0 0	0 0
Mini-Fyke Net	6 .	0 0	0 26	0 0	0 0	0 0	33 34	50 17	17 11	0 3	0 1	0 0	0 2	0 5	0 0
Otter Trawl	0 .	0 0	0 17	0 0	0 0	0 0	0 81	0 0	0 1	0 1	0 0	0 0	0 0	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 2007. 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	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Sturgeon Season (Fall through Spring)</b>							
1-inch Trammel Net	0 .	0 0	0 96	0 0	0 0	0 4	0 0
Gill Net	0 .	0 0	0 50	0 0	0 1	0 49	0 0
Otter Trawl	0 .	0 0	0 97	0 0	0 3	0 0	0 0
<b>Fish Community Season (Summer)</b>							
1-inch Trammel Net	0 .	0 1	0 99	0 0	0 1	0 0	0 0
Mini-Fyke Net	6 .	100 95	0 2	0 0	0 2	0 0	0 0
Otter Trawl	0 .	0 0	0 98	0 0	0 1	0 1	0 0

**Segment 13 - *Hybognathus* spp.**

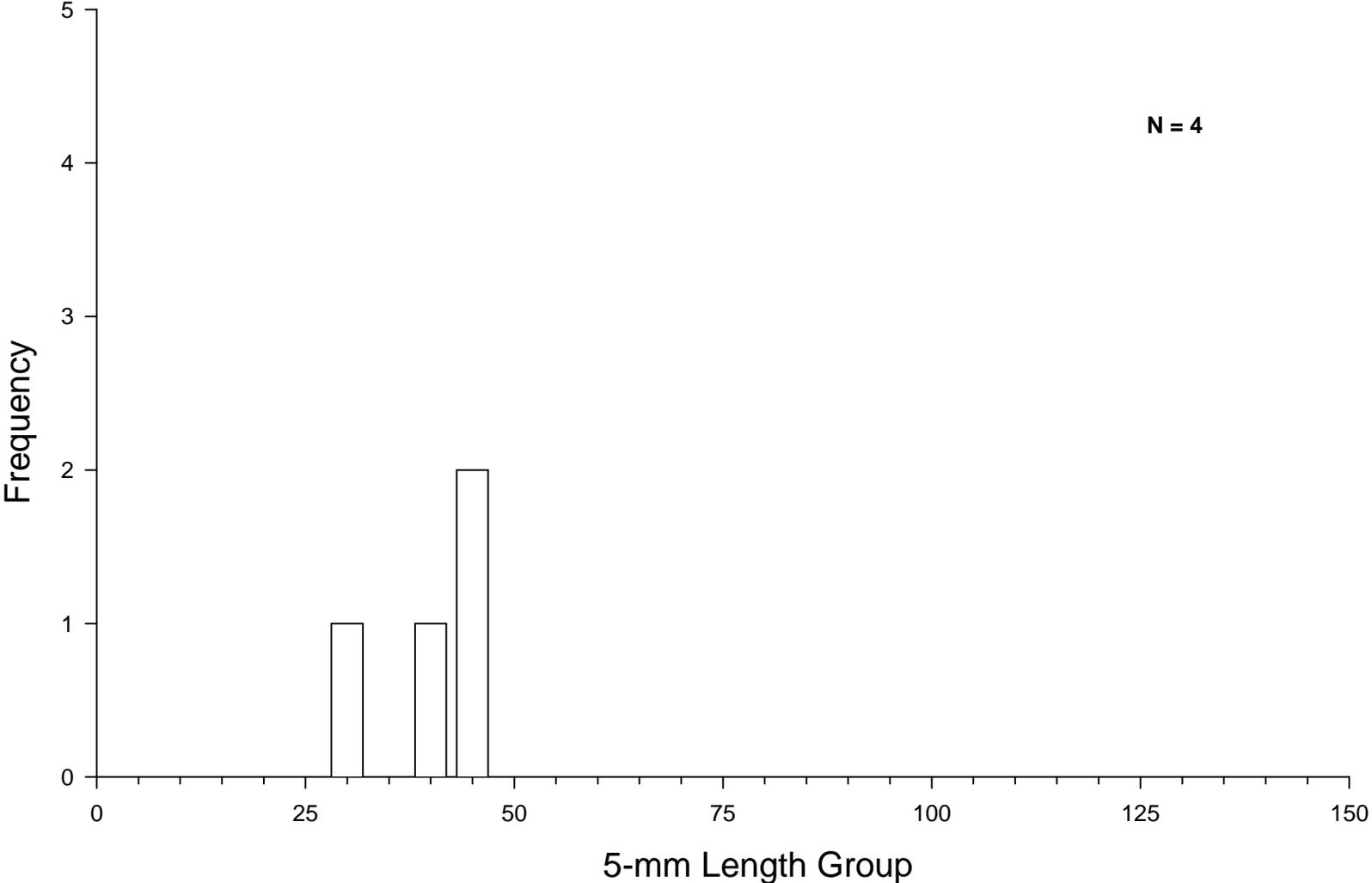


Figure 37. Length frequency of *Hybognathus* spp. caught during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during 2007.

## **Blue Sucker**

Eighty-two blue suckers were captured in segment 13 during 2007. Catch rates in gill nets increased from 0.028 fish per net night in 2006 to 0.064 fish per net night in 2007 (Figure 38). Otter trawl catch rates during ST decreased from 2005 and 2006 (0.030 fish per 100 m trawled in 2005 and 0.037 fish per 100 m trawled in 2006 compared to 0.020 fish per 100 m trawled in 2007; Figure 38). Trammel net catch rates during ST have been increasing since the beginning of this program (0.003 fish per 100 m in 2003 to 0.134 fish per 100 m in 2007; Figure 39). Otter trawl and trammel net catch rates during FC are variable from year to year with no clear trend (Figure 41). Otter trawl catch rates were higher in 2007 than 2006, while catch rates were lower for trammel nets in 2007 (Figure 41).

The majority of the blue sucker captures for all gears, and all seasons, occurred in the ISB macrohabitat (Table 36). There were notable catches in the CHXO macrohabitat with gill nets (21% of total catch relative to 23% of total effort) and FC otter trawls (27% of total catch relative to 17% of total effort; Table 36). Blue suckers were captured primarily in the CHNB mesohabitat with all gears and in both seasons (Table 37). Blue suckers are captured in POOL mesohabitats during the winter months in gill nets (36% of total gill net catch relative to 49% of the gill net effort; Table 37). Captures of blue suckers on CHNB during both seasons suggest that this species is tolerant to the high flow rates of this mesohabitat.

Blue suckers captured in segment 13 during 2007 ranged from 290 to 830 mm (Figure 44). Pflieger (1997) states blue suckers reach sexual maturity around 500 mm, indicating blue suckers in segment 13 should be capable of spawning. There were more captures of sub-adult blue suckers in 2007 than in previous years (6 fish under 400 mm in 2007 compared to four in 2004, 2005 and 2006 combined; Plauck et al. 2007). Sub-adult captures indicate that this species has been reproducing in or near (upstream or downstream) segment 13. The length frequency distribution of blue suckers shows distinct peaks at 650 and 725 mm (Figure 44). LaBay et al. (2008) suggest fish of this size would be older than 5 years. As in previous years, no YOY were captured in segment 13 (Plauck et al. 2007). Utrup et al. (2007) did document YOY blue suckers captured in segment 14, indicating these fish may have drifted downstream from spawning blue suckers in segment 13.

## Segment 13 - Blue Sucker / Sturgeon Season

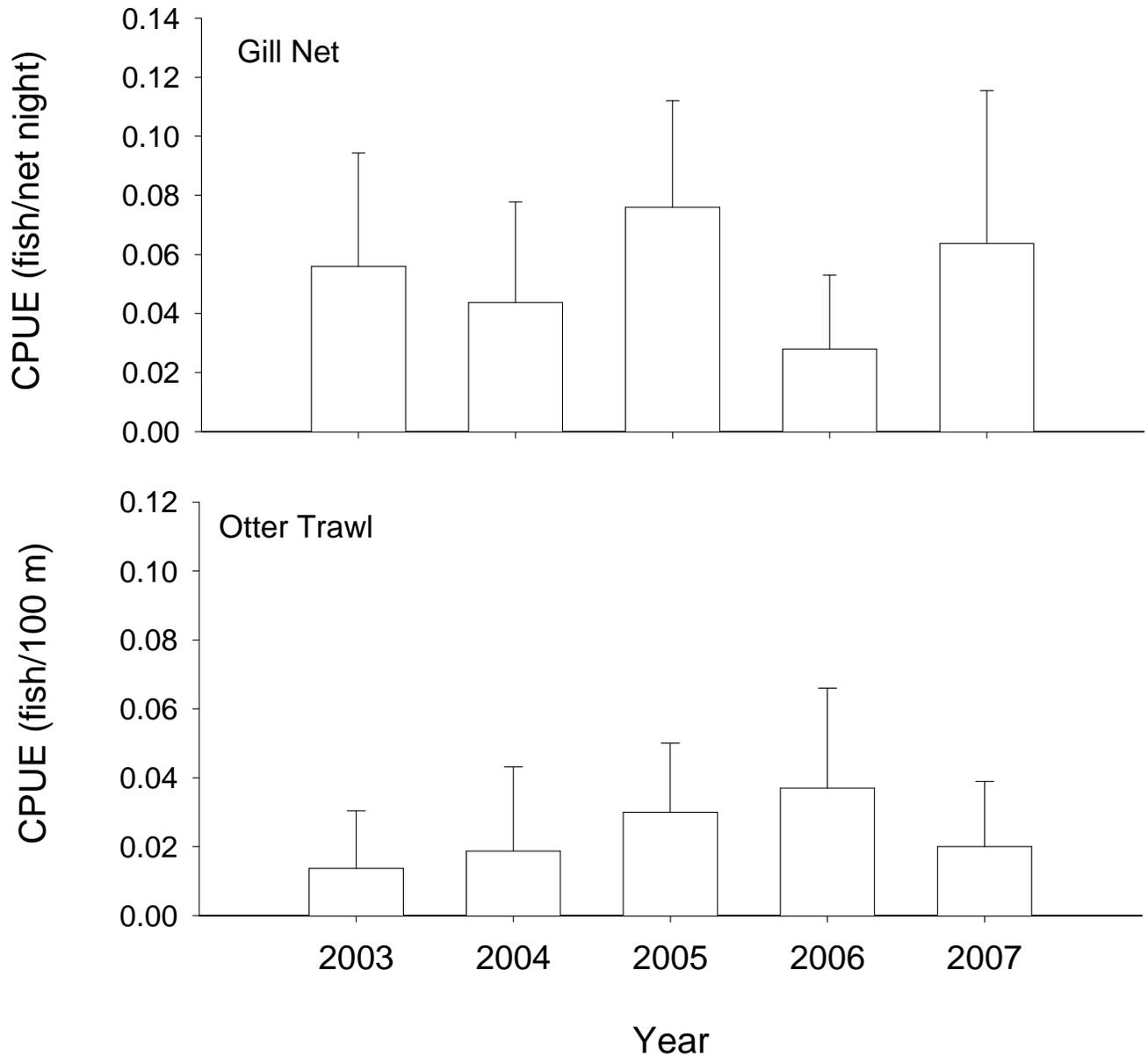


Figure 38. Mean annual catch-per-unit-effort ( $\pm$  2SE) of blue sucker with gill nets and otter trawls in segment 13 of the Missouri River during sturgeon season 2003 - 2007.

## Segment 13 - Blue Sucker / Sturgeon Season

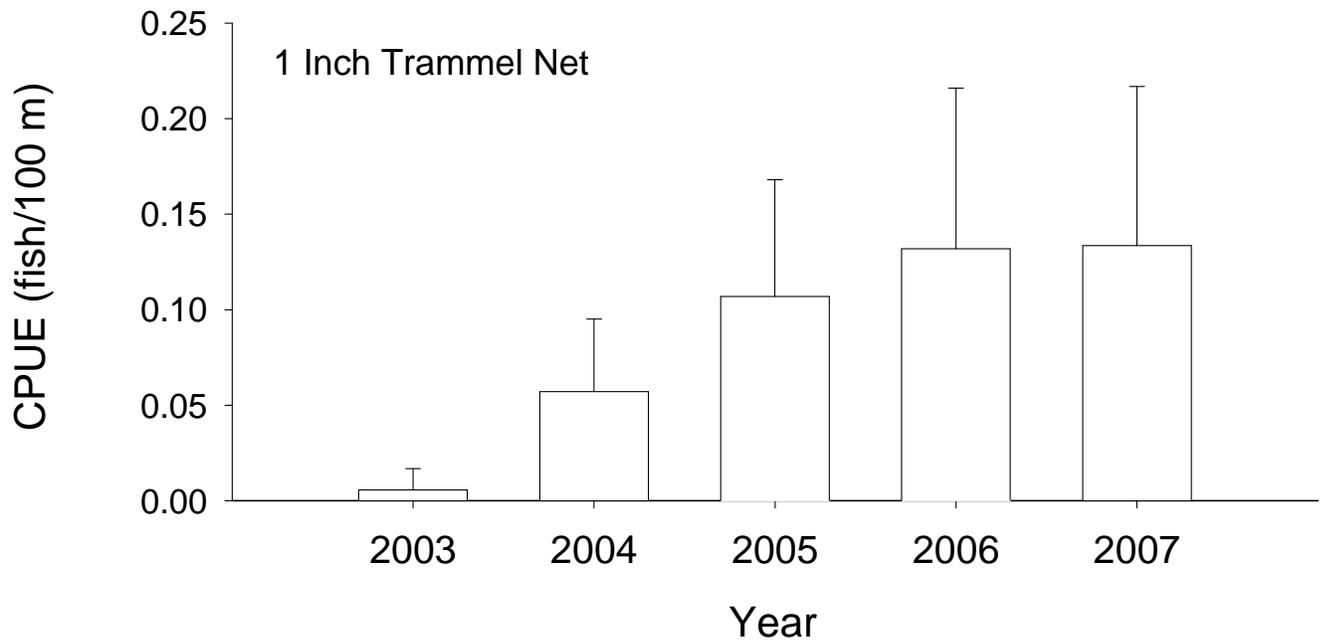


Figure 39. Mean annual catch-per-unit-effort ( $\pm$  2SE) of blue sucker with 1 inch trammel nets in segment 13 of the Missouri River during sturgeon season 2003 - 2007.

## Segment 13 - Blue Sucker / Fish Community Season

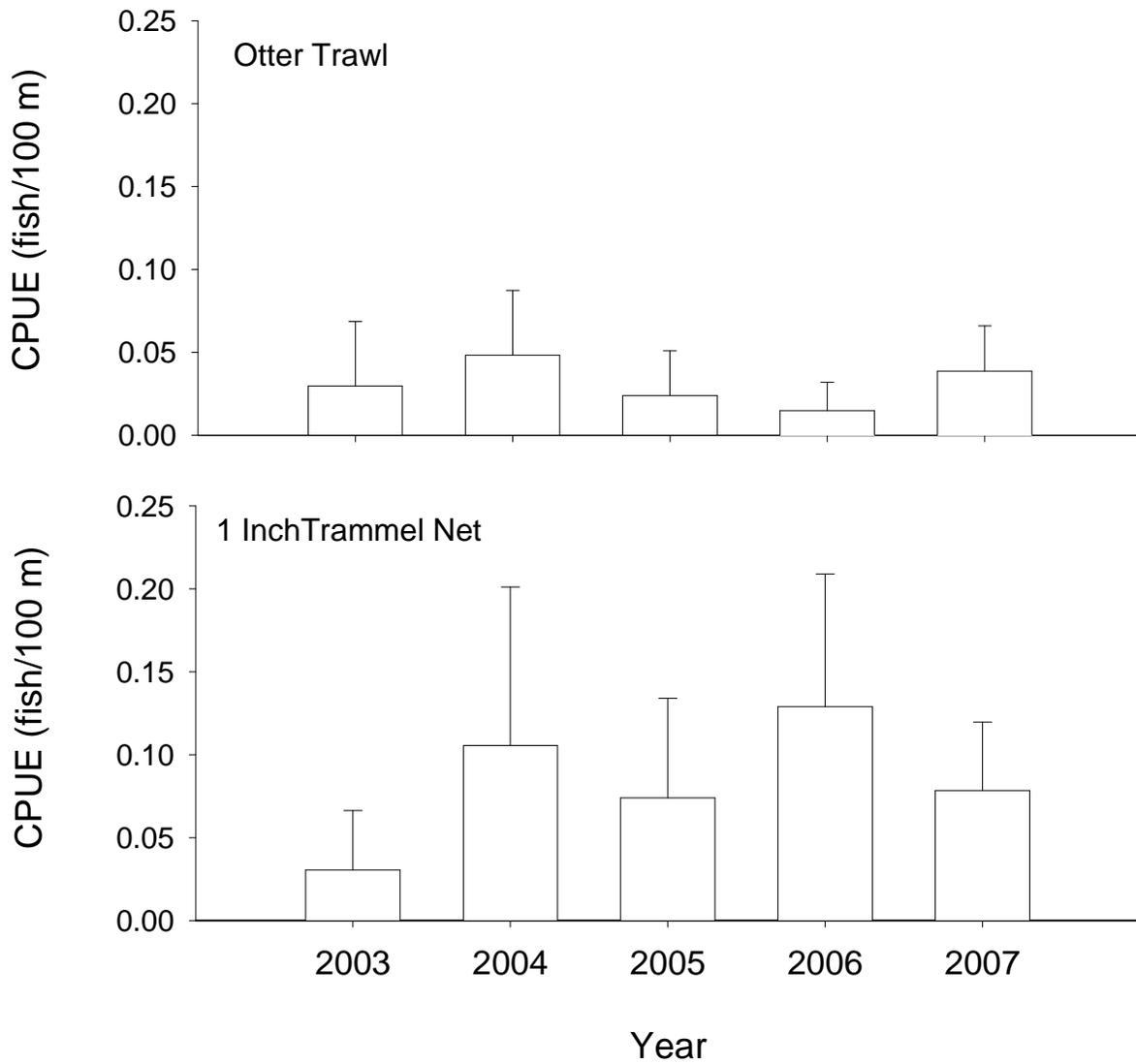


Figure 41. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of blue sucker using otter trawls and 1 inch trammel nets in segment 13 of the Missouri River during fish community season 2003 - 2007.

Table 36. Total number of blue suckers captured for each gear during each season and the proportion caught within each macrohabitat type in segment 13 of the Missouri River during 2007. 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
<b>Sturgeon Season (Fall through Spring)</b>															
1-inch Trammel Net	32	0	16	0	0	0	84	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	82	0	2	0	0	0	0	0	0
Gill Net	14	0	21	0	0	0	71	7	0	0	0	0	0	0	
	.	0	23	0	0	0	61	15	2	0	0	0	0	0	
Otter Trawl	5	0	0	0	0	0	100	0	0	0	0	0	0	0	
	.	0	11	0	0	0	81	1	5	1	0	0	0	0	
<b>Fish Community Season (Summer)</b>															
1-inch Trammel Net	20	0	15	0	0	0	85	0	0	0	0	0	0	0	
	.	0	14	0	0	0	85	0	1	1	0	0	0	0	
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	.	0	26	0	0	0	34	17	11	3	1	0	2	5	
Otter Trawl	11	0	27	0	0	0	64	0	0	9	0	0	0	0	
	.	0	17	0	0	0	81	0	1	1	0	0	0	0	

Table 37. Total number of blue suckers captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2007. 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	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Sturgeon Season (Fall through Spring)</b>							
1-inch Trammel Net	32	0	97	0	0	3	0
	.	0	96	0	0	4	0
Gill Net	14	0	64	0	0	36	0
	.	0	50	0	1	49	0
Otter Trawl	5	0	100	0	0	0	0
	.	0	97	0	3	0	0
<b>Fish Community Season (Summer)</b>							
1-inch Trammel Net	20	0	100	0	0	0	0
	.	1	99	0	1	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
	.	95	2	0	2	0	0
Otter Trawl	11	0	91	0	9	0	0
	.	0	98	0	1	1	0

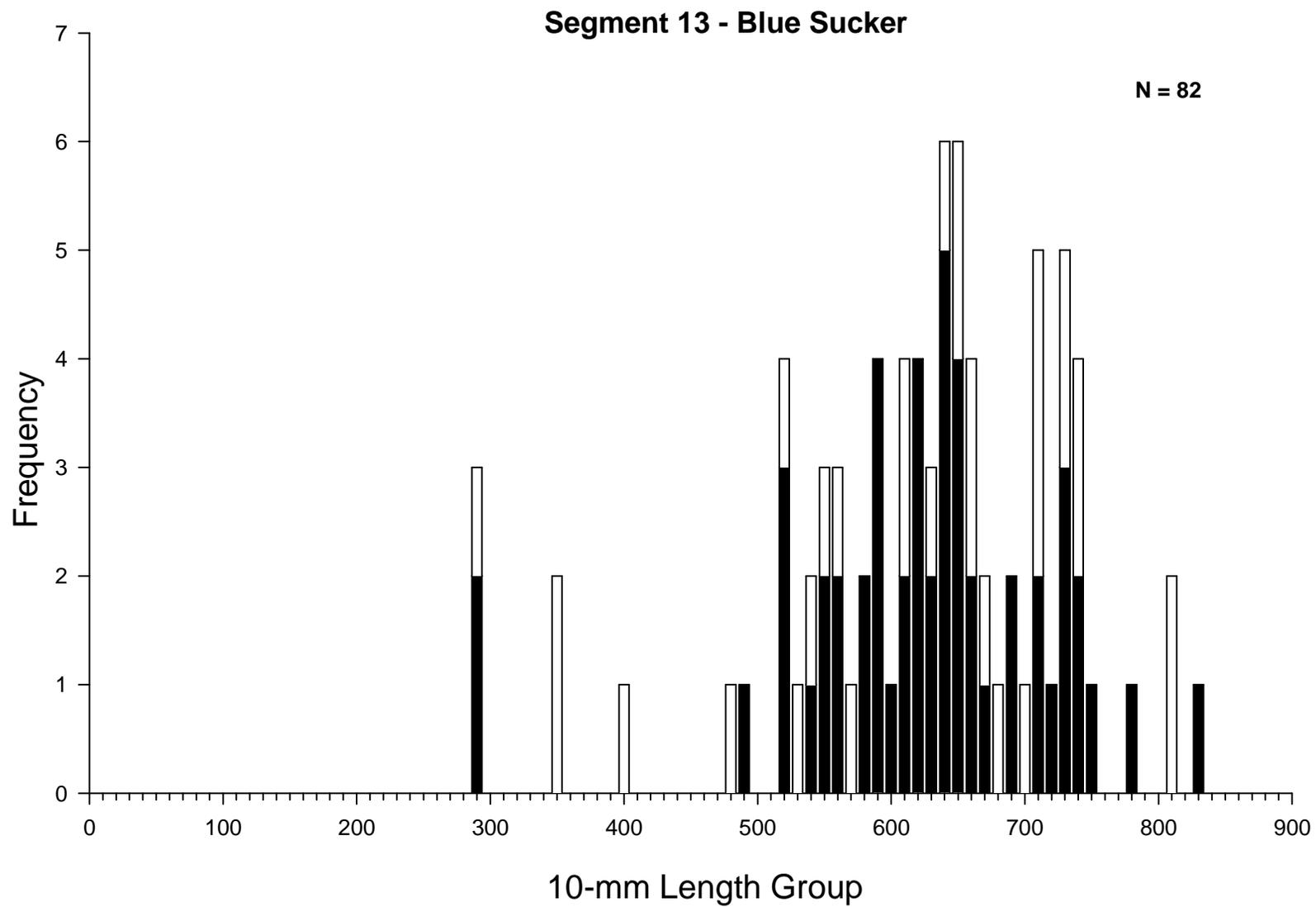


Figure 44. Length frequency of blue suckers during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during 2007.

## Sauger

Fifty-one sauger were captured in segment 13 during 2007. Gill nets captured 40 sauger, at a rate of 0.182 fish per net night (2SE = 0.109; Figure 45). Gill net catch rates seem to be stable for this species in the past years, ranging from 0.115 fish per net night to a high of 0.183 fish per net night (Figure 45). Only one sauger was captured during ST otter trawling (Tables 38 and 39). Sauger catch rates in otter trawls during ST have been low since 2003 ranging from 0 to 0.047 fish per 100 m trawled (Figure 45). Three sauger were captured in drifted trammel nets during ST (Tables 38 and 39). While variability is quite high for trammel net catch rates (2SE = 0.019), catch rates during ST in 2007 were higher than they have been in the past (0.015 fish per 100 m drifted; Figure 46). Only seven sauger were sampled in FC; 2 in drifted trammel nets, 1 in a mini-fyke net and 4 in otter trawls (Tables 38 and 39).

The majority of the sauger captures with gill nets occurred in the ISB macrohabitat (70% of catch relative to 60% of the effort; Table 38). A notable 25% of the captures occurred in the CHXO macrohabitat in which only 23% of the effort was expended (Table 38). Gill nets captures were evenly distributed between POOL (50%) and CHNB (50%) mesohabitats (Table 39). There were not enough captures with the other gear types to make inferences as to habitat preference.

Sauger ranged in length from 90 mm to 580 mm, with the majority between 300 and 450 mm (Figure 51). According to Datillo et al. (2008) sauger in the 300 to 450 mm size range could be between 2 and 5 years. Sauger in this size range should be capable of spawning yet we only captured one YOY (90 mm) in segment 13 (Figure 51). Utrup et al. (2007) reported catching several YOY sauger in segment 14, some of which may have originated in segment 13.

## Segment 13 - Sauger / Sturgeon Season

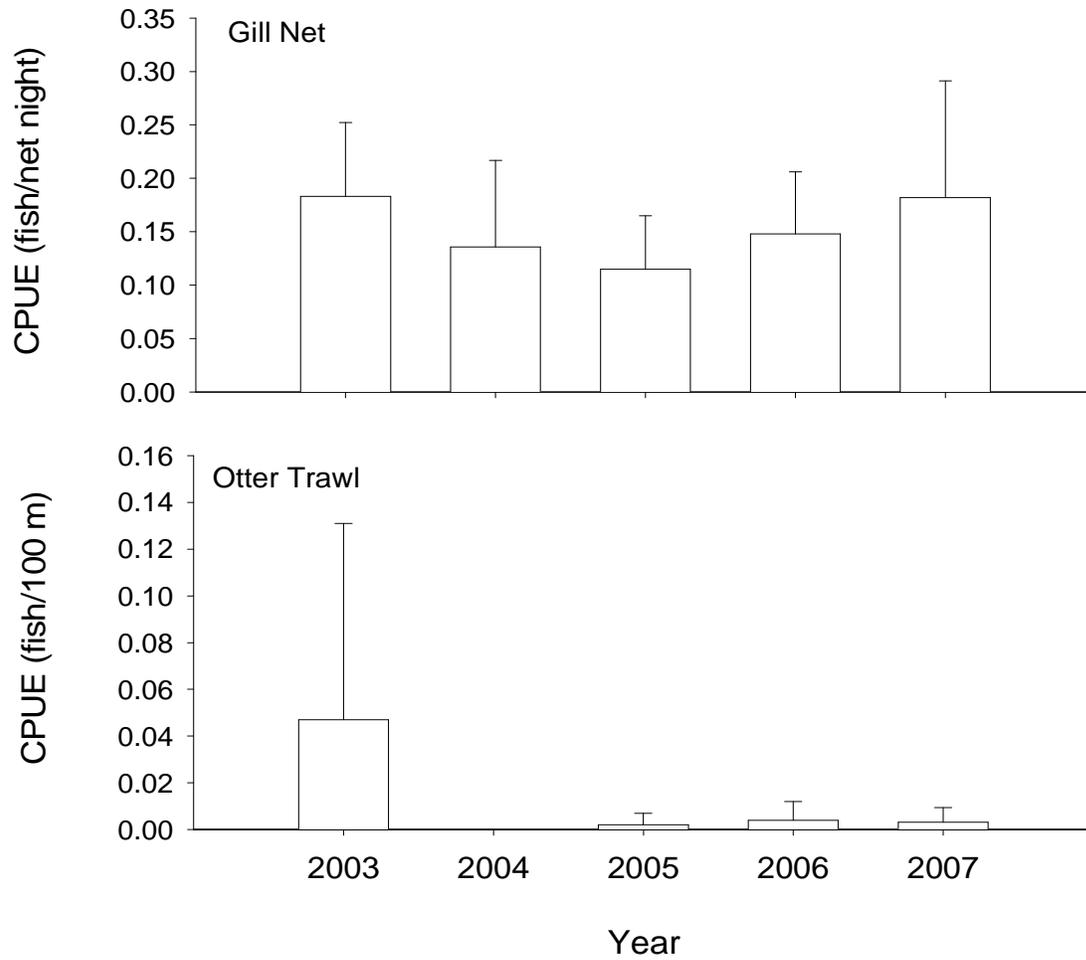


Figure 45. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sauger using gill nets and otter trawls in segment 13 of the Missouri River during sturgeon season 2003 - 2007.

## Segment 13 - Sauger / Sturgeon Season

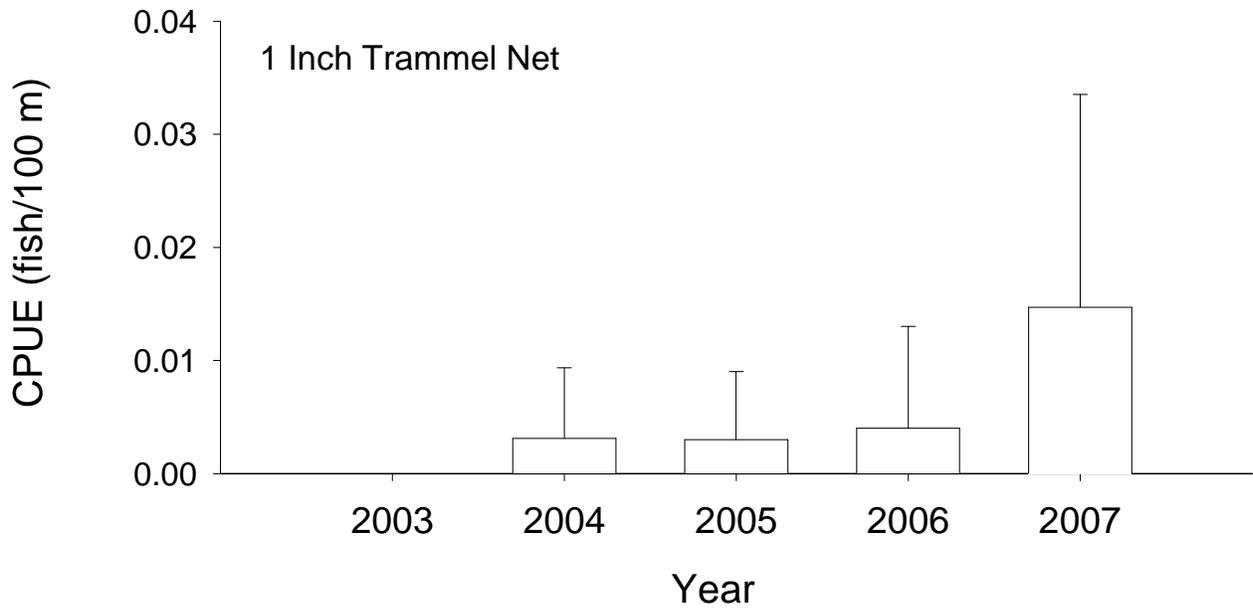


Figure 46. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sauger using 1 and 2.5 inch trammel nets in segment 13 of the Missouri River during sturgeon season 2003 - 2007.

## Segment 13 - Sauger / Fish Community Season

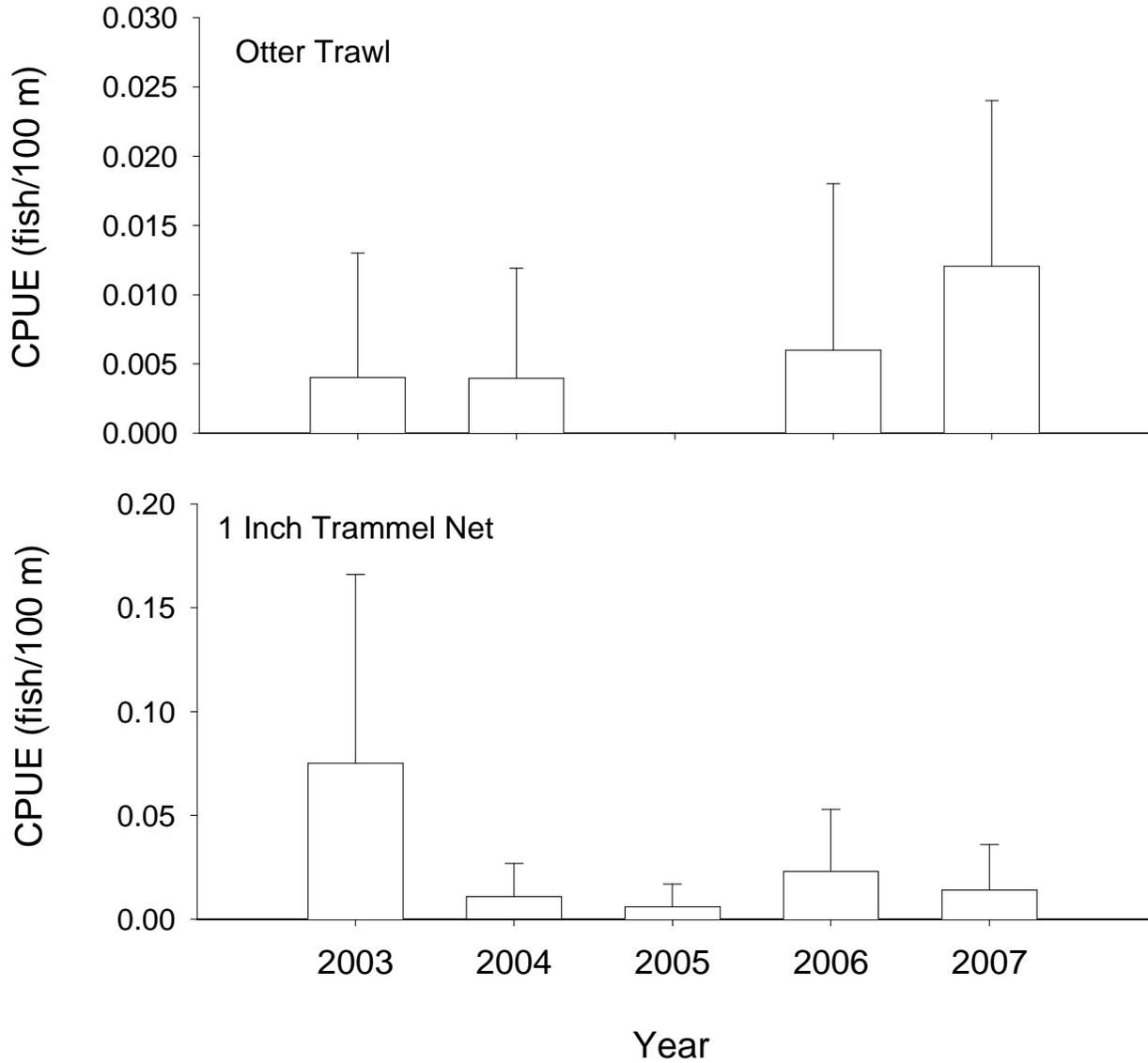


Figure 48. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sauger using otter trawls and 1 inch trammel nets in segment 13 of the Missouri River during fish community season 2003 - 2007.

## Segment 13 - Sauger / Fish Community Season

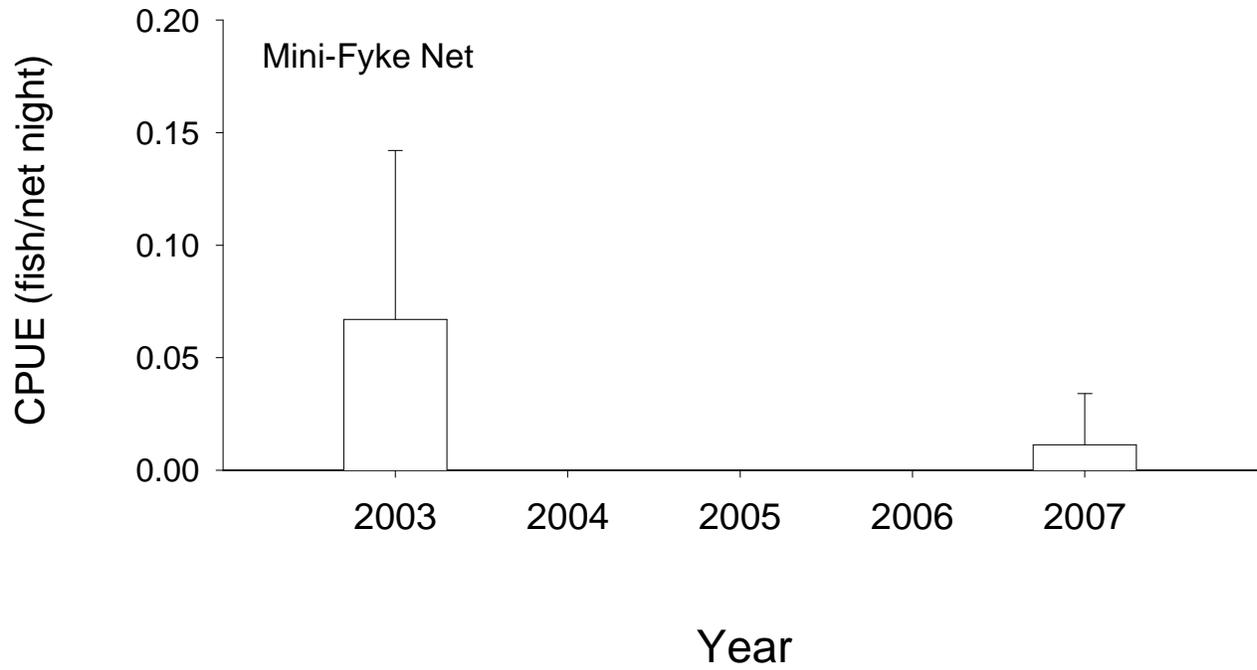


Figure 49. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sauger using mini-fyke nets in segment 13 of the Missouri River during fish community season 2003 - 2007.

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 2007. 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
<b>Sturgeon Season (Fall through Spring)</b>															
1-inch Trammel Net	3	0	33	0	0	0	67	0	0	0	0	0	0	0	0
	.	0	16	0	0	0	82	0	2	0	0	0	0	0	0
Gill Net	40	0	25	0	0	0	70	5	0	0	0	0	0	0	0
	.	0	23	0	0	0	61	15	2	0	0	0	0	0	0
Otter Trawl	1	0	0	0	0	0	100	0	0	0	0	0	0	0	0
	.	0	11	0	0	0	81	1	5	1	0	0	0	0	0
<b>Fish Community Season (Summer)</b>															
1-inch Trammel Net	2	0	50	0	0	0	50	0	0	0	0	0	0	0	0
	.	0	14	0	0	0	85	0	1	1	0	0	0	0	0
Mini-Fyke Net	1	0	100	0	0	0	0	0	0	0	0	0	0	0	0
	.	0	26	0	0	0	34	17	11	3	1	0	2	5	0
Otter Trawl	4	0	50	0	0	0	50	0	0	0	0	0	0	0	0
	.	0	17	0	0	0	81	0	1	1	0	0	0	0	0

Table 39. Total number of sauger captured for each gear during each season and the proportion caught within each mesohabitat type in segment 13 of the Missouri River during 2007. 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	Mesohabitat					
		BAR	CHNB	DTWT	ITIP	POOL	TLWG
<b>Sturgeon Season (Fall through Spring)</b>							
1-inch Trammel Net	3 .	0 0	100 96	0 0	0 0	0 4	0 0
Gill Net	40 .	0 0	50 50	0 0	0 1	50 49	0 0
Otter Trawl	1 .	0 0	100 97	0 0	0 3	0 0	0 0
<b>Fish Community Season (Summer)</b>							
1-inch Trammel Net	2 .	0 1	100 99	0 0	0 1	0 0	0 0
Mini-Fyke Net	1 .	100 95	0 2	0 0	0 2	0 0	0 0
Otter Trawl	4 .	0 0	100 98	0 0	0 1	0 1	0 0

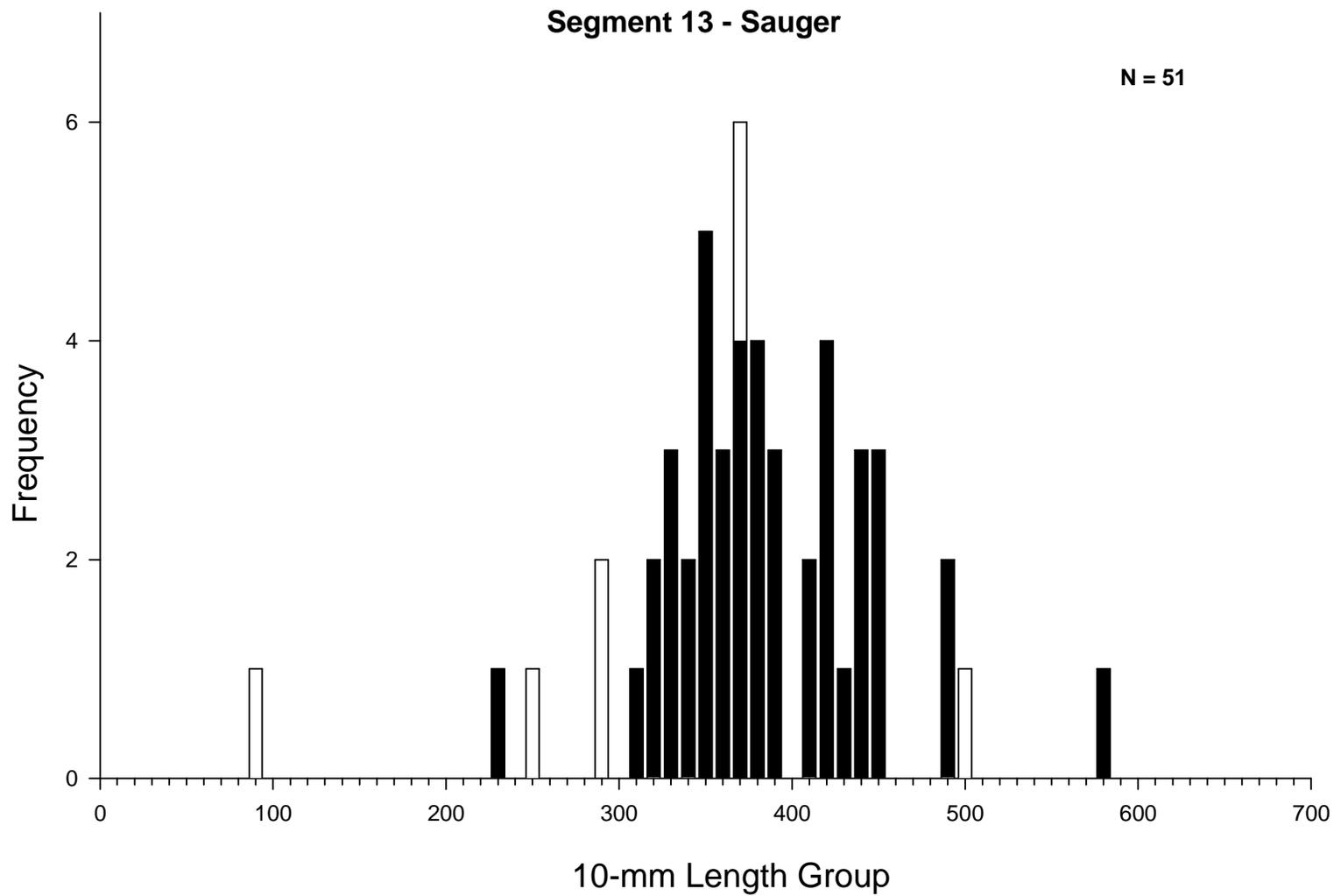


Figure 51. Length frequency of sauger during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during 2007.

## Missouri River Fish Community

This section covers the following objective 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 2007 sample year, 10,450 fish were captured in segment 13 using standard gears. Standard gears captured 53 species with shovelnose sturgeon comprising the largest percentage of the total catch (25.4%; N = 2,278), followed by blue catfish (14.2%; N = 1,276), emerald shiner (9.9 %; N = 888), red shiner (9.1%; N = 817), and channel catfish (9.1%; N = 813). Target species accounted for 32.5% of the total catch with each contributing in the following order of abundance: shovelnose sturgeon (25.4%; N = 2,278), speckled chub (3.8%; N = 340), sicklefin chub (1.4%; N = 130), blue sucker (0.9%; N = 82), sauger (0.6%; N = 51), pallid sturgeon (0.1%; N = 11), *Hybonathus* spp. (<0.1%; N = 4), and sand shiner (<0.1%; N = 1). Seventeen species were captured five or fewer times during the year (Appendix F).

Gill nets captured 1,545 fish consisting of 23 species and were most effective at capturing shovelnose sturgeon (75.7 % of gill net catch; N = 1,170). Blue catfish (5.2%; N = 80), shortnose gar (2.9%; N = 45), and sauger (2.6%; N = 40) were the next most abundant species.

Drifted trammel nets captured 909 fish between both seasons (Appendix F2). Twenty-two species were captured, with the majority of the catch consisting of shovelnose sturgeon (74.4%, N = 676), blue catfish (9.5%; N = 86), blue suckers (5.7%; N = 52), and channel catfish (2.4%; N = 22). Sixteen of the 22 species were captured 6 times or fewer.

Otter trawls during both seasons captured 3,037 fish consisting of 25 species and one hybrid (shovelnose x pallid; Appendix F3). Otter trawl catch was dominated by blue catfish (36.5% of total catch; N = 1,108), followed by channel catfish (19.2%; N = 584), shovelnose sturgeon (14.2%; N = 431), speckled chub (10.9%; N = 331), unidentified *Ictalurid* catfish (6.3%; N = 191), and sicklefin chub (3.6%; N = 109).

Mini fyke nets fished during FC captured 3,476 fish consisting of 45 species Appendix F6. Emerald shiner dominated the catch (24.9%; N = 864) followed by red shiners (23.4%; N = 814), gizzard shad (17.2%; N = 597), unidentified Catastomids (5.7%; N = 197), channel catfish (5.4%; N = 187), freshwater drum (4.8%; N = 168), and bullhead minnow (4.2%; N = 146).

Push trawls captured 3,671 fish consisting of at least 34 species (8 different categories of unidentifiable fish were captured as well; Appendix F7). Channel catfish dominated the catch (23.3%; N = 854) and unidentified cyprinids (22.6%; N = 828), followed by bullhead minnows (14.7%; N = 541), speckled chubs (12.4%; N = 455), unidentified *macrohybopsis* spp. (4.8%; N = 176), and freshwater drum (3.5%; N = 129).

## Discussion

Recaptures of several year classes of stocked pallid sturgeon in segment 13 indicate survival of individuals over time. Pallid sturgeon have been recaptured from every traceable stocking event in segment 13 (Boonville, MO). Pallid sturgeon are dispersing from this stocking location as well. Recapture information indicates upstream and downstream movement from this stocking location. Boonville stocked fish have been captured as far as 600 miles upstream and at least two fish were recently recaptured over two hundred miles downstream in the Mississippi River (Dave Herzog, Missouri Department of Conservation, personal communication). Relative weights of hatchery origin pallid sturgeon are in the “healthy” range (0.847 to 0.905) after several years in the wild. Fish stocked in the 1990’s are showing signs of sexual maturity (black eggs; Aaron Delonay, USGS, personal communication).

All Pallid sturgeon captures were in the CHNB mesohabitat indicating a preference for swift, deep water. Data from previous years indicate pallid sturgeon do use habitats other than CHNB such as POOL and ITIP (Utrup et al. 2006, Plauck et al. 2007). Mean capture depth in 2007 was similar to previous years, even though some sampling took place at higher discharge in 2007. Pallid sturgeon captures during every season reiterates the need for a year round, multi-gear sampling strategy.

### *Notable Trends*

Plauck et al. (2007) reported a decline in shovelnose sturgeon capture rates. While one year cannot document a change in population, it is of utmost importance that these fluctuations are noticed. Catch rates did improve for almost all gears and seasons in 2007. Many factors affect catch rates for a particular gear. Plauck et al. (2007) suggest FC trammel net data are the best indicator of population numbers since they do not reflect seasonal migratory behaviors or winter aggregations. Trammel net catch did increase in 2007 to 1.6 adult fish per 100 m. This catch rate has been as high as 2.7 fish per net night in the past (2004). Shovelnose sturgeon YOY otter trawl catch also increased relative to rates seen in previous years.

Fluctuating catch for all species can be attributed to seasonal migrations or aggregations, water levels, or variation in net placement. There is concern that low catch rates of shovelnose sturgeon

may be due to commercial harvest of this species. Caviar prices continue to rise, indicating shovelnose sturgeon numbers will continue to decline. Belly scars on sturgeon indicate commercial fishermen may be harming more fish than the ones they harvest. An egg check scar on a pallid sturgeon in segment 14 suggests commercial harvest of pallid sturgeon occurs.

Sporadic catch rates for all target species make annual analysis difficult. Catch rates for sturgeon chub and sicklefin chub declined in 2007. Speckled chub catch rate for otter trawls increased during FC 2007, but was lower during ST. Sand shiners (N = 1) and *Hybognathus* spp. (N = 6) were not captured in high enough numbers to estimate trends in their populations. Blue sucker catch rates were similar to previous years, indicating a stable population. Blue sucker catch rates for ST trammel netting and FC otter trawling show increases from previous years. Sauger catch rates increased in 2007 for all gears except 1-inch trammel nets.

#### *Additional gears*

The push trawl was added to the program in 2007. Push trawl catch data is being compared to mini-fyke nets to determine if the active push trawl is a satisfactory replacement. Push trawls offer many advantages to mini-fyke nets. First, only one trip is required to the selected bend, cutting fuel costs in half. Second, if a net does not fish, it can be re-deployed immediately and does not require an additional trip. In addition, a push trawl is less likely to trap and injure other wildlife (turtles, beavers, etc.). A push trawl can sample submerged bars where a mini-fyke can not be properly deployed. If the data illustrate that push trawls sample the same species as mini-fyke nets, they would be the most logical choice between the two sampling gear.

Preliminary results from segment 13 suggest that the push trawl is a highly effective gear for sampling speckled chubs and YOY *macrohybopsis* spp. Push trawls, fished only during FC, captured 631 chubs, whereas minifykes captured 38 species and otter trawls captured 456 species (in two seasons). More channel catfish were captured with the push trawl (N = 854) during FC than with the otter trawl (N = 584) during both seasons. However, push trawls did not capture blue catfish (N = 14) as effectively as otter trawls (N = 1,108).

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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, 5<sup>th</sup> edition (1991). Asterisks and bold type denote targeted native Missouri River species.

Scientific name	Common name	Letter Code
CLASS CEPHALASPIDOMORPHI-LAMPREYS		
ORDER PETROMYZONTIFORMES		
<b>Petromyzontidae – lampreys</b>		
<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		
<b>Acipenseridae – sturgeons</b>		
<i>Acipenser fulvescens</i>	Lake sturgeon	LKSG
<i>Scaphirhynchus</i> spp.	Unidentified Scaphirhynchus	USG
<b><i>Scaphirhynchus albus</i></b>	<b>Pallid sturgeon</b>	<b>PDSG*</b>
<b><i>Scaphirhynchus platyrhynchus</i></b>	<b>Shovelnose sturgeon</b>	<b>SNSG*</b>
<i>S. albus</i> X <i>S. platyrhynchus</i>	Pallid-shovelnose hybrid	SNPD
<b>Polyodontidae – paddlefishes</b>		
<i>Polyodon spathula</i>	Paddlefish	PDFH
ORDER LEPISOSTEIFORMES		
<b>Lepisosteidae – gars</b>		
<i>Lepisosteus oculatus</i>	Spotted gar	STGR
<i>Lepisosteus osseus</i>	Longnose gar	LNGR
<i>Lepisosteus platostomus</i>	Shortnose gar	SNGR
ORDER AMMIFORMES		
<b>Amiidae – bowfins</b>		
<i>Amia calva</i>	Bowfin	BWFN
ORDER OSTEOGLOSSIFORMES		
<b>Hiodontidae – mooneyes</b>		
<i>Hiodon alosoides</i>	Goldeye	GDEY
<i>Hiodon tergisus</i>	Mooneye	MNEY
ORDER ANGUILLIFORMES		
<b>Anguillidae – freshwater eels</b>		
<i>Anguilla rostrata</i>	American eel	AMEL

## Appendix A. (continued).

Scientific name	Common name	Letter Code
ORDER CLUPEIFORMES		
<b>Clupeidae – herrings</b>		
<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</i> X <i>D. petenense</i>	Gizzard-threadfin shad hybrid	GSTS
ORDER CYPRINIFORMES		
<b>Cyprinidae – carps and minnows</b>		
<i>Campostoma anomalum</i>	Central stoneroller	CLSR
<i>Campostoma oligolepis</i>	Largescale stoneroller	LSSR
<i>Carassus auratus</i>	Goldfish	GDFH
<i>Carassus auratus</i> X <i>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
<b><i>Hybognathus argyritis</i></b>	<b>Western silvery minnow</b>	<b>WSMN*</b>
<i>Hybognathus hankinsoni</i>	Brassy minnow	BSMN
<i>Hybognathus nuchalis</i>	Mississippi silvery minnow	SVMW
<b><i>Hybognathus placitus</i></b>	<b>Plains minnow</b>	<b>PNMW*</b>
<b><i>Hybognathus</i> spp.</b>	<b>Unidentified Hybognathus</b>	<b>HBNS*</b>
<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
<b><i>Macrhybopsis aestivalis</i></b>	<b>Speckled chub</b>	<b>SKCB*</b>
<b><i>Macrhybopsis gelida</i></b>	<b>Sturgeon chub</b>	<b>SGCB*</b>
<b><i>Macrhybopsis meeki</i></b>	<b>Sicklefin chub</b>	<b>SFCB*</b>
<i>Macrhybopsis storeriana</i>	Silver chub	SVCB
<i>M. aestivalis</i> X <i>M. gelida</i>	Speckled-Sturgeon chub hybrid	SPST
<i>M. gelida</i> X <i>M. meeki</i>	Sturgeon-Sicklefin chub hybrid	SCSC
<i>Macrhybopsis</i> spp.	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
<b>Cyprinidae – carps and minnows</b>		
<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
<b><i>Notropis stramineus</i></b>	<b>Sand shiner</b>	<b>SNSN*</b>
<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 vigilas</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
<b>Catostomidae - suckers</b>		
<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 Carpiodes	UCS
<i>Catostomus catostomus</i>	Longnose sucker	LNSK
<i>Catostomus commersoni</i>	White sucker	WTSK
<i>Catostomus platyrhincus</i>	Mountain sucker	MTSK
<i>Catostomus</i> spp.	Unidentified <i>Catostomus</i> spp.	UCA
<b><i>Cycleptus elongates</i></b>	<b>Blue sucker</b>	<b>BUSK*</b>
<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
<b>Catostomidae - suckers</b>	Unidentified Catostomidae	UCT
<b>ORDER SILURIFORMES</b>		
<b>Ictaluridae – bullhead catfishes</b>		
<i>Ameiurus melas</i>	Black bullhead	BKBH
<i>Ameiurus natalis</i>	Yellow bullhead	YLBH
<i>Ameiurusnebulosus</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 nocturnes</i>	Freckled madtom	FKMT
<i>Pylodictis olivaris</i>	Flathead catfish	FHCF
<b>ORDER SALMONIFORMES</b>		
<b>Esocidae - pikes</b>		
<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	TGMG
<b>Umbridae - mudminnows</b>		
<i>Umbra limi</i>	Central mudminnow	MDMN
<b>Osmeridae - smelts</b>		
<i>Osmerus mordax</i>	Rainbow smelt	RBST
<b>Salmonidae - trouts</b>		
<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>	Bonniville 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
	<b>ORDER PERCOPSIFORMES</b>	
	<b>Percopsidae – trout-perches</b>	
<i>Percopsis omiscomaycus</i>	Trout-perch	TTPH
	<b>ORDER GADIFORMES</b>	
	<b>Gadidae - cods</b>	
<i>Lota lota</i>	Burbot	BRBT
	<b>ORDER ATHERINIFORMES</b>	
	<b>Cyprinodontidae - killifishes</b>	
<i>Fundulus catenatus</i>	Northern studfish	NTSF
<i>Fundulus daphanus</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
	<b>Poeciliidae - livebearers</b>	
<i>Gambusia affinis</i>	Western mosquitofish	MQTF
	<b>Atherinidae - silversides</b>	
<i>Labidesthes sicculus</i>	Brook silverside	BKSS
	<b>ORDER GASTEROSTEIFORMES</b>	
	<b>Gasterosteidae - sticklebacks</b>	
<i>Culea inconstans</i>	Brook stickleback	BKSB
	<b>ORDER SCORPAENIFORMES</b>	
	<b>Cottidae - sculpins</b>	
<i>Cottus bairdi</i>	Mottled sculpin	MDSP
<i>Cottus carolinae</i>	Banded sculpin	BDSP
	<b>ORDER PERCIFORMES</b>	
	<b>Percichthyidae – temperate basses</b>	
<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
	<b>Centrarchidae - sunfishes</b>	
<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
<b>Centrarchidae - sunfishes</b>		
<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 punctatus</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
<b>Percidae - perches</b>		
<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 caproides</i>	Logperch	LGPH
<i>Percina cymatotaenia</i>	Bluestripe darter	BTDR
<i>Percina evides</i>	Gilt darter	GLDR
<i>Percina maculate</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
<b><i>Sander canadense</i></b>	<b>Sauger</b>	<b>SGER*</b>
<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
<b>Sciaenidae - drums</b>		
<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 <sup>3</sup> /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 <sup>3</sup> /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
Dam Tailwaters	Meso	Area below dam	DTWT
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 **xx** for the long-term pallid sturgeon and associated fish community sampling program. Long-term monitoring began in 20**xx** for segment **xx**.

Gear	Code	Type	Season	Years	CPUE units
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
Mini-fyke net	MF	Standard	Fish Comm.	2003 - Present	fish/net night
Push Trawl – 8 ft 4mm x 4mm	POT02	Evaluation	Fish Comm.	2006 - Present	fish/ m trawled
Trammel net – 1-inch inner mesh	TN	Standard	All	2003 - Present	fish/100 m drift
Trot Line – Circle hooks**	TLC_	Wild	Sturgeon	2007 - Present	fish/hook night
Trot Line – Octopus hooks**	TLO_	Wild	Sturgeon	2007 - Present	fish/hook night
Trot Line – O’Shaughnessy hooks**	TLS_	Wild	Sturgeon	2007 - Present	fish/hook 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

\* Standard only in upper Missouri River segments

\*\* Code ends with line length in feet (1 = 105 ft, 2 = 205 ft, 3 = 305 ft, 4 = 405 ft). Hooks are placed between 5 and 10 feet apart.

Appendix D. Stocking locations and codes 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 <sup>a</sup>	Primary Mark	Secondary Mark
1994	St. Charles	837	1992	3/9/1994	Fry	Coded Wire	Dangler
1994	Washington	607	1992	3/9/1994		Coded Wire	Dangler
1994	Herman	988	1992	3/9/1994	1yo	Coded Wire	Dangler
1997	St. Charles	400	1997	10/15/1997		Coded Wire	Dangler
1997	Washington	400	1997	10/16/1997	Fingerling	Coded Wire	Dangler
1997	Herman	400	1997	10/17/1997		Coded Wire	Dangler
2002	Boonville	2531	2001	4/3/2002		PIT Tag	Some Elastomer
2002	Boonville	165	1999	4/25/2002		PIT Tag	Elastomer
2003	Boonville	2852	2002	7/26/2003		PIT Tag	
2003	Boonville	1770	2003	12/2/2003		Coded Wire	Some Elastomer
2004	Boonville	774	2003	7/8/2004		PIT Tag	Elastomer
2004	Boonville	916	2003	7/30/2004		PIT Tag	
2004	Boonville	9761	2004	9/10/2004		Coded Wire	Elastomer
2004	Boonville	2199	2004	10/8/2004		Coded Wire	Elastomer

<sup>a</sup>Age of fish when stocked: Fry, Fingerling, Yearling, 1yo, 2yo, 3yo, etc...

## **Appendix F**

Total catch, overall mean catch per unit effort [ $\pm 2$  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 2006-2007. 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 on second line.

Species	Total Catch	Overall CPUE	CHXO		ISB		OSB		SCCL	
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP
BHCP	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0		
BHMW	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0		
BKSS	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0		
BLCF	80	0.364	0.278	0.562	0.111	0.629	0.111	0.5	0	0.5
		0.171	0.242	0.473	0.106	0.502	0.147	0.69		
BLGL	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0		
BMBF	1	0.005	0	0	0	0.016	0	0	0	0
		0.009	0	0	0	0.032	0	0		
BNMW	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0		
<b>BSMW*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>		
<b>BUSK*</b>	<b>14</b>	<b>0.064</b>	<b>0.111</b>	<b>0.031</b>	<b>0.097</b>	<b>0.048</b>	<b>0</b>	<b>0.071</b>	<b>0</b>	<b>0</b>
		<b>0.052</b>	<b>0.147</b>	<b>0.062</b>	<b>0.143</b>	<b>0.054</b>	<b>0</b>	<b>0.143</b>		
CARP	17	0.077	0.111	0.188	0.028	0.065	0.111	0.071	0	0
		0.049	0.222	0.221	0.039	0.077	0.222	0.143		
CKCB	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0		
CNCF	20	0.091	0.056	0.062	0.028	0.226	0.056	0	0	0
		0.081	0.111	0.125	0.056	0.266	0.111	0		
CNSN	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		
FHCF	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		
FWDM	14	0.064	0	0.094	0	0.032	0.111	0.5	0	0
		0.05	0	0.101	0	0.065	0.222	0.577		

Species	Total Catch	Overall CPUE	CHXO		ISB		OSB		SCCL	
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP
GDEY	36	0.164	0.389	0.062	0.111	0.226	0.167	0	0	1
		0.096	0.547	0.125	0.144	0.217	0.333	0		
GDRH	1	0.005	0	0	0	0	0.056	0	0	0
		0.009	0	0	0	0	0.111	0		
GNSF	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0		
GSCP	4	0.018	0	0.031	0.028	0.016	0	0	0	0
		0.018	0	0.062	0.039	0.032	0	0		
GZSD	23	0.105	0	0.062	0.083	0.21	0.056	0	0	0.5
		0.083	0	0.085	0.141	0.235	0.111	0		
<b>HBNS*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>		
HFCS	3	0.014	0	0.062	0	0.016	0	0	0	0
		0.02	0	0.125	0	0.032	0	0		
LGPH	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0		
LKSG	2	0.009	0	0	0.014	0	0	0.071	0	0
		0.013	0	0	0.028	0	0	0.143		
LMBS	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0		
LNGR	10	0.045	0	0	0	0.161	0	0	0	0
		0.065	0	0	0	0.229	0	0		
MMSN	0	0	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	0	0		
OSSF	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0		
<b>PDSG*</b>	<b>3</b>	<b>0.014</b>	<b>0</b>	<b>0</b>	<b>0.042</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0.016</b>	<b>0</b>	<b>0</b>	<b>0.047</b>	<b>0</b>	<b>0</b>	<b>0</b>		
<b>PNMW*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>		
RDSN	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0		
RVCS	24	0.109	0.111	0.125	0.028	0.145	0.056	0.429	0	0
		0.066	0.222	0.144	0.056	0.124	0.111	0.705		

Species	Total Catch	Overall CPUE	CHXO		ISB		OSB		SCCL	
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP
RVRH	0	0	0	0	0	0	0	0	0	0
RVSN	0	0	0	0	0	0	0	0	0	0
<b>SFCB*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>SGCB*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>SGER*</b>	<b>40</b>	<b>0.182</b>	<b>0.444</b>	<b>0.062</b>	<b>0.153</b>	<b>0.274</b>	<b>0.056</b>	<b>0.071</b>	<b>0</b>	<b>0</b>
		<b>0.109</b>	<b>0.455</b>	<b>0.085</b>	<b>0.177</b>	<b>0.293</b>	<b>0.111</b>	<b>0.143</b>		
SHRH	16	0.073	0.389	0	0.083	0.048	0	0	0	0
		0.051	0.401	0	0.075	0.097	0	0		
SJHR	1	0.005	0	0	0	0	0.056	0	0	0
		0.009	0	0	0	0	0.111	0		
<b>SKCB*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
SMBF	11	0.05	0.111	0.094	0	0.065	0	0.143	0	0
		0.041	0.147	0.188	0	0.077	0	0.286		
SNGR	45	0.205	0.5	0.25	0.194	0.21	0	0.071	0	0
		0.154	0.764	0.274	0.389	0.172	0	0.143		
SNPD	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0		
<b>SNSG</b>	<b>1170</b>	<b>5.318</b>	<b>6.778</b>	<b>7.625</b>	<b>3.486</b>	<b>7</b>	<b>3.222</b>	<b>4.143</b>	<b>1.5</b>	<b>0</b>
		<b>1.312</b>	<b>6.817</b>	<b>4.311</b>	<b>1.615</b>	<b>2.82</b>	<b>2.142</b>	<b>2.179</b>		
<b>SNSN*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>								
STBS	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0		
STCT	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		
SVCP	9	0.041	0	0.062	0.014	0.081	0	0.071	0	0
		0.029	0	0.085	0.028	0.082	0	0.143		
UBF	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0		

Species	Total Catch	Overall CPUE	CHXO		ISB		OSB		SCCL	
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP
UCA	0	0	0	0	0	0	0	0	0	0
UCN	0	0	0	0	0	0	0	0	0	0
UCS	0	0	0	0	0	0	0	0	0	0
UCT	0	0	0	0	0	0	0	0	0	0
UCY	0	0	0	0	0	0	0	0	0	0
UHY	0	0	0	0	0	0	0	0	0	0
UIC	0	0	0	0	0	0	0	0	0	0
ULP	0	0	0	0	0	0	0	0	0	0
UTB	0	0	0	0	0	0	0	0	0	0
WTBS	1	0.005	0	0	0	0.016	0	0	0	0
WTCP	0	0.009	0	0	0	0.032	0	0	0	0
YLBH	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0

Appendix F2. 1-inch Trammel Net: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors on second line.

Species	Total Catch	Overall CPUE	CHXO		ISB		SCCL			SCCS
			CHNB	POOL	CHNB	POOL	BAR	CHNB	ITIP	ITIP
BHCP	4	0.01	0.011	0	0.01	0	0	0	0	0
		0.01	0.022	0	0.012	0				
BHMW	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0				
BKSS	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0				
BLCF	86	0.186	0.371	0	0.148	0	0	0	0	0.625
		0.085	0.327	0	0.077	0				
BLGL	0	0	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	0	0				
BNMW	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0				
<b>BSMW*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		0	0	0	0	0				
<b>BUSK*</b>	<b>52</b>	<b>0.105</b>	<b>0.122</b>	<b>0</b>	<b>0.102</b>	<b>0.286</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0.045</b>	<b>0.09</b>	<b>0</b>	<b>0.054</b>	<b>0.571</b>				
CARP	6	0.014	0.011	0	0.016	0	0	0	0	0
		0.013	0.022	0	0.016	0				
CKCB	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0				
CNCF	22	0.058	0.084	0	0.054	0	0	0	0	0
		0.032	0.074	0	0.037	0				
CNSN	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				
FHCF	4	0.01	0.011	0	0.011	0	0	0	0	0
		0.011	0.022	0	0.013	0				
FHMW	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0				
FWDM	2	0.003	0	0	0.004	0	0	0	0	0
		0.004	0	0	0.005	0				

Species	Total Catch	Overall CPUE	CHXO		ISB		SCCL			SCCS
			CHNB	POOL	CHNB	POOL	BAR	CHNB	ITIP	ITIP
GDEY	8	0.028	0.074	0	0.019	0	0	0	0	0
		0.026	0.106	0	0.022	0				
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	0.001	0	0	0.002	0	0	0	0	0
		0.003	0	0	0.003	0				
GZSD	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0				
<b>HBNS*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>				
HFCS	1	0.002	0.012	0	0	0	0	0	0	0
		0.004	0.023	0	0	0				
LGPH	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0				
LKSG	1	0.001	0	0	0.002	0	0	0	0	0
		0.003	0	0	0.003	0				
LMBS	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0				
LNGR	6	0.016	0.035	0	0.012	0	0	0	0	0
		0.014	0.05	0	0.014	0				
MMSN	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	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0				
<b>PDSG*</b>	<b>6</b>	<b>0.017</b>	<b>0.052</b>	<b>0</b>	<b>0.01</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0.016</b>	<b>0.073</b>	<b>0</b>	<b>0.011</b>	<b>0</b>				
<b>PNMW*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>				
RDSN	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0				

Species	Total Catch	Overall CPUE	CHXO		ISB		SCCL			SCCS
			CHNB	POOL	CHNB	POOL	BAR	CHNB	ITIP	ITIP
RVCS	6	0.016	0.04	0	0.011	0	0	0	0	0
		0.017	0.081	0	0.012	0				
RVRH	1	0.005	0.03	0	0	0	0	0	0	0
		0.011	0.059	0	0	0				
RVSN	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0				
<b>SFCB*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>							
<b>SGCB*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>							
<b>SGER*</b>	<b>5</b>	<b>0.014</b>	<b>0.052</b>	<b>0</b>	<b>0.006</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0.014</b>	<b>0.073</b>	<b>0</b>	<b>0.007</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
SHRH	1	0.004	0.022	0	0	0	0	0	0	0
		0.008	0.044	0	0	0				
SJHR	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0				
<b>SKCB*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>							
SMBF	13	0.023	0.028	0.195	0.021	0	0	0	0	0
		0.014	0.039	0.389	0.015	0				
SNGR	2	0.003	0	0	0.004	0	0	0	0	0
		0.005	0	0	0.006	0				
SNPD	1	0.002	0	0	0.002	0	0	0	0	0
		0.004	0	0	0.005	0				
<b>SNSG*</b>	<b>676</b>	<b>1.74</b>	<b>3.438</b>	<b>2.013</b>	<b>1.357</b>	<b>1.238</b>	<b>5.172</b>	<b>0.333</b>	<b>0.943</b>	<b>0</b>
		<b>0.517</b>	<b>2.401</b>	<b>3.247</b>	<b>0.34</b>	<b>0.19</b>				
<b>SNSN*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>							
STBS	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0				
STCT	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				
SVCP	5	0.016	0.03	0	0.013	0	0	0	0	0
		0.015	0.059	0	0.014	0				

Species	Total Catch	Overall CPUE	CHXO		ISB		SCCL			SCCS
			CHNB	POOL	CHNB	POOL	BAR	CHNB	ITIP	ITIP
UBF	0	0	0	0	0	0	0	0	0	0
UCA	0	0	0	0	0	0	0	0	0	0
UCN	0	0	0	0	0	0	0	0	0	0
UCS	0	0	0	0	0	0	0	0	0	0
UCT	0	0	0	0	0	0	0	0	0	0
UCY	0	0	0	0	0	0	0	0	0	0
UHY	0	0	0	0	0	0	0	0	0	0
UIC	0	0	0	0	0	0	0	0	0	0
ULP	0	0	0	0	0	0	0	0	0	0
UTB	0	0	0	0	0	0	0	0	0	0
WTBS	0	0	0	0	0	0	0	0	0	0
WTCP	0	0	0	0	0	0	0	0	0	0
YLBH	0	0	0	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 on second line.

Species	Total Catch	Overall CPUE	CHXO	ISB		OSB	SCCL		SCCS
			CHNB	CHNB	POOL	CHNB	CHNB	ITIP	ITIP
BHCP	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0
BHMW	4	0.008	0	0.01	0	0	0	0	0
		0.008	0	0.01		0	0	0	0
BKSS	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0
BLCF	1108	1.966	3.024	1.541	52.5	0	0	0.171	2.566
		0.708	1.926	0.575		0	0	0.342	3.395
BLGL	0	0	0	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	0	0	0
BNMW	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0
<b>BSMW*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>	<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>BUSK*</b>	<b>16</b>	<b>0.029</b>	<b>0.032</b>	<b>0.028</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.142</b>
		<b>0.017</b>	<b>0.045</b>	<b>0.019</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0.284</b>
CARP	8	0.014	0.017	0.014	0	0	0	0	0
		0.011	0.034	0.013		0	0	0	0
CKCB	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0
CNCF	584	1.288	1.585	1.247	6.875	0	0.426	0.499	0.833
		0.54	0.7	0.676		0	0.348	0.652	1.667
CNSN	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0
ERSN	24	0.04	0.018	0.043	0	0	0	0	0.247
		0.031	0.037	0.039		0	0	0	0.494
FHCF	12	0.023	0.035	0.019	0	0	0	0.128	0
		0.014	0.04	0.015		0	0	0.256	0
FHMW	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0
FWDM	77	0.173	0.314	0.126	5	0	0.086	0	0
		0.08	0.186	0.077		0	0.172	0	0

Species	Total Catch	Overall CPUE	CHXO	ISB		OSB	SCCL		SCCS
			CHNB	CHNB	POOL	CHNB	CHNB	ITIP	ITIP
GDEY	35	0.053	0.094	0.046	0	0	0.132	0	0
		0.044	0.145	0.047		0	0.263	0	0
GDRH	0	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	0
GSCP	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0
GZSD	1	0.002	0	0.003	0	0	0	0	0
		0.005	0	0.006		0	0	0	0
<b>HBNS*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>	<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
HFCS	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0
LGPH	0	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	0
LMBS	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0
LNDR	1	0.002	0	0.003	0	0	0	0	0
		0.004	0	0.005		0	0	0	0
MMSN	3	0.005	0	0.004	0	0	0	0	0.167
		0.007	0	0.007		0	0	0	0.333
MQTF	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
<b>PDSG*</b>	<b>2</b>	<b>0.003</b>	<b>0.012</b>	<b>0.002</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0.005</b>	<b>0.024</b>	<b>0.004</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>PNMW*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>	<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
RDSN	3	0.004	0	0.006	0	0	0	0	0
		0.006	0	0.008		0	0	0	0
RVCS	7	0.018	0.048	0.013	0	0	0	0	0
		0.014	0.057	0.013		0	0	0	0

Species	Total Catch	Overall CPUE	CHXO	ISB		OSB	SCCL		SCCS
			CHNB	CHNB	POOL	CHNB	CHNB	ITIP	ITIP
RVRH	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0
RVSN	1	0.003	0	0	0	0	0	0	0.247
		0.006	0	0		0	0	0	0.494
<b>SFCB*</b>	<b>109</b>	<b>0.226</b>	<b>0.168</b>	<b>0.246</b>	<b>0</b>	<b>0</b>	<b>0.25</b>	<b>0</b>	<b>0.167</b>
		<b>0.071</b>	<b>0.152</b>	<b>0.084</b>		<b>0</b>	<b>0.5</b>	<b>0</b>	<b>0.333</b>
<b>SGCB*</b>	<b>14</b>	<b>0.026</b>	<b>0.041</b>	<b>0.015</b>	<b>0</b>	<b>0</b>	<b>0.069</b>	<b>0</b>	<b>0.494</b>
		<b>0.017</b>	<b>0.047</b>	<b>0.011</b>		<b>0</b>	<b>0.139</b>	<b>0</b>	<b>0.988</b>
<b>SGER*</b>	<b>5</b>	<b>0.008</b>	<b>0.017</b>	<b>0.006</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0.007</b>	<b>0.024</b>	<b>0.007</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
SHRH	0	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	0
<b>SKCB*</b>	<b>331</b>	<b>0.69</b>	<b>0.781</b>	<b>0.703</b>	<b>0</b>	<b>0</b>	<b>0.069</b>	<b>0</b>	<b>0.883</b>
		<b>0.26</b>	<b>0.705</b>	<b>0.297</b>		<b>0</b>	<b>0.139</b>	<b>0</b>	<b>1.362</b>
SMBF	2	0.003	0	0.004	0	0	0	0	0
		0.007	0	0.009		0	0	0	0
SNGR	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0
SNPD	1	0.004	0	0.005	0	0	0	0	0
		0.007	0	0.009		0	0	0	0
<b>SNSG*</b>	<b>431</b>	<b>0.83</b>	<b>1.032</b>	<b>0.734</b>	<b>1.25</b>	<b>0</b>	<b>0.481</b>	<b>4.573</b>	<b>1.061</b>
		<b>0.19</b>	<b>0.555</b>	<b>0.164</b>		<b>0</b>	<b>0.75</b>	<b>8.141</b>	<b>1.069</b>
<b>SNSN*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>	<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
STBS	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0
STCT	4	0.011	0.015	0.007	0	0	0	0	0.247
		0.011	0.03	0.011		0	0	0	0.494
SVCB	54	0.092	0.058	0.099	0	0	0	0.37	0
		0.056	0.051	0.07		0	0	0.741	0
SVCP	2	0.004	0.009	0.004	0	0	0	0	0
		0.006	0.017	0.007		0	0	0	0
UBF	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0

Species	Total Catch	Overall CPUE	CHXO	ISB		OSB	SCCL		SCCS
			CHNB	CHNB	POOL	CHNB	CHNB	ITIP	ITIP
UCA	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0
UCN	1	0.001	0	0.002	0	0	0	0	0
		0.003	0	0.004		0	0	0	0
UCS	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
UCY	4	0.007	0.024	0.004	0	0	0	0	0
		0.009	0.049	0.005		0	0	0	0
UHY	2	0.003	0	0.004	0	0	0	0	0
		0.006	0	0.007		0	0	0	0
UIC	191	0.342	0.208	0.368	1.25	1.255	0	0	0.426
		0.174	0.31	0.213		0.157	0	0	0.851
ULP	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0
UTB	0	0	0	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	0	0	0
WTCP	0	0	0	0	0	0	0	0	0
		0	0	0		0	0	0	0
YLBH	0	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 on second line.

Species	Total Catch	Overall CPUE	CHXO	ISB		OSB	SCCL		SCCS	SCN	TRML	TRMS
			BAR	BAR	CHNB	BAR	BAR	ITIP	BAR	BAR	BAR	BAR
BHCP	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
BHMW	146	1.659	2	1.071	1.5	3.733	0.5	0	0	0	0.5	1.5
		0.816	1.029	0.796	1	4.143	0.378	0	0	0	1	1.732
BKSS	1	0.011	0	0	0	0.067	0	0	0	0	0	0
		0.023	0	0	0	0.133	0	0	0	0	0	0
BLCF	2	0.023	0	0	0	0	0	0	0	0	0.5	0.25
		0.032	0	0	0	0	0	0	0	0	1	0.5
BLGL	24	0.273	0.261	0.107	0	0.267	0	0.5	0	0	3.5	0.75
		0.188	0.382	0.157	0	0.307	0	1	0	0	5	0.957
BMBF	1	0.011	0	0	0	0	0.125	0	0	0	0	0
		0.023	0	0	0	0	0.25	0	0	0	0	0
BNMW	6	0.068	0.043	0.036	0	0.2	0	0	0	0	0	0.25
		0.054	0.087	0.071	0	0.214	0	0	0	0	0	0.5
<b>BSMW*</b>	<b>1</b>	<b>0.011</b>	<b>0</b>	<b>0.036</b>	<b>0</b>							
		<b>0.023</b>	<b>0</b>	<b>0.071</b>	<b>0</b>							
<b>BUSK*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
CARP	18	0.205	0.261	0.214	1.5	0	0	0	0	0	0.5	0.5
		0.113	0.314	0.158	1	0	0	0	0	0	1	0.577
CKCB	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
CNCF	187	2.125	1.522	3.286	20	0.933	0.125	0	0	0	0	1.25
		1.443	1.088	3.43	40	0.816	0.25	0	0	0	0	0.5
CNSN	7	0.08	0.087	0.107	0	0.067	0.125	0	0	0	0	0
		0.066	0.174	0.119	0	0.133	0.25	0	0	0	0	0
ERSN	864	9.818	0.87	21.964	1.5	14.067	1.25	0	1.667	0	0	0
		7.686	1.234	20.328	1	22.552	1.296	0	2.404	0	0	0
FHCF	4	0.045	0.087	0.036	0	0.067	0	0	0	0	0	0
		0.055	0.174	0.071	0	0.133	0	0	0	0	0	0
FHMW	2	0.023	0	0	0	0.133	0	0	0	0	0	0
		0.045	0	0	0	0.267	0	0	0	0	0	0
FWDM	168	1.909	1.609	2.286	4.5	1.933	0.125	2	2.667	0	3	2.5
		0.63	1.249	1.451	3	1.059	0.25	4	2.404	0	6	1.915

Species	Total Catch	Overall CPUE	CHXO	ISB		OSB	SCCL		SCCS	SCN	TRML	TRMS
			BAR	BAR	CHNB	BAR	BAR	ITIP	BAR	BAR	BAR	BAR
GDEY	3	0.034	0.087	0	0	0	0	0.5	0	0	0	0
		0.051	0.174	0	0	0	0	1	0	0	0	0
GDRH	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
GNSF	7	0.08	0.087	0.036	0	0.267	0	0	0	0	0	0
		0.074	0.174	0.071	0	0.307	0	0	0	0	0	0
GSCP	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
GZSD	597	6.784	5.217	12.857	2	3.8	0.25	0.5	5.333	0	0	9.25
		3.352	4.426	8.981	4	4.034	0.327	1	4.667	0	0	18.5
<b>HBNS*</b>	<b>4</b>	<b>0.045</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.2</b>	<b>0.125</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0.072</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.4</b>	<b>0.25</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
HFCS	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
LGPH	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0
LMBS	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
LNGR	15	0.17	0.217	0.179	0	0.267	0.125	0	0	0	0	0
		0.087	0.176	0.18	0	0.236	0.25	0	0	0	0	0
MMSN	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
MQTF	22	0.25	0.043	0.357	0	0.667	0.125	0	0	0	0	0
		0.184	0.087	0.427	0	0.667	0.25	0	0	0	0	0
OSSF	12	0.136	0.174	0.107	0	0.2	0	0	0	1	0	0.25
		0.087	0.205	0.157	0	0.214	0	0	0	0	0	0.5
<b>PDSG*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>PNMW*</b>	<b>1</b>	<b>0.011</b>	<b>0</b>	<b>0.036</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0.023</b>	<b>0</b>	<b>0.071</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
RDSN	814	9.25	10.522	14.036	0.5	6.933	2.25	23.5	2.333	0	0	0.5
		4.571	7.938	12.127	1	5.788	1.296	5	1.333	0	0	1
RVCS	25	0.284	0.043	0.607	0	0.267	0	0	1	0	0	0
		0.165	0.087	0.441	0	0.307	0	0	1.155	0	0	0

Species	Total Catch	Overall CPUE	CHXO	ISB		OSB	SCCL		SCCS	SCN	TRML	TRMS
			BAR	BAR	CHNB	BAR	BAR	ITIP	BAR	BAR	BAR	BAR
RVRH	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
RVSN	17	0.193	0.13	0.357	0.5	0.067	0.125	0	0	0	0.5	0
		0.219	0.261	0.644	1	0.133	0.25	0	0	0	1	0
<b>SFCB*</b>	<b>21</b>	<b>0.239</b>	<b>0</b>	<b>0.679</b>	<b>0</b>	<b>0.133</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0.41</b>	<b>0</b>	<b>1.285</b>	<b>0</b>	<b>0.182</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>SGCB*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>SGER*</b>	<b>1</b>	<b>0.011</b>	<b>0.043</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0.023</b>	<b>0.087</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
SHRH	0	0	0	0	0	0	0	0	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	0	0	0
		0.023	0.087	0	0	0	0	0	0	0	0	0
<b>SKCB*</b>	<b>9</b>	<b>0.102</b>	<b>0.261</b>	<b>0.107</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0.152</b>	<b>0.522</b>	<b>0.214</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
SMBF	26	0.295	0.174	0.214	0	0.667	0.25	0	0	0	0	1
		0.162	0.24	0.259	0	0.637	0.327	0	0	0	0	0.816
SNGR	65	0.739	0.696	0.821	1	1	0.75	0	0.667	1	0	0
		0.266	0.554	0.591	2	0.552	0.5	0	1.333	0	0	0
SNPD	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
<b>SNSG*</b>	<b>1</b>	<b>0.011</b>	<b>0.043</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0.023</b>	<b>0.087</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>SNSN*</b>	<b>1</b>	<b>0.011</b>	<b>0</b>	<b>0.036</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0.023</b>	<b>0</b>	<b>0.071</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
STBS	1	0.011	0	0	0	0	0	0	0	1	0	0
		0.023	0	0	0	0	0	0	0	0	0	0
STCT	2	0.023	0	0.036	0	0.067	0	0	0	0	0	0
		0.032	0	0.071	0	0.133	0	0	0	0	0	0
SVCB	6	0.068	0	0.179	0	0	0	0.5	0	0	0	0
		0.096	0	0.292	0	0	0	1	0	0	0	0
SVCP	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
UBF	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0

Species	Total Catch	Overall CPUE	CHXO	ISB		OSB	SCCL		SCCS	SCN	TRML	TRMS
			BAR	BAR	CHNB	BAR	BAR	ITIP	BAR	BAR	BAR	BAR
UCA	56	0.636	0	0.286	0	0.133	0	0	0	46	0	0
		1.059	0	0.571	0	0.182	0	0	0		0	0
UCN	1	0.011	0	0.036	0	0	0	0	0	0	0	0
		0.023	0	0.071	0	0	0	0	0		0	0
UCS	1	0.011	0	0	0	0	0.125	0	0	0	0	0
		0.023	0	0	0	0	0.25	0	0		0	0
UCT	197	2.239	0.478	4.536	0.5	0.467	4.625	0	2.667	0	0	1.5
		1.468	0.451	4.276	1	0.384	4.325	0	2.667		0	2.38
UCY	43	0.489	0.261	0.679	0	0.6	0.125	0	0	3	2	0.25
		0.274	0.258	0.635	0	0.8	0.25	0	0		4	0.5
UHY	8	0.091	0.043	0.036	2.5	0.067	0	0	0	0	0	0
		0.119	0.087	0.071	5	0.133	0	0	0		0	0
UIC	3	0.034	0	0	0	0.133	0	0	0	0	0.5	0
		0.051	0	0	0	0.267	0	0	0		1	0
ULP	6	0.068	0.087	0	0	0.067	0	0	0	3	0	0
		0.084	0.174	0	0	0.133	0	0	0		0	0
UTB	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0		0	0
WTBS	39	0.443	0.217	0.393	2.5	0.2	0.75	4	0	0	0	0.25
		0.233	0.25	0.297	5	0.214	0.732	6	0		0	0.5
WTCP	38	0.432	0.391	0.214	0	0.067	0.375	0	0.667	0	1.5	3.5
		0.298	0.392	0.297	0	0.133	0.526	0	1.333		1	5.196
YLBH	2	0.023	0	0.036	0	0	0.125	0	0	0	0	0
		0.032	0	0.071	0	0	0.25	0	0		0	0

Appendix F7. Push Trawl: Overall season and segment summary. Lists CPUE (fish/net night) and 2 standard errors on second line.

Species	Total Catch	Overall CPUE	CHXO		ISB		OSB	SCCL		SCCS		TRMS
			BAR	CHNB	BAR	CHNB	BAR	BAR	CHNB	BAR	CHNB	BAR
BHCP	0	0	0	0	0	0	0	0	0	0	0	0
		0	0		0	0	0		0			0
BHMW	541	12.756	13.224	0	13.572	0	1	0	0	11.667	0	101.33
		10.727	19.722		22.06	0	1.155			9.188		69.333
BKSS	6	0.12	0	0	0.126	0	0	0	0	0	0	2.5
		0.158	0		0.194	0	0			0		5
BLCF	14	0.285	0.168	0	0.444	0.104	0	0	0	0.496	0	0
		0.265	0.336		0.595	0.208	0			0.728		0
BLGL	17	0.432	0.059	7.5	0.322	0	1.5	0	0.769	0.357	0	1.833
		0.279	0.118		0.293	0	1.915			0.714		0.333
BMBF	0	0	0	0	0	0	0	0	0	0	0	0
		0	0		0	0	0			0		0
BNMW	25	0.553	0.395	2.5	0.528	0.125	3	0	2.308	0	0	0
		0.396	0.675		0.563	0.25	4.761			0		0
<b>BSMW*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>			<b>0</b>		<b>0</b>
<b>BUSK*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>			<b>0</b>		<b>0</b>
CARP	5	0.104	0.38	0	0.034	0	0	0	0	0	0	0
		0.156	0.645		0.069	0	0			0		0
CKCB	2	0.042	0	0	0.103	0	0	0	0	0	0	0
		0.062	0		0.152	0	0			0		0
CNCF	854	30.189	70.391	0	8.049	0.586	0.5	0.714	13.077	89.754	5	0
		26.725	96.445		6.574	0.713	1			115.38		0
CNSN	25	0.414	0.39	0	0.714	0	0	0	0	0.313	0	0
		0.307	0.479		0.689	0	0			0.438		0
ERSN	74	2.241	0.294	0	4.133	0.438	0.625	0.714	0.769	3.318	2.5	0
		2.974	0.478		7.227	0.515	1.25			5.627		0
FHCF	1	0.014	0.059	0	0	0	0	0	0	0	0	0
		0.028	0.118		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
FWDM	129	4.289	7.294	0	4.665	0	1	0.714	3.846	5.119	0	0
		2.373	5.87		4.088	0	2			8.495		0

Species	Total Catch	Overall CPUE	CHXO		ISB		OSB	SCCL		SCCS		TRMS
			BAR	CHNB	BAR	CHNB	BAR	BAR	CHNB	BAR	CHNB	BAR
GDEY	10	0.215	0.412	0	0.071	0	0	0.714	0.769	0.618	0	0
		0.18	0.62		0.099	0	0			0.822		0
GDRH	0	0	0	0	0	0	0	0	0	0	0	0
		0	0		0	0	0			0		0
GNSF	2	0.06	0.254	0	0	0	0	0	0	0	0	0
		0.085	0.353		0	0	0			0		0
GSCP	0	0	0	0	0	0	0	0	0	0	0	0
		0	0		0	0	0			0		0
GZSD	54	1.269	1.605	0	1.222	0	1	0	0	0.125	0	11.833
		0.787	1.662		0.822	0	1.155			0.25		20.333
<b>HBNS*</b>	<b>1</b>	<b>0.023</b>	<b>0</b>	<b>0.833</b>								
		<b>0.046</b>	<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>			<b>0</b>		<b>1.667</b>
HFCS	0	0	0	0	0	0	0	0	0	0	0	0
		0	0		0	0	0			0		0
LGPH	1	0.014	0	0	0	0.125	0	0	0	0	0	0
		0.028	0		0	0.25	0			0		0
LKSG	0	0	0	0	0	0	0	0	0	0	0	0
		0	0		0	0	0			0		0
LMBS	1	0.035	0	2.5	0	0	0	0	0	0	0	0
		0.069	0		0	0	0			0		0
LNGR	11	0.233	0.314	0	0.253	0	0.5	0	0	0.26	0	0
		0.164	0.354		0.297	0	1			0.521		0
MMSN	0	0	0	0	0	0	0	0	0	0	0	0
		0	0		0	0	0			0		0
MQTF	5	0.095	0.065	0	0.081	0	0	0	0	0	0	1.667
		0.107	0.131		0.113	0	0			0		3.333
OSSF	4	0.106	0	0	0	0	1.5	0	0	0	0	0.833
		0.172	0		0	0	3			0		1.667
<b>PDSG*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>			<b>0</b>		<b>0</b>
<b>PNMW*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>			<b>0</b>		<b>0</b>
RDSN	92	2.038	2.894	0	2.803	0.25	0	0.714	4.615	1.114	0	0
		1.081	3.109		1.86	0.5	0			1.422		0
RVCS	10	0.268	0.607	5	0.027	0	0	0	0	0.403	0	0
		0.231	0.724		0.053	0	0			0.576		0

Species	Total Catch	Overall CPUE	CHXO		ISB		OSB	SCCL		SCCS		TRMS
			BAR	CHNB	BAR	CHNB	BAR	BAR	CHNB	BAR	CHNB	BAR
RVRH	0	0	0	0	0	0	0	0	0	0	0	0
		0	0		0	0	0			0		0
RVSN	45	0.862	0.098	0	1.262	0	0	0	0	0.472	0	10
		0.999	0.196		2.076	0	0			0.48		20
<b>SFCB*</b>	<b>40</b>	<b>0.826</b>	<b>0.294</b>	<b>0</b>	<b>0.389</b>	<b>0</b>	<b>0.625</b>	<b>0</b>	<b>0</b>	<b>5.083</b>	<b>0</b>	<b>0</b>
		<b>0.957</b>	<b>0.588</b>		<b>0.303</b>	<b>0</b>	<b>1.25</b>			<b>8.273</b>		<b>0</b>
<b>SGCB*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>			<b>0</b>		<b>0</b>
<b>SGER*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0</b>	<b>0</b>		<b>0</b>	<b>0</b>	<b>0</b>			<b>0</b>		<b>0</b>
SHRH	0	0	0	0	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	0	0			0		0
<b>SKCB*</b>	<b>455</b>	<b>13.091</b>	<b>6.843</b>	<b>0</b>	<b>14.237</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>51.671</b>	<b>0</b>	<b>0</b>
		<b>13.355</b>	<b>12.09</b>		<b>23.951</b>	<b>0</b>	<b>0</b>			<b>78.314</b>		<b>0</b>
SMBF	38	0.749	0.196	0	1.745	0	0	0	0	0	0	0
		1.235	0.392		3.05	0	0			0		0
SNGR	0	0	0	0	0	0	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	0		0	0	0			0		0
<b>SNSG*</b>	<b>3</b>	<b>0.035</b>	<b>0</b>	<b>0</b>	<b>0.038</b>	<b>0.104</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.069</b>	<b>0</b>	<b>0</b>
		<b>0.041</b>	<b>0</b>		<b>0.077</b>	<b>0.208</b>	<b>0</b>			<b>0.139</b>		<b>0</b>
<b>SNSN*</b>	<b>2</b>	<b>0.048</b>	<b>0.205</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>0.068</b>	<b>0.281</b>		<b>0</b>	<b>0</b>	<b>0</b>			<b>0</b>		<b>0</b>
STBS	9	0.176	0	0	0.207	0	0	0	0	0	0	3.333
		0.206	0		0.23	0	0			0		6.667
STCT	2	0.079	0	0	0	0	0	0	0	0.714	0	0
		0.159	0		0	0	0			1.429		0
SVCB	35	0.93	0.536	2.5	0.939	0	0	0	0	2.847	0	2.667
		0.748	0.942		1.131	0	0			4.931		1.333
SVCP	0	0	0	0	0	0	0	0	0	0	0	0
		0	0		0	0	0			0		0
UBF	2	0.043	0	0	0.038	0	0.5	0	0	0	0	0
		0.063	0		0.077	0	1			0		0

Species	Total Catch	Overall CPUE	CHXO		ISB		OSB	SCCL		SCCS		TRMS
			BAR	CHNB	BAR	CHNB	BAR	BAR	CHNB	BAR	CHNB	BAR
UCA	0	0	0	0	0	0	0	0	0	0	0	0
		0	0		0	0	0			0		0
UCN	1	0.023	0	0	0	0	0	0	0	0	0	0.833
		0.046	0		0	0	0			0		1.667
UCS	13	0.465	0.19	0	0.9	0	0	0	0	0.521	0	0
		0.528	0.28		1.265	0	0			1.042		0
UCT	76	2.257	2.989	0	3.471	0	1	0	0	0.885	0	0
		1.531	3.927		2.959	0	2			0.88		0
UCY	828	22.895	25.406	0	7.405	0.5	1.25	0	0	100.641	35	76.333
		21.691	30.088		5.563	1	2.5			182.143		20.667
UHY	176	7.831	14.895	0	7.983	0.25	0	0	0	9.643	0	0
		8.939	26.368		15.327	0.5	0			19.286		0
UIC	18	0.561	1.176	0	0.038	0.104	0	0	0	2.302	0	0
		0.702	2.353		0.077	0.208	0			3.852		0
ULP	0	0	0	0	0	0	0	0	0	0	0	0
		0	0		0	0	0			0		0
UTB	13	0.329	0	0	0	0	0	0	0	0	0	11.833
		0.462	0		0	0	0			0		0.333
WTBS	29	0.519	0.639	0	0.762	0	0	3.571	0	0.104	0	0
		0.309	0.545		0.643	0	0			0.208		0
WTCP	2	0.033	0.139	0	0	0	0	0	0	0	0	0
		0.046	0.191		0	0	0			0		0
YLBH	0	0	0	0	0	0	0	0	0	0	0	0
		0	0		0	0	0			0		0

Appendix G. Hatchery names, locations, and abbreviations.

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<b>Hatchery</b>	<b>State</b>	<b>Abbreviation</b>
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

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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 2006 – 2007 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	Gill Net	Otter Trawl	1-inch Trammel Net	Mini-Fyke Net	Otter Trawl	Push Trawl
BHCP	0.021	0.000	0.000	0.000	0.000	0.000	0.000
BHMW	0.000	0.000	0.012	0.000	1.659	0.003	12.756
BKSS	0.000	0.000	0.000	0.000	0.011	0.000	0.120
BLCF	0.044	0.364	0.246	0.317	0.023	3.686	0.285
BLGL	0.000	0.000	0.000	0.000	0.273	0.000	0.432
BMBF	0.000	0.005	0.000	0.000	0.011	0.000	0.000
BNMW	0.000	0.000	0.000	0.000	0.068	0.000	0.553
<b>BSMW*</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.011</b>	<b>0.000</b>	<b>0.000</b>
<b>BUSK*</b>	<b>0.134</b>	<b>0.064</b>	<b>0.020</b>	<b>0.078</b>	<b>0.000</b>	<b>0.039</b>	<b>0.000</b>
CARP	0.017	0.077	0.019	0.012	0.205	0.008	0.104
CKCB	0.000	0.000	0.000	0.000	0.000	0.000	0.042
CNCF	0.031	0.091	1.170	0.083	2.125	1.407	30.189
CNSN	0.000	0.000	0.000	0.000	0.080	0.000	0.414
ERSN	0.000	0.000	0.054	0.000	9.818	0.025	2.241
FHCF	0.018	0.000	0.024	0.004	0.045	0.021	0.014
FHMW	0.000	0.000	0.000	0.000	0.023	0.000	0.000
FWDM	0.003	0.064	0.166	0.003	1.909	0.181	4.289
GDEY	0.003	0.164	0.005	0.051	0.034	0.102	0.215
GDRH	0.000	0.005	0.000	0.000	0.000	0.000	0.000

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)			Fish Community Season (Summer)			
	1-inch Trammel Net	Gill Net	Otter Trawl	1-inch Trammel Net	Mini-Fyke Net	Otter Trawl	Push Trawl
GNSF	0.000	0.000	0.000	0.000	0.080	0.000	0.060
GSCP	0.003	0.018	0.000	0.000	0.000	0.000	0.000
GZSD	0.000	0.105	0.005	0.000	6.784	0.000	1.269
<b>HBNS*</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.045</b>	<b>0.000</b>	<b>0.023</b>
HFCS	0.000	0.014	0.000	0.004	0.000	0.000	0.000
LGPH	0.000	0.000	0.000	0.000	0.000	0.000	0.014
LKSG	0.000	0.009	0.000	0.003	0.000	0.000	0.000
LMBS	0.000	0.000	0.000	0.000	0.000	0.000	0.035
LNGR	0.008	0.045	0.000	0.023	0.170	0.004	0.233
MMSN	0.000	0.000	0.010	0.000	0.000	0.000	0.000
MQTF	0.000	0.000	0.000	0.000	0.250	0.000	0.095
NFSH	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OSSF	0.000	0.000	0.000	0.000	0.136	0.000	0.106
<b>PDSG*</b>	<b>0.017</b>	<b>0.014</b>	<b>0.000</b>	<b>0.017</b>	<b>0.000</b>	<b>0.007</b>	<b>0.000</b>
<b>PNMW*</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.011</b>	<b>0.000</b>	<b>0.000</b>
RDSN	0.000	0.000	0.006	0.000	9.250	0.003	2.038
RVCS	0.008	0.109	0.014	0.023	0.284	0.021	0.268
RVRH	0.011	0.000	0.000	0.000	0.000	0.000	0.000
RVSN	0.000	0.000	0.006	0.000	0.193	0.000	0.862
<b>SFCB*</b>	<b>0.000</b>	<b>0.000</b>	<b>0.227</b>	<b>0.000</b>	<b>0.239</b>	<b>0.225</b>	<b>0.826</b>

## Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)			Fish Community Season (Summer)			
	1-inch Trammel Net	Gill Net	Otter Trawl	1-inch Trammel Net	Mini-Fyke Net	Otter Trawl	Push Trawl
SGCB*	<b>0.000</b>	<b>0.000</b>	<b>0.029</b>	<b>0.000</b>	<b>0.000</b>	<b>0.023</b>	<b>0.000</b>
SGER*	<b>0.015</b>	<b>0.182</b>	<b>0.003</b>	<b>0.014</b>	<b>0.011</b>	<b>0.012</b>	<b>0.000</b>
SHRH	0.000	0.073	0.000	0.008	0.000	0.000	0.000
SJHR	0.000	0.005	0.000	0.000	0.011	0.000	0.000
SKCB*	<b>0.000</b>	<b>0.000</b>	<b>0.408</b>	<b>0.000</b>	<b>0.102</b>	<b>0.972</b>	<b>13.091</b>
SMBF	0.024	0.050	0.000	0.023	0.295	0.007	0.749
SNGR	0.000	0.205	0.000	0.006	0.739	0.000	0.000
SNPD	0.000	0.000	0.007	0.004	0.000	0.000	0.000
SNSG*	<b>1.649</b>	<b>5.318</b>	<b>0.766</b>	<b>1.824</b>	<b>0.011</b>	<b>0.894</b>	<b>0.035</b>
SNSN*	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.011</b>	<b>0.000</b>	<b>0.048</b>
STBS	0.000	0.000	0.000	0.000	0.011	0.000	0.176
STCT	0.000	0.000	0.018	0.000	0.023	0.005	0.079
SVCB	0.000	0.000	0.158	0.000	0.068	0.025	0.930
SVCP	0.022	0.041	0.006	0.010	0.000	0.003	0.000
UBF	0.000	0.000	0.000	0.000	0.000	0.000	0.043
UCA	0.000	0.000	0.000	0.000	0.636	0.000	0.000
UCN	0.000	0.000	0.000	0.000	0.011	0.003	0.023
UCS	0.000	0.000	0.000	0.000	0.011	0.000	0.465
UCT	0.000	0.000	0.000	0.000	2.239	0.000	2.257
UCY	0.000	0.000	0.006	0.000	0.489	0.008	22.895

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)			Fish Community Season (Summer)			
	1-inch Trammel Net	Gill Net	Otter Trawl	1-inch Trammel Net	Mini-Fyke Net	Otter Trawl	Push Trawl
UHY	0.000	0.000	0.000	0.000	0.091	0.006	7.831
UIC	0.000	0.000	0.306	0.000	0.034	0.378	0.561
ULP	0.000	0.000	0.000	0.000	0.068	0.000	0.000
UTB	0.000	0.000	0.000	0.000	0.000	0.000	0.329
WTBS	0.000	0.005	0.000	0.000	0.443	0.000	0.519
WTCP	0.000	0.000	0.000	0.000	0.432	0.000	0.033
YLBH	0.000	0.000	0.000	0.000	0.023	0.000	0.000

Appendix I. Comprehensive list of bend numbers and locations for segment 13 of the Missouri River comparing bend selection for both sturgeon season (ST) and fish community season (FC) between years from 2003 – 2007. \*Coordinate is upstream-most point of bend.

<b>Bend</b>		<b>Coordinates*</b>					<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
<b>Number</b>	<b>Name</b>	<b>River Mile</b>	<b>Latitude</b>	<b>Longitude</b>							
1	Cote Sans Dessein Bend	132.6	38.58370	-91.98935	FC			ST			
2	Rising Creek Bends	134.7	38.56614	-92.02019							
3	Rising Creek Bends	135.9	38.56129	-92.04077	ST			FC			
4	Rising Creek Bends	137.6	38.55783	-92.07141					ST, FC	ST, FC	
5	Rising Creek Bends	138.9	38.55951	-92.09576				ST			
6	Rising Creek Bends	142.0	38.57389	-92.14883	FC			ST			
7	Jefferson City Reach	143.5	38.58442	-92.17298			FC	FC		ST, FC	
8	Jefferson City Reach	146.0	38.60902	-92.20325							
9	Murrays Bend	149.5	38.64572	-92.23152	ST		FC				
10	Stanley Bend	151.6	38.64979	-92.26655	ST				ST, FC		
11	Burlington Bend	154.8	38.67036	-92.31632				ST			
12	Marion Bend	158.7	38.69745	-92.35399			FC	ST			
13	Eureka Bend	162.3	38.73236	-92.36921	FC				ST, FC	ST, FC	
14	Sandy Hook Bend	166.8	38.77592	-92.40073	ST					ST, FC	
15	Providence Bend	171.3	38.81963	-92.40320			FC	ST			
16	Plow Boy Bend	174.4	38.84120	-92.44640			ST	FC		ST, FC	
17	Lupus Bend	176.6	38.86762	-92.46709			ST, FC		ST		
18	McBaine Bend	178.4	38.88876	-92.47822	ST		FC		ST, FC		
19	Searcy's Bend	180.3	38.91222	-92.48511					ST, FC	ST, FC	
20	Rocheport Bends	181.7	38.92682	-92.50267					ST, FC		
21	Rocheport Bends	183.3	38.94314	-92.52277							
22	Rocheport Bends	184.8	38.95739	-92.54290			FC				
23	Rocheport Bends	186.9	38.97161	-92.57248	FC			ST		ST, FC	
24	Diana Bends	189.1	38.96944	-92.61167	FC			ST		ST, FC	
25	Diana Bend	191.9	38.97657	-92.66182	ST		FC		ST, FC		
26	Franklin Island Reach	193.8	38.97720	-92.69648	ST		FC			ST, FC	

## Appendix I cont.

<b>Bend</b>		<b>Coordinates*</b>							
<b>Number</b>	<b>Name</b>	<b>River Mile</b>	<b>Latitude</b>	<b>Longitude</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
27	Franklin Bend	197.2	38.97838	-92.75536	ST				
28	Booneville Bends	199.6	38.97331	-92.79757	ST			ST, FC	
29	Booneville Bends	201.2	38.97869	-92.82595	ST, FC				
30	Lamine River Bend	203.8	38.99286	-92.86725	ST	ST		ST, FC	
31	Slaughterhouse Bend	205.5	39.00777	-92.89094			ST		
32	Robinson Bends	207.3	39.02308	-92.91510	ST		FC		
33	Robinson Bends	209.3	39.04874	-92.92946	ST				
34	Arrow Rock Bend	211.0	39.06991	-92.92619			ST, FC		
35	Salt Creek Bend	214.0	39.09772	-92.91600	ST			ST, FC	
36	Saline City Bend	217.5	39.12863	-92.93490	FC			ST, FC	
37	Euphrase Bend	220.1	39.15083	-92.90565	FC	ST			
38	Fish Creek Bend	222.5	39.18126	-92.88823		ST, FC			ST, FC
39	Glasgow Bend	228.3	39.23412	-92.87000		ST, FC	FC		ST, FC
40	Cambridge Bend	232.3	39.24127	-92.91920					
41	Wilhoite Bend	234.4	39.26480	-92.92936					
42	Gilliam Bend	236.9	39.28693	-92.95833			ST, FC		
43	Little Missouri Bend	239.6	39.31535	-92.97281					
44	Bushwhacker Bend	246.3	39.34550	-93.07668				ST, FC	
45	Grand River Bend	250.3	39.38247	-93.11111					

Appendix J. Ratios of pallid to shovelnose sturgeon, hybrid to shovelnose sturgeon, and pallid to hybrid sturgeon, standardized by catch per unit effort for segment 13 between 2004 and 2007.

	<b>Gill Net</b>			<b>1-inch Trammel Net</b>			<b>Otter Trawl</b>		
	Pallid: Shovelnose	Hybrid: Shovelnose	Pallid: Hybrid	Pallid: Shovelnose	Hybrid: Shovelnose	Pallid: Hybrid	Pallid: Shovelnose	Hybrid: Shovelnose	Pallid: Hybrid
<b>2004</b>	1: 330	1:220	1: 2	1: 178	1: 400	2: 1	1: 87	1: 608	7: 1
<b>2005</b>	1: 462	1:462	1: 1	1: 125	N/A	N/A	1: 98	1: 197	2: 1
<b>2006</b>	1: 449	1:264	1: 1	1: 152	N/A	N/A	N/A	N/A	N/A
<b>2007</b>	1 : 380	N/A	N/A	1 : 277	1 : 870	8.5 : 1	1 : 276	1 : 208	1 : 1

Appendix K. Percentage of shovelnose sturgeon captured in each length group for each gear during sturgeon and fish community seasons in segment 13 of the Missouri River during 2007.

<b>Season</b>	<b>Gear Type</b>	<b>N</b>	<b>Sub-stock (0-149mm)</b>	<b>Sub-stock (150-249mm)</b>	<b>Stock (250-379mm)</b>	<b>Quality (&gt;380mm)</b>
ST	1-inch trammel Net	317	0	0.6	4.1	<b>95.3</b>
	Gill Net	1170	0	0.09	3.8	<b>96</b>
	Otter Trawl	176	3.4	10.2	13.6	<b>72.7</b>
FC	1-inch trammel Net	359	0.3	0.8	12	<b>80.2</b>
	Otter Trawl	255	12.5	8.2	11	<b>68.2</b>