

2006 Annual Report

Pallid Sturgeon Population Assessment and Associated Fish Community Monitoring for the Missouri River: Segment 14



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

Over the past four years, the number of hatchery reared and unknown origin (potentially wild) pallid sturgeon that have been captured in segment 14 has increased. In particular, from 2003 through 2005, the total number of pallid sturgeon captured increased from two in 2003 to four in 2004 and 13 in 2005. Of these, more than half were confirmed to be of hatchery origin. This increase depicts the contribution of the stocking program and exhibits biologist's improved ability to target these rare fish. During the 2006 sample year, however, the number of pallid sturgeon captured in segment 14 decreased slightly to nine with seven of those being of confirmed hatchery origin. Because no hatchery stockings have occurred in segment 13 since 2004, and in segment 14 since 1997, this decline in pallid sturgeon captures, particularly of hatchery origin sturgeon, may be the result of mortality of hatchery stocks. Of the nine pallid sturgeon collected using standard and wild (non-protocol) efforts, only one had no tags and was presumed of wild origin, however, genetic verification is still needed on this fish to confirm its origin. Until genetic verification, all presumed wild pallid sturgeon were considered of unknown origin. Pit tag retention was 100% on stocked fish with double tags.

Various gears were used throughout the entire year over a wide range of habitat types and temperatures. Seven of the nine pallid sturgeon were captured with standard stationary set gillnets. Wild gillnets were used to increase the effort for the largest and smallest pallid sturgeon, however, no pallid sturgeon were captured with wild gear in segment 14 during 2006. With active gears, two pallid sturgeon were captured in 1-inch trammel nets and no pallid sturgeon were captured in otter trawls or 2.5-inch trammel nets. Only two pallid sturgeon were captured in POOL mesohabitat, whereas POOL mesohabitat accounted for nearly half of the habitats gillnets were deployed in. The absence of pallid sturgeon in this habitat is significant because in years preceding 2004, only POOL habitat was sampled with this gear. The relative absence of pallid sturgeon in POOL habitat during 2006 may be attributed to lower river stages experienced in recent years or the presence of smaller pools and more sandbar habitat in segment 14 relative to segments further upstream, but at the very least, it suggests that channel border habitat was not sampled early enough in pallid monitoring efforts to detect pallid sturgeon

migration. Five pallid sturgeon (56%) occurred within inside-bend habitat, which was the most sampled habitat with all gears. Pallid sturgeon were also captured on less frequently occurring habitats including: two in channel crossovers, one in a small secondary connected channel, and one in large secondary connected channel. Pallids and other sturgeon have been shown to aggregate, or cluster around particular reaches of the river. One such area was discovered during the spring of 2005 at river mile (RM) 44.0 where biologists captured five large pallids (> 700 mm) during a week sampling period around a single sand bar. This sand bar was also reported to have produced pallid sturgeon in 2004. During the spring of 2006 near the bottom of bend 29 in segment 14 (RM 77.2), biologists captured four pallid sturgeon, one of which was > 700 mm, near a unique sandbar complex. Efforts will continue to identify clustering areas like these through additional telemetry efforts and targeted sampling. More of these areas need to be identified to enhance the ability of sampling crews to target pallid sturgeon populations in the future.

Pallid sturgeon that were recaptured in segment 14 since standard sampling began in 2003 were not recaptured for a second time despite dozens being potentially “at large” in this reach since 1999. The only pallid stockings in this reach of the river are of 2,445 fish in 1994 and 1,200 in 1997. Since that time, all additional stockings have occurred upstream, with the closest being at Booneville (RM 195). At present, there has been a cumulative total of 24,600 fish stocked between Booneville and St. Charles (RM 25), and of the fish recaptured during 2006, they represented their stocked year class as follows: 1997 – 0.08%, 2002 – 0.04%, 2003 – 0.06%. The combined total percentage of stocked fish captured ($N = 7$) versus proximate availability ($N = 24,600$) was 0.03%. This relatively low percentage of all fish versus the higher percentage of 1997 fish suggests that stocked fish have not dispersed into the lower segment at a high rate and that older fish have not readily moved out. There has been a relatively high rate of occurrence of the 1997 stocked year class of pallid sturgeon in the past several years, which have been found to exhibit a restricted upper home range. The 1997 year class sturgeon captured this year could have been of Mississippi origin (coded wire tagged), however, the vast majority of these fish have been found within the area they were stocked rather than 100’s of miles upstream.

The ratio of hybrid sturgeon to pallid and shovelnose sturgeon has been a useful tool to gauge the relative abundance of these fish and helps to monitor the impact of pallid population decline and the effects of hybridization. Because gillnets are the most consistent tool for monitoring these ratios, it was used to compare ratios between years. In 2005, the ratio of pallid to shovelnose sturgeon in segment 14 was one pallid for every 243 shovelnose. During the 2006 sample year, that ratio decreased to one pallid for every 300 shovelnose. The number of hybrids to pallid sturgeon has remained fairly constant from 2003 to 2005 at about two hybrids for every one pallid, however, during 2006 that number changed to one hybrid for every two pallid sturgeon. This ratio may indicate the success of the hatchery program but should be interpreted cautiously as shovelnose catch rates are affected by migrations and aggregations as well as commercial harvest.

Community target species are used as a gauge for relative change in the river in absence of pallid sturgeon information. Young of the year sturgeon (preliminarily identified as shovelnose) were present but not abundant in 2004 (N = 16). Sturgeon of larger sizes were the most abundant large fish represented in the sampling effort (N = 3192) which suggests that the appropriate gears are being used to detect pallid sturgeon. Of the 3,192 shovelnose sturgeon captured, they were represented in the gear as follows: 2,102 in gillnets, 496 in 1-inch trammel nets, 95 in 2.5 inch trammel nets, 482 in 16 ft otter trawls, and 3 in mini-fyke nets. Using all gears, 61 species were captured throughout the year. Different gears are used to target different fishes in the community and the project is adapting to determine the best methods to ensure efficiency within these gears. Sturgeon chubs, sicklefin chubs, and speckled chubs were captured most often with otter trawls. Sand shiners and *Hybognathus* spp. were captured most often in mini-fyke nets, but not in otter trawls. Blue suckers were captured in gillnets, trammel nets (of both sizes), and otter trawls; and sauger were most often captured with gillnets. Since 2004, there has been a decline in otter trawl and mini-fyke CPUE for both sturgeon chubs and sicklefin chubs in segment 14. It may be important to look at how environmental conditions in the river (i.e., water levels, spring rise, etc.) could be impacting these CPUE values. There has also been an increase in captures of YOY blue suckers in segment 14 during 2006 which suggests that a combination of habitat and recruitment needs for the fish have been met during the previous years.

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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 1000 NTU's in spring flood events to around 40 NTU's in the winter months. Substrates range from silt (behind dikes) to fine sand and gravel in the main channel and border habitats. Rock revetment lines the outside bend shoreline; whereas silt or sand banks dominate the inside bend shoreline. In low water, sand bars are visible on the insides of bends with water often carving secondary channels behind. Debris is often discharged from upstream tributaries and frequently gets lodged in sand bars

or on dike structures as water levels drop. The Osage River is the largest tributary feeding segment 14 enters the Missouri River at the top of the study area. 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, but water sometimes can flow 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 modification. Notches are now deeper and wider, following modifications starting in 2003, and can change how water is diverted into the bank allowing for increased erosion or deposition. Dike types vary in design but, in general, outside bends contain L-shaped dike pointing down stream while dikes on the inside bend are more wing shaped, projecting straight into the channel and slightly downstream. The subsequent habitats that exist behind these dikes vary widely and fish species may use them according to biologically different needs. In all, the river is much different than it used to be, though there are some remnant historical habitats that exist at different water stages. These remnant habitats are important biologically and this project aims to define and determine those most used by the pallid sturgeon.

Methods

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

seines were removed from standard sampling during the 2006 sample year because of their similarity to mini-fyke nets in regards to fish capture.

Sampling Site Selection and Description

Segment 14 starts at the confluence of the Osage River (RM 130.2) and ends at the confluence with the Mississippi River (RM 0.0; Figure 1a). Each segment represents a sampling replicate. Segments were divided into bends (defined as the crossing of the thalweg from one bank to the other), and bends were randomly selected from each segment to be sampled with a suite of gears. Twelve bends were randomly selected prior to November 2005. These twelve bends were each sampled twice, once between 1 November 2005 and 30 June 2006 (referred to as sturgeon season) and once between 1 July 2006 and 31 October 2006 (referred to as fish community season). Additional bends were randomly selected so additional sampling could take place if the first randomly selected bends were finished. The river was categorized into distinct river components called Mesohabitats which exist within Macrohabitats (Appendix B). Each Mesohabitat was sampled twice within each Macrohabitat. When a diversity of habitats was not available, a minimum of eight samples were used to ensure some consistent level of effort per bend. For example, most active gear effort was applied to inside bend channel border habitat because this habitat was available at all water stages in all bends. Samples that occurred outside of the predetermined sampling protocol were given a “Wild” designation and not included in the master data analyses.

In segment 14, 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

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

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

Trammel nets (1 and 2.5inch bar mesh) were set by throwing out a buoy attached to the float line of the net, then deploying the net until the other end entered the water. The net was maintained off the bow with a 30 foot lead line. When the net began to bunch up in the middle or align parallel with the current, it was pulled back to a perpendicular position and an estimate of sampling distance lost was accounted for. Trammel nets were most effective in moderately shallow water (2.5 m) without an eddy effect. Snags occurred frequently, but did not prevent effective sampling. The 2.5 inch trammel nets were only used in the sturgeon season to target larger spawning pallids.

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

Segment 14 standard sampling gear dimensions:

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

Data Collection and Analysis

Associated Environmental Data

GPS locations, temperature, and depth (beginning, mid-point and end for all gears except mini-fykes; where depth is measured at the opening/box) were taken for each sample. Additionally, substrate, turbidity and velocity samples were collected randomly for 25% of the Mesohabitat types within each Macrohabitat. Substrate samples were reported as an

estimate of the percentage of silt/sand/gravel within each dredge sample. Water column velocity in meters per second (MPS) was measured at (bottom), 80% (8/10) and 20% (2/10) of the depth. All habitat data was collected when pallid sturgeon were encountered. In an attempt to determine if flow/water velocity can be visually estimated by a trained eye, an additional box was added to the data sheet. The data recorder recorded a value corresponding with a set of categories (0 = could not be estimated, 1 = Eddy, 2 \approx 0.0-0.3 m/s, 3 \approx 0.3-0.6 m/s, 4 \approx 0.6-0.9 m/s, 5 \approx >0.9 m/s).

Genetic Verification

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

Relative Condition

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

Relative Stock Densities

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

Analyses

A sample target effort for each gear was defined as follows: 300 m drift (TN), 300 m tow (OT), and one overnight set (HN, MF). A minimum effort of 75m for TN and OT's was accepted in channel border habitat; because some areas have so much debris long drifts are not possible. Effort for seines could be determined using different methods such as a half or full arc or pulling up-stream or down-stream, however our primary effort was in a rectangular parallel pull downstream, effort was calculated by multiplying the width of the net by distance pulled. Effort was calculated as catch per 100 m² for active gears (including seines) or per overnight set for passive gears. Samples that occurred outside of the "Standard" gear or habitat effort or samples that occurred in "Non-random" bends were excluded from CPUE calculations. These data were, however, included into length frequencies, relative condition and population structure calculations.

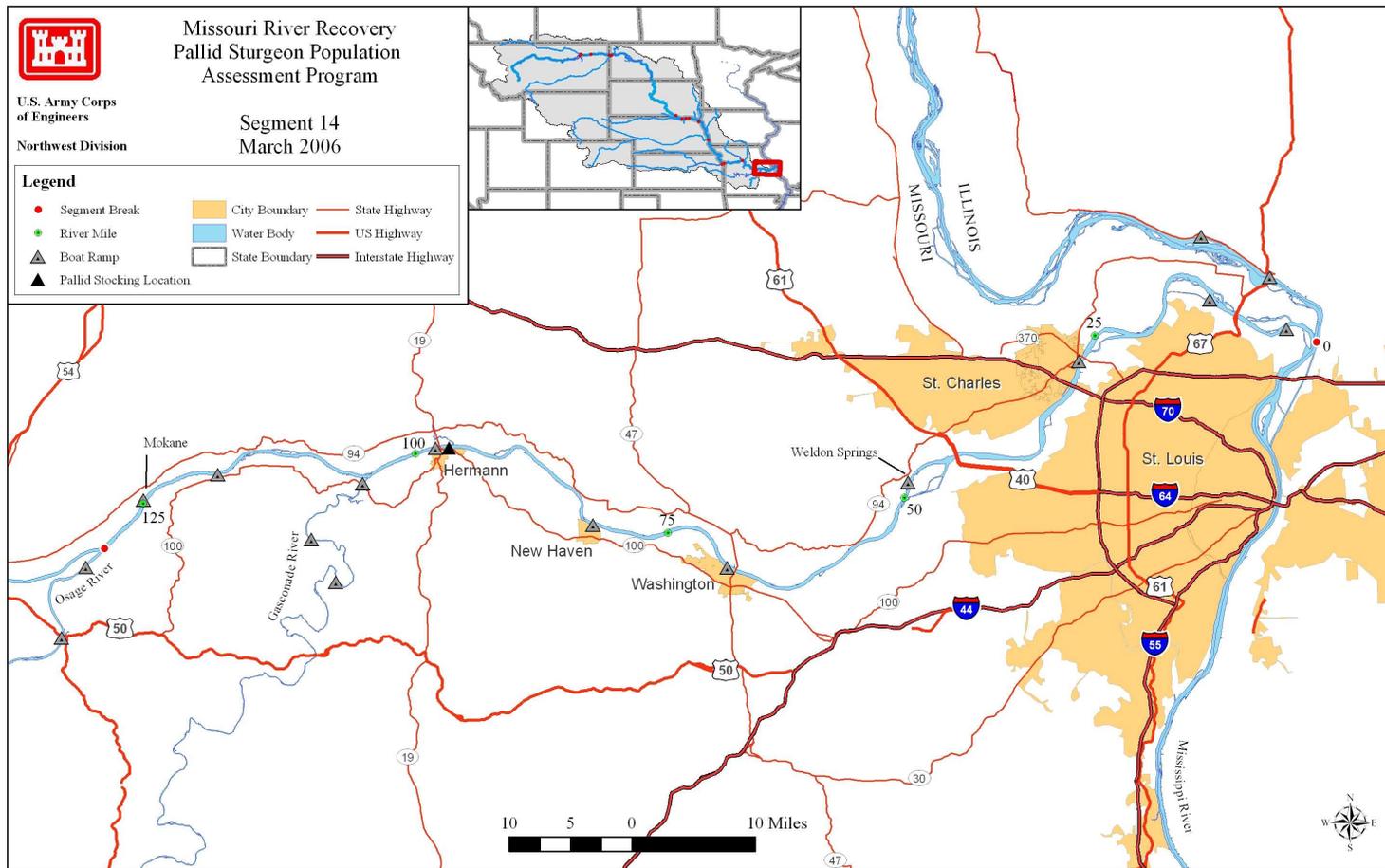


Figure 1a. Map of segment 14 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 14 encompasses the Missouri River from the confluence with the Osage River (River Mile 130.2) to the confluence with the Mississippi River (River Mile 0.0).

Results

Pallid Sturgeon

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

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

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

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

During the 2006 sample year in segment 14, biologists from the Columbia Fishery Resources Office (Columbia FRO) sampled 19 bents during sturgeon season (1 November 2005 to 30 June 2006) and 16 bents during fish community season (1 July to 31 October 2006) using multiple gears. For the sturgeon season; 16 bents were sampled with 1 inch trammel nets (total effort = 133 deployments; 28,077 m drifted), 17 bents with 2.5 inch trammel nets (total effort = 129 deployments; 28,745 m drifted), 19 bents with gill nets (total effort = 412 net nights), and 17 bents with 16 foot otter trawls (total effort = 130 nets deployed; 33,718 m trawled; Tables 1 and 2). For the fish community season; 16 bents were sampled with 1 inch trammel nets (total effort = 128 deployments; 30,749 m drifted), 16 bents with mini-fyke nets (total effort = 123 net nights), and 16 bents with 16 foot otter trawls (total effort = 128 deployments; 29,304 m trawled; Tables 1 and 2). Despite this effort, only 9 pallid sturgeon were captured in segment 14 during the 2006 sample year which emphasizes the rarity of this federally endangered fish.

Of the nine pallid sturgeon that were captured in segment 14, two are from unknown origin and seven were stocked (Figure 9). The majority of pallid sturgeon in segment 14 (N = 6; 67%) were captured in the upper half of the segment (RM 130.2 to 70), whereas only three (33%) were captured in the lower half of the segment (RM 70.0 to 0.0). One of the seven recaptured pallid sturgeon was stocked either in the middle Mississippi River or the lower Missouri River, three of the seven recaptured pallid sturgeon were positively identified as originating from the Booneville stocking location (RM 195), and all other recaptures are awaiting genetic verification so they can be positively traced back to a stocking site (Table 6; Appendix E). One pallid sturgeon was from the 1997 year class (stocked either on the Mississippi River or lower Missouri River), one was from the 2002 year class (stocked at Booneville; Table 6; Appendix E), and the other two were from the 2003 year class (stocked at Booneville; Table 6; Appendix E). Both traceable pallid sturgeon recaptured from the 2003 year class were reared at Garrison Dam National Fish Hatchery, the pallid sturgeon from the 2002 year class was reared at Gavins Point National Fish Hatchery, and the pallid recapture from the 1997 year class was reared at Blind Pony State Fish Hatchery. Condition (Kn), which is a measure of the fish's plumpness, was averaged for all recaptured pallid sturgeon from segment 14. All fish that leave the hatchery are considered to be in good or robust condition ($Kn \approx 1.0$) and were still in fairly good condition at the time of recapture (Table 6).

All of the pallid sturgeon collected from segment 14 during the 2006 sample year were captured during the sturgeon season. The majority of pallid sturgeon (N = 5; 55%) were captured in ISB macrohabitat relative to an average of 64% of the total effort being expended in that habitat during sturgeon season (Tables 13 and 15). Similarly, the majority of pallid sturgeon (N = 6; 67%) were captured in CHNB mesohabitat relative to an average of 88% of the total effort in that habitat (Tables 14 and 16). Similar to what was found by Utrup et al (2006), pallid sturgeon in ISB CHNB habitat (N = 3; 33%) were captured in deeper water (3.1 m) than what was sampled on average (2.9 m), though in all cases pallid sturgeon were captured closer to the mean sample depth than the extremes (captured between 2.8 and 3.5 m whereas the sample mean was between 0.3 to 6.3 m; Table 3). This trend was similar for bottom velocity where pallid sturgeon were captured at a mean velocity of 0.38 m/s (0.09 –

0.96) with a sample mean of 0.72 m/s (0.0 – 1.28). The majority of pallid sturgeon (N = 5; 72%) were captured in water temperatures equal to or less than 15.0 °C. On average, all pallid sturgeon were captured at a water temperature of 13.1 °C (3.6 – 26.1) with an average sample temperature of 19.1°C (2.8 – 32.7; Tables 3). Three of the nine pallid sturgeon were captured during the low flow winter months when turbidities generally ranged between 15 and 60 NTU's. Because of this the average turbidity for pallid sturgeon captures was 102.6 NTU's (20 to 219) with a mean turbidity per sample of 104.6 NTU's (7 – 992; Table 3).

The population structure, shown in Table 7, illustrates the influence of recently propagated fish (stock size N = 5) with four quality size pallid sturgeon being captured in segment 14. The RSD values indicate health of fish populations relative to reproductive potential and age of fish. The fact that few pallid sturgeon were seen at larger sizes suggests little opportunity exists for reproduction.

The average number of bends sampled in segment 14 increased from 13 in 2005 to 17 during the 2006 sample year. During the 2006 sampling season, gillnets were by far the most effective gear at capturing pallid sturgeon in segment 14 (mean overall CPUE = 0.017) followed by 1 inch trammel nets (mean overall CPUE = 0.004); capturing 78% and 22% of the pallid sturgeon respectively with no pallid sturgeon captured in 2.5 inch trammel nets, otter trawls, or mini-fyke nets (Figures 2-5; Appendix F). The CPUE for pallid sturgeon in gill nets remained constant from 2005 to 2006, 0.018 and 0.017 respectively, with a slight increase in CPUE for pallid sturgeon in 1 inch trammel nets since 2005 (Figure 2). Pallid sturgeon captures in 2.5 inch trammel nets have decreased since 2003 for the sturgeon season (Figure 3). No pallid sturgeon were captured during the 2006 fish community season in segment 14.

Since 2003, there has been an increase in the number of pallid sturgeon captured in segment 14; in particular, there was considerable increase in the capture of hatchery origin pallid sturgeon (2003 = 1; 2004 = 2; 2005 = 9; 2006 = 7; Figure 9). Though much of this can be explained by the increase of overall effort and sampling efficiency, this may also be attributable to the positive influence of stocking efforts.

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 14 of the Missouri River during fall through spring (sturgeon season) and summer (fish community season) during the 2006 sample year. N-E indicates the habitat is non-existent in the segment.

Gear	Number of Bends	Mean Effort	Macrohabitat													
			BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Fall through Spring - Sturgeon Season																
1 Inch Trammel Net	16	8.31	N-E	36	0	N-E	N-E	88	3	6	0	0	0	0	0	0
2.5 Inch Trammel Net	17	7.59	N-E	32	1	N-E	N-E	86	2	8	0	0	0	0	0	0
Gill Net	19	10.84	N-E	56	2	N-E	N-E	112	20	9	7	0	0	0	0	0
Otter Trawl	17	7.65	N-E	33	0	N-E	N-E	81	2	14	0	0	0	0	0	0
Summer – Fish Community Season																
1 Inch Trammel Net	16	8	N-E	34	0	N-E	N-E	85	3	4	2	0	0	0	0	0
Mini-Fyke Net	16	7.81	N-E	31	0	N-E	N-E	55	10	7	20	0	0	0	0	0
Otter Trawl	16	8.00	N-E	35	0	N-E	N-E	83		5	5	0	0	0	0	0

Table 2. Number of bends sampled, mean effort per bend (mean number of deployments), and total effort by mesohabitat (total number of deployments) for segment 14 of the Missouri River during fall through spring (sturgeon season) and summer (fish community season) during the 2006 sample year.

Gear	Number of bends	Mean Effort	Mesohabitat				
			BAR	POOL	CHNB	TLWG	ITIP
Fall through Spring – Sturgeon Season							
1 Inch Trammel Net	16	8.31	0	0	131	0	2
2.5 Inch Trammel Net	17	7.59	0	0	125	0	4
Gill Net	19	10.84	0	77	120	0	9
Otter Trawl	17	7.65	0	0	124	0	6
Summer – Fish Community Season							
1 Inch Trammel Net	16	8.00	0	0	124	0	4
Mini-Fyke Net	16	7.81	116	0	3	0	6
Otter Trawl	16	8.00	0	0	120	0	8

Segment 14 - Pallid Sturgeon Captures by River Mile

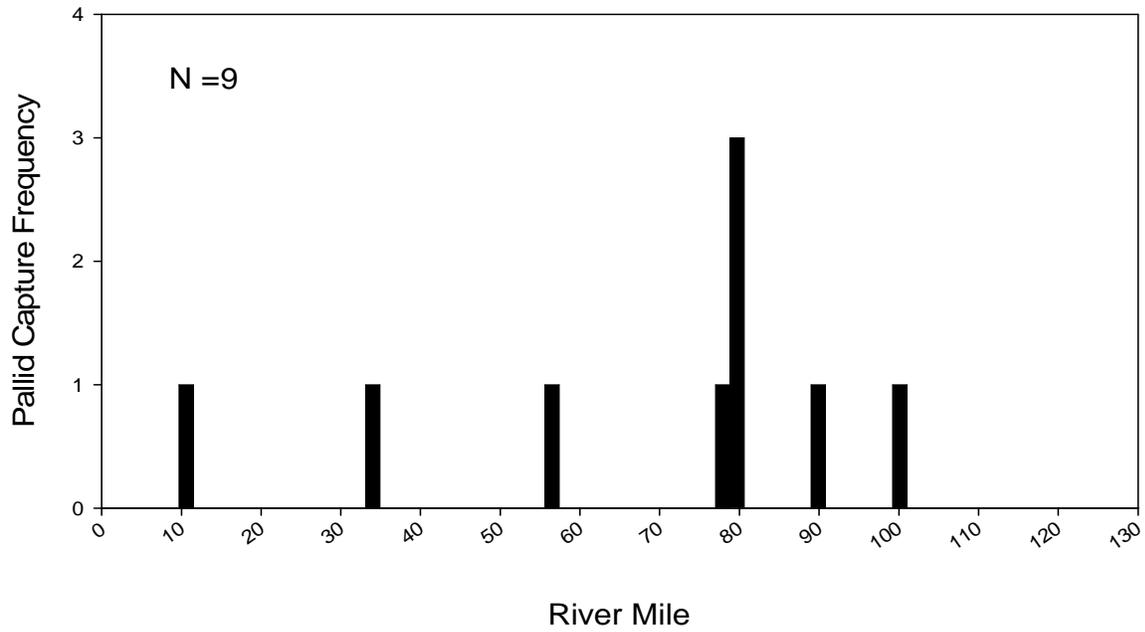


Figure 1b. Distribution of pallid sturgeon captures by river mile for segment 14 of the Missouri River during the 2006 sample year. Black bars represent pallid captures during Sturgeon Season and white bars during Fish Community Season. Figure included all pallid captures including non-random and wild samples.

Table 3. Pallid sturgeon (PDSG) capture summaries for all gears relative to habitat type and environmental variables on the Missouri River for segment 14 during the 2006 sample year. 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	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E
CHXO	BAR	0.5 (0.3-1.0)	-	0.03 (0-0.08)	-	27.6 (19.5-31.6)	-	69 (24-168)	-	-
	POOL	5.6 (1.4-11.7)	-	0.07 (0-0.47)	-	8.2 (3.7-18.0)	-	44 (21-108)	-	-
	CHNB	3.1 (1.0-10.0)	2.9 (2.0-3.8)	0.66 (0-1.15)	0.5 (0.2-0.8)	22.2 (3.0-32.5)	20.0 (14.0-26.0)	109 (20-397)	156 (110-202)	2
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
CONF	BAR	-	-	-	-	-	-	-	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	4.0 (2.3-6.0)	-	0.08 (0.08-0.08)	-	15.7 (14.0-19.0)	-	992 (992-992)	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
DEND	BAR	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E
DRNG	BAR	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E
ISB	BAR	0.6 (0.2-1.0)	-	0.06 (0-0.15)	-	28.0 (19.5-32.1)	-	63 (37-102)	-	-
	POOL	4.2 (1.8-10.0)	2.6 (1.8-3.4)	0.16 (0-0.94)	0.22 (0.11-0.32)	7.6 (3.6-14.5)	4.4 (3.6-5.1)	63 (20-241)	28 (20-36)	2
	CHNB	2.9 (0.3-6.3)	3.1 (2.8-3.5)	0.72 (0-1.28)	0.38 (0.09-0.96)	22.4 (2.8-32.6)	9.8 (6.7-14.5)	113 (20-495)	104 (39-219)	3
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	1.4 (0.5-3.1)	-	0.76 (0.76-0.76)	-	24.8 (19.5-30.9)	-	190 (64-421)	-	-

Table 3 (continued).

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Bottom Velocity (m/s) (Effort)	Bottom Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
OSB	BAR	0.3 (0.2-0.7)	-	0	-	29.4 (28.5-31.7)	-	104 (49-139)	-	-
	POOL	5.4 (2.5-12.2)	-	0.04 (0-0.2)	-	5.7 (3.9-14.5)	-	57 (15-201)	-	-
	CHNB	3.7 (2.0-5.2)	-	0.39 (0.04-0.9)	-	17.1 (5.7-27.4)	-	168 (32-320)	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
SCCL	BAR	0.5 (0.3-0.7)	-	-	-	25.5 (19.5-30.9)	-	32 (23-40)	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	2.6 (1.5-5.4)	2.9 (2.9-2.9)	0.43 (0.04-0.82)	0.49 (0.49-0.49)	21.5 (3.4-32.7)	26.1 (26.1-26.1)	119 (24-351)	102 (102-102)	1
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	2.5 (1.7-3.7)	-	0.71 (0.54-0.95)	-	22.4 (3.1-32.7)	-	87 (7-205)	-	-
SCCS	BAR	0.5 (0.3-0.9)	-	0.08 (0-0.18)	-	27.9 (19.5-32.5)	-	55 (30-81)	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	1.7 (1.5-2.0)	-	-	-	6.4 (6.4-6.4)	-	63 (63-63)	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	2.0 (0.4-3.3)	2.2 (2.2-2.2)	0.55 (0.08-0.79)	0.45 (0.45-0.45)	21.7 (6.0-32.6)	13.8 (13.8-13.8)	73 (29-141)	140 (140-140)	1
SCCN	BAR	-	-	-	-	-	-	-	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-

Table 3 (continued).

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Bottom Velocity (m/s) (Effort)	Bottom Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
TRIB	BAR	-	-	-	-	-	-	-	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
TRML	BAR	0.8 (0.8-0.8)	-	-	-	19.5 (19.5- 19.5)	-	100 (100- 100)	-	-
	POOL	4.7 (3.5-5.5)	-	0.29 (0.29- 0.29)	-	11.9 (11.0- 11.9)	-	-	-	-
	CHNB	5.6 (5.2-6.0)	-	-	-	11.0 (11.0- 11.0)	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
TRMS	BAR	0.6(0.5-0.6)	-	0.01 (0-0.02)	-	24.0 (19.5- 28.5)	-	100 (100- 100)	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
WILD	BAR	-	-	-	-	-	-	-	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-

Table 6. Mean fork length, weight, relative condition factor (Kn), growth rates, and water temperature for hatchery-reared pallid sturgeon captures, with traceable stocking histories, by year class at the time of stocking and recapture during 2006 from segment 14 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)
1997	1	-	-	-	811	2210	0.905	-	-
		-	-	-	-	-	-	-	-
2002	1	270	73	1.2	515	475	0.894	0.26	0.4
		-	-	-	-	-	-	-	-
2003	2	-	-	-	466	315	0.829	-	-
		-	-	-	2	40	0.117	-	-

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

Length Category	N	RSD	Kn (+/- 2SE)
Sturgeon Season			
Sub-stock (0-199)	0	-	-
Sub-stock (200-329)	0	-	-
Stock	5	56	0.832 (0.06)
Quality	4	44	0.841 (0.01)
Preferred	0	-	-
Memorable	0	-	-
Trophy	0	-	-
Overall	9	-	0.836 (0.05)
Fish Community Season			
Sub-stock (0-199)	0	-	-
Sub-stock (200-329)	0	-	-
Stock	0	-	-
Quality	0	-	-
Preferred	0	-	-
Memorable	0	-	-
Trophy	0	-	-
Overall	0	-	-

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

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

Segment 14 - Pallid Sturgeon / Sturgeon Season

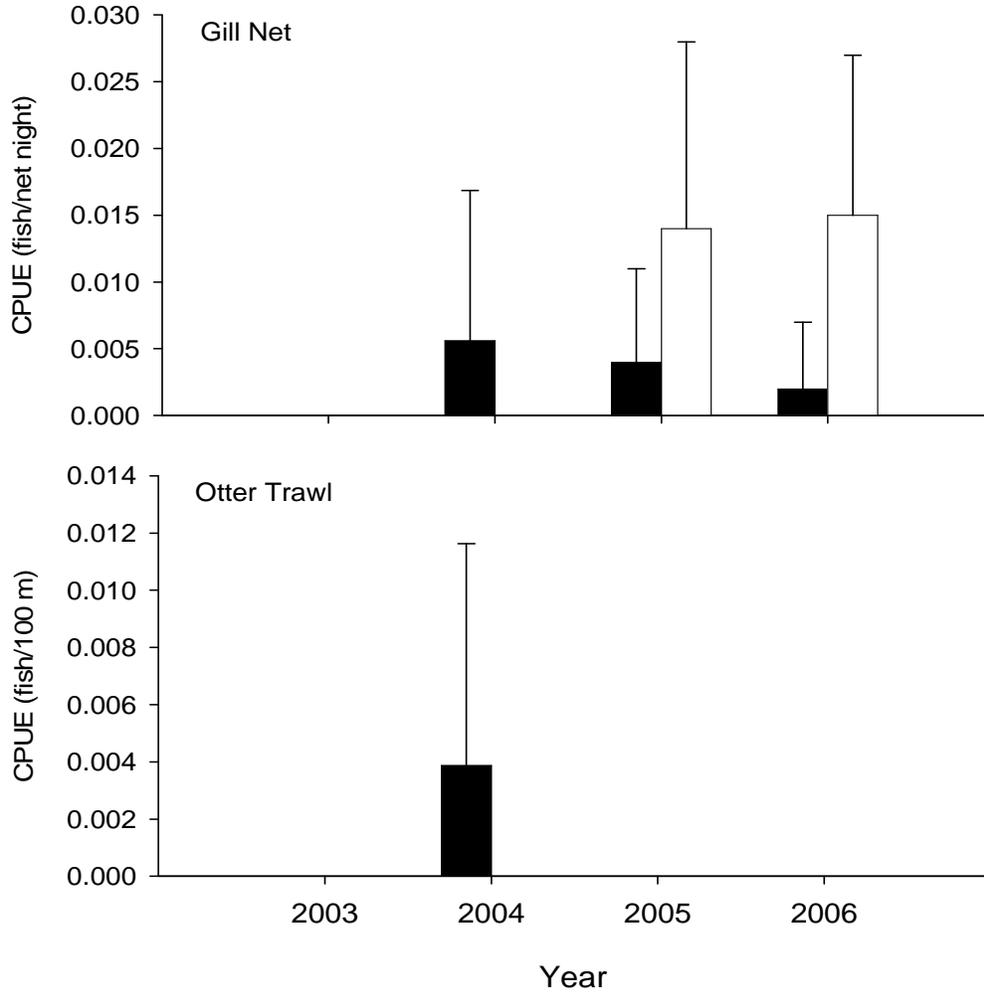


Figure 2. Mean annual catch-per-unit-effort (± 2 SE) of unknown origin (black bars) and hatchery reared (white bars) pallid sturgeon using gill nets and otter trawls in segment 14 of the Missouri River during sturgeon season 2003-2006.

Segment 14 - Pallid Sturgeon / Sturgeon Season

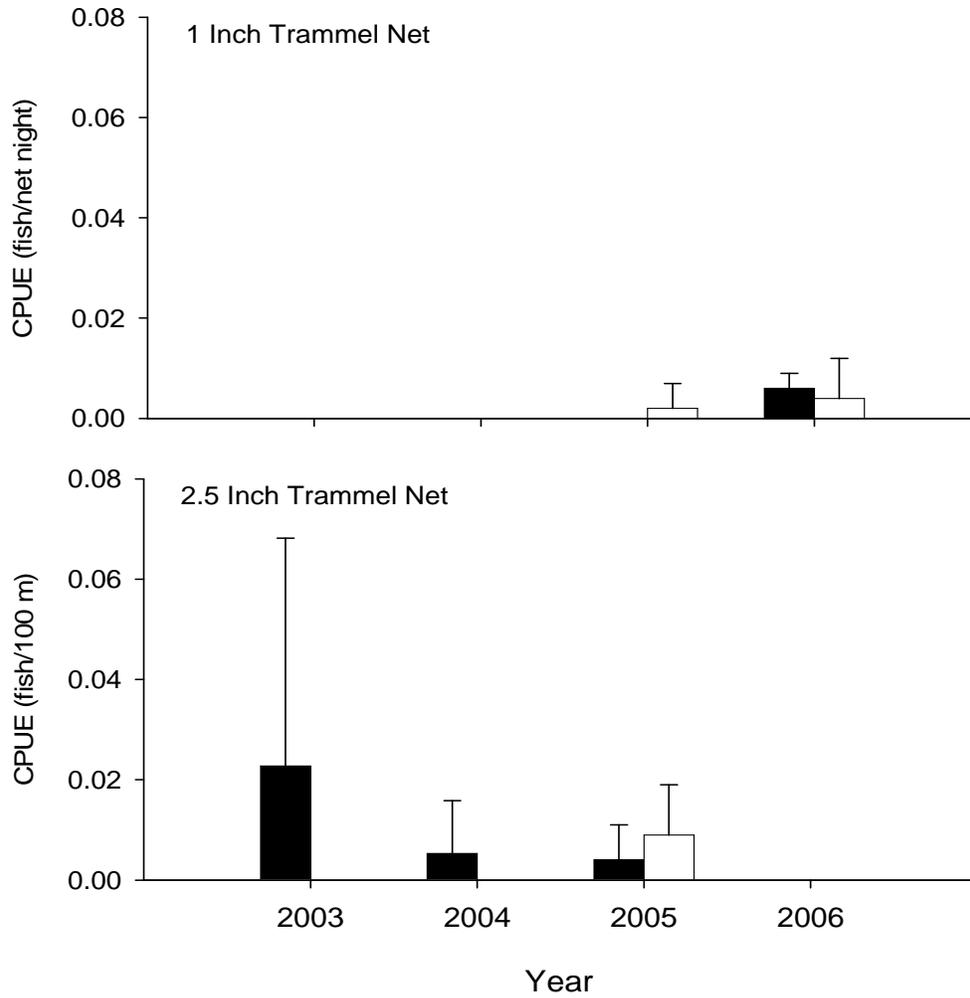


Figure 3. Mean annual catch-per-unit-effort (± 2 SE) of unknown origin (black bars) and hatchery reared (white bars) pallid sturgeon using 1 and 2.5 inch trammel nets in segment 14 of the Missouri River during sturgeon season 2003-2006.

Segment 14 - Pallid Sturgeon / Fish Community Season

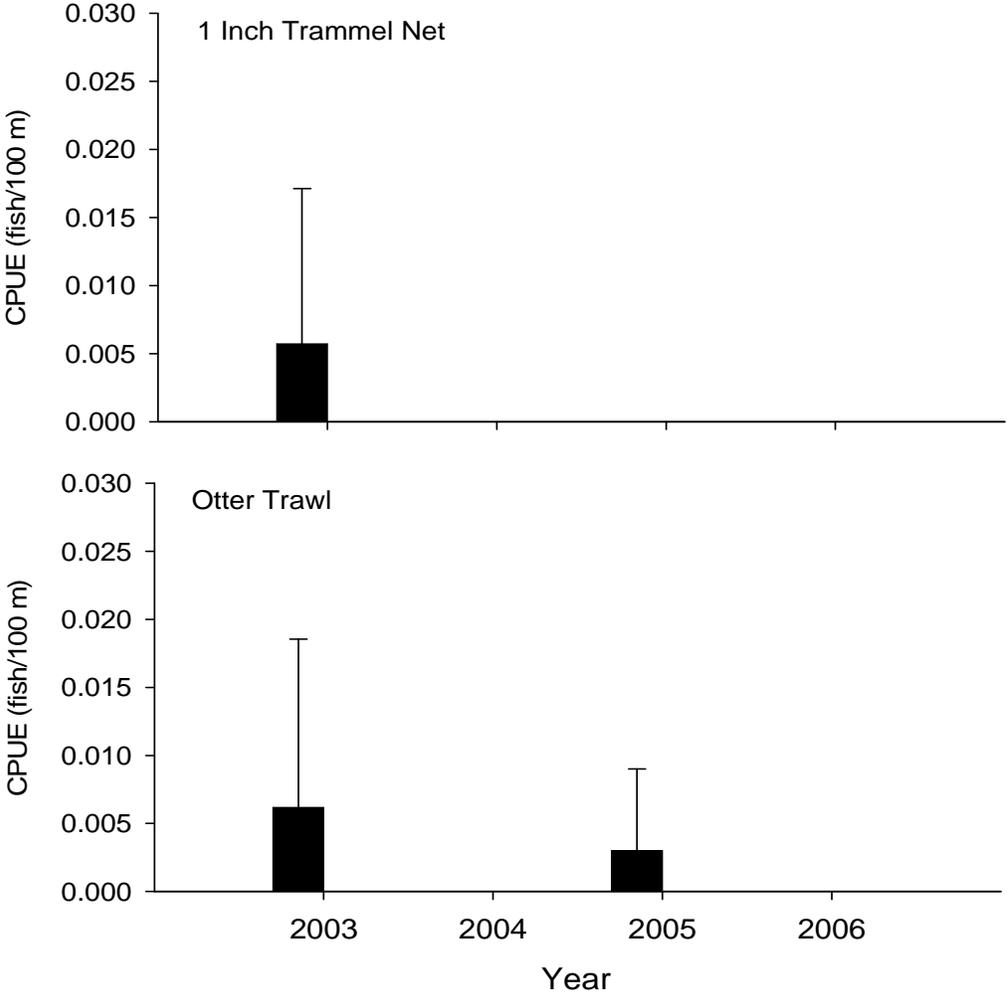


Figure 5. Mean annual catch-per-unit-effort (± 2 SE) of unknown origin (black bars) and hatchery reared (white bars) pallid sturgeon using 1 inch trammel nets and otter trawls in segment 14 of the Missouri River during fish community season 2003-2006.

Table 9. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	1	4	0	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	67	1	4	0	0	0	0	0	
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	54	10	4	3	0	0	0	0	
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	22	0	N-E	N-E	70	1	8	0	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	29	0	N-E	N-E	66	2	2	1	0	0	0	0	
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	25	0	N-E	N-E	44	8	6	16	0	0	2		
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	23	0	N-E	N-E	71	0	2	3	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	99	1	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Gill Net	0	0	0	0	0	0
		0	58	4	37	0
Otter Trawl	0	0	0	0	0	0
		0	97	3	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Mini-Fyke Net	0	0	0	0	0	0
		93	2	5	0	0
Otter Trawl	0	0	0	0	0	0
		0	95	5	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	1	4	0	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	67	1	4	0	0	0	0	0	
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	54	10	4	3	0	0	0	0	
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	22	0	N-E	N-E	70	1	8	0	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	29	0	N-E	N-E	66	2	2	1	0	0	0	0	
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	25	0	N-E	N-E	44	8	6	16	0	0	2	0	
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	23	0	N-E	N-E	71	0	2	3	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	99	1	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Gill Net	0	0	0	0	0	0
		0	58	4	37	0
Otter Trawl	0	0	0	0	0	0
		0	97	3	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Mini-Fyke Net	0	0	0	0	0	0
		93	2	5	0	0
Otter Trawl	0	0	0	0	0	0
		0	95	5	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	2	N-E	50	0	N-E	N-E	0	0	50	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	1	4	0	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	67	1	4	0	0	0	0	0	
Gill Net	3	N-E	0	0	N-E	N-E	67	0	0	33	0	0	0	0	
		N-E	27	1	N-E	N-E	54	10	4	3	0	0	0	0	
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	22	0	N-E	N-E	70	1	8	0	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	29	0	N-E	N-E	66	2	2	1	0	0	0	0	
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	25	0	N-E	N-E	44	8	6	16	0	0	2	0	
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	23	0	N-E	N-E	71	0	2	3	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	2	0	100	0	0	0
		0	99	1	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Gill Net	3	0	33	33	33	0
		0	58	4	37	0
Otter Trawl	0	0	0	0	0	0
		0	97	3	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Mini-Fyke Net	0	0	0	0	0	0
		93	2	5	0	0
Otter Trawl	0	0	0	0	0	0
		0	95	5	0	0

Table 15. Total number of quality size and greater (≥ 630 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	1	4	0	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	27	1	N-E	N-E	67	1	4	0	0	0	0	0	0
Gill Net	4	N-E	25	0	N-E	N-E	75	0	0	0	0	0	0	0	0
		N-E	27	1	N-E	N-E	54	10	4	3	0	0	0	0	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	22	0	N-E	N-E	70	1	8	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	2	2	1	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	25	0	N-E	N-E	44	8	6	16	0	0	0	2	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	23	0	N-E	N-E	71	0	2	3	0	0	0	0	0

Table 16. Total number of quality size and greater (≥ 630 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	99	1	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Gill Net	4	0	75	0	25	0
		0	58	4	37	0
Otter Trawl	0	0	0	0	0	0
		0	97	3	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Mini-Fyke Net	0	0	0	0	0	0
		93	2	5	0	0
Otter Trawl	0	0	0	0	0	0
		0	95	5	0	0

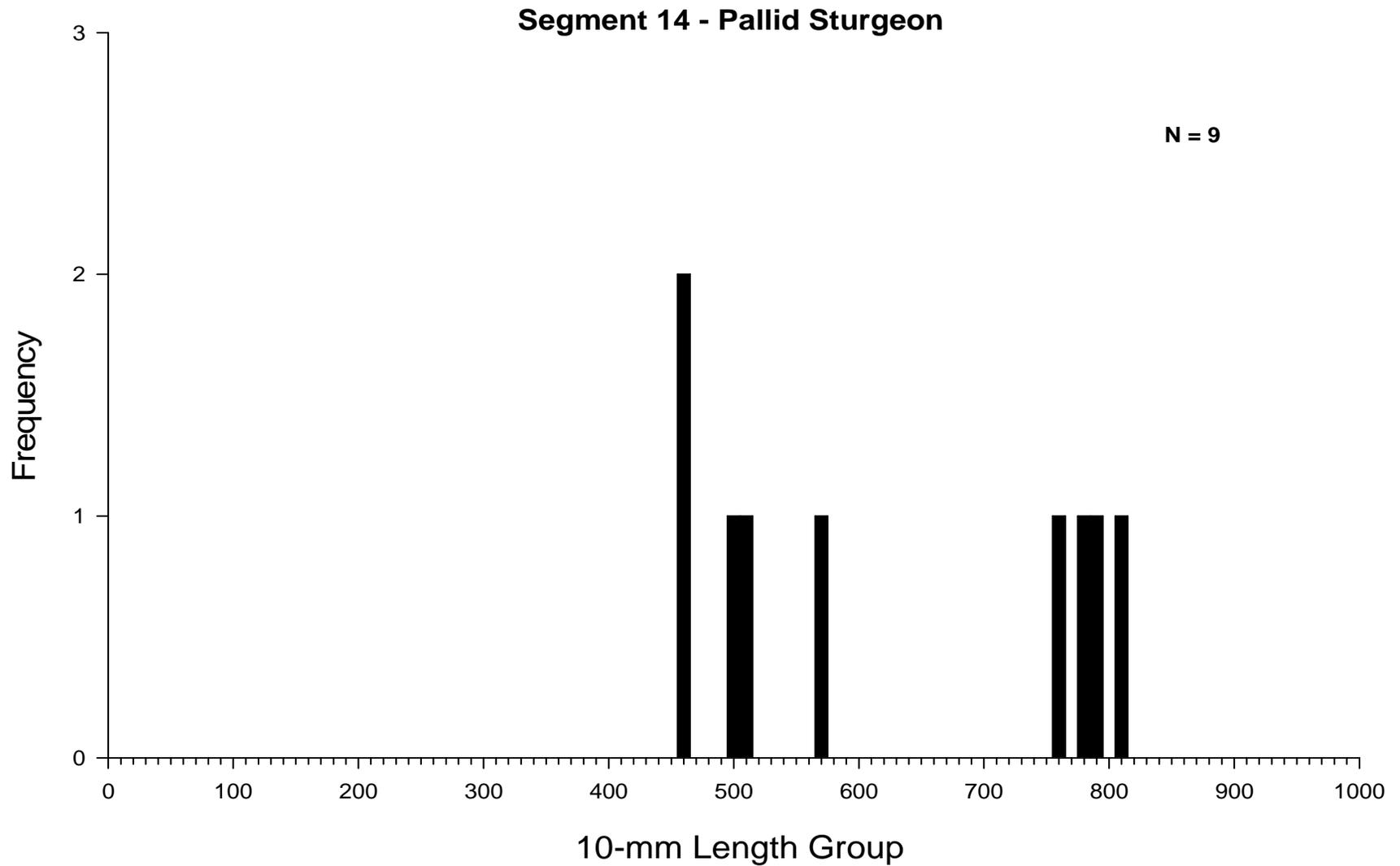


Figure 8. Length frequency of pallid sturgeon captured during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during the 2006 sample year including non-random and wild samples.

Segment 14 - Annual Pallid Sturgeon Capture History

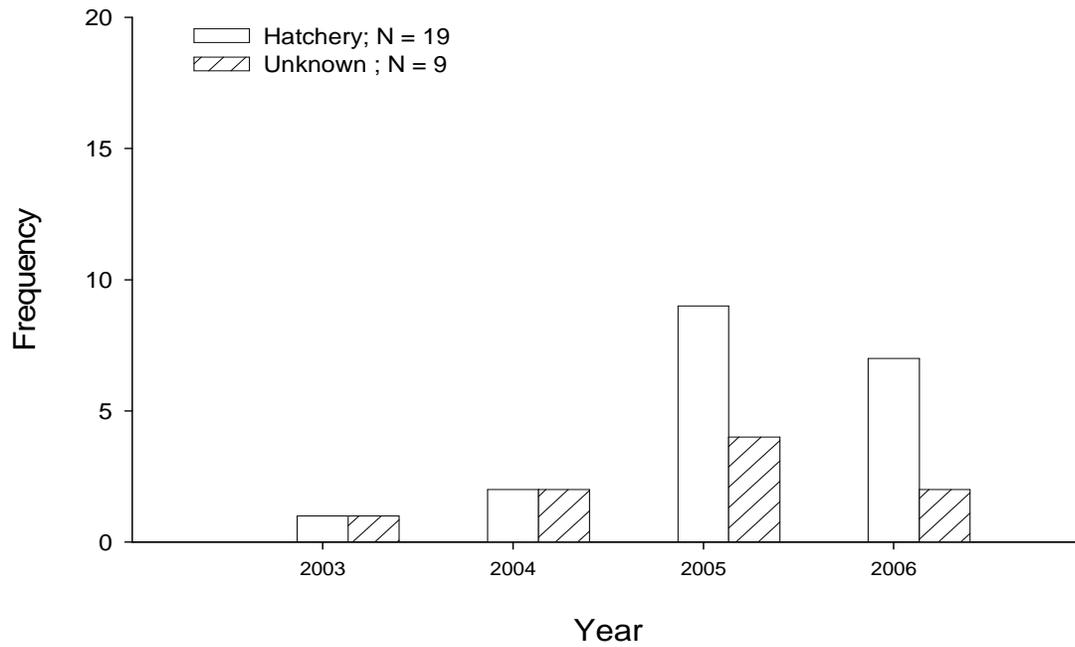


Figure 9. Annual capture history of hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon collected in segment 14 of the Missouri River from 2003 to 2006. Figure is designed to compare overall pallid sturgeon captures from year to year and may be biased by variable effort between years.

Shovelnose X Pallid Sturgeon Hybrids

Six hybrid sturgeon were captured in segment 14 during the 2006 sample year. All hybrid sturgeon were captured in CHNB mesohabitat with 83% of the total catch occurring in ISB macrohabitat. As in previous years, hybrid sturgeon were captured in slightly deeper water (mean depth = 3.6 m) than pallid sturgeon (mean depth = 3.1 m), though contrary to previous reports, hybrid sturgeon captured in 2006 were in slightly higher water velocities (mean velocity = 0.69 m/s) than pallid sturgeon (mean velocity = 0.38 m/s; Utrup et al 2006).

Ratios of hybrid sturgeon to shovelnose and pallid sturgeon are a useful way to document change from year to year due to the effects of hybridization and decline in the availability of pallid sturgeon to successfully spawn. To avoid the influence of increased sampling effort and efficiency over the years, the following ratios of hybrid sturgeon to pallid and shovelnose sturgeon were calculated from CPUE values to standardize by effort and are reported in Table 16a. It was necessary to separate ratios by gear type because of differences in effort calculations; however, gill net data may be the most accurate at depicting trends in this comparison of ratios.

Table 16a. Ratios of hybrid sturgeon to pallid and shovelnose sturgeon, standardized by effort, for samples collected from 2004 through 2006 in segment 14 of the Missouri River.

Year	Gill Net			1 Inch Trammel Net			Otter Trawl		
	Pallid: Shovelnose	Hybrid: Shovelnose	Pallid: Hybrid	Pallid: Shovelnose	Hybrid: Shovelnose	Pallid: Hybrid	Pallid: Shovelnose	Hybrid: Shovelnose	Pallid: Hybrid
2004	1 : 330	1 : 220	1 : 2	1 : 178	1 : 400	2 : 1	1 : 87	1 : 608	7 : 1
2005	1 : 243	1 : 156	1 : 2	1 : 673	N/A	N/A	1 : 323	1 : 97	1 : 3
2006	1 : 300	1 : 729	2 : 1	1 : 231	1 : 185	1 : 1	N/A	N/A	N/A

Targeted Native River Species

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

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

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

Shovelnose Sturgeon

Year and gear comparisons

A similar number of YOY shovelnose sturgeon were captured during the sturgeon season (N=6) as were captured during the fish community season (N=10). Fewer YOY sturgeon were captured in 2006 than were captured during the 2005 sample year (N = 16 in 2006 versus 42 in 2005; Table 17; Utrup et al 2006). Similar to the 2005 sample year, otter trawls were the most effective at capturing YOY shovelnose sturgeon (94% of total YOY catch, N = 15) during both seasons. Of the 15 YOY shovelnose sturgeon captured using otter trawls during both seasons; 14 were captured in ISB CHNB habitat with one shovelnose sturgeon captured in CHXO CHNB habitat. All of the YOY shovelnose sturgeon were found in CHNB Mesohabitat (100% of the catch relative to 78% of the total effort) despite efforts being expended in POOL (5% of the total effort) and BARS Mesohabitat (13% of the total effort; Table 18). More YOY fish should have been available in the community season versus the sturgeon season and this was not the case suggesting that few of these fish were available in 2006. As in previous years, the vast majority of shovelnose sturgeon greater than 250 mm were captured during the sturgeon season with gillnets (66% of the total catch; N = 2100; Tables 17-24) with ISB and CHXO providing the best macrohabitats. Gillnets were the most effective gear for capturing shovelnose sturgeon greater than 380 mm with the highest catch rate in ISB POOL habitat (CPUE = 7.77) followed by CHXO CHNB habitat (CPUE = 6.15; Appendix F1). Gillnet CPUE decreased slightly from 2005 to 2006, 5.1 to 4.5 respectively, and did not change much for otter trawl from 2005 (Figure

11). Catch rates for quality and greater size (> 380 mm) shovelnose sturgeon in 1 inch trammel nets during sturgeon season has steadily declined since the 2003 sample year (2003 = 2.5; 2004 = 1.6; 2005 = 1.3; 2006 = 0.6; Figure 12). Two and a half inch trammel net CPUE during sturgeon season remained constant from 2005. For fish community season, 1 inch trammel net and otter trawl CPUE has remained fairly constant over the past three years for adult shovelnose sturgeon (> 380 mm; mean 1 inch trammel net CPUE = 1.0; mean otter trawl CPUE = 0.5; Figure 14). Three shovelnose sturgeon were captured in mini-fyke nets during the 2006 sample year, all were > 380 mm (Figure 15).

Many of the declines and inconsistencies in CPUE from year to year may be attributable to both environmental and logistical issues. For instance, in the past few years the Lower Missouri River has been in a drought, which may be contributing to the decline in sturgeon numbers. Another issue may be sampling logistics. Because all standard effort is based on a random sampling design, nets are deployed unevenly in different seasons and bends which more than likely increases the variability between the samples and between years.

There was a greater proportion of larger fish captured during the sturgeon season (RSD-P = 67 and RSD-M = 16) than in the fish community season (RSD-P = 63 and RSD-M = 8; Table 25). Reasons for this disparity may be that spawning shovelnose were more available in the sturgeon season, or that trawls and trammel nets are not as effective at sampling the larger size classes compared to gillnets that represented the trophy size. Only 66 fish were captured in the sub-stock range in both seasons and only 2 shovelnose sturgeon were captured in the trophy range, one in each season. The size distribution of shovelnose sturgeon in segment 14 is typical of long-lived species and depicts minor contribution of smaller fish to the population (Figure 17). According to Pflieger (1997), shovelnose sturgeon reach 210 mm in their first year and 315 mm, 409 mm, 485 mm, 541 mm, and 600 mm in each of the subsequent years. Based on these age categories, the majority of shovelnose sturgeon captured in segment 14 were greater than age 2.

Habitat Use

The majority of the sampling effort in segment 14 was expended in ISB macrohabitat (63% of the total effort) and CHNB mesohabitat (78% of the total effort), due to their proportionate availability. Of the 16 YOY shovelnose sturgeon (0-149 mm; 0.005% of the total catch)

captured in segment 14, 94% (N = 15) were captured in ISB macrohabitat, with all occurring in CHNB mesohabitat (100%). Juvenile shovelnose sturgeon (150-249 mm) made up 0.02% of the total shovelnose catch (N = 50; Table 19). Of the juvenile shovelnose sturgeon, 72% (N = 36) were captured in ISB macrohabitat, with the vast majority (94%; N = 47) occurring in CHNB mesohabitat (Tables 19-20). Stock size (250-379 mm) shovelnose sturgeon (0.03% of the total catch; N = 109) were captured in segment 14, with the majority (69%; N = 75) occurring in ISB for all gear types (Table 21). The majority of stock size shovelnose sturgeon occurred in CHNB mesohabitat (90%; N = 99; Table 22). Quality and above size shovelnose sturgeon made up the bulk of the total catch (95%; N = 3017), with most captured during the sturgeon season (85%; Table 23). Most quality and greater size shovelnose sturgeon were caught in ISB macrohabitat with 60% (N = 1808) of the total catch, relative to 63% of the effort, followed by CHXO macrohabitat, which contained 34% (N = 1011) of the total catch, relative to 26% of the total effort (Table 23). Large secondary connected channels (SCCL) contained approximately 16% of the overall catch of shovelnose sturgeon relative to only 4% of the total effort expended (Table 23). This indicates the importance of these secondary channels to adult shovelnose sturgeon because, relative to effort, more adult shovelnose sturgeon were captured in secondary channels than in all other macrohabitats. Similar to the smaller shovelnose, the majority of quality and above shovelnose sturgeon (62%; N = 1872) occurred in CHNB mesohabitat with POOL mesohabitat contributing to 33% of the overall total catch (N = 1039) relative to only 5% of the total overall effort (Table 24).

Sturgeon and fish community season sampling captured shovelnose sturgeon representing 6 cohorts (40 mm, 100 mm, 200 mm, 340 mm, 400 mm, and 600 mm; Figure 17). Because of seasonal migration, a higher proportion of preferred and memorable sized shovelnose sturgeon were captured during the sturgeon season (RSD-P = 67, RSD-M = 16) and quality and preferred during the fish community season (RSD-Q = 19, RSD-P = 63; Table 25). Few sub-stock shovelnose sturgeon were captured in either season (N = 36 sturgeon; N = 30 community) and only 2 trophy size shovelnose sturgeon were captured, one during each season. Relative weight compared between stock sizes is normal for long lived fish like shovelnose sturgeon showing a general decrease in W_r as the fish matures (Table 25).

Segment 14 - Shovelnose Sturgeon / Sturgeon Season

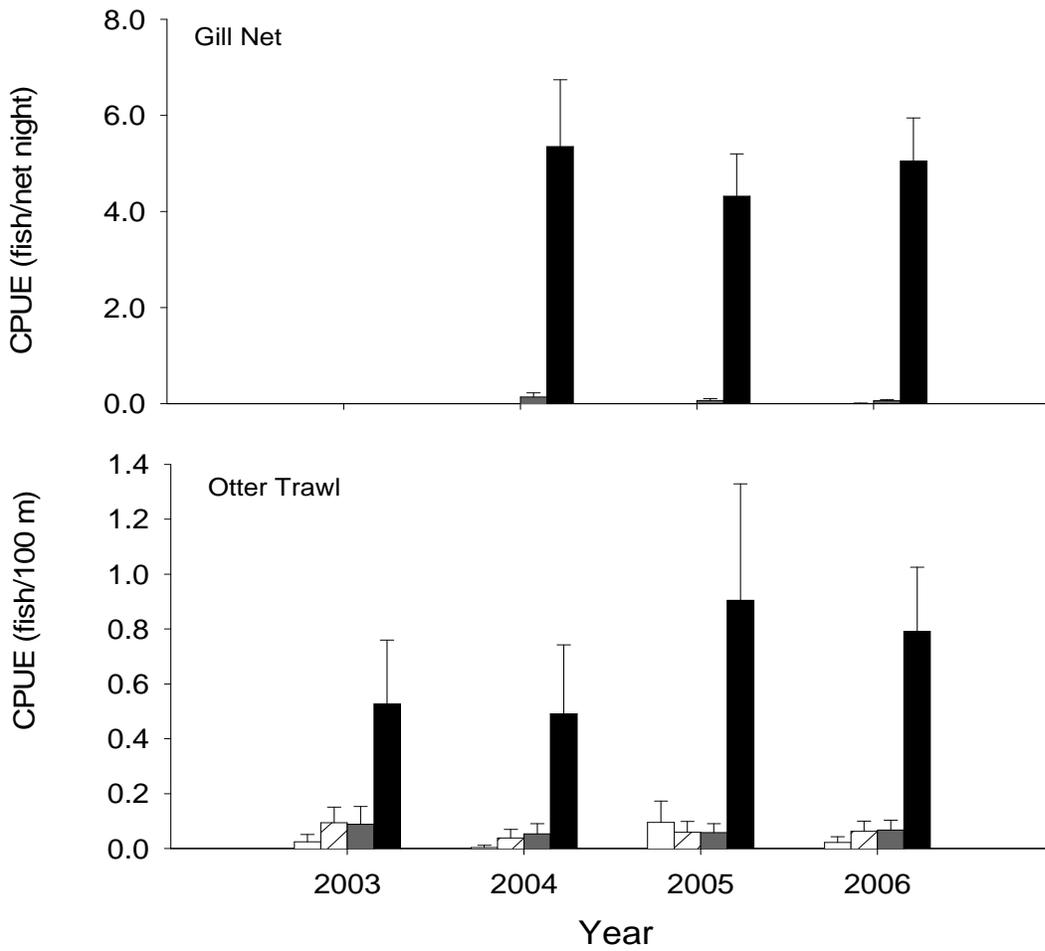


Figure 11. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched bars), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using gill nets and otter trawls in segment 14 of the Missouri River during sturgeon season 2003 - 2006.

Segment 14 - Shovelnose Sturgeon / Sturgeon Season

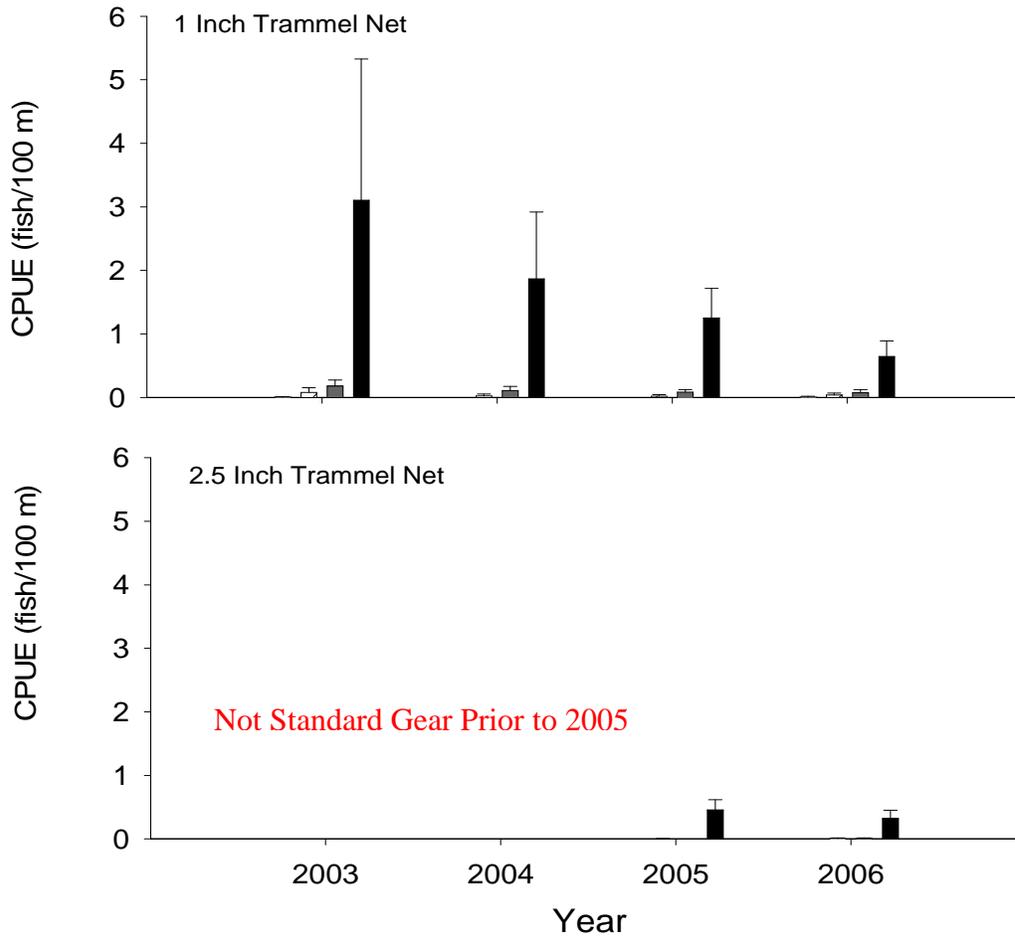


Figure 12. Mean annual catch-per-unit-effort (\pm 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched bars), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using 1 and 2.5 inch trammel nets in segment 14 of the Missouri River during sturgeon season 2003 - 2006.

Segment 14 - Shovelnose Sturgeon / Fish Community Season

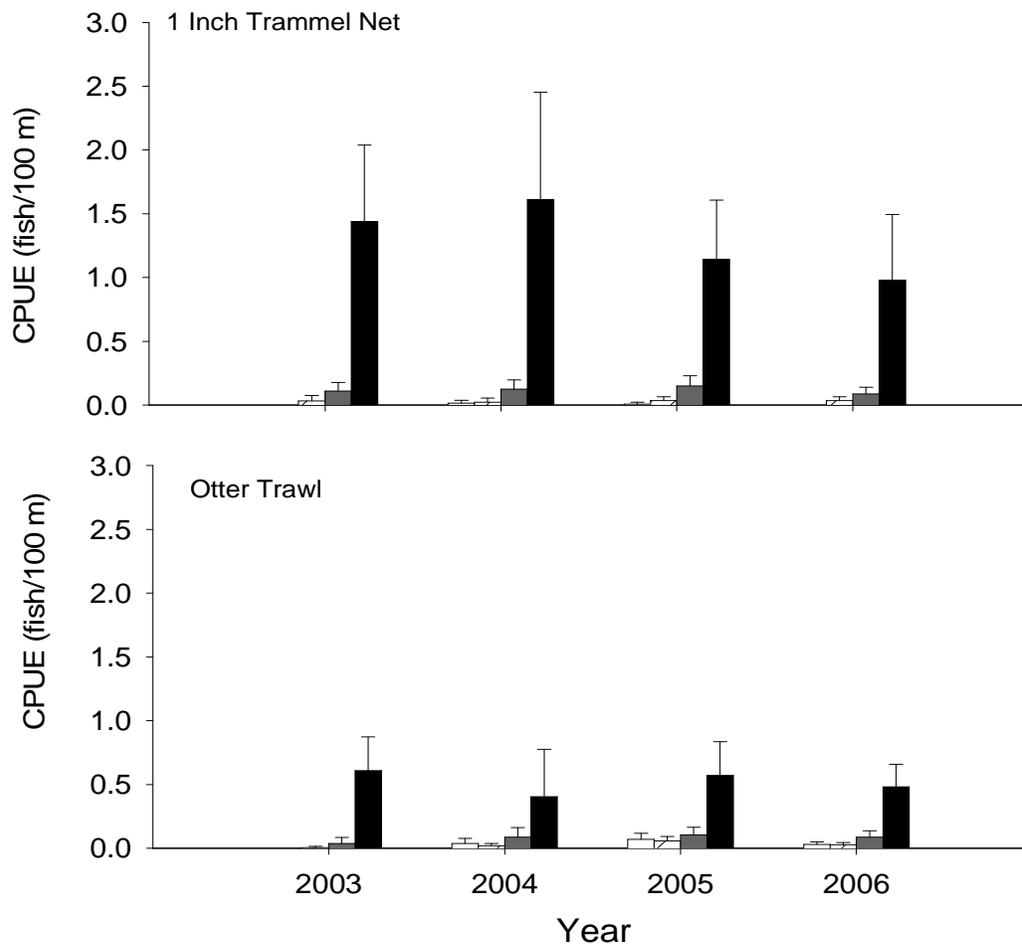


Figure 14. Mean annual catch-per-unit-effort (\pm 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched bars), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using 1 inch trammel nets and otter trawls in segment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

Segment 14 - Shovelnose Sturgeon / Fish Community Season

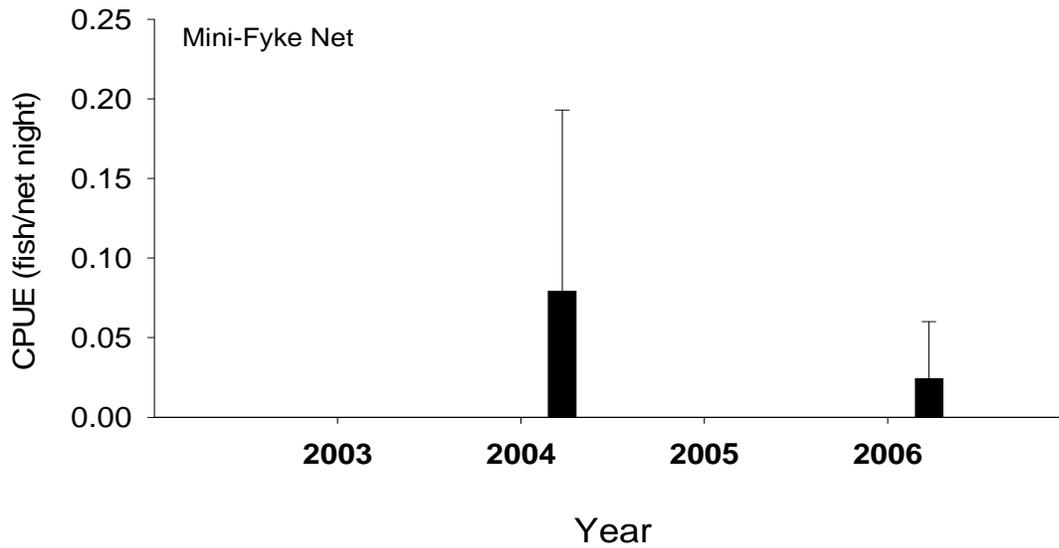


Figure 15. Mean annual catch-per-unit-effort (\pm 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched bars), stock size (250-379 mm; gray bars), and quality and above size ($>$ 380 mm; black bars) shovelnose sturgeon using mini-fyke nets and bag seines in segment 14 of the Missouri River during fish community season 2003 - 2006.

Table 17. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	1	4	0	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	67	1	4	0	0	0	0	0	
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	54	10	4	3	0	0	0	0	
Otter Trawl	5	N-E	20	0	N-E	N-E	80	0	0	0	0	0	0	0	
		N-E	22	0	N-E	N-E	70	1	8	0	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	29	0	N-E	N-E	66	2	2	1	0	0	0	0	
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	25	0	N-E	N-E	44	8	6	16	0	0	2	0	
Otter Trawl	10	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0		
		N-E	23	0	N-E	N-E	71	0	2	3	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	1	0	100	0	0	0
		0	99	1	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Gill Net	0	0	0	0	0	0
		0	58	4	37	0
Otter Trawl	5	0	100	0	0	0
		0	97	3	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Mini-Fyke Net	0	0	0	0	0	0
		93	2	5	0	0
Otter Trawl	10	0	100	0	0	0
		0	95	5	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	8	N-E	25	0	N-E	N-E	62	0	12	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	1	4	0	0	0	0	0	0
2.5 Inch Trammel Net	1	N-E	0	0	N-E	N-E	0	0	100	0	0	0	0	0	0
		N-E	27	1	N-E	N-E	67	1	4	0	0	0	0	0	0
Gill Net	2	N-E	0	0	N-E	N-E	50	0	0	50	0	0	0	0	0
		N-E	27	1	N-E	N-E	54	10	4	3	0	0	0	0	0
Otter Trawl	19	N-E	16	0	N-E	N-E	68	0	16	0	0	0	0	0	0
		N-E	22	0	N-E	N-E	70	1	8	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	11	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	2	2	1	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	25	0	N-E	N-E	44	8	6	16	0	0	0	2	0
Otter Trawl	9	N-E	33	0	N-E	N-E	67	0	0	0	0	0	0	0	0
		N-E	23	0	N-E	N-E	71	0	2	3	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	8	0	100	0	0	0
		0	99	1	0	0
2.5 Inch Trammel Net	1	0	100	0	0	0
		0	97	3	0	0
Gill Net	2	0	50	50	0	0
		0	58	4	37	0
Otter Trawl	19	0	89	11	0	0
		0	97	3	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	11	0	100	0	0	0
		0	97	3	0	0
Mini-Fyke Net	0	0	0	0	0	0
		93	2	5	0	0
Otter Trawl	9	0	100	0	0	0
		0	95	5	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	14	N-E	21	0	N-E	N-E	64	14	0	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	1	4	0	0	0	0	0	0
2.5 Inch Trammel Net	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	27	1	N-E	N-E	67	1	4	0	0	0	0	0	0
Gill Net	22	N-E	27	0	N-E	N-E	41	0	0	0	0	0	0	0	0
		N-E	27	1	N-E	N-E	54	10	4	3	0	0	0	0	0
Otter Trawl	21	N-E	14	0	N-E	N-E	76	0	10	0	0	0	0	0	0
		N-E	22	0	N-E	N-E	70	1	8	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	27	N-E	4	0	N-E	N-E	96	0	0	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	2	2	1	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	25	0	N-E	N-E	44	8	6	16	0	0	0	2	0
Otter Trawl	24	N-E	25	0	N-E	N-E	58	0	4	12	0	0	0	0	0
		N-E	23	0	N-E	N-E	71	0	2	3	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	14	0	100	0	0	0
		0	99	1	0	0
2.5 Inch Trammel Net	1	0	100	0	0	0
		0	97	3	0	0
Gill Net	22	0	68	0	32	0
		0	58	4	37	0
Otter Trawl	21	0	100	0	0	0
		0	97	3	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	27	0	100	0	0	0
		0	97	3	0	0
Mini-Fyke Net	0	0	0	0	0	0
		93	2	5	0	0
Otter Trawl	24	0	88	12	0	0
		0	95	5	0	0

Table 23. Total number of quality size and greater (≥ 380 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	160	N-E	16	0	N-E	N-E	72	1	11	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	1	4	0	0	0	0	0	0
2.5 Inch Trammel Net	93	N-E	14	0	N-E	N-E	84	1	1	0	0	0	0	0	0
		N-E	27	1	N-E	N-E	67	1	4	0	0	0	0	0	0
Gill Net	2078	N-E	32	2	N-E	N-E	52	10	1	2	0	0	0	0	0
		N-E	27	1	N-E	N-E	54	10	4	3	0	0	0	0	0
Otter Trawl	252	N-E	17	0	N-E	N-E	78	0	5	0	0	0	0	0	0
		N-E	22	0	N-E	N-E	70	1	8	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	289	N-E	8	0	N-E	N-E	82	1	4	5	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	2	2	1	0	0	0	0	0
Mini-Fyke Net	3	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	25	0	N-E	N-E	44	8	6	16	0	0	0	2	0
Otter Trawl	142	N-E	23	0	N-E	N-E	69	0	2	6	0	0	0	0	0
		N-E	23	0	N-E	N-E	71	0	2	3	0	0	0	0	0

Table 24. Total number of quality size and greater (≥ 380 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	160	0	96	4	0	0
		0	99	1	0	0
2.5 Inch Trammel Net	93	0	100	0	0	0
		0	97	3	0	0
Gill Net	2078	0	47	2	50	0
		0	58	4	37	0
Otter Trawl	252	0	98	2	0	0
		0	97	3	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	289	0	94	6	0	0
		0	97	3	0	0
Mini-Fyke Net	3	100	0	0	0	0
		93	2	5	0	0
Otter Trawl	142	0	92	8	0	0
		0	95	5	0	0

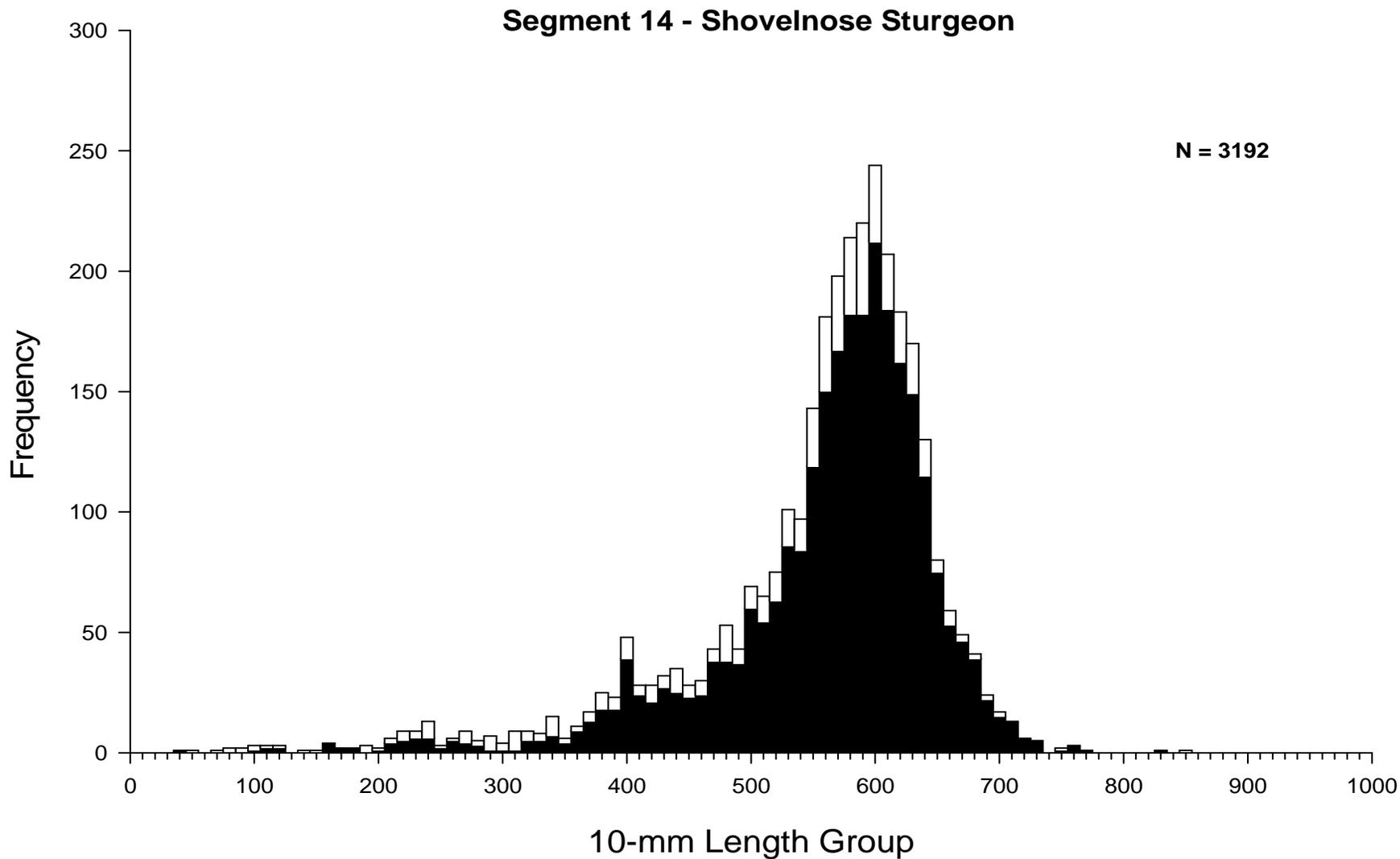


Figure 17. Length frequency of shovelnose sturgeon from fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during the 2006 sample year.

Table 25. Incremental relative stock density (RSD)^a and mean relative weight (Wr) by a length category for shovelnose sturgeon in segment 14 of the Missouri River captured during 2006. Length categories^b determined using methods proposed by Quist (1998).

Length category	N	RSD	Wr (+/- 2SE)
Sturgeon Season			
Sub-stock (0-149 mm)	6	-	-
Sub-stock (150-249 mm)	30	-	119 (31.14)
Stock	58	2	91 (7.09)
Quality	387	15	87 (2.43)
Preferred	1778	67	85 (1.20)
Memorable	417	16	84 (1.99)
Trophy	1	0.04	101
Overall	2677	-	86 (1.26)
Fish Community Season			
Sub-stock (0-149 mm)	10	-	141
Sub-stock (150-249 mm)	20	-	102
Stock	51	11	87 (5.55)
Quality	91	19	82 (1.95)
Preferred	303	63	81 (1.40)
Memorable	39	8	77 (3.88)
Trophy	1	0.2	-
Overall	515	-	82 (1.20)

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

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

Sturgeon Chub

During the 2006 sample year, a total of 23 sturgeon chubs were captured in segment 14 compared to 36 in 2005 (Utrup et al. 2006). Otter trawls were the only gear to capture sturgeon chubs with 9 captured during sturgeon season (CPUE = 0.02) and 14 during fish community season (CPUE = 0.04; Figures 18-19). Otter trawl CPUE increased slightly from 2004 to 2005 during both sturgeon (CPUE = 0.02 in 2004 versus 0.05 in 2005) and fish community seasons (CPUE = 0.06 in 2004 versus 0.09 in 2005), but decreased to 2004 levels during the 2006 sample year (Figures 18 and 19). During the sturgeon season, the majority of sturgeon chubs were captured in ISB macrohabitat (78% of the total catch relative to 63% of the total effort) and CHNB mesohabitat (100% of the total catch relative to 78% of the effort). For fish community season, sturgeon chubs were captured in similar habitats with 93% of sturgeon chubs occurring in ISB macrohabitat (relative to 63% of the total effort) and 100% occurring in CHNB mesohabitat relative to 78% of the total effort (Tables 26-27).

Not enough sturgeon chubs ($N < 50$) were captured in segment 14 during the 2006 sample year to summarize year to year trends and population structure.

Segment 14 - Sturgeon Chub / Sturgeon Season

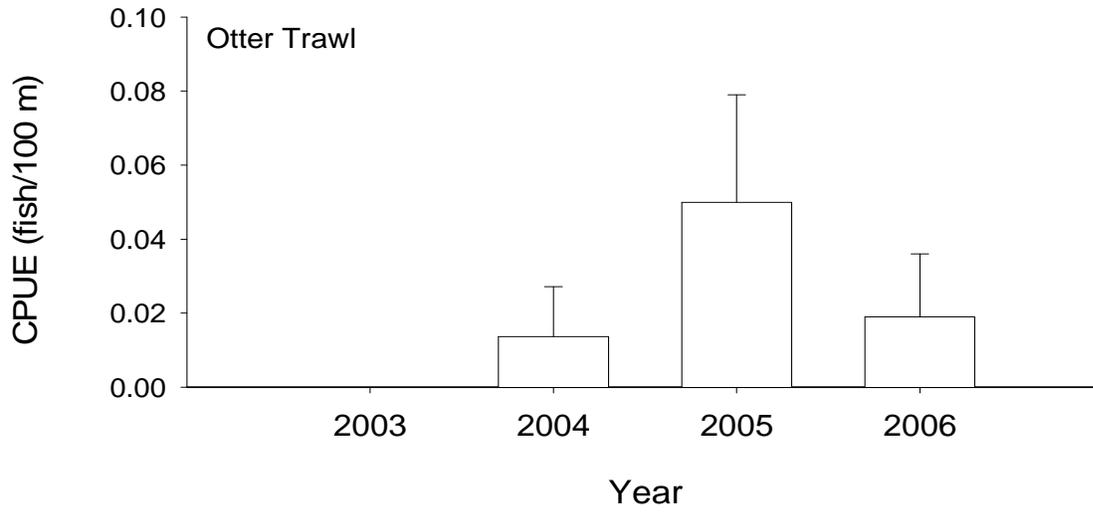


Figure 18. Mean annual catch-per-unit-effort ($\pm 2SE$) of sturgeon chub using otter trawls in segment 14 of the Missouri River during sturgeon season 2003-2006.

Segment 14 - Sturgeon Chub / Fish Community Season

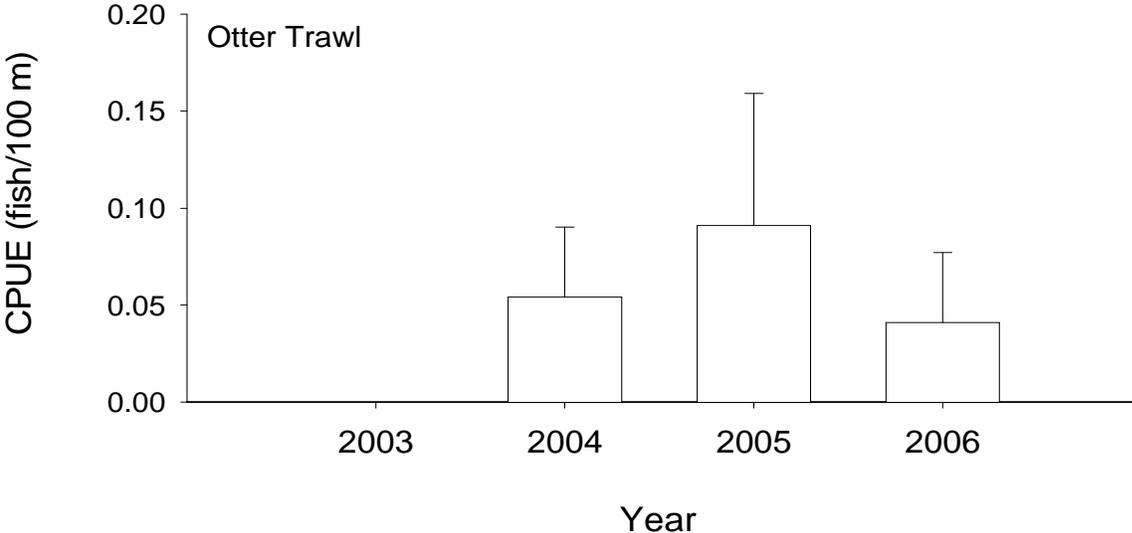


Figure 19. Mean annual catch-per-unit-effort (+/- 2SE) of sturgeon chub using otter trawls in segment 14 of the Missouri River during fish community season 2003-2006.

Table 26. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	1	4	0	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	67	1	4	0	0	0	0	0	
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	54	10	4	3	0	0	0	0	
Otter Trawl	9	N-E	22	0	N-E	N-E	78	0	0	0	0	0	0	0	
		N-E	22	0	N-E	N-E	70	1	8	0	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	29	0	N-E	N-E	66	2	2	1	0	0	0	0	
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	25	0	N-E	N-E	44	8	6	16	0	0	0	2	
Otter Trawl	14	N-E	7	0	N-E	N-E	93	0	0	0	0	0	0	0	
		N-E	23	0	N-E	N-E	71	0	2	3	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	99	1	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Gill Net	0	0	0	0	0	0
		0	58	4	37	0
Otter Trawl	9	0	100	0	0	0
		0	97	3	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Mini-Fyke Net	0	0	0	0	0	0
		93	2	5	0	0
Otter Trawl	14	0	100	0	0	0
		0	95	5	0	0

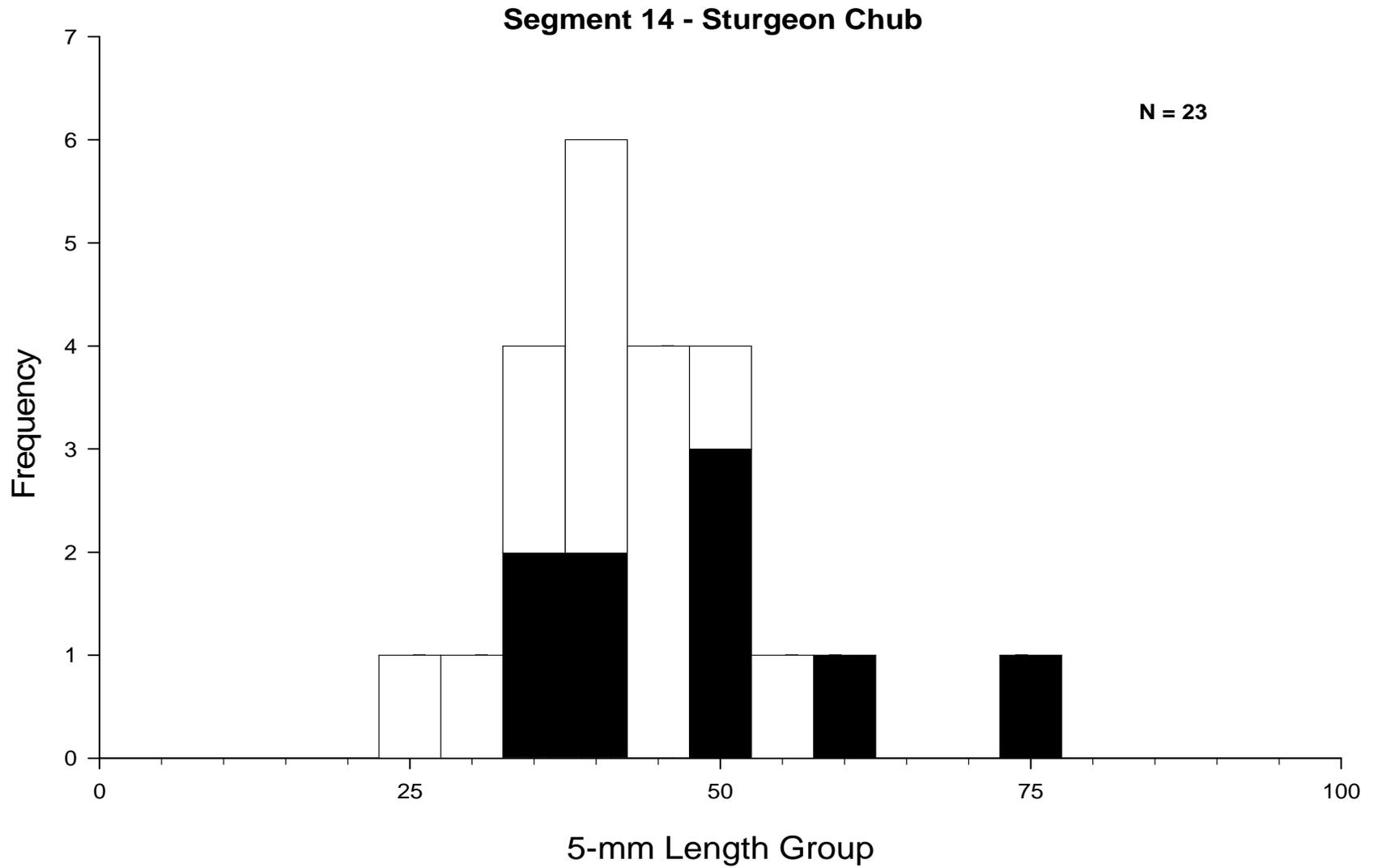


Figure 21. Length frequency of sturgeon chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during the 2006 sample year.

Sicklefin Chub

A total of 200 sicklefin chubs were captured in segment 14, which was fewer than were captured in 2005 (N = 355; Utrup et al. 2006). There has been a notable decline in the total number of sicklefin chubs captured in segment 14 since 2004 (N = 1029 in 2004, N = 355 in 2005, and N = 200 in 2006). Otter trawls were the most effective gear at capturing sicklefin chubs (making up over 98% of the total catch) with mini-fyke nets only making up 0.02% of the total catch. Nearly twice as many sicklefin chubs were captured during the fish community season (64%; N = 128) than in sturgeon season (N = 71), which is the complete opposite from the 2005 sample year (Table 28; Utrup et al. 2006). Catch-per-unit-effort with otter trawls during sturgeon season (CPUE = 0.23) was lower than it was for fish community season (CPUE of 0.38; Figures 22-23). Otter trawl CPUE decreased considerably from 2005 for sturgeon season (CPUE = 0.84 in 2004 versus 0.23 in 2005) and stayed constant for fish community season (CPUE = 0.37 in 2004 versus 0.38 in 2005; Figures 22-23). Mini-fyke CPUE has notably decreased since 2004 with Mini-fyke net catch rates decreasing from 0.94 sicklefin chubs per net night during the 2004 fish community season to 0.05 per net night in 2005 and 0.02 per net night in 2006 (Figure 24). During the sturgeon season, the majority of sicklefin chubs were captured in ISB macrohabitat (90% of the total catch relative to 64% of the total effort) and CHNB mesohabitat (100% of the total catch relative to 88% of the total effort). During fish community season, captures were distributed similarly with 89% of sicklefin chubs occurring in ISB macrohabitat (relative to 60% of the total effort) and 100% occurring in CHNB Mesohabitat relative to a total effort of 65% (Tables 26-27).

Similar to 2005, more large sicklefin chubs were captured earlier in the sample year (i.e. during sturgeon season), whereas, smaller (YOY) sicklefin chubs were captured during fish community season (Figure 25). Pflieger (1997) noted that many young sicklefin chubs were captured in July, suggesting a spring spawning season. Correspondingly, adult sicklefin chubs have been found to be full of eggs in the spring (Jennifer Johnson, U.S. Fish and Wildlife Service, personal communication) and are most likely actively spawning during the sturgeon season, perhaps making them more vulnerable to sampling gear than during the summer and fall months (fish community season). According to Pflieger (1997), YOY sicklefin chubs attain lengths of about 25 to 66 mm in their first year of life. There was a strong presence of age-1 sicklefin chubs in

the fish community season samples during the 2006 sample year corresponding to a successful spawn in 2005 and good recruitment in 2006 (Figure 25; Utrup et al. 2006).

Segment 14 - Sicklefin Chub / Sturgeon Season

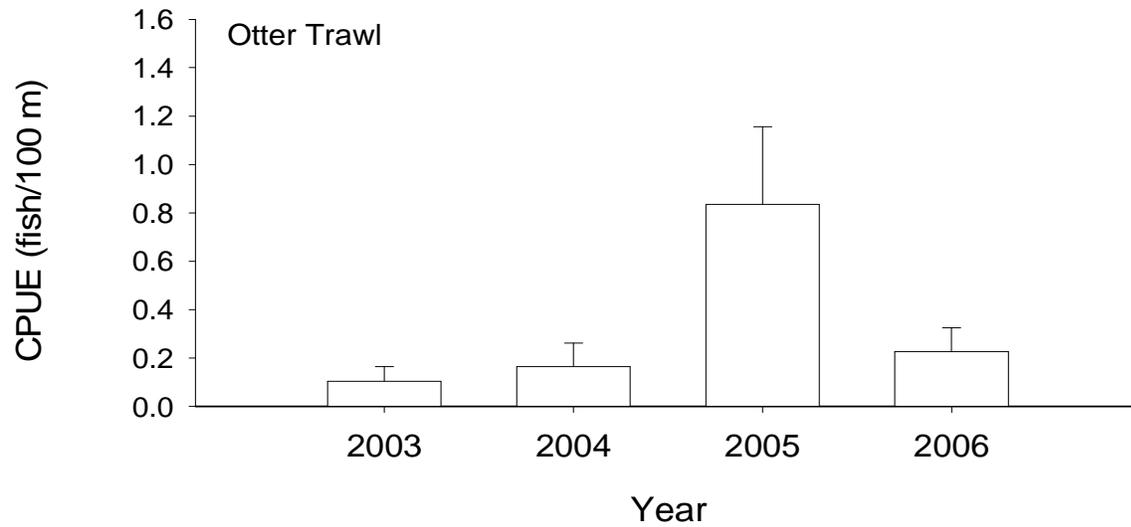


Figure 22. Mean annual catch-per-unit-effort ($\pm 2SE$) of sicklefin chub using otter trawls in segment 14 of the Missouri River during sturgeon season 2003-2006.

Segment 14 - Sicklefin Chub / Fish Community Season

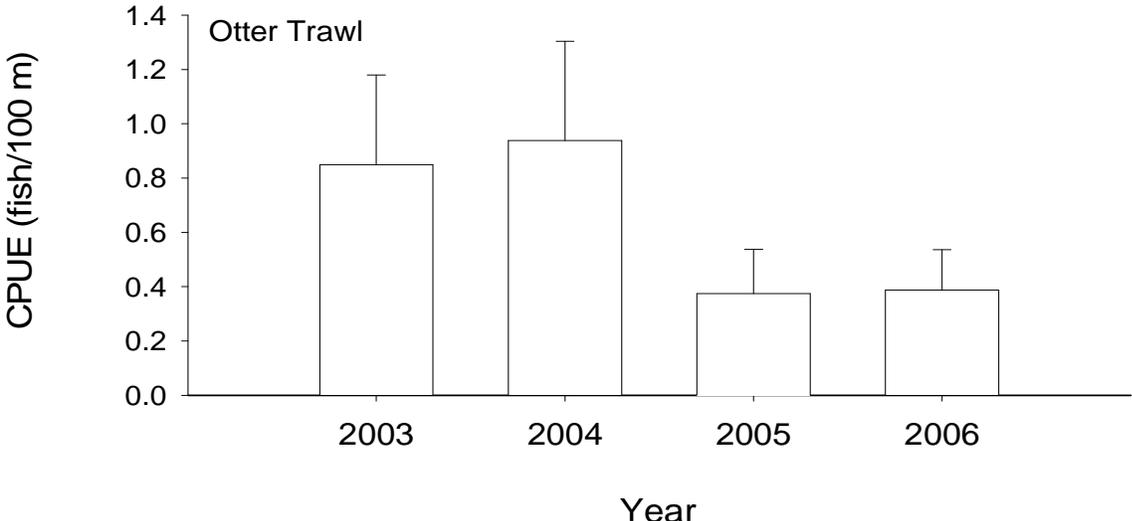


Figure 23. Mean annual catch-per-unit-effort (+/- 2SE) of sicklefin chub using otter trawls in segment 14 of the Missouri River during fish community season 2003-2006.

Segment 14 - Sicklefin Chub / Fish Community Season

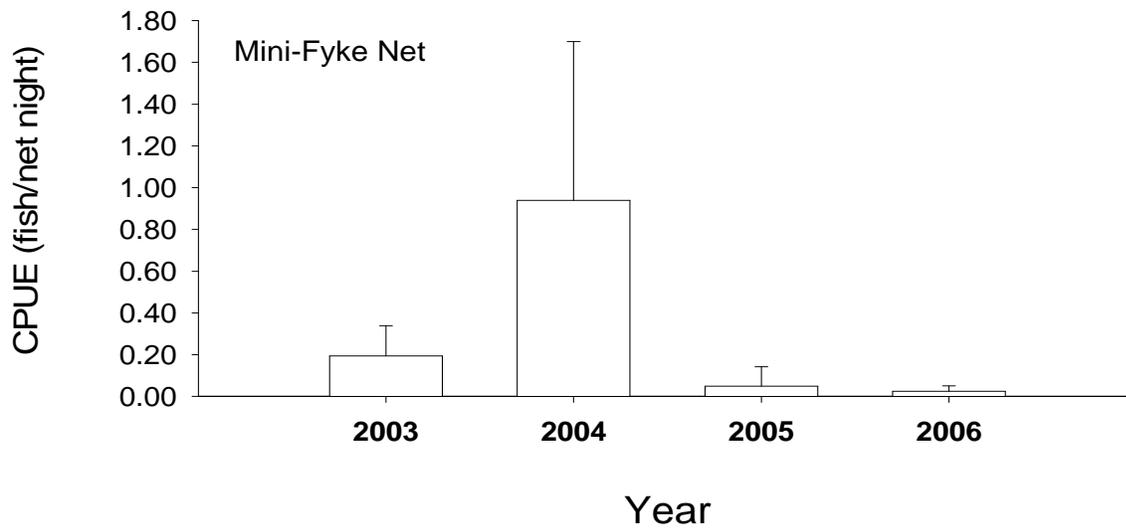


Figure 24. Mean annual catch-per-unit-effort ($\pm 2SE$) of sicklefin chub using mini-fyke nets in segment 14 of the Missouri River during fish community season 2003-2006.

Table 28. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	1	4	0	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	67	1	4	0	0	0	0	0	
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	54	10	4	3	0	0	0	0	
Otter Trawl	71	N-E	8	0	N-E	N-E	90	0	1	0	0	0	0	0	
		N-E	22	0	N-E	N-E	70	1	8	0	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	29	0	N-E	N-E	66	2	2	1	0	0	0	0	
Mini-Fyke Net	3	N-E	33	0	N-E	N-E	67	0	0	0	0	0	0		
		N-E	25	0	N-E	N-E	44	8	6	16	0	0	2	0	
Otter Trawl	126	N-E	9	0	N-E	N-E	90	0	2	0	0	0	0		
		N-E	23	0	N-E	N-E	71	0	2	3	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0 0	0 99	0 1	0 0	0 0
2.5 Inch Trammel Net	0	0 0	0 97	0 3	0 0	0 0
Gill Net	0	0 0	0 58	0 4	0 37	0 0
Otter Trawl	71	0 0	100 97	0 3	0 0	0 0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0 0	0 97	0 3	0 0	0 0
Mini-Fyke Net	3	100 93	0 2	0 5	0 0	0 0
Otter Trawl	126	0 0	100 95	0 5	0 0	0 0

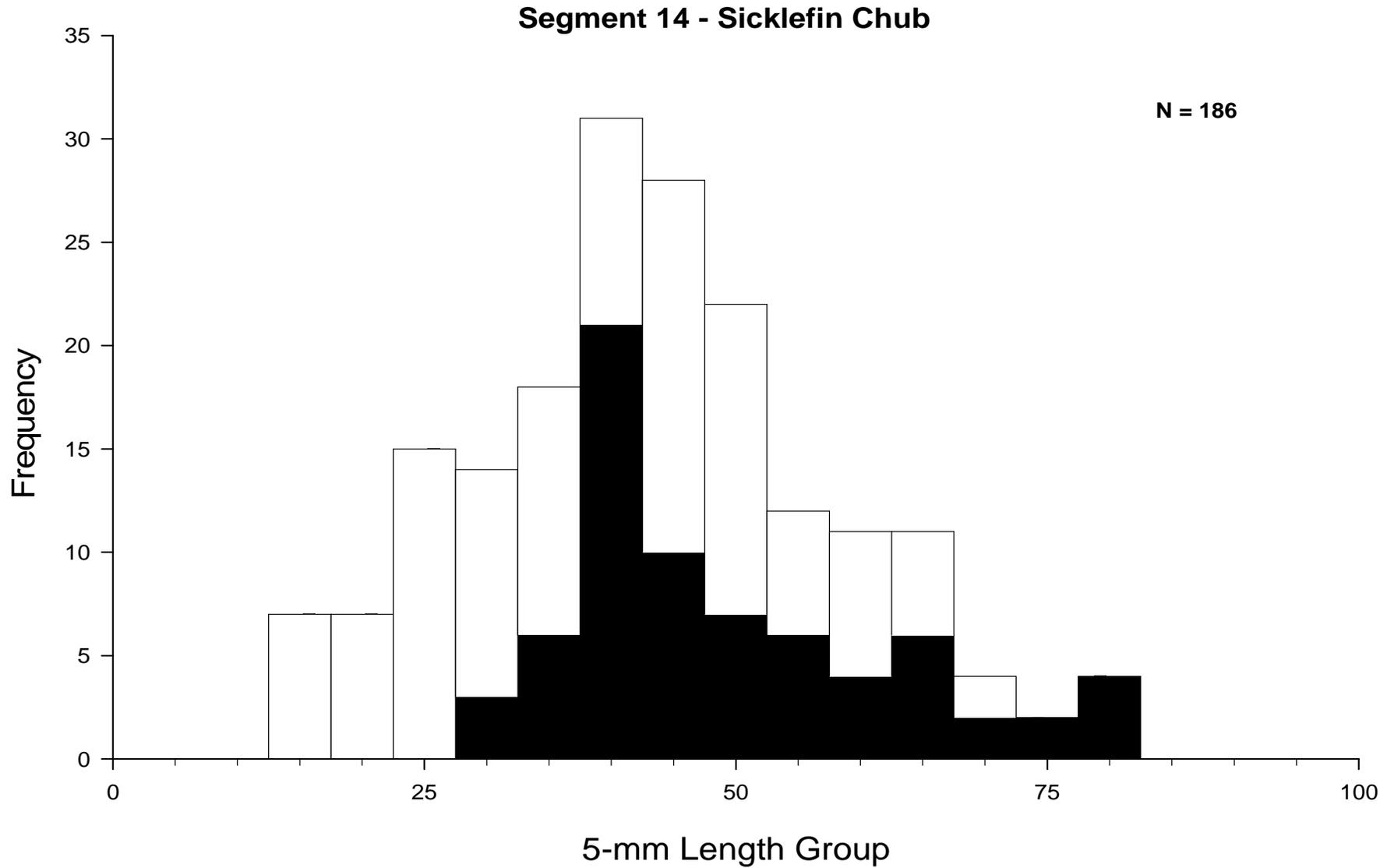


Figure 25. Length frequency of sicklefin chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during the 2006 sample year.

Speckled Chub

A total of 597 speckled chubs were captured in segment 14, slightly more than were captured in 2005 (N = 575; Utrup et al. 2006). The majority of speckled chubs were captured during the sturgeon season (61%; N = 365) versus fish community season (39%; N = 232; Table 30). Otter trawls were the most effective gear at capturing speckled chubs for both sturgeon and fish community seasons (making up 96% of the total catch) with mini-fyke nets only making up 0.04% of the total catch. Since mini-fyke nets were only used during fish community season, otter trawls were the only gear that captured speckled chubs during sturgeon season with a CPUE of 1.11 fish per 100 m trawled. Catch-per-unit-effort with otter trawls during sturgeon season (CPUE = 1.11) was slightly higher than for fish community season (CPUE = 0.72). Otter trawl CPUE for sturgeon season decreased slightly from 2004 to 2005 but rebounded during the 2006 sample year (CPUE = 0.93 in 2004; 0.65 in 2005, and 1.11 in 2006; Figure 26). Otter trawl CPUE for fish community season decreased slightly from 2005 but is still much greater than in 2003 and 2004 (Figure 27). Mini-fyke CPUE has decreased consistently since 2004 (2004 = 0.58; 2005 = 0.37; 2006 = 0.18; Figure 28). During sturgeon season, the majority of speckled chubs were captured in ISB macrohabitat (84% of the total catch relative to 64% of the total effort) and CHNB mesohabitat (99% of the total catch relative to 88% of the effort). During fish community season, the majority of speckled chubs were captured in ISB macrohabitat (76% of the total catch) relative to 60% of the total effort (Table 30). The majority (89% of total catch relative to 65% of the total effort) of speckled chubs were captured in CHNB mesohabitat (Table 31). It is worth noting that a disproportionate number of speckled chubs (23% of the total catch relative to only 4% of the total effort) were captured in ITIP mesohabitat (Table 31).

Similar to other chub species, larger individuals were captured earlier in the sample year (i.e. during sturgeon season), whereas, smaller (YOY) speckled chubs were captured during fish community season (Figure 29). Pflieger (1997) noted that speckled chubs begin to spawn in early May and continue through the summer. Correspondingly, adult speckled chubs have been found to be full of eggs in the spring (Jennifer Johnson, U.S. Fish and Wildlife Service, personal communication) and are most likely actively spawning during the sturgeon season. According to Pflieger (1997), YOY speckled chubs attain lengths of about 25 to 60 mm in their first year of life. Because speckled chubs are short-lived (seldom living longer than one and a half years; Pflieger et al. 1997), much of the reproduction is accomplished by year old fish that subsequently

die after spawning. Similar to what was found in 2005, of the speckled chubs captured during the 2006 sample year, it appears that the 2005 year class was captured during sturgeon season while they were actively spawning and slowly began to die off; as a result, we started capturing YOY speckled chubs toward the end of summer (Figure 29).

Segment 14 - Speckled Chub / Sturgeon Season

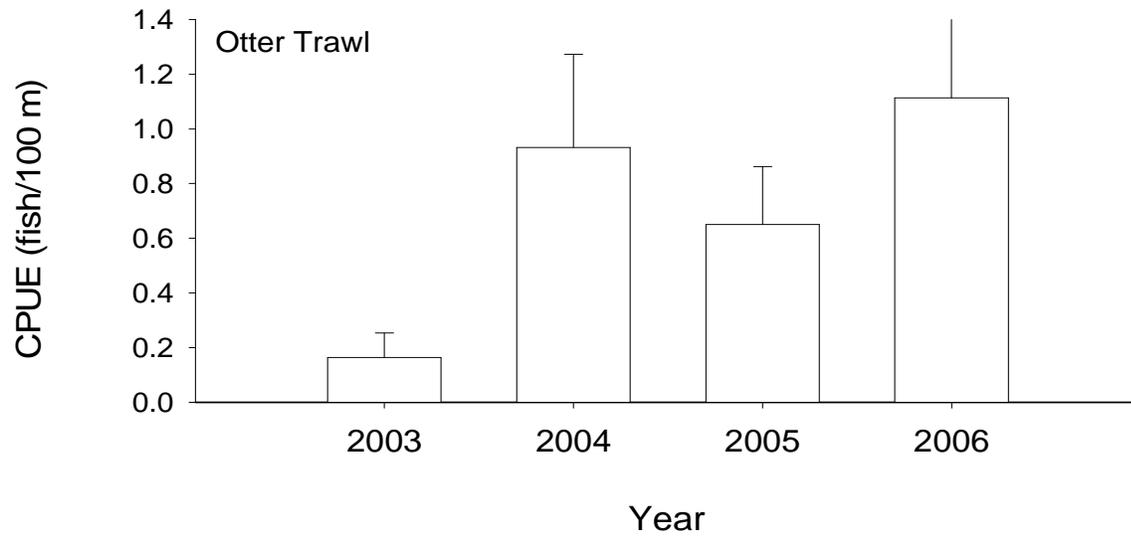


Figure 26. Mean annual catch-per-unit-effort (± 2 SE) of speckled chub using otter trawls in segment 04 of the Missouri River during sturgeon season 2003 -2006.

Segment 14 - Speckled Chub / Fish Community Season

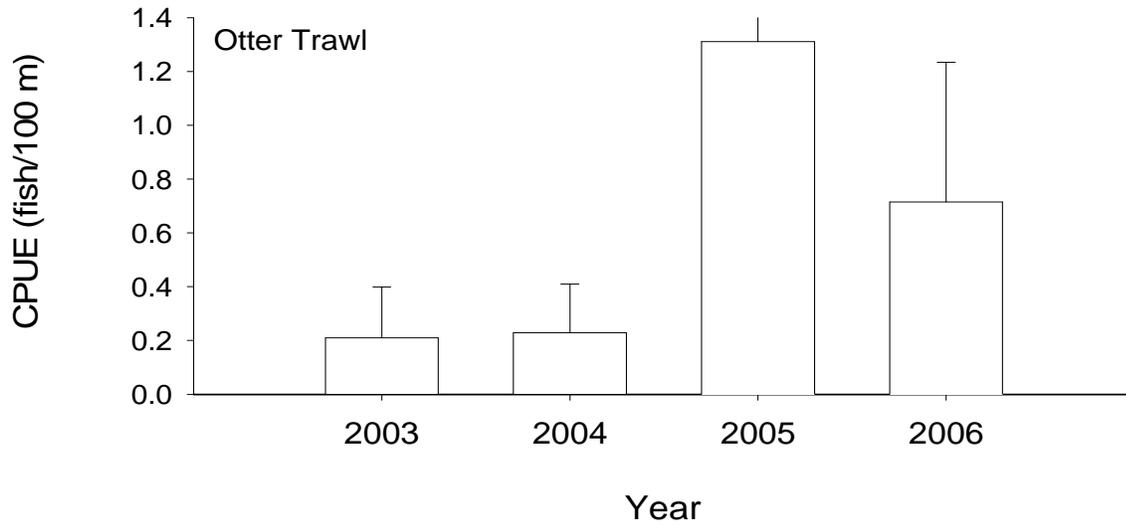


Figure 27. Mean annual catch-per-unit-effort (\pm 2SE) of speckled chub using otter trawls in segment 14 of the Missouri River during fish community season 2003 -2006.

Segment 14 - Speckled Chub / Fish Community Season

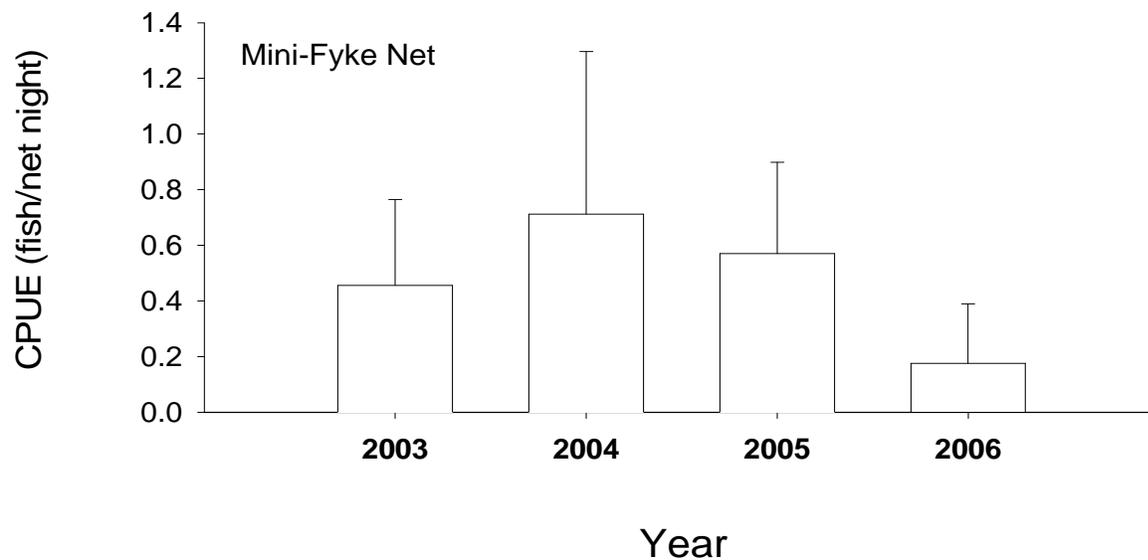


Figure 28. Mean annual catch-per-unit-effort ($\pm 2SE$) of speckled chub using mini-fyke nets in segment 14 of the Missouri River during fish community season 2003 -2006.

Table 30. Total number of speckled chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	1	4	0	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	67	1	4	0	0	0	0	0	
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	54	10	4	3	0	0	0	0	
Otter Trawl	365	N-E	8	0	N-E	N-E	84	7	0	0	0	0	0	0	
		N-E	22	0	N-E	N-E	70	1	8	0	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	29	0	N-E	N-E	66	2	2	1	0	0	0	0	
Mini-Fyke Net	22	N-E	5	0	N-E	N-E	14	0	59	23	0	0	0	0	
		N-E	25	0	N-E	N-E	44	8	6	16	0	0	0	2	
Otter Trawl	210	N-E	14	0	N-E	N-E	84	0	0	2	0	0	0	0	
		N-E	23	0	N-E	N-E	71	0	2	3	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0 0	0 99	0 1	0 0	0 0
2.5 Inch Trammel Net	0	0 0	0 97	0 3	0 0	0 0
Gill Net	0	0 0	0 58	0 4	0 37	0 0
Otter Trawl	365	0 0	99 97	1 3	0 0	0 0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0 0	0 97	0 3	0 0	0 0
Mini-Fyke Net	22	95 93	0 2	5 5	0 0	0 0
Otter Trawl	210	0 0	98 95	2 5	0 0	0 0

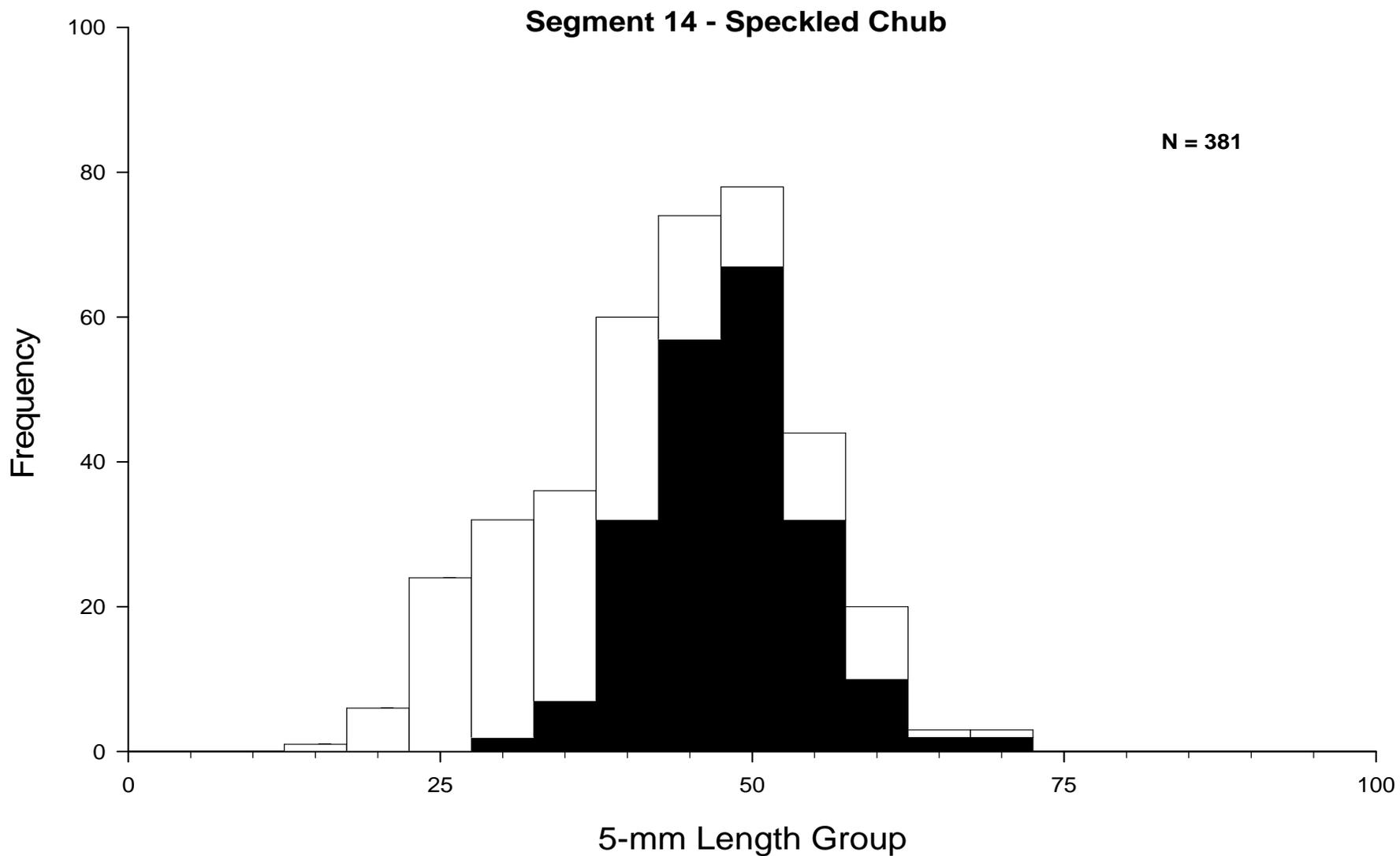


Figure 29. Length frequency of speckled chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during the 2006 sample year.

Sand Shiner

A total of 57 sand shiners were captured in segment 14, which was considerably less than were captured in 2005 ($N = 216$; Utrup et al. 2006). The vast majority of sand shiners were captured during fish community season (95%; $N = 54$) versus sturgeon season ($N = 3$; Table 32). Mini-fyke nets ($CPUE = 0.43$) were the most effective gears at capturing sand shiners (making up 95% of the total catch overall) with otter trawls only making up 0.05% of the total catch overall (Table 32). Since mini-fyke nets were only used during the fish community season, otter trawls were the only gear that captured sand shiners during sturgeon season with a $CPUE$ of 0.008 fish per 100 m trawled. Mini-fyke nets were the only gear to catch sand shiners during fish community season. Mini-fyke net $CPUE$ decreased from 2005 ($CPUE = 1.4$ in 2005 versus 0.43 in 2006; Figure 32). The majority of sand shiners were captured in ISB macrohabitat relative to the majority of the overall effort (63%; Table 32). A disproportionate number of sand shiners were captured in OSB macrohabitat relative to sampling effort (30% of the total catch relative to only 3% of the total effort; Table 32). Since mini-fyke nets were the primary gear that captured sand shiners, by definition, sand shiners were exclusively captured in BARS mesohabitat (100% of the total catch versus 13% of the total effort). It appears sand shiners primarily inhabit the BARS mesohabitat since mini-fyke nets captured almost all of the sand shiners (95%; Table 32).

Pflieger (1997) reported that the maximum life span of sand shiners is 3 years and that most do not reach sexual maturity until the second or third year. It was also reported that sand shiners reach 25 mm in the first year and between 40 and 60 mm in the second year. Sand shiners captured during the 2006 sample year in segment 14 were almost exclusively captured during late summer and early fall, near the end of their spawning season. Figure 33 illustrates that there is some influence from the 2006 spawning season, with a YOY sand shiner cohort at around 28 mm in length. The majority of sand shiners captured were more than likely spawned in late spring and summer of 2005, especially those caught in otter trawls during the sturgeon season (Figure 33). This indicates strong recruitment to age 1, however, only a few sand shiners were captured near their maximum age and length (70 mm) suggesting an absence of age 2+ fish in our samples (Figure 33).

Segment 14 - Sand Shiner / Sturgeon Season

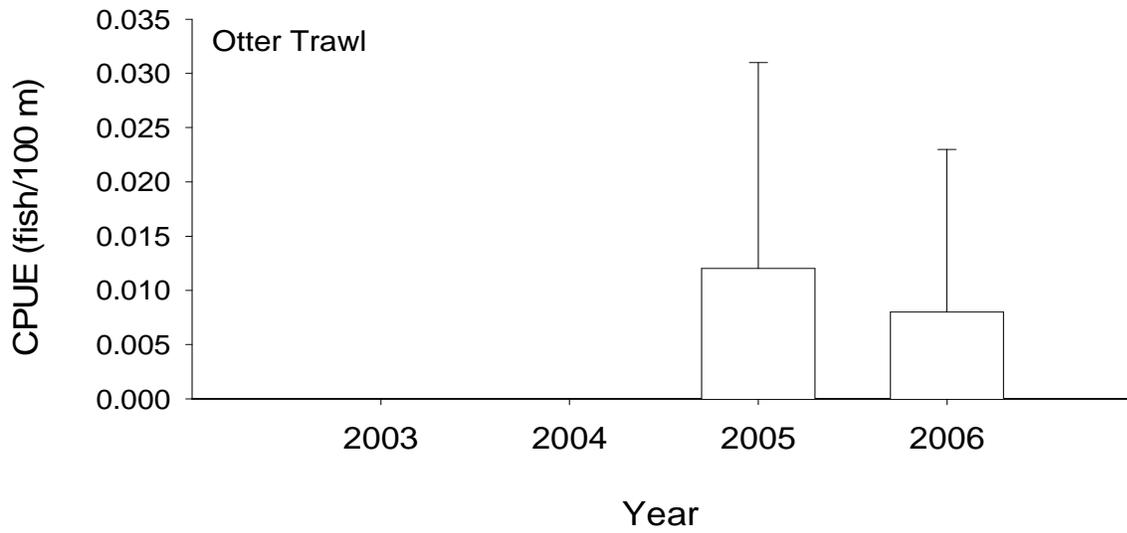


Figure 30. Mean annual catch-per-unit-effort ($\pm 2SE$) of sand shiner with otter trawls in segment 14 of the Missouri River during sturgeon season 2003 -2006.

Segment 14 - Sand Shiner / Fish Community Season

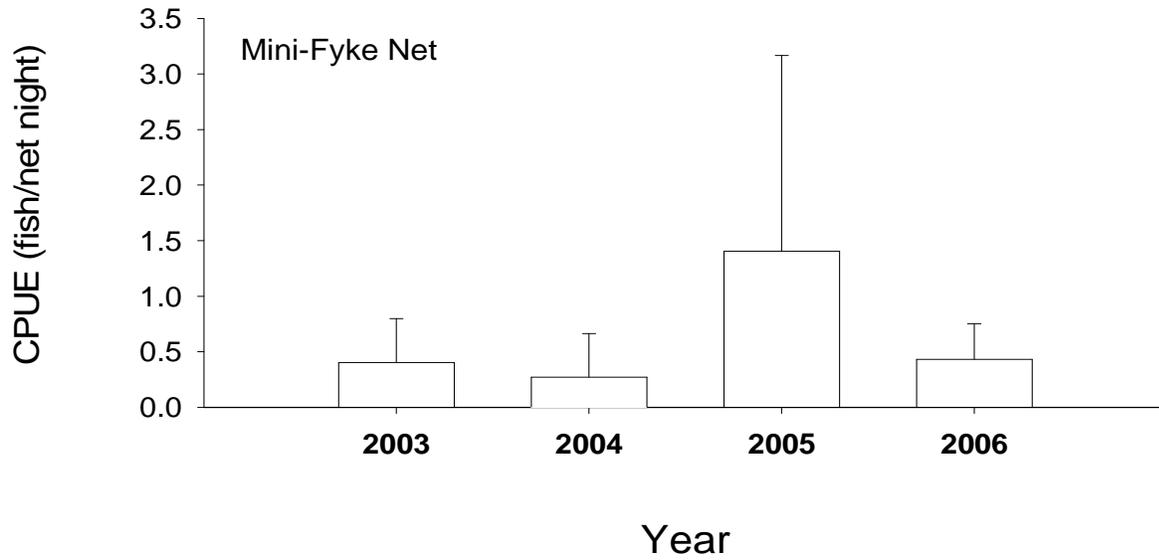


Figure 32. Mean annual catch-per-unit-effort ($\pm 2SE$) of sand shiner with mini-fyke nets in segment 14 of the Missouri River during fish community season 2003 - 2006.

Table 32. Total number of sand shiners captured for each gear during each season and the proportion caught within each macrohabitat type in segment 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	1	4	0	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	67	1	4	0	0	0	0	0	
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	54	10	4	3	0	0	0	0	
Otter Trawl	3	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	
		N-E	22	0	N-E	N-E	70	1	8	0	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	29	0	N-E	N-E	66	2	2	1	0	0	0	0	
Mini-Fyke Net	54	N-E	22	0	N-E	N-E	41	31	0	6	0	0	0		
		N-E	25	0	N-E	N-E	44	8	6	16	0	0	2		
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	23	0	N-E	N-E	71	0	2	3	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	99	1	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Gill Net	0	0	0	0	0	0
		0	58	4	37	0
Otter Trawl	3	0	100	0	0	0
		0	97	3	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Mini-Fyke Net	54	100	0	0	0	0
		93	2	5	0	0
Otter Trawl	0	0	0	0	0	0
		0	95	5	0	0

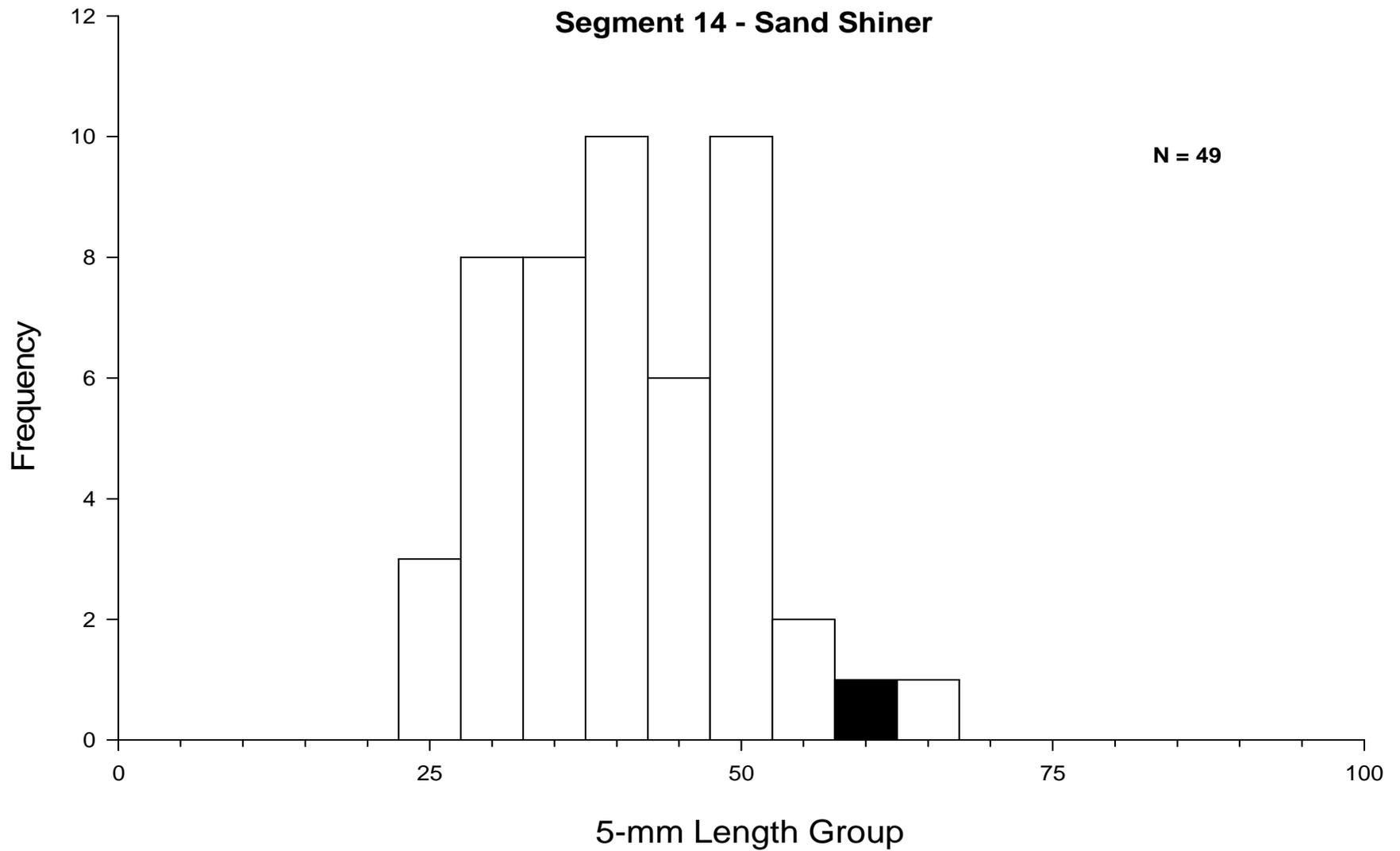


Figure 33. Length frequency of sand shiners during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during the 2006 sample year.

***Hybognathus* spp.**

A total of 24 *Hybognathus* spp. (HBNS) were captured in segment 14, which is much less than were captured in 2005 (N = 47; Utrup et al. 2006). The vast majority of the HBNS were captured in otter trawls during sturgeon season (96% of the total catch; N = 23; Table 37). This was the first year HBNS were captured in otter trawls and mini-fyke nets CPUE decreased from 2005 (CPUE = 0.68 in 2005 versus 0.008 in 2006; Figures 34 and 36). All of the HBNS captured in otter trawls occurred in ISB CHNB habitat (96% of the total catch relative to 49% of the total effort in segment 14). Pflieger (1997) noted that HBNS prefer sandy substrates with swift currents, which is consistent with CHNB mesohabitat. The dominance of HBNS in CHNB samples, and the fact that a majority were captured with otter trawls, suggests that either otter trawls were deployed in shallower water during 2006 or HBNS moved to deeper and swifter water than they have previously be captured (Utrup et al. 2006). This could, however, be because of river stage during sampling or variability in locations where mini-fyke nets were set relative to other years.

There were not enough HBNS (N < 50) captured in segment 14 during the 2006 sample year to summarize year to year trends and population structure.

Segment 14 - *Hybognathus* spp. / Sturgeon Season

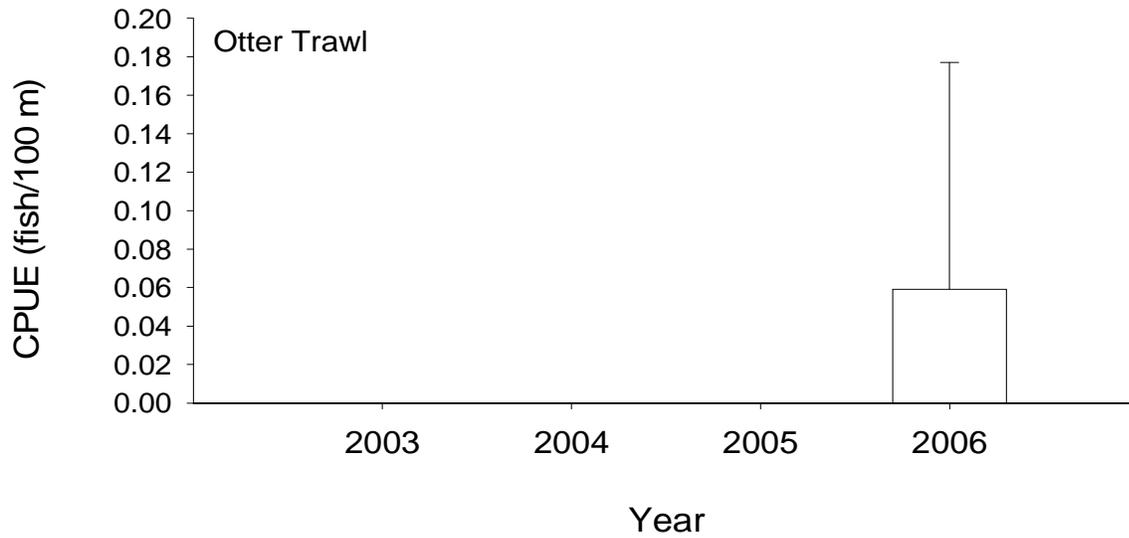


Figure 34. Mean annual catch-per-unit-effort ($\pm 2SE$) of *Hybognathus* spp. with otter trawls in segment 14 of the Missouri River during sturgeon season 2003 - 2006.

Segment 14 - *Hybognathus* spp. / Fish Community Season

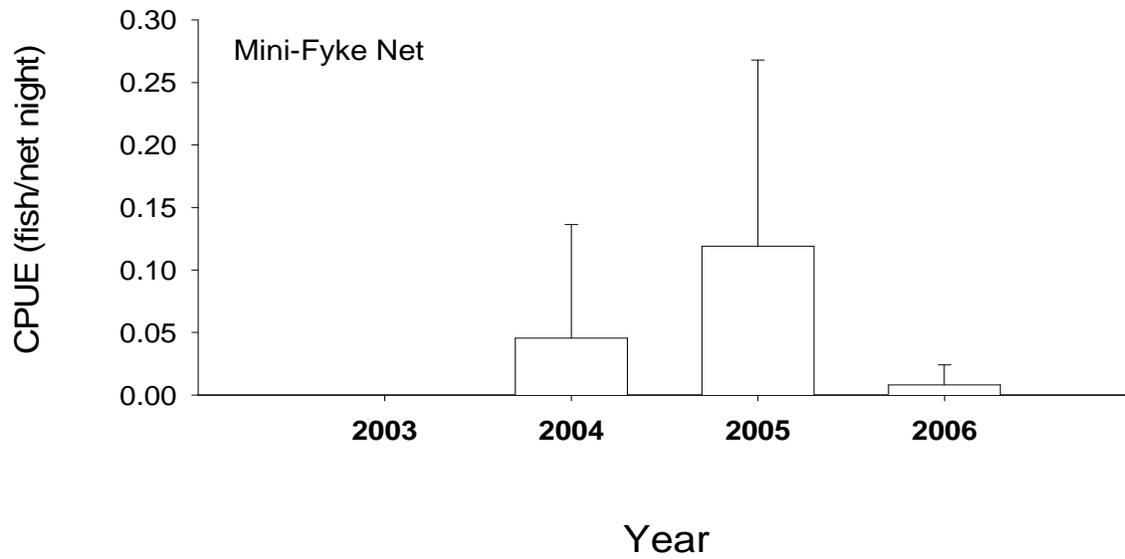


Figure 36. Mean annual catch-per-unit-effort ($\pm 2SE$) of *Hybognathus* spp. with mini-fyke nets in segment 14 of the Missouri River during fish community season 2003 - 2006.

Table 34. Total number of *Hybognathus* spp. captured for each gear during each season and the proportion caught within each macrohabitat type in segment 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	1	4	0	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	67	1	4	0	0	0	0	0	
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	54	10	4	3	0	0	0	0	
Otter Trawl	23	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	
		N-E	22	0	N-E	N-E	70	1	8	0	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	
		N-E	29	0	N-E	N-E	66	2	2	1	0	0	0	0	
Mini-Fyke Net	1	N-E	100	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	25	0	N-E	N-E	44	8	6	16	0	0	2	0	
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	23	0	N-E	N-E	71	0	2	3	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	99	1	0	0
2.5 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Gill Net	0	0	0	0	0	0
		0	58	4	37	0
Otter Trawl	23	0	100	0	0	0
		0	97	3	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0	0	0	0	0
		0	97	3	0	0
Mini-Fyke Net	1	100	0	0	0	0
		93	2	5	0	0
Otter Trawl	0	0	0	0	0	0
		0	95	5	0	0

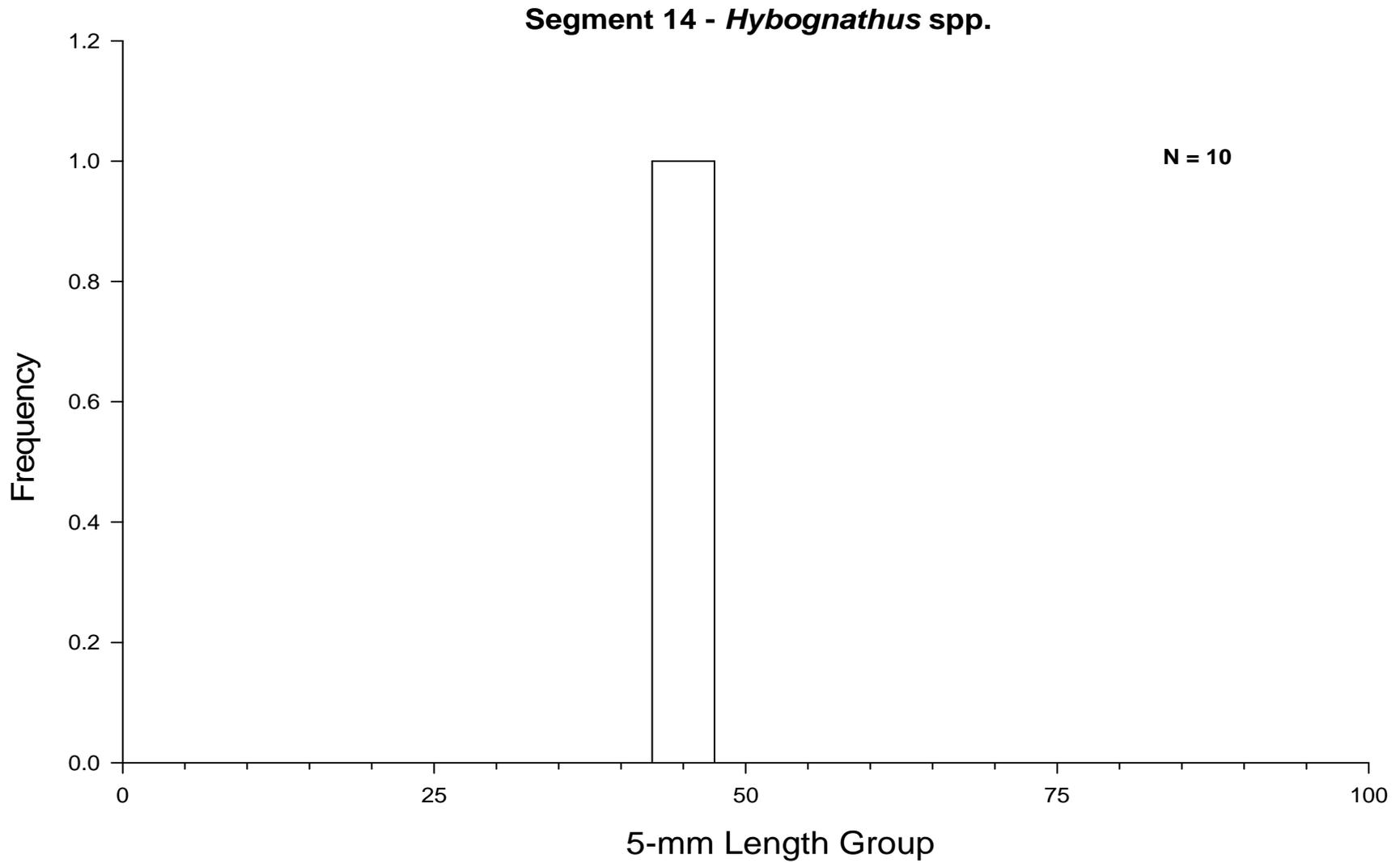


Figure 37. Length frequency of *Hybognathus* spp. caught during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during the 2006 sample year.

Blue Sucker

A total of 205 blue suckers were captured in segment 14, similar to the number that were captured in 2005 (N = 232; Utrup et al. 2006). The majority of blue suckers were captured during the sturgeon season (76%; N = 156) versus the fish community season (N = 49; Table 36). Two and a half inch trammel nets (CPUE = 0.20) were the most effective gear used for capturing blue suckers (27% of the total catch), followed by 1 inch trammel nets (overall mean CPUE = 0.13), gillnets (CPUE = 0.12), and otter trawls (overall mean CPUE = 0.06; Figures 38-41; Appendix F). Mini-fyke nets have never captured blue suckers. Two and a half inch trammel nets were only used during sturgeon season and there was a slight decline in CPUE between 2005 (CPUE = 0.34) and 2006 (CPUE = 0.20). For sturgeon season, catch rates in 1 inch trammel nets have remained fairly consistent since 2003 (CPUE = 0.23 in 2003, 0.17 in 2004, 0.20 in 2005, and 0.16 in 2006), whereas, gillnet CPUE increased greatly in 2005 and remained at that level through 2006 (CPUE = 0.02 in 2004, 0.13 in 2005, and 0.12 in 2006), and otter trawl CPUE has decreased slightly each year since 2004 (CPUE = 0.10 in 2004, 0.06 in 2005, and 0.04; Figures 38-39). During fish community season, both 1 inch trammel nets and otter trawls were very effective with 55% of the catch in 1 inch trammel nets and 45% of the catch in otter trawls. Catch-per-unit-effort for 1 inch trammel nets has remained constant since 2005 (CPUE = 0.10 in 2005 versus 0.09 in 2006; Figure 41). Otter trawl CPUE for fish community season has doubled every year since 2004 (CPUE = 0.02 in 2004, 0.04 in 2005, and 0.07 in 2006; Figure 41). In both sturgeon and fish community seasons, blue suckers were primarily captured in ISB CHNB habitat (68% of the total catch relative to 57% of the total effort; Tables 36-37).

The majority of blue suckers captured were mature adults likely four years old or older (Pflieger 1997; Figure 44). Pflieger (1997) noted that blue suckers sexually mature at a size between 500 and 660 mm which is the common size at capture during the sturgeon season. In 2006, there was an increase in the total number of juvenile and YOY blue suckers in segment 14. Five of the blue suckers captured during fish community season in 2006 more than likely spawned that year and six others that were captured during both sturgeon and fish community season spawned in 2005 (Figure 44). This indicates improvement in the system since captures of blue suckers < 500 mm have been rare.

Segment 14 - Blue Sucker / Sturgeon Season

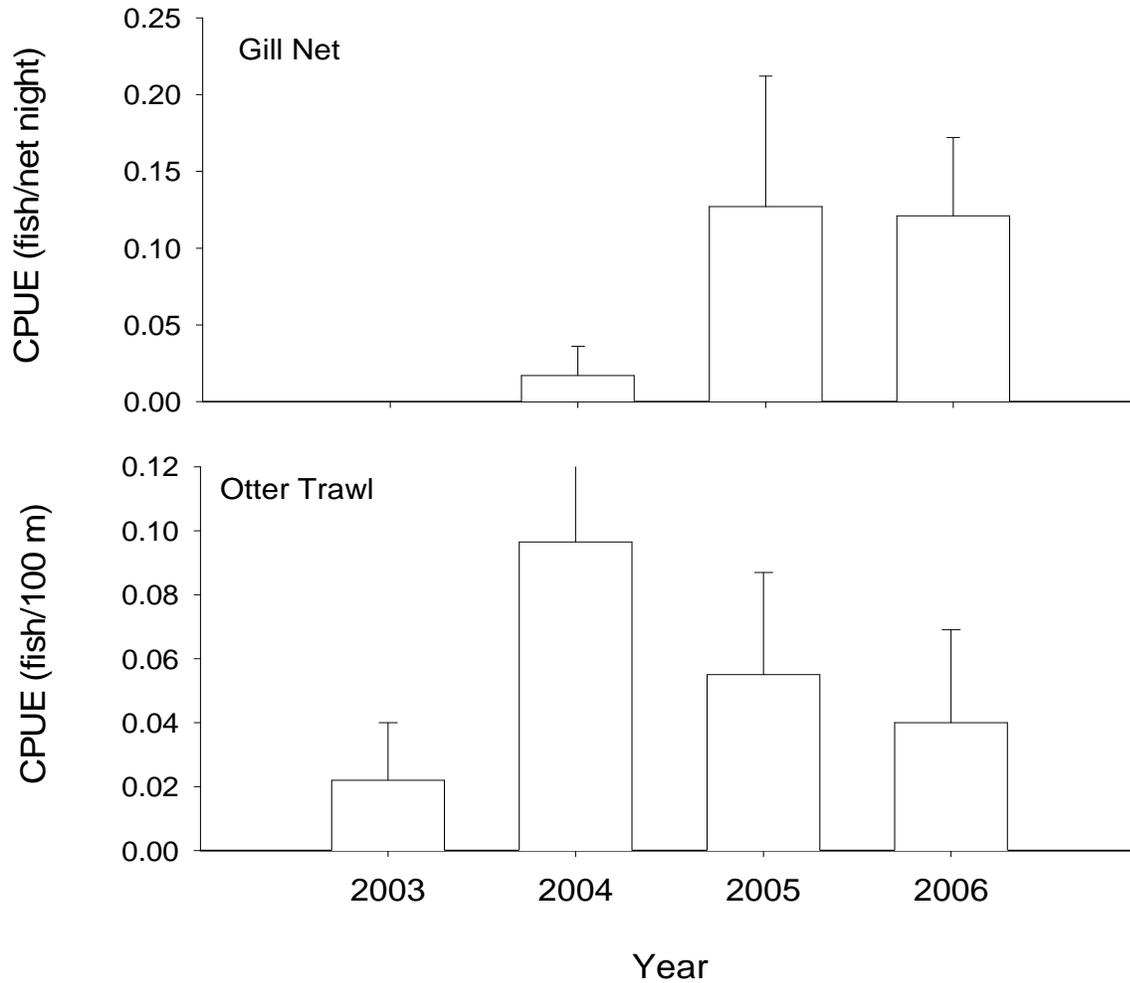


Figure 38. Mean annual catch-per-unit-effort ($\pm 2SE$) of blue sucker with gill nets and otter trawls in segment 14 of the Missouri River during sturgeon season 2003 - 2006.

Segment 14 - Blue Sucker / Sturgeon Season

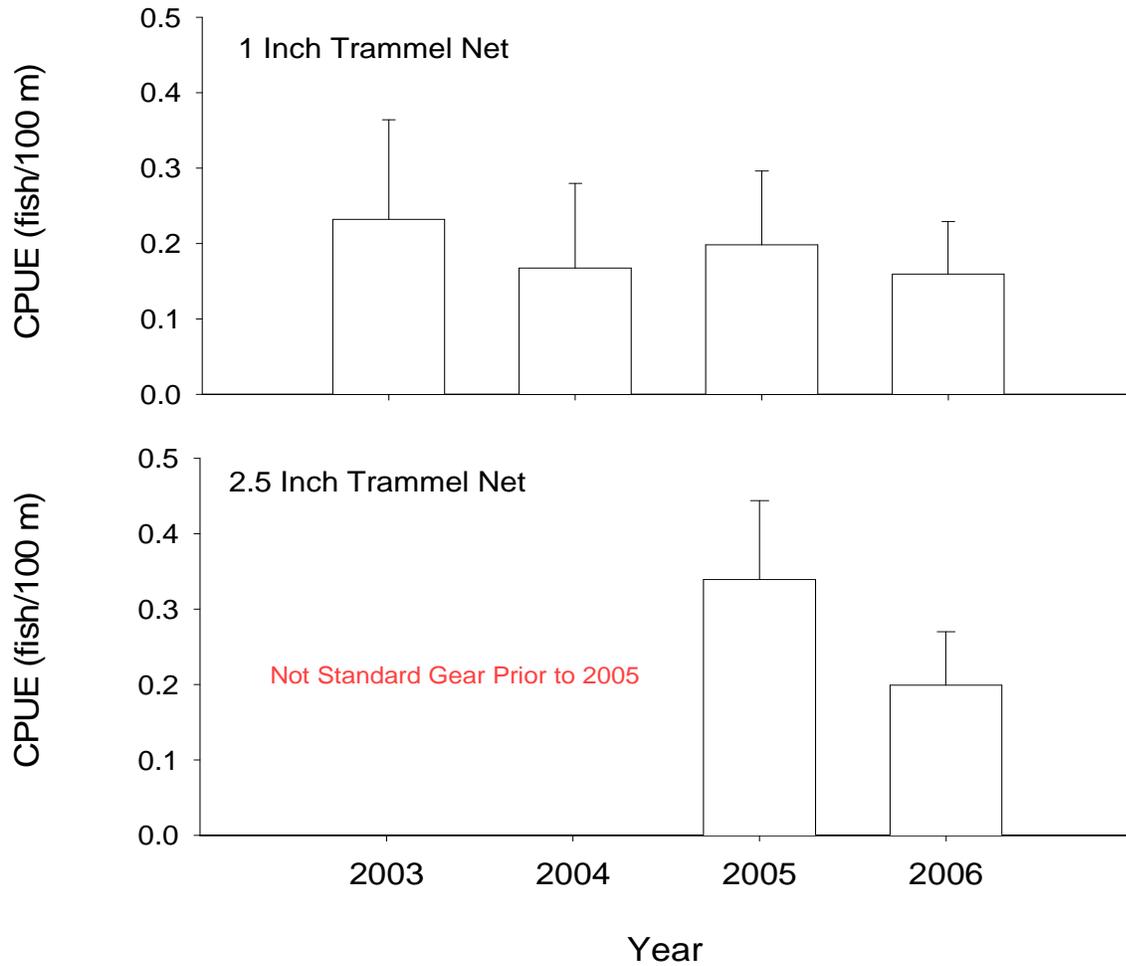


Figure 39. Mean annual catch-per-unit-effort ($\pm 2SE$) of blue sucker with 1 and 2.5 inch trammel nets in segment 14 of the Missouri River during sturgeon season 2003 - 2006.

Segment 14 - Blue Sucker / Fish Community Season

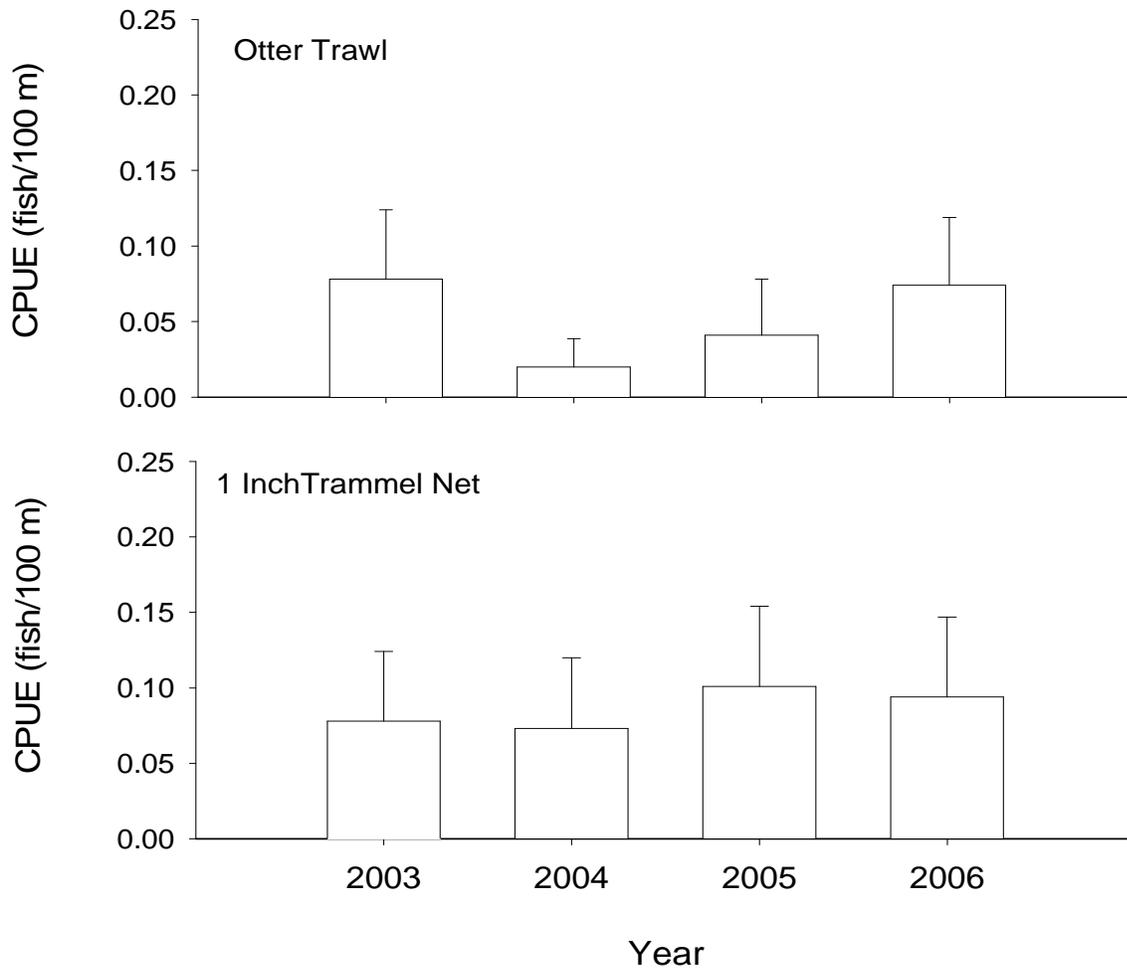


Figure 41. Mean annual catch-per-unit-effort (± 2 SE) of blue sucker using otter trawls and 1 inch trammel nets in segment 14 of the Missouri River during fish community season 2003- 2006.

Table 36. Total number of blue suckers captured for each gear during each season and the proportion caught within each macrohabitat type in segment 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	39	N-E	26	0	N-E	N-E	64	0	10	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	1	4	0	0	0	0	0	0
2.5 Inch Trammel Net	55	N-E	13	0	N-E	N-E	82	0	5	0	0	0	0	0	
		N-E	27	1	N-E	N-E	67	1	4	0	0	0	0	0	
Gill Net	50	N-E	20	0	N-E	N-E	58	18	2	2	0	0	0	0	
		N-E	27	1	N-E	N-E	54	10	4	3	0	0	0	0	
Otter Trawl	12	N-E	17		N-E	N-E	58	0	25	0	0	0	0	0	
		N-E	22	0	N-E	N-E	70	1	8	0	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	27	N-E	4	0	N-E	N-E	93	0	0	4	0	0	0	0	
		N-E	29	0	N-E	N-E	66	2	2	1	0	0	0	0	
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0		
		N-E	25	0	N-E	N-E	44	8	6	16	0	0	0	2	
Otter Trawl	22	N-E	14	0	N-E	N-E	77	0	5	5	0	0	0		
		N-E	23	0	N-E	N-E	71	0	2	3	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	39	0	92	8	0	0
		0	99	1	0	0
2.5 Inch Trammel Net	55	0	100	0	0	0
		0	97	3	0	0
Gill Net	50	0	70	0	30	0
		0	58	4	37	0
Otter Trawl	12	0	100	0	0	0
		0	97	3	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	27	0	96	4	0	0
		0	97	3	0	0
Mini-Fyke Net	0	0	0	0	0	0
		93	2	5	0	0
Otter Trawl	22	0	95	5	0	0
		0	95	5	0	0

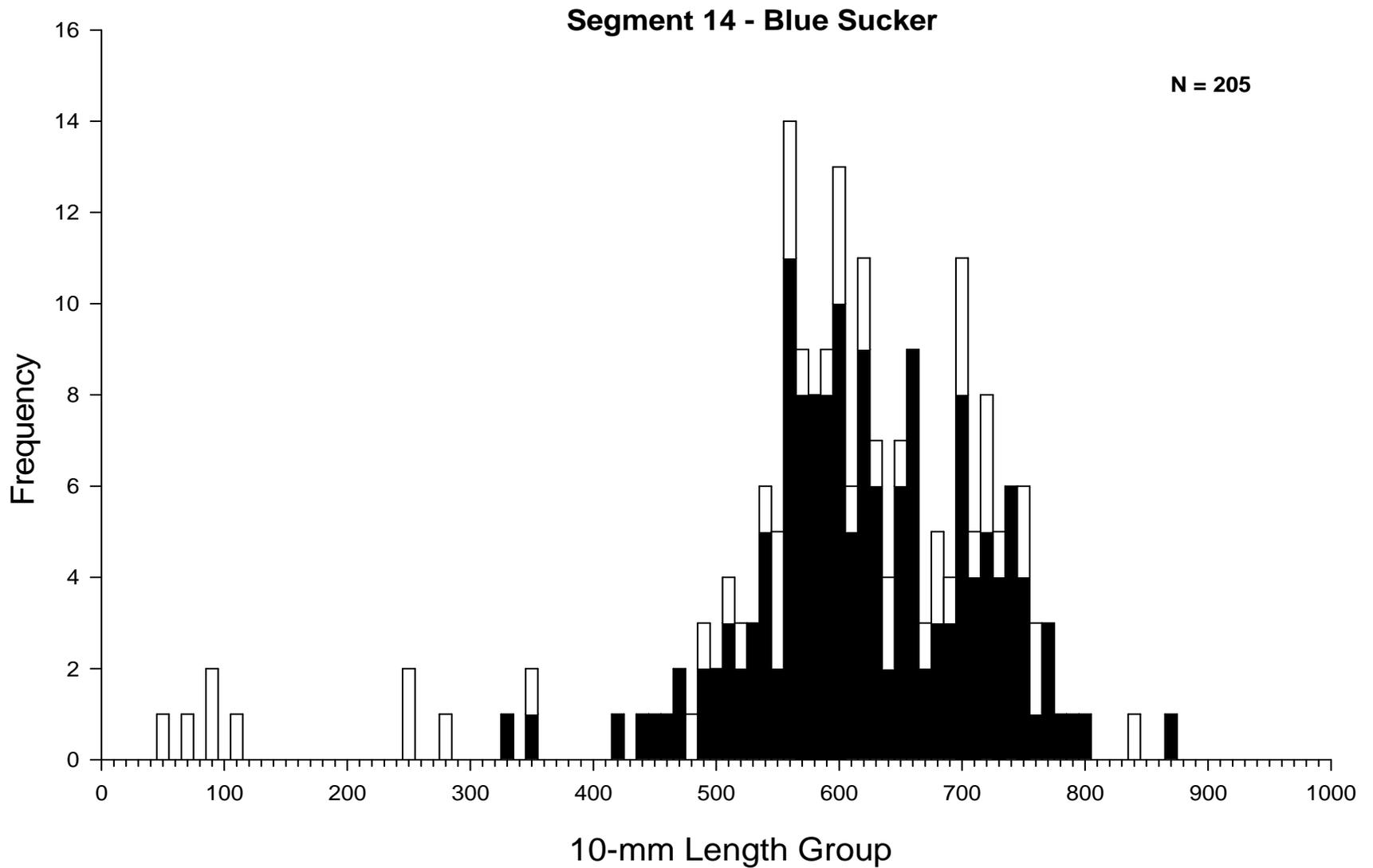


Figure 44. Length frequency of blue suckers during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during the 2006 sample year.

Sauger

A total of 57 sauger were captured in segment 14, slightly more than were captured in 2005 (N = 38; Utrup et al. 2006). A majority of the sauger were captured during the sturgeon season (65%; N = 37; Tables 38-39). Gillnets were the most effective gear at capturing sauger (53% of the total catch; CPUE = 0.07; Table 38; Figure 45). For sturgeon season, gillnet CPUE has decreased slightly every year since 2004 (CPUE = 0.12 in 2004, 0.09 in 2005, and 0.07 in 2006) with only one sauger being captured in 1 inch trammel nets (CPUE = 0.003; Figure 46; Table 38). During fish community season, otter trawls were the most effective gear detecting 60% of all sauger. One inch trammel nets and mini-fyke nets captured 25% and 15% of the fish community season catch respectively. Catch-per-unit-effort for otter trawls during fish community season increased greatly from 2005 (CPUE = 0.01 in 2005 to 0.04 in 2006). The majority of sauger captured in gillnets occurred in ISB macrohabitat (51% of the total catch relative to 64% of the effort). Sauger captured in otter trawls were mostly located in ISB mesohabitat with 40% of the catch relative to 65% of the effort. In gill nets, sauger were captured mostly in POOL mesohabitat with gillnets during sturgeon season (46% of the catch relative to 9% of the total effort during sturgeon season) and primarily in CHNB habitat during fish community season (Tables 38-39). This is because the majority of otter trawl effort was expended in CHNB mesohabitat (95% of the total effort; Table 39).

The majority of YOY and juvenile sauger in segment 14 were captured during the fish community season. Based on age structure described by Pflieger (1997), the majority of sauger captured in segment 14 were between 2 and 5 years old (280 mm to 450 mm; Figure 51). Based on the lack of YOY and juvenile sauger in the 2005 sample year, and a cohort of YOY and yearling sauger caught during the 2006 sample year, suggests that late 2005 and early 2006 adult sauger produced a good spawn with strong recruitment to 2006 (Figure 51; Utrup et al. 2006).

Segment 14 - Sauger / Sturgeon Season

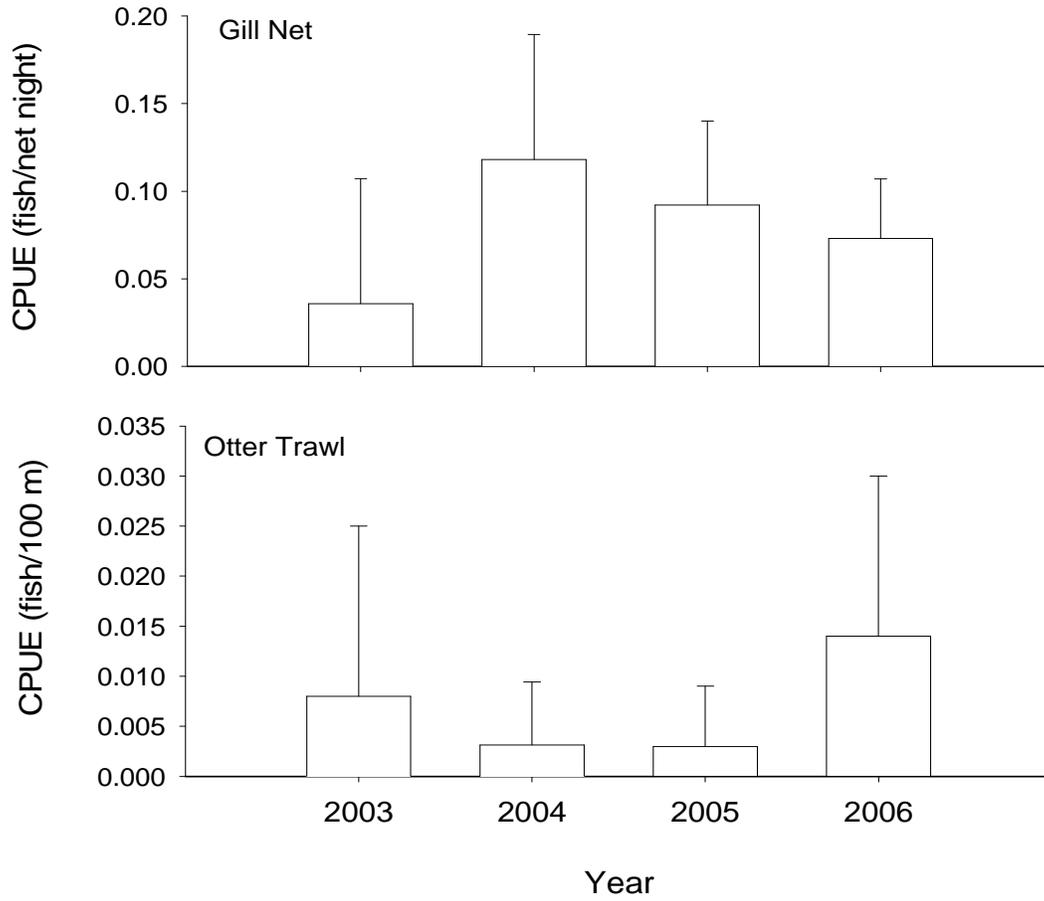


Figure 45. Mean annual catch-per-unit-effort ($\pm 2SE$) of sauger using gill nets and otter trawls in segment 14 of the Missouri River during sturgeon season 2003 - 2006.

Segment 14 - Sauger / Sturgeon Season

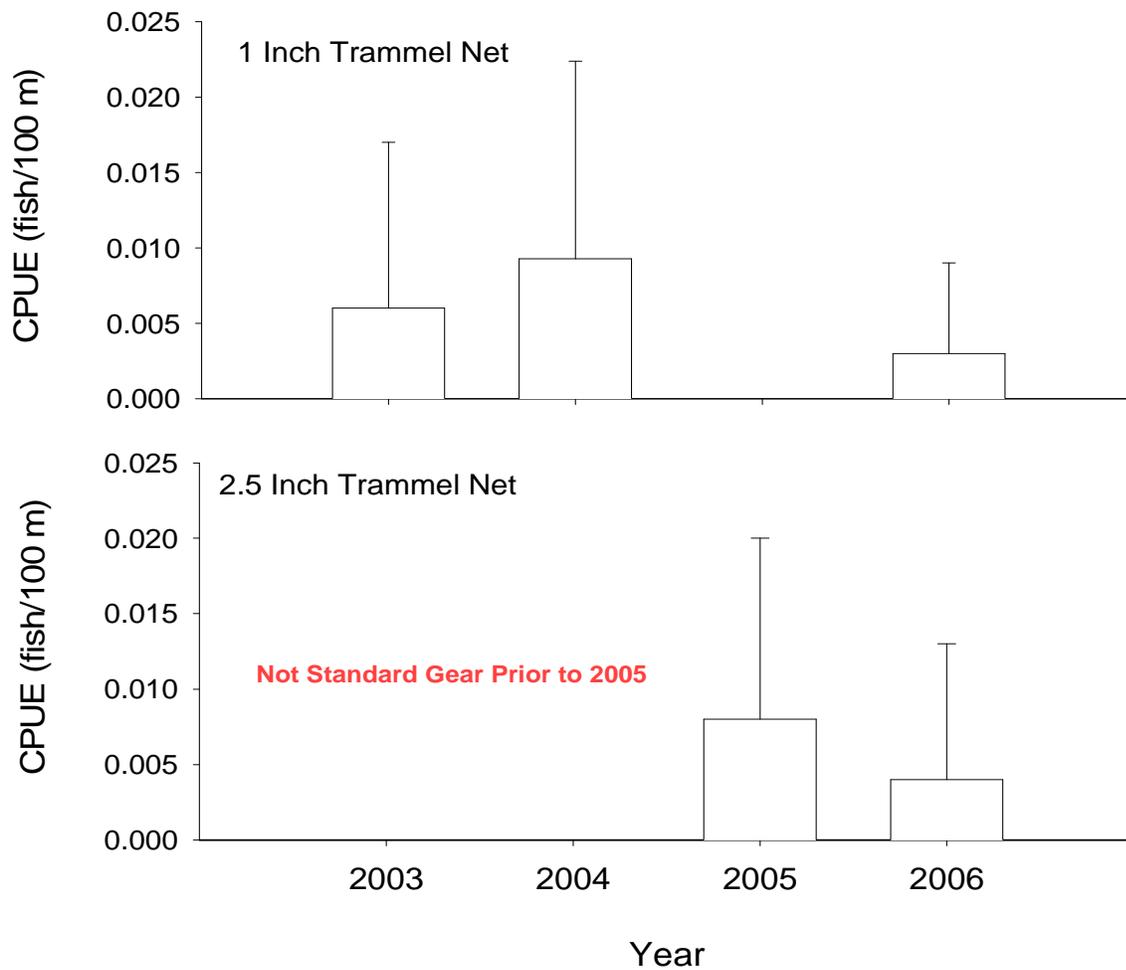


Figure 46. Mean annual catch-per-unit-effort (+/- 2SE) of sauger using 1 and 2.5 inch trammel nets in segment 14 of the Missouri River during sturgeon season 2003 - 2006.

Segment 14 - Sauger / Fish Community Season

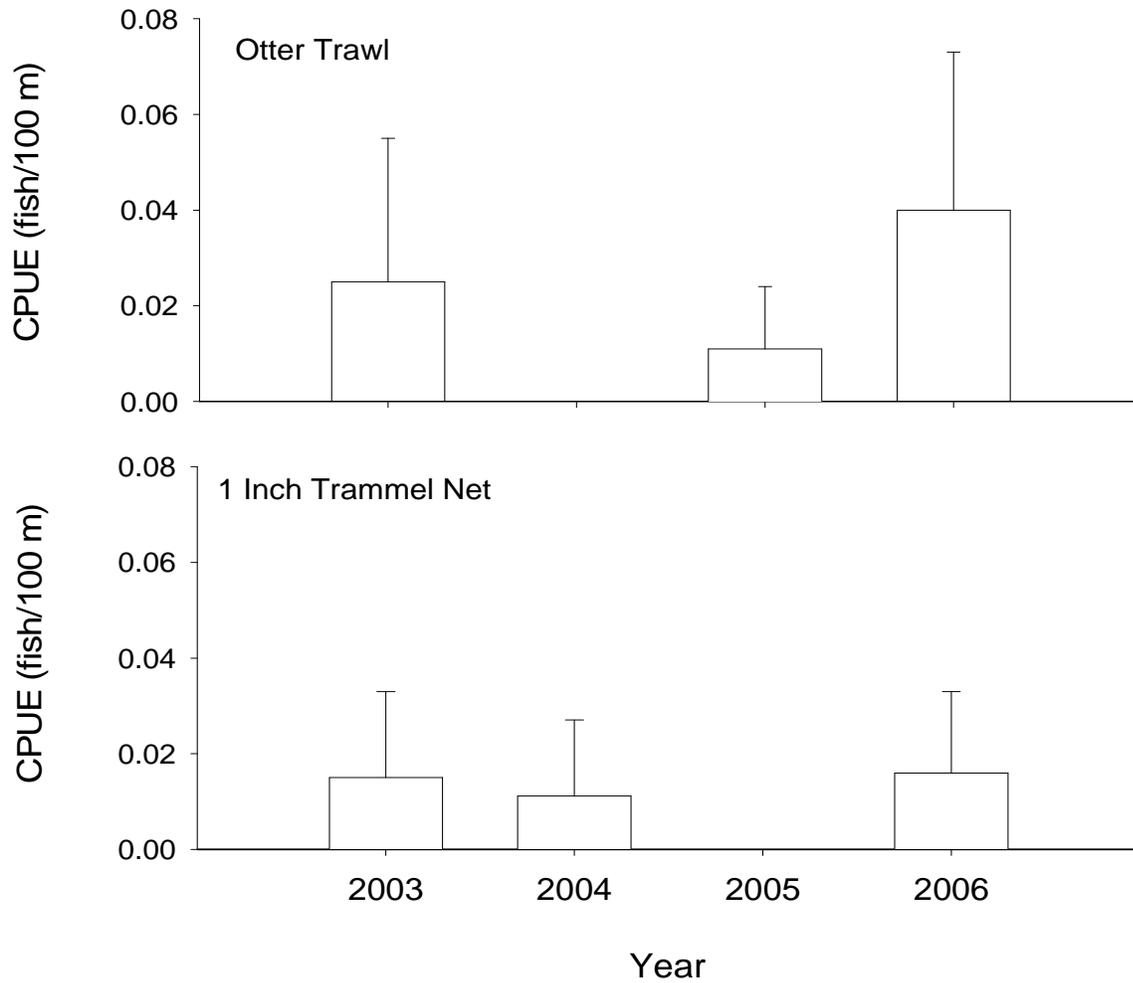


Figure 48. Mean annual catch-per-unit-effort ($\pm 2SE$) of sauger using otter trawls and 1 inch trammel nets in segment 14 of the Missouri River during fish community season 2003 - 2006.

Segment 14 - Sauger / Fish Community Season

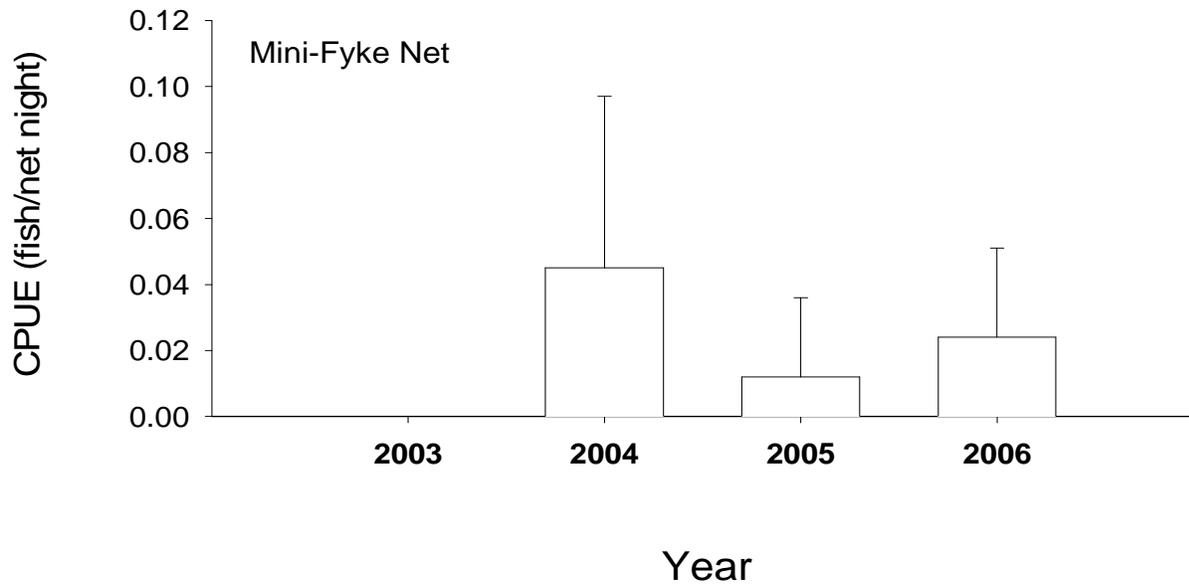


Figure 49. Mean annual catch-per-unit-effort ($\pm 2SE$) of sauger using mini-fyke nets in segment 14 of the Missouri River during fish community season 2003 - 2006.

Table 38. Total number of sauger captured for each gear during each season and the proportion caught within each macrohabitat type in segment 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	29	0	N-E	N-E	66	1	4	0	0	0	0	0	0
2.5 Inch Trammel Net	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	
		N-E	27	1	N-E	N-E	67	1	4	0	0	0	0	0	
Gill Net	30	N-E	27	0	N-E	N-E	63	7	0	3	0	0	0	0	
		N-E	27	1	N-E	N-E	54	10	4	3	0	0	0	0	
Otter Trawl	5	N-E	80	0	N-E	N-E	20	0	0	0	0	0	0	0	
		N-E	22	0	N-E	N-E	70	1	8	0	0	0	0	0	
Fish Community Season (Summer)															
1 Inch Trammel Net	5	N-E	20	0	N-E	N-E	80	0	0	0	0	0	0	0	
		N-E	29	0	N-E	N-E	66	2	2	1	0	0	0	0	
Mini-Fyke Net	3	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	
		N-E	25	0	N-E	N-E	44	8	6	16	0	0	0	2	
Otter Trawl	12	N-E	33	0	N-E	N-E	67	0	0	0	0	0	0	0	
		N-E	23	0	N-E	N-E	71	0	2	3	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 14 of the Missouri River during 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	1	0	100	0	0	0
		0	99	1	0	0
2.5 Inch Trammel Net	1	0	100	0	0	0
		0	97	3	0	0
Gill Net	30	0	40	3	57	0
		0	58	4	37	0
Otter Trawl	5	0	100	0	0	0
		0	97	3	0	0
Fish Community Season (Summer)						
1 Inch Trammel Net	5	0	100	0	0	0
		0	97	3	0	0
Mini-Fyke Net	3	67	33	0	0	0
		93	2	5	0	0
Otter Trawl	12	0	100	0	0	0
		0	95	5	0	0

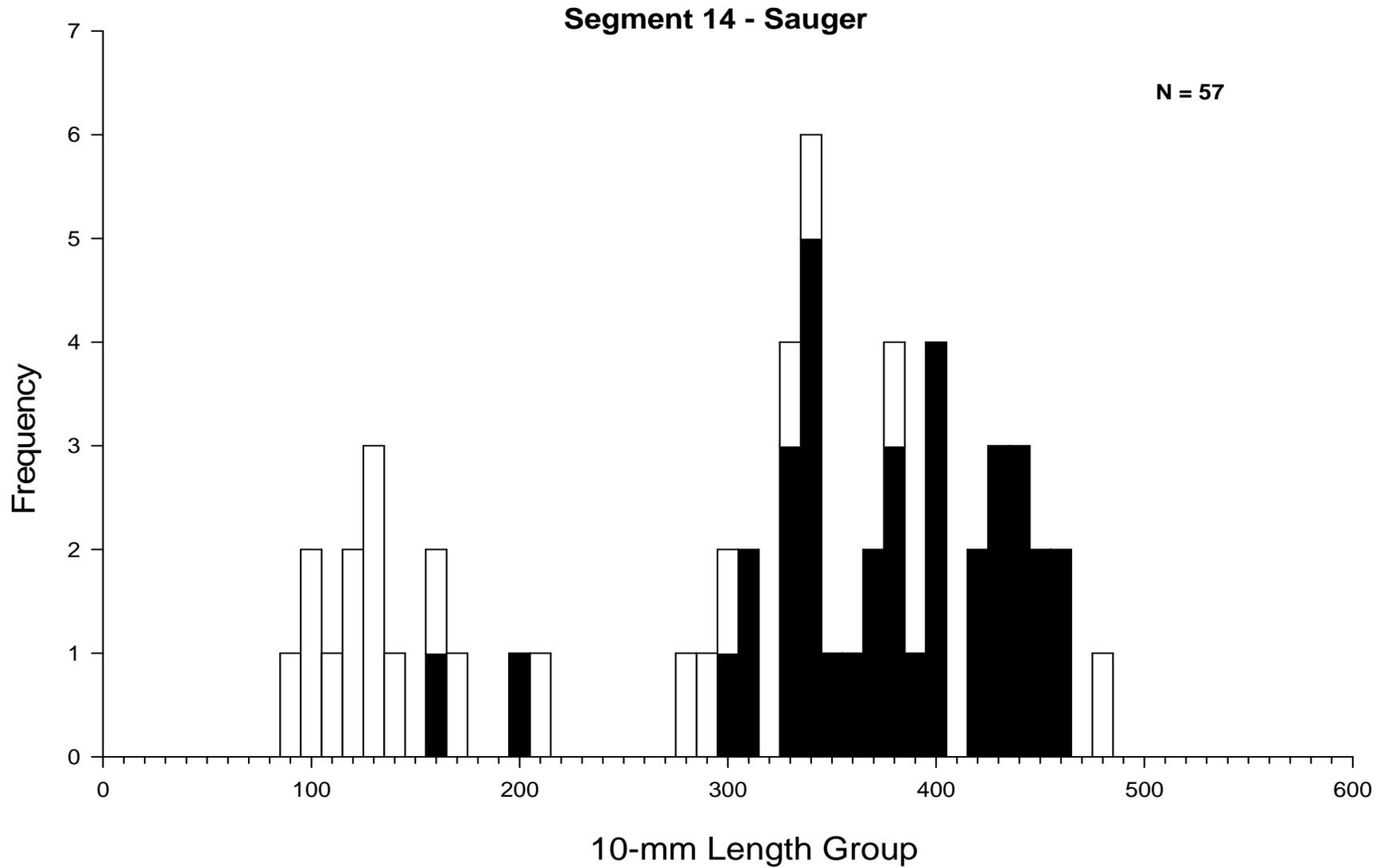


Figure 51. Length frequency of sauger during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during the 2006 sample year.

Missouri River Fish Community

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

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

During the 2006 sample year, 20,366 fish were captured in segment 14 of the Missouri River. Standard gears captured 61 species with emerald shiners making up the largest percentage of the total catch (17.6%; N = 3581), followed by shovelnose sturgeon (15.6%; N = 3192), blue catfish (11.5%; N = 2342), and channel catfish (11.0%; N = 2235). The 9 target species accounted for 21.1% of the total catch with each contributing in the following order of abundance: shovelnose sturgeon (15.6%; N = 3192), speckled chub (2.6%; N = 541), blue sucker (1.0%; N = 205), sicklefin chub (1.0%; N = 200), sand shiner (0.3%; N = 57), sauger (0.3%; N = 57), sturgeon chub (0.1%; N = 23), *Hybognathus* spp. (0.1%; N = 21), and pallid sturgeon (0.04%; N = 9). Sixteen species were captured fewer than five times during the entire sample year (Appendix F).

Gillnets captured 30 species and were most effective at capturing shovelnose sturgeon (61.2% of the catch; N = 2102), with an average CPUE of 5.1 fish per net night. Blue catfish (15.2%; N = 522), gizzard shad (3.8%; N = 130), and goldeye (2.7%; N = 93) were the next most abundant fish species collected in gillnet samples (mean CPUE = 1.27, 0.32, and 0.23 fish per net/night respectively). Gillnets were only used during sturgeon season.

One-inch trammel nets, fished during both seasons, captured 25 species with shovelnose sturgeon making up the majority of the catch (59.8%; N = 510; mean CPUE = 0.92). Other large bodied fish, such as blue catfish (19.6%; N = 167; mean CPUE = 0.25) and blue suckers (7.7%; N = 66; mean CPUE = 0.13), were also captured effectively with 1 inch trammel nets (Appendix H). Two and a half-inch trammel nets, fished only in sturgeon season, caught 19 species and, similar to 1-inch trammel nets, shovelnose sturgeon made up the majority of the total catch

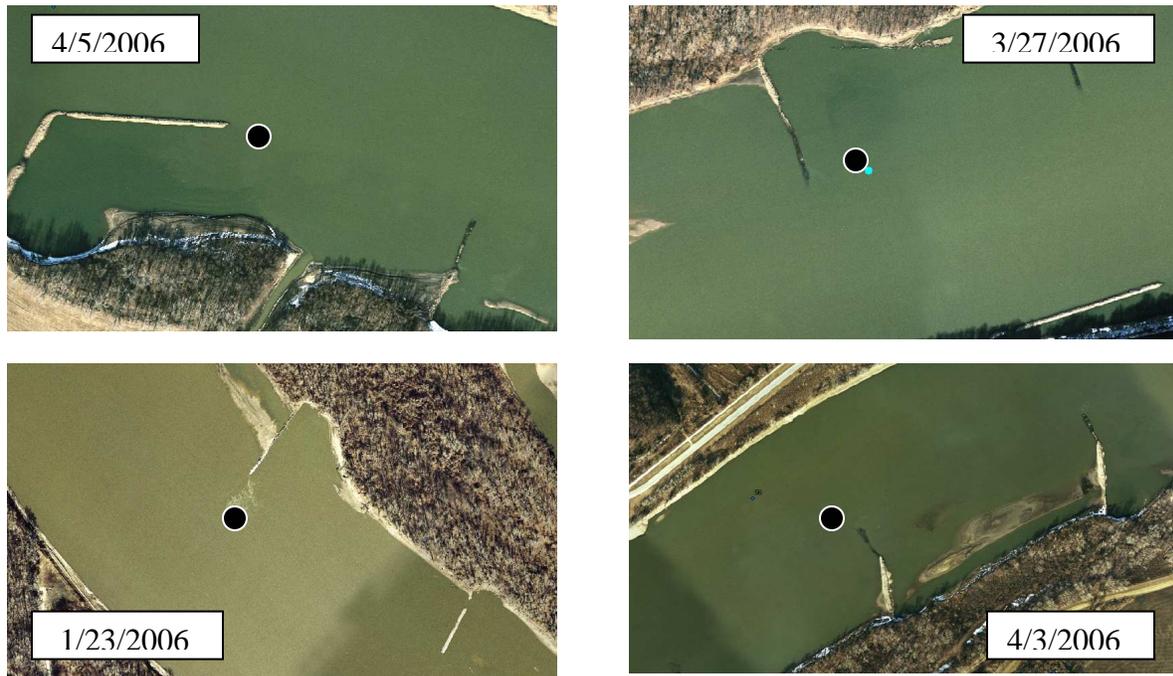
(38.5%; N = 95; mean CPUE = 0.33) followed by blue suckers (22.3%; N = 55; mean CPUE = 0.20) and smallmouth buffalo (17.0%; N = 42; mean CPUE = 0.14; Appendix H).

Otter trawls captured 36 species of fish, most of which were small benthic fishes, which are not easily sampled with other gear types. Young-of-year channel (29.1%; N = 2066; mean CPUE = 3.76) and blue catfish (23.2%; N = 1645; mean CPUE = 3.00) were captured most frequently in otter trawl samples. Otter trawls were very effective at capturing chub species in segment 14; speckled chub (7.3%; N = 519; mean CPUE = 0.92) and sicklefin chub (2.8%; N = 197; mean CPUE = 0.31), and sturgeon chub (0.3%; N = 23; mean CPUE 0.03), as well as shovelnose sturgeon (6.8%; N = 482; mean CPUE = 0.79; Appendix H). Nineteen juvenile paddlefish were also captured with otter trawls (mean CPUE = 0.04; Appendix H).

The fish community season is different because warm water temperatures and low water levels increase availability of fish and efficiency of sampling, especially in mini-fyke nets. This gear targets another group of fishes which are rarely detected with the other standard gear types. Mini-fyke nets captured 47 species of fish in segments 14 and almost all nets were dominated by cyprinid species, such as emerald shiners (40.6% of the catch; N = 3545) and red shiners (20.7% of the catch; N = 1806). Of the 45 species captured by mini-fyke nets, 9 species were not captured with any other gear type (western mosquitofish, N = 116; bluegill, N = 59; orange-spotted sunfish, N = 29; central stoneroller, N = 7; black-stripe topminnow, N = 3; black crappie, N = 1; plains killifish, N = 1; rainbow smelt, N = 1; smallmouth bass, N = 1) and also captured YOY common carp (N = 2), bighead carp (N = 1), and silver carp (N = 1), which are life stages rarely captured with other gear types. Asian carp are rarely captured at young life stages but, through observations in the field and through collections using other gear types from related projects (e.g., electrofishing and hoop nets); they seem to be increasing in abundance throughout the Lower Missouri River. Additional sampling gear and improved sampling techniques need to be further investigated to help document the population dynamics of this invasive exotic species.

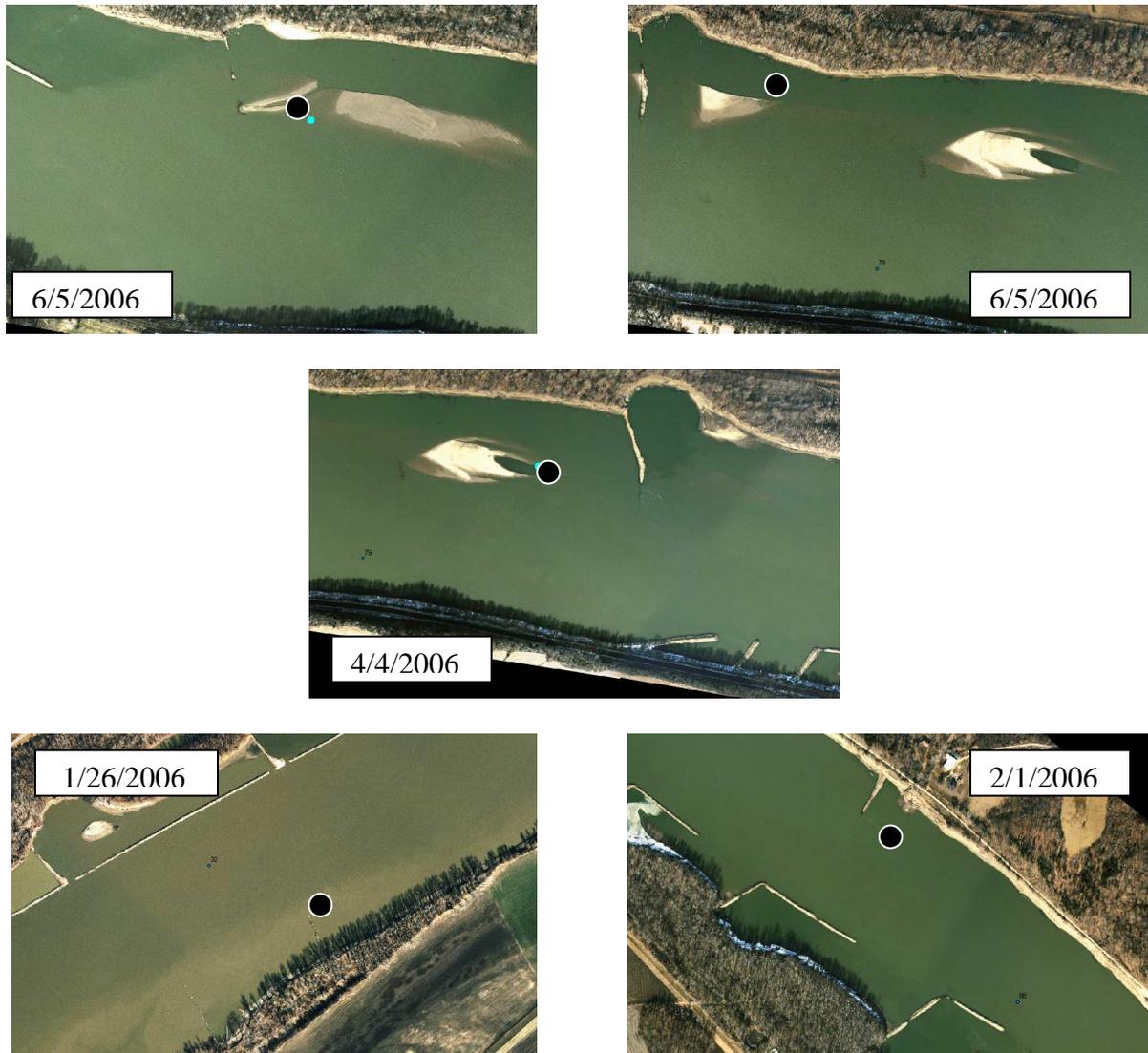
Discussion

Young-of-year (0 - 250 mm) or sub-stock size (< 330 mm) pallid sturgeon were not captured in segment 14 during the 2006 sample year. Of the nine pallid sturgeon that were captured, five were considered stock size and the other four were quality and above. In addition to the nine pallid sturgeon, eight hybrid sturgeon were captured in segment 14. Stock size pallid sturgeon appear to be using slightly different habitats than the large quality size pallid sturgeon. Larger pallid sturgeon (> 630 mm) captured in segment 14 during 2006 were found exclusively along the inside of the current seam and off the tips of dike structures (Map 1). This result, however, may be heavily biased by gear. All four quality size pallid sturgeon were captured using gill nets, which were predominately set off dike tips. This does, however, indicate that larger sturgeon are moving along these dike tips during the late winter and early spring months. This corresponds with telemetry data provided by USGS/CERC which shows that adult sturgeon move along the current seam as water temperature begins to rise, presumably to head upstream to spawn (Aaron Delonay, U.S. Geological Survey, personal communication).



Map 1. Location, relative to river structures and habitat, of quality and above size (630 – 839 mm) pallid sturgeon captured in segment 14 during the 2006 sample year.

Five of the nine pallid sturgeon captured in segment 14 were stock size (330 – 629 mm). All but two of these pallid sturgeon were captured at the tail end of a sandbar (Map 2). Two of the three pallid sturgeon were captured in secondary channel macrohabitat with a channel border mesohabitat and the third was captured in a channel crossover macrohabitat on an island tip. This corroborates findings from Doyle et al. (2005) who suggests that pallid sturgeon were more often found associated with the downstream end of sand bars during the late winter and early spring months.



Map 2. Location, relative to river structures and habitat, of stock size (330 – 629 mm) pallid sturgeon captured in segment 14 during the 2006 sample year.

Telemetry information provided by USGS/CERC shows that adult pallid sturgeon use deeper, swifter water than adult shovelnose. In past years, active gears such as trammel nets have been

used to try and capture sonic telemetered shovelnose and pallid sturgeon. Through these exercises we have learned that sturgeon are not as vulnerable to active nets as once suspected. The nature of the bed-form in which sturgeon live consists of sand dunes over one meter high in various geometric forms. Additionally, “drop-offs” associated with dike structures prevent drifted gear from reaching the habitat utilized by sturgeon due to high flow and sharp angles. These substrate features also limit the efficacy of otter trawls in catching individually targeted sturgeon.

Notable Trends

The numbers of shovelnose sturgeon in segment 14 seem to have declined since 2003, particularly when considering 1-inch trammel net data. There has been a steady decline in CPUE for quality and greater size classes of shovelnose sturgeon captured in 1-inch trammel nets during the sturgeon season over the past four years. Overall CPUE of shovelnose sturgeon in 1-inch trammel nets shows a similar trend declining from a CPUE of 1.56 fish per 100 m drifted in 2004 to 1.35 and 0.92 fish per 100 m drifted in 2005 and 2006 respectfully. Trammel nets may be one of the least biased sampling methods available for detecting trends in adult shovelnose sturgeon because they are not as influenced from seasonal migrations or winter aggregations.

There may be several reasons for this decline in shovelnose sturgeon ranging from drought conditions in the recent past to the influence of commercial fishing. Commercial harvest of sturgeon in segment 14 is a legitimate concern. Belly scars (egg checks) from knife probes in shovelnose show that commercial fishermen are likely killing more fish than would be documented from harvest reports. The differences in catch rates between segment 13 and 14 suggest that segment 14, which is closer to the Mississippi River, receives more fishing pressure than other segments of the Missouri River. In the past this was further confounded by the use of many commercial fisherman from the Mississippi River (Tennessee and Arkansas) who travel up the Missouri River in early spring (before seasons open on the Mississippi) to harvest Missouri sturgeon roe. Since 2005, however, non-residents are no longer allowed to fish in the lower Missouri River. Because of segment 14’s proximity to the Mississippi River, and the motile nature of the pallid sturgeon, there is still reason for concern. Anecdotal information from federal law enforcement officers indicate commercial fishermen from other states have already been observed fishing (legally and illegally) in the Mississippi River near the confluence. Over the

past several years, there have been numerous violations on the Mississippi River where pallid sturgeon have been “mistaken” for shovelnose and been found in the creels of commercial fishermen. Shovelnose sturgeon numbers will most likely continue to decline in segment 14, due to the rising prices of caviar. Documentation of a check scar on a pallid sturgeon in segment 14 suggests that commercial fishermen would likely harvest pallid sturgeon roe along with the shovelnose sturgeon.

Other notable trends are the declines in CPUE for all three chub species in segment 14 over the past three years. Since 2004, there has been a decline in otter trawl and mini-fyke CPUE for both sturgeon chubs and sicklefin chubs in segment 14. It may be important to look at how environmental conditions in the river (i.e., water levels, spring rise, etc...) could be impacting these CPUE values. One positive finding in segment 14, however, is the increase in CPUE of YOY blue suckers. The capture of young blue suckers (< 200 mm) has always been minimal in segment 14 and the increase in these young blue sucker captures during the 2006 sample year suggests that a combination of habitat and recruitment needs for the fish have been met during the previous years.

Wild Gear

During 2005 and 2006, Columbia FRO biologists deployed twenty eight 1-inch trammel nets in overnight stationary sets during sturgeon season to determine if one mesh size could catch the same numbers and sizes of sturgeon as the standard gill nets. The stationary set 1-inch trammel nets were increased in length to 200 feet (same length as the standard gill nets) so they could be compared directly to the gill net sets. These nets were deployed in the same randomly selected bends in which gill net were fished. Comparisons were made between gill nets and dead set 1-inch trammel nets (coded as TN2) that were fished on the same date, in the same river bend, and in the same habitats (i.e., same macro, meso, and micro habitats). The 28 trammel nets captured 325 shovelnose sturgeon yielding a catch rate of 11.6 fish per net night compared to 329 shovelnose sturgeon captured in 42 comparable gill net sets with a capture rate of 5.7 fish per net night. Not only did trammel nets catch more shovelnose sturgeon, they also captured a broader size range. Length frequencies of the compared nets are shown in Figure 52. Note the number of small shovelnose sturgeon (< 400 mm) captured in 1-inch trammel nets.

Segment 14 - Shovelnose Sturgeon, 2005 - 2006

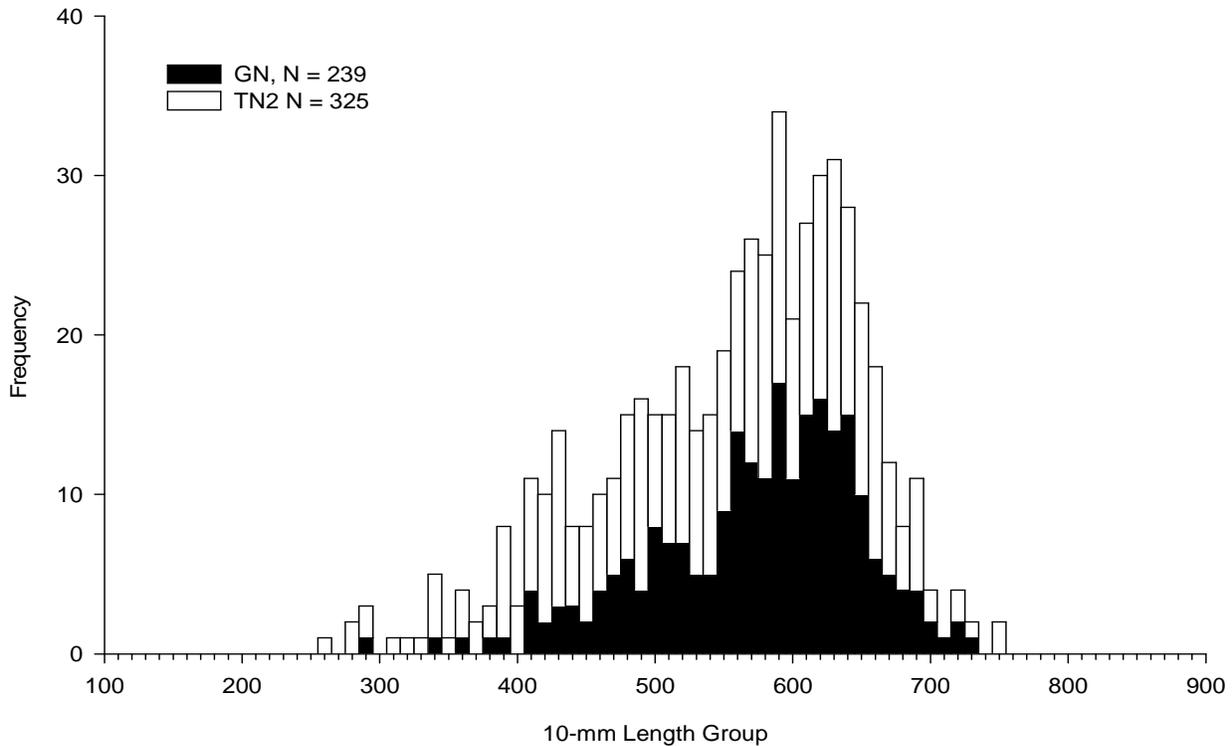


Figure 52. Length frequency of shovelnose sturgeon captured during fall through spring (sturgeon season) in stationary set 1 inch trammel nets (white bars) and standard gill nets (black bars) in segment 14 of the Missouri River during 2005-2006

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APPENDICES

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

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

Appendix A. (continued).

Scientific name	Common name	Letter Code
ORDER CLUPEIFORMES		
Clupeidae – herrings		
<i>Alosa alabame</i>	Alabama shad	ALSD
<i>Alosa chrysochloris</i>	Skipjack herring	SJHR
<i>Alosa pseudoharengus</i>	Alewife	ALWF
<i>Dorosoma cepedianum</i>	Gizzard shad	GZSD
<i>Dorosoma petenense</i>	Threadfin shad	TFSD
<i>D. cepedianum</i> X <i>D. petenense</i>	Gizzard-threadfin shad hybrid	GSTS
ORDER CYPRINIFORMES		
Cyprinidae – carps and minnows		
<i>Campostoma anomalum</i>	Central stoneroller	CLSR
<i>Campostoma oligolepis</i>	Largescale stoneroller	LSSR
<i>Carassius auratus</i>	Goldfish	GDFH
<i>Carassius auratus</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
<i>Hybognathus argyritis</i>	Western silvery minnow	WSMN*
<i>Hybognathus hankinsoni</i>	Brassy minnow	BSMN
<i>Hybognathus nuchalis</i>	Mississippi silvery minnow	SVMW
<i>Hybognathus placitus</i>	Plains minnow	PNMW*
<i>Hybognathus</i> spp.	Unidentified Hybognathus	HBNS*
<i>Hypophthalmichthys molitrix</i>	Silver carp	SVCP
<i>Hypophthalmichthys nobilis</i>	Bighead carp	BHCP
<i>Luxilus chrysocephalus</i>	Striped shiner	SPSN
<i>Luxilus cornutus</i>	Common shiner	CMSN
<i>Luxilus zonatus</i>	Bleeding shiner	BDSN
<i>Lythrurus unbratilis</i>	Western redfin shiner	WRFS
<i>Macrhybopsis aestivalis</i>	Speckled chub	SKCB*
<i>Macrhybopsis gelida</i>	Sturgeon chub	SGCB*
<i>Macrhybopsis meeki</i>	Sicklefin chub	SFCB*
<i>Macrhybopsis storeriana</i>	Silver chub	SVCB
<i>M. aestivalis</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 burchanani</i>	Ghost shiner	GTSN
<i>Notropis dorsalis</i>	Bigmouth shiner	BMSN
<i>Notropis greeniei</i>	Wedgespot shiner	WSSN

Appendix A. (continued).

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

Appendix A. (continued).

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

Appendix A. (continued).

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

Appendix A. (continued).

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

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

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

Appendix C. List of standard and wild gears (type), their corresponding codes in the database, seasons deployed (Fall-Spring, Summer, or all), years used, and catch-per-unit-effort units for collection of Missouri River fishes in segment 14 for the long-term pallid sturgeon and associated fish community sampling program. Long-term monitoring began in 2003 for segment 14.

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

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

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

Appendix E. Juvenile and adult pallid sturgeon stocking summary for segment 14 of the Missouri River (RPMA 4)

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

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

Appendix F

Total catch, overall mean catch per unit effort [± 2 SE], and mean CPUE (fish/100 m) by Mesohabitat within a Macrohabitat for all species caught with each gear type during sturgeon season and fish community season for segment 14 of the Missouri River during 2003-2006. Species captured are listed alphabetically and their codes are presented in Appendix A. Asterisks with bold type indicate targeted native Missouri River species and habitat abbreviations are presented in Appendix B. Standard Error was not calculated when $N < 2$.

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

Species	Total Catch	Overall CPUE	CHXO		CONF	ISB		OSB		SCCL		SCCS	
			CHNB	POOL	CHNB	CHNB	POOL	CHNB	POOL	CHNB	ITIP	CHNB	ITIP
BHCP	8	0.019	0	0.08	0	0	0.036	0	0.05	0	0	0	0
		[0.013]	[0]	[0.075]	[0]	[0]	[0.04]	[0]	[0.1]	[0]	[0]	[0]	[0]
BHMW	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BKCP	0	0	0	0	0	0	0	0	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]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BLCF	522	1.267	0.903	3.18	0	0.264	2.19	1.1	2.95	0.2	0	0	0.3
		[0.327]	[0.36]	[1.634]	[0]	[0.145]	[0.865]	[1.272]	[1.65]	[0.245]	[0]	[0]	[0.4]
BLGL	0	0	0	0	0	0	0	0	0	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]	[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]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BTTM	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BUSK	50	0.121	0.145	0.02	0	0.164	0.071	0.05	0.4	0.1	0	0.25	0
		[0.051]	[0.148]	[0.04]	[0]	[0.095]	[0.08]	[0.1]	[0.554]	[0.2]	[0]	[0.5]	[0]
CARP	20	0.049	0.048	0.04	0	0.014	0.131	0	0.1	0	0	0	0
		[0.025]	[0.071]	[0.055]	[0]	[0.02]	[0.091]	[0]	[0.133]	[0]	[0]	[0]	[0]
CLSR	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNCF	36	0.087	0.048	0.16	0	0.036	0.214	0.05	0.05	0	0	0	0
		[0.055]	[0.054]	[0.198]	[0]	[0.037]	[0.226]	[0.1]	[0.1]	[0]	[0]	[0]	[0]
CNLP	3	0.007	0.032	0.02	0	0	0	0	0	0	0	0	0
		[0.008]	[0.045]	[0.04]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNSN	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
ERSN	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
FHCF	11	0.027	0.016	0.06	0.25	0	0.036	0	0.15	0	0	0	0
		[0.018]	[0.032]	[0.066]	[0.5]	[0]	[0.053]	[0]	[0.213]	[0]	[0]	[0]	[0]
FWDM	46	0.112	0.048	0.28	0	0.007	0.226	0.1	0.35	0	0	0	0
		[0.061]	[0.071]	[0.217]	[0]	[0.014]	[0.244]	[0.133]	[0.26]	[0]	[0]	[0]	[0]
GDEY	93	0.226	0.016	0.4	0	0.221	0.262	0.45	0.4	0.1	0	0	0.1
		[0.107]	[0.032]	[0.337]	[0]	[0.237]	[0.229]	[0.433]	[0.467]	[0.2]	[0]	[0]	[0.2]

Appendix F1 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF	ISB		OSB		SCCL		SCCS	
			CHNB	POOL	CHNB	CHNB	POOL	CHNB	POOL	CHNB	ITIP	CHNB	ITIP
GNSF	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
GSCP	10	0.024	0.016	0	0	0.007	0.071	0.05	0	0	0	0	0.1
		[0.015]	[0.032]	[0]	[0]	[0.014]	[0.055]	[0.1]	[0]	[0]	[0]	[0]	[0.2]
GZSD	130	0.316	0.016	0.96	0	0.221	0.357	0.05	0.85	0.1	0	0	0.1
		[0.154]	[0.032]	[0.739]	[0]	[0.242]	[0.366]	[0.1]	[0.955]	[0.2]	[0]	[0]	[0.2]
HBNS	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
HFCS	3	0.007	0.016	0.02	0	0	0.012	0	0	0	0	0	0
		[0.008]	[0.032]	[0.04]	[0]	[0]	[0.024]	[0]	[0]	[0]	[0]	[0]	[0]
JYDR	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[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]	[0]	[0]
LKSG	11	0.027	0.016	0.16	0	0	0.024	0	0	0	0	0	0
		[0.023]	[0.032]	[0.17]	[0]	[0]	[0.033]	[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]	[0]	[0]
LNGR	71	0.172	0.032	0.28	0.25	0.036	0.536	0.15	0.05	0	0	0	0
		[0.152]	[0.045]	[0.37]	[0.5]	[0.037]	[0.7]	[0.213]	[0.1]	[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]	[0]	[0]
MNEY	0	0	0	0	0	0	0	0	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]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
OSSF	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
PDFH	8	0.019	0.016	0.04	0	0.007	0.036	0	0.05	0	0	0	0
		[0.013]	[0.032]	[0.055]	[0]	[0.014]	[0.04]	[0]	[0.1]	[0]	[0]	[0]	[0]
PDSG	7	0.017	0.016	0	0	0.021	0.024	0	0	0	0	0	0.1
		[0.013]	[0.032]	[0]	[0]	[0.024]	[0.033]	[0]	[0]	[0]	[0]	[0]	[0.2]
PKLF	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
QLBK	3	0.007	0	0.02	0	0	0.024	0	0	0	0	0	0
		[0.011]	[0]	[0.04]	[0]	[0]	[0.048]	[0]	[0]	[0]	[0]	[0]	[0]
RBST	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]

Appendix F1 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF	ISB		OSB		SCCL		SCCS	
			CHNB	POOL	CHNB	CHNB	POOL	CHNB	POOL	CHNB	ITIP	CHNB	ITIP
RDSN	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
RVCS	87	0.211	0.194	0.54	0.25	0.036	0.393	0.2	0.2	0.1	0	0	0
		[0.086]	[0.265]	[0.395]	[0.5]	[0.031]	[0.249]	[0.306]	[0.221]	[0.2]	[0]	[0]	[0]
RVSN	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SBWB	7	0.017	0	0.06	0	0.007	0.036	0	0	0	0	0	0
		[0.016]	[0]	[0.088]	[0]	[0.014]	[0.053]	[0]	[0]	[0]	[0]	[0]	[0]
SFCB	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SGCB	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SGER	30	0.073	0.032	0.12	0	0.064	0.119	0.05	0.05	0	0	0	0.1
		[0.034]	[0.045]	[0.119]	[0]	[0.067]	[0.089]	[0.1]	[0.1]	[0]	[0]	[0]	[0.2]
SHRH	25	0.061	0.065	0.04	0	0.043	0.06	0.4	0	0	0	0	0
		[0.028]	[0.09]	[0.08]	[0]	[0.034]	[0.061]	[0.249]	[0]	[0]	[0]	[0]	[0]
SJHR	1	0.002	0	0	0	0	0	0	0	0.1	0	0	0
		[0.005]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0.2]	[0]	[0]	[0]
SKCB	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SMBF	66	0.16	0.032	0.28	0.25	0.036	0.369	0.35	0.3	0	0	0	0
		[0.055]	[0.045]	[0.192]	[0.5]	[0.031]	[0.196]	[0.3]	[0.267]	[0]	[0]	[0]	[0]
SMBS	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNGR	57	0.138	0.032	0.78	0	0.014	0.143	0.05	0.05	0	0	0	0
		[0.074]	[0.045]	[0.504]	[0]	[0.02]	[0.119]	[0.1]	[0.1]	[0]	[0]	[0]	[0]
SNPD	3	0.007	0	0	0	0.021	0	0	0	0	0	0	0
		[0.011]	[0]	[0]	[0]	[0.032]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNSG	2102	5.102	6.145	5.88	10.75	3.171	7.774	5.45	5.15	2.5	0.375	0.25	4.6
		[0.911]	[1.942]	[2.716]	[9.5]	[1.075]	[2.894]	[2.622]	[5.196]	[2.387]	[0.479]	[0.5]	[4.306]
SNSN	0	0	0	0	0	0	0	0	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]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SVCB	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SVCP	19	0.046	0	0.18	0	0.029	0.06	0	0.05	0	0	0	0
		[0.023]	[0]	[0.128]	[0]	[0.028]	[0.061]	[0]	[0.1]	[0]	[0]	[0]	[0]

Appendix F1 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF	ISB		OSB		SCCL		SCCS	
			CHNB	POOL	CHNB	CHNB	POOL	CHNB	POOL	CHNB	ITIP	CHNB	ITIP
UCF	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCS	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCT	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCY	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UHY	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UNID	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
WTBS	2	0.005	0	0	0	0.007	0	0.05	0	0	0	0	0
		[0.007]	[0]	[0]	[0]	[0.014]	[0]	[0.1]	[0]	[0]	[0]	[0]	[0]
WTCP	2	0.005	0	0.02	0	0	0.012	0	0	0	0	0	0
		[0.007]	[0]	[0.04]	[0]	[0]	[0.024]	[0]	[0]	[0]	[0]	[0]	[0]
WTSK	2	0.005	0	0	0	0.007	0.012	0	0	0	0	0	0
		[0.007]	[0]	[0]	[0]	[0.014]	[0.024]	[0]	[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]	[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 in brackets.

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
BHCP	5	0.007	0.011	0.006	0	0	0	0
		[0.006]	[0.015]	[0.007]	[0]	[0]	[0]	[0]
BHMW	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
BKCP	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	167	0.25	0.369	0.222	0	0	0.275	0
		[0.069]	[0.174]	[0.074]	[0]	[0]	[0.549]	[0]
BLGL	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
BMBF	1	0.002	0	0.003	0	0	0	0
		[0.005]	[0]	[0.007]	[0]	[0]	[0]	[0]
BNMW	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
BTTM	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
BUSK	66	0.128	0.07	0.139	0	0.159	0.6	0.556
		[0.045]	[0.077]	[0.051]	[0]	[0.317]	[1.2]	[1.111]
CARP	1	0.002	0.008	0	0	0	0	0
		[0.004]	[0.016]	[0]	[0]	[0]	[0]	[0]
CLSR	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNCF	5	0.011	0.004	0.015	0	0	0	0
		[0.012]	[0.009]	[0.018]	[0]	[0]	[0]	[0]
CNLP	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNSN	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
ERSN	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
FHCF	4	0.005	0	0.004	0	0	0.167	0
		[0.006]	[0]	[0.005]	[0]	[0]	[0.333]	[0]

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
FWDM	9	0.016	0	0.024	0	0	0	0
		[0.011]	[0]	[0.017]	[0]	[0]	[0]	[0]
GDEY	13	0.027	0.01	0.036	0	0	0	0
		[0.025]	[0.013]	[0.038]	[0]	[0]	[0]	[0]
GNSF	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
GSCP	1	0.004	0	0.006	0	0	0	0
		[0.009]	[0]	[0.013]	[0]	[0]	[0]	[0]
GZSD	3	0.007	0.006	0.004	0.095	0	0	0
		[0.008]	[0.011]	[0.009]	[0.19]	[0]	[0]	[0]
HBNS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
HFCS	3	0.004	0.005	0.005	0	0	0	0
		[0.005]	[0.01]	[0.006]	[0]	[0]	[0]	[0]
JYDR	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]
LKSG	2	0.004	0	0.006	0	0	0	0
		[0.006]	[0]	[0.008]	[0]	[0]	[0]	[0]
LMBS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
LNGR	6	0.013	0.008	0.011	0	0.167	0	0
		[0.012]	[0.016]	[0.012]	[0]	[0.333]	[0]	[0]
MMSN	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
MNEY	3	0.004	0.005	0.004	0	0	0	0
		[0.005]	[0.01]	[0.006]	[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]
PDFH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
PDSG	2	0.004	0.006	0	0	0.083	0	0
		[0.005]	[0.012]	[0]	[0]	[0.167]	[0]	[0]
PKLF	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
QLBK	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
RBST	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
RDSN	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
RVCS	19	0.039	0.087	0.024	0	0	0	0
		[0.024]	[0.077]	[0.017]	[0]	[0]	[0]	[0]
RVSN	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SBWB	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SFCB	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SGCB	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SGER	6	0.009	0.005	0.012	0	0	0	0
		[0.009]	[0.01]	[0.013]	[0]	[0]	[0]	[0]
SHRH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SJHR	1	0.003	0	0.004	0	0	0	0
		[0.006]	[0]	[0.008]	[0]	[0]	[0]	[0]
SKCB	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SMBF	21	0.044	0.028	0.047	0.241	0	0	0
		[0.02]	[0.028]	[0.026]	[0.306]	[0]	[0]	[0]
SMBS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNGR	1	0.004	0	0	0	0.167	0	0
		[0.008]	[0]	[0]	[0]	[0.333]	[0]	[0]

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
SNPD	2	0.005	0	0.007	0	0	0	0
		[0.007]	[0]	[0.01]	[0]	[0]	[0]	[0]
SNSG	510	0.924	0.454	1.019	0.766	2.444	1.941	3.156
		[0.302]	[0.275]	[0.424]	[0.737]	[2.767]	[1.755]	[4.089]
SNSN	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	1	0.001	0	0.002	0	0	0	0
		[0.003]	[0]	[0.004]	[0]	[0]	[0]	[0]
UCA	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCF	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCT	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCY	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UHY	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UNID	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]
WTCP	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
WTSK	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
YLBH	1	0.001	0	0.002	0	0	0	0
		[0.003]	[0]	[0.004]	[0]	[0]	[0]	[0]

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

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB		OSB	SCCL	
			CHNB	CHNB	CHNB	ITIP	CHNB	CHNB	ITIP
BHCP	4	0.019	0	0	0.014	0	0	0.222	0
		[0.024]	[0]		[0.02]	[0]	[0]	[0.444]	[0]
BHMW	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
BKCP	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]
BLCF	5	0.017	0.016	0	0.02	0	0	0	0
		[0.017]	[0.031]		[0.023]	[0]	[0]	[0]	[0]
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]
BTTM	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
BUSK	55	0.199	0.106	0	0.246	0	0	0.282	0
		[0.071]	[0.084]		[0.101]	[0]	[0]	[0.259]	[0]
CARP	4	0.011	0.01	0	0.013	0	0	0	0
		[0.011]	[0.021]		[0.015]	[0]	[0]	[0]	[0]
CLSR	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
CNCF	2	0.005	0	0	0.008	0	0	0	0
		[0.007]	[0]		[0.011]	[0]	[0]	[0]	[0]
CNLP	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
CNSN	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
ERSN	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
FHCF	2	0.006	0	0	0.01	0	0	0	0
		[0.009]	[0]		[0.014]	[0]	[0]	[0]	[0]
FWDM	5	0.019	0.018	0	0.022	0	0	0	0
		[0.024]	[0.025]		[0.036]	[0]	[0]	[0]	[0]
GDEY	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]

Appendix F3 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB		OSB	SCCL	
			CHNB	CHNB	CHNB	ITIP	CHNB	CHNB	ITIP
GNSF	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
GSCP	1	0.003	0	0	0.005	0	0	0	0
		[0.006]	[0]		[0.01]	[0]	[0]	[0]	[0]
GZSD	1	0.004	0	0	0.007	0	0	0	0
		[0.009]	[0]		[0.013]	[0]	[0]	[0]	[0]
HBNS	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
HFCS	1	0.003	0	0	0.005	0	0	0	0
		[0.006]	[0]		[0.01]	[0]	[0]	[0]	[0]
JYDR	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	1	0.003	0	0	0.004	0	0	0	0
		[0.005]	[0]		[0.008]	[0]	[0]	[0]	[0]
LMBS	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
LNGR	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
MMSN	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
MNEY	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
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]
PDFH	1	0.003	0.01	0	0	0	0	0	0
		[0.005]	[0.021]		[0]	[0]	[0]	[0]	[0]
PDSG	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
PKLF	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
QLBK	1	0.004	0	0	0.007	0	0	0	0
		[0.009]	[0]		[0.014]	[0]	[0]	[0]	[0]
RDSN	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]

Appendix F3 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB		OSB	SCCL	
			CHNB	CHNB	CHNB	ITIP	CHNB	CHNB	ITIP
RVCS	21	0.065	0.071	0	0.067	0	0	0	0.2
		[0.031]	[0.062]		[0.04]	[0]	[0]	[0]	[0.4]
RVSN	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
SBWB	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
SFCB	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
SGCB	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
SGER	1	0.004	0	0	0.007	0	0	0	0
		[0.009]	[0]		[0.014]	[0]	[0]	[0]	[0]
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]
SKCB	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
SMBF	42	0.141	0.25	0.938	0.11	0	0	0	0
		[0.065]	[0.203]		[0.058]	[0]	[0]	[0]	[0]
SMBS	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
SNGR	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
SNPD	2	0.007	0.008	0	0.008	0	0	0	0
		[0.011]	[0.017]		[0.016]	[0]	[0]	[0]	[0]
SNSG	95	0.332	0.13	0	0.431	0	0.417	0.265	0
		[0.134]	[0.229]		[0.181]	[0]	[0.833]	[0.351]	[0]
SNSN	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]
SVCB	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
SVCP	3	0.007	0.007	0	0.008	0	0	0	0
		[0.008]	[0.014]		[0.011]	[0]	[0]	[0]	[0]
UCF	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]

Appendix F3 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB		OSB	SCCL	
			CHNB	CHNB	CHNB	ITIP	CHNB	CHNB	ITIP
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	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
UHY	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]
UNID	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]
WTSK	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 F4. Otter Trawl: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors in brackets.

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
BHCP	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
BHMW	11	0.023	0.058	0.012	0	0	0	0
		[0.021]	[0.073]	[0.013]	[0]	[0]	[0]	[0]
BKCP	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
BKSS	2	0.003	0	0.004	0	0	0	0
		[0.005]	[0]	[0.008]	[0]	[0]	[0]	[0]
BLCF	1709	3.003	3.326	2.901	1.503	3.121	0.864	6.167
		[0.7]	[1.202]	[0.915]	[0.169]	[3.183]	[0.792]	[10.423]
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	1	0.001	0	0.002	0	0	0	0
		[0.003]	[0]	[0.004]	[0]	[0]	[0]	[0]
BTTM	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
BUSK	34	0.057	0.036	0.055	0	0.268	0	0.087
		[0.027]	[0.041]	[0.035]	[0]	[0.226]	[0]	[0.174]
CARP	2	0.006	0.012	0.004	0	0	0	0
		[0.008]	[0.024]	[0.009]	[0]	[0]	[0]	[0]
CLSR	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNCF	2219	3.762	2.898	4.208	0	1.922	1	11.082
		[1.022]	[1.236]	[1.494]	[0]	[1.537]	[0.954]	[4.523]
CNLP	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNSN	190	0.294	0.511	0.247	0	0	0	0.133
		[0.201]	[0.629]	[0.179]	[0]	[0]	[0]	[0.267]
ERSN	36	0.06	0.046	0.04	0	0	0	1.19
		[0.042]	[0.045]	[0.038]	[0]	[0]	[0]	[1.462]
FHCF	19	0.029	0.034	0.029	0	0.04	0	0
		[0.015]	[0.031]	[0.019]	[0]	[0.08]	[0]	[0]
FWDM	624	1.309	2.238	1.07	0.794	0.6	0.272	0
		[0.731]	[2.252]	[0.664]	[1.587]	[1.114]	[0.375]	[0]
GDEY	437	0.83	1.508	0.632	0	0	0	1.605
		[0.597]	[1.952]	[0.467]	[0]	[0]	[0]	[3.046]

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
GNSF	1	0.001 [0.003]	0 [0]	0.002 [0.004]	0 [0]	0 [0]	0 [0]	0 [0]
GSCP	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
GZSD	7	0.01 [0.008]	0.004 [0.008]	0.015 [0.013]	0 [0]	0 [0]	0 [0]	0 [0]
HBNS	23	0.03 [0.059]	0 [0]	0.047 [0.093]	0 [0]	0 [0]	0 [0]	0 [0]
HFCS	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
JYDR	1	0.001 [0.002]	0.005 [0.009]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
LGPH	4	0.003 [0.004]	0 [0]	0.004 [0.006]	0 [0]	0 [0]	0 [0]	0 [0]
LKSG	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
LMBS	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
LNGR	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
MMSN	76	0.096 [0.102]	0.016 [0.026]	0.145 [0.16]	0 [0]	0 [0]	0 [0]	0 [0]
MNEY	40	0.064 [0.038]	0.055 [0.058]	0.069 [0.052]	0 [0]	0 [0]	0 [0]	0.308 [0.615]
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]
PDFH	19	0.039 [0.031]	0 [0]	0.05 [0.046]	0 [0]	0.058 [0.117]	0.148 [0.296]	0 [0]
PDSG	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
PKLF	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
QLBK	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
RBST	0	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
RDSN	259	0.423	0.232	0.499	0	0.32	0.074	1.538
		[0.563]	[0.307]	[0.872]	[0]	[0.64]	[0.148]	[3.077]
RVCS	122	0.224	0.55	0.115	0.397	0.053	0	0.067
		[0.228]	[0.841]	[0.081]	[0.794]	[0.105]	[0]	[0.133]
RVSN	1	0.002	0.007	0	0	0	0	0
		[0.004]	[0.014]	[0]	[0]	[0]	[0]	[0]
SBWB	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SFCB	197	0.306	0.1	0.43	0	0.164	0	0
		[0.089]	[0.072]	[0.133]	[0]	[0.229]	[0]	[0]
SGCB	23	0.03	0.016	0.041	0	0	0	0
		[0.02]	[0.018]	[0.03]	[0]	[0]	[0]	[0]
SGER	17	0.027	0.057	0.019	0	0	0	0
		[0.018]	[0.047]	[0.021]	[0]	[0]	[0]	[0]
SHRH	45	0.061	0.011	0.092	0	0	0	0
		[0.104]	[0.023]	[0.163]	[0]	[0]	[0]	[0]
SJHR	1	0.002	0.009	0	0	0	0	0
		[0.005]	[0.018]	[0]	[0]	[0]	[0]	[0]
SKCB	575	0.916	0.409	1.173	0	1.122	0.28	0.481
		[0.353]	[0.185]	[0.541]	[0]	[1.119]	[0.291]	[0.499]
SMBF	3	0.004	0	0.006	0	0	0	0
		[0.005]	[0]	[0.007]	[0]	[0]	[0]	[0]
SMBS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNGR	2	0.003	0.007	0.002	0	0	0	0
		[0.005]	[0.015]	[0.004]	[0]	[0]	[0]	[0]
SNPD	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNSG	482	0.788	0.714	0.828	0	0.635	0.728	1.183
		[0.162]	[0.347]	[0.203]	[0]	[0.519]	[0.849]	[0.269]
SNSN	3	0.004	0	0.006	0	0	0	0
		[0.008]	[0]	[0.012]	[0]	[0]	[0]	[0]
STCT	5	0.006	0	0.009	0	0	0	0
		[0.006]	[0]	[0.009]	[0]	[0]	[0]	[0]
SVCB	189	0.384	0.574	0.29	0	0.185	1.006	0.308
		[0.213]	[0.557]	[0.233]	[0]	[0.25]	[1.22]	[0.615]
SVCP	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
UCA	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCF	9	0.018	0.01	0.019	0	0	0.101	0
		[0.014]	[0.02]	[0.017]	[0]	[0]	[0.202]	[0]
UCS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCT	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCY	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
UHY	73	0.128	0.035	0.187	0	0	0	0
		[0.227]	[0.049]	[0.357]	[0]	[0]	[0]	[0]
UNID	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
WTBS	2	0.003	0	0.005	0	0	0	0
		[0.005]	[0]	[0.008]	[0]	[0]	[0]	[0]
WTCP	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
WTSK	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
YLBH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]

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

Species	Total Catch	Overall CPUE	CHXO	ISB			OSB	SCCL	SCCS		TRMS
			BARS	BARS	CHNB	ITIP	BARS	BARS	BARS	ITIP	BARS
BHCP	1	0.008	0	0	0	0	0	0	0.062	0	0
		[0.016]	[0]	[0]	[0]	[0]	[0]	[0]	[0.125]	[0]	[0]
BHMW	1212	9.696	13.774	8.1	7.333	2	19.7	3.857	3.562	7.5	21.5
		[3.344]	[5.527]	[5.76]	[14.667]	[4]	[21.811]	[4.173]	[2.536]	[12.396]	[43]
BKCP	1	0.008	0.032	0	0	0	0	0	0	0	0
		[0.016]	[0.065]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BKSS	6	0.048	0.129	0.02	0	0	0.1	0	0	0	0
		[0.038]	[0.122]	[0.04]	[0]	[0]	[0.2]	[0]	[0]	[0]	[0]
BLCF	3	0.024	0	0.02	0	0	0.2	0	0	0	0
		[0.036]	[0]	[0.04]	[0]	[0]	[0.4]	[0]	[0]	[0]	[0]
BLGL	59	0.472	0.774	0.22	0	0	0.3	0.857	0.75	0	1.5
		[0.236]	[0.647]	[0.192]	[0]	[0]	[0.427]	[1.19]	[0.992]	[0]	[3]
BMBF	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BNMW	223	1.784	2.032	2.66	0	0	2.1	0.286	0.25	0	0
		[1.289]	[1.494]	[3.034]	[0]	[0]	[2.485]	[0.571]	[0.5]	[0]	[0]
BTTM	3	0.024	0.065	0.02	0	0	0	0	0	0	0
		[0.027]	[0.09]	[0.04]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BUSK	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
CARP	2	0.016	0.065	0	0	0	0	0	0	0	0
		[0.023]	[0.09]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
CLSR	7	0.056	0.065	0.02	0	0	0.2	0	0	0	1
		[0.052]	[0.09]	[0.04]	[0]	[0]	[0.4]	[0]	[0]	[0]	[2]
CNCF	130	1.04	1.71	0.62	0.667	1.5	0.5	0.714	1.75	0.25	1
		[0.449]	[1.482]	[0.328]	[1.333]	[3]	[0.803]	[0.948]	[1.489]	[0.5]	[2]
CNLP	1	0.008	0	0.02	0	0	0	0	0	0	0
		[0.016]	[0]	[0.04]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNSN	59	0.472	0.452	0.74	0	0	0	0	0.5	0	0
		[0.495]	[0.585]	[1.161]	[0]	[0]	[0]	[0]	[0.753]	[0]	[0]
ERSN	3861	30.888	44.097	28.52	4.667	2.5	43.6	21.714	22.688	17.25	14.5
		[10.837]	[23.187]	[19.395]	[9.333]	[5]	[40.409]	[13.471]	[27.391]	[24.622]	[19]
FHCF	5	0.04	0.097	0.02	0	0	0	0	0.062	0	0
		[0.035]	[0.108]	[0.04]	[0]	[0]	[0]	[0]	[0.125]	[0]	[0]
FWDM	148	1.184	2.032	1.2	2.333	1.5	0.4	0.571	0.25	0	1.5
		[0.325]	[0.832]	[0.461]	[4.667]	[3]	[0.8]	[0.595]	[0.224]	[0]	[3]
GDEY	2	0.016	0	0	0	0	0	0	0.125	0	0
		[0.032]	[0]	[0]	[0]	[0]	[0]	[0]	[0.25]	[0]	[0]

Appendix F6 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB			OSB	SCCL	SCCS		TRMS
			BARS	BARS	CHNB	ITIP	BARS	BARS	BARS	ITIP	BARS
GNSF	2	0.016	0	0.04	0	0	0	0	0	0	0
		[0.032]	[0]	[0.08]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
GSCP	2	0.016	0	0.02	0	0	0	0.143	0	0	0
		[0.023]	[0]	[0.04]	[0]	[0]	[0]	[0.286]	[0]	[0]	[0]
GZSD	36	0.288	0.258	0.5	0	0	0.1	0	0.062	0	0.5
		[0.168]	[0.16]	[0.397]	[0]	[0]	[0.2]	[0]	[0.125]	[0]	[1]
HBNS	1	0.008	0.032	0	0	0	0	0	0	0	0
		[0.016]	[0.065]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
HFCS	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
JYDR	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
LGPH	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]
LMBS	7	0.056	0.097	0	0	0	0.2	0	0	0	1
		[0.052]	[0.142]	[0]	[0]	[0]	[0.267]	[0]	[0]	[0]	[2]
LNGR	13	0.104	0.129	0	0.333	0	0.4	0.571	0	0	0
		[0.067]	[0.154]	[0]	[0.667]	[0]	[0.327]	[0.738]	[0]	[0]	[0]
MMSN	128	1.024	2.968	0.54	0	0	0.1	0.286	0.375	0	0
		[0.75]	[2.792]	[0.555]	[0]	[0]	[0.2]	[0.571]	[0.512]	[0]	[0]
MNEY	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
MQTF	138	1.104	1.065	0.74	0	0	5.5	0.429	0.188	1.75	0
		[0.723]	[1.061]	[1.131]	[0]	[0]	[5.69]	[0.857]	[0.202]	[2.217]	[0]
OSSF	29	0.232	0.161	0.14	0	0	0.9	0	0.312	0	1.5
		[0.131]	[0.209]	[0.14]	[0]	[0]	[0.814]	[0]	[0.507]	[0]	[3]
PDFH	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
PDSG	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
PKLF	1	0.008	0.032	0	0	0	0	0	0	0	0
		[0.016]	[0.065]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
QLBK	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
RBST	1	0.008	0	0	0	0	0	0.143	0	0	0
		[0.016]	[0]	[0]	[0]	[0]	[0]	[0.286]	[0]	[0]	[0]

Appendix F6 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB			OSB	SCCL	SCCS		TRMS
			BARS	BARS	CHNB	ITIP	BARS	BARS	BARS	ITIP	BARS
RDSN	2005	16.04	17.806	7.92	8.333	6.5	70.6	4.429	12.812	11	16.5
		[6.347]	[5.995]	[4.643]	[6.36]	[9]	[63.73]	[2.955]	[10.719]	[17.088]	[31]
RVCS	646	5.168	3.677	3.12	1	11	3.7	4	11.875	22.75	2.5
		[2.809]	[2.041]	[1.905]	[2]	[22]	[3.578]	[5.589]	[18.191]	[37.642]	[5]
RVSN	127	1.016	0.032	0.62	0	0	9.4	0	0.062	0	0
		[1.534]	[0.065]	[0.97]	[0]	[0]	[18.579]	[0]	[0.125]	[0]	[0]
SBWB	2	0.016	0.065	0	0	0	0	0	0	0	0
		[0.032]	[0.129]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SFCB	3	0.024	0.032	0.04	0	0	0	0	0	0	0
		[0.027]	[0.065]	[0.056]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SGCB	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SGER	3	0.024	0	0.04	0.333	0	0	0	0	0	0
		[0.027]	[0]	[0.056]	[0.667]	[0]	[0]	[0]	[0]	[0]	[0]
SHRH	1	0.008	0	0.02	0	0	0	0	0	0	0
		[0.016]	[0]	[0.04]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SJHR	1	0.008	0	0	0	0	0	0	0.062	0	0
		[0.016]	[0]	[0]	[0]	[0]	[0]	[0]	[0.125]	[0]	[0]
SKCB	22	0.176	0.032	0.06	0	0	0	1.857	0.25	0.25	0
		[0.213]	[0.065]	[0.068]	[0]	[0]	[0]	[3.714]	[0.289]	[0.5]	[0]
SMBF	41	0.328	0.097	0.12	0	0	0	4.571	0	0	0
		[0.517]	[0.194]	[0.168]	[0]	[0]	[0]	[9.143]	[0]	[0]	[0]
SMBS	1	0.008	0	0.02	0	0	0	0	0	0	0
		[0.016]	[0]	[0.04]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNGR	135	1.08	1.29	0.82	0.333	0	2.5	0.714	1	1.5	0.5
		[0.3]	[0.602]	[0.411]	[0.667]	[0]	[1.82]	[0.571]	[0.816]	[1.915]	[1]
SNPD	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNSG	3	0.024	0	0.06	0	0	0	0	0	0	0
		[0.036]	[0]	[0.089]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNSN	54	0.432	0.387	0.44	0	0	1.7	0	0.188	0	0
		[0.32]	[0.432]	[0.458]	[0]	[0]	[2.982]	[0]	[0.272]	[0]	[0]
STCT	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SVCB	31	0.248	0.161	0.2	0	0	0	0	0.062	3.75	0
		[0.255]	[0.264]	[0.151]	[0]	[0]	[0]	[0]	[0.125]	[7.5]	[0]
SVCP	1	0.008	0	0	0	0	0	0.143	0	0	0
		[0.016]	[0]	[0]	[0]	[0]	[0]	[0.286]	[0]	[0]	[0]

Appendix F6 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB			OSB	SCCL	SCCS		TRMS
			BARS	BARS	CHNB	ITIP	BARS	BARS	BARS	ITIP	BARS
UCA	1	0.008	0.032	0	0	0	0	0	0	0	0
		[0.016]	[0.065]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCF	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCS	65	0.52	0.194	0	0	0	0	0	3.688	0	0
		[0.917]	[0.387]	[0]	[0]	[0]	[0]	[0]	[7.113]	[0]	[0]
UCT	211	1.688	0.29	0.88	0.667	0	1.2	0.429	0.25	33.75	1
		[2.197]	[0.373]	[1.529]	[1.333]	[0]	[1.833]	[0.857]	[0.5]	[65.515]	[2]
UCY	43	0.344	0.935	0	0	0	0	0	0.875	0	0
		[0.378]	[1.22]	[0]	[0]	[0]	[0]	[0]	[1.75]	[0]	[0]
UHY	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UNID	3	0.024	0	0	0	0	0	0	0.188	0	0
		[0.048]	[0]	[0]	[0]	[0]	[0]	[0]	[0.375]	[0]	[0]
WTBS	26	0.208	0.387	0.16	0	0	0.4	0.286	0	0	0
		[0.127]	[0.379]	[0.119]	[0]	[0]	[0.8]	[0.571]	[0]	[0]	[0]
WTCP	6	0.048	0.161	0	0	0	0.1	0	0	0	0
		[0.068]	[0.264]	[0]	[0]	[0]	[0.2]	[0]	[0]	[0]	[0]
WTSK	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
YLBH	1	0.008	0	0	0	0	0	0	0	0	0.5
		[0.016]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[1]

Appendix G. Hatchery names, locations, and abbreviations.

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

Appendix H. Alphanumeric list of Missouri River fishes with total catch-per-unit-effort by gear type for sturgeon season (fall through spring) and fish community season (summer) during the 2006 sample year for segment 14 of the Missouri River. Species codes are located in Appendix A. Asterisks and bold type denote targeted native Missouri River species.

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)		
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl
ALSD							
ALWF							
AMEL							
AMGL							
BCCC							
BDDR							
BDKF							
BDSN							
BDSP							
BESN							
BHCP	0.008	0.019	0.019		0.005	0.008	
BHMW				0.003		9.696	0.044
BKBF							
BKBH							
BKCP						0.008	
BKRH							
BKSB							
BKSS				0.005		0.048	
BKTT							
BLCF	0.165	0.017	1.267	1.359	0.340	0.024	4.673
BLGL						0.472	
BMBF					0.005		
BMSN							
BNDC							
BNMW				0.003		1.784	
BNSN							
BNTT							
BTTM						0.024	
BRBT							

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)		
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl
BSDR							
BSMN							
BSTM							
BTDR							
BUSK*	0.159	0.199	0.121	0.040	0.094		0.074
BVSC							
BWFN							
CARP	0.004	0.011	0.049			0.016	0.012
CHSM							
CKCB							
CLDR							
CLSR						0.056	
CMSN							
CNCF	0.012	0.005	0.087	1.967	0.010	1.040	5.586
CNLP			0.007			0.008	
CNSM							
CNSN				0.421		0.472	0.165
CSCO							
CTTT							
ERSN				0.038		30.888	0.084
FCSC							
FHCB							
FHCF		0.006	0.027	0.019	0.011	0.040	0.040
FHMW							
FKMT							
FSDC							
FTDR							
FWDM	0.011	0.019	0.112	0.271	0.021	1.184	2.363
GDEY	0.046		0.226	0.007	0.006	0.016	1.602
GDFH							

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)		
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl
GDTT							
GFCC							
GLDR							
GN*?							
GNSF				0.003			0.016
GSBG							
GSCP	0.008	0.003	0.024				0.016
GSDR							
GSOS							
GSPK							
GSTS							
GTSN							
GVCB							
GZSD	0.006	0.004	0.316	0.021	0.008		0.288
HBNS*				0.059			0.008
HFCS	0.005	0.003	0.007		0.003		
HHCB							
IODR							
JYDR				0.002			
LESF							
LGPH				0.005			
LKCB							
LKSG		0.003	0.027		0.008		
LKTT							
LKWF							
LMBS							0.056
LNDC							
LNGR	0.010		0.172		0.017		0.104
LNSK							
GDRH							

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)		
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl
GDSN							
LSSR							
LTDR							
LVLN							
MDSP							
MMSN				0.108		1.024	0.084
MNEY	0.003			0.010	0.006		0.119
MQTF						1.104	
MSDR							
MSKG							
MTSK							
MTWF							
NBLP							
NHSK							
NRBD							
NTPK							
NTSF							
OSSF						0.232	
OTDR							
OZMW							
PDFH		0.003	0.019	0.078			
PDSG*	0.007		0.017				
PEMT							
PKLF						0.008	
PLDC							
PNMW							
PNMW*							
PNSD							
PTMW							
QLBK		0.004	0.007				

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)		
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl
RBDR							
RBST						0.008	
RBTT							
RDSN				0.048		16.040	0.805
RDSS							
RKBS							
RRDR							
RUDD							
RVCS	0.036	0.065	0.211	0.041	0.043	5.168	0.410
RVRH							
RVSN				0.004		1.016	
RYSN							
SBLR							
SBSN							
SBWB			0.017			0.016	
SCSC							
SDBS							
SDMT							
SESM							
SFCB*				0.226		0.024	0.387
SFSN							
SGCB*				0.019			0.041
SGER*	0.003	0.004	0.073	0.014	0.016	0.024	0.040
SGWE							
SHDR							
SHRH			0.061			0.008	0.123
SJHR			0.002		0.006	0.008	0.005
SKCB*				1.114		0.176	0.715
SLDR							
SMBF	0.040	0.141	0.160	0.001	0.048	0.328	0.006

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)		
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl
SMBS						0.008	
SMMW							
SNGR			0.138	0.003	0.008	1.080	0.004
SNPD	0.009	0.007	0.007				
SNSG*	0.758	0.332	5.102	0.946	1.100	0.024	0.627
SNSN*				0.008		0.432	
SPSK							
SPSN							
SPST							
SRBD							
SSPS							
STBS							
STCT				0.011			
STGR							
STPD							
STSN							
SVCB				0.077		0.248	0.695
SVCP	0.003	0.007	0.046			0.008	
SVLP							
SVMW							
SVRH							
TFSD							
TPMT							
TPSN							
TTPH							
UCA						0.008	
UAC							
UBF							
UCF				0.006			0.031
UCN							
UCS						0.520	

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)		
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl
UCT						1.688	
UCY						0.344	
UDR							
UET							
UHY				0.005			0.253
ULP							
ULY							
UNO							
UPC							
UPN							
URH							
USG							
UST							
UNID						0.024	
WLEY							
WRFS							
WRMH							
WSMN*							
WSSN							
WTBS			0.005			0.208	0.007
WTCP			0.005			0.048	
WTPH							
WTSK			0.005				
YLBH					0.003	0.008	
YWBS							
YWPH							

Appendix I. Comprehensive list of bend numbers and bend river miles for segment 14 of the Missouri River comparing bend selection for both sturgeon season (ST) and fish community season (FC) between years from 2003 – 2006.

Bend Number	Bend River Mile	2003	2004	2005	2006
1	3.4			ST	
2	6.0		FC	ST, FC	
3	9.2				
4	10.6		FC		ST, FC
5	16.7		ST, FC	FC	
6	21.9		FC		
7	25.4				ST, FC
8	26.5				
9	28.2			ST, FC	
10	31.9				
11	33.9				ST, FC
12	37.7		FC		ST, FC
13	38.8		ST		
14	40.7		FC		
15	43.7	ST	FC		ST, FC
16	45.5	FC			ST, FC
17	48.6				ST, FC
18	49.8				
19	51.2	FC			ST, FC
20	54.4	FC			
21	56.5				ST, FC
22	58.9				
23	60.6				
24	65.0		ST	FC	
25	66.7			FC	
26	69.6	ST	FC		
27	74.6				
28	76.9	ST			
29	77.9				ST
30	79.7				ST, FC

Appendix I. (continued).

Bend Number	Bend River Mile	2003	2004	2005	2006
31	80.9	FC			
32	82.7		FC	ST	
33	85.4				
34	86.7				ST, FC
35	87.9		FC		ST
36	89.7		FC		ST
37	91.8				
38	93.9			FC	
39	95.3				ST, FC
40	96.8				
41	97.9				ST, FC
42	100.1				ST
43	103.4				
44	104.9	ST			ST
45	106.3				
46	107.8				
47	110.2		ST	FC	
48	112.1			ST	
49	116.0	FC			ST, FC
50	118.4			ST	
51	121.0	FC		ST, FC	
52	122.3				
53	125.0	FC			
54	127.0	FC			
55	128.7	FC			ST, FC
56	130.2				ST