2005 Annual Report

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

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EXECUTIVE SUMMARY

The number of pallid sturgeon collected in segment 13 has increased from 20 (4 wild and 16 hatchery) in 2004 to 26 (9 wild and 17 hatchery) in 2005. The difference in numbers of wild fish suggests that there could have been some reproduction in the system, probably between 1997 and 2001. However, the sizes of fish captured are consistent with the size range of stocked pallids recaptured from 1997, 2002 and 2003 when the year classes only had one type of tag. It is not possible to calculate tag loss this year, except to say that one pallid with an elastomer had lost a PIT tag and one fish was observed to have a PIT tag scar. Genetic validation of these presumed wild fish is still needed to confirm their true origin and that information is not available at this time. The number of hatchery fish observed should have increased dramatically in 2005 as 13,650 pallids were released in the segment during 2004, but it only increased by one. In addition, more fish should be recruiting to gillnets as their size increases and this was not the case, in that only two juvenile fish were captured in standard gillnets. Recaptures of hatchery pallids has not yet increased in proportion to the number of fish stocked in the segment.

Sampling gears were used throughout the entire year to sample available habitat types over a range of water temperatures. Stationary set gillnets captured 12 pallids, 6 of which were captured in standard gillnets and 6 in wild gillnets. Wild gillnets were used to increase the effort for the largest and smallest pallids. In active gears, 3 pallids were captured in 2.5 inch trammel nets, 6 in standard trammel nets and 5 in otter-trawls. Of the 26 pallids sampled, only 3 were sampled in POOL habitat and POOL habitat accounted for half of the habitat for which gillnets were used. The absence of pallids in this habitat is significant because in years preceding 2004, only POOL habitat was sampled with this gear. This relative absence may be an anomaly that could be attributed to lower river stages seen in recent years, but at the very least, it suggests that a potential winter habitat was not sampled early on in pallid monitoring efforts (1999-2003). Two pallids were captured from island tips, which are disproportionately available habitat. Thirteen pallids (54%) occurred within inside-bend Macro habitat, which is the most sampled habitat within all gears. Pallids were also captured on less frequently occurring and potentially more important habitats including; 6 (25%) in channel cross-overs and 6 (25%) in side-channel

habitats. Channel crossovers occur at every bend but are sampled less proportionately and side-channels rarely occur. Pallids were found to occur disproportionately in the segment relative to the bends sampled, whereby more pallids were captured between river miles 205-220 than throughout the rest of the segment. This reach of river contains a naturally created side channel separating Lisbon Island (RM 217) and has produced 11 juvenile and no adult pallids. In 2005, this bend area produced 5 juvenile pallids in two days of sampling including one fish sampled twice in the side channel. Areas like Lisbon Island and other "cluster" areas could be targeted with additional efforts in the future to answer questions relative to natural recruitment and hatchery successes.

Since 2002, over 30 pallids have been recaptured at least once in this segment and are potentially at large to be recaptured again. Only one was recaptured in 2005 and it was on the same day in the same habitat by a different crew. A principle of mark recapture theory is that multiple recaptures of the same fish give a more accurate estimate of the population size or at least suggest that the program is beginning to detect a limit of population size. In the case of pallid sturgeon, this has not occurred in this segment. Pallid stockings at the time of sampling included 20,968 fish released in the segment (RM 195), and of the fish recaptured, they represented their stocked year class as follows: 2001 – 0.08%, 2002 – 0.14%, 2003 – 0.17%. The combined total percentage of stocked fish (N=13) versus proximate availability (N= 20,968) was 0.06% recaptured. Preliminary recapture data suggests that stocked fish do not move much in the first two years and then rapidly expand their range. In contrast, adult fish found in segment 14 appear not to have moved far out of their range in over a decade. For the fish origins that could be determined in 2005, only one had originated from outside of Segment 13 and it came from 420 miles upstream.

The relative condition of older pallids seems to be less robust than younger fish. The condition for pallids captured in standard gears was: 0.772 (2001), 0.806 (2002) and 0.902 (2003) where a value of one is considered good. It would appear that fish are slowly declining in condition, but the differences at the time of capture and time of stocking are not significant. At the very least, it can be said that condition is not increasing after release. Annual growth rates were 0.301, 0.211

and 0.241 (mm/day) for 2001-2003 year classes. The ratio of pallid to shovelnose has been used as a gauge of relative abundance. The ratio for 2005 was 1 pallid to 205 shovelnose including hatchery and wild pallids and 1: 457 for wild pallids. This ratio shows 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 information. Young of the year sturgeon (preliminarily identified as shovelnose) were present but not abundant relative to adults (N=126 of 4,113). Sturgeon of larger sizes were the most abundant large fish represented in the sampling effort (N=4,113), which suggests that the appropriate gears are being used to detect pallid sturgeon. The 4,113 shovelnose sturgeon captured, were represented in the gear as follows: 2,745 in gillnets, 683 in standard trammel nets, 160 in 2.5 inch trammel nets, 527 in the 16ft otter trawl, 1 in a bag seine. No shovelnose were captured in mini-fyke nets. Within all gears, 63 species and 2 hybrids 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 trawls. Sand shiners and *Hybognathus* spp were captured in seines and mini-fyke nets, but not in trawls. Blue suckers were captured in gillnets, trammel nets (of both sizes) as well as trawls, and sauger were most often captured with gillnets. For each of these species, there appears to be particular habitat types for which they occur and a sampling design could be adapted to capture higher numbers of each if it were a priority.

Asian carp were represented in almost all gears including some young of year sizes. Considered as nuisance species, these fish appear to have expanded well throughout segment 13, but few young of year have been observed, suggesting that these fish are likely recruiting in reaches of the Mississippi River and immigrating into the Missouri at later life stages. Sampling gears used by this program are not sufficient to draw inferences about these species except to say they exist and are observed more often through jumping or through other gears like hoop nets and electrofishing used in other related projects.

TABLE OF CONTENTS

LIST OF TABLES

Pallid sturgeon

Shovelnose sturgeon

Sturgeon chub

Sicklefin chub

Speckled chub

Sand shiner

***Hybognathus* spp.**

Blue sucker

Sauger

LIST OF FIGURES

Shovelnose sturgeon

Sturgeon chub

Sicklefin chub

Speckled chub

Sand shiner

***Hybognathus* spp.**

Blue sucker

Sauger

LIST OF APPENDICES

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).

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

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

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

Study Area

Historically, the Missouri River was very wide and shallow, containing meandering channels with many islands and snags. Today, the Missouri River is maintained by the COE as a navigation channel for barges with high levies and armored banks to protect the adjacent farm land. Reveted banks and dikes line the river making it a self-scouring channel. Water velocities exceed 1.3 m/s in the main channel and drop to zero in pools that exist behind dike structures. Depths range from six meters in the main channel to 12 meters behind dikes. Turbidities can vary widely from over 1,000 NTU's in spring flood events to around 40 NTU's in the winter months. Substrates range from silt (behind dikes) to fine sand and gravel in the main channel and border habitats. Rock revetment lines the outside bend shore-

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

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

Methods

Sampling was conducted in accordance with Standard Operating Procedures established by a panel of representatives from various State and Federal agencies involved with pallid recovery on the Missouri River (Drobish, 2005). The sampling guidelines were meant to be adaptive and have been modified to ensure sampling efficiency and scientific accuracy.

Sampling Site Selection and Description

Segment 13 starts at the confluence of the Grand River (RM 250.3) and ends at the confluence with the Osage River (RM 130.2; Figure 1a). Each segment represents a sampling replicate. Segments were divided into bends (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. Ten bends in each segment were sampled from November through June, (designated as the sturgeon season), and another 10 bends were selected and sampled for the community season (July through October). The river was categorized into distinct river components called Mesohabitats which exist within Macrohabitats (Appendix B). Each Mesohabitat was sampled twice within each Macrohabitat. When a diversity of habitats was not available, a minimum of eight samples were used to ensure some consistent level of effort per bend. For example, most active gear effort was applied to inside bend channel border habitat because this habitat was available at all water stages in all bends. Samples that occurred outside of the predetermined sampling protocol were given a "Wild" designation and not included in the master data analyses.

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

MACRO
CHXO (channel cross over)
ISB (inside bend)
OSB (outside bend),
CONF (confluence- area downstream of a tributary)
SCCS or SCCL (side channel connected small or large)
SCCN (side channel not connected)
TRMS or TRML (small or large tributary mouth)
TRIB (tributary)

MESO
CHNB (channel border- where depth is > 4 ft. to toe of thalweg)
POOL (scour hole)
ITIP (island tip- associated with SCCS or SCCL where the two water currents meet behind an island
BARS (sand bar or shallow water habitat were 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 (<55 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. 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 and seines were the only gears used solely in the community season. These nets are more effective at capturing smaller fish, and seasonally, small fish are more abundant after the spawning season. Mini-fykes (MF) were set on mud bars behind dikes and on sand bars in the main-channel. Steep slopes and shallow sand bars may have affected the efficiency of this gear. In many cases, the gear was set close to the bank behind bars and the lead 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.

Bag-seines (BS) were pulled wherever wadable substrate existed. There are many methods of pulling seines (half or whole arcs, upstream or downstream), but the rectangular downstream method provided the most fish per effort for this section of the river and was used almost exclusively.

Segment 13 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
Bag Seine:	30 ft, $1/8^{th}$ inch 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, turbidity and depth (beginning, mid-point and end) were taken for each sample. Additionally, substrate 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 was measured at (bottom), 80% (8/10) and 20% (2/10) of the depth. All habitat data was collected when pallid sturgeon were encountered.

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 deemed to be of wild origin pending genetic verification.

Relative Condition

The relative condition of recaptured hatchery reared pallid sturgeon was calculated using Kn = (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 =

0.9740)] for pallid sturgeon throughout its range which was used to calculate a relative condition factor.

Relative Stock Densities

A length frequency index measures changes in fish population structure. Length categories based on the percentage of the largest known pallid sturgeon are as follows (Shuman et al. 2006): sub-stock fork length < 330mm (20%), stock fork length = 330-629mm (20-36%), quality fork length = 630-839mm (36-45%), preferred fork length = 840-1039mm (45- 59%), memorable fork length = 1040- 1269mm(59 – 74%) and trophy fork length > 1270mm (>74%).

Length categories based on the percentage of the largest known shovelnose sturgeon are as follows (Quist 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), one overnight set (HN, MF) and 30 ft half arc pull (BS). 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 m^2 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 included into length frequencies, relative condition and population structure calculations.

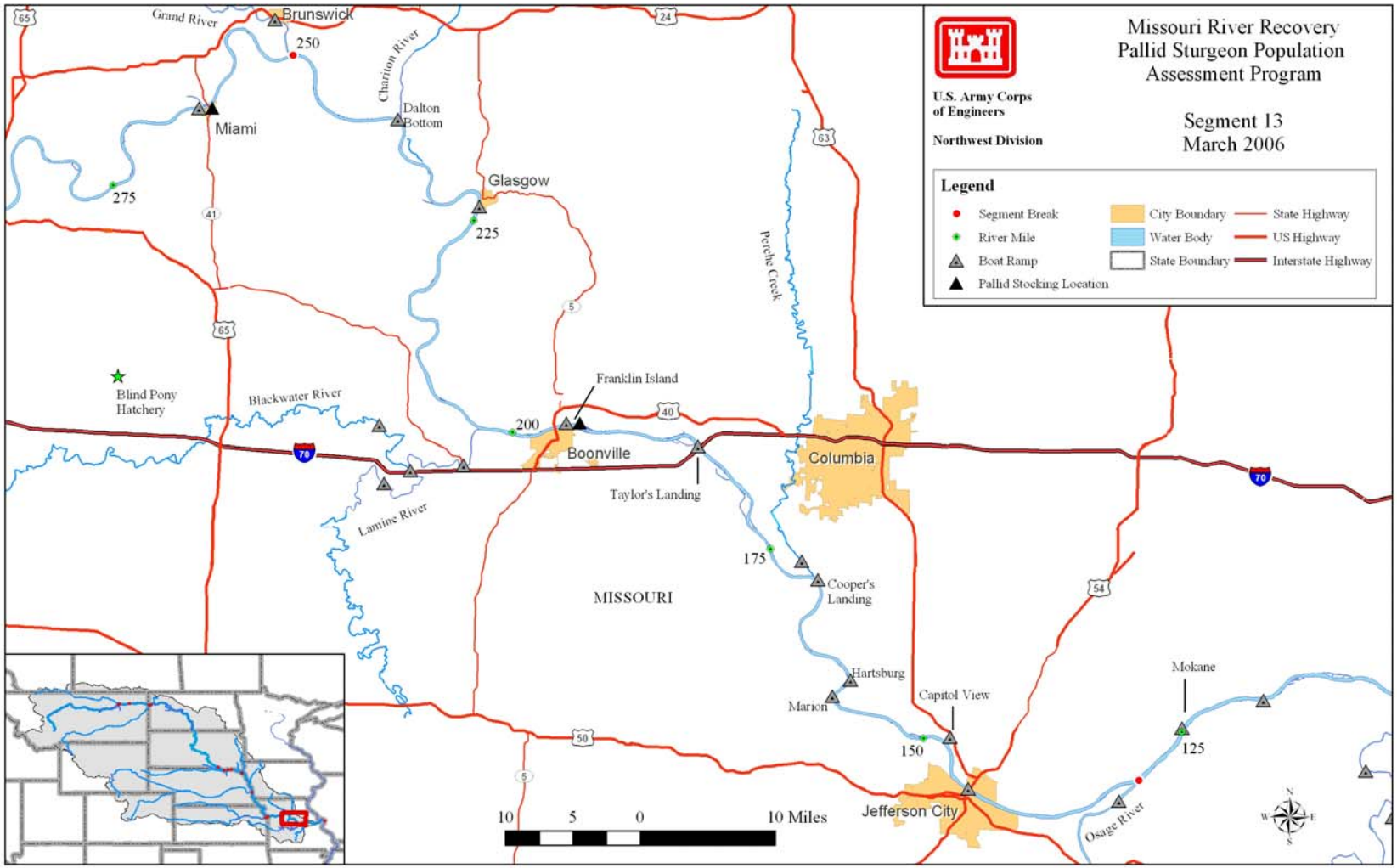

Figure 1a. Map of segment 13 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 13 encompasses the Missouri River from the Grand River (River Mile 250.3) to the Osage River (River Mile 130.2).

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.

In 2005, biologists at the Columbia Fishery Resources Office (Columbia FRO) sampled 19 bends from segment 13 during sturgeon season (1 November 2004 to 30 June 2005) and 11 bends during fish community season (1 July 2005 to 30 October 2005) using multiple gears. For sturgeon season, fourteen bends were sampled with 1 inch trammel nets (total effort = 23,688 m drifted), fifteen bends with 2.5 inch trammel nets (total effort = 26,489 m drifted), nineteen bends with gill nets (total effort = 330 net nights), and fourteen bends with 16 foot otter trawls (total effort = 39,695 m trawled; Table 1). For fish community season, ten bends were sampled with 1 inch trammel nets (total effort = 16,469 m drifted), 8 bends with bag seines (total effort = 11,254 m^2 seined), ten bends with mini-fyke nets (total effort = 63 net nights), and eleven bends with 16 foot otter trawls (total effort = 17,826 m trawled; Table 1). Regardless of all this effort, only 9 wild and 17 stocked pallid sturgeon were captured in segment 13 (Table 4), which emphasizes the rarity of this federally endangered species.

Of the 23 randomly selected bends in segment 13 only two were sampled during both sturgeon and fish community seasons (Figure 1b). Most of the pallid sturgeon were captured in the upper half of the segment (RM 180 to 240; N = 21) with 14 captured in the lower half (RM 120 to 180; Figure 1b). Seven of the 17 recaptured pallid sturgeon were positively identified as originating from the Booneville stocking location (RM 195) and all other recaptures could not be positively traced back to a stocking site due to lack of or obscure data received from the field (Tables 4 and 6; Appendix E). Untraceable pallid sturgeon will be positively identified at a later date using genetic verification. Two pallid sturgeon were from the 2001 year class (Booneville stocking site), four pallids were from the 2002 year class (3 from the Booneville stocking site), seven pallids were from the 2003 year class, and one pallid from the 2004 year class that was stocked at Booneville (Tables 4 and 6; Appendix E). One of the 2003 year class pallids (ID = CF-1-13-2122-18) was stocked near Bellevue Iowa (RM = 601.4) on 30 July 2004 and traveled 420 river miles downstream over 224 days before being captured in an otter trawl near Columbia Missouri (RM = 181.1) on 10 March 2005. All traceable pallid sturgeon captured in 2005 were reared at either Garrison Dam National Fish Hatchery or Neosho National Fish Hatchery. Condition (Kn), which is a measure of the fish's overall plumpness, was averaged for all recaptured pallids from segment 13. All fish that leave the hatchery are considered to be in good or robust condition (Kn ≈ 1.0) and were still in fairly good condition at the time of recapture (Table 6).

The majority of pallid sturgeon captured in segment 13 (58%; N = 11) were captured in ISB CHNB habitat, however, this may be an artifact of sampling effort since over half (55%) of the sampling in segment 13 occurred in ISB CHNB habitat (Tables 1-2 and 9). In ISB CHNB habitat, pallid sturgeon were captured at the average depths sampled (2.8 m), and were always captured at depths closer to the mean sample depth than the extremes (captured between 3.0 and 5.5 m whereas the sample mean was between 0.5 to 8.1 m; Tables 3 and 5-6). This trend was similar for bottom velocity where pallid sturgeon were captured at a mean velocity of 0.44 m/s (0.27 – 0.57) with a sample mean of 0.51 m/s (0.09 – 1.16). In segment 13, standard gill nets were not used after water temperatures exceeded 15 ºC because of possible mortality. Half the pallid sturgeon captured during the 2005 sample year were captured in water equal to or less than 15.0 ºC. On average, pallid sturgeon were captured in

water temperatures of 13.9 ºC (5.0 – 27.0) with an average sample temperature of 18.4 ºC (1.0 – 29.8; Tables 3 and 5-6). Eleven of the 26 pallid sturgeon were captured during the low flow winter months when turbidities generally ranged between 30 and 146 NTU's, whereas, the majority of pallids were captured during periods of high flow (navigation flows) with turbidities between 73 and 633 NTU's (Table 5). The average turbidity for pallid captures over both seasons was 243.9 NTU's (30 to 633) with a mean turbidity per sample of 151 NTU's (27 – 1762; Table 3). Sand was the dominate substrate on which pallid sturgeon were captured ($\bar{x}$ = 79.8%; ±2SE = 13.8%) with silt and gravel making up 26.7% (±2SE = 12.9%) and 14.0% (±2SE = 6.8%) of the substrate respectively.

The population structure, shown in Table 7, illustrates the influence of recently propagated fish but no quality fish were captured in the fish community season. The RSD values indicate health of populations in terms of reproductive potential and relative age of fish. The fact that few fish are seen at larger sizes suggests little opportunity exists for reproduction. The proportion of pallids to shovelnose, shown in Table 8, gives some measure of change in the system. For wild pallids to shovelnose, Carlson et al (1985) reported a ratio of 1:398, Grady et al (2001) reported a ratio of 1:647, Doyle and Starostka (2003) reported a ratio of 1:387, and Doyle et al (2004) reported ratios of 1:1188 in 2003 and 1:133 in 2004. Recent results for 2005 show a ratio of 1:205.8 (Table 8). Methods of capture, improved sampling techniques, changing environmental conditions, commercial harvest, and sampling locations may confound any probable assumptions that could be made using this comparison and warrant noting. Despite these assumptions, the proportion, at the very least, does not provide any evidence of population improvement.

Table 1. Number of bends sampled, mean effort per bend, and total effort by macrohabitat for segment 13 on the Missouri River during fall through spring (sturgeon season) and summer (fish community season) in 2004 - 2005. Effort is defined as net nights for gill and mini-fyke nets, 100 m drifted for trammel nets and trawls, and 100 m^2 for bag seines. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

Gear	Number of Bends	Mean Effort /Bend	Macrohabitat													
			BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Fall through Spring - Sturgeon Season																
1 Inch Trammel Net	14	16.9	N-E	37.90	3.20	N-E	N-E	146.91	0	26.20	22.67	0	0	0	0	0
2.5 Inch Trammel Net	15	17.7	N-E	42.93	8.40	N-E	N-E	181.31	0	21.30	10.95	0	0	0	0	0
Gill Net	19	17.4	N-E	70	6	N-E	N-E	124	78	26	22	0	0	4	0	0
Otter Trawl	14	28.4	N-E	39.81	3.05	N-E	N-E	258.13	18.76	47.14	30.06	0	0	0	0	0
Beam Trawl	-	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Summer – Fish Community Season																
1 Inch Trammel Net	10	16.5	N-E	42.53	0	N-E	N-E	113.83	0	5.58	2.75	0	0	0	0	-
Bag Seine	8	14.1	N-E	19.04	0	N-E	N-E	55.63	4.76	0	26.18	6.93	0	0	0	-
Mini-Fyke Net	10	6.3	N-E	11	0	N-E	N-E	18	9	0	15	0	8	0	2	-
Otter Trawl	11	16.2	N-E	37.53	0	N-E	N-E	106.08	1.30	11.75	3.15	0	18.45	0	0	-
Beam Trawl	-	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 2. Number of bends sampled, mean effort per bend, and total effort by mesohabitat for segment 13 on the Missouri River during fall through spring (sturgeon season) and summer (fish community season) in 2004– 2005. Effort is defined as net nights for gill and mini-fyke nets, 100 m drifted for trammel nets and trawls, and 100 m^2 for bag seines. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

Gear	Number of bends	Mean Effort/Bend	**Mesohabitat**				
			BAR	POOL	CHNB	TLWG	ITIP
Fall through Spring – Sturgeon Season							
1 inch Trammel Net	14	16.9	0	0	210.81	3.00	23.07
2.5 Inch Trammel Net	15	17.7	0	0	250.94	0	13.95
Gill Net	19	17.4	0	120	166	2	30
Otter Trawl	14	28.4	0	0	362.41	0	33.04
Beam Trawl	-	-	-	-	-	-	-
Summer – Fish Community Season							
1 Inch Trammel Net	10	16.5	0	0	158.86	0	5.83
Bag Seine	8	14.1	112.54	0	0	0	0
Mini-Fyke Net	10	6.3	63	0	0	0	0
Otter Trawl	11	16.2	0	0	170.36	0	7.90
Beam Trawl	-	-	-	-	-	-	-

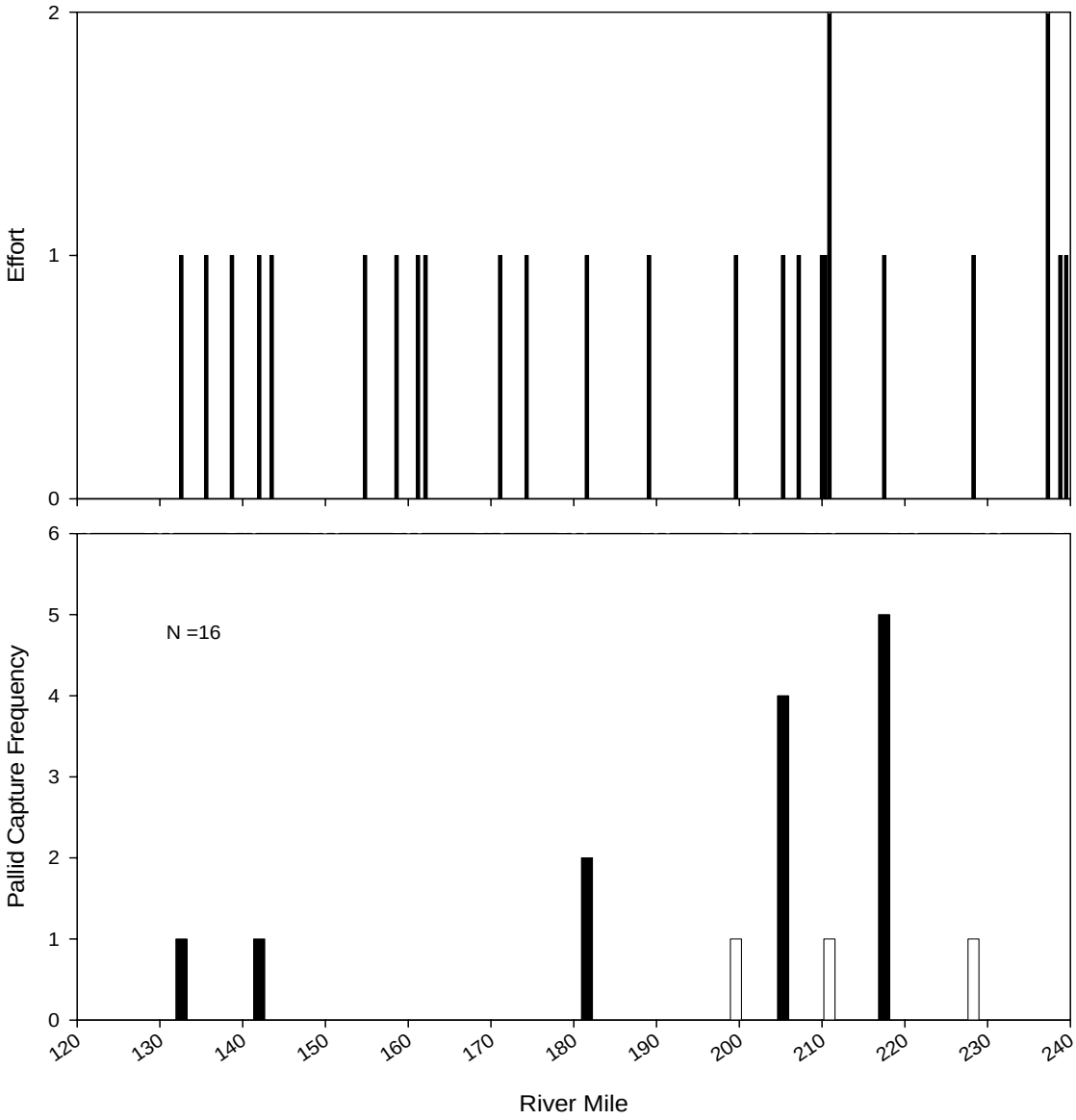

Figure 1b. Distribution of: A) seasonal sampling effort and B) pallid sturgeon captures by river mile for segment 13 in randomly selected bends of the Missouri River during 2004-2005. Sampling effort of 2 indicates bend sampled in both sturgeon and fish community seasons. Sampling effort of 1 indicates bend sampled in only one season. Black bars represent pallid captures during sturgeon season and white bars during fish community season.

Table 3. Pallid sturgeon (PDSG) capture summaries relative to habitat type and environmental variables on the Missouri River for Segment 13 during 2004-2005. Means and two standard errors (in parentheses) are presented. Habitat definitions and codes presented in Appendix B.

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Velocity (m/s) (Effort)	Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
BRAD	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E
CHXO	BAR	0.5 (0.3-1.1)	-	0.04 (0.00-0.11)	-	25.1 (13.5-30.0)	-	55 (29-107)	-	-
	POOL	6.2 (2.0 - 12.0)	-	0.04 (0.00-0.65)	-	6.0 (1.0-11.0)	-	74 (26-230)	-	-
	CHNB	3.2 (1.3-6.1)	2.4 (1.8-3.1)	0.52 (0.02-1.35)	0.38 (0.24-0.52)	17.9 (1.0-30.8)	21.1 (11.0-26.2)	152 (25-1426)	342 (42-633)	3
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
CONF	BAR	-	-	-	-	-	-	-	-	-
	POOL	7.0 (5.3-8.4)	-	0.14 (0.10-0.50)	-	6.0 (6.0-6.0)	-	296 (260-300)	-	-
	CHNB	5.6 (1.7-8.0)	-	0.48 (0.15-0.51)	-	26.4 (23.0-27.0)	-	337 (315-369)	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
DEND	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E
DRNG	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E
ISB	BAR	0.4 (0.2-1.0)	-	0.16 (0.00-0.33)	-	21.5 (13.5-32.0)	-	65 (31-85)	-	-
	POOL	6.0 (1.3-10.7)	-	0.11 (0.01-0.48)	-	5.7 (1.0-12.0)	-	62 (27-240)	-	-
	CHNB	2.8 (0.8-7.7)	2.8 (1.8-4.5)	0.51 (0.09-1.16)	0.44 (0.27-0.57)	18.4 (1.0-29.8)	13.9 (5.0-27.0)	151 (27-1762)	155 (30-615)	10
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	1.6 (1.5-2.3)	-	0.65 (0.65-0.65)	-	7.0 (7.0-7.0)	-	-	-	-

Table 3 (continued).

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Velocity (m/s) (Effort)	Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
OSB	BAR	0.8 (0.3-1.6)	-	0.36 (0.00-0.47)	-	28.2 (17.5-30.8)	-	52 (42-150)	-	-
	POOL	6.0 (2.5 - 10.8)	-	0.10 (0.00-0.25)	-	4.9 (1.0-11.0)	-	48 (15-146)	-	-
	CHNB	4.1 (2.0-6.7)	6.7 (6.7-6.7)	0.17 (0.00-0.75)	0.04 (0.04-0.04)	11.4 (1.0-29.0)	2.0 (2.0-2.0)	144 (27-410)	146 (146-146)	1
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
SCCL	BAR	-	-	-	-	-	-	-	-	-
	POOL	6.1 (5.5-7.5)	-	0.07 (0.07-0.07)	-	6.0 (6.0-6.0)	-	310 (310-310)	-	-
	CHNB	2.7 (1.4-4.5)	3.4 (2.3-4.5)	0.48 (0.01-0.75)	0.65 (0.65-0.65)	22.2 (1.0-29.7)	26.0 (25.4-26.5)	238 (36-404)	331 (258-404)	3
	TLWG	2.7 (2.7-2.7)	2.7 (2.7-2.7)	-	-	26.1 (26.1-26.1)	26.1 (26.1-26.1)	404 (404-404)	404 (404-404)	1
	ITIP	3.2 (1.3-6.1)	-	0.44 (0.36-0.59)	-	13.9 (1.0-29.8)	-	139 (36-350)	-	-
SCCS	BAR	0.5 (0.2-1.0)	-	0.05 (0.00-0.35)	-	23.3 (13.5-32.0)	-	53 (29-68)	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	1.8 (1.4-1.8)	-	0.73 (0.73-0.73)	-	18.8 (18.8-19.5)	-	1000 (1000-1000)	-	-
	TLWG	3.8 (3.8-3.8)	-	-	-	15.0 (15.0-15.0)	-	-	-	-
	ITIP	2.7 (1.0-5.4)	2.8 (2.3-3.2)	0.63 (0.36-0.92)	0.70 (0.70-0.70)	11.0 (0.0-26.8)	11.5 (8.0-15.0)	129 (39-582)	-	2
SCCN	BAR	0.3 (0.2-0.3)	-	0.00 (0.00-0.00)	-	22.8 (17.7-26.5)	-	46 (10-65)	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-

Table 3 (continued).

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Velocity (m/s) (Effort)	Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
TRIB	BAR	0.7 (0.5-0.9)	-	0.00 (0.00-0.00)	-	18.6 (17.0-21.5)	-	82 (70-306)	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	2.5 (0.9-3.9)	-	0.03 (0.03-0.03)	-	17.5 (17.5-18.0)	-	37 (37-37)	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
TRML	BAR	-	-	-	-	-	-	-	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
TRMS	BAR	0.7 (0.5-1.1)	-	0.08 (0.03-0.10)	-	27.3 (26.9-27.5)	-	68 (61-71)	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
WILD	BAR	-	-	-	-	-	-	-	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-

Table 4. Individual pallid sturgeon fork length (mm), weights (g), morphometric character index (CI) (Sheehan et al. 1999), status (H = Hatchery, W = Wild), tags found, elastomer tags (color, position, orientation), if tags were inserted in field, stocking locations, and hatchery information on the Missouri River during 2004-2005. (* not enough information to calculate CI.)

ID	Recapture Data							Stocking Data				
	FL (mm)	Wt (g)	CI	Status	Tags found[a]	Elastomer[b]	Marked in field?	Year class	FL (mm)	Wt (g)	Site	Source[c]
CF-1-13-1906-1	317	81	*	H	E,P	Yellow-R-H	No	2004	279	65	Boonville	NEO
CF-1-13-1916-14	297	74	*	H	E,P	Yellow-R-H	No	2003	269	55	Boonville	NEO
CF-1-13-1920-1	790	1580	-1.2623	W			Yes					
CF-1-13-2045-18	476	335	-0.6656	W			No					
CF-1-13-2095-2	323	-	*	H	E	Yellow-H	Yes	2003				GAR
CF-1-13-2095-1	394	-	*	H	E	Yellow-H	Yes	2003				GAR
CF-1-13-2122-18	309	85	*	H	E,P	Yellow-R-H	No	2003	269	70	Bellevue	NEO
CF-1-13-2117-37	340	-	*	H	E	Yellow-L-H	Yes	2003				GAR
CF-1-13-2146-48	377	-	*	H	E,P	Yellow-L-V; Red-R-V	No	2002	261	48	Boonville	NEO
CF-1-13-2225-25	925	2865	*	H	P,C	none	No					
CF-1-13-2264-29	738	1470	-1.3252	W			Yes					
CF-1-13-2265-1	736	1435	-1.3849	W			Yes					
CF-1-13-2214-11	711	1230	-0.958	W	S		Yes					
CF-1-13-2311-14	281	65	*	H	E	Yellow-L-H	Yes	2003				GAR
CF-1-13-2285-1	445	285	-1.2231	W			Yes					
CF-1-13-2299-1	783	-	-0.1148	W			Yes					
CF-1-13-2300-1	427	-	*	H		none	-					
CF-1-13-2493-24	390	185	*	H	E,P	Yellow-L; Red-R	Yes					
CF-1-13-2363-12	393	195	*	H	E	Yelllow-L; Red-R	Yes	2002				

Table 4 (continued).

ID	Recapture Data							Stocking Data				
	FL (mm)	Wt (g)	CI	Status	Tags found[a]	Elastomer[b]	Marked in field?	Year class	FL (mm)	Wt (g)	Site	Source[c]
CF-1-13-2370-5	535	470	-0.5424	W			Yes					
CF-1-13-2365-2	631	855	-1.5249	W			Yes					
CF-1-13-2404-3	488	360	*	H	P	none	No	2002	339		Boonville	GAR
CF-1-13-2688-11	597	-	-0.67	H	P	none	No	2001	190		Boonville	GAR
CF-1-13-2696-3	391	195	-0.6305	H	E	Yellow-L-H	Yes	2003				GAR
CF-1-13-2789-2	592	655	-0.7622	H	P	none	No	2001	210		Boonville	GAR
CF-1-13-2198-1	422	190	*	H	P	none	No	2002	303		Boonville	GAR

[a] Tag types include: coded wire tag (C), elastomer tag (E) and passive induced transponder tag, i.e. PIT tag (P), sonic tag (S).
[b] Positions and orientations listed after each color can include: fish's right (R), fish's left (L), center of rostrum (C), vertical (V), and horizontal (H).
[c] Hatchery sources: source abbreviations reported in Appendix G.
[d] All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

Table 5. Pallid sturgeon (PDSG) and hybrid pallid X shovelnose sturgeon (SNPD) capture locations and habitat characteristics for segment 13 of the Missouri River during 2004-05. ID number links pallid sturgeon habitat information with individual fish length, weight, and tagging data in Table 4. Gear codes presented in Appendix C. Habitat definitions and codes presented in Appendix B

Species	ID#	Date	Gear	River mile	Habitat			Water Temp (°C)	Turb[a] (NTU)	Depth[b] (m)	Bottom velocity (m/s)	Substrate[c] (silt/sand/ gravel)
					Macro-	Meso-	Micro-					
PDSG	CF-1-13-1906-1	11/9/2004	TN2W	188.0	ISB	CHNB	600230	11.0	38	2.1	-	5 / 90 / 5
PDSG	CF-1-13-1916-14	11/23/2004	TNS	178.8	ISB	CHNB	600240	11.0	35	2.2	-	0 / 95 / 5
PDSG	CF-1-13-1920-1	12/1/2004	GN18S	204.6	ISB	CHNB	210340	5.0	-	2.3	-	0 / 100 / 0
PDSG	CF-1-13-2045-18	2/10/2005	GN81S	138.9	OSB	CHNB	110300	2.0	146	6.7	0.04	100 / 0 / 0
PDSG	CF-1-13-2095-1	3/8/2005	TN2W	235.6	ISB	POOL	230140	7.0	-	4.2	0.30	0 / 100 / 0
PDSG	CF-1-13-2095-2	3/8/2005	TN2W	235.6	ISB	POOL	230140	7.0	-	4.2	0.30	0 / 100 / 0
PDSG	CF-1-13-2117-37	3/10/2005	OT16S	17.0	SCCS	ITIP	000000	8.0	-	2.3	0.70	0 / 90 / 10
PDSG	CF-1-13-2122-18	3/10/2005	OT16S	181.1	ISB	CHNB	600230	8.0	-	2.0	0.27	0 / 85 / 15
PDSG	CF-1-13-2146-48	3/15/2005	GN81S	131.1	ISB	CHNB	210140	7.0	30	4.0	0.31	0 / 100 / 0
PDSG	CF-1-13-2225-25	3/29/2005	GN18S	185.1	ISB	CHNB	230100	9.0	-	4.5	-	-
PDSG	CF-1-13-2264-29	3/30/2005	GN18S	183.3	CHXO	CHNB	-	11.0	42	3.1	0.24	-
PDSG	CF-1-13-2198-1	4/4/2005	OT16S	204.5	ISB	CHNB	210310	14.0	-	2.0	0.33	10 / 90 / 0
PDSG	CF-1-13-2214-11	4/7/2005	GN18S	180.7	SCCS	ITIP	600240	15.0	-	3.2	-	-
PDSG	CF-1-13-2265-1	4/28/2005	T25DW	-	CHXO	CHNB	213280	14.9		5.6	-	0 / 50 / 50
PDSG	CF-1-13-2299-1	5/4/2005	T25DW	142.8	ISB	POOL	-	15.0	209	2.7	0.60	0 / 95 / 5

Table 5 (continued).

Species	ID#	Date	Gear	River mile	Habitat			Water Temp (°C)	Turb[a] (NTU)	Depth[b] (m)	Bottom velocity (m/s)	Substrate[c] (silt/sand/ gravel)
					Macro-	Meso-	Micro-					
PDSG	CF-1-13-2300-1	5/4/2005	T25D W	143.0	CHXO	CHNB	-	15.0	-	3.4	0.69	0 / 90 / 10
PDSG	CF-1-13-2311-14	5/9/2005	OT16S	204.3	ISB	CHNB	220320	18.4	74	3.2	0.50	0 / 100 / 0
PDSG	CF-1-13-2285-1	5/10/2005	TNS	204.8	ISB	CHNB	221230	19.5	73	1.8	0.53	0 / 95 / 5
PDSG	CF-1-13-2493-24	6/20/2005	OT16S	215.0	SCCL	CHNB	821000	25.4	258	4.5	0.65	30 / 40 / 30
PDSG	CF-1-13-2370-5	6/20/2005	TN25S	216.6	SCCL	CHNB	841000	26.5	404	2.3	-	0 / 97 / 3
PDSG	CF-1-13-2365-2	6/20/2005	TNS	215.6	SCCL	CHNB	841300	26.1	-	3.3	-	0 / 60 / 40
PDSG	CF-1-13-2363-12	6/20/2005	TNS	215.6	SCCL	TLWG	841300	26.1	404	2.7	-	0 / 60 / 40
PDSG	CF-1-13-2404-3	6/21/2005	TN25S	217.2	CHXO	CHNB	230250	26.1	352	2.3	-	0 / 100 / 0
PDSG	CF-1-13-2688-11	8/22/2005	TNS	210.6	ISB	CHNB	223330	27.0	615	3.5	0.57	50 / 50 / 0
PDSG	CF-1-13-2696-3	8/23/2005	TNS	228.0	CHXO	CHNB	221314	26.2	633	1.8	0.52	0 / 95 / 5
PDSG	CF-1-13-2789-2	9/30/2005	OT16S	197.9	ISB	CHNB	221230	20.0	105	2.5	0.57	0 / 100 / 0
SNPD	CF-1-13-1604-46	11/8/2004	GN81S	181.3	ISB	POOL	213120	11.0	-	9.9	-	-
SNPD	CF-1-13-2061-10	2/10/2005	GN81S	141.9	CHXO	POOL	112110	2.0	146	12.0	0.20	40 / 60 / 0
SNPD	CF-1-13-2104-28	2/22/2005	OT16S	179.5	ISB	CHNB	000000	6.0	-	2.0	-	-
SNPD	CF-1-13-2134-12	3/14/2005	GN81S	137.4	OSB	CHNB	110300	7.0	-	2.0	-	-
SNPD	CF-1-13-2148-36	3/15/2005	GN81S	131.7	ISB	CHNB	210140	7.0	30	3.7	-	-
SNPD	CF-1-13-2151-20	3/15/2005	GN81S	132.5	CHXO	CHNB	110140	7.0	28	3.4	0.85	0 / 80 / 20

Table 5 (continued).

Species	ID#	Date	Gear	River mile	Habitat			Water Temp (°C)	Turb[a] (NTU)	Depth[b] (m)	Bottom velocity (m/s)	Substrate[c] (silt/sand/ gravel)
					Macro-	Meso-	Micro-					
SNPD	CF-1-13-2229-23	4/11/2005	GN18S	142.0	CHXO	CHNB	110300	16.0	-	3.3	-	-
SNPD	CF-1-13-2458-24	6/21/2005	OT16S	216.5	ISB	CHNB	631240	25.8	-	2.5	-	-
SNPD	CF-1-13-2506-5	6/22/2005	OT16S	151.8	OSB	CHNB	130230	26.2	410	4.0	0.16	10 / 90 / 0
SNPD	CF-1-13-2531-3	6/22/2005	TN25S	170.8	CHXO	CHNB	230300	27.5	326	3.4	-	0 / 70 / 30

[a]Turb = turbidity.
[b]Depths presented are the average of the starting, middle, and ending depths measured during gear deployment.
[c]Substrates are percents determined visually and by feel in the field.

Table 6. Mean fork length, weight, relative condition factor (Kn), and growth rates of hatchery-reared pallid sturgeon by year class at the time of stocking and recapture during 2005 from segment 13 of the Missouri River. Relative condition factor was calculated using the equation in Keenlyne and Evanson (1993). Standard error (+/- 2SE) was calculated where N>1 and is represented on second line of each year.

Year class	N	Stocking Data			Recapture Data			Growth Data	
		Length (mm)	Weight (g)	Kn	Length (mm)	Weight (g)	Kn	Length (mm/d)	Weight (g/d)
2001	1	210	-	-	592	655.0	0.772	0.301	-
		-	-	-	-	-	-	-	-
2002	5	301	48.0	0.884	404	248.3	0.806	0.211	-
		45	-	-	50	111.7	0.122	0.024	-
2003	3	269	55.0	0.916	296	74.7	0.902	0.241	0.100
		-	-	-	16	11.6	0.033	-	-

Table 7. Relative stock density (RSD)[a] by a length category for wild and stocked pallid sturgeon in the Missouri River captured during 2004-2005. Length categories[b] determined using the methods proposed by Shuman et al. (2006). Relative stock density calculated using the traditional method.

Length Category	Wild[c]		Stocked	
	N	RSD	N	RSD
Sturgeon Season				
Sub-stock (0-199)	0		0	
Sub-stock (200-329)	0		3	
Stock	8		6	
Quality	5	63	0	0
Preferred	1	13	0	0
Memorable	0	0	0	0
Trophy	0	0	0	0
Fish Community Season				
Sub-stock (0-199)	0		0	
Sub-stock (200-329)	0		0	
Stock	2		1	
Quality	0	0	0	0
Preferred	0	0	0	0
Memorable	0	0	0	0
Trophy	0	0	0	0

[a] RSD = number of fish of a specified length ÷ number minimum stock length fish x 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 %).
[c] All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

Table 8. Ratios of wild pallid sturgeon to shovelnose sturgeon, wild pallid sturgeon to hybrid sturgeon (pallid X shovelnose), and stocked pallid sturgeon to wild pallid sturgeon captured in the Missouri River during 2003-2005 including non-random and wild samples.

Year	All Pallids : Shovelnose	Wild* Pallids: Shovelnose	Wild* Pallids: Hybrids	Stocked Pallids: Wild* Pallids
2003	1 : 1188	1 : 2339	1 : 8.5	1 : 1
2004	1 : 133	1 : 887	1 : 2.6	5.6 : 1
2005	1 : 205.8	1 : 411.5	1 : 1	1 : 1

* All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

Year comparisons, Gear evaluation, and Habitat associations

Overall catch of pallid sturgeon in segment 13 was similar to 2005 (N=26; Doyle et al 2005) despite the addition of 2.5 inch trammel nets to the suit of standard sampling gear. Similar to 2004, the majority of pallid sturgeon were captured during sturgeon season (N = 23) rather than in fish community season (N = 4). During the 2005 sturgeon season, gillnets were by far the most effective gear at capturing both stocked and wild pallid sturgeon in segment 13 (mean overall CPUE = 0.018; ±2SE = 0.015) followed by 1 inch trammel nets (mean overall CPUE = 0.014; ±2SE = 0.012), 2.5 inch trammel nets (mean overall CPUE = 0.006; ±2SE = 0.008), and otter trawls (mean overall CPUE = 0.01; ±2SE = 0.01); capturing 30%, 30%, 10% and 30% of the pallid sturgeon respectively (Figures 2-5; Appendix F). For sturgeon season, there was a decrease in the number of stocked pallid sturgeon captured in gillnets from 2004 (CPUE = 0.014 I 2004 versus 0.003 in 2005) and an increase in the number of wild pallid sturgeon captured (CPUE = 0.009 in 2004 versus 0.015 in 2005; Figure 2). Only stocked pallid sturgeon have been captured with otter trawls during sturgeon season and since 2004 CPUE has decreased (CPUE = 0.1 in 2004 versus 0.01 in 2005; Figure 2). Stocked pallid sturgeon captures in 1 inch trammel nets have also appeared to decrease from 2004 for the sturgeon season (CPUE = 0.02 in 2004 versus 0.006 in 2005), whereas wild pallid sturgeon captures have increased (CPUE = 0.0 in 2004 versus 0.01 in 2005; Figure 3). For fish community season, 1 inch trammel nets captured all wild pallids (mean CPUE = 0.013) and otter trawls captured pallid sturgeon at about the same rate as in 2004 (CPUE = 0.01 in 2004 versus 0.009 in 2005; Figure 5). No pallid sturgeon were captured in mini-fyke nets or bag seines in 2005 (Figure 7).

No sub-stock size (0-199 mm) pallid sturgeon were captured in segment 13. Sub-stock size (200-329 mm) pallids (N = 3) were captured exclusively in ISB CHNB habitat relative to 55% of the total effort (Table 11). A majority (70%; N = 14) of pallid sturgeon captured were of stock size (330-629 mm) and most (47%; N = 8) of these were captured in ISB and SCCL macrohabitat (relative to 55% and 6% of the effort respectively; Table 13). Most of the stock size pallid sturgeon captured were in CHNB mesohabitat (50% of the total catch relative to 64.6% of the total effort; Table 14). Five quality size and above (> 630 mm)

pallid sturgeon were captured during sturgeon season. Of these, 2 were captured in ISB macrohabitat (relative to 55% of the total effort) and one was captured in each of three other macrohabitats (CHXO, SCCL, and SCCS; Table 15). Four out of the 5 quality and above pallid sturgeon were captured in CHNB mesohabitat (relative to 81.2% of the total effort) and one was captured in ITIP mesohabitat (relative to 8% of the total effort; Table 16). All quality and above size pallid sturgeon were captured during sturgeon season.

It is important to note the differences in size classes of pallid sturgeon and the associated habitats they use. The largest pallid sturgeon have never been captured outside of sturgeon season, in fact, only pallid sturgeon that were 600 mm or less have been captured during the fish community season (Figure 8). Larger pallid sturgeon occupy a wider range of habitats, such as CHXO, OSB, SCCL, and SCCS macrohabitats and ITIP and TLWG mesohabitats; whereas smaller pallid sturgeon tend to be found more frequently in ISB CHNB habitat and were captured in both seasons. There may be some gear bias associated with catches of larger fish, since large mesh size is only used during the sturgeon season.

Figures 9 and 10 show the cumulative capture history and size distribution of pallid sturgeon in segment 13; clearly illustrating the contribution of stocked fish to the overall population. Lack of larger fish in the system implies there is less chance that spawning can occur regardless of the availability of good environmental spawning conditions.

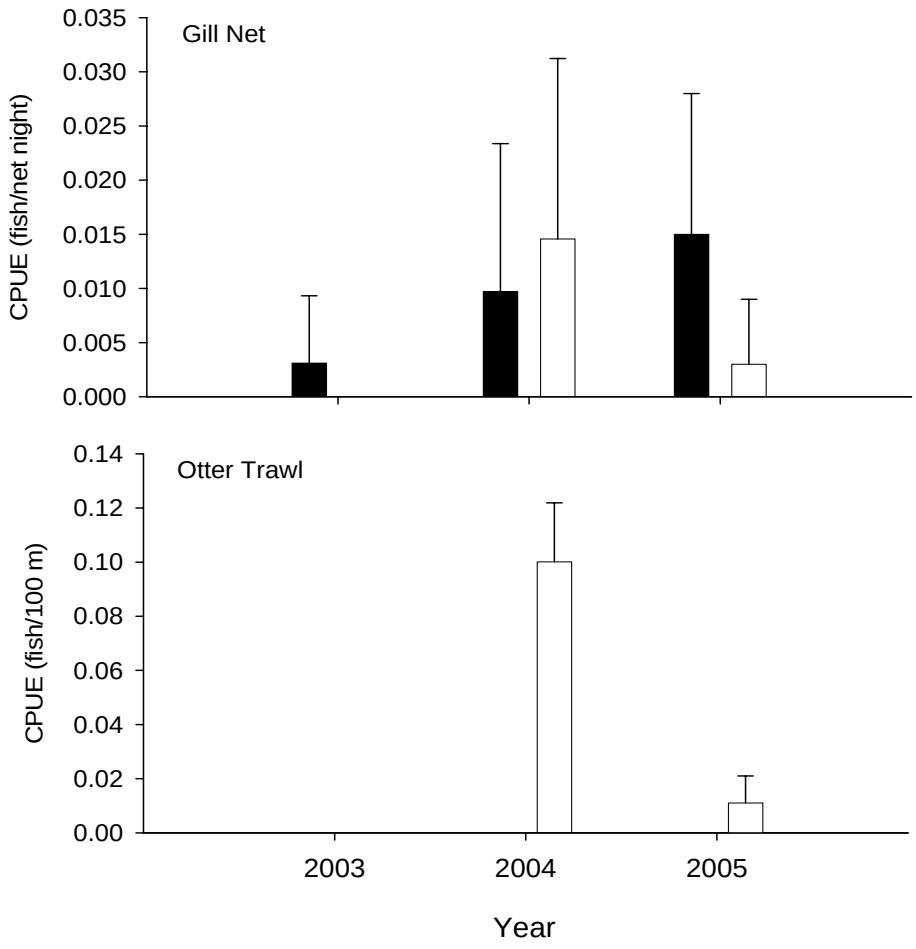

Figure 2. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon using gill nets and otter trawls in segment 13 of the Missouri River during sturgeon season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

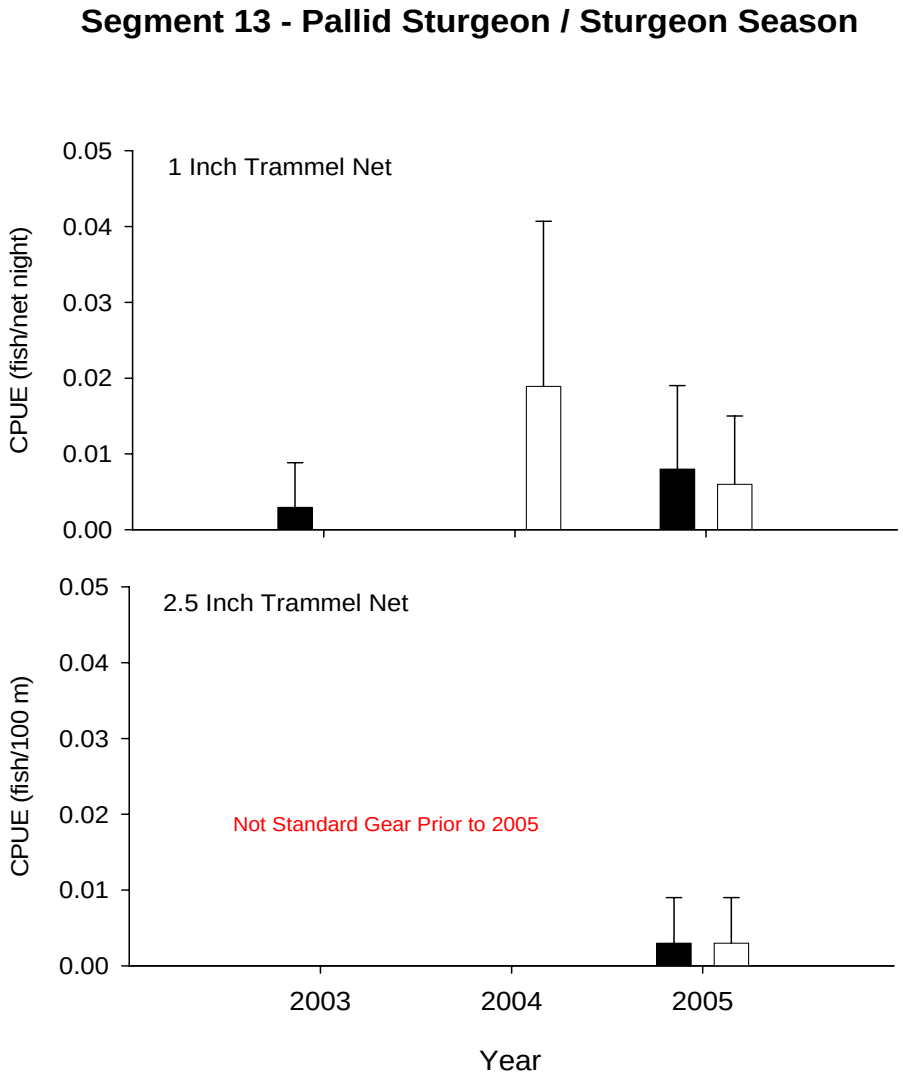

Figure 3. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon using 1 and 2.5 inch trammel nets in segment 13 of the Missouri River during sturgeon season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

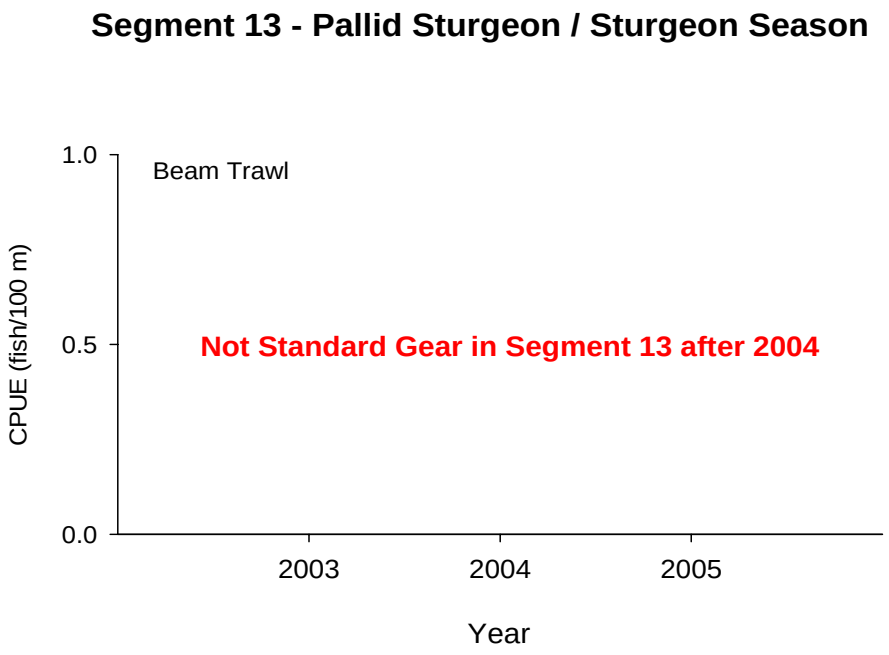

Figure 4. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon using beam trawls in segment 13 of the Missouri River during sturgeon season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

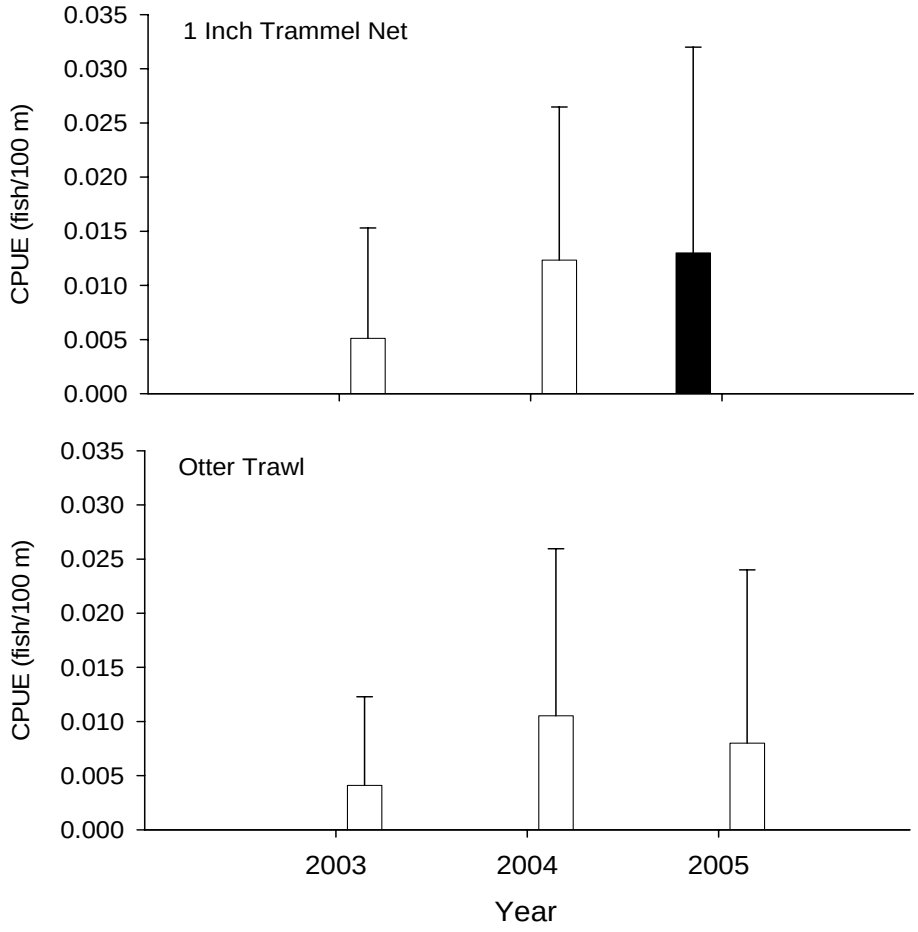

Figure 5. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon using 1 inch trammel nets and otter trawls in segment 13 of the Missouri River during fish community season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

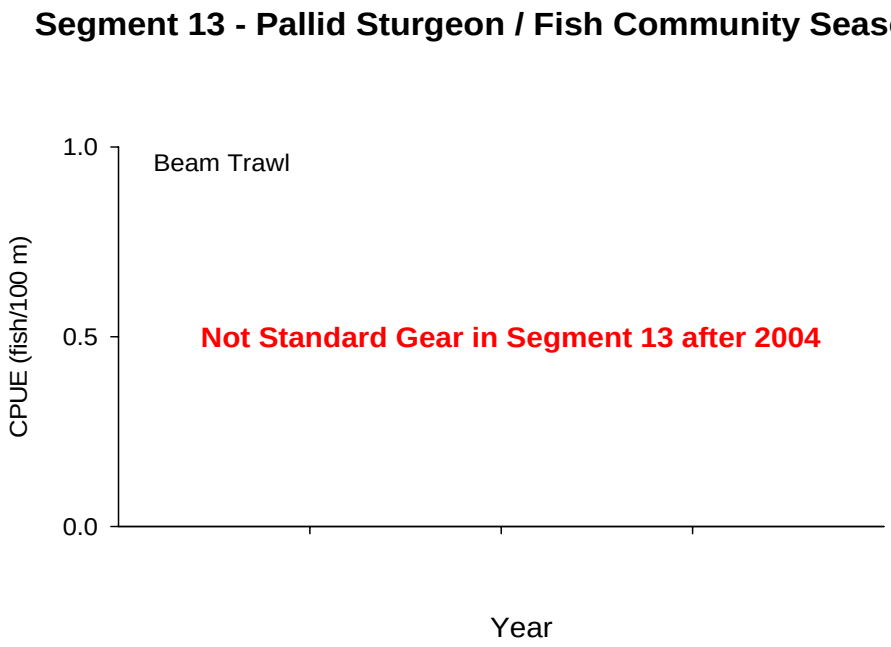

Figure 6. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon using beam trawls in segment 13 of the Missouri River during fish community season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

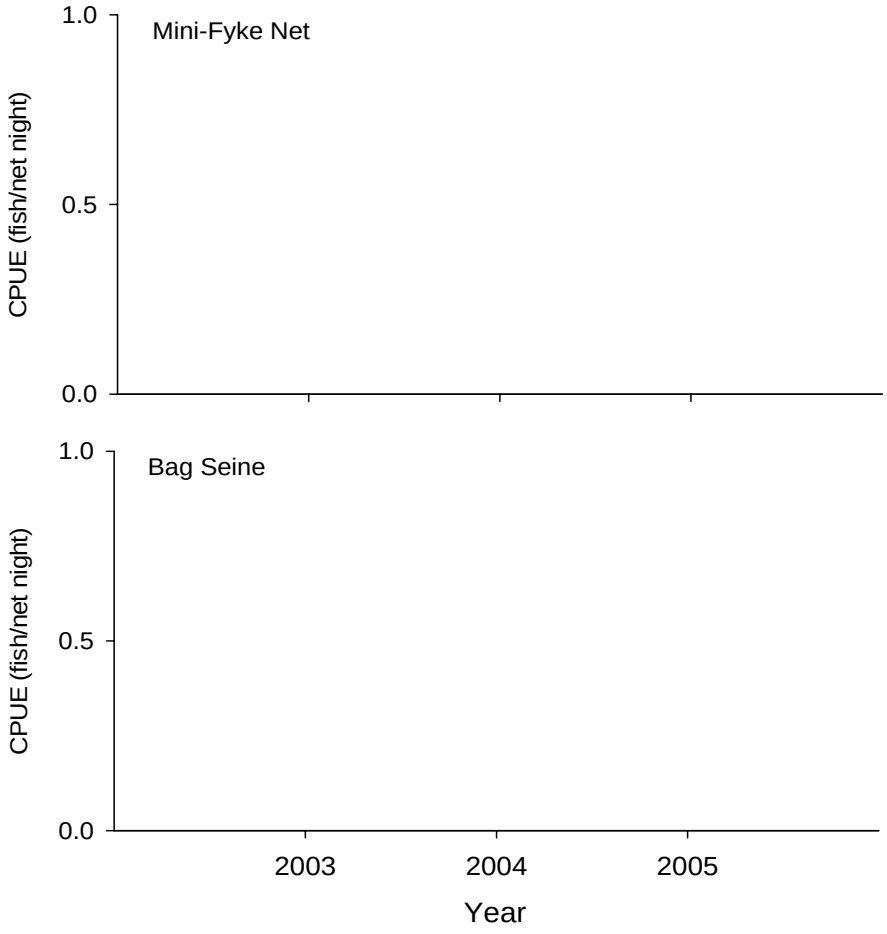

Figure 7. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon using mini-fyke nets and bag seines in segment 13 of the Missouri River during fish community season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

Table 9. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-05. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

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	16	1	N-E	N-E	62	0	11	10	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	16	3	N-E	N-E	68	0	8	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	21	2	N-E	N-E	38	24	8	7	0	0	1	0	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	10	1	N-E	N-E	65	5	12	8	0	0	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
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	26	0	N-E	N-E	69	0	3	2	0	0	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	49	4	0	23	6	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	17	0	N-E	N-E	29	14	0	24	0	13	0	3	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	21	0	N-E	N-E	60	1	7	2	0	10	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

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 microhabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If numbers on the second line do not add to 100 then some Microhabitats were not recorded in the field. The beam trawl is not standard gear in segment 13.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	89	N-E	10	0	1
2.5 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	95	N-E	5	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	50	N-E	9	36	1
Otter Trawl	0	0	0	N-E	0	0	0
		0	91	N-E	8	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Otter Trawl	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

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 (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

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	16	1	N-E	N-E	62	0	11	10	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	16	3	N-E	N-E	68	0	8	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	21	2	N-E	N-E	38	24	8	7	0	0	1	0	0
Otter Trawl	2	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	10	1	N-E	N-E	65	5	12	8	0	0	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
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	26	0	N-E	N-E	69	0	3	2	0	0	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	49	4	0	23	6	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	17	0	N-E	N-E	29	14	0	24	0	13	0	3	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	21	0	N-E	N-E	60	1	7	2	0	10	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

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 (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	1	0	100	N-E	0	0	0
		0	89	N-E	10	0	1
2.5 Trammel Net	0	0	0	N-E	0	0	0
		0	95	N-E	5	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	50	N-E	9	36	1
Otter Trawl	2	0	100	N-E	0	0	0
		0	91	N-E	8	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Otter Trawl	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

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 (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

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	0	0	N-E	N-E	50	0	50	0	0	0	0	0	0
		N-E	16	1	N-E	N-E	62	0	11	10	0	0	0	0	0
2.5 Trammel Net	2	N-E	50	0	N-E	N-E	0	0	50	0	0	0	0	0	0
		N-E	16	3	N-E	N-E	68	0	8	4	0	0	0	0	0
Gill Net	2	N-E	0	0	N-E	N-E	50	50	0	0	0	0	0	0	0
		N-E	21	2	N-E	N-E	38	24	8	7	0	0	1	0	0
Otter Trawl	3	N-E	0	0	N-E	N-E	33	0	33	33	0	0	0	0	0
		N-E	10	1	N-E	N-E	65	5	12	8	0	0	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	2	N-E	50	0	N-E	N-E	50	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	69	0	3	2	0	0	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	49	4	0	23	6	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	17	0	N-E	N-E	29	14	0	24	0	13	0	3	0
Otter Trawl	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	21	0	N-E	N-E	60	1	7	2	0	10	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

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 (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	2	0	50	N-E	0	0	50
		0	89	N-E	10	0	1
2.5 Trammel Net	2	0	100	N-E	0	0	0
		0	95	N-E	5	0	0
Gill Net	2	0	100	N-E	0	0	0
		0	50	N-E	9	36	1
Otter Trawl	3	0	67	N-E	33	0	0
		0	91	N-E	8	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	2	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Otter Trawl	1	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

Table 15. Total number of quality and above size (>630 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

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	0	0	100	0	0	0	0	0	0
		N-E	16	1	N-E	N-E	62	0	11	10	0	0	0	0	0
2.5 Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	16	3	N-E	N-E	68	0	8	4	0	0	0	0	0
Gill Net	4	N-E	25	0	N-E	N-E	50	0	0	25	0	0	0	0	0
		N-E	21	2	N-E	N-E	38	24	8	7	0	0	1	0	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	10	1	N-E	N-E	65	5	12	8	0	0	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
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	26	0	N-E	N-E	69	0	3	2	0	0	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	49	4	0	23	6	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	17	0	N-E	N-E	29	14	0	24	0	13	0	3	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	21	0	N-E	N-E	60	1	7	2	0	10	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 16. Total number of quality and above size (>630 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	1	0	100	N-E	0	0	0
		0	89	N-E	10	0	1
2.5 Trammel Net	0	0	0	N-E	0	0	0
		0	95	N-E	5	0	0
Gill Net	4	0	75	N-E	25	0	0
		0	50	N-E	9	36	1
Otter Trawl	0	0	0	N-E	0	0	0
		0	91	N-E	8	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Otter Trawl	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

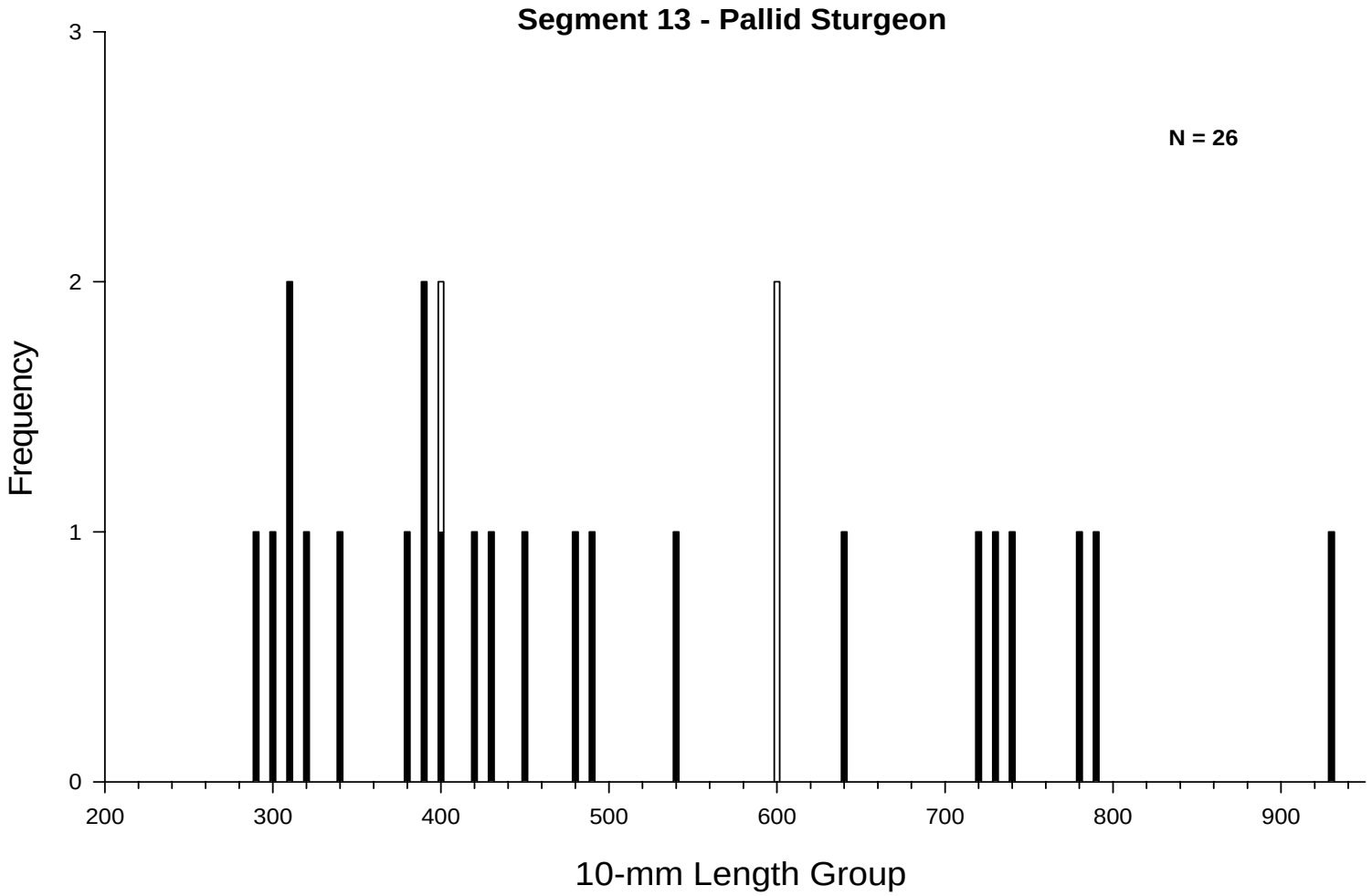

Figure 8. Length frequency of pallid sturgeon during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during 2004 - 2005 including non-random and wild samples.

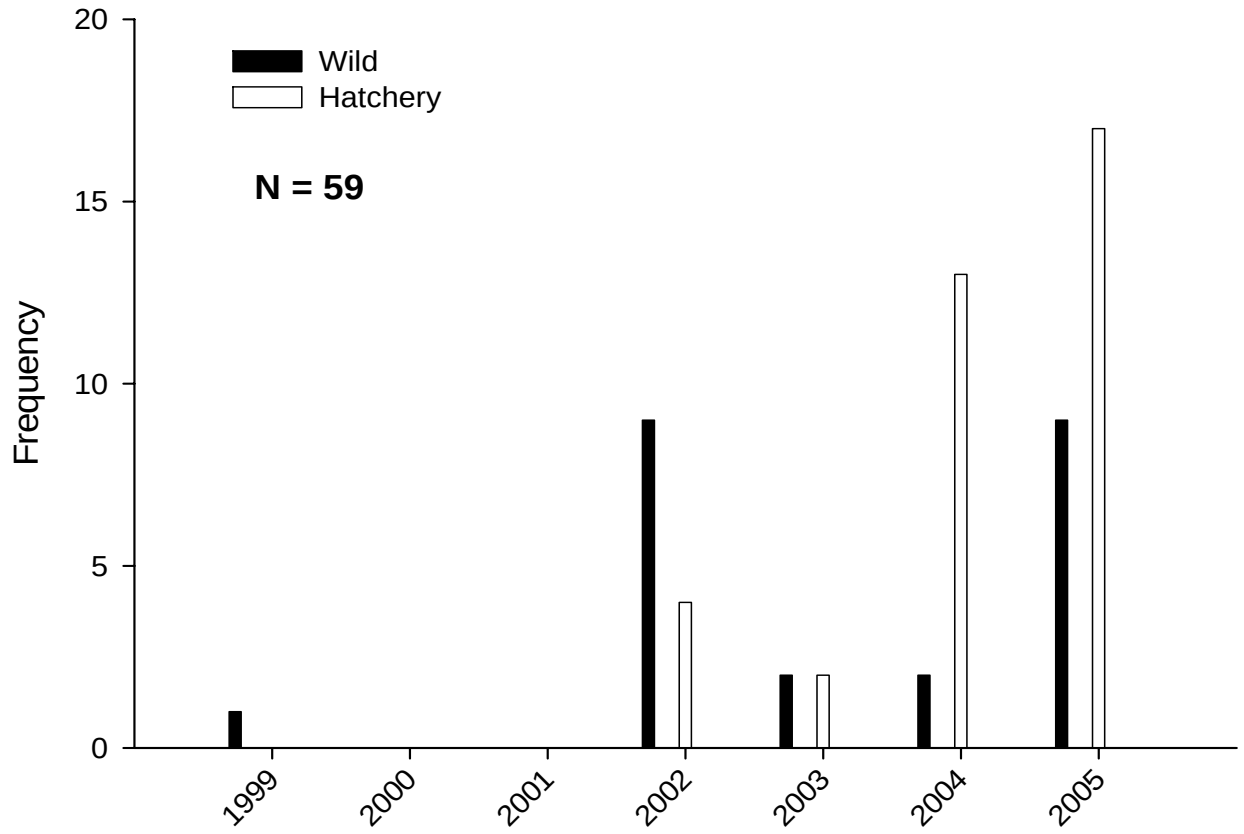

Figure 9. Cumulative capture history of wild (black bars) and hatchery reared (white bars) pallid sturgeon collected in segment 13 of the Missouri River from 1999 to 2005.

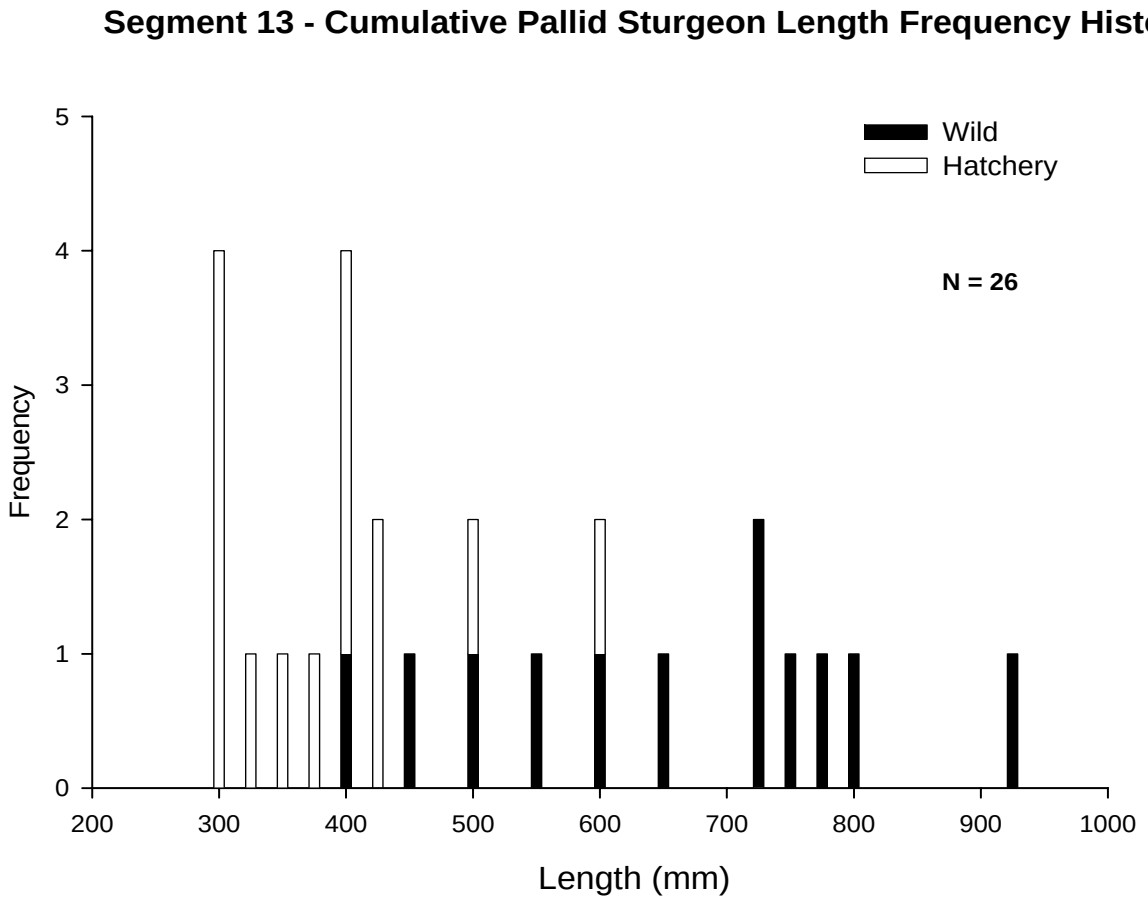

Figure 10. Cumulative pallid sturgeon length frequency histogram for segment 13 comparing hatchery reared (white bars) and wild (black bars) pallid sturgeon captures in 2005.

Shovelnose X Pallid Sturgeon Hybrids

Ten hybrid sturgeon were captured in segment 13 during the 2005 sample season. As in previous years, hybrid sturgeon were captured in POOL mesohabitat more than pallid sturgeon (20% of the hybrids vs. 0% of the pallids) but were captured more often in mesohabitat (44%; Tables 5-6 and 10; Doyle et al. 2005). Hybrid sturgeon were also captured in ISB macrohabitat (50 % of the catch). They were captured at slightly greater depths than pallid sturgeon (mean depth = 4.6 m vs. 3.0 m) and slightly lower water velocities than pallid sturgeon (mean velocity = 0.40 m/s vs. 0.44 m/s). Similar to pallid sturgeon, hybrid sturgeon were captured in predominantly sand substrates.

The pallid to hybrid ratio was 1:8.5 in 2003, 1:2.6 in 2004, and 1:1 in 2005 (Table 8). Though these ratios seem to be decreasing, caution must be taken while viewing these results. Methods of capture, improved sampling techniques, changing environmental conditions, commercial harvest, biased and targeted sampling, and sampling locations are probable confounding issues and must be taken into consideration when viewing data over the years. Indications in the field suggest that hybridization in the wild is continuing and, by all indications, seems to be increasing. Increases in hybridization suggest that pallid sturgeon are loosing their genetic integrity as more crosses occur.

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

The number of shovelnose sturgeon captured in segment 13 increased from 2004 (N = 4,113 vs. 2,662; Doyle et al. 2005). Increases in effort and sampling efficiency may have attributed to the increase in total fish captured. However, 1 inch trammel nets, experimental gillnet, and otter trawl CPUE remained fairly constant for the sturgeon season and 1 inch trammel nets and otter trawls only decreased slightly during fish community season from 2004 (Figures 11-14). Gillnets continued to be the most effective gear since 2003, capturing approximately 8 fish per 100ft. of net.

A similar number of YOY shovelnose sturgeon were captured during the sturgeon season (N=25) as were captured during the fish community season (N=20; Table 17). Otter trawls were the most effective at capturing YOY shovelnose sturgeon during both seasons. The highest catch rate for otter trawls was in OSB CHNB habitat (CPUE = 1.4; ±2SE = 1.16) followed by SCCL CHNB habitat (CPUE = 1.37; ±2SE = 1.29; Appendix F4). Outside bends and secondary channels were underrepresented habitats in segment 13 suggesting that a stratified effort within these could increase the number of YOY shovelnose sturgeon captured each year. The majority of YOY shovelnose sturgeon were found in CHNB mesohabitat (87% of the catch relative to 65% of the total effort) despite efforts being expended in POOL (5% of the total effort) and

BARS mesohabitat (25% of the total effort; Table 18). The lack of small sturgeon found suggests few fish were in the system, more fish should have been available in the community season versus the sturgeon season and this was not the case. More trawling effort in CHNB mesohabitat within side channels, outside bend, and crossover macrohabitats would likely produce more YOY sturgeon. The vast majority of shovelnose sturgeon in segment 13 were captured during the sturgeon season with gillnets (67% of the total catch; N = 2,742; Tables 17-24). Gillnets were most effective at capturing shovelnose sturgeon greater than 250 mm with the highest catch rate in SCCL POOL habitat (CPUE = 15.5; ±2SE = 9.64) followed by ISB POOL (CPUE = 14.1; ±2SE = 5.38) and CHXO CHNB habitats (CPUE = 12.1; ±2SE = 6.32; Appendix F1). During sturgeon season, gillnet CPUE decreased from 2004 (mean CPUE = 8.32 versus 12.1) whereas otter trawl CPUE increased slightly (mean CPUE = 0.7 versus 1.0; Figure 11). One inch trammel net CPUE has increased slightly over the past three years for adult shovelnose sturgeon greater than 380 mm (2003 = 0.6; 2004 = 1.2; 2005 = 1.5; Figure 12). Two and a half inch trammel nets are a new standard gear with an average CPUE during sturgeon season of 0.5 shovelnose sturgeon per 100 m drifted. During fish community season, 1 inch trammel net and otter trawl CPUE has remained fairly constant over the past three years with CPUE for adult shovelnose sturgeon (> 380 mm) near 1 for otter trawls and near 2 for 1 inch trammel nets (mean 1 inch trammel net CPUE = 1.8; mean otter trawl CPUE = 0.5; Figure 14). To date, no shovelnose sturgeon have been captured in mini-fyke nets or bag seines in segment 13 (Figure 15).

The size structure illustrated in Table 25 is similar to the 2003 and 2004 sample years (Doyle and Starostka 2004; Doyle et al. 2005). There was a greater proportion of larger fish captured during the sturgeon season (RSD-P = 86 and RSD-M = 13) than in the fish community season (RSD-P = 71 and RSD-M = 11; 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. All gears combined, only 126 fish were captured in the sub-stock range in both seasons and only one fish was captured in the trophy range. The size distribution of shovelnose sturgeon in segment 13 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. In 2005, more YOY shovelnose sturgeon were captured during sturgeon season than in 2004 (Doyle et al.

2005; Figure 17). This may be an artifact of increased sampling effort in segment 13 since CPUE for YOY shovelnose sturgeon in otter trawls remained fairly constant since 2004 (CPUE = 0.06 versus 0.05; Figures 11 and 14). Young-of-year shovelnose sturgeon catch with otter trawls during fish community season has increased over the past three years (CPUE in 2003 = 0.06, 2004 = 0.1, 2005 = 0.13; Figure 14).

Segment 13 - Shovelnose Sturgeon / Sturgeon Season

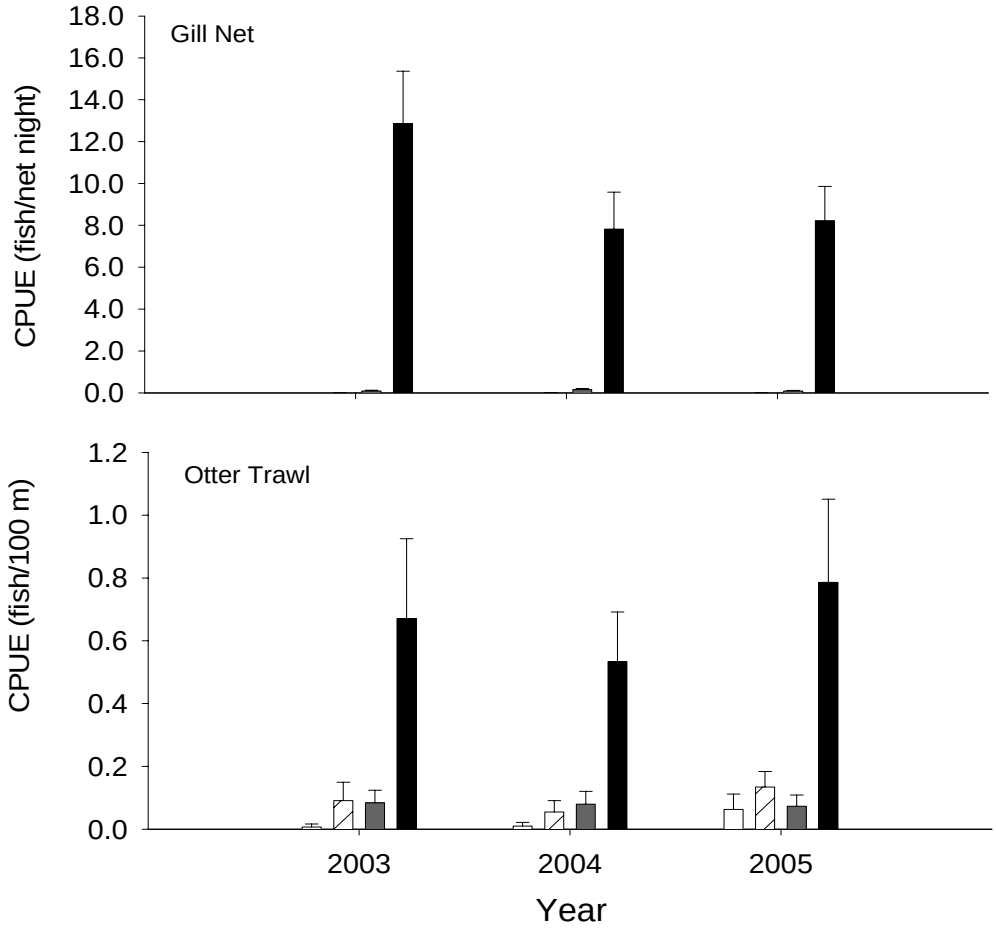

Figure 11. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using gill nets and otter trawls in segment 13 of the Missouri River during sturgeon season 2003 - 2005.

Segment 13 - Shovelnose Sturgeon / Sturgeon Season

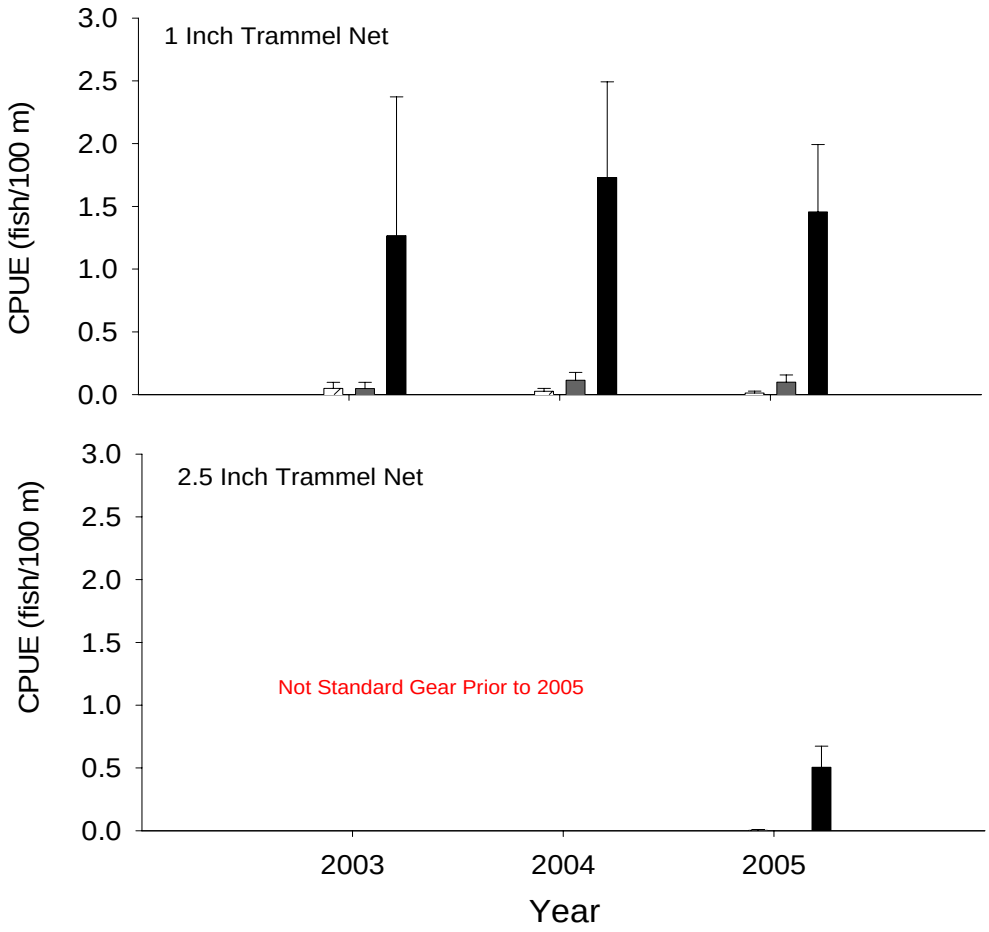

Figure 12. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using 1 and 2.5 inch trammel nets in segment 13 of the Missouri River during sturgeon season 2003 - 2005.

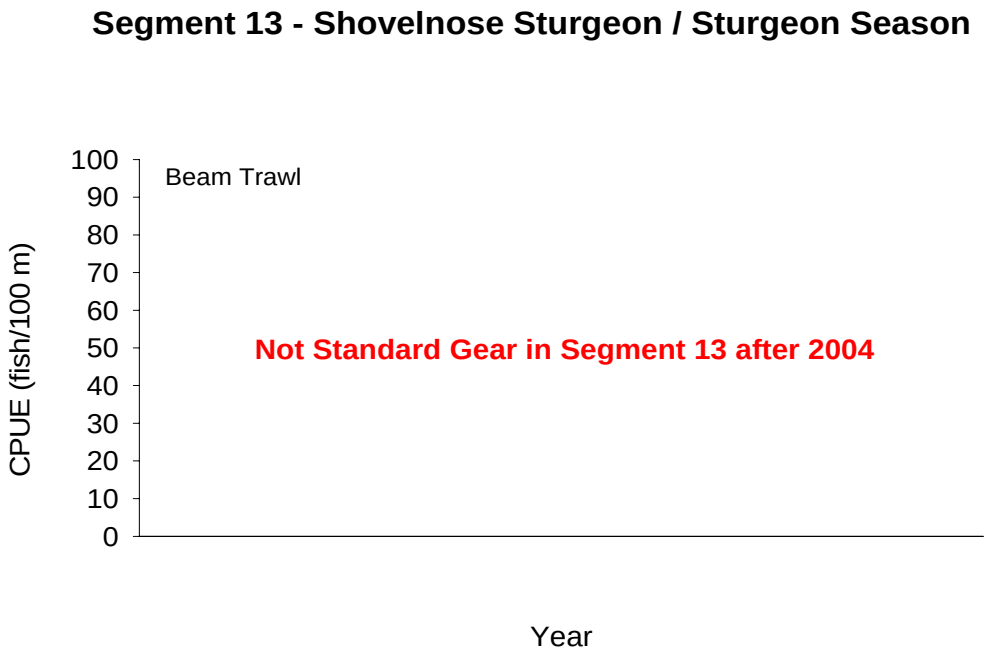

Figure 13. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using beam trawls in segment 13 of the Missouri River during sturgeon season 2003 - 2005.

Segment 13 - Shovelnose Sturgeon / Fish Community Season

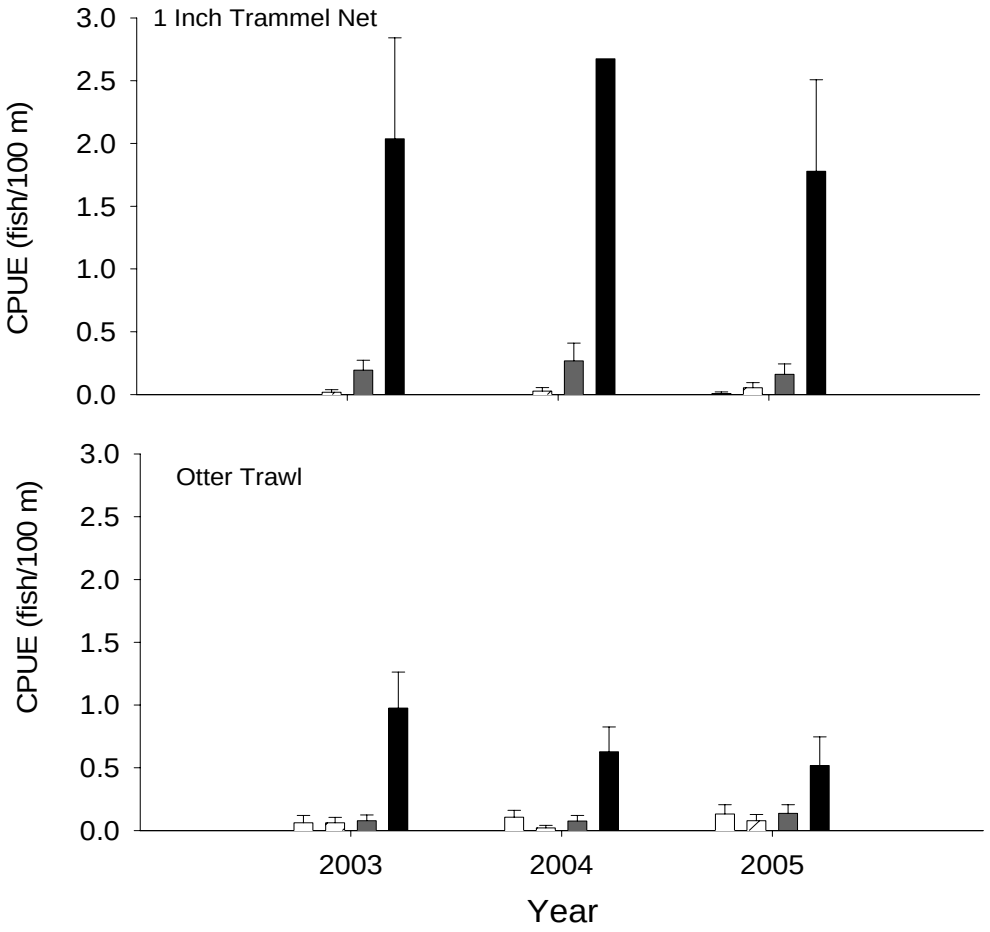

Figure 14. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using 1 inch trammel nets and otter trawls in segment 13 of the Missouri River during fish community season 2003 - 2005.

Segment 13 - Shovelnose Sturgeon / Fish Community Season

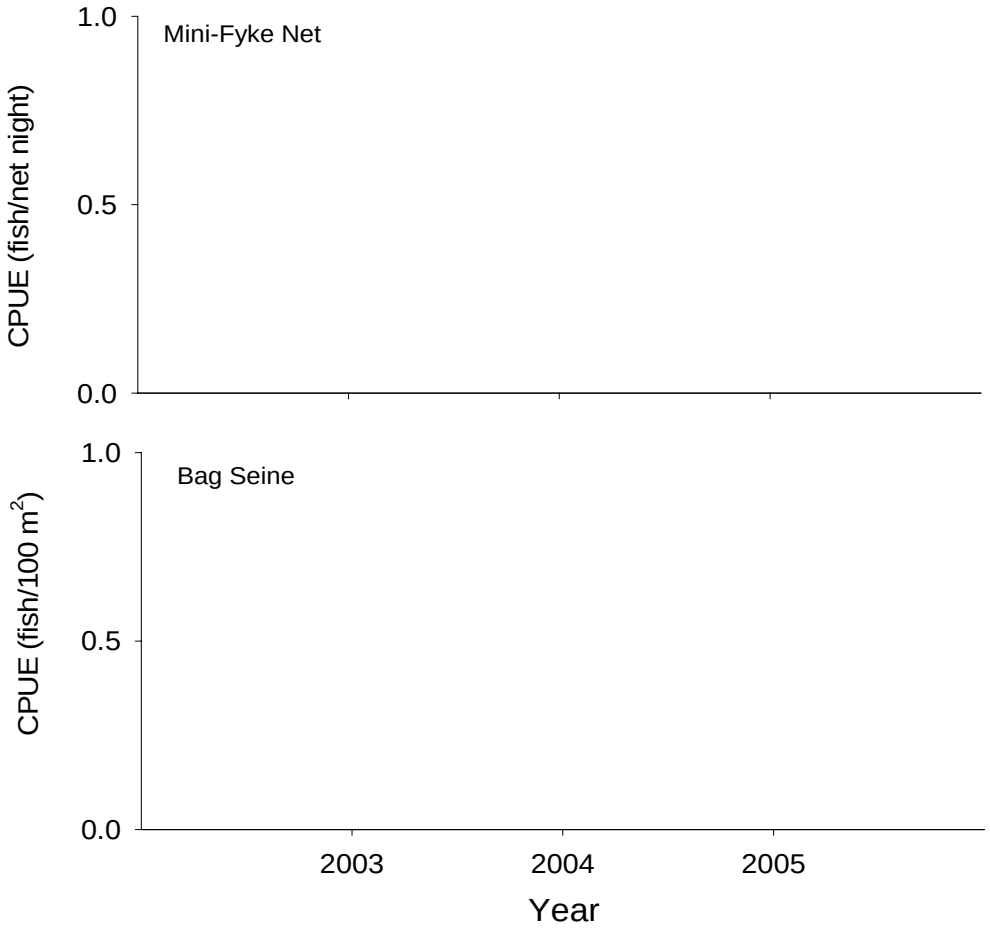

Figure 15. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using mini-fyke nets and bag seines in segment 13 of the Missouri River during fish community season 2003 - 2005.

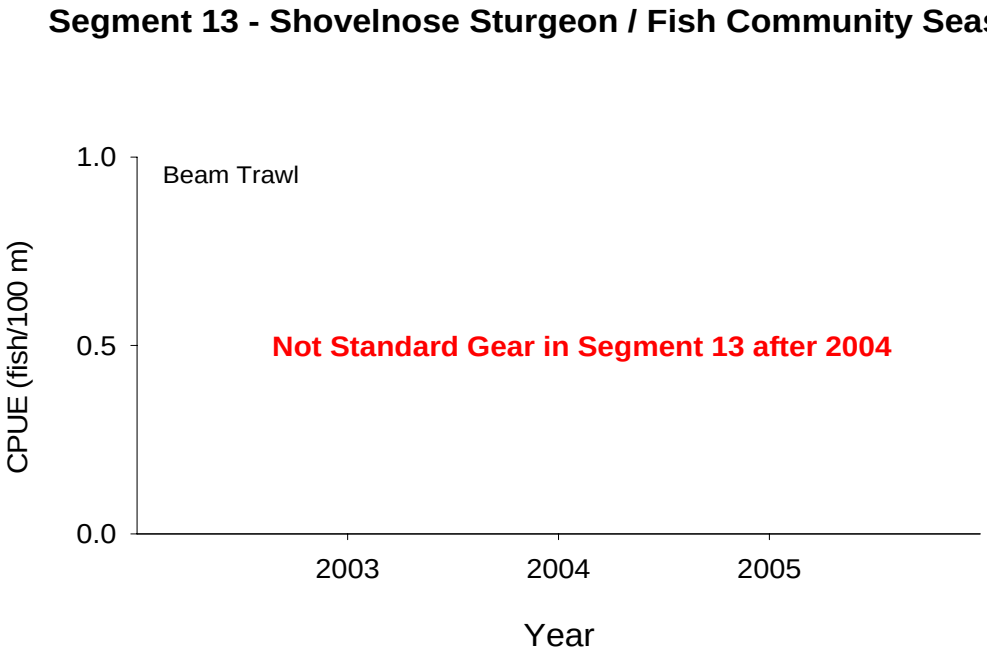

Figure 16. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using beam trawls in segment 13 of the Missouri River during fish community season 2003 - 2005.

Habitat Use

The majority of the sampling effort in segment 13 was expended in ISB macrohabitat (55% of the total effort) and CHNB mesohabitat (65% of the total effort), due to their proportionate availability. Of the 45 YOY shovelnose sturgeon (0-149 mm; 0.009% of the total catch) captured in segment 13, 67% (N = 30) were captured in ISB macrohabitat, with the majority occurring in CHNB mesohabitat (91%). Juvenile shovelnose sturgeon (150-249 mm) made up 0.02% of the total shovelnose catch (N = 81; Table 19). Similar to YOY shovelnose sturgeon, 68% (N = 55) of juveniles where captured in ISB macrohabitat, with the majority (94%; N = 76) occurring in CHNB mesohabitat (Tables 19-20). Stock size (250-379 mm) shovelnose sturgeon (0.03% of the total catch; N = 130) were captured in segment 13, with the majority (50%; N = 65) occurring in ISB for all gear types except for gillnets where a disproportionate number of stock size shovelnose sturgeon where captured in CHXO and SCCS macrohabitats (45% and 14% of total gillnet catch relative to 21% and 7% of the effort respectively; Table 21). The majority of stock size shovelnose sturgeon occurred in CHNB mesohabitat (78%; N = 101; Table 22). Quality and above size shovelnose sturgeon made up the bulk of the total catch (94%; N = 3,857), with most captured during the sturgeon season (90%; Table 23). Inside bend macrohabitat was the most preferred habitat for quality and above size shovelnose with 45% (N = 1,750) of the total catch occurring there followed by CHXO macrohabitat, which contained 26% (N = 1,015) of the total catch (Table 23). Large and small secondary connected channels (SCCL and SCCS) contained approximately 5% of the quality and above size shovelnose sturgeon (Table 23). Similar to the smaller shovelnose, the majority of quality and above shovelnose sturgeon (56% of the catch relative to 65% of the total effort) occurred in CHNB mesohabitat with POOL mesohabitat contributing to 34% (N = 1,302) of the total catch relative to 36% of the total effort, all of which were from winter gillnet sets (Table 24). It is important to note that over 32% of the entire shovelnose sturgeon catch during 2005 was a result of winter gillnet sets in POOL mesohabitat relative to only 5 % of the total effort expended (for all gears and habitats).

Sturgeon and fish community season sampling captured shovelnose sturgeon representing 5 cohorts (60 mm, 120 mm, 200 mm, 260 mm, 420 mm, and 600 mm; Figure 17). A higher proportion of quality and memorable sized fish were captured in the shovelnose population

during both the sturgeon season (RSD-Q = 98, RSD-P = 86) than the fish community season (RSD-Q =89, RSD-P = 71; Table 25). Few sub-stock shovelnose sturgeon were captured in either season (N=84 sturgeon; N = 42 community) and only one trophy shovelnose sturgeon was captured (Table 25).

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 (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

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	16	1	N-E	N-E	62	0	11	10	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	16	3	N-E	N-E	68	0	8	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	21	2	N-E	N-E	38	24	8	7	0	0	1	0	0
Otter Trawl	25	N-E	16	0	N-E	N-E	68	0	4	12	0	0	0	0	0
		N-E	10	1	N-E	N-E	65	5	12	8	0	0	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	2	N-E	50	0	N-E	N-E	50	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	69	0	3	2	0	0	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	49	4	0	23	6	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	17	0	N-E	N-E	29	14	0	24	0	13	0	3	0
Otter Trawl	18	N-E	28	0	N-E	N-E	67	0	6	0	0	0	0	0	0
		N-E	21	0	N-E	N-E	60	1	7	2	0	10	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

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 (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	89	N-E	10	0	1
2.5 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	95	N-E	5	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	50	N-E	9	36	1
Otter Trawl	25	0	88	N-E	12	0	0
		0	91	N-E	8	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	2	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Otter Trawl	18	0	94	N-E	6	0	0
		0	96	N-E	4	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

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 (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	4	N-E	0	0	N-E	N-E	0	0	100	0	0	0	0	0	0
		N-E	16	1	N-E	N-E	62	0	11	10	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	16	3	N-E	N-E	68	0	8	4	0	0	0	0	0
Gill Net	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	21	2	N-E	N-E	38	24	8	7	0	0	1	0	0
Otter	53	N-E	8	0	N-E	N-E	68	4	13	8	0	0	0	0	0
		N-E	10	1	N-E	N-E	65	5	12	8	0	0	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	8	N-E	38	0	N-E	N-E	63	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	69	0	3	2	0	0	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	49	4	0	23	6	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	17	0	N-E	N-E	29	14	0	24	0	13	0	3	0
Otter Trawl	14	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	21	0	N-E	N-E	60	1	7	2	0	10	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

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 (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	4	0	75	N-E	0	0	25
		0	89	N-E	10	0	1
2.5 Inch Trammel Net	1	0	100	N-E	0	0	0
		0	95	N-E	5	0	0
Gill Net	1	0	100	N-E	0	0	0
		0	50	N-E	9	36	1
Otter Trawl	53	0	92	N-E	8	0	0
		0	91	N-E	8	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	8	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Otter Trawl	14	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

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 (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

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	26	N-E	12	0	N-E	N-E	38	0	42	8	0	0	0	0	0
		N-E	16	1	N-E	N-E	62	0	11	10	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	16	3	N-E	N-E	68	0	8	4	0	0	0	0	0
Gill Net	29	N-E	45	0	N-E	N-E	34	7	0	14	0	0	0	0	0
		N-E	21	2	N-E	N-E	38	24	8	7	0	0	1	0	0
Otter Trawl	31	N-E	6	0	N-E	N-E	32	16	32	13	0	0	0	0	0
		N-E	10	1	N-E	N-E	65	5	12	8	0	0	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	23	N-E	17	0	N-E	N-E	74	0	0	9	0	0	0	0	0
		N-E	26	0	N-E	N-E	69	0	3	2	0	0	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	49	4	0	23	6	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	17	0	N-E	N-E	29	14	0	24	0	13	0	3	0
Otter Trawl	21	N-E	14	0	N-E	N-E	86	0	0	0	0	0	0	0	0
		N-E	21	0	N-E	N-E	60	1	7	2	0	10	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

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 (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If numbers on the second line do not add to 100 then some mesohabitats were not recorded in the field. The beam trawl is not standard gear in segment 13.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	26	0	81	N-E	8	0	12
		0	89	N-E	10	0	1
2.5 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	95	N-E	5	0	0
Gill Net	29	0	48	N-E	10	38	3
		0	50	N-E	9	36	1
Otter Trawl	31	0	77	N-E	16	0	0
		0	91	N-E	8	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	23	0	91	N-E	9	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Otter Trawl	21	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

Table 23. Total number of quality and above size (>380 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

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	350	N-E	9	5	N-E	N-E	72	0	12	2	0	0	0	0	0
		N-E	16	1	N-E	N-E	62	0	11	10	0	0	0	0	0
2.5 Inch Trammel Net	159	N-E	14	1	N-E	N-E	74	0	7	4	0	0	0	0	0
		N-E	16	3	N-E	N-E	68	0	8	4	0	0	0	0	0
Gill Net	2713	N-E	30	0	N-E	N-E	37	18	5	10	0	0	0	0	0
		N-E	21	2	N-E	N-E	38	24	8	7	0	0	1	0	0
Otter Trawl	280	N-E	12	1	N-E	N-E	58	11	16	3	0	0	0	0	0
		N-E	10	1	N-E	N-E	65	5	12	8	0	0	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	270	N-E	33	0	N-E	N-E	61	0	5	1	0	0	0	0	0
		N-E	26	0	N-E	N-E	69	0	3	2	0	0	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	49	4	0	23	6	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	17	0	N-E	N-E	29	14	0	24	0	13	0	3	0
Otter Trawl	85	N-E	28	0	N-E	N-E	59	7	4	2	0	0	0	0	0
		N-E	21	0	N-E	N-E	60	1	7	2	0	10	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 24. Total number of quality and above size (>380 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If numbers on the second line do not add to 100 then some Mesohabitats were not recorded in the field. The beam trawl is not standard gear in segment 13.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	350	0	95	N-E	2	0	2
		0	89	N-E	10	0	1
2.5 Inch Trammel Net	159	0	96	N-E	4	0	0
		0	95	N-E	5	0	0
Gill Net	2713	0	40	N-E	8	48	2
		0	50	N-E	9	36	1
Otter Trawl	280	0	89	N-E	6	0	0
		0	91	N-E	8	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	270	0	97	N-E	3	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Otter Trawl	85	0	98	N-E	2	0	0
		0	96	N-E	4	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

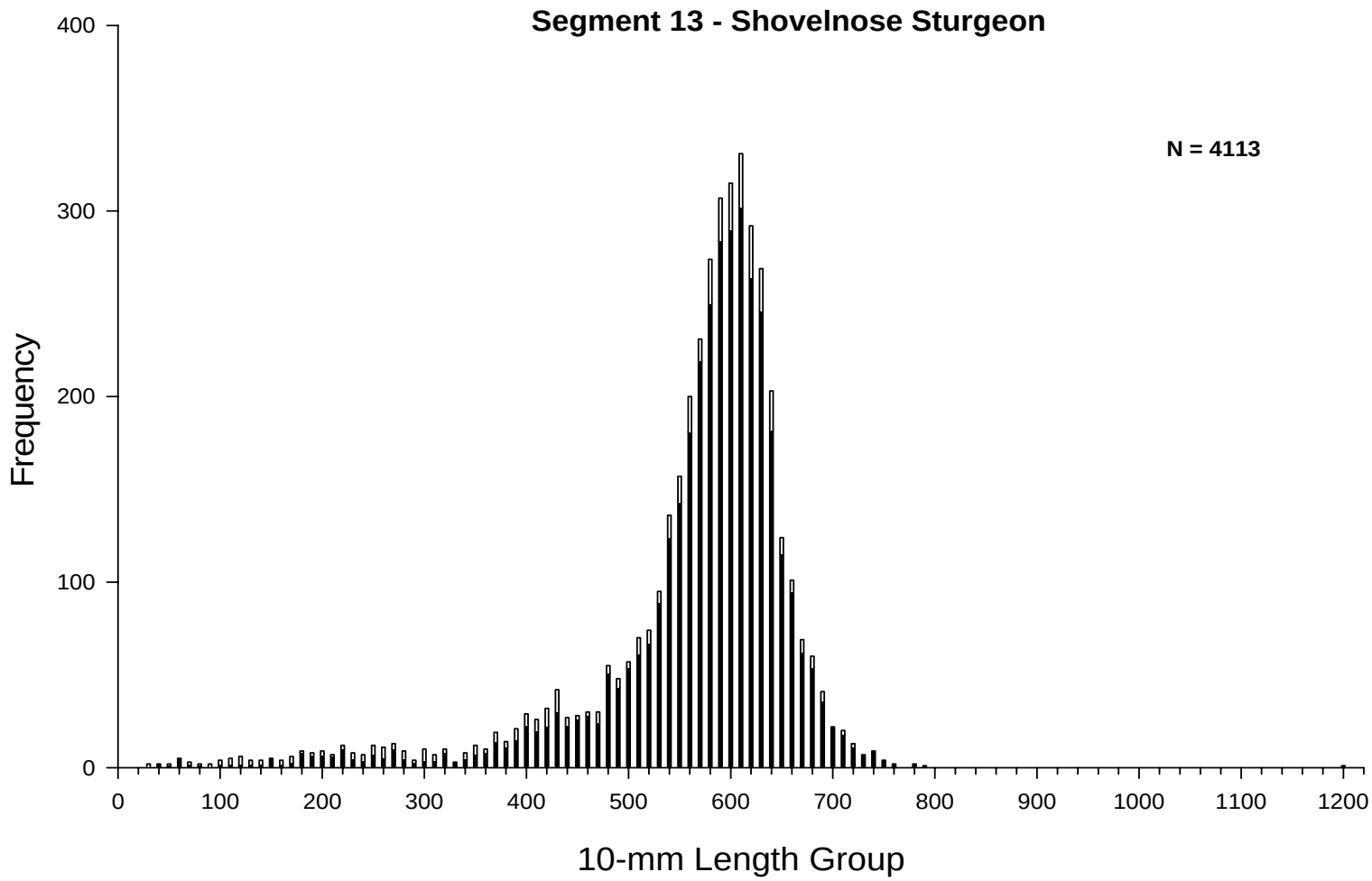

Figure 17. Length frequency of shovelnose sturgeon from fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during 2004 - 2005.

Table 25. Relative stock density (RSD)[a] by a length category for shovelnose sturgeon in segment 13 of the Missouri River captured during 2005. Length categories[b] determined using methods proposed by Quist (1998). Relative stock density calculated using the traditional method.

Length category	N	RSD
Sturgeon Season		
Sub-stock (0-149 mm)	25	
Sub-stock (150-249 mm)	59	
Stock	3588	
Quality	3502	98
Preferred	3093	86
Memorable	466	13
Trophy	1	0
Fish Community Season		
Sub-stock (0-149 mm)	20	
Sub-stock (150-249 mm)	22	
Stock	399	
Quality	355	89
Preferred	283	71
Memorable	43	11
Trophy	0	0

[a] RSD = number of fish of a specified length ÷ number minimum stock length fish x 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

A total of 41 sturgeon chubs were captured in segment 13, compared to 24 in 2004 (Doyle et al. 2005). Otter trawls were the only gear to capture sturgeon chubs during sturgeon season with 17 captured (CPUE = 0.038; ±2SE = 0.02) and 21 during fish community season (CPUE = 0.122; ±2SE = 0.075; Figures 18-19). During fish community season, three sturgeon chubs were also collected using bag seines (CPUE = 0.043; ±2SE = 0.063; Figure 20). Otter trawl CPUE increased slightly from 2004 for both sturgeon (CPUE = 0.0303 in 2004 versus 0.038 in 2005) and fish community seasons (CPUE = 0.0713 in 2004 versus 0.122 in 2005; Figures 18-19). During the sturgeon season, the majority of sturgeon chubs were captured in ISB macrohabitat (76% of the total catch relative to 65% of the effort) and CHNB mesohabitat (82% of the total catch relative to 91% of the effort). During fish community season, 87.5% (N = 21) of sturgeon chubs were captured in otter trawls, while bag seines captured 12.5% (N = 3) of the sturgeon chubs for the season. The catch in community season was in similar habitats as sturgeon season with 87.5% of sturgeon chubs occurring in ISB macrohabitat (relative to 60% of the total effort) and 87.5% occurring in CHNB mesohabitat relative to a total effort of 96% (Tables 26-27).

There were too few sturgeon chubs (N < 50) captured in segment 14 during the 2005 sample season to summarize year to year trends and population structure.

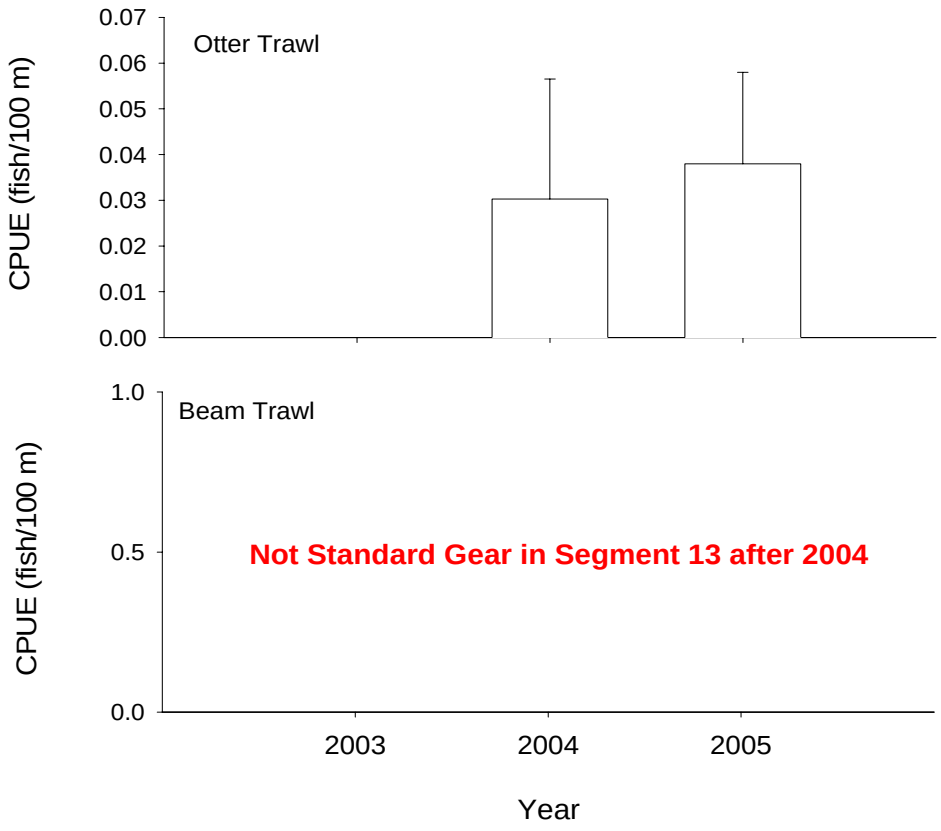

Figure 18. Mean annual catch-per-unit-effort (+/- 2SE) of sturgeon chub using otter trawls and beam trawls in segment 13 of the Missouri River during sturgeon season 2003-2005.

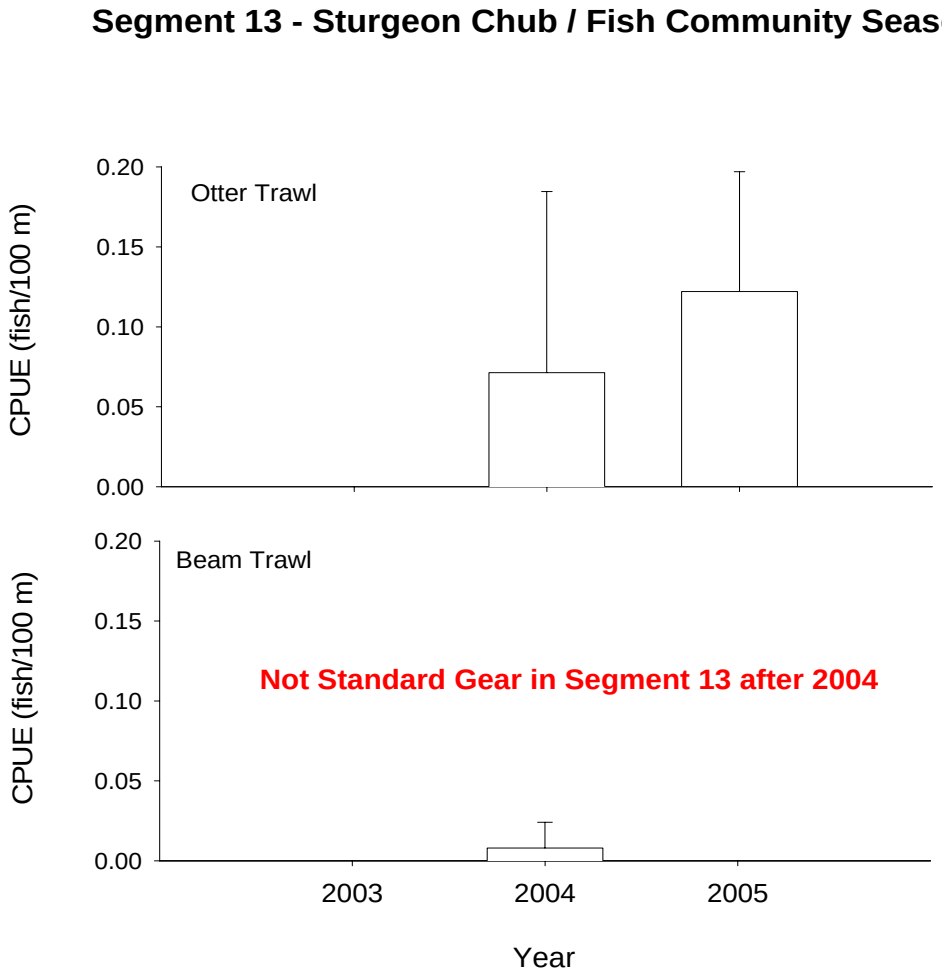

Figure 19. Mean annual catch-per-unit-effort (+/- 2SE) of sturgeon chub using otter trawls and beam trawls in segment 13 of the Missouri River during fish community season 2003-2005.

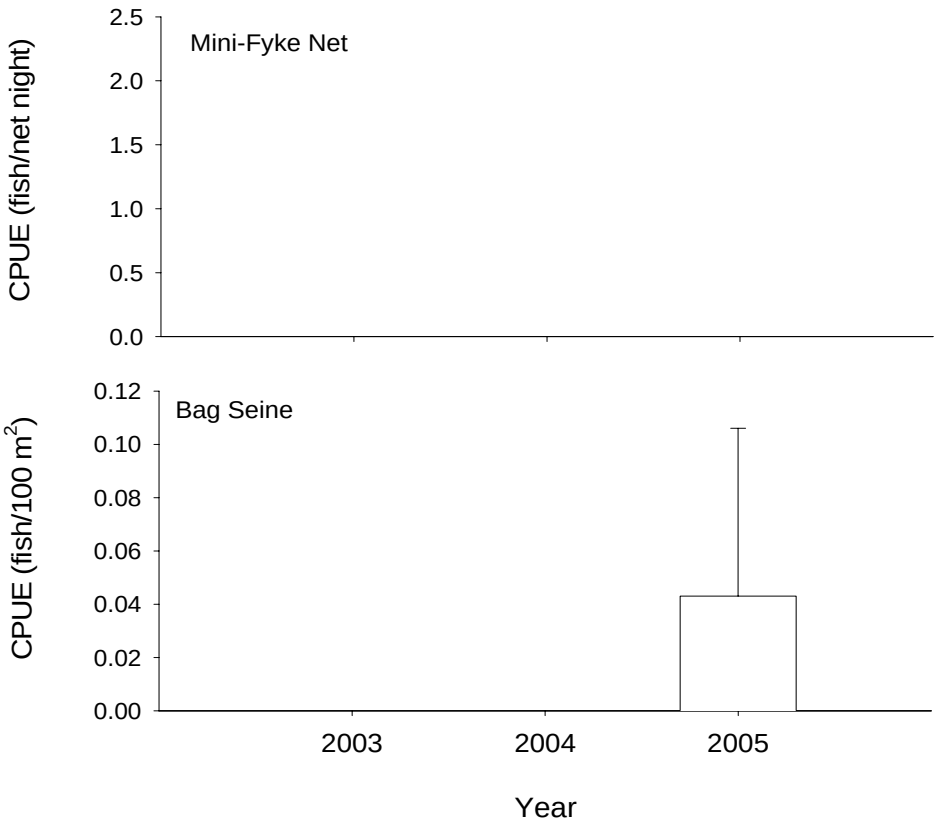

Figure 20. Mean annual catch-per-unit-effort (+/- 2SE) of sturgeon chub using mini-fyke nets and bag seines in segment 13of the Missouri River during fish community season 2003-2005.

Table 26. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each macrohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

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	16	1	N-E	N-E	62	0	11	10	0	0	0	0	0
2.5 Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	16	3	N-E	N-E	68	0	8	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	21	2	N-E	N-E	38	24	8	7	0	0	1	0	0
Otter Tawl	17	N-E	6	0	N-E	N-E	76	0	0	18	0	0	0	0	0
		N-E	10	1	N-E	N-E	65	5	12	8	0	0	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
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	26	0	N-E	N-E	69	0	3	2	0	0	0	0	0
Bag Seine	3	N-E	100	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	49	4	0	23	6	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	17	0	N-E	N-E	29	14	0	24	0	13	0	3	0
Otter Tawl	21	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	21	0	N-E	N-E	60	1	7	2	0	10	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 27. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each mesohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	89	N-E	10	0	1
2.5 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	95	N-E	5	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	50	N-E	9	36	1
Otter Trawl	17	0	82	N-E	18	0	0
		0	91	N-E	8	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	3	100	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Otter Trawl	21	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

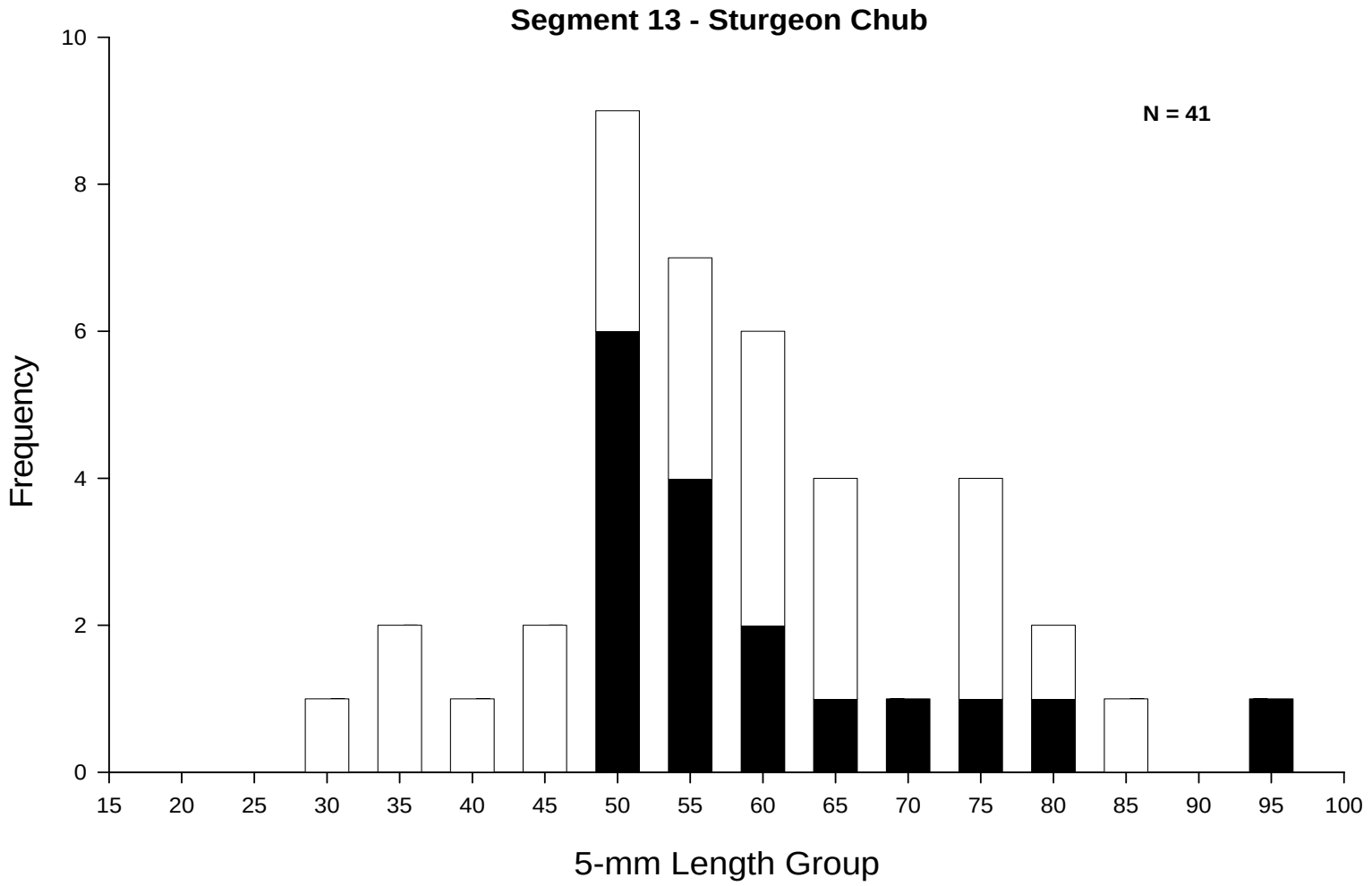

Figure 21. Length frequency of sturgeon chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during 2004 - 2005.

Sicklefin Chub

A total of 796 sicklefin chubs were captured in segment 13, which was similar to the total captured in 2004 (N = 780; Doyle et al. 2005). Otter trawls were the most effect gear at capturing sicklefin chubs (making up 98% of the total catch) with mini-fyke nets and bag seines only making up 2% of the total catch. More sicklefin chubs were captured during sturgeon season (62%; N = 490) than fish community season (N = 306; Table 28). Catch-per-unit-effort with otter trawls during fish community season (CPUE = 1.835; ±2SE = 1.138) was higher than it was for sturgeon season (CPUE of 1.089; ±2SE = 0.399). Otter trawl CPUE increased a great deal from 2004 for sturgeon season (CPUE = 0.2437 in 2004 versus 1.089 in 2005) and for fish community season (CPUE = 0.9043 in 2004 versus 1.835 in 2005; Figures 22-23). Mini-fyke CPUE decreased the most from 2004 with mini-fyke catch rates going from 1.6104 sicklefin chubs per net night to 0.175 per net night. Bag seines did not catch any sicklefin chubs in 2004, but had a CPUE of 0.047 sicklefin chubs per 100 m^2 (Figure 24). For the sturgeon season, the majority of sicklefin chubs were captured in ISB Macrohabitat (74% of the total catch relative to 65% of the effort) and CHNB Mesohabitat (88% of the total catch relative to 91% of the effort). For fish community season, the catch was in similar habitats with 40% of sicklefin chubs occurring in ISB Macrohabitat (relative to 60% of the total effort) and 99% occurring in CHNB Mesohabitat relative to a total effort of 96% (Tables 26-27).

Similar to data reported by Doyle et al. (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, 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. Similar to 2004, there was a strong presence of YOY sicklefin chubs in the fish community season samples during 2005, indicating a successful spawn (Figure 25).

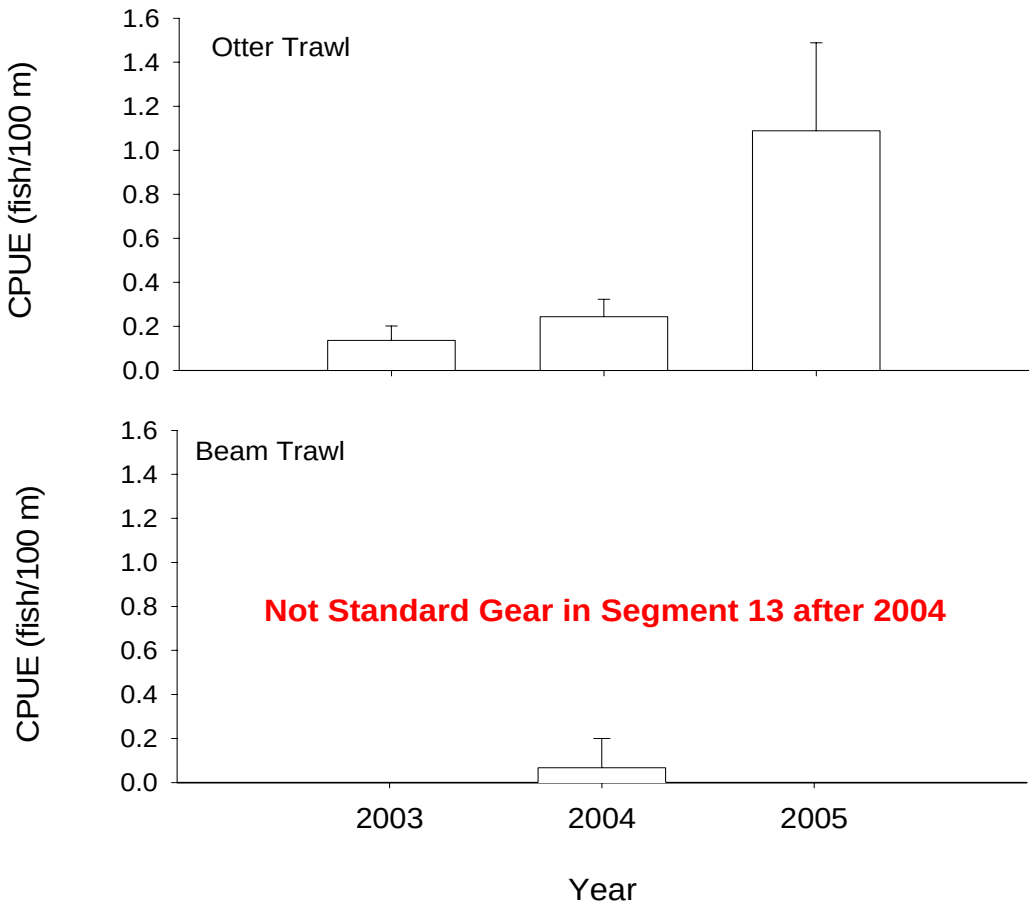

Figure 22. Mean annual catch-per-unit-effort (+/- 2SE) of sicklefin chub in segment 13 of the Missouri River during sturgeon season 2003-2005.

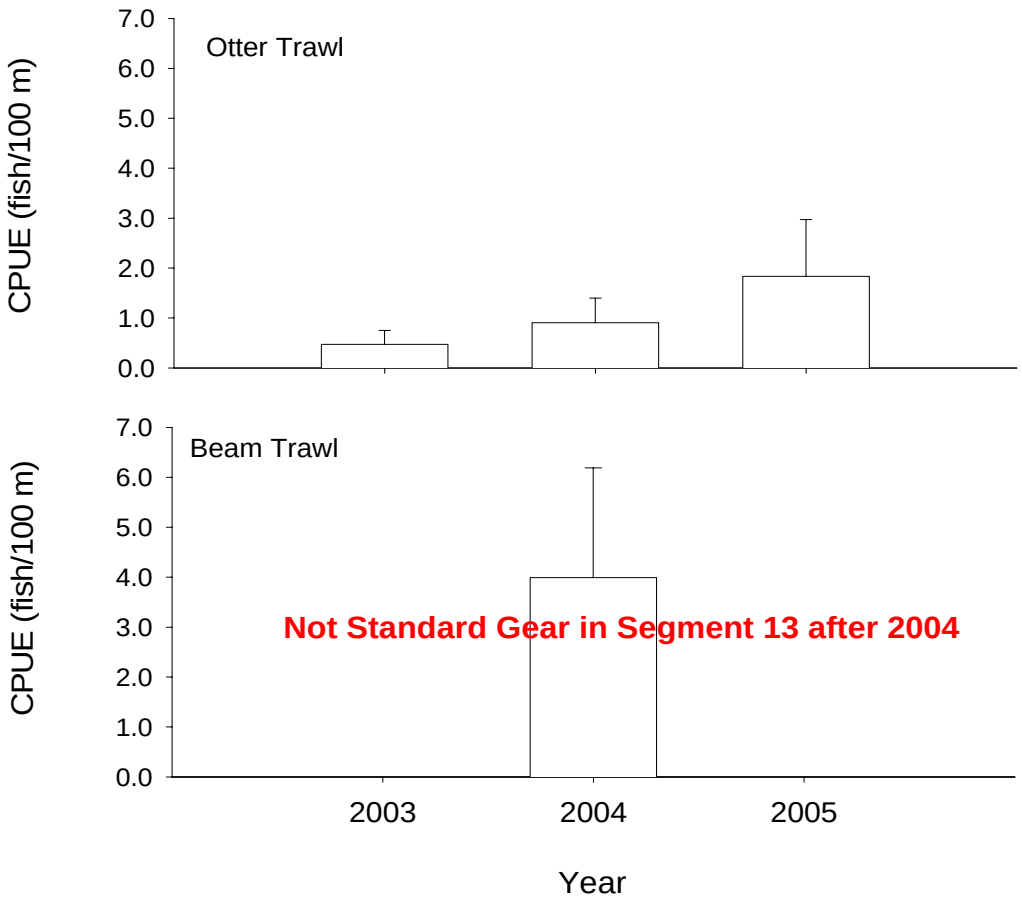

Figure 23. Mean annual catch-per-unit-effort (+/- 2SE) of sicklefin chub in segment 13 of the Missouri River during fish community season 2003-2005.

Segment 13 - Sicklefin Chub / Fish Community Season

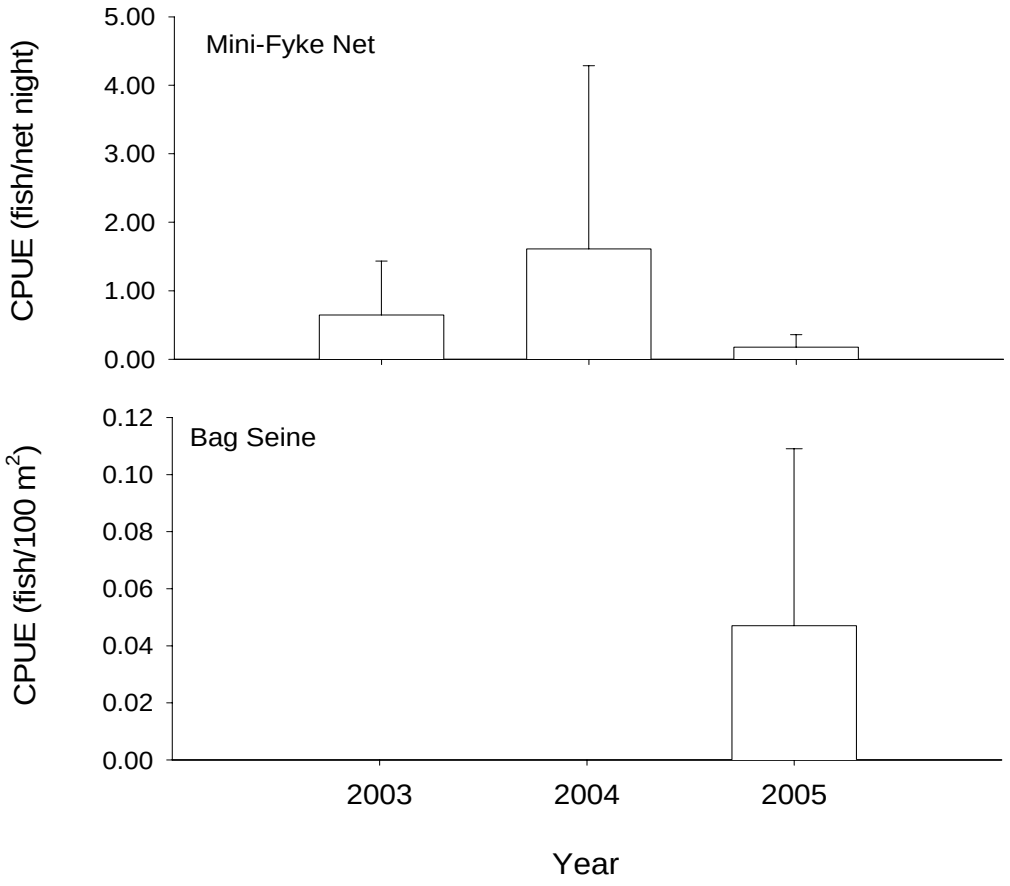

Figure 24. Mean annual catch-per-unit-effort (+/- 2SE) of sicklefin chub in segment 13 of the Missouri River during fish community season 2003-2005.

Table 28. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each macrohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

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	16	1	N-E	N-E	62	0	11	10	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	16	3	N-E	N-E	68	0	8	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	21	2	N-E	N-E	38	24	8	7	0	0	1	0	0
Otter Trawl	490	N-E	4	1	N-E	N-E	74	1	7	12	0	0	0	0	0
		N-E	10	1	N-E	N-E	65	5	12	8	0	0	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
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	26	0	N-E	N-E	69	0	3	2	0	0	0	0	0
Bag Seine	4	N-E	0	0	N-E	N-E	50	0	0	50	0	0	0	0	0
		N-E	17	0	N-E	N-E	49	4	0	23	6	0	0	0	0
Mini-Fyke Net	11	N-E	0	0	N-E	N-E	55	9	0	36	0	0	0	0	0
		N-E	17	0	N-E	N-E	29	14	0	24	0	13	0	3	0
Otter Trawl	291	N-E	19	0	N-E	N-E	40	1	1	1	0	38	0	0	0
		N-E	21	0	N-E	N-E	60	1	7	2	0	10	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 29. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each mesohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If numbers on the second line do not add to 100 then some mesohabitats were not recorded in the field. The beam trawl is not standard gear in segment 13.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	89	N-E	10	0	1
2.5 Trammel Net	0	0	0	N-E	0	0	0
		0	95	N-E	5	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	50	N-E	9	36	1
Otter Trawl	490	0	88	N-E	11	0	0
		0	91	N-E	8	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	4	100	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	11	100	0	N-E	0	0	0
		100	0	N-E	0	0	0
Otter Trawl	291	0	99	N-E	1	0	0
		0	96	N-E	4	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

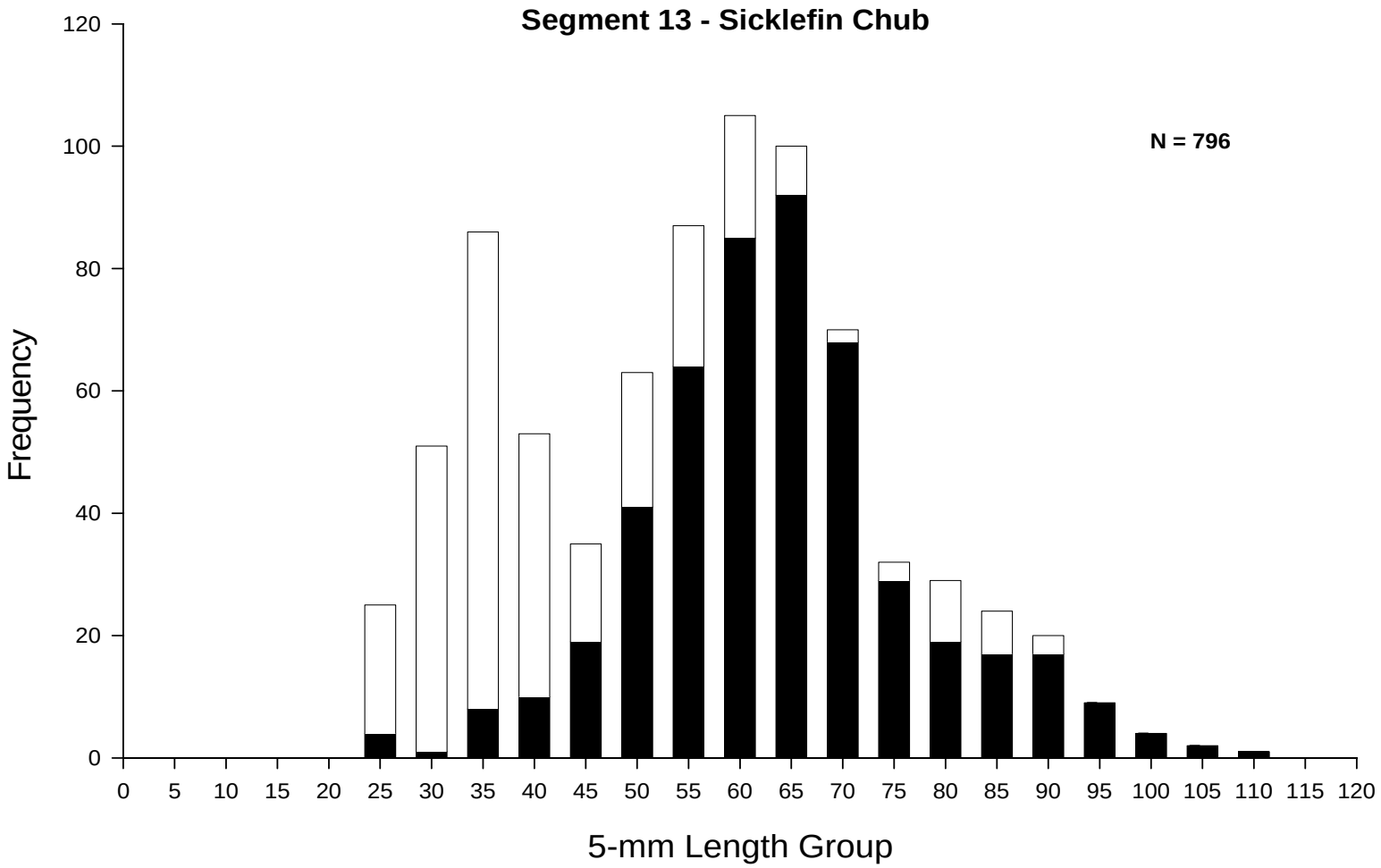

Figure 25. Length frequency of sicklefin chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during 2004 - 2005.

Speckled Chub

A total of 536 speckled chubs were captured in segment 13, more than were captured in 2004 (N = 374; Doyle et al. 2005). The majority of speckled chubs were captured during the fish community season (57%; N = 308) versus the sturgeon season (N = 228; Table 30). Otter trawls were the most effective gear at capturing speckled chubs for sturgeon and fish community seasons combined (making up 65% of the total catch) with mini-fyke nets and bag seines making up 23% and 12% of the total catch, respectively. Otter trawls and mini-fyke nets yielded equal numbers during fish community season (making up 79% of the total catch combined) with bag seines only making up 21% of the total catch for the season. Since mini-fyke nets and bag seines were only used during fish community season, otter trawls were the only gear that captured speckled chubs during sturgeon season with a CPUE of 0.65 (±2SE = 0.2). Catch-per-unit-effort with otter trawls during fish community season was higher than for sturgeon season (CPUE = 0.827; ±2SE = 0.483). Otter trawl CPUE decreased slightly from 2004 for sturgeon season (CPUE = 0.95 in 2004 versus 0.65 in 2005) but greatly increased for fish community season (CPUE = 0.21 in 2004 versus 0.827 in 2005; Figures 26-27). Mini-fyke CPUE has declined dramatically since 2004, but remains higher than in 2003 (2003 = 0.24; 2004 = 5.89; 2005 = 1.94; Figure 28). Bag seine CPUE increased from 0.36 speckled chubs per 100 m^2 in 2004 to 0.56 per 100 m^2 in 2005 (Figure 28). For sturgeon season, the majority of speckled chubs were captured in ISB Macrohabitat (46% of the total catch relative to 65% of the effort) and CHNB Mesohabitat (87% of the total catch relative to 91% of the effort). For fish community season, most speckled chubs were distributed between ISB, CHXO, SCCS Macrohabitat. During fish community season, otter trawls captured most speckled chubs in CHNB Mesohabitat, 88%, relative to all the effort (96% of the total effort), while all speckled chubs captured with bag seines and mini-fykes were sampled on BARS Mesohabitat(100% of the total catch relative to 100% of the total effort) (Table 31). It is important to note that a disproportionate number of speckled chubs were captured with bag seines in ISB Macrohabitat (91% of the total catch relative to only 49% of the total effort) and mini-fykes in CHXO Macrohabitat (34% of the total catch relative to only 17% of the total effort) (Table 30). Though only 24% of the effort was expended by otter trawls in SCCS BARS habitat, 41% of speckled chubs were captured there with a CPUE of 3.333 (±2SE =3.702; Tables 30-31).

Similar to other chub species, more large individuals were captured earlier in the sample year (i.e. during sturgeon season), whereas, smaller (YOY) speckled chubs were captured during fish community season (Figure 29). Pflieger (1997) noted that speckled chubs begin to spawn in early May and continue through the summer. Correspondingly, adult speckled chubs have been found to be full of eggs in the spring (Jennifer Johnson, 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. Of the speckled chubs captured during the 2005 sample season, it appears that the 2004 year class was captured during sturgeon season while they where actively spawning and slowly began to die off; as a result, we started capturing YOY speckled chubs toward the end of summer (Figure 29).

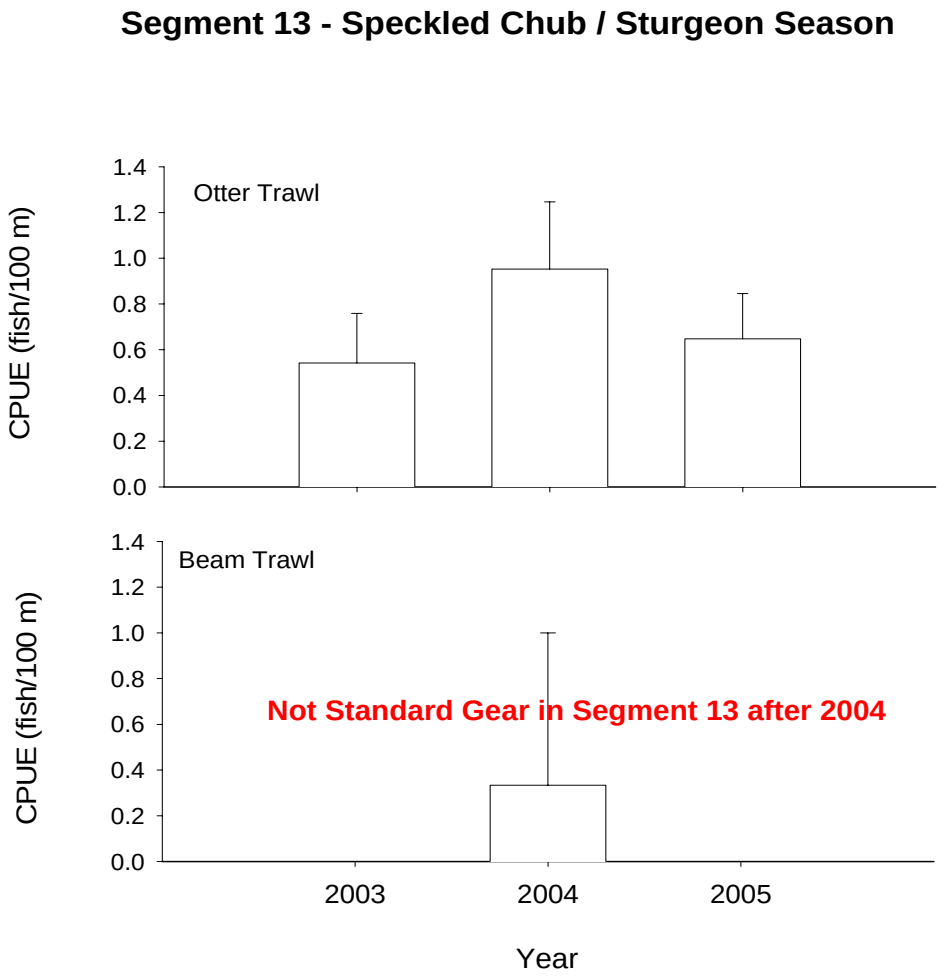

Figure 26. Mean annual catch-per-unit-effort (+/- 2SE) of speckled chub in segment 13 of the Missouri River during sturgeon season 2003-2005.

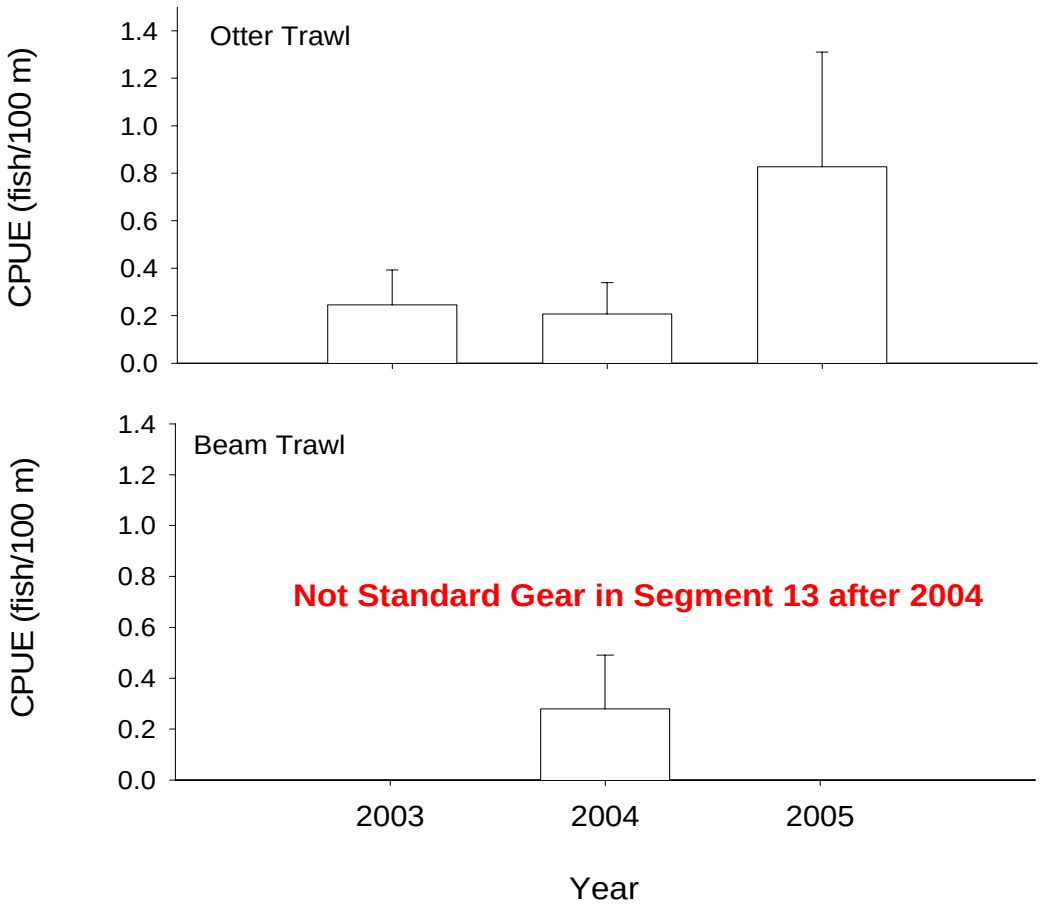

Figure 27. Mean annual catch-per-unit-effort (+/- 2SE) of speckled chub in segment 13 of the Missouri River during fish community season 2003-2005.

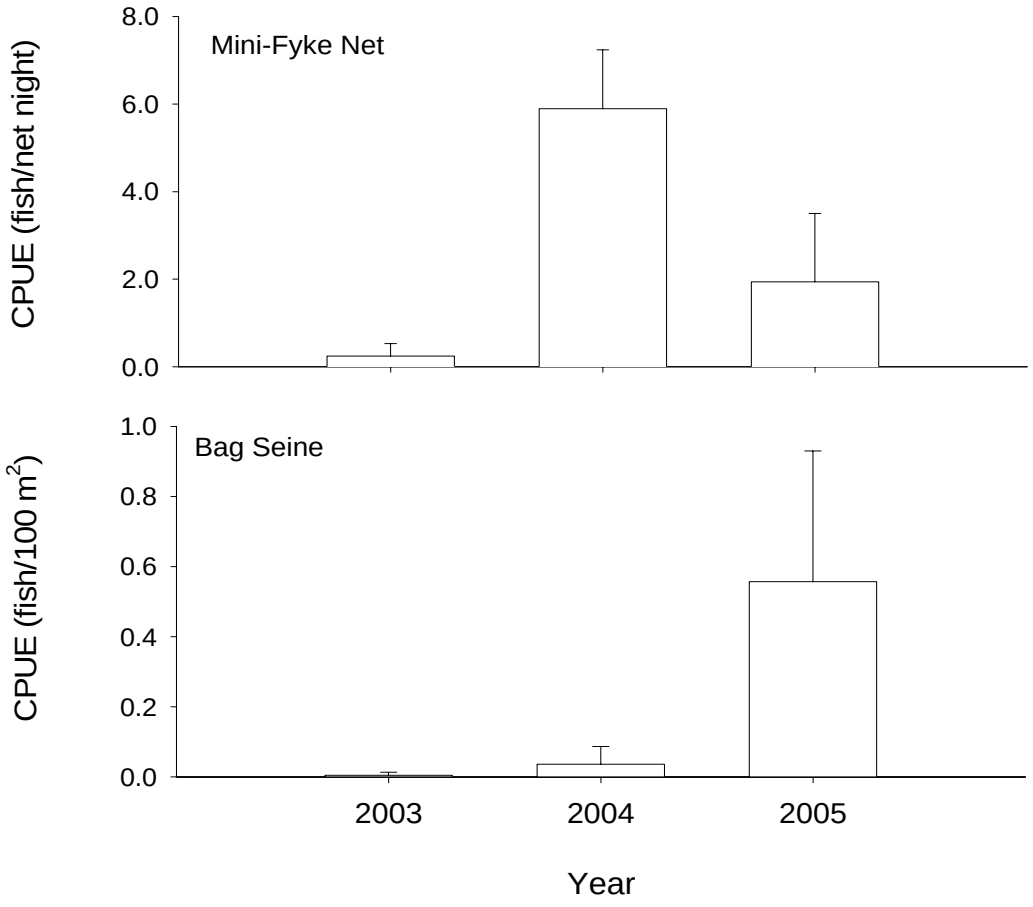

Figure 28. Mean annual catch-per-unit-effort (+/- 2SE) of speckled chub in segment 13 of the Missouri River during fish community season 2003-2005.

Table 30. Total number of speckled chubs captured for each gear during each season and the proportion caught within each macrohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

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	16	1	N-E	N-E	62	0	11	10	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	16	3	N-E	N-E	68	0	8	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	21	2	N-E	N-E	38	24	8	7	0	0	1	0	0
Otter Trawl	228	N-E	13	0	N-E	N-E	46	13	15	12	0	0	0	0	0
		N-E	10	1	N-E	N-E	65	5	12	8	0	0	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
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	26	0	N-E	N-E	69	0	3	2	0	0	0	0	0
Bag Seine	64	N-E	0	0	N-E	N-E	91	0	0	5	5	0	0	0	0
		N-E	17	0	N-E	N-E	49	4	0	23	6	0	0	0	0
Mini-Fyke Net	122	N-E	34	0	N-E	N-E	25	0	0	41	0	0	0	0	0
		N-E	17	0	N-E	N-E	29	14	0	24	0	13	0	3	0
Otter Trawl	122	N-E	19	0	N-E	N-E	68	0	0	12	0	1	0	0	0
		N-E	21	0	N-E	N-E	60	1	7	2	0	10	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 31. Total number of speckled chubs captured for each gear during each season and the proportion caught within each mesohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	89	N-E	10	0	1
2.5 Trammel Net	0	0	0	N-E	0	0	0
		0	95	N-E	5	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	50	N-E	9	36	1
Otter Trawl	228	0	87	N-E	13	0	0
		0	91	N-E	8	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	64	100	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	122	100	0	N-E	0	0	0
		100	0	N-E	0	0	0
Otter Trawl	122	0	88	N-E	12	0	0
		0	96	N-E	4	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

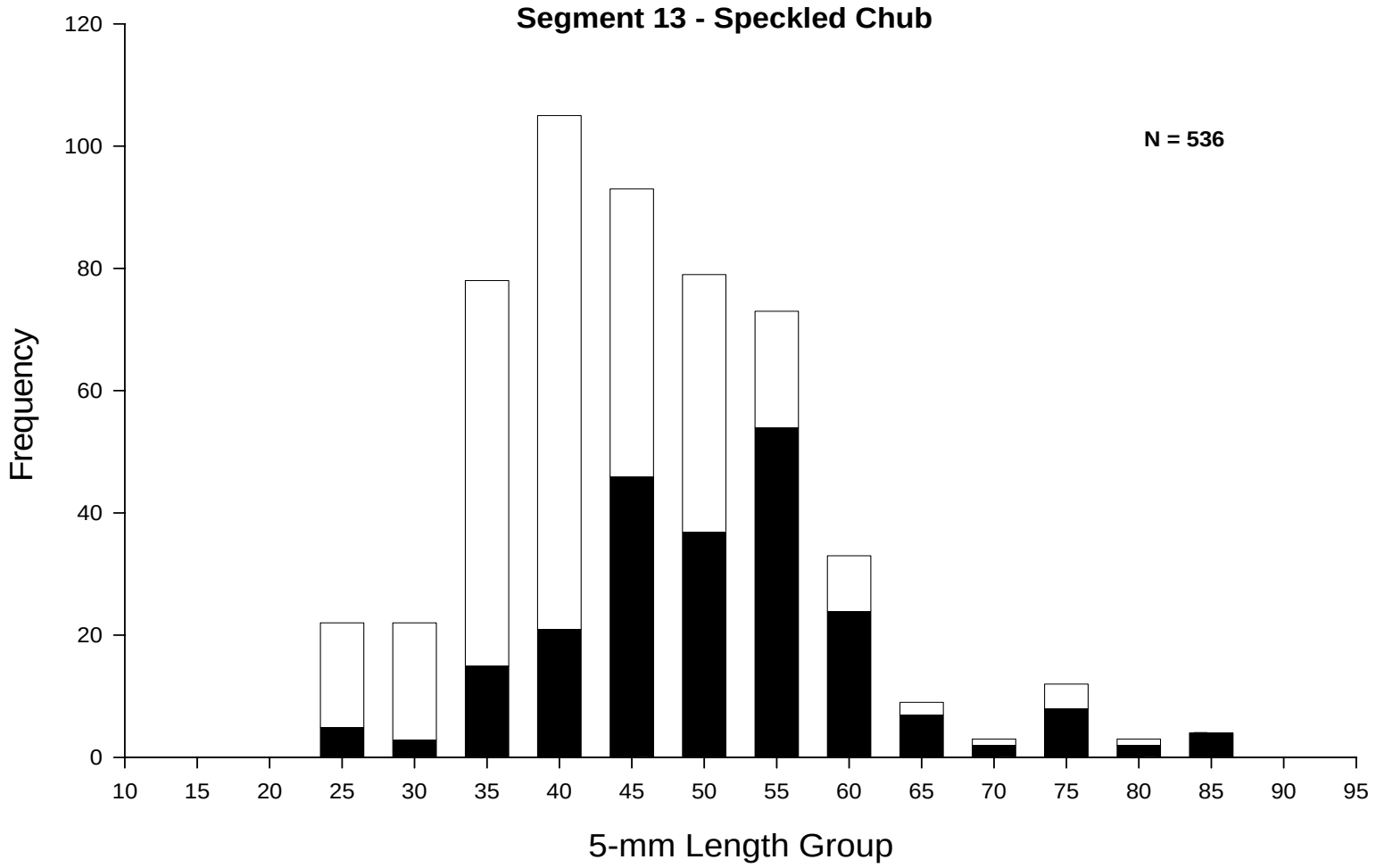

Figure 29. Length frequency of speckled chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during 2004 - 2005.

Sand Shiner

A total of 5 sand shiners were captured in segment 13, which was less than were captured in 2004 (N = 28; Doyle et al. 2005). All of sand shiners were captured during fish community season. Mini-fyke nets (CPUE = 0.063; ±2SE = 0.089) and bag seines (CPUE = 0.026; ±2SE = 0.052) were the only effective gears for capturing sand shiners (making up 100% of the total catch (Table 32-33; Figure 32). Mini-fyke net CPUE (CPUE = 0.364 in 2004 versus 0.063 in 2005) and bag seine CPUE (CPUE = 0.058 in 2004 versus 0.026 in 2005; Figure 32) both decreased from 2004. Only five sand shiners were captured so no inferences can be made as to the macrohabitats used by sand shiners in segment 13. Since mini-fyke nets and bag seines were the primary gears that captured sand shiners, by definition, sand shiners were exclusively captured in BARS Mesohabitat (100% of the total catch versus 99.5% of the total effort). It appears sand shiners primarily inhabit the BARS mesohabitat since seines and mini-fyke nets were the only gear to capture sand shiners. Three of the five sand shiners captured in segment 13 were in their second year (Figure 33) according to Pflieger (1997).

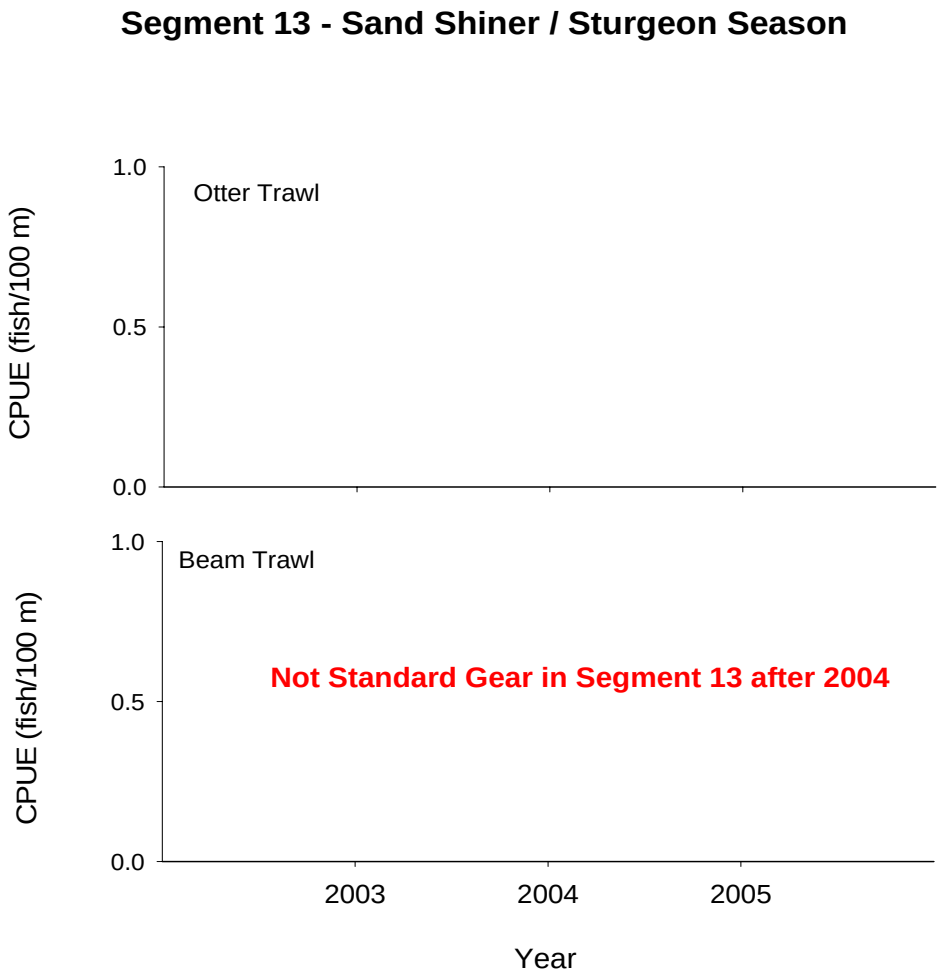

Figure 30. Mean annual catch-per-unit-effort (+/- 2SE) of sand shiner in segment 13 of the Missouri River during sturgeon season 2003-2005.

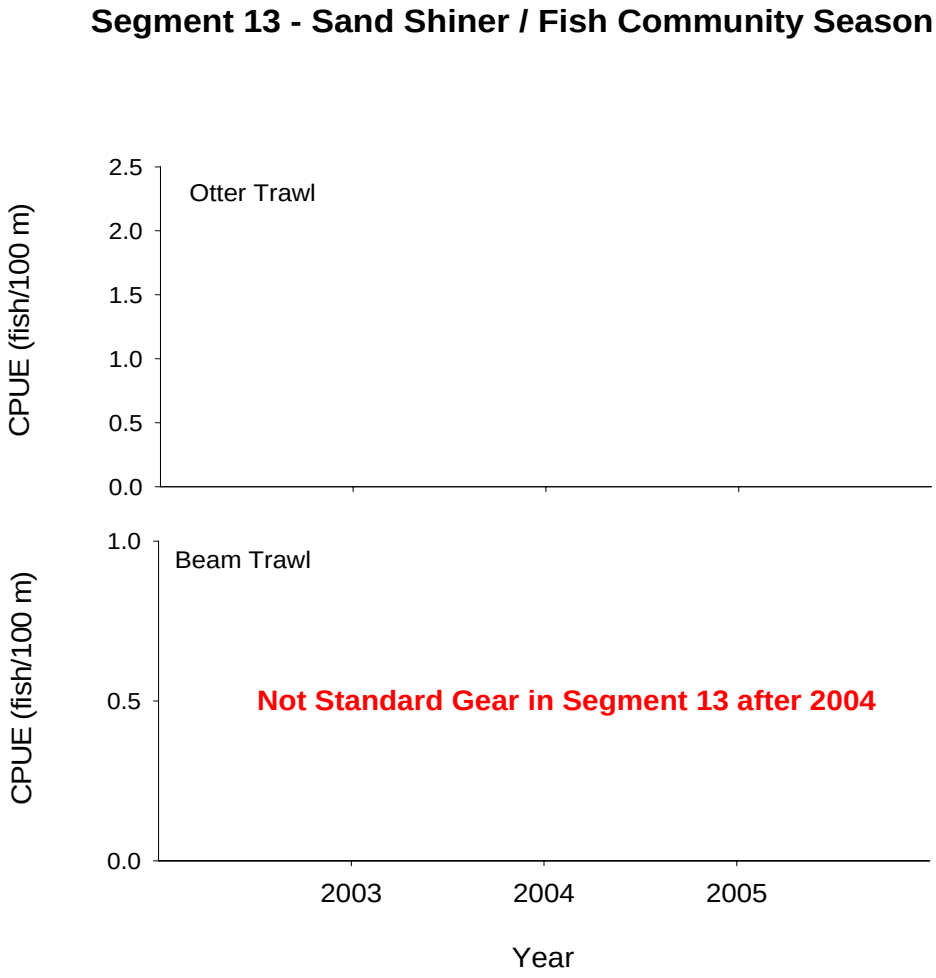

Figure 31. Mean annual catch-per-unit-effort (+/- 2SE) of sand shiner in segment 13 of the Missouri River during fish community season 2003-2005.

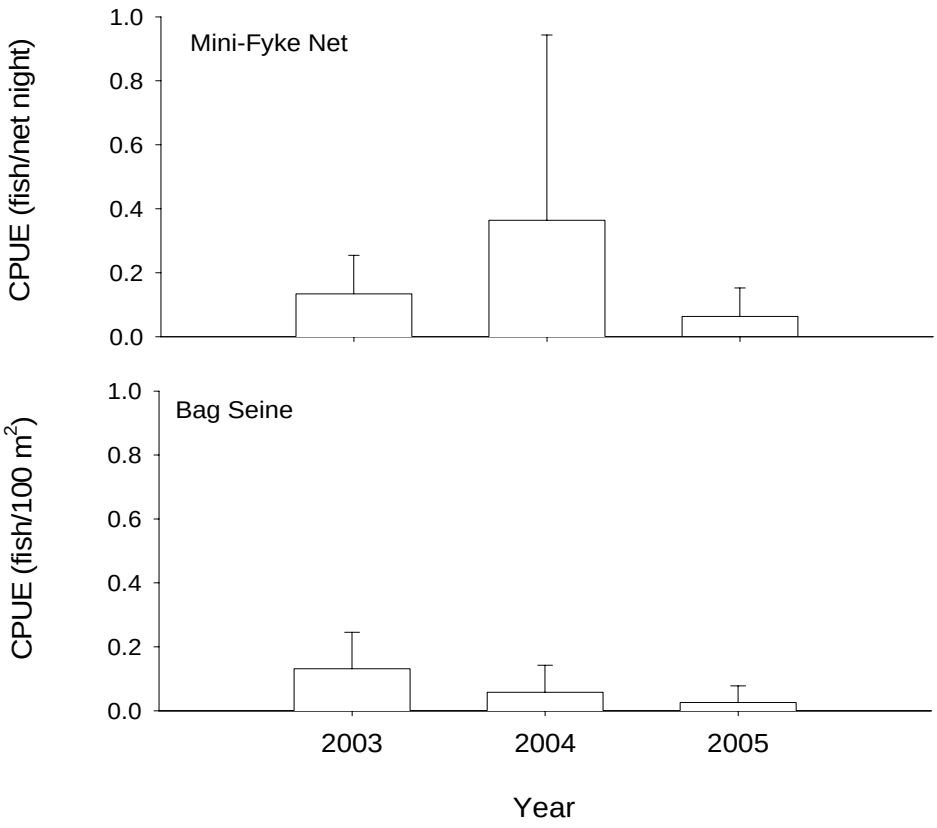

Figure 32. Mean annual catch-per-unit-effort (+/- 2SE) of sand shiner in segment 13 of the Missouri River during fish community season 2003-2005.

Table 32. Total number of sand shiners captured for each gear during each season and the proportion caught within each macrohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

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	16	1	N-E	N-E	62	0	11	10	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	16	3	N-E	N-E	28	0	8	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	21	2	N-E	N-E	38	24	8	7	0	0	1	0	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	10	1	N-E	N-E	65	5	12	8	0	0	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
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	26	0	N-E	N-E	69	0	3	2	0	0	0	0	0
Bag Seine	1	N-E	0	0	N-E	N-E	0	100	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	49	4	0	23	6	0	0	0	0
Mini-Fyke Net	4	N-E	0	0	N-E	N-E	0	0	0	50	0	50	0	0	0
		N-E	17	0	N-E	N-E	29	14	0	24	0	13	0	3	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	21	0	N-E	N-E	60	1	7	2	0	10	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 33. Total number of sand shiners captured for each gear during each season and the proportion caught within each mesohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	89	N-E	10	0	1
2.5 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	95	N-E	5	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	50	N-E	9	36	1
Otter Trawl	0	0	0	N-E	0	0	0
		0	91	N-E	8	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	1	100	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	4	100	0	N-E	0	0	0
		100	0	N-E	0	0	0
Otter Trawl	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

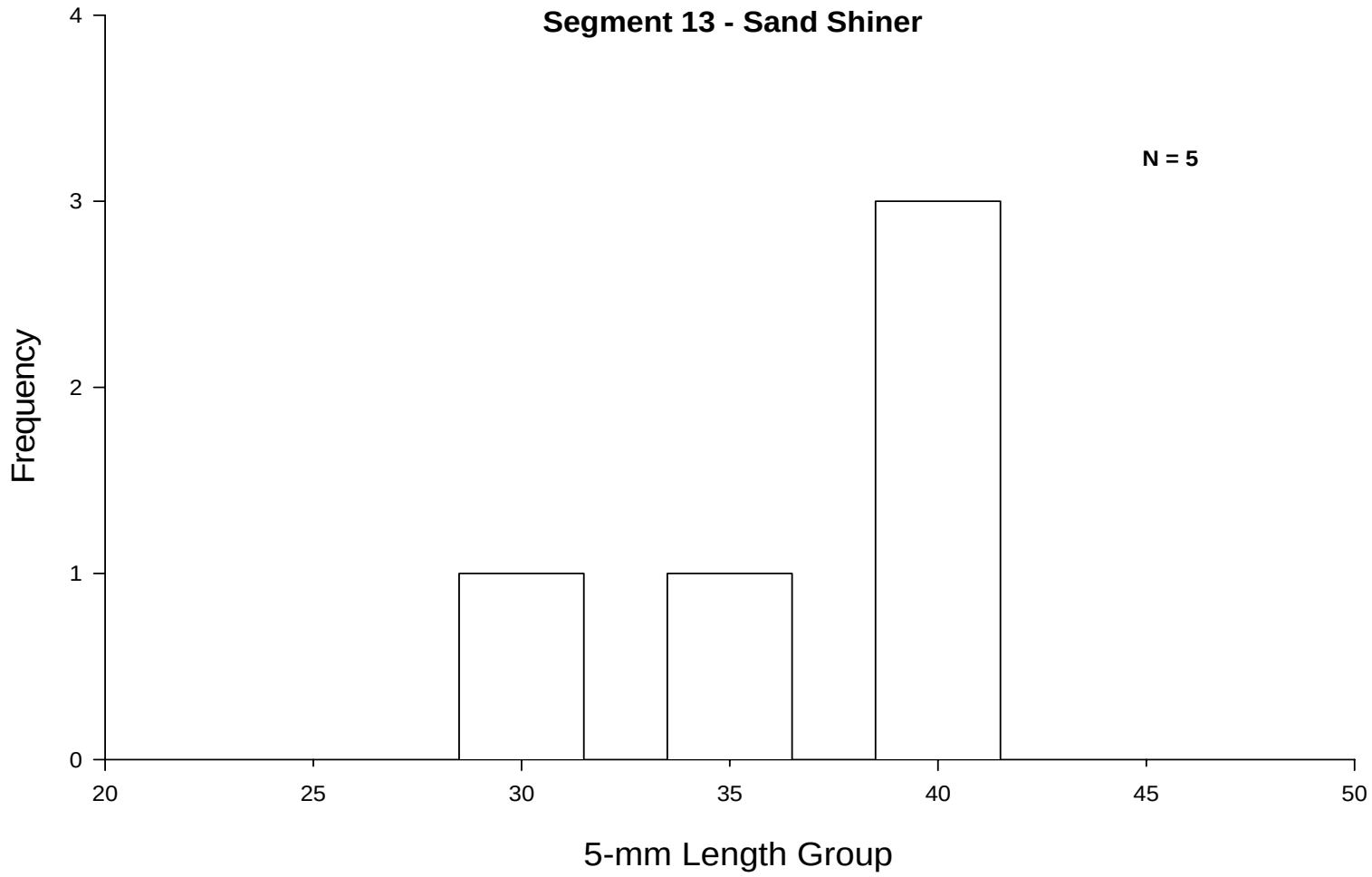

Figure 33. Length frequency of sand shiners in segment 13 of the Missouri River during summer (fish community season) 2004-2005.

***Hybognathus* spp**.

A total of 26 *Hybognathus* spp. (HBNS) were captured in segment 13, which was more than were captured in 2004 (N = 5; Doyle et al. 2005). All of the HBNS were captured during the fish community season (100%; N = 26; Table 37). Mini-fyke nets (CPUE = 0.175; ±2SE = 0.173) and bag seines (CPUE = 0.181; ±2SE = 0.164) were the only gears that captured HBNS (Table 34; Figure 36). Catch-per-unit-effort increased for both mini-fyke nets (CPUE = 0.065 in 2004 versus 0.175 in 2005) and bag seines (CPUE = 0 in 2004 versus 0.181 in 2005) from 2004 (Figure 36).

Though effort was allocated similarly between macro and mesohabitats for mini-fyke nets and bag seines, capture rates were different for each gear. The majority of HBNS captured in mini-fyke nets occurred in CHXO BARS habitat (45% of the total catch relative to a total effort of 17%) but notable numbers were captured in OSB BARS habitat (36% of the total catch relative to a total effort of 14%). The majority of HBNS captured in bag seines occurred in SCCS BARS habitat (40% of the total catch relative to a total effort of 23%; Tables 34-35) with a notable amount capture in the OSB BARS habitat which were sampled far less frequently (27% of the total catch relative to a total effort of 4%; Tables 34-35). It is important to note the frequencies of detecting HBNS in habitats which are sampled less frequently, indicating a possible lack of representation of this species in segment 13. Pflieger (1997) noted that HBNS prefer sandy substrates with swift currents, which is consistent with the BARS Mesohabitat.

There were not enough HBNS (N < 50) captured in segment 13 during the 2005 sample season to summarize year to year trends and population structure. It is apparent from Figure 37, however, that the majority of HBNS captured in segment 13 were over 40mm, which is approaching the size Pflieger (1997) lists as age 1+, which is sexually mature.

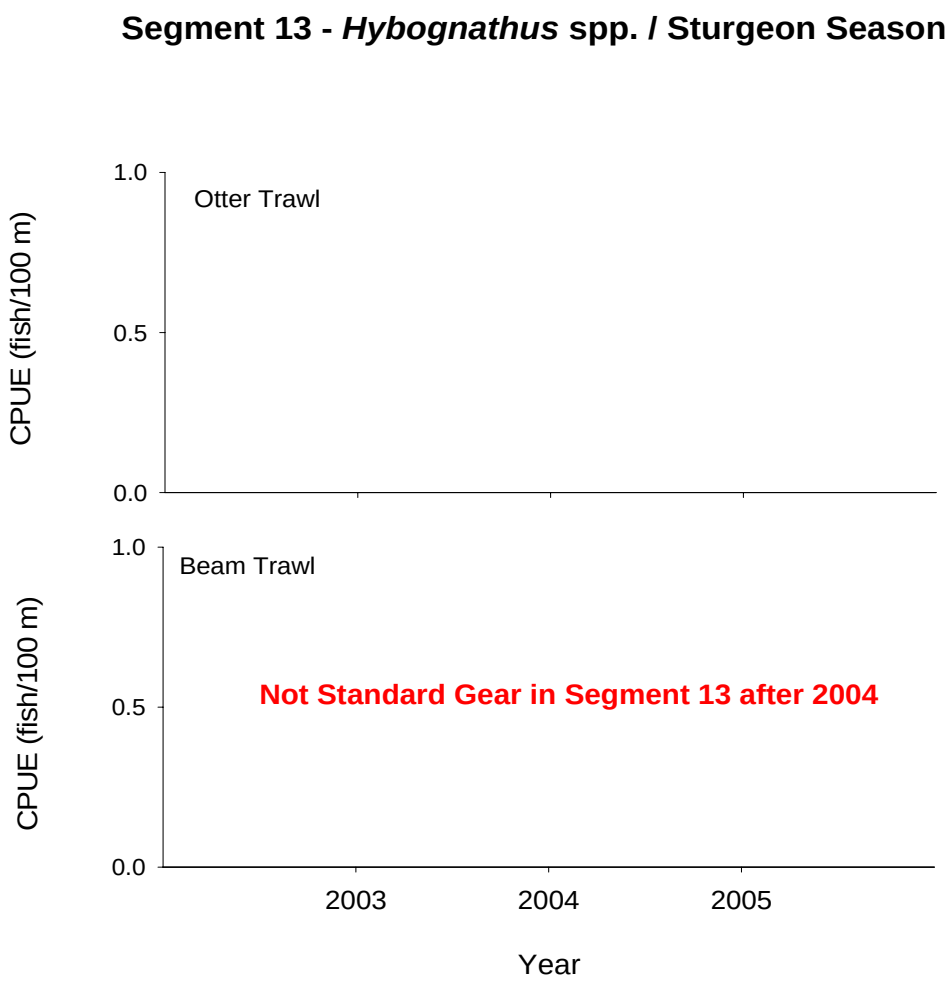

Figure 34. Mean annual catch-per-unit-effort (+/- 2SE) of *Hybognathus* spp. in segment 13 of the Missouri River during sturgeon season 2003-2005.

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

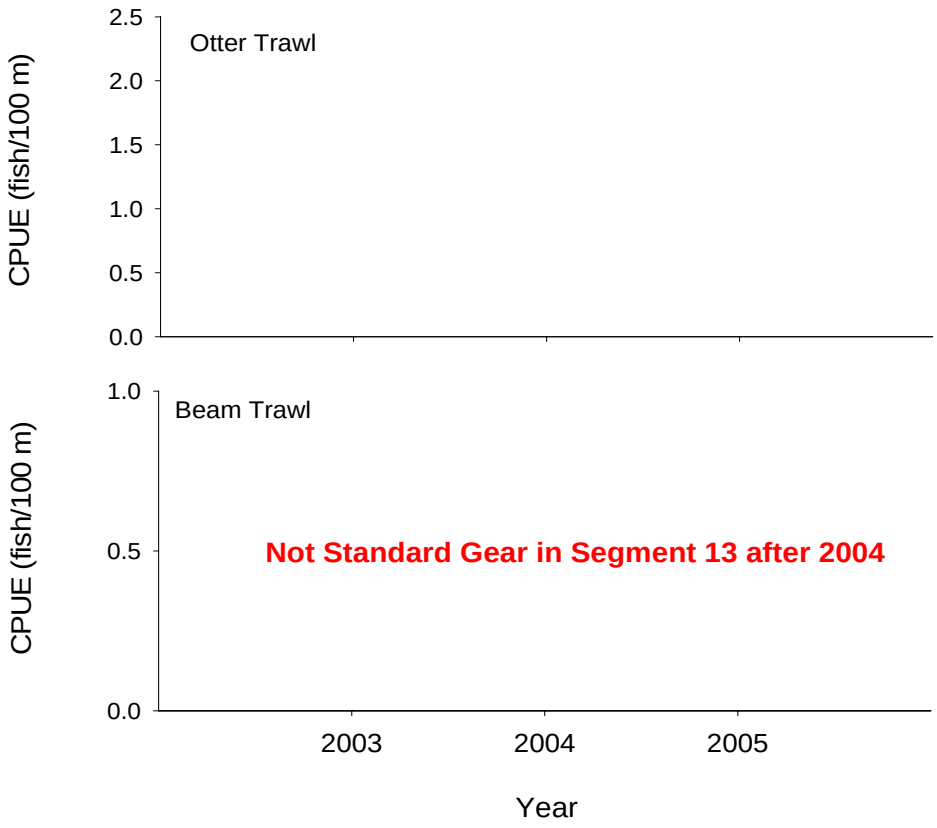

Figure 35. Mean annual catch-per-unit-effort (+/- 2SE) of *Hybognathus* spp. in segment 13 of the Missouri River during fish community season 2003-2005.

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

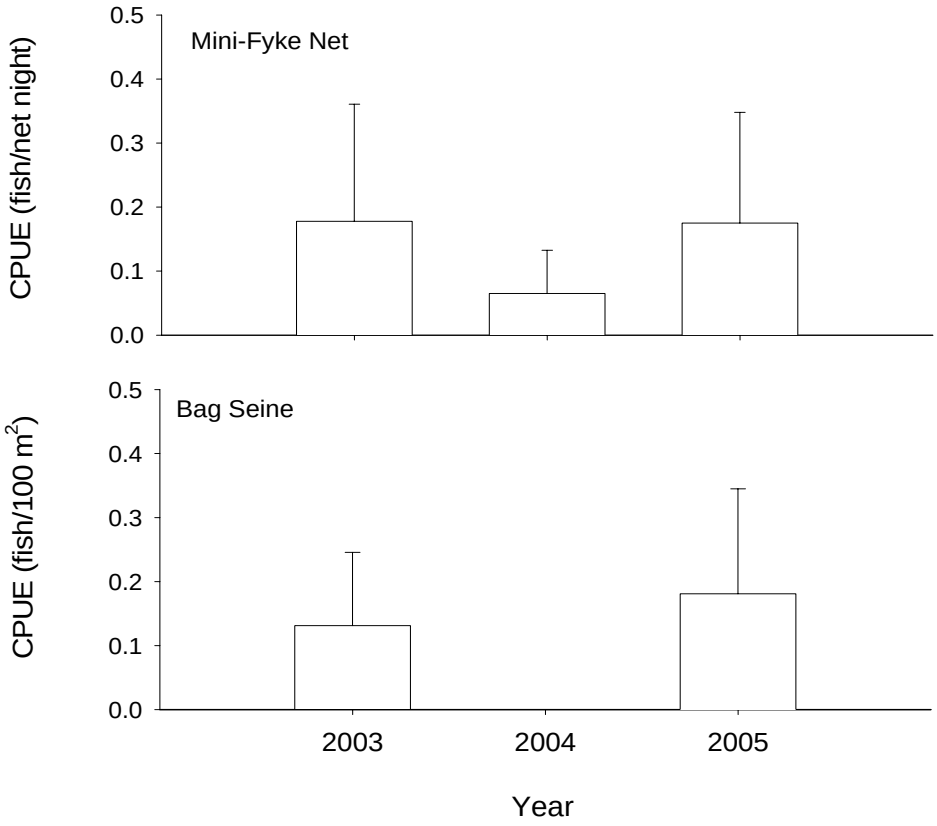

Figure 36. Mean annual catch-per-unit-effort (+/- 2SE) of *Hybognathus* spp. in segment 13 of the Missouri River during fish community season 2003-2005.

Table 34. Total number of Hybognathus spp. captured for each gear during each season and the proportion caught within each macrohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

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	16	1	N-E	N-E	62	0	11	10	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	16	3	N-E	N-E	68	0	8	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	21	2	N-E	N-E	38	24	8	7	0	0	1	0	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	10	1	N-E	N-E	65	5	12	8	0	0	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
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	26	0	N-E	N-E	69	0	3	2	0	0	0	0	0
Bag Seine	15	N-E	0	0	N-E	N-E	33	27	0	40	0	0	0	0	0
		N-E	17	0	N-E	N-E	49	4	0	23	6	0	0	0	0
Mini-Fyke Net	11	N-E	45	0	N-E	N-E	0	36	0	18	0	0	0	0	0
		N-E	17	0	N-E	N-E	29	14	0	24	0	13	0	3	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	21	0	N-E	N-E	60	1	7	2	0	10	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 35. Total number of Hybognathus spp. captured for each gear during each season and the proportion caught within each mesohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	89	N-E	10	0	1
2.5 Inch Trammel	0	0	0	N-E	0	0	0
		0	95	N-E	5	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	50	N-E	9	36	1
Otter Trawl	0	0	0	N-E	0	0	0
		0	91	N-E	8	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	15	100	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	11	100	0	N-E	0	0	0
		100	0	N-E	0	0	0
Otter Trawl	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

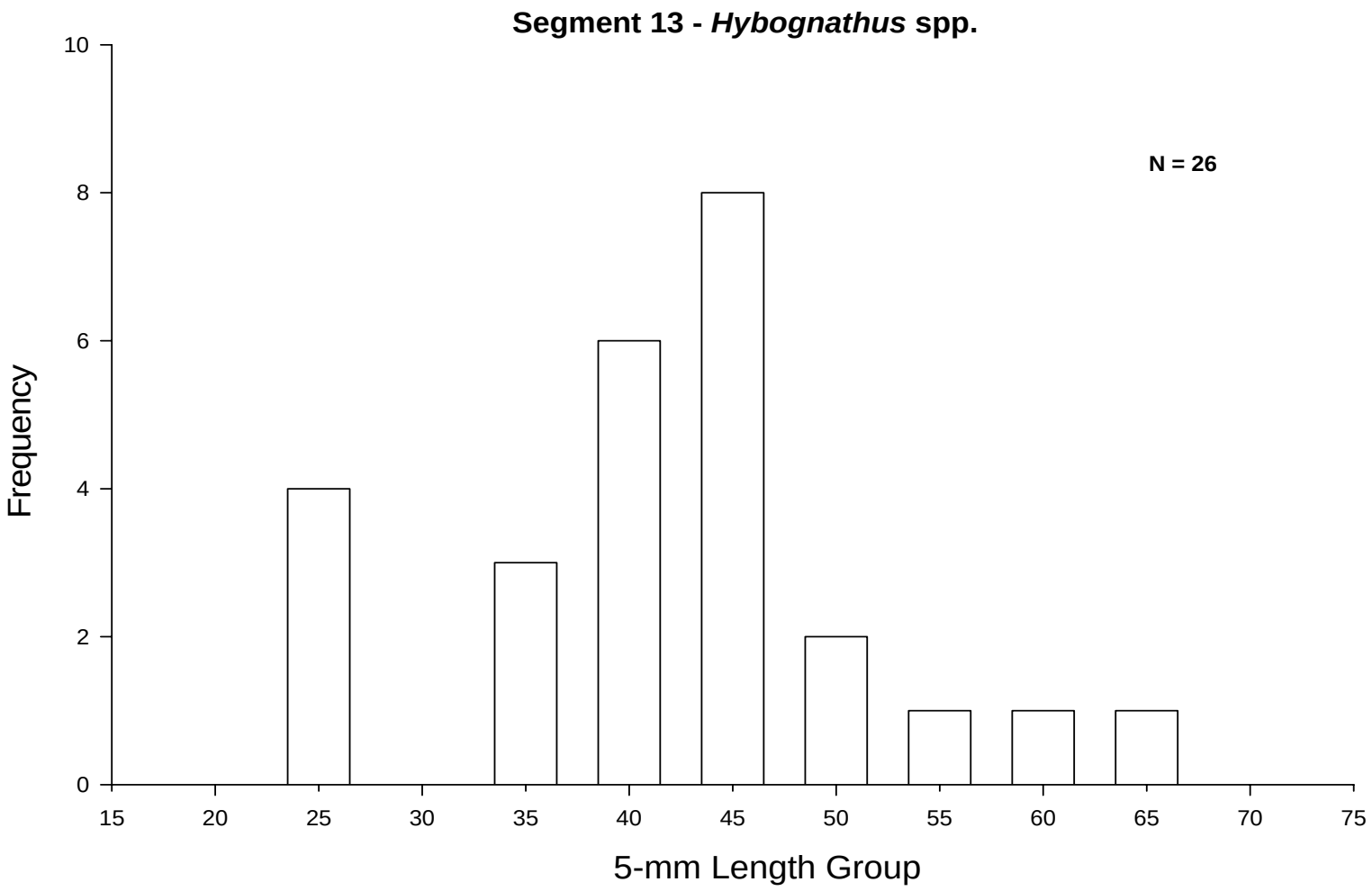

Figure 37. Length frequency of *Hybognathus* spp. caught in segment 13 of the Missouri River during summer (fish community season) 2004-2005

Blue Sucker

A total of 118 blue suckers were captured in segment 13, an increase over 2004, when only 87 were captured (Doyle et al. 2005). The vast majority of blue suckers were captured during the sturgeon season (85.6%; N = 101) versus the fish community season (N = 17; Table 36). Two and a half inch trammel nets (CPUE = 0.13 (±2SE =0.058) were the most effective gear used for capturing blue suckers (46% of the total catch), followed by 1 inch trammel nets (overall mean CPUE = 0.093 (±2SE =0.043), gillnets (CPUE = 0.076 (±2SE =0.036), and otter trawls (overall mean CPUE = 0.028 (±2SE =0.016); Figures 38-41; Appendix F). Mini-fyke nets and bag seines did not capture any blue suckers in 2005. This was the first year for 2.5 inch trammel nets in segment 13 so there is no comparison between years. For sturgeon season, catch rates increased from 2004 in 1 inch trammel nets (CPUE = 0.057 in 2004 versus 0.107 in 2005), gillnets (CPUE = 0.044 in 2004 versus 0.076 in 2005), and otter trawl CPUE decreased slightly (CPUE = 0.019 in 2004 versus 0.03 in 2005; Figures 38-39). For fish community season, 1 inch trammel nets were the most effective. Catch-per-unit-effort for 1 inch trammel nets decreased from 2004 (2004 = 0.106 versus 2005 = 0.074; Figure 41). Otter trawl CPUE for fish community season decreased from 2004 (CPUE = 0.048 in 2004 versus 0.024 in 2005; Figure 41). In both sturgeon and fish community seasons, blue suckers were primarily captured in ISB CHNB habitat (66% of the total catch relative to 50.6% of the total effort; Tables 36-37). No general trends could be seen between 2003 through 2005.

All blue suckers captured were mature adults more than 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 point at which we start to see them in our nets. Interestingly, it is rare for us to capture blue suckers before they are sexually mature (< 500 mm; Figure 44). Sexually mature and actively spawning blue suckers seem to be vulnerable to our sampling gear, though, we may have to explore new methods and techniques to detect the presence (or absence) of YOY and juvenile blue suckers.

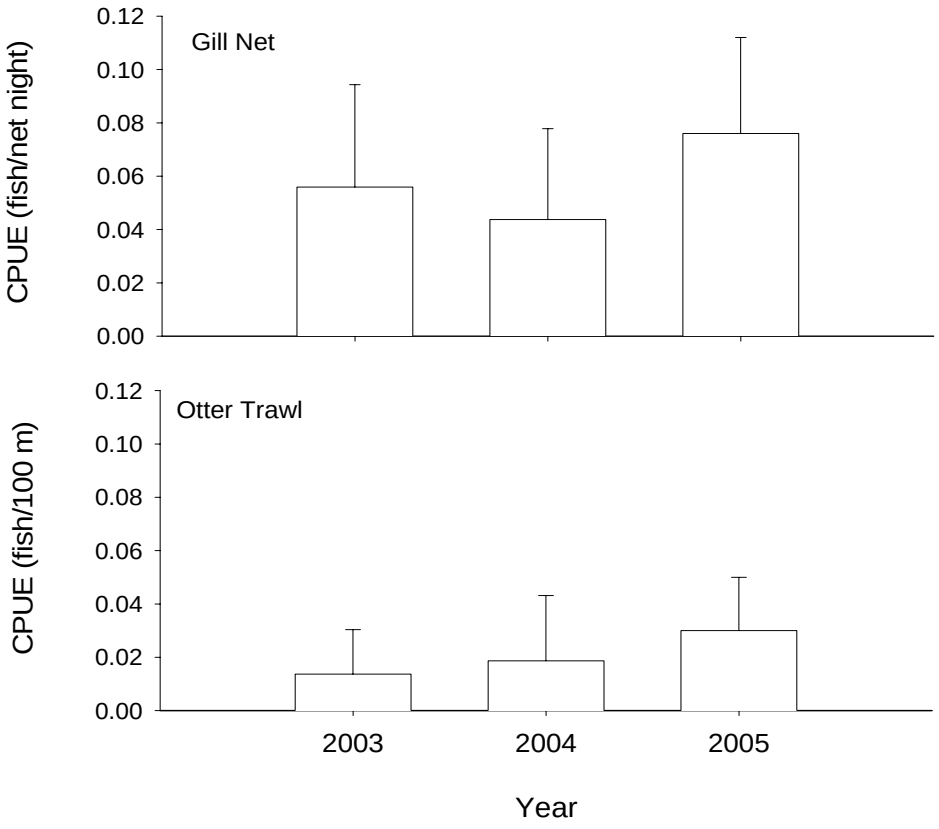

Figure 38. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segment 13 of the Missouri River during sturgeon season 2003-2005.

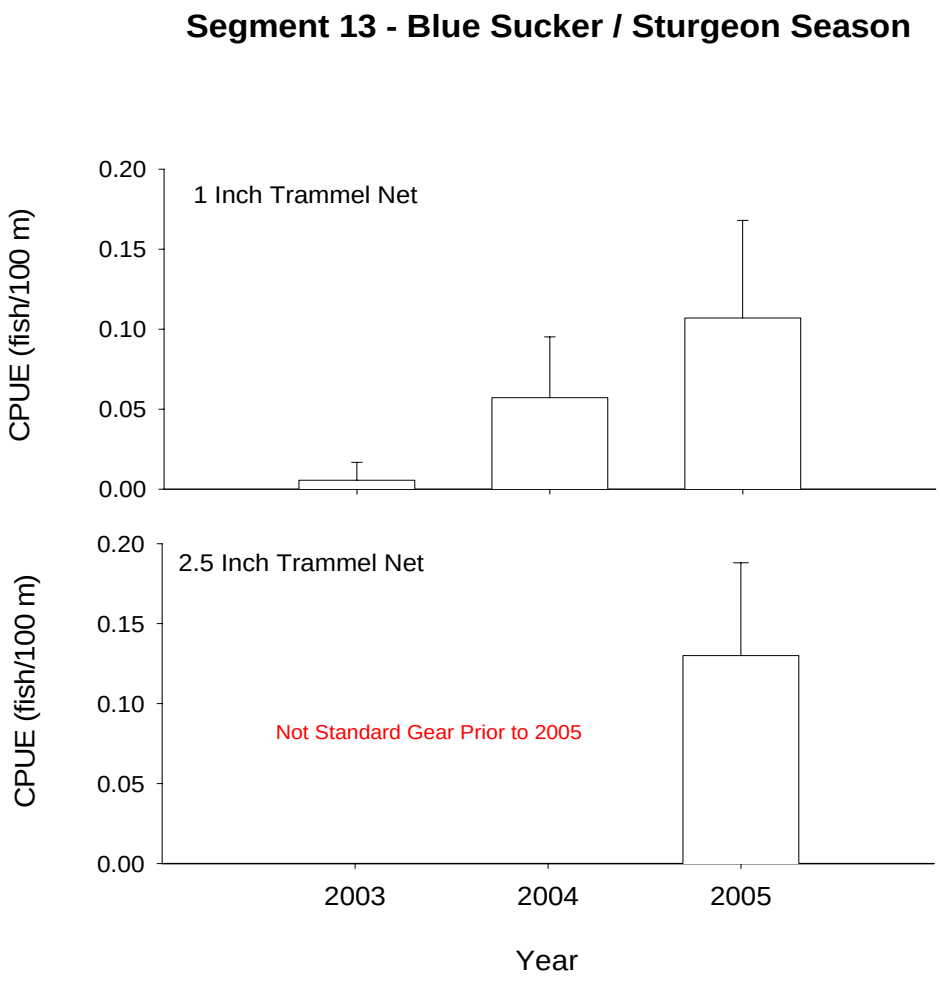

Figure 39. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segment 13 of the Missouri River during sturgeon season 2003-2005.

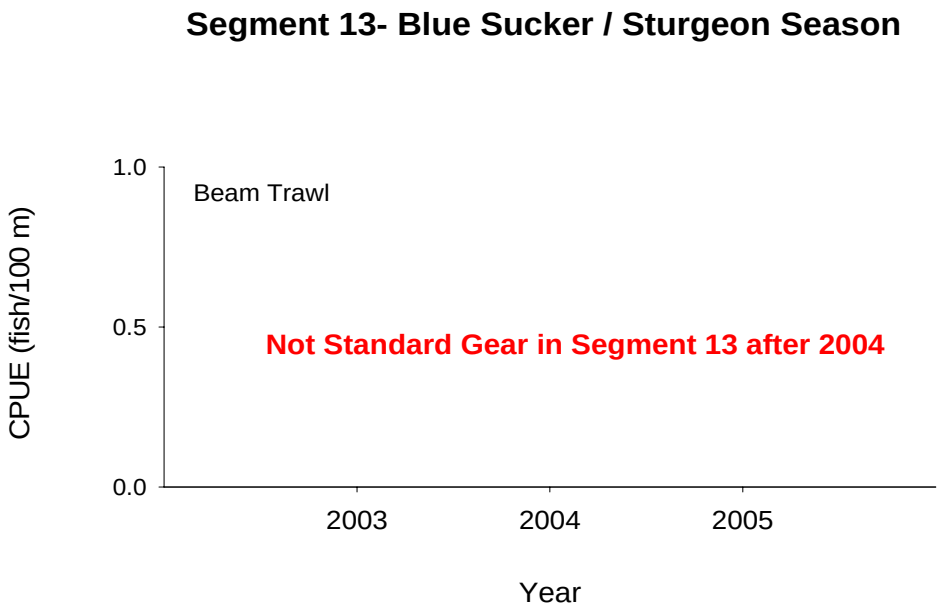

Figure 40. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segment 13 of the Missouri River during sturgeon season 2003-2005.

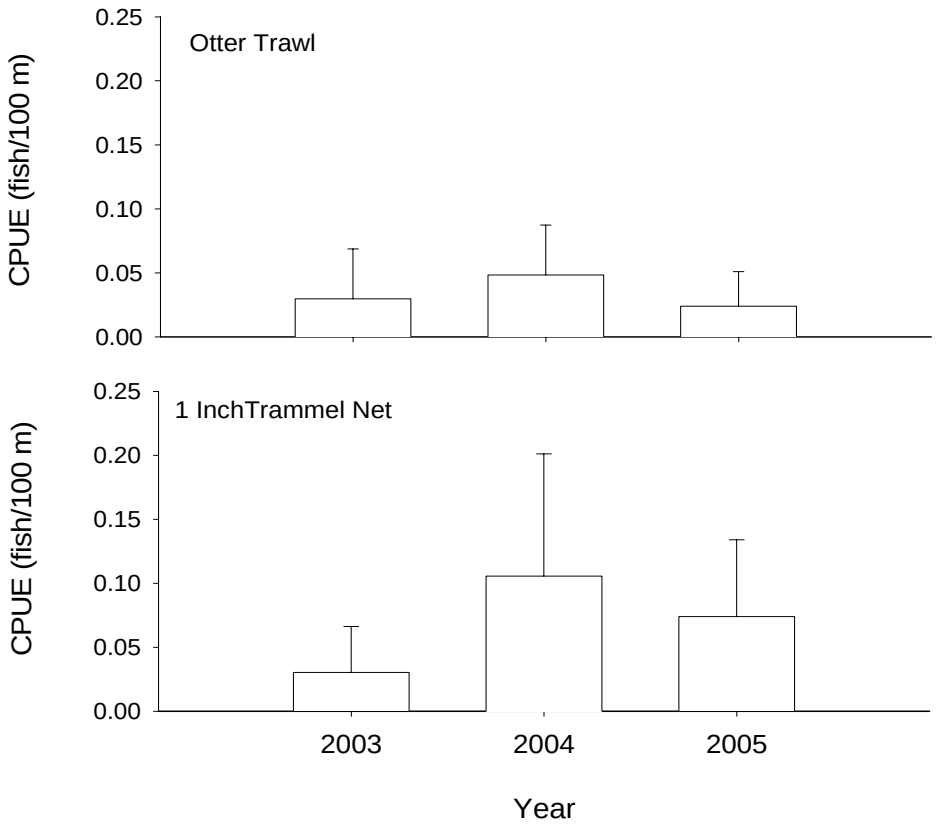

Figure 41. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker using otter trawls and 1 inch trammel nets in segment 13 of the Missouri River during fish community season 2003-2005.

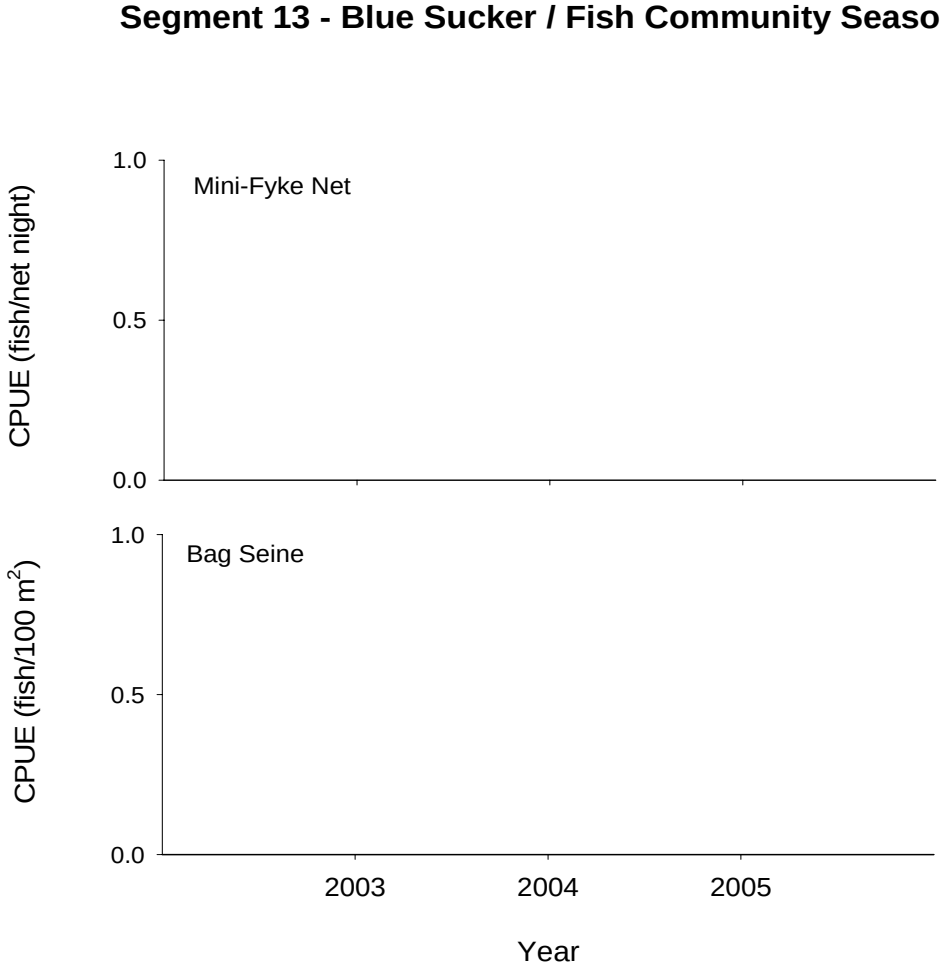

Figure 42. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segment 13 of the Missouri River during fish community season 2003-2005.

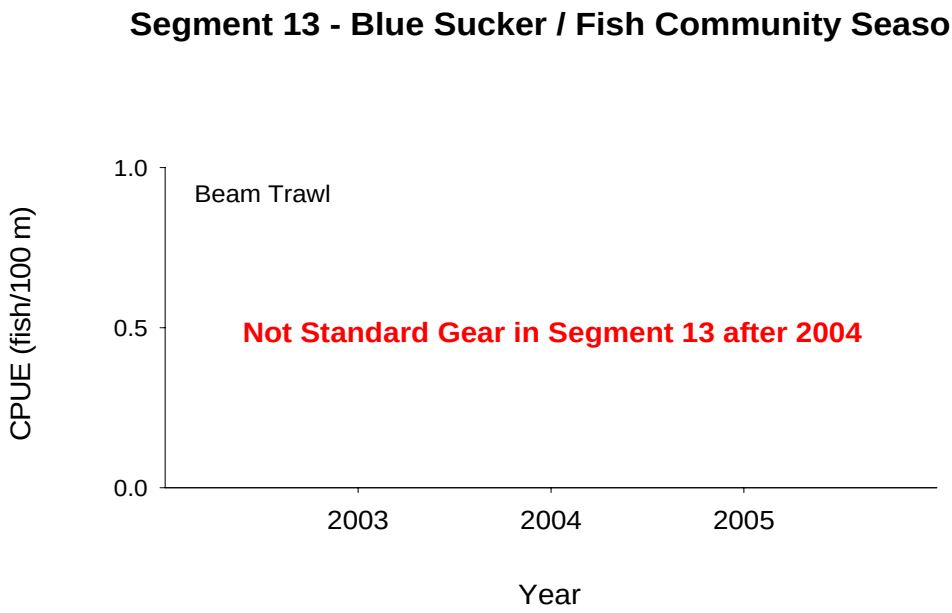

Figure 43. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segment 13 of the Missouri River during fish community season 2003-2005.

Table 36. Total number of blue suckers captured for each gear during each season and the proportion caught within each macrohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

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	27	N-E	15	0	N-E	N-E	67	0	0	19	0	0	0	0	0
		N-E	16	1	N-E	N-E	62	0	11	10	0	0	0	0	0
2.5 Inch Trammel Net	38	N-E	8	0	N-E	N-E	87	0	0	5	0	0	0	0	0
		N-E	16	3	N-E	N-E	68	0	8	4	0	0	0	0	0
Gill Net	25	N-E	24	0	N-E	N-E	40	28	0	8	0	0	0	0	0
		N-E	21	2	N-E	N-E	38	24	8	7	0	0	1	0	0
Otter Trawl	11	N-E	0	0	N-E	N-E	91	0	0	9	0	0	0	0	0
		N-E	10	1	N-E	N-E	65	5	12	8	0	0	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	13	N-E	15	0	N-E	N-E	85	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	69	0	3	2	0	0	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	49	4	0	23	6	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	17	0	N-E	N-E	29	14	0	24	0	13	0	3	0
Otter Trawl	4	N-E	25	0	N-E	N-E	75	0	0	0	0	0	0	0	0
		N-E	21	0	N-E	N-E	60	1	7	2	0	10	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 37. Total number of blue suckers captured for each gear during each season and the proportion caught within each mesohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	27	0	81	N-E	19	0	0
		0	89	N-E	10	0	1
2.5 Inch Trammel Net	38	0	95	N-E	5	0	0
		0	95	N-E	5	0	0
Gill Net	25	0	72	N-E	8	12	8
		0	50	N-E	9	36	1
Otter Trawl	11	0	91	N-E	9	0	0
		0	91	N-E	8	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	13	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Otter Trawl	4	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

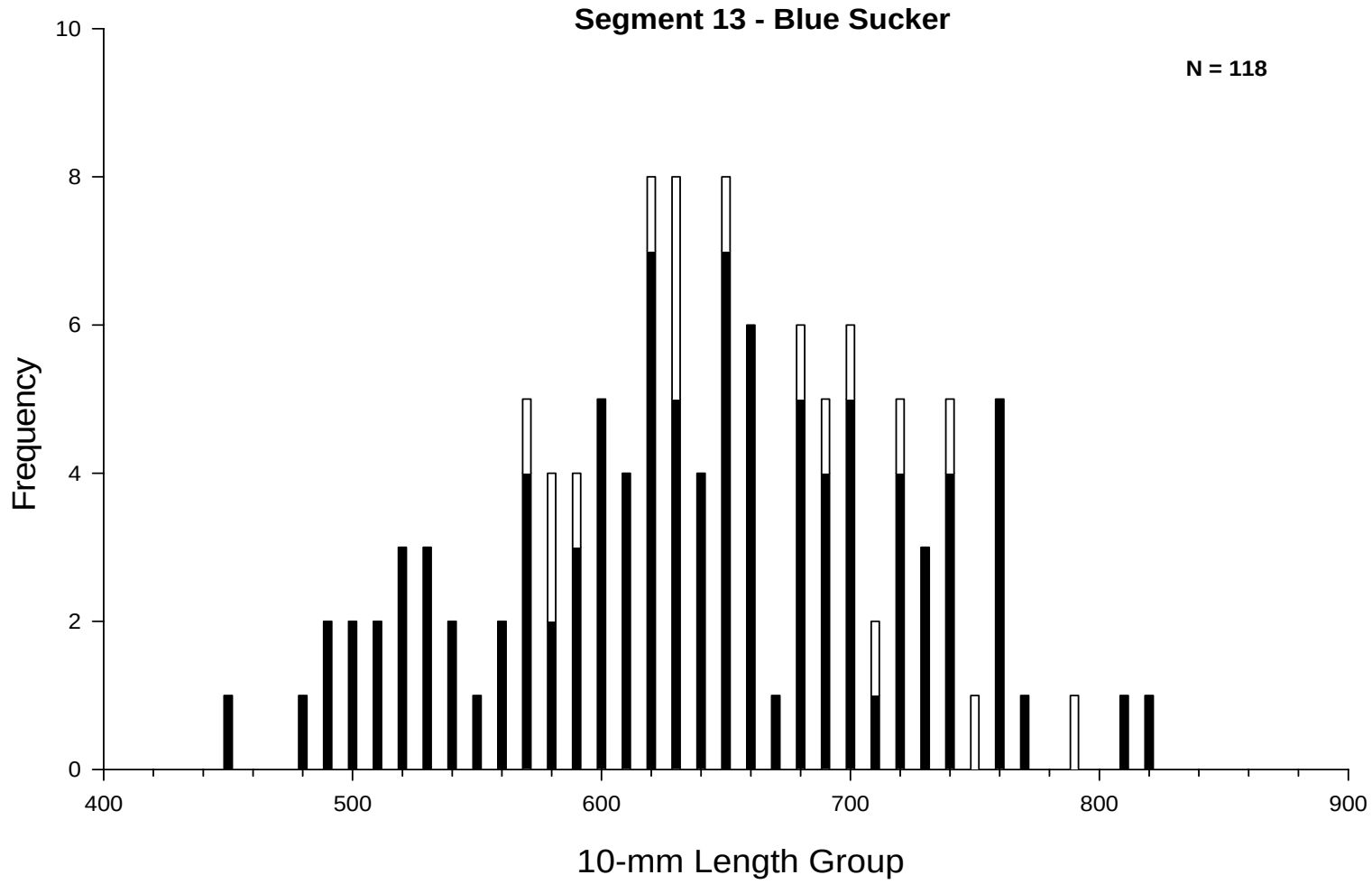

Figure 44. Length frequency of blue suckers during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during 2004 - 2005.

Sauger

A total of 43 sauger were captured in segment 13, which was slightly more than were captured in 2004 (N = 30; Doyle et al. 2005). Nearly all of the sauger were captured during sturgeon season (98%%; N = 42; Table 38). Gillnets were the most effective gear at capturing sauger (90% of the total catch; CPUE = 0.115; Table 38; Figure 45). For sturgeon season, gillnet CPUE decreased slightly from 2003 and 2004(CPUE = 0.1830 in 2003, CPUE = 0.136 in 2004 versus 0.115 in 2005; Figure 45). Only one sauger was captured in 1 inch trammel nets during 2005 sturgeon season (Figure 46; Table 38). The majority of sauger captured in gillnets occurred in OSB macrohabitat (45% of the total catch relative to 24% of the effort; Table 38) even though sampling in this habitat occurred less frequently than ISB macrohabitat (29% of the total catch relative to 38% of the effort; Table 38). Sauger were captured almost evenly between CHNB (42% of gillnet catch) and POOL (45% of gillnet catch) even though CHNB mesohabitats (50% of sampling effort) were sampled more than POOL mesohabitats (36% of sampling effort; Tables 38-39).

There were not enough sauger (N < 50) captured in segment 13 during the 2005 sample season to summarize year to year trends and population structure. Based on age structure described by Pflieger (1997), however, it seems that the majority of sauger captured in segment 13 were between 3 and 4 years old (350 to 415 mm; Figure 51).

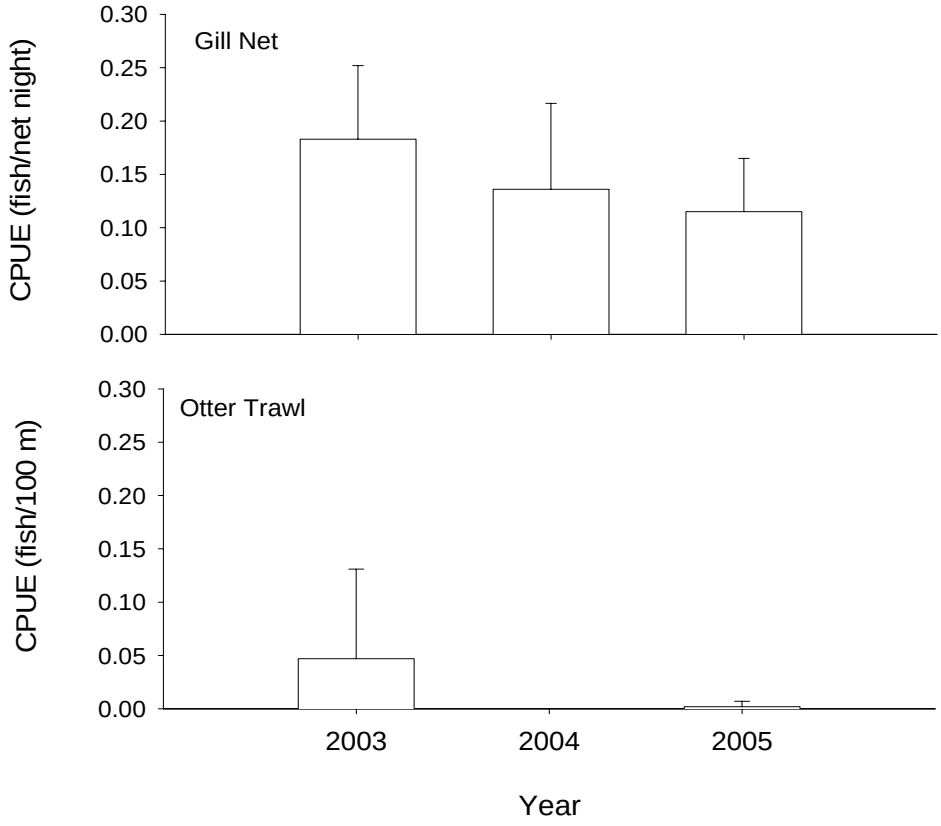

Figure 45. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segment 13 of the Missouri River during sturgeon season 2003-2005.

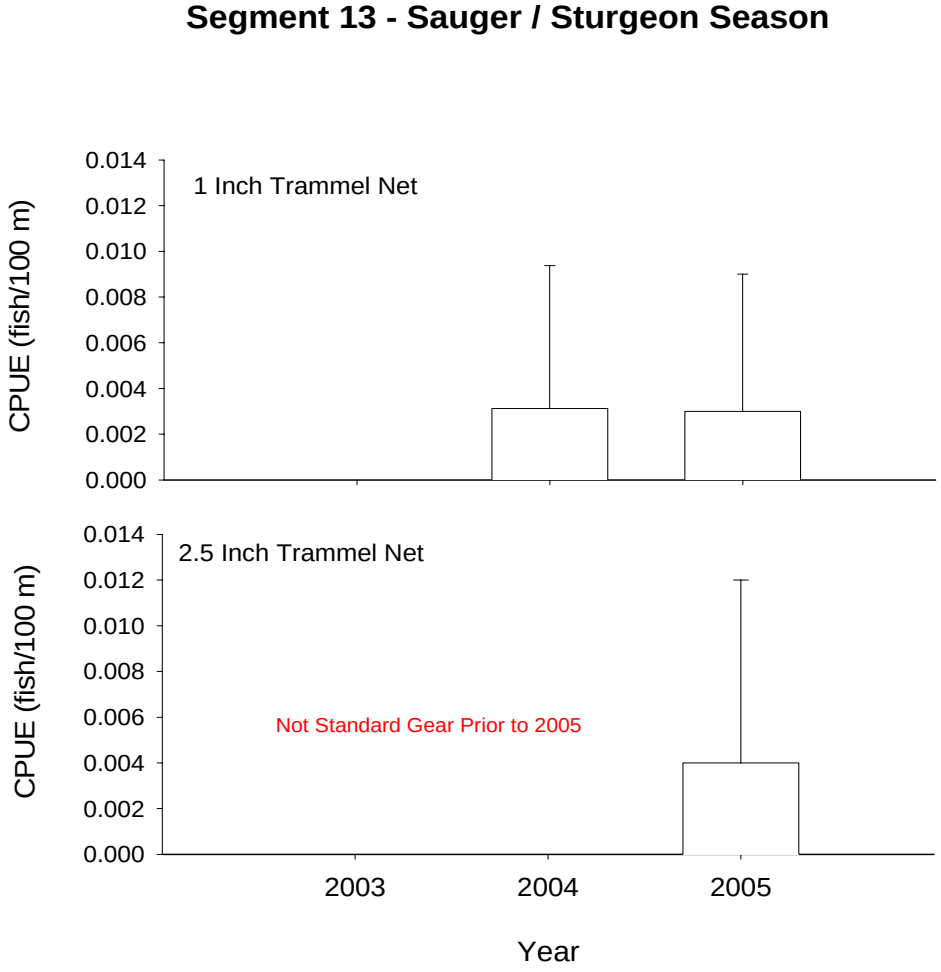

Figure 46. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segment 13 of the Missouri River during sturgeon season 2003-2005.

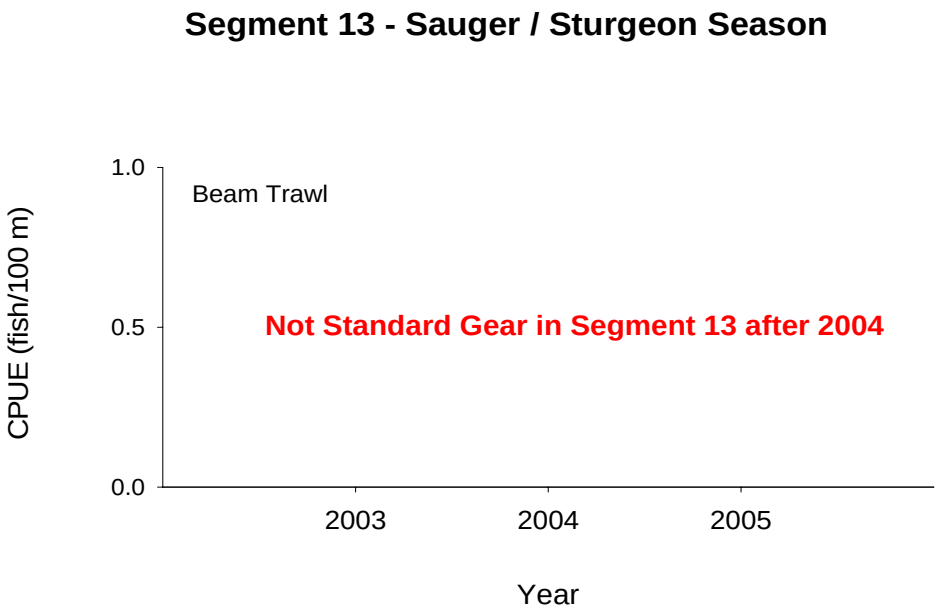

Figure 47. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segment 13 of the Missouri River during sturgeon season 2003-2005.

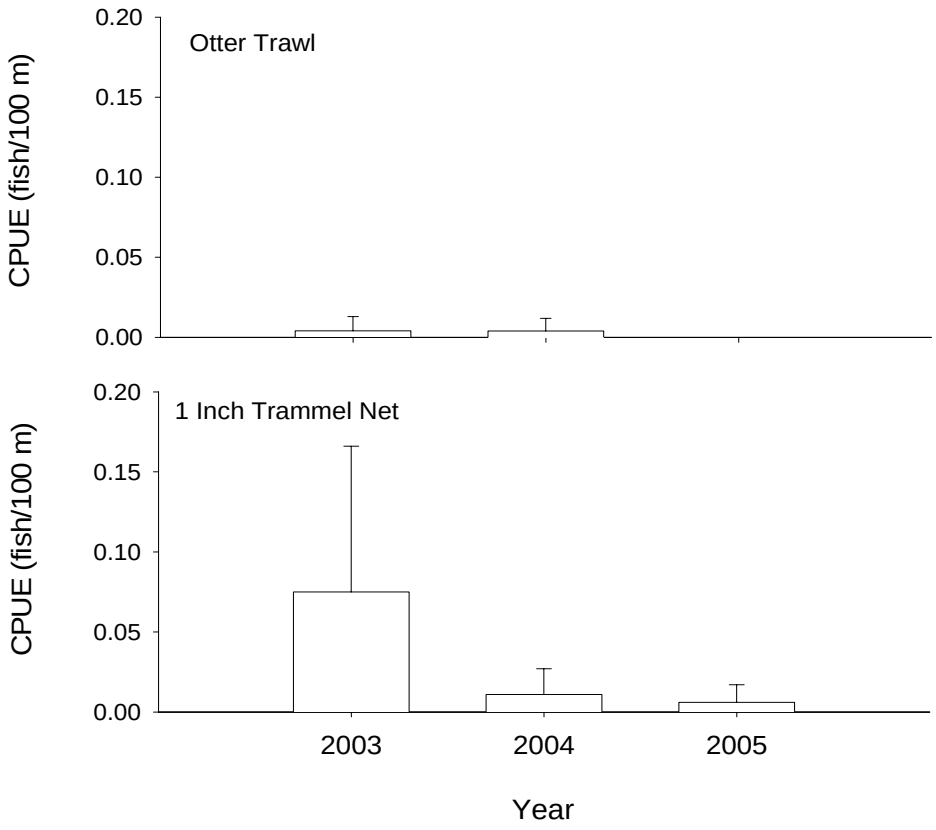

Figure 48. Mean annual catch-per-unit-effort (+/- 2SE) of sauger using otter trawls and 1 inch trammel nets in segment 13 of the Missouri River during fish community season 2003-2005.

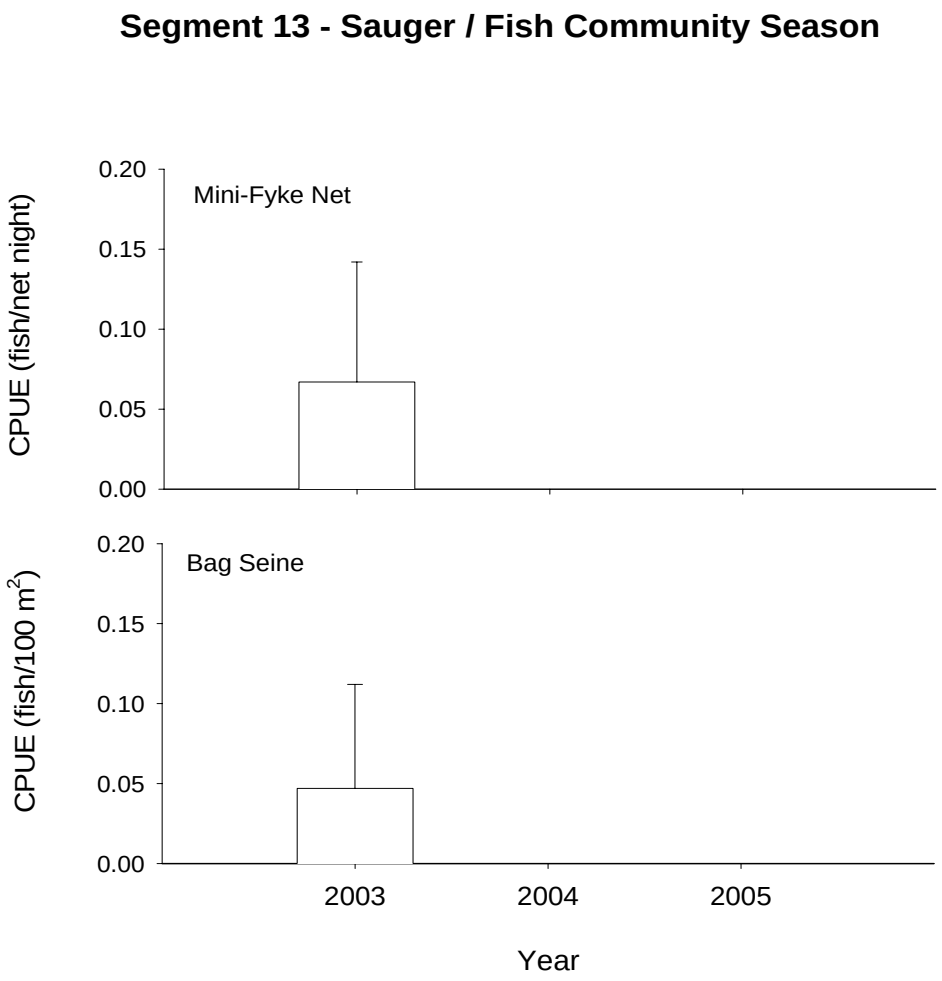

Figure 49. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segment 13 of the Missouri River during fish community season 2003-2005.

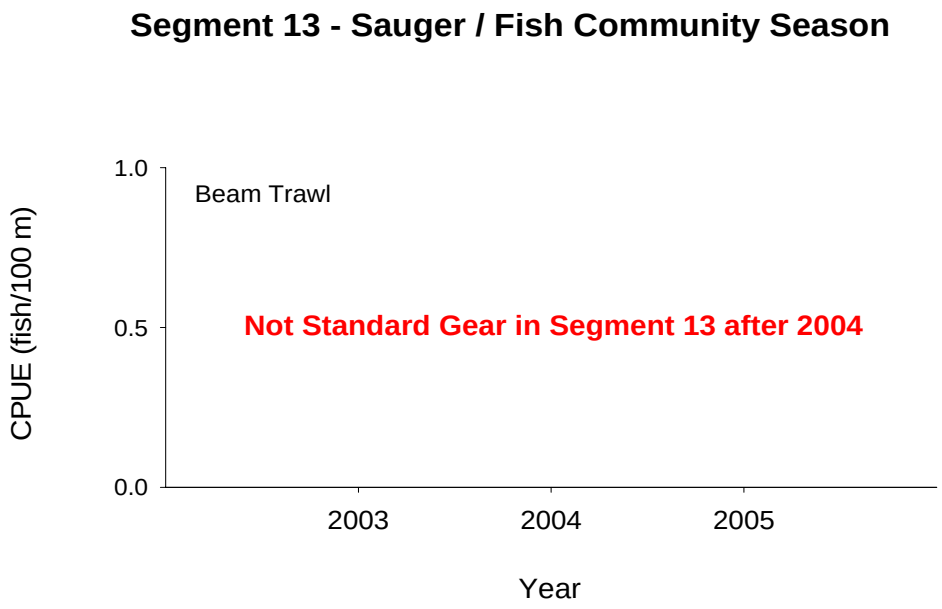

Figure 50. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segment 13 of the Missouri River during fish community season 2003-2005.

Table 38. Total number of saugers captured for each gear during each season and the proportion caught within each macrohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of the gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 13.

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	16	1	N-E	N-E	62	0	11	10	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	16	3	N-E	N-E	68	0	8	4	0	0	0	0	0
Gill Net	38	N-E	8	0	N-E	N-E	29	45	13	3	0	0	3	0	0
		N-E	21	2	N-E	N-E	38	24	8	7	0	0	1	0	0
Otter Trawl	2	N-E	50	0	N-E	N-E	50	0	0	0	0	0	0	0	0
		N-E	10	1	N-E	N-E	65	5	12	8	0	0	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	26	0	N-E	N-E	69	0	3	2	0	0	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	49	4	0	23	6	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	17	0	N-E	N-E	29	14	0	24	0	13	0	3	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	21	0	N-E	N-E	60	1	7	2	0	10	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 39. Total number of saugers captured for each gear during each season and the proportion caught within each mesohabitat (first line of the gear type) in segment 13 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If numbers in parenthesis do not add to 100 then some Mesohabitats were not recorded in the field. The beam trawl is not standard gear in segment 13.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	1	0	100	N-E	0	0	0
		0	89	N-E	10	0	1
2.5 Inch Trammel Net	1	0	100	N-E	0	0	0
		0	95	N-E	5	0	0
Gill Net	38	0	42	N-E	8	45	0
		0	50	N-E	9	36	1
Otter Trawl	2	0	100	N-E	0	0	0
		0	91	N-E	8	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	1	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Otter Trawl	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

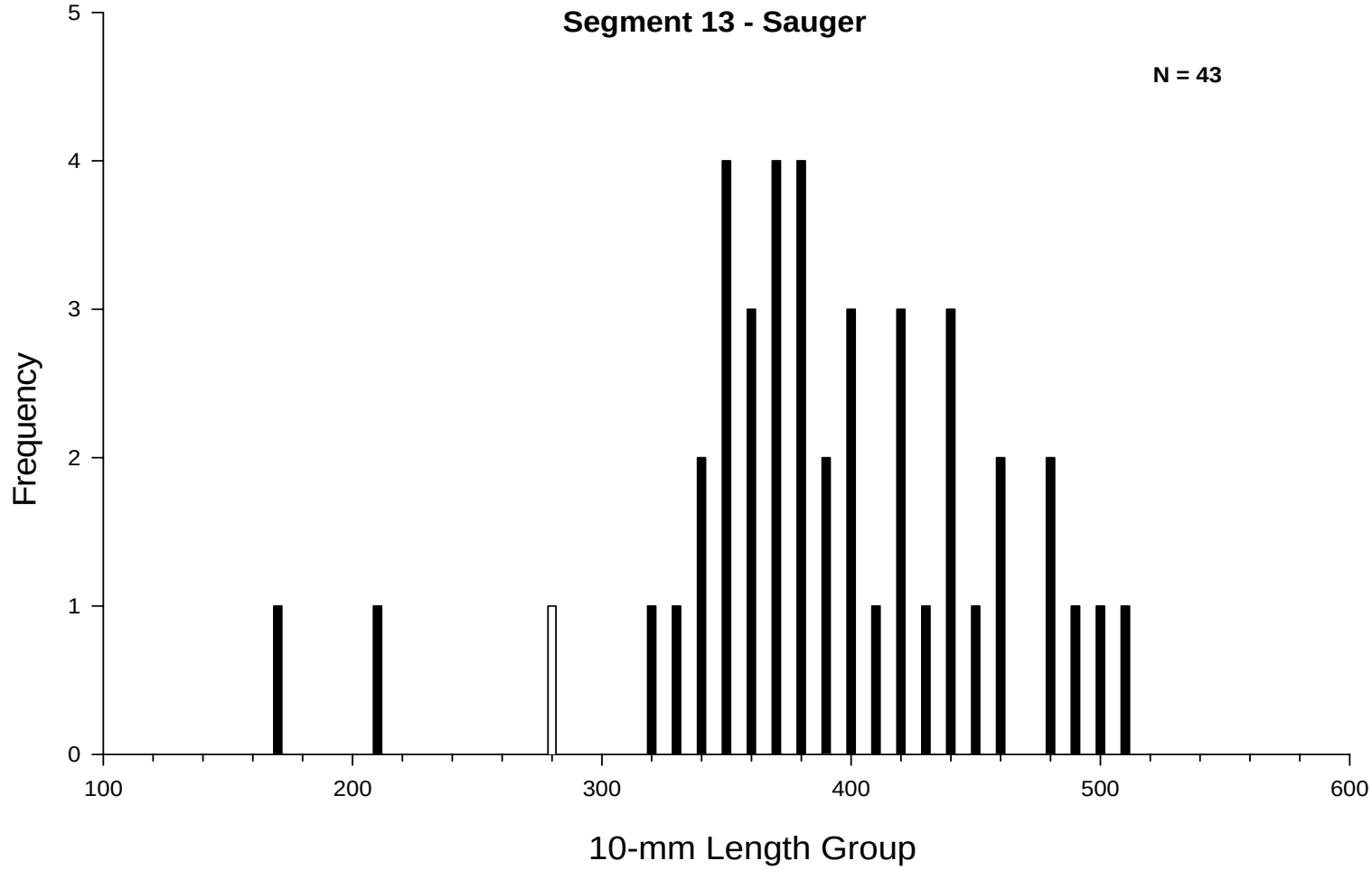

Figure 51. Length frequency of sauger during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 13 of the Missouri River during 2004-2005.

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 2005 sample season, 12,147 fish were captured in segment 13 of the Lower Missouri River. Standard gears captured 63 species with shovelnose sturgeon making up the largest percentage of the total catch (29.5%; N = 3,546), followed by red shiners (24.9%; N = 2,993), emerald shiners (12.0%; N = 1,447), and blue catfish (6.2%; N = 750). The 9 target species accounted for 36.8% of the total catch with each contributing in the following order of abundance: shovelnose sturgeon (29.5%; N = 3,546), sicklefin chub (2.8%; N = 341), speckled chub (2.6%; N = 318), blue sucker (0.8%; N = 101), sauger (0.6%; N = 67), pallid sturgeon (0.2%; N = 26), sturgeon chub (0.08%; N = 10), *Hybognathus* spp. (0.07%; N = 8), and sand shiner (0.05%; N = 5). Similar to 2004, 22 species were captured fewer than five times during the entire sample year (Appendix F).

Gillnets captured 33 species and were most effective at capturing shovelnose sturgeon (67.1% of the catch; N = 2,119), with an average CPUE of 8.318 (±2SE =1.649) per net night. Longnose gar (7.3%; N = 230), goldeye (5.7%; N = 180), and blue catfish (4.5%; N = 142) were the next most abundant fish species collected in gillnet samples, averaging approximately one fish every other net night (0.742, 0.603, and 0.445 fish per net/night respectively).

One inch trammel nets, fished during both seasons, caught 15 species with shovelnose sturgeon making up the majority of the catch (81.8%; N = 310). Other large bodied fish, such as blue suckers (5.8%; N = 22) and blue catfish (3.7%; N = 14), were also captured effectively with 1 inch trammel nets. 2.5 inch trammel nets, fished only in sturgeon season, caught 17 species and, similar to 1 inch trammel nets, shovelnose sturgeon made up the majority of the total catch

(57.9%; N = 136) followed by blue suckers (14.5%; N = 34) and river carpsuckers (5.5%; N = 13).

Similar to 2004, YOY blue (22.7%; N = 557) and channel catfish (22.7%; N = 433) were captured most frequently in otter trawl samples. Three of the target species; shovelnose sturgeon (12.2%; N = 233), sicklefin chub (17.6; N = 335) and speckled chub (8.0%; N = 154) were captured in similar proportions in otter trawls, suggesting some overlap of habitat use among these important species. Twenty seven juvenile paddlefish were also captured with otter trawls. In summary, otter trawling captured 38 species of fish, most of which are small benthic fishes, which are not easily sampled with other gear types.

The fish community season is different because warm water temperatures and low water levels increase availability of fish and efficiency of sampling, especially in bag seines and mini-fyke nets. These gear types target another group of fishes which are rarely detected with the other standard gear types. Cyprinid species, such as the red shiner (N = 2,799) and emerald shiner (N = 1,414), were caught in high numbers with bag seines and mini-fyke nets. Specifically, bag seines captured 25 species of fish including two species not captured with other gear types (black stripe topminnow, N = 1 and logperch darter, N = 1). Mini-fyke nets captured 38 species and also captured YOY bighead carp (N = 1) and common carp (N = 3), which are life stages of these species that are hard to capture with other gear types. Mini-fyke nets had the highest species richness relative to bag seines, emphasizing the overall redundancy of using both of these gears. Abundant small prey fish in shallow water habitats suggests that these habitats are of great importance to the Missouri River fish community.

Discussion

Adult pallid sturgeon appeared to use different habitats than juveniles. Doyle et al. (2005) suggested in the winter and spring months large pallid sturgeon were more often found associated with the downstream end of sand bars. This held true during the 2005 sampling season in segment 13 in which four adult pallid sturgeon were captured on the lower end or tail end of a sandbar. Inside bend and secondary connected channels macrohabitat types yielded the most captured stock and sub-stock pallid sturgeon. Stock size, quality, and larger pallid sturgeon were captured typically in channel crossovers along with the inside bend and secondary connected channels. Channel border and island tips resulted in more pallid sturgeon captures than other mesohabitats. Standard trammel netting and trawling, along with wild stationary netting on sand bars consistently captured juvenile pallid sturgeon during the spring months and started capturing larger pallid sturgeon as the water warmed past 12ºC. For example, passive nets can be set in edge habitat safely and effectively and occupy the benthic portion of edges, while active gears cannot.

Telemetry information provided by USGS/CERC shows that adult pallid sturgeon use deeper, swifter water than adult shovelnose sturgeon. Active gears such as trammel nets have been used in the last year 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 to catch individually targeted sturgeon. It is likely that juvenile pallid sturgeon may be distributed in areas of lower velocity such as side channels during high water events. An example of this occurred during a sampling trip inside Lisbon chute (RM=218) in late June of 2005 when four juvenile pallid sturgeon were captured with 1 and 2.5 inch trammel nets and 16’ otter trawls in one day. It was apparent that, as discharge increased, juvenile pallid sturgeon tended to aggregate in shallow, slower side channel habitat, making it easier to locate and capture them.

Trawl nets are effective at catching the smaller size classes of sturgeon, 150 - 249 mm, but despite their effectiveness, collection of young of year (YOY) sturgeon remains rare. These

sturgeon were captured in CHNB and ITIP mesohabitats in even proportions to the habitat sampled. Otter trawl CPUE of 0 – 149 mm sturgeon has increased each year since 2003 in Segment 13. Understanding what habitats these small sturgeon occur in is an important component needed to effectively evaluate this younger size class of fish.

Sicklefin and sturgeon chub CPUE has increased each year since 2003, similar to the trend showed by YOY sturgeon. Other Missouri River target species have showed different trends over the last three years. Compared to 2004, blue sucker CPUE in 2005 increased during sturgeon season, but decreased in fish community season. Speckled chub CPUE decreased in sturgeon season and increased in fish community season compared to 2004. Sand shiner CPUE has decreased since 2004, while Hybognathus spp. CPUE has increased since 2004. Sauger CPUE has remained constant over the last three years.

Morphometric measurements were taken on hatchery stocked juvenile pallid sturgeon captured in segment 13, to compare the CI value of a juvenile pallid sturgeon with that of an adult pallid sturgeon. The typical scale is: less than -0.5000 is a pallid sturgeon, -0.4999 to 0.5999 a hybrid (pallid x shovelnose), and greater than 0.6000 a shovelnose sturgeon. The CI value on smaller pallid sturgeon, 400 – 600 mm, was close to the typical cutoff value of -0.5000 for pallid sturgeon/hybrid sturgeon boundary. These results were similar to those of suspected wild fish of the same size group. Pallid sturgeon larger than 700 mm yielded CI values more typical of a true pallid sturgeon, near or less than -1.0000. This provides evidence that size is an important factor in the resulting morphometric index value.

Wild Gear

Side-by-side comparisons of wild stationary one-inch, 200 ft.-long trammel nets and standard gillnets were used to compare the different gear types and test the assumption that smaller fish are not present in areas where standard gillnets are placed. It was discovered that the smaller mesh trammel nets did capture smaller sturgeon, including stocked pallid sturgeon, in these areas more effectively than standard gillnets. Standard gillnets did not capture any juvenile pallid sturgeon while stationary trammel nets captured two, even though efforts were almost ten times higher in gillnets than stationary trammel nets. Stationary trammel nets also captured one stock size pallid sturgeon and two quality hybrid sturgeon. Standard gillnets also only captured

shovelnose sturgeon 280 mm and above, whereas the stationary trammel nets captured shovelnose sturgeon as small as 160 mm. This information is important to understanding the assumptions of monitoring protocols and accepting biases of the different gear types used within each season.

The standard 2.5-inch trammel net was also used as a wild, stationary entanglement gear during the months of April and May. It was used with the idea of selecting for larger sturgeon to focus on capture of broodstock-size pallid sturgeon. It was used as the water temperature exceeded 12.7°C during times when it was thought that pallid sturgeon might be attempting spawning runs. These stationary-set trammel nets captured one stock size and two quality pallid sturgeon along with three quality hybrid sturgeon.

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

Appendix A. (continued).

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

Appendix A. (continued).

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

Appendix A. (continued).

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

Appendix A. (continued).

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

Appendix A. (continued).

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

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

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

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

Gear	Code	Type	Season	Years	CPUE units
Trammel net – 1 inch inner mesh	TN	Standard	All	2003 - Present	fish/100 m drift
Trammel net – 2.5 inch inner mesh	TN25	Standard	Sturgeon	2005 - Present	fish/100 m drift
Gillnet – 4 meshes, small mesh set upstream	GN14	Standard	Sturgeon	2003 - Present	fish/net night
Gillnet – 4 meshes, large mesh set upstream	GN41	Standard	Sturgeon	2003 - Present	fish/net night
Gillnet – 8 meshes, small mesh set upstream	GN18	Standard	Sturgeon	2003 - Present	fish/net night
Gillnet – 8 meshes, large mesh set upstream	GN81	Standard	Sturgeon	2003 - Present	fish/net night
Otter trawl – 16 ft head rope	OT16	Standard	All	2003 - Present	fish/100 m trawled
Bag Seine – quarter arc method pulled upstream	BSQU	Standard	Fish Comm.	2003 - Present	fish/100 m^2
Bag Seine – quarter arc method pulled downstream	BSQD	Standard	Fish Comm.	2003 - Present	fish/100 m^2
Bag Seine – half arc method pulled upstream	BSHU	Standard	Fish Comm.	2003 - Present	fish/100 m^2
Bag Seine – half arc method pulled downstream	BSHD	Standard	Fish Comm.	2003 - Present	fish/100 m^2
Bag seine – rectangular method pulled upstream	BSRU	Standard	Fish Comm.	2003 - Present	fish/100 m^2
Bag seine – rectangular method pulled upstream	BSRD	Standard	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	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	Kansas City	KAC	Missouri	342.0
MO	4	Miami	MIA	Missouri	262.8
MO	4	Grand River	GDR	Missouri	250.0
MO	4	Boonville	BOO	Missouri	195.1
MO	4	Overton	OVT	Missouri	185.1
MO	4	Hartsburg	HAR	Missouri	160.0
MO	4	Jefferson City	JEF	Missouri	143.9
MO	4	Mokane	MOK	Missouri	124.7
MO	4	Hermann	HER	Missouri	97.6
MO	4	Washington	WAS	Missouri	68.5
MO	4	St. Charles	STC	Missouri	28.5

Appendix E. Juvenile and adult pallid sturgeon stocking summary for segment 13 and 14 of the Missouri River (RPMA 4)

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Average Length (mm)	Primary Mark	Secondary Mark
1994	St. Charles	837	1992	3/9/1994	N/A	Coded Wire	Dangler
1994	Washington	607	1992	3/9/1994	N/A	Coded Wire	Dangler
1994	Herman	988	1992	3/9/1994	N/A	Coded Wire	Dangler
1997	St. Charles	400	1997	10/15/1997	N/A	Coded Wire	Dangler
1997	Washington	400	1997	10/16/1997	N/A	Coded Wire	Dangler
1997	Herman	400	1997	10/17/1997	N/A	Coded Wire	Dangler
2002	Boonville	2531	2001	4/3/2002	204	PIT Tag	Some Elastomer
2002	Boonville	165	1999	4/25/2002	437	PIT Tag	Elastomer
2003	Boonville	2852	2002	7/26/2003	284	PIT Tag	
2003	Boonville	1770	2003	12/2/2003	N/A	Coded Wire	Some Elastomer
2004	Boonville	774	2003	7/8/2004	208	PIT Tag	Elastomer
2004	Boonville	916	2003	7/30/2004	263	PIT Tag	
2004	Boonville	9761	2004	9/10/2004	86	Coded Wire	Elastomer
2004	Boonville	2199	2004	10/8/2004	117	Coded Wire	Elastomer

Appendix F

Total catch, overall mean catch per unit effort [± 2 SE], and mean CPUE (fish/100 m) by Mesohabitat within a Macrohabitat for all species caught with each gear type during sturgeon season and fish community season for segment 13 of the Missouri River during 2004-2005. 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	POOL	CHNB	ITIP	POOL	CHNB	POOL	CHNB	ITIP	POOL	ITIP	TLWG
BHCP	4	0.012	0	0	0	0.014	0	0	0.045	0	0	0	0	0	0
		[0.012]	[0]	[0]	[0]	[0.028]	[0]	[0]	[0.063]	[0]	[0]	[0]	[0]	[0]	
BHMW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	
BKBF	1	0.003	0	0	0	0	0	0	0	0	0	0	0	0.062	0
		[0.006]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0.125]	
BKCP	1	0.003	0	0	0	0	0	0.021	0	0	0	0	0	0	0
		[0.006]	[0]	[0]	[0]	[0]	[0]	[0.042]	[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]	[0]	[0]	[0]	
BLCF	147	0.445	0.295	1.231	0.167	0.236	0	0.625	0.523	0.382	0	0	2	0.062	0.5
		[0.132]	[0.225]	[0.859]	[0.333]	[0.167]	[0]	[0.367]	[0.275]	[0.433]	[0]	[0]	[2.517]	[0.125]	
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]	[0]	[0]	[0]	
BMBF	2	0.006	0.023	0	0	0	0	0	0	0.029	0	0	0	0	0
		[0.009]	[0.045]	[0]	[0]	[0]	[0]	[0]	[0]	[0.059]	[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]	[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]	[0]	[0]	[0]	
BUSK*	**25**	**0.076**	**0.136**	**0**	**0**	**0.097**	**0.5**	**0.021**	**0.114**	**0.059**	**0**	**0**	**0**	**0**	**1**
		[0.036]	**[0.097]**	**[0]**	**[0]**	**[0.104]**	**[1]**	**[0.042]**	**[0.113]**	**[0.081]**	**[0]**	**[0]**	**[0]**	**[0]**	
CARP	30	0.091	0	0	0.5	0.028	0.25	0.167	0	0.294	0	0	0.667	0	0
		[0.053]	[0]	[0]	[0.577]	[0.039]	[0.5]	[0.155]	[0]	[0.354]	[0]	[0]	[1.333]	[0]	
CNCF	41	0.124	0.114	0.154	1.167	0.056	0.5	0.083	0.091	0.029	0	0	0.5	0	0.5
		[0.052]	[0.091]	[0.175]	[0.882]	[0.053]	[1]	[0.098]	[0.084]	[0.059]	[0]	[0]	[0.577]	[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]	[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]	[0]	[0]	[0]	
FHCF	3	0.009	0	0.038	0	0	0	0.021	0.023	0	0	0	0	0	0
		[0.01]	[0]	[0.077]	[0]	[0]	[0]	[0.042]	[0.045]	[0]	[0]	[0]	[0]	[0]	
FWDM	17	0.052	0.045	0.115	0	0.014	0	0.062	0.045	0.088	0	0	0	0.062	0
		[0.025]	[0.063]	[0.166]	[0]	[0.028]	[0]	[0.069]	[0.063]	[0.095]	[0]	[0]	[0]	[0.125]	

Appendix F1 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF	ISB			OSB		SCCL			SCCS	
			CHNB	POOL	POOL	CHNB	ITIP	POOL	CHNB	POOL	CHNB	ITIP	POOL	ITIP	TLWG
GDEY	199	0.603	0.318	0.538	0.167	0.486	0.25	0.292	1.364	0.882	0.833	0.5	0	0.438	0
		[0.265]	[0.545]	[0.548]	[0.333]	[0.679]	[0.5]	[0.275]	[1.166]	[1.024]	[0.882]	[1]	[0]	[0.479]	
GDRH	4	0.012	0	0	0	0	0	0.021	0.023	0.029	0	0	0	0	0
		[0.012]	[0]	[0]	[0]	[0]	[0]	[0.042]	[0.045]	[0.059]	[0]	[0]	[0]	[0]	
GNSF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	
GSCP	13	0.039	0	0	0	0.028	0	0.021	0.114	0.059	0.167	0	0	0.125	0
		[0.024]	[0]	[0]	[0]	[0.039]	[0]	[0.042]	[0.113]	[0.081]	[0.333]	[0]	[0]	[0.25]	
GZSD	40	0.121	0.091	0	0	0.028	0	0.083	0.159	0.206	1	0	0	0.125	0
		[0.066]	[0.142]	[0]	[0]	[0.056]	[0]	[0.115]	[0.166]	[0.211]	[2]	[0]	[0]	[0.25]	
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]**	**[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]	[0]	[0]	[0]	
LKSG	12	0.036	0.045	0.038	0	0.014	0	0.042	0.068	0.059	0	0	0	0.062	0
		[0.022]	[0.091]	[0.077]	[0]	[0.028]	[0]	[0.058]	[0.075]	[0.081]	[0]	[0]	[0]	[0.125]	
LNGR	245	0.742	1.545	0.769	0	0.792	0	0.25	0.909	0.765	0	0	0.333	0.188	0.5
		[0.445]	[2.763]	[1.294]	[0]	[0.718]	[0]	[0.217]	[1.062]	[0.892]	[0]	[0]	[0.333]	[0.183]	
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]	[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]	[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]	[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]	[0]	[0]	[0]	
PDFH	5	0.015	0	0	0	0.042	0	0	0.045	0	0	0	0	0	0
		[0.013]	[0]	[0]	[0]	[0.047]	[0]	[0]	[0.063]	[0]	[0]	[0]	[0]	[0]	
PDSG*	**6**	**0.018**	**0.023**	**0**	**0**	**0.042**	**0**	**0**	**0.023**	**0**	**0**	**0**	**0**	**0.062**	**0**
		[0.015]	**[0.045]**	**[0]**	**[0]**	**[0.047]**	**[0]**	**[0]**	**[0.045]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0.125]**	
QLBK	8	0.024	0	0	0.333	0	0	0.042	0	0.118	0	0	0	0	0
		[0.027]	[0]	[0]	[0.333]	[0]	[0]	[0.058]	[0]	[0.235]	[0]	[0]	[0]	[0]	

Appendix F1 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF	ISB			OSB		SCCL			SCCS	
			CHNB	POOL	POOL	CHNB	ITIP	POOL	CHNB	POOL	CHNB	ITIP	POOL	ITIP	TLWG
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]	[0]	[0]	[0]	
RVCS	62	0.188	0.068	0.308	0	0.083	0	0.208	0.023	0.647	0.167	0	0	0	0
		[0.082]	[0.075]	[0.46]	[0]	[0.093]	[0]	[0.199]	[0.045]	[0.381]	[0.333]	[0]	[0]	[0]	
RVRH	1	0.003	0	0	0	0	0	0	0.023	0	0	0	0	0	0
		[0.006]	[0]	[0]	[0]	[0]	[0]	[0]	[0.045]	[0]	[0]	[0]	[0]	[0]	
RVSN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	
SBWB	2	0.006	0	0	0	0.014	0	0.021	0	0	0	0	0	0	0
		[0.009]	[0]	[0]	[0]	[0.028]	[0]	[0.042]	[0]	[0]	[0]	[0]	[0]	[0]	
SDBS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	
SFCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[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]**	**[0]**	**[0]**	**[0]**	
SGER*	**38**	**0.115**	**0.045**	**0.038**	**0**	**0.056**	**0.25**	**0.125**	**0.159**	**0.294**	**0.5**	**0.1**	**0**	**0.062**	**0**
		[0.05]	**[0.091]**	**[0.077]**	**[0]**	**[0.066]**	**[0.5]**	**[0.09]**	**[0.166]**	**[0.322]**	**[0.577]**	**[0.2]**	**[0]**	**[0.125]**	
SHRH	27	0.082	0.091	0	0	0.042	0	0.083	0.068	0.176	0.333	0.2	0	0.062	0
		[0.046]	[0.142]	[0]	[0]	[0.047]	[0]	[0.098]	[0.1]	[0.296]	[0.667]	[0.4]	[0]	[0.125]	
SJHR	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]	[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]**	**[0]**	**[0]**	**[0]**	
SMBF	27	0.082	0.068	0.038	0	0.056	0	0.167	0.023	0.206	0.167	0	0	0	0
		[0.035]	[0.1]	[0.077]	[0]	[0.053]	[0]	[0.143]	[0.045]	[0.15]	[0.333]	[0]	[0]	[0]	
SNGR	90	0.273	0.068	0.192	0	0.111	0	0.208	0.182	0.706	0.167	0	0.167	0	0
		[0.139]	[0.1]	[0.311]	[0]	[0.09]	[0]	[0.19]	[0.224]	[0.522]	[0.333]	[0]	[0.333]	[0]	
SNPD	6	0.018	0.045	0.038	0	0.014	0	0.021	0.023	0	0	0	0	0	0
		[0.015]	[0.063]	[0.077]	[0]	[0.028]	[0]	[0.042]	[0.045]	[0]	[0]	[0]	[0]	[0]	
SNSG*	**2745**	**8.318**	**12.114**	**11.192**	**0.167**	**4.778**	**2**	**14.083**	**5.295**	**7.618**	**0.667**	**3.8**	**15.5**	**11.625**	**34**
		[1.649]	**[6.32]**	**[4.789]**	**[0.333]**	**[2.114]**	**[2]**	**[5.375]**	**[1.685]**	**[5.073]**	**[0.882]**	**[3.172]**	**[9.644]**	**[10.459]**	
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]**	**[0]**	**[0]**	**[0]**	

Appendix F1 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF	ISB			OSB		SCCL			SCCS	
			CHNB	POOL	POOL	CHNB	ITIP	POOL	CHNB	POOL	CHNB	ITIP	POOL	ITIP	TLWG
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]	[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]	[0]	[0]	[0]	
SVCP	6	0.018	0	0.115	0	0	0	0.042	0.023	0	0	0	0	0	0
		[0.015]	[0]	[0.122]	[0]	[0]	[0]	[0.058]	[0.045]	[0]	[0]	[0]	[0]	[0]	
TPMT	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]	[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]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	
UCN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[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]	[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]	[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]	[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]	[0]	[0]	[0]	
WLYE	5	0.015	0.045	0	0	0	0.25	0.021	0	0.029	0	0	0	0	0
			(0.063)	(0)	(0)	(0)	(0.5)	(0.042)	(0)	(0.059)	(0)	(0)	(0)	(0)	
WTBS	1	0.003	0.023	0	0	0	0	0	0	0	0	0	0	0	0
		[0.006]	[0.045]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	
WTCP	2	0.006	0	0	0	0	0	0.042	0	0	0	0	0	0	0
		[0.012]	[0]	[0]	[0]	[0]	[0]	[0.083]	[0]	[0]	[0]	[0]	[0]	[0]	
WTSK	5	0.015	0	0.038	0	0	0	0.021	0.023	0.059	0	0	0	0	0
		[0.013]	[0]	[0.077]	[0]	[0]	[0]	[0.042]	[0.045]	[0.081]	[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	CONF	ISB	SCCL			SCCS	
			CHNB	CHNB	CHNB	CHNB	ITIP	TLWG	CHNB	ITIP
BHCP	1	0.002	0	0	0.003	0	0	0	0	0
		[0.004]	[0]	[0]	[0.006]	[0]	[0]			[0]
BHMW	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
BKBF	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]
BKSS	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
BLCF	26	0.058	0.022	0	0.071	0.111	0.154	0	0	0
		[0.033]	[0.033]	[0]	[0.048]	[0.222]	[0.309]			[0]
BLGL	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]
BNMW	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]
BUSK*	**40**	**0.093**	**0.083**	**0**	**0.09**	**0**	**0**	**0**	**0**	**0.3**
		[0.043]	**[0.102]**	**[0]**	**[0.04]**	**[0]**	**[0]**			**[0.451]**
CARP	3	0.01	0.01	0	0.012	0	0	0	0	0
		[0.013]	[0.02]	[0]	[0.019]	[0]	[0]			[0]
CNCF	10	0.025	0.024	0	0.028	0	0	0	0	0.04
		[0.02]	[0.049]	[0]	[0.025]	[0]	[0]			[0.079]
CNSN	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
ERSN	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
FHCF	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
FWDM	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	SCCL			SCCS	
			CHNB	CHNB	CHNB	CHNB	ITIP	TLWG	CHNB	ITIP
GDEY	12	0.027	0.023	0	0.024	0	0	0	0	0.119
		[0.023]	[0.046]	[0]	[0.025]	[0]	[0]			[0.237]
GDRH	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
GNSF	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
GSCP	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
GZSD	2	0.004	0	0	0.006	0	0	0	0	0
		[0.005]	[0]	[0]	[0.008]	[0]	[0]			[0]
HBNS*	**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]
LKSG	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
LNGR	3	0.01	0	0	0.011	0.074	0	0	0	0
		[0.012]	[0]	[0]	[0.015]	[0.148]	[0]			[0]
MMSN	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]
MQTF	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
OSSF	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
PDFH	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
PDSG*	**6**	**0.014**	**0.014**	**0**	**0.012**	**0.037**	**0**	**0.333**	**0**	**0**
		[0.012]	**[0.027]**	**[0]**	**[0.014]**	**[0.074]**	**[0]**			**[0]**
QLBK	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	SCCL			SCCS	
			CHNB	CHNB	CHNB	CHNB	ITIP	TLWG	CHNB	ITIP
RDSN	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
RVCS	5	0.011	0.02	0	0.01	0	0	0	0	0
		[0.013]	[0.041]	[0]	[0.014]	[0]	[0]			[0]
RVRH	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
RVSN	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
SBWB	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
SDBS	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
SFCB*	**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]**
SGER*	**2**	**0.004**	**0**	**0**	**0.007**	**0**	**0**	**0**	**0**	**0**
		[0.006]	**[0]**	**[0]**	**[0.01]**	**[0]**	**[0]**			**[0]**
SHRH	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
SJHR	1	0.002	0	0	0.003	0	0	0	0	0
		[0.004]	[0]	[0]	[0.006]	[0]	[0]			[0]
SKCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**			**[0]**
SMBF	16	0.043	0.032	0	0.04	0	0	0	0	0.194
		[0.023]	[0.044]	[0]	[0.028]	[0]	[0]			[0.18]
SNGR	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
SNPD	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
SNSG*	**683**	**1.754**	**1.747**	**5.397**	**1.75**	**2.491**	**0.977**	**4**	**0**	**0.789**
		[0.45]	**[1.262]**	**[6.349]**	**[0.525]**	**[1.646]**	**[1.131]**			**[0.875]**
SNSN*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**			**[0]**

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	SCCL			SCCS	
			CHNB	CHNB	CHNB	CHNB	ITIP	TLWG	CHNB	ITIP
STCT	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
SVCB	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
SVCP	1	0.007	0	0	0.012	0	0	0	0	0
		[0.014]	[0]	[0]	[0.023]	[0]	[0]			[0]
TPMT	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
UCF	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
UCN	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]
UCY	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]
UNID	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
WLYE	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]			[0]
WTBS	0	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]			[0]
WTSK	0	0	0	0	0	0	0	0	0	0

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

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
BHCP	1	0.006	0.034	0	0	0	0	0
		[0.012]	[0.069]	[0]	[0]	[0]		[0]
BHMW	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
BKBF	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]
BKSS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
BLCF	1	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
BLGL	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]
BNMW	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]
BUSK*	**38**	**0.13**	**0.067**	**0**	**0.167**	**0**	**0**	**0.111**
		[0.058]	**[0.092]**	**[0]**	**[0.08]**	**[0]**		**[0.222]**
CARP	5	0.02	0.023	0	0.02	0.054	0	0
		[0.021]	[0.045]	[0]	[0.028]	[0.108]		[0]
CNCF	1	0.003	0	0	0.005	0	0	0
		[0.006]	[0]	[0]	[0.009]	[0]		[0]
CNSN	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]
FHCF	2	0.005	0	0	0.008	0	0	0
		[0.007]	[0]	[0]	[0.011]	[0]		[0]
FWDM	4	0.011	0.014	0	0.008	0.056	0	0
		[0.011]	[0.028]	[0]	[0.011]	[0.111]		[0]

Appendix F3 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
GDEY	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
GDRH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
GNSF	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
GSCP	4	0.013	0.014	0	0.011	0.064	0	0
		[0.017]	[0.028]	[0]	[0.022]	[0.128]		[0]
GZSD	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
HBNS*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**		**[0]**
LGPH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
LKSG	1	0.005	0	0	0.007	0	0	0
		[0.009]	[0]	[0]	[0.014]	[0]		[0]
LNGR	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]
MNEY	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]
OSSF	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
PDFH	2	0.008	0.034	0	0.003	0	0	0
		[0.013]	[0.069]	[0]	[0.005]	[0]		[0]
PDSG*	**2**	**0.006**	**0.017**	**0**	**0**	**0.056**	**0**	**0**
		[0.008]	**[0.033]**	**[0]**	**[0]**	**[0.111]**		**[0]**
QLBK	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	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
RDSN	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
RVCS	14	0.072	0	0	0.085	0.056	0.333	0.167
		[0.067]	[0]	[0]	[0.096]	[0.111]		[0.333]
RVRH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
RVSN	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
SBWB	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
SDBS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
SFCB*	**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]**
SGER*	**1**	**0.004**	**0**	**0**	**0.006**	**0**	**0**	**0**
		[0.008]	**[0]**	**[0]**	**[0.011]**	**[0]**		**[0]**
SHRH	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]
SKCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**		**[0]**
SMBF	32	0.117	0.102	0	0.135	0.16	0	0
		[0.066]	[0.098]	[0]	[0.094]	[0.143]		[0]
SNGR	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
SNPD	1	0.009	0.048	0	0	0	0	0
		[0.017]	[0.095]	[0]	[0]	[0]		[0]
SNSG*	**160**	**0.508**	**0.485**	**0.114**	**0.501**	**0.66**	**0**	**0.861**
		[0.169]	**[0.493]**	**[0.227]**	**[0.194]**	**[0.828]**		**[0.896]**
SNSN*	**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	SCCL		SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP	ITIP
STCT	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]
SVCP	4	0.023	0	0	0.034	0	0	0
		[0.027]	[0]	[0]	[0.041]	[0]		[0]
TPMT	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]
UCN	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]
UCY	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]
UNID	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
WLYE	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]		[0]
WTBS	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]
WTSK	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	CONF	ISB	OSB	SCCL		SCCS		TRIB
			CHNB	CHNB	CHNB	CHNB	CHNB	ITIP	CHNB	ITIP	CHNB
BHCP	1	0.003	0	0	0.005	0	0	0	0	0	0
		[0.006]	[0]	[0]	[0.01]	[0]	[0]	[0]		[0]	[0]
BHMW	28	0.064	0	0	0.007	0	0.022	0	0	0	1.411
		[0.056]	[0]	[0]	[0.015]	[0]	[0.044]	[0]		[0]	[1.052]
BKBF	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]
BKSS	1	0.001	0	0	0	0	0	0	0	0.037	0
		[0.003]	[0]	[0]	[0]	[0]	[0]	[0]		[0.073]	[0]
BLCF	954	2.093	1.914	1.212	2.465	4.682	0.212	0.114	0	0.219	0.254
		[1.269]	[1.252]	[2.424]	[1.971]	[8.299]	[0.225]	[0.229]		[0.29]	[0.508]
BLGL	9	0.021	0	0.357	0.002	0	0	0	0	0	0.389
		[0.029]	[0]	[0.714]	[0.005]	[0]	[0]	[0]		[0]	[0.662]
BMBF	1	0.002	0	0	0.004	0	0	0	0	0	0
		[0.005]	[0]	[0]	[0.008]	[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]
BTTM	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]
BUSK*	**15**	**0.028**	**0.009**	**0**	**0.042**	**0**	**0**	**0**	**0**	**0.025**	**0**
		[0.016]	**[0.018]**	**[0]**	**[0.026]**	**[0]**	**[0]**	**[0]**		**[0.049]**	**[0]**
CARP	7	0.016	0.013	0	0	0	0	0	0	0.046	0.297
		[0.019]	[0.025]	[0]	[0]	[0]	[0]	[0]		[0.093]	[0.408]
CNCF	615	1.236	1.095	3.139	1.265	0.455	0.556	0.167	0.813	3.251	1.768
		[0.52]	[0.607]	[3.42]	[0.807]	[0.332]	[0.473]	[0.333]		[3.87]	[1.377]
CNSN	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]
ERSN	26	0.065	0.009	0	0.072	0.051	0.074	0	0	0	0.322
		[0.052]	[0.019]	[0]	[0.079]	[0.101]	[0.149]	[0]		[0]	[0.426]
FHCF	14	0.035	0.009	0	0.021	0.277	0.076	0	0	0	0.056
		[0.026]	[0.018]	[0]	[0.018]	[0.438]	[0.11]	[0]		[0]	[0.111]
FWDM	196	0.452	0.53	3.82	0.129	0.62	0.101	0	0.203	0.237	4.823
		[0.25]	[0.654]	[5.216]	[0.098]	[1.113]	[0.137]	[0]		[0.312]	[4.012]

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	SCCL		SCCS		TRIB
			CHNB	CHNB	CHNB	CHNB	CHNB	ITIP	CHNB	ITIP	CHNB
GDEY	36	0.068	0.094	1.071	0.06	0	0.106	0	0	0	0
		[0.045]	[0.128]	[2.143]	[0.055]	[0]	[0.157]	[0]		[0]	[0]
GDRH	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]
GNSF	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]
GSCP	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]
GZSD	39	0.085	0.013	0	0	0	0	0	0	0	2.022
		[0.104]	[0.026]	[0]	[0]	[0]	[0]	[0]		[0]	[2.278]
HBNS*	**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]
LKSG	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]
LNGR	1	0.001	0	0	0.002	0	0	0	0	0	0
		[0.003]	[0]	[0]	[0.005]	[0]	[0]	[0]		[0]	[0]
MMSN	1	0.003	0	0	0	0	0.051	0	0	0	0
		[0.006]	[0]	[0]	[0]	[0]	[0.103]	[0]		[0]	[0]
MNEY	1	0.003	0	0	0.005	0	0	0	0	0	0
		[0.006]	[0]	[0]	[0.01]	[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]
OSSF	2	0.005	0	0.303	0	0	0	0	0	0	0.056
		[0.007]	[0]	[0.606]	[0]	[0]	[0]	[0]		[0]	[0.111]
PDFH	50	0.133	0.228	0.606	0.078	0.744	0.057	0	0	0	0
		[0.067]	[0.2]	[1.212]	[0.064]	[0.743]	[0.078]	[0]		[0]	[0]
PDSG*	**6**	**0.01**	**0**	**0**	**0.012**	**0**	**0.027**	**0**	**0**	**0.024**	**0**
		[0.009]	**[0]**	**[0]**	**[0.013]**	**[0]**	**[0.053]**	**[0]**		**[0.048]**	**[0]**
QLBK	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	SCCL		SCCS		TRIB
			CHNB	CHNB	CHNB	CHNB	CHNB	ITIP	CHNB	ITIP	CHNB
RDSN	29	0.084	0	0	0.113	0	0.273	0	0	0	0
		[0.12]	[0]	[0]	[0.193]	[0]	[0.546]	[0]		[0]	[0]
RVCS	14	0.038	0.051	0	0.01	0	0.025	0	0	0	0.391
		[0.024]	[0.071]	[0]	[0.016]	[0]	[0.05]	[0]		[0]	[0.238]
RVRH	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]
RVSN	1	0.004	0	0	0.007	0	0	0	0	0	0
		[0.009]	[0]	[0]	[0.015]	[0]	[0]	[0]		[0]	[0]
SBWB	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]
SDBS	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]
SFCB*	**781**	**1.371**	**0.796**	**1.071**	**1.404**	**0.429**	**0.578**	**0.16**	**1.22**	**2.132**	**5.783**
		[0.498]	**[0.482]**	**[2.143]**	**[0.736]**	**[0.353]**	**[0.365]**	**[0.32]**		**[1.76]**	**[4.11]**
SGCB*	**38**	**0.069**	**0.022**	**0**	**0.105**	**0**	**0**	**0**	**0**	**0.073**	**0**
		[0.031]	**[0.044]**	**[0]**	**[0.049]**	**[0]**	**[0]**	**[0]**		**[0.103]**	**[0]**
SGER*	**2**	**0.001**	**0**	**0**	**0.002**	**0**	**0**	**0**	**0**	**0**	**0**
		[0.003]	**[0]**	**[0]**	**[0.005]**	**[0]**	**[0]**	**[0]**		**[0]**	**[0]**
SHRH	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]
SJHR	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]
SKCB*	**350**	**0.716**	**0.877**	**0.357**	**0.637**	**1.385**	**0.789**	**0**	**0**	**1.648**	**0.056**
		[0.22]	**[0.572]**	**[0.714]**	**[0.293]**	**[0.964]**	**[0.508]**	**[0]**		**[1.662]**	**[0.111]**
SMBF	1	0.003	0	0	0.006	0	0	0	0	0	0
		[0.007]	[0]	[0]	[0.011]	[0]	[0]	[0]		[0]	[0]
SNGR	7	0.018	0.023	0	0	0	0	0	0	0	0.346
		[0.017]	[0.046]	[0]	[0]	[0]	[0]	[0]		[0]	[0.304]
SNPD	3	0.005	0	0	0.004	0.057	0	0	0	0	0
		[0.007]	[0]	[0]	[0.006]	[0.114]	[0]	[0]		[0]	[0]
SNSG*	**527**	**0.984**	**1.014**	**0.606**	**0.953**	**1.409**	**1.372**	**0.431**	**0.407**	**0.539**	**0**
		[0.212]	**[0.515]**	**[1.212]**	**[0.23]**	**[1.164]**	**[1.286]**	**[0.463]**		**[0.467]**	**[0]**
SNSN*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**		**[0]**	**[0]**

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	SCCL		SCCS		TRIB
			CHNB	CHNB	CHNB	CHNB	CHNB	ITIP	CHNB	ITIP	CHNB
STCT	4	0.009	0.027	0.303	0.003	0	0	0	0	0	0
		[0.009]	[0.038]	[0.606]	[0.005]	[0]	[0]	[0]		[0]	[0]
SVCB	89	0.178	0.163	0	0.161	0	0.352	0	0.203	0.118	0.65
		[0.089]	[0.143]	[0]	[0.129]	[0]	[0.424]	[0]		[0.115]	[0.645]
SVCP	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]
TPMT	1	0.002	0	0	0	0	0	0	0	0	0.044
		[0.004]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0.089]
UCF	6	0.017	0	0	0.011	0.21	0	0	0	0	0
		[0.023]	[0]	[0]	[0.015]	[0.42]	[0]	[0]		[0]	[0]
UCN	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]
UCT	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]
UHY	120	0.243	0.114	0	0.038	0	0	0	0	0	4.867
		[0.393]	[0.229]	[0]	[0.044]	[0]	[0]	[0]		[0]	[9.486]
UNID	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]
WLYE	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]
WTBS	35	0.051	0	0	0.085	0	0	0	0	0	0
		[0.078]	[0]	[0]	[0.13]	[0]	[0]	[0]		[0]	[0]
WTCP	2	0.004	0	0	0	0	0	0	0	0	0.096
		[0.006]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0.128]
WTSK	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]	[0]

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

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCS	TRIB	TRMS
			BARS	BARS	BARS	BARS	BARS	BARS
BHCP	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
BHMW	60	0.952	2.545	0.389	1.111	0.667	0.125	2
		[0.511]	[1.97]	[0.401]	[1.778]	[0.797]	[0.25]	[2]
BKBF	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	10	0.159	0	0	0.333	0.467	0	0
		[0.24]	[0]	[0]	[0.667]	[0.933]	[0]	[0]
BLCF	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
BLGL	18	0.286	0.091	0.222	0.333	0.133	1	0
		[0.189]	[0.182]	[0.258]	[0.333]	[0.182]	[1.195]	[0]
BMBF	1	0.016	0	0	0	0	0.125	0
		[0.032]	[0]	[0]	[0]	[0]	[0.25]	[0]
BNMW	1	0.016	0	0	0.111	0	0	0
		[0.032]	[0]	[0]	[0.222]	[0]	[0]	[0]
BTTM	1	0.016	0	0	0.111	0	0	0
		[0.032]	[0]	[0]	[0.222]	[0]	[0]	[0]
BUSK*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
CARP	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNCF	48	0.762	1	0.333	0.556	1.667	0.125	0
		[0.361]	[1.144]	[0.229]	[0.676]	[1.045]	[0.25]	[0]
CNSN	6	0.095	0.091	0	0	0.133	0.375	0
		[0.108]	[0.182]	[0]	[0]	[0.182]	[0.75]	[0]
ERSN	947	15.032	32.273	12.333	12.111	12.867	8	2
		[9.616]	[46.667]	[14.113]	[14.979]	[10.863]	[6.761]	[4]
FHCF	4	0.063	0	0.056	0	0.133	0.125	0
		[0.077]	[0]	[0.111]	[0]	[0.267]	[0.25]	[0]
FWDM	16	0.254	1.273	0	0.111	0.067	0	0
		[0.384]	[2.159]	[0]	[0.222]	[0.133]	[0]	[0]

Appendix F6 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCS	TRIB	TRMS
			BARS	BARS	BARS	BARS	BARS	BARS
GDEY	1	0.016	0	0	0.111	0	0	0
		[0.032]	[0]	[0]	[0.222]	[0]	[0]	[0]
GDRH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
GNSF	13	0.206	0.545	0.222	0	0.133	0.125	0
		[0.222]	[1.091]	[0.345]	[0]	[0.267]	[0.25]	[0]
GSCP	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
GZSD	57	0.905	1.273	1.333	1.111	0.333	0.5	0
		[0.819]	[1.147]	[2.551]	[2.222]	[0.319]	[1]	[0]
HBNS*	**11**	**0.175**	**0.455**	**0**	**0.444**	**0.133**	**0**	**0**
		[0.173]	**[0.563]**	**[0]**	**[0.889]**	**[0.267]**	**[0]**	**[0]**
LGPH	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]
LNGR	2	0.032	0	0.056	0.111	0	0	0
		[0.045]	[0]	[0.111]	[0.222]	[0]	[0]	[0]
MMSN	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
MNEY	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
MQTF	32	0.508	0.455	0.611	0	0.667	0.75	0
		[0.362]	[0.415]	[0.902]	[0]	[0.95]	[0.824]	[0]
OSSF	25	0.397	0.636	0.444	0.444	0	0.5	1
		[0.285]	[0.619]	[0.779]	[0.676]	[0]	[0.756]	[2]
PDFH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
PDSG*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
QLBK	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]

Appendix F6 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCS	TRIB	TRMS
			BARS	BARS	BARS	BARS	BARS	BARS
RDSN	1757	27.889	57.636	14.833	35.333	30.133	8	11
		[14.037]	[55.642]	[12.481]	[51.637]	[23.72]	[5.707]	[22]
RVCS	18	0.286	0.273	0.333	0.111	0.4	0.25	0
		[0.153]	[0.282]	[0.323]	[0.222]	[0.428]	[0.327]	[0]
RVRH	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
RVSN	8	0.127	0	0.056	0.111	0.333	0.125	0
		[0.096]	[0]	[0.111]	[0.222]	[0.319]	[0.25]	[0]
SBWB	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SDBS	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SFCB*	**11**	**0.175**	**0**	**0.333**	**0.111**	**0.267**	**0**	**0**
		[0.184]	**[0]**	**[0.457]**	**[0.222]**	**[0.533]**	**[0]**	**[0]**
SGCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
SGER*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
SHRH	1	0.016	0	0.056	0	0	0	0
		[0.032]	[0]	[0.111]	[0]	[0]	[0]	[0]
SJHR	1	0.016	0	0	0.111	0	0	0
		[0.032]	[0]	[0]	[0.222]	[0]	[0]	[0]
SKCB*	**122**	**1.937**	**3.727**	**1.722**	**0**	**3.333**	**0**	**0**
		[1.561]	**[6.186]**	**[2.483]**	**[0]**	**[3.702]**	**[0]**	**[0]**
SMBF	2	0.032	0.091	0.056	0	0	0	0
		[0.045]	[0.182]	[0.111]	[0]	[0]	[0]	[0]
SNGR	40	0.635	0.818	0.333	0.667	0.667	0.875	1
		[0.269]	[0.592]	[0.362]	[0.882]	[0.504]	[1.161]	[2]
SNPD	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNSG*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
SNSN*	**4**	**0.063**	**0**	**0**	**0**	**0.133**	**0.25**	**0**
		[0.089]	**[0]**	**[0]**	**[0]**	**[0.267]**	**[0.5]**	**[0]**

Appendix F6 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCS	TRIB	TRMS
			BARS	BARS	BARS	BARS	BARS	BARS
STCT	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
SVCB	7	0.111	0.182	0	0.111	0.267	0	0
		[0.112]	[0.244]	[0]	[0.222]	[0.413]	[0]	[0]
SVCP	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
TPMT	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]
UCN	2	0.032	0	0.111	0	0	0	0
		[0.063]	[0]	[0.222]	[0]	[0]	[0]	[0]
UCT	1	0.016	0	0	0.111	0	0	0
		[0.032]	[0]	[0]	[0.222]	[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]
WLYE	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]
WTBS	7	0.111	0.091	0.111	0.333	0	0.125	0
		[0.121]	[0.182]	[0.222]	[0.667]	[0]	[0.25]	[0]
WTCP	30	0.476	0.364	0	0.556	0.067	2.375	0.5
		[0.323]	[0.557]	[0]	[0.676]	[0.133]	[1.849]	[1]
WTSK	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]

Appendix F7. Bag Seine: overall season and segment summary. Lists CPUE (fish/100 m^2) and 2 standard errors in brackets.

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCS	SCN
			BARS	BARS	BARS	BARS	BARS
BHCP	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
BHMW	3	0.026	0	0.057	0	0	0
		[0.03]	[0]	[0.063]	[0]	[0]	[0]
BKBF	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]
BKSS	1	0.006	0.039	0	0	0	0
		[0.012]	[0.078]	[0]	[0]	[0]	[0]
BLCF	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
BLGL	1	0.006	0.037	0	0	0	0
		[0.012]	[0.074]	[0]	[0]	[0]	[0]
BMBF	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
BNMW	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
BTTM	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
BUSK*	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
CARP	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
CNCF	42	0.424	0.089	0.433	0	0.879	0
		[0.234]	[0.179]	[0.321]	[0]	[0.68]	[0]
CNSN	1	0.014	0	0	0	0.06	0
		[0.029]	[0]	[0]	[0]	[0.119]	[0]
ERSN	534	4.801	3.067	6.987	2.035	3.838	0.663
		[2.015]	[1.345]	[4.057]	[1.393]	[2.05]	[0.592]
FHCF	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
FWDM	25	0.4	0.455	0.063	4.329	0.159	0
		[0.438]	[0.632]	[0.091]	[6.243]	[0.244]	[0]

Appendix F7 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCS	SCN
			BARS	BARS	BARS	BARS	BARS
GDEY	8	0.064	0	0.109	0	0.06	0
		[0.103]	[0]	[0.217]	[0]	[0.119]	[0]
GDRH	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
GNSF	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
GSCP	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
GZSD	270	2.393	0.186	1.618	3.426	5.887	0
		[2.294]	[0.372]	[1.389]	[5.604]	[9.051]	[0]
HBNS*	**15**	**0.181**	**0**	**0.108**	**0.841**	**0.335**	**0**
		[0.164]	**[0]**	**[0.113]**	**[0.842]**	**[0.593]**	**[0]**
LGPH	1	0.012	0.074	0	0	0	0
		[0.024]	[0.149]	[0]	[0]	[0]	[0]
LKSG	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
LNGR	5	0.042	0.263	0	0	0	0
		[0.084]	[0.525]	[0]	[0]	[0]	[0]
MMSN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
MNEY	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
MQTF	4	0.039	0	0	0	0.105	0.179
		[0.057]	[0]	[0]	[0]	[0.21]	[0.357]
OSSF	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
PDFH	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
PDSG*	**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]

Appendix F7 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCS	SCN
			BARS	BARS	BARS	BARS	BARS
RDSN	1049	9.561	9.836	9.216	2.956	9.951	14.778
		[3.56]	[5.936]	[6.353]	[3.084]	[7.458]	[4.8]
RVCS	33	0.415	0.179	0.355	0.866	0.595	0.357
		[0.318]	[0.357]	[0.217]	[1.732]	[1.19]	[0.714]
RVRH	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
RVSN	5	0.047	0	0.056	0.353	0	0
		[0.041]	[0]	[0.062]	[0.379]	[0]	[0]
SBWB	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SDBS	1	0.008	0	0	0	0.035	0
		[0.017]	[0]	[0]	[0]	[0.07]	[0]
SFCB*	**4**	**0.047**	**0**	**0.04**	**0**	**0.119**	**0**
		[0.062]	**[0]**	**[0.055]**	**[0]**	**[0.238]**	**[0]**
SGCB*	**3**	**0.043**	**0.268**	**0**	**0**	**0**	**0**
		[0.063]	**[0.376]**	**[0]**	**[0]**	**[0]**	**[0]**
SGER*	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
SHRH	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SJHR	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SKCB*	**64**	**0.557**	**0**	**1.078**	**0**	**0.13**	**0.37**
		[0.373]	**[0]**	**[0.752]**	**[0]**	**[0.175]**	**[0.485]**
SMBF	19	0.169	0.311	0.163	0	0.124	0.179
		[0.144]	[0.437]	[0.251]	[0]	[0.21]	[0.357]
SNGR	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SNPD	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SNSG*	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
SNSN*	**1**	**0.026**	**0**	**0**	**0.433**	**0**	**0**
		[0.052]	**[0]**	**[0]**	**[0.866]**	**[0]**	**[0]**

Appendix F7 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCS	SCN
			BARS	BARS	BARS	BARS	BARS
STCT	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SVCB	13	0.146	0.519	0.037	0	0.134	0.179
		[0.116]	[0.576]	[0.073]	[0]	[0.182]	[0.357]
SVCP	1	0.014	0	0	0	0.06	0
		[0.029]	[0]	[0]	[0]	[0.119]	[0]
TPMT	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UCF	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UCN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UCT	1	0.014	0	0	0	0.06	0
		[0.029]	[0]	[0]	[0]	[0.119]	[0]
UCY	3	0.071	0	0.155	0	0	0
		[0.143]	[0]	[0.311]	[0]	[0]	[0]
UHY	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UNID	5	0.071	0	0	0	0.298	0
		[0.143]	[0]	[0]	[0]	[0.595]	[0]
WLYE	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
WTBS	15	0.113	0	0.186	0.136	0.079	0
		[0.175]	[0]	[0.373]	[0.272]	[0.159]	[0]
WTCP	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
WTSK	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]

Appendix G. Hatchery names, locations, and abbreviations.

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

Appendix H. Alphabetic list of Missouri River fishes with total CPUE by gear type for sturgeon season (fall through spring) and fish community season (summer) during 2004 – 2005 for segment 13 of the Missouri River. Species codes are located in Appendix A. Asterisks and bold type denote targeted native Missouri River species.

Species Code	Sturgeon Season (Fall through Spring)					Fish Community Season (Summer)			
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl		1 Inch Trammel Net	Bag Seine	Mini-Fyke Net	Otter Trawl
BDKF									
BESN									
BHCP	0.003	0.006	0.012	0.005					
BHMW				0.002			0.026	0.952	0.165
BKBF			0.003						
BKBH									
BKCP			0.003						
BKSS				0.002			0.006	0.159	
BLCF	0.052		0.445	0.229		0.067			5.146
BLGL				0.005			0.006	0.286	0.046
BMBF			0.006	0.004				0.016	
BMSN									
BNMW								0.016	
BRBT									
BSMW									
BTTM								0.016	
BUSK*	**0.107**	**0.13**	**0.076**	**0.03**		**0.074**			**0.024**
CARP	0.004	0.02	0.091	0.006		0.018			0.032
CKCB									
CLSR									
CMSN									
CNCF	0.032	0.003	0.124	0.621		0.016	0.424	0.762	2.244
CNLP									
CNSN							0.014	0.095	
ERSN				0.02			4.801	15.032	0.138
FHCB									
FHCF		0.005	0.009	0.034				0.063	0.036
FHMW									

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	Bag Seine	Mini-Fyke Net	Otter Trawl
FWDM		0.011	0.052	0.09			0.4	0.254	1.045
GDEY	0.029		0.603	0.033		0.025	0.064	0.016	0.126
GDFH									
GDRH			0.012						
GDSN									
GNSF								0.206	
GSBG									
GSCP		0.013	0.039						
GSPK									
GZSD	0.006		0.121				2.393	0.905	0.225
HBNS*							**0.181**	**0.175**	
HFCS									
JYDR									
LAB									
LESF									
LGPH							0.012		
LKSG		0.005	0.036						
LMBS									
LNDC									
LNGR	0.005		0.742			0.017	0.042	0.032	0.004
MMSN									0.008
MNEY									0.008
MQTF							0.039	0.508	
NTPK									
OSSF				0.004				0.397	0.006
PDFH		0.008	0.015	0.208					0.009
PDSG*	**0.014**	**0.006**	**0.018**	**0.011**		**0.013**			**0.008**
PNMW									

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	Bag Seine	Mini-Fyke Net	Otter Trawl
QLBK			0.024						
RBST									
RDSN				0.027			9.561	27.889	0.176
RESF									
RFSN									
RKBS									
RVCS	0.008	0.072	0.188	0.015		0.014	0.415	0.286	0.077
RVRH			0.003						
RVSN							0.047	0.127	0.012
SBWB			0.006						
SDBS							0.008		
SFCB*				**1.089**			**0.047**	**0.175**	**1.835**
SFSN									
SGCB*				**0.038**			**0.043**		**0.122**
SGER*	**0.003**	**0.004**	**0.115**	**0.002**		**0.006**			
SGWE									
SHRH			0.082					0.016	
SJHR	0.003							0.016	
SKCB*				**0.648**			**0.557**	**1.937**	**0.827**
SMBF	0.034	0.117	0.082			0.056	0.169	0.032	0.009
SMBS									
SMMW									
SNGR			0.273					0.635	0.048
SNPD		0.009	0.018	0.008					
SNSG*	**1.567**	**0.508**	**8.318**	**1.056**		**2.001**			**0.866**
SNSN*							**0.026**	**0.063**	
SPSK									
STBS									
STCT				0.014					
STSN									

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	Bag Seine	Mini-Fyke Net	Otter Trawl
SVCB				0.081			0.146	0.111	0.336
SVCP	0.013	0.023	0.018				0.014		
TPMT									0.005
UBF									
UCF									0.044
UCN								0.032	
UCS									
UCT							0.014	0.016	
UCY							0.071		
UHY				0.024					0.601
ULP									
UNID							0.071		
UNO									
URH									
USG									
WLYE			0.015						
WSMW									
WTBS			0.003				0.113	0.111	0.134
WTCP			0.006					0.476	0.01
WTSK			0.015						
YLBH									
YOYF									
YWPH									