

2005 Annual Report

Pallid Sturgeon Population Assessment Project and Associated Fish Community Monitoring for the Missouri River: Segment 4



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EXECUTIVE SUMMARY

The Missouri River below the confluence of the Yellowstone River is a highly dynamic system and features a diverse assemblage of habitats that typify the historic conditions of the river. The influence of the Yellowstone River and the seasonal fluctuations in the hydrograph, including the immense sediment load, greatly influence the fish community, including the pallid sturgeon (*Scaphrynchus albus*).

This was the first year of sampling under the standardized sampling regime devised for the Missouri River. Sampling for segment 4 started well into the sturgeon season which ended at the end of June. Although sampling was initiated in May and the trawl gear had not been acquired, a full complement of standard trammel nets were deployed. Sampling continued through the entire fish community season with a full complement of standard gears.

Pallid sturgeon is the primary target of this sampling effort. Although the population within this segment of the Missouri River is typified by older individuals with very little indication of wild fish recruitment, the stocking efforts have provided an opportunity to gain further insight into this earlier life stage.

Of the total of 31 pallids that were captured in segment 4 with combined efforts, 28 pallid sturgeon were captured using standard protocols and gears, while three were captured with nonrandom sampling. Due to the limited effort during the sturgeon season, only two were captured during this time period. The remaining 29 pallids were captured during the fish community season. The percentage of pallids originating from previous stocking events was about 81% (N = 25), while 19% were likely wild origin. One fish classified as wild may actually be a stocked fish that shed its passive integrated transponder (PIT) tag.

Of the six pallids that were considered wild, three had been captured in previous efforts and three were untagged. Tag retention rates are still uncertain; however, from the 2005 data for segment 4, ten of the twelve (83%) juvenile pallids that were stocked with PIT tags still retained their tags. This included two fish from the earliest stockings conducted for this reach. Six of the

eight year classes that have been stocked were sampled during 2005. The only year classes of stocked pallid sturgeon that were not sampled were the 1999 and 2005 year classes. The standard trammel net accounted for 77% (N=24) of the pallid captures while the otter trawl caught 23% (N=7). Although age data is not available, young of the year and one year old sturgeon were sampled, however, a majority of these were identified as shovelnose sturgeon. Relative condition factors for all pallid sturgeon captured during this effort ranged from 0.622 to 1.797. Growth rates for recaptured juvenile sturgeon ranged from 0.048 to 0.161 mm/day. Pallids are widely distributed throughout this segment as pallids were sampled in ten of the twelve bends. Outside bend macrohabitats produced pallid sturgeon in almost half of the captures with channel crossovers and inside bends producing most of the remaining captures. Channel border and island tip mesohabitats produced most of the pallid sturgeon captures.

Shovelnose sturgeon (*S. platyrhynchus*) captures totaled 275 samples in trammel nets and otter trawls combined. The otter trawl captured the smaller size classes more effectively than the trammel nets, however, the trammel nets appeared to sample the larger size classes more effectively. The ratio of pallid to shovelnose sturgeon was one pallid for every 8.9 shovelnose sturgeon.

In 2005, seven of the eight native Missouri River species that were targeted for assessment were sampled. Sturgeon chub (*Macrohybopsis gelida*) were only sampled during the fish community season. The majority of sturgeon chub were sampled in otter trawls (N = 176) with mini-fyke nets (N = 8) and bag seines (N = 3) capturing the remaining specimens. A total of 331 sicklefin chubs (*M. meeki*) were collected in segment 4. Most sicklefin chubs were captured in the otter trawl (N = 329). Speckled chubs (*M. aestivalis*) were the only targeted native species not captured in any gear. Only one sand shiner (*Notropis stramineus*) was sampled in 2005 and it was captured in a mini-fyke net. *Hybognathus spp.* were the most abundant targeted native river species sampled. Most *Hybognathus spp.* were captured during the fish community season in mini-fyke nets (N = 5,587) and bag seines (N = 230). A total of nine *Hybognathus spp.* were captured in the otter trawl. A total of four blue suckers (*Cycleptus elongates*) were collected in trammel nets (N = 3) and otter trawls (N = 1). Sauger (*Sander canadense*) were captured in all gears during both seasons. Mini-fyke nets (N = 104) captured the most sauger, followed by

trammel nets (N = 60), bag seine (N = 11), and otter trawl (N = 9). A total of 25,143 fish representing 32 species were sampled in segment 4 of the Missouri River during 2005.

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Introduction

Since 1990 when the pallid sturgeon (*Scaphirhynchus albus*) was listed as an endangered species and 1993 when the Pallid Sturgeon Recovery Plan was implemented, the primary emphasis recovery efforts has been to restore habitat conditions, prevent the immediate extirpation of the species, and increase our knowledge of this ancient fish. Unlike other sturgeon species in the world, very limited information has been available from the historical perspective for the pallid sturgeon, primarily due to the rare status and the lack of historic research work on the big rivers of the central United States. In the last decade, emphasis has been shifting to the development of a more thorough understanding of the species that rely and reside in these ecosystems. However, a great amount of uncertainty still exists about what is needed to prevent the pallids' extinction and how to effectively improve habitat conditions with the multitude of uses for the limited resource. Increased and sometimes conflicting uses of water in big river systems is requiring that communities, states, and the federal government collaboratively develop management strategies that balance the multiple uses and provide adequate habitats for the aquatic communities. This monitoring program is designed to assist in that decision process by providing trend information on the pallid sturgeon and related aquatic communities.

The strategy as outlined in the Missouri River Standard Operating Procedures for Sampling and Data Collection (SOP's) (Drobish 2005) details the methodology and information to be collected under this program. This monitoring effort is a collaborative effort of State and Federal biologists all working toward the same goals. It is considered a long term monitoring due to the need to develop trend information that describe population conditions and a causal relationship with the environmental conditions that exist. A great deal of variation exists within the aquatic populations, habitats, and conditions on the Missouri River.

Sampling Season and Species

This program has been developed with two sampling seasons (sturgeon and fish community) based primarily on water temperatures. The primary objective of the two seasons is to focus

efforts that are conducive to capturing sturgeon using gears that are temperature limited and utilize other gears toward the fish community during the summer and fall months.

The sampling conducted under this program has been incrementally implemented and segment 4 was added to the total effort during 2005. Although funding was not received until mid spring, sampling efforts were initialized in May during the sturgeon season (fall 2004 through spring 2005). However, insufficient time and lack of sampling equipment prevented deployment of the full complement of gears for this initial effort as only trammel nets were used during the sturgeon season.

Although gill nets appear to be an effective method for capturing sturgeon for downstream segments, with agreement from the Governance Committee, we have declined to use that method during the sturgeon season, primarily due to the lack of habitats where this gear is effective and the propensity of the gear to cause mortality. The habitats within segment 4 do not contain sufficient areas of slack water that would allow a gill net to fish effectively and would likely fill with debris to the point that either the net would be lost or causing undue mortality on captured fish.

The fish community season sampling began on July 1 and continued until late October when water temperatures reached about 9 C. Six gear types were deployed during the fish community season; bag seine, mini-fyke nets, trammel nets, angling, large mesh trammel nets, and the otter trawl.

Under this program, sampling is conducted at the bend level with bends randomly and nonrandomly selected. A total of 12 bends were selected randomly and sampled with standard gears and two additional nonrandom bends were sampled with trammel nets (Figure 1b).

During the fish community season, in addition to targeting sturgeon, the monitoring program has also selected nine native fish species to monitor to gain a greater understanding of the influences of flows and habitat usage. These species are shovelnose sturgeon, blue sucker,

sauger, bigmouth buffalo, sturgeon chub, sicklefin chub, speckled chub, *Hybognathus spp*, and the sand shiner.

Success Criteria:

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. Evaluation of the ultimate success will be tied directly to the biological assessment and the resulting information that these assessments provide. The following 4 statements may be used to determine whether success is achieved:

1. Develop a monitoring plan to provide the ability to detect population changes.
2. Develop a monitoring plan that identifies survival of hatchery reared and stocked pallid sturgeon in the river.
3. Develop a monitoring plan that identifies reproduction of pallid sturgeon in the Missouri River.
4. Develop a monitoring plan that identifies recruitment of wild pallid sturgeon in the Missouri River system.

The objectives of this program are as follows:

Objectives:

1. Document current 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 usage of wild pallid sturgeon and hatchery stocked pallid sturgeon by season and by life stage.
3. Document the population structure and dynamics of pallid sturgeon in the Missouri River system.

4. Document 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

This program encompasses the Missouri River from Fort Peck Dam (RM 1771.5) downstream to the confluence of the Missouri and Mississippi Rivers (RM 0). During development of the methodology that would be used during monitoring efforts, the Pallid Sturgeon Population Assessment Team categorized the study area into 14 segments (Drobish, editor 2005).

Segment 4 is defined as that area of the Missouri River from the Yellowstone River Confluence (RM 1582) downstream to the headwaters of Lake Sakakawea (Figure 1a). The amount of riverine habitat available for sampling in segment 4 is entirely dependant on reservoir levels. For example, in 2005 the river reached below rivermile 1535. At full pool, the reservoir will extend as far up as rivermile 1574, however, the normal reach of river is around rivermile 1550. Although the Yellowstone River is not part of the segment, it does provide a significant amount of influence on this reach of the Missouri River. Seasonal flows, sediment load, and natural temperature fluctuations provide a semblance of the historic conditions that existed prior to development of the Missouri River under the Pick Sloan plan.

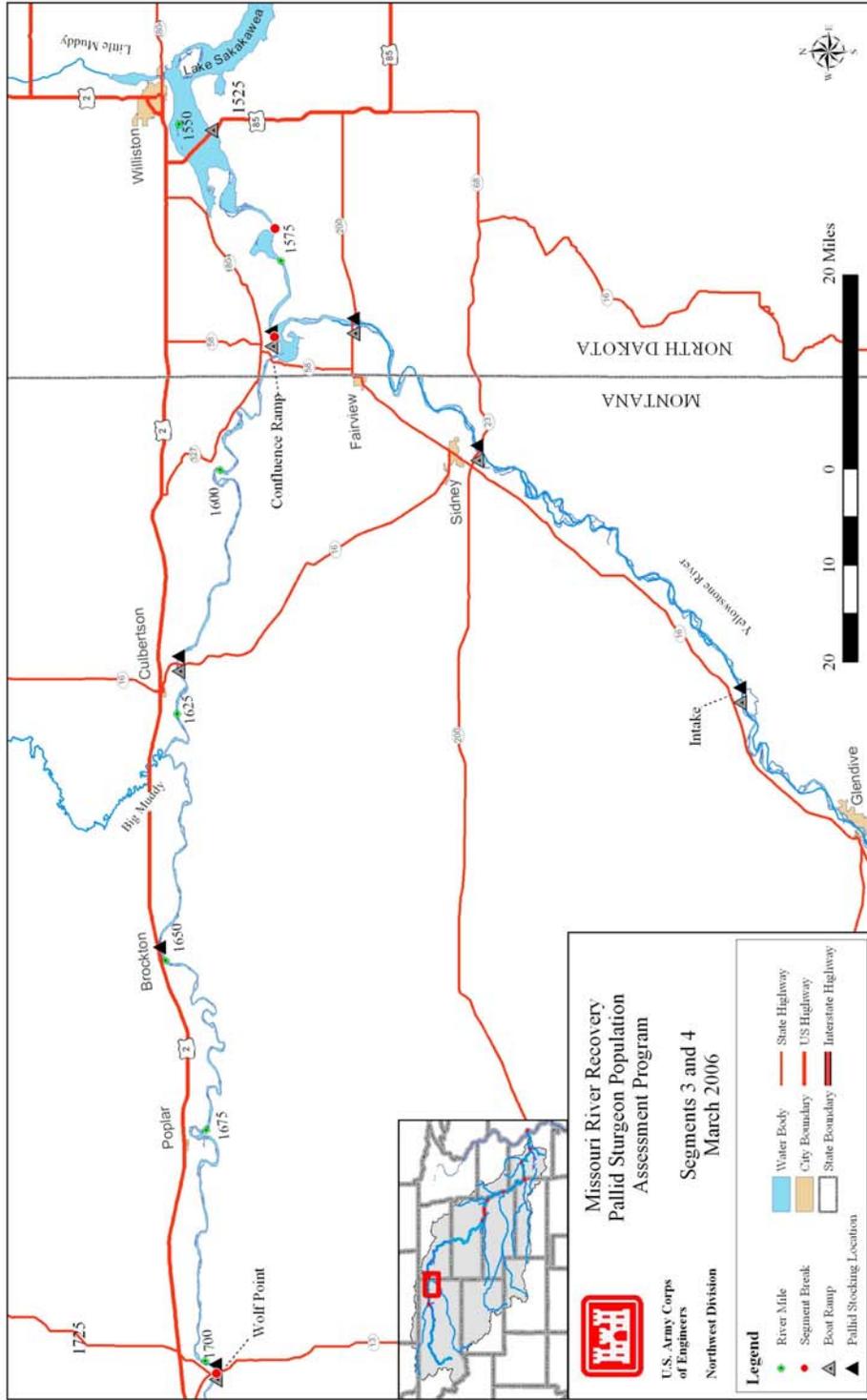


Figure 1a. Map of segments 3 and 4 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 4 encompasses the Missouri River from the confluence with the Yellowstone River (River Mile 1582) through the headwaters of Lake Sakakawea (River Mile 1568).

Methods

Sampling for segment 4 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 handling protocol for pallid sturgeon was followed using the guidelines established by the U.S. Fish and Wildlife Service (USFWS, 2005).

Sampling Site Selection and Description

A habitat classification system was developed by the Pallid Sturgeon Assessment Team that consists of three continuous macrohabitats found in every bend, main channel cross over, main channel outside bend, and main channel inside bend. An additional 10 discrete macrohabitats have been identified that may not be present in every bend: large tributary mouths, small tributary mouths, confluence areas, large and small secondary connected channels, non-connected secondary channels, deranged channels, braided channels, dendritic channels, and dam tailwaters. Mesohabitats have been established and defined to further classify areas within macrohabitats. Mesohabitat classifications include bars, pools, channel borders, thalweg, and island tips. Bars are sandbars or shallow bankline habitat at the area of terrestrial/aquatic interface, where water depth is less than 1.2 m deep. Pools are areas immediately downstream from sandbars, dikes, snag-piles, or other obstructions that have formed a scour hole greater than 1.2 m deep. Channel borders lies between the maximum depth and 1.2 m depth. Thalweg is the main channel between channel borders conveying the majority of flow which includes the deepest part of the main channel. Island tips are the areas immediately downstream of a bar or island where two channels converge and water depth is greater than 1.2 m. Microhabitats are used to further describe structures within mesohabitats.

Each segment was divided up into sampling units called bends where each bend begins with a channel crossover and contains both an inside bend and outside bend and ends with the

beginning of the next downstream channel crossover. Each bend can contain several macrohabitats and mesohabitats.

Sampling Gear

Trammel Net

The standard trammel net had a length of 38.1 m (125 ft.), with an inner mesh 2.4 m (8 ft.) deep and two outer walls 1.8 m (6 ft.) deep. The inner mesh was made up of #139 multifilament twine with a bar mesh size of 25.4 mm (1.0 inch). The outer walls were #9 multifilament twine with a bar mesh size of 203.2 mm (8.0 inch). The float line was a 12.7 mm (1/2 inch) foam core and the lead line was 22.7 kg (50 lbs.). Trammel nets were deployed from the bow of the boat and were drifted a minimum of 75 m after full deployment.

Otter Trawl

The standard otter trawl had a width of 4.9 m (16 ft.), height of 0.9 m (3 ft.), and a length of 7.6 m (25 ft.). The otter trawl had an inner mesh (6.35 mm (1/4 inch) bar, #18 polyethylene twine) and an outer mesh (38.1 mm (1.5 inch) bar, #9 polyethylene twine), with a cod-end opening of 406.4 mm (16 inch). The inner mesh had a 50.8 mm (2 inch) sleeve sewn along the top section for the insertion of a hoop to keep the net open, allowing fish to reach the cod end of the net. Trawl doors were 762 mm (30 inches) long by 381 mm (15 inches) high by 19.1 mm (3/4 inch) thick with 12.7 mm (1/2 inch) thick heavy steel runners. The doors were made from marine grade plywood and were used to keep the trawl open and on the river bottom. A 7.9 m (26 ft.) long 3.2 m (1/8 inch) tickler chain was attached to the bottom front of the trawl for added strength and to disturb the river bottom. Two 30.5 m (100 ft.) 19.1 mm (3/4 inch) thick braided Tenex ropes were attached to each door and tied to the bow railings of the boat. The otter trawl was deployed from the bow of the boat and fished downstream at a rate slightly faster than the current. Each trawl sample covered a minimum of 75 m (246 ft.) and a maximum of 300 m (984 ft.) depending on the habitat being sampled.

Bag Seine

The standard bag seine was 9.1 m (30 ft.) long by 1.8 m (6 ft.) high with a 1.8 m wide x 1.8 m high x 1.8 m deep bag. The mesh was 6.4 mm (1/4 inch) ace mesh with a 29.5 kg (65 lb.) lead core line. Bag seines were pulled in either an upstream or downstream direction using quarter arc, half arc, or rectangular methods. The area sampled (length x width) was measured to the nearest tenth of a meter using a 100 m (328 ft.) field tape.

Mini-Fyke Nets

The standard mini-fyke nets consisted of two rectangular frames 1.2 m (4 ft.) wide by 0.6 m (2 ft.) long and two 0.6 m (2 ft.) hoops made of 0.63 cm (1/4 inch) black oil-tempered spring steel. A 4.5 m (15 ft.) long and 0.6 m (2 ft.) lead was connected to the second rectangular frame. The mesh for the frame and lead was made up of 3 mm (1/8 inch) “ace” mesh that was coated for protection. The lead had foam floats on the top and bulleted lead weights on the bottom. Mini-fyke nets were set as perpendicular to shore when possible but a slight downstream set was used more frequently to prevent the net from rolling over in the current. Mini-fyke nets were set in the evening and pulled the next morning with the optimum duration of a set being 18 hours.

Data Collection and Analysis

Associated Environmental Data

GPS locations were taken for each sample using a WAAS enabled GPS receiver with submeter accuracy. Temperature and depth were also recorded at each sampling location. Substrate, velocity, and turbidity were collected randomly for 25% of the mesohabitat types within each macrohabitat. Substrate was sampled using a Hesse sampler and reported as a percentage of silt/sand/gravel within each sample. Velocity was taken at three depths in the water column, bottom, 80%, and 20% of the depth using a Marsh-McBirney Flo-Mate 2000 velocity meter. Turbidity was collected using a Hach 2100P turbidimeter and recorded as NTU (Nephelometric Turbidity Units). Additionally, these measurements were collected whenever a pallid sturgeon was sampled.

Genetic Validation

Genetic samples were from all unmarked pallids and potential hybrid sturgeon following the protocol outlined in the SOP's (Drobish 2005). Two fin clips (approximately 1 cm² each) were removed from each fish using surgical scissors and forceps. The samples were placed in two separate tubes with 95% non-denatured ethanol and sealed in a plastic bag along with a sturgeon genetic card that contained all the pertinent information for that fish. All genetic samples were sent to the U.S. Fish and Wildlife Service Abernathy Fish Technology Center for validation.

Relative Condition

The relative condition of recaptured hatchery reared pallid sturgeon was calculated using $K_n = (W / W')$, where W is weight of the individual and W' is the length-specific mean weight predicted by the weight-length equation calculated for that population. Keenlyne and Evanson (1993) provided a weight-length regression [$\log_{10} W = -6.378 + 3.357 \log_{10} L$ ($r^2 = 0.9740$)] 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, 2005): sub-stock fork length <330 mm (20%), stock fork length = 330 – 629 mm (20-36%), quality fork length = 630 – 839 mm (36-45%), preferred fork length = 840 – 1039 mm (45-59%), memorable fork length = 1040 – 1269 mm (59-74%), and trophy fork length >1270 mm (>74%).

Length categories based on the percentage of the largest known shovelnose sturgeon are as follows (Quist, 1998): sub-stock fork length <250 mm (20%), stock fork length = 250 – 379 mm (20-36%), quality fork length = 380 – 509 mm (36-45%), preferred fork length = 510 – 639 mm (45-59%), memorable fork length = 640 – 809 mm (59-74%), and trophy fork length >810 mm (>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 for each gear was defined as follows: 300 m drift (TN), 300 m tow (OT), one overnight set (MF), and 30 ft half arc pull (BS). A minimum effort of 75 m for TN and OT's was accepted in some habitats because certain areas have so much debris that long drifts/tows are not possible. Also, due to the length of some habitats available in a bend and the distance required to deploy and retrieve the OT, it was not possible to sample 300 m without sampling an adjacent habitat. Effort for seines was calculated by multiplying the width of the net being used by distance pulled. Effort was calculated for TN and OT as fish per 100 m sampled. Effort was calculated for MF nets as catch per 100 m². Samples that occurred outside of the "Standard" gear or habitat effort or samples that occurred in "Non-random" bends were excluded from CPUE calculations. This data was included into length frequencies, relative condition, and population structure calculations.

Results

Pallid Sturgeon

A total of 31 pallid sturgeon were captured in Segment 4 for the sampling conducted during the 2005 sturgeon and fish community seasons. Of these, 25 were considered originating from previous hatchery stocking while six of these were considered as wild (Table 4, Figure 9.). However, it should be noted that one wild pallid (Unique ID MR-1-4-83-1) was not genetically identified as hatchery origin due to the lack of parentage genetic material to correctly assign true origin. It is also highly suspected that this fish may have shed its PIT tag and is not a wild fish due to the lack of previously documented recruitment and its similarity in size to the 1997 and 1998 year class of fish that were previously stocked.

Fork lengths (FL) of pallid sturgeon ranged from 182 – 1550 mm for the segment 4 sampling effort. This segment is typified by the aging adult population with recruitment following from previous augmentation efforts as shown by the length frequency histogram (Figure 8). Almost all the previous year classes of augmented pallids were sampled during 2005 with the exception of the 1999 and 2005 year classes. Comparing recapture information with the information from the time of stocking is showing that these stocked fish are growing at a range of rates (0.048 – 0.161 mm/day) (Table 6.). Data was very limited for calculating relative weights and condition factor on each year class (Table 6). Relative Stock Density was calculated for pallid sturgeon (Table 7).

All untagged juvenile sturgeon (N = 3) that were suspected as being a possible pallid were genetically sampled for submission to the Abernathy Fish Technology Center (FTC) for verification. A cursory look at species identity was calculated from the Character Index (CI) proposed by Sheehan et al., (1999). For the known pallids captured during 2005, the character index ranged from a low (pallid classification) of -3.86 to a high of 0.98 (shovelnose classification).

Tag retention has always been an extremely important aspect of the evaluation of pallid sturgeon augmentation efforts. Of the 31 pallids captured, six pallids were considered wild. From these, three were recaptures, while the remaining three were untagged. Two of the pallids were later determined to be untagged fish from a larval drift experiment conducted in 2004. The remaining 23 pallid sturgeon had some type of mark that allowed the designation as a previously stocked fish. From the year classes, we can outline some of the retention rates. For the 1997 year class (N=1), PIT tag was detected; for the 1998 year class (N=1), PIT tag was detected; for the 2001 year class (N=6), four originated from stockings that did not use a PIT tag and two other did (based on elastomer); and for the 2002 year class (N=8), six fish retained a PIT tag. The 2003 and the 2004 year classes do not allow this type of documentation primarily due to some of the fish from the 2003 year class being stocked and having the similar elastomer tag as some of the fish being stocked without a PIT tag. The pallids sampled in 2005 and originating from the 2004 year class were stocked without PIT tags.

Utilization of the ratio of pallid sturgeon to shovelnose sturgeon to quantify abundance dates back to early commercial records and field studies (Bailey and Cross, 1954, Fisher, 1962). The 2005 sampling resulted in a ratio of pallid to shovelnose of 1 to 8.9. No known hybrids were collected during this effort.

Table 1. Number of bends sampled, mean effort per bend, and total effort by macrohabitat for segment 4 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 squared for bag seines. N-E indicates the habitat is nonexistent in the segment.

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	12	21.1	N-E	58.4	0	N-E	N-E	70.8	66.3	53.7	0	0	0	4.2	0	0
2.5 Inch Trammel Net	-	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	-	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
Summer – Fish Community Season																
1 Inch Trammel Net	13	19.5	N-E	43.6	0	N-E	N-E	56.3	84.4	36.3	0	0	28.7	4.7	0	0
Bag Seine	12	4.9	N-E	0	0	N-E	N-E	20.6	6.5	12.3	10.6	7.5	0	1.3	0	0
Beam Trawl	-	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Mini-Fyke Net	11	7.4	N-E	1.0	0	N-E	N-E	32.0	13.0	21.0	4.0	10.0	0	0	0	0
Otter Trawl	12	22.4	N-E	64.4	0	N-E	N-E	80.3	96.4	23.6	0	0	0	4.4	0	0

Table 2. Number of bends sampled, mean effort per bend, and total effort by mesohabitat for segment 4 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 squared for bag seines N-E indicates the habitat is nonexistent in the segment.

Gear	Number of bends	Mean effort	Mesohabitat					
			BARS	CHNB	DTWT	ITTP	POOL	TLWG
Fall through Spring – Sturgeon Season								
1 Inch Trammel Net	12	21.1	0	227.8	N-E	26.07	N-E	N-E
2.5 Inch Trammel Net	-	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0.0	0	0	N-E	0	N-E	N-E
Summer – Fish Community Season								
1 Inch Trammel Net	13	19.5	0	228.6	N-E	25.4	N-E	N-E
Bag Seine	12	4.9	37.6	0	N-E	13.2	N-E	N-E
Beam Trawl	-	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	11	7.4	59	2	N-E	12	N-E	N-E
Otter Trawl	12	22.4	0	259.1	N-E	10.1	N-E	N-E

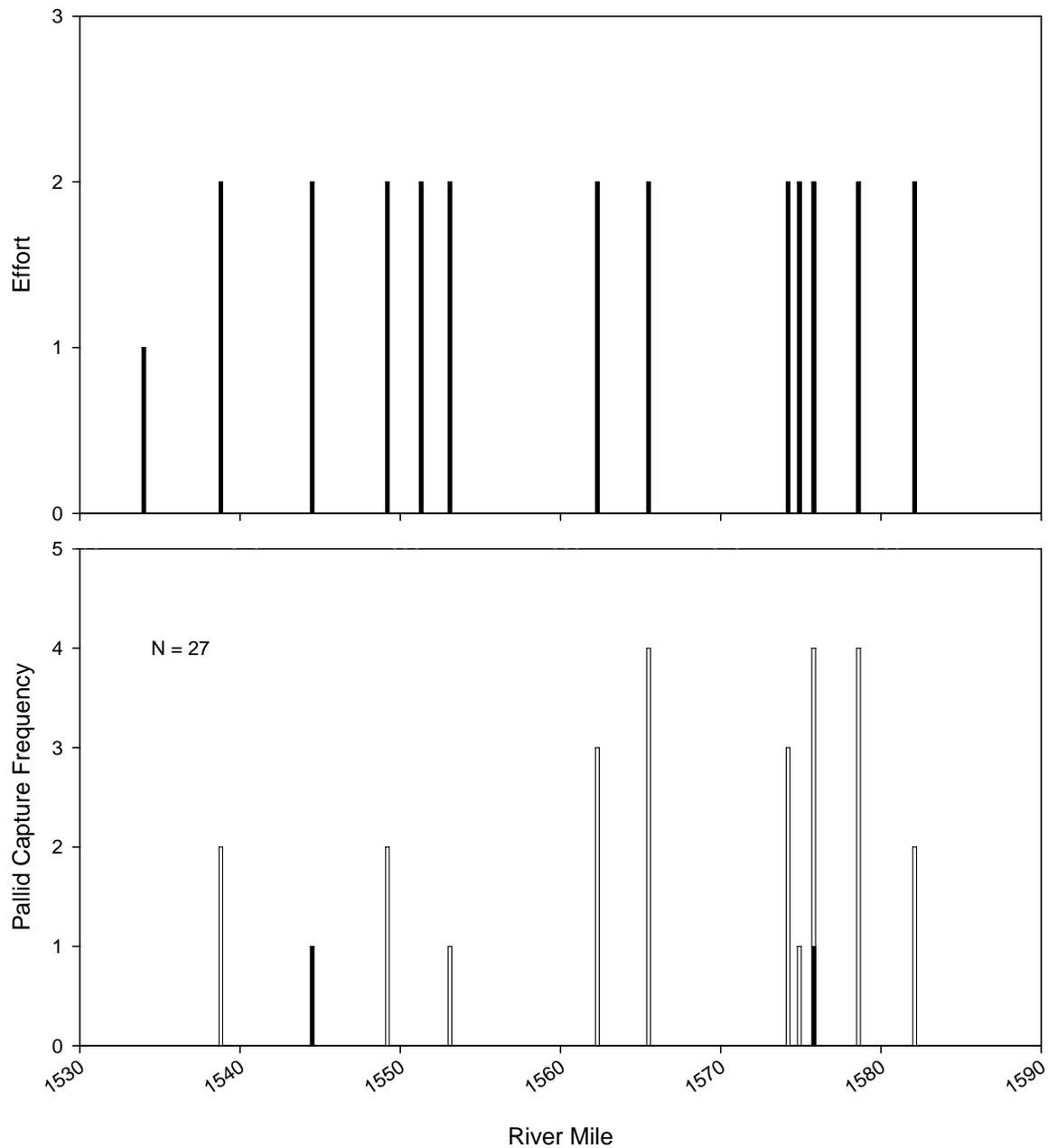


Figure 1b. Distribution of: A) seasonal sampling effort and B) pallid sturgeon captures by river mile for segment 4 in randomly selected bends of the Missouri River during 2004-2005. Sampling effort of 2 indicates bend sampled in both sturgeon and fish community seasons. Sampling effort of 1 indicates 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 during 2004-2005. Means (minimum and maximum) are presented. Habitat definitions and codes presented in Appendix B. N-E indicates the habitat is nonexistent in the segment.

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	BAR	N-E								
	POOL									
	CHNB									
	TLWG									
	ITIP									
CHXO	BAR	0.5 (0.5-0.5)				9.0 (9.0-9.0)				
	POOL									
	CHNB	3.0 (0.8-5.1)	3.2 (1.2-4.6)	0.50 (0.05-0.99)	0.55 (0.35-0.70)	20.4 (9.7-25.6)	22.3 (20.5-23.2)	355 (45-2160)	274 (65-766)	6
	TLWG									
	ITIP									
CONF	BAR	N-E								
	POOL									
	CHNB									
	TLWG									
	ITIP									
DEND	BAR	N-E								
	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
DRNG	BAR	N-E								
	POOL									
	CHNB									
	TLWG									
	ITIP									
ISB	BAR	0.7 (0.3-1.2)				16.9 (9.0-26.1)		248 (27-1000)		
	POOL									
	CHNB	2.5 (0.5-8.2)	1.6 (1.0-2.7)	0.51 (0.17-1.10)	0.25(0.21-0.29)	18.5 (9.0-26.1)	17.2(15.0-23.7)	398 (33-2244)	106 (35-178)	4
	TLWG									
OSB	ITIP									
	BAR	0.7 (0.2-1.2)				13.7 (9.0-21.6)		222 (23-897)		
	POOL									
	CHNB	3.5 (1.0-7.1)	3.7 (2.1-5.8)	0.48 (0.14-0.97)	0.53(0.30-0.72)	19.6 (9.7-26.1)	22.2(17.1-26.1)	345 (40-2400)	185 (40-1169)	15
	TLWG									
SCCL	ITIP									
	BAR	0.6 (0.2-1.2)				20.3 (9.0-23.1)		202 (29-839)		
	POOL									
	CHNB	2.3 (0.9-5.8)	2.1 (2.1-2.1)	0.58 (0.13-0.98)	0.98(0.98-0.98)	22.4 (13.5-26.1)	17.1(17.1-17.1)	748 (43-2320)	43 (43-43)	1
	TLWG									
SCCS	ITIP	1.8 (0.5-7.4)	2.2 (1.2-3.1)	0.63 (0.06-1.22)	0.54(0.20-0.87)	21.3 (9.0-26.6)	19.3(15.0-23.5)	230 (27-1958)	118 (43-193)	2
	BAR	0.8 (0.6-1.2)				23.0 (15.8-26.1)		52 (31-78)		

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
SCCS	POOL									
	CHNB									
	TLWG									
	ITIP	0.6 (0.3-1.0)				14.3 (9.0-20.0)		66 (59-70)		
SCCN	BAR	0.6 (0.2-0.6)				23.0(18.3-23.1)		58 (27-59)		
	POOL									
	CHNB									
	TLWG									
	ITIP									
TRIB	BAR									
	POOL									
	CHNB	2.7 (1.6-3.8)	2.9 (2.9-2.9)	0.6 1 (0.43-0.75)	0.75 (0.75-0.75)	25.1 (24.6-26.0)	24.7 (24.7-24.7)	71 (51-81)	80 (79-81)	2
	TLWG									
	ITIP	3.8 (2.4-5.8)	3.4 (2.4-4.4)	0.46 (0.44-0.61)	0.52 (0.44-0.61)	25.3 (25.0-25.6)	25.3 (25.1-25.5)	71 (51-81)	80 (79-81)	2
TRML	BAR	0.5 (0.5-0.5)				19.5 (19.5-19.5)		36 (36-36)		
	POOL									
	CHNB	2.3 (1.5-4.4)		0.56 (0.31-0.67)		22.2 (19.2-22.7)		78 (31-811)		
	TLWG									
	ITIP									
TRMS	BAR	N-E								
	POOL									
	CHNB									

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
TRMS	TLWG									
	ITIP									
WILD	BAR	N-E								
	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^d), 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.

ID	Recapture Data							Stocking Data				
	FL (mm)	Wt (g)	mCI	Status	Tags found ^a	Elastomer ^b	Marked in field?	Year class	FL (mm)	Wt (g)	Site	Source ^c
MR-1-4-34-1	355	150	-0.42	H	E	Red - R, Yellow - L	Yes	2002				
MR-1-4-83-1	602	730	0.98	W			Yes					
MR-1-4-131-1	1540	26500	-2.15	W			Yes					
MR-1-4-135-2	405	205	-0.48	H	E	Green - R, Yellow - L	Yes	2001				MCH
MR-1-4-137-1	380	160	-0.81	H	E	Red - R, Yellow - L	Yes	2002				MCH
MR-1-4-161-1	1130	11500	-2.36	W			Yes					
MR-1-4-166-2	190	24	0.31	H			No	2004			Larval Drift ^e	GAR
MR-1-4-166-3	210	31	-0.50	H			No	2004			Larval Drift ^e	GAR
MR-1-4-174-1	388	200	0.18	H	E, P	Red - R, Yellow - L	No	2002	279		Intake	MCH
MR-1-4-181-9	282	85	0.01	H	P		No	2003	224		Intake	MCH
MR-1-4-192-1	385	195	-3.86	H	E, P	Red - R, Yellow - L	No	2002	252		Fairview	MCH
MR-1-4-196-4	370	160	-0.50	H	E, P	Red - R, Yellow - L	No	2002	278		Intake	MCH
MR-1-4-196-5	377	180	-0.58	H	E	Green - R, Orange- L	Yes	2001				MCH
MR-1-4-198-2	398	215	-0.19	H	E,P	Green -R, Yellow - L	No	2001	224		Intake	MCH
MR-1-4-221-1	182	18.5	0.02	H	E	Red - L	No	2004				GAR
MR-1-4-228-1	644	700	-0.78	H	P		No	1998	560		Culbertson	GAV
MR-1-4-247-4	377	185	-1.03	H	E	Green - R, Orange - L	Yes	2001			Fairview	MCH
MR-1-4-248-1	1372	16000	-1.77	W	P		No					

Table 4. (continued)

ID	Recapture Data							Stocking Data				
	FL (mm)	Wt (g)	mCI	Status	Tags found ^a	Elastomer ^b	Marked in field?	Year class	FL (mm)	Wt (g)	Site	Source ^c
MR-1-4-268-1	328	210	-1.28	H	E,P	Green - R	No	2001	290		Wolf Point	GAR
MR-1-4-376-1	452	295	-0.90	H	E, P	Green - R	No	2001	300		Fairview	GAR
MR-1-4-382-1	291	105	-0.47	H	E	Yellow - H	Yes	2003				MCH
MR-1-4-382-2	336	120	-0.32	H	E, P	Yellow - H	No	2003	275		Sidney	MCH
MR-1-4-384-1	1450	17500	-1.34	W	P		No					
MR-1-4-510-6	320	95	-0.29	H	E	Green - R, Orange - L	Yes	2001				MCH
MR-1-4-510-7	388	180	-0.68	H	E,P	Red - R, Yellow - L	No	2002	299		Intake	MCH
MR-1-4-513-1	210	28	-0.36	H	E	Red - L	No	2004				GAR
MR-1-4-572-1	546	520	-1.08	H	E,P	Orange - R, Orange - L	No	1997			Nohly Bridge	GAV
MR-1-4-645-1	1535		-2.00	W	P		No					
MR-1-4-651-1	393	175	-0.82	H	E, P	Red - R, Yellow - L	No	2002	320		Culbertson	MCH
MR-1-4-652-2	393	175	-0.53	H	E, P	Red - R, Yellow - L	No	2002	320		Culbertson	MCH
MR-1-4-652-3	295	70	-0.53	H	E, P	Yellow - H	No	2003	261		Intake	MCH

^a Tag types include: coded wire tag (C), elastomer tag (E) and passive integrated transponder tag, i.e. PIT tag (P).

^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.

^e Pallids released as 11 and 17 day olds as part of USGS/MTFWP Larval Drift Study conducted in 2004.

Table 5. Pallid sturgeon (PDSG) and hybrid pallid X shovelnose sturgeon (SNPD) capture locations and habitat characteristics for segment 4 of the Missouri River during 2005. 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	MR-1-4-34-1	6/8/2005	TNS	1575.4	OSB	CHNB		18.9	1169	2.4	0.34	0 / 100 / 0
PDSG	MR-1-4-83-1	6/21/2005	TNS	1539	CHXO	CHNB		23.2	766	1.2	0.7	0 / 100 / 0
PDSG	MR-1-4-131-1	7/12/2005	TNS	1.4	TRIB	CHNB	801280	24.7	51	2.9	0.75	0 / 100 / 0
PDSG	MR-1-4-135-2	7/12/2005	TNS	1.2	TRIB	ITIP	801250	25.1	81	4.4	0.44	0 / 100 / 0
PDSG	MR-1-4-137-1	7/12/2005	TNS	1.2	TRIB	ITIP	801250	25.5	79	2.4	0.61	0 / 100 / 0
PDSG	MR-1-4-161-1	7/14/2005	TNS	1552	OSB	CHNB	701300	25.6	151	2.6	0.48	0 / 100 / 0
PDSG	MR-1-4-166-2	7/19/2005	TNS	1575.8	CHXO	CHNB	701300	22.7		2.4		
PDSG	MR-1-4-166-3	7/19/2005	TNS	1575.8	CHXO	CHNB	701300	22.7		2.4		
PDSG	MR-1-4-174-1	7/19/2005	TNS	1575	SCCL	ITIP	611250	23.5	193	1.2	0.2	0 / 100 / 0
PDSG	MR-1-4-181-9	7/20/2005	OT16S	1578.1	CHXO	CHNB	701300	22.8	180	3.8	0.56	0 / 100 / 0
PDSG	MR-1-4-192-1	7/20/2005	TNS	1574.8	ISB	CHNB	701300	23.7	178	2.7	0.21	0 / 100 / 0
PDSG	MR-1-4-196-4	7/20/2005	TNS	1574.2	OSB	CHNB	701300	24	176	5.8	0.68	0 / 100 / 0
PDSG	MR-1-4-196-5	7/20/2005	TNS	1574.2	OSB	CHNB	701300	24	176	5.8	0.68	0 / 100 / 0
PDSG	MR-1-4-198-2	7/20/2005	TNS	1574.2	OSB	CHNB	701300	24.1	184	4.8	0.6	0 / 100 / 0

Table 5. (continued)

Species	ID#	Date	Gear	River mile	Macro	Habitat		Water Temp (°C)	Turb ^a (NTU)	Depth ^b (m)	Bottom velocity (m/s)	Substrate ^c (silt/sand/gravel)
						Meso-	Micro-					
PDSG	MR-1-4-221-1	8/10/2005	OT16S	1538.8	CHXO	CHNB	701300	22.1	84	4.6	0.35	0 / 100 / 0
PDSG	MR-1-4-228-1	8/10/2005	OT16S	1537.7	OSB	CHNB	701300	22.2	64	3.3	0.52	0 / 100 / 0
PDSG	MR-1-4-247-4	8/11/2005	OT16S	1581.3	OSB	CHNB	701300	21.8	40	4.4	0.37	0 / 100 / 0
PDSG	MR-1-4-248-1	8/11/2005	OT16S	1581.3	OSB	CHNB	701300	22	40	5.5	0.57	0 / 100 / 0
PDSG	MR-1-4-268-1	8/15/2005	OT16S	1548.7	OSB	CHNB	701300	20.3	348	4.5	0.72	0 / 100 / 0
PDSG	MR-1-4-376-1	9/13/2005	OT16S	1563.7	SCCL	CHNB	701300	17.1	43	2.1	0.98	0 / 100 / 0
PDSG	MR-1-4-382-2	9/13/2005	TNS	1564.6	OSB	CHNB	701300	17.1	46	2.2	0.66	0 / 100 / 0
PDSG	MR-1-4-382-1	9/13/2005	TNS	1564.6	OSB	CHNB	701300	17.1	46	2.2	0.66	0 / 100 / 0
PDSG	MR-1-4-384-1	9/13/2005	TNS	1564.6	OSB	CHNB	701300	17.3		2.4		
PDSG	MR-1-4-510-6	8/10/2005	TNS	1561.4	OSB	CHNB	701300	26.1	50	3.6	0.3	0 / 100 / 0
PDSG	MR-1-4-510-7	8/10/2005	TNS	1561.4	OSB	CHNB	701300	26.1	50	3.6	0.3	0 / 100 / 0
PDSG	MR-1-4-513-1	8/10/2005	TNS	1561.2	OSB	CHNB	701300	26.1	49	2.1	0.6	0 / 100 / 0
PDSG	MR-1-4-572-1	8/17/2005	TNS	1549.2	CHXO	CHNB	701300	20.5	65	4.5	0.57	0 / 100 / 0
PDSG	MR-1-4-645-1	9/14/2005	TNS	1579.5	SCCL	ITIP	701250	15	43	3.1	0.87	0 / 100 / 0

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	MR-1-4-651-1	9/14/2005	TNS	1577.5	ISB	CHNB	701280	15	35	1	0.29	0 / 100 / 0
PDSG	MR-1-4-652-2	9/14/2005	TNS	1577.5	ISB	CHNB	701280	15		1.4		
PDSG	MR-1-4-652-3	9/14/2005	TNS	1577.5	ISB	CHNB	701280	15		1.4		

^aTurb = turbidity.

^bDepths presented are the average of the starting, middle, and ending depths measured during gear deployment.

^cSubstrates 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 in 1997-2005 in 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	Growth (mm/d)	Growth (g/d)
1997	1	--	--	--	546	520.0	0.804	--	--
		--	--	--	--	--	--	--	--
1998	1	560	--	--	644	700.0	0.622	0.048	--
		--	--	--	--	--	--	--	--
2001	6	295	--	--	377	195.0	1.060	0.076	--
		10	--	--	40	52.5	0.298	0.090	--
2002	9	280	145.0	5.542	382	179.4	0.917	0.161	0.100
		30	--	--	10	16.0	0.047	0.063	--
2003	4	253	--	--	301	95.0	1.088	0.135	--
		30	--	--	24	22.0	0.226	0.051	--
2004	4	--	--	--	198	25.4	1.170	--	--
		--	--	--	14	5.4	0.089	--	--
2005	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--

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).

Length Category	Wild ^c		Stocked	
	N	RSD	N	RSD
Sturgeon Season				
Sub-stock (0-199)	0	--	0	--
Sub-stock (200-329)	0	--	0	--
Stock	1	--	1	--
Quality	0	0	0	0
Preferred	0	0	0	0
Memorable	0	0	0	0
Trophy	0	0	0	0
Fish Community Season				
Sub-stock (0-199)	0	--	2	--
Sub-stock (200-329)	0	--	7	--
Stock	5	--	14	--
Quality	5	100	1	7
Preferred	5	100	0	0
Memorable	5	100	0	0
Trophy	4	80	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 2004-2005 including non-random and wild samples.

Year	All Pallids : Shovelnose	Wild* Pallids: Shovelnose	Wild* Pallids: Hybrids	Stocked Pallids: Wild* Pallids
2003	--	--	--	--
2004	--	--	--	--
2005	1 : 8.9	1 : 45.8	6 : 0	4.2 : 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

Since this is the first year of sampling, comparisons between years will not be accomplished.

The standard trammel net accounted for 24 (77%) of these pallids, with 7 (23%) captured with the otter trawl (Table 5.). With only two pallids captured during the sturgeon season, it is too early to describe the implications that this sampling season may play on the distribution and abundance of the pallid. Catch per unit effort was greatest in the trammel nets during the fish community season (0.074 fish per 100 meters drifted) followed by the otter trawl (0.024 fish per 100 meters trawled) during the fish community season. Trammel nets during the late part of the sturgeon season showed the lowest catch per unit effort (0.01 fish per 100 meters). Mini-fyke nets and seines caught no pallid sturgeon during the fish community season.

The 31 pallids captured were the result of both random and nonrandom bends and efforts. Four of the pallids were captured in two separate non-random bends. Three pallids came from the first bend in the Yellowstone River and one pallid came from bend #2 immediately downstream of the Yellowstone.

If the capture rate experienced during the fish community season is an early indication, both stocked and wild pallid sturgeon appear to be widely distributed throughout this segment. Of the 14 bends sampled (2 nonrandom, 12 random), pallid sturgeon were sampled in 13 of the sampled bends. Macrohabitats where pallid sturgeon were captured included inside and outside bends, channel crossovers, tributary, and large connected secondary channels. For sub-stock sized (0-199 mm) pallids (N=2), channel crossover macrohabitat were the only habitat where these fish were collected. The sub-stock (200-329) pallids (N=7) were predominantly sampled in the outside bend and channel crossover macrohabitats, while the stock size (330-629 mm) pallids (N=15) were primarily associated with the outside bends and large connected secondary channels. The quality sized pallids (>630 mm) (N=6) were associated with similar habitats as the stock sized fish. (Tables 9, 11, 13, 15)

The habitat conditions in this segment are extremely variable and diverse. The turbidity experienced from the sampled macrohabitats ranged from 23 to 2400 NTU, while the turbidity during captures of pallid sturgeon ranged from 35 to 1169 ntu. Water velocities also varied with measured velocities ranging from 0.05 to 1.22 meters/second (m/s), while pallid captures experienced water velocities that ranged from 0.20 to 0.98 m/s. This segment of the monitoring effort experiences significant swings in temperature. Pallids were captured at a range of temperatures from 15.0 to 26.1 Celsius. Measured depths at the point of capture for pallid sturgeon ranged from 1.0 to 5.8 meters (m). (Table 3)

Segment 4 - Pallid Sturgeon / Sturgeon Season

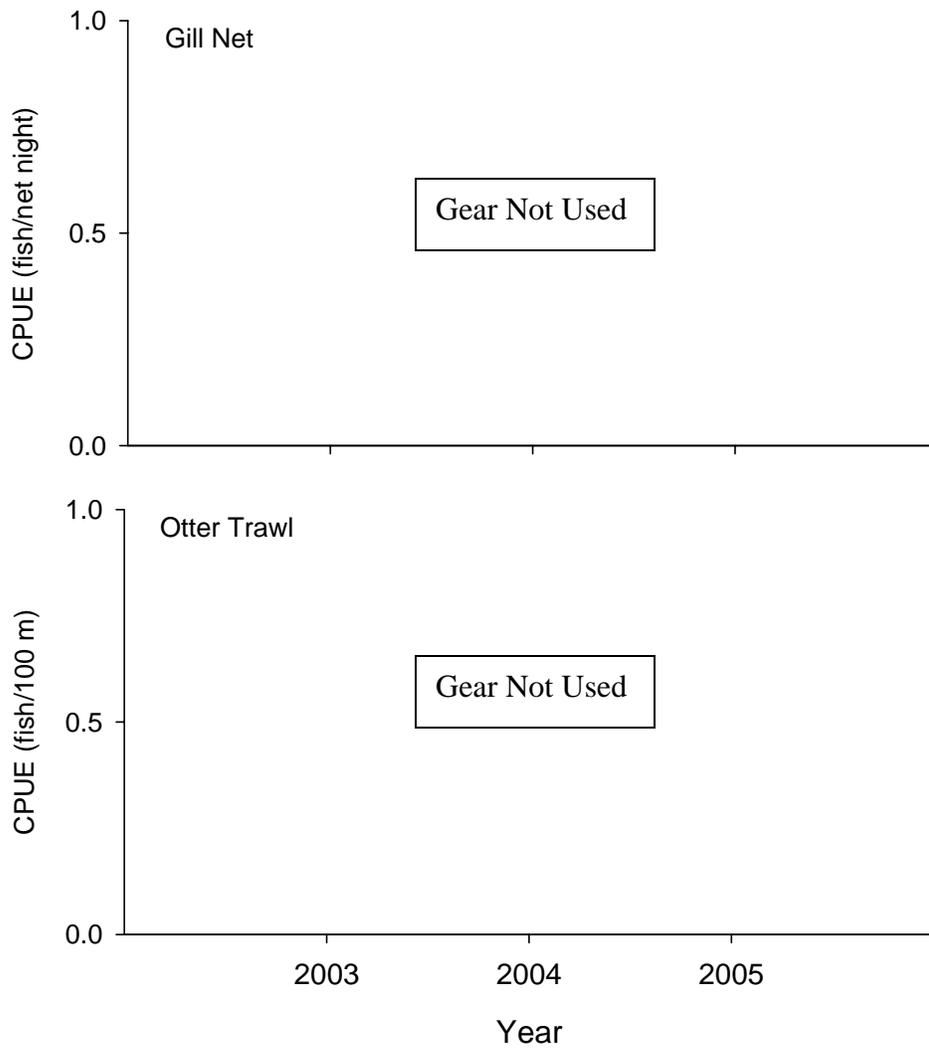


Figure 2. Mean annual catch-per-unit-effort (± 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segment 4 of the Missouri River during sturgeon season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

Segment 4 - Pallid Sturgeon / Sturgeon Season

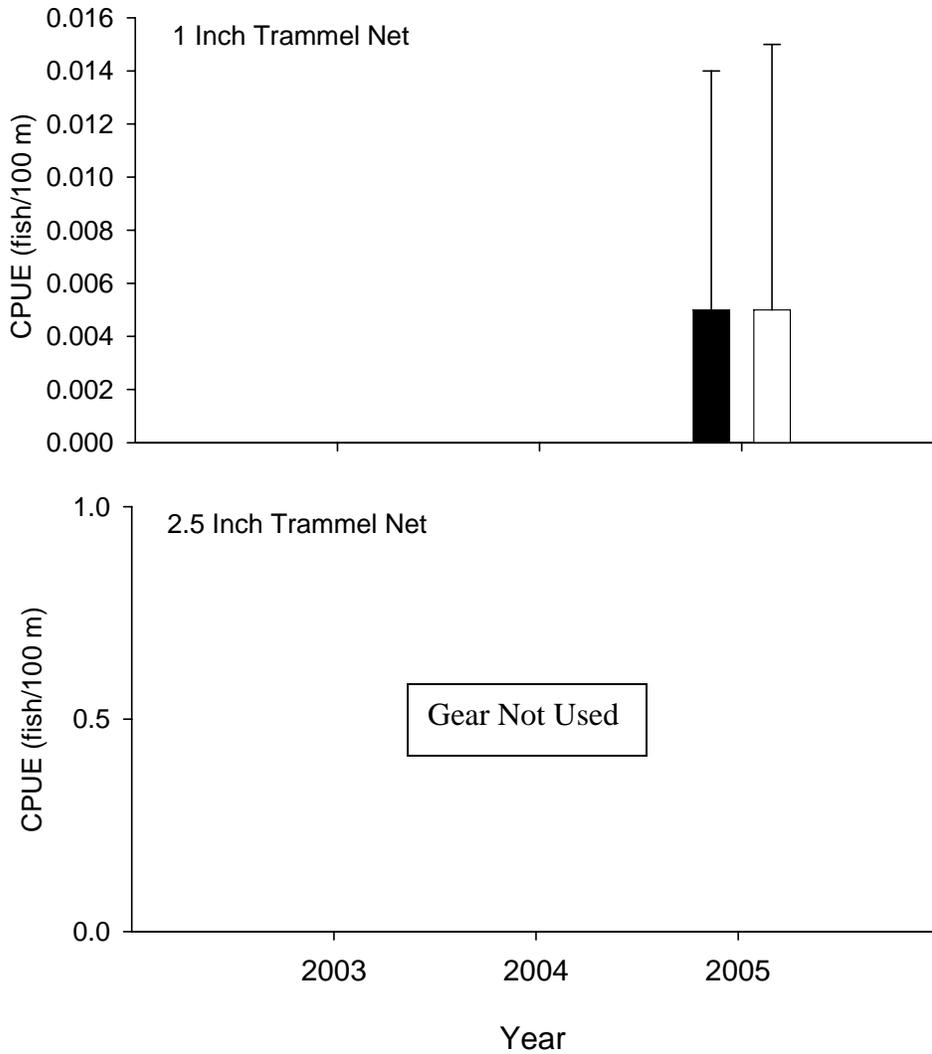


Figure 3. Mean annual catch-per-unit-effort (± 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segment 4 of the Missouri River during sturgeon season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

Segment 4 - Pallid Sturgeon / Sturgeon Season

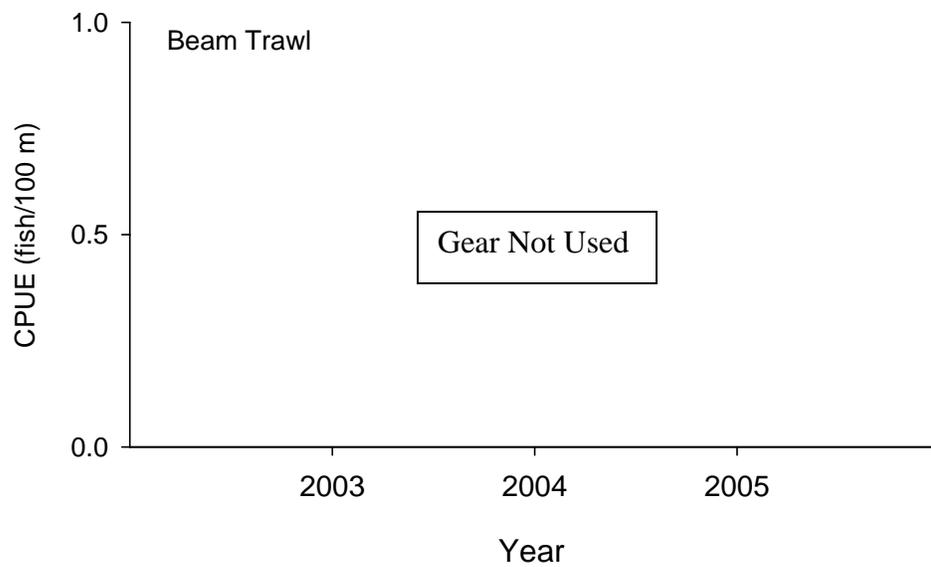


Figure 4. Mean annual catch-per-unit-effort (± 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segment 4 of the Missouri River during sturgeon season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

Segment 4 - Pallid Sturgeon / Fish Community Season

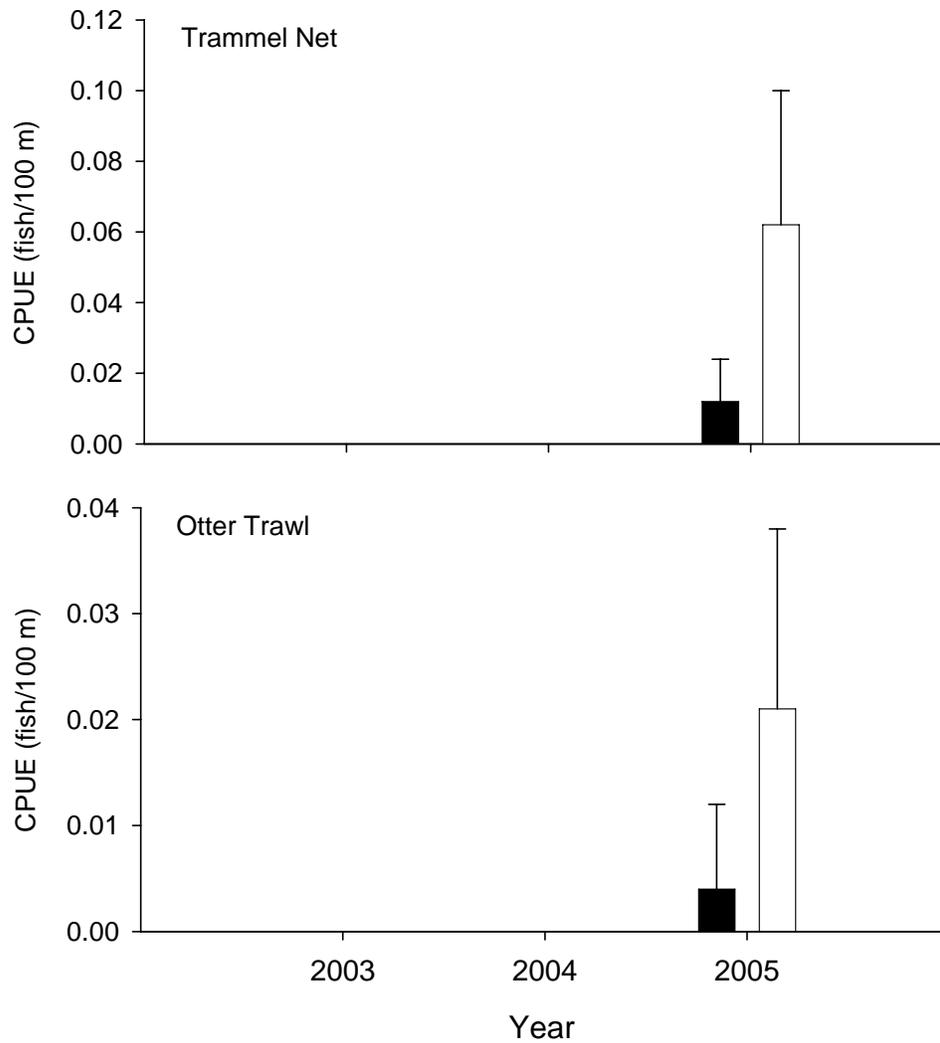


Figure 5. Mean annual catch-per-unit-effort (± 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segment 4 of the Missouri River during fish community season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

Segment 4 - Pallid Sturgeon / Fish Community Season

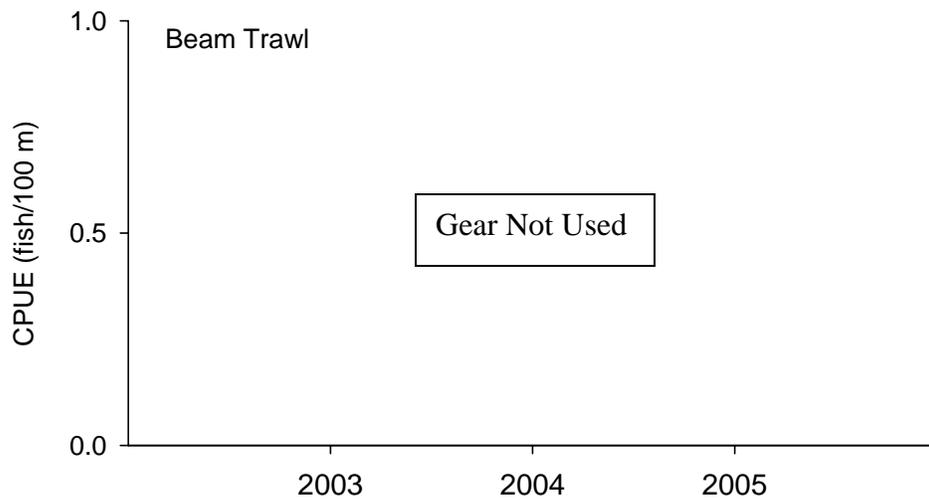


Figure 6. Mean annual catch-per-unit-effort (± 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segment 4 of the Missouri River during fish community season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

Segment 4 - Pallid Sturgeon / Fish Community Season

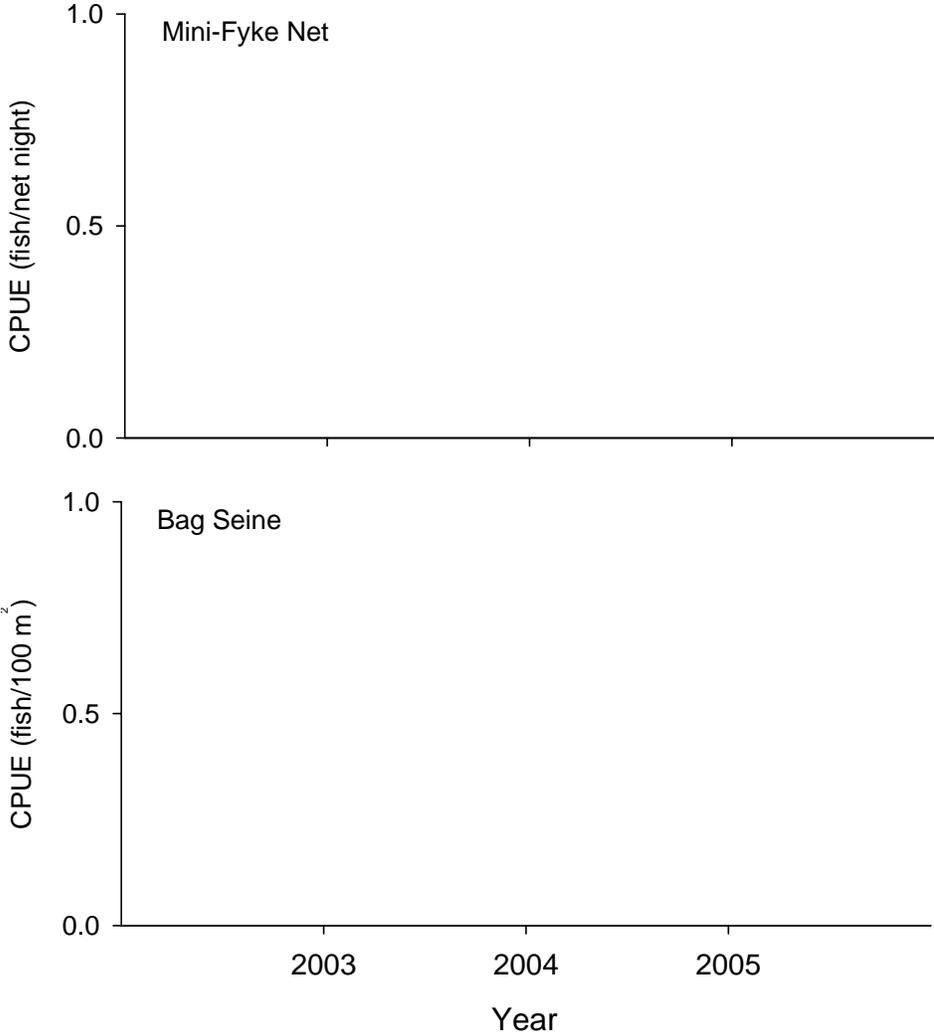


Figure 7. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segment 4 of the Missouri River during fish community season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

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, which is on the first line of the gear type, in segment 4 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. Size categories described in Table 7. N-E indicates the habitat is nonexistent in the segment. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

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 (23)	0 (0)	N-E	N-E	0 (28)	0 (26)	0 (21)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-
2.5 Inch Trammel Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-
Otter Trawl	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-
Fish Community Season (Summer)															
1 Inch Trammel Net	1	N-E	100 (17)	0 (0)	N-E	N-E	0 (22)	0 (33)	0 (14)	0 (0)	0 (0)	0 (11)	0 (2)	0 (0)	-
Bag Seine	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (35)	0 (11)	0 (21)	0 (17)	0 (13)	0 (0)	0 (2)	0 (0)	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Mini-Fyke Net	0	N-E	0 (1)	0 (0)	N-E	N-E	0 (40)	0 (16)	0 (26)	0 (5)	0 (12)	0 (0)	0 (0)	0 (0)	-
Otter Trawl	1	N-E	100 (24)	0 (0)	N-E	N-E	0 (30)	0 (36)	0 (9)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-

Table 10. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat, which is on the first line of the gear type, in segment 4 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is nonexistent in the segment. If numbers on the second line do not add to 100 then some mesohabitats were not recorded in the field. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	0 (10)	N-E	N-E
2.5 Inch Trammel Net	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (0)	N-E	0 (0)	N-E	N-E
Fish Community Season (Summer)							
1 Inch Trammel Net	1	0 (0)	100 (90)	N-E	0 (10)	N-E	N-E
Bag Seine	0	0 (65)	0 (0)	N-E	0 (23)	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	0	0 (73)	0 (2)	N-E	0 (15)	N-E	N-E
Otter Trawl	1	0 (0)	100 (96)	N-E	0 (4)	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, which is on the first line of the gear type, in segment 4 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. Size categories described in Table 7. N-E indicates the habitat is nonexistent in the segment. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

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 (23)	0 (0)	N-E	N-E	0 (28)	0 (26)	0 (21)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-
2.5 Inch Trammel Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-
Fish Community Season (Summer)															
1 Inch Trammel Net	5	N-E	20 (17)	0 (0)	N-E	N-E	20 (22)	60 (33)	0 (14)	0 (0)	0 (0)	0 (11)	0 (2)	0 (0)	-
Bag Seine	-	N-E	0 (0)	0 (0)	N-E	N-E	0 (35)	0 (11)	0 (21)	0 (17)	0 (13)	0 (0)	0 (2)	0 (0)	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Mini-Fyke Net	0	N-E	0 (1)	0 (0)	N-E	N-E	0 (40)	0 (16)	0 (26)	0 (5)	0 (12)	0 (0)	0 (0)	0 (0)	-
Otter Trawl	2	N-E	50 (24)	0 (0)	N-E	N-E	0 (30)	50 (36)	0 (9)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-

Table 12. Total number of sub-stock size size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat, which is on the first line of the gear type, in segment 4 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is nonexistent in the segment. If numbers on the second line do not add to 100 then some mesohabitats were not recorded in the field. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	0 (10)	N-E	N-E
2.5 Inch Trammel Net	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (0)	N-E	0 (0)	N-E	N-E
Fish Community Season (Summer)							
1 Inch Trammel Net	5	0 (0)	100 (90)	N-E	0 (10)	N-E	N-E
Bag Seine	0	0 (65)	0 (0)	N-E	0 (23)	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	0	0 (73)	0 (2)	N-E	0 (15)	N-E	N-E
Otter Trawl	2	0 (0)	100 (96)	N-E	0 (4)	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, which is on the first line of the gear type, in segment 4 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. Size categories described in Table 7. N-E indicates the habitat is nonexistent in the segment. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	2	N-E	50 (23)	0 (0)	N-E	N-E	0 (28)	50 (26)	0 (21)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-
2.5 Inch Trammel Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-
Fish Community Season (Summer)															
1 Inch Trammel Net	11	N-E	9 (17)	0 (0)	N-E	N-E	18 (22)	45 (33)	9 (14)	0 (0)	0 (0)	18 (11)	0 (2)	0 (0)	-
Bag Seine	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (35)	0 (11)	0 (21)	0 (17)	0 (13)	0 (0)	0 (2)	0 (0)	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Mini-Fyke Net	0	N-E	0 (1)	0 (0)	N-E	N-E	0 (40)	0 (16)	0 (26)	0 (5)	0 (12)	0 (0)	0 (0)	0 (0)	-
Otter Trawl	2	N-E	0 (24)	0 (0)	N-E	N-E	0 (30)	50 (36)	50 (9)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-

Table 14. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat, which is on the first line of the gear type, in segment 4 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is nonexistent in the segment. If numbers on the second line do not add to 100, then some mesohabitats were not recorded in the field. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	2	0 (0)	100 (90)	N-E	0 (10)	N-E	N-E
2.5 Inch Trammel Net	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (0)	N-E	0 (0)	N-E	N-E
Fish Community Season (Summer)							
1 Inch Trammel Net	11	0 (0)	27 (90)	N-E	27 (10)	N-E	N-E
Bag Seine	0	0 (65)	0 (0)	N-E	0 (23)	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	0	0 (73)	0 (2)	N-E	0 (15)	N-E	N-E
Otter Trawl	2	0 (0)	100 (96)	N-E	0 (4)	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, which is on the first line of the gear type, in segment 4 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. Size categories described in Table 7. N-E indicates the habitat is nonexistent in the segment. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

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 (23)	0 (0)	N-E	N-E	0 (28)	0 (26)	0 (21)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-
2.5 Inch Trammel Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-
Fish Community Season (Summer)															
1 Inch Trammel Net	4	N-E	0 (17)	0 (0)	N-E	N-E	0 (22)	50 (33)	25 (14)	0 (0)	0 (0)	0 (11)	0 (2)	0 (0)	-
Bag Seine	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (35)	0 (11)	0 (21)	0 (17)	0 (13)	0 (0)	0 (2)	0 (0)	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Mini-Fyke Net	0	N-E	0 (1)	0 (0)	N-E	N-E	0 (40)	0 (16)	0 (26)	0 (5)	0 (12)	0 (0)	0 (0)	0 (0)	-
Otter Trawl	2	N-E	0 (24)	0 (0)	N-E	N-E	0 (30)	100 (36)	0 (9)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-

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, which is on the first line of the gear type, in segment 4 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is nonexistent in the segment. If numbers on the second line do not add to 100, then some mesohabitats were not recorded in the field. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	0 (10)	N-E	N-E
2.5 Inch Trammel Net	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (0)	N-E	0 (0)	N-E	N-E
Fish Community Season (Summer)							
1 Inch Trammel Net	4	0 (0)	75 (90)	N-E	0 (10)	N-E	N-E
Bag Seine	0	0 (65)	0 (0)	N-E	0 (23)	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	0	0 (73)	0 (2)	N-E	0 (15)	N-E	N-E
Otter Trawl	2	0 (0)	100 (96)	N-E	0 (4)	N-E	N-E

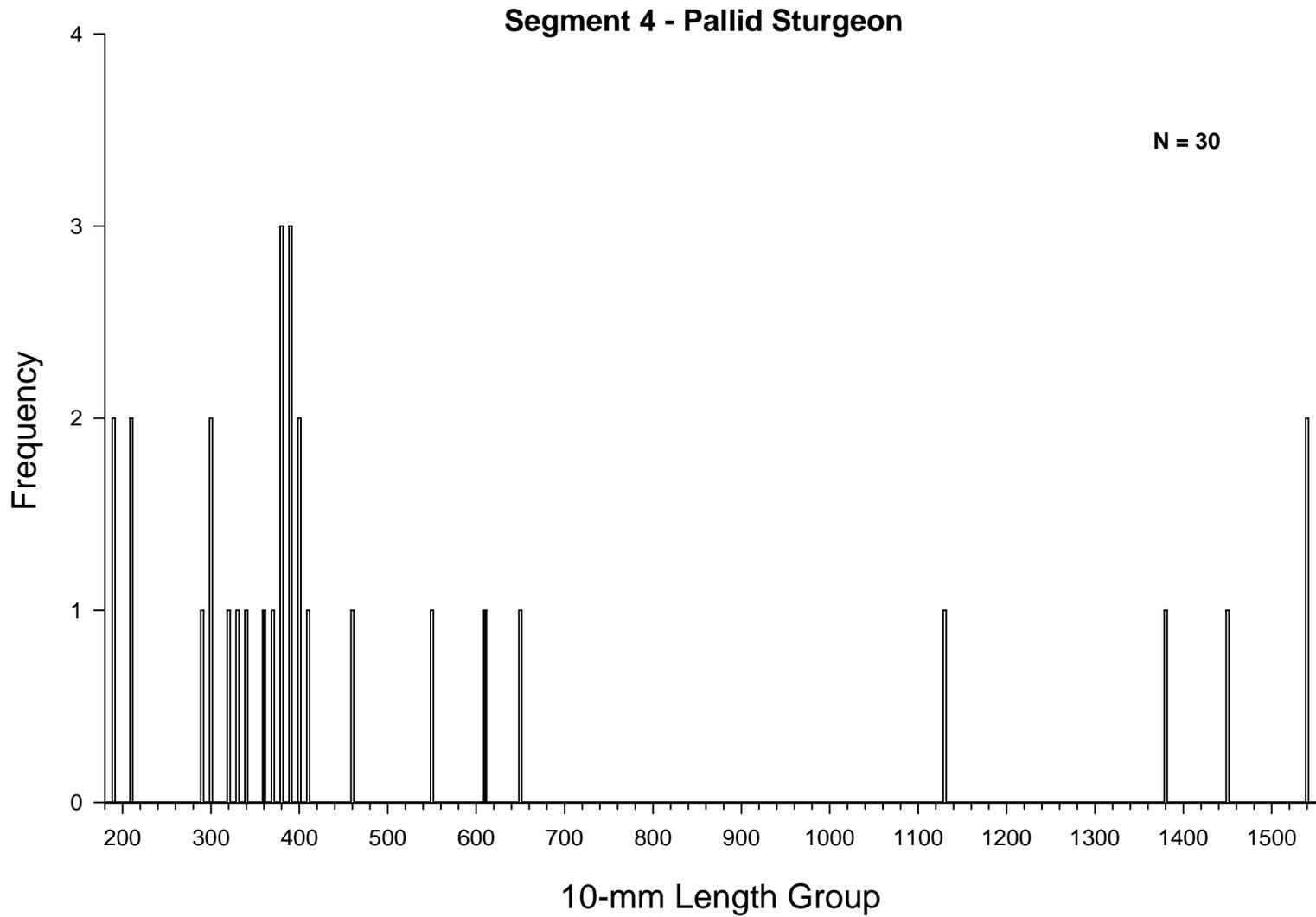


Figure 8. Length frequency of pallid sturgeon during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2004 - 2005.

Segment 4 - Cumulative Pallid Sturgeon Capture History

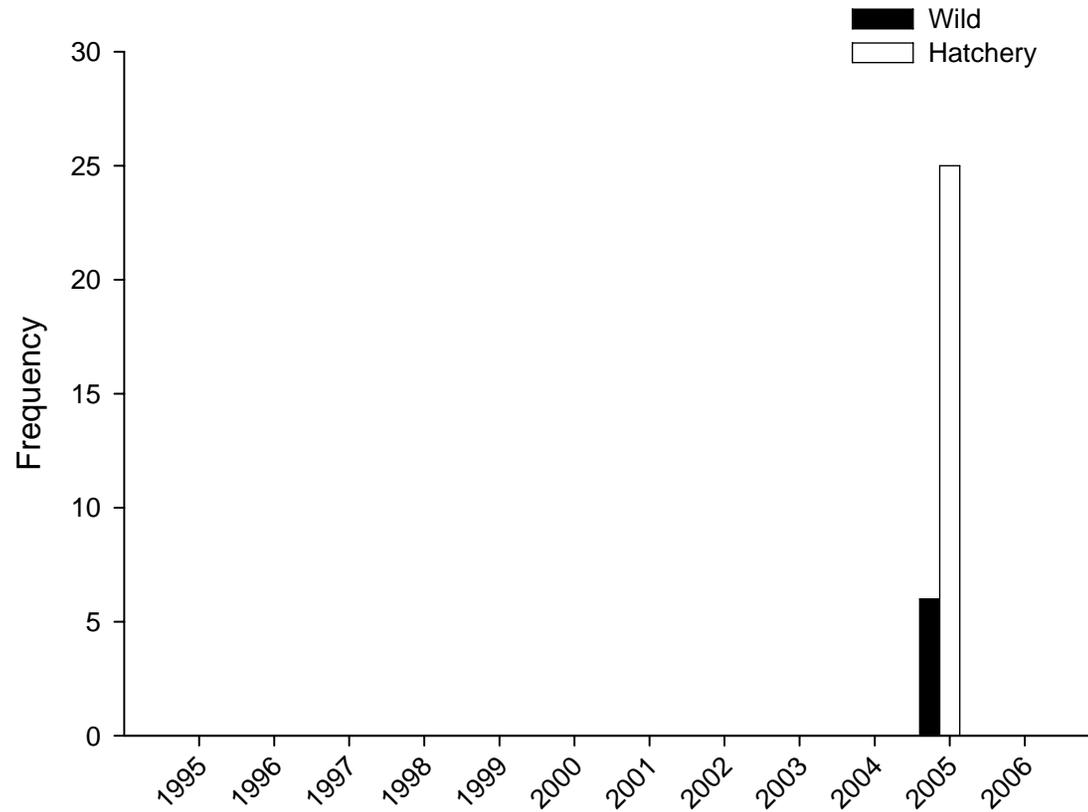


Figure 9. Cumulative capture history of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon collected in segment 4 of the Missouri River from 1995 to 2005.

Segment 4 - Cumulative Pallid Sturgeon Length Frequency History

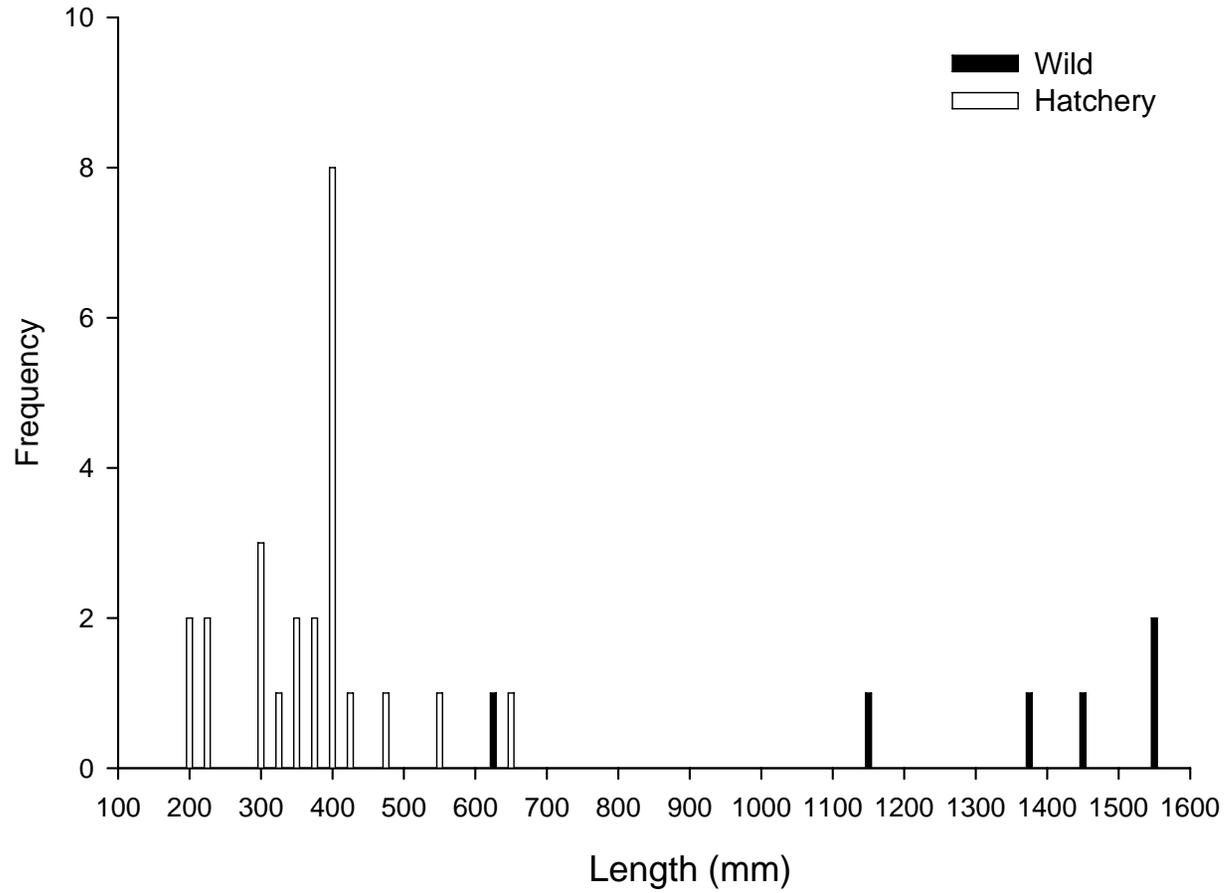


Figure 10. Cumulative pallid sturgeon length frequency histogram for segment 4 comparing hatchery reared (white bars), wild (black bars), and unknown origin (cross-hatched bars) pallid sturgeon captures in 2005.

Shovelnose X Pallid Sturgeon Hybrids

No known pallid x shovelnose sturgeon hybrids were sampled during the 2005 sampling period.

Targeted Native River Species

Shovelnose Sturgeon

A total of 275 shovelnose sturgeon were captured in segment 4 for the sampling conducted during the 2005 sturgeon and fish community seasons. Due to a minimal effort conducted during the sturgeon season, limited data is available for shovelnose sturgeon (N=17) for this time period (Figure 19) compared to the number (N= 258) of shovelnose sampled during the fish community season.

The standard trammel net accounted for 171 (62%) of the captured shovelnose, with 104 (38%) captured with the otter trawl. However, overall catch per unit effort was similar between trammel net (CPUE = 0.331 fish/ 100 meters) and the otter trawl (CPUE = 0.376 fish/ 100 meters). Catch per unit of effort was greatest for the trammel nets during the fish community season (0.547 fish per 100 meters drifted) followed by the otter trawl (0.376 fish per 100 meters trawled) during the fish community season. Trammel nets during the late part of the sturgeon season showed the lowest catch per unit effort (0.074 fish per 100 meters). Mini-fyke nets and seines did not catch any pallid sturgeon during the fish community season.

The otter trawl (CPUE = 0.198 fish/100 m) appears to be more effective in capturing the substock sized (0-149 mm) shovelnose sturgeon than trammel nets (CPUE = 0.004) (Figure 14). Only one shovelnose sturgeon of this size class was sampled with the trammel net versus the 54 collected with the otter trawl during the fish community season. The trammel nets (CPUE = 0.466 fish/ 100 m), on the other hand, appear to be more effective at capturing stock size shovelnose sturgeon than the otter trawl (CPUE = 0.132 fish/ 100m).

Fork lengths (FL) of shovelnose sturgeon ranged from 49 – 856 mm for the segment 4 sampling season. Based on length frequency histogram, there appears to be three significant size classes. Although specific age data was not available at the time of this analysis, previous work (Pierce et al., 2003) suggests these size classes are made up of several year classes. Relative Stock Density (RSD) values suggest that recruitment is occurring as fish in all size classes were captured.

Segment 4 - Shovelnose Sturgeon / Sturgeon Season

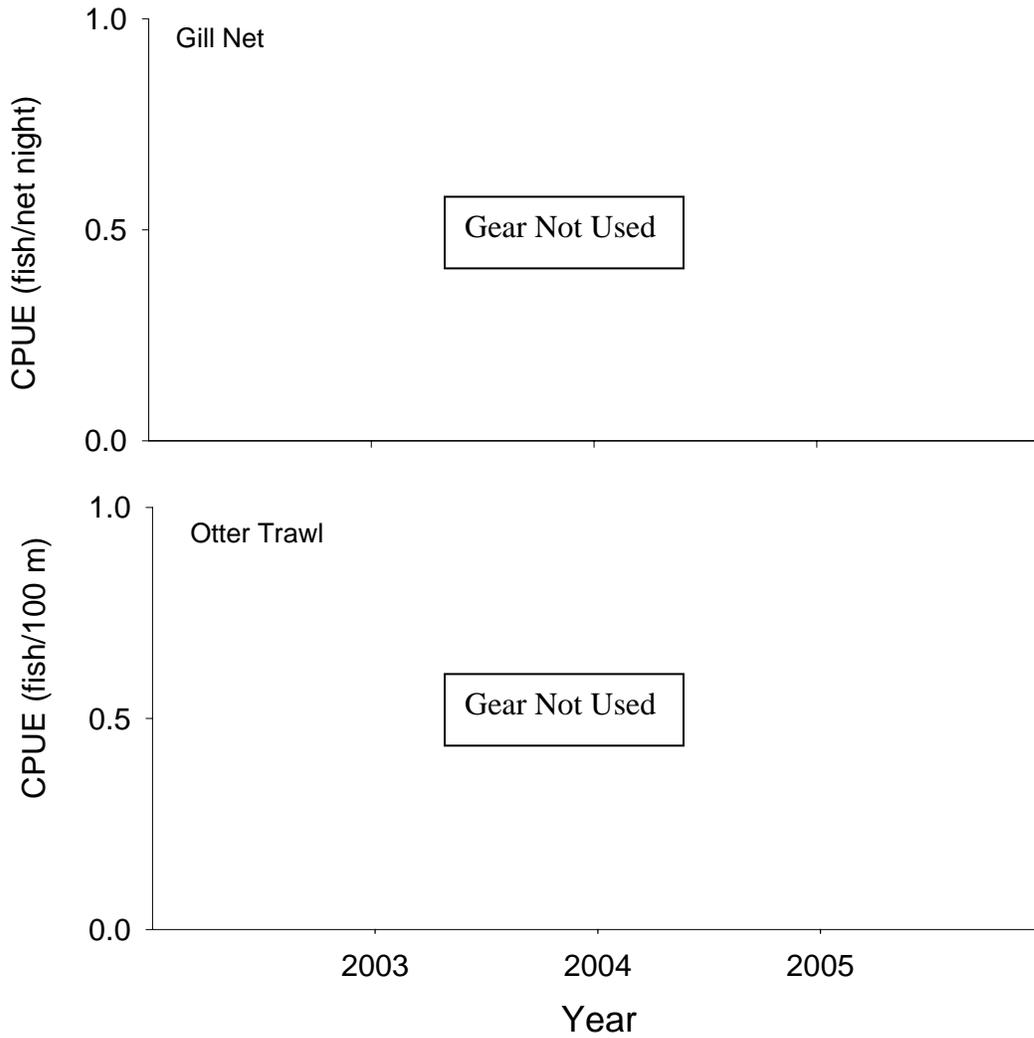


Figure 11. Mean annual catch-per-unit-effort (\pm 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size ($>$ 380 mm; black bars) shovelnose sturgeon in segment 4 of the Missouri River during sturgeon season 2003 - 2005.

Segment 4 - Shovelnose Sturgeon / Sturgeon Season

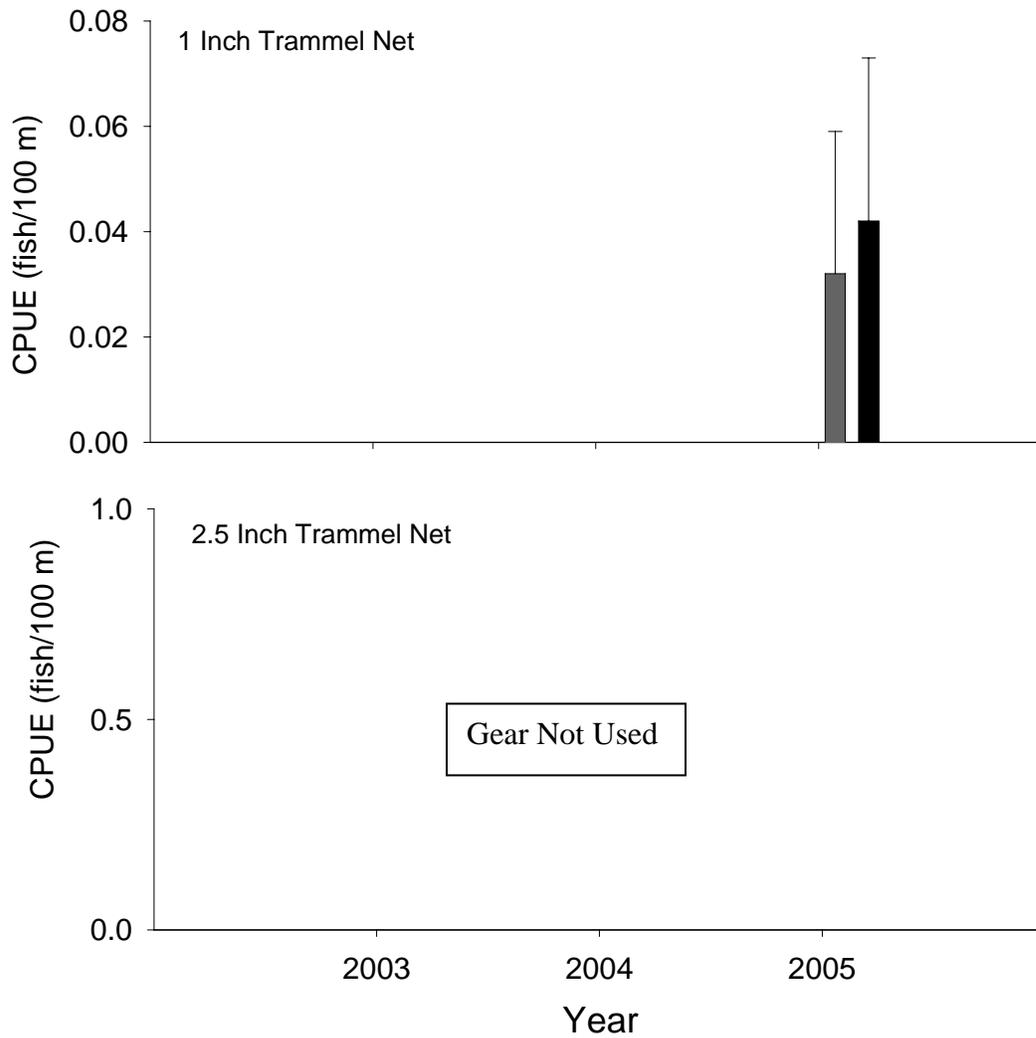


Figure 12. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segment 4 of the Missouri River during sturgeon season 2003 - 2005.

Segment 4 - Shovelnose Sturgeon / Sturgeon Season

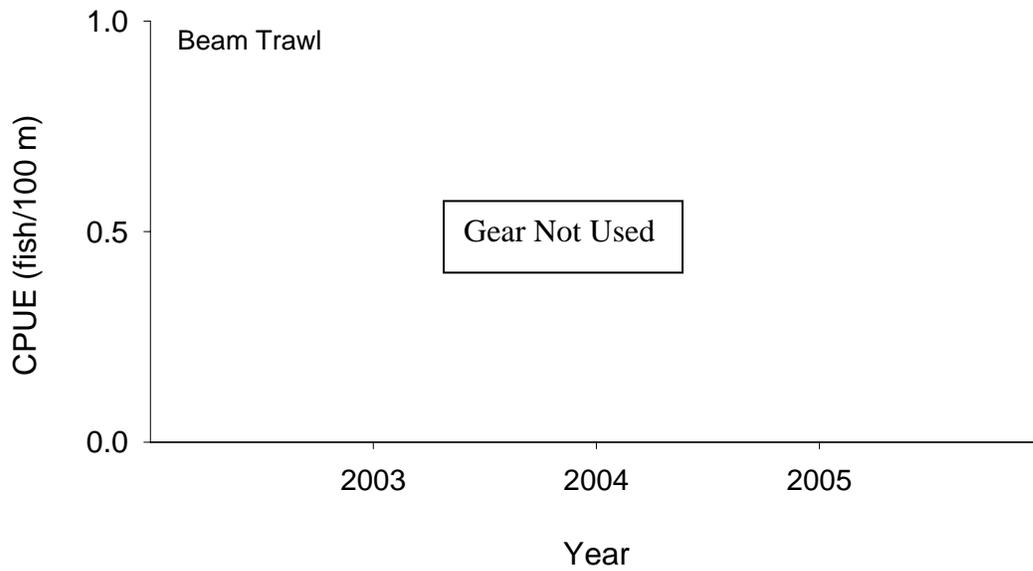


Figure 13. Mean annual catch-per-unit-effort (\pm 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segment 4 of the Missouri River during sturgeon season 2003 - 2005.

Segment 4 - Shovelnose Sturgeon / Fish Community Season

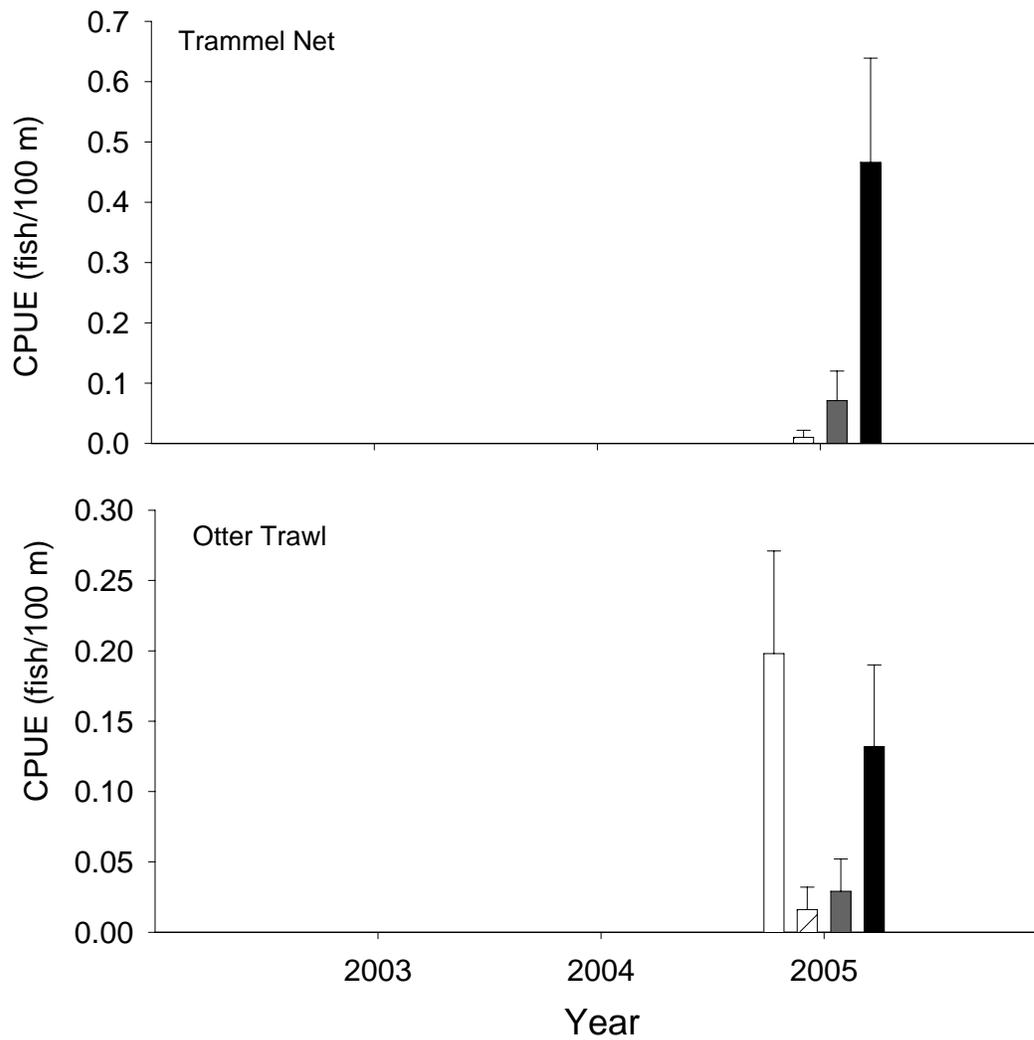


Figure 14. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segment 4 of the Missouri River during fish community season 2003 - 2005.

Segment 4 - Shovelnose Sturgeon / Fish Community Season

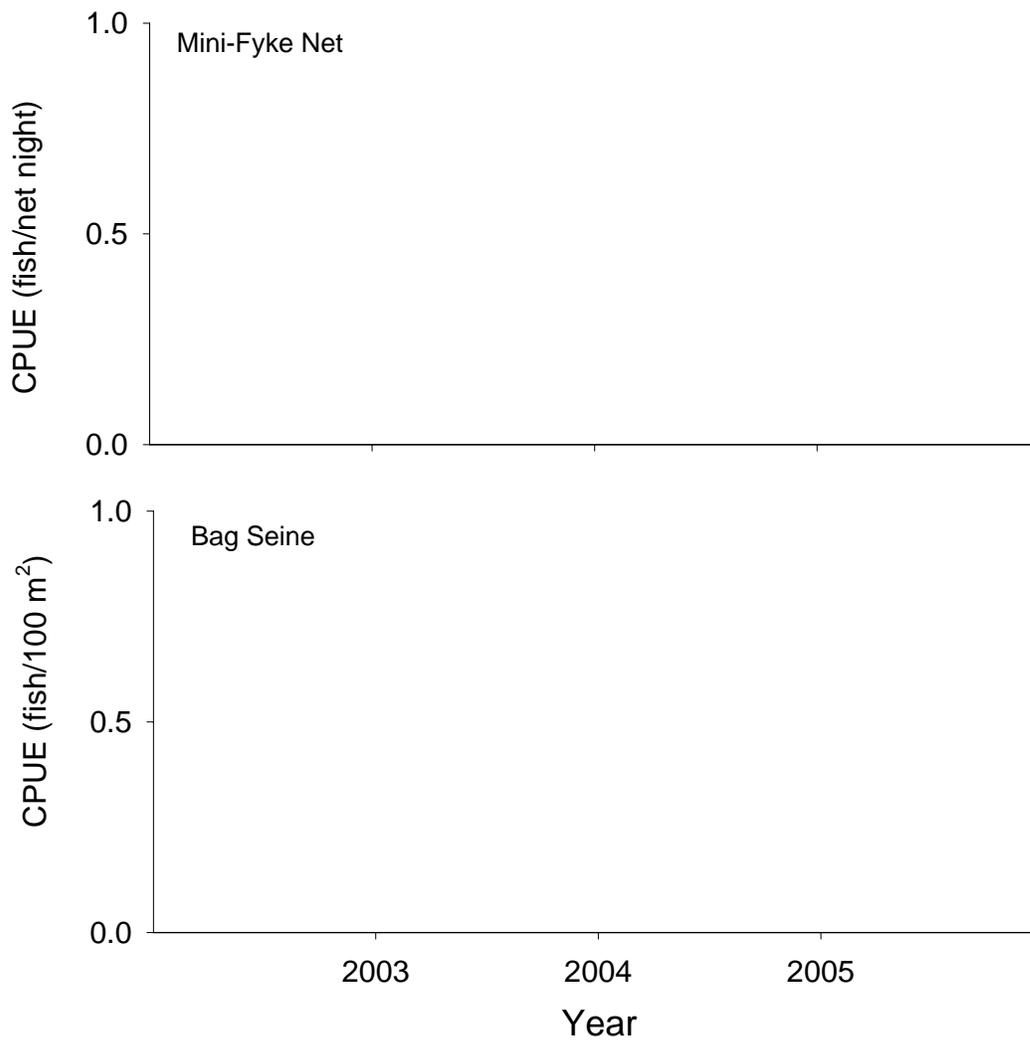


Figure 15. Mean annual catch-per-unit-effort (\pm 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size ($>$ 380 mm; black bars) shovelnose sturgeon in segment 4 of the Missouri River during fish community season 2003 - 2005.

Segment 4 - Shovelnose Sturgeon / Fish Community Season

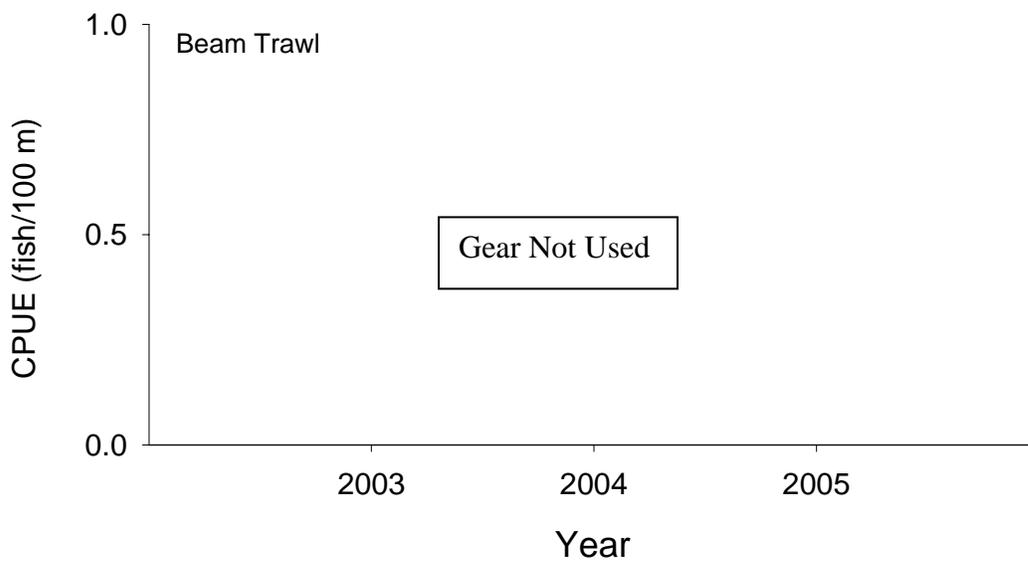


Figure 16. Mean annual catch-per-unit-effort (\pm 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size ($>$ 380 mm; black bars) shovelnose sturgeon in segment 4 of the Missouri River during fish community season 2003 - 2005.

Habitat Use

Macrohabitats where shovelnose sturgeon were captured included inside and outside bends, channel crossovers, tributary, and large connected secondary channels. For sub-stock sized (0-149 mm) shovelnose (N=55), inside bend and outside bend macrohabitats were dominant habitats where these fish were collected. The sub-stock (150-249) shovelnose (N=7) were sampled in the inside and outside bends, channel crossovers, and large connected secondary channel macrohabitats while the habitats associated with the stock size (250-379 mm) shovelnose (N=33) were fairly similar. The quality sized (>380 mm) shovelnose sturgeon (N=180) were associated with inside and outside bends, channel crossovers, large connected secondary channels, tributaries and small tributary mouths. (Tables 17, 19, 21, 23) The mesohabitats associated with shovelnose sturgeon captures were primarily classified as channel border and island tips. Sand substrate dominated the sampling area and is the predominant substrate found during the sampling period.

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, which is on the first line of the gear type, in segment 4 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. Size categories described in Table 25. N-E indicates the habitat is nonexistent in the segment. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

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 (23)	0 (0)	N-E	N-E	0 (28)	0 (26)	0 (21)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-
2.5 Inch Trammel Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-
Fish Community Season (Summer)															
1 Inch Trammel Net	1	N-E	0 (17)	0 (0)	N-E	N-E	100 (22)	0 (33)	0 (14)	0 (0)	0 (0)	0 (11)	0 (2)	0 (0)	-
Bag Seine	0	N-E	0 (10)	0 (0)	N-E	N-E	0 (35)	0 (11)	0 (21)	0 (17)	0 (13)	0 (0)	0 (2)	0 (0)	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Mini-Fyke Net	0	N-E	0 (1)	0 (0)	N-E	N-E	0 (40)	0 (16)	0 (26)	0 (5)	0 (12)	0 (0)	0 (0)	0 (0)	-
Otter Trawl	54	N-E	15 (24)	0 (0)	N-E	N-E	39 (30)	44 (36)	2 (9)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-

Table 18. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat, which is on the first line of the gear type, in segment 4 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is nonexistent in the segment. If numbers on the second line do not add to 100, then some mesohabitats were not recorded in the field. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	0 (10)	N-E	N-E
2.5 Inch Trammel Net	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (0)	N-E	0 (0)	N-E	N-E
Fish Community Season (Summer)							
1 Inch Trammel Net	1	0 (0)	100 (90)	N-E	0 (10)	N-E	N-E
Bag Seine	0	0 (65)	0 (0)	N-E	0 (23)	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	0	0 (73)	0 (2)	N-E	0 (15)	N-E	N-E
Otter Trawl	54	0 (0)	98 (96)	N-E	2 (4)	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, which is on the first line of the gear type, in segment 4 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. Size categories described in Table 25. N-E indicates the habitat is nonexistent in the segment. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

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 (23)	0 (0)	N-E	N-E	0 (28)	0 (26)	0 (21)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-
2.5 Inch Trammel Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-
Fish Community Season (Summer)															
1 Inch Trammel Net	3	N-E	33 (17)	0 (0)	N-E	N-E	0 (22)	67 (33)	0 (14)	0 (0)	0 (0)	0 (11)	0 (2)	0 (0)	-
Bag Seine	0	N-E	0 (10)	0 (0)	N-E	N-E	0 (35)	0 (11)	0 (21)	0 (17)	0 (13)	0 (0)	0 (2)	0 (0)	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Mini-Fyke Net	0	N-E	0 (1)	0 (0)	N-E	N-E	0 (40)	0 (16)	0 (26)	0 (5)	0 (12)	0 (0)	0 (0)	0 (0)	-
Otter Trawl	4	N-E	25 (24)	0 (0)	N-E	N-E	25 (30)	25 (36)	25 (9)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-

Table 20. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat, which is on the first line of the gear type, in segment 4 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is nonexistent in the segment. If numbers on the second line do not add to 100, then some mesohabitats were not recorded in the field. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	0 (10)	N-E	N-E
2.5 Inch Trammel Net	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (0)	N-E	0 (0)	N-E	N-E
Fish Community Season (Summer)							
1 Inch Trammel Net	3	0 (0)	100 (90)	N-E	0 (10)	N-E	N-E
Bag Seine	0	0 (65)	0 (0)	N-E	0 (23)	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	0	0 (73)	0 (2)	N-E	0 (15)	N-E	N-E
Otter Trawl	4	0 (0)	75 (96)	N-E	25 (4)	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, which is on the first line of the gear type, in segment 4 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. Size categories described in Table 25. N-E indicates the habitat is nonexistent in the segment. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

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	7	N-E	14 (23)	0 (0)	N-E	N-E	14 (28)	0 (26)	71 (21)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-
2.5 Inch Trammel Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-
Fish Community Season (Summer)															
1 Inch Trammel Net	18	N-E	22 (17)	0 (0)	N-E	N-E	22 (22)	22 (33)	28 (14)	0 (0)	0 (0)	0 (11)	6 (2)	0 (0)	-
Bag Seine	0	N-E	0 (10)	0 (0)	N-E	N-E	0 (35)	0 (11)	0 (21)	0 (17)	0 (13)	0 (0)	0 (2)	0 (0)	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Mini-Fyke Net	0	N-E	0 (1)	0 (0)	N-E	N-E	0 (40)	0 (16)	0 (26)	0 (5)	0 (12)	0 (0)	0 (0)	0 (0)	-
Otter Trawl	8	N-E	38 (24)	0 (0)	N-E	N-E	25 (30)	13 (36)	25 (9)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-

Table 22. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat, which is on the first line of the gear type, in segment 4 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is nonexistent in the segment. If numbers on the second line do not add to 100, then some mesohabitats were not recorded in the field. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	7	0 (0)	71 (90)	N-E	29 (10)	N-E	N-E
2.5 Inch Trammel Net	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (0)	N-E	0 (0)	N-E	N-E
Fish Community Season (Summer)							
1 Inch Trammel Net	18	0 (0)	83 (90)	N-E	17 (10)	N-E	N-E
Bag Seine	0	0 (65)	0 (0)	N-E	0 (23)	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	0	0 (73)	0 (2)	N-E	0 (15)	N-E	N-E
Otter Trawl	8	0 (0)	100 (96)	N-E	0 (4)	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, which is on the first line of the gear type, in segment 4 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. Size categories described in Table 25. N-E indicates the habitat is nonexistent in the segment. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

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	10	N-E	0 (23)	0 (0)	N-E	N-E	10 (28)	10 (26)	80 (21)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-
2.5 Inch Trammel Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-
Fish Community Season (Summer)															
1 Inch Trammel Net	132	N-E	15 (17)	0 (0)	N-E	N-E	21 (22)	34 (33)	12 (14)	0 (0)	0 (0)	8 (11)	10 (2)	0 (0)	-
Bag Seine	0	N-E	0 (10)	0 (0)	N-E	N-E	0 (35)	0 (11)	0 (21)	0 (17)	0 (13)	0 (0)	0 (2)	0 (0)	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Mini-Fyke Net	0	N-E	0 (1)	0 (0)	N-E	N-E	0 (40)	0 (16)	0 (26)	0 (5)	0 (12)	0 (0)	0 (0)	0 (0)	-
Otter Trawl	38	N-E	13 (24)	0 (0)	N-E	N-E	21 (30)	61 (36)	0 (9)	0 (0)	0 (0)	0 (0)	5 (2)	0 (0)	-

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, which is on the first line of the gear type, in segment 4 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is nonexistent in the segment. If numbers on the second line do not add to 100, then some mesohabitats were not recorded in the field. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	10	0 (0)	60 (90)	N-E	40 (10)	N-E	N-E
2.5 Inch Trammel Net	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (0)	N-E	0 (0)	N-E	N-E
Fish Community Season (Summer)							
1 Inch Trammel Net	132	0 (0)	88 (90)	N-E	12 (10)	N-E	N-E
Bag Seine	0	0 (65)	0 (0)	N-E	0 (23)	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	0	0 (73)	0 (2)	N-E	0 (15)	N-E	N-E
Otter Trawl	38	0 (0)	100 (96)	N-E	0 (4)	N-E	N-E

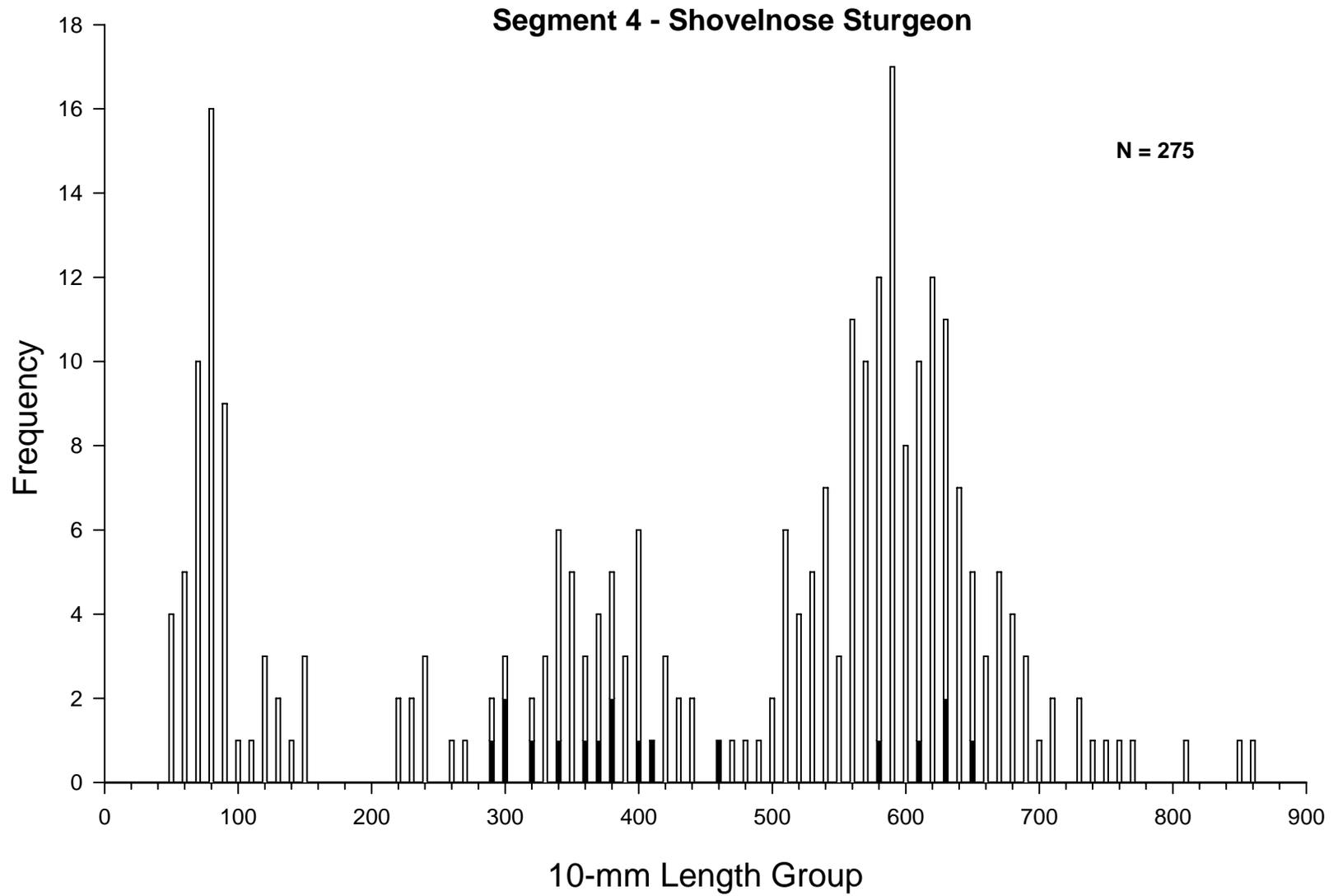


Figure 17. Length frequency of shovelnose sturgeon from fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2004 - 2005.

Table 25. Relative stock density (RSD)^a by a length category for shovelnose sturgeon in segment 4 of the Missouri River captured during 2005. Length categories^b determined using methods proposed by Quist (1998).

Length category	N	RSD
Sturgeon Season		
Sub-stock (0-149 mm)	0	--
Sub-stock (150-249 mm)	0	--
Stock	17	--
Quality	10	59
Preferred	5	29
Memorable	1	6
Trophy	0	0
Fish Community Season		
Sub-stock (0-149 mm)	55	--
Sub-stock (150-249 mm)	7	--
Stock	196	--
Quality	170	87
Preferred	146	74
Memorable	32	16
Trophy	2	1

^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

The highest catch per unit effort for sturgeon chub was with otter trawls (0.681 fish per 100m), followed by mini-fyke nets (0.099 fish per net night) and bag seines (0.062 fish per 100 m)(Figures 19 and 20). All sturgeon chub were sampled during the fish community season. The majority of fish sampled with the otter trawl were found on outside bend macrohabitats (44%), followed by inside bends (24%), channel crossovers (16%) and large secondary channel macrohabitats (15%) (Table 26). Sturgeon chubs were collected more frequently in mini-fyke nets from inside bend macrohabitat (50%), followed by large secondary channels (25%), outside bends (12%) and nonconnected secondary channels (12%). All three sturgeon chubs sampled with a bag seine were found in large secondary channel macrohabitats. Most (91%) of the sturgeon chubs sampled with the otter trawl were collected from channel border mesohabitats (Table 27). The other 9% were found on island tip mesohabitats. Fifty (32%) sturgeon chubs captured were in the 25 – 49 mm total length size range. There were 67 (43%) sampled between 50 mm and 74 mm, 38 (24%) between 75 mm and 99 mm and 1 (.06%) greater than 100 mm in length (Figure 21). The 75 – 79 mm size range contained the most fish with 23 collected followed by 70– 74 mm and 18 in the 45 – 49 mm size range. The smallest sicklefin chub sampled in the otter trawl was 2 mm and the largest was 101 mm with the average length of 57.4 mm.

Segment 4 - Sturgeon Chub / Sturgeon Season

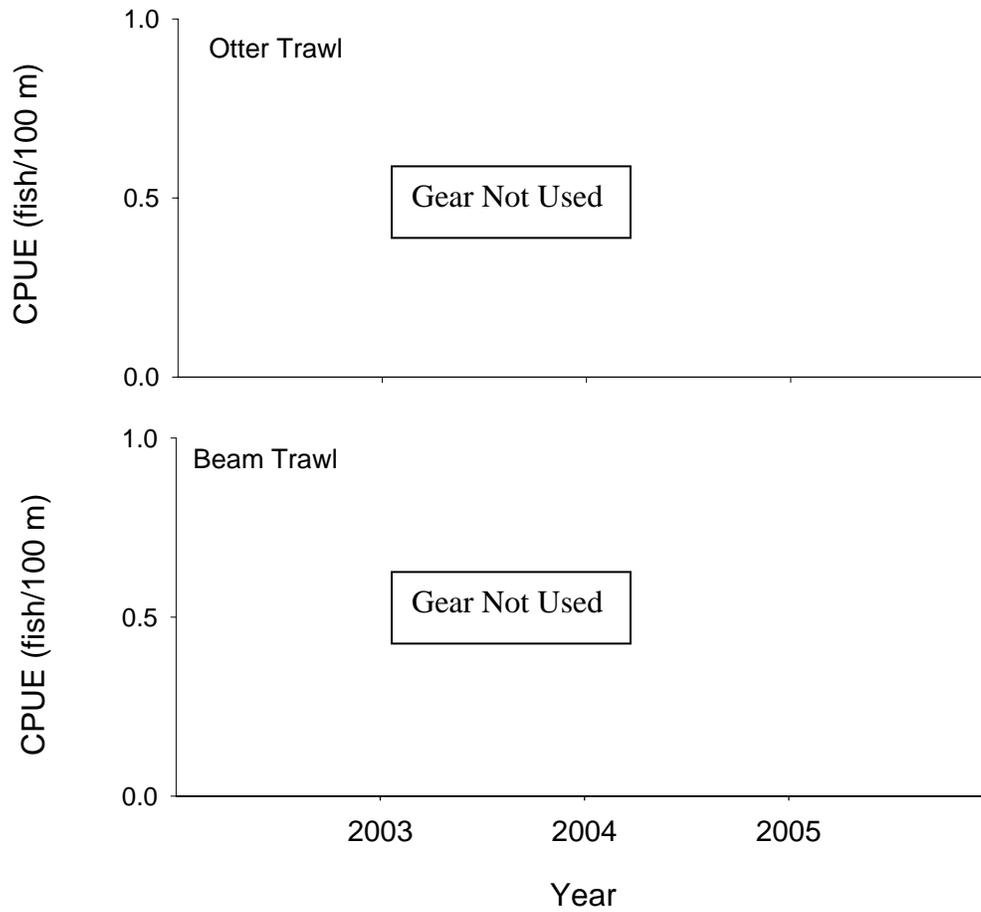


Figure 18. Mean annual catch-per-unit-effort (\pm 2SE) of sturgeon chub using otter trawls and beam trawls in segment 4 of the Missouri River during sturgeon season 2003-2005.

Segment 4 - Sturgeon Chub / Fish Community Season

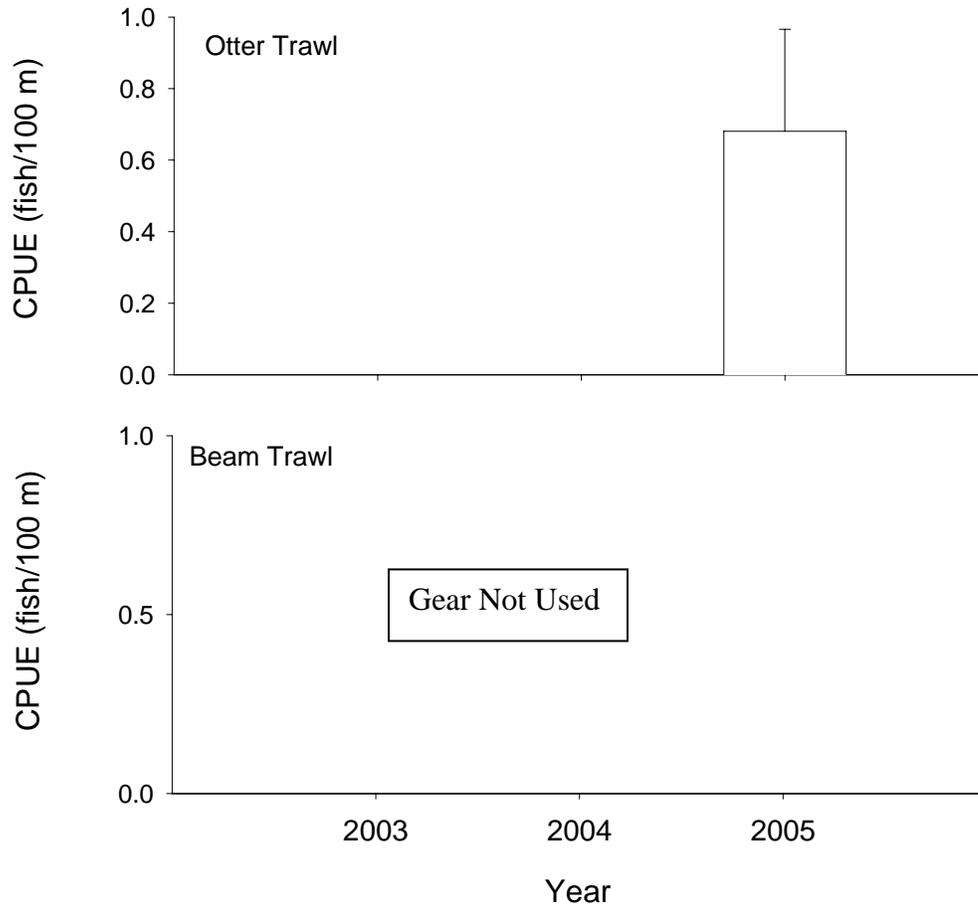


Figure 19. Mean annual catch-per-unit-effort ($\pm 2SE$) of sturgeon chub using otter trawls and beam trawls in segment 4 of the Missouri River during fish community season 2003-2005.

Segment 4 - Sturgeon Chub / Fish Community Season

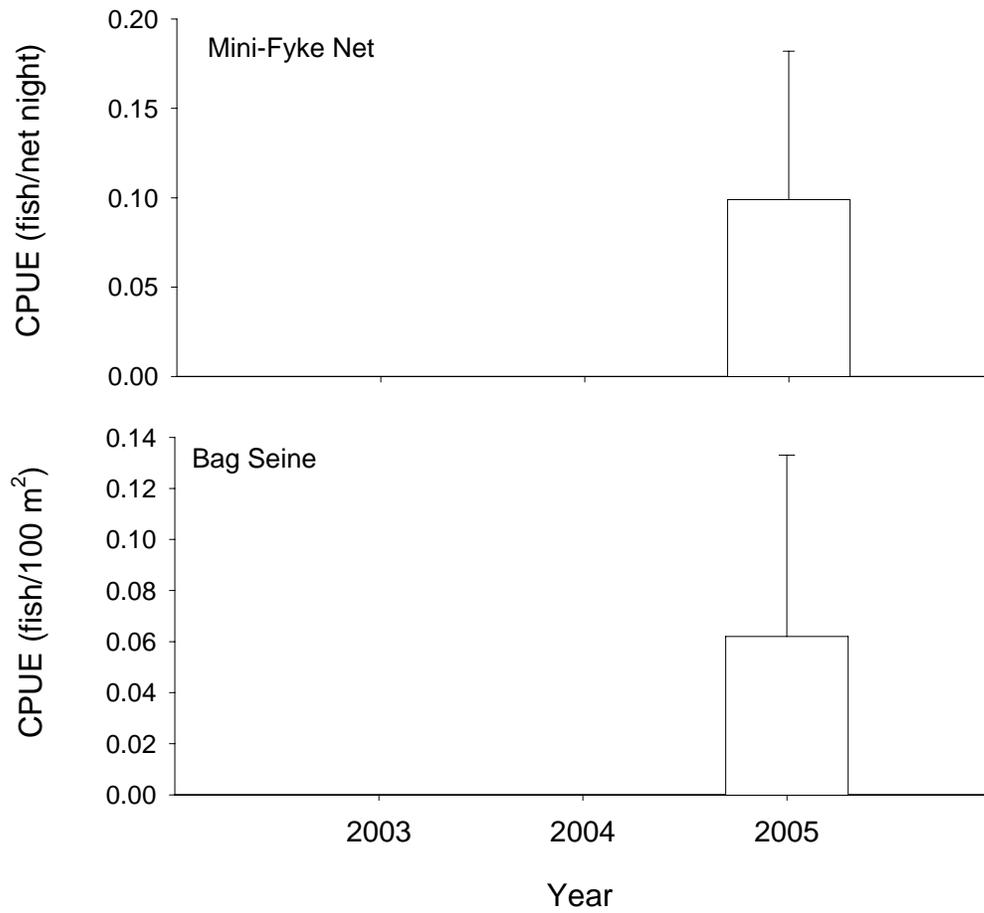


Figure 20. Mean annual catch-per-unit-effort (\pm 2SE) of sturgeon chub using mini-fyke nets and bag seines in segment 4 of the Missouri River during fish community season 2003-2005.

Table 26. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each macrohabitat, which is on the first line of the gear type, in segment 4 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. N-E indicates the habitat is nonexistent in the segment. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

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 (23)	0 (0)	N-E	N-E	0 (28)	0 (26)	0 (21)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-
2.5 Inch Trammel Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0 (17)	0 (0)	N-E	N-E	0 (22)	0 (33)	0 (14)	0 (0)	0 (0)	0 (11)	0 (2)	0 (0)	-
Bag Seine	3	N-E	0 (10)	0 (0)	N-E	N-E	0 (35)	0 (11)	100 (21)	0 (17)	0 (13)	0 (0)	0 (2)	0 (0)	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Mini-Fyke Net	8	N-E	0 (1)	0 (0)	N-E	N-E	50 (40)	12 (16)	25 (26)	0 (5)	12 (12)	0 (0)	0 (0)	0 (0)	-
Otter Trawl	176	N-E	16 (24)	0 (0)	N-E	N-E	24 (30)	44 (36)	15 (9)	0 (0)	0 (0)	0 (0)	1 (2)	0 (0)	-

Table 27. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each mesohabitat, which is on the first line of the gear type, in segment 4 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is nonexistent in the segment. If numbers on the second line do not add to 100, then some mesohabitats were not recorded in the field. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	0 (10)	N-E	N-E
2.5 Inch Trammel Net	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (0)	N-E	0 (0)	N-E	N-E
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	12 (10)	N-E	N-E
Bag Seine	3	67 (65)	0 (0)	N-E	33 (23)	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	8	88 (73)	0 (2)	N-E	0 (15)	N-E	N-E
Otter Trawl	176	0 (0)	91 (96)	N-E	9 (4)	N-E	N-E

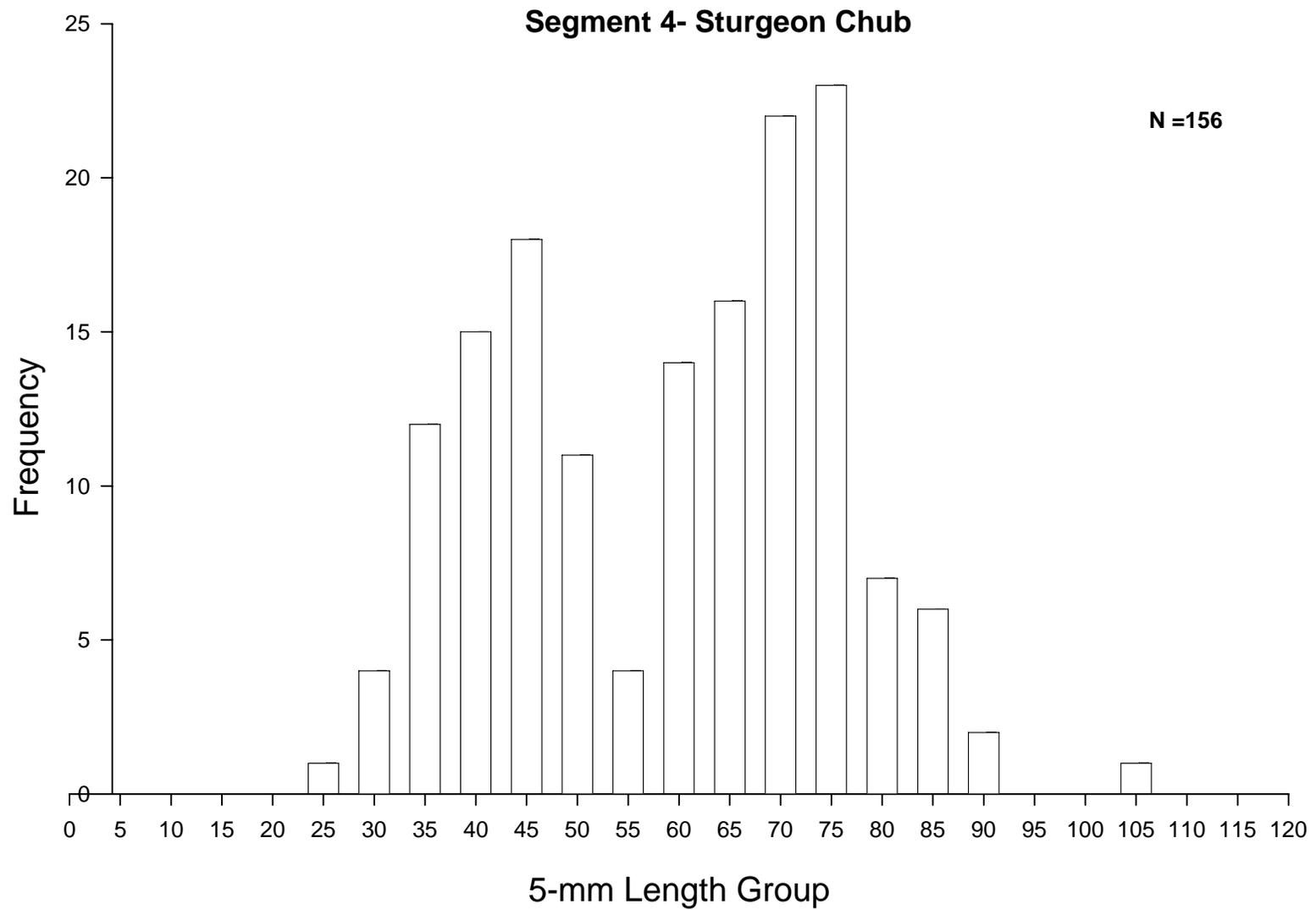


Figure 21. Length frequency of sturgeon chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2004 - 2005.

Sicklefin Chub

Catch per unit effort was highest for sicklefin chubs in the otter trawl (1.26 fish per 100 m) during the fish community season followed by mini-fyke nets (0.012 fish per net night) and bag seines (0.01 fish per 100 m²) (Figures 23 and 24). There were 329 sicklefin chubs collected in the otter trawl during the fish community season. Over half of these fish were sampled in outside bend macrohabitats followed by 25% caught in inside bends (Table 28). Only one sicklefin chub was caught with a bag seine in a small secondary channel macrohabitat and one was collected with a min-fyke net in an inside bend. Almost all (98%) of the sicklefin chubs sampled were found in channel border mesohabitat (Table 29). Thirty two (10%) sicklefin chubs captured were in the 40 – 59 mm total length size range. There were 200 (67%) sampled between 60 mm and 79 mm, 52 (17%) between 80 mm and 99 mm, and 13 (4%) 100 mm and greater in length (Figure 25). The 70 – 74 mm size range contained the most fish with 76 collected followed by 75 – 80 mm and 65 – 69 mm size ranges with 59 and 53, respectively. The smallest sicklefin chub sampled in the otter trawl was 32 mm and the largest was 118 mm with an average length of 69.6 mm.

Segment 4 - Sicklefin Chub / Sturgeon Season

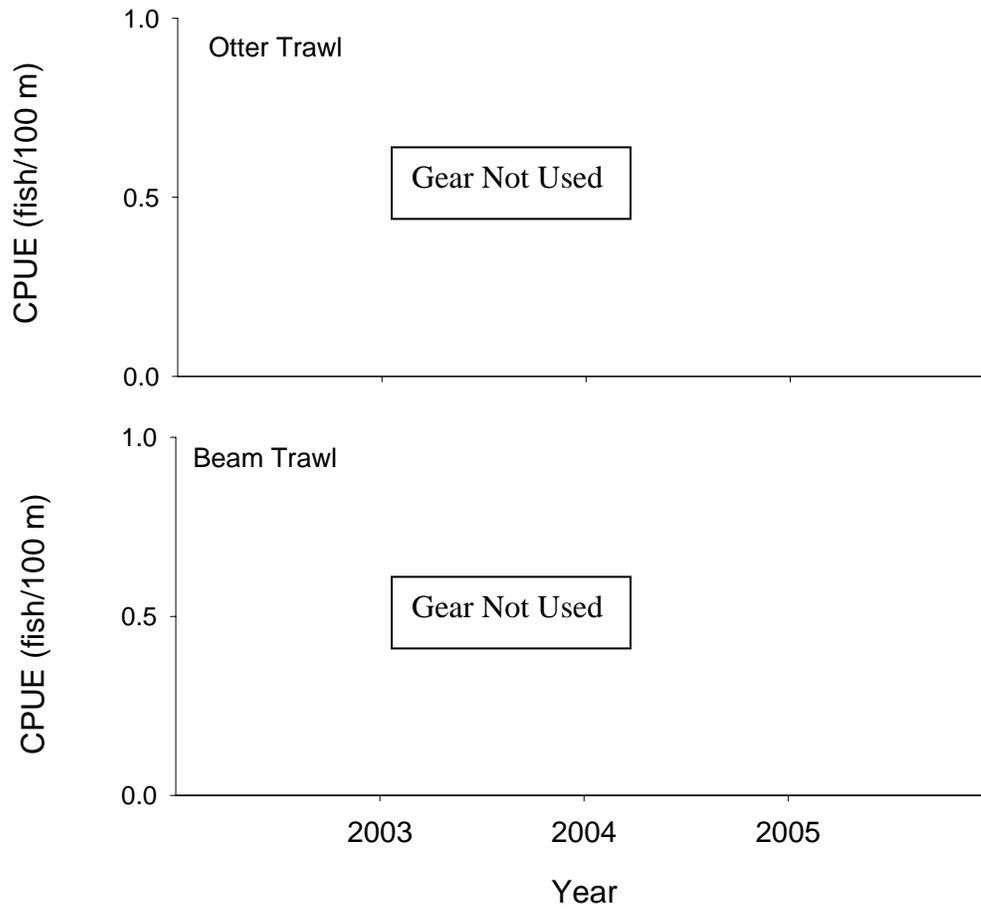


Figure 22. Mean annual catch-per-unit-effort ($\pm 2SE$) of sicklefin chub using otter trawls and beam trawls in segment 4 of the Missouri River during sturgeon season 2003-2005.

Segment 4 - Sicklefin Chub / Fish Community Season

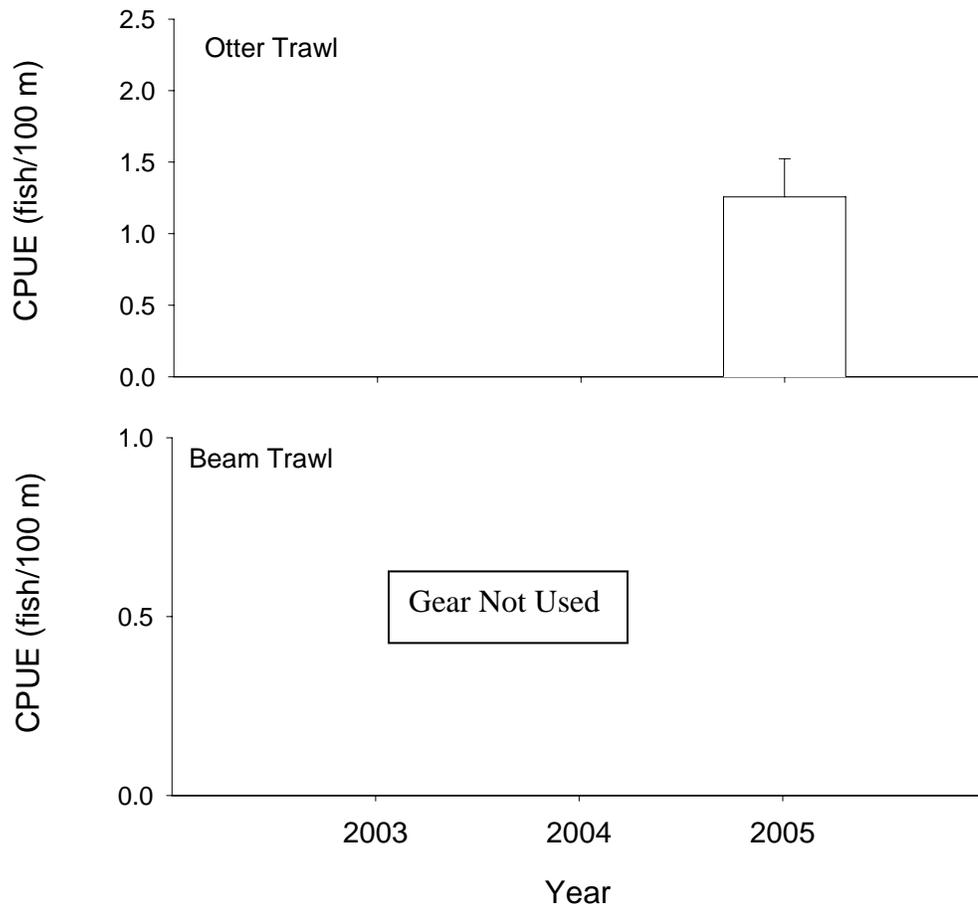


Figure 23. Mean annual catch-per-unit-effort (\pm 2SE) of sicklefin chub using otter trawls and beam trawls in segment 4 of the Missouri River during fish community season 2003-2005.

Segment 4 - Sicklefin Chub / Fish Community Season

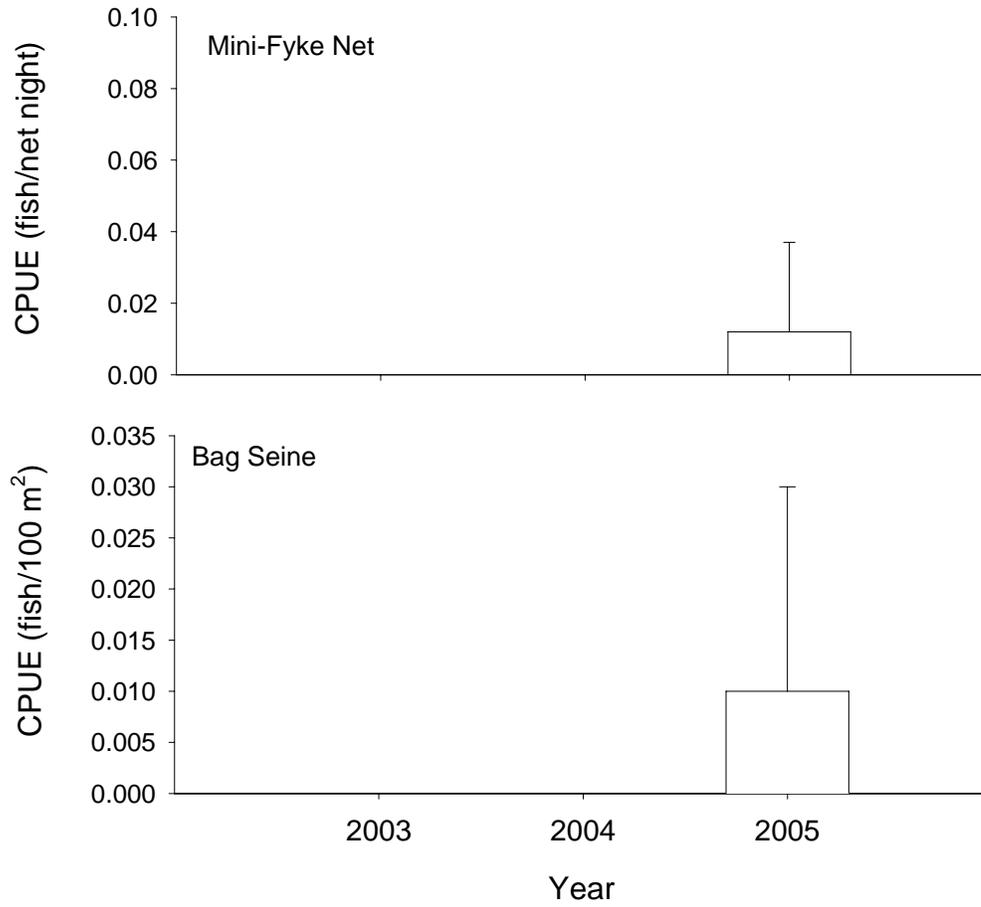


Figure 24. Mean annual catch-per-unit-effort (\pm 2SE) of sicklefin chub using mini-fyke nets and bag seines in segment 4 of the Missouri River during fish community season 2003-2005.

Table 28. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each macrohabitat, which is on the first line of the gear type, in segment 4 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. N-E indicates the habitat is nonexistent in the segment. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

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 (23)	0 (0)	N-E	N-E	0 (28)	0 (26)	0 (21)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-
2.5 Inch Trammel Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0 (17)	0 (0)	N-E	N-E	0 (22)	0 (33)	0 (14)	0 (0)	0 (0)	0 (11)	0 (2)	0 (0)	-
Bag Seine	1	N-E	0 (0)	0 (0)	N-E	N-E	0 (35)	0 (11)	0 (21)	100 (17)	0 (13)	0 (0)	0 (2)	0 (0)	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Mini-Fyke Net	1	N-E	0 (1)	0 (0)	N-E	N-E	100 (40)	0 (16)	0 (26)	0 (5)	0 (12)	0 (0)	0 (0)	0 (0)	-
Otter Trawl	329	N-E	19 (24)	0 (0)	N-E	N-E	25 (30)	52 (36)	4 (9)	0 (0)	0 (0)	0 (0)	1 (2)	0 (0)	-

Table 29. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each mesohabitat, which is on the first line of the gear type, in segment 4 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is nonexistent in the segment. If numbers on the second line do not add to 100, then some mesohabitats were not recorded in the field. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	0 (10)	N-E	N-E
2.5 Inch Trammel Net	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (0)	N-E	0 (0)	N-E	N-E
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	0 (10)	N-E	N-E
Bag Seine	1	0 (65)	0 (0)	N-E	100 (23)	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	1	100 (73)	0 (2)	N-E	0 (15)	N-E	N-E
Otter Trawl	329	0 (0)	98 (96)	N-E	2 (4)	N-E	N-E

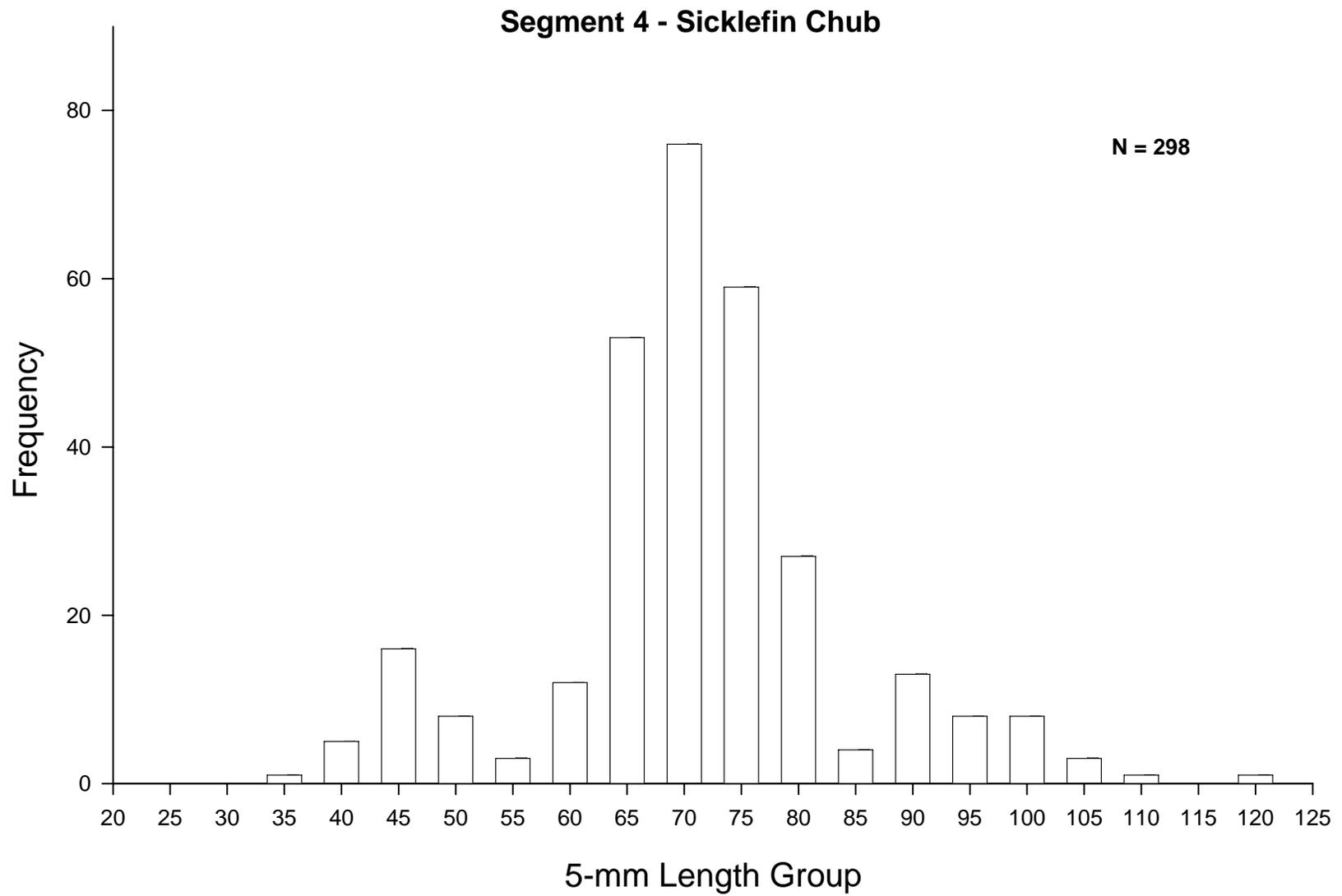


Figure 25. Length frequency of sicklefin chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2004 - 2005.

Speckled Chub

No speckled chubs were captured during the 2005 sampling season.

Segment 4 - Speckled Chub / Sturgeon Season

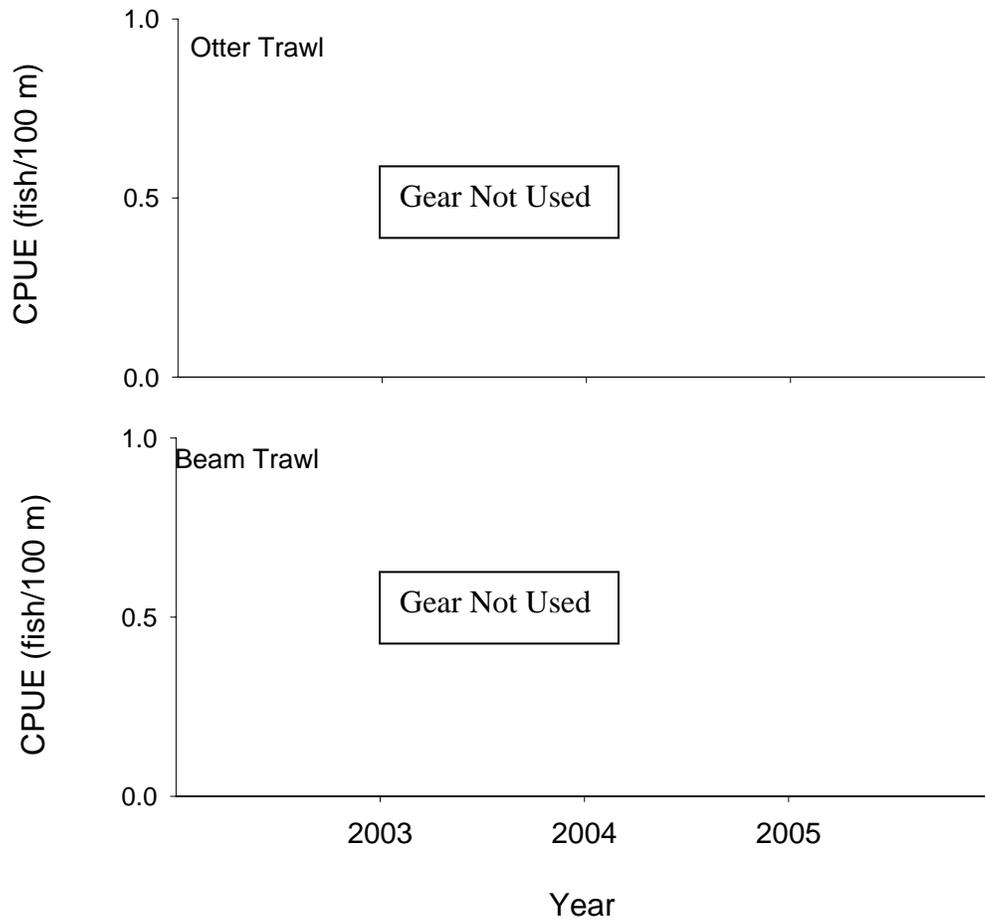


Figure 26. Mean annual catch-per-unit-effort (\pm 2SE) of speckled chub using otter trawls and beam trawls in segment 4 of the Missouri River during sturgeon season 2003-2005.

Segment 4 - Speckled Chub / Fish Community Season

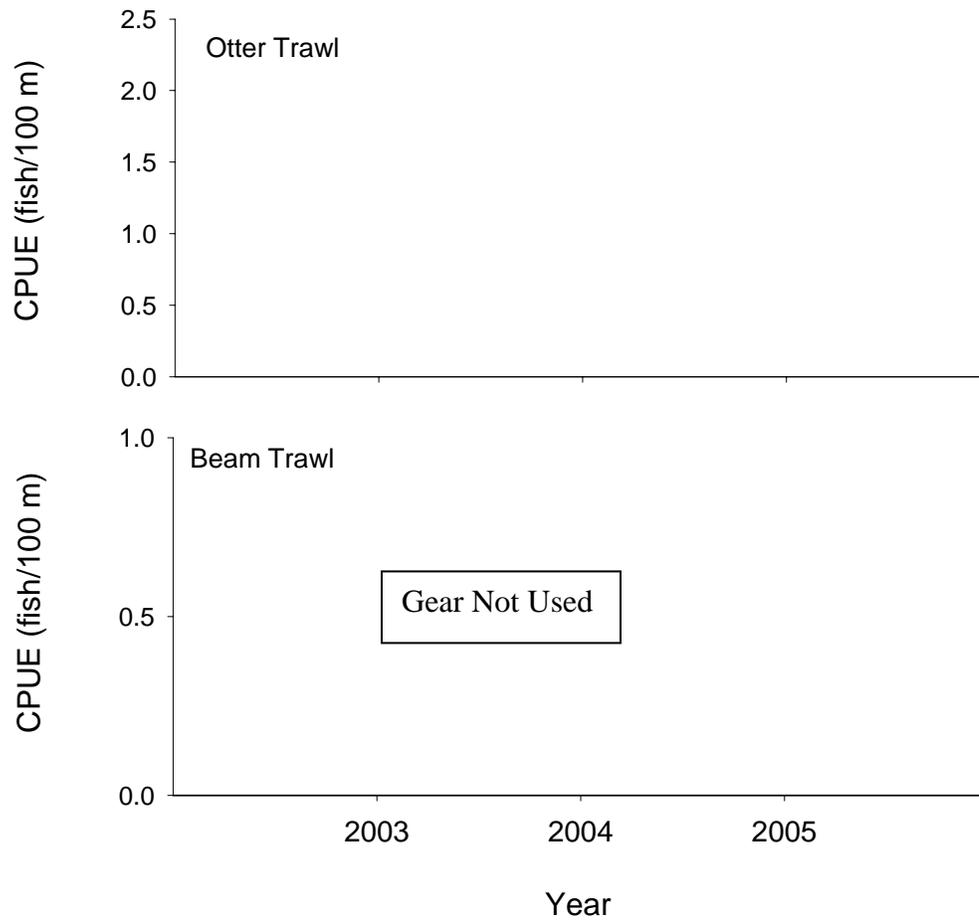


Figure 27. Mean annual catch-per-unit-effort (\pm 2SE) of speckled chub using otter trawls and beam trawls in segment 4 of the Missouri River during fish community season 2003-2005.

Segment 4 - Speckled Chub / Fish Community Season

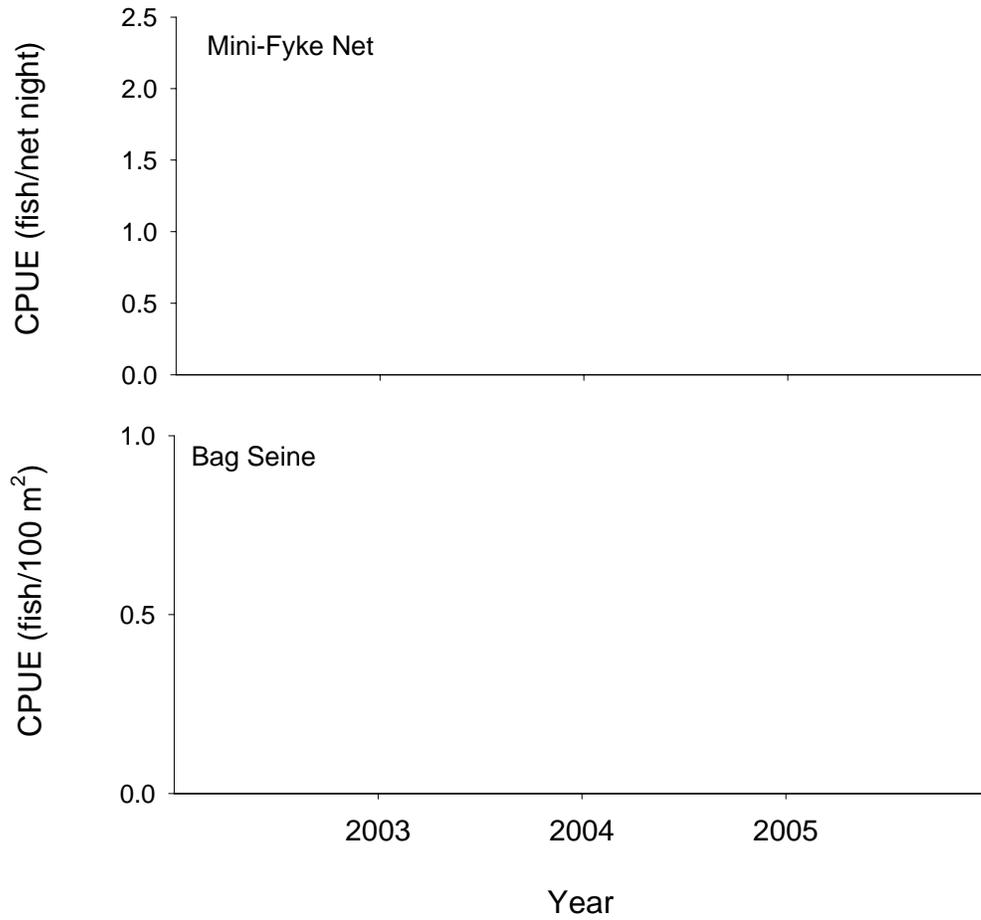


Figure 28. Mean annual catch-per-unit-effort (\pm 2SE) of speckled chub using mini-fyke nets and bag seines in segment 4 of the Missouri River during fish community season 2003-2005.

Table 30. Total number of speckled chubs captured for each gear during each season and the proportion caught within each macrohabitat, which is on the first line of the gear type, in segment 4 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. N-E indicates the habitat is nonexistent in the segment. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

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 (23)	0 (0)	N-E	N-E	0 (28)	0 (26)	0 (21)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-
2.5 Inch Trammel Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0 (17)	0 (0)	N-E	N-E	0 (22)	0 (33)	0 (14)	0 (0)	0 (0)	0 (11)	0 (2)	0 (0)	-
Bag Seine	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (35)	0 (11)	0 (21)	0 (17)	0 (13)	0 (0)	0 (2)	0 (0)	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Mini-Fyke Net	0	N-E	0 (1)	0 (0)	N-E	N-E	0 (40)	0 (16)	0 (26)	0 (5)	0 (12)	0 (0)	0 (0)	0 (0)	-
Otter Trawl	0	N-E	0 (24)	0 (0)	N-E	N-E	0 (30)	0 (36)	0 (9)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-

Table 31. Total number of speckled chubs captured for each gear during each season and the proportion caught within each mesohabitat, which is on the first line of the gear type, in segment 4 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is nonexistent in the segment. If numbers on the second line do not add to 100, then some mesohabitats were not recorded in the field. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	0 (10)	N-E	N-E
2.5 Inch Trammel Net	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (0)	N-E	0 (0)	N-E	N-E
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	0 (10)	N-E	N-E
Bag Seine	0	0 (65)	0 (0)	N-E	0 (23)	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	0	0 (73)	0 (2)	N-E	0 (15)	N-E	N-E
Otter Trawl	0	0 (0)	0 (96)	N-E	0 (4)	N-E	N-E

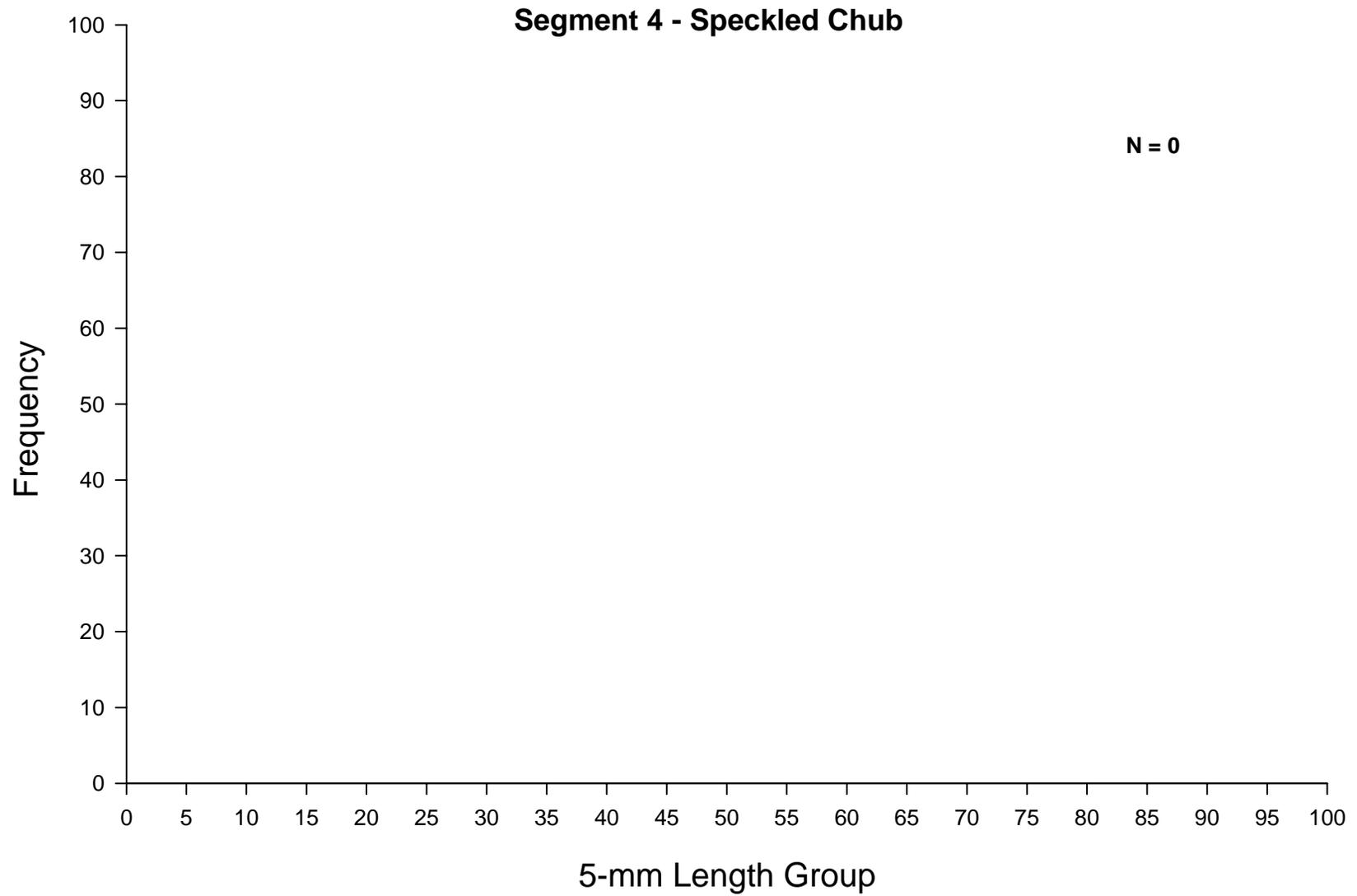


Figure 29. Length frequency of speckled chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2004- 2005.

Sand Shiner

Only one sand shiner was sampled during 2005. This single specimen was captured in a mini-fyke net in a large secondary channel macrohabitat and a bar mesohabitat.

Segment 4 - Sand Shiner / Sturgeon Season

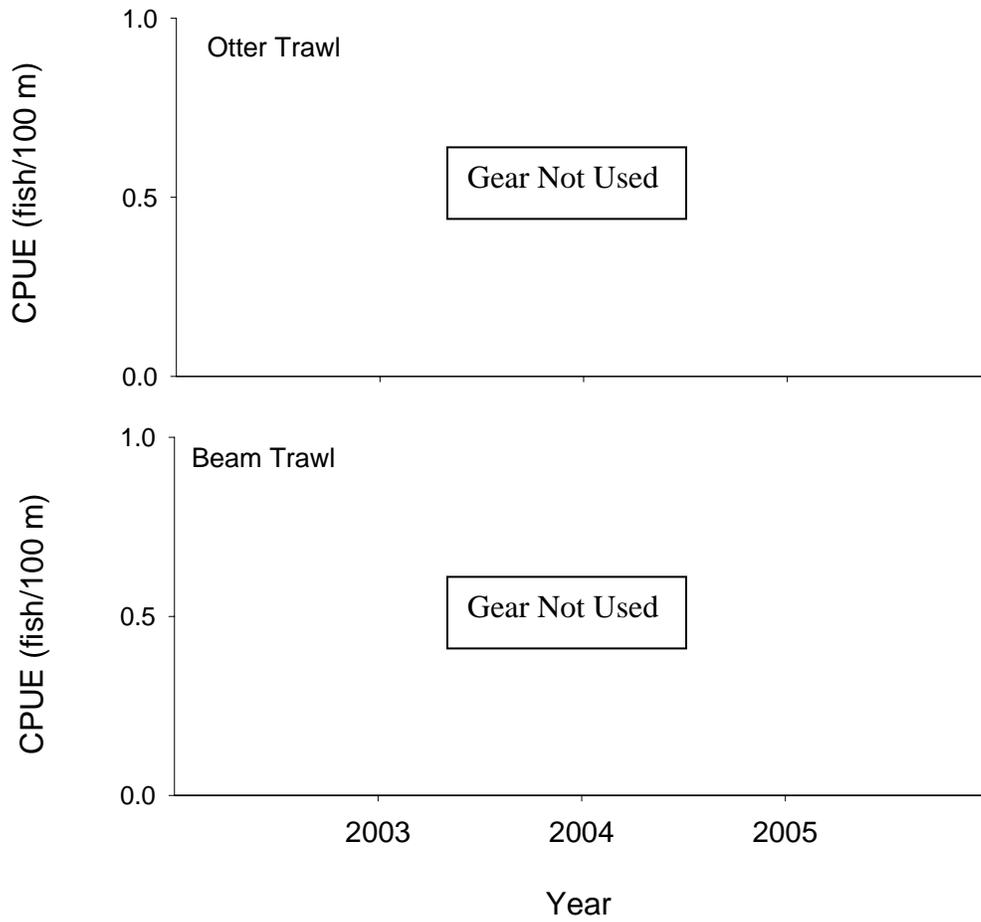


Figure 30. Mean annual catch-per-unit-effort ($\pm 2SE$) of sand shiner using otter trawls and beam trawls in segment 4 of the Missouri River during sturgeon season 2003-2005.

Segment 4 - Sand Shiner / Fish Community Season

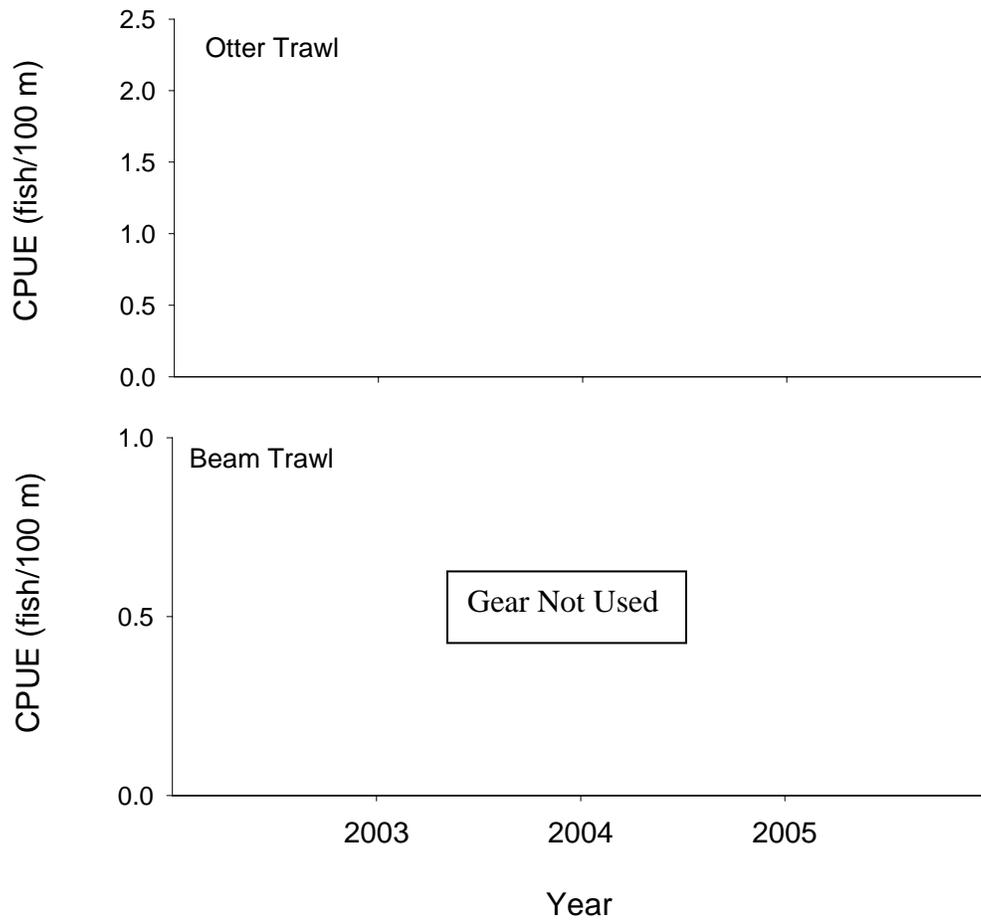


Figure 31. Mean annual catch-per-unit-effort (\pm 2SE) of sand shiner using otter trawls and beam trawls in segment 4 of the Missouri River during fish community season 2003-2005.

Segment 4 - Sand Shiner / Fish Community Season

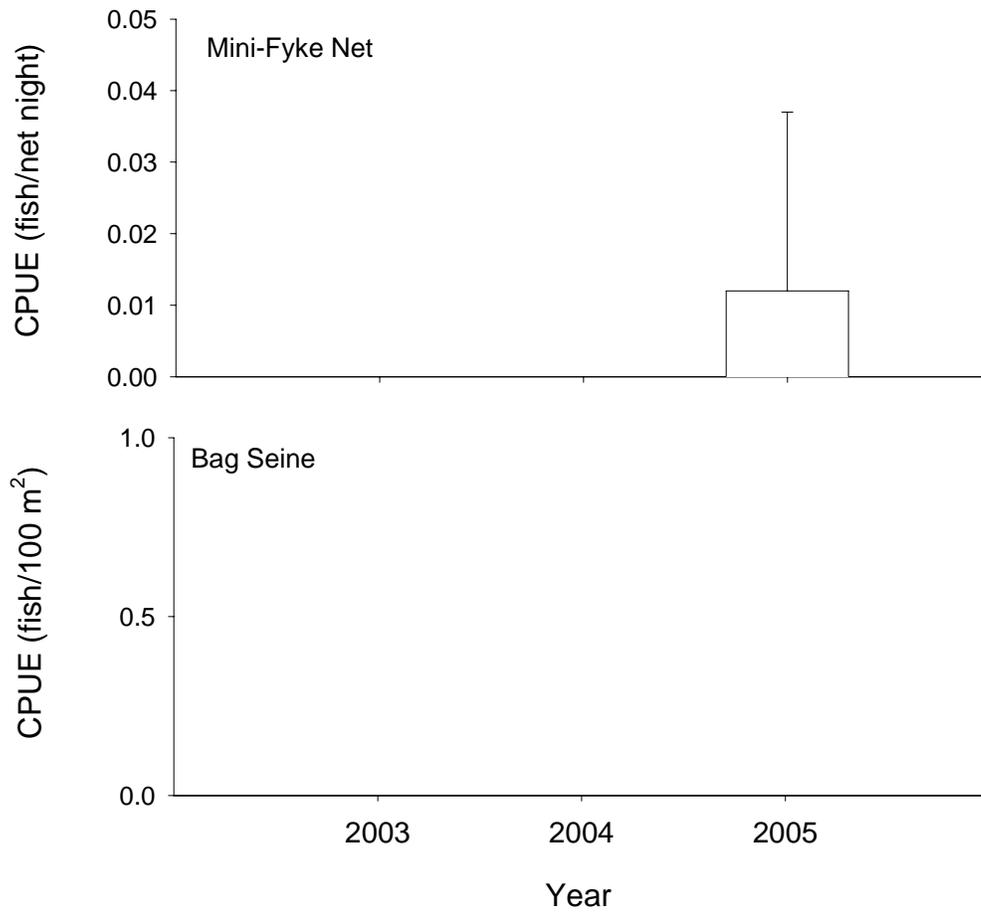


Figure 32. Mean annual catch-per-unit-effort ($\pm 2SE$) of sand shiner using mini-fyke nets and bag seines in segment 4 of the Missouri River during fish community season 2003-2005.

Table 32. Total number of sand shiners captured for each gear during each season and the proportion caught within each macrohabitat, which is on the first line of the gear type, in segment 4 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. N-E indicates the habitat is nonexistent in the segment. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

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 (23)	0 (0)	N-E	N-E	0 (28)	0 (26)	0 (21)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-
2.5 Inch Trammel Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0 (17)	0 (0)	N-E	N-E	0 (22)	0 (33)	0 (14)	0 (0)	0 (0)	0 (11)	0 (2)	0 (0)	-
Bag Seine	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (35)	0 (11)	0 (21)	0 (17)	0 (13)	0 (0)	0 (2)	0 (0)	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Mini-Fyke Net	1	N-E	0 (1)	0 (0)	N-E	N-E	0 (40)	0 (16)	100 (26)	0 (5)	0 (12)	0 (0)	0 (0)	0 (0)	-
Otter Trawl	0	N-E	0 (24)	0 (0)	N-E	N-E	0 (30)	0 (36)	0 (9)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-

Table 33. Total number of sand shiners captured for each gear during each season and the proportion caught within each mesohabitat, which is on the first line of the gear type, in segment 4 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is nonexistent in the segment. If numbers on the second line do not add to 100, then some mesohabitats were not recorded in the field. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	0 (10)	N-E	N-E
2.5 Inch Trammel Net	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (0)	N-E	0 (0)	N-E	N-E
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	0 (10)	N-E	N-E
Bag Seine	0	0 (65)	0 (0)	N-E	0 (23)	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	1	100 (73)	0 (2)	N-E	0 (15)	N-E	N-E
Otter Trawl	0	0 (0)	0 (96)	N-E	0 (4)	N-E	N-E

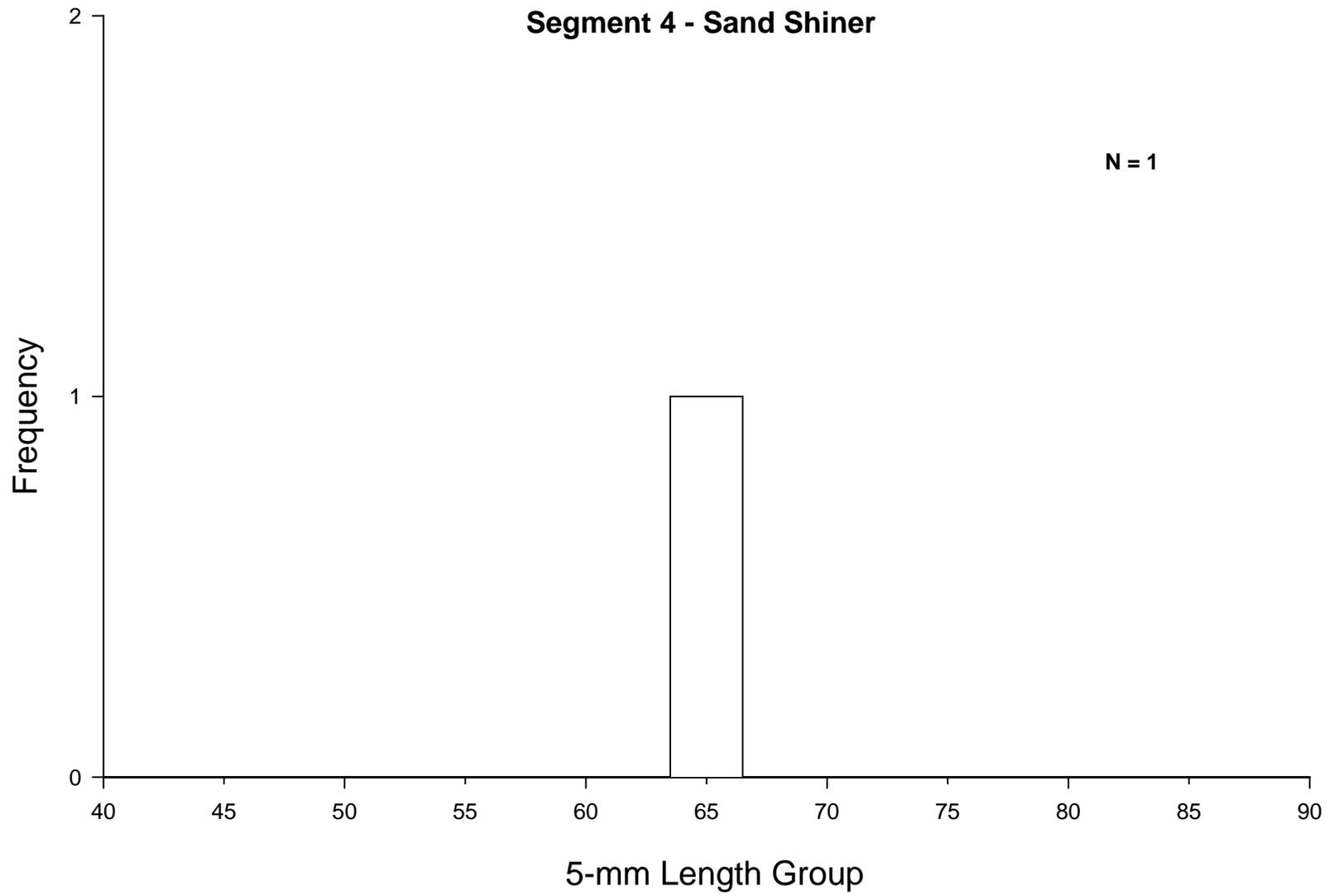


Figure 33. Length frequency of sand shiners in segment 4 of the Missouri River during summer (fish community season) 2004-2005.

Hybognathus spp.

A total of 5826 *hybognathus spp.* were collected during the 2005 fish community season. No *hybognathus spp.* were sampled during the sturgeon season. Annual catch per unit effort (Figure 36) was greatest for mini-fyke nets (68.98 fish per net night) followed by bag seines (3.97 fish per m²) and otter trawls (0.032 fish per 100 m). Over 95% (5587) of *hybognathus spp.* were sampled in mini-fyke nets, while 4% (230) were captured in bag seines and only nine *hybognathus spp.* were found in otter trawls. *Hybognathus spp.* were collected in every macrohabitat that was sampled with the exception of large tributary mouths (Table 34). The majority of fish that were captured were from inside bends followed by outside bends. The bar mesohabitat was where most *hybognathus spp.* were sampled (Table 35). Over 60% of *hybognathus spp.* were between 25 - 49 mm total length (Figure 37), 21% were between 50 and 74 mm, 12% were between 75 and 99 mm, and 6% were between 100 – 125 mm in total length (Figure 37).

Segment 4 - *Hybognathus* spp. / Sturgeon Season

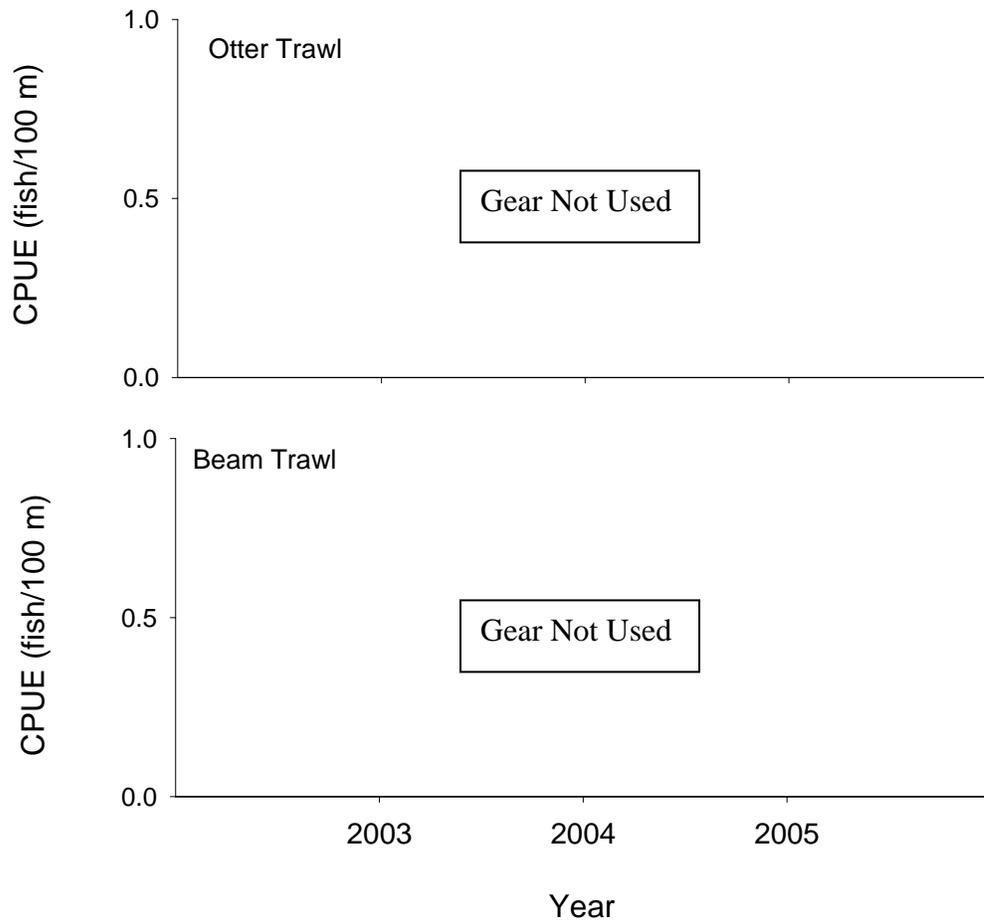


Figure 34. Mean annual catch-per-unit-effort (\pm 2SE) of *Hybognathus* spp. using otter trawls and beam trawls in segment 4 of the Missouri River during sturgeon season 2003-2005.

Segment 4 - *Hybognathus* spp. / Fish Community Season

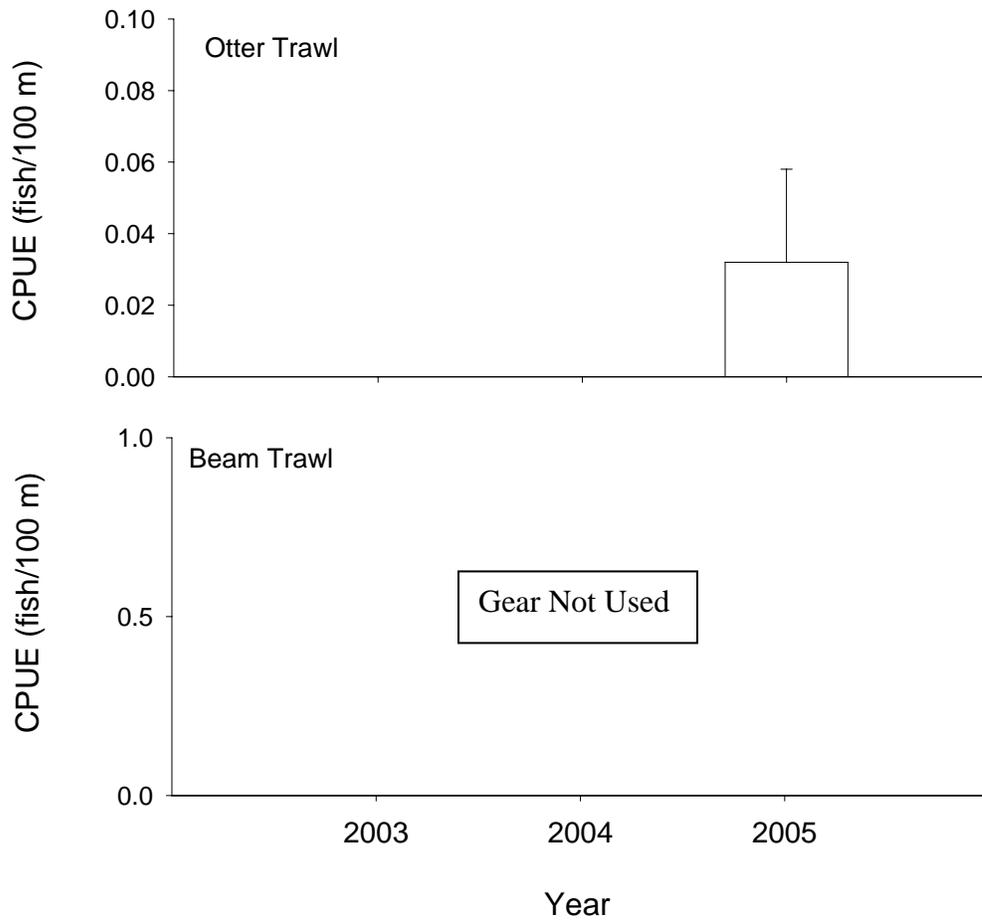


Figure 35. Mean annual catch-per-unit-effort ($\pm 2SE$) of *Hybognathus* spp. using otter trawls and beam trawls in segment 4 of the Missouri River during fish community season 2003-2005.

Segment 4 - *Hybognathus* spp. / Fish Community Season

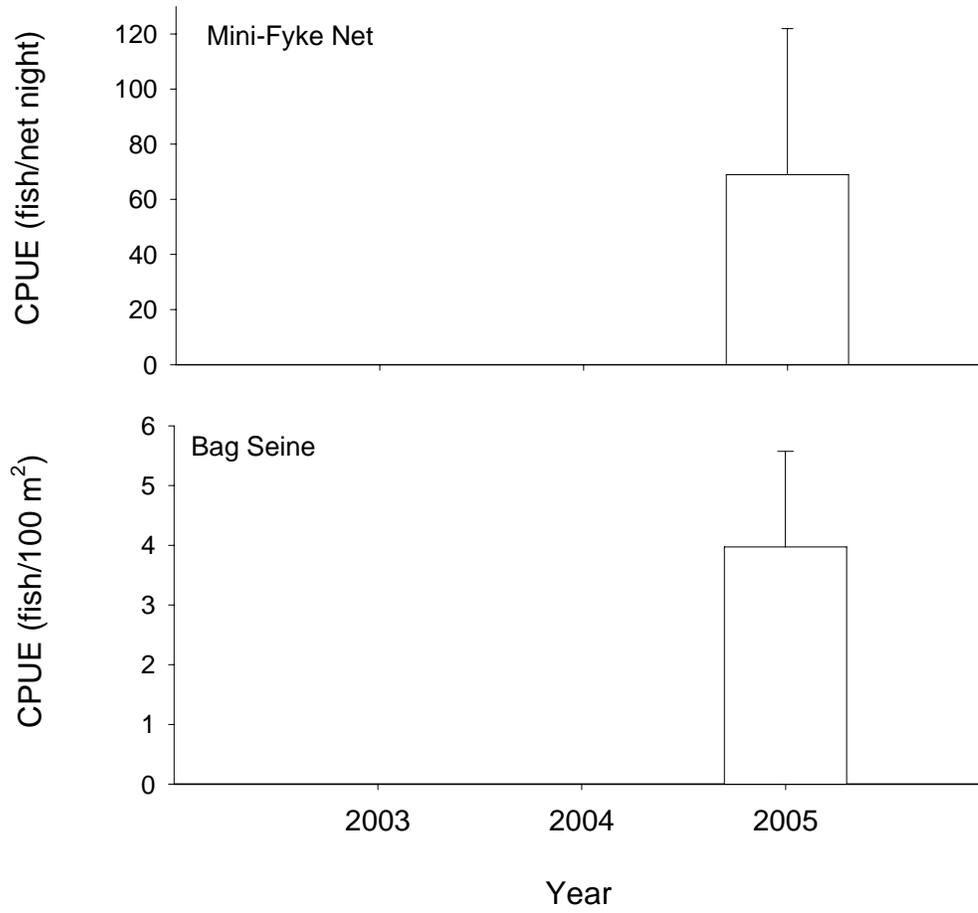


Figure 36. Mean annual catch-per-unit-effort ($\pm 2SE$) of *Hybognathus* spp. using mini-fyke net bag seines in segment 4 of the Missouri River during fish community season 2003-2005.

Table 34. Total number of *Hybognathus* spp. captured for each gear during each season and the proportion caught within each macrohabitat, which is on the first line of the gear type, in segment 4 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. N-E indicates the habitat is nonexistent in the segment. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

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 (23)	0 (0)	N-E	N-E	0 (28)	0 (26)	0 (21)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-
2.5 Inch Trammel Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0 (17)	0 (0)	N-E	N-E	0 (22)	0 (33)	0 (14)	0 (0)	0 (0)	33 (11)	0 (2)	0 (0)	-
Bag Seine	230	N-E	0 (0)	0 (0)	N-E	N-E	33 (35)	6 (11)	25 (21)	10 (17)	27 (13)	0 (0)	0 (2)	0 (0)	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Mini-Fyke Net	5587	N-E	0 (1)	0 (0)	N-E	N-E	71 (40)	20 (16)	1 (26)	0 (5)	8 (12)	0 (0)	0 (0)	0 (0)	-
Otter Trawl	9	N-E	44 (24)	0 (0)	N-E	N-E	22 (30)	22 (36)	11 (9)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-

Table 35. Total number of *Hybognathus* spp. captured for each gear during each season and the proportion caught within each mesohabitat, which is on the first line of the gear type, in segment 4 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is nonexistent in the segment. If numbers on the second line do not add to 100, then some mesohabitats were not recorded in the field. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	0 (10)	N-E	N-E
2.5 Inch Trammel Net	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (0)	N-E	0 (0)	N-E	N-E
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	0 (10)	N-E	N-E
Bag Seine	230	72 (65)	0 (0)	N-E	28 (23)	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	5587	97 (73)	0 (2)	N-E	3 (15)	N-E	N-E
Otter Trawl	9	0 (0)	100 (96)	N-E	0 (4)	N-E	N-E

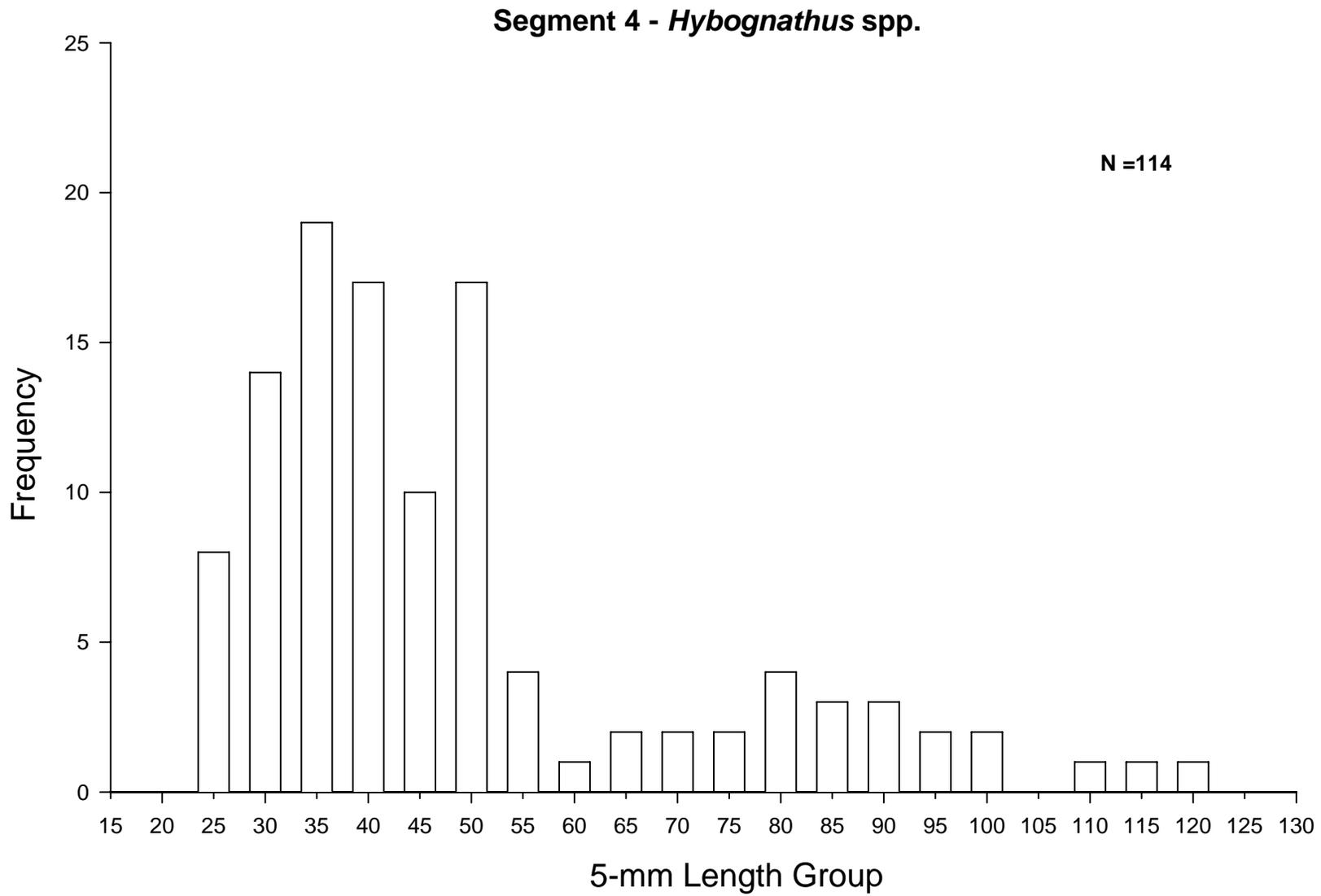


Figure 37. Length frequency of *Hybognathus* spp. caught in segment 4 of the Missouri River during summer (fish community season) 2004-2005

Blue Sucker

Only four blue suckers were captured during the 2005 sampling season. All four were sampled during the fish community season with three captured in the trammel net and one in the otter trawl. Two blue suckers were sampled in outside bend macrohabitats while one was sampled in inside bend macrohabitats and one in a large tributary (Table 36). All of the blue suckers were collected in channel border mesohabitats (Table 37). Three blue suckers were 600 mm to 700 mm in total length and the fourth fish was 380 mm (Figure 44).

Segment 4 - Blue Sucker / Sturgeon Season

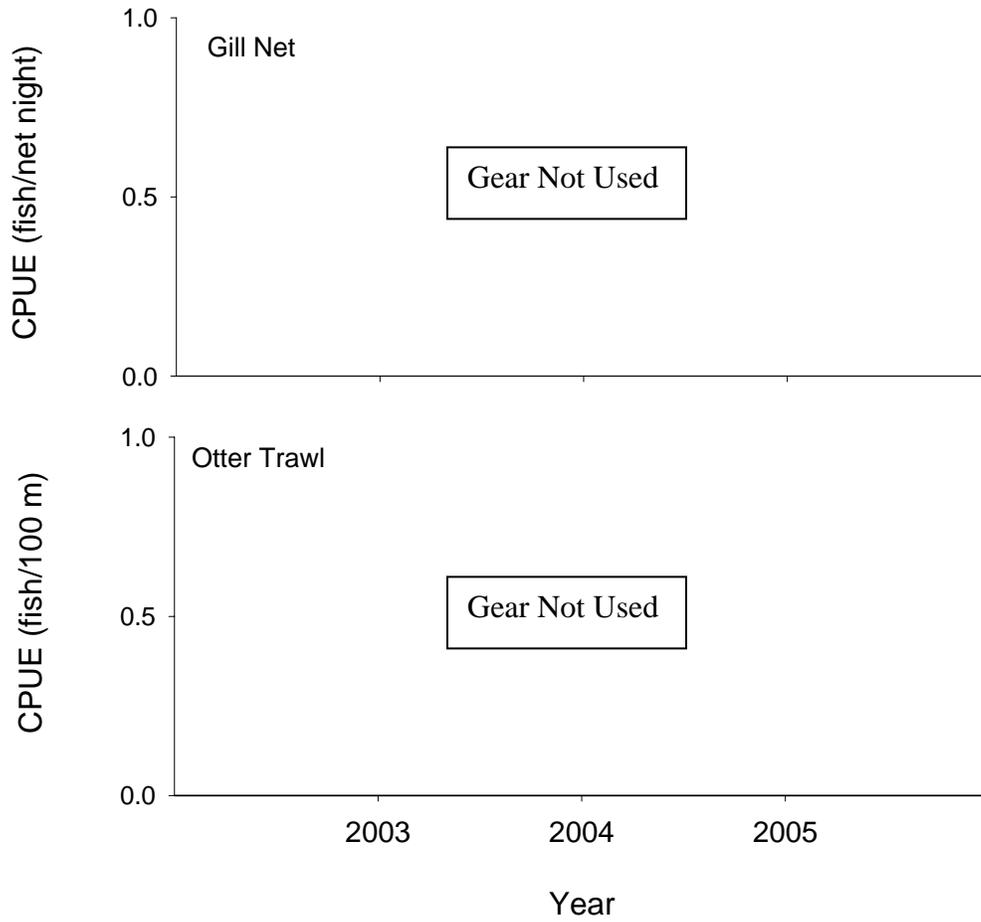


Figure 38. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker using gill nets and otter trawls in segment 4 of the Missouri River during sturgeon season 2003-2005.

Segment 4 - Blue Sucker / Sturgeon Season

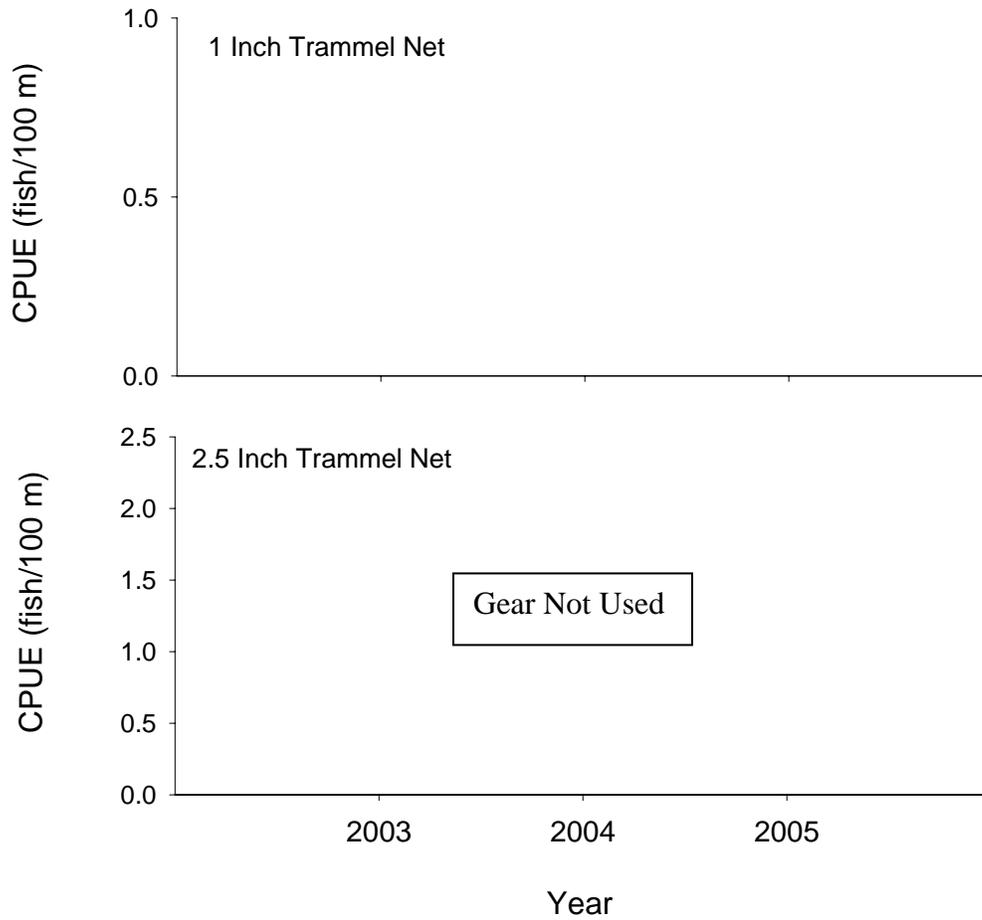


Figure 39. Mean annual catch-per-unit-effort (\pm 2SE) of blue sucker using 1 inch trammel nets and 2.5 inch trammel nets in segment 4 of the Missouri River during sturgeon season 2003-2005

Segment 4 - Blue Sucker / Sturgeon Season

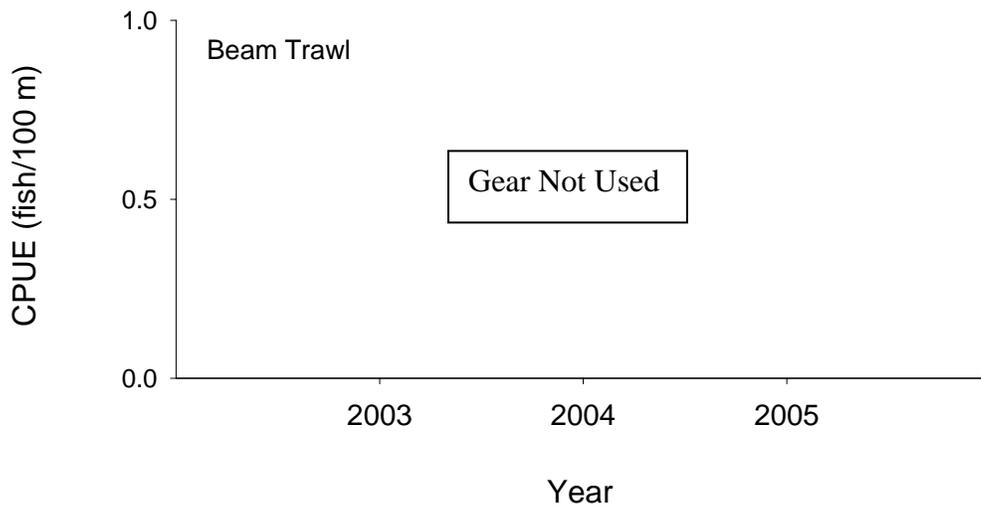


Figure 40. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker using beam trawls in segment 4 of the Missouri River during sturgeon season 2003-2005.

Segment 4 - Blue Sucker / Fish Community Season

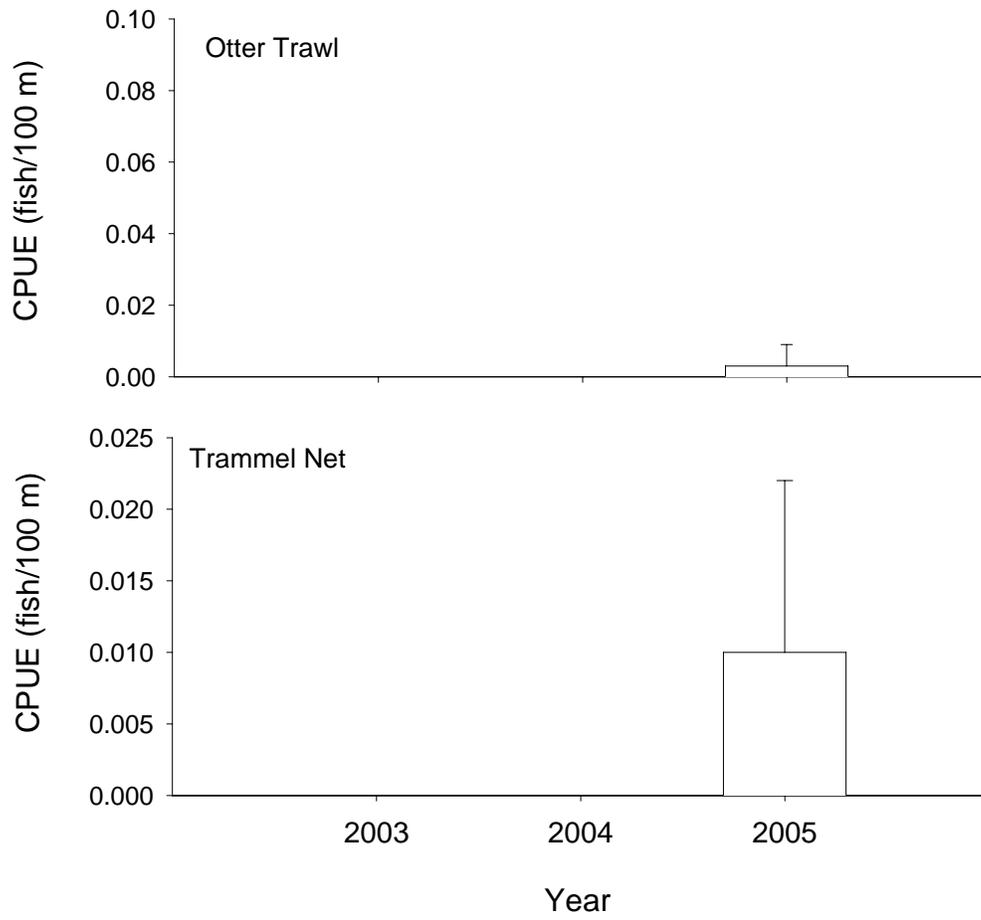


Figure 41. Mean annual catch-per-unit-effort (\pm 2SE) of blue sucker using otter trawls and trammel nets in segment 4 of the Missouri River during fish community season 2003-2005.

Segment 4 - Blue Sucker / Fish Community Season

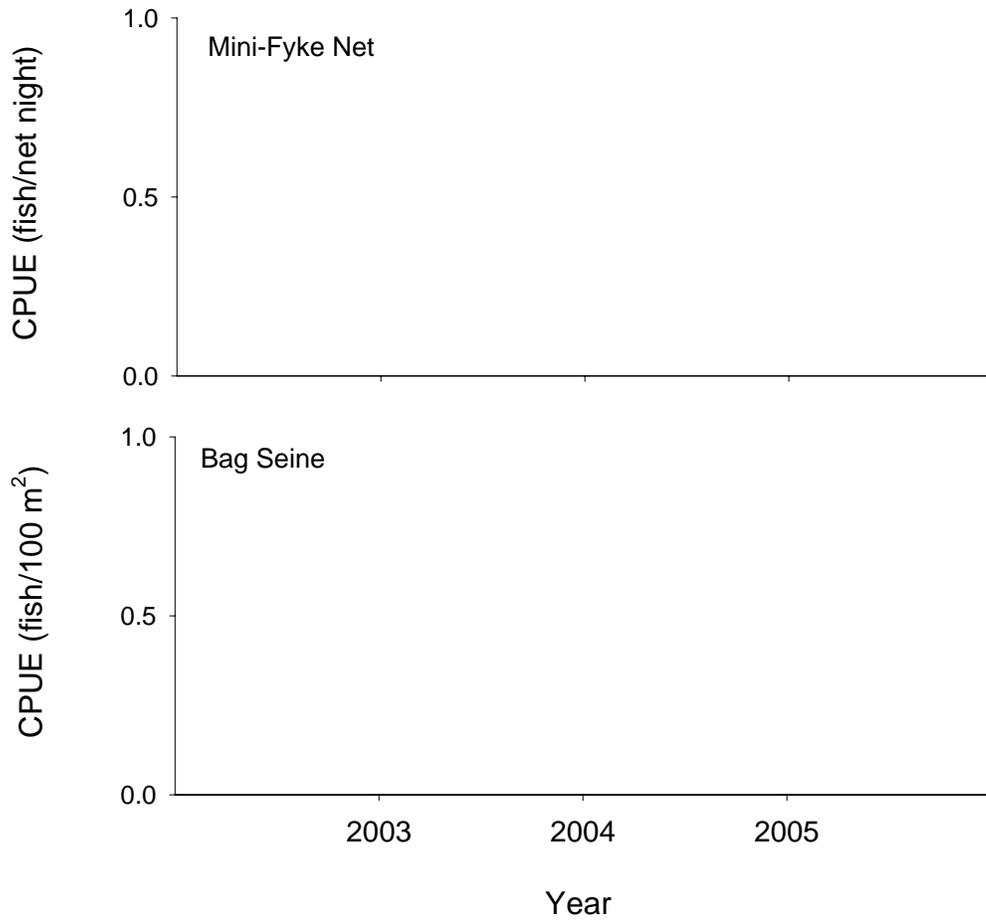


Figure 42. Mean annual catch-per-unit-effort (\pm 2SE) of blue sucker using mini-fyke nets and bag seines in segment 4 of the Missouri River during fish community season 2003-2005.

Segment 4 - Blue Sucker / Fish Community Season

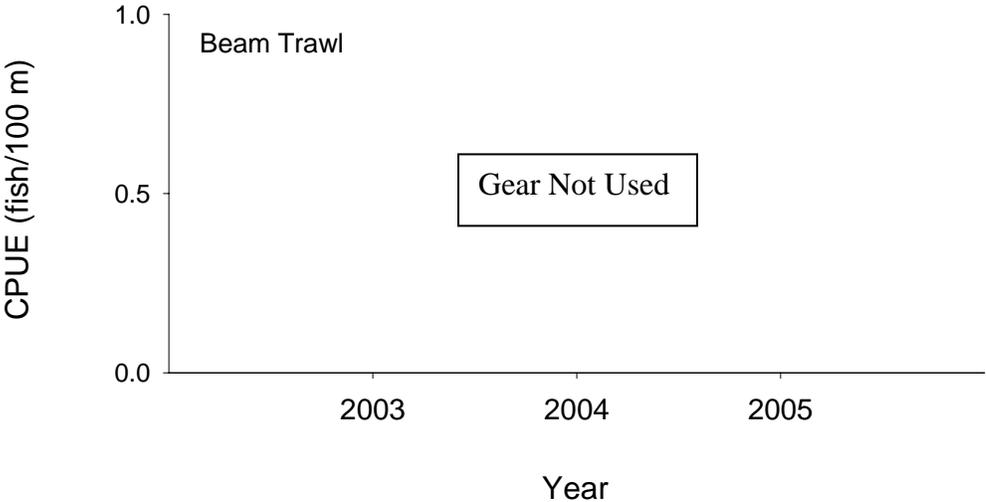


Figure 43. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker using beam trawls in segment 4 of the Missouri River during fish community season 2003-2005.

Table 36. Total number of blue suckers captured for each gear during each season and the proportion caught within each macrohabitat, which is on the first line of the gear type, in segment 4 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. N-E indicates the habitat is nonexistent in the segment. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

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 (23)	0 (0)	N-E	N-E	0 (28)	0 (26)	0 (21)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-
2.5 Inch Trammel Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	-
Fish Community Season (Summer)															
1 Inch Trammel Net	3	N-E	0 (17)	0 (0)	N-E	N-E	33 (22)	33 (33)	0 (14)	0 (0)	0 (0)	33 (11)	0 (2)	0 (0)	-
Bag Seine	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (35)	0 (11)	0 (21)	0 (17)	0 (13)	0 (0)	0 (2)	0 (0)	-
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Mini-Fyke Net	0	N-E	0 (1)	0 (0)	N-E	N-E	0 (40)	0 (16)	0 (26)	0 (5)	0 (12)	0 (0)	0 (0)	0 (0)	-
Otter Trawl	1	N-E	0 (24)	0 (0)	N-E	N-E	0 (30)	100 (36)	0 (9)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	-

Table 37. Total number of blue suckers captured for each gear during each season and the proportion caught within each mesohabitat, which is on the first line of the gear type, in segment 4 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is nonexistent in the segment. If numbers on the second line do not add to 100, then some mesohabitats were not recorded in the field. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 (0)	0 (90)	N-E	0 (10)	N-E	N-E
2.5 Inch Trammel Net	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (0)	N-E	0 (0)	N-E	N-E
Fish Community Season (Summer)							
1 Inch Trammel Net	3	0 (0)	100 (90)	N-E	0 (10)	N-E	N-E
Bag Seine	0	0 (65)	0 (0)	N-E	0 (23)	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	0	0 (73)	0 (2)	N-E	0 (15)	N-E	N-E
Otter Trawl	1	0 (0)	100 (96)	N-E	0 (4)	N-E	N-E

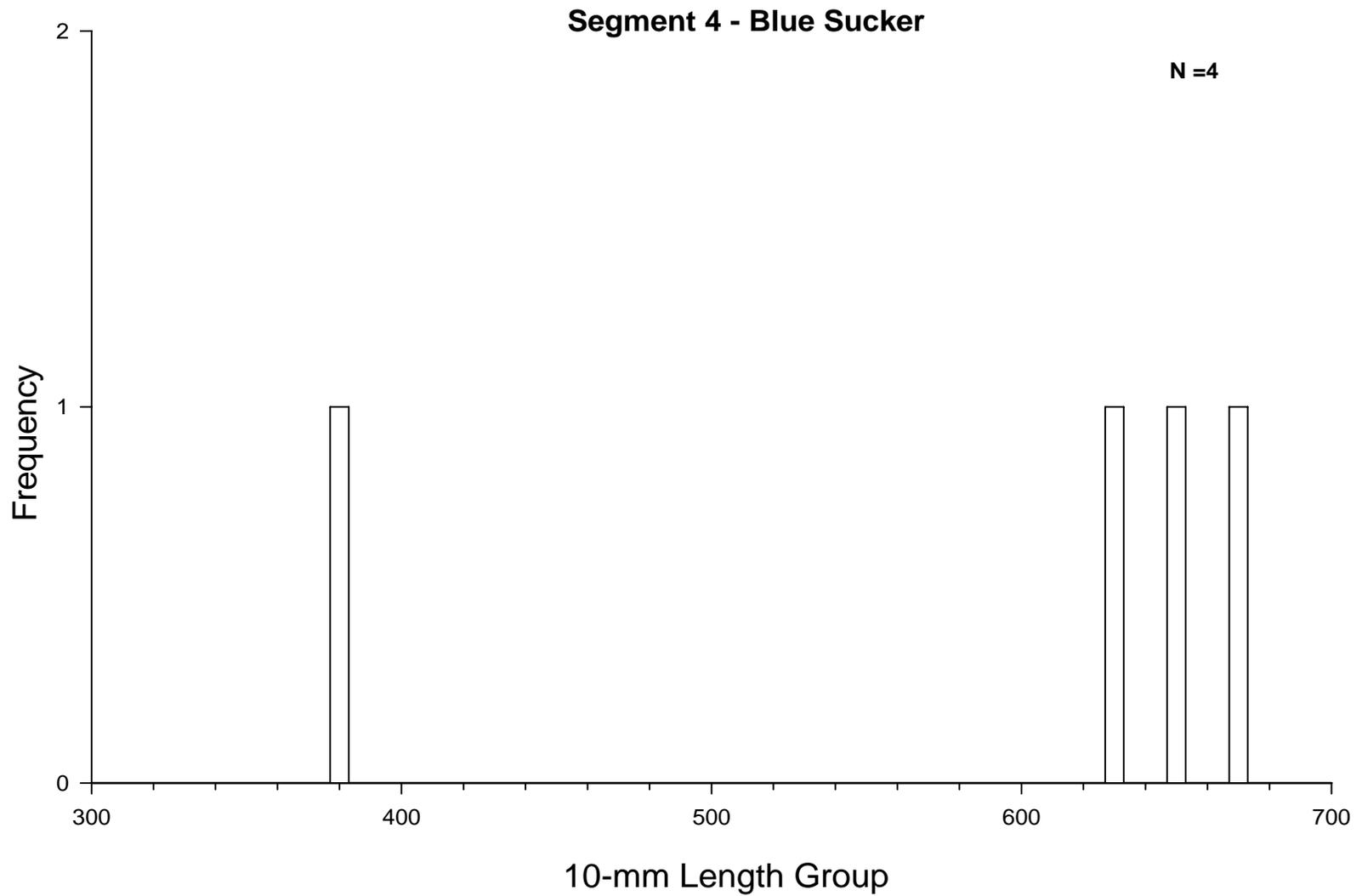


Figure 44. Length frequency of blue suckers during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2004 - 2005.

Sauger

A total of 184 sauger were sampled during 2005 with 104 fish captured in mini-fyke nets, 60 in trammel nets, 11 in bag seines, and 9 with the otter trawl. Trammel net CPUE for sauger was four times higher in the fish community season than in the sturgeon season (Figure 46 and 48). Mini-fyke nets caught nearly ten times as many sauger as the bag seines. CPUE for mini-fyke nets in the fish community season was 1.2 fish per net night, whereas the bag seine was 0.2 fish per 100 m². Many of the sauger sampled in mini-fyke nets were young of the year and age 1 fish. Sauger were sampled in the channel crossovers, large secondary channels, inside and outside bend macrohabitats (Table 38). Most sauger were caught in channel border mesohabitats with trammel nets and otter trawls while bag seines and mini-fyke nets caught the most fish in bar mesohabitats (Table 39). Over 40% of the sauger sampled were <160 mm total length. All of these fish were sampled during the fish community season (Figure 51) with the majority being sampled in mini-fyke nets.

Segment 4 - Sauger / Sturgeon Season



Figure 45. Mean annual catch-per-unit-effort (+/- 2SE) of sauger using gill nets and otter trawls in segment 4 of the Missouri River during sturgeon season 2003-2005.

Segment 4 - Sauger / Sturgeon Season

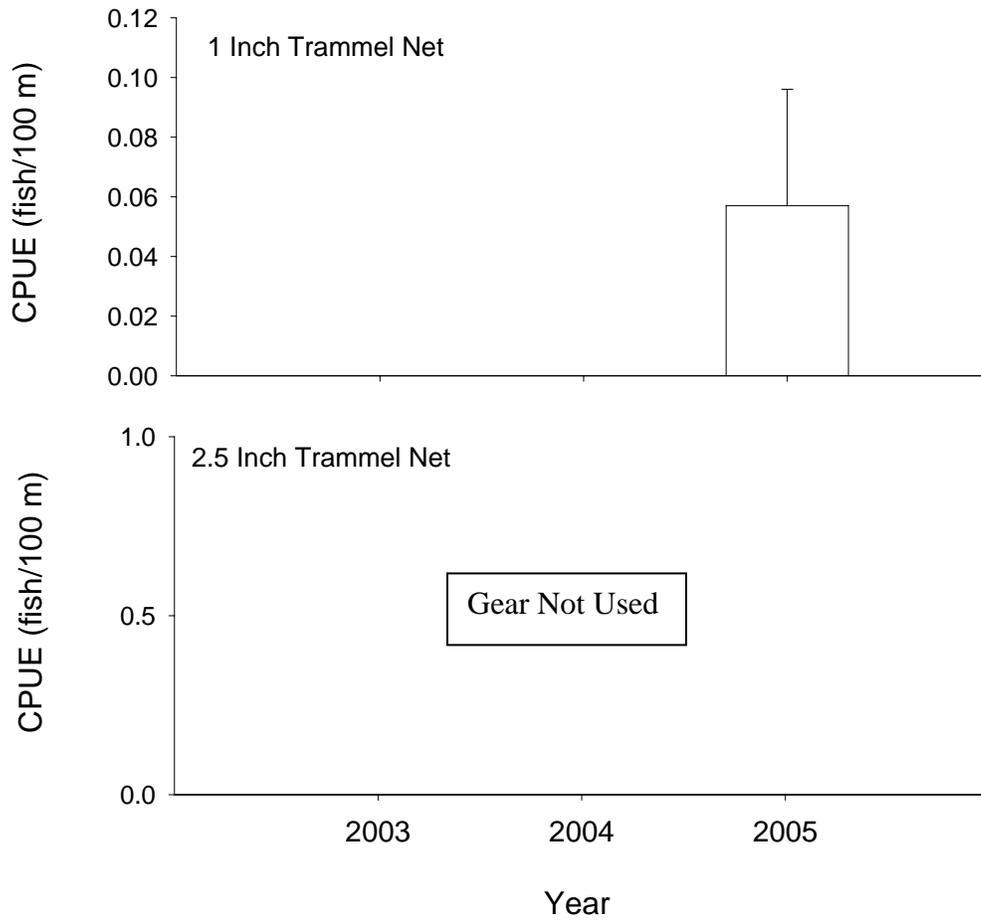


Figure 46. Mean annual catch-per-unit-effort ($\pm 2SE$) of sauger using 1 inch trammel nets and 2.5 inch trammels nets in segment 4 of the Missouri River during sturgeon season 2003-2005.

Segment 4 - Sauger / Sturgeon Season

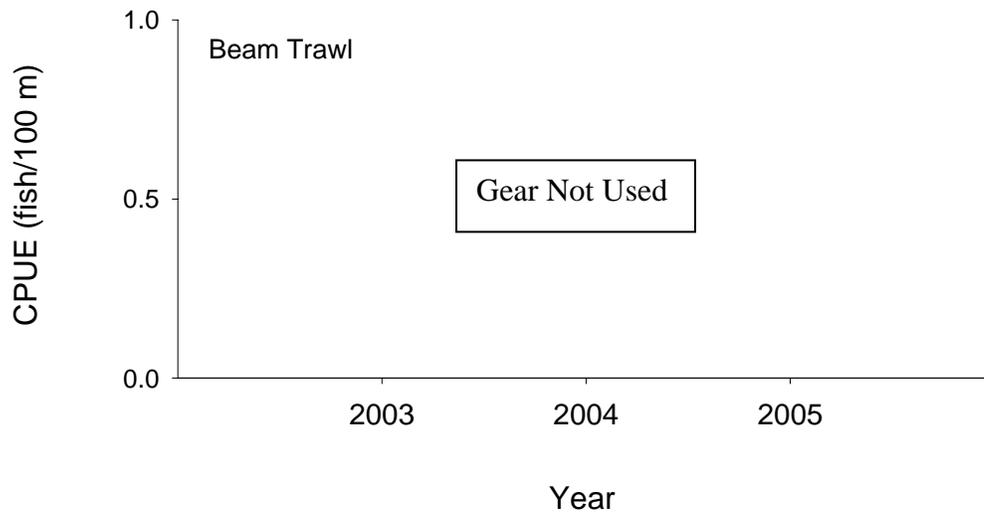


Figure 47. Mean annual catch-per-unit-effort (\pm 2SE) of sauger using beam trawls in segment 4 of the Missouri River during sturgeon season 2003-2005.

Segment 4 - Sauger / Fish Community Season

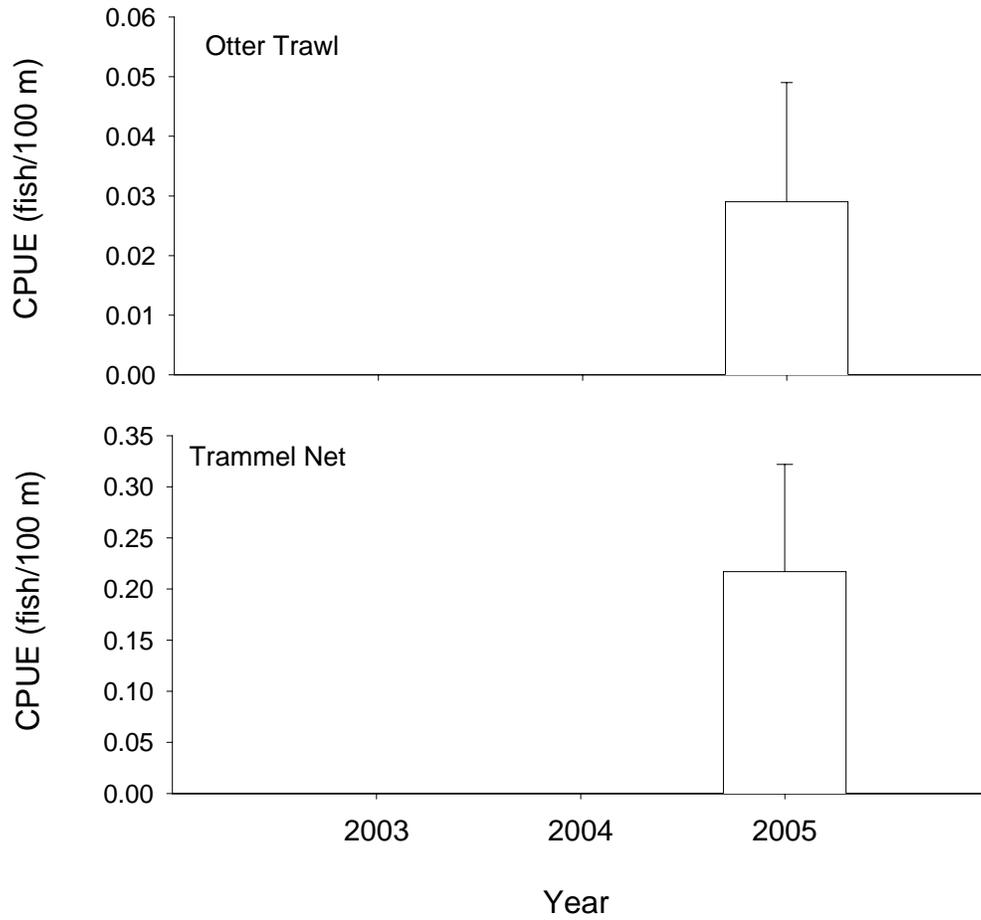


Figure 48. Mean annual catch-per-unit-effort ($\pm 2SE$) of sauger using otter trawls and trammel nets in segment 4 of the Missouri River during fish community season 2003-2005.

Segment 4 - Sauger / Fish Community Season

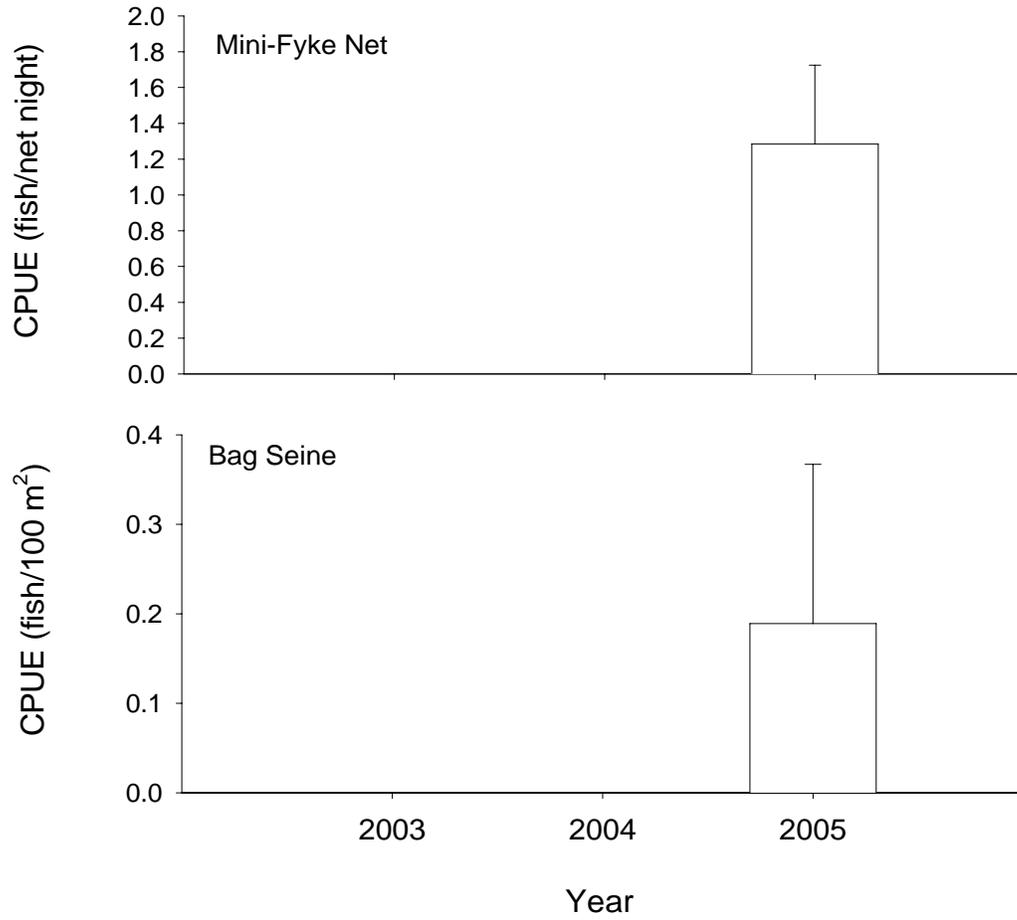


Figure 49. Mean annual catch-per-unit-effort ($\pm 2SE$) of sauger using mini-fyke nets and bag seines in segment 4 of the Missouri River during fish community season 2003-2005.

Segment 4 - Sauger / Fish Community Season

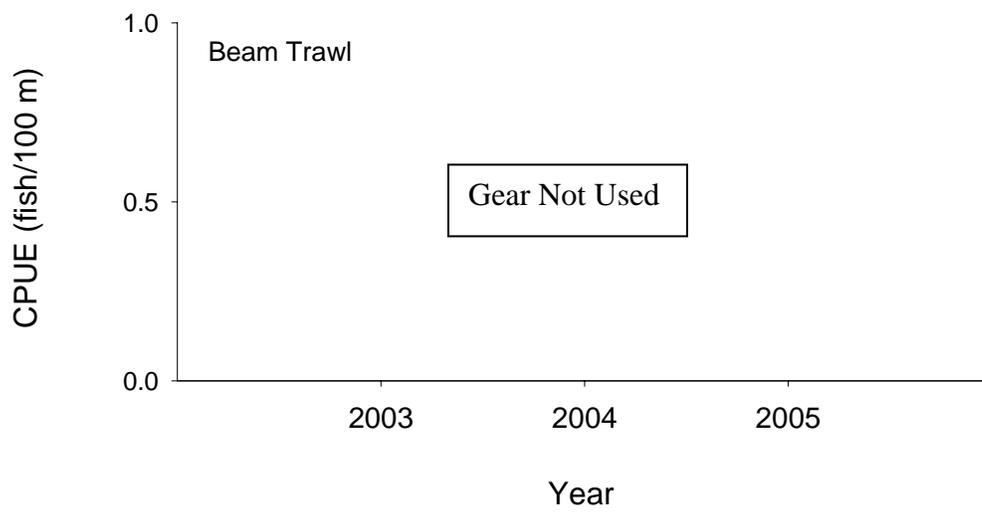


Figure 50. Mean annual catch-per-unit-effort (\pm 2SE) of sauger using beam trawls in segment 4 of the Missouri River during fish community season 2003-2005.

Table 38. Total number of sauger captured for each gear during each season and the proportion caught within each macrohabitat, which is on the first line of the gear type, in segment 4 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. N-E indicates the habitat is nonexistent in the segment. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

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	12	N-E	33 (23)	0 (0)	N-E	N-E	8 (28)	33 (26)	25 (21)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	- -
2.5 Inch Trammel Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Beam Trawl	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Gill Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Otter Trawl	0	N-E	0 (0)	0 (0)	N-E	N-E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	- -
Fish Community Season (Summer)															
1 Inch Trammel Net	48	N-E	15 (17)	0 (0)	N-E	N-E	38 (22)	10 (33)	35 (14)	0 (0)	0 (0)	2 (11)	0 (2)	0 (0)	- -
Bag Seine	11	N-E	0 (0)	0 (0)	N-E	N-E	36 (35)	36 (11)	18 (21)	0 (17)	9 (13)	0 (0)	0 (2)	0 (0)	- -
Beam Trawl	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Mini-Fyke Net	104	N-E	0 (1)	0 (0)	N-E	N-E	39 (40)	10 (16)	38 (26)	4 (5)	9 (12)	0 (0)	0 (0)	0 (0)	- -
Otter Trawl	9	N-E	0 (24)	0 (0)	N-E	N-E	44 (30)	33 (36)	22 (9)	0 (0)	0 (0)	0 (0)	0 (2)	0 (0)	- -

Table 39. Total number of sauger captured for each gear during each season and the proportion caught within each mesohabitat, which is on the first line of the gear type, in segment 4 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is nonexistent in the segment. If numbers on the second line do not add to 100, then some mesohabitats were not recorded in the field. Beam trawl, 2.5 inch trammel nets, and gill nets are not standard gear in segment 4.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	12	0 (0)	92 (90)	N-E	8 (10)	N-E	N-E
2.5 Inch Trammel Net	-	-	-	N-E	-	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Gill Net	-	-	-	N-E	-	N-E	N-E
Otter Trawl	0	0 (0)		N-E	0 (0)	N-E	N-E
Fish Community Season (Summer)							
1 Inch Trammel Net	48	0 (0)	75 (90)	N-E	25 (10)	N-E	N-E
Bag Seine	11	82 (65)	0 (0)	N-E	9 (23)	N-E	N-E
Beam Trawl	-	-	-	N-E	-	N-E	N-E
Mini-Fyke Net	104	78 (73)	0 (2)	N-E	13 (15)	N-E	N-E
Otter Trawl	9	0 (0)	100 (96)	N-E	0 (4)	N-E	N-E

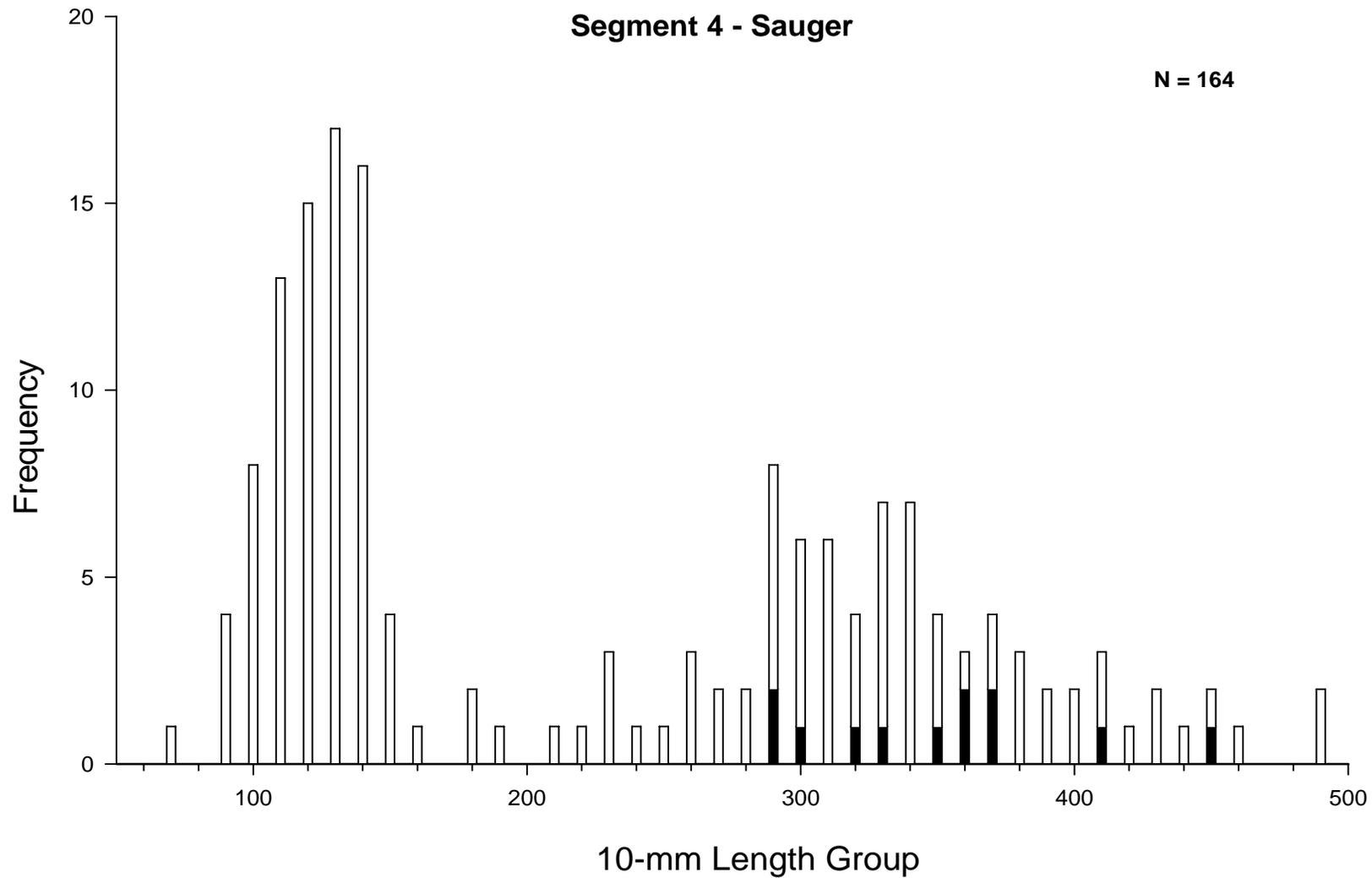


Figure 51. Length frequency of sauger during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2004-2005.

Missouri River Fish Community

During the 2005 sampling season, 25,143 fish were sampled in segment 4 of the Missouri River. Standard gears captured 32 different species of fish with emerald shiners contributing the largest percentage of total catch (48%, N = 12,125). *Hybognathus spp.* accounted for nearly a quarter (23%, N=5825) of all fish sampled followed by river carpsuckers (9%, N = 2,499) and flathead chub (4%, N = 1,055). More than 50 individuals were collected for 14 species of fish. Twenty four species were captured in multiple gears.

Trammel nets were the only gear deployed during the sturgeon season in 2005. A total of 152 fish representing 10 species were captured in 56,156 meters of drifting. Channel catfish (N = 61) were the most abundant species collected in trammel nets, followed by shovelnose sturgeon (N = 19) and bigmouth buffalo (N = 18). Additionally, trammel nets also collected goldeye (N = 15), sauger (N = 14), common carp (N = 9), smallmouth buffalo (N = 9), river carpsuckers (N = 3), pallid sturgeon (N = 2), and walleye (N = 2). During the fish community season, trammel nets captured 504 fish representing 13 species. There were 206 channel catfish collected in 94,907 meters of drifting. Shovelnose sturgeon (N = 152) comprised almost one third of the catch, followed by goldeye (N = 97), sauger (N = 46), pallid sturgeon (N = 22), smallmouth buffalo (N = 22), river carpsucker (N = 18), common carp (N = 11), walleye (N = 2), blue sucker (N = 2), shorthead redhorse (N = 2), northern pike (N = 1), flathead chub (N = 1), and one stonecat (Appendix F2).

Otter trawls were only used during the fish community season. A total of 1,337 fish representing 19 species were captured in 258,927 meters of trawling. Channel catfish (N = 501) were the most abundant species collected in otter trawls followed by sicklefin chubs (N = 328), sturgeon chubs (N = 176), and shovelnose sturgeon (N = 104). Seven species were sampled in the otter trawl that were not sampled in the trammel net: sicklefin and sturgeon chubs, freshwater drum (N = 15), *Hybognathus spp.* (N = 9), common shiner (N = 4), burbot (N = 1), and white sucker (N = 1) (Appendix F4).

Mini-fyke nets collected more fish and species of fish than any other gear used in segment 4. In 2005, there were 21,120 fish representing 26 species captured. Emerald shiners (N = 11,091)

were the most abundant species sampled, followed by *hybognathus spp.* (N = 5,586), river carpsuckers (N = 2,294), and white crappie (N = 810). Mini-fyke nets collected three species that were unique to that gear: banded killifish (N = 2), long nose dace (N = 25), and sand shiner (N = 1) (Appendix F6).

In 2005, a total of 2,043 fish representing 16 species of fish were captured in bag seines. Emerald shiners (N = 1,035) were the most prominent species, followed by flathead chubs (N = 406), *Hybognathus spp.* (N = 230), and river carpsuckers (N = 179). Bag seines caught fewer species than mini-fyke nets and only one unique species: fathead minnow (N = 1).

One species not identified as a target species for this monitoring effort, but is of interest for this segment, is the burbot, *Lota lota*. Although very few were captured during both sampling seasons, the burbot were a more frequently captured species in the mini-fyke nets as water temperatures dropped late in the fish community season. Fourteen burbot were sampled that ranged in size from 203 to 515 mm. Since very little is known of the burbot populations, this information may also provide information to understand their status.

Discussion

A considerable amount of information was gained from this first year of sampling segment 4. Since this was the first year of implementation, a clearer understanding of the protocols and application of the strategies helped immensely for efficiency purposes.

The combination of gears will provide a comprehensive evaluation of the fish population for segment 4, primarily with the use of trammel nets, mini-fyke nets, and otter trawls. The trammel nets did capture larger size class sturgeon (> stock) while the otter trawl was more efficient in capturing substock size sturgeon (FL <330 mm). Adult pallid sturgeon (FL >1040 mm) were captured in both the trammel nets and the otter trawl. The otter trawl caught more sicklefin and sturgeon chub than other standard gears. The mini-fyke nets outsampled the other gears for sauger and *Hybognathus spp.* In addition, the mini-fyke nets were more efficient at sampling species (26 MF vs 16 BS) and greater numbers (21,117 MF vs 2,043 BS) of fish than the bag seines. Although both seines and mini-fyke nets were implemented in 2005, seines will be discontinued for 2006 efforts. Based on an evaluation of the capture rates and species sampled for both gears, the Governance Committee agreed to discontinue seines as a required, standard gear.

The absence of pallid sturgeon within the preferred length class (FL 840 mm – 1039) is indicative of the population of pallids in segment 4. The large memorable sized pallid sturgeon (FL >1040) that were sampled are the remnants of an aging adult population whereas the smaller sized pallid sturgeon (FL <840) are the results of stocking hatchery juvenile pallid sturgeon. Monitoring the survival of hatchery pallid sturgeon as they reach sexual maturity will be critical.

One observation that is becoming apparent from the preliminary information is that efficiency of gears is dependant on flows, especially trammel nets. Although this is not a surprise from previous experiences, it is hopeful that these efforts may allow us to quantify when efficiencies are compromised due to high flows from the Yellowstone River. At this time, when flows on the Yellowstone are peaking due to the spring rise, the efficiency of using trammel nets may be compromised. This is based on the data that shows 83% of our trammel nets that did not catch a fish were deployed when flows were in excess of 20,000 cubic feet per second. No analysis has been done to evaluate the effectiveness of the gears on other species or by habitat. This is

obviously part of the future analysis and additional information will allow us to determine when sampling is most efficient.

Two gear additions for 2006 will be the 6 foot beam trawl and the mini-fyke net with “Delta” mesh. The beam trawl will be evaluated as a potential gear for sampling smaller sturgeon (<100 mm). The mini-fyke net will be the same dimensions as the standard mini-fyke net. The difference will be in the mesh type with the new net having a stronger “Delta”. The new gears will be initially deployed as experimental to determine application to the program and targeted species.

Implementation of strategies that could allow for comparisons of pallid sturgeon from various reaches of river will provide an important tool to evaluate actions that will benefit recovery. This effort is essentially the first comprehensive effort that incorporates the ability to focus on sturgeon and the associated community for this segment.

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APPENDICES

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

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

Appendix A. (continued).

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

Appendix A. (continued).

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

Appendix A. (continued).

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

Appendix A. (continued).

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

Appendix A. (continued).

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

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

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

Appendix C. List of standard and wild gears (type), their corresponding codes in the database, seasons deployed (Fall-Spring, Summer, or all), years used, and catch-per-unit-effort units for collection of Missouri River fishes in segment 4 for the long-term pallid sturgeon and associated fish community sampling program. Long-term monitoring began in 2005 for segment 4.

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
Beam trawl	BT	Wild	Fish Comm.	2003 - 2004	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
Trammel net – 6 inch inner and 10 inch outer mesh	TN610	Wild	All	2005 - Present	Fish/100 m drift

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 4 of the Missouri River (RPMA 2)

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Average Length (mm)	Primary Mark	Secondary Mark
1998	Sidney	255	1997	6/17/1997	N/A	PIT Tag	Elastomer
1998	Big Sky Bend	230	1997	6/17/1997	N/A	PIT Tag	Elastomer
1998	Nohly Bridge	255	1997	6/17/1997	N/A	PIT Tag	Elastomer
1998	Confluence	40	1997	6/17/1997	N/A	PIT Tag	Elastomer
2000	Sidney	216	1999	10/17/2000	350	PIT Tag	
2000	Fairview	216	1999	10/17/2000	350	PIT Tag	
2000	Wolf Point	124	1999	10/17/2000	350	PIT Tag	
2000	Culbertson	124	1999	10/17/2000	350	PIT Tag	
2002	Intake	454	2001	7/18/2002	290	PIT Tag	Elastomer
2002	Sidney	698	2001	7/18/2002	290	PIT Tag	Elastomer
2002	Fairview	629	2001	7/18/2002	290	PIT Tag	Elastomer
2002	Wolf Point	694	2001	7/18/2002	290	PIT Tag	Elastomer
2002	Culbertson	586	2001	7/18/2002	290	PIT Tag	Elastomer
2003	Intake	1040	2002	8/7/2003	275	PIT Tag	Elastomer
2003	Fairview	887	2002	8/7/2003	275	PIT Tag	Elastomer
2003	Wolf Point	1164	2002	8/7/2003	275	PIT Tag	Elastomer
2003	Culbertson	1033	2002	8/7/2003	275	PIT Tag	Elastomer
2004	Intake	362	2003	8/9/2004	165	PIT Tag	Elastomer
2004	Sidney	350	2003	8/9/2004	165	PIT Tag	Elastomer
2004	Milk River	821	2003	4/13/2004	94	PIT Tag	Elastomer
2004	Wolf Point	394	2003	8/9/2004	165	PIT Tag	Elastomer
2004	Culbertson	541	2003	8/9/2004	165	PIT Tag	Elastomer
2004	Intake	2445	2004	11/18/2004	155	Coded Wire	Elastomer
2004	Sidney	2991	2004	9/10/2004	86	Coded Wire	Elastomer

Appendix E. (continued)

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Average Length (mm)	Primary Mark	Secondary Mark
2004	Mouth of Milk	3482	2004	10/15/2004	115	Coded Wire	Elastomer
2004	Wolf Point	4040	2004	9/10/2004	84	Coded Wire	Elastomer
2004	Culbertson	3819	2004	9/10/2004	84	Coded Wire	Elastomer
2005	Intake	424	2004	4/12/2005	N/A	Coded Wire	Elastomer
2005	Wolf Point	758	2004	4/12/2005	N/A	Coded Wire	Elastomer
2005	Culbertson	285	2004	4/12/2005	N/A	Coded Wire	Elastomer
2005	Intake	3303	2005	10/12/2005	130	Coded Wire	Elastomer
2005	Sidney	1084	2005	10/12/2005	119	Coded Wire	Elastomer
2005	Milk River	603	2005	10/12/2005	125	Coded Wire	Elastomer
2005	Wolf Point	3194	2005	10/12/2005	119	Coded Wire	Elastomer
2005	Brockton	600	2005	10/12/2005	N/A	Coded Wire	Elastomer
2005	Culbertson	2984	2005	10/12/2005	130	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 4 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	TRML	TRIB	
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	CHNB	CHNB	ITIP
BDKF	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
BMBF	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
BRBT	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
BSMW	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
BUSK*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
CARP	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
CMSN	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
CNCF	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
ERSN	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
FHCB	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
FHMW	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
FWDM	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
GDEY	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
GNSF	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
HBNS*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
LNDC	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
NTPK	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
PDSG*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
RVCS	0	0	0	N-E	0	N-E	0	N-E	0	N-E	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	TRML	TRIB	
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	CHNB	CHNB	ITIP
SFCB*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SGCB*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SGER*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SHRH	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SMBF	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SNSG*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SNSN*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
STCT	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
WLYE	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
WSMW*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
WTBS	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
WTCP	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
WTSK	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]

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

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML		TRIB	
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	CHNB	CHNB	ITIP	
BDKF	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0	0
BMBF	18	0.033 [0.034]	0	N-E	0	N-E	0.016	N-E	0.017	N-E	0.22	0.01	0	0	0	0	0
BRBT	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0	0
BSMW	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0	0
BUSK*	3	0.005 [0.007]	0	N-E	0	N-E	0.004	N-E	0.01	N-E	0	0	0	0	0	0	0
CARP	22	0.051 [0.032]	0.035	N-E	0	N-E	0.062	N-E	0.031	N-E	0.149	0.051	0	0	0	0	0
CMSN	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0	0
CNCF	267	0.571 [0.228]	0.204	N-E	0	N-E	0.69	N-E	0.498	N-E	1.083	0.477	0	3.494	0.085	0.377	0
ERSN	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0	0
FHCB	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0	0
FHMW	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0	0
FWDM	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0	0
GDEY	112	0.288 [0.127]	0.038	N-E	0	N-E	0.247	N-E	0.062	N-E	0.723	0.931	0	0.71	0.062	0.639	0
GNSF	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0	0
HBNS*	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0	0
LNDC	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0	0
NTPK	1	0.004 [0.009]	0	N-E	0	N-E	0	N-E	0	N-E	0.043	0	0	0	0	0	0
PDSG*	24	0.044 [0.022]	0.04	N-E	0	N-E	0.01	N-E	0.071	N-E	0	0.043	0	0	0.045	0.322	0
RVCS	21	0.046 [0.025]	0.046	N-E	0	N-E	0.038	N-E	0.047	N-E	0.061	0.065	0	0.137	0	0	0

F2 (continued)

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML	TRIB	
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	CHNB	CHNB	ITIP
SFCB*	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
SGCB*	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
SGER*	60	0.144 [0.06]	0.126 [0.092]	N-E	0 [0]	N-E	0.179 [0.165]	N-E	0.056 [0.045]	N-E	0.17 [0.146]	0.388 [0.35]	0 [0]	0 [0]	0 [0]	0.128 [0.256]
SHRH	2	0.001 [0.003]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0.005 [0.01]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
SMBF	31	0.06 [0.031]	0.009 [0.017]	N-E	0 [0]	N-E	0.058 [0.046]	N-E	0.084 [0.065]	N-E	0.124 [0.188]	0.031 [0.045]	0 [0]	0 [0]	0.045 [0.09]	0.147 [0.295]
SNSG*	171	0.331 [0.114]	0.324 [0.314]	N-E	0 [0]	N-E	0.249 [0.237]	N-E	0.337 [0.225]	N-E	0.277 [0.167]	0.348 [0.195]	0 [0]	1.285 [2.221]	0.106 [0.111]	0.949 [0.734]
SNSN*	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
STCT	1	0.004 [0.007]	0.019 [0.037]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
WLYE	4	0.009 [0.011]	0 [0]	N-E	0 [0]	N-E	0.022 [0.044]	N-E	0.007 [0.014]	N-E	0.019 [0.037]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
WSMW*	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
WTBS	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
WTCP	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
WTSK	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]

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

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML	TRIB	
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	CHNB	CHNB	ITIP
BDKF	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
BMBF	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
BRBT	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
BSMW	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
BUSK*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
CARP	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
CMSN	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
CNCF	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
ERSN	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
FHCB	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
FHMW	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
FWDM	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
GDEY	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
GNSF	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
HBNS*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
LNDC	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
NTPK	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
PDSG*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
RVCS	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]

Appendix F3 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML	TRIB	
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	CHNB	CHNB	ITIP
SFCB*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SGCB*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SGER*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SHRH	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SMBF	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SNSG*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SNSN*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
STCT	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
WLYE	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
WSMW*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
WTBS	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
WTCP	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
WTSK	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]

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

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		TRML		TRIB
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	CHNB	CHNB	ITIP
BDKF	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
BMBF	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
BRBT	1	0.003 [0.006]	0.013 [0.026]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
BSMW	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
BUSK*	1	0.003 [0.006]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0.009 [0.017]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
CARP	5	0.039 [0.053]	0 [0]	N-E	0 [0]	N-E	0.115 [0.181]	N-E	0.018 [0.036]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
CMSN	4	0.019 [0.02]	0.028 [0.039]	N-E	0 [0]	N-E	0 [0]	N-E	0.022 [0.044]	N-E	0 [0]	0 [0]	0.231 [0.463]	0 [0]	0 [0]
CNCF	501	1.89 [0.538]	1.333 [0.725]	N-E	0 [0]	N-E	2.007 [0.986]	N-E	2.147 [1.134]	N-E	2.039 [2.18]	2.084 [1.963]	1.762 [3.524]	0 [0]	0 [0]
ERSN	2	0.01 [0.02]	0 [0]	N-E	0 [0]	N-E	0.035 [0.069]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
FHCB	72	0.292 [0.164]	0.228 [0.168]	N-E	0 [0]	N-E	0.399 [0.488]	N-E	0.118 [0.12]	N-E	0.857 [0.922]	0.348 [0.696]	1.113 [1.299]	0 [0]	0 [0]
FHMW	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
FWDM	15	0.061 [0.042]	0.026 [0.052]	N-E	0 [0]	N-E	0.037 [0.042]	N-E	0.034 [0.039]	N-E	0.298 [0.595]	0.174 [0.348]	0.452 [0.022]	0 [0]	0 [0]
GDEY	80	0.313 [0.258]	0 [0]	N-E	0 [0]	N-E	0.331 [0.35]	N-E	0.052 [0.045]	N-E	2.249 [3.629]	0.348 [0.696]	3.704 [7.407]	0 [0]	0 [0]
GNSF	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
HBNS*	9	0.032 [0.026]	0.065 [0.091]	N-E	0 [0]	N-E	0.022 [0.03]	N-E	0.017 [0.024]	N-E	0.067 [0.134]	0 [0]	0 [0]	0 [0]	0 [0]
LNDC	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
NTPK	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
PDSG*	7	0.024 [0.018]	0.028 [0.039]	N-E	0 [0]	N-E	0 [0]	N-E	0.041 [0.04]	N-E	0.057 [0.115]	0 [0]	0 [0]	0 [0]	0 [0]
RVCS	14	0.051 [0.042]	0.017 [0.034]	N-E	0 [0]	N-E	0.077 [0.095]	N-E	0.036 [0.054]	N-E	0 [0]	0 [0]	0.694 [1.389]	0 [0]	0 [0]

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		TRML	TRIB	
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	CHNB	CHNB	ITIP
SFCB*	329	1.257 [0.267]	0.976 [0.48]	N-E	0 [0]	N-E	1.098 [0.434]	N-E	1.811 [0.529]	N-E	0.479 [0.437]	0.668 [0.585]	0.441 [0.881]	0 [0]	0 [0]
SGCB*	176	0.681 [0.285]	0.484 [0.253]	N-E	0 [0]	N-E	0.476 [0.232]	N-E	0.925 [0.69]	N-E	0.688 [0.759]	1.304 [2.609]	0.22 [0.441]	0 [0]	0 [0]
SGER*	9	0.029 [0.02]	0 [0]	N-E	0 [0]	N-E	0.044 [0.051]	N-E	0.028 [0.031]	N-E	0.124 [0.158]	0 [0]	0 [0]	0 [0]	0 [0]
SHRH	4	0.016 [0.019]	0 [0]	N-E	0 [0]	N-E	0.025 [0.049]	N-E	0 [0]	N-E	0.166 [0.216]	0 [0]	0 [0]	0 [0]	0 [0]
SMBF	1	0.003 [0.007]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0.01 [0.02]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
SNSG*	104	0.376 [0.096]	0.256 [0.152]	N-E	0 [0]	N-E	0.382 [0.169]	N-E	0.511 [0.196]	N-E	0.132 [0.265]	0.185 [0.227]	0.452 [0.022]	0 [0]	0 [0]
SNSN*	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
STCT	6	0.023 [0.019]	0.049 [0.055]	N-E	0 [0]	N-E	0 [0]	N-E	0.02 [0.028]	N-E	0.079 [0.157]	0 [0]	0 [0]	0 [0]	0 [0]
WLYE	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
WSMW*	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
WTBS	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
WTCP	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
WTSK	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]

Appendix F5. Beam 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	TRML	TRIB	
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	CHNB	CHNB	ITIP
BDKF	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
BMBF	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
BRBT	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
BSMW	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
BUSK*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
CARP	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
CMSN	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
CNCF	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
ERSN	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
FHCB	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
FHMW	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
FWDM	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
GDEY	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
GNSF	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
HBNS*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
LNDC	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
NTPK	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
PDSG*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
RVCS	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]

Appendix F5 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML	TRIB	
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	CHNB	CHNB	ITIP
SFCB*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SGCB*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SGER*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SHRH	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SMBF	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SNSG*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
SNSN*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
STCT	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
WLYE	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
WSMW*	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
WTBS	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
WTCP	0	0	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	0	0	0
		[0]	[0]		[0]		[0]		[0]		[0]	[0]	[0]	[0]	[0]	[0]
WTSK	0	0	0	N-E	0	N-E	0	N-E	0	N-E	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	CONF		ISB		OSB	SCCL		SCCS		SCCN	
			BARS	CHNB	POOL	BARS	CHNB	BARS	BARS	ITIP	BARS	ITIP	CHNB	BARS
BDKF	2	0.025 [0.049]	0	0	N-E	0.067 [0.133]	0	0	0	0	0	0	0	0
BMBF	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
BRBT	13	0.16 [0.114]	0	0	N-E	0.3 [0.256]	0	0	0.167 [0.333]	0.111 [0.222]	0	0	0	0.125 [0.25]
BSMW	2	0.025 [0.035]	0	0	N-E	0	0	0.077 [0.154]	0.083 [0.167]	0	0	0	0	0
BUSK*	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
CARP	20	0.247 [0.194]	0	0	N-E	0.1 [0.111]	0	0.231 [0.332]	1.083 [1.14]	0	1	0	0	0
CMSN	394	4.864 [4.986]	0	0	N-E	6.8 [8.861]	0	0.385 [0.769]	1.917 [2.249]	18 [33.808]	0	0	0	0
CNCF	57	0.704 [0.484]	0	0	N-E	0.9 [0.781]	0	0.077 [0.154]	1.167 [2.158]	1.444 [1.975]	0	0.333 [0.667]	0	0.125 [0.25]
ERSN	11091	136.926 [54.116]	73	0	N-E	250.8 [126.366]	35.5 [41]	131.538 [89.505]	52.667 [49.029]	15.889 [9.04]	47	29.667 [55.382]	7.5 [15]	98.375 [104.631]
FHCB	577	7.123 [2.962]	4	0	N-E	9.467 [5.595]	13.5 [3]	10.385 [11.656]	4.5 [4.064]	2.889 [2.504]	3	3 [2.309]	0	4.375 [6.346]
FHMW	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
FWDM	41	0.506 [0.244]	0	0	N-E	0.367 [0.325]	0	0.308 [0.35]	0.833 [0.689]	0.333 [0.333]	0	2 [4]	2 [4]	0.375 [0.526]
GDEY	63	0.778 [0.408]	0	0	N-E	0.933 [0.79]	0	0.462 [0.772]	1.75 [1.598]	0.333 [0.333]	1	0.333 [0.667]	0	0.375 [0.526]
GNSF	8	0.099 [0.09]	0	0	N-E	0.233 [0.229]	0	0.077 [0.154]	0	0	0	0	0	0
HBNS*	5586	68.963 [52.927]	12	0	N-E	132.067 [135.751]	1 [2]	86.769 [70.617]	3.083 [4.267]	0.889 [1.222]	0	0.333 [0.667]	152.5 [305]	16.375 [15.775]
LNDC	3	0.037 [0.055]	0	0	N-E	0.067 [0.133]	0	0	0	0.111 [0.222]	0	0	0	0
NTPK	5	0.062 [0.064]	0	0	N-E	0.1 [0.147]	0	0	0.083 [0.167]	0	0	0.333 [0.667]	0	0
PDSG*	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
RVCS	2294	28.321 [24.159]	0	0	N-E	60.5 [61.423]	4.5 [7]	6.462 [6.323]	5.583 [5.776]	4.222 [2.921]	276	0	0	0.625 [0.526]

Appendix F6 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF		ISB		OSB	SCCL		SCCS		SCCN	
			BARS	CHNB	POOL	BARS	CHNB	BARS	BARS	ITIP	BARS	ITIP	CHNB	BARS
SFCB*	1	0.012 [0.025]	0	0 [0]	N-E	0.033 [0.067]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
SGCB*	8	0.099 [0.083]	0	0 [0]	N-E	0.133 [0.159]	0 [0]	0.077 [0.154]	0.167 [0.333]	0 [0]	0 [0]	0 [0]	0 [0]	0.125 [0.25]
SGER*	104	1.284 [0.441]	0	0 [0]	N-E	1.367 [0.701]	0 [0]	0.769 [0.685]	2.5 [1.899]	1.111 [1.024]	0 [2.667]	1.333 [2.667]	0 [0]	1.125 [0.796]
SHRH	0	0 [0]	0	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
SMBF	1	0.012 [0.025]	0	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0.083 [0.167]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
SNSG*	0	0 [0]	0	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
SNSN*	1	0.012 [0.025]	0	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0.083 [0.167]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
STCT	4	0.049 [0.048]	0	0 [0]	N-E	0.1 [0.111]	0 [0]	0.077 [0.154]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]
WLYE	3	0.037 [0.055]	0	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0.167 [0.333]	0.111 [0.222]	0 [0]	0 [0]	0 [0]	0 [0]
WSMW*	1	0.012 [0.025]	0	0 [0]	N-E	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0.5 [1]	0 [0]
WTBS	19	0.235 [0.348]	0	0 [0]	N-E	0.5 [0.933]	0 [0]	0.154 [0.208]	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	0.25 [0.327]
WTCP	810	10 [7.135]	0	0 [0]	N-E	13.3 [17.146]	4 [8]	3 [3.187]	16.25 [13.563]	2.333 [3.249]	16 [1.333]	0.667 [1.333]	4.5 [9]	15.125 [25.499]
WTSK	0	0 [0]	0	0 [0]	N-E	0 [0]	0 [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 m²) and 2 standard errors in brackets.

Species	Total Catch	Overall CPUE	CHXO	CONF		ISB		OSB	SCCL		SCCS		SCCN	TRML
			BARS	CHNB	POOL	BARS	CHNB	BARS	BARS	ITIP	BARS	ITIP	BARS	BARS
BDKF	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
BMBF	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
BRBT	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
BSMW	2	0.02 [0.039]	0	0	N-E	0.054	0	0	0	0	0	0	0	0
BUSK*	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
CARP	1	0.02 [0.039]	0	0	N-E	0.054	0	0	0	0	0	0	0	0
CMSN	132	2.177 [2.161]	0	0	N-E	1.541	0	0	0	2.515	0	0.561	12.546	0
CNCF	1	0.017 [0.035]	0	0	N-E	0	0	0.139	0	0	0	0	0	0
ERSN	1035	18.385 [7.728]	0	0	N-E	20.971	0	56.189	6.175	10.419	3.015	6.281	10.046	0.786
FHCB	406	7.322 [2.176]	0	0	N-E	6.744	0	6.445	12.712	8.151	3.773	5.78	6.457	9.431
FHMW	1	0.02 [0.039]	0	0	N-E	0	0	0	0	0.157	0	0	0	0
FWDM	11	0.21 [0.173]	0	0	N-E	0.093	0	0	0.349	0.472	0	0.225	0.589	0
GDEY	14	0.231 [0.256]	0	0	N-E	0	0	1.221	0	0	0	0.561	0.295	0
GNSF	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
HBNS*	230	3.971 [1.599]	0	0	N-E	3.409	0	2.043	5.426	4.076	0.629	4.94	8.888	0
LNDC	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
NTPK	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
PDSG*	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
RVCS	179	2.899 [1.675]	0	0	N-E	2.469	0	0.453	0.699	2.201	0.185	1.322	12.505	8.645
						[1.728]		[0.463]	[0.924]	[2.054]	[0.37]	[1.854]	[13.817]	[7.86]

Appendix F7 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF		ISB		OSB	SCCL		SCCS		SCCN	TRML
			BARS	CHNB	POOL	BARS	CHNB	BARS	BARS	ITIP	BARS	ITIP	BARS	BARS
SFCB*	1	0.01 [0.02]	0	0	N-E	0	0	0	0	0	0	0.112 [0.225]	0	0
SGCB*	3	0.062 [0.071]	0	0	N-E	0	0	0	0.38 [0.505]	0.157 [0.314]	0	0	0	0
SGER*	11	0.189 [0.178]	0	0	N-E	0.163 [0.181]	0	0.629 [1.258]	0.175 [0.349]	0.101 [0.202]	0	0	0.196 [0.393]	0
SHRH	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
SMBF	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
SNSG*	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
SNSN*	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
STCT	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
WLYE	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
WSMW*	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0
WTBS	6	0.118 [0.109]	0	0	N-E	0.108 [0.151]	0	0.472 [0.671]	0.175 [0.349]	0	0	0	0	0
WTCP	10	0.174 [0.347]	0	0	N-E	0	0	1.389 [2.778]	0	0	0	0	0	0
WTSK	0	0 [0]	0	0	N-E	0	0	0	0	0	0	0	0	0

Appendix G. Hatchery names, locations, and abbreviations.

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

Appendix H. Alphabetic list of Missouri River fishes with total catch-per-unit-effort by gear type for sturgeon season (fall through spring) and fish community season (summer) during 2004 – 2005 for segment 4 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							0.025	
BMBF	0.071							
BSMW						0.02	0.025	
BUSK*					0.01			0.003
CARP	0.042				0.058	0.02	0.247	0.039
CMSN						2.177	4.864	0.019
CNCF	0.293				0.805	0.017	0.704	1.89
ERSN						18.385	136.926	0.01
FHCB	0.008					7.322	7.123	0.292
FHMW						0.02		
FWDM						0.21	0.506	0.061
GDEY	0.243				0.325	0.231	0.778	0.313
GNSF							0.099	
HBNS*						3.971	68.963	0.032
LNDC							0.037	
NTPK					0.008		0.062	
PDFH								
PDSG*	0.01				0.074			0.024
RVCS	0.036				0.055	2.899	28.321	0.051
SFCB*						0.01	0.012	1.257
SGCB*						0.062	0.099	0.0681
SGER*	0.057				0.217	0.189	1.284	0.029
SHRH					0.003			0.016
SMBF	0.071				0.051		0.012	0.003
SNSG*	0.074				0.547			0.376
SNSN*							0.012	
STCT					0.007		0.049	0.023

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
WSMW*							0.012	
WTBS						0.118	0.235	
WTCP						0.174	10	
WTSK							0.012	0.004