2005 Annual Report

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

Prepared for the U.S. Army Corps of Engineers – Northwest Division
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EXECUTIVE SUMMARY

The number of pallid sturgeon collected in segment 14 has increased from 5 in 2004 to 13 in 2005. This increase depicts the contribution of the stocking program and exhibits biologist's improved ability to target these rare fish. Of the 13 pallids collected using standard and wild (non-protocol) efforts, four had no tags and were presumed to be wild while nine had some type of tag from a hatchery stocking. Pit tag retention was 100% as far as could be determined on the stocked fish with double tags, however genetic confirmation is still needed on the wild fish to verify their origin.

Sampling gears were used throughout the entire year to sample available habitat types over a range of temperatures. Stationary set gillnets produced 8 pallids, 5 of which were captured in standard gillnets and 3 in wild gillnets. Wild gillnets were used to increase the effort for the largest and smallest pallids. With active gears, four pallids were captured in 2.5 inch trammel nets and one was captured in a 1 inch trammel net. Of the 13 pallids sampled, only 1 was sampled in POOL habitat and POOL habitat accounted for half of the habitat gillnets were deployed in. The absence of pallids in this habitat is significant because in years preceding 2004, only POOL habitat was sampled with this gear. This relative absence may be an anomaly that could be attributed to lower river stages experienced in recent years, but at the very least, it suggests that this potential winter habitat was not sampled early enough in pallid monitoring efforts. Nine pallids (69%) occurred within inside-bend macrohabitat, which was the most sampled habitat with all gears. Pallids were also captured on less frequently occurring habitats including: 2 in channel crossovers, 1 in a confluence area and 1 in an outside bend. Pallids and other sturgeon have been shown to aggregate, or cluster around particular areas that are being examined through telemetry and targeted sampling. One such area was discovered in the spring of 2005 at bend RM 44 where biologists captured five large pallids (>700mm) within a week's time period around a single sand bar. This sand bar had produced pallid sturgeon in 2004, but recently in 2006, targeted sampling produced no pallids. Pallids were otherwise captured

proportionately to the areas where sampling occurred. Efforts will continue to try and identify unique clustering areas through additional telemetry efforts and targeted sampling.

No wild or hatchery fish were recaptured for a second time despite dozens being potentially "at large" in this reach since 1999. There has been a relatively high rate of occurrence of the 1997 stocked year-class of pallids, which have been found to exhibit a restricted upper home range. Pallid stockings of 2,445 fish in 1994 and 1,200 in 1997 have occurred in this reach of the river. Since that time, all additional stockings have occurred upstream, with the closest being at Boonville (RM 195). At the time of sampling, there were 24,600 fish stocked between Booneville and St. Charles (RM 25) and of the fish recaptured they represented their stocked year class as follows: 1992 – 0.04%, 1997 – 0.42%, 2001 – 0.04%, 2002 – 0.04%, 2003 – 0.03%. The combined total percentage of stocked fish (N = 9) versus proximate availability (N= 24,600) was 0.04%. This relatively low percentage of all fish versus the higher percentage of 1997 fish suggests that stocked fish have not dispersed into the lower segment at a high rate and that older fish have not readily moved out. The fish from 1997 and 1992 were also stocked in the Mississippi River and could have been of Mississippi origin (coded wire tagged), but the vast majority of these year classes have been found within the area they were stocked rather than 100's of miles upstream. The relative condition of older pallids seems to be less robust than the younger fish. The range of condition for pallids captured in standard gears was: 0.78 (1992) – 1.07 (2003) and fish captured in between these years were represented on a consistent gradient with younger fish having better relative condition. This would suggest that hatchery fish are at least finding an adequate food source for survival. However, the low condition of older fish may be reflective of other factors like a post spawn event, or an inaccurate equation used to describe the growth of these fish. Annual growth rates were 0.15 (mm/day) for 2002 fish and 0.36 for 2003 fish. In the past, the ratio of pallid to shovelnose has been used as a gauge of relative abundance, the ratio for 2005 was 1 pallid to 223 shovelnose including hatchery and wild pallids and 1: 819 for wild pallids only. This ratio indicates the success of the hatchery program but should be interpreted cautiously as shovelnose catch rates are affected by migrations and aggregations as well as commercial harvest.

Community target species are used as a gauge for relative change in the river in absence of pallid information. Young of the year sturgeon (preliminarily identified as shovelnose) were present but not abundant in 2004 (N=42). Sturgeon of larger sizes were the most abundant large fish represented in the sampling effort (N=2,458) which suggests that the appropriate gears are being used to detect pallid sturgeon. Of the 2,458 sturgeon captured they were represented in the gear as follows: 1,244 in gillnets, 558 in standard trammel nets, 136 in 2.5 inch trammel nets, 519 in the 16ft otter trawl, 1 in a bag seine and 0 in mini-fyke nets. Using all gears, 67 species were captured throughout the year. Different gears are used to target different fishes in the community and the project is adapting to determine the best methods to ensure efficiency within these gears. Sturgeon chubs, sicklefin chubs and speckled chubs were captured most often with otter trawls. Sand shiners and *Hybognathus* spp. were captured in seines and mini-fyke nets, but not in otter trawls. Blue suckers were captured in gillnets, trammel nets (of both sizes) as well as otter trawls, and sauger were most often captured with gillnets. For each of these species there appears to be particular habitat types for which they occur and a sampling design could be adapted to capture higher numbers of each if it were a priority.

Asian carp were represented in almost all gears including some young of year sizes. Considered as nuisance species, these fish appear to have expanded well throughout segment 14, but few young of year have been observed, suggesting that these fish are likely recruiting more in reaches of the Mississippi River and immigrating into the Missouri at later life stages. The gears used by this program are not sufficient to draw inferences about these species except to say they exist and are observed more often through jumping or through other gears like hoop nets and electrofishing used in other related projects.

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Introduction

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

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

In response to the 2000 Missouri River Biological Opinion, the COE is developing monitoring and restoration projects to avoid jeopardizing pallid sturgeon populations. As

part of their Implementation Plan, the COE is working with the U. S. Fish and Wildlife Service (USFWS) and State Resource Agencies to develop and conduct a pallid sturgeon monitoring and assessment program. The objectives of this program are as follows:

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

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

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

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

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

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

Study Area

Historically, the Missouri River was very wide and shallow, containing meandering channels with many islands and snags. Today, the Missouri River is maintained by the COE as a navigation channel for barges with high levies and armored banks to protect the adjacent farm land. Reveted banks and dikes line the river making it a self-scouring channel. Water velocities exceed 1.3 m/s in the main channel and drop to zero in pools that exist behind dike structures. Depths range from six meters in the main channel to 12 meters behind dikes. Turbidities can vary widely from over 1000 NTU's in spring flood events to around 40 NTU's in the winter months. Substrates range from silt (behind dikes) to fine sand and gravel in the main channel and border habitats. Rock revetment lines the outside bend shore-line; whereas silt or sand banks dominate the inside bend shoreline. In low water, sand bars are visible on the insides of bends with water often carving secondary channels behind.

Debris is often discharged from upstream tributaries and frequently gets lodged in sand bars or on dike structures as water levels drop. The Osage River is the largest tributary feeding segment 14 enters the Missouri River at the top of the study area. The Osage River originates in the foothills of the Ozark mountains and feeds into the Lake of the Ozarks where the water is used to generate power at Bagnell Dam. Since it is a bottom release reservoir, cool and clear water travels the remaining 80 miles (with low sediment inputs) over coarse sand and gravel substrates until its confluence with the Missouri River. Other smaller floodplain tributaries deliver large silt loads from rain events and can quickly change water stage height. Spring floods rarely top the banks, however usually on an annual basis, the river flows through some breached levies onto refuge floodplain land.

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

Methods

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

Sampling Site Selection and Description

Segment 14 starts at the confluence of the Osage River (RM 130.2) and ends at the confluence with the Mississippi River (RM 0.0; Figure 1a). Each segment represents a sampling replicate. Segments were divided into bends (defined as the crossing of the thalweg from one bank to the other), and bends were randomly selected from each segment to be sampled with a suite of gears. Ten bends in each segment were selected and sampled from November through June, (designated as the sturgeon season), and another 10 bends were selected and sampled for the community season (July through October). The river was categorized into distinct river components called Mesohabitats which exist within Macrohabitats (Appendix B). Each Mesohabitat was sampled twice within each Macrohabitat. When a diversity of habitats was not available, a minimum of eight samples were used to ensure some consistent level of effort per bend. For example, most active gear effort was applied to inside bend channel border habitat because this habitat was available at all water stages in all bends. Samples that occurred outside of the predetermined sampling protocol were given a "Wild" designation and not included in the master data analyses.

In segment 14, sampling was distributed among the following available habitats:

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

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

Sampling Gear

Gillnets were the most effective at capturing sturgeon of all gears combined and was the only gear used to target fish in colder water temperatures (<55 degrees). Other gears were utilized above this temperature to avoid fish mortality. Gillnets (GN) were set in POOL habitat off of dikes or in CHNB habitat where the sand bar sloped down towards the main-channel. Gillnets were anchored upstream with a 20 pound grappling hook and back-anchored with a cement weight tied to a buoy. Gillnets were most effective when they settled on a steep slope tailing off a sand bar into the thalweg or a dike structure. Gillnets were ineffective when flood events occurred in tributaries upstream, which flush debris in the river that subsequently becomes entangled in the nets.

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

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

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

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

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

Segment 13 sampling gear dimensions:

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

Data Collection and Analysis

Associated Environmental Data

GPS locations, temperature, turbidity and depth (beginning, mid-point and end) were taken for each sample. Additionally, substrate and velocity samples were collected randomly for 25% of the Mesohabitat types within each Macrohabitat. Substrate samples were reported as an estimate of the percentage of silt/sand/gravel within each dredge sample. Water column velocity was measured at (bottom), 80% (8/10) and 20% (2/10) of the depth. All habitat data was collected when pallid sturgeon were encountered.

Genetic Verification

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

Relative Condition

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

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

Relative Stock Densities

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

Length categories based on the percentage of the largest known shovelnose sturgeon are as follows (Quist 1998): sub-stock fork length <250mm (20%), stock fork length = 250 – 379mm (20- 36%), quality fork length = 380 – 509mm (36 – 45%), preferred fork length = 510 – 639mm (45- 59%), memorable fork length = 640 – 809mm (59 -74%) and trophy fork length > 810mm (> 74%). Proportional Stock Density (PSD) is the proportion of fish of quality size in a stock. Relative Stock Density (RSD) is the proportion of fish of a size group in a stock.

Analyses

A sample target effort for each gear was defined as follows: 300 m drift (TN), 300 m tow (OT), one overnight set (HN, MF) and 30 ft half arc pull (BS). A minimum effort of 75m for TN and OT's was accepted in channel border habitat; because some areas have so much debris long drifts are not possible. Effort for seines could be determined using different methods such as a half or full arc or pulling up-stream or down-stream, however our primary effort was in a rectangular parallel pull downstream, effort was calculated by multiplying the width of the net by distance pulled. Effort was calculated as catch per 100 m^2 for active gears (including seines) or per overnight set for passive gears. Samples that occurred outside of the "Standard" gear or habitat effort or samples that occurred in "Non-random" bends were

excluded from CPUE calculations. These data were included into length frequencies, relative condition and population structure calculations.

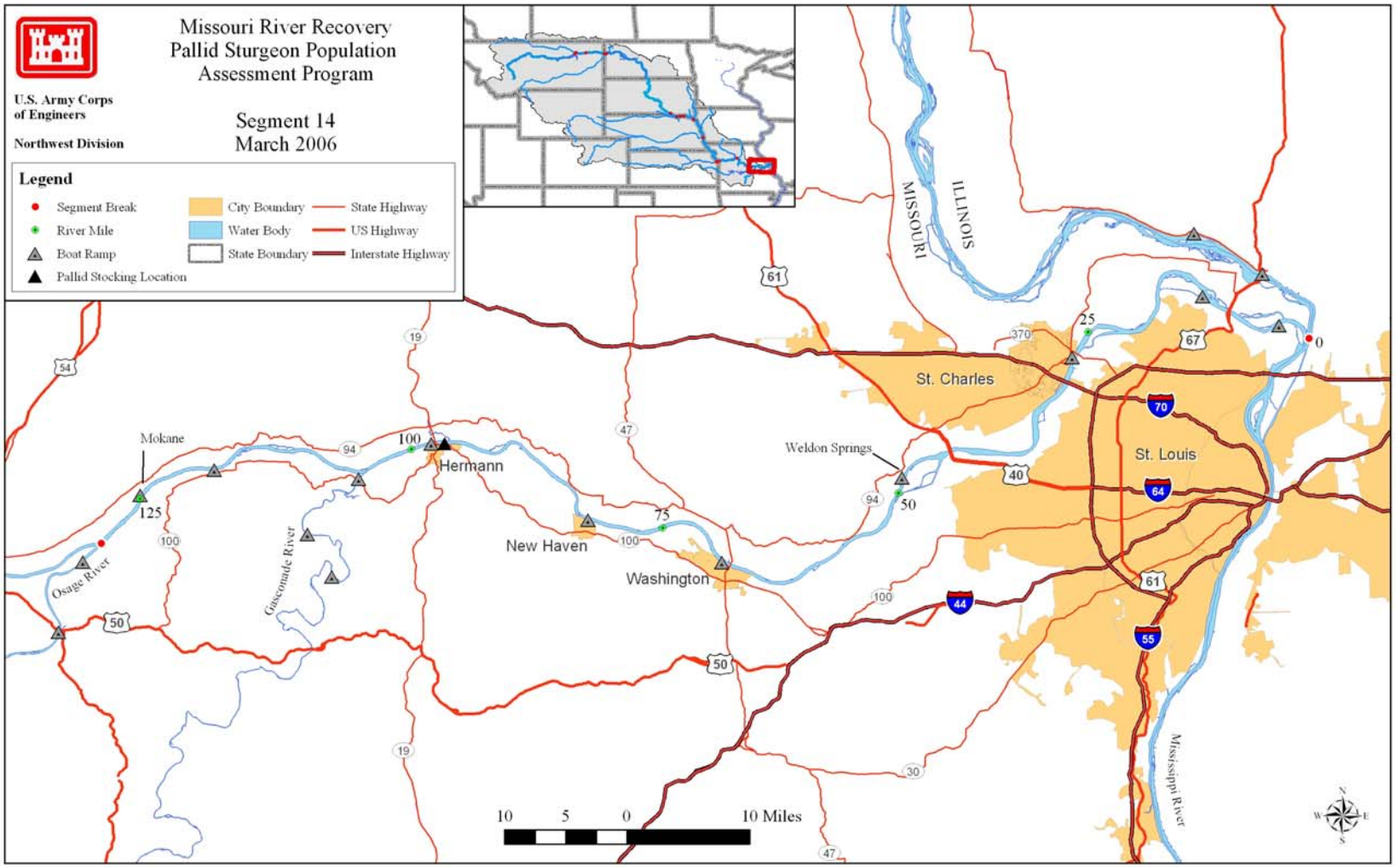

Figure 1a. Map of segment 14 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 14 encompasses the Missouri River from the Osage River (River Mile 130.2) to the confluence with the Mississippi River (River Mile 0.0).

Results

Pallid Sturgeon

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

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

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

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

In 2005 in segment 14, biologists from the Columbia Fishery Resources Office (Columbia FRO) sampled 17 bends during the sturgeon season (1 November 2004 to 30 Jun 2005) and 13 bends during the fish community season (1 July 2005 to 30 October 2005) using multiple gears. For the sturgeon season; 12 bends were sampled with 1 inch trammel nets (total effort = 19,996m drifted), 17 bends with 2.5 inch trammel nets (total effort = 33,460 m drifted), 14 bends with gillnets (total effort = 284 net nights), and 15 bends with 16 foot otter trawls (total effort = 26,113 m trawled; Tables 1-2). For the fish community season; 12 bends were sampled with 1 inch trammel nets (total effort = 19,644 m drifted), 11 bends with bag seines (total effort = 10,083 m^2 seined), 13 bends with mini-fyke nets (total effort = 84 net nights), and 13 bends with 16 foot otter trawls (total effort = 25,159 m trawled; Tables 1 and 2). Despite this effort, only 4 wild pallid sturgeon and 9 stocked pallid sturgeon were captured in segment 14 (Table 4), which emphasizes the rarity of this federally endangered species.

Of the 23 randomly selected bends in segment 14 only five were sampled during both sturgeon and fish community seasons (Figure 1b). Of the 13 pallids that were captured, 6 (46%) were captured in the lower half of the segment (RM 0.0 to 70.0) and 7 (54%) were captured in the upper half of the segment (RM 70.0 to 130.2; Figure 1b). Two of the 9 recaptured pallids were positively identified as originating from the Booneville stocking location (RM 195) whereas all other recaptures could not be positively traced back to a stocking site due to lack of or obscure data (i.e., unreadable datasheets or inadequate information to pinpoint origin) received from the field (Table 6; Appendix E). Untraceable pallids will be positively identified at a later date using genetic verification. One pallid was from the 1992 year class (stocking site unknown), five pallids were from the 1997 year class (stocking site unknown), two pallids were from the 2002 year class (stocked at Booneville), and one was from the 2003 year class (stocked at Booneville; Tables 3 and 6; Appendix E). All traceable pallids captured in 2005 were reared at either Garrison Dam National Fish Hatchery or Gavins Point Dam National Fish Hatchery. Condition (Kn), which is a measure of the fish's plumpness, was averaged for all recaptured pallids from segment 14. All fish that leave the hatchery are considered to be in good or robust condition (Kn ≈ 1.0) and were still in fairly good condition at the time of recapture (Table 6).

The majority of pallids captured in segment 14 (82%) were in ISB CHNB habitat, however, this may be an artifact of sampling effort since over half (51%) of the sampling in segment 14 occurred in ISB CHNB habitat (Tables 1-2). In ISB CHNB habitat, pallids were captured a little deeper (3.8 m) than what was sampled on average (2.8 m), though in all cases pallids were collected closer to the mean sample depth than the extremes (captured between 3.0 and 5.5 m whereas the sample mean was between 0.5 to 8.1 m; Table 3). This trend was similar for bottom velocity where pallids were captured at a mean velocity of 0.54 m/s (0.20 – 0.68) with a sample mean of 0.52 m/s (0.18 – 1.03). The majority (73%) of pallids were captured in water temperatures equal to or less than 15.0 ºC. On average, pallids were captured at a water temperature of 12.9 ºC (5.0 – 23.8) with an average sample temperature of 22.5 ºC (1.0 – 31.3; Tables 3 and 5). Nine of the 13 pallids were captured during the low flow winter months when turbidities generally ranged between 18 and 44 NTU's (with one exception of 150 NTU's; Table 5). Because of this the average turbidity for pallid captures was 100.5

NTU's (18 to 303) with a mean turbidity per sample of 104 NTU's (23 – 353; Table 3). Sand was the dominate substrate on which pallid sturgeon were captured ($\bar{x}$ = 64.2%; ±2SE = 21.6%; Table 5) with silt and gravel making up 22.1% (±2SE = 22.8%) and 13.8% (±2SE = 12.9%) of the substrate respectively (able 5).

The population structure, shown in Table 7, illustrates the influence of recently propagated fish with only one quality fish being captured in the fish community season. The RSD values indicate health of fish populations relative to reproductive potential and age of fish. The fact that few fish are seen at larger sizes suggests little opportunity exists for reproduction. The proportion of pallids to shovelnose, shown in Table 8, gives some measure of change in the system. For wild pallids to shovelnose, Carlson et al (1985) reported a ratio of 1:398, Grady et al (2001) reported a ratio of 1:647, Doyle and Starostka (2003) reported a ratio of 1:387, and Doyle et al (2004) reported ratios of 1:278 in 2003 and 1:341 in 2004. Recent results for 2005 reveal a ratio of 1:223.5 (Table 8). Methods of capture, improved sampling techniques, changing environmental conditions, commercial harvest, and sampling locations may confound any probable assumptions that could be made using this comparison and warrant noting. Despite these assumptions, the proportion, at the very least, does not provide any evidence of population improvement.

Table 1. Number of bends sampled, mean effort per bend, and total effort by macrohabitat for segment 14 on the Missouri River during fall through spring (sturgeon season) and summer/fall (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 non-existent in the segment. Beam trawl is not standard gear in segment 14.

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	16.7	N-E	52.33	10.75	N-E	N-E	119.99	0	10.05	6.84	0	0	0	0	0
2.5 Inch Trammel Net	17	19.7	N-E	50.08	11.83	N-E	N-E	247.6	3	7.5	14.59	0	0	0	0	0
Gill Net	14	20.3	N-E	62	10	N-E	N-E	104	76	14	14	0	0	4	0	0
Otter Trawl	15	17.4	N-E	56.7	17.1	N-E	N-E	123.66	15.66	23.8	11.51	0	7.4	5.3	0	0
Beam Trawl	-	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Summer – Fish Community Season																
1 Inch Trammel Net	12	16.4	N-E	36.96	0	N-E	N-E	129.18	2.80	9.40	6.00	0	12.10	0	0	-
Bag Seine	11	9.2	N-E	8.52	0	N-E	N-E	34.70	3.60	8.75	12.69	4.51	28.06	0	0	-
Mini-Fyke Net	13	6.5	N-E	14	0	N-E	N-E	26	11	3	12	3	14	0	1	-
Otter Trawl	13	19.4	N-E	44.84	0	N-E	N-E	141.67	3.05	8.70	10.00	0.0	43.33	0	0	-
Beam Trawl	-	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 2. Number of bends sampled, mean effort per bend, and total effort by mesohabitat for segment 14 on the Missouri River during fall through spring (sturgeon season) and summer/fall (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 non-existent in the segment. Beam trawl is not standard gear in segment 14.

Gear	Number of bends	Mean Effort/Bend	**Mesohabitat**				
			BAR	POOL	CHNB	TLWG	ITIP
Fall through Spring – Sturgeon Season							
1 inch Trammel Net	12	16.7	0	0	186.47	4.75*	8.74
2.5 Inch Trammel Net	17	19.7	0	0	320.01	0	14.59
Gill Net	14	20.3	0	124	136	4*	20
Otter Trawl	15	17.4	0	0	243.62	0	17.51
Beam Trawl	-	-	-	-	-	-	-
Summer – Fish Community Season							
1 Inch Trammel Net	12	16.4	0	0	187.69	0	8.75
Bag Seine	11	9.2	100.83	0	0	0	0
Mini-Fyke Net	13	6.5	83	0	1	0	0
Otter Trawl	13	19.4	0	0	238.04	0	13.55
Beam Trawl	-	-	-	-	-	-	-

* Since these would be considered wild samples, these data were either miss-identified or recorded improperly

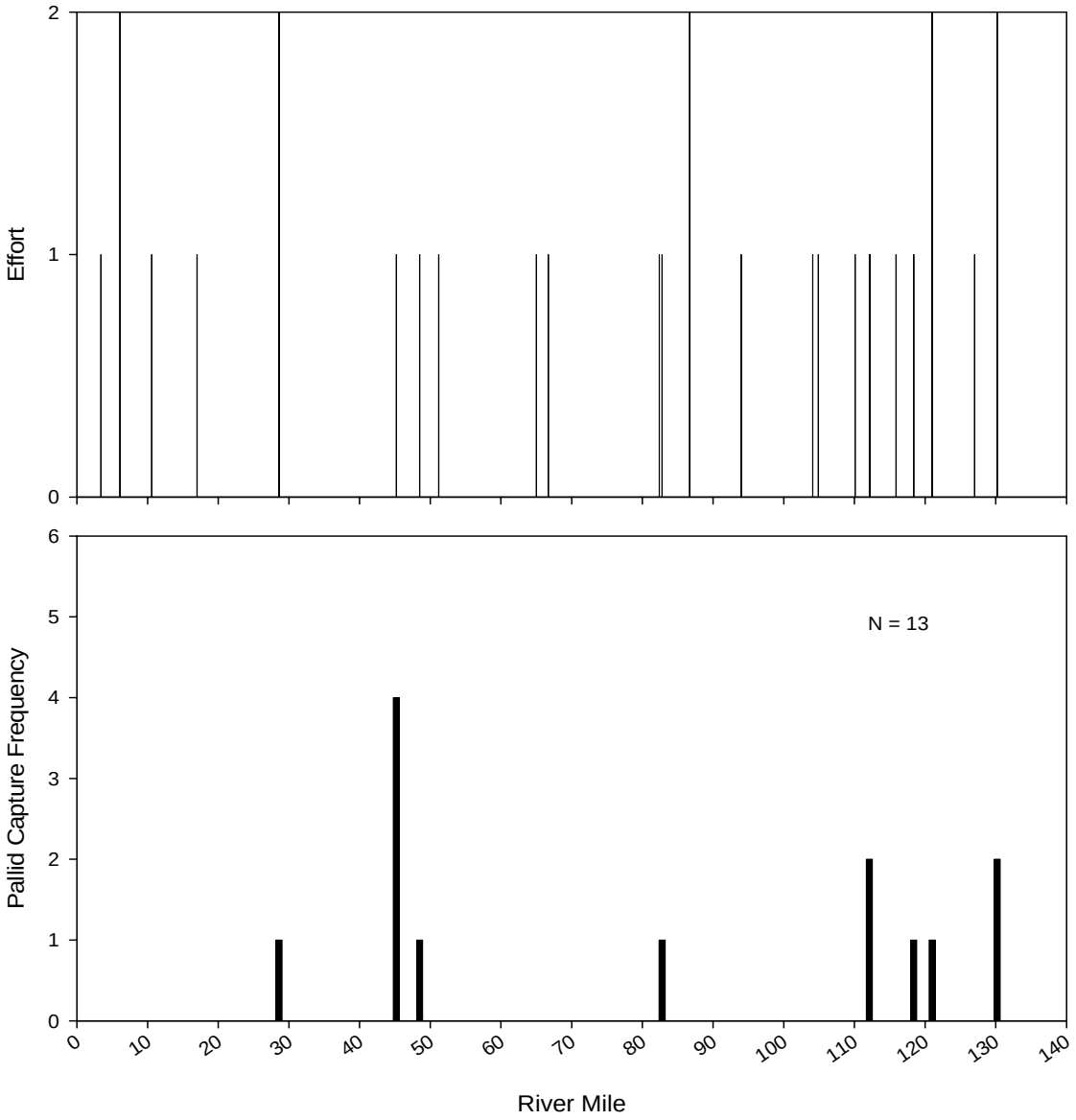

Figure 1b. Distribution of: A) seasonal sampling effort and B) pallid sturgeon captures by river mile for segment 14 in randomly selected bends of the Missouri River during 2004-2005. Sampling effort of 2 indicates bend sampled in both sturgeon and fish community seasons. Sampling effort of 1 indicates bend sampled in only one season. Black bars represent pallid captures during sturgeon season and white bars during fish community season.

Table 3. Pallid sturgeon (PDSG) capture summaries relative to habitat type and environmental variables on the Missouri River for Segment 14 during 2004-2005. Means and two standard errors (in parentheses) are presented. Habitat definitions and codes presented in Appendix B.

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Velocity (m/s) (Effort)	Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
BRAD	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E
CHXO	BAR	0.6 (0.3-1.2)	-	0.13 (0.00-0.26)	-	25.6 (19.5-30.0)	-	48 (41-78)	-	-
	POOL	7.3 (3.0-15.0)	-	0.10 (0.00-0.65)	-	4.2 (2.0-9.0)	-	38 (23-148)	-	-
	CHNB	3.2 (0.4-10.2)	2.7 (2.7-2.7)	0.41 (0.05-1.40)	0.63 (0.63-0.63)	21.0 (3.0-31.3)	7.0 (7.0-7.0)	94 (26-768)	26 (26-26)	1
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
CONF	BAR	-	-	-	-	-	-	-	-	-
	POOL	4.0 (3.6-4.2)	-	0.61 (0.61-0.61)	-	4.0 (4.0-4.0)	-	52 (52-52)	-	-
	CHNB	4.5 (1.4-8.0)	-	0.63 (0.36-0.88)	-	20.7 (4.0-29.0)	-	45 (1-154)	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
DEND	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E
DRNG	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E	N-E
ISB	BAR	0.5 (0.2-1.2)	-	0.09 (0.02-0.24)	-	26.7 (19.5-32.0)	-	55 (27-130)	-	-
	POOL	7.1 (3.0-10.4)	-	0.30 (0.00-0.63)	-	6.8 (1.0-11.0)	-	49 (23-150)	-	-
	CHNB	2.8 (0.5-8.1)	3.8 (3.0-5.5)	0.52 (0.18-1.03)	0.54 (0.20-0.68)	22.5 (1.0-31.3)	12.9 (5.0-23.8)	104 (23-353)	118 (36-303)	9
	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
OSB	BAR	0.5 (0.3-0.8)	-	0.05 (0.00-0.13)	-	24.6 (19.5-31.0)	-	68 (29-134)	-	-
	POOL	6.8 (3.0-11.0)	-	0.18 (0.00-1.30)	-	4.3 (1.0-9.0)	-	29 (16-60)	-	-
	CHNB	4.6 (1.4-9.5)	5.0 (5.0-5.0)	0.27 (0.08-0.43)	0.08 (0.08-0.08)	13.6 (1.0-29.5)	8.0 (8.0-8.0)	65 (18-228)	18 ((18-18)	1
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
SCCL	BAR	0.4 (0.3-0.5)	-	0.16 (0.02-0.30)	-	22.2 (19.5-24.0)	-	165 (61-255)	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	3.1 (1.0-5.0)	-	0.49 (0.06-0.97)	-	22.0 (1.0-31.3)	-	113 (23-312)	-	-
	TLWG	1.7 (1.7-1.7)	-	-	-	21.1 (21.1-21.1)	-	-	-	-
	ITIP	3.8 (0.6-6.5)	-	0.31 (0.12-0.82)	-	18.5 (1.0-31.3)	-	93 (23-312)	-	-
SCCS	BAR	0.5 (0.3-0.8)	-	0.12 (0.03-0.36)	-	28.4 (19.5-34.0)	-	40 (29-89)	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	3.3 (3.3-3.3)	-	-	-	21.1 (21.1-21.1)	-	-	-	-
	ITIP	2.4 (1.2-4.9)	-	0.17 (0.09-0.71)	-	18.0 (3.0-29.5)	-	66 (24-115)	-	-
SCCN	BAR	0.4 (0.3-1.1)	-	0.05 (0.02-0.05)	-	29.5 (24.0-30.5)	-	39 (29-130)	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-

Table 3 (continued).

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Velocity (m/s) (Effort)	Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
TRIB	BAR	0.6 (0.3-1.0)	-	0.05 (0.01-0.17)	-	19.5 (18.0-23.8)	-	13 (11-16)	-	-
	POOL	2.8 (1.2-7.8)	-	0.15 (0.13-0.32)	-	19.6 (18.0-26.5)	-	26 (10-74)	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
TRML	BAR	-	-	-	-	-	-	-	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	7.3 (7.0-7.5)	-	-	-	28.2 (28.2-28.2)	-	1 (1-1)	-	-
	TLWG	4.0 (3.0-4.2)	-	0.10 (0.10-0.10)	-	11.0 (11.0-11.0)	-	326 (31-1536)	-	-
	ITIP	-	-	-	-	-	-	-	-	-
TRMS	BAR	0.5 (0.5-0.5)	-	0.00 (0.00-0.00)	-	24.5 (24.5-24.5)	-	34 (34-34)	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-
WILD	BAR	-	-	-	-	-	-	-	-	-
	POOL	-	-	-	-	-	-	-	-	-
	CHNB	-	-	-	-	-	-	-	-	-
	TLWG	-	-	-	-	-	-	-	-	-
	ITIP	-	-	-	-	-	-	-	-	-

Table 4. Individual pallid sturgeon fork length (mm), weights (g), morphometric character index (CI) (Sheehan et al. 1999), status (H = Hatchery, W = Wild), tags found, elastomer tags (color, position, orientation), if tags were inserted in field, stocking locations, and hatchery information for segment 14 of the Missouri River during 2004-2005. (* not enough information to calculate CI.). Includes non-random samples and wild gear types.

ID	Recapture Data							Stocking Data				
	FL (mm)	Wt (g)	CI	Status	Tags found[a]	Elastomer[b]	Marked in field?	Year class	FL (mm)	Wt (g)	Site	Source[c]
CF-1-14-1886-1	834	2250	-1.502	W			Yes					
CF-1-14-1926-4	571	-	*	H	C		Yes	1997				
CF-1-14-1949-1	370	-	*	H	E,P	Red-R; Yellow-L	No	2002	264	63	Boonville	NEO
CF-1-14-1977-31	713	1390	-0.643	W			Yes					
CF-1-14-1983-36	795	1810	-1.537	H	E	Red-L; Red-R	No	1997				GAV
CF-1-14-2007-13	642	965	-1.431	W	S		Yes					
CF-1-14-2009-4	769	1650	-1.592	H	C		Yes	1997				
CF-1-14-2050-1	405	235	*	H	P		No	2002	311		Boonville	GAR
CF-1-14-2056-4	796	1960	*	H	C		Yes	1997				
CF-1-14-2059-1	934	3090	*	H	C		Yes	1992				
CF-1-14-2071-1	728	1440	*	H	C		Yes	1997				
CF-1-14-2149-24	270	65	*	H	E	Yellow-L-H	Yes	2003	160			GAR
CF-1-14-2313-8	793	1805	-0.753	W			Yes					

[a] Tag types include: coded wire tag (C), elastomer tag (E) and passive induced 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.

Table 5. Pallid sturgeon (PDSG) and hybrid pallid X shovelnose sturgeon (SNPD) capture locations and habitat characteristics for segment 14 of the Missouri River during 2004-05. ID number links pallid sturgeon habitat information with individual fish length, weight, and tagging data in Table 4. Gear codes presented in Appendix C. Habitat definitions and codes presented in Appendix B. Includes non-random samples and wild gear types.

Species	ID#	Date	Gear	River mile	Habitat			Water Temp (°C)	Turb[a] (NTU)	Depth[b] (m)	Bottom velocity (m/s)	Substrate[c] (silt/sand/ gravel)
					Macro-	Meso-	Micro-					
PDSG	CF-1-14-1886-1	12/7/2004	GN18S	118.6	ISB	CHNB	230300	6.0	150	5.5	0.48	0 / 85 / 15
PDSG	CF-1-14-1926-4	12/15/2004	GN81S	27.4	ISB	CHNB	411230	5.0	40	3.8	0.20	70 / 30 / 0
PDSG	CF-1-14-1949-1	12/16/2004	TN2W	116.0	ISB	CHNB	200230	3.0	28	4.2	-	0 / 90 / 10
PDSG	CF-1-14-1983-36	3/16/2005	GN81S	128.6	OSB	CHNB	110300	8.0	18	5.0	0.08	-
PDSG	CF-1-14-1977-1	3/16/2005	TN2DW	130.2	CONF	CHNB	-	8.0	-	5.6	-	-
PDSG	CF-1-14-2050-1	3/24/2005	GN18S	111.7	CHXO	CHNB	110300	7.0	26	2.7	0.63	0 / 20 / 80
PDSG	CF-1-14-2071-1	3/27/2005	GN81S	44.0	ISB	CHNB	600240	9.0	44	3.7	0.62	0 / 80 / 20
PDSG	CF-1-14-2059-1	3/27/2005	TN25S	44.0	ISB	CHNB	600240	9.0	36	3.4	0.60	0 / 80 / 20
PDSG	CF-1-14-2056-4	3/27/2005	TN25S	44.6	ISB	CHNB	600230	9.0	36	3.0	0.62	0 / 100 / 0
PDSG	CF-1-14-2007-1	5/3/2005	GN4W	45.2	CHXO	POOL	213150	15.0	243	3.8	0.6	0 / 25 / 75
PDSG	CF-1-14-2009-4	5/4/2005	TN25S	43.9	ISB	CHNB	621254	15.0	254	4.0	0.68	0 / 90 / 10
PDSG	CF-1-14-2149-24	5/13/2005	TNS	110.8	ISB	CHNB	430264	21.0	303	3.7	-	5 / 95 / 0
PDSG	CF-1-14-2313-8	6/2/2005	TN25S	82.6	ISB	CHNB	621290	23.8	96	4.0	-	0 / 90 / 10
SNPD	CF-1-14-2739-24	10/13/2005	OT16S	110.9	ISB	CHNB	420220	18.5	102	3.1	0.58	0 / 90 / 10

Table 5 (continued).

Species	ID#	Date	Gear	River mile	Habitat			Water Temp (°C)	Turb[a] (NTU)	Depth[b] (m)	Bottom velocity (m/s)	Substrate[c] (silt/sand/ gravel)
					Macro-	Meso-	Micro-					
SNPD	CF-1-14-1892-12	12/7/2004	GN18S	120.5	CHXO	CHNB	230300	6.0	140	4.2	0.53	100 / 0 / 0
SNPD	CF-1-14-1909-9	12/13/2004	GN81S	3.0	OSB	POOL	133120	3.0	-	7.0	0.04	90 / 10 / 0
SNPD	CF-1-14-1933-28	12/16/2004	GN18S	118.3	CHXO	POOL	112110	3.0	28	15.0	-	-
SNPD	CF-1-14-1932-30	12/16/2004	GN81S	118.4	CHXO	POOL	110300	3.0	28	5.3	-	-
SNPD	CF-1-14-1980-32	3/16/2005	GN18S	128.7	ISB	POOL	200100	9.0	42	10.0	0.62	-
SNPD	CF-1-14-1983-25	3/16/2005	GN81S	128.6	OSB	CHNB	110300	8.0	18	5.0	0.08	-
SNPD	CF-1-14-2031-37	3/23/2005	GN81S	45.0	ISB	POOL	213120	8.0	35	8.6	0.09	95 / 5 / 0
SNPD	CF-1-14-2072-9	3/27/2005	GN18S	43.8	ISB	POOL	200100	9.0	-	6.4	-	0 / 80 / 20
SNPD	CF-1-14-2135-1	6/28/2005	TN25S	27.3	ISB	CHNB	210230	27.2	137	5.2	0.59	0 / 100 / 0
SNPD	CF-1-14-2416-25	8/18/2005	OT16S	65.4	ISB	CHNB	230310	27.0	82	4.2	0.38	0 / 90 / 10
SNPD	CF-1-14-2718-5	10/12/2005	OT16S	109.9	ISB	CHNB	221250	18.0	-	2.2	-	-
SNPD	CF-1-14-2733-88	10/13/2005	OT16S	120.5	CHXO	CHNB	222330	19.5	82	2.7	0.58	0 / 100 / 0

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

Table 6. Mean fork length, weight, relative condition factor (Kn), and growth rates of hatchery-reared pallid sturgeon by year class at the time of stocking and recapture during 2005 from segment 14 of the Missouri River. Relative condition factor was calculated using the equation in Keenlyne and Evanson (1993). Standard error (+/- 2SE) was calculated where N>1 and is represented on second line of each year.

Year class	N	Stocking Data			Recapture Data			Growth Data	
		Length (mm)	Weight (g)	Kn	Length (mm)	Weight (g)	Kn	Length (mm/d)	Weight (g/d)
1992	1	-	-	-	934	3090.0	0.788	-	-
		-	-	-	-	-	-	-	-
1997	5	-	-	-	731	1715.0	0.830	-	-
		-	-	-	84	222.8	0.028	-	-
2002	1	311	-	-	405	235.0	0.990	0.152	-
		-	-	-	-	-	-	-	-
2003	1	160	-	-	270	65.0	1.069	0.356	-
		-	-	-	-	-	-	-	-

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

Length Category	Wild[c]		Stocked	
	N	RSD	N	RSD
Sturgeon Season				
Sub-stock (0-199)	0		0	
Sub-stock (200-329)	0		1	
Stock	2		7	
Quality	2	100	5	71
Preferred	0	0	1	14
Memorable	0	0	0	0
Trophy	0	0	0	0
Fish Community Season				
Sub-stock (0-199)	0		0	
Sub-stock (200-329)	0		0	
Stock	0		0	
Quality	0	0	0	
Preferred	0	0	0	
Memorable	0	0	0	
Trophy	0	0	0	

[a] RSD = number of fish of a specified length ÷ number minimum stock length fish x 100.
[b] Length categories based on the percentage of the largest known pallid sturgeon: Sub-stock FL < 330 mm (20 %), Stock FL =330 - 629 mm (20 – 36 %), Quality FL = 630 – 839 mm (36 – 45 %), Preferred FL = 840 – 1039 mm (45 – 59 %), Memorable FL = 1040 – 1269 mm (59 – 74 %), Trophy FL > 1270 mm (>74 %).
[c] All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

Table 8. Ratios of wild pallid sturgeon to shovelnose sturgeon, wild pallid sturgeon to hybrid sturgeon (pallid X shovelnose), and stocked pallid sturgeon to wild pallid sturgeon captured in segment 14 of the Missouri River during 2003-2005 including non-random and wild samples.

Year	All Pallids : Shovelnose	Wild* Pallids: Shovelnose	Wild* Pallids: Hybrids	Stocked Pallids: Wild* Pallids
2003	1 : 278	1 : 416	1 : 1.5	1 : 2
2004	1 : 341	1 : 854	1 : 4.5	1.5 : 1
2005	1 : 223.5	1 : 819.3	1 : 4	2.7 : 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

In 2005, there was an increase in effort in segment 14 relative to 2004, that included the addition of 2.5 inch trammel nets in 2005, an additional four bends during the sturgeon season, and 2 additional bends during the fish community season essentially doubling the amount of effort expended in segment 14. During the 2005 sturgeon season, gillnets were by far the most effective gear at capturing both stocked and wild pallids in segment 14 (mean overall CPUE = 0.018; ±2SE = 0.016) followed by 2.5 inch trammel nets (mean overall CPUE = 0.011; ±2SE = 0.011), 1 inch trammel nets (mean overall CPUE = 0.002; ±2SE = 0.004), and otter trawls (mean overall CPUE = 0.001; ±2SE = 0.003); capturing 46%, 36%, 10% and 10% of the pallids respectively (Figures 2-5; Appendix F). There was a noticeable increase in the number of stocked pallids captured in gillnets from 2004 to 2005 and a decrease in the overall number of pallids captured in otter trawls since 2004 (Figure 2). Pallid captures in 1 inch trammel nets have also appeared to decrease since 2003 for the sturgeon season (Figure 3). Three juvenile pallids were captured during the sturgeon season in segment 14, one of which was captured in CHXO CHNB habitat though only 26% of the effort was expended in CHXO Macrohabitat (Table 11). The majority of effort (> 58%) expended in segment 14 was in CHNB Mesohabitat and the CPUE for all gear types was higher in this habitat than in all others (Appendix E). No pallid sturgeon were captured during the 2005 fish community season in segment 14.

One hatchery origin pallid (ID = CF-1-14-1983-36) contained an encrypted PIT tag that was unreadable with our equipment, however, because of the elastomer markings this fish could be positively traced back to Gavins Point Dam National Fish Hatchery as being a 1997 year class fish that was part of an experimental stocking either in the Platte River or above Gavins Point Dam (Herb Bollig personal communication). The significance of this is the pallid traveled hundreds of miles downstream and was positively identified by the elastomer markings eight years after implantation without the use of a blacklight. This illustrates the importance of unique secondary elastomer markings, in addition to primary markings (e.g. PIT tag), for proper documentation of recaptures in the future.

Since 2003, there has been an increase in the number of pallid sturgeon captured in segment 14, in particular, there was considerable increase in the capture of hatchery origin pallid sturgeon (2003 = 1; 2004 = 2; 2005 = 9; Figure 9). Though much of this can be explained by the increase of overall effort and sampling efficiency, this may also be attributable to the positive influence of stocking efforts. Figure 10 shows the cumulative length frequency history of pallids in segment 14 but, for this report, only includes 2005 data so it is identical to Figure 8.

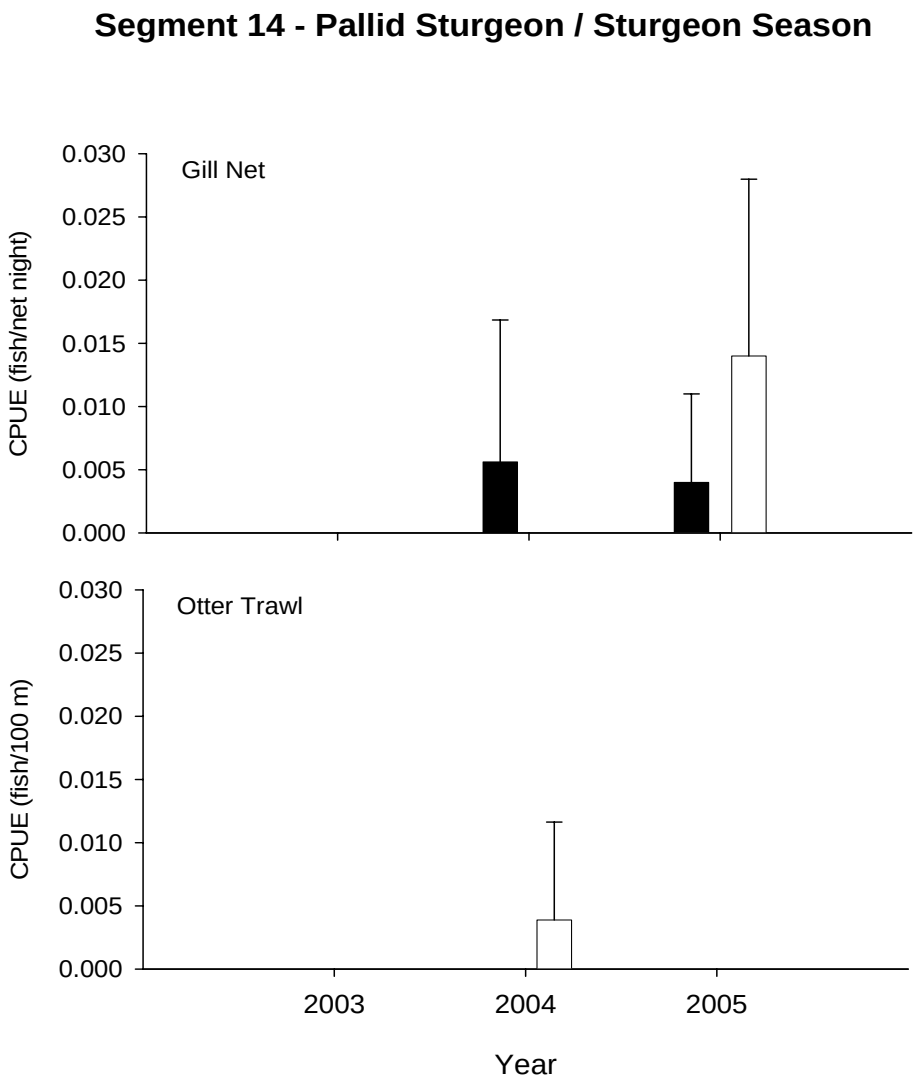

Figure 2. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segment 14 of the Missouri River during sturgeon season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

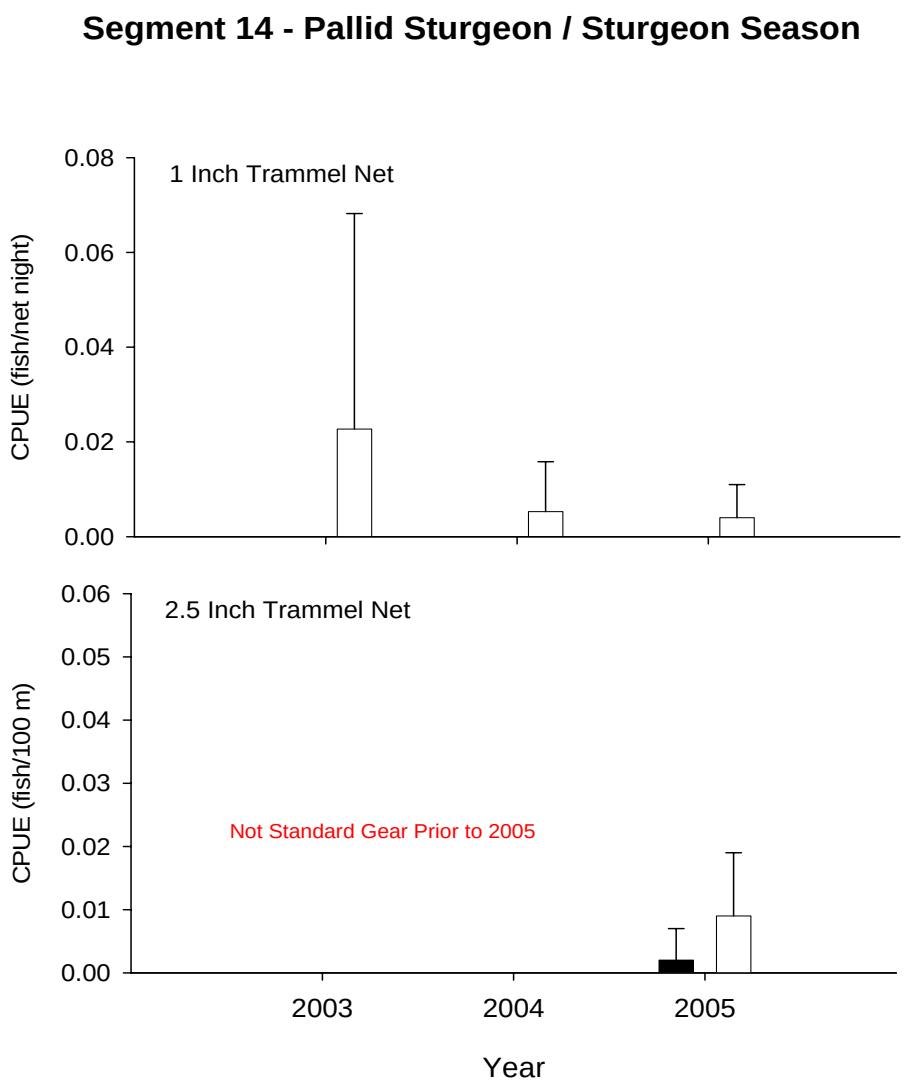

Figure 3. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segment 14 of the Missouri River during sturgeon season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

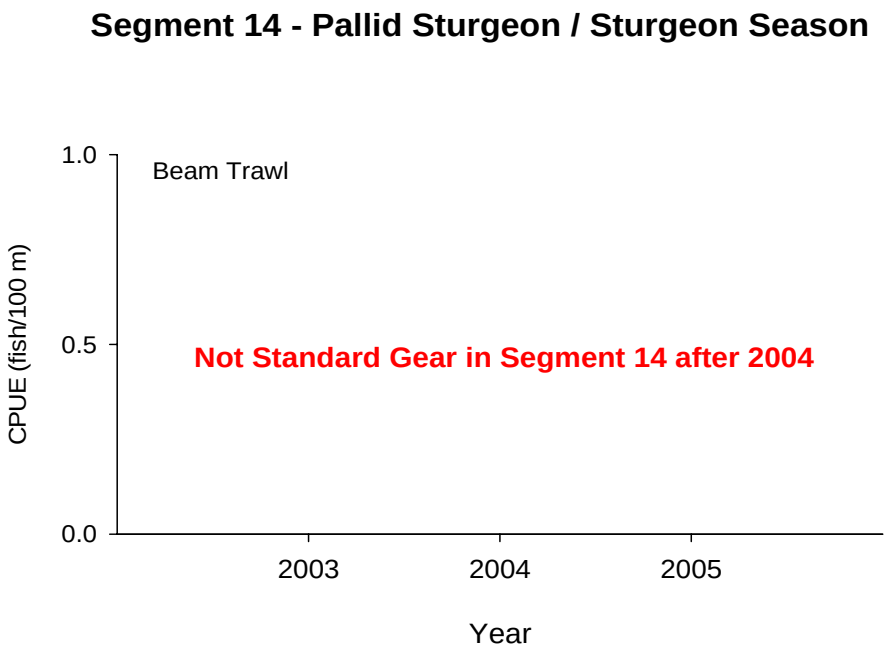

Figure 4. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segment 14 of the Missouri River during sturgeon season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

Segment 14 - Pallid Sturgeon / Fish Community Season

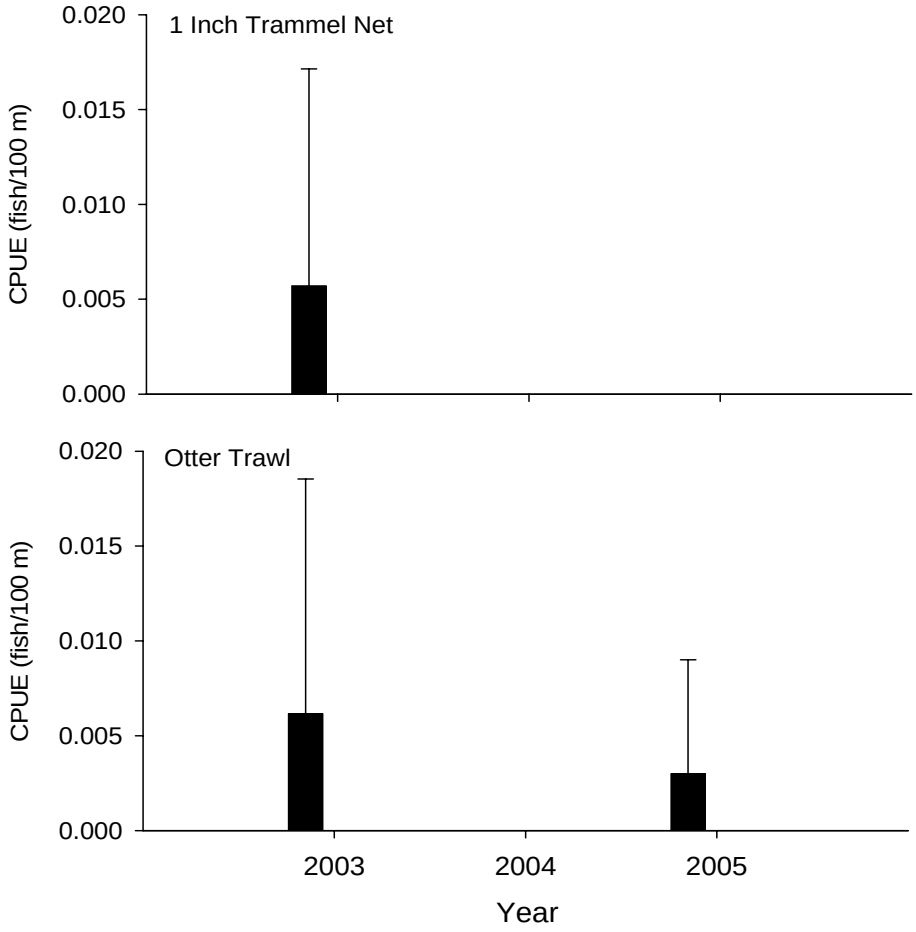

Figure 5. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segment 14 of the Missouri River during fish community season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

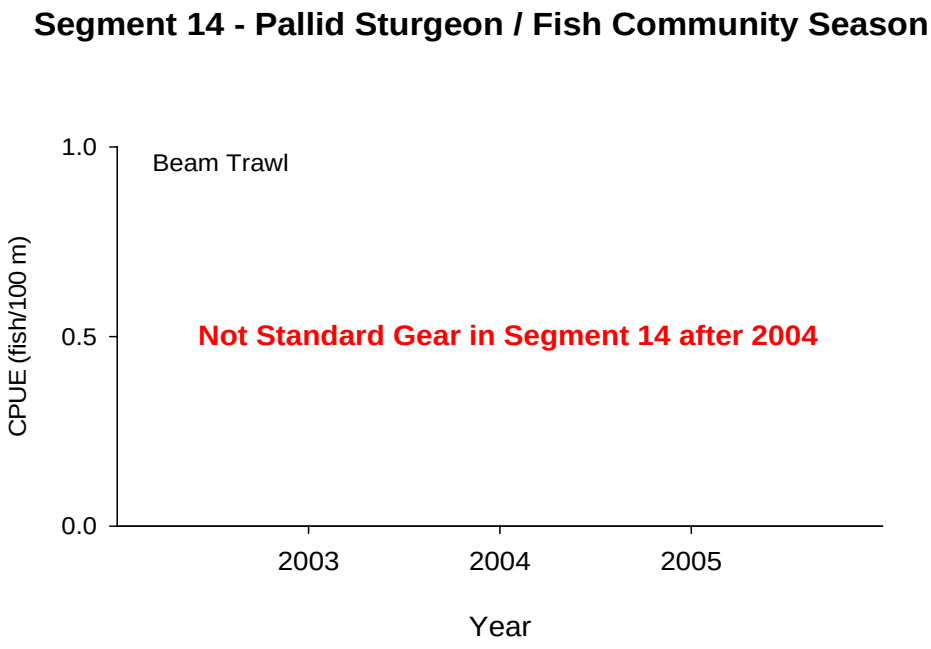

Figure 6. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segment 14 of the Missouri River during fish community season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

Segment 14 - Pallid Sturgeon / Fish Community Season

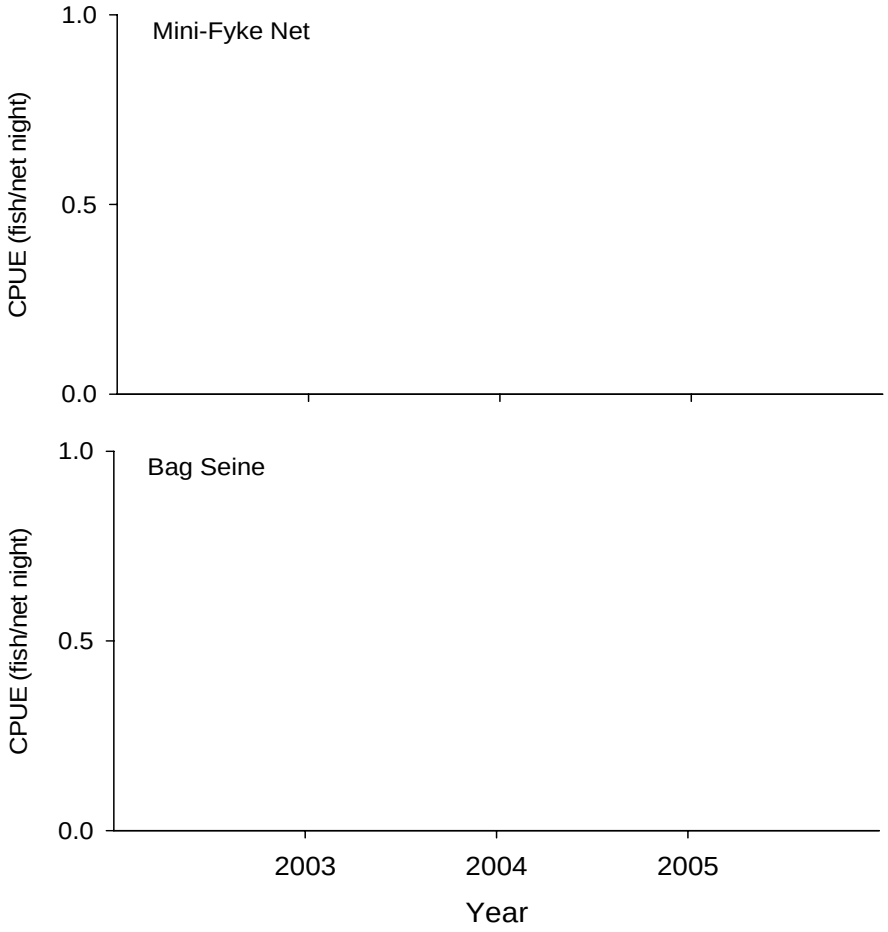

Figure 7. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segment 14 of the Missouri River during fish community season 2003-2005. All pallids that were captured with no evidence of previously being tagged were deemed wild pending genetic 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 type (first line of gear type) in segment 14 of the Missouri River during 2004-05 The percent of total effort for each gear in each habitat presented is on the second line for each gear type. The N-E indicates the habitat is non-existent in the segment. Beam trawl is not standard gear in segment 14.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	5	N-E	N-E	60	0	5	3	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	15	4	N-E	N-E	74	1	2	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	22	4	N-E	N-E	37	27	5	5	0	0	1	0	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	22	7	N-E	N-E	47	6	9	4	0	3	2	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	19	0	N-E	N-E	66	1	5	3	0	6	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	8	0	N-E	N-E	34	4	9	13	4	28	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	31	13	4	14	4	17	0	1	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	18	0	N-E	N-E	56	1	3	4	0	17	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 10. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. Size categories described in Table 7. The N-E indicates the habitat is non-existent in the segment. If the numbers on the second line do not add to 100 then some mesohabitats were not recorded in the table. The beam trawl is not standard gear in segment 14.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	93	N-E	4	0	2
2.5 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	48	N-E	7	44	1
Otter Trawl	0	0	0	N-E	0	0	0
		0	93	N-E	7	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		99	1	N-E	0	0	0
Otter Trawl	0	0	0	N-E	0	0	0
		0	95	N-E	5	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

Table 11. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 14.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	26	5	N-E	N-E	60	0	5	3	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	15	4	N-E	N-E	74	1	2	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	22	4	N-E	N-E	37	27	5	5	0	0	1	0	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	22	7	N-E	N-E	47	6	9	4	0	3	2	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	19	0	N-E	N-E	66	1	5	3	0	6	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	8	0	N-E	N-E	34	4	9	13	4	28	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	31	13	4	14	4	17	0	1	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	18	0	N-E	N-E	56	1	3	4	0	17	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 12. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If the numbers on the second line do not add to 100 then some mesohabitats were not taken in the field. The beam trawl is not standard gear in segment 14.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	1	0	100	N-E	0	0	0
		0	93	N-E	4	0	2
2.5 Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	48	N-E	7	44	1
Otter Trawl	0	0	0	N-E	0	0	0
		0	93	N-E	7	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		99	1	N-E	0	0	0
Otter Trawl	0	0	0	N-E	0	0	0
		0	95	N-E	5	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

Table 13. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 14.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	5	N-E	N-E	60	0	5	3	0	0	0	0	0
2.5 Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	15	4	N-E	N-E	74	1	2	4	0	0	0	0	0
Gill Net	2	N-E	50	0	N-E	N-E	50	0	0	0	0	0	0	0	0
		N-E	22	4	N-E	N-E	37	27	5	5	0	0	1	0	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	22	7	N-E	N-E	47	6	9	4	0	3	2	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	19	0	N-E	N-E	66	1	5	3	0	6	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	8	0	N-E	N-E	34	4	9	13	4	28	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	31	13	4	14	4	17	0	1	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	18	0	N-E	N-E	56	1	3	4	0	17	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 14. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type (first line of the gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If the numbers on the second line do not add to 100 then some mesohabitats were not taken in the field. The Beam trawl is not standard gear in segment 14.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	93	N-E	4	0	2
2.5 Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Gill Net	2	0	100	N-E	0	0	0
		0	48	N-E	7	44	1
Otter Trawl	0	0	0	N-E	0	0	0
		0	93	N-E	7	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		99	1	N-E	0	0	0
Otter Trawl	0	0	0	N-E	0	0	0
		0	95	N-E	5	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

Table 15. Total number of quality and above size (>630 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2006. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 14.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	5	N-E	N-E	60	0	5	3	0	0	0	0	0
2.5 Trammel Net	4	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	15	4	N-E	N-E	74	1	2	4	0	0	0	0	0
Gill Net	3	N-E	0	0	N-E	N-E	67	33	0	0	0	0	0	0	0
		N-E	22	4	N-E	N-E	37	27	5	5	0	0	1	0	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	22	7	N-E	N-E	47	6	9	4	0	3	2	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	19	0	N-E	N-E	66	1	5	3	0	6	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	8	0	N-E	N-E	34	4	9	13	4	28	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	31	13	4	14	4	17	0	1	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	18	0	N-E	N-E	56	1	3	4	0	17	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 16. Total number of quality and above size (>630 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If the numbers on the second line do not add to 100 then some mesohabitats were not taken in the field. The beam trawl is not standard gear in segment 14.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	93	N-E	4	0	2
2.5 Trammel Net	4	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Gill Net	3	0	100	N-E	0	0	0
		0	48	N-E	7	44	1
Otter Trawl	0	0	0	N-E	0	0	0
		0	93	N-E	7	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		99	1	N-E	0	0	0
Otter Trawl	0	0	0	N-E	0	0	0
		0	95	N-E	5	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

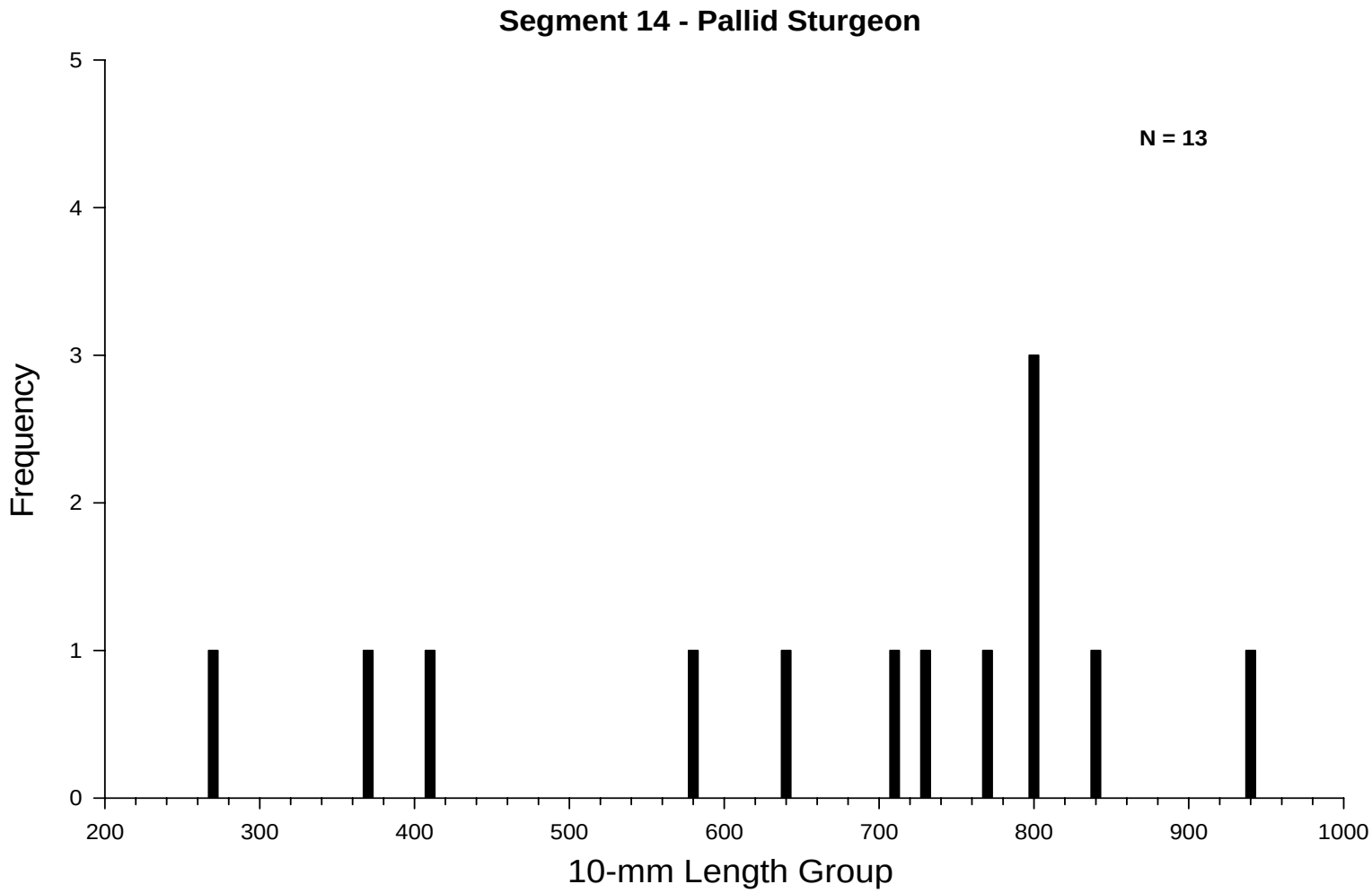

Figure 8. Length frequency of pallid sturgeon during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during 2004 - 2005.

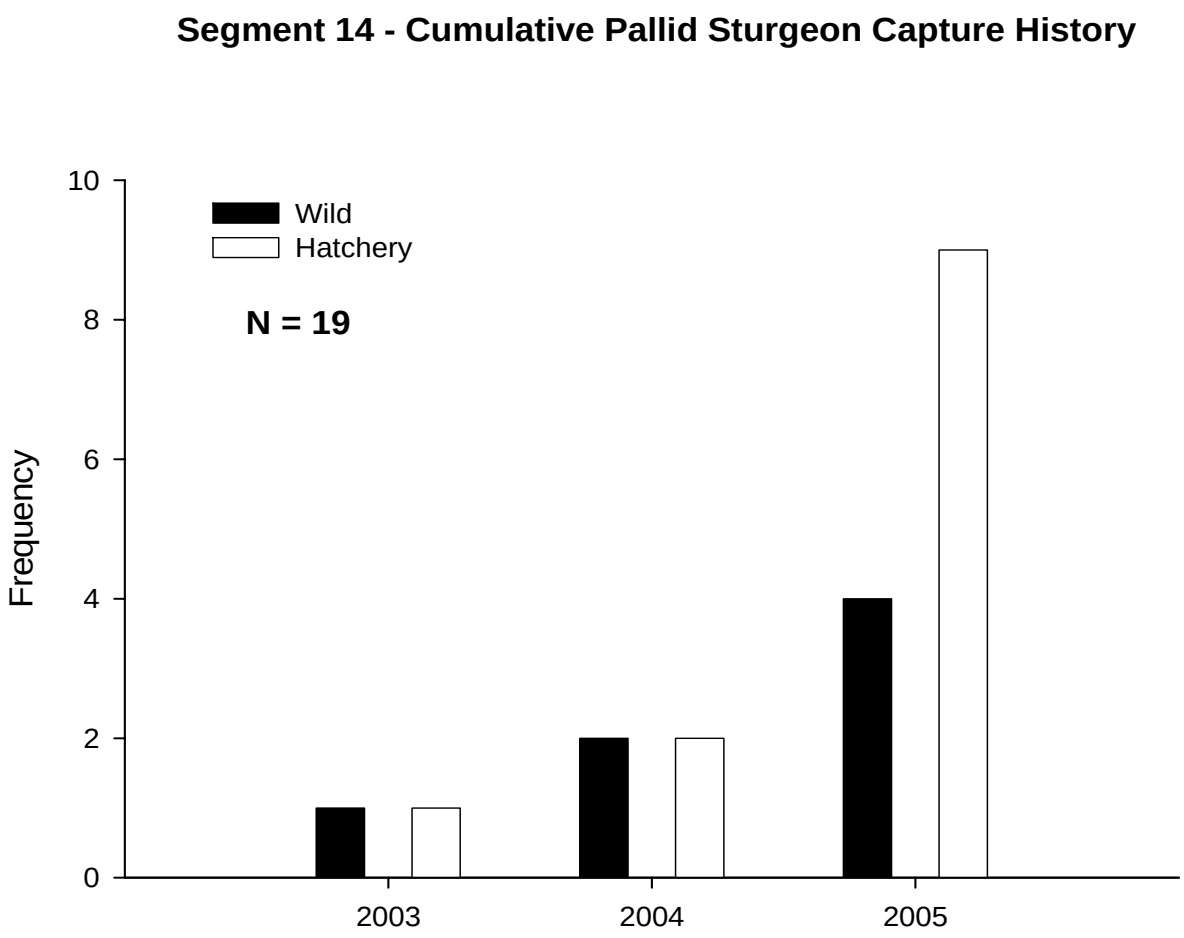

Figure 9. Cumulative capture history of wild (black bars) and hatchery reared (white bars) pallid sturgeon collected in segment 14 of the Missouri River from 1995 to 2005.

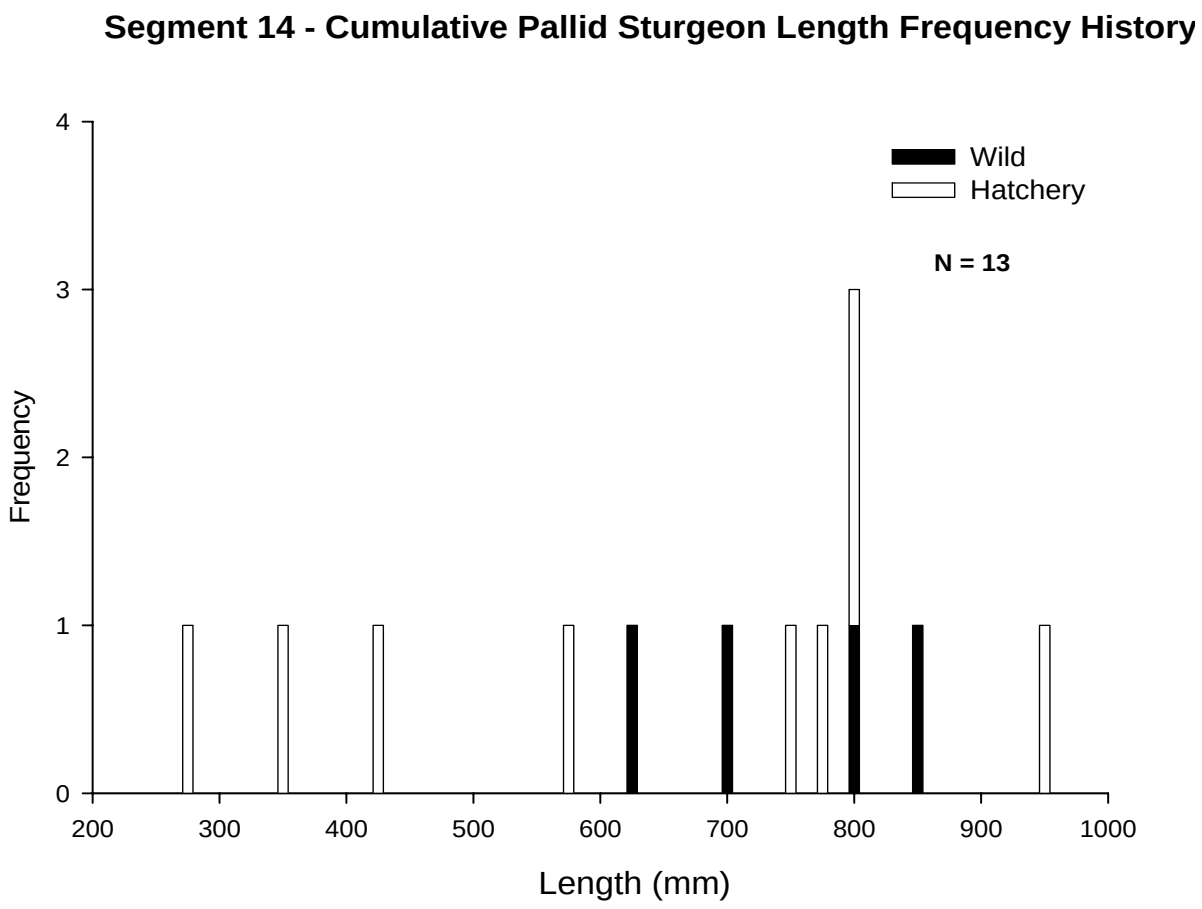

Figure 10. Cumulative pallid sturgeon length frequency histogram for segment 14 comparing wild (black bars) and hatchery reared (white bars) pallid sturgeon captures in 2005.

Shovelnose X Pallid Sturgeon Hybrids

Thirteen hybrid sturgeon were captured in segment 14 during the 2005 sample season. As in previous years, hybrid sturgeon were captured in POOL mesohabitat (50% of the catch) more often than pallid sturgeon and were captured more than the total effort expended in POOL mesohabitat (44%; Tables 5-6 and 10; Doyle et al. 2005). Hybrid sturgeon were also captured in ISB macrohabitat (50 % of the catch). Compared to pallid sturgeon, hybrid sturgeon were captured in deeper water (mean depth = 6.3m vs. 3.8m) and slightly lower water velocities (mean velocity = 0.36 m/s vs. 0.50 m/s). Similar to pallids, hybrid sturgeon were captured in predominantly sand substrates.

Targeted Native River Species

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

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

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

Shovelnose Sturgeon

Year and gear comparisons

The number of shovelnose sturgeon captured in segment 14 increased slightly from 2004 (N = 2,448 vs. 1,703; Doyle et al. 2005). Increases in effort and sampling efficiency may have attributed to the increase in total fish captured. However, 1 inch trammel nets and experimental gillnet CPUE remained fairly constant from 2004 with otter trawl CPUE increasing from 0.45 in 2004 to 0.9 in 2005. Gillnets were not used in 2003 in Segment 14, but were the most effective gear in 2004 and 2005, capturing approximately 4 fish per 100ft. of net.

A similar number of YOY shovelnose sturgeon were captured during the sturgeon season (N=22) as were captured during the fish community season (N=20; Table 17). Otter trawls were the most effective at capturing YOY shovelnose sturgeon during both seasons. The highest catch rate for otter trawls was in CHXO CHNB habitat (CPUE = 1.5; ±2SE = 0.94) followed by SCCL CHNB habitat (CPUE = 1.03; ±2SE = 1.137; Appendix F4). Channel crossovers and secondary channels were underrepresented habitats in segment 14 suggesting that a stratified effort within these could increase the number of YOY shovelnose sturgeon captured each year. The majority of YOY shovelnose sturgeon were found in CHNB Mesohabitat (88% of the catch relative to 65% of the total effort) despite efforts being expended in POOL (5% of the total effort) and BARS Mesohabitat (25% of the total effort; Table 18). The lack of small sturgeon captured suggests few fish were in the system, more fish should have been available in the community season versus the sturgeon season and this was not the case. More trawling effort in CHNB

Mesohabitat within side channels and crossover Macrohabitats would likely produce more YOY sturgeon. The vast majority of shovelnose sturgeon greater than 250 mm were captured during the sturgeon season with gillnets (77% of the total catch; N = 1,886; Tables 17-24) and channel crossover habitats were the best habitat. Gillnets were the most effective at capturing shovelnose sturgeon greater than 380 mm with the highest catch rate in CHXO POOL habitat (CPUE = 8.75; ±2SE = 3.83) followed by CHXO CHNB habitat (CPUE = 5.89; ±2SE = 1.92; Appendix F1). During sturgeon season, gillnet (mean CPUE = 4.38 in 2005 versus 4.5 in 2004) and otter trawl CPUE (mean CPUE = 1.14 in 2005 versus 0.5 in 2004) did not change much from 2004 (Figure 44). One inch trammel net CPUE has slightly declined over the past three years for adult shovelnose sturgeon greater than 380 mm (2003 = 2.5; 2004 = 1.6; 2005 = 1.3; Figure 12). Two and a half inch trammel nets are a new standard gear with an average CPUE during sturgeon season of 0.46 shovelnose sturgeon per 100 m drifted. For fish community season, 1 inch trammel net and otter trawl CPUE has remained fairly constant over the past three years with CPUE for adult shovelnose sturgeon (> 380 mm) near 1 for each gear type (mean 1 inch trammel net CPUE = 1.3; mean otter trawl CPUE = 0.8; Figure 14). To date, no shovelnose sturgeon have been captured in mini-fyke nets (Figure 15).

There was a greater proportion of larger fish captured during the sturgeon season (RSD-P = 84 and RSD-M = 18) than in the fish community season (RSD-P = 67 and RSD-M = 11; Table 25). Reasons for this disparity may be that spawning shovelnose were more available in the sturgeon season, or that trawls and trammel nets are not as effective at sampling the larger size classes compared to gillnets that represented the trophy size. Only 90 fish were captured in the sub-stock range in both seasons and no fish were captured in the trophy range. The size distribution of shovelnose sturgeon in segment 14 is typical of long-lived species and depicts minor contribution of smaller fish to the population (Figure 17). According to Pflieger (1997), shovelnose sturgeon reach 210 mm in their first year and 315 mm, 409 mm, 485 mm, 541 mm, and 600 mm in each of the subsequent years. In 2005, more YOY shovelnose sturgeon were captured during sturgeon season than in 2004 (Doyle et al. 2005; Figure 17). This may be an artifact of increased sampling effort in segment 14 since CPUE for YOY shovelnose sturgeon in otter trawls remained fairly constant since 2004 (CPUE = 0.1 versus 0.09; Figures 11 and 14). Young-of-year shovelnose sturgeon catch with otter trawls during fish community season has increased over the past three years (CPUE in 2003 = 0.0, 2004 = 0.03, 2005 = 0.07; Figure 14).

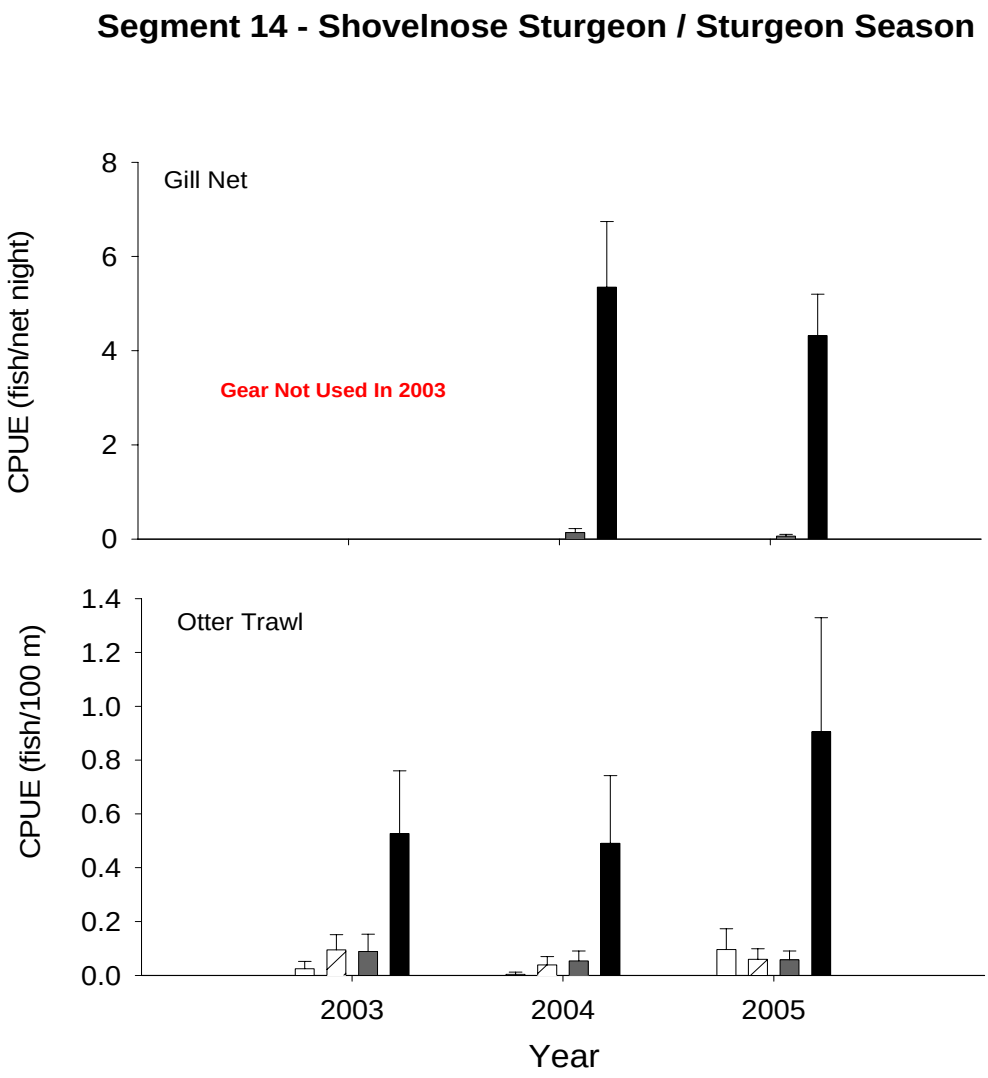

Figure 11. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segment 14 of the Missouri River during sturgeon season 2003 - 2005.

Segment 14 - Shovelnose Sturgeon / Sturgeon Season

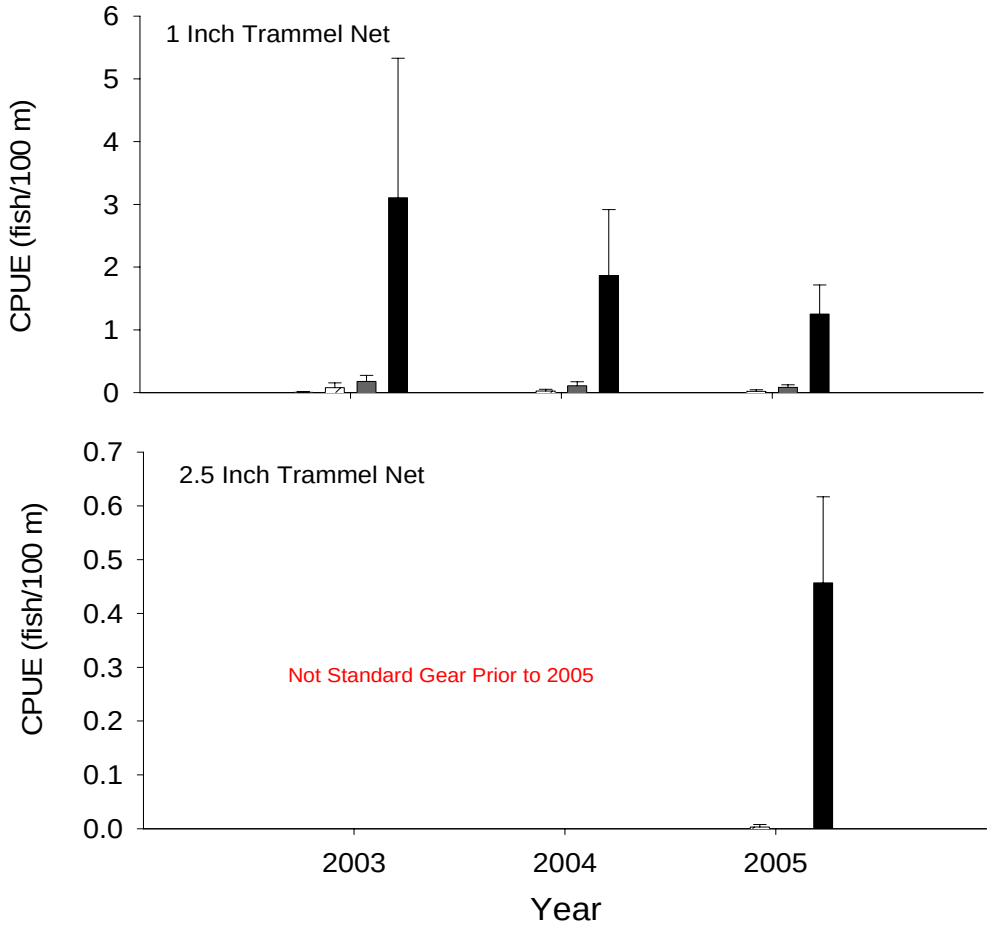

Figure 12. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segment 14 of the Missouri River during sturgeon season 2003 - 2005.

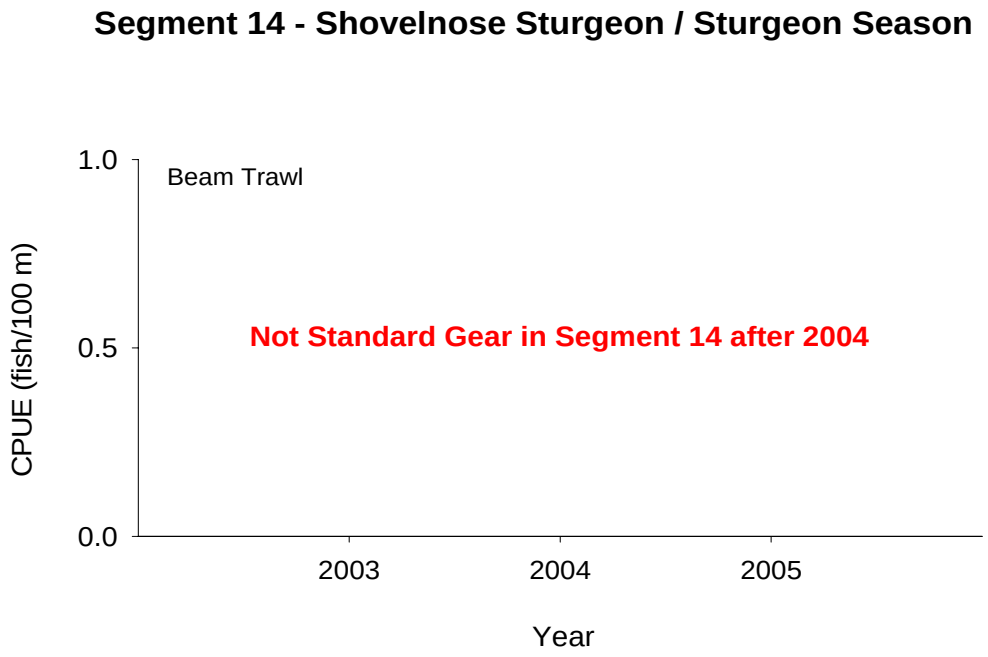

Figure 13. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segment 14 of the Missouri River during sturgeon season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

Segment 14 - Shovelnose Sturgeon / Fish Community Season

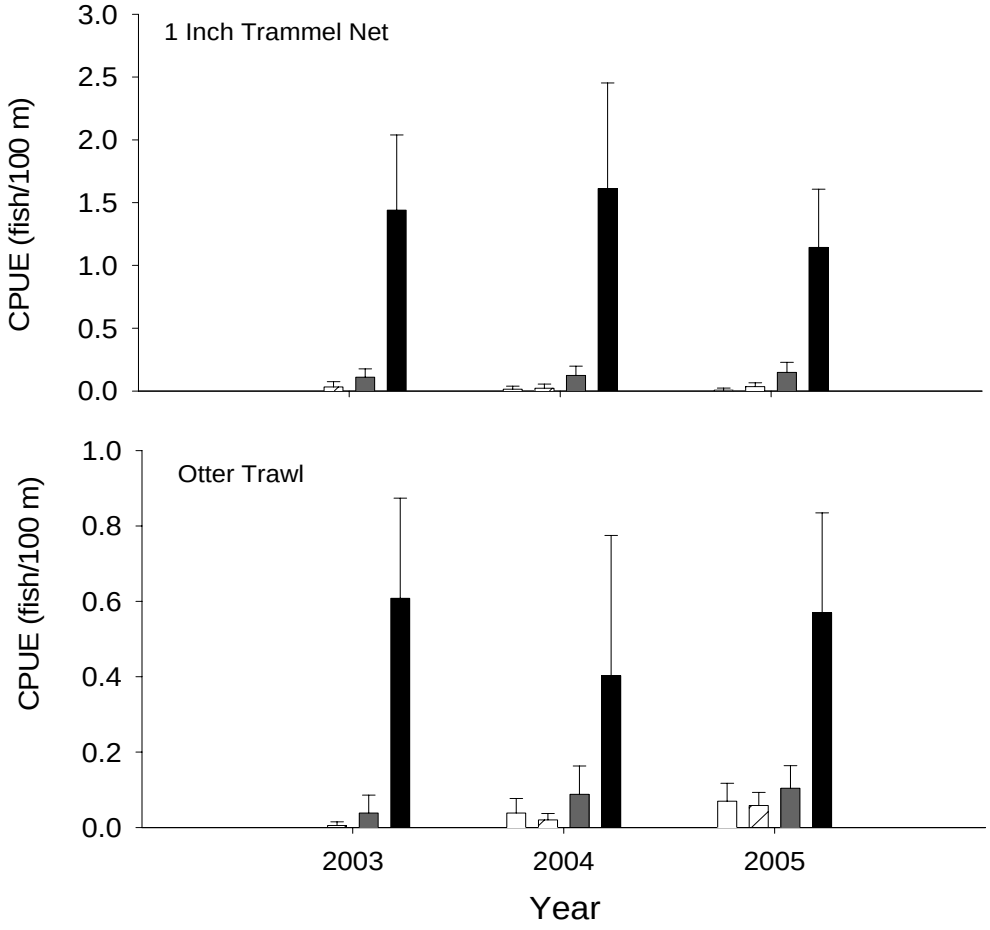

Figure 14. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segment 14 of the Missouri River during fish community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

Segment 14 - Shovelnose Sturgeon / Fish Community Season

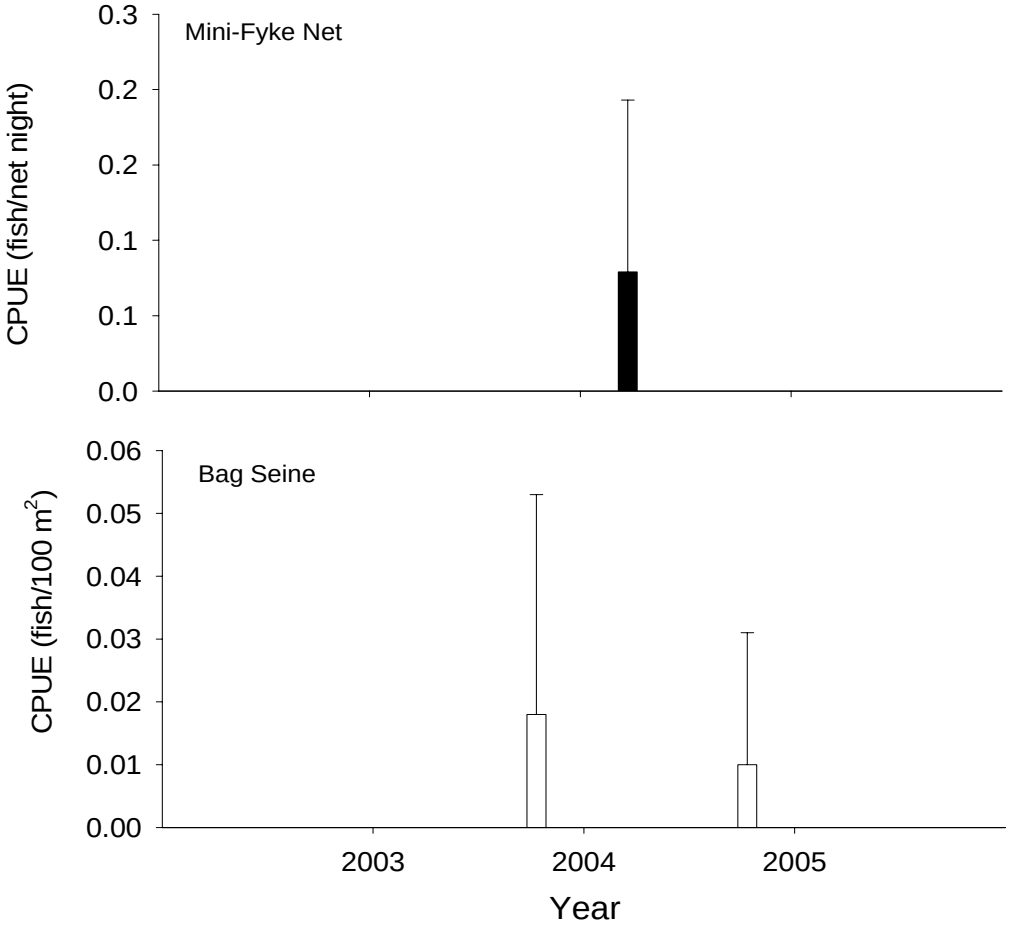

Figure 15. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segment 14 of the Missouri River during fish community season 2003 - 2005.

Figure 16. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segment 14 of the Missouri River during fish community season 2003 - 2005.

Habitat Use

The majority of the sampling effort in segment 14 was expended in ISB Macrohabitat (50% of the total effort) and CHNB Mesohabitat (75% of the total effort), due to their proportionate availability. Of the 42 YOY shovelnose sturgeon (0-149 mm; 0.02% of the total catch) captured in segment 13, 62% (N = 24) were captured in ISB Macrohabitat, with the majority occurring in CHNB Mesohabitat (86%). Juvenile shovelnose sturgeon (150-249 mm) also made up 0.02% of the total shovelnose catch (N = 48; Table 19). Similar to YOY shovelnose sturgeon, 62.5% (N = 30) of juveniles where captured in ISB Macrohabitat, with the majority (96%; N = 46) occurring in CHNB Mesohabitat (Tables 19-20). Stock size (250-379 mm) shovelnose sturgeon (0.04% of the total catch; N = 104) were captured in segment 14, with the majority (68%; N = 71) occurring in ISB for all gear types except for gillnets where a disproportionate number of stock size shovelnose sturgeon where captured in CHXO Macrohabitat (56% catch versus 22% effort; Table 21). The majority of stock size shovelnose sturgeon occurred in CHNB Mesohabitat (88%; N = 92; Table 22). Quality and above size shovelnose sturgeon made up the bulk of the total catch (92%; N = 2,254), with most captured during the sturgeon season (84%; Table 23). Inside bend Macrohabitat was the most preferred habitat for quality and above size shovelnose with 48% (N = 1,091) of the total catch occurring there followed by CHXO Macrohabitat, which contained 31% (N = 710) of the total catch (Table 23). Large and small secondary connected channels (SCCL and SCCS) contained approximately 4% of the quality and above size shovelnose sturgeon (Table 23). Similar to the smaller shovelnose, the majority of quality and above shovelnose sturgeon (57%) occurred in CHNB Mesohabitat with POOL Mesohabitat contributing to 29% of the total catch (N = 699; Table 24).

Sturgeon and fish community season sampling captured shovelnose sturgeon representing 5 cohorts (40 mm, 200 mm, 280 mm, 400 mm, and 600 mm; Figure 17). A higher proportion of quality and memorable sized fish were captured in the shovelnose population during both the sturgeon season (RSD-Q = 97, RSD-P = 84) and the fish community season (RSD-Q =88, RSD-P = 67; Table 25). Few sub-stock shovelnose sturgeon were captured in either season (N = 48 sturgeon; N = 42 community) and no trophy shovelnose sturgeon were captured.

Table 17. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 14.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	5	N-E	N-E	60	0	5	3	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	15	4	N-E	N-E	74	1	2	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	22	4	N-E	N-E	37	27	5	5	0	0	1	0	0
Otter Trawl	22	N-E	18	0	N-E	N-E	77	0	5	0	0	0	0	0	0
		N-E	22	7	N-E	N-E	47	6	9	4	0	3	2	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	19	0	N-E	N-E	66	1	5	3	0	6	0	0	0
Bag Seine	1	N-E	0	0	N-E	N-E	0	0	0	100	0	0	0	0	0
		N-E	8	0	N-E	N-E	34	4	9	13	4	28	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	31	13	4	14	4	17	0	1	0
Otter Trawl	18	N-E	22	0	N-E	N-E	44	0	0	22	0	11	0	0	0
		N-E	18	0	N-E	N-E	56	1	3	4	0	17	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 18. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If numbers on the second line do not add to 100 then some mesohabitats were not taken in the field. The beam trawl is not standard gear in segment 14.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	93	N-E	4	0	2
2.5 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	48	N-E	7	44	1
Otter Trawl	22	0	100	N-E	0	0	0
		0	93	N-E	7	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	1	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	1	100	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		99	1	N-E	0	0	0
Otter Trawl	18	0	78	N-E	22	0	0
		0	95	N-E	5	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

Table 19. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 14.

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	5	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	26	5	N-E	N-E	60	0	5	3	0	0	0	0	0
2.5 Inch Trammel Net	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	15	4	N-E	N-E	74	1	2	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	22	4	N-E	N-E	37	27	5	5	0	0	1	0	0
Otter	20	N-E	10	0	N-E	N-E	50	0	40	0	0	0	0	0	0
		N-E	22	7	N-E	N-E	47	6	9	4	0	3	2	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	7	N-E	43	0	N-E	N-E	57	0	0	0	0	0	0	0	0
		N-E	19	0	N-E	N-E	66	1	5	3	0	6	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	8	0	N-E	N-E	34	4	9	13	4	28	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	31	13	4	14	4	17	0	1	0
Otter Trawl	15	N-E	20	0	N-E	N-E	67	0	0	13	0	0	0	0	0
		N-E	18	0	N-E	N-E	56	1	3	4	0	17	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 20. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If numbers on the second line do not add to 100 then some mesohabitats were not taken in the field. The beam trawl is not standard gear in segment 14.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	5	0	100	N-E	0	0	0
		0	93	N-E	4	0	2
2.5 Inch Trammel Net	1	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	48	N-E	7	44	1
Otter Trawl	20	0	100	N-E	0	0	0
		0	93	N-E	7	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	7	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		99	1	N-E	0	0	0
Otter Trawl	15	0	87	N-E	13	0	0
		0	95	N-E	5	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

Table 21. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type (first line of the gear type) in segment 14 of the Missouri River during 2004-5005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 14.

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	18	N-E	22	0	N-E	N-E	72	0	6	0	0	0	0	0	0
		N-E	26	5	N-E	N-E	60	0	5	3	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	15	4	N-E	N-E	74	1	2	4	0	0	0	0	0
Gill Net	18	N-E	56	0	N-E	N-E	39	6	0	0	0	0	0	0	0
		N-E	22	4	N-E	N-E	37	27	5	5	0	0	1	0	0
Otter Trawl	16	N-E	31	0	N-E	N-E	63	0	6	0	0	0	0	0	0
		N-E	22	7	N-E	N-E	47	6	9	4	0	3	2	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	27	N-E	15	0	N-E	N-E	81	0	4	0	0	0	0	0	0
		N-E	19	0	N-E	N-E	66	1	5	3	0	6	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	8	0	N-E	N-E	34	4	9	13	4	28	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	31	13	4	14	4	17	0	1	0
Otter Trawl	25	N-E	4	0	N-E	N-E	76	0	4	12	0	4	0	0	0
		N-E	18	0	N-E	N-E	56	1	3	4	0	17	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 22. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type (first line of gear type) in segment 7 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If numbers on the second line do not add to 100 then some mesohabitats were not taken in the field. The beam trawl is not standard gear in segment 14.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	18	0	100	N-E	0	0	0
		0	93	N-E	4	0	2
2.5 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Gill Net	18	0	50	N-E	0	50	0
		0	48	N-E	7	44	1
Otter Trawl	16	0	100	N-E	0	0	0
		0	93	N-E	7	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	27	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		99	1	N-E	0	0	0
Otter Trawl	25	0	88	N-E	12	0	0
		0	95	N-E	5	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

Table 23. Total number of quality and above size (>380 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type (first line of gear type) in segment14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. Beam trawl is not standard gear in segment 14.

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	276	N-E	17	6	N-E	N-E	69	0	8	0	0	0	0	0	0
		N-E	26	5	N-E	N-E	60	0	5	3	0	0	0	0	0
2.5 Inch Trammel Net	135	N-E	13	2	N-E	N-E	77	0	1	6	0	0	0	0	0
		N-E	15	4	N-E	N-E	74	1	2	4	0	0	0	0	0
Gill Net	1226	N-E	37	0	N-E	N-E	35	20	1	3	0	0	3	0	0
		N-E	22	4	N-E	N-E	37	27	5	5	0	0	1	0	0
Otter Trawl	249	N-E	40	4	N-E	N-E	42	2	8	3	0	0	1	0	0
		N-E	22	7	N-E	N-E	47	6	9	4	0	3	2	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	224	N-E	18	0	N-E	N-E	79	0	2	1	0	0	0	0	0
		N-E	19	0	N-E	N-E	66	1	5	3	0	6	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	8	0	N-E	N-E	34	4	9	13	4	28	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	31	13	4	14	4	17	0	1	0
Otter Trawl	144	N-E	36	0	N-E	N-E	60	2	1	1	0	0	0	0	0
		N-E	18	0	N-E	N-E	56	1	3	4	0	17	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 24. Total number of quality and above size (>380 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear code. The N-E indicates the habitat is non-existent in the segment. If numbers on the second line do not add to 100 then some mesohabitats were not taken in the field. The beam trawl is not standard gear in segment 14.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	276	0	93	N-E	6	0	1
		0	93	N-E	4	0	2
2.5 Inch Trammel Net	135	0	94	N-E	6	0	0
		0	96	N-E	4	0	0
Gill Net	1226	0	35	N-E	5	57	3
		0	48	N-E	7	44	1
Otter Trawl	249	0	94	N-E	6	0	0
		0	93	N-E	7	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	224	0	98	N-E	2	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		99	1	N-E	0	0	0
Otter Trawl	144	0	98	N-E	2	0	0
		0	95	N-E	5	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

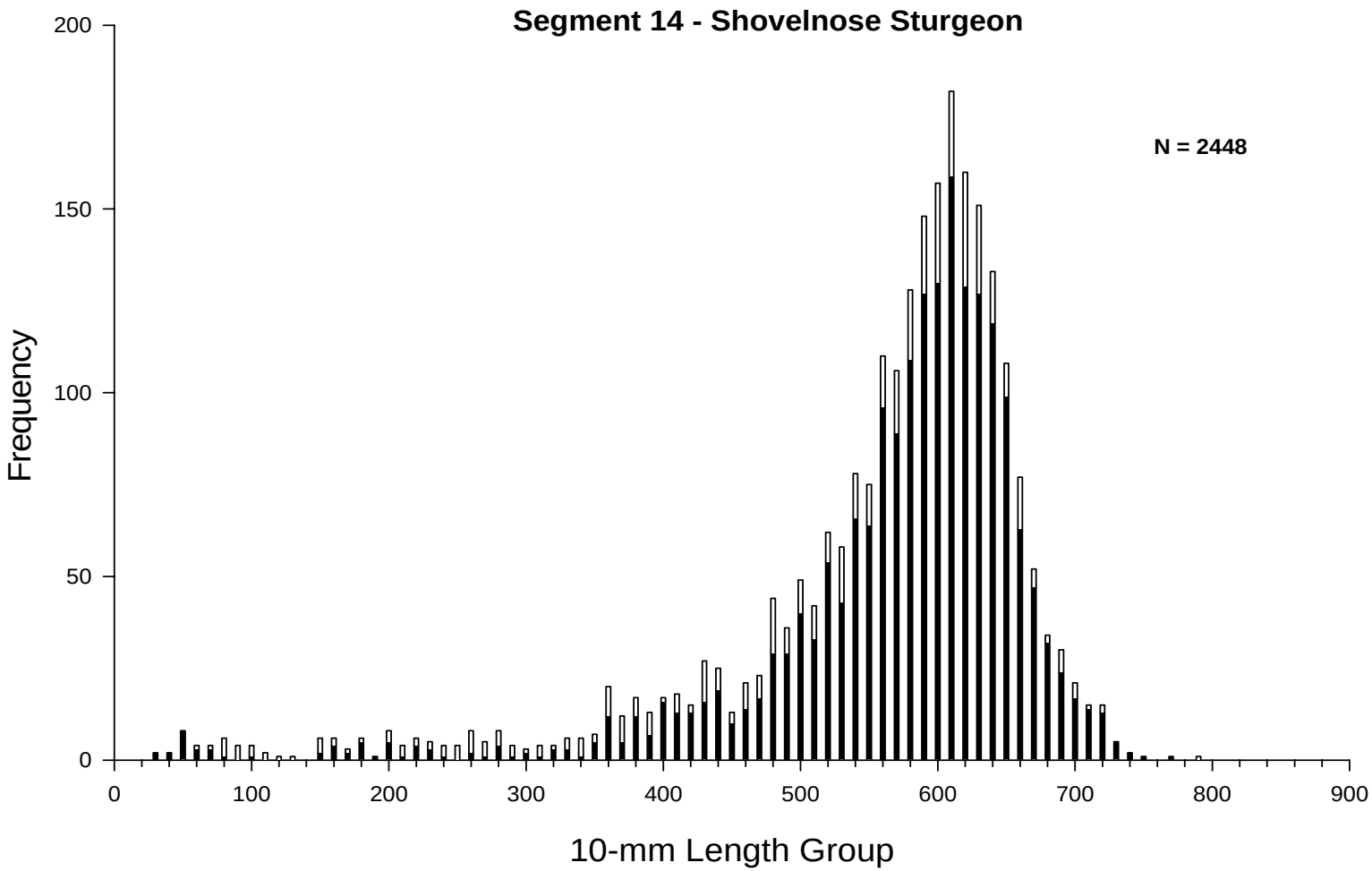

Figure 17. Length frequency of shovelnose sturgeon from fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during 2004 - 2005.

Table 25. Relative stock density (RSD)[a] by a length category for shovelnose sturgeon in segment 14 of the Missouri River captured during 2005. Length categories[b] determined using methods proposed by Quist (1998). Relative stock density calculated using the traditional method.

Length category	N	RSD
	Sturgeon Season	
Sub-stock (0-149 mm)	22	
Sub-stock (150-249 mm)	26	
Stock	1938	
Quality	1886	97
Preferred	1635	84
Memorable	342	18
Trophy	0	0
	Fish Community Season	
Sub-stock (0-149 mm)	20	
Sub-stock (150-249 mm)	22	
Stock	420	
Quality	368	88
Preferred	281	67
Memorable	48	11
Trophy	0	0

[a] RSD = number of fish of a specified length ÷ number minimum stock length fish x 100.
[b] Length categories based on the percentage of the largest known shovelnose sturgeon: Sub-stock FL < 250 mm (20 %), Stock FL =250-379 mm (20 – 36 %), Quality FL = 380 – 509 mm (36 – 45 %), Preferred FL = 510 - 639 mm (45 – 59 %), Memorable FL = 640 – 809 mm (59 – 74 %), Trophy FL > 810 mm (>74 %).

Sturgeon Chub

A total of 36 sturgeon chubs were captured in segment 14 compared to 19 in 2004 (Doyle et al. 2005). Otter trawls were the only gear to capture sturgeon chubs with 16 captured during sturgeon season (CPUE = 0.05; ±2SE = 0.03) and 20 during fish community season (CPUE = 0.09; ±2SE = 0.07; Figures 18-19). Otter trawl CPUE increased slightly from 2004 for both sturgeon (CPUE = 0.02 in 2004 versus 0.05 in 2005) and fish community seasons (CPUE = 0.06 in 2004 versus 0.09 in 2005; Figures 18-19). For the sturgeon season, the majority of sturgeon chubs were captured in ISB macrohabitat (62% of the total catch relative to 47% of the effort) and CHNB mesohabitat (100% of the total catch relative to 93% of the effort). For the fish community season, the catch was in similar habitats with 60% of sturgeon chubs occurring in ISB macrohabitat (relative to 56% of the total effort) and 100% occurring in CHNB mesohabitat relative to a total effort of 95% (Tables 26-27).

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

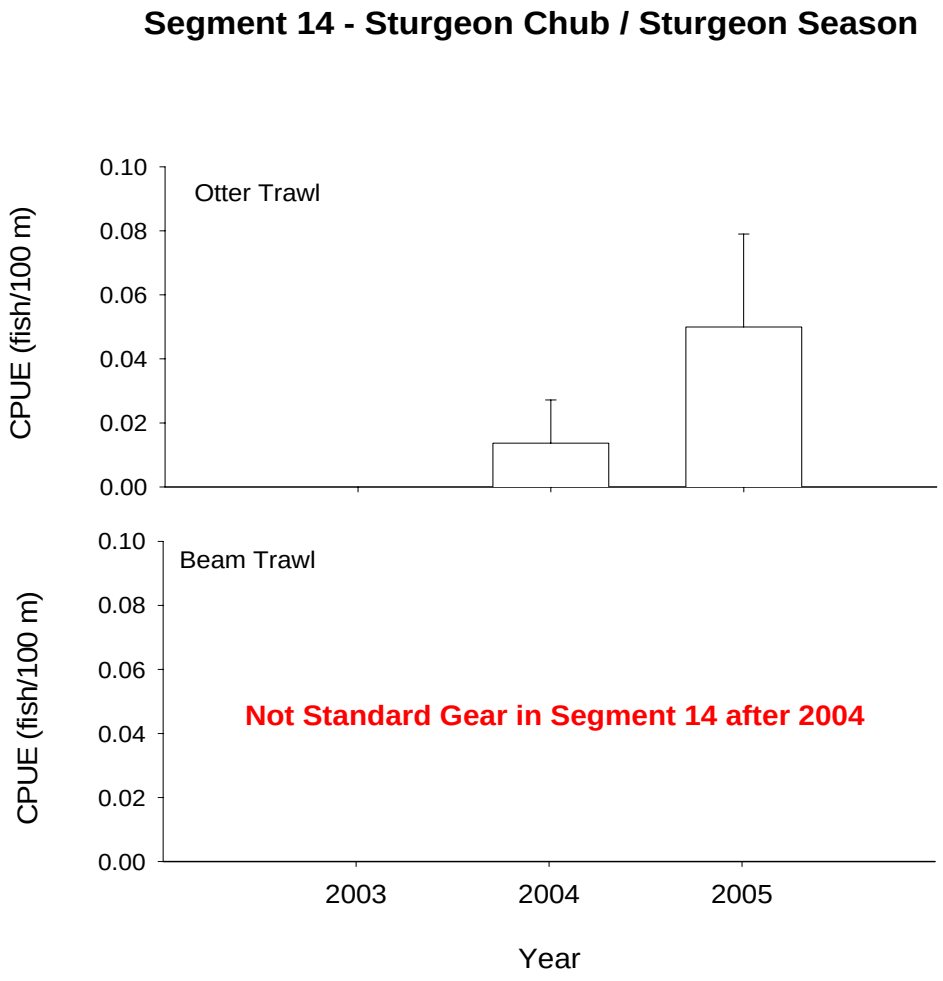

Figure 18. Mean annual catch-per-unit-effort (+/- 2SE) of sturgeon chub in segment 14 of the Missouri River during sturgeon season 2003-2005.

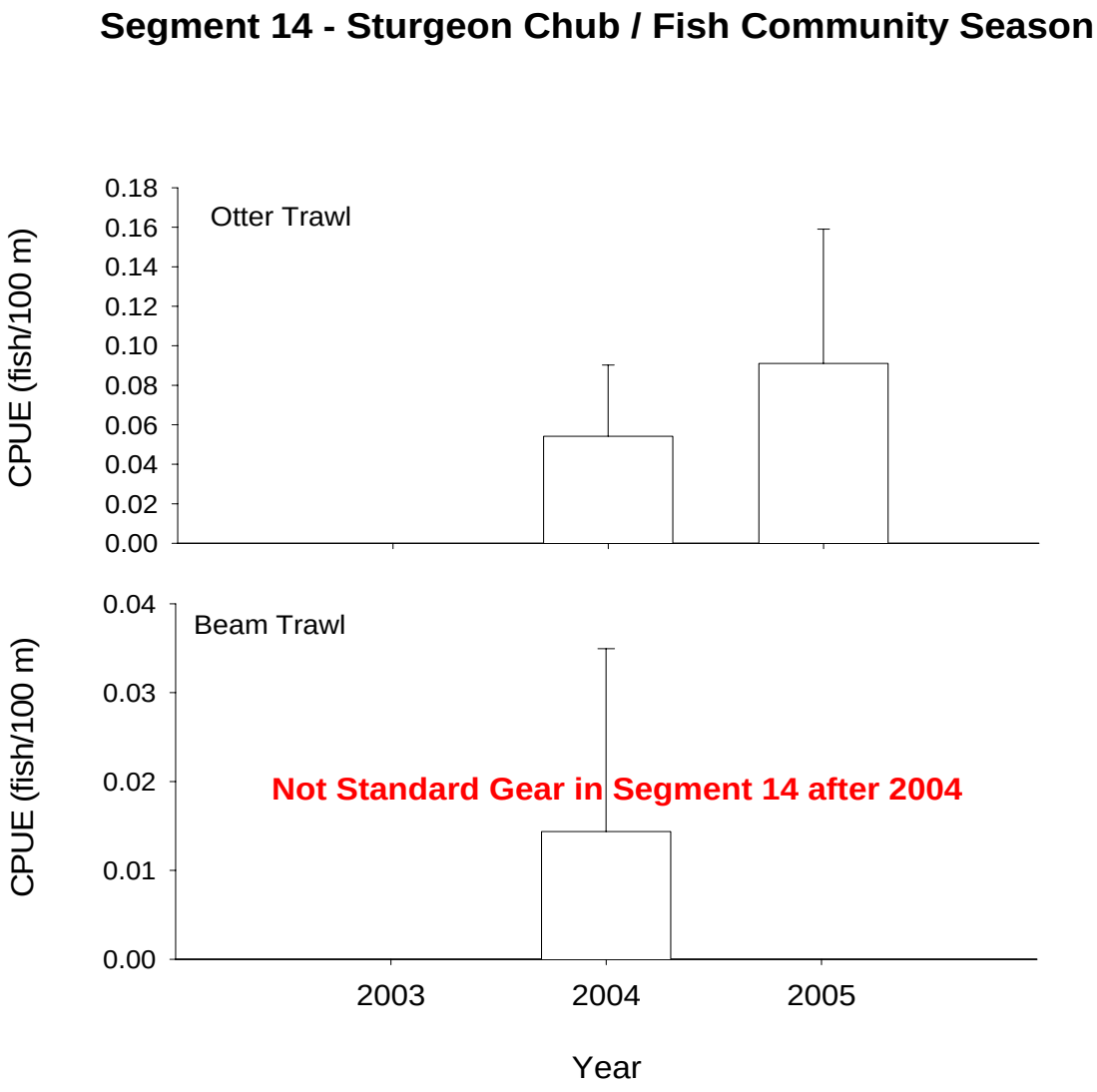

Figure 19. Mean annual catch-per-unit-effort (+/- 2SE) of sturgeon chub in segment 14 of the Missouri River during fish community season 2003-2005.

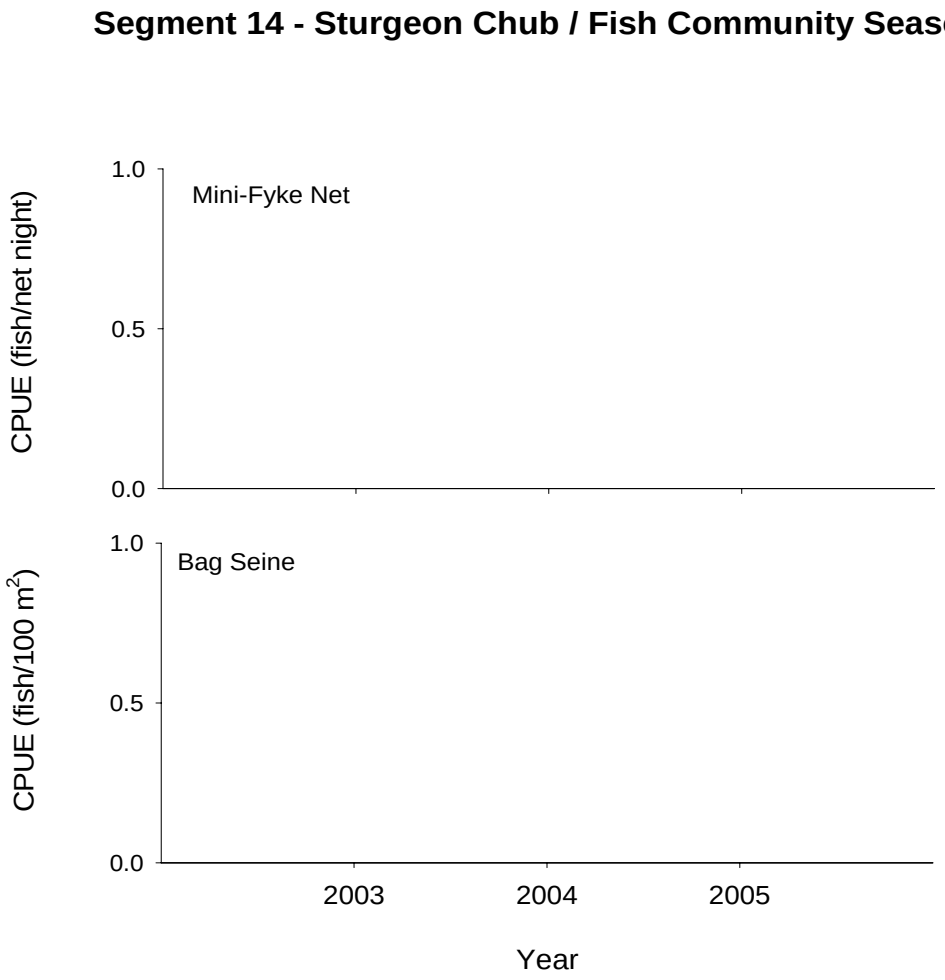

Figure 20. Mean annual catch-per-unit-effort (+/- 2SE) of sturgeon chub in segment 14 of the Missouri River during fish community season 2003-2005.

Table 26. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each macrohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 14.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	5	N-E	N-E	60	0	5	3	0	0	0	0	0
2.5 Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	15	4	N-E	N-E	74	1	2	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	22	4	N-E	N-E	37	27	5	5	0	0	1	0	0
Otter Tawl	16	N-E	12	0	N-E	N-E	62	0	25	0	0	0	0	0	0
		N-E	22	7	N-E	N-E	47	6	9	4	0	3	2	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	19	0	N-E	N-E	66	1	5	3	0	6	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	8	0	N-E	N-E	34	4	9	13	4	28	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	31	13	4	14	4	17	0	1	0
Otter Tawl	20	N-E	40	0	N-E	N-E	60	0	0	0	0	0	0	0	0
		N-E	18	0	N-E	N-E	56	1	3	4	0	17	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 27. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each mesohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If numbers on the second line do not add to 100 then some mesohabitats were not taken in the field. The beam trawl is not standard gear in segment 14.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	93	N-E	4	0	2
2.5 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	48	N-E	7	44	1
Otter Trawl	16	0	100	N-E	0	0	0
		0	93	N-E	7	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		99	1	N-E	0	0	0
Otter Trawl	20	0	100	N-E	0	0	0
		0	95	N-E	5	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

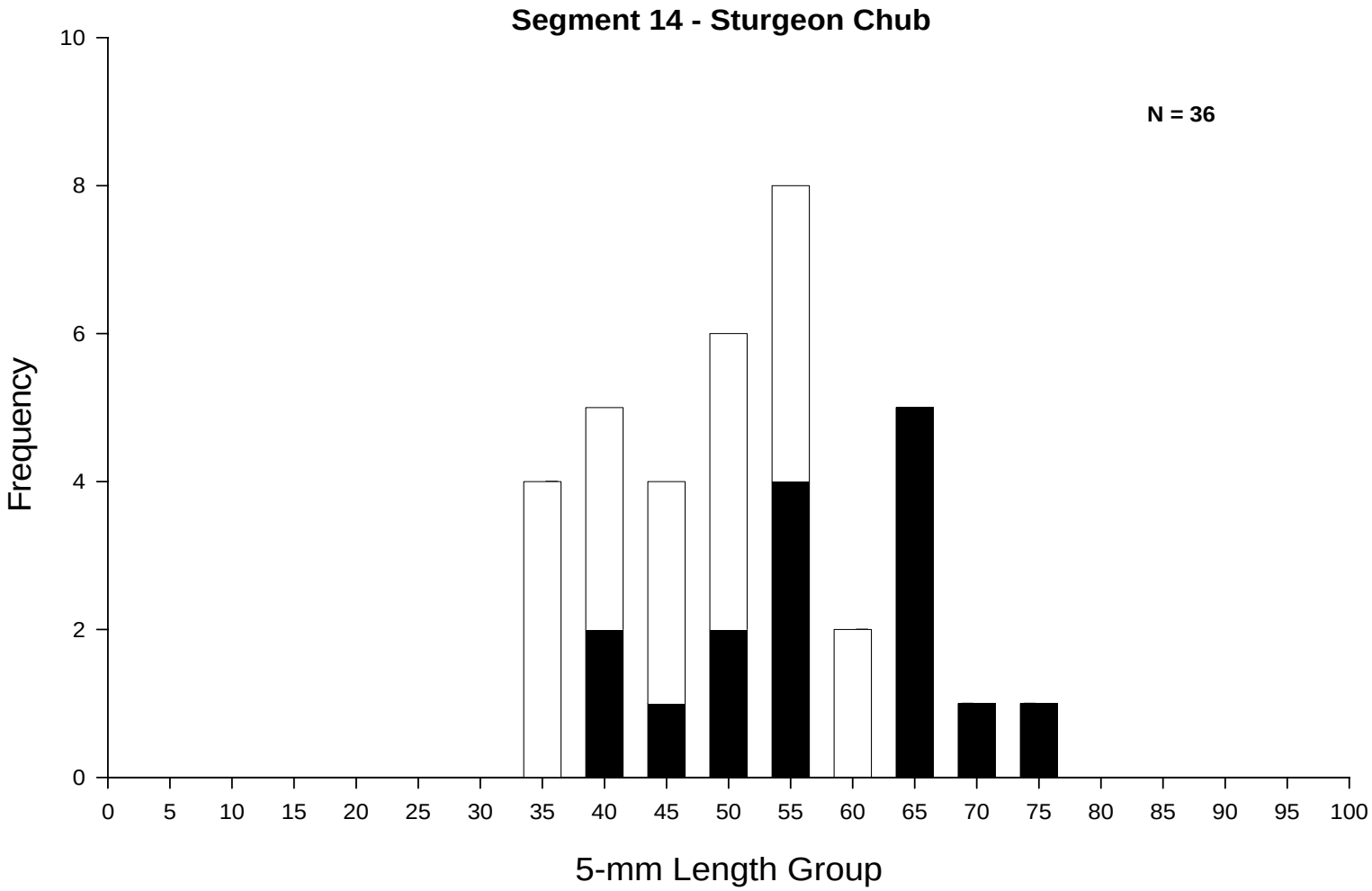

Figure 21. Length frequency of sturgeon chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during 2004 - 2005.

Sicklefin Chub

A total of 355 sicklefin chubs were captured in segment 14, which was much less than were captured in 2004 (N = 1,029; Doyle et al. 2005). Otter trawls were the most effective gear at capturing sicklefin chubs (making up 97% of the total catch) with mini-fyke nets and bag seines only making up 3% of the total catch. More than twice as many sicklefin chubs were captured during the sturgeon season (69%; N = 245) than in the fish community season (N = 110; Table 28). Catch-per-unit-effort with otter trawls during fish community season (CPUE = 0.37; ±2SE = 0.16) was lower than it was for sturgeon season (CPUE of 0.84 ±2SE = 0.32; Figures 22-23). Otter trawl CPUE increased considerably from 2004 for sturgeon season (CPUE = 0.17 in 2004 versus 0.84 in 2005) but decreased slightly for fish community season (CPUE = 0.94 in 2004 versus 0.37 in 2005; Figures 22-23). Mini-fyke and bag seine CPUE decreased the most from 2004 with Mini-fyke net catch rates going from 0.94 sicklefin chubs per net night to 0.05 per net night and bag seines from 0.84 sicklefin chubs per 100 m^2 to just 0.09 per 100 m^2 (Figure 24). For the sturgeon season, the majority of sicklefin chubs were captured in ISB Macrohabitat (62% of the total catch relative to 47% of the effort) and CHNB Mesohabitat (98% of the total catch relative to 93% of the effort). For fish community season, the catch was in similar habitats with 69% of sicklefin chubs occurring in ISB Macrohabitat (relative to 56% of the total effort) and 100% occurring in CHNB Mesohabitat relative to a total effort of 95% (Tables 26-27).

More large sicklefin chubs were captured earlier in the sample year (i.e. during sturgeon season), whereas, smaller (YOY) sicklefin chubs were captured during fish community season (Figure 25). Pflieger (1997) noted that many young sicklefin chubs were captured in July, suggesting a spring spawning season. Correspondingly, adult sicklefin chubs have been found to be full of eggs in the spring (Jennifer Johnson, personal communication) and are most likely actively spawning during the sturgeon season, perhaps making them more vulnerable to sampling gear than during the summer and fall months (fish community season). According to Pflieger (1997), YOY sicklefin chubs attain lengths of about 25 to 66 mm in their first year of life. There was a strong presence of YOY sicklefin chubs in the fish community season samples during 2005 along with an increase in otter trawl CPUE during the sturgeon season, indicating a successful spawn in both 2004 and 2005 (Figure 25). Low CPUE for all gears during the fish community season, however, may indicate poor recruitment in 2005.

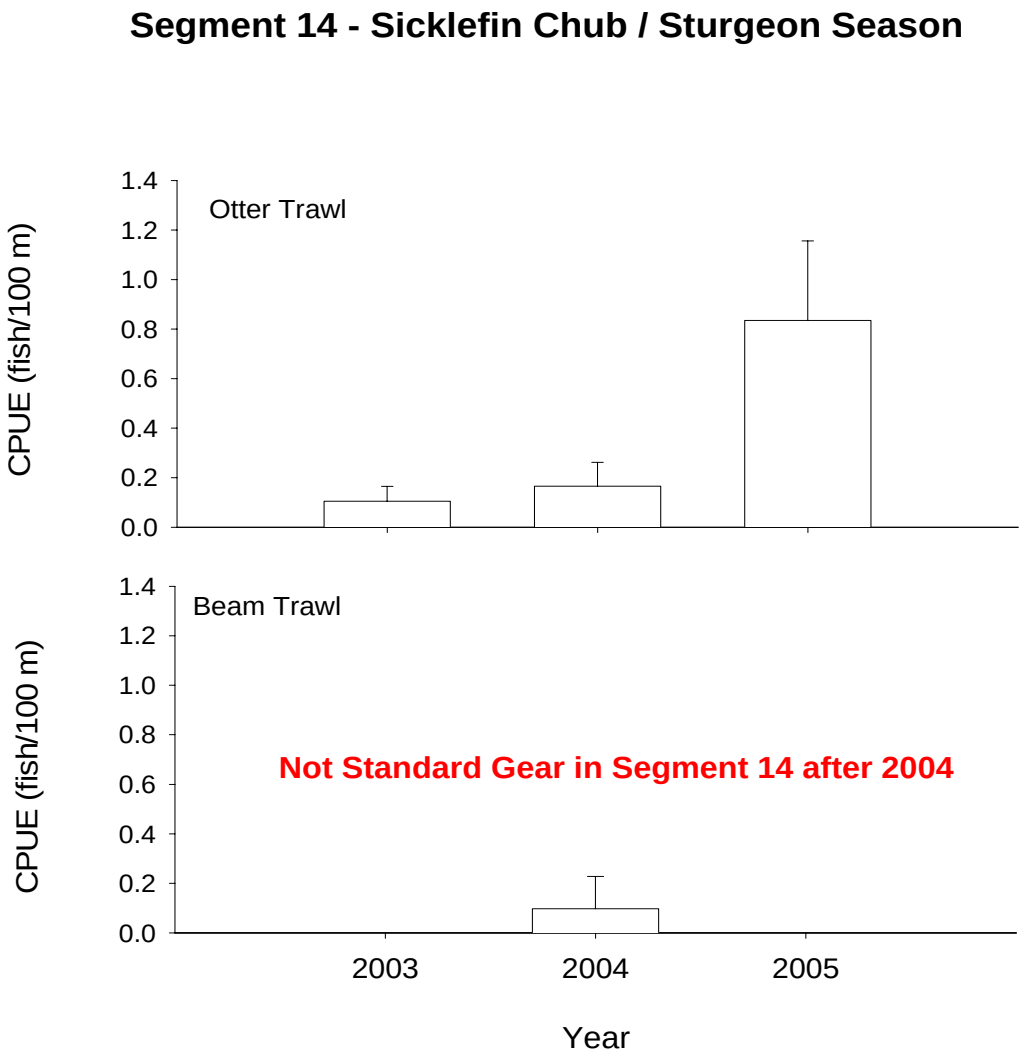

Figure 22. Mean annual catch-per-unit-effort (+/- 2SE) of sicklefin chub in segment 14 of the Missouri River during sturgeon season 2003-2005.

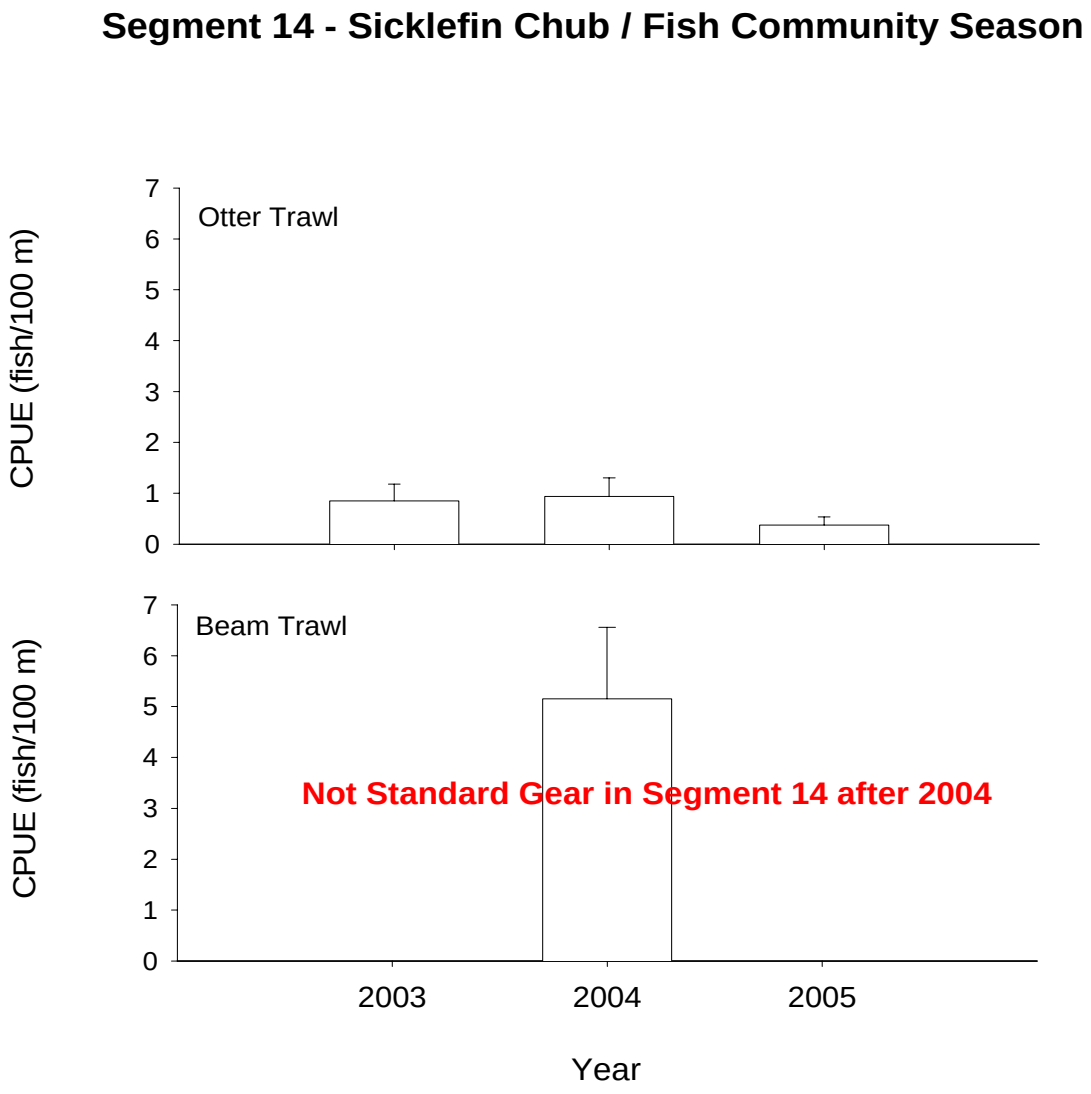

Figure 23. Mean annual catch-per-unit-effort (+/- 2SE) of sicklefin chub in segment 14 of the Missouri River during fish community season 2003-2005.

Segment 14 - Sicklefin Chub / Fish Community Season

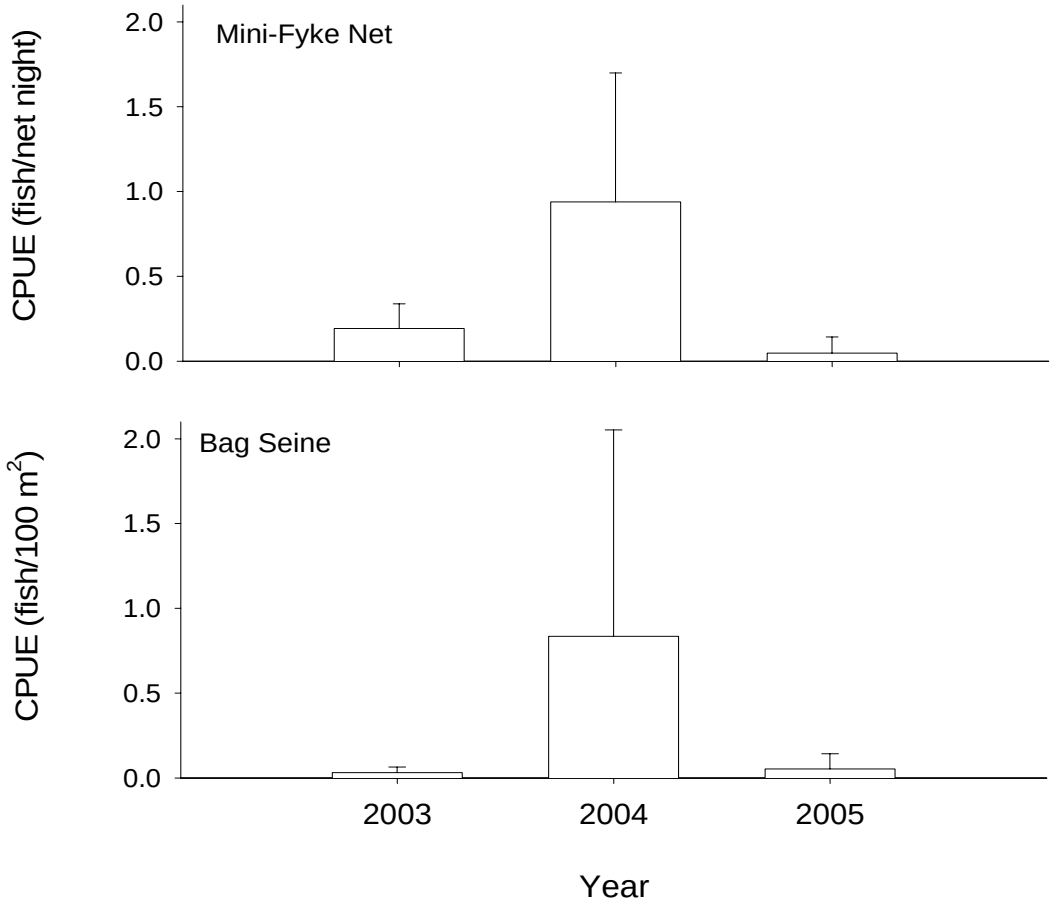

Figure 24. Mean annual catch-per-unit-effort (+/- 2SE) of sicklefin chub in segment 14 of the Missouri River during fish community season 2003-2005.

Table 28. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each macrohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 14.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	5	N-E	N-E	60	0	5	3	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	15	4	N-E	N-E	74	1	2	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	22	4	N-E	N-E	37	27	5	5	0	0	1	0	0
Otter Trawl	245	N-E	20	0	N-E	N-E	62	4	13	0	0	0	0	0	0
		N-E	22	7	N-E	N-E	47	6	9	4	0	3	2	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	19	0	N-E	N-E	66	1	5	3	0	6	0	0	0
Bag Seine	6	N-E	0	0	N-E	N-E	0	0	0	17	0	83	0	0	0
		N-E	8	0	N-E	N-E	34	4	9	13	4	28	0	0	0
Mini-Fyke Net	4	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	31	13	4	14	4	17	0	1	0
Otter Trawl	100	N-E	28	0	N-E	N-E	69	2	0	0	0	1	0	0	0
		N-E	18	0	N-E	N-E	56	1	3	4	0	17	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 29. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each mesohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If numbers on the second line do not add to 100 then some mesohabitats were not taken in the field. The beam trawl is not standard gear in segment 14.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	93	N-E	4	0	2
2.5 Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	48	N-E	7	44	1
Otter Trawl	245	0	98	N-E	2	0	0
		0	93	N-E	7	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	6	100	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	4	100	0	N-E	0	0	0
		99	1	N-E	0	0	0
Otter Trawl	100	0	100	N-E	0	0	0
		0	95	N-E	5	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

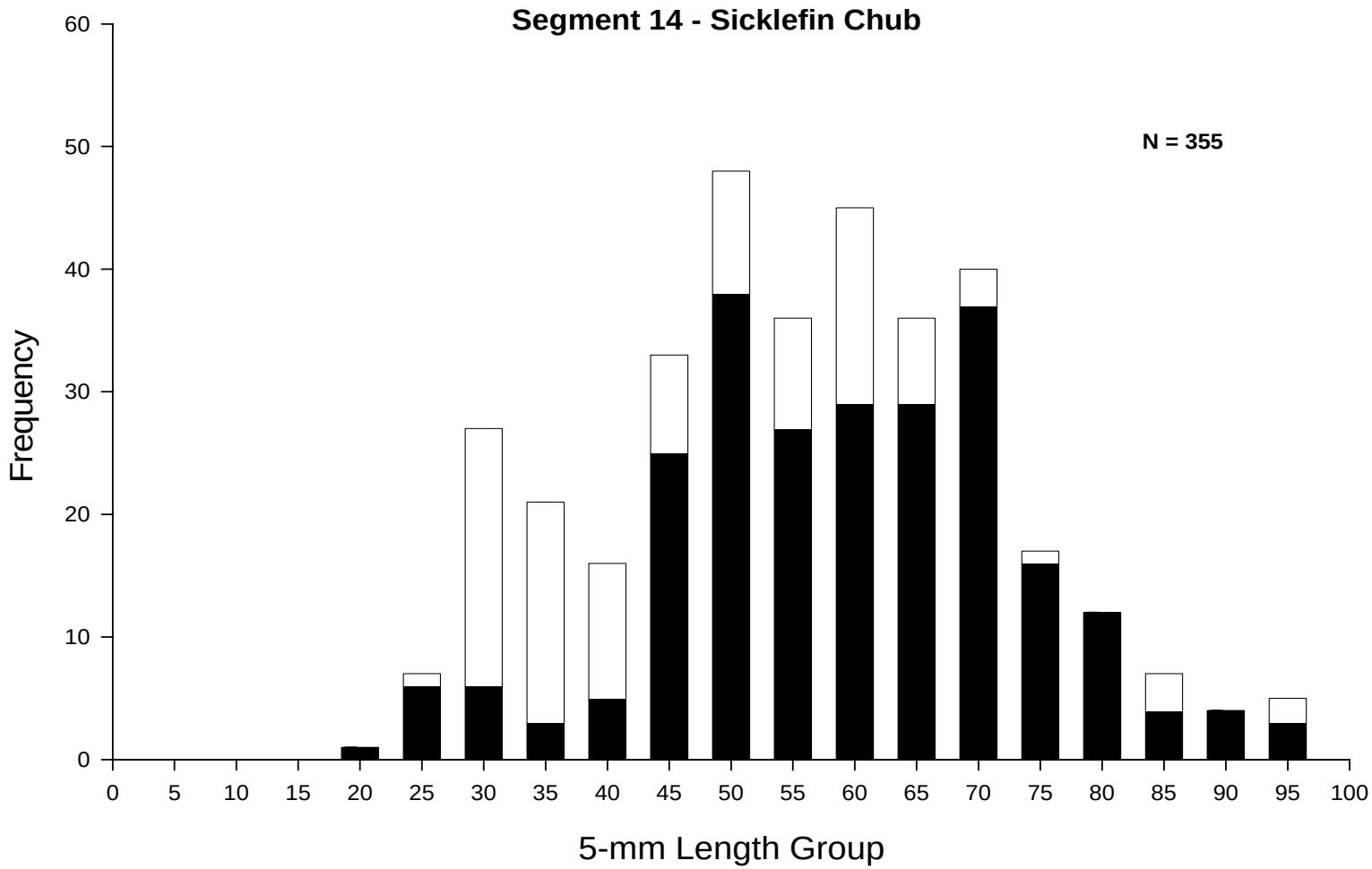

Figure 25. Length frequency of sicklefin chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during 2004 - 2005.

Speckled Chub

A total of 575 speckled chubs were captured in segment 14, slightly more than were captured in 2004 (N = 493; Doyle et al. 2005). The majority of speckled chubs were captured during the fish community season (70%; N = 402) versus sturgeon season (N = 173; Table 30). Otter trawls were the most effective gear at capturing speckled chubs for both sturgeon and fish community seasons (making up 88% of the total catch) with mini-fyke nets and bag seines only making up 12% of the total catch. Since mini-fyke nets and bag seines were only used during fish community season, otter trawls were the only gear that captured speckled chubs during sturgeon season with a CPUE of 0.65 (±2SE = 0.21). Catch-per-unit-effort with otter trawls during fish community season was nearly twice as high as it was for sturgeon season (CPUE = 1.31; ±2SE = 0.6). Otter trawl CPUE decreased slightly from 2004 for sturgeon season (CPUE = 0.93 in 2004 versus 0.65 in 2005) but greatly increased for fish community season (CPUE = 0.22 in 2004 versus 1.31 in 2005; Figures 26-27). Mini-fyke CPUE has remained fairly constant since 2003 (2003 = 0.31; 2004 = 0.58; 2005 = 0.37; Figure 28). Bag seine CPUE greatly decreased from 1.11 speckled chubs per 100 m^2 in 2004 to just 0.19 per 100 m^2 in 2005 (Figure 28). For sturgeon season, the majority of speckled chubs were captured in ISB macrohabitat (51% of the total catch relative to 47% of the effort) and CHNB mesohabitat (95% of the total catch relative to 93% of the effort). For fish community season, speckled chubs were distributed between ISB, CHXO, SCCS macrohabitat. Relative to all the effort in ISB macrohabitat during fish community season (47% of the total effort), on 36% of the speckled chubs were captured there (Table 30). It is important to note that a disproportionate number of speckled chubs were captured in CHXO (32% of the total catch relative to only 14% of the total effort) and SCCS (14% of the total catch relative to only 10% of the total effort) macrohabitat (Table 30). The majority (79% of total catch relative to 65% of the total effort) of speckled chubs were captured in CHNB mesohabitat (Table 31). It is worth noting that a disproportionate number of speckled chubs (13% of the total catch relative to only 5% of the total effort) were captured in ITIP mesohabitat (Table 31).

Similar to other chub species, more large individuals were captured earlier in the sample year (i.e. during sturgeon season), whereas, smaller (YOY) speckled chubs were captured during fish community season (Figure 29). Pflieger (1997) noted that speckled chubs begin to spawn in

early May and continue through the summer. Correspondingly, adult speckled chubs have been found to be full of eggs in the spring (Jennifer Johnson, personal communication) and are most likely actively spawning during the sturgeon season. According to Pflieger (1997), YOY speckled chubs attain lengths of about 25 to 60 mm in their first year of life. Because speckled chubs are short-lived (seldom living longer the one and a half years; Pflieger et al. 1997), much of the reproduction is accomplished by year old fish that subsequently die after spawning. Of the speckled chubs captured during the 2005 sample season, it appears that the 2004 year class was captured during sturgeon season while they where actively spawning and slowly began to die off; as a result, we started capturing YOY speckled chubs toward the end of summer (Figure 29).

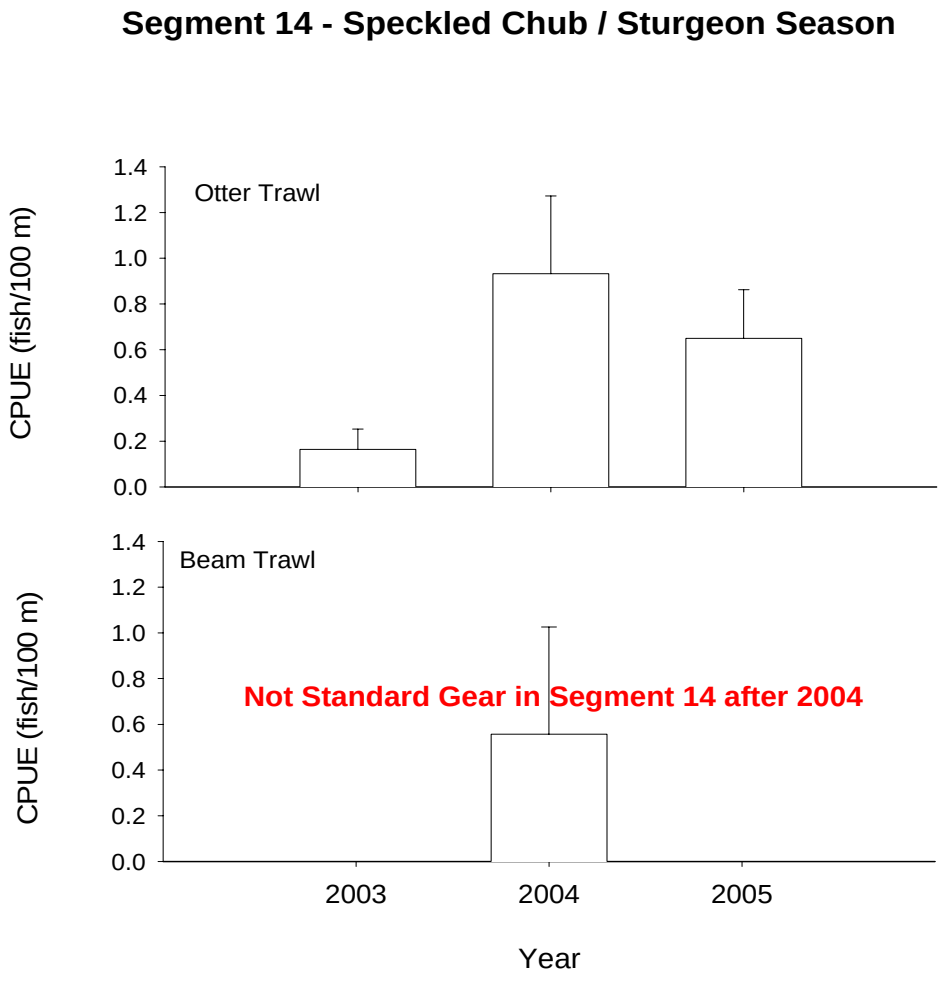

Figure 26. Mean annual catch-per-unit-effort (+/- 2SE) of speckled chub in segment 14 of the Missouri River during sturgeon season 2003-2005.

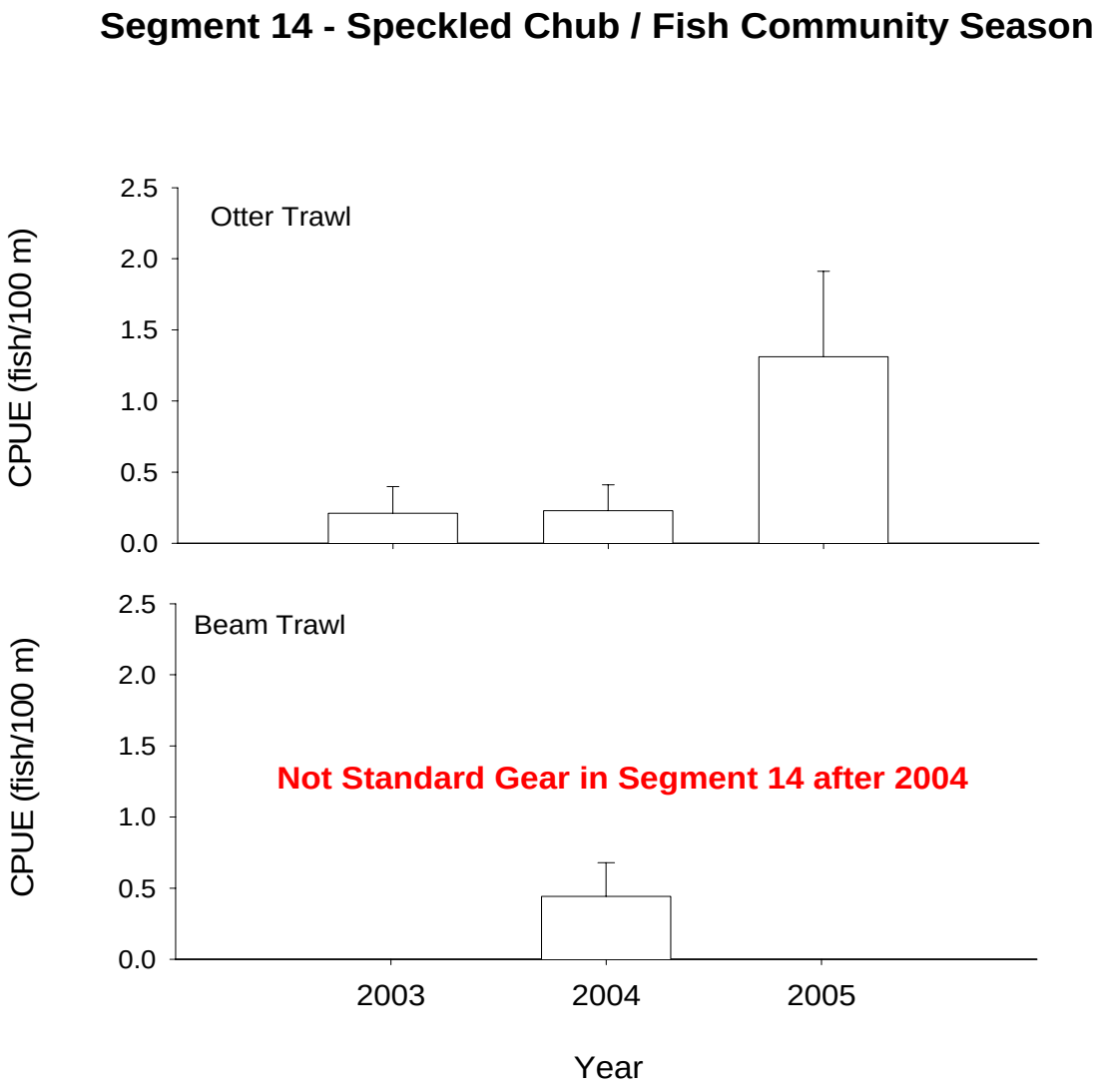

Figure 27. Mean annual catch-per-unit-effort (+/- 2SE) of speckled chub in segment 14 of the Missouri River during fish community season 2003-2005.

Segment 14 - Speckled Chub / Fish Community Season

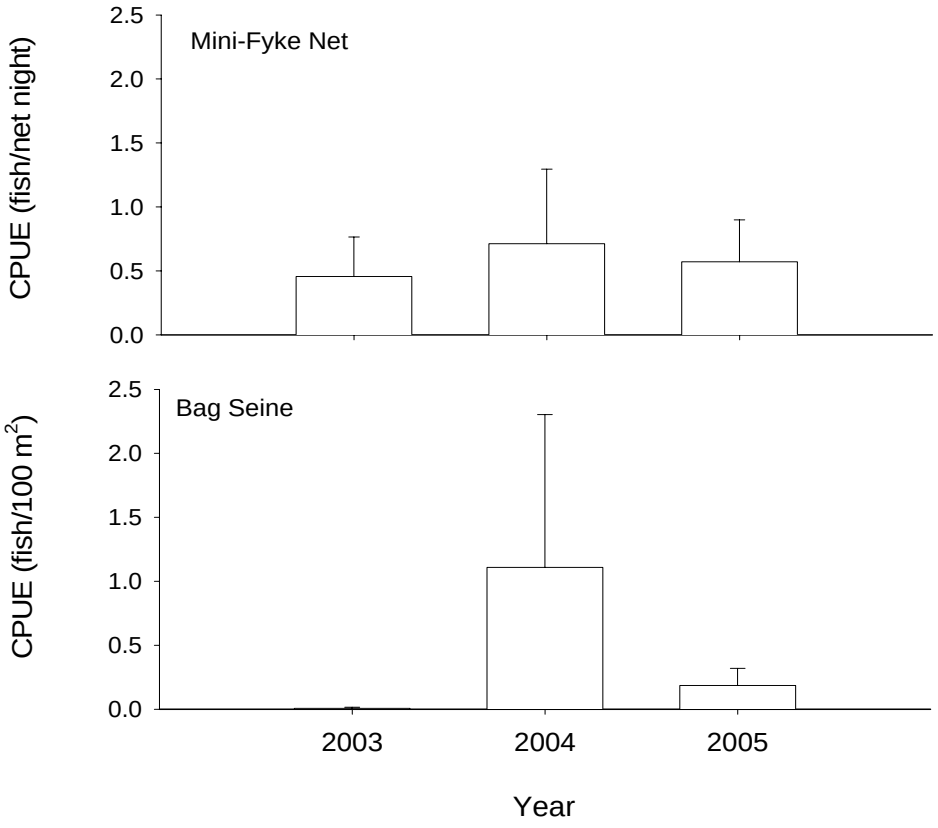

Figure 28. Mean annual catch-per-unit-effort (+/- 2SE) of speckled chub in segment 14 of the Missouri River during fish community season 2003-2005.

Table 30. Total number of speckled chubs captured for each gear during each season and the proportion caught within each macrohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 14.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	5	N-E	N-E	60	0	5	3	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	15	4	N-E	N-E	74	1	2	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0		0	0	0	0	0
		N-E	22	4	N-E	N-E	37	27	5	5	0	0	1	0	0
Otter Trawl	173	N-E	27	1	N-E	N-E	51	6	10	5	0	0	0	0	0
		N-E	22	7	N-E	N-E	47	6	9	4	0	3	2	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	19	0	N-E	N-E	66	1	5	3	0	6	0	0	0
Bag Seine	23	N-E	0	0	N-E	N-E	26	0	35	35	4	0	0	0	0
		N-E	8	0	N-E	N-E	34	4	9	13	4	28	0	0	0
Mini-Fyke Net	48	N-E	21	0	N-E	N-E	46	8	12	12	0	0	0	0	0
		N-E	17	0	N-E	N-E	31	13	4	14	4	17	0	1	0
Otter Trawl	331	N-E	36	0	N-E	N-E	35	8	2	12	0	7	0	0	0
		N-E	18	0	N-E	N-E	56	1	3	4	0	17	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 31. Total number of speckled chubs captured for each gear during each season and the proportion caught within each mesohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If numbers on the second line do not add to 100 then some mesohabitats were not taken in the field. The beam trawl is not standard gear in segment 14.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	93	N-E	4	0	2
2.5 Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	48	N-E	7	44	1
Otter Trawl	173	0	95	N-E	5	0	0
		0	93	N-E	7	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	23	100	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	48	90	10	N-E	0	0	0
		99	1	N-E	0	0	0
Otter Trawl	331	0	87	N-E	13	0	0
		0	95	N-E	5	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

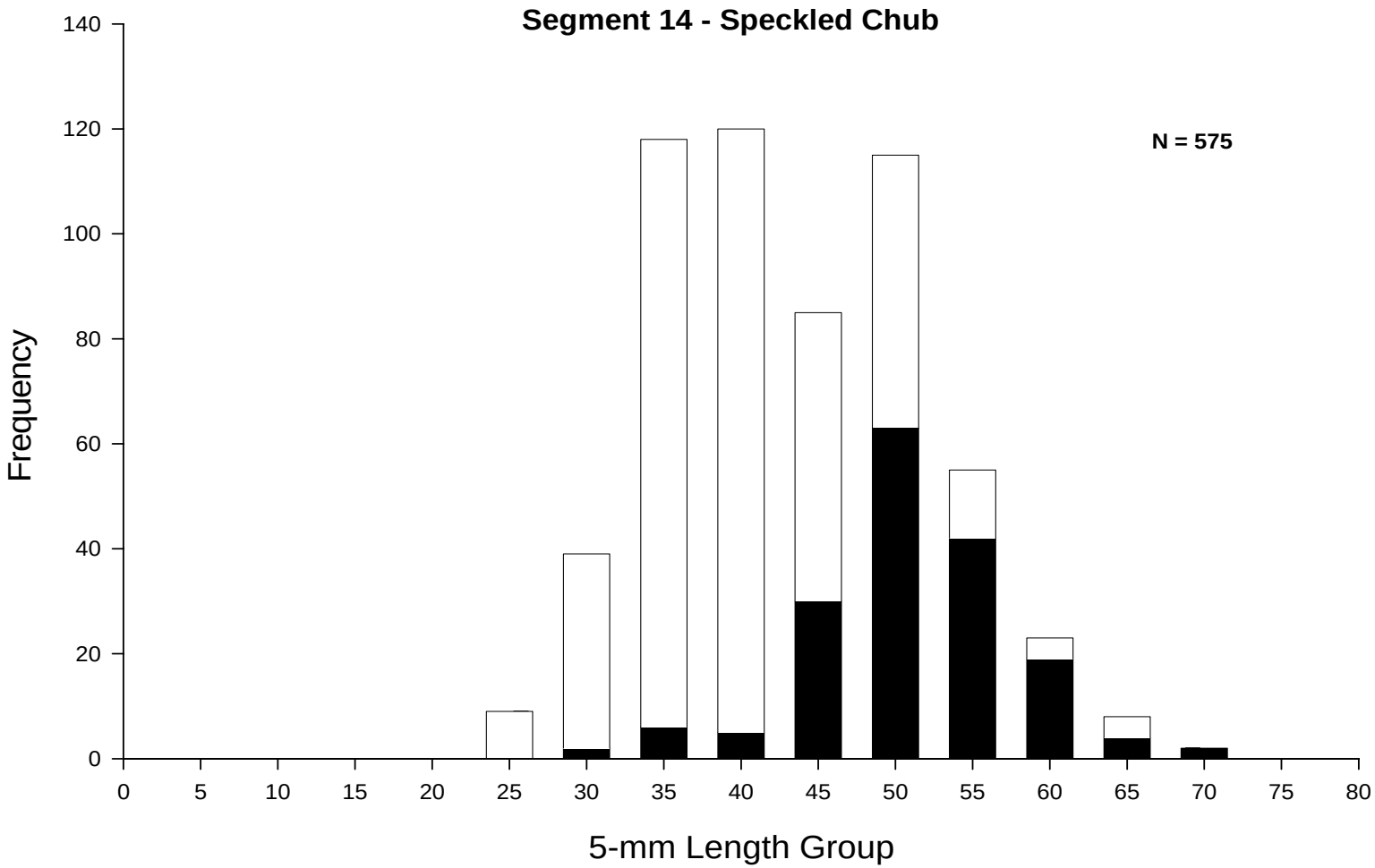

Figure 29. Length frequency of speckled chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during 2004 - 2005.

Sand Shiner

A total of 216 sand shiners were captured in segment 14, which was more than were captured in 2004 (N = 48; Doyle et al. 2005). The vast majority of sand shiners were captured during fish community season (99%; N = 213) versus sturgeon season (N = 3; Table 32). Mini-fyke nets (CPUE = 1.4; ±2SE = 1.76) and bag seines (CPUE = 0.97; ±2SE = 0.68) were the most effective gears at capturing sand shiners (making up 97% of the total catch) with otter trawls only making up 3% of the total catch (Table 32; Figure 32). Since mini-fyke nets and bag seines were only used during the fish community season, otter trawls were the only gear that captured sand shiners during sturgeon season with a CPUE of 0.01(±2SE = 0.01). Catch-per-unit-effort with otter trawls during sturgeon season was the same as for fish community season. Mini-fyke net CPUE greatly increased from 2004 (CPUE = 0.27 in 2004 versus 1.4 in 2005) and slightly increased for bag seines from 2004 (CPUE = 0.26 in 2004 versus 0.68 in 2005; Figure 32). The majority of sand shiners were captured in SCCL macrohabitat, which was largely disproportionate to sampling effort (43% of the total catch relative to only 5% of the total effort; Table 32). Since mini-fyke nets and bag seines were the primary gears that captured sand shiners, by definition, sand shiners were exclusively captured in BARS mesohabitat (100% of the total catch versus 99.5% of the total effort). It appears sand shiners primarily inhabit the BARS mesohabitat since seines and mini-fyke nets were the captured almost all of the sand shiners (97%; Table 32). Perhaps higher numbers of sand shiners would be captured if effort was increased effort in SCCL macrohabitat.

Pflieger (1997) reported that the maximum life span of the sand shiner is 3 years and that most do not reach sexual maturity until the second or third year. It was also report that sand shiners reach 25 mm in the first year and between 40 and 60 mm in the second year. Sand shiners captured during the 2005 sample season in segment 14 were almost exclusively captured during late summer and early fall, near the end of their spawning season. Figure 33 illustrates that there is some influence from the 2005 spawning season, with a YOY sand shiner cohort at around 25 mm in length. The majority of sand shiners captured were more than likely spawned in late spring and summer of 2004 (Figure 33). This indicates strong recruitment to age 1, however, no sand shiners were captured near their maximum age and length (70 mm) indicating an absence of age 2+ fish in our samples (Figure 33).

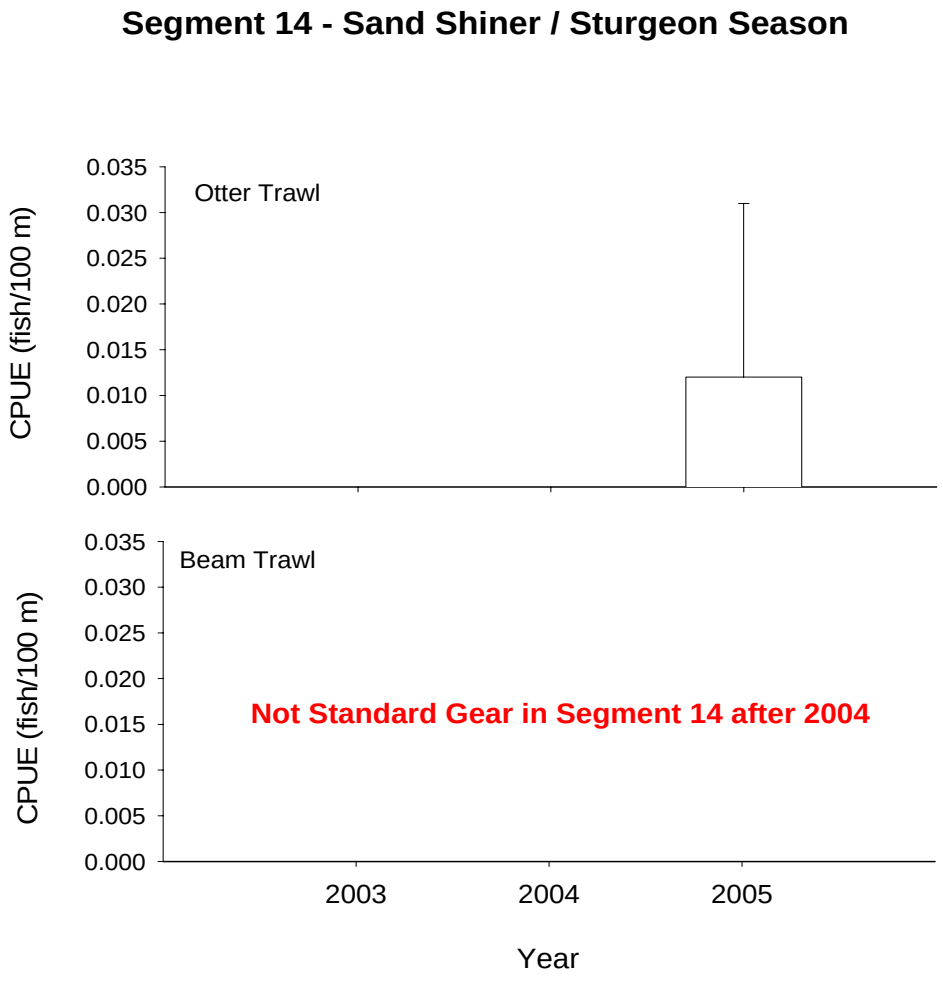

Figure 30. Mean annual catch-per-unit-effort (+/- 2SE) of sand shiner in segment 14 of the Missouri River during sturgeon season 2003-2005.

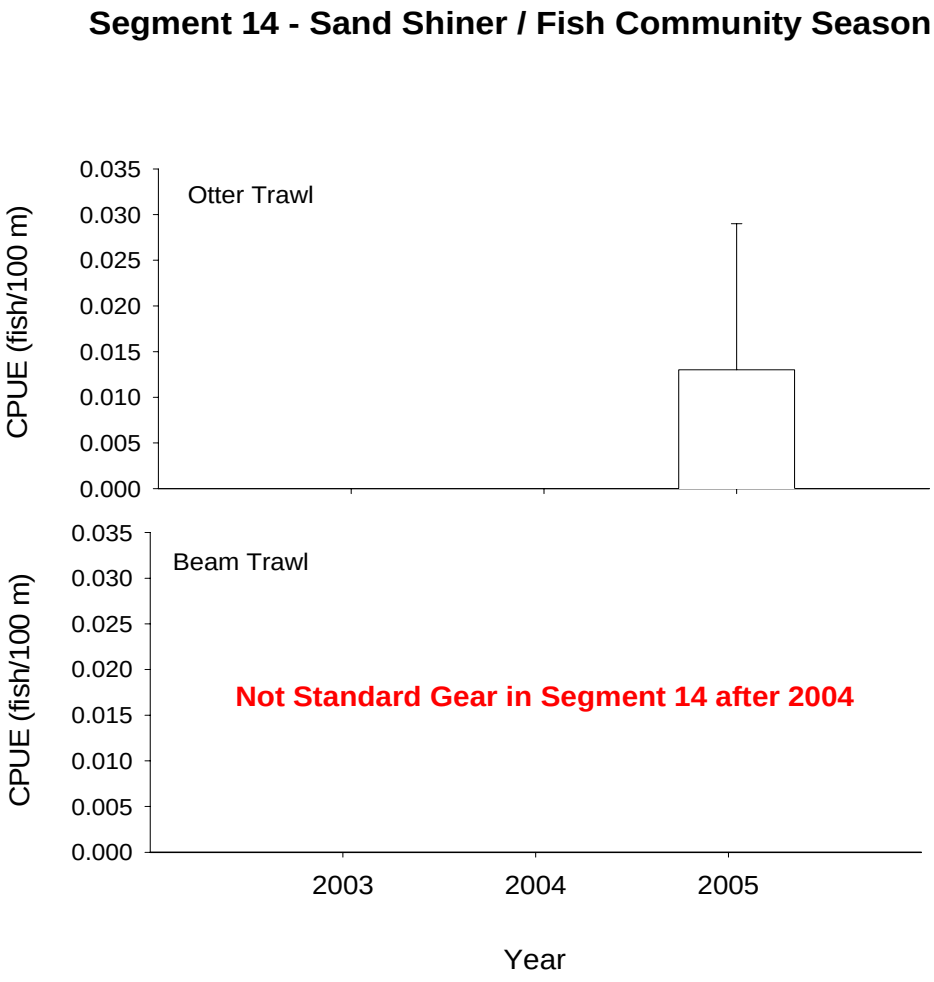

Figure 31. Mean annual catch-per-unit-effort (+/- 2SE) of sand shiner in segment 14 of the Missouri River during fish community season 2003-2005.

Segment 14 - Sand Shiner / Fish Community Season

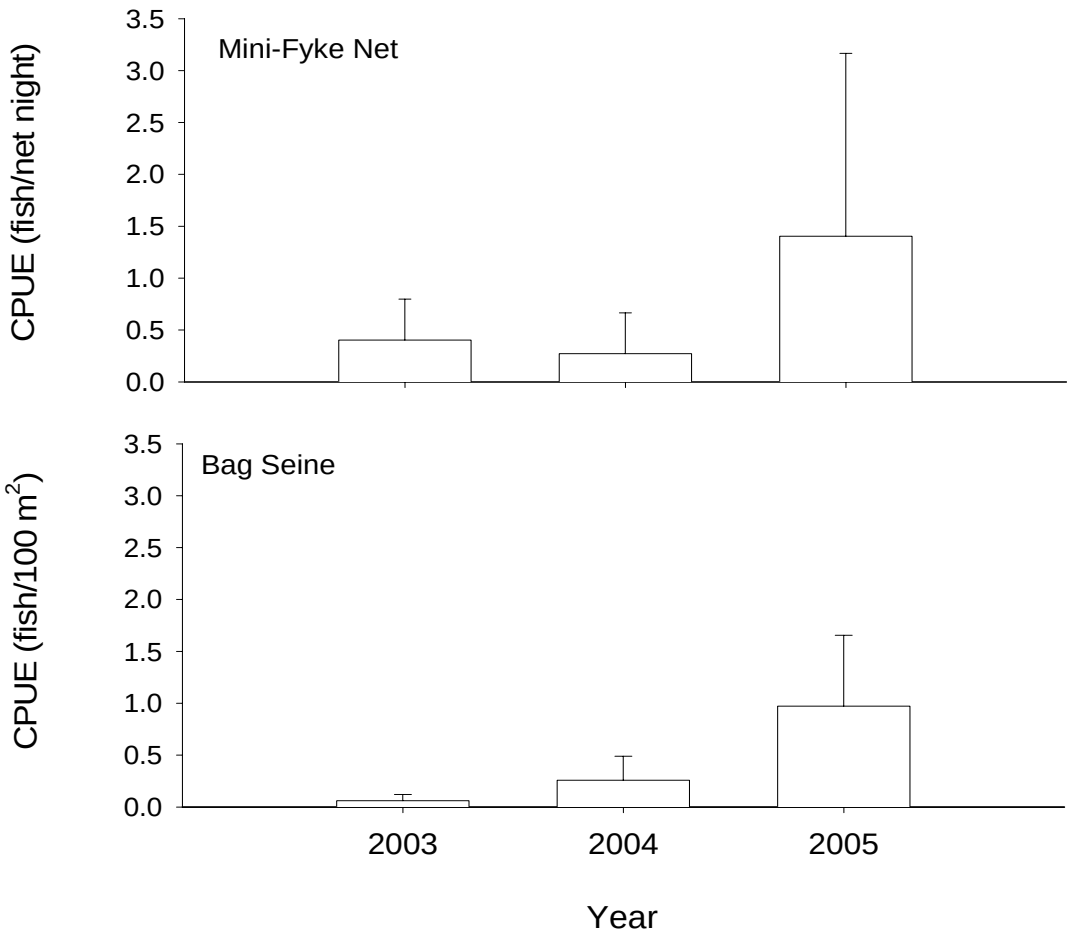

Figure 32. Mean annual catch-per-unit-effort (+/- 2SE) of sand shiner in segment 14 of the Missouri River during fish community season 2003-2005.

Table 32. Total number of sand shiners captured for each gear during each season and the proportion caught within each macrohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 14.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	5	N-E	N-E	60	0	5	3	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	15	4	N-E	N-E	74	1	2	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0		0	0	0	0	0
		N-E	22	4	N-E	N-E	37	27	5	5	0	0	1	0	0
Otter Trawl	3	N-E	0	0	N-E	N-E	33	67	0	0	0	0	0	0	0
		N-E	22	7	N-E	N-E	47	6	9	4	0	3	2	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	19	0	N-E	N-E	66	1	5	3	0	6	0	0	0
Bag Seine	92	N-E	9	0	N-E	N-E	58	0	28	0	0	5	0	0	0
		N-E	8	0	N-E	N-E	34	4	9	13	4	28	0	0	0
Mini-Fyke Net	118	N-E	5	0	N-E	N-E	28	2	57	0	0	8	0	0	0
		N-E	17	0	N-E	N-E	31	13	4	14	4	17	0	1	0
Otter Trawl	3	N-E	0	0	N-E	N-E	67	0	0	0	0	33	0	0	0
		N-E	18	0	N-E	N-E	56	1	3	4	0	17	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 33. Total number of sand shiners captured for each gear during each season and the proportion caught within each mesohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If numbers on the second line do not add to 100 then some mesohabitats were not taken in the field. The beam trawl is not standard gear in segment 14.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	93	N-E	4	0	2
2.5 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	48	N-E	7	44	1
Otter Trawl	3	0	100	N-E	0	0	0
		0	93	N-E	7	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	92	100	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	118	100	0	N-E	0	0	0
		99	1	N-E	0	0	0
Otter Trawl	3	0	100	N-E	0	0	0
		0	95	N-E	5	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

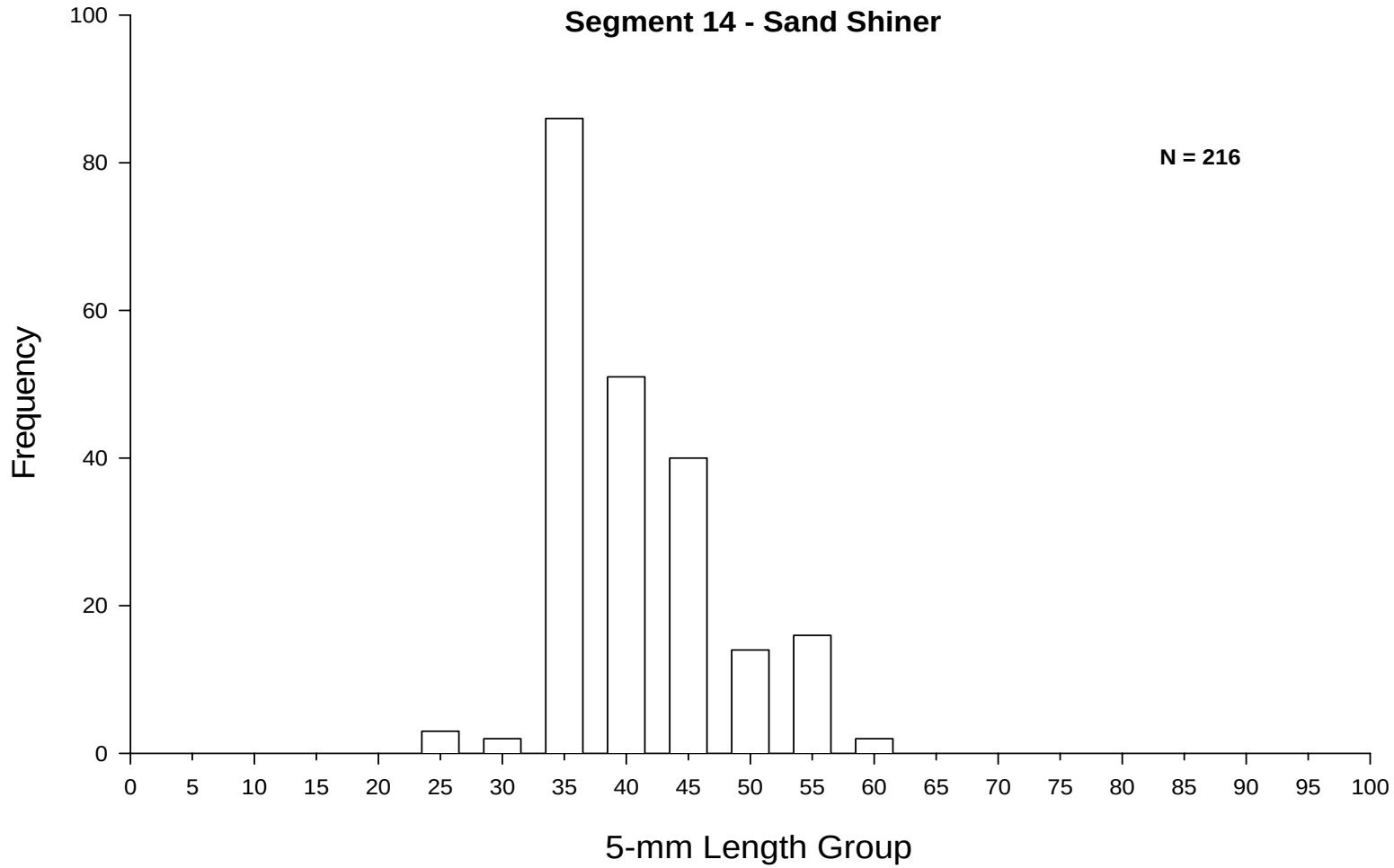

Figure 33. Length frequency of sand shiners in segment 14 of the Missouri River during summer (fish community season) 2004-2005.

Hybognathus spp.

A total of 47 *Hybognathus* spp. (HBNS) were captured in segment 14, which was more than were captured in 2004 (N = 4; Doyle et al. 2005). All of the HBNS were captured during fish community season (100%; N = 47; Table 37). Mini-fyke nets (CPUE = 0.12; ±2SE = 0.15) and bag seines (CPUE = 0.36; ±2SE = 0.47) were the only gears that captured HBNS (Table 34; Figure 36). Catch-per-unit-effort increased for both mini-fyke nets (CPUE = 0.05 in 2004 versus 0.12 in 2005) and bag seines (CPUE = 0.26 in 2004 versus 0.68 in 2005) from 2004 (Figure 36). Though effort was allocated similarly between macro and mesohabitats for mini-fyke nets and bag seines, capture rates were different for each gear. The majority of HBNS captured in mini-fyke nets occurred in CHXO BARS habitat (80% of the total catch relative to a total effort of 17%), whereas, the majority of HBNS captured in bag seines occurred in ISB BARS habitat (86% of the total catch relative to a total effort of 34%; Tables 34-35). Pflieger (1997) noted that HBNS prefer sandy substrates with swift currents, which is consistent with BARS mesohabitat. The lack of HBNS in trawl samples and the presence in seine and mini-fyke nets suggest this species primarily inhabits BARS mesohabitats, and does not stray into the CHNB mesohabitat.

There were not enough HBNS (N < 50) captured in segment 14 during the 2005 sample season to summarize year to year trends and population structure. It is apparent from Figure 37, however, that the majority of HBNS captured in segment 14 were age 1+, which is sexually mature.

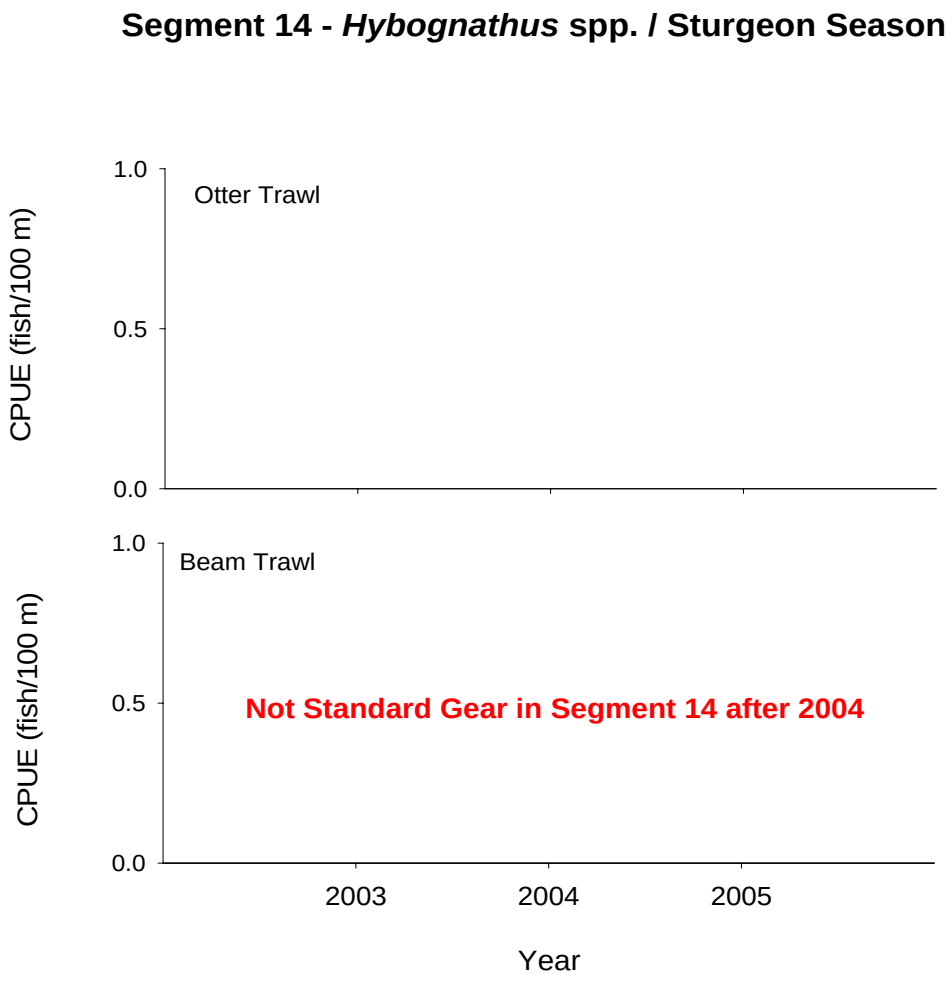

Figure 34. Mean annual catch-per-unit-effort (+/- 2SE) of *Hybognathus* spp. in segment 14 of the Missouri River during sturgeon season 2003-2005.

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

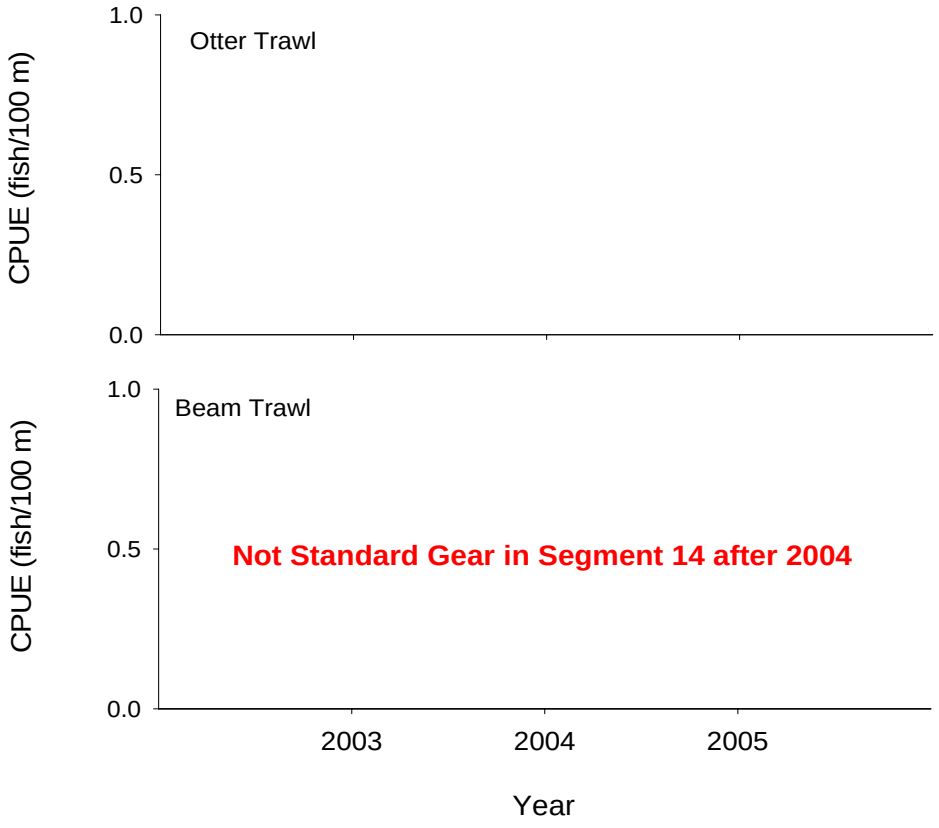

Figure 35. Mean annual catch-per-unit-effort (+/- 2SE) of *Hybognathus* spp. in segment 14 of the Missouri River during fish community season 2003-2005.

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

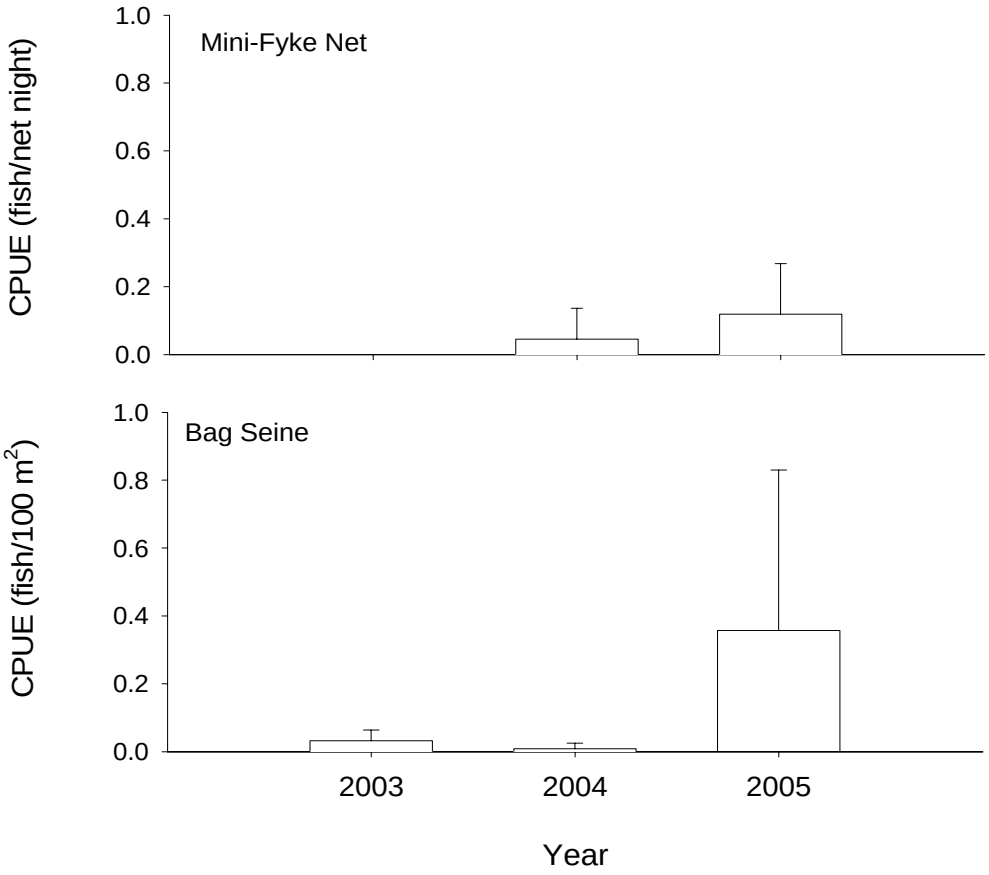

Figure 36. Mean annual catch-per-unit-effort (+/- 2SE) of *Hybognathus* spp. in segment 14 of the Missouri River during fish community season 2003-2005.

Table 34. Total number of *Hybognathus* spp. captured for each gear during each season and the proportion caught within each macrohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 14.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	5	N-E	N-E	60	0	5	3	0	0	0	0	0
2.5 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	15	4	N-E	N-E	74	1	2	4	0	0	0	0	0
Gill Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	22	4	N-E	N-E	37	27	5	5	0	0	1	0	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	22	7	N-E	N-E	47	6	9	4	0	3	2	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	19	0	N-E	N-E	66	1	5	3	0	6	0	0	0
Bag Seine	37	N-E	3	0	N-E	N-E	86	8	3	0	0	0	0	0	0
		N-E	8	0	N-E	N-E	34	4	9	13	4	28	0	0	0
Mini-Fyke Net	10	N-E	80	0	N-E	N-E	0	10	10	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	31	13	4	14	4	17	0	1	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	18	0	N-E	N-E	56	1	3	4	0	17	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 35. Total number of *Hybognathus* spp. captured for each gear during each season and the proportion caught within each mesohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If numbers on the second line do not add to 100 then some mesohabitats were not taken in the field. The beam trawl is not standard gear in segment 14.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	93	N-E	4	0	2
2.5 Inch Trammel	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Gill Net	0	0	0	N-E	0	0	0
		0	48	N-E	7	44	1
Otter Trawl	0	0	0	N-E	0	0	0
		0	93	N-E	7	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	37	100	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	10	100	0	N-E	0	0	0
		99	1	N-E	0	0	0
Otter Trawl	0	0	0	N-E	0	0	0
		0	95	N-E	5	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

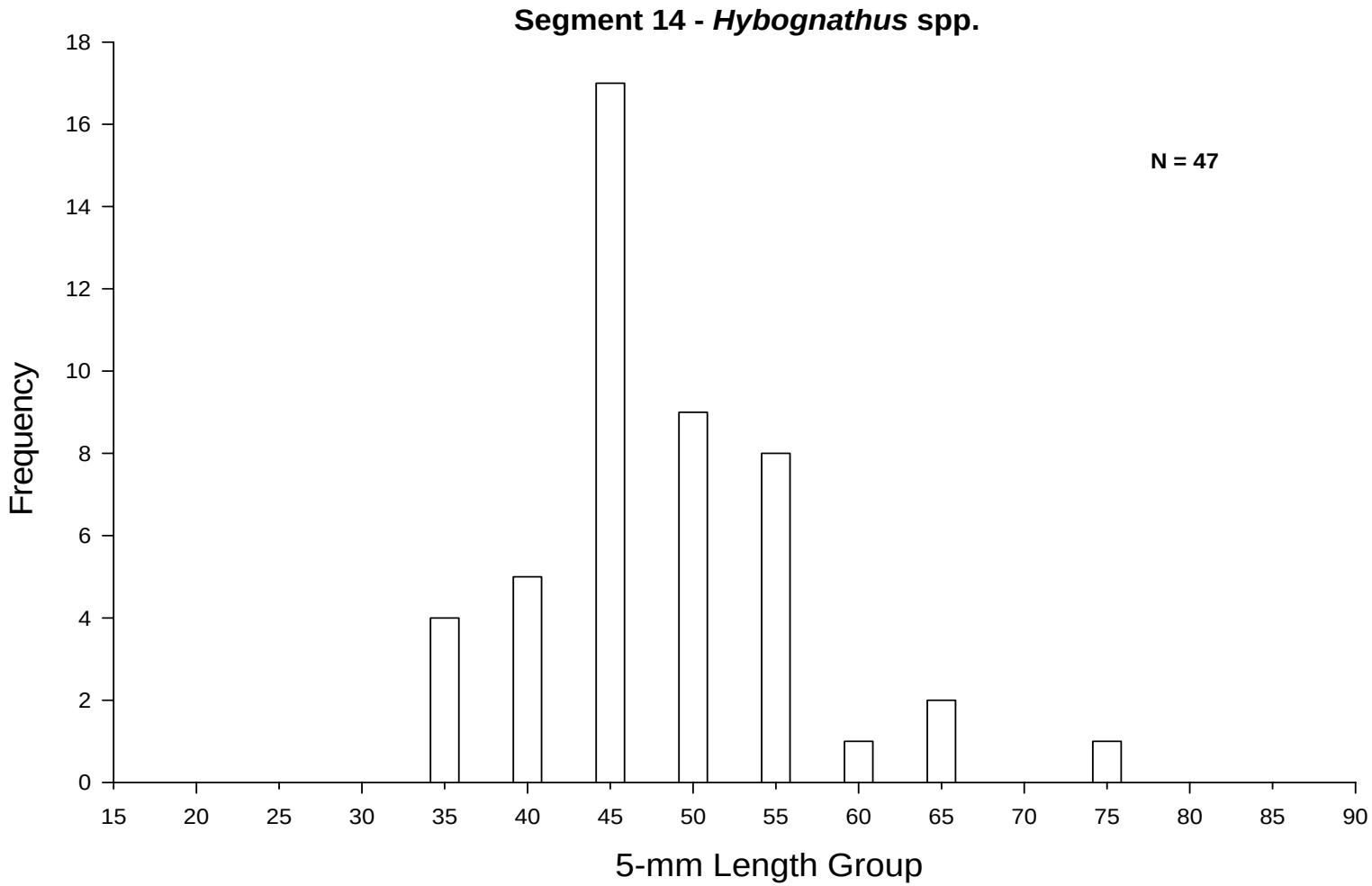

Figure 37. Length frequency of *Hybognathus* spp. caught in segment 14 of the Missouri River during summer (fish community season) 2004-2005

Blue Sucker

A total of 232 blue suckers were captured in segment 14, more than twice the number that were captured in 2004 (N = 106; Doyle et al. 2005). Most blue suckers were captured during the sturgeon season (87.9%; N = 204) versus the fish community season (N = 26; Table 36). Two and a half inch trammel nets (CPUE = 0.34; ±2SE = 0.11) were the most effective gear used for capturing blue suckers (46% of the total catch), followed by 1 inch trammel nets (overall mean CPUE = 0.15; ±2SE = 0.06), gillnets (CPUE = 0.13; ±2SE = 0.09), and otter trawls (overall mean CPUE = 0.05; ±2SE = 0.02; Figures 38-41; Appendix F). Mini-fyke nets and bag seines did not capture any blue suckers in 2005. This was the first year for 2.5 inch trammel nets in segment 14 so there is no comparison between years. For sturgeon season, catch rates in 1 inch trammel nets (CPUE = 0.17 in 2004 versus 0.2 in 2005) and gillnets (CPUE = 0.02 in 2004 versus 0.13 in 2005) increased from 2004, whereas otter trawl CPUE decreased slightly (CPUE = 0.1 in 2004 versus 0.06 in 2005; Figures 38-39). For fish community season, 1 inch trammel nets were the most effective. Catch-per-unit-effort for 1 inch trammel nets has increased over the past three years (2003 = 0.006; 2004 = 0.07; 2005 = 0.1; Figure 41). Otter trawl CPUE for fish community season has doubled from 2004 (CPUE = 0.02 in 2004 versus 0.04 in 2005), however, only 8 blue suckers were captured (Figure 41). In both sturgeon and fish community seasons, blue suckers were primarily captured in ISB CHNB habitat (66% of the total catch relative to 50.6% of the total effort; Tables 36-37). Overall, there seems to be a trend in increased catch for blue suckers since 2003 (Figure 38-39, 41).

All blue suckers captured were mature adults more than likely four years old or older (Pflieger 1997; Figure 44). Pflieger (1997) noted that blue suckers sexually mature at a size between 500 and 660 mm which is the point at which we start to see them in our nets. Interestingly, it is rare for us to capture blue suckers before they are sexually mature (< 500 mm; Figure 44). Sexually mature and actively spawning blue suckers seem to be vulnerable to our sampling gear, though, we may have to explore new methods and techniques to detect the presence (or absence) of YOY and juvenile blue suckers.

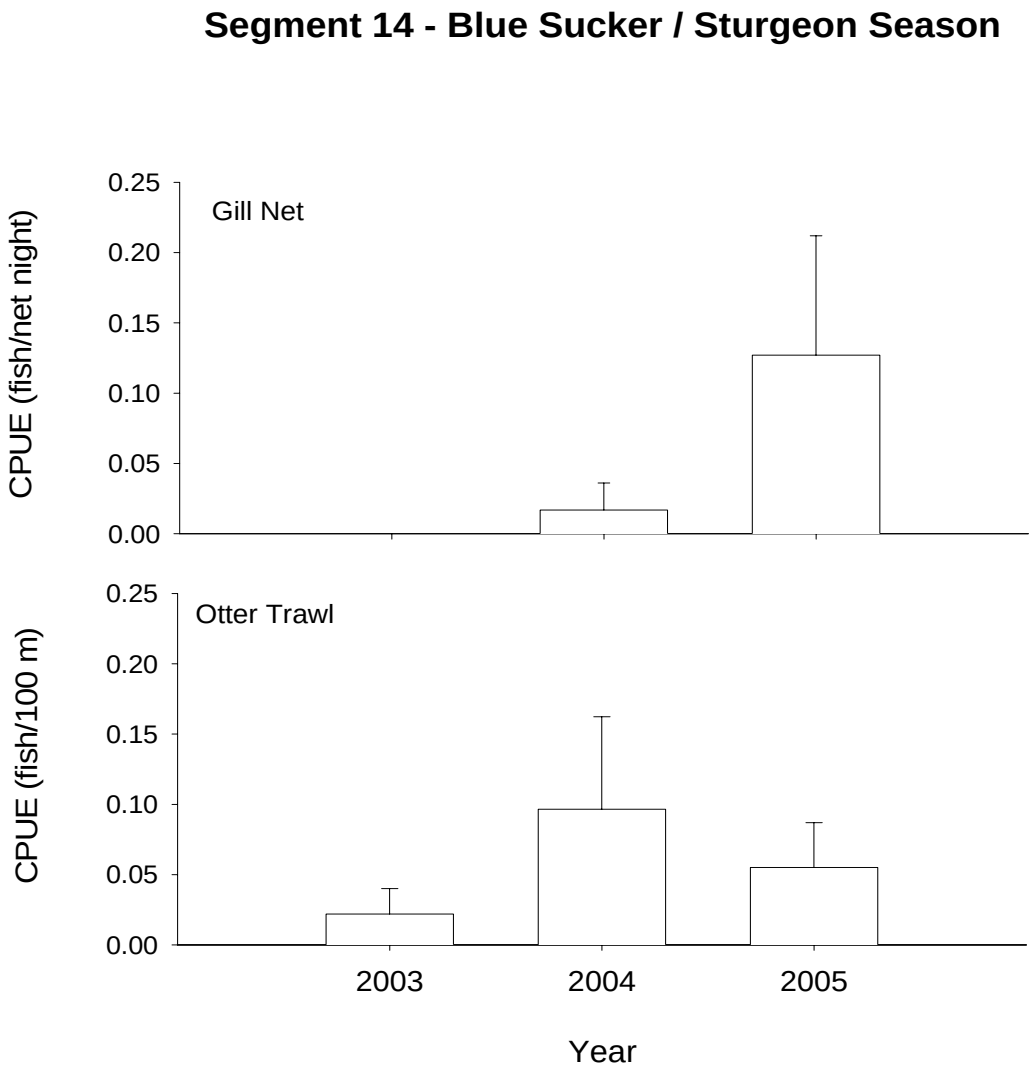

Figure 38. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segment 14 of the Missouri River during sturgeon season 2003-2005.

Figure 39. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segment 14 of the Missouri River during sturgeon season 2003-2005.

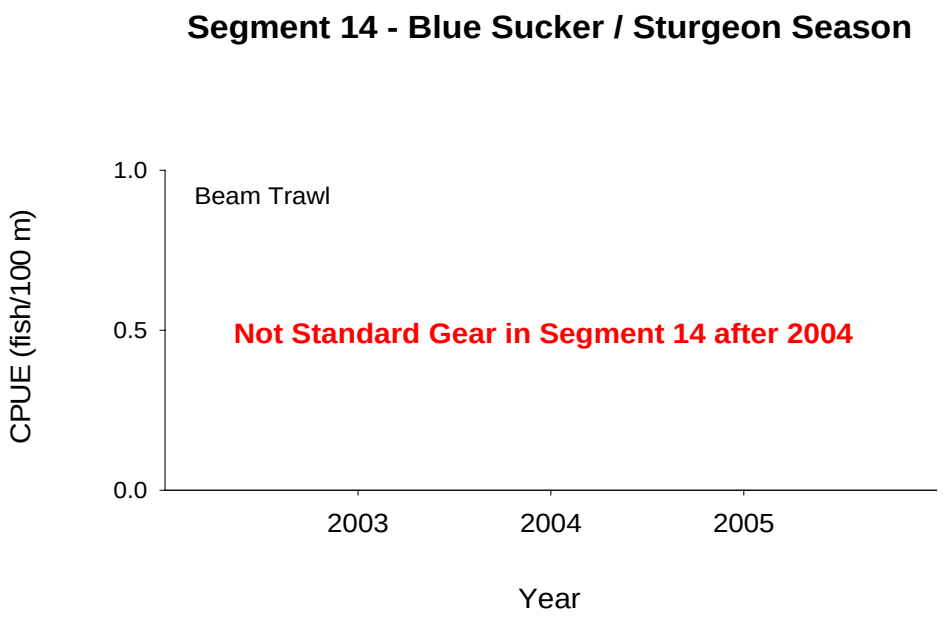

Figure 40. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segment 14 of the Missouri River during sturgeon season 2003-2005.

Segment 14 - Blue Sucker / Fish Community Season

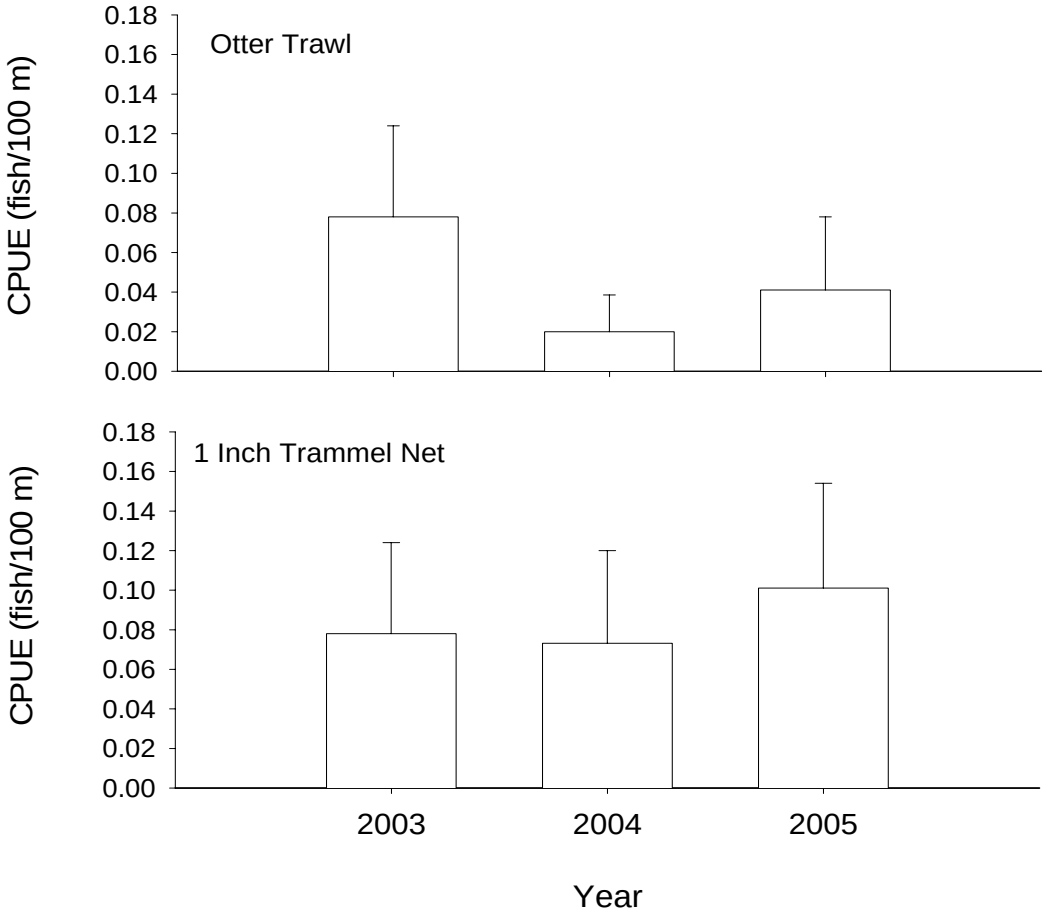

Figure 41. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segment 14 of the Missouri River during fish community season 2003-2005.

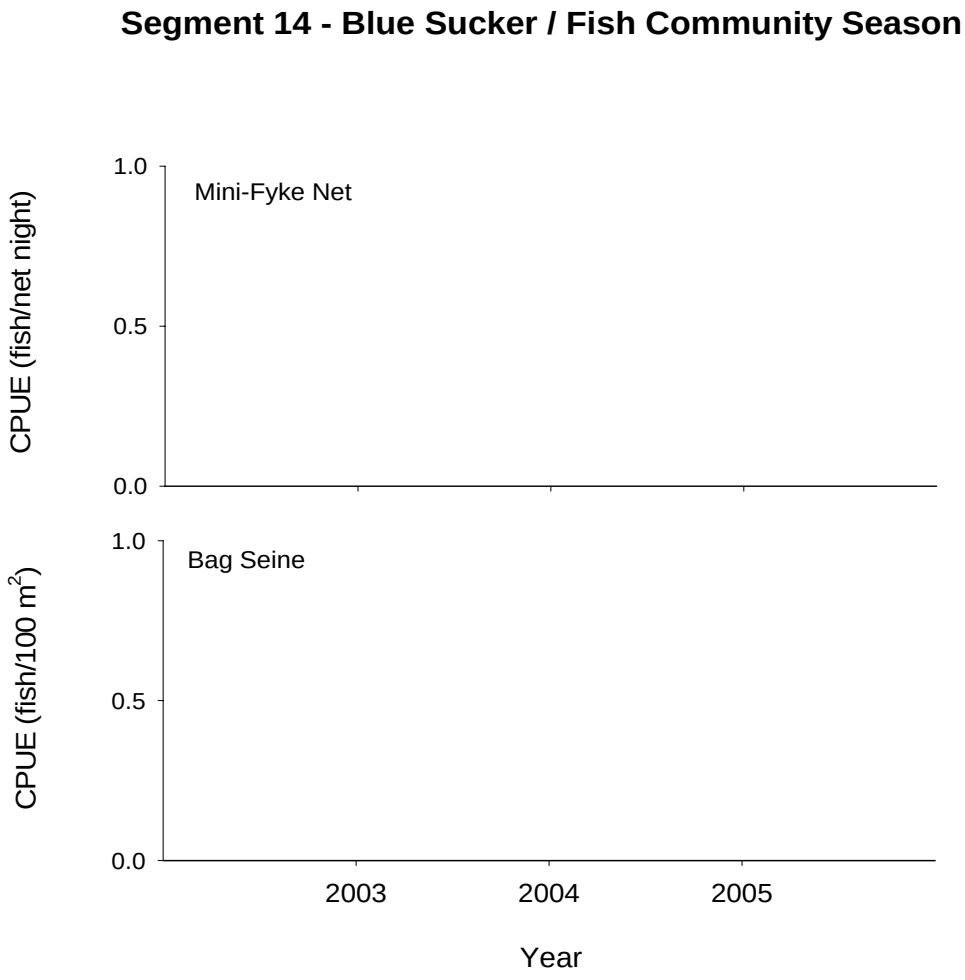

Figure 42. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segment 14 of the Missouri River during fish community season 2003-2005.

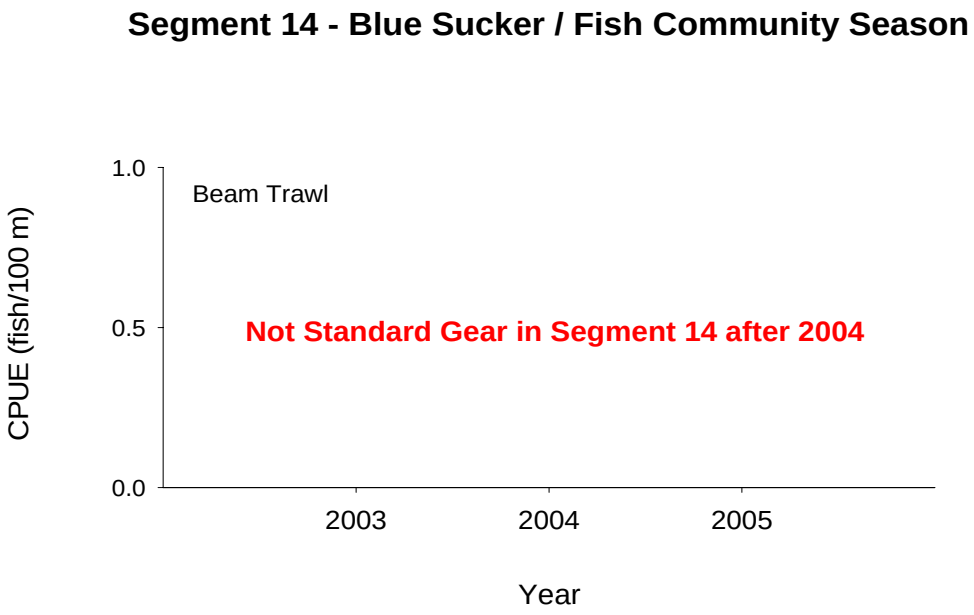

Figure 43. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segment 14 of the Missouri River during fish community season 2003-2005.

Table 36. Total number of blue suckers captured for each gear during each season and the proportion caught within each macrohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 14.

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	47	N-E	38	6	N-E	N-E	55	0	0	0	0	0	0	0	0
		N-E	26	5	N-E	N-E	60	0	5	3	0	0	0	0	0
2.5 Inch Trammel Net	107	N-E	7	7	N-E	N-E	79	0	2	5	0	0	0	0	0
		N-E	15	4	N-E	N-E	74	1	2	4	0	0	0	0	0
Gill Net	36	N-E	17	0	N-E	N-E	28	11	0	19	0	0	25	0	0
		N-E	22	4	N-E	N-E	37	27	5	5	0	0	1	0	0
Otter Trawl	14	N-E	7	29	N-E	N-E	50	0	7	0	0	0	7	0	0
		N-E	22	7	N-E	N-E	47	6	9	4	0	3	2	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	22	N-E	0	0	N-E	N-E	91	0	5	5	0	0	0	0	0
		N-E	19	0	N-E	N-E	66	1	5	3	0	6	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	8	0	N-E	N-E	34	4	9	13	4	28	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	31	13	4	14	4	17	0	1	0
Otter Trawl	8	N-E	38	0	N-E	N-E	62	0	0	0	0	0	0	0	0
		N-E	18	0	N-E	N-E	56	1	3	4	0	17	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 37. Total number of blue suckers captured for each gear during each season and the proportion caught within each mesohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If numbers on the second line do not add to 100 then some mesohabitats were not taken in the field. The beam trawl is not standard gear in segment 14.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	47	0	100	N-E	0	0	0
		0	93	N-E	4	0	2
2.5 Inch Trammel Net	107	0	95	N-E	5	0	0
		0	96	N-E	4	0	0
Gill Net	36	0	36	N-E	19	19	25
		0	48	N-E	7	44	1
Otter Trawl	14	0	100	N-E	0	0	0
		0	93	N-E	7	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	22	0	95	N-E	5	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	0	0
		99	1	N-E	0	0	0
Otter Trawl	8	0	100	N-E	0	0	0
		0	95	N-E	5	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

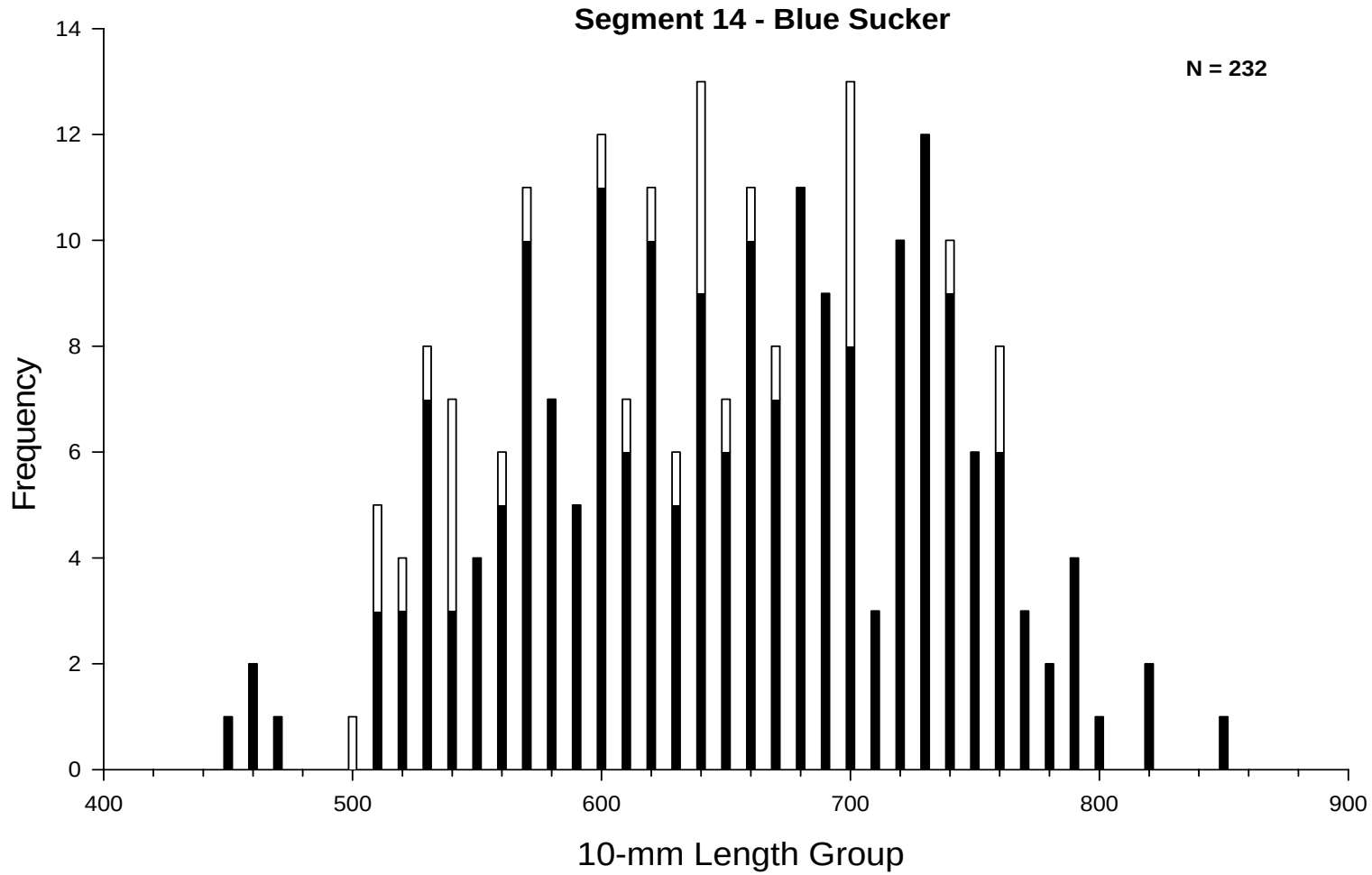

Figure 44. Length frequency of blue suckers during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during 2004 - 2005.

Sauger

A total of 38 sauger were captured in segment 14, slightly more than were captured in 2004 (N = 31; Doyle et al. 2005). Nearly all of the sauger were captured during sturgeon season (78.9%; N = 30; Tables 38-39). Gillnets were the most effective gear at capturing sauger (68.4% of the total catch; CPUE = 0.09; Table 38; Figure 45). For sturgeon season, gillnet CPUE decreased slightly from 2004 (CPUE = 0.12 in 2004 versus 0.09 in 2005) and no sauger were captured in 1 inch trammel nets in 2005 (Figure 46; Table 38). The majority of sauger captured in gillnets occurred in OSB Macrohabitat (54% of the total catch relative to 27% of the effort). Sauger were captured evenly between CHNB and POOL Mesohabitats with gillnets during sturgeon season and between CHNB and BARS habitat during fish community season (Tables 38-39).

There were not enough sauger (N < 50) captured in segment 14 during the 2005 sample season to summarize year to year trends and population structure. Based on age structure described by Pflieger (1997), however, it seems that the majority of sauger captured in segment 14 were between 3 and 4 years old (350 to 415 mm; Figure 51).

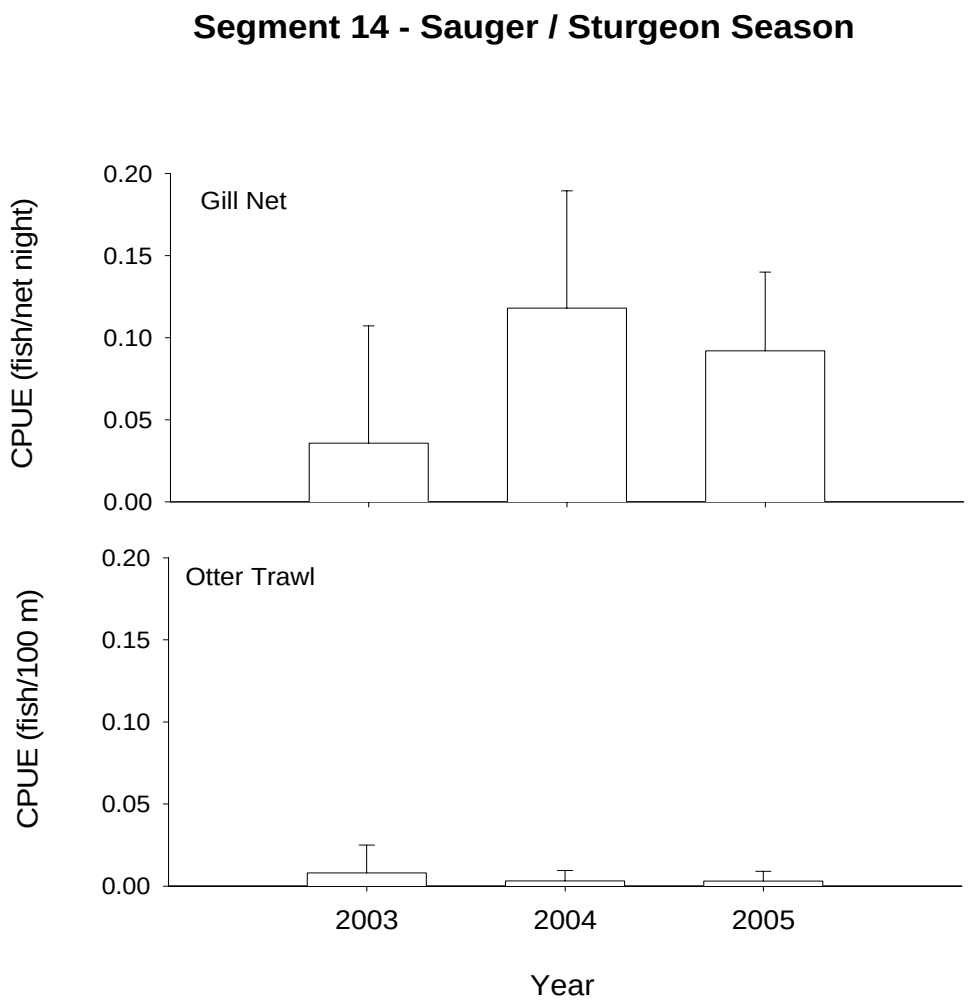

Figure 45. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segment 14 of the Missouri River during sturgeon season 2003-2005.

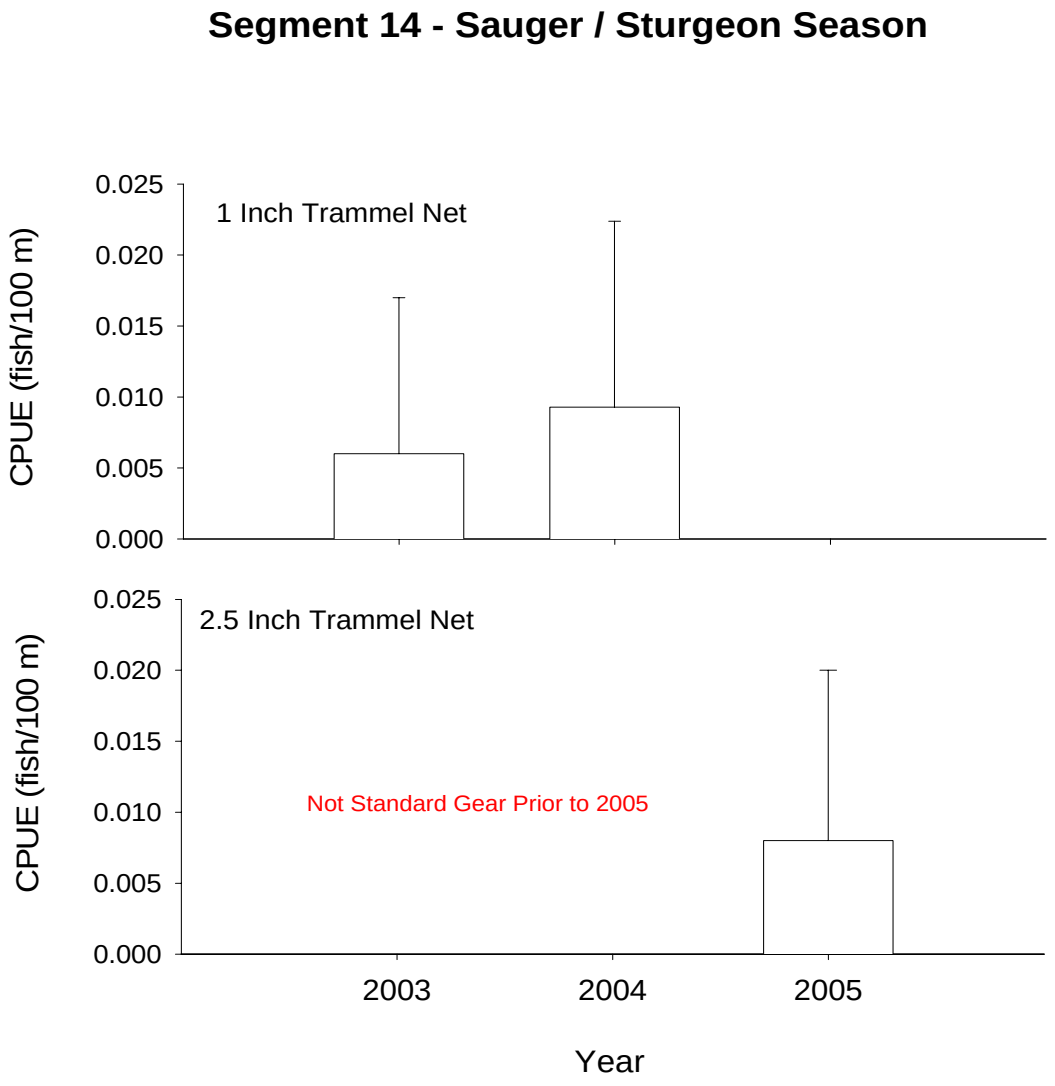

Figure 46. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segment 14 of the Missouri River during sturgeon season 2003-2005.

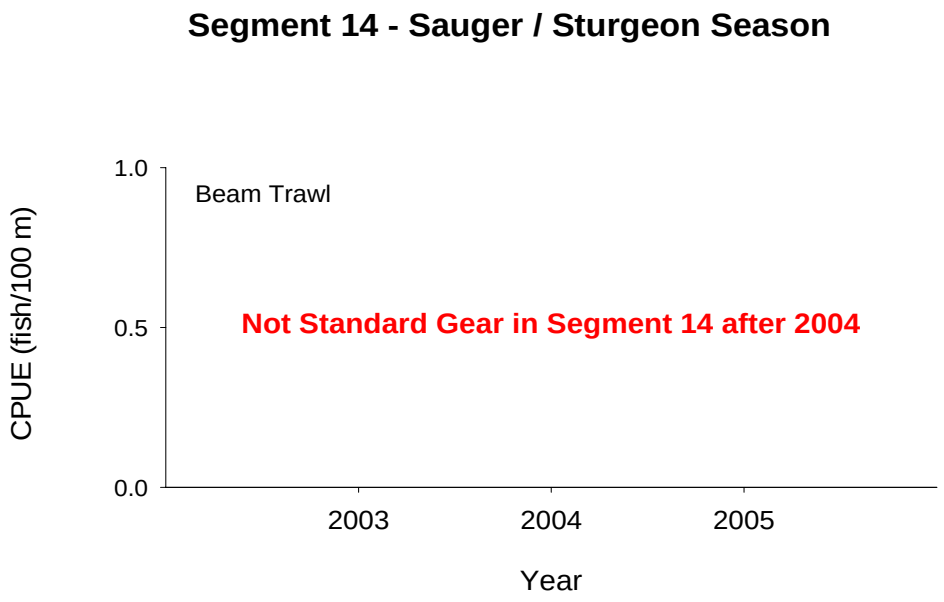

Figure 47. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segment 14 of the Missouri River during sturgeon season 2003-2005.

Segment 14 - Sauger / Fish Community Season

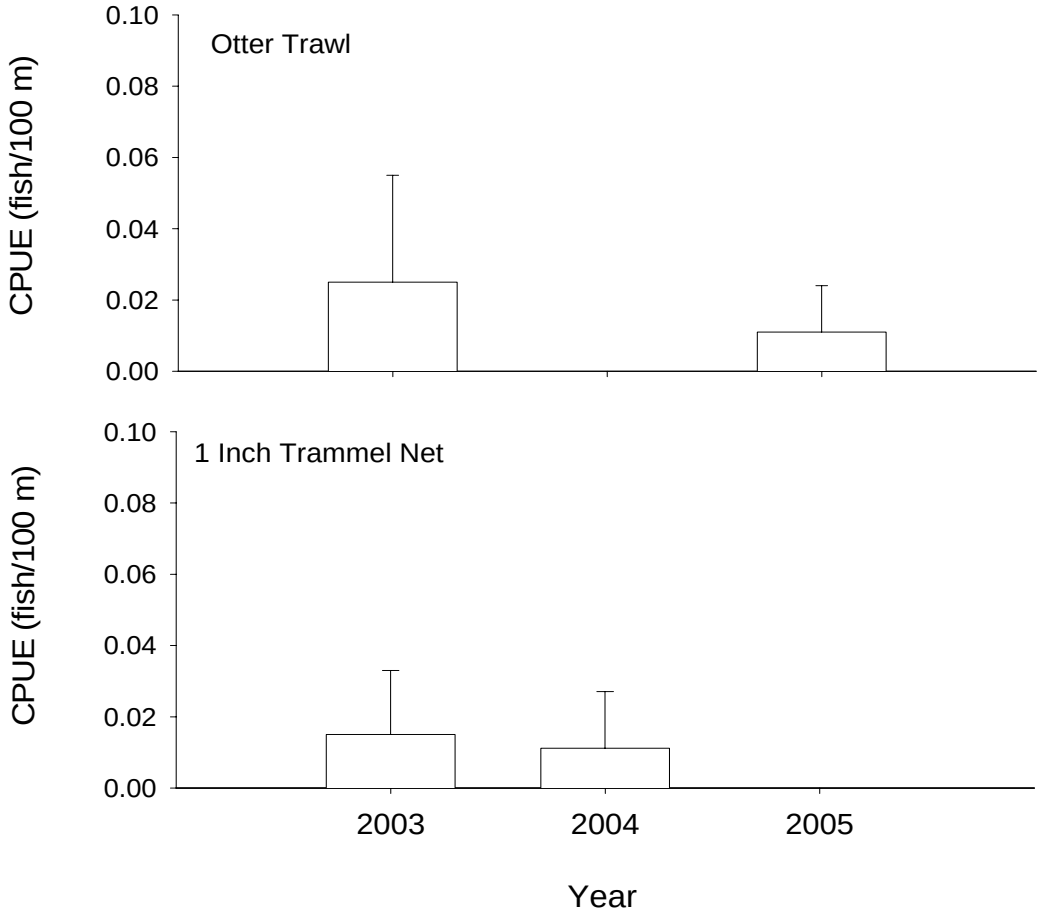

Figure 48. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segment 14 of the Missouri River during fish community season 2003-2005.

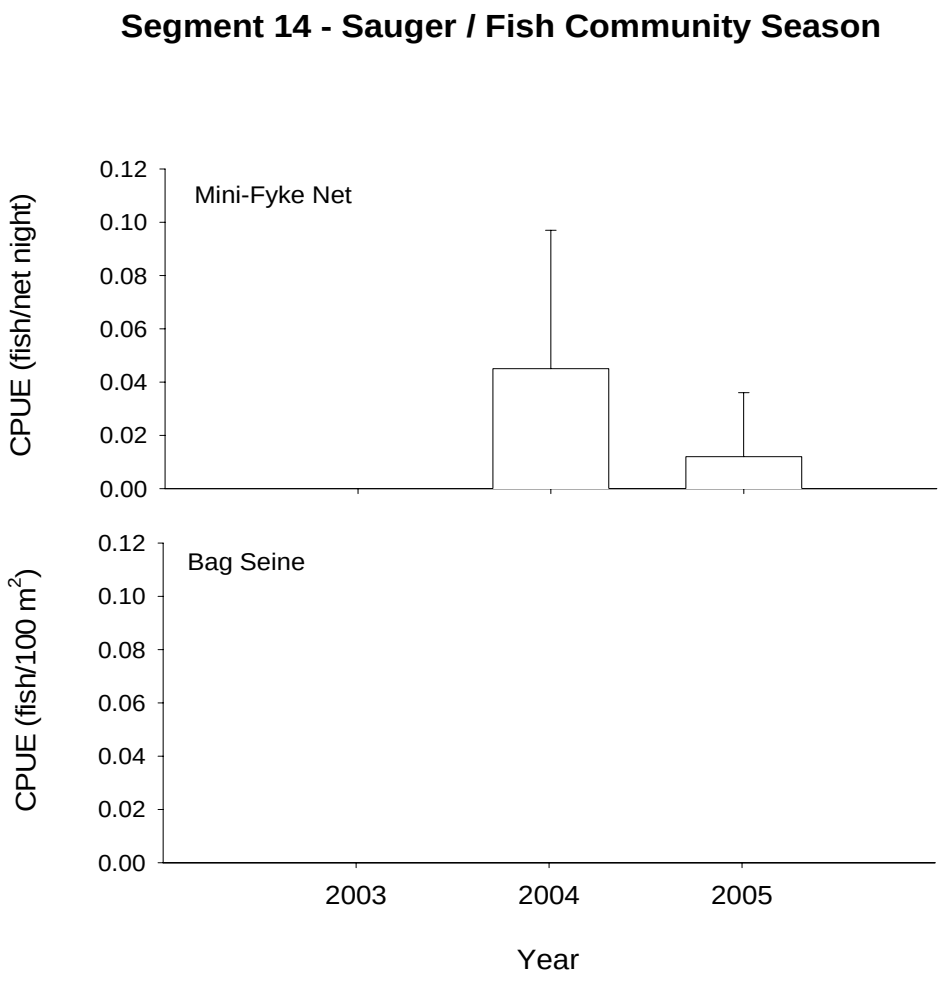

Figure 49. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segment 14 of the Missouri River during fish community season 2003-2005.

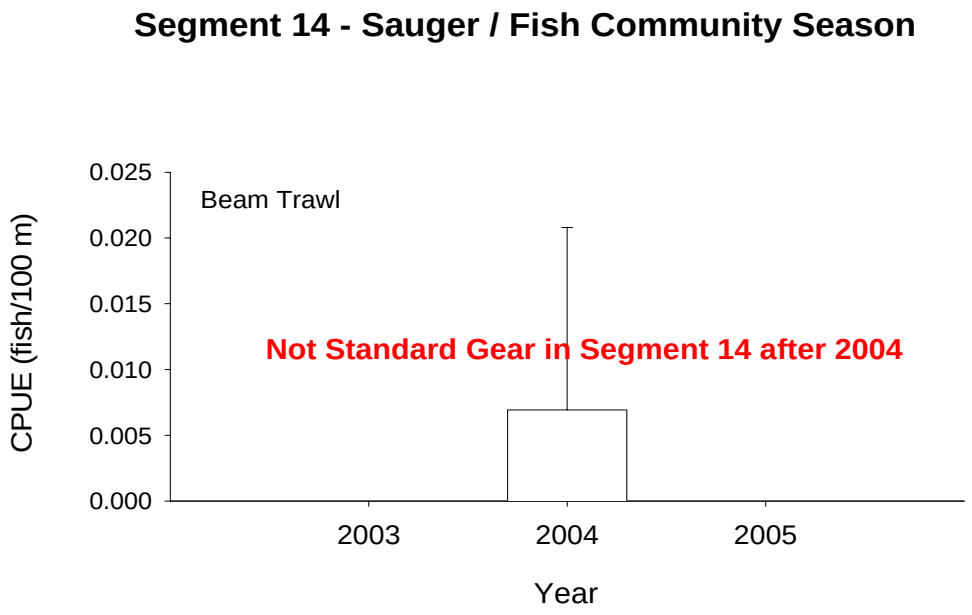

Figure 50. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segment 14 of the Missouri River during fish community season 2003-2005.

Table 38. Total number of sauger captured for each gear during each season and the proportion caught within each macrohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. The beam trawl is not standard gear in segment 14.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	26	5	N-E	N-E	60	0	5	3	0	0	0	0	0
2.5 Inch Trammel Net	3	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	0
		N-E	15	4	N-E	N-E	74	1	2	4	0	0	0	0	0
Gill Net	26	N-E	38	0	N-E	N-E	8	54	0	0	0	0	0	0	0
		N-E	22	4	N-E	N-E	37	27	5	5	0	0	1	0	0
Otter Trawl	1	N-E	0	0	N-E	N-E	0	0	0	0	0	0	100	0	0
		N-E	22	7	N-E	N-E	47	6	9	4	0	3	2	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Fish Community Season (Summer)															
1 Inch Trammel Net	4	N-E	50	0	N-E	N-E	50	0	0	0	0	0	0	0	0
		N-E	19	0	N-E	N-E	66	1	5	3	0	6	0	0	0
Bag Seine	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	0
		N-E	8	0	N-E	N-E	34	4	9	13	4	28	0	0	0
Mini-Fyke Net	1	N-E	0	0	N-E	N-E	0	100	0	0	0	0	0	0	0
		N-E	17	0	N-E	N-E	31	13	4	14	4	17	0	1	0
Otter Trawl	3	N-E	0	0	N-E	N-E	33	0	0	0	0	67	0	0	0
		N-E	18	0	N-E	N-E	56	1	3	4	0	17	0	0	0
Beam Trawl	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
		N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-

Table 39. Total number of sauger captured for each gear during each season and the proportion caught within each mesohabitat type (first line of gear type) in segment 14 of the Missouri River during 2004-2005. The percent of total effort for each gear in each habitat presented is on the second line of each gear type. The N-E indicates the habitat is non-existent in the segment. If numbers on the second line do not add to 100 then some mesohabitats were not taken in the field. The beam trawl is not standard gear in segment 14.

Gear	N	**Mesohabitat**					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	0	0
		0	93	N-E	4	0	2
2.5 Inch Trammel Net	3	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Gill Net	26	0	50	N-E	0	50	0
		0	48	N-E	7	44	1
Otter Trawl	1	0	100	N-E	0	0	0
		0	93	N-E	7	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-
Fish Community Season (Summer)							
1 Inch Trammel Net	4	0	100	N-E	0	0	0
		0	96	N-E	4	0	0
Bag Seine	0	0	0	N-E	0	0	0
		100	0	N-E	0	0	0
Mini-Fyke Net	1	100	0	N-E	0	0	0
		99	1	N-E	0	0	0
Otter Trawl	3	0	100	N-E	0	0	0
		0	95	N-E	5	0	0
Beam Trawl	-	-	-	N-E	-	-	-
		-	-	N-E	-	-	-

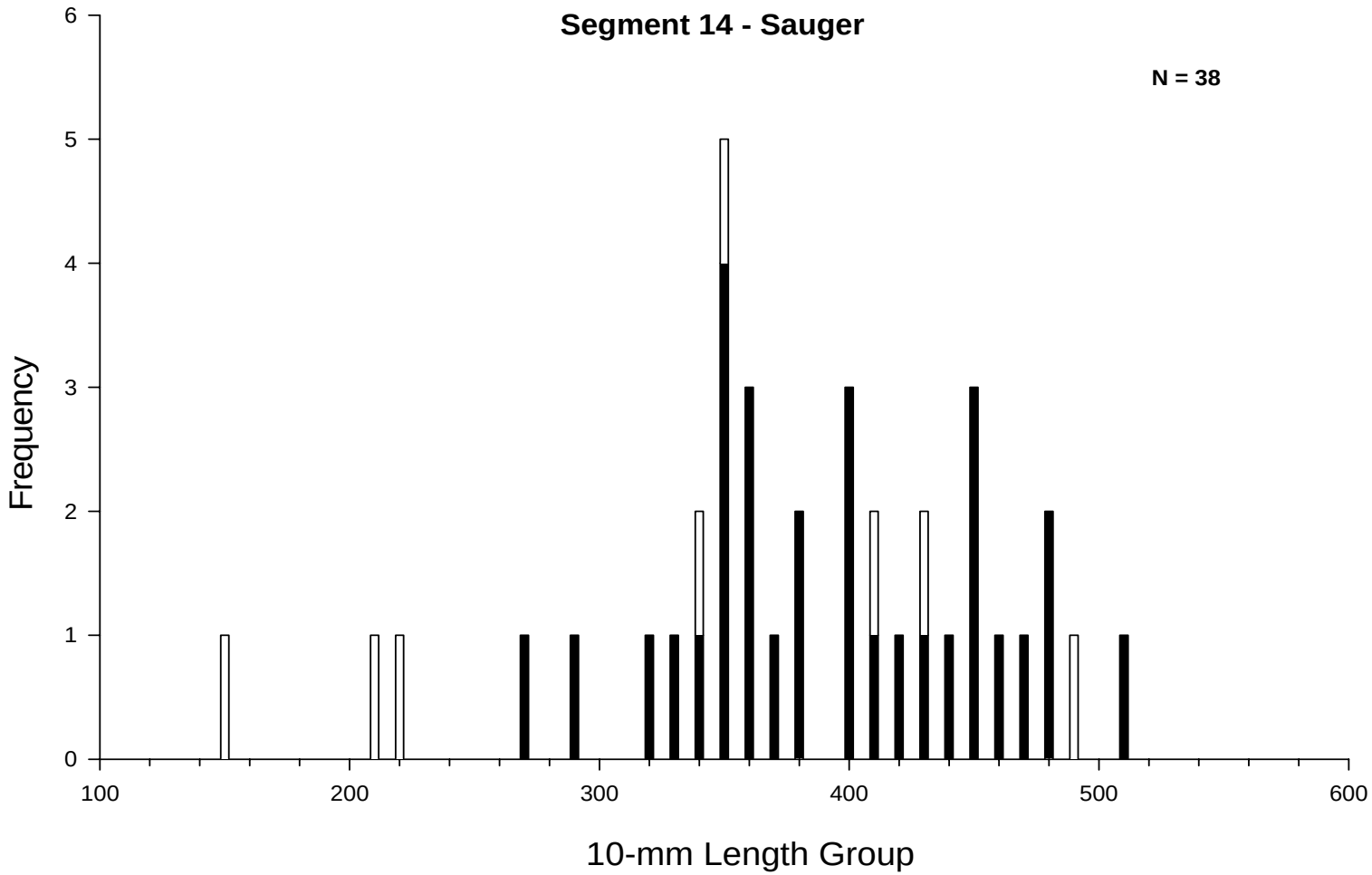

Figure 51. Length frequency of sauger during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 14 of the Missouri River during 2004-2005.

Missouri River Fish Community

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

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

During the 2005 sample season, 19,374 fish were captured in segment 14 of the Lower Missouri River. Standard gears captured 67 species with river carpsuckers making up the largest percentage of the total catch (22.9%; N = 4,437), followed by shovelnose sturgeon (11.0%; N = 2,448), blue catfish (11.0%; N = 2,135), and emerald shiner (9.9%; N = 1,914). The 9 target species accounted for only 17.1% of the total catch with each contributing in the following order of abundance: shovelnose sturgeon (11.0%; N = 2,448), speckled chub (2.0%; N = 575), sicklefin chub (1.4%; N = 355), blue sucker (1.2%; N = 232), sand shiner (1.0%; N = 216), *Hybognathus* spp. (0.3%; N = 47), sauger (0.2%; N = 38), sturgeon chub (0.2%; N = 36), and pallid sturgeon (0.05%; N = 11). Seventeen species were captured fewer than five times during the entire sample year (Appendix F).

Gillnets captured 29 species and were most effective at capturing shovelnose sturgeon (60.0% of the catch; N = 1,018), with an average CPUE of 4.38 per net night. Blue catfish (13.7%; N = 232), goldeye (6.3%; N = 107), and longnose gar (2.8%; N = 48) were the next most abundant fish species collected in gillnet samples (mean CPUE = 0.831, 0.074, and 0.18 fish per net/night respectively). Gillnets were only used during sturgeon season.

One inch trammel nets, fished during both seasons, captured 25 species with shovelnose sturgeon making up the majority of the catch (65.7%; N = 492; mean CPUE = 1.36). Other large bodied fish, such as blue suckers (10.8%; N = 81; mean CPUE = 0.2) and blue catfish (8.7%; N = 65; mean CPUE = 0.15), were also captured effectively with 1 inch trammel nets (Appendix H). 2.5 inch trammel nets, fished only in sturgeon season, caught 17 species and, similar to 1 inch trammel nets, shovelnose sturgeon made up the majority of the total catch (36.1%; N = 130;

mean CPUE = 0.46) followed by blue suckers (29.4%; N = 106; mean CPUE = 0.34) and smallmouth buffalo (12.5%; N = 45; mean CPUE = 0.14; Appendix H).

Otter trawls captured 49 species of fish, most of which were small benthic fishes, which are not easily sampled with other gear types. Young-of-year blue (30.7%; N = 1,790; mean CPUE = 0.64) and channel catfish (20.8%; N = 1,214; mean CPUE = 0.69) were captured most frequently in otter trawl samples. Otter trawls were very effective at capturing chub species in segment 14; speckled chub (5.5; N = 320; mean CPUE = 0.65) and sicklefin chub (4.5%; N = 260; mean CPUE = 0.84), and sturgeon chub (0.6%; N = 35; mean CPUE 0.05), as well as shovelnose sturgeon (8.3%; N = 483; mean CPUE = 1.14; Appendix H). Twenty juvenile paddlefish were also captured with otter trawls (mean CPUE = 0.11; Appendix H).

The fish community season is different because warm water temperatures and low water levels increase availability of fish and efficiency of sampling, especially in bag seines and mini-fyke nets. These gear types target another group of fishes which are rarely detected with the other standard gear types. Cyprinid species, such as emerald shiners (N = 1,914) and red shiners (N = 1,623), were caught in high numbers with bag seines and mini-fyke nets. Specifically, bag seines captured 47 species of fish including one species not captured with any other gear type (bigeye shiner, N = 1). Mini-fyke nets captured 45 species including 6 species not captured with any other gear type (orange spotted sunfish, N = 36; green sunfish, N = 10; redfin shiner, N = 2; central stoneroller, N = 1; and fathead minnow, N = 1) and also captured YOY common carp (N = 4), which is a life stage of this species that is hard to capture with other gear types. Asian carp are still hard to capture at young life stages but, through observations in the field and through collections using other gear types from related projects (e.g., electrofishing, hoop nets), seem to be increasing in abundance throughout the Lower Missouri River. Additional sampling gear and improved sampling techniques need to be further investigated to help document the population dynamics of this increasingly invasive exotic species.

Discussion

Adult pallid sturgeon appeared to use different habitats than juveniles. Doyle et al. (2005) suggested that during the winter and spring months, large pallid sturgeon were more often found associated with the downstream end of sand bars. This held true during the 2005 sampling season in segment 14, where seven adult pallid sturgeon were captured on the lower end or tail end of a sandbar. Four of these pallid sturgeon were captured within 0.7 of each other, over a span of two months. In segment 14, only one sub-stock pallid sturgeon was captured. It was netted in an inside bend macrohabitat and channel border mesohabitat. Stock size pallid sturgeon were captured in channel crossover and inside bend macrohabitats and channel border mesohabitat. Quality size and larger pallid sturgeon were captured typically in inside bend macrohabitat and channel border mesohabitat. All of the pallid sturgeon captures took place in the CHNB mesohabitat. Nine of the eleven captures took place in ISB macrohabitats, while the remaining captures occurred in both OSB (quality size pallid sturgeon) and CHXO (stock size) macrohabitats.

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

Trawl nets are effective at catching the sub-stock size class of sturgeon, 150 - 249 mm, but despite their effectiveness, collection of young of year (YOY) sturgeon remains rare. These sub-stock sturgeon were captured in CHNB and ITIP mesohabitats in even proportions to the habitat sampled. Otter trawl CPUE of 0 – 149 mm sturgeon has increased each year since 2003 in Segment 14. Understanding what habitats these small sturgeon occur in is an important component needed to effectively evaluate this younger size class of fish.

Sturgeon chub CPUE has increased each year since 2003, similar to the trend observed in YOY shovelnose sturgeon. Sand shiner and *Hybognathus* spp. CPUE has increased only since 2004. Other Missouri River target species have exhibited different trends over the last three years. Speckled chub CPUE decreased in the sturgeon season and increased in the fish community season compared to 2004. Sicklefin chub CPUE increased in sturgeon season and decreased in fish community season since 2004. Sauger CPUE decreased compared to 2004. Blue sucker CPUE has remained relatively constant over the last three years.

Commercial harvest of sturgeon in segment 14 is a legitimate concern. Belly scars (egg checks) from knife probes in shovelnose show that commercial fishermen are likely killing more fish than would be documented from harvest reports. The differences in catch rates between the two segments, suggest that segment 14, which is closer to the Mississippi River, receives more fishing pressure than other segments of the Missouri River. This is further confounded by the use of many commercial fisherman from the Mississippi River (Tennessee and Arkansas) who travel up the Missouri River in early spring (before seasons open on the Mississippi) to harvest Missouri sturgeon roe. A recent change in statewide commercial fishing regulations, however, may alleviate much of this problem. Documentation of a check scar on a pallid sturgeon in segment 14 suggests that commercial fishermen would likely harvest pallid sturgeon roe along with the shovelnose sturgeon.

Wild Gear

Side-by-side comparisons of wild stationary one-inch trammel nets and standard gillnets were used to compare the different gear types and test the assumption that smaller fish were not present in areas where standard gillnets are placed. It was discovered that the smaller mesh trammel nets did capture smaller sturgeon, including stocked pallid sturgeon, in these areas more effectively than standard gillnets and were able to capture the largest sizes of shovelnose sturgeon as well. Standard gillnets did not capture any juvenile pallid sturgeon while stationary trammel nets captured one, even though efforts with gillnets were almost seven times higher than stationary trammel nets. Standard gillnets also only captured shovelnose 280 mm and above, whereas the stationary trammel nets captured shovelnose as small as 160 mm. This information is important to understanding the assumptions of monitoring protocols and accepting biases of the different gear types used within each season.

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

Acknowledgments

Special thanks to the staff of the Columbia Fishery Resources Office (Columbia FRO) for data collection, in the field and in the lab, scientific expertise in data interpretation, and dedication to the recovery of the federally endangered pallid sturgeon. The Columbia FRO has played a pivotal role in the ongoing effort to manage and protect the Missouri River and to promote the overall well being of its native fish fauna. Funding for this project was provided by the Army Corps of Engineers, Omaha District. Appreciation is extended to Yan Hong, Vince Travnichek, and the staff at the Missouri Department of Conservation's Chillicothe Office for maintaining the database and providing and summarizing the data for this report. Thanks to Mark Drobish for his flexibility and efforts in facilitating discussion and incorporating changes in the adaptive process of this project. Thanks to Mark Wildhaber for his contributions in project design and his willing service to help in the protocol development process. Craig Paukert has been providing data analyses that are becoming important tools as we continue to refine our sampling efforts. Andy Starostka, Jeff Finley, and Nick Frohnauer of the Columbia Fishery Resources Office provided assistance in project design and field work that was important to 2005 completion. Aaron Delonay of USGS/CERC continues to be an asset to our sampling efforts; providing locations and general information regarding movements and habitat use of this elusive fish.

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APPENDICES

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

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

Appendix A. (continued).

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

Appendix A. (continued).

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

Appendix A. (continued).

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

Appendix A. (continued).

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

Appendix A. (continued).

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

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

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

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

Gear	Code	Type	Season	Years	CPUE units
Trammel net – 1 inch inner mesh	TN	Standard	All	2003 - Present	fish/100 m drift
Trammel net – 2.5 inch inner mesh	TN25	Standard	Sturgeon	2005 - Present	fish/100 m drift
Gillnet – 4 meshes, small mesh set upstream	GN14	Standard	Sturgeon	2003 - Present	fish/net night
Gillnet – 4 meshes, large mesh set upstream	GN41	Standard	Sturgeon	2003 - Present	fish/net night
Gillnet – 8 meshes, small mesh set upstream	GN18	Standard	Sturgeon	2003 - Present	fish/net night
Gillnet – 8 meshes, large mesh set upstream	GN81	Standard	Sturgeon	2003 - Present	fish/net night
Otter trawl – 16 ft head rope	OT16	Standard	All	2003 - Present	fish/100 m trawled
Beam trawl	BT	Standard*	All	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

* Standard only in upper Missouri River segments

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

State(s)	RPMA	Site Name	Code	River	RM
MT	2	Above Intake	AIN	Yellowstone	70 +
MT	2	Intake	INT	Yellowstone	70.0
MT	2	Sidney	SID	Yellowstone	31.0
MT	2	Big Sky Bend	BSB	Yellowstone	17.0
ND	2	Fairview	FRV	Yellowstone	9.0
MT	2	Milk River	MLK	Milk	11.5
MT	2	Mouth of Milk	MOM	Missouri	1761.5
MT	2	Wolf Point	WFP	Missouri	1701.5
MT	2	Poplar	POP	Missouri	1649.5
MT	2	Brockton	BRK	Missouri	1678.0
MT	2	Culbertson	CBS	Missouri	1621.0
MT	2	Nohly Bridge	NOB	Missouri	1590.0
ND	2	Confluence	CON	Missouri	1581.5
SD/NE	3	Sunshine Bottom	SUN	Missouri	866.2
SD/NE	3	Verdel Boat Ramp	VER	Missouri	855.0
SD/NE	3	Standing Bear Bridge	STB	Missouri	845.0
SD/NE	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 segments 13 and 14 of the Missouri River (RPMA 4)

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

Appendix F

Total catch, overall mean catch per unit effort [± 2 SE], and mean CPUE (fish/100 m) by Mesohabitat within a Macrohabitat for all species caught with each gear type during sturgeon season and fish community season for segment 14 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
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
BESN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BHCP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BHMW	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BKCP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BKSS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BLCF	236	0.831	1.038	1.111	0	0	0.196	1.083	0.95	1.444	0.375	1.167	0.357	0.25
		[0.215]	[0.763]	[0.575]	[0]	[0]	[0.226]	[0.595]	[0.464]	[0.903]	[0.75]	[2.333]	[0.565]	[0.5]
BLGL	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BMBF	1	0.004	0	0	0	0	0	0	0	0.028	0	0	0	0
		[0.007]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0.056]	[0]	[0]	[0]	[0]
BNMW	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BUSK*	**36**	**0.127**	**0.077**	**0.111**	**0**	**0**	**0.143**	**0.042**	**0.075**	**0.028**	**0**	**0**	**0.5**	**2.25**
		[0.085]	**[0.104]**	**[0.173]**	**[0]**	**[0]**	**[0.161]**	**[0.058]**	**[0.082]**	**[0.056]**	**[0]**	**[0]**	**[1]**	**[3.5]**
CARP	19	0.067	0	0.167	0	0	0	0	0	0.333	0.125	0	0	0
		[0.043]	[0]	[0.162]	[0]	[0]	[0]	[0]	[0]	[0.256]	[0.25]	[0]	[0]	[0]
CLSR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNCF	17	0.06	0.077	0.056	0	0	0.054	0.042	0.05	0.083	0.125	0	0.071	0.25
		[0.029]	[0.154]	[0.076]	[0]	[0]	[0.06]	[0.058]	[0.069]	[0.09]	[0.25]	[0]	[0.143]	[0.5]
CNLP	1	0.004	0	0.028	0	0	0	0	0	0	0	0	0	0
		[0.007]	[0]	[0.056]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNSN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
ERSN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
FHCF	6	0.021	0.038	0	0	0	0	0.021	0.025	0.028	0	0.167	0.071	0
		[0.017]	[0.077]	[0]	[0]	[0]	[0]	[0.042]	[0.05]	[0.056]	[0]	[0.333]	[0.143]	[0]

Appendix F1 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
FHMW	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
FWDM	10	0.035	0	0.028	0	0	0	0.021	0.05	0.139	0.125	0	0	0
		[0.026]	[0]	[0.056]	[0]	[0]	[0]	[0.042]	[0.069]	[0.158]	[0.25]	[0]	[0]	[0]
GDEY	112	0.394	0.385	0.556	0	0	0.089	0.271	0.525	0.75	0.375	0	0.786	0.5
		[0.164]	[0.469]	[0.536]	[0]	[0]	[0.146]	[0.313]	[0.352]	[0.801]	[0.479]	[0]	[1.27]	[1]
GDRH	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
GNSF	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
GSCP	8	0.028	0	0.111	0	0	0	0	0.05	0.028	0	0	0.071	0
		[0.024]	[0]	[0.129]	[0]	[0]	[0]	[0]	[0.1]	[0.056]	[0]	[0]	[0.143]	[0]
GZSD	20	0.07	0.154	0.167	0	0	0.036	0.042	0.05	0.028	0	0	0.214	0
		[0.042]	[0.237]	[0.14]	[0]	[0]	[0.071]	[0.083]	[0.069]	[0.056]	[0]	[0]	[0.429]	[0]
HBNS*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
HFCS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
LGPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
LKSG	6	0.021	0	0.028	0	0	0	0.062	0.025	0.028	0	0	0	0
		[0.02]	[0]	[0.056]	[0]	[0]	[0]	[0.092]	[0.05]	[0.056]	[0]	[0]	[0]	[0]
LMBS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
LNGR	51	0.18	0.654	0.139	0	0	0.054	0.229	0.25	0	0	0.5	0	0.5
		[0.11]	[0.97]	[0.226]	[0]	[0]	[0.06]	[0.217]	[0.256]	[0]	[0]	[1]	[0]	[0]
MMSN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
MNEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
MQTF	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
OSSF	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]

Appendix F1 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
PDFH	9	0.032	0	0.083	0	0	0	0.104	0	0.028	0	0	0	0
		[0.025]	[0]	[0.121]	[0]	[0]	[0]	[0.104]	[0]	[0.056]	[0]	[0]	[0]	[0]
PDSG*	**5**	**0.018**	**0.038**	**0**	**0**	**0**	**0.054**	**0**	**0.025**	**0**	**0**	**0**	**0**	**0**
		[0.016]	**[0.077]**	**[0]**	**[0]**	**[0]**	**[0.06]**	**[0]**	**[0.05]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
QLBK	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
RDSN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
RFSN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
RVCS	36	0.127	0.077	0.5	0	0	0	0.146	0.075	0.167	0	0	0	0
		[0.078]	[0.104]	[0.524]	[0]	[0]	[0]	[0.127]	[0.082]	[0.198]	[0]	[0]	[0]	[0]
RVSN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SBWB	2	0.007	0.038	0	0	0	0	0	0	0	0	0	0.071	0
		[0.01]	[0.077]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0.143]	[0]
SFCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
SFSN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SGCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
SGER*	**26**	**0.092**	**0.115**	**0.194**	**0**	**0**	**0**	**0.042**	**0.25**	**0.111**	**0**	**0**	**0**	**0**
		[0.048]	**[0.122]**	**[0.231]**	**[0]**	**[0]**	**[0]**	**[0.083]**	**[0.199]**	**[0.101]**	**[0]**	**[0]**	**[0]**	**[0]**
SHRH	20	0.07	0	0.056	0	0	0.054	0.042	0.25	0.056	0	0.167	0	0
		[0.038]	[0]	[0.076]	[0]	[0]	[0.06]	[0.058]	[0.212]	[0.076]	[0]	[0.333]	[0]	[0]
SJHR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SKCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
SMBF	27	0.095	0.154	0.111	0	0	0.089	0.104	0.125	0.056	0.125	0	0	0.25
		[0.042]	[0.175]	[0.129]	[0]	[0]	[0.104]	[0.104]	[0.143]	[0.076]	[0.25]	[0]	[0]	[0.5]
SNGR	21	0.074	0.038	0.111	0	0	0.054	0.167	0.05	0.083	0	0	0	0
		[0.059]	[0.077]	[0.173]	[0]	[0]	[0.079]	[0.293]	[0.069]	[0.121]	[0]	[0]	[0]	[0]

Appendix F1 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
SNPD	8	0.028	0.038	0.056	0	0	0	0.062	0.025	0.028	0	0	0	0
		[0.019]	[0.077]	[0.076]	[0]	[0]	[0]	[0.069]	[0.05]	[0.056]	[0]	[0]	[0]	[0]
SNSG*	**1244**	**4.38**	**5.885**	**8.75**	**0.333**	**0.75**	**2.946**	**5.625**	**3**	**3.389**	**0.5**	**2.333**	**3**	**8.5**
		[0.893]	**[1.915]**	**[3.825]**	**[0.333]**	**[1.5]**	**[1.589]**	**[2.155]**	**[1.755]**	**[2.065]**	**[0.408]**	**[4.177]**	**[3.723]**	**[14]**
SNSN*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
SPSK	1	0.004	0	0	0	0	0.018	0	0	0	0	0	0	0
		[0.007]	[0]	[0]	[0]	[0]	[0.036]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
STBS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
STCT	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SVCB	1	0.004	0	0	0	0	0	0.021	0	0	0	0	0	0
		[0.007]	[0]	[0]	[0]	[0]	[0]	[0.042]	[0]	[0]	[0]	[0]	[0]	[0]
SVCP	10	0.035	0.038	0.083	0	0	0	0.062	0	0.028	0.125	0	0	0.25
		[0.026]	[0.077]	[0.121]	[0]	[0]	[0]	[0.092]	[0]	[0.056]	[0.25]	[0]	[0]	[0.5]
TPMT	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCF	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCY	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UHY	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
ULP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UNID	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
USG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
WLYE	1	0.004	0	0	0	0	0	0	0	0.028	0	0	0	0
		[0.007]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0.056]	[0]	[0]	[0]	[0]

Appendix F1 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
WTBS	3	0.011	0	0.028	0	0	0	0.021	0	0.028	0	0	0	0
		[0.012]	[0]	[0.056]	[0]	[0]	[0]	[0.042]	[0]	[0.056]	[0]	[0]	[0]	[0]
WTCP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
WTSK	1	0.004	0	0	0	0	0	0	0	0.028	0	0	0	0
		[0.007]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0.056]	[0]	[0]	[0]	[0]
YLBH	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[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		TRIB
			CHNB	CHNB	CHNB	CHNB	CHNB	ITIP	TLWG	ITIP	TLWG	CHNB
BESN	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
BHCP	1	0.002	0	0	0.003	0	0	0		0		0
		[0.003]	[0]	[0]	[0.006]	[0]	[0]	[0]		[0]		[0]
BHMW	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
BKCP	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
BKSS	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
BLCF	85	0.205	0.244	0.111	0.227	0	0.111	0		0.083		0.104
		[0.058]	[0.145]	[0.222]	[0.076]	[0]	[0.222]	[0]		[0.167]		[0.208]
BLGL	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
BMBF	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
BNMW	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
BUSK*	**69**	**0.15**	**0.145**	**0.278**	**0.174**	**0**	**0.056**	**0**		**0.083**		**0**
		[0.056]	**[0.164]**	**[0.436]**	**[0.066]**	**[0]**	**[0.111]**	**[0]**		**[0.167]**		**[0]**
CARP	2	0.004	0	0	0.004	0	0	0		0		0.046
		[0.006]	[0]	[0]	[0.008]	[0]	[0]	[0]		[0]		[0.093]
CLSR	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
CNCF	21	0.049	0.049	0.111	0.054	0	0	0		0.083		0
		[0.027]	[0.062]	[0.222]	[0.036]	[0]	[0]	[0]		[0.167]		[0]
CNLP	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
CNSN	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
ERSN	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
FHCF	3	0.014	0.034	0	0.01	0	0	0		0		0
		[0.016]	[0.047]	[0]	[0.021]	[0]	[0]	[0]		[0]		[0]

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	SCCL			SCCS		TRIB
			CHNB	CHNB	CHNB	CHNB	CHNB	ITIP	TLWG	ITIP	TLWG	CHNB
FHMW	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
FWDM	7	0.021	0.02	0.222	0.008	0	0.167	0		0		0
		[0.019]	[0.028]	[0.444]	[0.011]	[0]	[0.333]	[0]		[0]		[0]
GDEY	7	0.018	0	0.056	0.02	0	0	0.167		0		0
		[0.016]	[0]	[0.111]	[0.024]	[0]	[0]	[0.333]		[0]		[0]
GDRH	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
GNSF	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
GSCP	3	0.009	0.016	0	0.009	0	0	0		0		0
		[0.01]	[0.032]	[0]	[0.013]	[0]	[0]	[0]		[0]		[0]
GZSD	9	0.024	0.066	0	0.013	0	0	0		0.083		0
		[0.019]	[0.074]	[0]	[0.015]	[0]	[0]	[0]		[0.167]		[0]
HBNS*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**0**		**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**		**[0]**		**[0]**
HFCS	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
LGPH	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
LKSG	2	0.006	0.013	0	0	0	0	0		0		0.074
		[0.008]	[0.026]	[0]	[0]	[0]	[0]	[0]		[0]		[0.147]
LMBS	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
LNGR	2	0.006	0.014	0	0.004	0	0	0		0		0
		[0.008]	[0.027]	[0]	[0.009]	[0]	[0]	[0]		[0]		[0]
MMSN	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
MNEY	1	0.002	0	0.056	0	0	0	0		0		0
		[0.003]	[0]	[0.111]	[0]	[0]	[0]	[0]		[0]		[0]
MQTF	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
OSSF	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	SCCL			SCCS		TRIB
			CHNB	CHNB	CHNB	CHNB	CHNB	ITIP	TLWG	ITIP	TLWG	CHNB
PDFH	1	0.002	0.011	0	0	0	0	0		0		0
		[0.005]	[0.021]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
PDSG*	**1**	**0.002**	**0**	**0**	**0.003**	**0**	**0**	**0**		**0**		**0**
		[0.004]	**[0]**	**[0]**	**[0.006]**	**[0]**	**[0]**	**[0]**		**[0]**		**[0]**
QLBK	3	0.006	0	0.056	0.004	0	0	0		0		0.046
		[0.008]	[0]	[0.111]	[0.009]	[0]	[0]	[0]		[0]		[0.093]
RDSN	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
RFSN	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
RVCS	16	0.035	0.047	0.111	0.035	0	0	0		0		0
		[0.021]	[0.056]	[0.222]	[0.025]	[0]	[0]	[0]		[0]		[0]
RVSN	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
SBWB	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
SFCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**0**		**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**		**[0]**		**[0]**
SFSN	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
SGCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**0**		**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**		**[0]**		**[0]**
SGER*	**4**	**0.009**	**0.019**	**0**	**0.008**	**0**	**0**	**0**		**0**		**0**
		[0.009]	**[0.027]**	**[0]**	**[0.011]**	**[0]**	**[0]**	**[0]**		**[0]**		**[0]**
SHRH	9	0.023	0.018	0	0.009	0	0	0		0		0.338
		[0.021]	[0.035]	[0]	[0.013]	[0]	[0]	[0]		[0]		[0.378]
SJHR	2	0.005	0.009	0	0.005	0	0	0		0		0
		[0.007]	[0.017]	[0]	[0.01]	[0]	[0]	[0]		[0]		[0]
SKCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**0**		**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**		**[0]**		**[0]**
SMBF	14	0.04	0.032	0	0.044	0	0	0.167		0		0.074
		[0.025]	[0.044]	[0]	[0.035]	[0]	[0]	[0.333]		[0]		[0.147]
SNGR	2	0.01	0.014	0	0	0	0	0		0		0.167
		[0.015]	[0.027]	[0]	[0]	[0]	[0]	[0]		[0]		[0.333]

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	SCCL			SCCS		TRIB
			CHNB	CHNB	CHNB	CHNB	CHNB	ITIP	TLWG	ITIP	TLWG	CHNB
SNPD	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
SNSG*	**558**	**1.345**	**1.112**	**0.944**	**1.611**	**0**	**0.852**	**2.348**	**1.778**	**0.167**		**0.062**
		[0.348]	**[0.608]**	**[1.382]**	**[0.508]**	**[0]**	**[0.958]**	**[1.466]**		**[0.333]**		**[0.125]**
SNSN*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**0**		**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**		**[0]**		**[0]**
SPSK	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
STBS	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
STCT	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
SVCB	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
SVCP	1	0.002	0	0	0.003	0	0	0		0		0
		[0.003]	[0]	[0]	[0.006]	[0]	[0]	[0]		[0]		[0]
TPMT	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
UCF	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
UCN	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
UCY	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
UHY	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
ULP	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
UNID	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
USG	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
WLYE	1	0.002	0	0	0	0	0	0		0		0.046
		[0.004]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0.093]

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	SCCL			SCCS		TRIB
			CHNB	CHNB	CHNB	CHNB	CHNB	ITIP	TLWG	ITIP	TLWG	CHNB
WTBS	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
WTCP	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
WTSK	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]
YLBH	0	0	0	0	0	0	0	0		0		0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]		[0]		[0]

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

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	SCCL	SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP
BESN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
BHCP	1	0.002	0	0	0	0.111	0
		[0.005]	[0]	[0]	[0]	[0.222]	[0]
BHMW	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
BKCP	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
BKSS	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
BLCF	19	0.086	0.075	0	0.08	0	0.287
		[0.054]	[0.071]	[0]	[0.069]	[0]	[0.297]
BLGL	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
BMBF	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
BNMW	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
BUSK*	**107**	**0.339**	**0.155**	**0.623**	**0.362**	**0.222**	**0.475**
		[0.105]	**[0.126]**	**[0.894]**	**[0.124]**	**[0.444]**	**[0.748]**
CARP	1	0.002	0	0	0.003	0	0
		[0.005]	[0]	[0]	[0.007]	[0]	[0]
CLSR	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
CNCF	4	0.012	0	0.09	0.007	0	0.059
		[0.012]	[0]	[0.18]	[0.01]	[0]	[0.118]
CNLP	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
CNSN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
ERSN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
FHCF	1	0.007	0	0	0	0	0.125
		[0.015]	[0]	[0]	[0]	[0]	[0.25]
FHMW	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]

Appendix F3 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	SCCL	SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP
FWDM	5	0.016	0	0	0.007	0	0.194
		[0.016]	[0]	[0]	[0.01]	[0]	[0.214]
GDEY	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
GDRH	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
GNSF	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
GSCP	4	0.014	0.043	0	0.01	0	0
		[0.016]	[0.087]	[0]	[0.011]	[0]	[0]
GZSD	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
HBNS*	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
HFCS	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
LGPH	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
LKSG	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
LMBS	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
LNGR	16	0.036	0	0.175	0.041	0	0
		[0.039]	[0]	[0.216]	[0.052]	[0]	[0]
MMSN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
MNEY	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
MQTF	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
OSSF	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
PDFH	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
PDSG*	**4**	**0.011**	**0**	**0**	**0.015**	**0**	**0**
		[0.011]	**[0]**	**[0]**	**[0.016]**	**[0]**	**[0]**

Appendix F3 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	SCCL	SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP
QLBK	3	0.01	0	0.1	0.005	0	0.059
		[0.012]	[0]	[0.199]	[0.009]	[0]	[0.118]
RDSN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
RFSN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
RVCS	19	0.071	0.107	0	0.054	0.222	0.168
		[0.036]	[0.121]	[0]	[0.036]	[0.444]	[0.244]
RVSN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SBWB	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SFCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
SFSN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SGCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
SGER*	**3**	**0.008**	**0**	**0**	**0.011**	**0**	**0**
		[0.012]	**[0]**	**[0]**	**[0.016]**	**[0]**	**[0]**
SHRH	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SJHR	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SKCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
SMBF	46	0.142	0.051	0.095	0.131	0	0.63
		[0.066]	[0.101]	[0.19]	[0.064]	[0]	[0.718]
SNGR	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SNPD	1	0.006	0	0	0.009	0	0
		[0.013]	[0]	[0]	[0.018]	[0]	[0]
SNSG*	**136**	**0.459**	**0.48**	**0.265**	**0.457**	**0.222**	**0.702**
		[0.16]	**[0.382]**	**[0.218]**	**[0.199]**	**[0.444]**	**[0.709]**
SNSN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]

Appendix F3 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	SCCL	SCCS
			CHNB	CHNB	CHNB	CHNB	ITIP
SPSK	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
STBS	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
STCT	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SVCB	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
SVCP	1	0.003	0	0.09	0	0	0
		[0.007]	[0]	[0.18]	[0]	[0]	[0]
TPMT	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UCF	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UCN	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UCY	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UHY	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
ULP	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
UNID	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
USG	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
WLYE	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
WTBS	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
WTCP	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
WTSK	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]
YLBH	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]

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

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	SCCL		SCCS	TRIB	TRML
			CHNB	CHNB	CHNB	CHNB	CHNB	ITIP	ITIP	CHNB	CHNB
BESN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BHCP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BHMW	22.00	0.04	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.39	0.00
		[0.035]	[0]	[0]	[0.013]	[0]	[0]	[0]	[0]	[0.374]	[0]
BKCP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BKSS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BLCF	2053.00	5.18	10.53	0.32	5.44	1.25	0.39	0.54	1.99	0.04	0.17
		[3.295]	[12.832]	[0.635]	[3.599]	[0.898]	[0.455]	[0.568]	[3.168]	[0.074]	[0.333]
BLGL	8.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00
		[0.013]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0.145]	[0]
BMBF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BNMW	1.00	0.01	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00
		[0.013]	[0]	[0]	[0]	[0.178]	[0]	[0]	[0]	[0]	[0]
BUSK*	**22.00**	**0.05**	**0.07**	**0.21**	**0.05**	**0.00**	**0.05**	**0.00**	**0.00**	**0.00**	**0.17**
		[0.024]	**[0.084]**	**[0.191]**	**[0.03]**	**[0]**	**[0.095]**	**[0]**	**[0]**	**[0]**	**[0.333]**
CARP	4.00	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
		[0.009]	[0.04]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0.333]
CLSR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNCF	1255.00	2.53	3.06	0.25	3.08	2.16	0.64	1.99	2.50	0.12	0.94
		[1.26]	[2.032]	[0.284]	[2.314]	[1.434]	[0.812]	[3.141]	[4.53]	[0.186]	[0.13]
CNLP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNSN	233.00	0.38	1.25	0.00	0.07	0.00	0.00	0.00	0.00	0.92	0.00
		[0.545]	[2.459]	[0]	[0.087]	[0]	[0]	[0]	[0]	[1.697]	[0]
ERSN	2.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
		[0.007]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0.077]	[0]
FHCF	12.00	0.03	0.05	0.00	0.04	0.07	0.00	0.00	0.00	0.00	0.00
		[0.021]	[0.052]	[0]	[0.031]	[0.133]	[0]	[0]	[0]	[0]	[0]
FHMW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	SCCL		SCCS	TRIB	TRML
			CHNB	CHNB	CHNB	CHNB	CHNB	ITIP	ITIP	CHNB	CHNB
FWDM	667.00	2.18	6.05	9.30	0.58	3.65	0.00	0.00	0.16	0.68	0.87
		[1.613]	[6.886]	[18.504]	[0.433]	[4.001]	[0]	[0]	[0.249]	[0.41]	[1.739]
GDEY	75.00	0.17	0.36	0.00	0.15	0.22	0.00	0.00	0.00	0.04	0.17
		[0.105]	[0.379]	[0]	[0.126]	[0.238]	[0]	[0]	[0]	[0.074]	[0.333]
GDRH	17.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.00
		[0.03]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0.33]	[0]
GNSF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
GSCP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
GZSD	32.00	0.06	0.02	0.37	0.02	0.00	0.00	0.00	0.06	0.42	0.00
		[0.044]	[0.024]	[0.741]	[0.018]	[0]	[0]	[0]	[0.125]	[0.409]	[0]
HBNS*	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
HFCS	1.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00
		[0.008]	[0]	[0]	[0]	[0.111]	[0]	[0]	[0]	[0]	[0]
LGPH	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
		[0.005]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0.058]	[0]
LKSG	2.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0.004]	[0]	[0.121]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
LMBS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
LNGR	1.00	0.01	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0.011]	[0]	[0.37]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
MMSN	3.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.03	0.00	0.00
		[0.007]	[0]	[0]	[0.013]	[0]	[0]	[0]	[0.062]	[0]	[0]
MNEY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
MQTF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
OSSF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
PDFH	22.00	0.06	0.12	0.00	0.04	0.09	0.00	0.00	0.04	0.00	0.00
		[0.037]	[0.127]	[0]	[0.041]	[0.178]	[0]	[0]	[0.083]	[0]	[0]
PDSG*	**1.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		[0.003]	**[0]**	**[0]**	**[0.006]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	SCCL		SCCS	TRIB	TRML
			CHNB	CHNB	CHNB	CHNB	CHNB	ITIP	ITIP	CHNB	CHNB
QLBK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
RDSN	7.00	0.02	0.00	0.00	0.02	0.03	0.05	0.00	0.00	0.00	0.00
		[0.012]	[0]	[0]	[0.021]	[0.063]	[0.095]	[0]	[0]	[0]	[0]
RFSN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
RVCS	55.00	0.15	0.56	0.00	0.01	0.00	0.00	0.00	0.00	0.33	0.00
		[0.166]	[0.761]	[0]	[0.019]	[0]	[0]	[0]	[0]	[0.26]	[0]
RVSN	4.00	0.01	0.01	0.00	0.00	0.12	0.00	0.00	0.00	0.02	0.00
		[0.018]	[0.017]	[0]	[0]	[0.242]	[0]	[0]	[0]	[0.046]	[0]
SBWB	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SFCB*	**345.00**	**0.60**	**0.66**	**0.00**	**0.74**	**0.57**	**1.22**	**0.25**	**0.05**	**0.02**	**0.00**
		[0.182]	**[0.393]**	**[0]**	**[0.301]**	**[0.445]**	**[0.895]**	**[0.319]**	**[0.094]**	**[0.037]**	**[0]**
SFSN	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
		[0.007]	[0]	[0]	[0.014]	[0]	[0]	[0]	[0]	[0]	[0]
SGCB*	**36.00**	**0.07**	**0.11**	**0.00**	**0.09**	**0.00**	**0.14**	**0.00**	**0.00**	**0.00**	**0.00**
		[0.037]	**[0.127]**	**[0]**	**[0.048]**	**[0]**	**[0.194]**	**[0]**	**[0]**	**[0]**	**[0]**
SGER*	**4.00**	**0.01**	**0.00**	**0.00**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.04**	**0.17**
		[0.007]	**[0]**	**[0]**	**[0.009]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0.051]**	**[0.333]**
SHRH	4.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00
		[0.01]	[0]	[0]	[0.005]	[0]	[0]	[0]	[0]	[0.111]	[0]
SJHR	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
		[0.003]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0.038]	[0]
SKCB*	**504.00**	**0.98**	**1.47**	**0.05**	**0.74**	**2.01**	**0.81**	**0.49**	**2.14**	**0.43**	**0.00**
		[0.322]	**[0.73]**	**[0.093]**	**[0.262]**	**[2.885]**	**[0.664]**	**[0.976]**	**[3.138]**	**[0.852]**	**[0]**
SMBF	18.00	0.04	0.15	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0.052]	[0.237]	[0.37]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNGR	15.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00
		[0.032]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0.359]	[0]
SNPD	3.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
		[0.008]	[0.014]	[0]	[0.015]	[0]	[0]	[0]	[0]	[0]	[0]
SNSG*	**519.00**	**0.97**	**1.50**	**0.87**	**1.00**	**0.52**	**1.03**	**0.62**	**0.90**	**0.06**	**0.55**
		[0.27]	**[0.935]**	**[1.119]**	**[0.33]**	**[0.436]**	**[1.137]**	**[0.726]**	**[0.535]**	**[0.111]**	**[0.232]**
SNSN*	**6.00**	**0.01**	**0.00**	**0.00**	**0.01**	**0.06**	**0.00**	**0.00**	**0.00**	**0.02**	**0.00**
		[0.012]	**[0]**	**[0]**	**[0.016]**	**[0.127]**	**[0]**	**[0]**	**[0]**	**[0.037]**	**[0]**

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	SCCL		SCCS	TRIB	TRML
			CHNB	CHNB	CHNB	CHNB	CHNB	ITIP	ITIP	CHNB	CHNB
SPSK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
STBS	3.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00
		[0.005]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0.06]	[0]
STCT	1.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0.004]	[0.017]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SVCB	107.00	0.22	0.22	0.00	0.20	0.06	0.10	0.00	0.83	0.36	0.17
		[0.172]	[0.317]	[0]	[0.287]	[0.121]	[0.157]	[0]	[1.667]	[0.229]	[0.333]
SVCP	8.00	0.03	0.03	0.00	0.01	0.22	0.00	0.00	0.00	0.00	0.00
		[0.034]	[0.041]	[0]	[0.02]	[0.444]	[0]	[0]	[0]	[0]	[0]
TPMT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCF	32.00	0.08	0.24	0.00	0.04	0.18	0.00	0.00	0.06	0.00	0.00
		[0.075]	[0.328]	[0]	[0.039]	[0.242]	[0]	[0]	[0.125]	[0]	[0]
UCN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCY	99.00	0.19	0.00	0.00	0.37	0.00	0.00	0.00	0.00	0.02	0.00
		[0.372]	[0]	[0]	[0.74]	[0]	[0]	[0]	[0]	[0.037]	[0]
UHY	632.00	1.39	5.92	1.48	0.12	0.29	0.00	0.00	0.00	0.04	0.00
		[1.678]	[7.771]	[2.963]	[0.136]	[0.398]	[0]	[0]	[0]	[0.051]	[0]
ULP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UNID	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
USG	4.00	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0.01]	[0.046]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
WLYE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
WTBS	7.00	0.02	0.01	0.28	0.00	0.00	0.00	0.00	0.00	0.02	0.17
		[0.014]	[0.017]	[0.38]	[0.008]	[0]	[0]	[0]	[0]	[0.037]	[0.333]
WTCP	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
		[0.003]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0.038]	[0]
WTSK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
YLBH	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
		[0.005]	[0]	[0]	[0.01]	[0]	[0]	[0]	[0]	[0]	[0]

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

Species	Total Catch	Overall CPUE	CHXO		ISB	OSB	SCCL	SCCS	SCN	TRIB	TRMS
			BARS	CHNB	BARS	BARS	BARS	BARS	BARS	BARS	BARS
BESN	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
BHCP	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
BHMW	167	1.988	2.615	0	0.615	1.818	0.333	1.583	0.667	5.143	3
		[1.181]	[2.348]		[0.666]	[1.497]	[0.667]	[1.914]	[1.333]	[6.191]	
BKCP	3	0.036	0	0	0	0	0	0	0	0.214	0
		[0.041]	[0]		[0]	[0]	[0]	[0]	[0]	[0.228]	
BKSS	7	0.083	0	0	0	0.091	0.333	0.083	0	0.286	0
		[0.069]	[0]		[0]	[0.182]	[0.667]	[0.167]	[0]	[0.327]	
BLCF	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
BLGL	96	1.143	0.231	1	0.385	0.818	0.333	0	0	5	2
		[0.682]	[0.243]		[0.295]	[1.002]	[0.667]	[0]	[0]	[3.341]	
BMBF	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
BNMW	23	0.274	0.385	0	0.154	0.545	0	0.167	0	0.429	0
		[0.145]	[0.482]		[0.182]	[0.625]	[0]	[0.225]	[0]	[0.404]	
BUSK*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**		**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	
CARP	3	0.036	0.154	0	0	0.091	0	0	0	0	0
		[0.041]	[0.208]		[0]	[0.182]	[0]	[0]	[0]	[0]	
CLSR	1	0.012	0	0	0	0	0	0	0	0.071	0
		[0.024]	[0]		[0]	[0]	[0]	[0]	[0]	[0.143]	
CNCF	143	1.702	3.154	2	1.962	2.182	2	1.333	0.667	0.071	0
		[0.697]	[2.285]		[1.418]	[2.626]	[2.309]	[1.054]	[1.333]	[0.143]	
CNLP	1	0.012	0	0	0	0	0	0	0	0.071	0
		[0.024]	[0]		[0]	[0]	[0]	[0]	[0]	[0.143]	
CNSN	194	2.31	3.231	1	1.692	9.455	0	0.25	0	0	0
		[1.632]	[3.081]		[2.839]	[8.962]	[0]	[0.359]	[0]	[0]	
ERSN	1435	17.083	23.615	0	7.885	43.273	8.667	1.917	0.667	24.857	48
		[8.201]	[20.737]		[4.261]	[49.528]	[14.345]	[2.79]	[1.333]	[17.107]	
FHCF	3	0.036	0.077	0	0.038	0	0	0.083	0	0	0
		[0.041]	[0.154]		[0.077]	[0]	[0]	[0.167]	[0]	[0]	
FHMW	1	0.012	0	0	0.038	0	0	0	0	0	0
		[0.024]	[0]		[0.077]	[0]	[0]	[0]	[0]	[0]	

Appendix F6 (continued).

Species	Total Catch	Overall CPUE	CHXO		ISB	OSB	SCCL	SCCS	SCN	TRIB	TRMS
			BARS	CHNB	BARS	BARS	BARS	BARS	BARS	BARS	BARS
FWDM	33	0.393	0.692	0	0.462	0.364	0.333	0.25	0	0.286	0
		[0.2]	[0.572]		[0.523]	[0.304]	[0.667]	[0.261]	[0]	[0.327]	
GDEY	1	0.012	0	0	0	0	0	0.083	0	0	0
		[0.024]	[0]		[0]	[0]	[0]	[0.167]	[0]	[0]	
GDRH	3	0.036	0	0	0	0	0	0	0	0.214	0
		[0.071]	[0]		[0]	[0]	[0]	[0]	[0]	[0.429]	
GNSF	4	0.048	0.077	0	0.115	0	0	0	0	0	0
		[0.047]	[0.154]		[0.128]	[0]	[0]	[0]	[0]	[0]	
GSCP	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
GZSD	190	2.262	1.385	1	0.885	9.909	0	2.75	0.333	0.357	0
		[2.271]	[0.948]		[0.713]	[16.46]	[0]	[4.342]	[0.667]	[0.45]	
HBNS*	**10**	**0.119**	**0.615**	**0**	**0**	**0.091**	**0.333**	**0**	**0**	**0**	**0**
		[0.149]	**[0.921]**		**[0]**	**[0.182]**	**[0.667]**	**[0]**	**[0]**	**[0]**	
HFCS	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
LGPH	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
LKSG	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
LMBS	1	0.012	0	0	0	0	0	0	0	0.071	0
		[0.024]	[0]		[0]	[0]	[0]	[0]	[0]	[0.143]	
LNGR	2	0.024	0.077	0	0	0.091	0	0	0	0	0
		[0.033]	[0.154]		[0]	[0.182]	[0]	[0]	[0]	[0]	
MMSN	9	0.107	0.077	0	0.308	0	0	0	0	0	0
		[0.169]	[0.154]		[0.541]	[0]	[0]	[0]	[0]	[0]	
MNEY	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
MQTF	37	0.44	0.385	0	0.385	0.909	4	0	0	0	0
		[0.369]	[0.769]		[0.556]	[0.872]	[8]	[0]	[0]	[0]	
OSSF	31	0.369	0	0	0.538	0.909	0	0.583	0	0	0
		[0.297]	[0]		[0.794]	[0.784]	[0]	[0.869]	[0]	[0]	
PDFH	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
PDSG*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**		**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	

Appendix F6 (continued).

Species	Total Catch	Overall CPUE	CHXO		ISB	OSB	SCCL	SCCS	SCN	TRIB	TRMS
			BARS	CHNB	BARS	BARS	BARS	BARS	BARS	BARS	BARS
QLBK	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
RDSN	1217	14.488	23.769	3	14	21.636	48	7.583	1.333	3.286	18
		[5.086]	[19.477]		[7.643]	[11.694]	[70.057]	[5.557]	[2.667]	[3.634]	
RFSN	2	0.024	0.077	0	0.038	0	0	0	0	0	0
		[0.033]	[0.154]		[0.077]	[0]	[0]	[0]	[0]	[0]	
RVCS	4425	52.679	6.615	0	122.269	4.091	1	89.083	14.333	0	0
		[66.597]	[8.201]		[202.513]	[5.843]	[2]	[156.623]	[23.842]	[0]	
RVSN	367	4.369	9.769	5	3.308	11.818	0	0.833	0	0.214	6
		[2.659]	[8.272]		[2.85]	[15.678]	[0]	[1.176]	[0]	[0.309]	
SBWB	1	0.012	0	0	0	0	0	0	0	0.071	0
		[0.024]	[0]		[0]	[0]	[0]	[0]	[0]	[0.143]	
SFCB*	**4**	**0.048**	**0**	**0**	**0.154**	**0**	**0**	**0**	**0**	**0**	**0**
		[0.095]	**[0]**		**[0.308]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	
SFSN	5	0.06	0	0	0.077	0	0	0	0	0.214	0
		[0.078]	[0]		[0.107]	[0]	[0]	[0]	[0]	[0.429]	
SGCB*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**		**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	
SGER*	**1**	**0.012**	**0**	**0**	**0**	**0.091**	**0**	**0**	**0**	**0**	**0**
		[0.024]	**[0]**		**[0]**	**[0.182]**	**[0]**	**[0]**	**[0]**	**[0]**	
SHRH	1	0.012	0	0	0	0.091	0	0	0	0	0
		[0.024]	[0]		[0]	[0.182]	[0]	[0]	[0]	[0]	
SJHR	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
SKCB*	**48**	**0.571**	**0.385**	**5**	**0.846**	**0.364**	**2**	**0.5**	**0**	**0**	**0**
		[0.327]	**[0.426]**		**[0.835]**	**[0.727]**	**[0]**	**[0.718]**	**[0]**	**[0]**	
SMBF	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
SNGR	56	0.667	0.769	0	0.769	0.455	0	1.583	0.667	0	0
		[0.24]	[0.514]		[0.434]	[0.415]	[0]	[1.029]	[0.667]	[0]	
SNPD	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
SNSG*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**		**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	
SNSN*	**118**	**1.405**	**0.462**	**0**	**1.269**	**0.182**	**22.333**	**0**	**0**	**0.714**	**0**
		[1.761]	**[0.537]**		**[2.46]**	**[0.364]**	**[44.667]**	**[0]**	**[0]**	**[0.875]**	

Appendix F6 (continued).

Species	Total Catch	Overall CPUE	CHXO		ISB	OSB	SCCL	SCCS	SCN	TRIB	TRMS
			BARS	CHNB	BARS	BARS	BARS	BARS	BARS	BARS	BARS
SPSK	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
STBS	1	0.012	0	0	0	0	0	0	0	0.071	0
		[0.024]	[0]		[0]	[0]	[0]	[0]	[0]	[0.143]	
STCT	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
SVCB	20	0.238	0.923	0	0.154	0.091	0	0.083	0.333	0	1
		[0.146]	[0.767]		[0.144]	[0.182]	[0]	[0.167]	[0.667]	[0]	
SVCP	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
TPMT	1	0.012	0	0	0	0	0	0.083	0	0	0
		[0.024]	[0]		[0]	[0]	[0]	[0.167]	[0]	[0]	
UCF	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
UCN	4	0.048	0.077	0	0.115	0	0	0	0	0	0
		[0.075]	[0.154]		[0.231]	[0]	[0]	[0]	[0]	[0]	
UCY	5	0.06	0	0	0	0.273	0	0.167	0	0	0
		[0.071]	[0]		[0]	[0.39]	[0]	[0.333]	[0]	[0]	
UHY	5	0.06	0	0	0.115	0	0.667	0	0	0	0
		[0.085]	[0]		[0.231]	[0]	[1.333]	[0]	[0]	[0]	
ULP	23	0.274	1.308	0	0.115	0.182	0	0.083	0	0	0
		[0.292]	[1.803]		[0.128]	[0.244]	[0]	[0.167]	[0]	[0]	
UNID	7	0.083	0	0	0.269	0	0	0	0	0	0
		[0.145]	[0]		[0.465]	[0]	[0]	[0]	[0]	[0]	
USG	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
WLYE	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
WTBS	7	0.083	0.077	0	0.038	0	0	0	1	0.143	0
		[0.084]	[0.154]		[0.077]	[0]	[0]	[0]	[2]	[0.194]	
WTCP	7	0.083	0.077	0	0.077	0	0	0.083	0	0.214	0
		[0.069]	[0.154]		[0.107]	[0]	[0]	[0.167]	[0]	[0.309]	
WTSK	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	
YLBH	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]		[0]	[0]	[0]	[0]	[0]	[0]	

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

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCL	SCCS	SCN	TRIB
			BARS	BARS	BARS	BARS	BARS	BARS	BARS
BESN	1	0.016	0	0.045	0	0	0	0	0
		[0.032]	[0]	[0.089]	[0]	[0]	[0]	[0]	[0]
BHCP	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BHMW	5	0.048	0	0.061	0	0	0	0	0.13
		[0.06]	[0]	[0.086]	[0]	[0]	[0]	[0]	[0.26]
BKCP	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BKSS	9	0.064	0	0.082	0	0	0	0	0.17
		[0.053]	[0]	[0.092]	[0]	[0]	[0]	[0]	[0.193]
BLCF	2	0.024	0	0	0	0	0.148	0	0
		[0.048]	[0]	[0]	[0]	[0]	[0.296]	[0]	[0]
BLGL	4		0	0.015	0	0	0	0	0.115
		[0.037]	[0]	[0.029]	[0]	[0]	[0]	[0]	[0.177]
BMBF	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BNMW	4		0	0	0	0	0	0	0.11
		[0.035]	[0]	[0]	[0]	[0]	[0]	[0]	[0.171]
BUSK*	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
CARP	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
CLSR	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNCF	49		0	0.44	0	3.444	0.099	0	0
		[0.475]	[0]	[0.572]	[0]	[5.61]	[0.198]	[0]	[0]
CNLP	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
CNSN	123		3.901	2.697	0	0.638	0	0	0
		[1.577]	[5.418]	[4.079]	[0]	[0.765]	[0]	[0]	[0]
ERSN	614		7.348	11.708	3.2	0.595	2	0	7.523
		[4.683]	[12.411]	[11.98]	[5.619]	[0.977]	[2.54]	[0]	[4.987]
FHCF	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
FHMW	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]

Appendix F7 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCL	SCCS	SCN	TRIB
			BARS	BARS	BARS	BARS	BARS	BARS	BARS
FWDM	6		0	0	0	0.085	0.296	0	0.026
		[0.098]	[0]	[0]	[0]	[0.17]	[0.593]	[0]	[0.052]
GDEY	4		0.16	0.092	0	0	0.089	0	0
		[0.062]	[0.32]	[0.132]	[0]	[0]	[0.178]	[0]	[0]
GDRH	4		0	0	0	0	0	0	0.164
		[0.044]	[0]	[0]	[0]	[0]	[0]	[0]	[0.207]
GNSF	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
GSCP	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
GZSD	120		0.467	0.265	0	0.255	8.272	1.278	0.53
		[1.814]	[0.423]	[0.176]	[0]	[0.51]	[10.424]	[1.788]	[0.51]
HBNS*	**37**		**0.16**	**0.797**	**0.8**	**0.128**	**0**	**0**	**0**
		[0.473]	**[0.32]**	**[1.273]**	**[1.6]**	**[0.255]**	**[0]**	**[0]**	**[0]**
HFCS	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
LGPH	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
LKSG	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
LMBS	5		0	0	0	0	0	0	0.176
		[0.036]	[0]	[0]	[0]	[0]	[0]	[0]	[0.159]
LNGR	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
MMSN	8		0.762	0	0	0	0	0	0
		[0.139]	[1.524]	[0]	[0]	[0]	[0]	[0]	[0]
MNEY	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
MQTF	5		0.32	0.033	0	0	0	0	0.081
		[0.066]	[0.64]	[0.067]	[0]	[0]	[0]	[0]	[0.112]
OSSF	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
PDFH	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
PDSG*	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**

Appendix F7 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCL	SCCS	SCN	TRIB
			BARS	BARS	BARS	BARS	BARS	BARS	BARS
QLBK	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
RDSN	465		0.821	10.158	0	7.202	1.693	0.622	2.411
		[3.504]	[0.541]	[9.059]	[0]	[3.362]	[1.712]	[0.627]	[3.23]
RFSN	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
RVCS	322		0.197	5.233	6.364	0.434	5.832	23.611	0
		[3.224]	[0.394]	[5.326]	[12.727]	[0.516]	[5.67]	[42.321]	[0]
RVSN	42		0.529	0.257	0	2.211	0.113	0.144	0.163
		[0.294]	[1.058]	[0.27]	[0]	[3.384]	[0.151]	[0.289]	[0.188]
SBWB	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SFCB*	**6**		**0**	**0**	**0**	**0**	**0.063**	**0**	**0.216**
		[0.089]	**[0]**	**[0]**	**[0]**	**[0]**	**[0.127]**	**[0]**	**[0.433]**
SFSN	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SGCB*	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
SGER*	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**
		[0]	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**	**[0]**
SHRH	1		0	0	0	0	0	0	0.043
		[0.017]	[0]	[0]	[0]	[0]	[0]	[0]	[0.087]
SJHR	1		0	0.033	0	0	0	0	0
		[0.024]	[0]	[0.067]	[0]	[0]	[0]	[0]	[0]
SKCB*	**23**		**0**	**0.146**	**0**	**0.757**	**0.425**	**0.144**	**0**
		[0.133]	**[0]**	**[0.148]**	**[0]**	**[0.714]**	**[0.617]**	**[0.289]**	**[0]**
SMBF	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNGR	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNPD	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SNSG*	**1**		**0**	**0**	**0**	**0**	**0.063**	**0**	**0**
		[0.021]	**[0]**	**[0]**	**[0]**	**[0]**	**[0.127]**	**[0]**	**[0]**
SNSN*	**92**		**0.905**	**1.799**	**0**	**2.764**	**0**	**0**	**0.172**
		[0.683]	**[0.807]**	**[1.657]**	**[0]**	**[3.316]**	**[0]**	**[0]**	**[0.208]**

Appendix F7 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCL	SCCS	SCN	TRIB
			BARS	BARS	BARS	BARS	BARS	BARS	BARS
SPSK	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
STBS	7		0	0	0	0	0	0	0.204
		[0.047]	[0]	[0]	[0]	[0]	[0]	[0]	[0.214]
STCT	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SVCB	2		0	0.024	0	0	0	0	0.043
		[0.024]	[0]	[0.048]	[0]	[0]	[0]	[0]	[0.087]
SVCP	16		0.16	0.529	0	0	0.494	0	0
		[0.415]	[0.32]	[1.059]	[0]	[0]	[0.988]	[0]	[0]
TPMT	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCF	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCN	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UCY	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UHY	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
ULP	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
UNID	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
USG	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
WLYE	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
WTBS	7		0.32	0.096	0	0	0.237	0	0
		[0.082]	[0.392]	[0.136]	[0]	[0]	[0.326]	[0]	[0]
WTCP	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
WTSK	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
YLBH	0		0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]

Appendix G. Hatchery names, locations, and abbreviations.

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

Appendix H. Alphabetic list of Missouri River fishes with total CPUE by gear type for sturgeon season (fall through spring) and fish community season (summer) during 2004 – 2005 for segment 14 of the Missouri River. Species codes are located in Appendix A. Asterisks and bold type denote targeted native Missouri River species.

Species Code	**Sturgeon Season (Fall through Spring)**					**Fish Community Season (Summer)**			
	1 Inch Trammel Net	2 Inch Trammel Net	Gill Net	Otter Trawl		1 Inch Trammel Net	Bag Seigne	Mini-Fyke Net	Otter Trawl
BDKF									
BESN							0.016		
BHCP	0.003	0.002							
BHMW							0.048	1.988	0.072
BKBF									
BKBH									
BKCP								0.036	
BKSS							0.064	0.083	
BLCF	0.146	0.086	0.831	0.64		0.263	0.024		9.678
BLGL							0.028	1.143	0.025
BMBF			0.004						
BMSN									
BNMW				0.013			0.022	0.274	
BRBT									
BSMW									
BTTM									
BUSK*	**0.198**	**0.339**	**0.127**	**0.055**		**0.101**			**0.041**
CARP	0.005	0.002	0.067	0.018		0.004		0.036	
CKCB									
CLSR								0.012	
CMSN									
CNCF	0.028	0.012	0.06	0.692		0.069	0.427	1.702	4.353
CNLP			0.004					0.012	
CNSN				0.016			1.382	2.31	0.737
ERSN							6.975	17.083	0.009
FHCB									

Appendix H (continued).

Species Code	Sturgeon Season (Fall through Spring)					Fish Community Season (Summer)			
	1 Inch Trammel Net	2 Inch Trammel Net	Gill Net	Otter Trawl		1 Inch Trammel Net	Bag Seigne	Mini-Fyke Net	Otter Trawl
FHCF	0.007	0.007	0.021	0.019		0.02		0.036	0.048
FHMW								0.012	
FWDM	0.038	0.016	0.035	1.256		0.005	0.06	0.393	3.091
GDEY	0.028		0.394	0.074		0.007	0.063	0.012	0.273
GDFH									
GDRH							0.033	0.036	0.054
GDSN									
GNSF								0.048	
GSBG									
GSCP	0.014	0.014	0.028			0.003			
GSPK									
GZSD	0.033		0.07	0.032		0.015	1.687	2.262	0.089
HBNS*							**0.357**	**0.119**	
HFCS				0.008					
JYDR									
LAB									
LESF									
LGPH				0.004					0.003
LKSG			0.021	0.005		0.012			
LMBS							0.035	0.012	
LNDC									
LNGR	0.005	0.036	0.18	0.011		0.006		0.024	
MMSN							0.069	0.107	0.009
MNEY	0.003								
MQTF							0.057	0.44	
NTPK									
OSSF								0.369	

Appendix H (continued).

Species Code	Sturgeon Season (Fall through Spring)					Fish Community Season (Summer)			
	1 Inch Trammel Net	2 Inch Trammel Net	Gill Net	Otter Trawl		1 Inch Trammel Net	Bag Seigne	Mini-Fyke Net	Otter Trawl
PDFH			0.032	0.112		0.005			
PDSG*	**0.004**	**0.011**	**0.018**						**0.003**
PNMW									
QLBK	0.009	0.01				0.004			
RBST									
RDSN				0.017			5.085	14.488	0.013
RESF									
RFSN								0.024	
RKBS									
RVCS	0.03	0.071	0.127	0.006		0.04	4.542	52.679	0.301
RVRH									
RVSN				0.004			0.361	4.369	0.021
SBWB			0.007					0.012	
SDBS									
SFCB*				**0.835**			**0.054**	**0.048**	**0.374**
SFSN								0.06	0.007
SGCB*				**0.05**					**0.091**
SGER*		**0.008**	**0.092**	**0.003**		**0.018**		**0.012**	**0.011**
SGWE									
SHRH			0.07			0.047	0.009	0.012	0.012
SJHR	0.004					0.006	0.012		0.003
SKCB*				**0.65**			**0.186**	**0.571**	**1.311**
SMBF	0.032	0.142	0.095	0.017		0.048			0.059
SMBS									
SMMW									
SNGR			0.074			0.02		0.667	0.047
SNPD		0.006	0.028						0.014
SNSG*	**1.356**	**0.459**	**4.38**	**1.14**		**1.335**	**0.01**		**0.802**

Appendix H (continued).

Species Code	Sturgeon Season (Fall through Spring)					Fish Community Season (Summer)			
	1 Inch Trammel Net	2 Inch Trammel Net	Gill Net	Otter Trawl		1 Inch Trammel Net	Bag Seigne	Mini-Fyke Net	Otter Trawl
SNSN*				**0.012**			**0.972**	**1.405**	**0.013**
SPSK			0.004						
STBS							0.041	0.012	0.009
STCT				0.004					
STSN									
SVCB			0.004	0.045			0.017	0.238	0.392
SVCP	0.003	0.003	0.035	0.058			0.288		
TPMT								0.012	
UBF									
UCF				0.145					0.022
UCN								0.048	
UCS									
UCT									
UCY								0.06	0.373
UHY				0.247				0.06	2.516
ULP								0.274	
UNID								0.083	
UNO									
URH									
USG				0.017					
WLYE			0.004			0.004			
WSMW									
WTBS			0.011	0.023			0.103	0.083	0.007
WTCP								0.083	0.003
WTSK			0.004						
YLBH				0.005					
YOYF									
YWPH									