2005 Annual Report

Pallid Sturgeon Population Assessment Project and Associated Fish Community Monitoring for the Missouri River: Segments 5 and 6

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

Pallid sturgeon *Scaphirhynchus albus* and the associated fish community were randomly sampled in the unchannalized Missouri River below Fort Randall Dam to the headwaters of Lewis and Clark Lake (Recovery Priority Management Area #3; [RPMA]) with standardized gear and protocols from fall of 2004 to fall of 2005 (i.e., 2005 season). Ten randomly selected bends were sampled with a minimum of 8 gear deployments expended in each bend. The confluence of a major tributary, the Niobrara River, delineates segment 5 (upstream of the confluence) from segment 6 (the confluence to the headwaters of Lewis and Clark Lake); however, both segments were pooled for analysis. In 2005, all recaptured pallid sturgeons (n = 44) were of hatchery origin and readable passive integrated transponder (PIT) tags were found in 84% of the fish. Recaptured pallid sturgeon represented all year classes that have been stocked (1997 - 1999 and 2001 - 2004) into RPMA #3 as part of population supplementation efforts. For standardized gears, 7 pallid sturgeon were captured with gillnets, 26 with trammel nets and 11 with the otter trawl. In 2005, the relative abundance of pallid sturgeon captured in gillnets was 32% lower compared to the overall running average (2003-2004). For drifted trammel nets in 2005, relative abundance increased 9% during fall through spring (i.e. the sturgeon season) and increased 79% during summer (i.e. fish community season) when compared to the overall running averages (2003-2004). Forty-five percent of pallid sturgeon were caught in the same location where a gear initially captured a pallid sturgeon (i.e. duplicate samples). Relative condition of recaptured pallid sturgeons ranged from 0.7 to 1.0. The mean growth of age-6 and older fish was < 0.06 mm/d whereas the mean growth for ages 2-4 was 0.238 mm/d and the youngest year class (2004) grew 1.249 mm/d. Spatially, pallid sturgeons were captured throughout most of the length of segments 5 and 6 (river mile 869 to 832) with most fish

captured in the channel border mesohabitat of inside bends (23%), outside bends (16%), channel crossovers (20%) and braided channels (36%). One pallid sturgeon was captured in the channel border mesohabitat of a large secondary connected channel and at the Niobrara River confluence. A total of 236 shovelnose sturgeons *S. platorynchus* were captured in 2005: 99 with gillnets, 93 with trammel nets, 31 with otter trawls, and 13 with set lines. No young-of-year *Scaphirhynchus* spp. were captured and the ratio of pallid to shovelnose sturgeons was 1:5.1.

In addition to sturgeon, eight native Missouri River species were targeted for assessment: speckled chub *Macrhybopsis aestivalis,* sturgeon chub *M. gelida*, sicklefin chub *M. meeki*, Western silvery minnow *Hybognathus* argyritis, plains minnow *H. placitus*, sand shiner *Notropis stramineus*, blue sucker *Cycleptus elongates,* and sauger *Sander canadense*. One *Hybognathus spp*. was captured in a mini-fyke net during summer which is the first occurrence in segments 5 and 6 since monitoring began in 2003. No sturgeon chubs, sicklefin chubs, or speckled chubs were captured in 2005. Sand shiners were only captured with mini-fyke nets (n = 25) during summer and otter trawls (n = 1) during the spring. A total of 34 blue suckers were captured: four in gillnets, three in otter trawls, and 27 in hoopnets (a nonstandard gear) during spring. During 2005 a total of 114 saugers were caught: 46 in trammel nets, 40 in otter trawls, 24 in gillnets, two in mini-fyke nets, and one in bag seines and hoopnets (a wild gear). Saugers were captured with gillnets (n = 46) primarily during April to June. A total of 45 fish species and one hybrid were caught in segments 5 and 6 of the Missouri River during 2005. None of the four exotic Asian carps, bighead carp *Hypophthalmichthys noblis*, silver carp *H. molitrix*, grass carp *Ctenopharyngodon idella*, and black carp *Mylopharyngodon piceus*, were captured.

TABLE OF CONTENTS

LIST OF TABLES

Pallid sturgeon

Shovelnose sturgeon

Sturgeon chub

Sicklefin chub

Speckled chub

Sand shiner

***Hybognathus* spp.**

Blue sucker

Sauger

LIST OF FIGURES

Pallid sturgeon

Shovelnose sturgeon

Sturgeon chub

Sicklefin chub

Speckled chub

Sand shiner

Hybognathus spp.

Blue sucker

Sauger

Wild (non-standardized) sampling

LIST OF APPENDICES

Introduction

A team of biologists representing State and Federal resource management agencies was assembled to develop and implement a standardized long term resource monitoring program for the Missouri River. This team is now known as the Pallid Sturgeon Population Assessment Team (Drobish 2005a). The primary goal of this program is monitoring the status and recovery of endangered pallid sturgeon *Scaphirhynchus albus* (Dryer and Sandoval 1993). However, the monitoring program is also directed towards the native riverine fish community (Appendix A). This team developed standardized protocols for habitat classification (Appendix B), gear types, and deployment methods (Appendix C), and data reporting (Drobish 2005b). Four high priority pallid sturgeon recovery management areas (RPMAs), were identified in the recovery plan (Dryer and Sandoval 1993), which encompass nearly 1775 KM (1,100 miles) of the Missouri River system. The Pallid Sturgeon Population Assessment Team selected 14 sampling segments within these RPMAs to implement the monitoring program. Each sampling segment was selected based on a variety of characteristics such as water temperature, turbidity, influence of tributaries, presence of degrading or aggrading stream beds, stream gradient, natural hydrograph, spillway releases and flow fluctuations (Drobish 2005a). Sampling within these segments allows biologists to monitor trends of pallid sturgeon and the associated fish community as well as evaluate mitigation efforts and shallow water habitat restoration projects.

Pallid sturgeon within segments 5 and 6 of the Missouri River, also known as RPMA 3 (Figure 1a), have been supplemented through stocking since 2000 (Appendices D and E). From 2000 to 2005, a total of 3,240 juvenile pallid sturgeon were released consisting of seven year classes (1997, 1998, 1999, 2001, 2002, 2003, and 2004) and 9 adult consisting of

former broodstock or rehabilitated fish from Lake Sharpe, SD that were also stocked (Appendix E). These fish were stocked at three locations: the most upstream site was Sunshine Bottoms, the middle site was at the Verdel Boat Ramp, and lower most site was at the Running Water Boat Ramp (Figure 2). The monitoring program will serve to assess the success of hatchery propagated fish and guide future stocking efforts.

Because current pallid sturgeon abundance is extremely low, data collection that solely targets pallid sturgeon likely would not provide adequate information to evaluate restoration projects and flow modifications to the Missouri River. An ecologically based long-term population assessment approach was adopted to address this concern and evaluate the entire warm water benthic fish community in the Missouri River as required by the U. S. Fish & Wildlife Service's (USFWS) 2000 Biological Opinion on operations of the main-stem Missouri River dams (USFWS 2000). Additionally, evaluating responses of other native, short-lived Missouri River fishes to changes in habitat or flow modifications may be a more sensitive indicator of habitat change in the near term compared with the rare, long-lived pallid sturgeon. Information derived from this project will be vital for developing sound management recommendations for recovering the native Missouri River fish fauna. Because the pallid sturgeon is a known piscivore (Carlson et al. 1985), assessment of the native benthic Missouri River fish assemblage, which likely serves as pallid sturgeon prey, is also a critical component of the monitoring program. A representative group of nine native Missouri River fishes was selected as indicator species for detecting improvement in the warm water benthic fish community. The species selected were: shovelnose sturgeon *S. platorynchus*, western silvery minnow *Hybognathus argyritis*, plains minnow *H. placitus*, speckled chub *Macrhybopsis aestivalis*, sturgeon chub *M. gelida*, sicklefin chub *M. meeki*,

sand shiner *Notropis stramineus*, blue sucker *Cycleptus elongatus,* and sauger *Sander canadense.* Bigmouth buffalo *Ictiobus cyprenellus* was dropped as a targeted native species in the 2005 sampling season. Counts and lengths of all fish collected during population assessment activities are recorded; however, detailed data (weight and age structures such as scales, otoliths, or pectoral fin rays) are only being collected on pallid sturgeon and the representative group of nine native Missouri River species. No pectoral fin ray clips were taken on shovelnose sturgeon, blue suckers, and in segments 5 and 6 due to biologist's concerns regarding the risk of post-clip mortality.

Goals

Although the Pallid Sturgeon Population Assessment Program itself will not aid in direct recovery of pallid sturgeon, information derived from this program will be used to evaluate the progress of current and proposed management actions. Restoration of pallid sturgeon in the Missouri River can be divided into three broad categories: population supplementation with hatchery-reared pallid sturgeon, habitat restoration, and changes in current operations of the main-stem dams (i.e. natural hydrograph or "spring rise"). These three main management actions are all directed towards the ultimate goal of recovery of pallid sturgeon and require monitoring to ascertain success. Therefore, the specific overall goals of this population assessment program for the Missouri River are:

1. Provide needed information to detect change in pallid sturgeon and native target species populations and
2. Determine habitat preferences over time for pallid sturgeon and select native species.

Objectives

Six objectives have been identified for the monitoring program. Detailed hypotheses for each objective can be found in Drobish (2005a).

1. Evaluate annual and long-term trends in pallid sturgeon population abundance and geographic distribution throughout the Missouri River System.
2. Evaluate annual long-term trends of habitat usage by wild and hatchery stocked pallid sturgeon by season and life stage.
3. Evaluate population structure and dynamics of pallid sturgeon in the Missouri River system.
4. Evaluate annual results and long-term trends in population abundance and geographic distribution for nine native target species throughout the Missouri River system.
5. Evaluate annual results and long-term trends of habitat usage for nine target native species by season and life stage.
6. Evaluate annual results and long-term trends in all remaining species (minimum of 50 fish collected/species) population abundance and geographic distribution throughout the Missouri River system.

Success Criteria

Evaluation of success will be tied directly to the results of the Pallid Sturgeon Population Assessment Program and the resulting information that these assessments provide. The following four statements may be used to determine program success:

1. The program has the ability to detect population changes.

2. The program has the ability to measure survival of hatchery reared and stocked pallid sturgeon in the river.
3. The program has the ability to detect reproduction of pallid sturgeon in the Missouri River.
4. The program has the ability to detect recruitment of wild pallid sturgeon in the Missouri River.

STUDY AREA

Lewis and Clark Lake, the most downstream reservoir of the Missouri River, was formed by the closure of Gavins Point Dam in 1955. The head waters of Lewis and Clark Lake (river kilometer [rkm] 1327, river mile [rm] 825) defines the downstream end of segment 6. Lewis and Clark Lake extends to Fort Randall Dam (rkm 1416, rm 880) which also defines the upper end segment 5 (Figure 1a). Both dams are operated by the U. S. Army Corps of Engineers (USACE). The primary function of Gavins Point Dam is to level out release fluctuations from upstream dams to serve downstream purposes (i.e., navigation and water supply). The riverine section of Lewis and Clark Lake extends approximately 89 rkm from Fort Randall Dam to Springfield, South Dakota (Figures 1a). Maximum depth of the riverine section of Lewis and Clark Lake is about 12 m and channel width ranges from 45 - 90 m. Downstream of Springfield, Lewis and Clark Lake becomes more like a reservoir. However, sedimentation from the Niobrara River has formed a large braided delta, that starts near rkm 1351. This delta is progressively expanding downriver into the reservoir. The riverine section of Lewis and Clark Lake was selected in the Pallid Sturgeon Recovery Plan

(Dryer and Sandoval 1993) as 1 of 4 Recovery Priority Management Areas (RPMAs) in the Missouri River for potential recovery of the species and was designated RPMA 3.

The riverine section of Lewis and Clark Lake retains many natural characteristics such as sandbars, sandbar pools, side channels, backwater areas, islands, old growth riparian forest and year round flows. However the historical temperature and flow (i.e., the hydrograph) in the riverine section has been altered due to operation of Fort Randall Dam. Water levels substantially fluctuate daily and seasonally. Diel water levels are subject to changes of almost 1 m. Lowest daily flows generally occur at 0600 hours with peak flows occurring between 1200 to 1900 hours in support of power generation demands (USACE 1994). The USACE Missouri River Main Stem Reservoirs 2000 - 2001 Annual Operating Plan (http://www.nwd-mr.usace.army.mil/rcc/reports/aop.html) reports the highest seasonal releases from Ft. Randall Dam occurred from August through November to support navigation on the Missouri River below Sioux City, Iowa. The lowest releases were from December through April to prevent flooding due to ice jams.

Based on the presence of a major tributary, the Niobrara River, the riverine section of Lewis and Clark Lake (RPMA 3) was divided into two sampling segments by the Population Assessment Team. Segment 5 encompasses the riverine section below Fort Randall Dam to the confluence. In this segment, water temperatures are depressed by bottom discharges from Fort Randall Dam and turbidity is low. Segment 6 encompasses the riverine section from the confluence of the Missouri and Niobrara Rivers to the headwaters of Lewis and Clark Lake (Figure 1a). This segment has increased water temperatures and turbidity due to inflows from the Niobrara River.

METHODS

Our sampling protocol followed the detailed guidelines identified in the "Long Term Pallid Sturgeon and Associated Fish Community Assessment for the Missouri River Guidelines and Standardized Guidelines for Sampling and Data Collection" developed by the Pallid Sturgeon Population Assessment Team (Drobish 2005b). A general summary of those guidelines follows.

Habitat Classification

The basic habitat classification system used in the Benthic Fishes Study (Berry and Young 2001) was adopted by this program (Appendix B). The Benthic Fishes Study was conducted in the late 1990's by the U. S. Geological Survey Cooperative Fish and Wildlife Research Units located at universities throughout the Missouri River Basin states. This basic habitat classification system was further modified to address both broad and specific habitats using a hierarchical classification system (e.g., Macrohabitat, Mesohabitat, and Microhabitat) to aid in consistent and comparable data collection across all segments of the Missouri River. Three continuous macrohabitats are present in every bend: outside bends, inside bends and channel crossovers. An additional 10 discrete macrohabitats have been identified that may not be present in each bend: large tributary mouths, small tributary mouths, confluence areas, large and small secondary connected channels, non-connected secondary channels, deranged channels, braided channels, dendritic channels, and dam tailwaters. Mesohabitats and microhabitats have been defined to further describe macrohabitats. This approach provides continuity with previous studies (e.g., Benthic Fish Study) while providing a more detailed and flexible habitat

classification system for future work. All habitats were classified based on the conditions at the time of sampling.

The bend served as the basic hydrologic unit sampled within each river segment. A bend was comprised of three continuous macrohabitats: an outside bend (main channel), an inside bend (main channel) and a channel crossover (main channel). Bends were determined by the hydrologic nature of the river and extended from the upstream crossover to the next downstream crossover and encompassed any islands and secondary channels (i.e., discrete habitats) between these two crossovers. Typically, the river channel parallels the adjacent geographic landforms in the channelized river. However, in the unchannelized portions of the Missouri River, bends do not necessarily follow the general form of the landscape; multiple meanders occur within what appears as one large bend based on the shape of the entire river channel. Also, in unchannelized sections, the location of bends and the number of bends within a segment may change over time. The habitat classification scheme allows for bend comparisons between the channelized and unchannelized river despite changes in scale.

Sampling effort and gear

All bends within each segment were sequentially numbered, from upstream to downstream, and then ten bends (five per segment) were randomly selected for sampling. In the past years (2003 and 2004) eight bends were randomly selected and two bends, one upstream and one downstream of the confluence of the Niobrara and Missouri rivers, were non-randomly selected. Following the 2004 sample season, no non-random bends were sampled (i.e., all five bends in each segment were randomly selected). Additional randomly selected bends to increase sample size were sampled as time allowed. Each mesohabitat within a macrohabitat was

sampled using standard gears (Appendices B and C). A minimum of two sub-samples were required for each standard gear type for each habitat within that bend where a particular gear can effectively be deployed. Habitat data (velocity, substrate, turbidity) were collected at each pallid sturgeon capture site and in each bend for one of the two sub-samples. Depth and temperature were collected at all sampling locations. Detailed habitat data collection methods are found in Drobish (2005b).

A minimum number of gear deployments for each standard gear was used, (10 for gillnets and eight for all other gears in each bend) to ensure sufficient sample size for comparisons between segments (Tables 1 and 2). The standard gears were selected to sample specific habitats, fish species, and seasons. Some gears were selected to maximize capture of pallid sturgeon, while others targeted the associated fish community. However, all gears sampled multiple species despite targeting pallid sturgeon.

The sampling year was divided into two seasons: sturgeon season and fish community season. The sturgeon season encompassed the fall through spring while the fish community season occurred during summer. The sturgeon season focused on the assessment of sturgeon species while collections in the fish community season continued to assess sturgeon but placed additional emphasis and effort towards descriptions of the native fish community. Delineation between the sturgeon and fish community seasons is primarily based on water temperature. Based on the pallid sturgeon collection and handling protocols (USFWS 2002) pallid sturgeon can only be collected with gill nets at water temperatures < 12 °C. Due to the diverse habitats in the river and the longitudinal changes in climate along the Missouri River, a wide time frame was necessary to facilitate comparable sampling effort among the 14 segments. For example, gill netting in the Fork Peck reach of Montana and North Dakota (segments 1 – 4) is typically not

feasible throughout winter because of ice. However, lack of ice in the lower reaches of the Missouri River permit gill netting during most of the winter. Additional gears were deployed during the fish community season to assess the main channel and shallow water habitats (< 1.2 m) and their associated fish communities. The fish community season ran between July 1 and October 30 and the intensive sturgeon sampling occurred when possible for the remainder of the year. Data in this report covers the time period from October 1, 2004 through September 30, 2005and herein referred to as the 2005 sampling season. Focused studies are initiated in conjunction with the fish population assessments program to fulfill unique biological information gaps (e.g., food habits and telemetry projects). However, these specialized studies fall into the focused research category and are not reported here.

Sampling Gear

Multiple standard gears were deployed to sample deep and shallow habitats of the Missouri River. Gill nets, trammel nets, and otter trawls were fished in deep waters of the main channel, large secondary connected channels, and large tributaries during the sturgeon season. In the fish community season, trammel nets and otter trawls were again used with the addition of mini-fyke nets and bag seines to sample shallow water habitats (i.e. bars). Multi-filament gill nets (1.8 m deep x 38 m length) consisted of five 8-m long panels with bar mesh sizes of 2.54 cm, 3.81 cm, 5.08 cm, 7.62 cm, and 10.16 cm. Trammel nets were 1.8 m deep X 38 m with outside wall panels of 15.24 cm bar mesh and an inside wall panel of 2.54 cm bar mesh. The otter trawl (0.5 m deep x 9.1 m wide) had an outer chafing mesh of 0.64 cm bar mesh, inner bar mesh of 0.32 cm constructed of Sapphire® and a 2-m long cod end. Mini-fyke nets consisted of a lead set at the bankline (4.5 m long x 0.6 m high) with two 1.2 m wide x 0.6 m high rectangular

steel frames (cab) and two 0.6 m diameter circular hoops with 3 mm "ACE" type nylon mesh. Bag seines were constructed of 6.4 mm "ACE" type mesh and were 9.1 m long, 1.8 m high, containing a 1.8 m x 1.8 m x 1.8 m bag. Gill nets and mini-fyke nets were set overnight for a maximum of 18 h and CPUE was calculated as the number of fish per net night. Trammel nets were drifted and otter trawls were pulled downstream on the river bottom for a minimum distance of 75 m and a maximum distance of 300 m. A global positioning system (GPS) was used to quantify distance sampled for trammel nets and otter trawls with CPUE measured as numbers of fish per 100 m of distance deployed. Deployment technique and seine width were used to quantify numbers of fish per 100 m^2. All gear deployments followed the detailed standard operating procedures (SOP) outlined in Drobish (2005b).

In addition to the required standard gears, set lines and hoopnets, were used during both sampling seasons to target juvenile pallid sturgeon and shovelnose sturgeon. These additional gears are considered "wild" in the SOP (Drobish 2005b). Each set line contained two Mustad Tuna Circle hooks (sizes 10/0 and 12/0) and was held fast to the river bottom with a 1.8 kg collapsible anchor. Hooks were staged at 1-m intervals from the anchor. Hoop nets were 4.8 m in length with 3.8 cm bar mesh and consisted of seven tapered 1.2 m diameter hoops. Hoop nets were used in areas where flow velocities were sufficient to maintain the net in a deployed position. Both setlines and hoop nets were marked with a float attached to a 40-ft line and set overnight for a maximum of 18 h. Hoop net and setline CPUE was calculated as the numbers of fish per net or hook night respectively. All target species captured with wild gears were used in calculating percents of the catch by habitat (macro- and meso- levels), length frequency histograms, and relative stock density (RSD) indices when applicable.

Calculations

The fundamental sampling unit (i.e., replicate) for the population assessment program was the bend. Therefore, our effective sample size was the number of bends sampled with each gear deployed in each season collectively for segments 5 and 6 (Tables 1 and 2). Data were pooled for segments 5 and 6 because of the short length (in river miles) and low number of bends sampled in each segment (n = 5). Mean CPUE was separately calculated for each species caught in each gear during each sampling season. First, the average CPUE for all sub-samples within a bend was calculated and then these "bend means" were averaged to calculate the overall mean CPUE. The overall CPUE was also calculated for each habitat effectively sampled by a particular gear in each season (Appendix F). Variability of CPUE was presented as 2 standard errors (SE) which approximates a 95% confidence interval around the mean.

Indices of fish condition (health) were calculated for pallid sturgeon and two native target Missouri River species: shovelnose sturgeon, and sauger. Relative condition factor (Kn) was calculated to assess the condition of pallid sturgeon and used the weight-length relation in Keenlyne and Evanson (1993). Relative weight (Wr) calculations require a length-specific standard weight derived from an overall standard weight-length relation encompassing multiple populations across a species' range. Standard weight relations have been derived for shovelnose sturgeon (Quist et al. 1998). Detailed equations for calculating Kn, and Wr are found in (Anderson and Newman 1996).

Incremental relative stock density (RSD) was calculated to describe the population size-structure of pallid sturgeon and shovelnose sturgeon using methods proposed by Gabelhouse (1984). For pallid sturgeon, length categories proposed by Shuman et al. (2006) were used to determine relative stock densities (RSD). These length categories are stock-quality (330 – 629

mm), quality-preferred (630 - 839 mm), preferred-memorable (840 - 1039 mm), memorable-trophy (1040 - 1269 mm), and trophy (≥ 1270 mm). Length categories exist in the literature for two the two sturgeon species of the population assessment. We calculated the percents of < stock, stock, and > stock sized fish captured in each macrohabitat and mesohabitat type. Sub-stock was further divided < 250 mm (FL) for pallid sturgeon and < 150 mm (FL) for shovrlnose sturgeon, to provide greater resolution of recruitment by young-of-year sturgeon Detailed calculations of RSD are found in Anderson and Newman (1996).

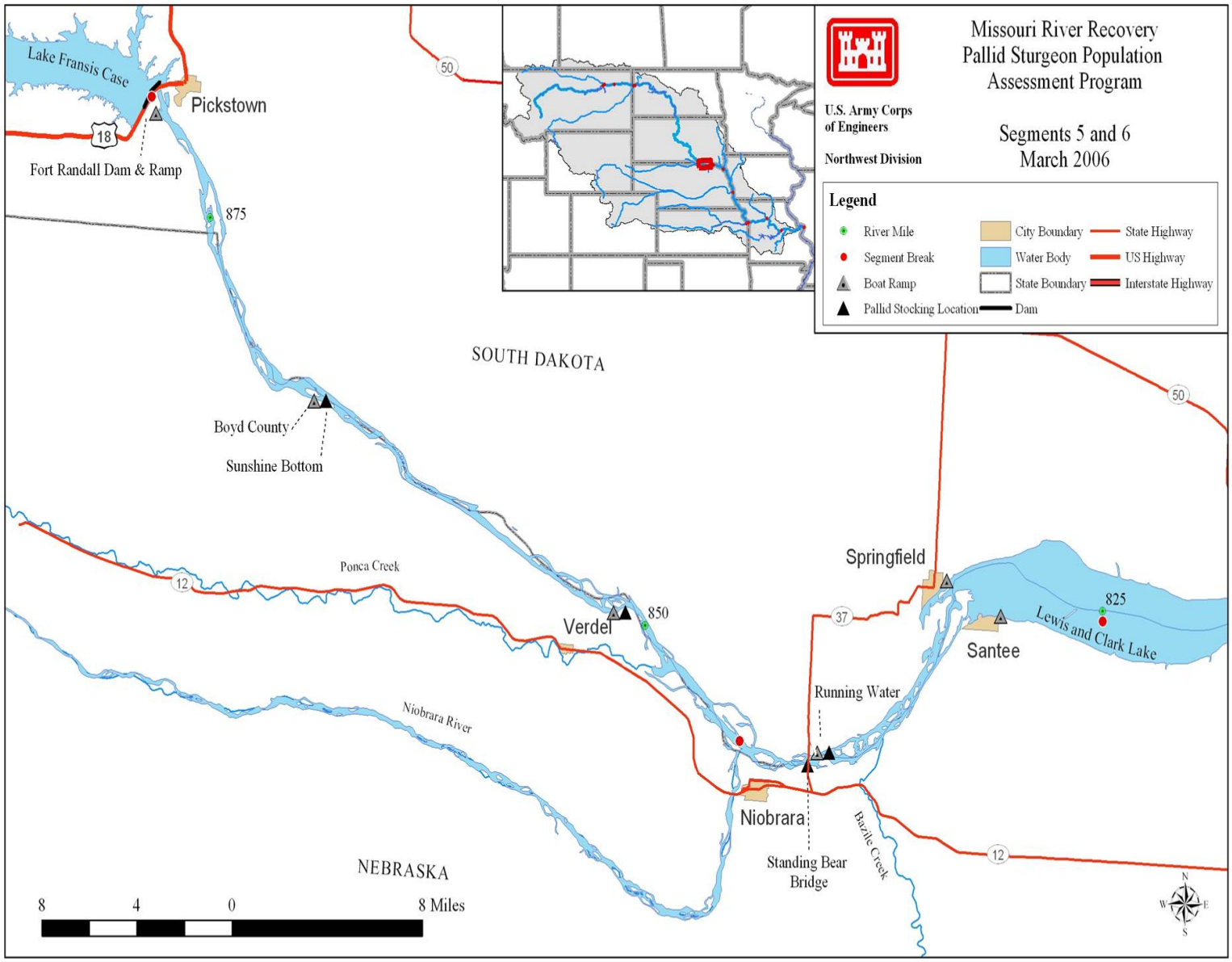

Figure 1a. Map of segments 5 and 6 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segments 5 and 6 encompasses the Missouri River from Fort Randall Dam to the headwaters of Lewis and Clark Lake.

Results

Errata 2004 - Bag seine data reported as fish/m^2 but actual values were fish/100 m^2.

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.

Pallid Sturgeon

A total of 44 pallid sturgeons were captured during the 2005 season with all fish caught in standard gears: gill nets (n = 7), drifted trammel nets (n = 26), and 16-ft otter trawl (n = 11). Catch per unit effort was 6 fold greater for trammel nets during summer (0.099 fish/100 m) compared to fall-spring (0.016 fish/100 m; Figures 3 and 5). The mean CPUE of pallid sturgeon with gill nets was essentially the same in 2005 (32% lower) compared to the average from 2003 to 2004. Mean CPUE for trammel nets in 2005 was similar to 2004 during the sturgeon season (fall through spring); whereas mean CPUE during the fish community season (summer) increased over 3 times compared to 2003 to 2004. As expected, the variability in mean CPUE for all gears was high to due the high incidence of zero catches, 93% for gillnets and 92% for trammel nets. The majority of pallid sturgeons were captured during the fish community season (n = 29); 15 fish were captured during the sturgeon season. No pallid sturgeons were captured with mini-fyke nets and seines.

Pallid sturgeon were captured throughout segments 5 and 6 demonstrating no affinity towards a specific bend (Figure 1b). Macrohabitats where pallid sturgeon were captured

included outside bends, inside bends, channel crossovers, braided channels and large secondary connected channels (Tables 9, 11, 13, and 15). Channel borders were the mesohabitat where most pallid sturgeon were captured (Tables 10, 12, 14 and 16).

All pallid sturgeon captured were considered to be of hatchery origin. Recaptured pallid sturgeon either had detectable marks or were similar in size to stocked fish (Table 4). Passive integrated transponder (PIT) tag retention was 84%. Two recaptured fish from the 2003 year class lost weight while at liberty, however, the oldest year classes (1997-1999) continued to increase in weight (Table 4). All fish increased in length since stocking (Table 6). The mean relative condition factor ranged from 0.67 to 0.99 for all year classes and declined since stocking.

Fork lengths (FL) of pallid sturgeon ranged from 328 – 726 mm in segments 5 and 6 during 2005 (Table 4 and Figure 8). There was no evidence of recruitment by wild pallid sturgeon. Most pallid sturgeon were of stock-quality length (Table 7) with only one fish smaller than stock size (Table 11). Incremental RSD for pallid sturgeon during the sturgeon season was generally similar to the fish community season (Table 7). No hybrid *Scaphirhynchus* (pallid x shovelnose sturgeon) were captured and the ratio of pallid to shovelnose sturgeon decreased compared to 2003 and 2004 (Table 8).

Table 1. Number of bends sampled, mean effort per bend, and total effort by macrohabitat for segments 5 and 6 on the Missouri River during fall through spring (sturgeon season) and summer (fish community season) in 2005. Effort is defined as net nights for gill and mini-fyke nets, 100 m drifted for trammel nets and trawls, and 100 m^2 for bag seines. N-E indicates the habitat is nonexistent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	Number of bends	Mean effort/ bend	Macrohabitat													
			BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Fall through Spring - Sturgeon Season																
1 Inch Trammel Net	10	15.3	14.9	29.8	4.60	0		43.9	53.7	6.7	0		0		0	
2.5 Inch Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gill Net	10	19.9	20	46	0	3		54	51	20	5		0		0	
Otter Trawl	10	26.0	60.9	57.9	11.5	6.0		46.4	50.7	26.4	0		0		0	
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Summer – Fish Community Season																
1 Inch Trammel Net	10	22.5	109.8	41.4	0	0		41.0	27.5	5.7	0		0		0	
Bag Seine	11	5.1	26.7	6.5	0	0		6.8	7.8	5.3	2.0		0		1.3	
Mini-Fyke Net	10	8.0	39	9	0	0		12	12	4	2		1		1	
Otter Trawl	11	23.6	132.8	27.3	0	0		52.4	34.8	12.0	0		0		0	
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 2. Number of bends sampled, mean effort per bend, and total effort by mesohabitat for segments 5 and 6 on the Missouri River during fall through spring (sturgeon season) and summer (fish community season) in 2005. Effort is defined as net nights for gill and mini-fyke nets, 100 m drifted for trammel nets and trawls, and 100 m squared for bag seines. N-E indicates the habitat is nonexistent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	Number of bends	Mean effort/ bend	Mesohabitat					
			BAR	CHNB	DTWT	ITIP	POOL	TLWG
Fall through Spring – Sturgeon Season								
1 Inch Trammel Net	10	15.3	0	147.9	0	4.6	0.9	n-e
2.5 Inch Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n-e
Gill Net	10	19.9	0	181	0	2	14	n-e
Otter Trawl	10	26.0	0	259.7	0	0	0	n-e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n-e
Summer – Fish Community Season								
1 Inch Trammel Net	10	22.5	0	225.4	0	0	0	n-e
Bag Seine	11	5.1	56.3	0	0	0	0	n-e
Mini-Fyke Net	10	8.0	77	3	0	0	0	n-e
Otter Trawl	11	23.6	0	259.3	0	0	0	n-e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n-e

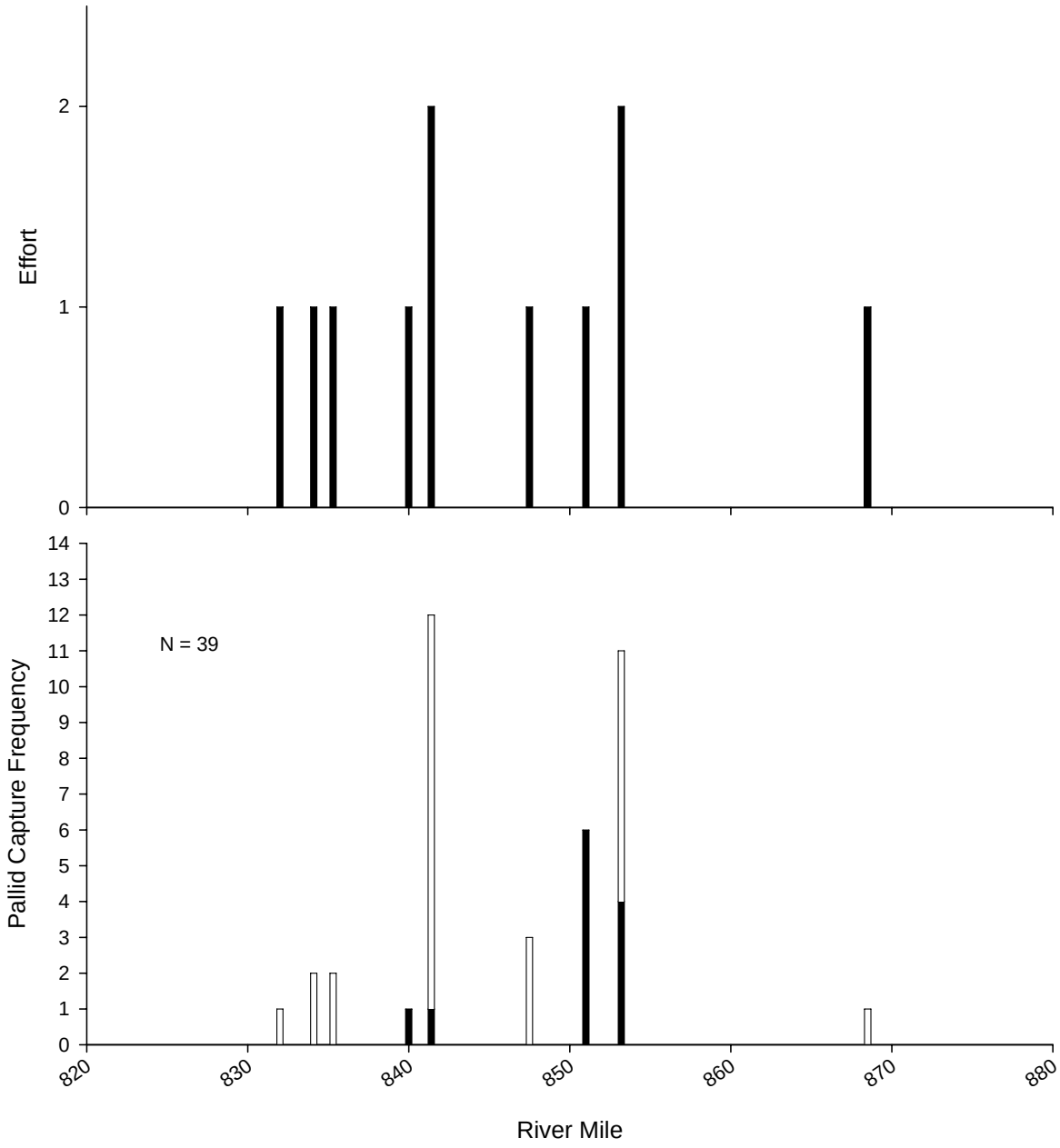

Figure 1b. Distribution of: A) seasonal sampling effort and B) pallid sturgeon captures by river mile for segments 5 and 6 in randomly selected bends of the Missouri River during 2004-2005. Sampling effort of 2 indicates bend sampled in both sturgeon and fish community seasons. Sampling effort of 1 indicates bend sampled in only one season. Black bars represent pallid sturgeon captures during sturgeon season and white bars during fish community season.

Table 3. Pallid sturgeon (PDSG) capture summaries for all gears relative to habitat type and environmental variables on the Missouri River during 2005. Means (minimum and maximum) are presented. Habitat definitions and codes presented in Appendix B. N-E indicates the habitat is non-existent in the segment.

	OSB					ISB				
	BAR	POOL	CHNB	TLWG	ITIP	BAR	POOL	CHNB	TLWG	ITIP
Depth (m) (Effort)	0.7 (0.3-0.9)	4.8 (4.8-4.8)	4.2 (1.4-8.0)	N-E	2.8 (2.8-2.8)	0.6 (0.3-1.0)	1.7 (1.0-2.9)	2.4 (0.8-8.4)	N-E	
Depth (m) (Catch)			4.2 (1.4-8.0)	N-E				1.9 (1.5-2.4)	N-E	
Velocity (m/s) (Effort)	0.02 (0.00-0.09)	0.12 (0.12-0.12)	0.51 (0.09-0.98)	N-E	0.74 (0.74-0.74)	0.09 (0.00-0.20)	0.30 (0.30-0.30)	0.49 (0.00-0.97)	N-E	
Velocity (m/s) (Catch)			0.52 (0.32-0.98)	N-E				0.41 (0.21-0.49)	N-E	
Temp. °C (Effort)	23.3 (21.1-24.0)	4.9 (3.3-9.7)	13.3 (1.5-24.4)	N-E	8.0 (8.0-8.0)	22.4 (20.9-23.8)	10.9 (10.0-12.0)	14.6 (1.5-25.2)	N-E	6.6 (6.6-6.6)
Temp. °C (Catch)			13.6 (2.3-23.6)	N-E				17.7 (2.2-24.2)	N-E	
Turbidity (ntu) (Effort)	22 (4-55)	6 (5-7)	25 (3-94)	N-E	13 (13-13)	12 (4-59)	16 (15-17)	24 (3-180)	N-E	
Turbidity (ntu) (Catch)			14 (5-21)	N-E				5 (3-14)	N-E	
Total Pallids caught	0	0	7	N-E	0	0	0	10	N-E	0

Table 3 (continued)

	CHXO					SCCL				
	BAR	POOL	CHNB	TLWG	ITIP	BAR	POOL	CHNB	TLWG	ITIP
Depth (m) (Effort)	0.6 (0.2-1.0)	1.3 (1.3-1.5)	3.2 (0.7-7.5)	N-E		0.9 (0.4-7.0)		2.8 (1.2-5.0)	N-E	
Depth (m) (Catch)			3.6 (2.3-5.3)	N-E				1.8 (1.8-1.8)	N-E	
Velocity (m/s) (Effort)	0.12 (0.06-0.20)		0.43 (0.00-0.75)	N-E		0.07 (0.00-0.11)		0.32 (0.11-0.56)	N-E	
Velocity (m/s) (Catch)			0.46 (0.21-0.67)	N-E				0.25 (0.25-0.25)	N-E	
Temp. °C (Effort)	22.3 (21.1-23.8)	12.0 (12.0-12.0)	13.4 (1.5-24.4)	N-E		23.0 (21.1-24.0)		12.5 (1.8-24.2)	N-E	
Temp. °C (Catch)			18.0 (10.0-23.8)	N-E				13.0 (13.0-13.0)	N-E	
Turbidity (ntu) (Effort)	9 (4-17)	15 (15-15)	13 (2-122)	N-E		10 (7-42)		8 (4-21)	N-E	
Turbidity (ntu) (Catch)			9 (4-17)	N-E				11 (11-11)	N-E	
Total Pallids caught	0	0	9	N-E		0		1	N-E	0

Table 3 (continued)

	SCCS					SCN				
	BAR	POOL	CHNB	TLWG	ITIP	BAR	POOL	CHNB	TLWG	ITIP
Depth (m) (Effort)	0.9 (0.6-0.9)		2.0 (1.3-2.5)	N-E					N-E	
Depth (m) (Catch)				N-E					N-E	
Velocity (m/s) (Effort)	0.04 (0.00-0.07)		0.42 (0.12-0.67)	N-E					N-E	
Velocity (m/s) (Catch)				N-E					N-E	
Temp. °C (Effort)	24.6 (23.0-25.0)		11.4 (10.0-13.0)	N-E					N-E	
Temp. °C (Catch)				N-E					N-E	
Turbidity (ntu) (Effort)	6 (5-6)		12 (10-12)	N-E					N-E	
Turbidity (ntu) (Catch)				N-E					N-E	
Total Pallids caught	0		0	N-E					N-E	

Table 3 (continued)

	TRIB					TRML				
	BAR	POOL	CHNB	TLWG	ITIP	BAR	POOL	CHNB	TLWG	ITIP
Depth (m) (Effort)				N-E					N-E	
Depth (m) (Catch)				N-E					N-E	
Velocity (m/s) (Effort)				N-E					N-E	
Velocity (m/s) (Catch)				N-E					N-E	
Temp. °C (Effort)			20.6 (20.6-20.6)	N-E					N-E	
Temp. °C (Catch)				N-E					N-E	
Turbidity (ntu) (Effort)			14 (14-14)	N-E					N-E	
Turbidity (ntu) (Catch)				N-E					N-E	
Total Pallids caught			0	N-E					N-E	

Table 3 (continued)

	TRMS					CONF				
	BAR	POOL	CHNB	TLWG	ITIP	BAR	POOL	CHNB	TLWG	ITIP
Depth (m) (Effort)	0.7 (0.5-1.0)			N-E				2.9 (1.8-6.0)	N-E	
Depth (m) (Catch)				N-E				1.8 (1.8-1.8)	N-E	
Velocity (m/s) (Effort)	0.06 (0.05-0.10)			N-E				0.59 (0.35-0.61)	N-E	
Velocity (m/s) (Catch)				N-E				0.61 (0.61-0.61)	N-E	
Temp. °C (Effort)	20.8 (20.5-22.4)			N-E				18.8 (13.4-21.1)	N-E	
Temp. °C (Catch)				N-E				14.6 (14.6-14.6)	N-E	
Turbidity (ntu) (Effort)	15 (12-16)			N-E				72 (60-73)	N-E	
Turbidity (ntu) (Catch)				N-E				73 (73-73)	N-E	
Total Pallids caught	0			N-E				1	N-E	

Table 3 (continued)

	BRAD					DEND				
	BAR	POOL	CHNB	TLWG	ITIP	BAR	POOL	CHNB	TLWG	ITIP
Depth (m) (Effort)	0.7 (0.2-1.6)		2.5 (0.7-6.3)	N-E				2.1 (1.5-2.6)	N-E	
Depth (m) (Catch)			2.1 (1.0-4.0)	N-E					N-E	
Velocity (m/s) (Effort)	0.07 (0.00-0.32)		0.42 (0.00-0.84)	N-E				0.54 (0.54-0.54)	N-E	
Velocity (m/s) (Catch)			0.42 (0.20-0.61)	N-E					N-E	
Temp. °C (Effort)	22.4 (20.6-25.4)	6.3 (6.3-6.3)	19.0 (6.3-27.9)	N-E	6.5 (6.5-6.5)			17.4 (6.5-22.0)	N-E	
Temp. °C (Catch)			14.4 (12.3-16.4)	N-E					N-E	
Turbidity (ntu) (Effort)	13 (4-27)		53 (7-517)	N-E				375 (49-484)	N-E	
Turbidity (ntu) (Catch)			34 (14-56)	N-E					N-E	
Total Pallids caught			16	N-E					N-E	

Table 3 (continued)

	DRNG				
	BAR	POOL	CHNB	TLWG	ITIP
Depth (m) (Effort)				N-E	
Depth (m) (Catch)				N-E	
Velocity (m/s) (Effort)				N-E	
Velocity (m/s) (Catch)				N-E	
Temp. °C (Effort)				N-E	
Temp. °C (Catch)				N-E	
Turbidity (ntu) (Effort)				N-E	
Turbidity (ntu) (Catch)				N-E	
Total Pallids caught				N-E	

Table 4. Individual pallid sturgeon fork length (mm), weights (g), morphometric character index (CI) (Sheehan et al. 1999), status (H = Hatchery, W = Wild[d]), tags found, elastomer tags (color, position, orientation), if tags were inserted in field, stocking locations, and hatchery information on the Missouri River during 2005.

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]
GP-1-5-5-1	605	797	n/a	H	P, D	L-G, R-G	N	1997	545	715	VER	GAV
GP-1-5-43-1	355	130	n/a	H	P		N	2002	228	49	SUN	GAV
GP-1-5-105-2	430	220	n/a	H	P		N	1999	394	193	SUN	GAV
GP-1-5-359-1	396	220	n/a	H	P		N	2001	180	-	VER	GAR
GP-1-5-361-1	417	240	n/a	H	P		N	2001	170	-	VER	GAR
GP-1-5-362-1	434	265	n/a	H		L-Y, H-Y	Y					
GP-1-5-367-2	412	265	n/a	H	P	L-Y, H-Y	N	2003	383	230	SUN	GAV
GP-1-5-368-1	661	930	n/a	H	P,D	L-Y, R-Y	N	1997	542	715	VER	GAV
GP-1-5-584-1	450	265	n/a	H	P	H-Y	N	2003	380	232	STB	GAV
GP-1-5-585-2	438	245	n/a	H	P		N	2001	180	-	VER	GAR
GP-1-5-596-1	395	160	n/a	H	P		N	2001	180	-	VER	GAR
GP-1-5-596-2	464	270	n/a	H	P		N	2001	200	-	VER	GAR
GP-1-5-602-1	680	850	n/a	H		L-Y, R-Y	Y					
GP-1-5-608-1	410	195	n/a	H	P	H-Y	N	2003	355	204	STB	GAV
GP-1-5-609-1	328	110	n/a	H	P	H-Y	N	2003	236	45	STB	GAV
GP-1-5-611-1	380	155	n/a	H	P	H-Y	N	2003	320	128	SUN	GAV
GP-1-5-611-2	416	205	n/a	H	P	H-Y	N	2003	345	210	STB	GAV
GP-1-5-614-1	369	105	n/a	H	P	H-Y	N	2003	304	95	SUN	GAV
GP-1-5-838-1	362	155	n/a	H	P	L-Y	N	2003	264	73	SUN	GAV
GP-1-5-900-3	366	145	n/a	H	P		N	2004	317	140	STB	GAV
GP-1-5-901-1	585	520	n/a	H	P		N	1998	506	481	VER	GAV
GP-1-5-10118-9	575	540	n/a	H	P		N	1998	509	488	VER	GAV
GP-1-5-10123-4	355	160	n/a	H	P		N	2002	210	32	STB	GAV

Table 4. Continued.

ID	Recapture Data							Stocking Data				
	FL (mm)	Wt (g)	CI	Status	Tags found[a]	Elastomer[b]	Marked in field?	Year class	FL (mm)	Wt (g)	Site	Source
GP-1-5-10135-2	509	550	n/a	H	P		N	2002	340		SUN	GAV
GP-1-5-10156-1	457	291	n/a	H			Y					
GP-1-6-152-1	480	320	n/a	H			Y					
GP-1-6-214-2	726	1375		H	P	L-O. R-O	N	1997	588	990	VER	GAV
GP-1-6-818-6	639	900		H			Y					
GP-1-6-828-5	344	120		H	P		N	2004	297	98	STB	GAV
GP-1-6-830-1	343	140		H	P		N	2004	302	109	STB	GAV
GP-1-6-834-3	530	445		H	P	H-Y	N	2003	377	205	STB	GAV
GP-1-6-909-1	475	410		H	P		N	2002	253	66	STB	GAV
GP-1-6-911-3	342	120		H	P		N	2004	290	100	STB	GAV
GP-1-6-923-1	579	605		H	P		N	2002	260	71	STB	GAV
GP-1-6-939-3	500	395		H	P		N	2002	240	54	STB	GAV
GP-1-6-944-1	538	495		H			Y					
GP-1-6-944-2	331	135		H	P		N	2004	278	89	STB	GAV
GP-1-6-944-3	366	175		H	P		N	2004	317	125	STB	GAV
GP-1-6-945-4	490	325		H	P	L-Y	N	2003	351	156	STB	GAV
GP-1-6-948-1	442	295		H	P	H-Y	N					
GP-1-6-949-1	364	180		H	P		N	2004	310	117	STB	GAV
GP-1-6-949-2	396	255	n/a	H	P		N	2002	218	40	SUN	GAV
GP-1-6-950-2	534	480		H	P		N					
GP-1-6-50116-3	524	430		H			Y					

[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 segments 5 and 6 of the Missouri River during 2005. ID number links pallid sturgeon habitat information with individual fish length, weight, and tagging data in Table 4. Gear codes presented in Appendix C. Habitat definitions and codes presented in Appendix B.

Species	ID#	Date	Gear	River mile	Habitat			Water Temp (°C)	Turb[a] (NTU)	Depth[b] (m)	Bottom velocity (m/s)	Substrate[c] (silt/sand/ gravel)
					Macro-	Meso-	Micro-					
PDSG	GP-1-5-10118-9	10/31/2004	GN14S		ISB	CHNB		12	14	1.6	0.21	0 / 100 / 0
PDSG	GP-1-5-10123-4	10/31/2004	GN14S		SCCL	CHNB		13	11	1.8	0.25	0 / 100 / 0
PDSG	GP-1-5-10135-2	11/1/2004	GN14S		CHXO	CHNB		11	12	5.3	0.21	0 / 100 / 0
PDSG	GP-1-5-10156-1	11/3/2004	GN14S		CHXO	CHNB		10	5	4.2	0.24	0 / 100 / 0
PDSG	GP-1-5-5-1	3/13/2005	GN14S		ISB	CHNB		2.2	7			0 / 100 / 0
PDSG	GP-1-5-43-1	3/15/2005	GN41S		OSB	CHNB		2.3	6	5.7		70 / 30 / 0
PDSG	GP-1-5-105-2	4/18/2005	TNS		ISB	CHNB		8.7	4	2.4	0.37	0 / 100 / 0
PDSG	GP-1-5-359-1	6/21/2005	OT16S		CHXO	CHNB		17.3	17	3.9	0.67	0 / 100 / 0
PDSG	GP-1-5-361-1	6/21/2005	OT16S		CHXO	CHNB		17.3	17	3.9	0.67	0 / 100 / 0
PDSG	GP-1-5-362-1	6/21/2005	OT16S		CHXO	CHNB		17.3	17	3.9	0.67	0 / 100 / 0
PDSG	GP-1-5-367-2	6/21/2005	OT16S		OSB	CHNB		17.5	19	5	0.32	0 / 100 / 0
PDSG	GP-1-5-368-1	6/21/2005	OT16S		OSB	CHNB		18.3	19	5	0.32	0 / 100 / 0
PDSG	GP-1-5-584-1	8/10/2005	TNS		CHXO	CHNB		23.8	4	2.3	0.4	0 / 100 / 0
PDSG	GP-1-5-585-2	8/10/2005	TNS		CHXO	CHNB		23.8	4	2.5		0 / 100 / 0

Table 5. Continued.

Species	ID#	Date	Gear	River mile	Habitat			Water Temp (°C)	Turb[a] (NTU)	Depth[b] (m)	Bottom velocity (m/s)	Substrate[c] (silt/sand/ gravel)
					Macro-	Meso-	Micro-					
PDSG	GP-1-5-602-1	8/11/2005	TNS		CHXO	CHNB		23.4	5	3.2	0.3	50 / 50 / 0
PDSG	GP-1-5-614-1	8/11/2005	TNS		ISB	CHNB		24.2	3	1.6	0.35	0 / 100 / 0
PDSG	GP-1-5-608-1	8/11/2005	TNS		ISB	CHNB		24	3	2.3	0.49	0 / 100 / 0
PDSG	GP-1-5-609-1	8/11/2005	TNS		ISB	CHNB		24	3	1.9	0.49	0 / 100 / 0
PDSG	GP-1-5-611-2	8/11/2005	TNS		ISB	CHNB		24	3	2.2	0.49	0 / 100 / 0
PDSG	GP-1-5-611-1	8/11/2005	TNS		ISB	CHNB		24	3	2.2	0.49	0 / 100 / 0
PDSG	GP-1-5-596-2	8/11/2005	TNS		OSB	CHNB		23.6	5	8	0.44	0 / 80 / 20
PDSG	GP-1-5-596-1	8/11/2005	TNS		OSB	CHNB		23.6	5	8	0.44	0 / 80 / 20
PDSG	GP-1-5-838-1	10/4/2005	TNS		CHXO	CHNB		18	4	2.9	0.56	0 / 100 / 0
PDSG	GP-1-5-901-1	10/12/2005	OT16S		ISB	CHNB		17.1	5	1.5		-
PDSG	GP-1-5-900-3	10/12/2005	OT16S		ISB	CHNB		17.1		1.5	0.4	0 / 85 / 15
PDSG	GP-1-6-50116-3	11/2/2004	GN14S		OSB	CHNB		10	21	3	0.35	0 / 100 / 0
PDSG	GP-1-6-152-1	5/3/2005	TNS		OSB	CHNB		10.2	10	1.4	0.98	0 / 95 / 5
PDSG	GP-1-6-214-2	5/26/2005	OT16S		CONF	CHNB		14.6	73	1.8	0.61	0 / 100 / 0
PDSG	GP-1-6-945-4	10/6/2005	TNS		BRAD	CHNB		13.1		2		-

Table 5. Continued.

Species	ID#	Date	Gear	River mile	Habitat			Water Temp (°C)	Turb[a] (NTU)	Depth[b] (m)	Bottom velocity (m/s)	Substrate[c] (silt/sand/ gravel)
					Macro-	Meso-	Micro-					
PDSG	GP-1-6-944-2	10/6/2005	TNS		BRAD	CHNB		12.8		2.2		-
PDSG	GP-1-6-828-5	10/6/2005	TNS		BRAD	CHNB		12.5	54	1.7	0.61	0 / 100 / 0
PDSG	GP-1-6-830-1	10/6/2005	TNS		BRAD	CHNB		12.3	56	2.4	0.44	0 / 95 / 5
PDSG	GP-1-6-944-1	10/6/2005	TNS		BRAD	CHNB		12.8		2.2		-
PDSG	GP-1-6-944-3	10/6/2005	TNS		BRAD	CHNB		12.8		2.2		-
PDSG	GP-1-6-950-2	10/11/2005	TNS		BRAD	CHNB		14.9		1		-
PDSG	GP-1-6-948-1	10/11/2005	TNS		BRAD	CHNB		15.3		1.2		-
PDSG	GP-1-6-834-3	10/11/2005	TNS		BRAD	CHNB		15.3		1.3		-
PDSG	GP-1-6-949-2	10/11/2005	TNS		BRAD	CHNB		15.3	30	1.3	0.51	0 / 100 / 0
PDSG	GP-1-6-949-1	10/11/2005	TNS		BRAD	CHNB		15.3	30	1.3	0.51	0 / 100 / 0
PDSG	GP-1-6-939-3	10/12/2005	TNS		BRAD	CHNB		14.9		4		-
PDSG	GP-1-6-818-6	10/12/2005	TNS		BRAD	CHNB		14.9	22	3.8	0.2	0 / 100 / 0
PDSG	GP-1-6-909-1	10/13/2005	OT16S		BRAD	CHNB		15.5		1.5		-
PDSG	GP-1-6-911-3	10/13/2005	OT16S		BRAD	CHNB		15.7		2		-
PDSG	GP-1-6-923-1	10/13/2005	OT16S		BRAD	CHNB		16.4	14	3.7	0.27	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 absolute growth rates of hatchery-reared pallid sturgeon by year class at the time of stocking and recapture in 2005 in the Missouri River. Relative condition factor was calculated using the equation in Keenlyne and Evanson (1993). Standard error (+/- 2SE) was calculated where N>1 and is represented on second line of each year.

Year class	N	Recapture Data			Stocking Data			Growth Data	
		Length (mm)	Weight (g)	Kn	Length (mm)	Weight (g)	Kn	Length (mm/d)	Weight (g/d)
1997	3	664	1034.0	0.816	558	806.7	1.146	0.058	0.100
		70	349.5	0.067	30	183.3	0.049	0.025	0.143
1998	2	580	530.0	0.670	508	484.5	0.958	0.043	0.000
		10	20.0	0.064	3	7.0	0.006	0.001	0.057
1999	1	430	220.0	0.758	394	193.0	0.892	0.033	0.000
		-	-	-	-	-	-	-	-
2001	5	422	227.0	0.833	182	-	-	0.202	0.160
		26	37.1	0.109	10	-	-	0.016	0.109
2002	7	453	357.9	0.963	250	52.0	1.331	0.260	0.317
		65	139.3	0.112	33	12.2	0.052	0.075	0.218
2003	10	415	222.5	0.821	332	157.8	1.209	0.252	0.140
		39	66.8	0.082	32	43.5	0.900	0.058	0.160
2004	7	351	145.0	0.985	302	111.1	1.253	1.249	0.829
		11	18.3	0.082	11	13.3	0.051	0.086	0.446

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

Length Category	Wild[c]		Stocked	
	N	RSD	N	RSD
Sturgeon Season				
Sub-stock (0-199)	0		0	
Sub-stock (200-329)	0		0	
Stock	0		13	87
Quality	0		2	13
Preferred	0		0	0
Memorable	0		0	0
Trophy	0		0	0
Fish Community Season				
Sub-stock (0-199)	0		0	
Sub-stock (200-329)	0		1	
Stock	0		26	93
Quality	0		2	7
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 the Missouri River during 2005 including non-random and wild samples.

Year	All Pallids : Shovelnose	Wild* Pallids: Shovelnose	Wild* Pallids: Hybrids	Stocked Pallids: Wild* Pallids
2003	1 : 3.8	0 : 242	0 : 0	63 : 0
2004	1 : 3.3	0 : 91	0 : 0	28 : 0
2005	1 : 5.1	0 : 223	0 : 0	44 : 0

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

Segment 5 and 6 - Pallid Sturgeon / Sturgeon Season

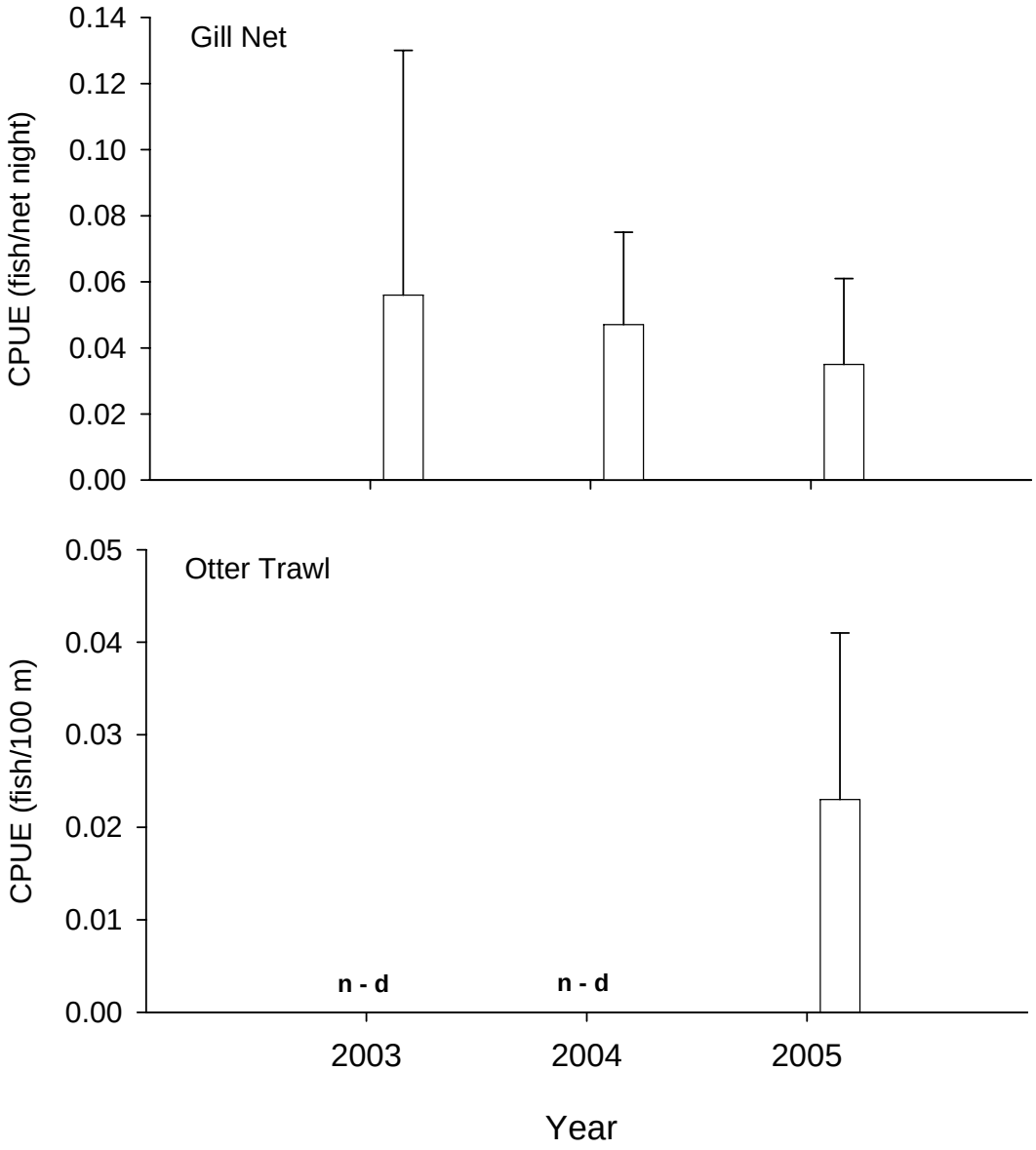

Figure 2. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segments 5 and 6 of the Missouri River using gill nets and otter trawls during sturgeon season 2003-2005. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification. N - d indicates that particular gear was not deployed during that specific year.

Segment 5 and 6 - Pallid Sturgeon / Sturgeon Season

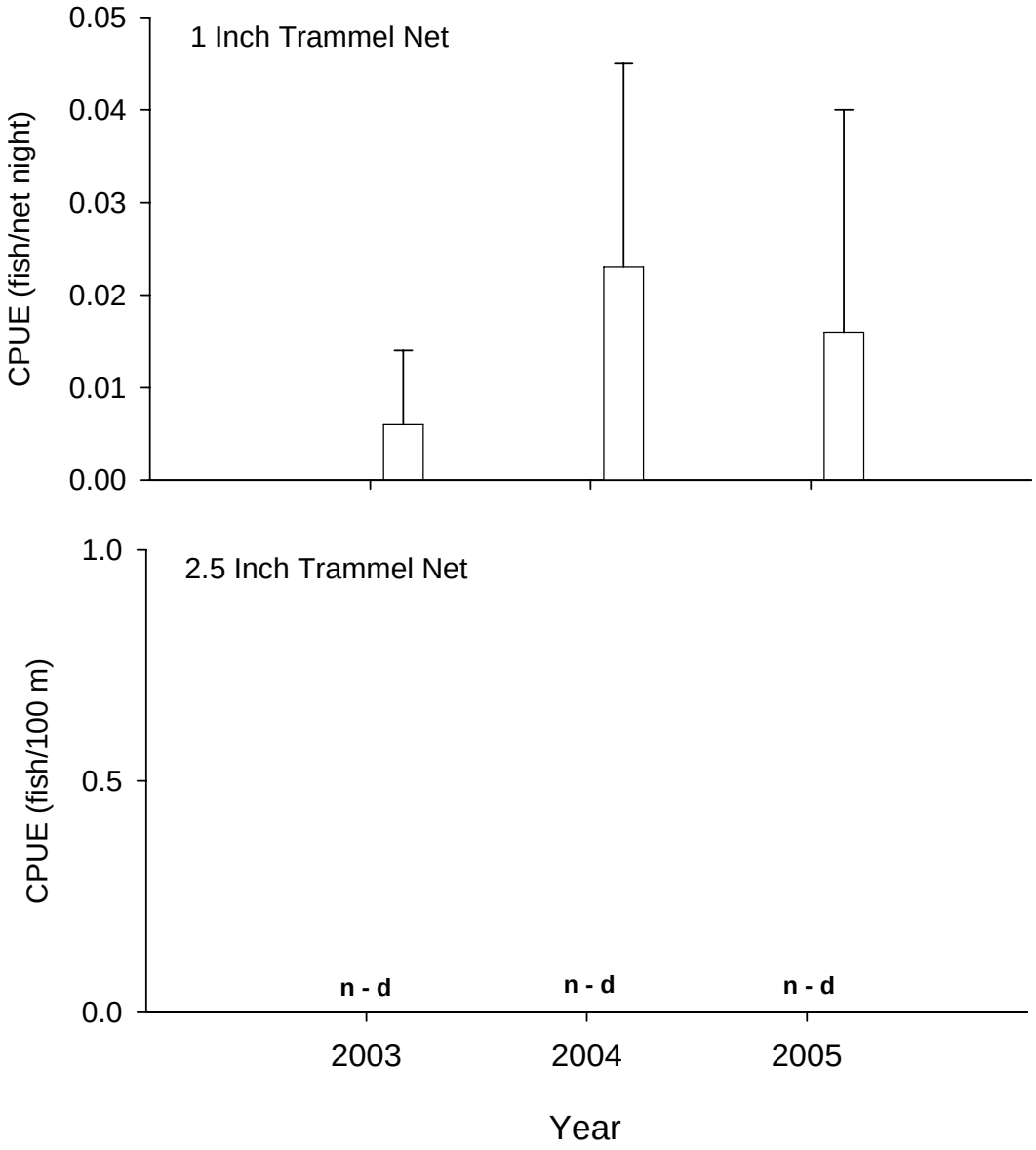

Figure 3. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segments 5 and 6 of the Missouri River using 1.0 and 2.5 in trammel nets during sturgeon season 2003-2005. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification. N - d indicates that particular gear was not deployed during that specific year.

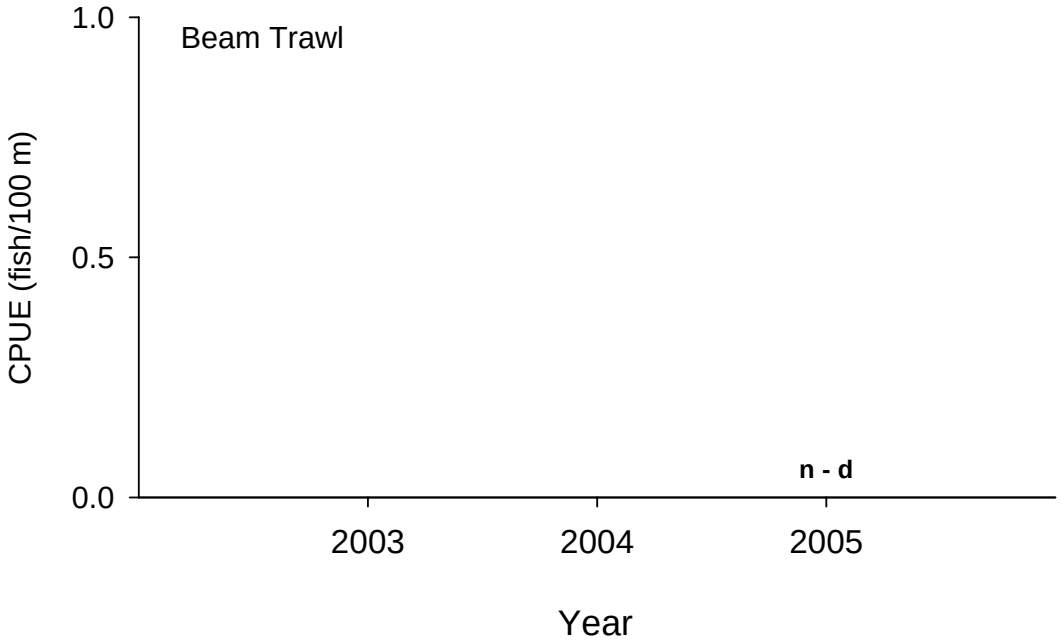

Figure 4. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segments 5 and 6 of the Missouri River using beam trawls during sturgeon season 2003-2005. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification. N - d indicates that particular gear was not deployed during that specific year.

Segment 5 and 6 - Pallid Sturgeon / Fish Community Season

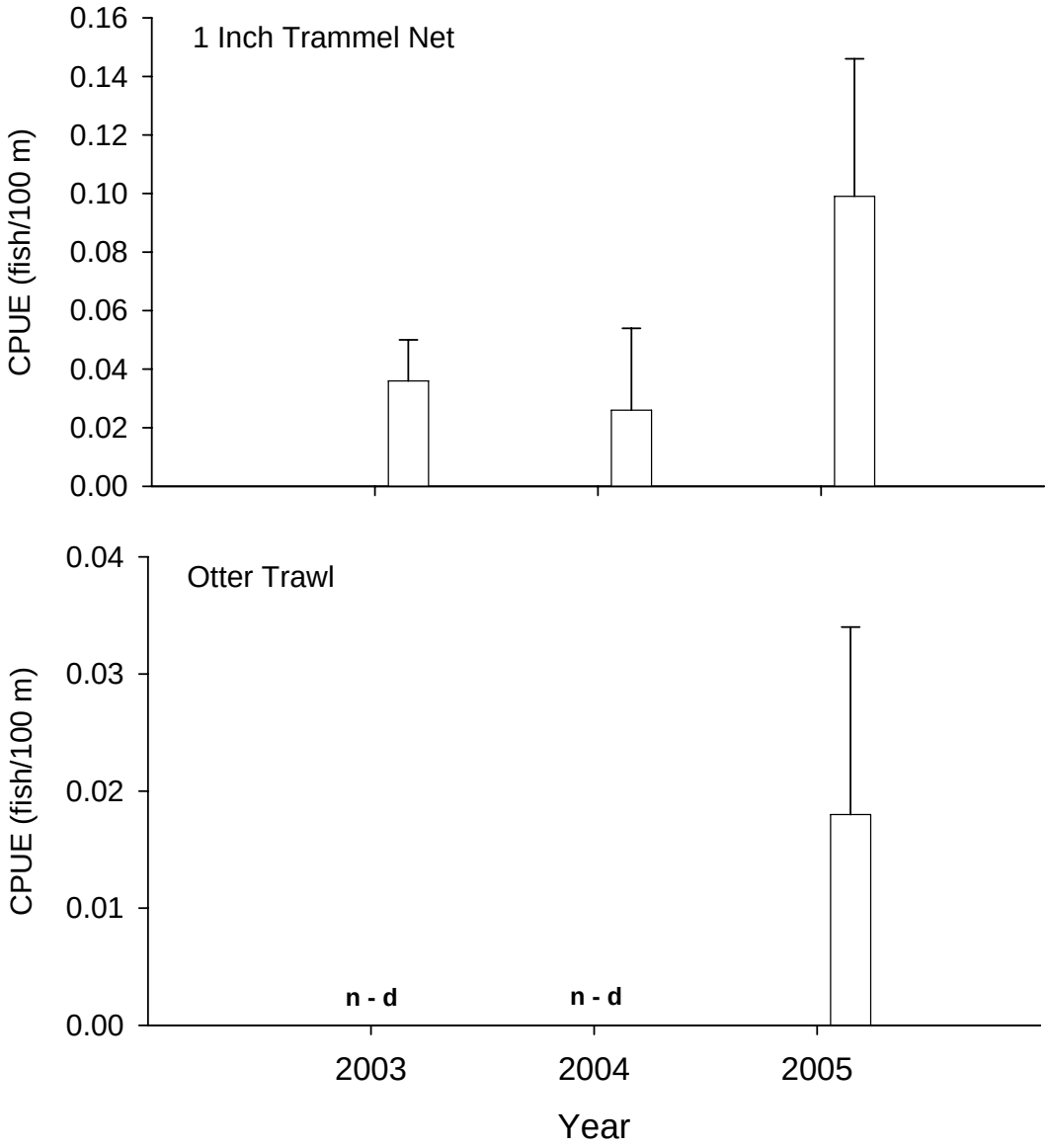

Figure 5. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segments 5 and 6 of the Missouri River using trammel nets and otter trawls during fish community season 2003-2005. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification. N - d indicates that particular gear was not deployed during that specific year.

Segment 5 and 6 - Pallid Sturgeon / Fish Community Season

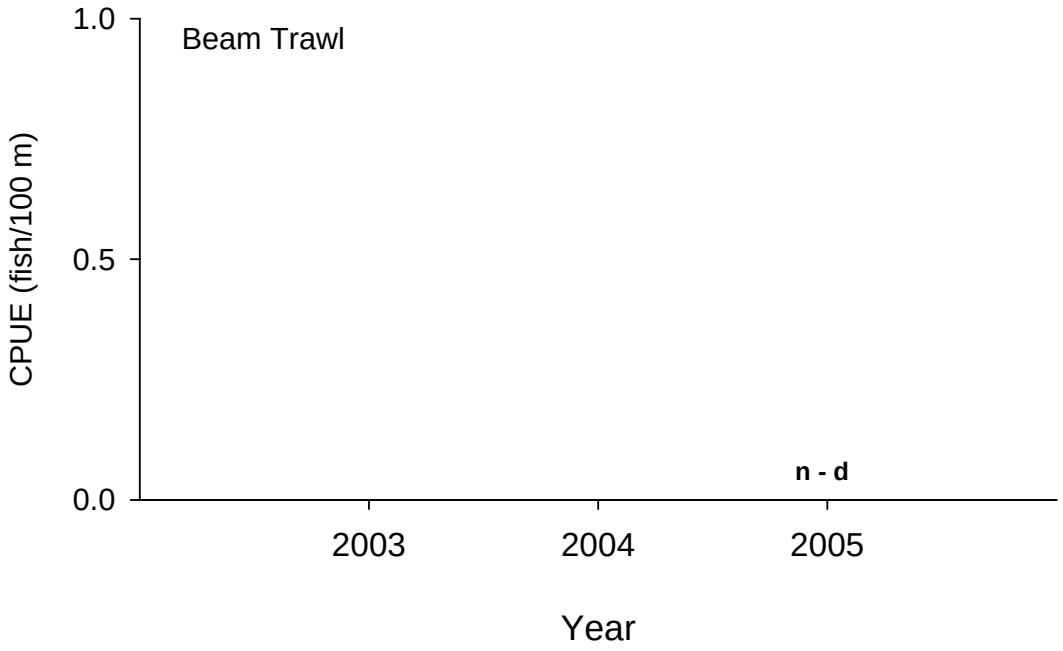

Figure 6. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segments 5 and 6 of the Missouri River beam trawl during fish community season 2003-2005. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification. N - d indicates that particular gear was not deployed during that specific year.

Segment 5 and 6 - Pallid Sturgeon / Fish Community Season

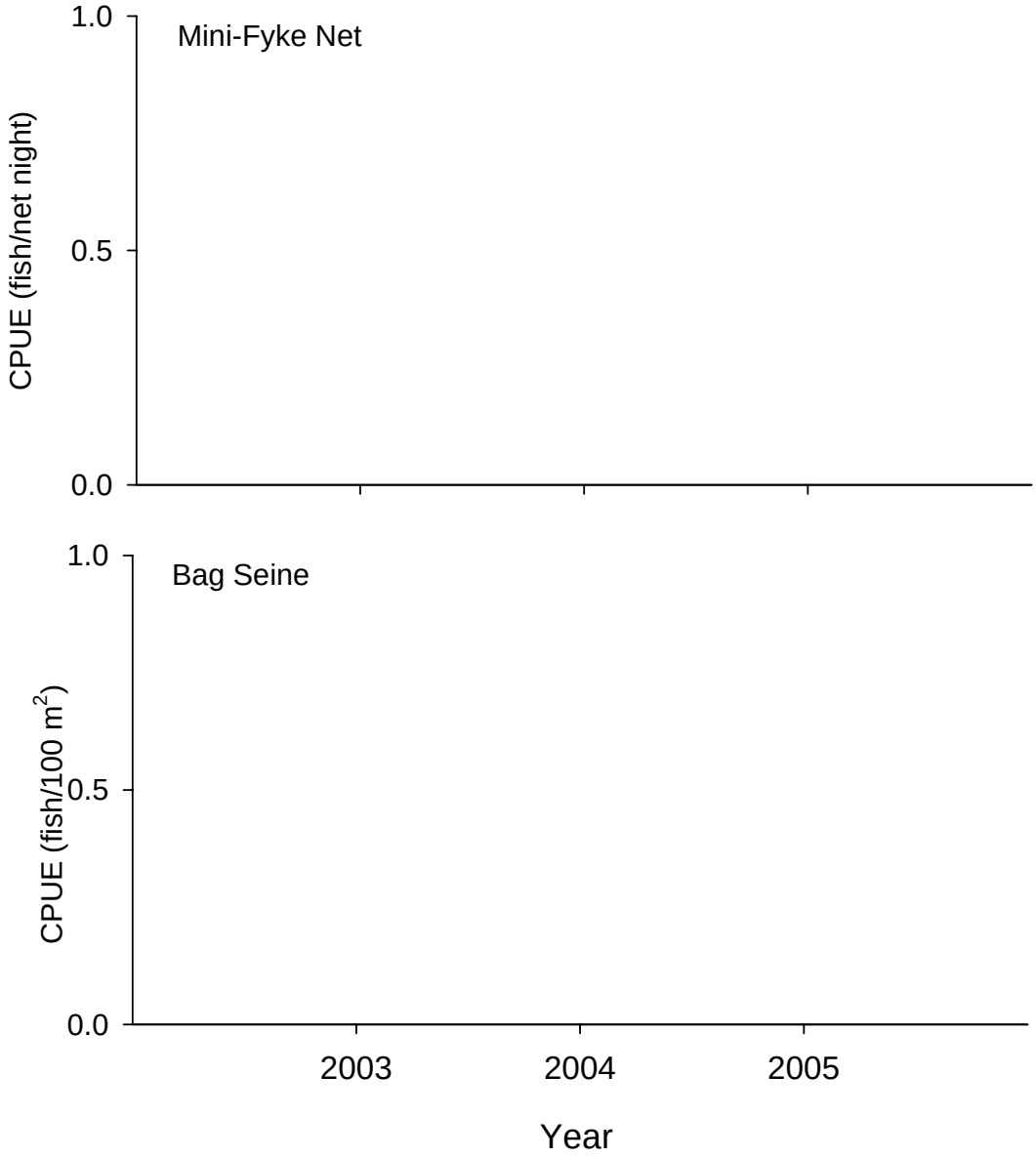

Figure 7. Mean annual catch-per-unit-effort (+/- 2 SE) of wild (black bars) and stocked (white bars) pallid sturgeon in segments 5 and 6 of the Missouri River mini-fyke nets and bag seines during fish community season 2003-2005. All pallid sturgeon that were captured with no evidence of previously being 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 in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat												
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0		0	0	0	0		0		0	
		10	19	3	0		29	35	4	0		0		0	
2.5 Inch Trammel Net	n/a														
Gill Net	0	0	0	0	0		0	0	0	0		0		0	
		10	23	0	2		27	26	10	3		0		0	
Otter Trawl	0	0	0	0	0		0	0	0	0		0		0	
		23	22	4	2		18	20	10	0		0		0	
Beam Trawl	n/a														
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0		0	0	0	0		0		0	
		49	18	0	0		18	12	3	0		0		0	
Bag Seine	0	0	0	0	0		0	0	0	0		0		0	
		47	12	0	0		12	14	9	3		0		2	
Mini-Fyke Net	0	0	0	0	0		0	0	0	0		0		0	
		49	11	0	0		15	15	5	3		1		1	
Otter Trawl	0	0	0	0	0		0	0	0	0		0		0	
		51	11	0	0		20	13	5	0		0		0	
Beam Trawl	n/a														

Table 10. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 0	0 96	0 0	0 3	0 1	n-e
2.5 Inch Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gill Net	0	0 0	0 91	0 0	0 1	0 7	n-e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n-e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0 0	0 100	0 0	0 0	0 0	n-e
Bag Seine	0	0 100	0 0	0 0	0 0	0 0	n-e
Mini-Fyke Net	0	0 96	0 4	0 0	0 0	0 0	n-e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n-e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 11. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat												
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0 10	0 19	0 3	0 0		0 29	0 35	0 4	0 0		0 0		0 0	
2.5 Inch Trammel Net	n/a														
Gill Net	0	0 10	0 23	0 0	0 2		0 27	0 26	0 10	0 3		0 0		0 0	
Otter Trawl	0	0 23	0 22	0 4	0 2		0 18	0 20	0 10	0 0		0 0		0 0	
BeamTrawl	n/a														
Fish Community Season (Summer)															
1 Inch Trammel Net	1	0 49	0 18	0 0	0 0		100 18	0 12	0 3	0 0		0 0		0 0	
Bag Seine	0	0 47	0 12	0 0	0 0		0 12	0 14	0 9	0 3		0 0		0 2	
Mini-Fyke Net	0	0 49	0 11	0 0	0 0		0 15	0 15	0 5	0 3		0 1		0 1	
Otter Trawl	0	0 51	0 11	0 0	0 0		0 20	0 13	0 5	0 0		0 0		0 0	
Beam Trawl	n/a														

Table 12. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 0	0 96	0 0	0 3	0 1	n-e
2.5 Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gill Net	0	0 0	0 91	0 0	0 1	0 7	n-e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n-e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fish Community Season (Summer)							
1 Inch Trammel Net	1	0 0	100 100	0 0	0 0	0 0	n-e
Bag Seine	0	0 100	0 0	0 0	0 0	0 0	n-e
Mini-Fyke Net	0	0 96	0 4	0 0	0 0	0 0	n-e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n-e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	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 in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat												
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	2	0	0	0	0		50	50	0	0		0		0	
		10	19	3	0		29	35	4	0		0		0	
2.5 Trammel Net	n/a														
Gill Net	7	0	29	0	0		29	29	14	0		0		0	
		10	23	0	2		27	26	10	3		0		0	
Otter Trawl	4	0	75	0	0		0	25	0	0		0		0	
		23	22	4	2		18	20	10	0		0		0	
Beam Trawl	n/a														
Fish Community Season (Summer)															
1 Inch Trammel Net	21	57	14	0	0		19	10	0	0		0		0	
		49	18	0	0		18	12	3	0		0		0	
Bag Seine	0	0	0	0	0		0	0	0	0		0		0	
		47	12	0	0		12	14	9	3		0		2	
Mini-Fyke Net	0	0	0	0	0		0	0	0	0		0		0	
		49	11	0	0		15	15	5	3		1		1	
Otter Trawl	5	60	0	0	0		40	0	0	0		0		0	
		51	11	0	0		20	13	5	0		0		0	
Beam Trawl	n/a														

Table 14. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	2	0 0	100 96	0 0	0 3	0 1	n-e
2.5 Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n-e
Gill Net	7	0 0	100 91	0 0	0 1	0 7	n-e
Otter Trawl	4	0 0	100 100	0 0	0 0	0 0	n-e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n-e
Fish Community Season (Summer)							
1 Inch Trammel Net	21	0 0	100 100	0 0	0 0	0 0	n-e
Bag Seine	0	0 100	0 0	0 0	0 0	0 0	n-e
Mini-Fyke Net	0	0 96	0 4	0 0	0 0	0 0	n-e
Otter Trawl	5	0 0	100 100	0 0	0 0	0 0	n-e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	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 in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat												
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0		0	0	0	0		0		0	
		10	19	3	0		29	35	4	0		0		0	
2.5 Trammel Net	n/a														
Gill Net	0	0	0	0	0		0	0	0	0		0		0	
		10	23	0	2		27	26	10	3		0		0	
Otter Trawl	2	0	0	50	0		0	50	0	0		0		0	
		23	22	4	2		18	20	10	0		0		0	
Beam Trawl	n/a														
Fish Community Season (Summer)															
1 Inch Trammel Net	2	50	50	0	0		0	0	0	0		0		0	
		49	18	0	0		18	12	3	0		0		0	
Bag Seine	0	0	0	0	0		0	0	0	0		0		0	
		47	12	0	0		12	14	9	3		0		2	
Mini-Fyke Net	0	0	0	0	0		0	0	0	0		0		0	
		49	11	0	0		15	15	5	3		1		1	
Otter Trawl	0	0	0	0	0		0	0	0	0		0		0	
		51	11	0	0		20	13	5	0		0		0	
Beam Trawl	n/a														

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 in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 0	0 96	0 0	0 3	0 1	n-e
2.5 Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gill Net	0	0 0	0 91	0 0	0 1	0 7	n-e
Otter Trawl	2	0 0	100 100	0 0	0 0	0 0	n-e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fish Community Season (Summer)							
1 Inch Trammel Net	2	0 0	100 100	0 0	0 0	0 0	n-e
Bag Seine	0	0 100	0 0	0 0	0 0	0 0	n-e
Mini-Fyke Net	0	0 96	0 4	0 0	0 0	0 0	n-e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n-e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a

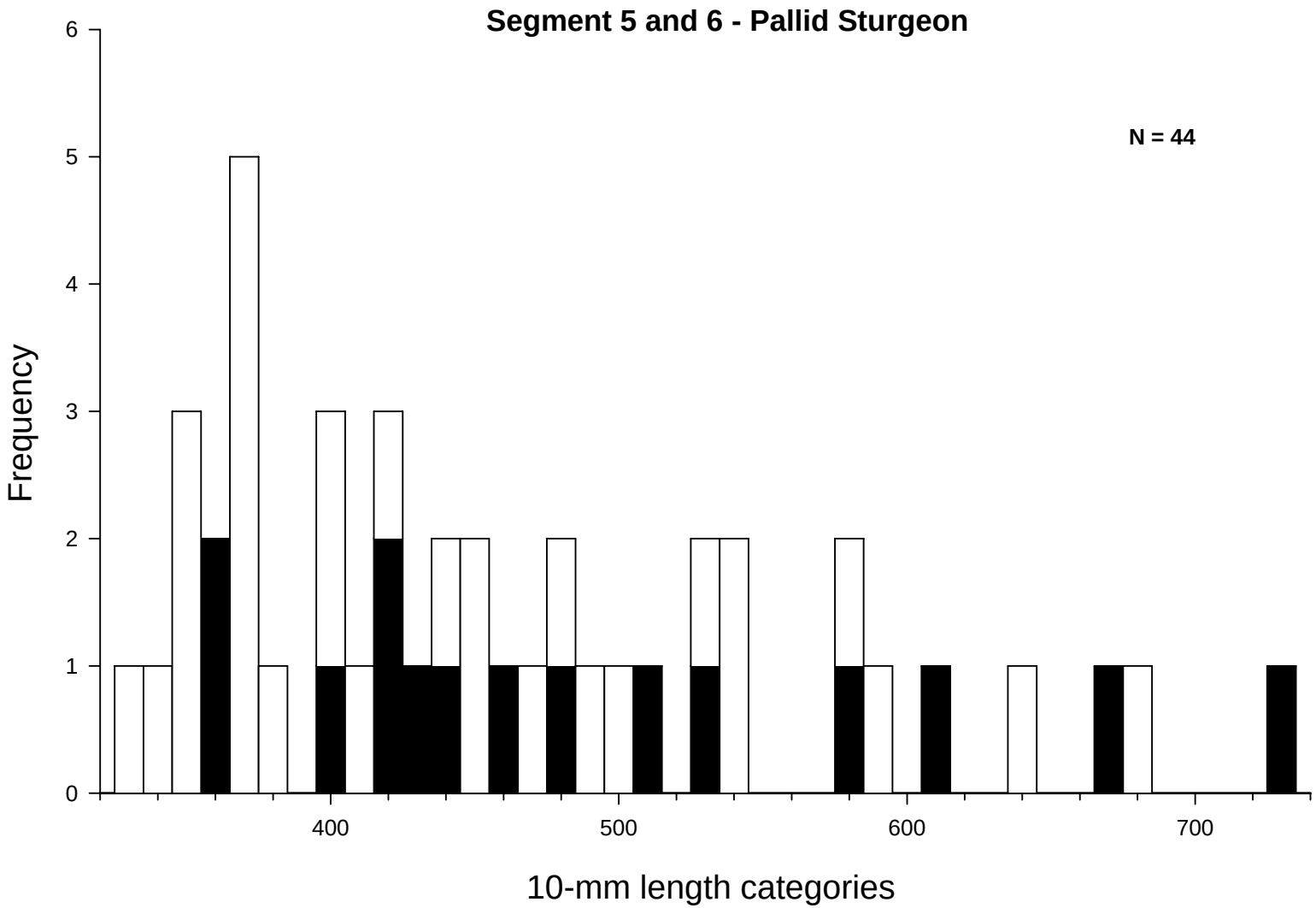

Figure 8. Length frequency of pallid sturgeon during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segments 5 and 6 of the Missouri River during 2005.

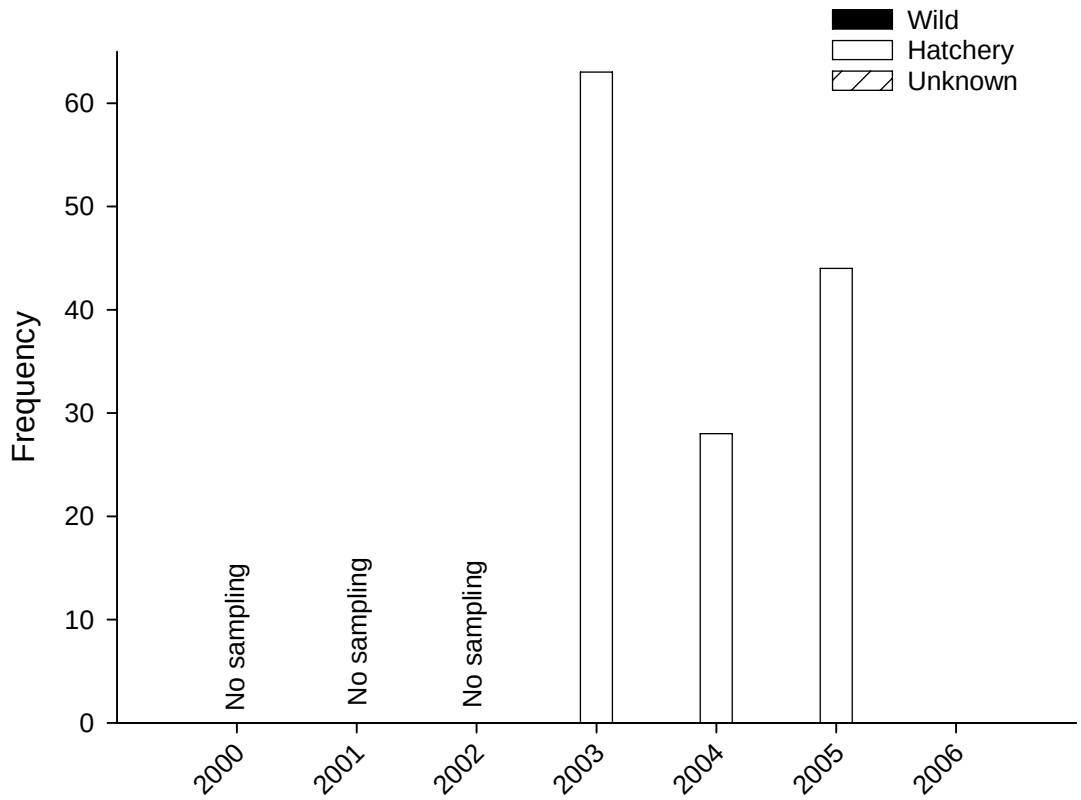

Figure 9. Cumulative capture history of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon collected in segments 5 and 6 of the Missouri River during 2005.

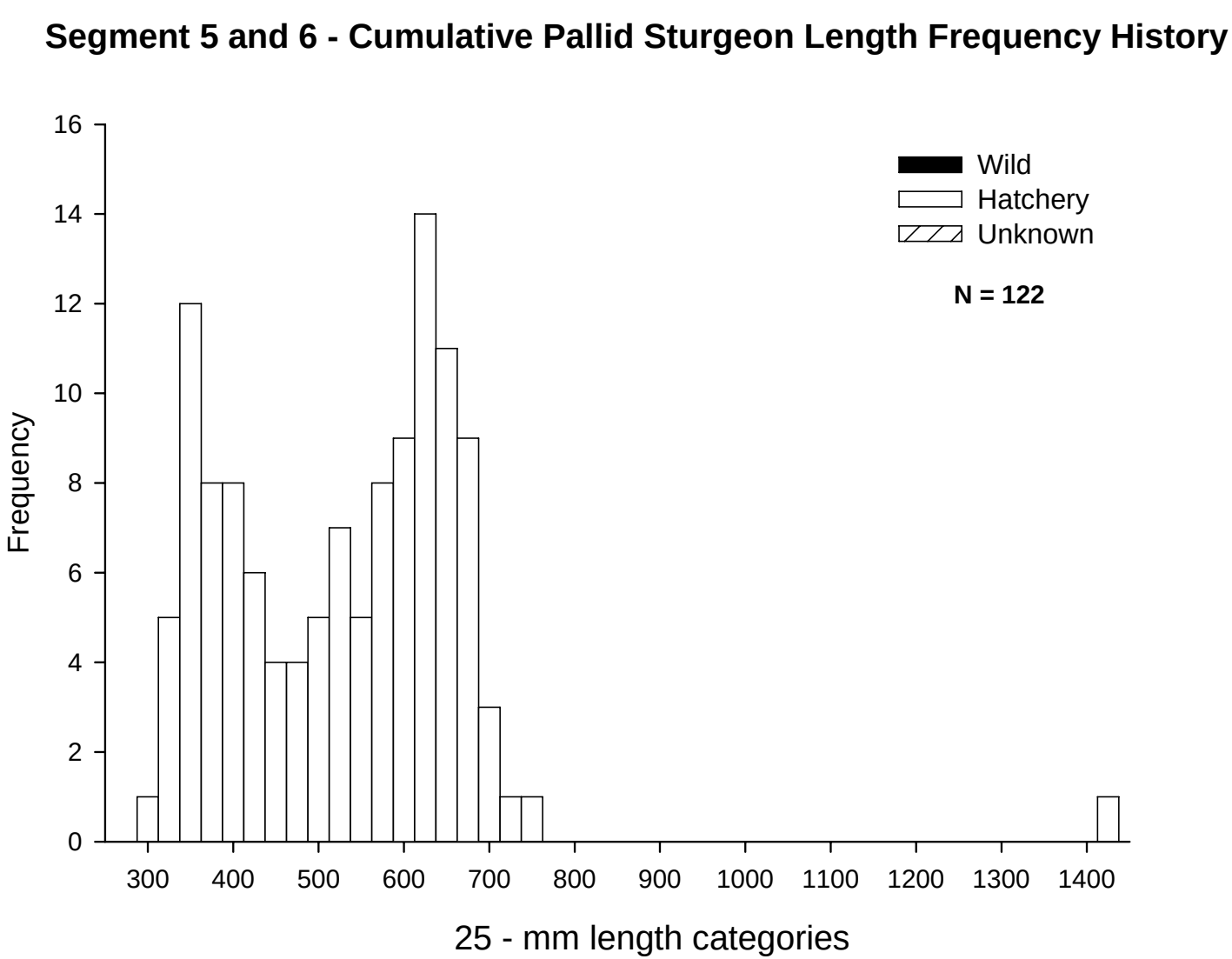

Figure 10. Cumulative pallid sturgeon length frequency histogram for segment 5 and 6 comparing hatchery reared (white bars), wild (black bars), and unknown origin (cross-hatched bars) pallid sturgeon captures in 2003 - 2005.

Shovelnose X Pallid Sturgeon Hybrids

No shovelnose X pallid sturgeon hybrids have been captured in segments 5 and 6 during 2005 or the previous 2 years.

Targeted Native River Species

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

A total of 223 shovelnose sturgeon were sampled in 2005 with 222 captured in standard gears. Most shovelnose sturgeon were captured with gill nets (n = 99), trammel nets (n = 93), and otter trawls (n = 31). Catch per unit effort of shovelnose sturgeon (Figures 11 - 16) was greatest in gill nets (0.49 fish/net night). The CPUE by trammel net in the sturgeon season (0.33 fish/100 m) was nearly twice that of the fish community season CPUE (0.18 fish/100 m). Mean CPUE in gill nets increased three fold from the running average (2003 – 2004; Figure 11). Mean CPUE during both seasons with trammel nets increased from 2004 - 2005 (Figure 12 and 14). Fifty-eight shovelnose sturgeons were captured during the fish community season while 165 were captured during the sturgeon season. No shovelnose sturgeon were captured in the mini-fyke nets or bag seines.

Shovelnose sturgeon were found in all macrohabitats sampled with the exception of dendritic channels. Most fish were captured from outside bend (44%), inside bend (22%), channel crossover (16%), and braided channel (6%) macrohabitats during the sturgeon season. During the fish community season, 88% of shovelnose sturgeon were captured in braided channels (79%) and inside bends (9%; Table 23). Nearly all shovelnose sturgeon captured were

caught in the channel boarder mesohabitat, with the exception of 4 fish collected from pools (Table 24). Fork lengths of shovelnose sturgeon ranged from 540 - 770 mm with 94% of the fish between the 550 – 700 mm (Figure 17). No shovelnose sturgeon of quality length and smaller were captured. Incremental RSD for shovelnose sturgeon in both seasons indicated an ageing population with little recruitment (Table 25). Shovelnose sturgeon captured during the sturgeon (n =165) and fish community seasons (n = 57) exhibited a mean Wr of 96 and 93, respectively. Relative weights of shovelnose sturgeon had a more extended range during the sturgeon season (49 – 134) compared to the fish community season (72 – 116).

Segment 5 and 6 - Shovelnose Sturgeon / Sturgeon Season

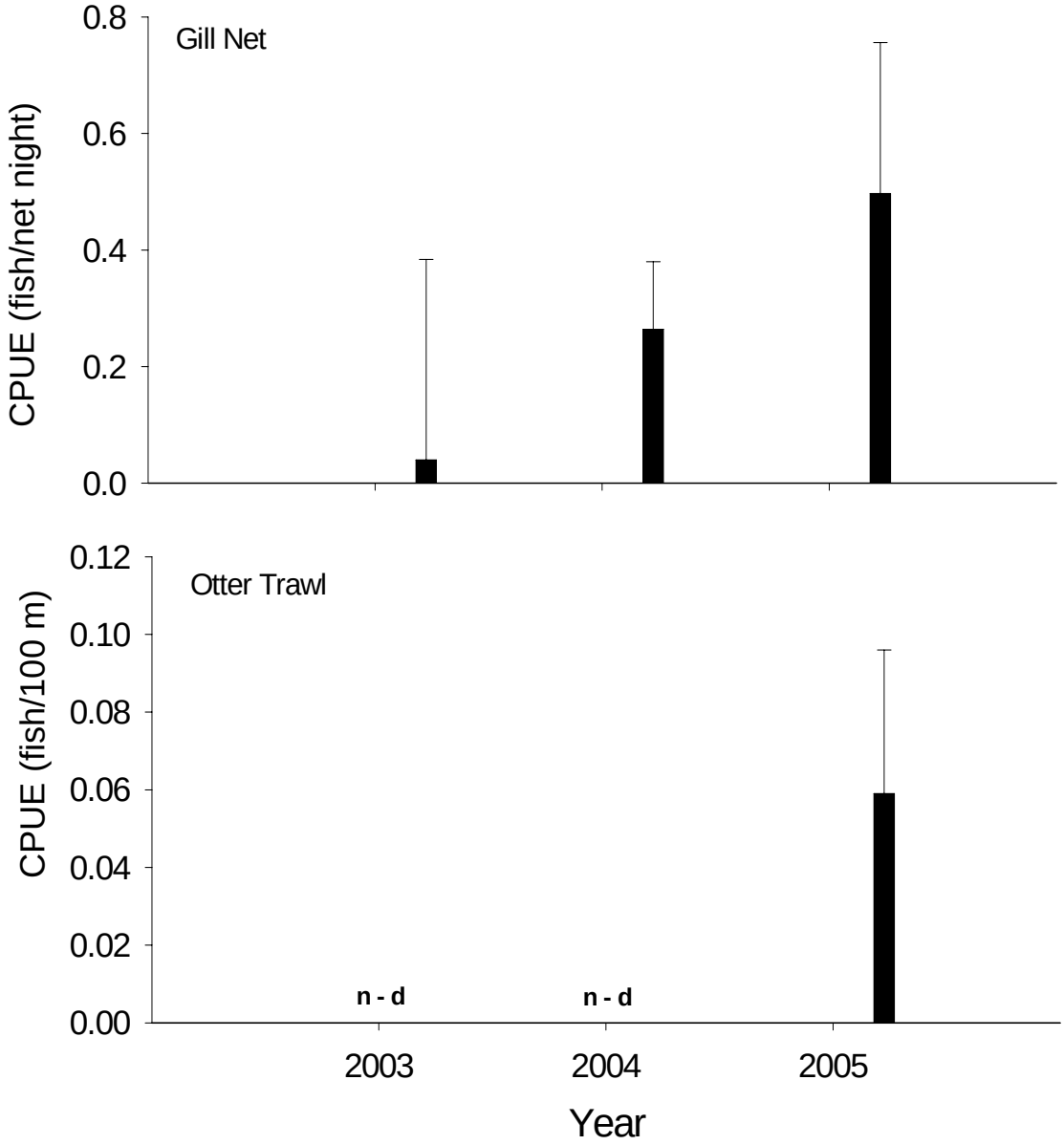

Figure 11. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segments 5 and 6 of the Missouri River using gill nets and otter trawls during sturgeon season 2003 - 2005. N - d indicates that particular gear was not deployed during that specific year.

Segment 5 and 6 - Shovelnose Sturgeon / Sturgeon Season

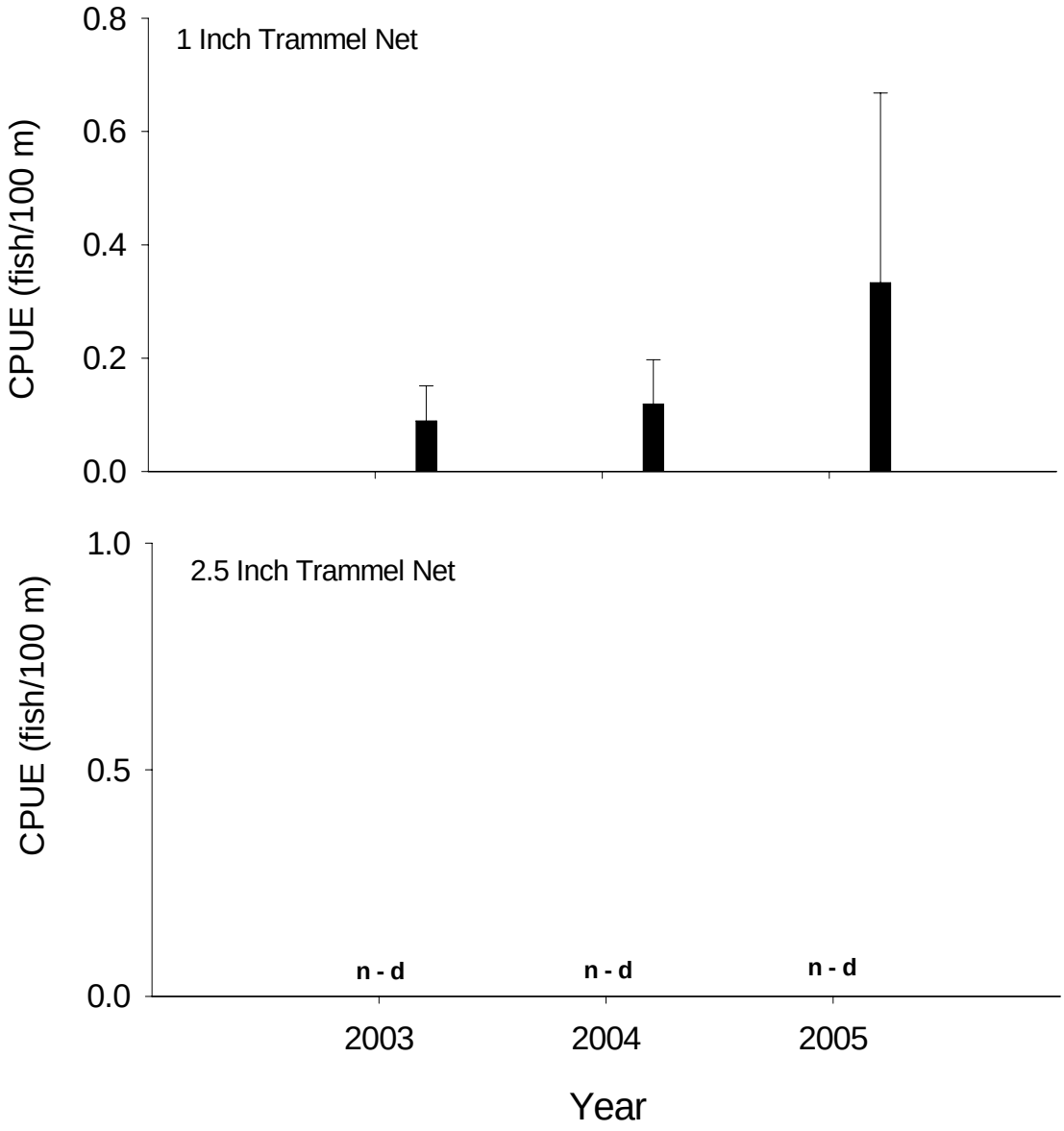

Figure 12. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segments 5 and 6 of the Missouri River using 1.0 and 2.5 inch trammel nets during sturgeon season 2003 - 2005. N - d indicates that particular gear was not deployed during that specific year.

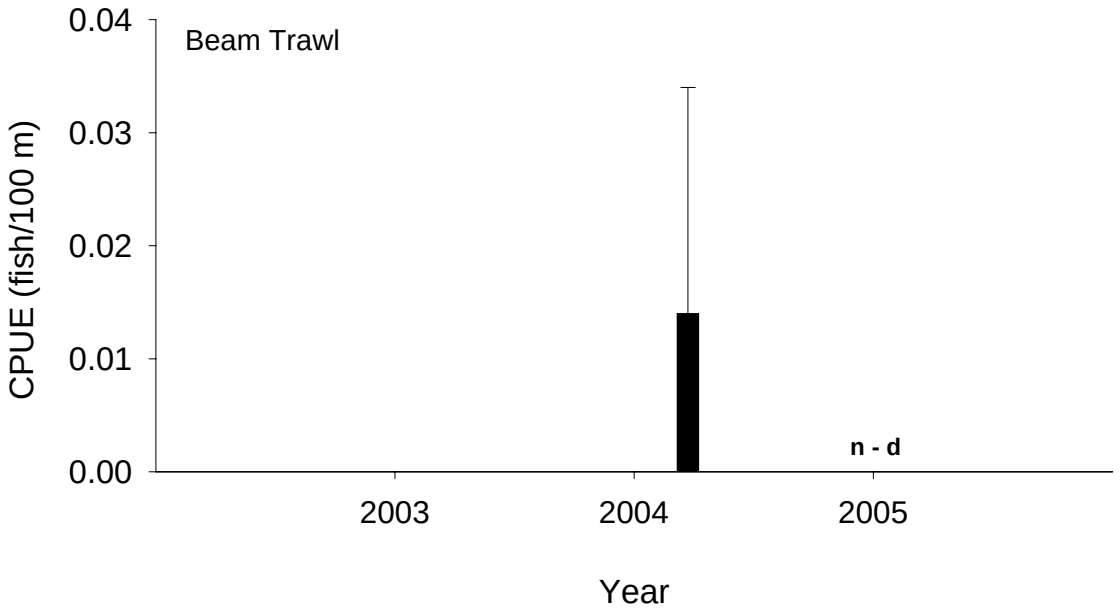

Figure 13. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segments 5 and 6 of the Missouri River using beam trawls during sturgeon season 2003 - 2005. N - d indicates that particular gear was not deployed during that specific year.

Segment 5 and 6 - Shovelnose Sturgeon / Fish Community Season

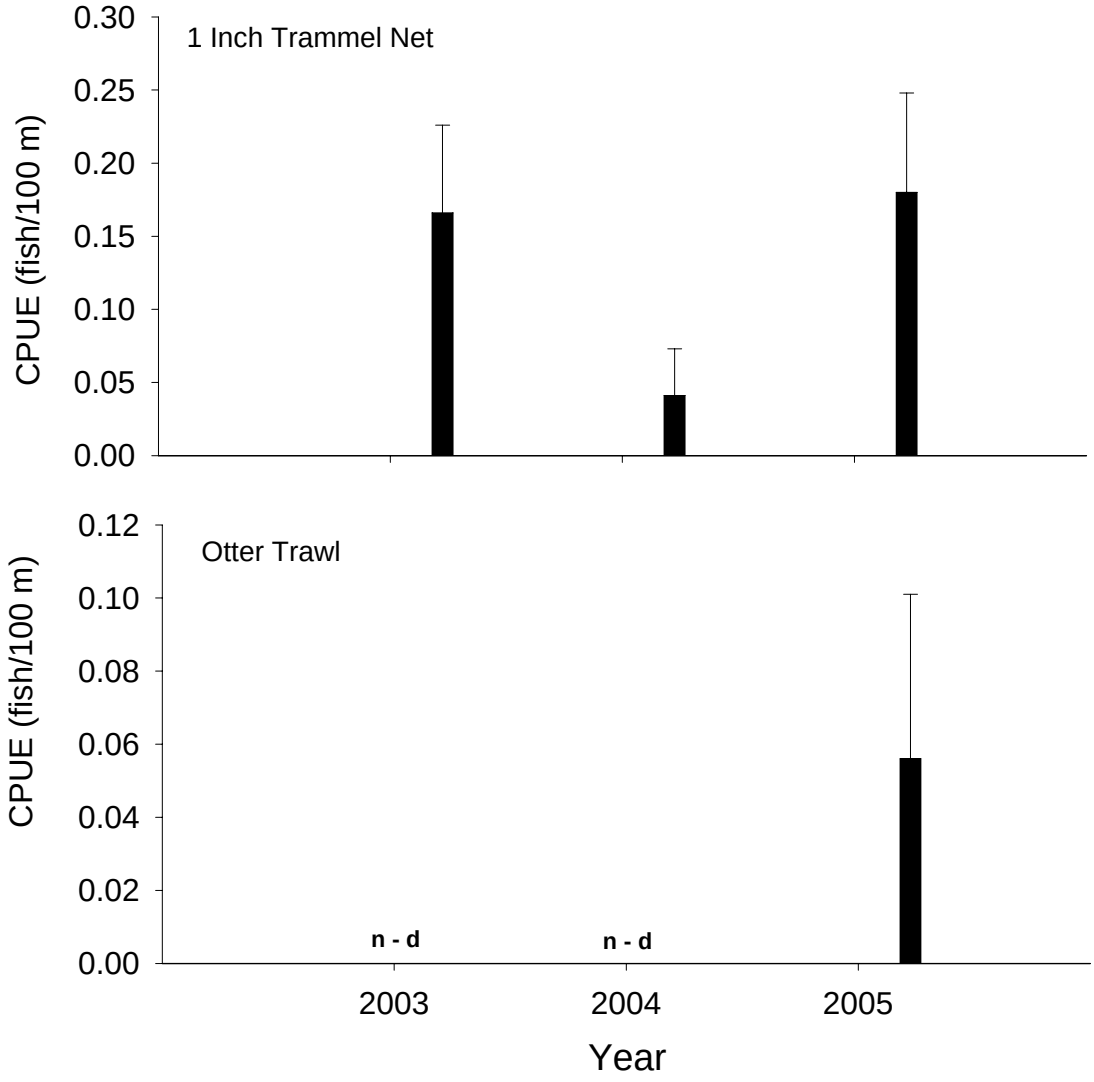

Figure 14. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segments 5 and 6 of the Missouri River using trammel nets and otter trawls during fish community season 2003 - 2005. N - d indicates that particular gear was not deployed during that specific year.

Segment 5 and 6 - Shovelnose Sturgeon / Fish Community Season

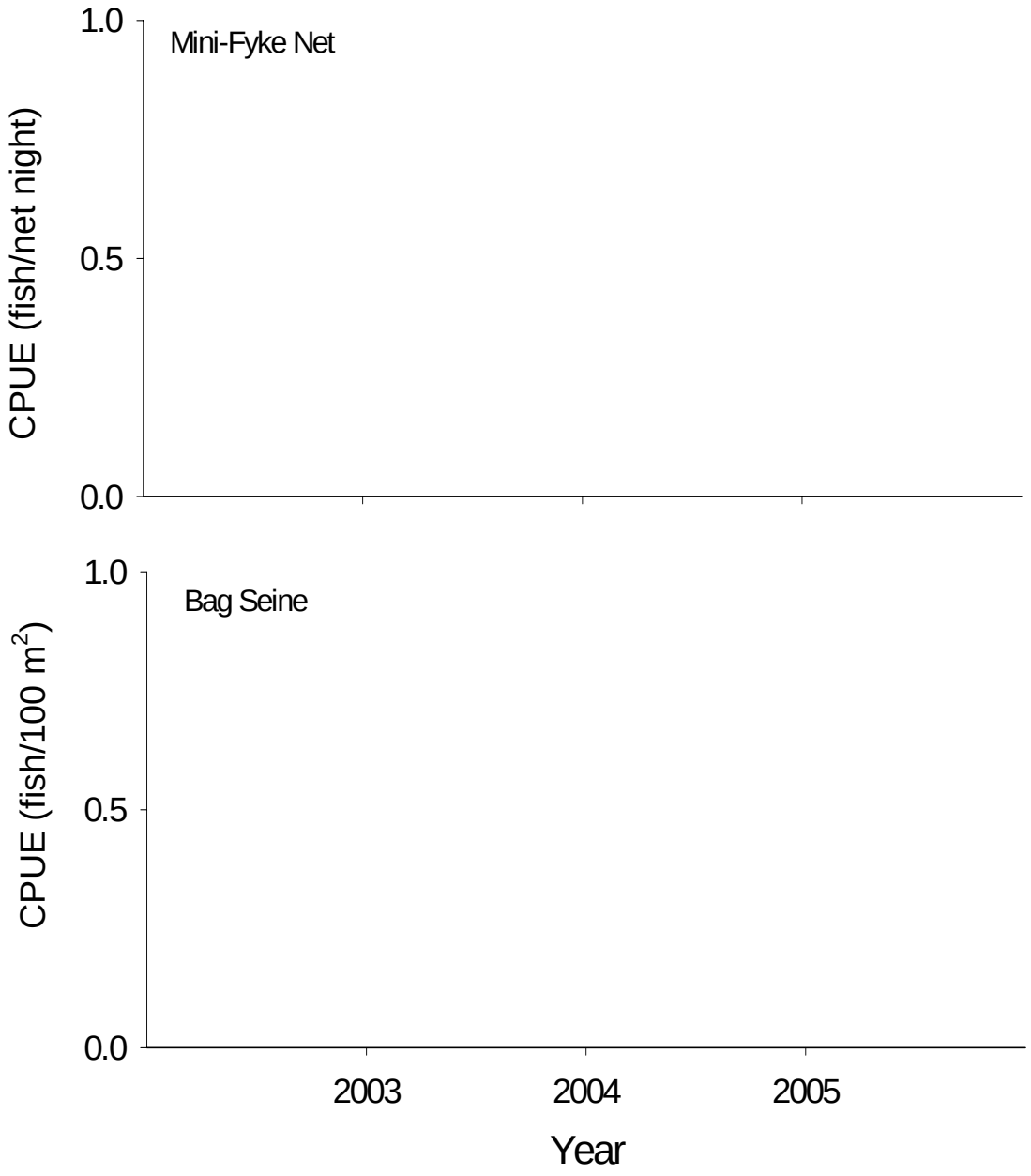

Figure 15. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segments 5 and 6 of the Missouri River using mini-fyke nets and seines during fish community season 2003 - 2005.

Segment 5 and 6 - Shovelnose Sturgeon / Fish Community Season

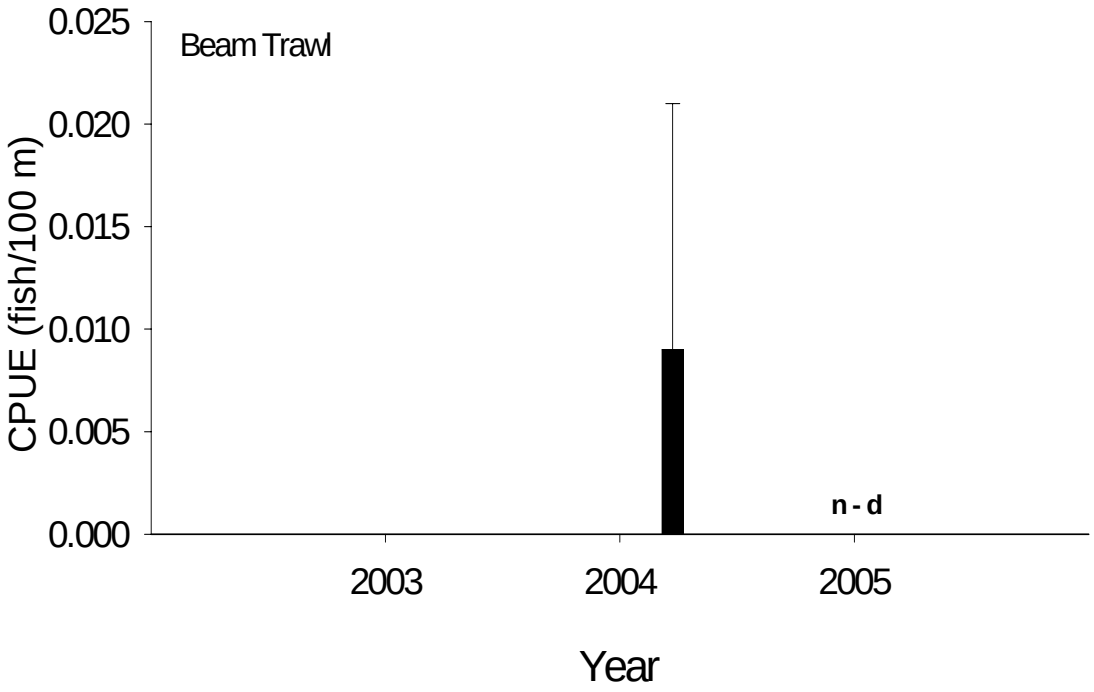

Figure 16. Mean annual catch-per-unit-effort (+/- 2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segments 5 and 6 of the Missouri River using beam trawls during fish community season 2003 - 2005. N - d indicates that particular gear was not deployed during that specific year.

Table 17. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat												
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0 10	0 19	0 3	0 0		0 29	0 35	0 4	0 0		0 0		0 0	
2.5 Inch Trammel Net	n/a														
Gill Net	0	0 10	0 23	0 0	0 2		0 27	0 26	0 10	0 3		0 0		0 0	
Otter Trawl	0	0 23	0 22	0 4	0 2		0 18	0 20	0 10	0 0		0 0		0 0	
Beam Trawl	n/a														
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0 49	0 18	0 0	0 0		0 18	0 12	0 3	0 0		0 0		0 0	
Bag Seine	0	0 47	0 12	0 0	0 0		0 12	0 14	0 9	0 3		0 0		0 2	
Mini-Fyke Net	0	0 49	0 11	0 0	0 0		0 15	0 15	0 5	0 3		0 1		0 1	
Otter Trawl	0	0 51	0 11	0 0	0 0		0 20	0 13	0 5	0 0		0 0		0 0	
Beam Trawl	n/a														

Table 18. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 0	0 96	0 0	0 3	0 1	n - e
2.5 Inch Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gill Net	0	0 0	0 91	0 0	0 1	0 7	n - e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0 0	0 100	0 0	0 0	0 0	n - e
Bag Seine	0	0 100	0 0	0 0	0 0	0 0	n - e
Mini-Fyke Net	0	0 96	0 4	0 0	0 0	0 0	n - e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 19. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat												
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0		0	0	0	0		0		0	
		10	19	3	0		29	35	4	0		0		0	
2.5 Inch Trammel Net	n/a														
Gill Net	0	0	0	0	0		0	0	0	0		0		0	
		10	23	0	2		27	26	10	3		0		0	
Otter Trawl	0	0	0	0	0		0	0	0	0		0		0	
		23	22	4	2		18	20	10	0		0		0	
Beam Trawl	n/a														
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0		0	0	0	0		0		0	
		49	18	0	0		18	12	3	0		0		0	
Bag Seine	0	0	0	0	0		0	0	0	0		0		0	
		47	12	0	0		12	14	9	3		0		2	
Mini-Fyke Net	0	0	0	0	0		0	0	0	0		0		0	
		49	11	0	0		15	15	5	3		1		1	
Otter Trawl	0	0	0	0	0		0	0	0	0		0		0	
		51	11	0	0		20	13	5	0		0		0	
Beam Trawl	n/a														

Table 20. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segments 5 and 6of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 0	0 96	0 0	0 3	0 1	n - e
2.5 Inch Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gill Net	0	0 0	0 91	0 0	0 1	0 7	n - e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0 0	0 100	0 0	0 0	0 0	n - e
Bag Seine	0	0 100	0 0	0 0	0 0	0 0	n - e
Mini-Fyke Net	0	0 96	0 4	0 0	0 0	0 0	n - e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 21. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	N	Macrohabitat												
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0		0	0	0	0		0		0	
		10	19	3	0		29	35	4	0		0		0	
2.5 Inch Trammel Net	n/a														
Gill Net	0	0	0	0	0		0	0	0	0		0		0	
		10	23	0	2		27	26	10	3		0		0	
Otter Trawl	0	0	0	0	0		0	0	0	0		0		0	
		23	22	4	2		18	20	10	0		0		0	
Beam Trawl	n/a														
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0		0	0	0	0		0		0	
		49	18	0	0		18	12	3	0		0		0	
Bag Seine	0	0	0	0	0		0	0	0	0		0		0	
		47	12	0	0		12	14	9	3		0		2	
Mini-Fyke Net	0	0	0	0	0		0	0	0	0		0		0	
		49	11	0	0		15	15	5	3		1		1	
Otter Trawl	0	0	0	0	0		0	0	0	0		0		0	
		51	11	0	0		20	14	5	0		0		0	
Beam Trawl	n/a														

Table 22. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 0	0 96	0 0	0 3	0 1	n - e
2.5 Inch Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gill Net	0	0 0	0 91	0 0	0 1	0 7	n - e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0 0	0 100	0 0	0 0	0 0	n - e
Bag Seine	0	0 100	0 0	0 0	0 0	0 0	n - e
Mini-Fyke Net	0	0 96	0 4	0 0	0 0	0 0	n - e
Otter	0	0 0	0 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a

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 in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	N	Macrohabitat												
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	49	8	4	20	0		18	49	0	0		0		0	
		10	19	3	0		29	35	4	0		0		0	
2.5 Inch Trammel Net	n/a														
Gill Net	99	1	23	0	0		25	43	5	2		0		0	
		10	23	0	2		27	26	10	3		0		0	
Otter Trawl	16	31	12	6	0		19	31	0	0		0		0	
		23	22	4	2		18	20	10	0		0		0	
Beam Trawl	n/a														
Fish Community Season (Summer)															
1 Inch Trammel Net	42	76	10	0	0		12	2	0	0		0		0	
		49	18	0	0		18	12	3	0		0		0	
Bag Seine	0	0	0	0	0		0	0	0	0		0		0	
		47	12	0	0		12	14	9	3		0		2	
Mini-Fyke Net	0	0	0	0	0		0	0	0	0		0		0	
		49	11	0	0		15	15	5	3		1		1	
Otter Trawl	15	87	0	0	0		0	13	0	0		0		0	
		51	11	0	0		20	13	5	0		0		0	
Beam Trawl	n/a														

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 in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	49	0 0	100 96	0 0	0 3	0 1	n - e
2.5 Inch Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gill Net	99	0 0	96 91	0 0	0 1	4 7	n - e
Otter Trawl	16	0 0	100 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fish Community Season (Summer)							
1 Inch Trammel Net	42	0 0	100 100	0 0	0 0	0 0	n - e
Bag Seine	0	0 100	0 0	0 0	0 0	0 0	n - e
Mini-Fyke Net	0	0 96	0 4	0 0	0 0	0 0	n - e
Otter Trawl	15	0 0	100 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a

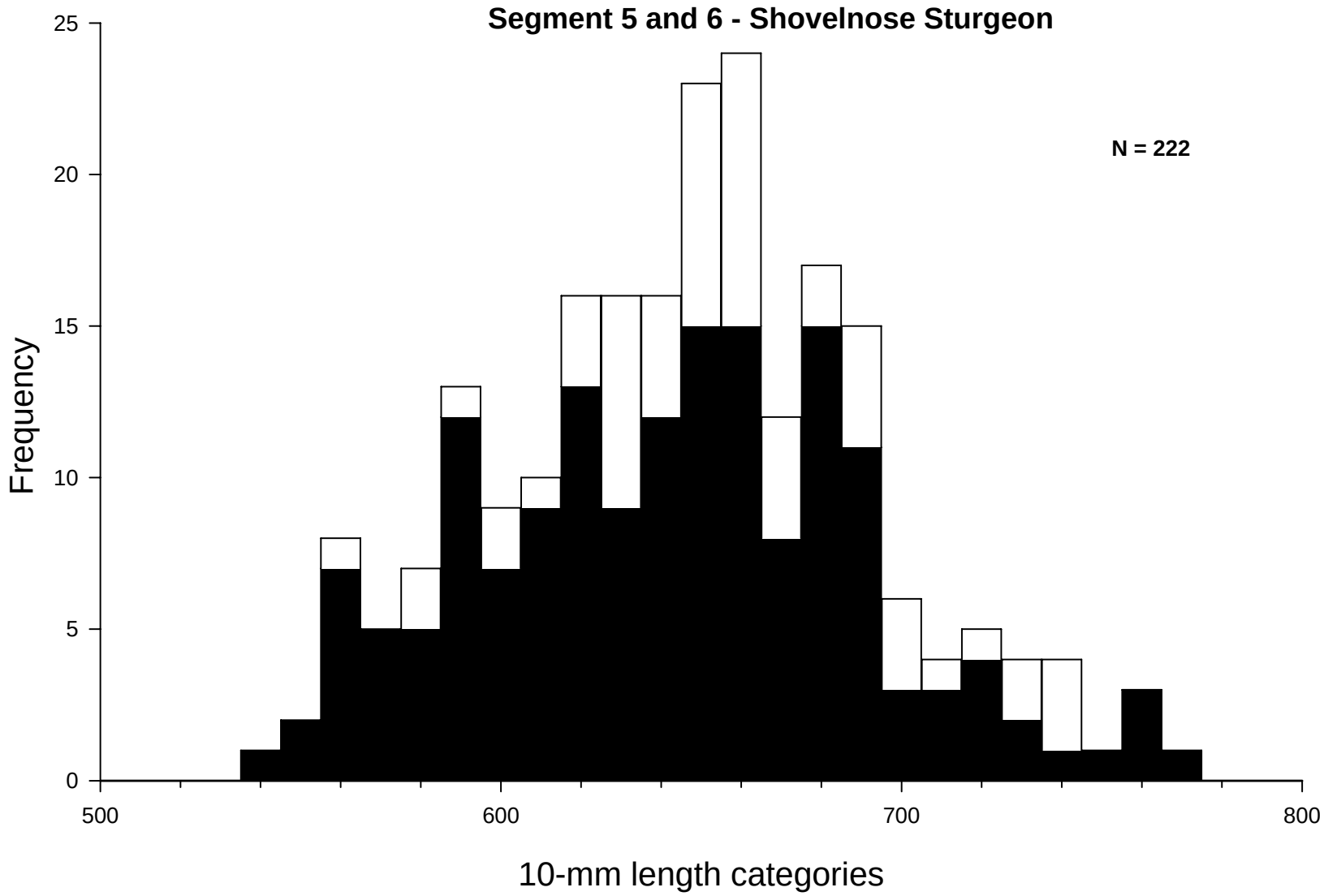

Figure 17. Length frequency of shovelnose sturgeon from fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segments 5 and 6 of the Missouri River during 2004 - 2005.

Table 25. Incremental relative stock density (RSD)[a] by a length category for shovelnose sturgeon in segments 5 and 6 of the Missouri River captured during 2005. Length categories[b] determined using methods proposed by Quist (1998).

Length category	N	RSD
	Sturgeon Season	
Sub-stock (0-149 mm)	0	
Sub-stock (150-249 mm)	0	
Stock	0	0
Quality	0	0
Preferred	78	48
Memorable	85	52
Trophy	1	> 1
	Fish Community Season	
Sub-stock (0-149 mm)	0	
Sub-stock (150-249 mm)	0	
Stock	0	0
Quality	0	0
Preferred	19	33
Memorable	38	66
Trophy	1	2

[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

No sturgeon chubs were captured during the 2005 sampling season. This is the third year of zero captures for sturgeon chubs.

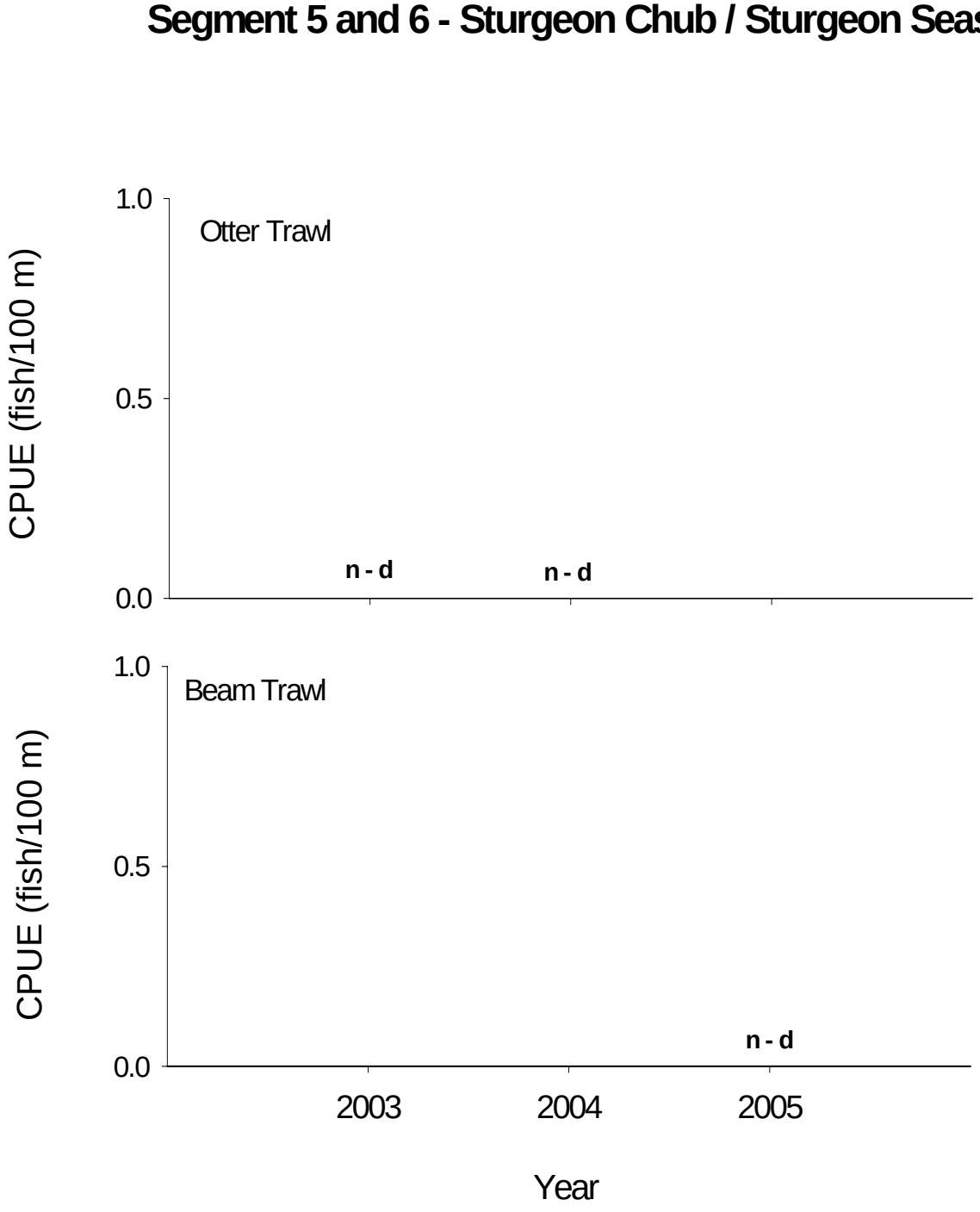

Figure 18. Mean annual catch-per-unit-effort (+/- 2SE) of sturgeon chub in segments 5 and 6 of the Missouri River using otter trawls and beam trawls during sturgeon season 2003-2005. N - d indicates that particular gear was not deployed during that specific year.

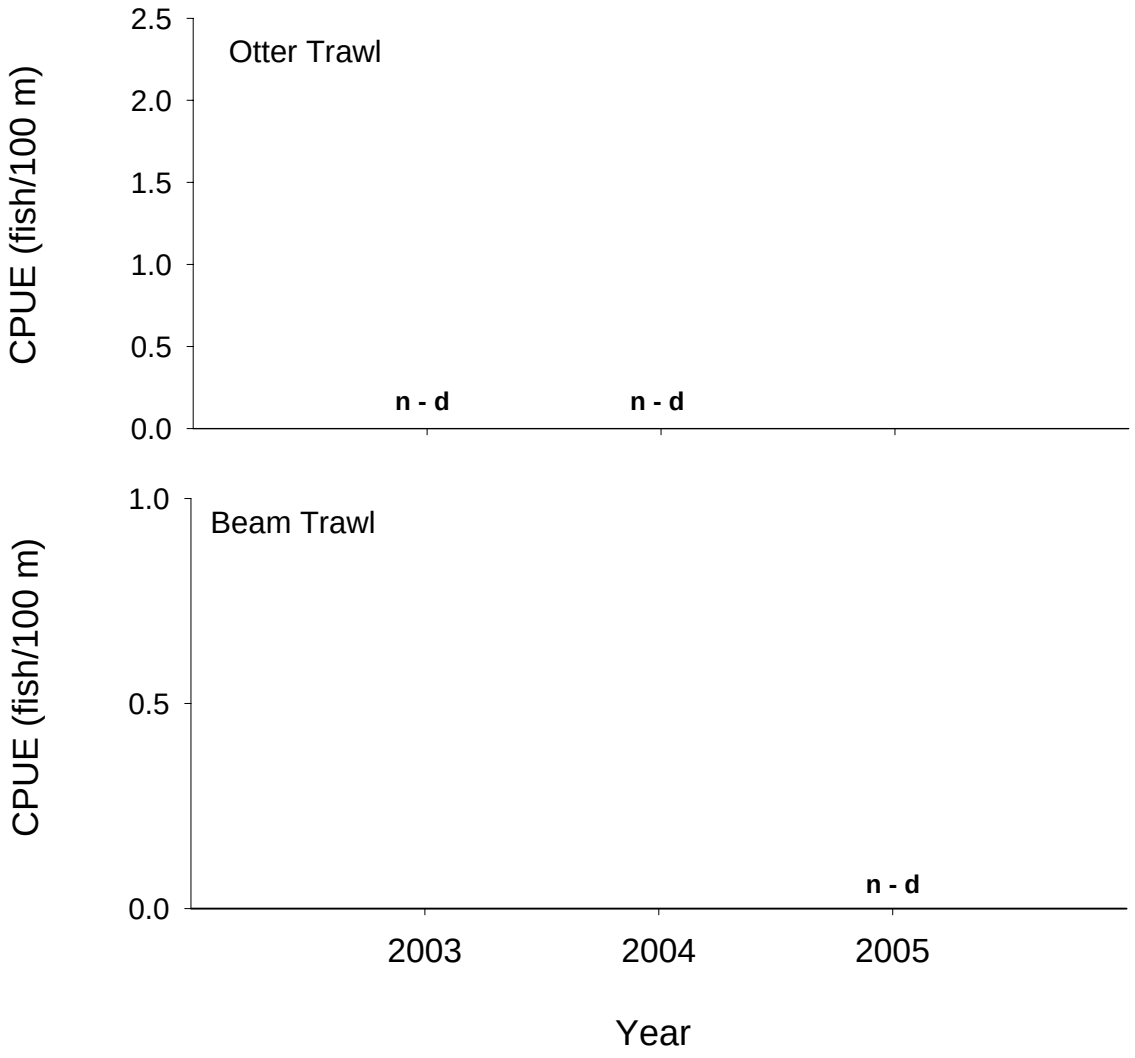

Figure 19. Mean annual catch-per-unit-effort (+/- 2SE) of sturgeon chub in segments 5 and 6 of the Missouri River using otter trawls and beam trawls during fish community season 2003-2005. N - d indicates that particular gear was not deployed during that specific year.

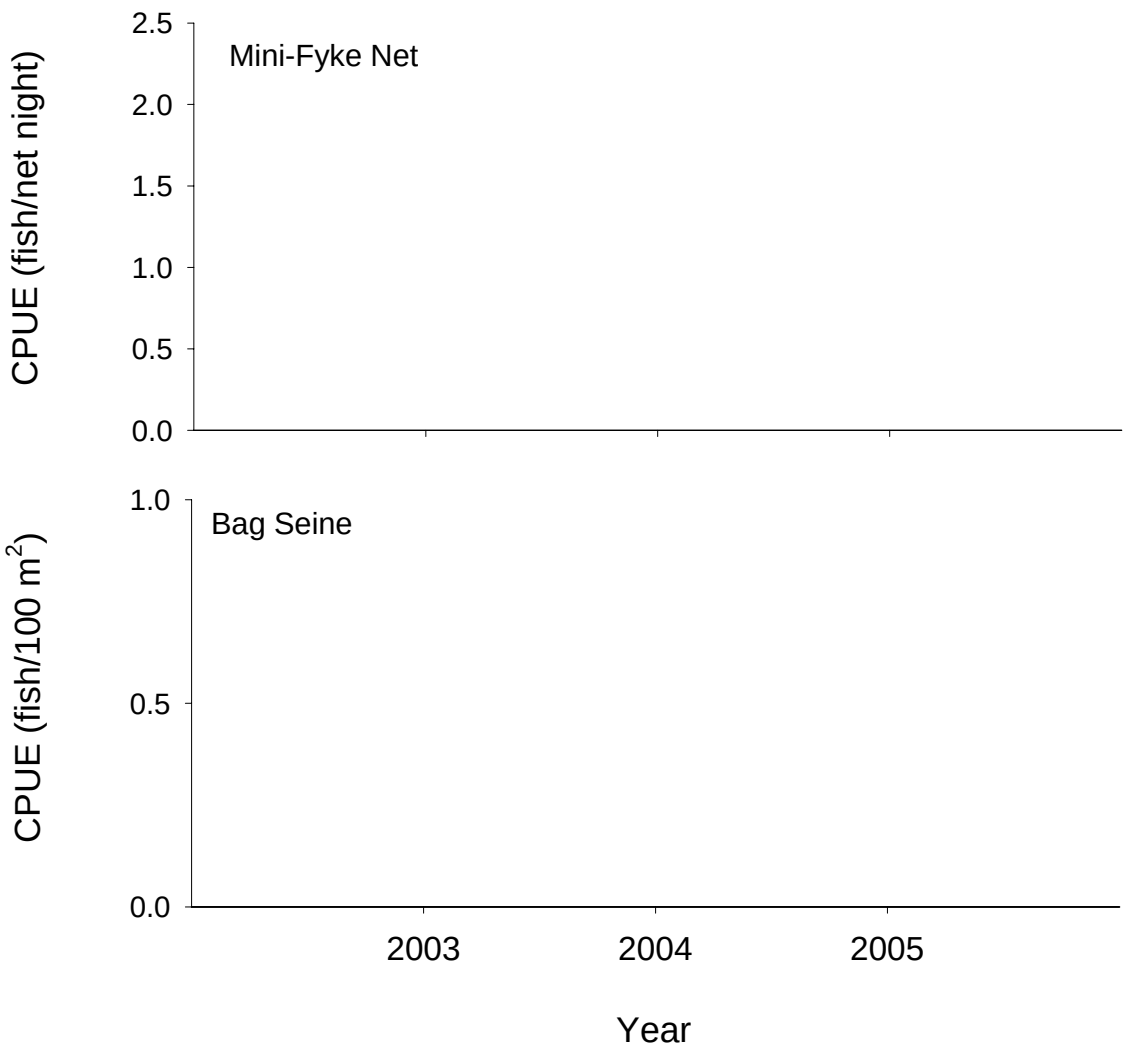

Figure 20. Mean annual catch-per-unit-effort (+/- 2SE) of sturgeon chub in segments 5 and 6 of the Missouri River using mini-fyke nets and seines during fish community season 2003-2005.

Table 26. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0 10	0 19	0 3	0 0		0 29	0 35	0 4	0 0		0 0		0 0	
2.5 Trammel Net	n/a														
Gill Net	0	0 10	0 23	0 0	0 2		0 27	0 26	0 10	0 3		0 0		0 0	
Otter Trawl	0	0 23	0 22	0 4	0 2		0 18	0 20	0 10	0 0		0 0		0 0	
Beam Trawl	n/a														
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0 49	0 18	0 0	0 0		0 18	0 12	0 3	0 0		0 0		0 0	
Bag Seine	0	0 47	0 12	0 0	0 0		0 12	0 14	0 9	0 3		0 0		0 2	
Mini-Fyke Net	0	0 49	0 11	0 0	0 0		0 15	0 15	0 5	0 3		0 1		0 1	
Otter Tawl	0	0 51	0 11	0 0	0 0		0 20	0 13	0 5	0 0		0 0		0 0	
Beam Trawl	n/a														

Table 27. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 0	0 96	0 0	0 3	0 1	n - e
2.5 Inch Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gill Net	0	0 0	0 91	0 0	0 1	0 7	n - e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0 0	0 100	0 0	0 0	0 0	n - e
Bag Seine	0	0 100	0 0	0 0	0 0	0 0	n - e
Mini-Fyke Net	0	0 96	0 4	0 0	0 0	0 0	n - e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a

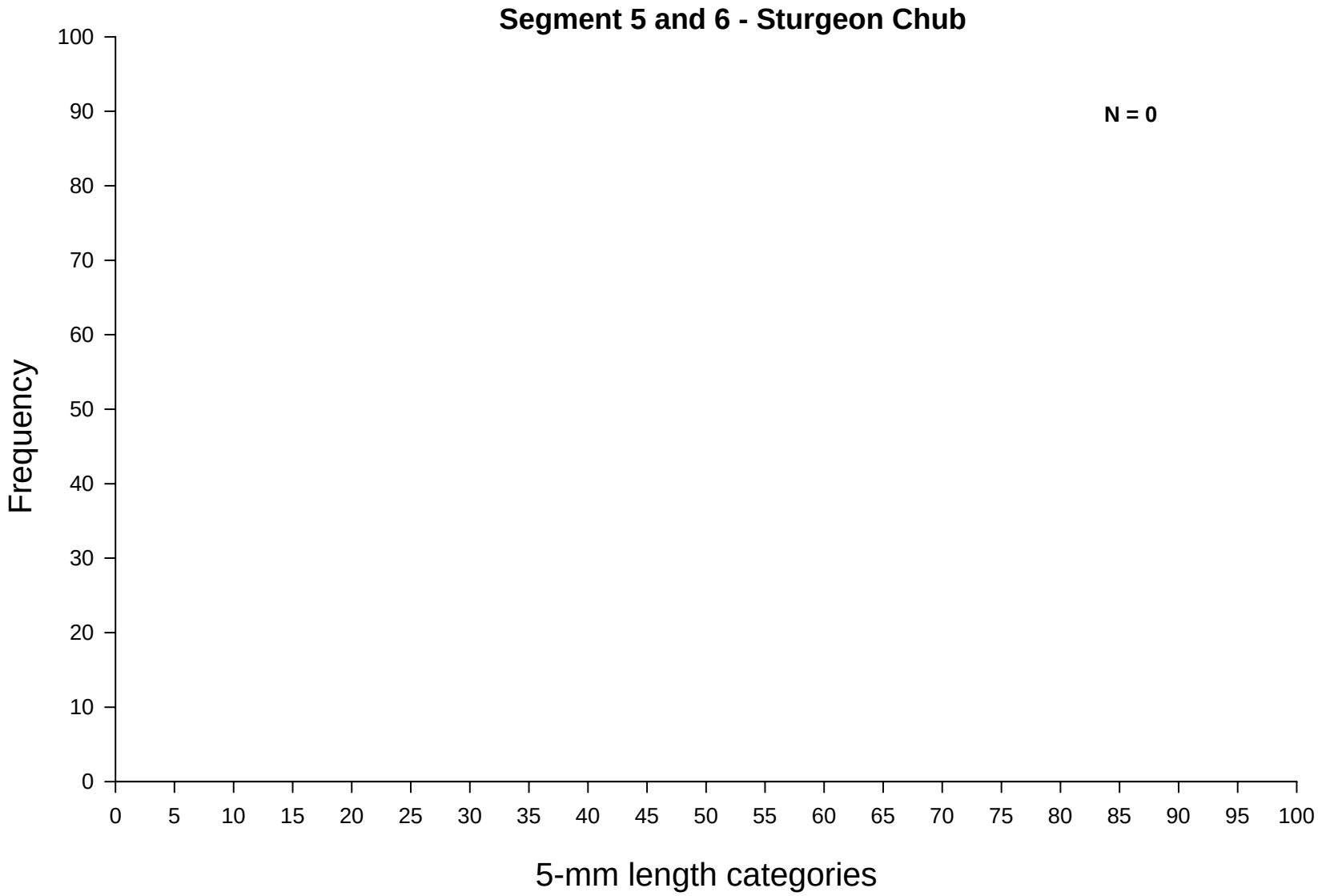

Figure 21. Length frequency of sturgeon chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segments 5 and 6 of the Missouri River during 2004 - 2005.

Sicklefin Chub

No sicklefin chubs were captured during the 2005 sampling season. This is the third year of zero captures for sicklefin chubs.

Segment 5 and 6 - Sicklefin Chub / Sturgeon Season

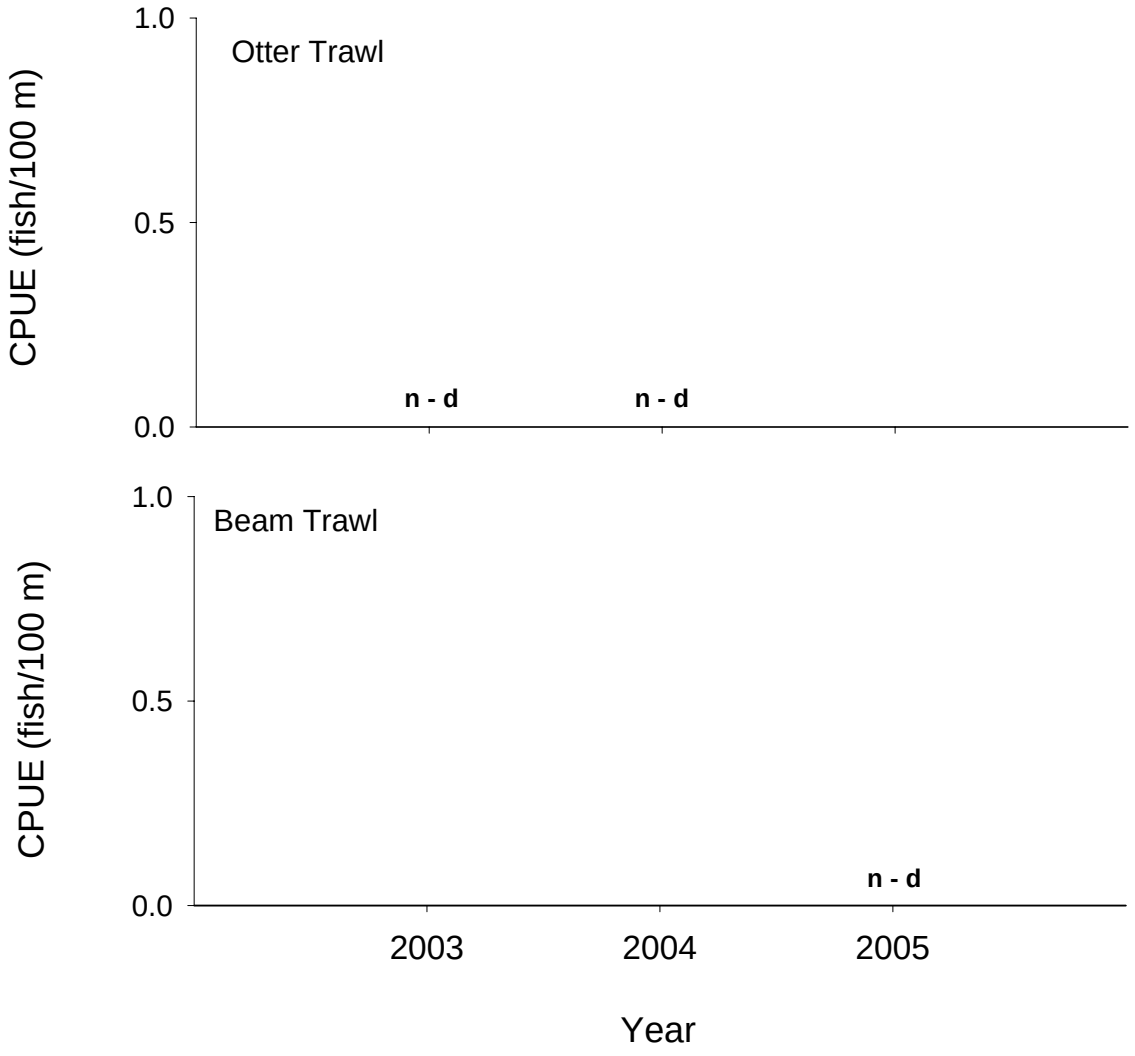

Figure 22. Mean annual catch-per-unit-effort (+/- 2SE) of sicklefin chub in segments 5 and 6 of the Missouri River using otter trawls and beam trawls during sturgeon season 2003-2005. N - d indicates that particular gear was not deployed during that specific year.

Segment 5 and 6 - Sicklefin Chub / Fish Community Season

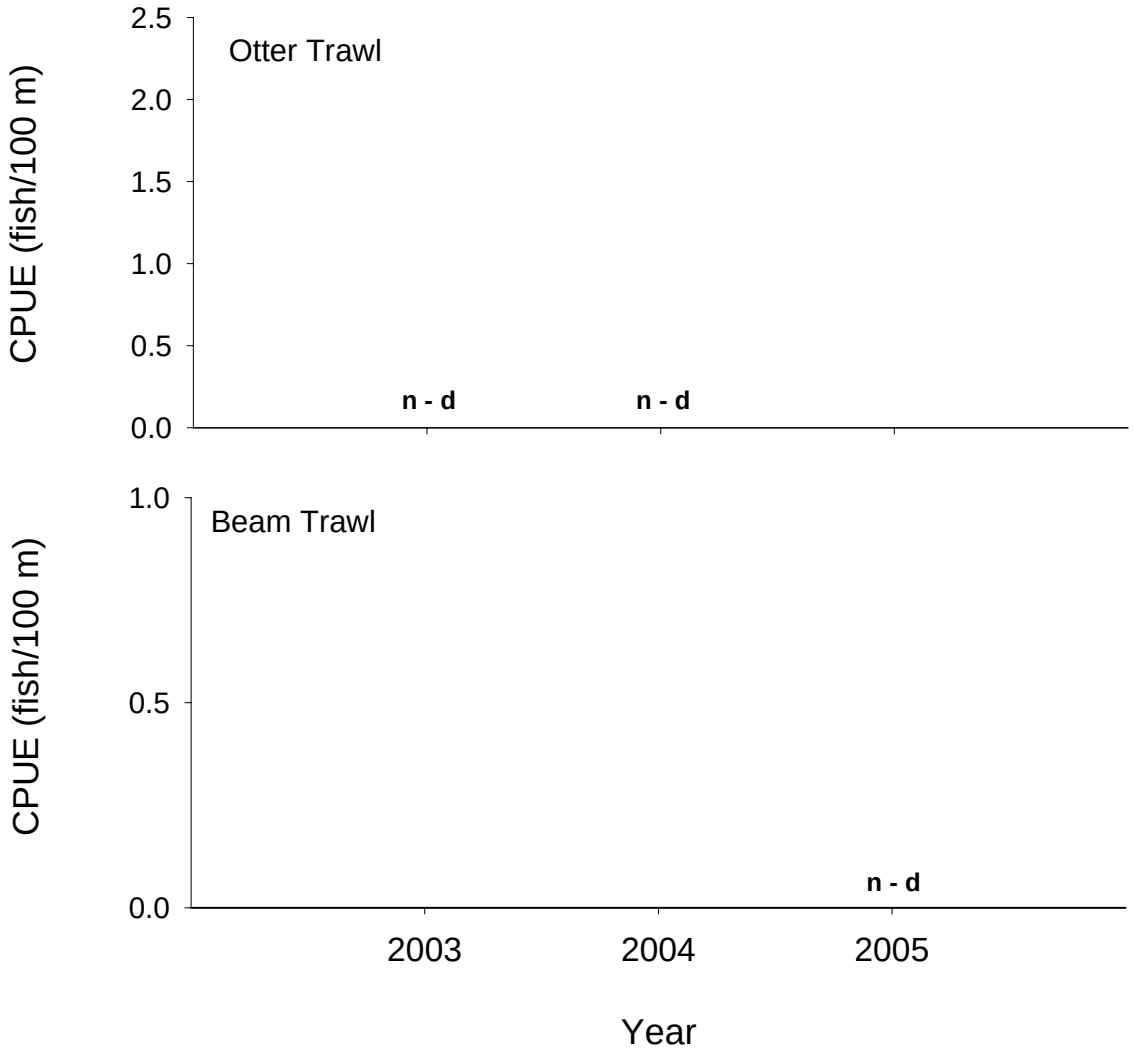

Figure 23. Mean annual catch-per-unit-effort (+/- 2SE) of sicklefin chub in segments 5 and 6 of the Missouri River using otter trawls and beam trawls during fish community season 2003-2005. N - d indicates that particular gear was not deployed during that specific year.

Segment 5 and 6 - Sicklefin Chub / Fish Community Season

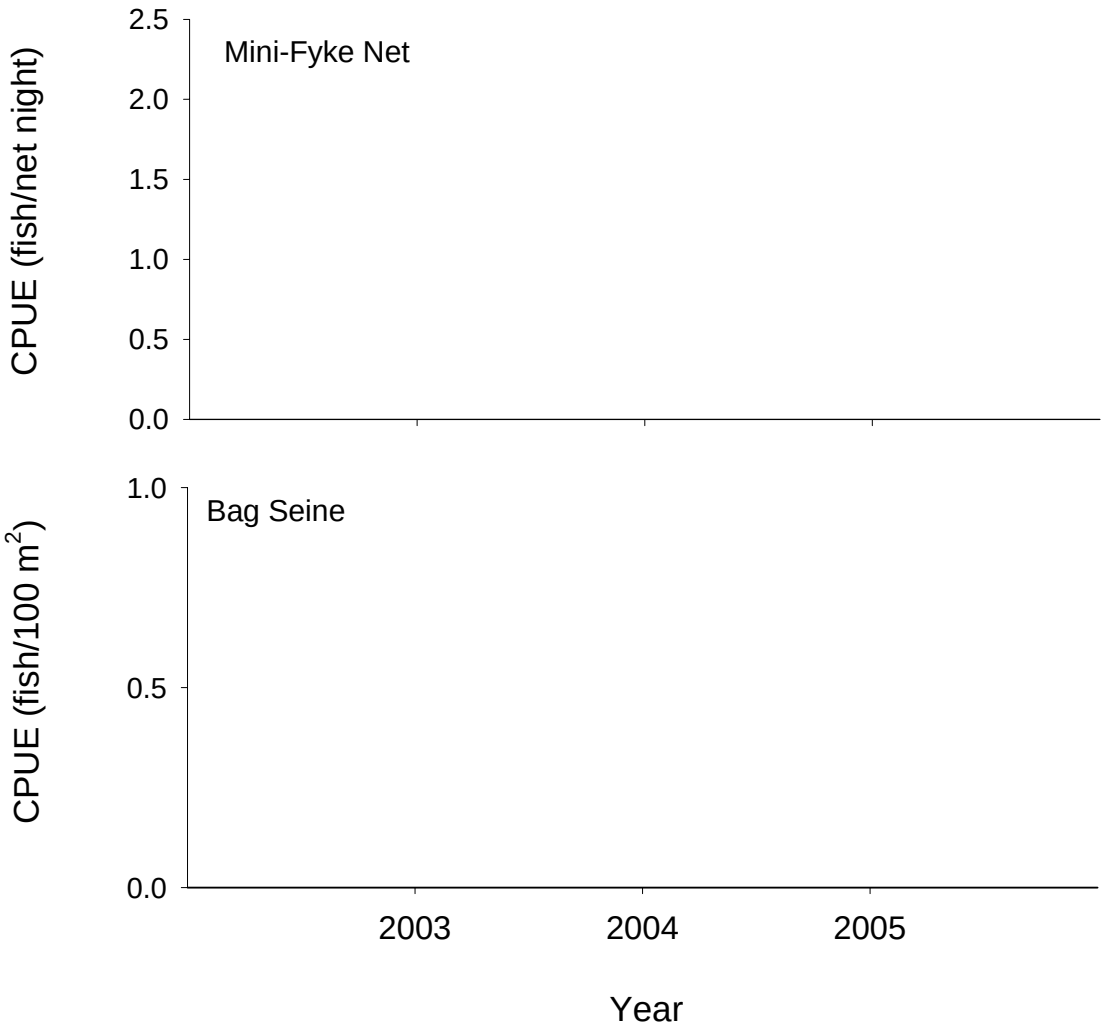

Figure 24. Mean annual catch-per-unit-effort (+/- 2SE) of sicklefin chub in segments 5 and 6 of the Missouri River using mini-fyke nets and seines during fish community season 2003-2005.

Table 28. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0		0		0	
		10	19	3	0	0	29	35	4	0		0		0	
2.5 Inch Trammel Net	n/a														
Gill Net	0	0	0	0	0	0	0	0	0	0		0		0	
		10	23	0	2	0	27	26	10	3		0		0	
Otter	0	0	0	0	0	0	0	0	0	0		0		0	
		23	22	4	2	0	18	20	10	0		0		0	
Beam Trawl	n/a														
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0		0		0	
		49	18	0	0	0	18	12	3	0		0		0	
Bag Seine	0	0	0	0	0	0	0	0	0	0		0		0	
		47	12	0	0	0	12	14	9	3		0		2	
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0		0		0	
		49	11	0	0	0	15	15	5	3		1		1	
Otter Trawl	0	0	0	0	0	0	0	0	0	0		0		0	
		51	11	0	0	0	20	13	5	0		0		0	
Beam Trawl	n/a														

Table 29. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 0	0 96	0 0	0 3	0 1	n - e
2.5 Inch Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gill Net	0	0 0	0 91	0 0	0 1	0 7	n - e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0 0	0 100	0 0	0 0	0 0	n - e
Bag Seine	0	0 100	0 0	0 0	0 0	0 0	n - e
Mini-Fyke Net	0	0 96	0 4	0 0	0 0	0 0	n - e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a

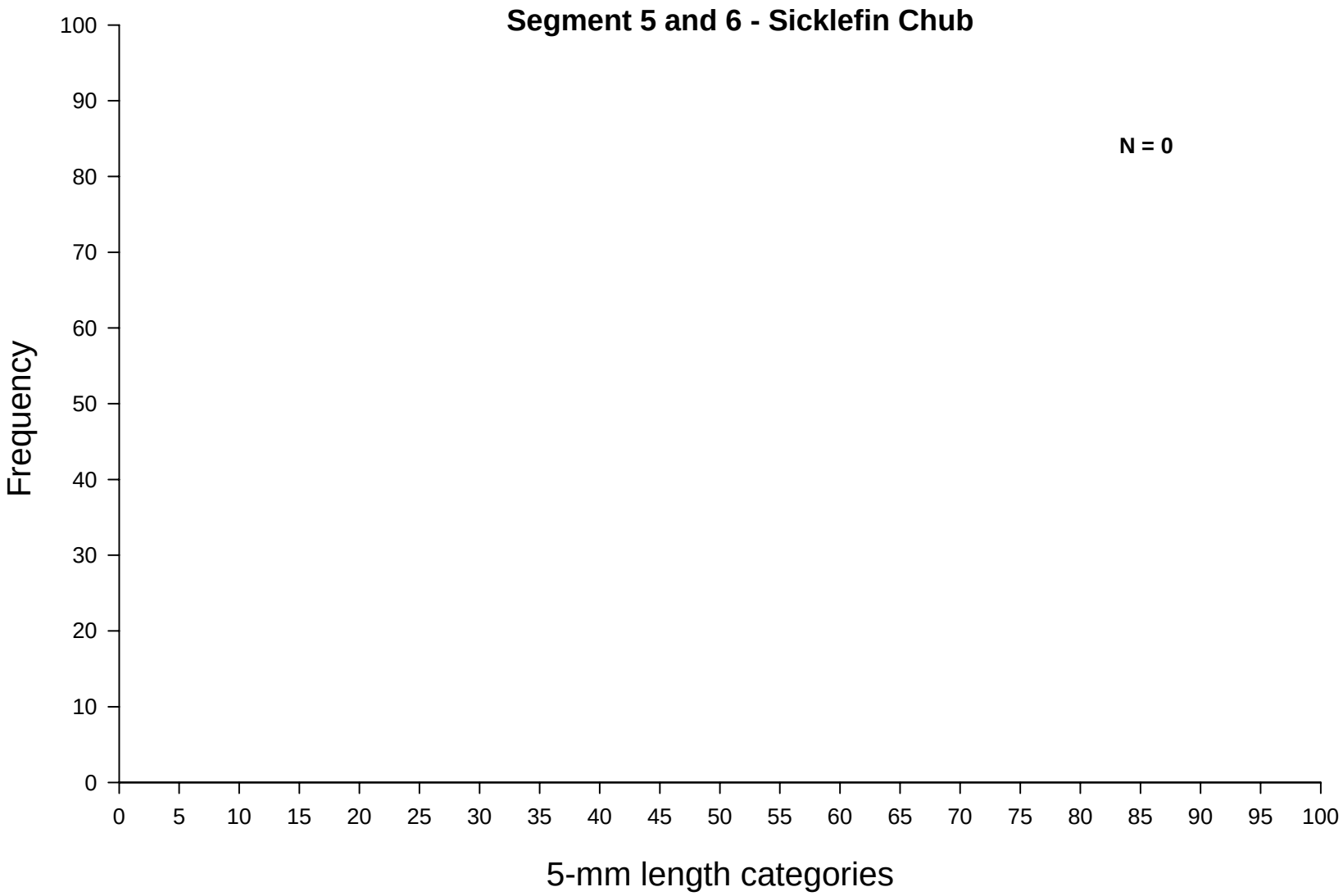

Figure 25. Length frequency of sicklefin chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segments 5 and 6 of the Missouri River during 2004 - 2005.

Speckled Chub

No speckled chubs were captured during the 2005 sampling season. This is the third year of zero captures for speckled chubs.

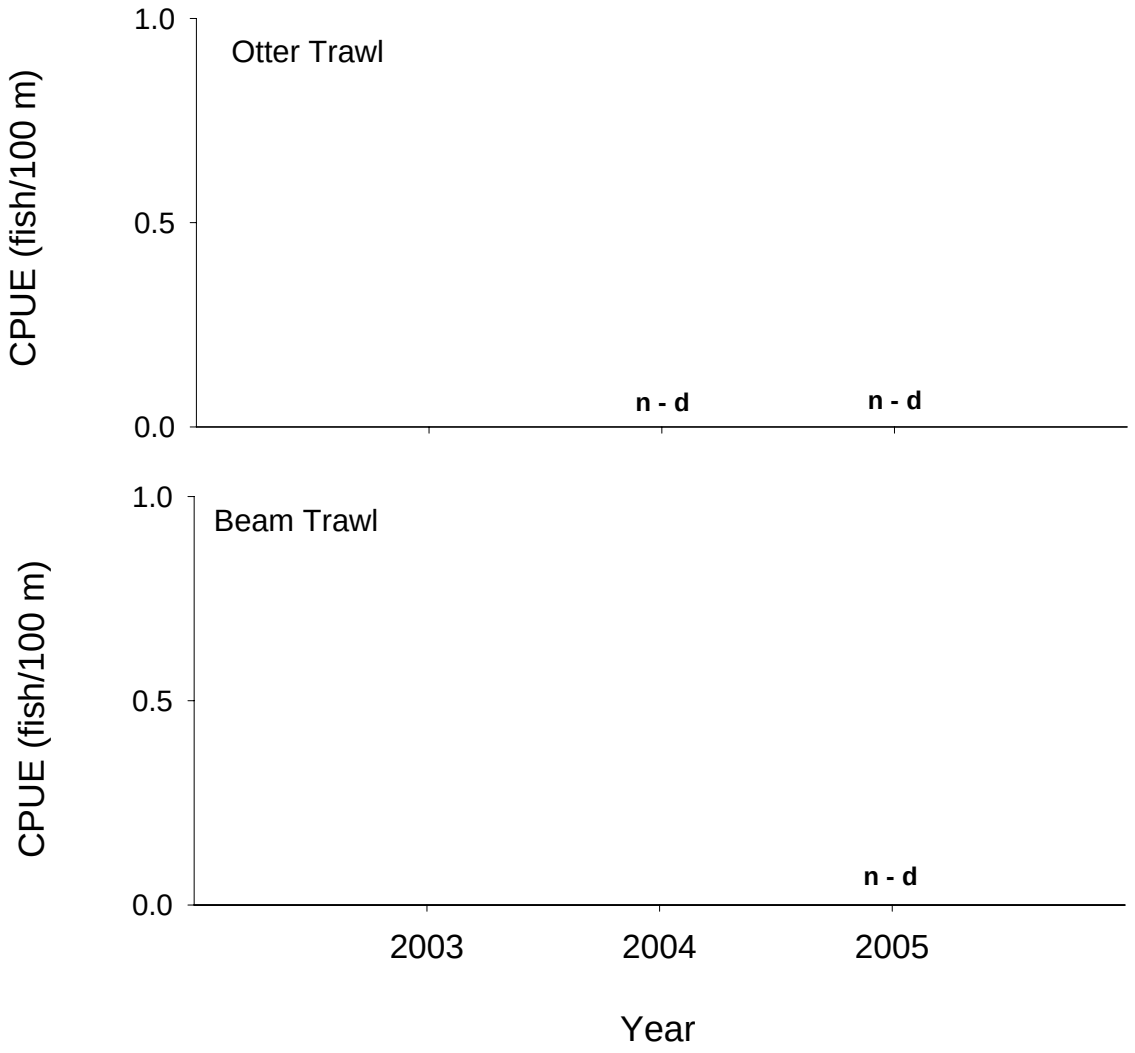

Figure 26. Mean annual catch-per-unit-effort (+/- 2SE) of speckled chub in segments 5 and 6 of the Missouri River using otter trawls and beam trawls during sturgeon season 2003-2005. N - d indicates that particular gear was not deployed during that specific year.

Segment 5 and 6 - Speckled Chub / Fish Community Season

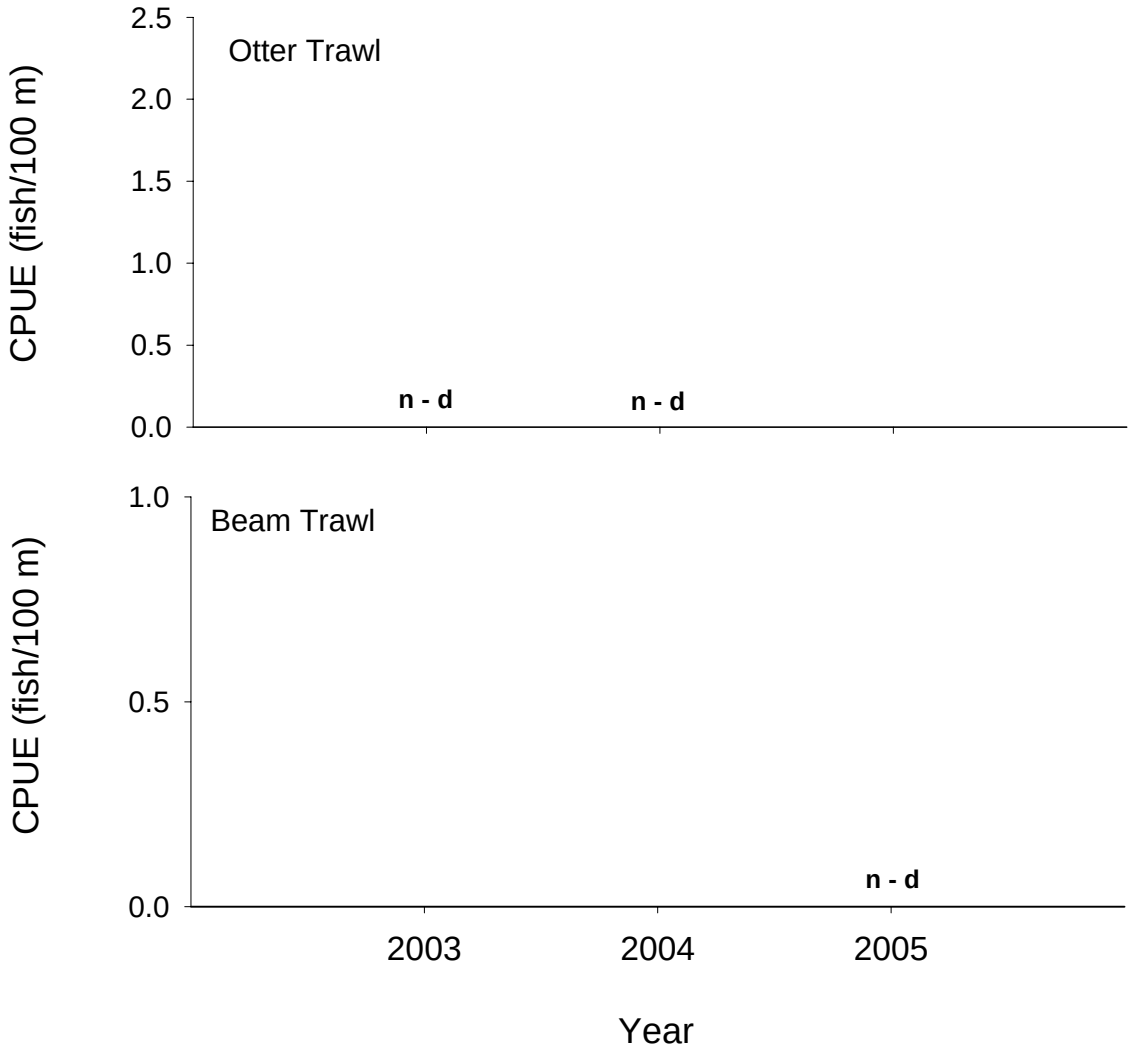

Figure 27. Mean annual catch-per-unit-effort (+/- 2SE) of speckled chub in segments 5 and 6 of the Missouri River using otter trawls and beam trawls during fish community season 2003-2005. N - d indicates that particular gear was not deployed during that specific year.

Segment 5 and 6 - Speckled Chub / Fish Community Season

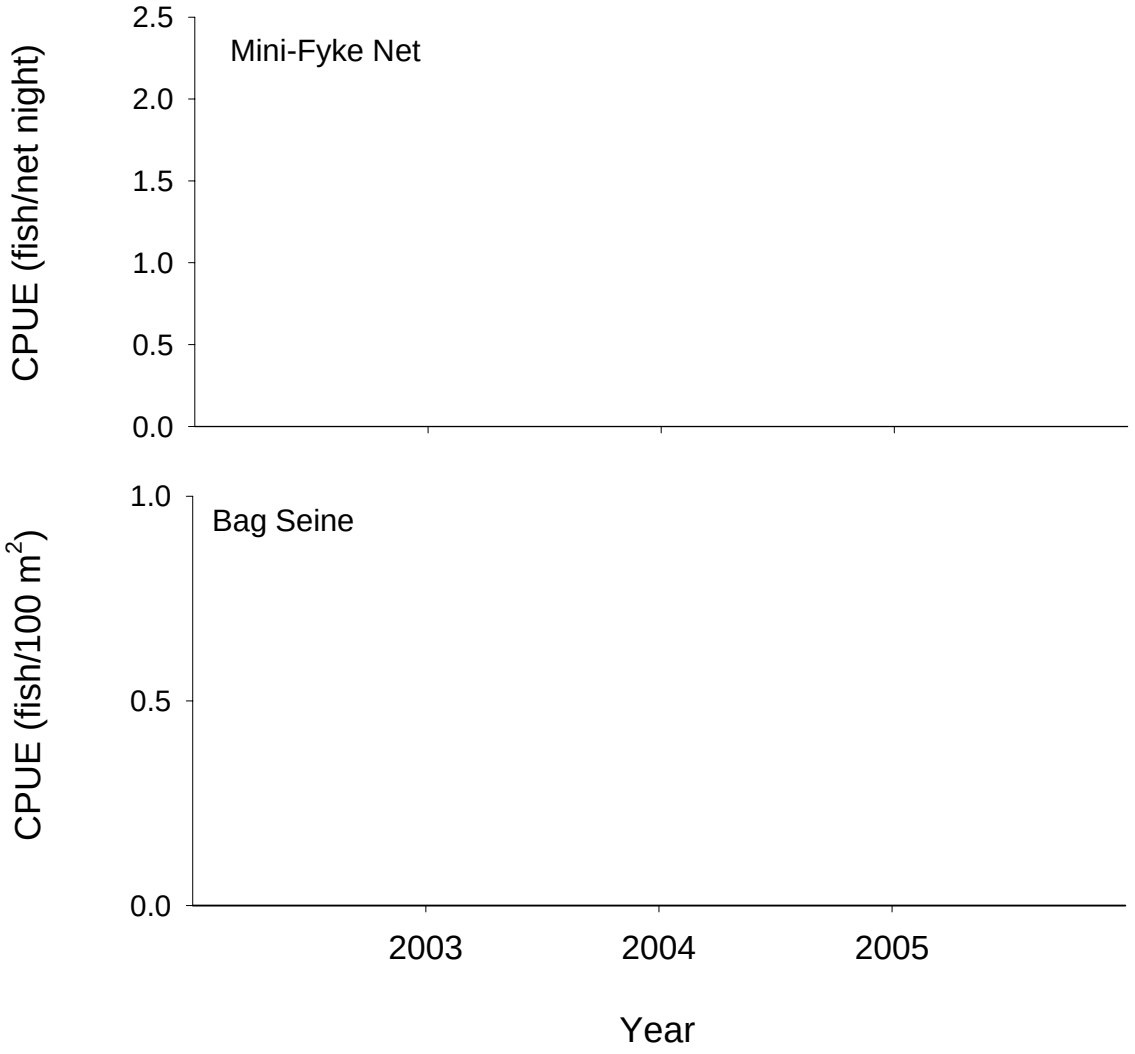

Figure 28. Mean annual catch-per-unit-effort (+/- 2SE) of speckled chub in segments 5 and 6 of the Missouri River using mini-fyke nets and seines during fish community season 2003-2005.

Table 30. Total number of speckled chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat												
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0		0	0	0	0		0		0	
		10	19	3	0		29	35	4	0		0		0	
2.5 Inch Trammel Net	n/a														
Gill Net	0	0	0	0	0		0	0	0	0		0		0	
		10	23	0	2		27	26	10	3		0		0	
Otter Trawl	0	0	0	0	0		0	0	0	0		0		0	
		23	22	4	2		18	20	10	0		0		0	
Beam Trawl	n/a														
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0		0	0	0	0		0		0	
		49	18	0	0		18	12	3	0		0		0	
Bag Seine	0	0	0	0	0		0	0	0	0		0		0	
		47	12	0	0		12	14	9	3		0		2	
Mini-Fyke Net	0	0	0	0	0		0	0	0	0		0		0	
		49	11	0	0		15	15	5	3		1		1	
Otter Trawl	0	0	0	0	0		0	0	0	0		0		0	
		51	11	0	0		20	13	5	0		0		0	
Beam Trawl	n/a														

Table 31. Total number of speckled chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 0	0 96	0 0	0 3	0 1	n - e
2.5 Inch Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gill Net	0	0 0	0 91	0 0	0 1	0 7	n - e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0 0	0 100	0 0	0 0	0 0	n - e
Bag Seine	0	0 100	0 0	0 0	0 0	0 0	n - e
Mini-Fyke Net	0	0 96	0 4	0 0	0 0	0 0	n - e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a

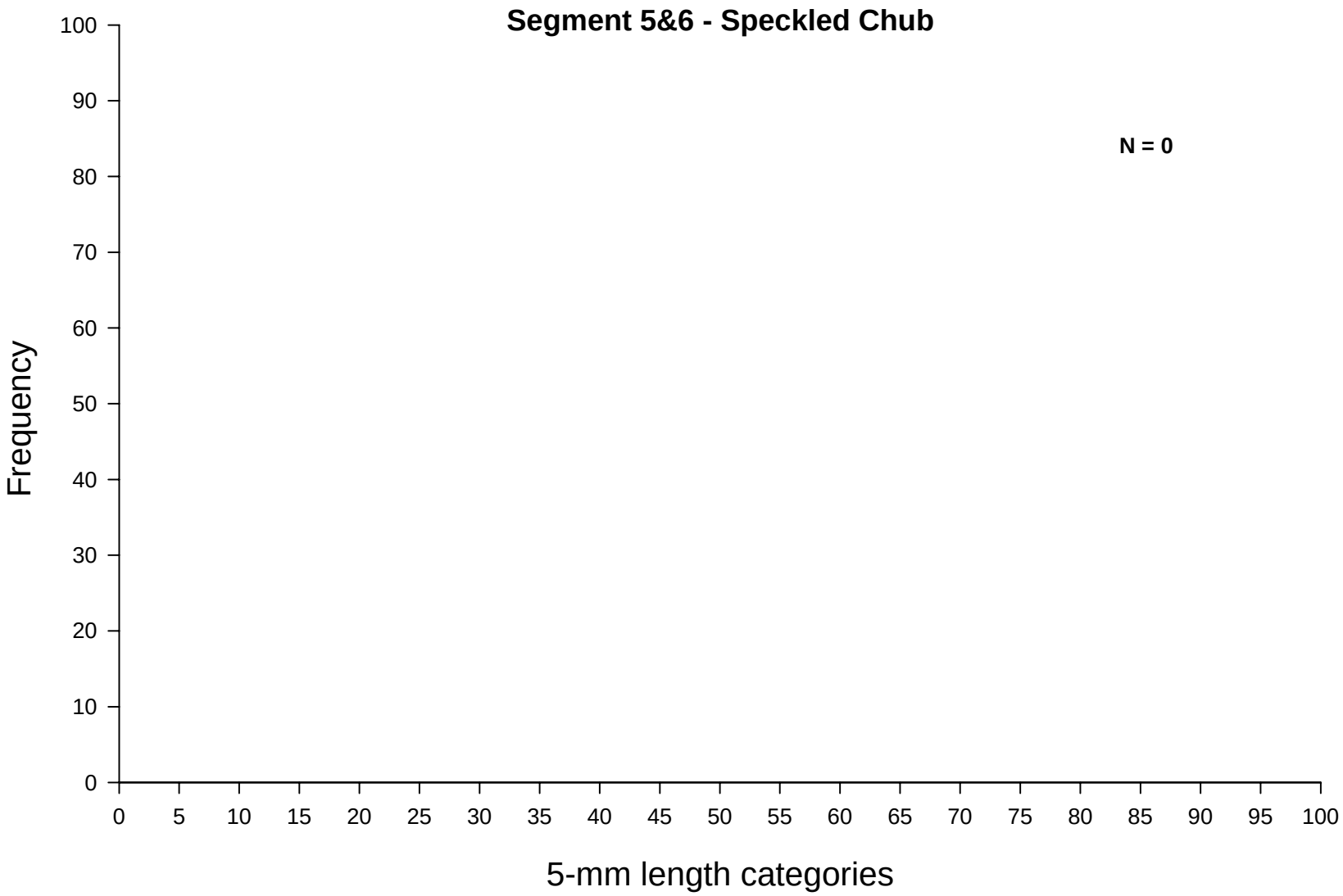

Figure 29. Length frequency of speckled chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segments 5 and 6 of the Missouri River during 2004 - 2005.

Sand Shiner

A total of 26 sand shiners were captured in otter trawls (n = 1) and mini-fyke nets (n = 25) during the 2005 sampling year. One sand shiner was captured during the sturgeon season in the otter trawl. Annual catch per unit effort for mini-fyke nets (Figure 32) was lower (0.312 fish/net night) than 2004 (1.65 fish/net night). Over 60% of the fish captured in mini-fyke nets were collected in the braided macrohabitat with the remainder captured in channel crossovers, outside bends, and secondary channel connected small (Table 32). Of the four meso habitats sampled mini-fyke nets were the most successful in the bar mesohabitat consisting of 92% of the catch (Table 33). Over 84% of the sand shiners captured were between 50 – 64 mm (Figure 33).

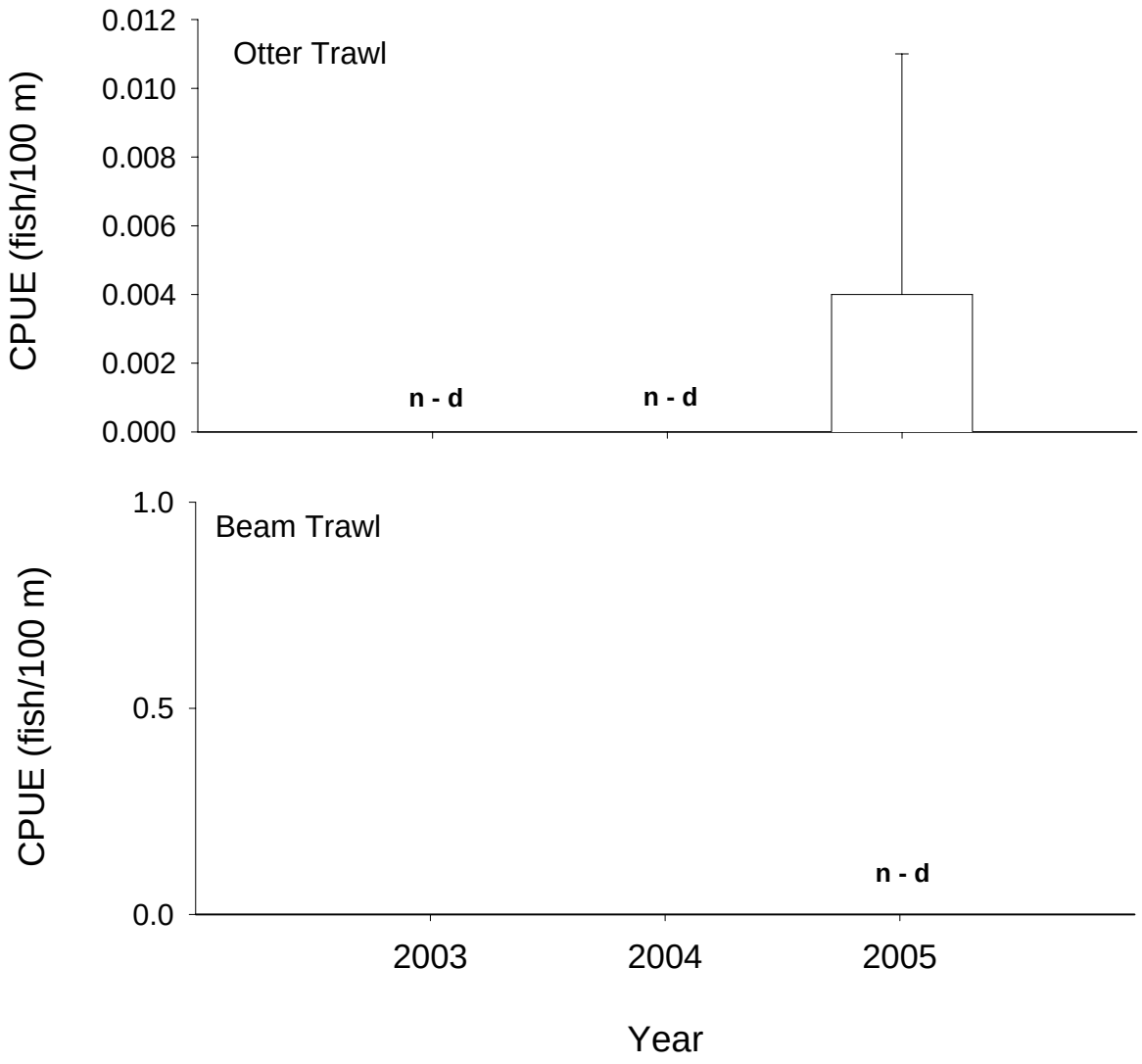

Figure 30. Mean annual catch-per-unit-effort (+/- 2SE) of sand shiner in segments 5 and 6 of the Missouri River using otter trawls and beam trawls during sturgeon season 2003-2005.

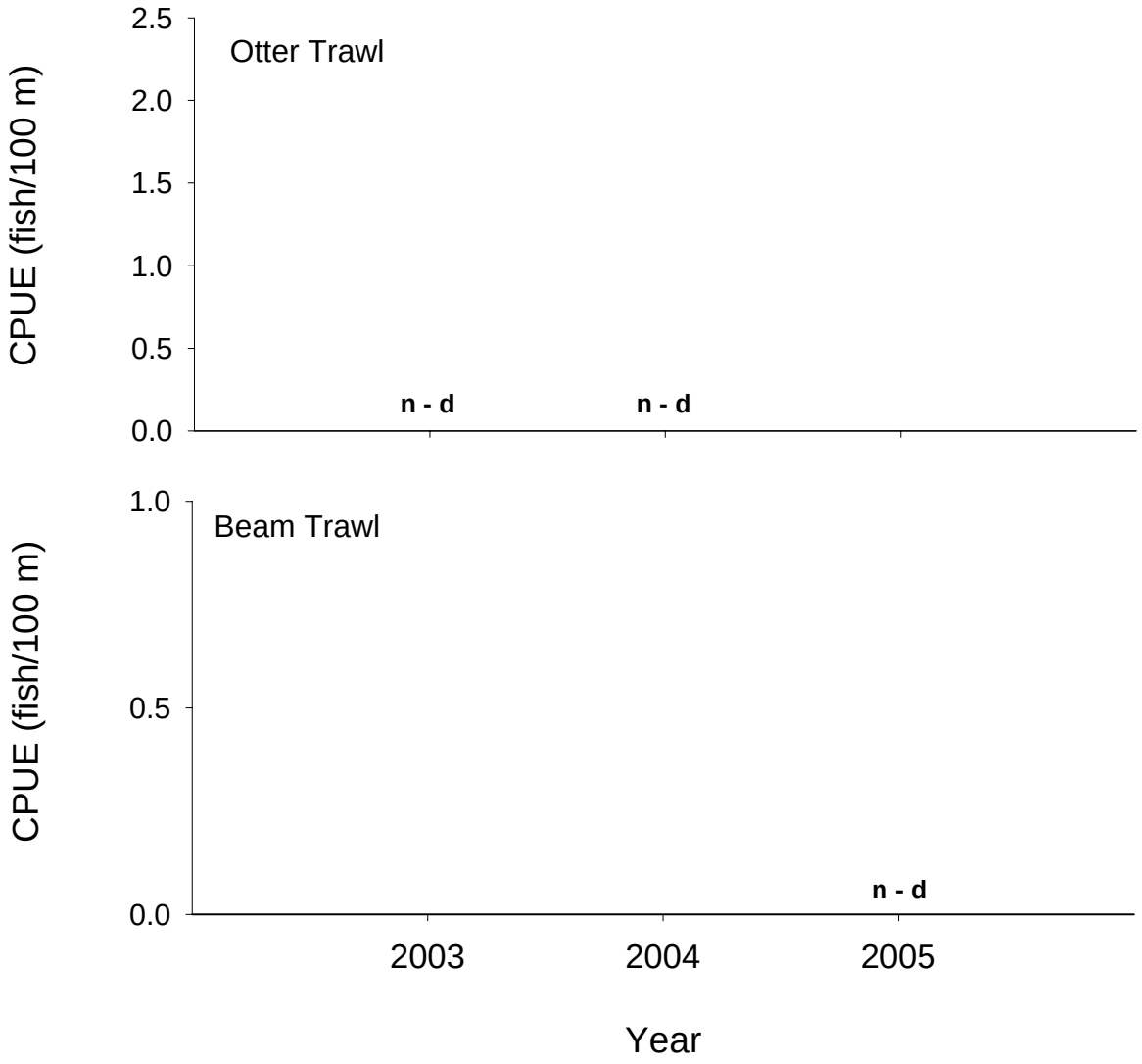

Figure 31. Mean annual catch-per-unit-effort (+/- 2SE) of sand shiner in segments 5 and 6 of the Missouri River using otter trawls and beam trawls during fish community season 2003-2005. N - d indicates that particular gear was not deployed during that specific year.

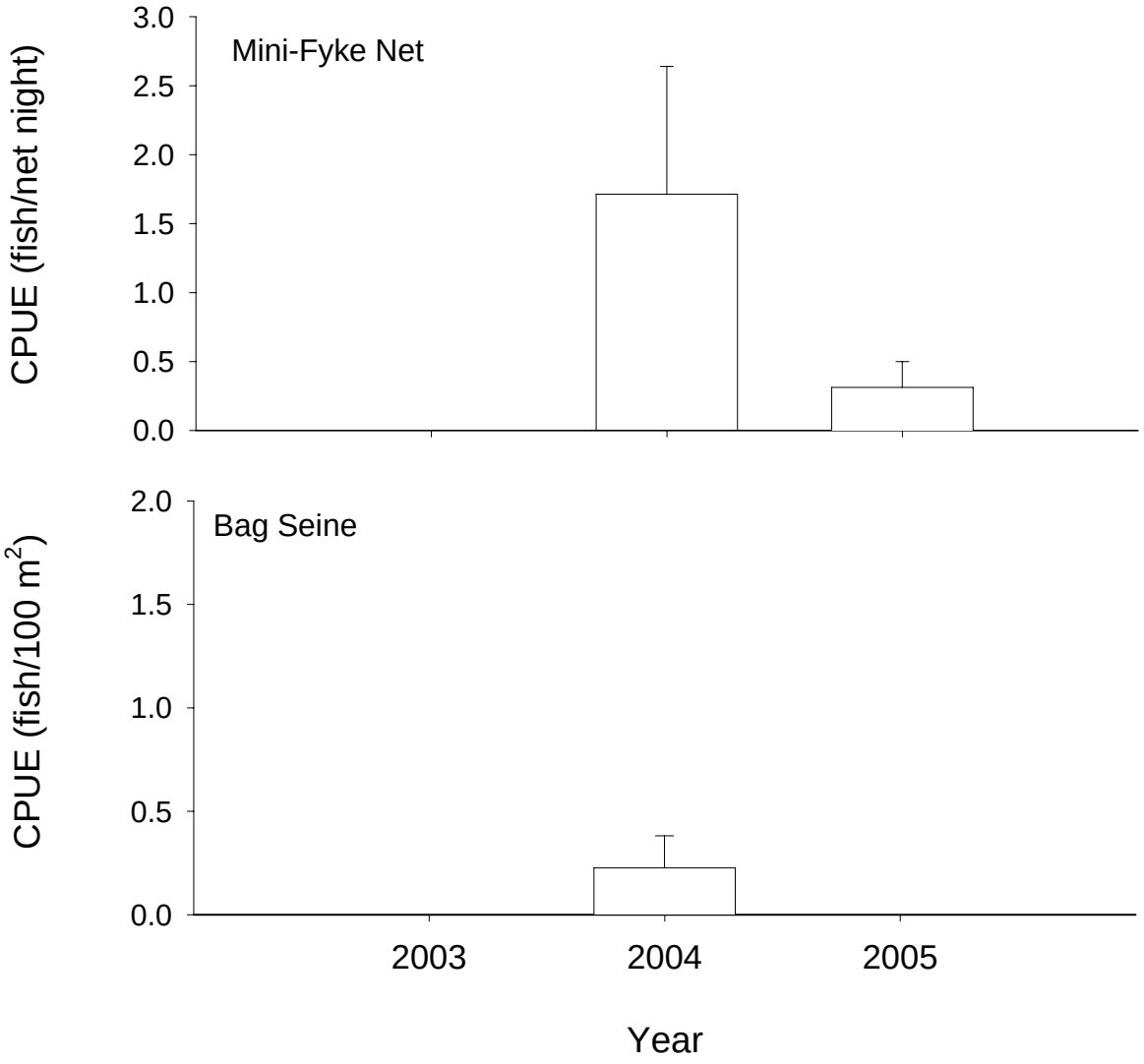

Figure 32. Mean annual catch-per-unit-effort (+/- 2SE) of sand shiner in segments 5 and 6 of the Missouri River using mini-fyke nets and seines during fish community season 2003-2005.

Table 32. Total number of sand shiners captured for each gear during each season and the proportion caught within each macrohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat												
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0		0	0	0	0		0		0	
		10	19	3	0		29	35	4	0		0		0	
2.5 Inch Trammel Net	n/a														
Gill Net	0	0	0	0	0		0	0	0	0		0		0	
		10	23	0	2		27	26	10	3		0		0	
Otter Trawl	1	0	0	0	0		0	0	100	0		0		0	
		23	22	4	2		18	20	10	0		0		0	
Beam Trawl	n/a														
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0		0	0	0	0		0		0	
		49	18	0	0		18	12	3	0		0		0	
Bag Seine	0	0	0	0	0		0	0	0	0		0		0	
		47	12	0	0		12	14	9	3		0		2	
Mini-Fyke Net	25	64	20	0	0		0	8	0	8		0		0	
		49	11	0	0		15	15	5	3		1		1	
Otter Trawl	0	0	0	0	0		0	0	0	0		0		0	
		51	11	0	0		20	13	5	0		0		0	
Beam Trawl	n/a														

Table 33. Total number of sand shiners captured for each gear during each season and the proportion caught within each mesohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 0	0 96	0 0	0 3	0 1	n - e
2.5 Inch Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gill Net	0	0 0	0 91	0 0	0 1	0 7	n - e
Otter Trawl	1	0 0	100 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0 0	0 100	0 0	0 0	0 0	n - e
Bag Seine	0	0 100	0 0	0 0	0 0	0 0	n - e
Mini-Fyke Net	25	96 96	4 4	0 0	0 0	0 0	n - e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a

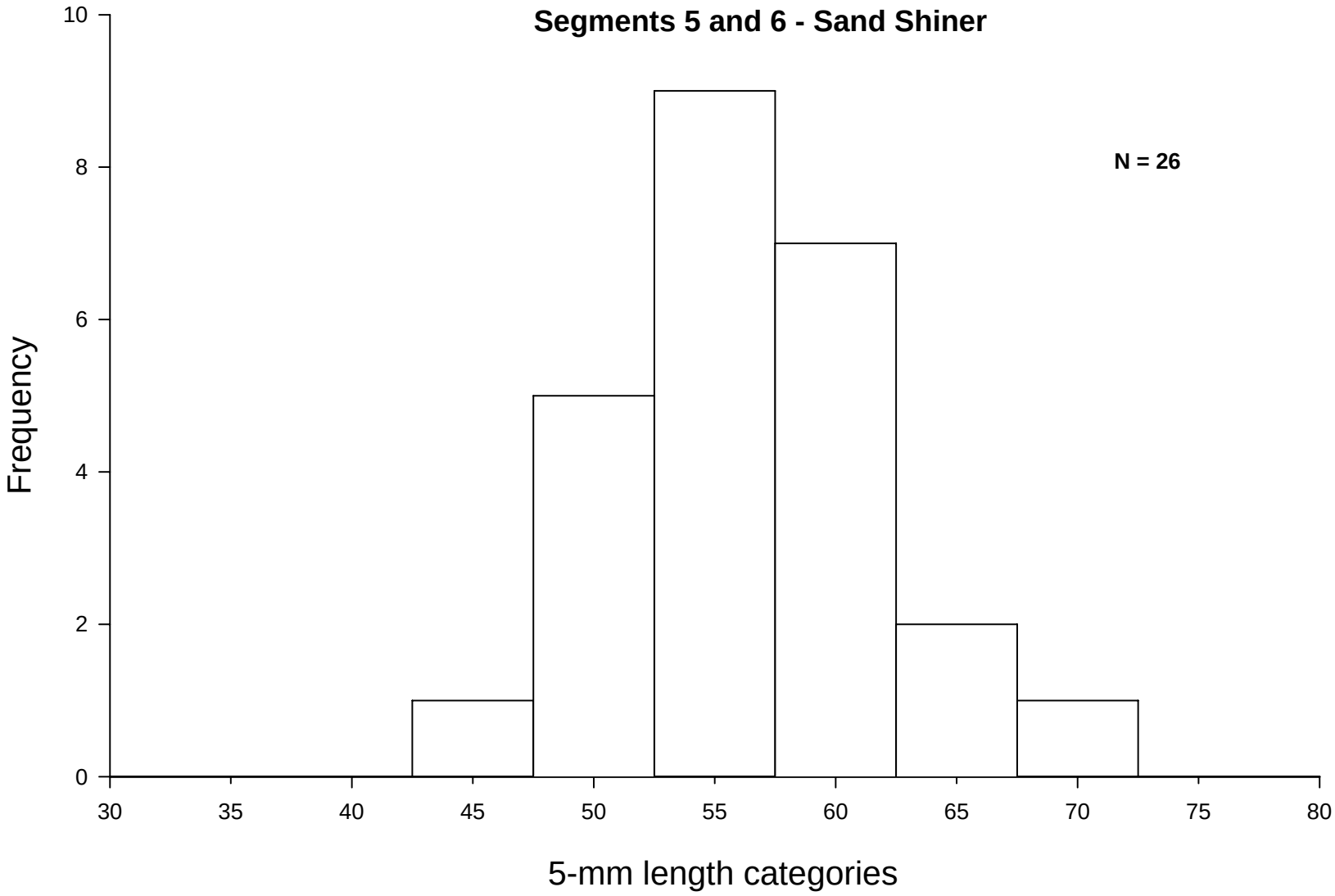

Figure 33. Length frequency of sand shiners in segments 5 and 6 of the Missouri River during summer (fish community season) 2004-2005.

***Hybognathus* spp**.

One *Hybognathus* spp. was captured during the 2005 sampling season. This fish was captured in a mini-fyke net set on a bar in an outside bend. This is the only *Hybognathus* spp. captured during the three years of monitoring.

Segment 5 and 6 - *Hybognathus* spp. / Sturgeon Season

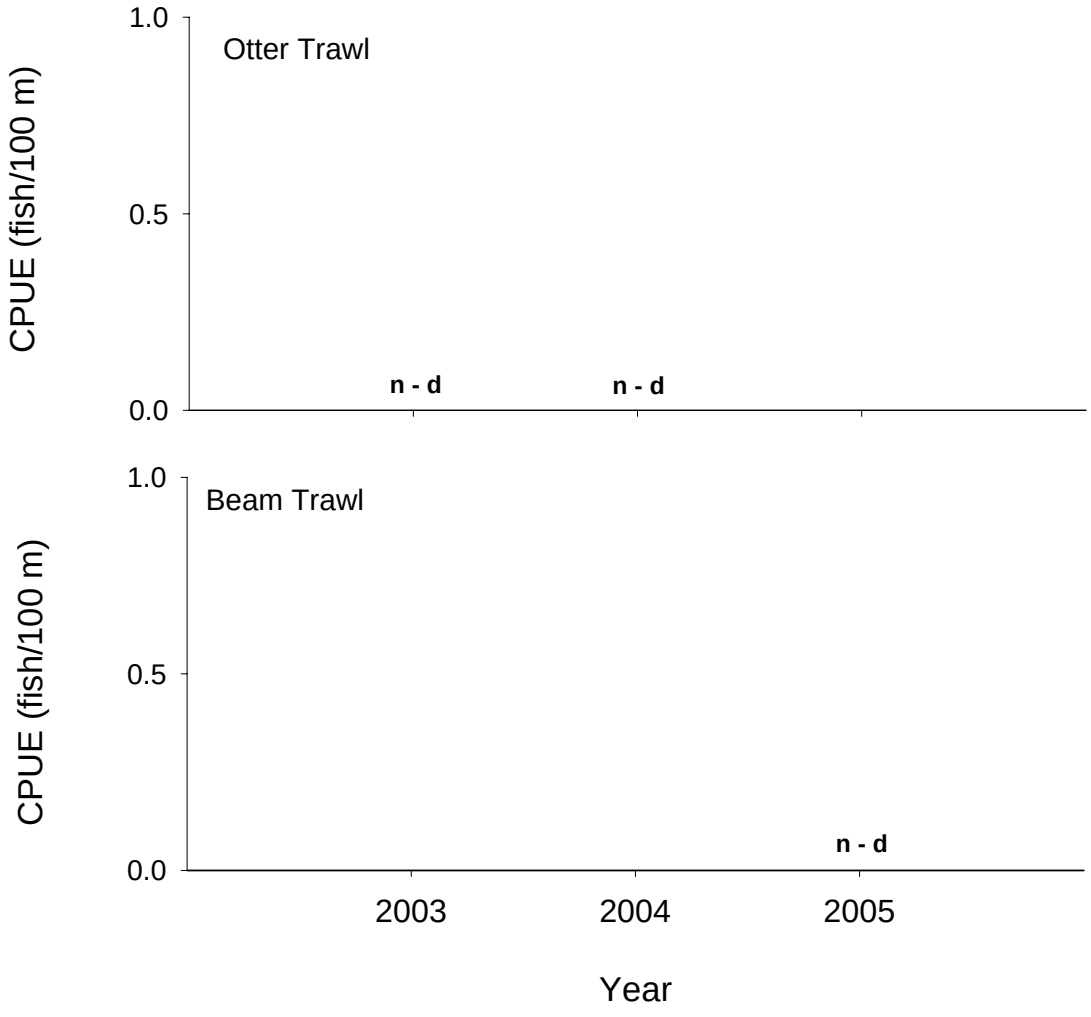

Figure 34. Mean annual catch-per-unit-effort (+/- 2SE) of *Hybognathus* spp. in segments 5 and 6 of the Missouri River using otter trawls and beam trawls during sturgeon season 2003-2005. N - d indicates that particular gear was not deployed during that specific year.

Segment 5 and 6 - *Hybognathus* spp. / Fish Community Season

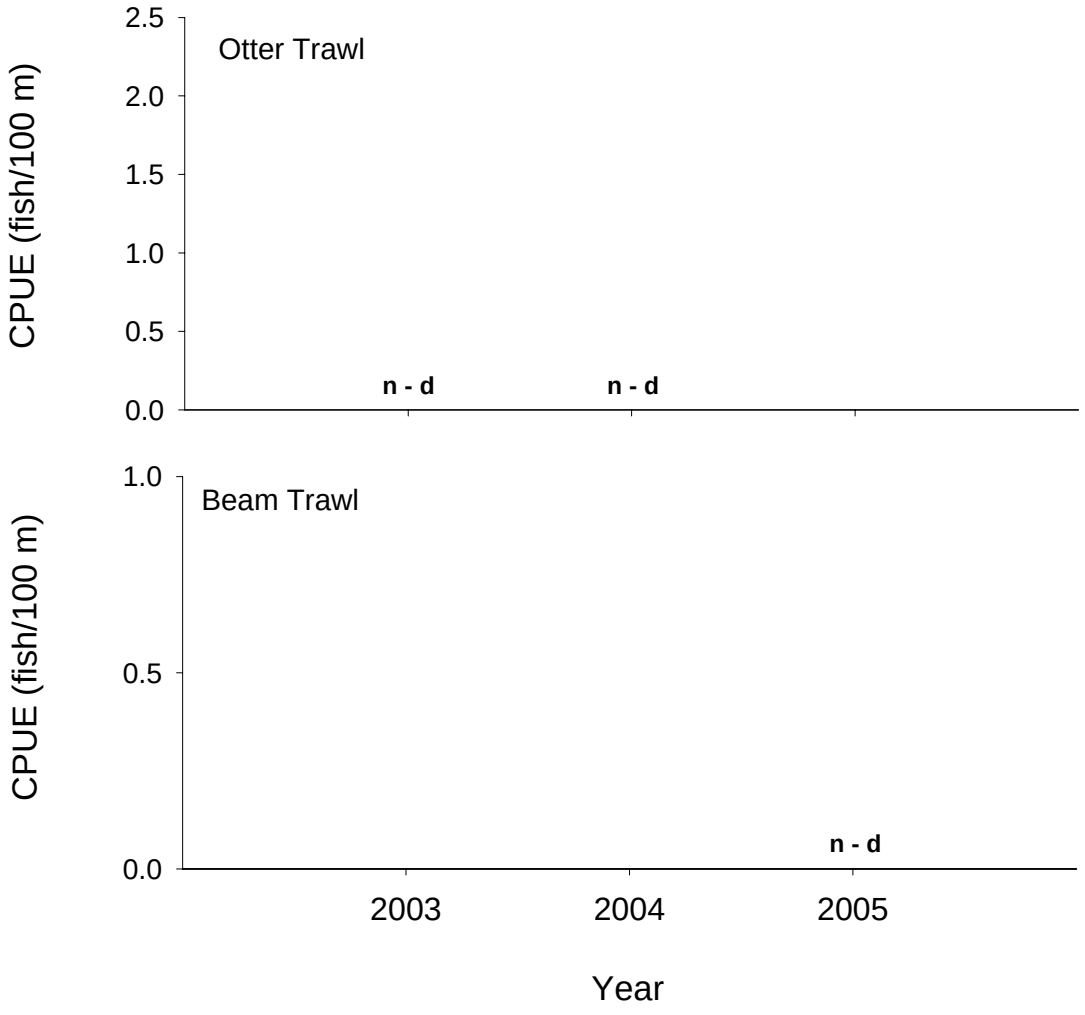

Figure 35. Mean annual catch-per-unit-effort (+/- 2SE) of *Hybognathus* spp. in segments 5 and 6 of the Missouri River using otter trawls and beam trawls during fish community season 2003-2005. N - d indicates that particular gear was not deployed during that specific year.

Segment 5 and 6 - *Hybognathus* spp. / Fish Community Season

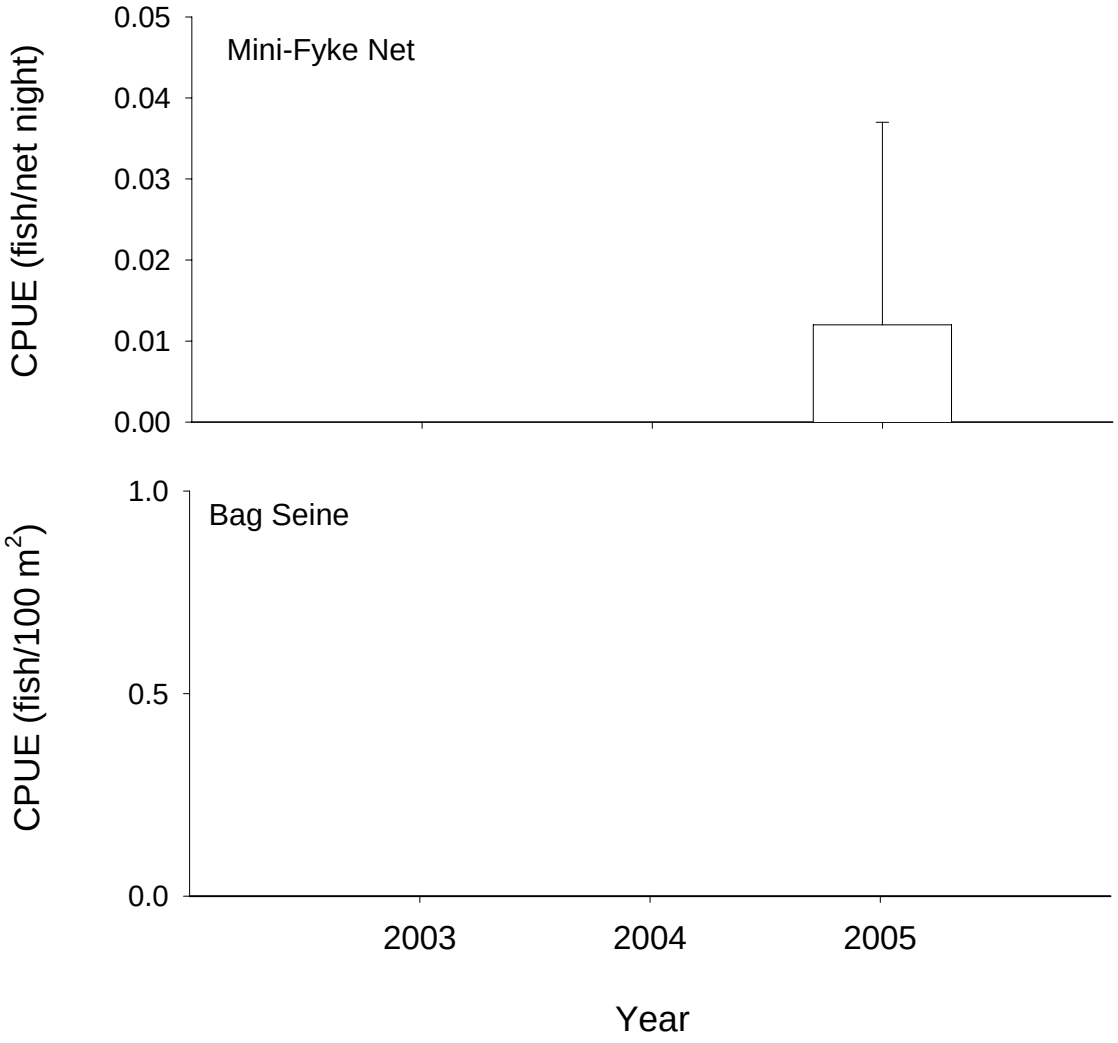

Figure 36. Mean annual catch-per-unit-effort (+/- 2SE) of *Hybognathus* spp. in segments 5 and 6 of the Missouri River using mini-fyke nets and seines during fish community season 2003-2005.

Table 34. Total number of *Hybognathus* spp. captured for each gear during each season and the proportion caught within each macrohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0		0	0	0	0		0		0	
		10	19	3	0		29	35	4	0		0		0	
2.5 Inch Trammel Net	n/a														
Gill Net	0	0	0	0	0		0	0	0	0		0		0	
		10	23	0	2		27	26	10	3		0		0	
Otter Trawl	0	0	0	0	0		0	0	0	0		0		0	
		23	22	4	2		18	20	10	0		0		0	
Beam Trawl	n/a														
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0		0	0	0	0		0		0	
		49	18	0	0		18	12	3	0		0		0	
Bag Seine	0	0	0	0	0		0	0	0	0		0		0	
		47	12	0	0		12	14	9	3		0		2	
Mini-Fyke Net	1	0	0	0	0		0	100	0	0		0		0	
		49	11	0	0		15	15	5	3		1		1	
Otter Trawl	0	0	0	0	0		0	0	0	0		0		0	
		51	11	0	0		20	13	5	0		0		0	
Beam Trawl	n/a														

Table 35. Total number of *Hybognathus* spp. captured for each gear during each season and the proportion caught within each mesohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 0	0 96	0 0	0 3	0 1	n - e
2.5 Inch Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gill Net	0	0 0	0 91	0 0	0 1	0 7	n - e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0 0	0 100	0 0	0 0	0 0	n - e
Bag Seine	0	0 100	0 0	0 0	0 0	0 0	n - e
Mini-Fyke Net	1	100 96	0 4	0 0	0 0	0 0	n - e
Otter Trawl	0	0 0	0 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a

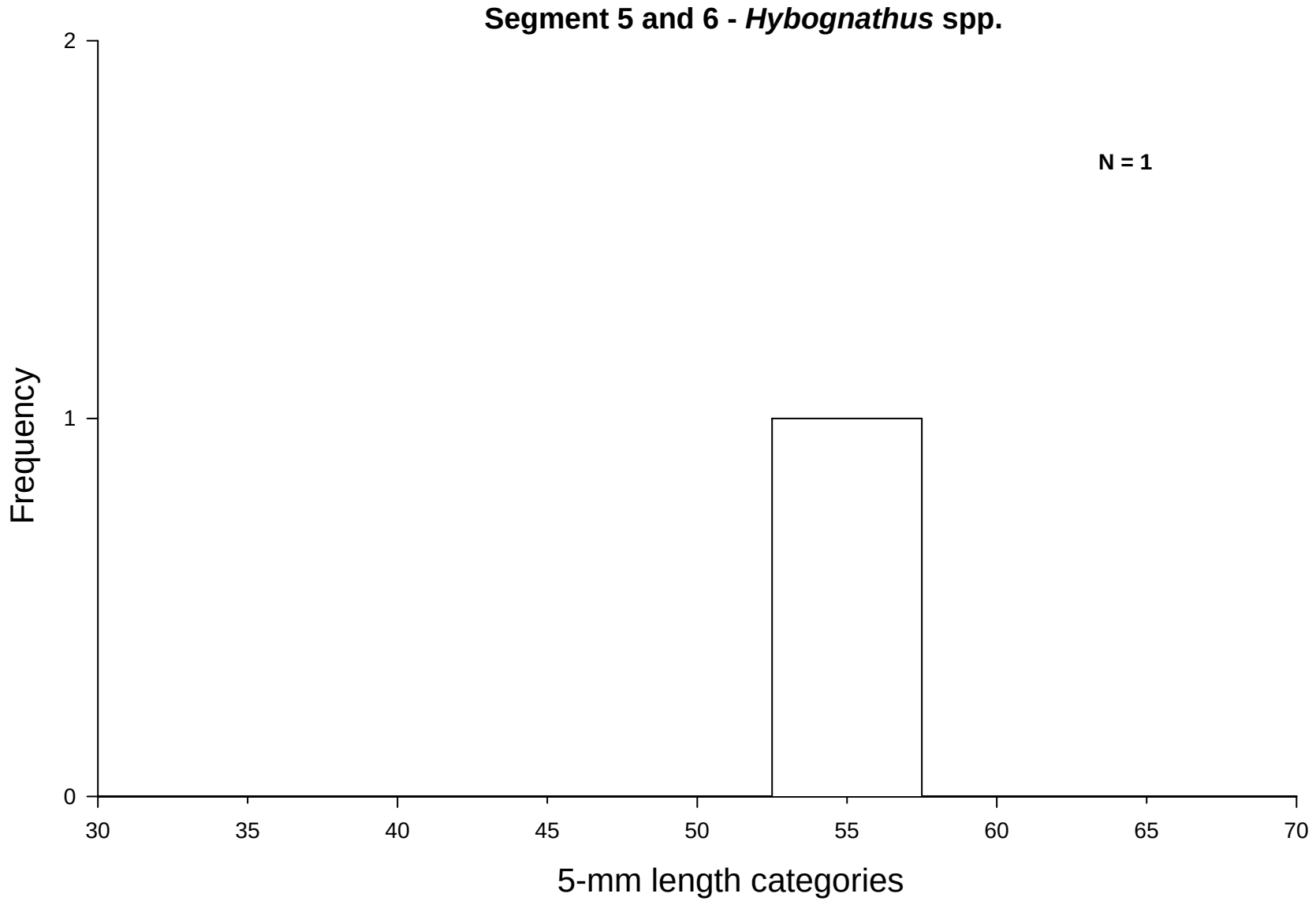

Figure 37. Length frequency of *Hybognathus* spp. caught in segments 5 and 6 of the Missouri River during summer (fish community season) 2004-2005.

Blue Sucker

The total catch of blue suckers in 2005 was small (n = 7), precluding analysis of habitat use and population size structure. No blue suckers were captured with trammel nets, bag seines, or mini-fyke nets (Figures 38 - 43). Of the seven blue suckers captured in the standard gears four were captured in gill nets and three were captured in otter trawls. Macrohabitats where blue suckers were captured include outside bends (n = 3), inside bends, braided channels, confluence, and secondary channel connected small (Table 36). Blue suckers were captured in channel border (n = 5) and pool (n = 2) mesohabitats (Table 37). All blue suckers captured in segments 5 and 6 were over 680 mm TL indicating an aging population with no evidence of recruitment or poor sampling efficiency for small blue suckers (Figure 44). An additional 27 blue suckers were captured with wild gears and are presented in appendix I.

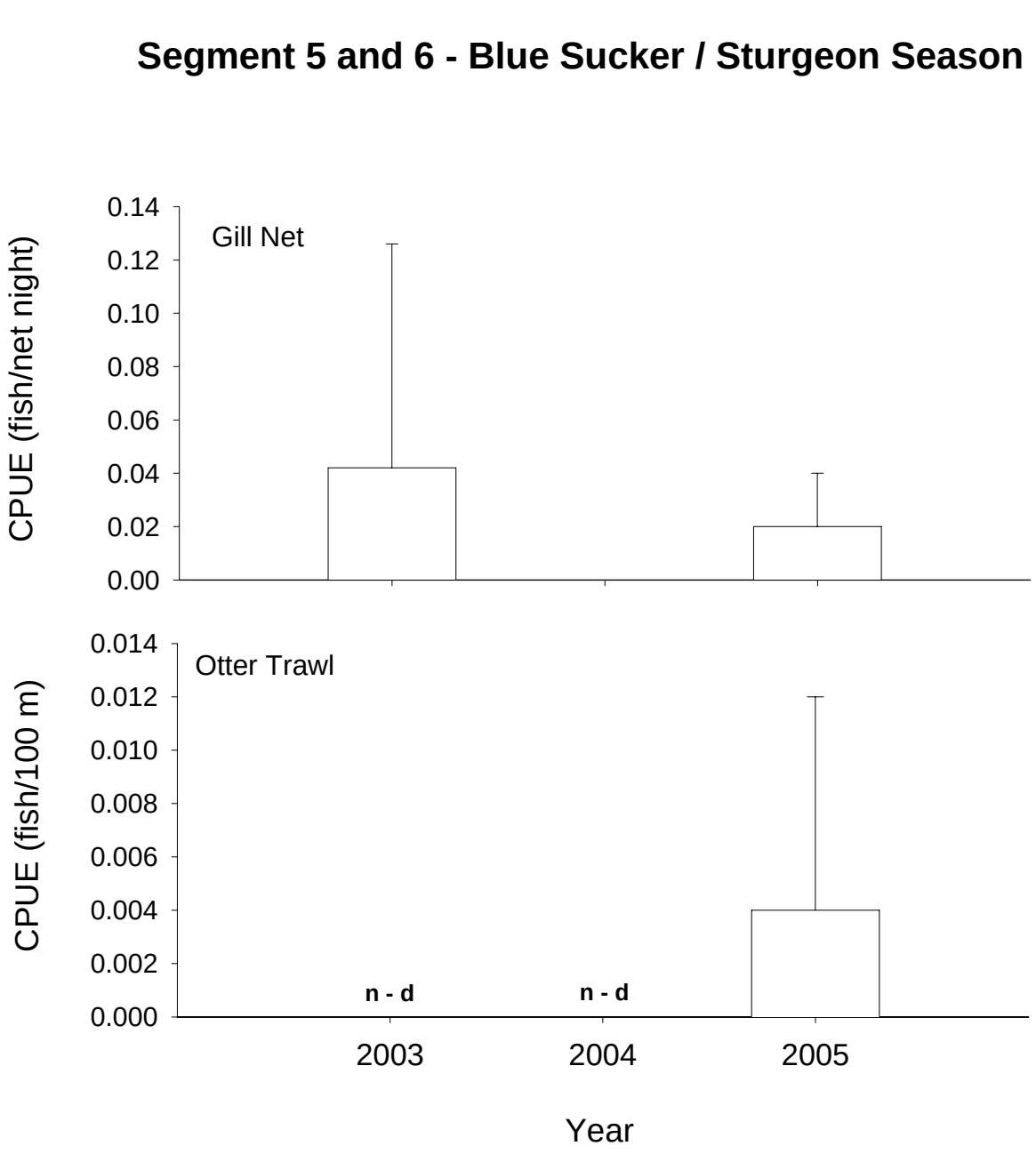

Figure 38. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segments 5 and 6 of the Missouri River using gill nets and otter trawls during sturgeon season 2003-2005.

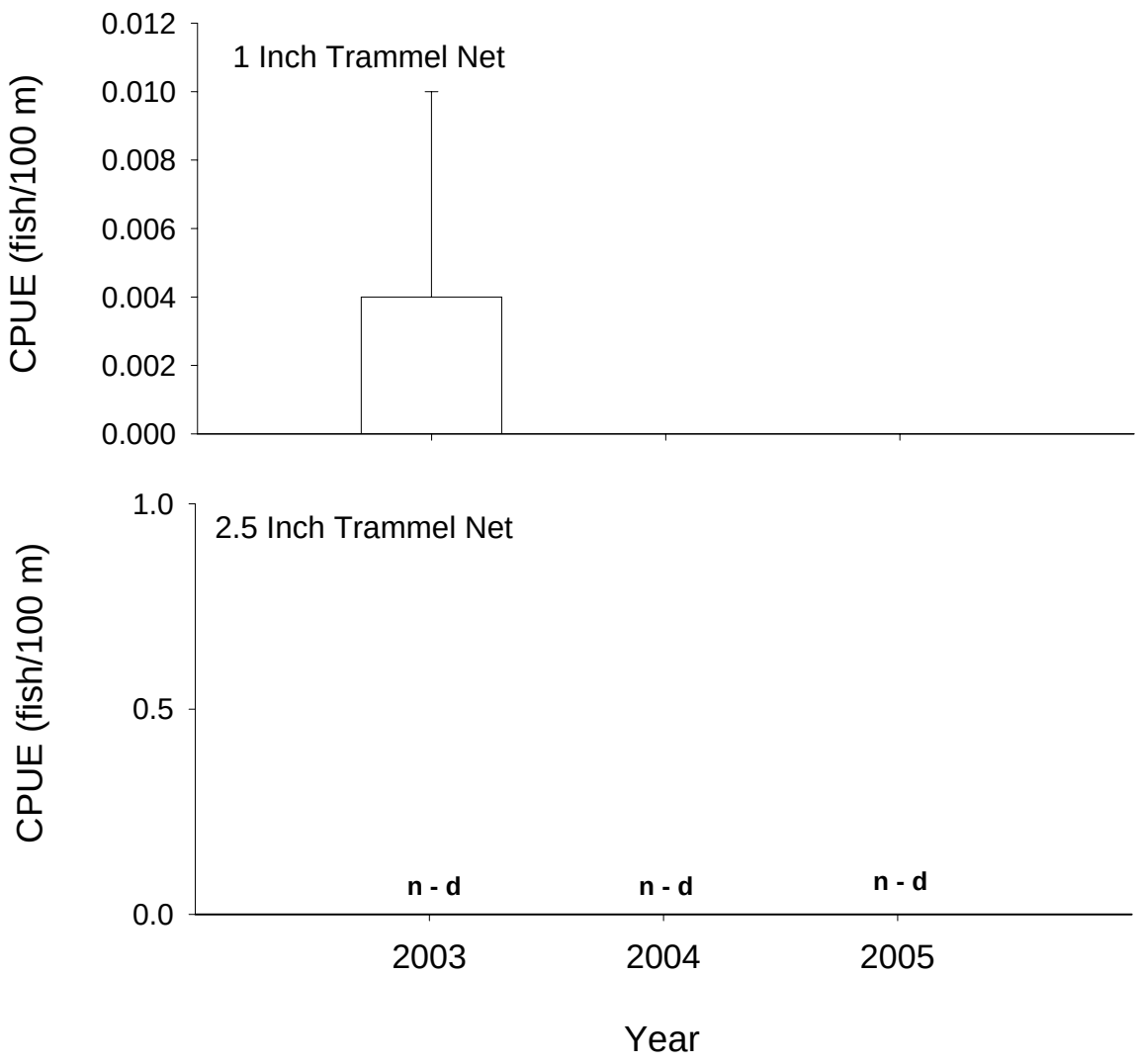

Figure 39. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segments 5 and 6 of the Missouri River using 1.0 and 2.5 in trammel nets during sturgeon season 2003-2005.

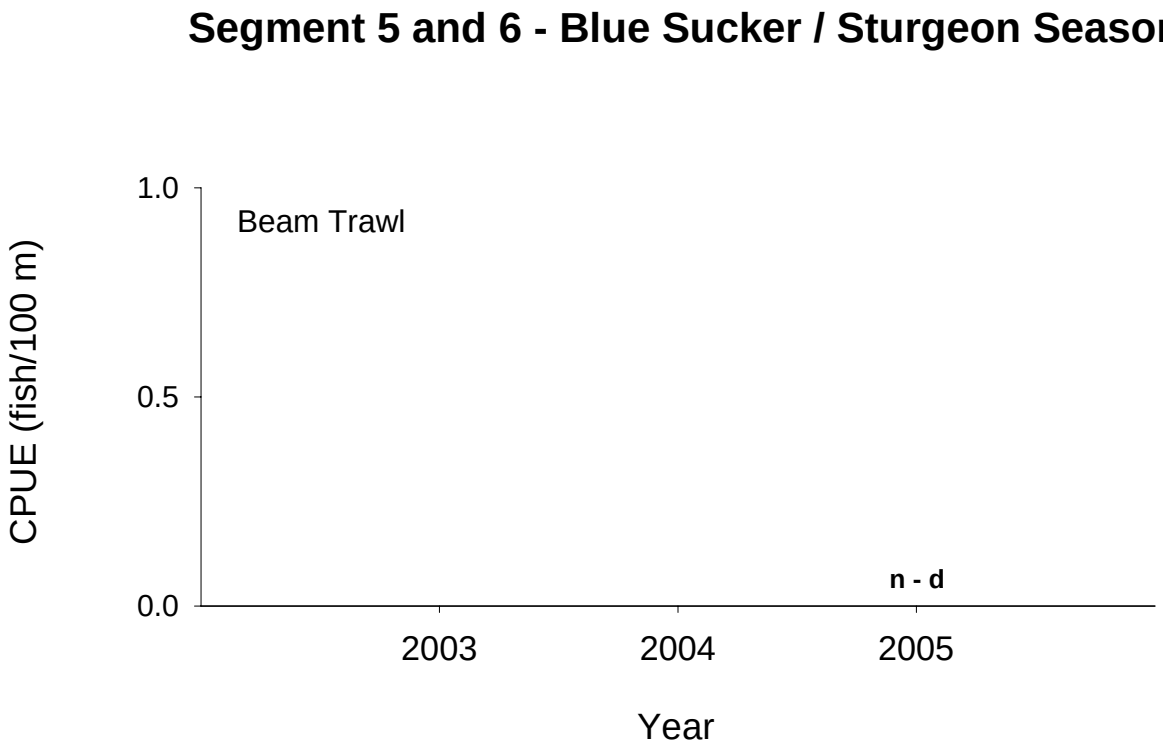

Figure 40. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segments 5 and 6 of the Missouri River using beam trawls during sturgeon season 2003-2005.

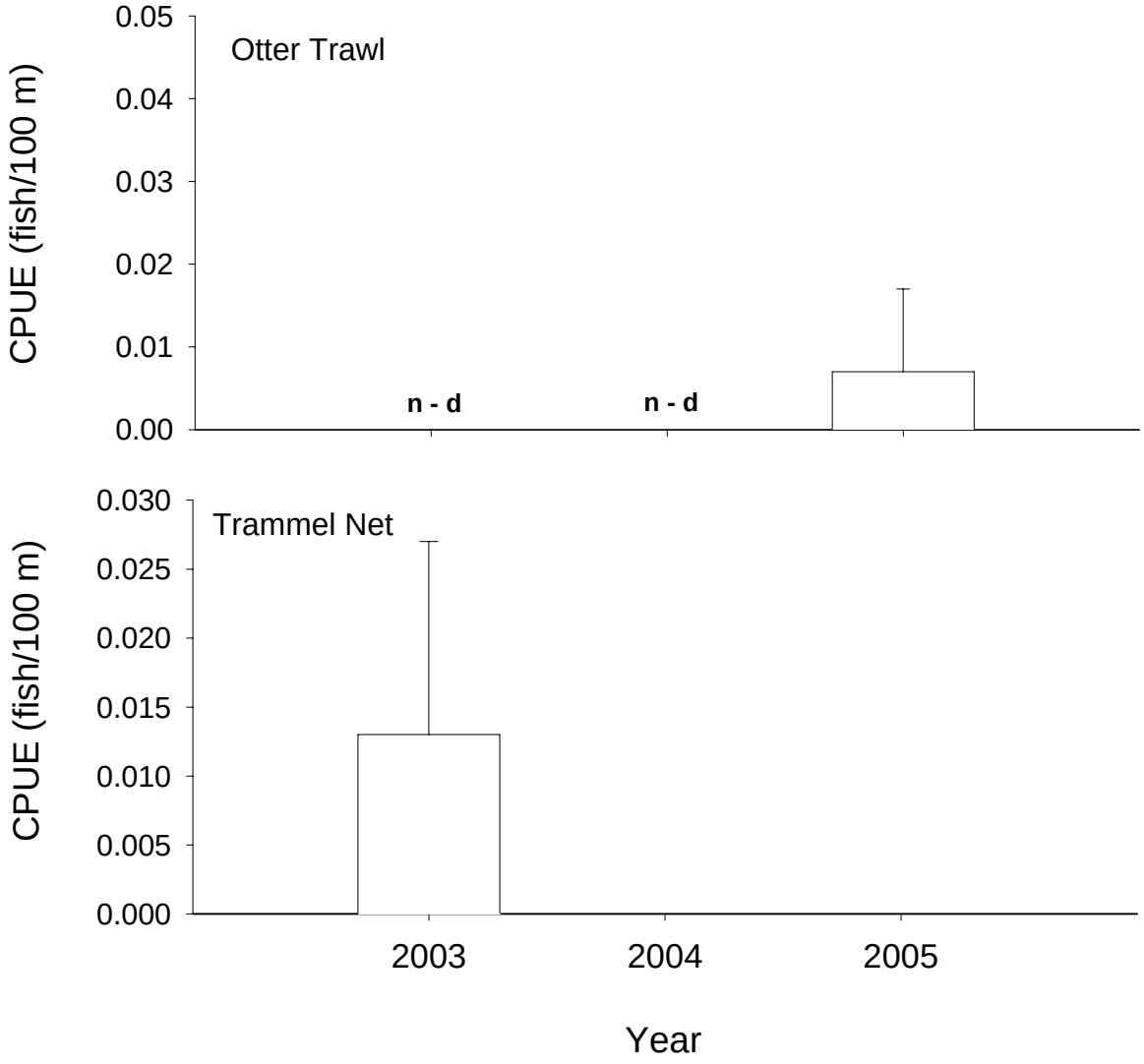

Figure 41. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segments 5 and 6 of the Missouri River using otter trawls and beam trawls during fish community season 2003-2005.

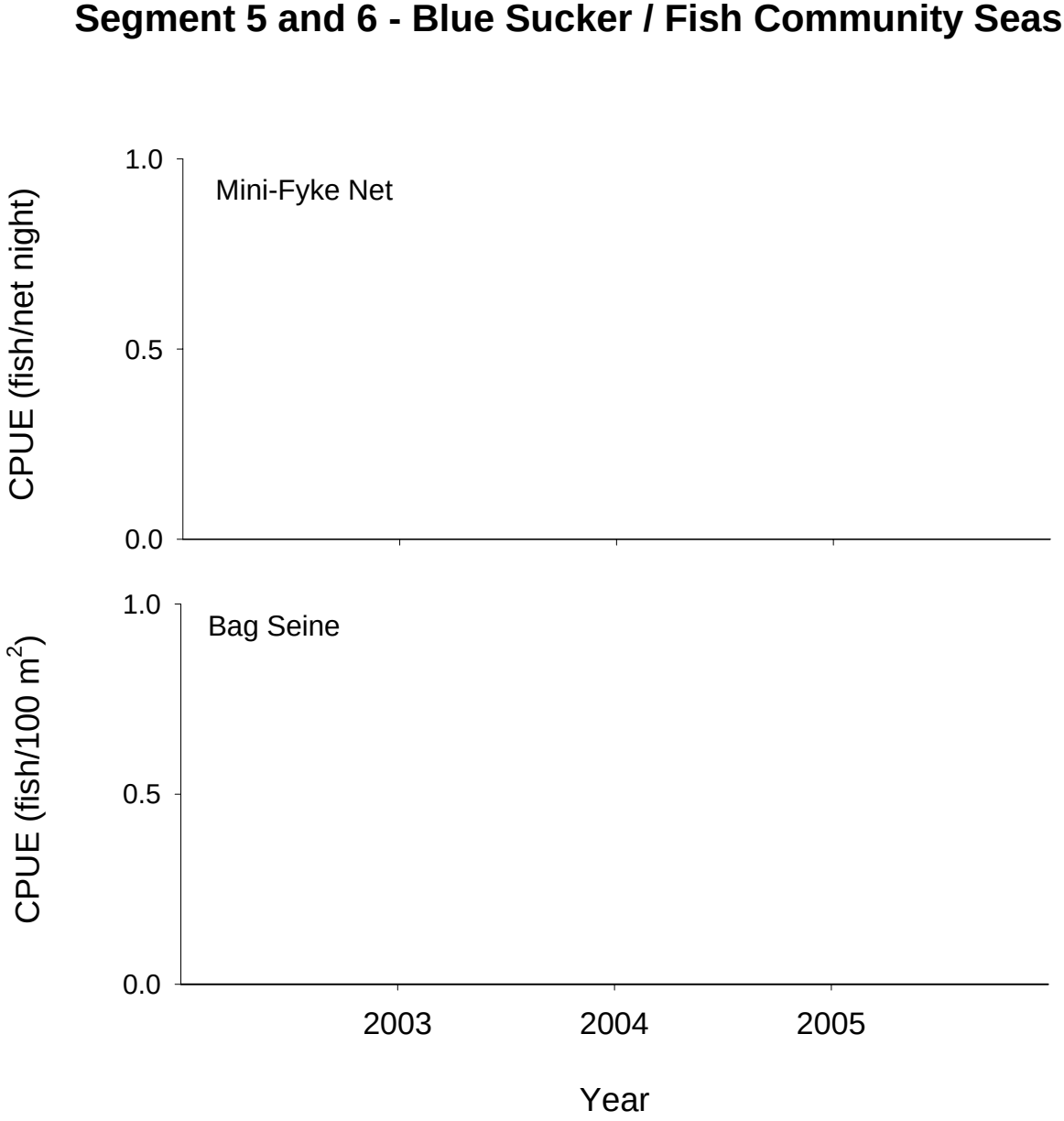

Figure 42. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segments 5 and 6 of the Missouri River using mini-fyke nets and seines during fish community season 2003-2005.

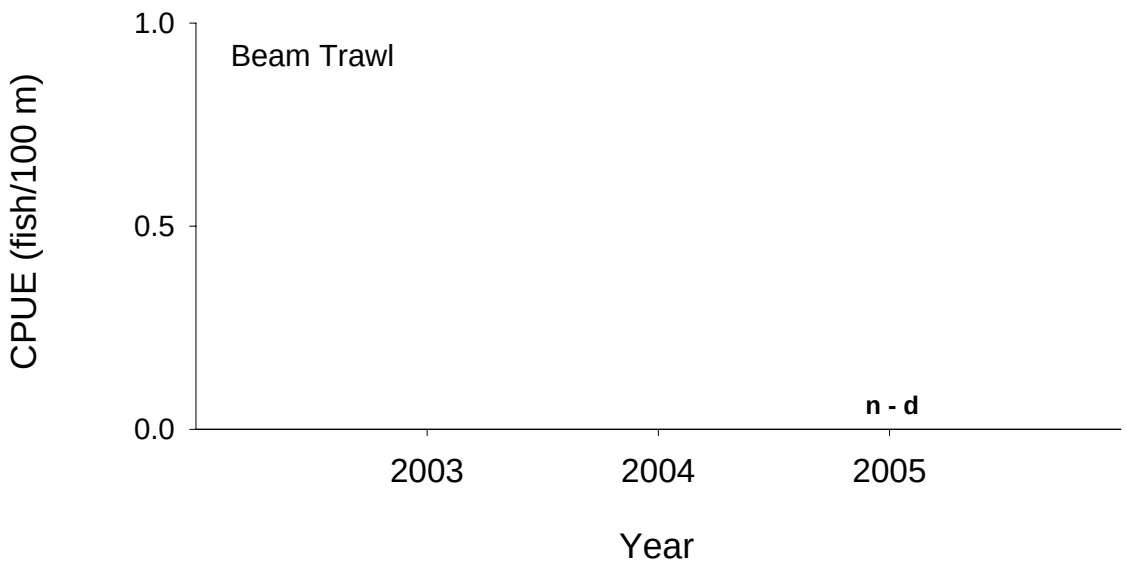

Figure 43. Mean annual catch-per-unit-effort (+/- 2SE) of blue sucker in segments 5and 6 of the Missouri River using beam trawls during fish community season 2003-2005.

Table 36. Total number of blue suckers captured for each gear during each season and the proportion caught within each macrohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0		0		0	
		10	19	3	0	0	29	35	4	0		0		0	
2.5 Inch Trammel Net	n/a														
Gill Net	4	0	0	0	0	0	25	50	0	25		0		0	
		10	23	0	2	0	27	26	10	349		0		0	
Otter Trawl	1	0	0	100	0	0	0	0	0	0		0		0	
		23	22	4	2	0	18	20	10	0		0		0	
Beam Trawl	n/a														
Fish Community Season (Summer)															
1 Inch Trammel Net	0	0	0	0	0	0	0	0	0	0		0		0	
		49	18	0	0	0	18	12	3	0		0		0	
Bag Seine	0	0	0	0	0	0	0	0	0	0		0		0	
		47	12	0	0	0	12	14	9	3		0		2	
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0		0		0	
		49	11	0	0	0	15	15	5	3		1		1	
Otter Trawl	2	50	0	0	0	0	0	50	0	0		0		0	
		51	11	0	0	0	20	13	5	0		0		0	
Beam Trawl	n/a														

Table 37. Total number of blue suckers captured for each gear during each season and the proportion caught within each mesohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0 0	0 96	0 0	0 3	0 1	n - e
2.5 Inch Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gill Net	4	0 0	50 91	0 0	0 1	50 7	n - e
Otter Trawl	1	0 0	100 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0 0	0 100	0 0	0 0	0 0	n - e
Bag Seine	0	0 100	0 0	0 0	0 0	0 0	n - e
Mini-Fyke Net	0	0 96	0 4	0 0	0 0	0 0	n - e
Otter Trawl	2	0 0	100 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a

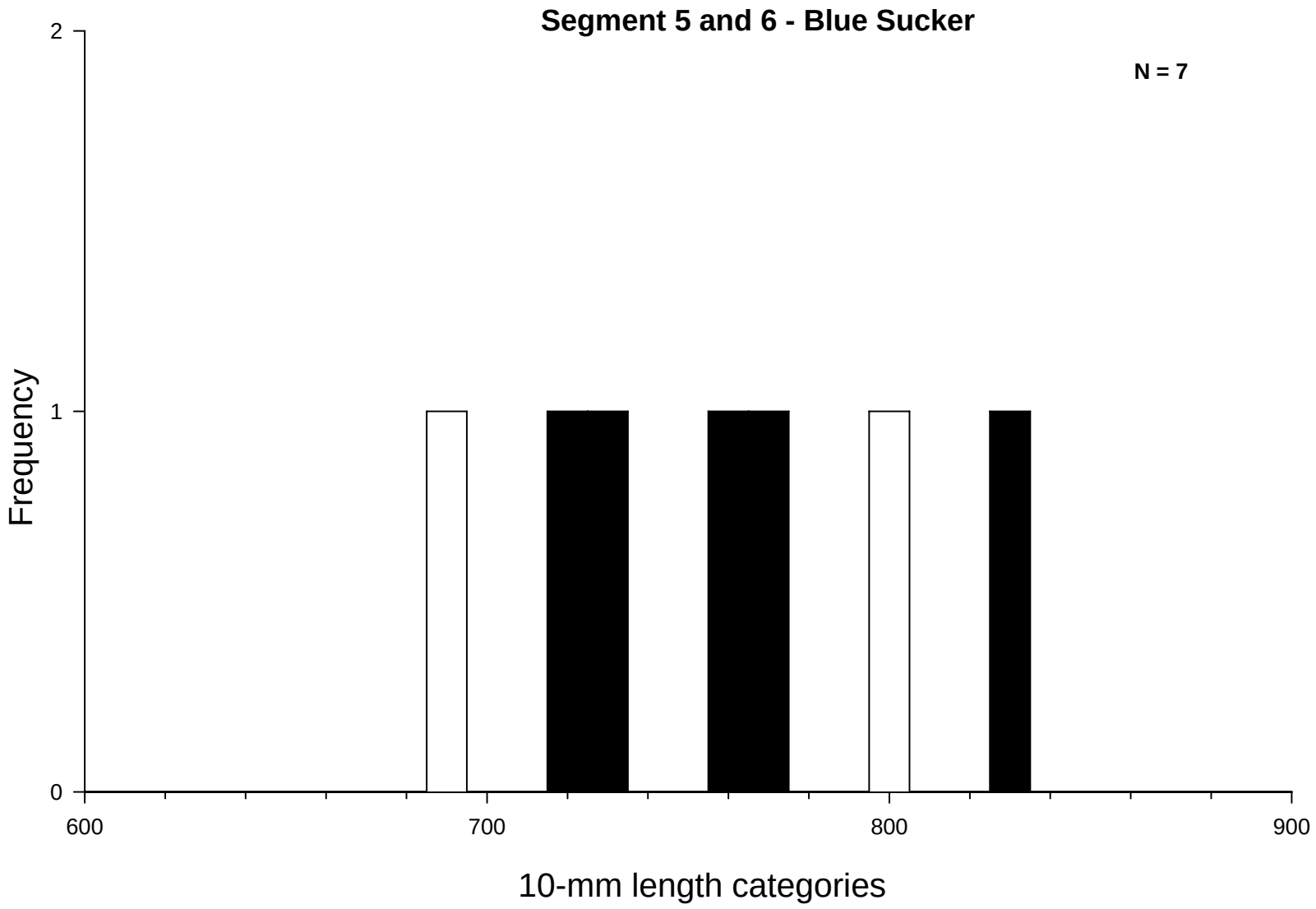

Figure 44. Length frequency of blue suckers during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segments 5 and 6 of the Missouri River during 2004 - 2005.

Sauger

A total of 110 sauger were sampled in segments 5 and 6 during 2005 with 113 fish captured in standard gears: gillnets (n = 24) trammel nets (n = 46), otter trawls (n = 40), mini-fyke nets (n = 2), and bag seines (n = 1). Gill net CPUE declined from the previous mean (0.359; 2003 to 2004) to 0.121 (Figure 45). However, changes in trammel net CPUE increased from the previous mean for the sturgeon (0.102) and fish community (0.042) season, to 0.166 and 0.048 in 2005 (Figures 46 and 48). Trammel net catches of saugers were approximately 2.5 times greater during the sturgeon season (fall through spring) compared to the fish community season (summer). Over 65% of saugers captured were collected in the braided channel (44%) and outside bend (25%) macrohabitats during both seasons (Figure 38). Saugers were caught in three mesohabitats with most fish captured in channel borders (Table 39). Over 75% of saugers were between the 250 - 420 mm TL; however, catches of fish < 160 mm TL indicate some reproduction occurred (Figure 51). Mean relative weights for saugers during the sturgeon and fish community seasons were 77 and 75, respectively. The range of relative weights was wider during the sturgeon season (33 - 136) compared to the fish community season (36 - 108) likely due to ripe and spent fish caught during the spawning season in spring.

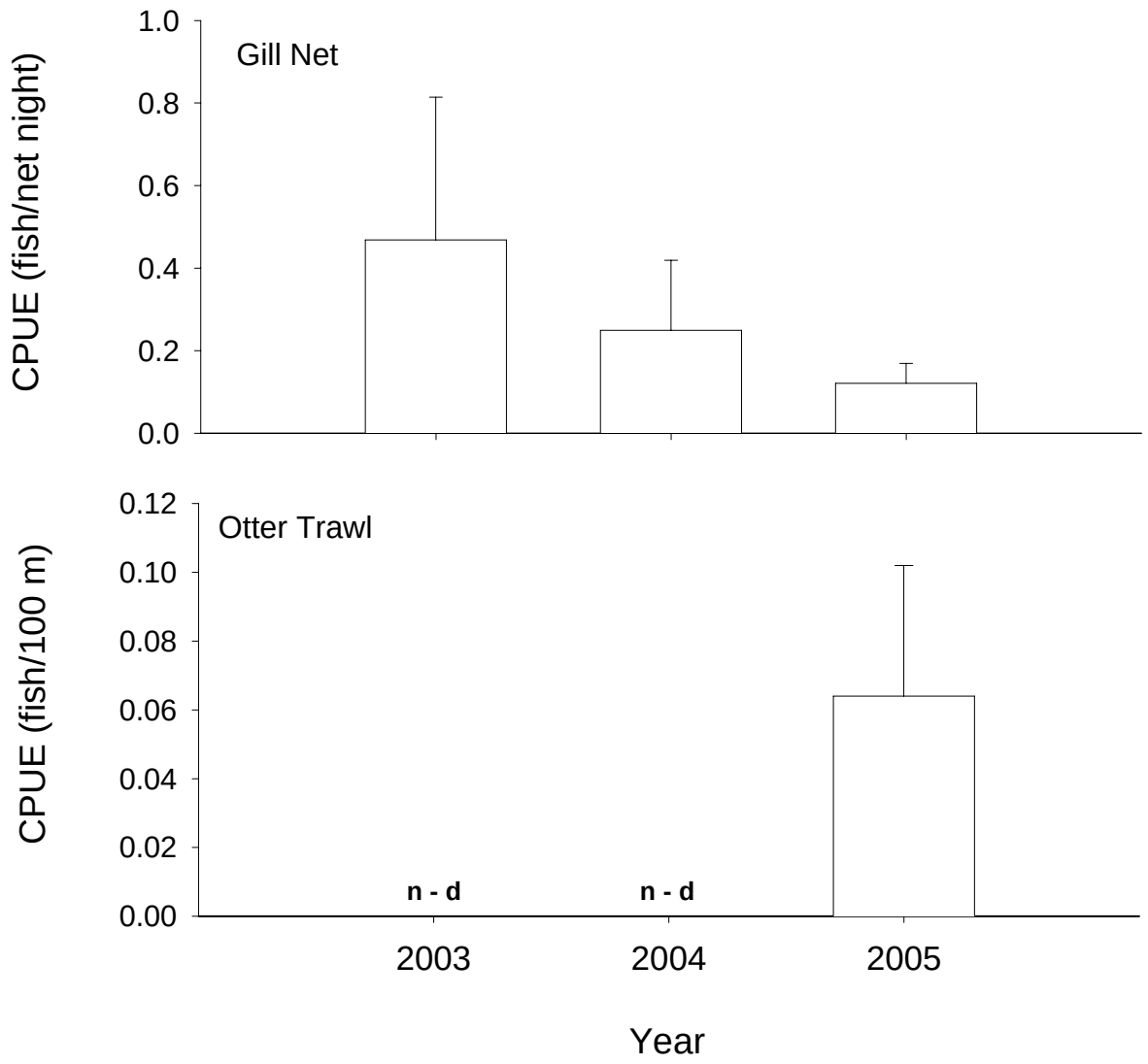

Figure 45. Mean annual catch-per-unit-effort (+/- 2SE) of sauger captured in gillnets and otter trawls in segments 5 and 6 of the Missouri River using gill nets and otter trawls during sturgeon season 2003-2005.

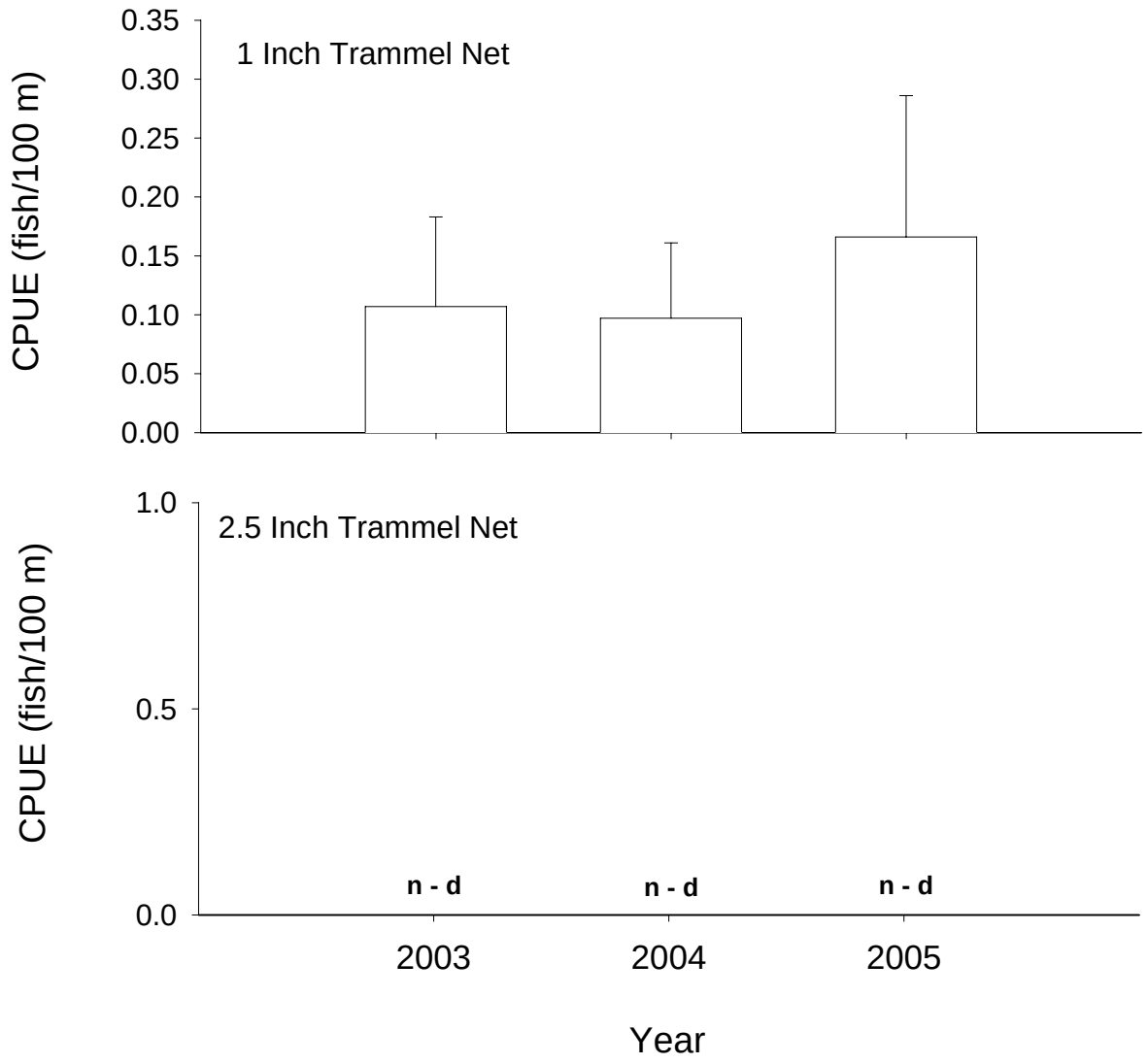

Figure 46. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segments 5 and 6 of the Missouri River using 1.0 and 2.5 in trammel nets during sturgeon season 2003-2005.

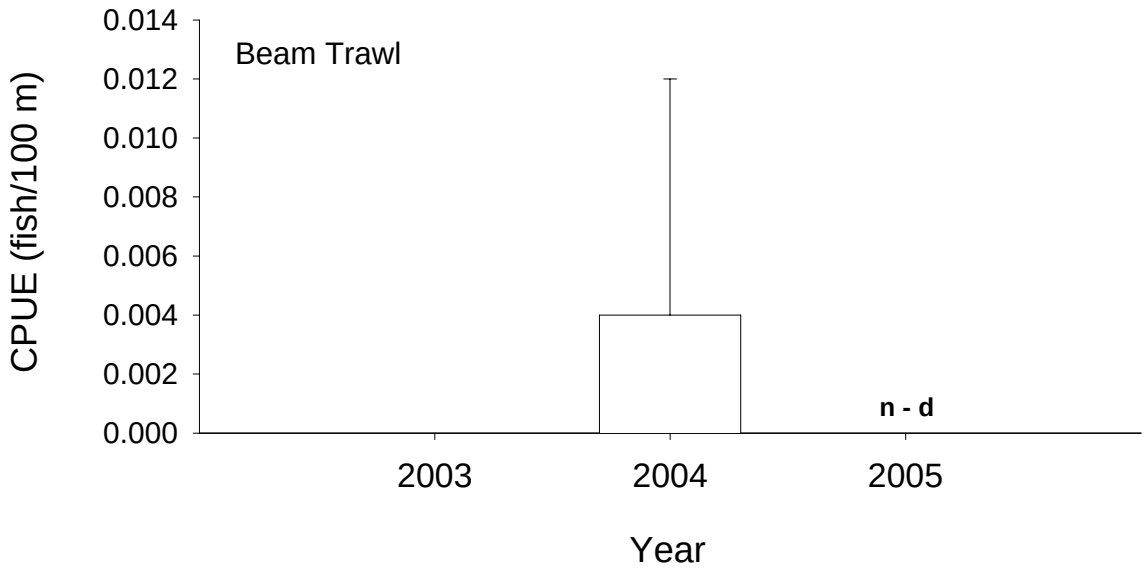

Figure 47. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segments 5 and 6 of the Missouri River using beam trawls during sturgeon season 2003-2005.

Segment 5 and 6 - Sauger / Fish Community Season

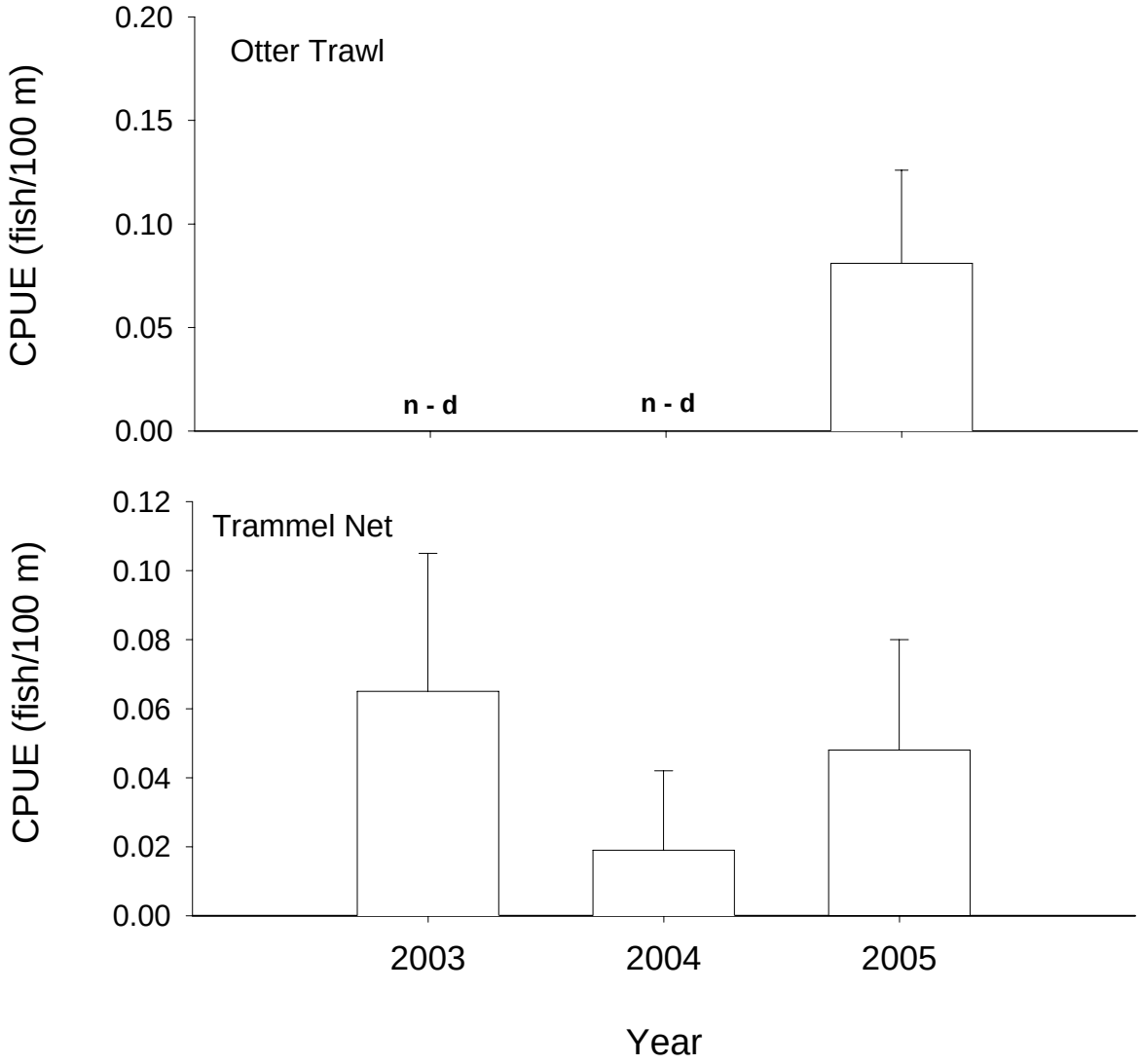

Figure 48. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segments 5 and 6 of the Missouri River using otter trawls and beam trawls during fish community season 2003-2005.

Segment 5 and 6 - Sauger / Fish Community Season

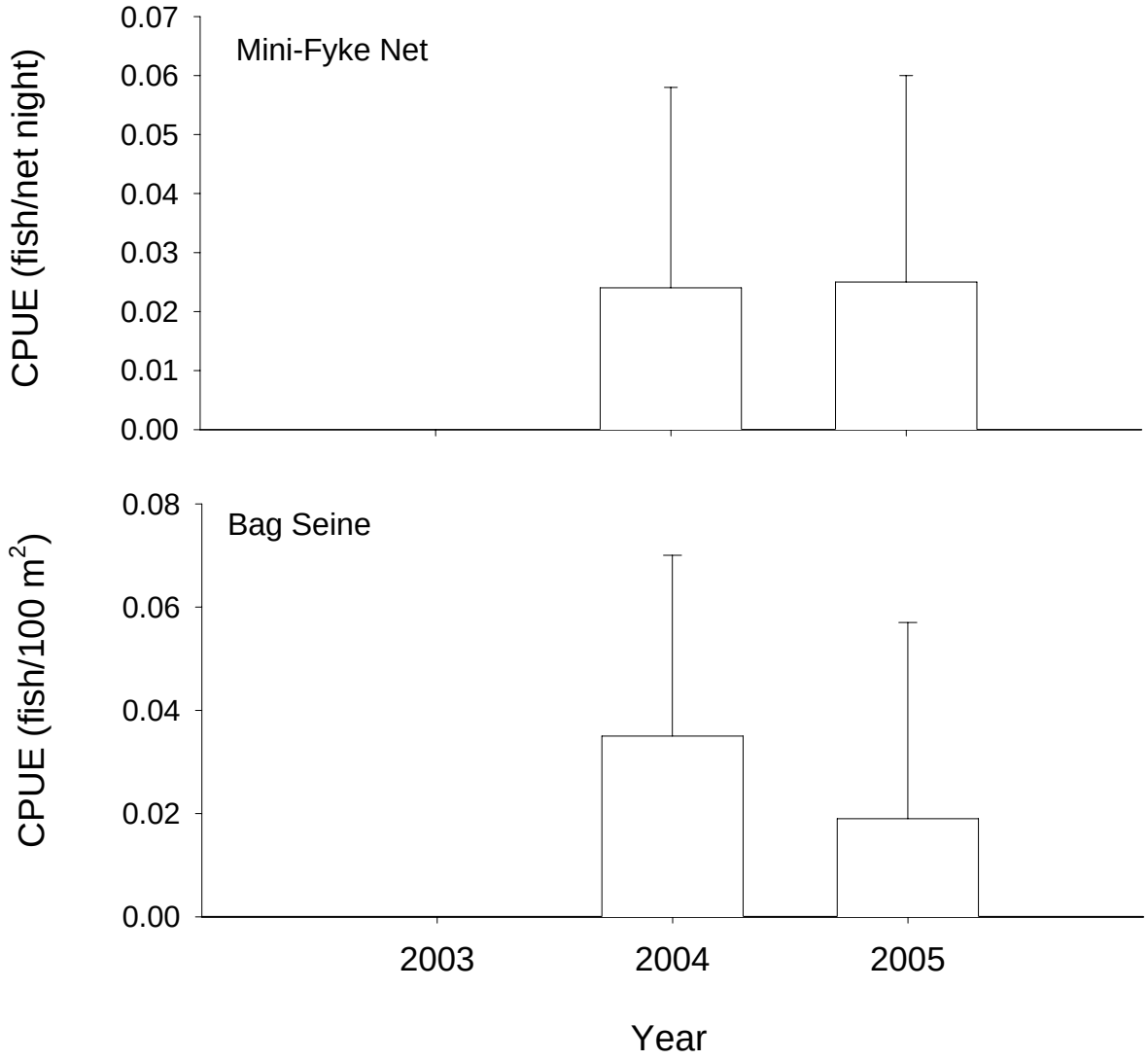

Figure 49. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segments 5 and 6 of the Missouri River using mini-fyke nets and seines during fish community season 2003-2005.

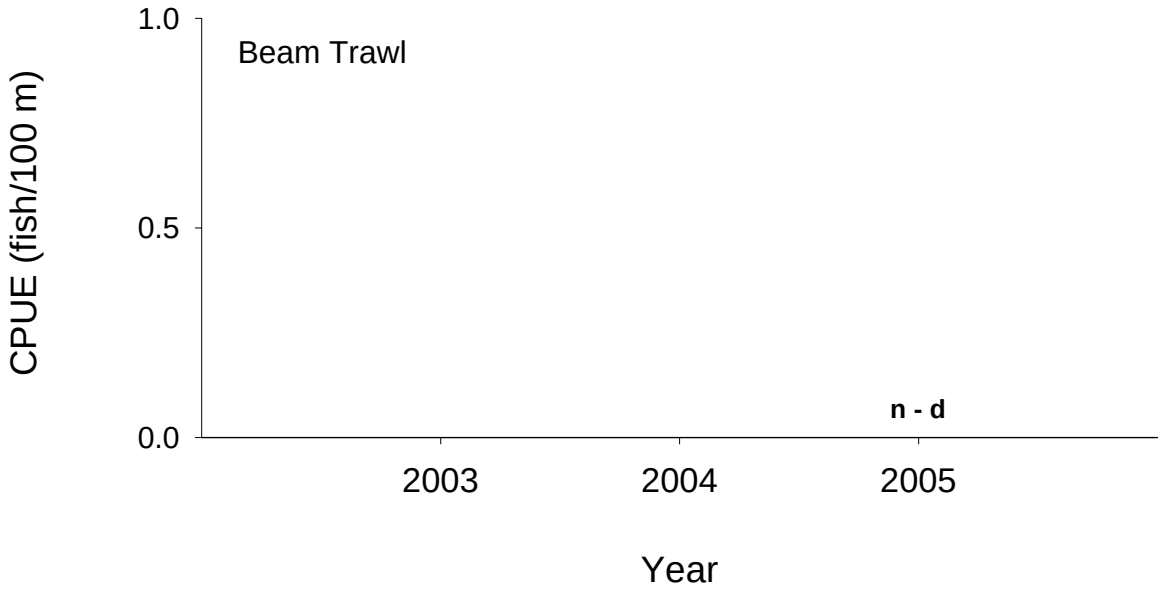

Figure 50. Mean annual catch-per-unit-effort (+/- 2SE) of sauger in segments 5 and 6 of the Missouri River using beam trawls during fish community season 2003-2005.

Table 38. Total number of saugers captured for each gear during each season and the proportion caught within each macrohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat												
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	31	39	6	0	0		23	32	0	0		0		0	
		10	19	3	0		29	35	4	0		0		0	
2.5 Inch Trammel	0														
Gill Net	24	0	25	0	0		29	42	4	0		0		0	
		10	23	0	2		27	26	10	3		0		0	
Otter Trawl	17	0	12	12	0		24	29	24	0		0		0	
		23	22	4	2		18	20	10	0		0		0	
Beam Trawl															
Fish Community Season (Summer)															
1 Inch Trammel Net	12	100	0	0	0		0	0	0	0		0		0	
		49	18	0	0		18	12	3	0		0		0	
Bag Seine	1	100	0	0	0		0	0	0	0		0		0	
		47	12	0	0		12	14	9	3		0		2	
Mini-Fyke Net	2	100	0	0	0		0	0	0	0		0		0	
		49	11	0	0		15	15	5	3		1		1	
Otter Trawl	23	87	0	0	0		0	13	0	0		0		0	
		51	11	0	0		20	13	5	0		0		0	
Beam Trawl															

Table 39. Total number of saugers captured for each gear during each season and the proportion caught within each mesohabitat type in segments 5 and 6 of the Missouri River during 2005. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment and n/a indicates a non-applicable gear in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	31	0 0	100 96	0 0	0 3	0 1	n - e
2.5 Inch Trammel Net	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gill Net	24	0 0	88 91	0 0	0 1	12 7	n - e
Otter Trawl	17	0 0	100 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fish Community Season (Summer)							
1 Inch Trammel Net	12	0 0	100 100	0 0	0 0	0 0	n - e
Bag Seine	1	100 100	0 0	0 0	0 0	0 0	n - e
Mini-Fyke Net	2	100 96	0 4	0 0	0 0	0 0	n - e
Otter Trawl	23	0 0	100 100	0 0	0 0	0 0	n - e
Beam Trawl	n/a	n/a	n/a	n/a	n/a	n/a	n/a

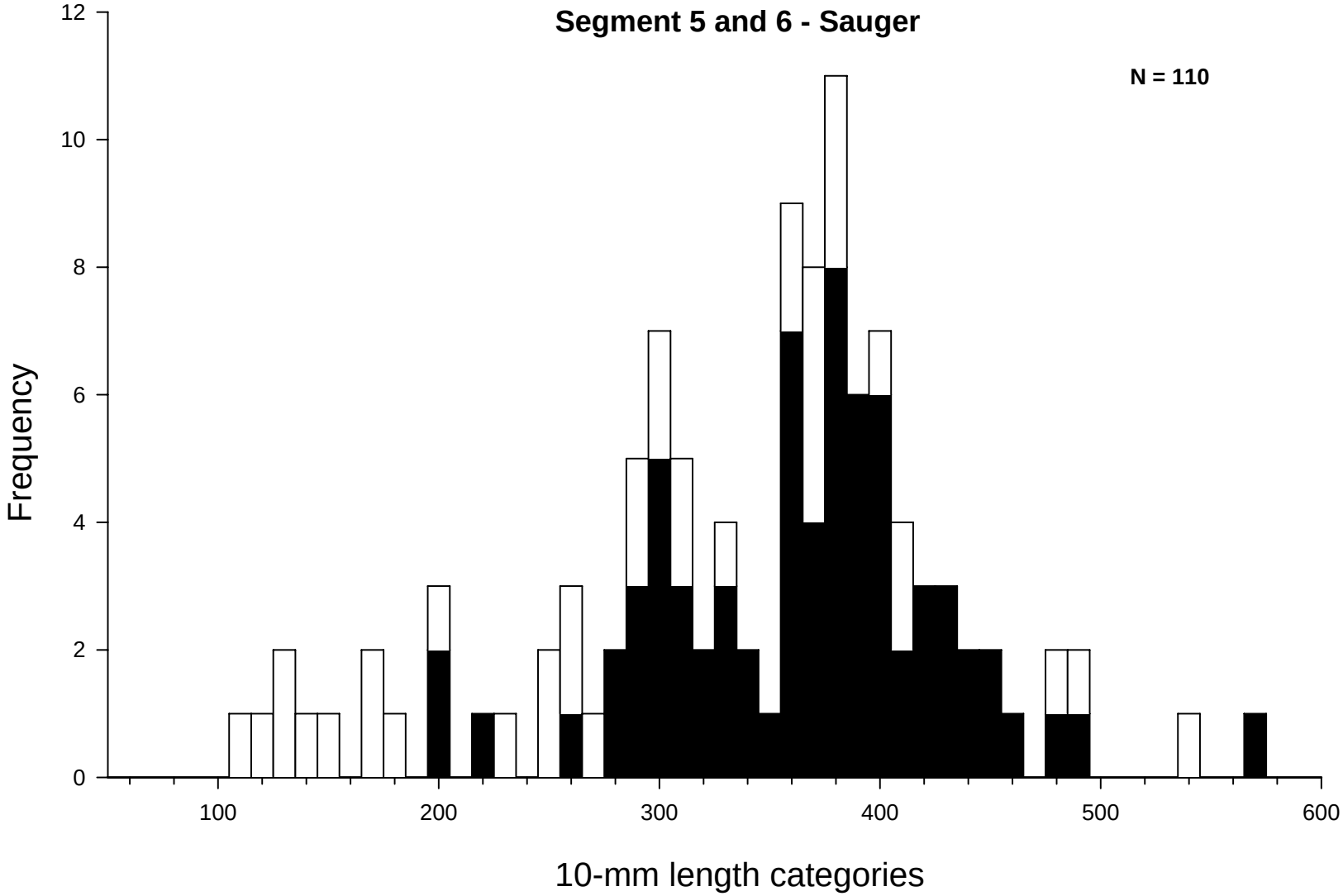

Figure 51. Length frequency of sauger during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segments 5 and 6 of the Missouri River during 2004-2005.

Missouri River Fish Community

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.

VI. General Missouri River fish community

A total of 14,622 fish comprised of 45 species and one hybrid (sauger x walleye) were captured during the 2005 sampling season in segments 5 and 6 of the Missouri River (Appendix F). We captured five species during the 2005 season that were not seen in the previous season: flathead chub *Platygobio gracilis* (n = 1), fathead minnow *Pimephales promelas* (n = 11), grass pickerel *Esox americanus vermiculatus* (n = 1), *Hybognathus* spp. (n = 1), and paddlefish *Polyodon spathula* (n = 1). Three species captured in 2004 were not observed in 2005: black bullhead *Ameiurus melas*, longnose gar *Lepisosteus osseus*, and white perch *Morone americana*. Greatest numbers of fishes were captured during the summer with seines (n = 1,120) and mini-fyke nets (n = 12,149). These summer catches consisted mainly of small bodied cyprinids and young-of-the-year (YOY) catastomids, centrarchids, and percids. Gears with the greatest percentage of their catch comprised of pallid sturgeon and the nine targeted native fish species were gillnets (69%), trammel nets (45%) and the otter trawl (12%). Target species comprised < 0.2% of the catch in mini-fyke nets and seines. However, most sand shiners (96%) and the single *Hybognathus* spp. specimen were captured with mini-fyke nets.

Collectively for all standard gears > 50 individuals were captured for the following 16 species: shovelnose sturgeon (n = 222), spotfin shiner *Cyprinella spiloptera* (n = 840), emerald shiner *Notropis atherinoides* (n = 4,447), silver chub *Macrhybopsis storeriana* (n = 256), bluntnose minnow *Pimephales notatus* (n = 249), river carpsucker *Carpiodes carpio* (n = 157), shorthead redhorse *Moxostoma macrolepidotum* (n = 96), channel catfish *Ictalurus punctatus* (n = 274), white bass *Morone chrysops* (n = 6,282), bluegill *Lepomis macrochirus* (n = 111),

smallmouth bass *Micropterus dolomieu* (n = 84), largemouth bass *M. salmoides* (n = 61), white crappie *Pomoxis nigromaculatus* (n = 106), sauger (n = 110), walleye *Sander vitreum* (n = 669), and freshwater drum *Aplodinotus grunniens* (n = 239). Six species were represented in the collective catches by only one specimen: paddlefish, goldeye *Hiodon alosoides,* flathead chub, *Hybognathus* spp., flathead catfish *Pylodictis olivaris*, and grass pickerel. Five species represented by 50 or more fish in 2004 season catches, gizzard shad *Dorosoma cepedianum*, sand shiner, spottail shiner *Notropis hudsonius*, Johnny darter *Etheostoma nigrum*, and yellow perch *Perca flavescens* were not represented by > 50 individuals in the cumulative 2005 season catches.

For gears targeting large fish in deep water habitats, channel catfish, shorthead redhorse, and walleye were the three most common non-targeted species. Only three species, shovelnose sturgeon, shorthead redhorse, and channel catfish had gillnet CPUE > 0.2 fish/net night during 2005 (Appendix H). In the sturgeon season, CPUE of shovelnose sturgeon, channel catfish, sauger and walleye were the only species with a trammel net CPUE > 0.1 fish/100 m with shovelnose sturgeon having the highest relative abundance (Appendix H). For trammel nets in the fish community season, only channel catfish, shorthead redhorse and shovelnose sturgeon had a CPUE > 0.1 fish/100 m (Appendix H). There were five species with a CPUE ≥ 0.1 fish/100 m caught with the otter trawl: silver chub, emerald shiner, channel catfish, sauger and walleye. Silver chubs were the most abundant species captured with the otter trawl during both seasons with relative abundance twice as great during summer compared to the fall through spring period.

The greatest numbers of fish species were captured in shallow water habitats with bag seines and mini-fyke nets. Mini-fyke nets captured more species (n = 37) compared to the seine (n = 23) and generally captured the same species with the exception of the flathead chub and silver chub which were represented by single specimens caught in the seine. Only three species

captured with bag seines had densities > 1 fish/m^2, spotfin shiner (2.2 fish/m^2), emerald shiner (6.7 fish/m^2), and white bass (10.3 fish/m^2) during 2005 (Appendix F7). Compared to 2004, densities of spotfin and emerald shiners were similar in 2005; however, the relative abundance of white bass increased over ten fold. The three most abundant species captured in mini-fyke nets were white bass (71.5 fish/net night), emerald shiner (50.4 fish/net night) and spotfin shiner (9 fish/net night). Additionally, the following six species had CPUE > 1 fish/net night with mini-fyke nets: bluegill, bluntnose minnow, freshwater drum, river carpsucker, walleye and white crappie.

Seven exotic species were captured in segments 5 and 6 during 2005 and five of these species are sport fishes that were intentionally introduced: northern pike *Esox lucius*, white bass, smallmouth bass, largemouth bass (Bailey and Allum 1954). Additonal exotic species encountered in 2005 were common carp *Cyprinus carpio*, white perch *Morone americana* and rainbow smelt *Osmerus mordax*. Based on high CPUE in mini-fyke nets (0.775 fish/net night), smallmouth bass were the most abundant exotic species seen in segments 5 and 6 during 2005 followed by common carp (0.112 fish/net night). None of the four exotic Asian carps, bighead carp *Hypophthalmichthys noblis*, silver carp *H. molitrix*, grass carp *Ctenopharyngodon idella*, or black carp *Mylopharyngodon piceus,* were captured or seen within segments 5 and 6 during 2005. Additonally, no zebra mussels *Dreissena polymorpha* were observed while working in segments 5 and 6 during 2005 despite the identification of larval zebra mussels (veligers) from samples at the Verdel Boat Ramp in 2003.

Discussion

Pallid sturgeon were captured in the all three continuous macrohabitats and in three discrete macrohabitats (braided channels, large secondary connected channels, and the confluence mouth) with the greatest number captured in braided channels. Braided macrohabitats were only first distinguished as a habitat type in 2004 and greater effort (4 bends) in the Niobrara River Delta of segment 6 was expended during the 2005 season to assess use of this habitat by juvenile pallid sturgeon. All pallid sturgeon captured were within channel border mesohabitats. Pallid sturgeon captured in 2005 correspond with habitats where fish were relocated during a telemetry study in segments 5 and 6 during 2000 – 2002 (Jordan et al. in press). Most sonic-tagged age-3 to age-5 pallid sturgeon were relocated in the main channel (91%) with few fish found in secondary connected channels (4%).

Trammel nets captured more pallid sturgeon than any other gear in segments 5 and 6 during 2005. No substantial differences were found in trammel net mean CPUE among years (2003-2005) during the sturgeon season. However, mean CPUE was substantially higher in 2005 compared to the previous years during the fish community season. In 2004, no substantial seasonal differences were detected in mean CPUE of trammel nets to capture pallid sturgeon. However, the mean CPUE was substantially higher during the summer (fish community season) compared to the fall through spring (sturgeon season) in 2005. G. Wanner (unpublished data) also reported that from 2003 to 2005 trammel net mean CPUE for pallid sturgeon was the highest and the coefficient of variation (CV) was the lowest during the month of August. A higher proportion of pallid sturgeon captured by trammel nets were in depths greater than 5 m, over sandy substrate, and in the OSB (Wanner 2006). Gill nets were an effective gear for capturing pallid sturgeon. No substantial differences were detected in gill net mean CPUE among years. However, there is a decreasing trend in mean CPUE from 2003 to 2005. A higher proportion of

pallid sturgeon were captured in the fall, in bottom water velocities less than 0.4 m/s, at depths greater than 2.5 m, and in the ISB (Wanner 2006). The 16-ft otter trawl was an effective gear for capturing pallid sturgeon. Otter trawls were the most effective over sandy substrate, in depths greater than 2.5 m, and during October where the relative precision of the mean CPUE was the greatest (G. Wanner, unpublished data). Hoop nets and set lines caught no pallid sturgeon in 2005. However, set lines were effective in 2003 and 2004 (n=19) (Wanner 2006). Set lines are easy to deploy and may be an effective method to increase samples for diet, age assessment, growth, contaminant, and stable isotope studies that require larger numbers of fish. Trammel nets, gill nets, and otter trawls were likely capturing the size structure of the population of pallid sturgeon in segments 5 and 6, while set lines captured longer fish (G. Wanner, unpublished data).

Although pallid sturgeon were captured in almost all bends sampled during 2005 there was evidence of fish clustering within specific river miles. During 2005, 12 pallid sturgeon were captured within river miles 842 to 844 and 11 fish were captured with river miles 851 to 854. Clusters of age-3 to age-5 pallid sturgeon were also seen in a telemetry study in segments 5 and 6 during 2000 to 2002 (Jordan et al. in press). Clusters of > 2 sonic-tagged pallid sturgeon within a river kilometer were observed on 20 dates from 2000 to 2002 with most aggregations found at river mile 847 (rkm 1363) (Jordan et al. in press). River mile 847 contains the deepest habitat (11 m) within segments 5 and 6 (known as the "deep pump hole") and is located down river of the Ponca Creek confluence on the South Dakota side of the main channel. The bend containing the deep pump hole was randomly selected for sampling in 2005 and two pallid sturgeon were captured in a trammel net, thus giving more evidence of clustering.

The mean relative condition (Kn) declined for all year classes (1997-1999 and 2001-2004) of stocked pallid sturgeon since release. However, the mean length and weight has increased for all year classes from time of stocking. Condition of most fish was > 1.0 at the time of stocking which may have provided excess energy reserves to better enable the transition from

the hatchery to a natural environment, thereby increasing survival. The decrease in condition of hatchery-reared pallid sturgeon may reflect a lack of sufficient prey resources. A macroinvertebrate study was initiated in 2005 (K. Berg, unpublished data) and in 2006 (B. Spindler, unpublished data) to investigate prey types; availability and spatial distribution in relationship to pallid sturgeon capture locations in segments 5 and 6.

Gill nets, trammel nets, and otter trawls were all effective at capturing shovelnose sturgeon. Gill net mean CPUE increased substantially in 2005 compared to previous years. Trammel net mean CPUE was the highest during the sturgeon season for shovelnose sturgeon, while pallid sturgeon trammel net mean CPUE was highest during the fish community season. This evidence illustrates that pallid sturgeon and shovelnose sturgeon in segments 5 and 6 may likely use different habitats during different times of the year. Bramblett and White (2001) also reported that pallid sturgeon in Montana frequented deeper areas with sandier substrate in wider river channels associated with islands and sand bars compared to shovelnose sturgeon. No differences were detected in otter trawl mean CPUE for shovelnose sturgeon between seasons.

The lack of shovelnose sturgeon within the stock and quality length categories indicated no recent recruitment has occurred within segments 5 and 6 of the Missouri River. Jordan and Willis (2001) also reported only capturing preferred length and larger shovelnose sturgeon in RPMA 3 from 1998 to 1999. Fish within the preferred and memorable length classes were in good relative condition, thus these fish should be physically capable of reproduction. Personal observations also identified exceptionally rotund shovelnose sturgeon, most likely females in later stages of egg development. The standardized gears (gill nets, otter trawl, and trammel nets) have captured smaller shovelnose sturgeon (i.e. < 200 mm FL) from the channelized Missouri River in the states of Nebraska (segment 9, Steffensen and Mestl 2005) and Missouri (segments 13 and 14, Doyle et al. 2005). These catches further indicate that shovelnose sturgeon in segments 5 and 6 are failing to either spawn due lack of habitat or have poor larval and juvenile

survival. However, failure to effectively sample YOY shovelnose sturgeon with these standard gears in the unchannelized Missouri River remains a possibility. Initiation of sampling in the unchannelized Missouri River below Gavins Point Dam (segment 7) by the South Dakota Department of Game, Fish and Parks in 2005 should further assist in determining effectiveness of standard gears to sample young shovelnose sturgeon in the unchannelized river.

Failure to capture sturgeon chubs, sicklefin chubs, and speckled chubs with the otter trawl is likely due to lack of recruitment in segments 5 and 6. The otter trawl did capture 255 silver chubs in 2005 with the otter trawl in segments 5 and 6. This same trawls has captured sturgeon chub (n=40), sicklefin chub (n=531), and speckled chub (n=492) in segments 13 and 14 of the Missouri River in 2004 (Doyle et al 2005) indicating that we should capture these species if present in segments 5 and 6..

One *Hybognathus* spp. was captured in segments 5 and 6 with a mini-fyke net in 2005. This was the first *Hybognathus* spp. captured since sampling began in 2003. This species is likely at a very low abundance in segments 5 and 6. *Hybognathus* spp. were captured in the lower Missouri River during 2004 with bag seines and mini-fyke nets in Nebraska (Steffensen and Mestl 2005) and Missouri (Doyle et al. 2005).

No small blue suckers (< 700 mm TL) were captured in segments 5 and 6 during 2005 with few fish overall being captured with the standard gears (gill nets, trammel nets, otter trawls). At present, blue suckers appear to not be successfully reproducing or survival of early life stages is low in segments 5 and 6. Few small (< 200 mm TL) blue suckers have also been captured in the lower segments of the Missouri River in Nebraska (Steffensen and Mestl 2005). These low catch rates of small blue suckers in the channelized and unchannelized segments of the Missouri River highlight that habitats used by early life stages are poorly known. Therefore, ineffective sampling with either inefficient gears or in habitats not inhabited by the early life stages of blue suckers may also explain the lack of evidence of recruitment. Hoop nets were

continued in 2005 to further address sampling issues for this species. It appears that May is the most appropriate time to sample for adult blue suckers with hoop nets. Hoop nets in spring caught the majority of blue suckers in segments 5 and 6 with most caught in a single hoop net (n=27) set in May 2005. Interestingly, in May 2004, 11 blue suckers were captured by a hoop net near the same area.

Gill nets, trammel nets, and otter trawls were effective at capturing sauger in segments 5 and 6. Gill net mean CPUE has been declining since 2003 for sauger and was substantially lower in 2005. Trammel net mean CPUE has consistently been higher during the sturgeon season from 2003 to 2005. This likely due to sauger moving up into segments 5 and 6 from Lewis and Clark Lake as they stage for a spawning run.

We captured three times as many fish in 2005 (14,622) compared to 2004 (4,489). This increase was mostly in the mini-fyke nets with 12,149 fish in 2005 compared to 2,281 in 2004. Mini-fyke nets captured ten times as many emerald shiners and 5,723 YOY white bass in 2005 compared to 16 YOY white bass in 2004. We can not be certain that the increases in fish captures represent an increase in fish relative abundance in segments 5 and 6. However, B. Graeb (South Dakota State University, personal communication) also reported high numbers of YOY white bass captured in mini-fyke nets in segment 5 and 6 in 2005. The fish community season extends from July to October. Because different fish species may become more abundant during different times of the year (increase in YOY), sampling during the fish community season should be systematically spread out through the four months or should be shortened into a more intense sampling period.

The pallid sturgeon population assessment program is adaptive, allowing for changes in standard gear types and experimentation with the effectiveness of non-standard gears. Hoop nets and setlines were used from 2003 to 2005 to evaluate the effectiveness of these gears and determine appropriate time frames when they are most effective at capturing sturgeon and other

native species. Set lines were most effective from April to May and in October to capture pallid sturgeon and shovelnose sturgeon when water temperatures were lower (Wanner 2006). Hoop nets were most effective during the spring when native fish were likely making spawning runs. Beam trawling was discontinued in 2005 as a standard gear due to extremely low catches for all fish species during 2003 and 2004. In 2005, a 16-ft. otter trawl replaced the beam trawl and appears to effectively sample channel border habitats. Mini-fyke nets capture more species and more numbers of fish compared to seines in 2005 (V. Travnichek, Missouri Department of Conservation, unpublished data). Therefore, seines will be discontinued after the 2005 season. A small-mesh 16-ft otter trawl will be deployed and tested in the 2006 fish community season to evaluate the effectiveness to capture small-bodied benthic fishes. Additionally, comparison of catches between white and green mesh gill and trammel nets will be evaluated in 2006 to determine if dyed nets are required in low turbidity water such as it exists in segments 5 and 6.

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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 (1991), 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 segments 5 and 6 for the long-term pallid sturgeon and associated fish community sampling program. Long-term monitoring began in 2003 for segments 5 and 6.

Gear	Code	Type	Season	Years	CPUE units
Trammel net – 1 inch inner mesh	TN	Standard	All	2003 - Present	fish/100 m drift
Trammel net – 1 inch inner mesh	TN50	Standard	All	2003- 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
Otter trawl – 16 ft head rope	OT16	Standard	All	2005 - 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 - 2005	fish/100 m^2
Bag Seine – quarter arc method pulled downstream	BSQD	Standard	Fish Comm.	2003 - 2005	fish/100 m^2
Bag Seine – half arc method pulled upstream	BSHU	Standard	Fish Comm.	2003 - 2005	fish/100 m^2
Bag Seine – half arc method pulled downstream	BSHD	Standard	Fish Comm.	2003 - 2005	fish/100 m^2
Bag seine – rectangular method pulled upstream	BSRU	Standard	Fish Comm.	2003 - 2005	fish/100 m^2
Bag seine – rectangular method pulled upstream	BSRD	Standard	Fish Comm.	2003 - 2005	fish/100 m^2
Mini-fyke net	MF	Standard	Fish Comm.	2003 - 2005	fish/net night
Hoop nets	HN	Standard Wild	All	2003 – 2004 (Std) 2005 (Wild)	fish/net night
Setlines	SL	Wild	All	2003 - 2005	fish/hook 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 5 and 6 of the Missouri River (RPMA 3).

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Average Length (mm)	Primary Mark	Secondary Mark
2000	Verdel	416	1997	6/6/00	524	PIT	Elastomer /Dangler
	Verdel	98	1998	9/20/00	473	PIT	
	Verdel	4	Adults	7/6/00	n/a	PIT	Sonic Tag
	Verdel	3	Adults	9/20/00	n/a	PIT	2 with Sonic Tag
	Running Water	2	Adults	7/6/00	n/a	PIT	
2002	Verdel	561	2001	4/20/02	200	PIT	Elastomer
	Sunshine Bottoms	181	1999	4/25/02	417	PIT	Elastomer
2003	Running Water	300	2002	7/24/03	244	PIT	Elastomer
	Sunshine Bottoms	301	2002	7/24/03		PIT	Elastomer
2004	Sunshine Bottoms	244	2003	8/7/04	312	PIT	Elastomer
	Running Water	271	2003	8/7/04		PIT	Elastomer
2005	Running Water	868	2004	8/30/05	294	PIT	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 segments 5 and 6 of the Missouri River during 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	BRAD			CHXO		DEND	ISB			OSB		SCCL	SCCS
			CHNB	ITIP	POOL	CHNB	POOL	CHNB	CHNB	ITIP	POOL	CHNB	POOL	CHNB	CHNB
BUSK	4	0.02	0	0	0	0	0	0	0	0	0.125	0.021	0.5	0	0.2
		[0.02]	[0]		[0]	[0]	[0]	[0]	[0]		[0.25]	[0.042]	[1]	[0]	[0.4]
CARP	1	0.005	0	0	0	0	0	0	0	0	0.125	0	0	0	0
		[0.01]	[0]		[0]	[0]	[0]	[0]	[0]		[0.25]	[0]	[0]	[0]	[0]
CNCF	74	0.372	0	0	0	0.75	0.5	0.333	0.295	0	1.875	0.188	0	0.1	0
		[0.248]	[0]		[0]	[0.945]	[1]	[0.667]	[0.458]		[1.485]	[0.175]	[0]	[0.2]	[0]
GDEY	1	0.005	0	0	0	0	0	0	0	0	0.125	0	0	0	0
		[0.01]	[0]		[0]	[0]	[0]	[0]	[0]		[0.25]	[0]	[0]	[0]	[0]
NTPK	5	0.025	0	0	0	0	0	0	0.045	0	0	0.062	0	0	0
		[0.026]	[0]		[0]	[0]	[0]	[0]	[0.091]		[0]	[0.071]	[0]	[0]	[0]
PDSG	7	0.035	0	0	0	0.045	0	0	0.045	0	0	0.042	0	0.05	0
		[0.026]	[0]		[0]	[0.064]	[0]	[0]	[0.064]		[0]	[0.058]	[0]	[0.1]	[0]
QLBK	3	0.015	0	0	0	0	0	0	0.045	0	0	0.021	0	0	0
		[0.022]	[0]		[0]	[0]	[0]	[0]	[0.091]		[0]	[0.042]	[0]	[0]	[0]
RKBS	2	0.01	0	0	0	0	0	0	0	0	0	0.042	0	0	0
		[0.014]	[0]		[0]	[0]	[0]	[0]	[0]		[0]	[0.058]	[0]	[0]	[0]
RVCS	4	0.02	0	0	0	0.023	0	0	0	0	0.125	0.021	0.5	0	0
		[0.02]	[0]		[0]	[0.045]	[0]	[0]	[0]		[0.25]	[0.042]	[1]	[0]	[0]
SGER	24	0.121	0	0	0	0.136	0	0	0.091	0	0.375	0.208	0	0.05	0
		[0.048]	[0]		[0]	[0.123]	[0]	[0]	[0.088]		[0.366]	[0.118]	[0]	[0.1]	[0]
SGWE	1	0.005	0	0	0	0	0	0	0	0	0.125	0	0	0	0
		[0.01]	[0]		[0]	[0]	[0]	[0]	[0]		[0.25]	[0]	[0]	[0]	[0]
SHRH	43	0.216	0	0	0	0.386	1.5	0	0.182	0	0.125	0.188	0	0.2	0.2
		[0.075]	[0]		[0]	[0.227]	[1]	[0]	[0.149]		[0.25]	[0.114]	[0]	[0.234]	[0.4]
SMBF	1	0.005	0.059	0	0	0	0	0	0	0	0	0	0	0	0
		[0.01]	[0.118]		[0]	[0]	[0]	[0]	[0]		[0]	[0]	[0]	[0]	[0]
SMBS	1	0.005	0	0	0	0.023	0	0	0	0	0	0	0	0	0
		[0.01]	[0]		[0]	[0.045]	[0]	[0]	[0]		[0]	[0]	[0]	[0]	[0]
SNSG	99	0.497	0.059	0	0	0.432	2	0	0.568	0	0	0.896	0	0.25	0.4
		[0.259]	[0.118]		[0]	[0.279]	[4]	[0]	[0.392]		[0]	[0.953]	[0]	[0.246]	[0.49]

Appendix F1. Gill Net (continued).

Species	Total Catch	Overall CPUE	BRAD			CHXO		DEND	ISB			OSB		SCCL	SCCS
			CHNB	ITIP	POOL	CHNB	POOL	CHNB	CHNB	ITIP	POOL	CHNB	POOL	CHNB	CHNB
STCT	1	0.005	0	0	0	0	0	0	0	0	0	0.021	0	0	0
		[0.01]	[0]		[0]	[0]	[0]	[0]	[0]		[0]	[0.042]	[0]	[0]	[0]
WLYE	25	0.126	0.059	0	0	0.045	0	0	0.091	0	0.25	0.271	1.5	0	0
		[0.118]	[0.118]		[0]	[0.064]	[0]	[0]	[0.088]		[0.327]	[0.46]	[3]	[0]	[0]
WTBS	1	0.005	0	0	0	0	0	0	0	0	0.125	0	0	0	0
		[0.01]	[0]		[0]	[0]	[0]	[0]	[0]		[0.25]	[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	BRAD CHNB	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
BMBF	2	0.007	0.024	0	0	0	0	0
		[0.011]	[0.037]	[0]	[0]	[0]	[0]	[0]
CARP	17	0.042	0.09	0.013	0	0.046	0.009	0
		[0.028]	[0.068]	[0.027]	[0]	[0.079]	[0.017]	[0]
CNCF	64	0.171	0.154	0.043	1.613	0.129	0.322	0.093
		[0.076]	[0.089]	[0.05]	[3.226]	[0.103]	[0.281]	[0.185]
FWDM	1	0.002	0.008	0	0	0	0	0
		[0.005]	[0.015]	[0]	[0]	[0]	[0]	[0]
GZSD	1	0.002	0.006	0	0	0	0	0
		[0.004]	[0.012]	[0]	[0]	[0]	[0]	[0]
PDFH	1	0.002	0	0	0.161	0	0	0
		[0.003]	[0]	[0]	[0.323]	[0]	[0]	[0]
PDSG	26	0.064	0.098	0.053	0	0.069	0.04	0
		[0.029]	[0.064]	[0.052]	[0]	[0.064]	[0.061]	[0]
QLBK	1	0.002	0.008	0	0	0	0	0
		[0.005]	[0.016]	[0]	[0]	[0]	[0]	[0]
RKBS	1	0.002	0.008	0	0	0	0	0
		[0.005]	[0.016]	[0]	[0]	[0]	[0]	[0]
RVCS	17	0.047	0.06	0.029	0	0.052	0.055	0
		[0.027]	[0.06]	[0.058]	[0]	[0.054]	[0.06]	[0]
SGER	43	0.099	0.181	0.019	0	0.077	0.113	0
		[0.055]	[0.117]	[0.037]	[0]	[0.108]	[0.161]	[0]
SGWE	4	0.007	0.008	0	0	0	0.024	0
		[0.011]	[0.015]	[0]	[0]	[0]	[0.048]	[0]
SHRH	31	0.102	0.225	0.039	0	0.041	0.083	0
		[0.091]	[0.288]	[0.061]	[0]	[0.058]	[0.077]	[0]
SMBF	12	0.028	0.036	0.027	0.161	0.039	0.008	0
		[0.024]	[0.038]	[0.053]	[0.323]	[0.077]	[0.016]	[0]
SMBS	1	0.002	0	0.01	0	0	0	0
		[0.003]	[0]	[0.019]	[0]	[0]	[0]	[0]

Appendix F2. 1 Inch Trammel Net: (continued).

Species	Total Catch	Overall CPUE	BRAD CHNB	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
SNGR	1	0.003 [0.005]	0 [0]	0 [0]	0 [0]	0.011 [0.022]	0 [0]	0 [0]
SNSG	92	0.248 [0.149]	0.271 [0.114]	0.078 [0.068]	1.613 [3.226]	0.192 [0.246]	0.442 [0.64]	0 [0]
WLYE	40	0.081 [0.072]	0.073 [0.058]	0.01 [0.019]	0 [0]	0.047 [0.056]	0.227 [0.338]	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	BRAD CHNB	CHXO CHNB	CONF CHNB	DEND CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
BLGL	4	0.007	0.005	0	0	0	0.029	0	0
		[0.012]	[0.01]	[0]	[0]	[0]	[0.057]	[0]	[0]
BUSK	3	0.006	0.005	0	0.093	0	0	0.011	0
		[0.007]	[0.01]	[0]	[0.185]	[0]	[0]	[0.022]	[0]
CARP	6	0.009	0.005	0	0	0	0.029	0	0.026
		[0.008]	[0.01]	[0]	[0]	[0]	[0.032]	[0]	[0.051]
CNCF	132	0.241	0.357	0.187	0	0.667	0.127	0.197	0.205
		[0.078]	[0.184]	[0.146]	[0]	[0.667]	[0.088]	[0.115]	[0.207]
ERSN	56	0.107	0.066	0.033	0	0	0.399	0	0
		[0.138]	[0.036]	[0.049]	[0]	[0]	[0.702]	[0]	[0]
FHCF	1	0.002	0.005	0	0	0	0	0	0
		[0.004]	[0.01]	[0]	[0]	[0]	[0]	[0]	[0]
FWDM	23	0.036	0.087	0	0	0	0.011	0.014	0
		[0.021]	[0.054]	[0]	[0]	[0]	[0.022]	[0.028]	[0]
GNSF	1	0.002	0.005	0	0	0	0	0	0
		[0.004]	[0.01]	[0]	[0]	[0]	[0]	[0]	[0]
GZSD	9	0.016	0.044	0	0	0	0	0	0
		[0.016]	[0.044]	[0]	[0]	[0]	[0]	[0]	[0]
JYDR	3	0.006	0.005	0	0	0	0.021	0	0
		[0.007]	[0.009]	[0]	[0]	[0]	[0.029]	[0]	[0]
OSSF	1	0.002	0.005	0	0	0	0	0	0
		[0.004]	[0.01]	[0]	[0]	[0]	[0]	[0]	[0]
PDSG	11	0.02	0.015	0.033	0.093	0	0.018	0.022	0
		[0.012]	[0.017]	[0.036]	[0.187]	[0]	[0.026]	[0.03]	[0]
RBST	2	0.004	0	0	0	0	0.01	0.011	0
		[0.005]	[0]	[0]	[0]	[0]	[0.019]	[0.022]	[0]
RKBS	1	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
RVCS	2	0.004	0.005	0.011	0	0	0	0	0
		[0.005]	[0.01]	[0.022]	[0]	[0]	[0]	[0]	[0]

Appendix F4. Otter Trawl: (continued).

Species	Total Catch	Overall CPUE	BRAD CHNB	CHXO CHNB	CONF CHNB	DEND CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
SFSN	2	0.003	0.005	0	0	0	0	0	0.026
		[0.005]	[0.009]	[0]	[0]	[0]	[0]	[0]	[0.051]
SGER	40	0.072	0.096	0.022	0.183	0	0.038	0.087	0.103
		[0.029]	[0.058]	[0.044]	[0.211]	[0]	[0.06]	[0.069]	[0.117]
SGWE	5	0.009	0.021	0	0	0	0	0	0.026
		[0.008]	[0.02]	[0]	[0]	[0]	[0]	[0]	[0.051]
SHRH	20	0.041	0.035	0.011	0	0	0.04	0.086	0.051
		[0.022]	[0.029]	[0.022]	[0]	[0]	[0.047]	[0.093]	[0.069]
SMBS	15	0.03	0.026	0.035	0	0	0.019	0.041	0.051
		[0.018]	[0.027]	[0.053]	[0]	[0]	[0.027]	[0.048]	[0.103]
SNSG	31	0.057	0.092	0.022	0.076	0	0.028	0.076	0
		[0.029]	[0.063]	[0.031]	[0.152]	[0]	[0.057]	[0.074]	[0]
SNSN	1	0.002	0	0	0	0	0	0	0.026
		[0.004]	[0]	[0]	[0]	[0]	[0]	[0]	[0.051]
STCT	2	0.004	0.005	0	0	0	0	0.013	0
		[0.006]	[0.01]	[0]	[0]	[0]	[0]	[0.026]	[0]
STSN	3	0.006	0.005	0	0	0	0	0.011	0.026
		[0.006]	[0.01]	[0]	[0]	[0]	[0]	[0.022]	[0.051]
SVCB	255	0.475	0.829	0.213	0.537	0.5	0.181	0.424	0.208
		[0.134]	[0.302]	[0.133]	[0.384]	[0.333]	[0.218]	[0.27]	[0.146]
UCS	1	0.002	0.005	0	0	0	0	0	0
		[0.004]	[0.01]	[0]	[0]	[0]	[0]	[0]	[0]
UCY	1	0.002	0	0.011	0	0	0	0	0
		[0.004]	[0]	[0.022]	[0]	[0]	[0]	[0]	[0]
WLYE	49	0.094	0.21	0	0.093	0	0.048	0.028	0.026
		[0.046]	[0.114]	[0]	[0.185]	[0]	[0.056]	[0.056]	[0.051]
WTBS	24	0.044	0.097	0.012	0	0	0.038	0	0
		[0.048]	[0.125]	[0.024]	[0]	[0]	[0.076]	[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	BRAD		CHXO		ISB	OSB	SCCL	SCCS	TRIB	TRMS
			BARS	CHNB	BARS	CHNB	BARS	BARS	BARS	BARS	CHNB	BARS
BKCP	8	0.1	0.105	0	0	0	0.083	0.25	0	0	0	0
		[0.098]	[0.165]		[0]		[0.167]	[0.359]	[0]	[0]		
BLGL	101	1.262	1.447	0	0.5	0	0.75	1.667	0.5	0.5	10	0
		[0.495]	[0.714]		[0.655]		[0.892]	[1.524]	[1]	[1]		
BNMW	249	3.112	4.763	0	0.25	0	0.083	5.167	0	0	3	0
		[2.18]	[3.592]		[0.327]		[0.167]	[8.797]	[0]	[0]		
CARP	9	0.112	0.158	0	0.125	0	0	0.167	0	0	0	0
		[0.08]	[0.142]		[0.25]		[0]	[0.225]	[0]	[0]		
CNCF	3	0.038	0	0	0	0	0	0.083	0.5	0	0	0
		[0.043]	[0]		[0]		[0]	[0.167]	[0.577]	[0]		
ERSN	4028	50.35	97.658	0	1.875	0	5.083	4.667	6.75	1	154	2
		[39.757]	[81.082]		[1.221]		[7.034]	[4.474]	[6.551]	[2]		
FHMW	1	0.012	0.026	0	0	0	0	0	0	0	0	0
		[0.025]	[0.053]		[0]		[0]	[0]	[0]	[0]		
FWDM	215	2.688	5.658	0	0	0	0	0	0	0	0	0
		[3.342]	[6.957]		[0]		[0]	[0]	[0]	[0]		
GNSF	25	0.312	0.158	0	0.25	0	0.083	1	0	0	0	4
		[0.2]	[0.16]		[0.5]		[0.167]	[0.921]	[0]	[0]		
GSPK	1	0.012	0.026	0	0	0	0	0	0	0	0	0
		[0.025]	[0.053]		[0]		[0]	[0]	[0]	[0]		
GZSD	9	0.112	0.211	0	0	0	0	0.083	0	0	0	0
		[0.101]	[0.202]		[0]		[0]	[0.167]	[0]	[0]		
HBNS	1	0.012	0	0	0	0	0	0.083	0	0	0	0
		[0.025]	[0]		[0]		[0]	[0.167]	[0]	[0]		
JYDR	25	0.312	0.579	0	0	0	0.25	0	0	0	0	0
		[0.413]	[0.852]		[0]		[0.5]	[0]	[0]	[0]		
LAB	1	0.012	0.026	0	0	0	0	0	0	0	0	0
		[0.025]	[0.053]		[0]		[0]	[0]	[0]	[0]		
LMBS	54	0.675	1.237	0	0	0	0	0.333	0	0	3	0
		[0.596]	[1.222]		[0]		[0]	[0.376]	[0]	[0]		

Appendix F6. Mini-fyke Net: (continued).

Species	Total Catch	Overall CPUE	BRAD		CHXO		ISB	OSB	SCCL	SCCS	TRIB	TRMS
			BARS	CHNB	BARS	CHNB	BARS	BARS	BARS	BARS	CHNB	BARS
NTPK	1	0.012	0.026	0	0	0	0	0	0	0	0	0
		[0.025]	[0.053]		[0]		[0]	[0]	[0]	[0]		
OSSF	9	0.112	0.211	0	0	0	0	0.083	0	0	0	0
		[0.159]	[0.33]		[0]		[0]	[0.167]	[0]	[0]		
RBST	9	0.112	0.026	0	0	1	0.333	0.25	0	0	0	0
		[0.112]	[0.053]		[0]		[0.512]	[0.5]	[0]	[0]		
RDSN	7	0.088	0.158	0	0	0	0	0.083	0	0	0	0
		[0.081]	[0.16]		[0]		[0]	[0.167]	[0]	[0]		
RKBS	7	0.088	0.053	0	0.125	0	0.25	0	0.25	0	0	0
		[0.073]	[0.073]		[0.25]		[0.359]	[0]	[0.5]	[0]		
RVCS	131	1.638	3.421	0	0	0	0.083	0	0	0	0	0
		[3.199]	[6.734]		[0]		[0.167]	[0]	[0]	[0]		
RVSN	6	0.075	0.079	1	0.25	0	0	0	0	0	0	0
		[0.069]	[0.116]		[0.327]		[0]	[0]	[0]	[0]		
SFSN	723	9.038	6.079	14	7.25	9	2.5	26.583	13.25	3.5	2	0
		[7.335]	[2.551]		[10.335]		[2.263]	[47.967]	[9.069]	[7]		
SGER	2	0.025	0.053	0	0	0	0	0	0	0	0	0
		[0.035]	[0.073]		[0]		[0]	[0]	[0]	[0]		
SHRH	2	0.025	0	0	0.125	0	0	0.083	0	0	0	0
		[0.035]	[0]		[0.25]		[0]	[0.167]	[0]	[0]		
SMBS	62	0.775	0.816	0	0.75	0	0.75	1.167	0	0.5	1	0
		[0.316]	[0.419]		[0.824]		[1.019]	[1.176]	[0]	[1]		
SNGR	31	0.388	0.316	0	0.25	0	0.25	0.833	0.5	0	2	0
		[0.165]	[0.201]		[0.5]		[0.261]	[0.644]	[1]	[0]		
SNSN	25	0.312	0.421	0	0.5	1	0	0.167	0	1	0	0
		[0.187]	[0.298]		[1]		[0]	[0.333]	[0]	[2]		
STCT	1	0.012	0.026	0	0	0	0	0	0	0	0	0
		[0.025]	[0.053]		[0]		[0]	[0]	[0]	[0]		

Appendix F6. Mini-fyke Net: (continued).

Species	Total Catch	Overall CPUE	BRAD		CHXO		ISB	OSB	SCCL	SCCS	TRIB	TRMS
			BARS	CHNB	BARS	CHNB	BARS	BARS	BARS	BARS	CHNB	BARS
STSN	1	0.012	0	0	0	0	0	0.083	0	0	0	0
		[0.025]	[0]		[0]		[0]	[0.167]	[0]	[0]		
UCN	1	0.012	0.026	0	0	0	0	0	0	0	0	0
		[0.025]	[0.053]		[0]		[0]	[0]	[0]	[0]		
UCS	4	0.05	0	0	0	0	0.083	0	0.75	0	0	0
		[0.079]	[0]		[0]		[0.167]	[0]	[1.5]	[0]		
		[0.025]	[0.053]		[0]		[0]	[0]	[0]	[0]		
URH	5	0.062	0.079	0	0	0	0.167	0	0	0	0	0
		[0.065]	[0.116]		[0]		[0.225]	[0]	[0]	[0]		
WLYE	555	6.938	14.474	2	0	0	0	0.25	0	0	0	0
		[13.169]	[27.71]		[0]		[0]	[0.359]	[0]	[0]		
WTBS	5723	71.538	148.316	17	1.125	4	3	1.417	0.75	0.5	0	0
		[79.342]	[164.557]		[1.98]		[5.286]	[2.492]	[1.5]	[1]		
WTCP	106	1.325	0.526	0	0.625	0	1.083	5.167	0.75	0	3	0
		[1.283]	[0.375]		[0.996]		[1.992]	[8.127]	[1.5]	[0]		
YWPH	8	0.1	0.132	0	0.125	0	0	0.083	0.25	0	0	0
		[0.11]	[0.216]		[0.25]		[0]	[0.167]	[0.5]	[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	BRAD BARS	CHXO BARS	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	TRMS BARS
BLGL	6	0.115	0.192	0	0.154	0	0	0	0
		[0.131]	[0.251]	[0]	[0.308]	[0]	[0]	[0]	[0]
CARP	1	0.019	0	0	0	0.128	0	0	0
		[0.038]	[0]	[0]	[0]	[0.256]	[0]	[0]	[0]
CNCF	1	0.019	0	0	0	0.128	0	0	0
		[0.038]	[0]	[0]	[0]	[0.256]	[0]	[0]	[0]
ERSN	363	6.688	6.535	4.228	11.993	9.353	0	0	3.844
		[3.285]	[4.136]	[5.687]	[17.328]	[8.502]	[0]	[0]	[1.538]
FHCB	1	0.019	0.038	0	0	0	0	0	0
		[0.038]	[0.077]	[0]	[0]	[0]	[0]	[0]	[0]
FWDM	10	0.192	0.384	0	0	0	0	0	0
		[0.167]	[0.326]	[0]	[0]	[0]	[0]	[0]	[0]
GZSD	25	0.48	0.884	0.192	0	0.128	0	0	0
		[0.512]	[1.008]	[0.384]	[0]	[0.256]	[0]	[0]	[0]
JYDR	10	0.192	0.384	0	0	0	0	0	0
		[0.184]	[0.361]	[0]	[0]	[0]	[0]	[0]	[0]
LMBS	7	0.135	0.269	0	0	0	0	0	0
		[0.125]	[0.243]	[0]	[0]	[0]	[0]	[0]	[0]
RDSN	3	0.058	0.077	0	0	0.128	0	0	0
		[0.086]	[0.154]	[0]	[0]	[0.256]	[0]	[0]	[0]
RKBS	1	0.019	0.038	0	0	0	0	0	0
		[0.038]	[0.077]	[0]	[0]	[0]	[0]	[0]	[0]
RVCS	3	0.058	0.077	0	0	0.128	0	0	0
		[0.086]	[0.154]	[0]	[0]	[0.256]	[0]	[0]	[0]
RVSN	3	0.058	0.115	0	0	0	0	0	0
		[0.086]	[0.17]	[0]	[0]	[0]	[0]	[0]	[0]
SFSN	115	2.201	3.748	3.075	0	0.128	0	0	0
		[2.066]	[3.933]	[5.724]	[0]	[0.256]	[0]	[0]	[0]
SGER	1	0.019	0.038	0	0	0	0	0	0
		[0.038]	[0.077]	[0]	[0]	[0]	[0]	[0]	[0]
SMBS	6	0.115	0.115	0	0	0.256	0.308	0	0
		[0.131]	[0.231]	[0]	[0]	[0.346]	[0.615]	[0]	[0]

Appendix F7. Bag Seine: (continued).

Species	Total Catch	Overall CPUE	BRAD BARS	CHXO BARS	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	TRMS BARS
SNGR	1	0.019	0	0	0	0.128	0	0	0
		[0.038]	[0]	[0]	[0]	[0.256]	[0]	[0]	[0]
STSN	1	0.019	0.038	0	0	0	0	0	0
		[0.038]	[0.077]	[0]	[0]	[0]	[0]	[0]	[0]
SVCB	1	0.019	0.038	0	0	0	0	0	0
		[0.038]	[0.077]	[0]	[0]	[0]	[0]	[0]	[0]
UCS	17	0.321	0.538	0	0.11	0	0.308	0.513	0
		[0.365]	[0.718]	[0]	[0.22]	[0]	[0.615]	[1.025]	[0]
UCY	6	0.115	0.231	0	0	0	0	0	0
		[0.162]	[0.322]	[0]	[0]	[0]	[0]	[0]	[0]
URH	3	0.058	0.077	0	0	0.128	0	0	0
		[0.066]	[0.107]	[0]	[0]	[0.256]	[0]	[0]	[0]
WTBS	535	10.282	19.258	0	0.154	0.641	0.308	0	20.757
		[13.716]	[27.266]	[0]	[0.308]	[0.799]	[0.615]	[0]	[7.688]

Appendix G. Hatchery names, locations, and abbreviations.

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

Appendix H. Alphabetic list of Missouri River fishes with total catch-per-unit-effort by gear type for sturgeon season (fall through spring) and fish community season (summer) during 2005 for segments 5 and 6 of the Missouri River. Species codes are located in Appendix A. Asterisks and bold type denote targeted native Missouri River species.

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)			
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Bag Seine	Mini-Fyke Net	Otter Trawl
ALSD								
ALWF								
AMEL								
AMGL								
BCCC								
BDDR								
BDKF								
BDSN								
BDSP								
BESN								
BHCP								
BHMW								
BKBF								
BKBH								
BKCP							0.1	
BKRH								
BKSB								
BKSS								
BKTT								
BLCF								
BLGL						0.115	1.262	0.015
BMBF	0.004				0.009			
BMSN								
BNDC								
BNMW							3.112	
BNSN								
BNTT								
BPTM								
BRBT								

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)			
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Bag Seine	Mini-Fyke Net	Otter Trawl
BSDR								
BSMN								
BSTM								
BTDR								
BUSK			0.02	0.004				0.007
BVSC								
BWFN								
CARP	0.035		0.005	0.011	0.048	0.019	0.112	0.007
CHSM								
CKCB								
CLDR								
CLSR								
CMSN								
CNCF	0.221		0.372	0.28	0.134	0.019	0.038	0.202
CNLP								
CNSM								
CNSN								
CSCO								
CTTT								
ERSN				0.181		6.688	50.35	0.033
FCSC								
FHCB						0.019		
FHCF								0.004
FHMW							0.012	
FKMT								
FSDC								
FTDR								
FWDM					0.004	0.192	2.688	0.072
GDEY			0.005					
GDFH								

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)			
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Bag Seine	Mini-Fyke Net	Otter Trawl
GDTT								
GFCC								
GLDR								
GN*?								
GNSF							0.312	0.004
GSBG								
GSCP								
GSDR								
GSOS								
GSPK							0.012	
GSTS								
GTSN								
GVCB								
GZSD					0.003	0.48	0.112	0.032
HBNS*							0.012	
HFCS								
HHCB								
IODR								
JYDR				0.004		0.192	0.312	0.007
LESF								
LGPH								
LKCB								
LKSG								
LKTT								
LKWF								
LMBS								
LNDC								
LNGR								
LNSK								
GDRH								

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)			
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Bag Seine	Mini-Fyke Net	Otter Trawl
GDSN								
LSSR								
LTDR								
LVLP								
MDSP								
MMSN								
MNEY								
MQTF								
MSDR								
MSKG								
MTSK								
MTWF								
NBLP								
NHSK								
NRBD								
NTPK			0.025				0.012	
NTSF				0.004			0.112	
OSSF								
OTDR								
OZMW								
PDFH	0.004							
PDSG*	0.016		0.035	0.023	0.099			0.018
PEMT								
PKLF								
PLDC								
PNMW								
PNMW*								
PNSD								
PTMW								
QLBK			0.015		0.004			

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)			
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Bag Seine	Mini-Fyke Net	Otter Trawl
RBDR								
RBST				0.007			0.112	
RBTT								
RDSN						0.058	0.088	
RDSS								
RKBS			0.01		0.004	0.019	0.088	
RRDR								
RUDD								
RVCS	0.073		0.02		0.027	0.058	1.638	0.007
RVRH								
RVSN						0.058	0.075	
RYSN								
SBLR								
SBSN								
SBWB								
SCSC								
SDBS								
SDMT								
SESM								
SFCB*								
SFSN				0.004		2.201	9.038	0.003
SGCB*								
SGER*	0.166		0.121	0.064	0.048	0.019	0.025	0.081
SGWE	0.011		0.005		0.004			0.019
SHDR								
SHRH	0.026		0.216	0.015	0.159		0.025	0.067
SJHR								
SKCB*								
SLDR								
SMBF	0.045		0.005		0.016			

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)			
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Bag Seine	Mini-Fyke Net	Otter Trawl
SMBS			0.005	0.004	0.003	0.115	0.775	0.056
SMMW								
SNGR					0.005	0.019	0.388	
SNPD								
SNSG*	0.333		0.497	0.059	0.183		0.012	0.056
SNSN*				0.004			0.312	
SPSK								
SPSN								
SPST								
SRBD								
SSPS								
STBS								
STCT			0.005	0.004			0.012	0.004
STGR								
STPD								
STSN				0.011		0.019	0.012	
SVCB				0.342		0.019		0.609
UCN							0.012	
UCS						0.321	0.05	0.004

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)			
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Bag Seine	Mini-Fyke Net	Otter Trawl
URH						0.058	0.062	
WLEY	0.148		0.126	0.021	0.03		6.938	0.167
WTBS			0.005			10.282	71.538	0.089
WTCP							1.325	
YWPH							0.1	

Appendix I.

Additional Gear use and Analysis

Wild gears (i.e., non-standard) used in 2003 -2005 consisted of hoopnets and setlines during the sturgeon and fish community seasons. Hoop nets in the past were considered a standard gear but since completion of the 2003 season were not required. Therefore, hoop net catches are included in this section. This is the third continuous year deploying these gears. During the sturgeon and fish community seasons an average of 24 setlines/bend were deployed in 10 bends. Each meso macrohabitat combination received 8 hooknights per season. An average of 8 hoop nets/bend was deployed in 10 bends during both seasons.

Pallid and shovelnose sturgeon catches with hoop nets and set lines were low during 2005. Hoop nets had varied success in capturing targeted native Missouri River fishes; whereas, set lines failed to capture any target species other than shovelnose sturgeon. Hoop nets captured a total of 269 fish consisting of 18 fish species. The only target species captured was the blue sucker (n = 27) and sauger (n = 1). During the sturgeon season hoop nets captured 165 fish consisting of 13 species, while during the fish community season a total of 104 fish were captured consisting of 15 species. Hoop nets caught more blue suckers (n = 27) than any other target species and relative abundance remained unchanged from 2003 to 2004 (Figures 52 and 53). However, all blue suckers were captured in a single hoop net on 06 May 2005. The occurrence of a single net capturing most of the total blue suckers captured occurred during the previous year on 03 May 2004. Hoopnets containing large numbers of blue suckers occurred at the confluence of the Niobrara and Missouri rivers in early May. No pallid sturgeon were collected in hoop nets during 2003-2005 and no shovelnose sturgeon were captured during 2005.

Setlines captured a total of 25 fish during both the sturgeon (n = 22) and fish community (n = 3) seasons. Four species were captured including shovelnose sturgeon, channel catfish, bigmouth buffalo, and walleye. No pallid sturgeon were caught with setlines during the sturgeon and fish community seasons

during 2005. During 2003-2004 CPUE for pallid sturgeon with set lines was lower with large variances due to the prevalence of zero catches while 2005 had a CPUE of zero (Figures 56 and 57). Thirteen shovelnose sturgeons were caught on set lines during 2005 and CPUE was greatest (0.046 fish/hook night) during the sturgeon season (Figure 54). Set lines caught one shovelnose sturgeon during the fish community season (summer season; Figure 55).

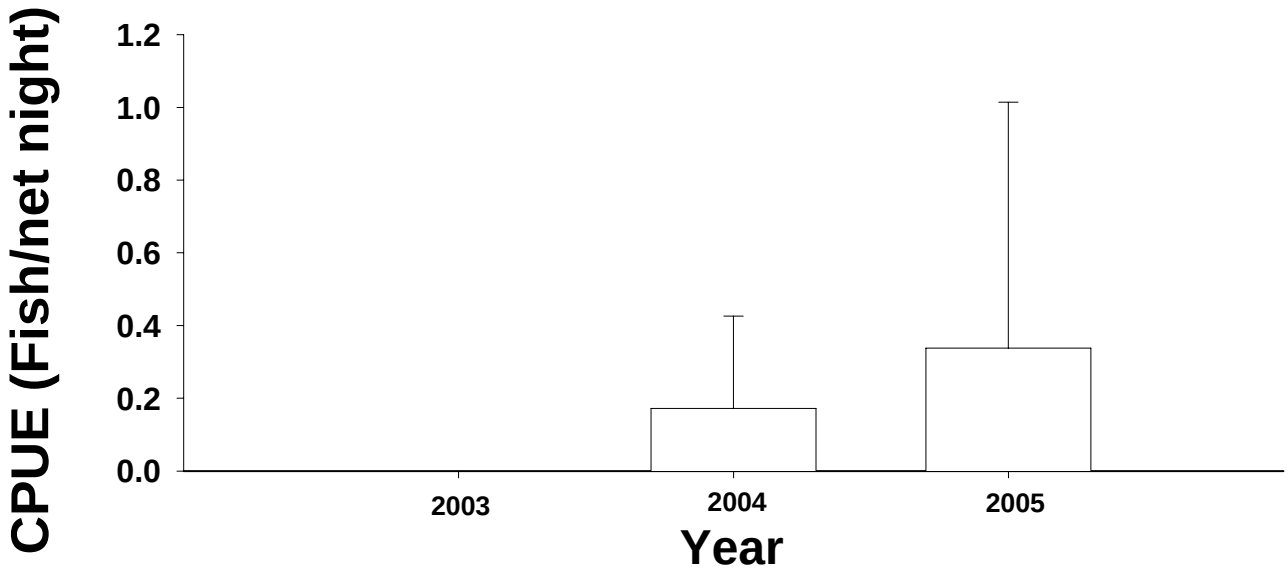

Figure 52. Mean annual catch-per-unit-effort (+/- 2 SE) of blue suckers in segment 5 and 6 of the Missouri River for hoop nets fished during fall through spring (Sturgeon Season) during 2003 - 2005.

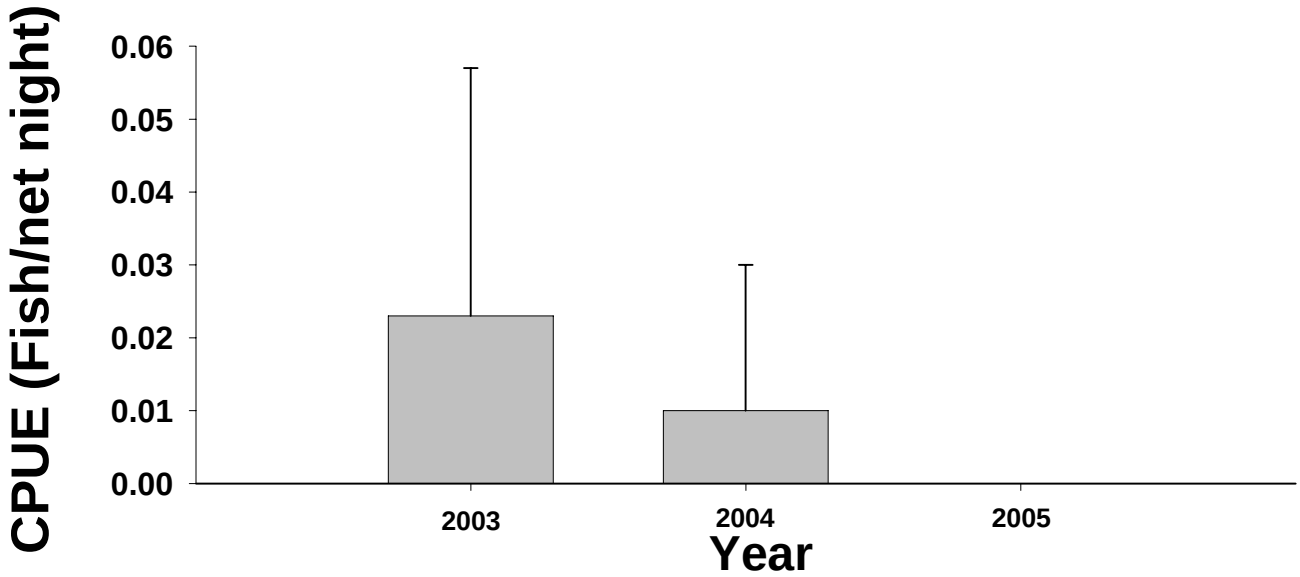

Figure 53. Mean annual catch-per-unit-effort (+/- 2 SE) of blue suckers in segments 5 and 6 of the Missouri River for hoop nets fished during summer (Fish Community Season) during 2003 - 2005.

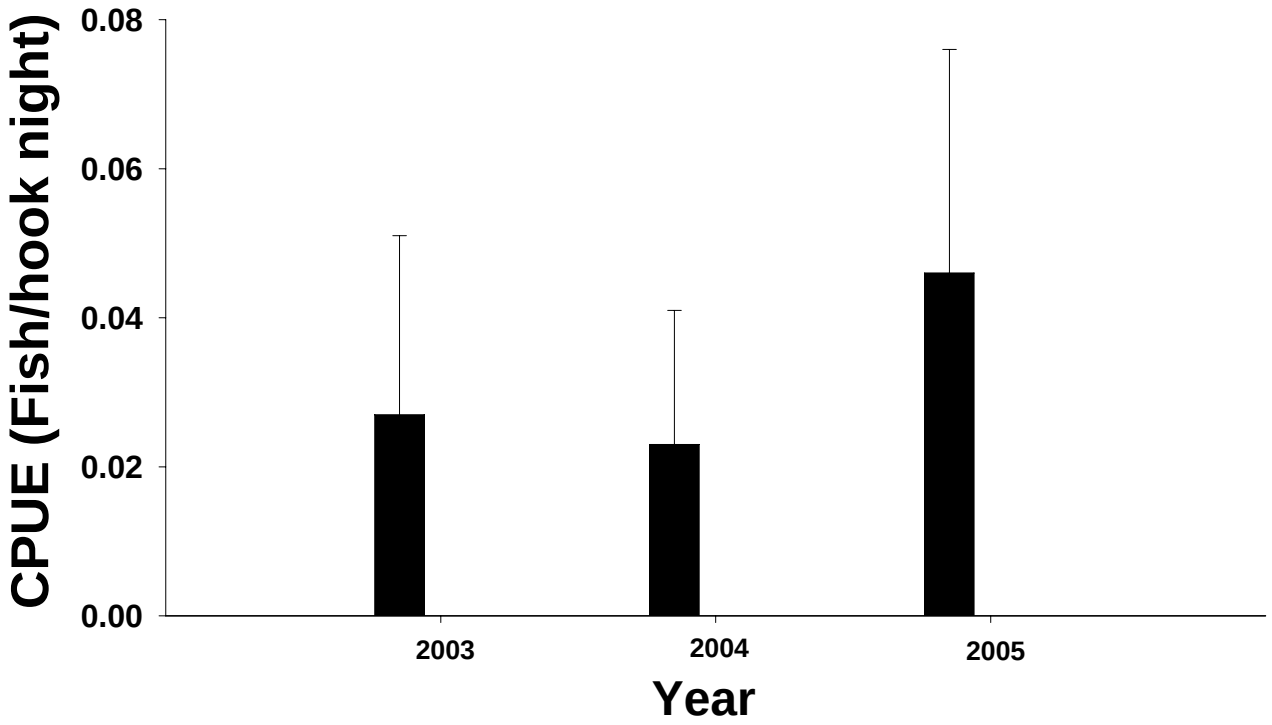

Figure 54. Mean annual catch-per-unit-effort (+/- 2 SE) of shovelnose sturgeon in segments 5 and 6 of the Missouri River for set lines fished during fall through spring (Sturgeon Season) during 2003 - 2005.

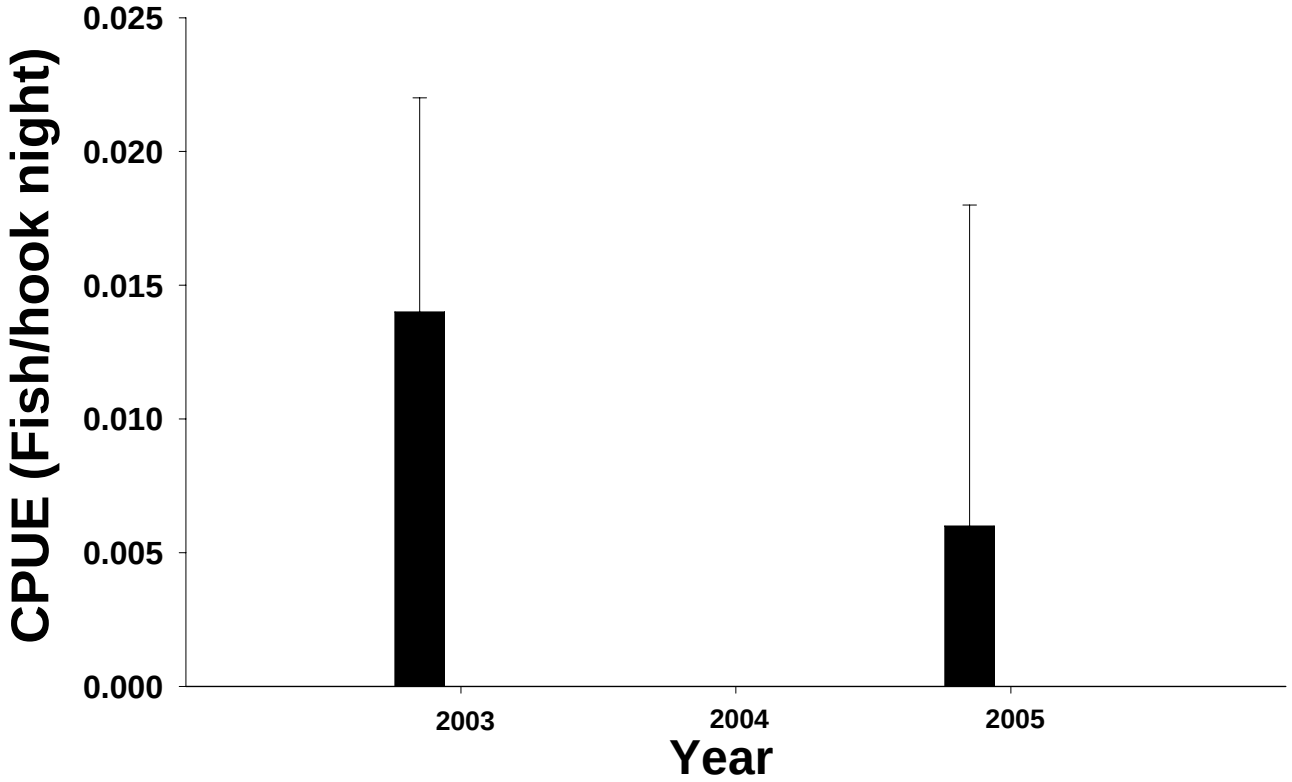

Figure 55. Mean annual catch-per-unit-effort (+/- 2 SE) of shovelnose sturgeon in segments 5 and 6 of the Missouri River for set lines fished during the (Fish Community Season) during 2003 - 2005.

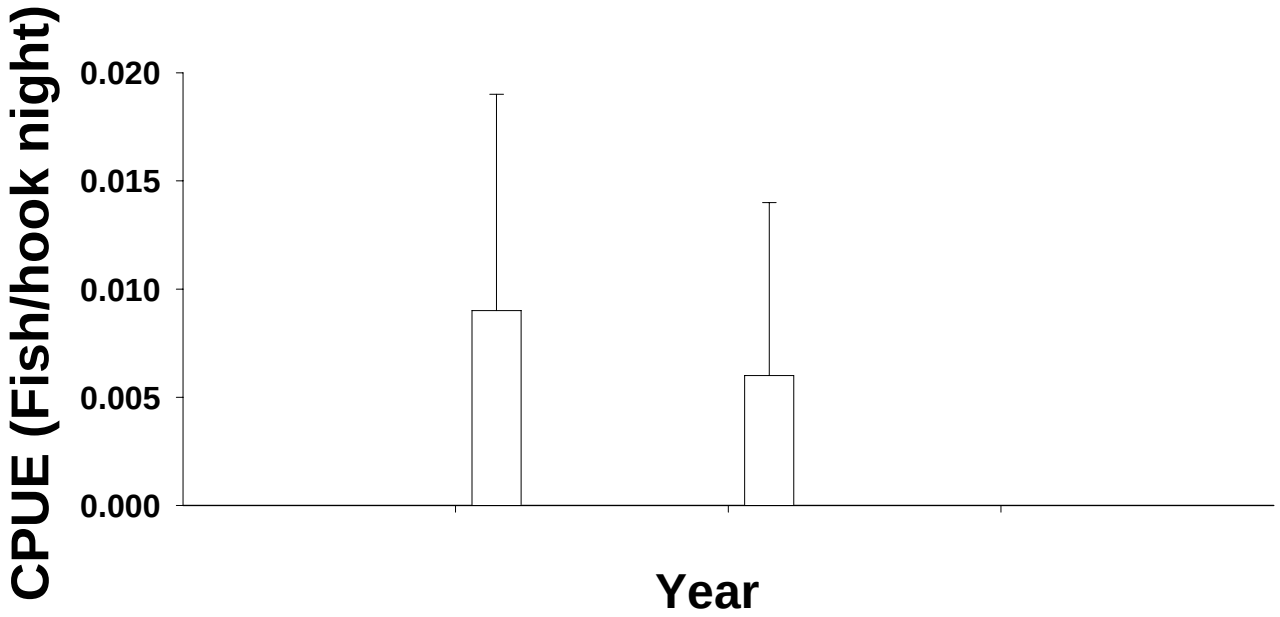

Figure 56. Mean annual catch-per-unit-effort (+/- 2 SE) of stocked pallid sturgeon in segments 5 and 6 of the Missouri River for set lines fished during fall through spring (Sturgeon Season) during 2003 - 2005.

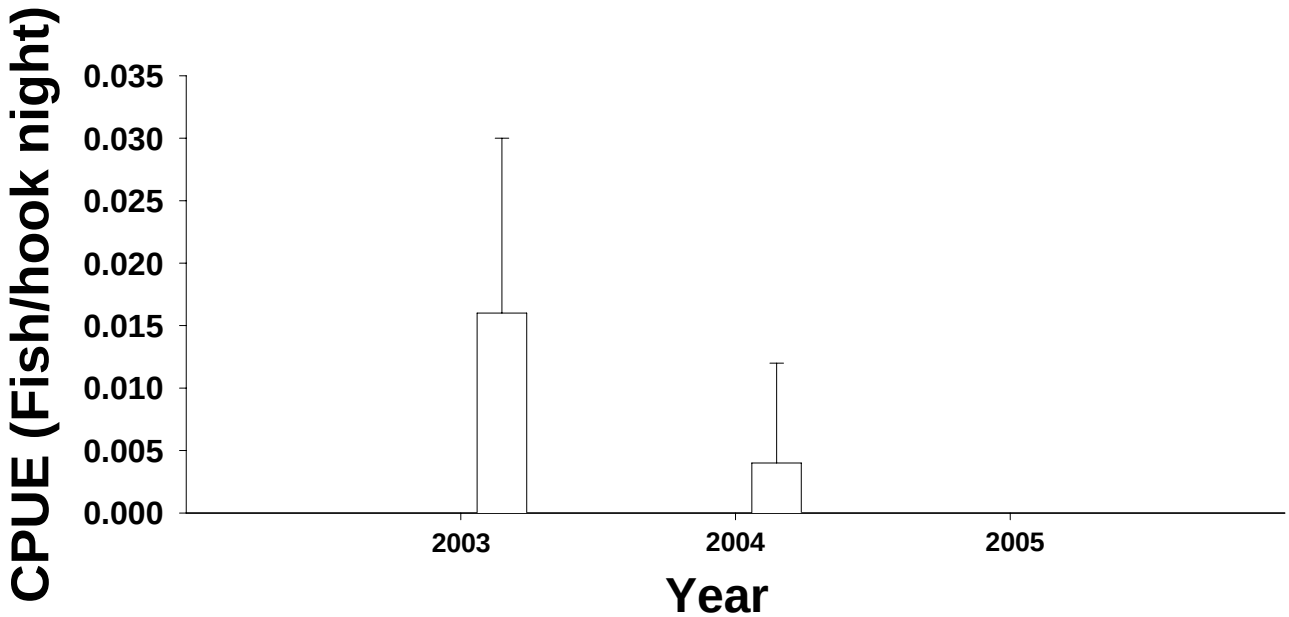

Figure 57. Mean annual catch-per-unit-effort (+/- 2 SE) of stocked pallid sturgeon in segments 5 and 6 of the Missouri River for set lines during summer (Fish Community Season) during 2003 - 2005.