2011 Annual Report

Pallid Sturgeon Population Assessment and Associated Fish Community Monitoring for the Missouri River: Segment 2

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

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May 2012

EXECUTIVE SUMMARY

The 2011 field season was a very challenging one for the Pallid Sturgeon Population Assessment Program (Program) due to the historically high flows of the Missouri River. Record snow accumulation, monumental rain events and spillway releases from Fort Peck Reservoir caused flows throughout segment 2 that had not been seen since Fort Peck Dam was constructed. The Missouri River peaked at 90,600 cfs in segment 2 on June 14 and remained above 30,000 from June 3rd to August 9th. Even though standard sampling did not take place during the peak of the runoff, standard sampling did occur at flows that were between two to three times higher than the flow conditions of the previous five sampling years. These significantly higher flows likely reduced the efficiencies of all our standard gears and makes comparisons of CPUE from 2011 to prior years problematic.

In addition, due to the high water season, less effort was expended in segment 2 during 2011 than prior sampling years. Normally 12 bends are randomly selected for standardized sampling, which occurs once each in sturgeon and fish community seasons. In response to the high flows, standard sampling was not fully completed in 2011. Of the 12 bends selected in 2011, seven were sampled using standard gears during sturgeon season, in addition to two of the 6 bends which were chosen for trotlines were completed. During fish community season 4 of the 12 selected bends were completed using all standard gears, while seven bends were partially completed with a portion of the standard gears. In addition, three bends were sampled with trotlines in fish community season.

Standard sampling within segment 2 in 2011 resulted in the capture of 25 hatchery-reared juvenile pallid sturgeon *Scaphirhynchus albus*, which was a substantial decrease of the all time high (forty-three) observed in 2010. Since the implementation of the Program in 2006, one hundred fifty-five pallid sturgeon have been captured in segment 2, all of which were hatchery-reared. Although the total catch of pallid sturgeon was down in 2011, overall trammel net CPUE was at an all time high of 0.025 fish/100 m. Overall trammel net CPUE of pallid sturgeon has followed an increasing trajectory since 2006. It is significant that the overall trammel net CPUE of pallid sturgeon increased in 2011, since shovelnose sturgeon *Scaphirhynchus platorynchus* CPUE declined substantially and was at a six year low. Since we do not necessarily believe that the shovelnose sturgeon population drastically declined from 2010, it is likely that trammel net

efficiencies were very low in 2011. Therefore, the relatively high CPUE we observed for pallid sturgeon is likely biased low. Similar to trammel nets, pallid sturgeon trotline CPUE for 2011was up, while shovelnose sturgeon were down.

Confounding both the trammel net and trotline data is the 2011 otter trawl data. Pallid sturgeon CPUE for the otter trawl was lower in 2011 than during 2010, while shovelnose CPUE increased. It should be cautioned to read too much into any of these findings since the total level of effort was significantly down in 2011 and flows were substantially higher than prior years.

A total of seven year classes were capture in segment 2 in 2011. Year classes captured ranged from 2001 (N=1) to 2010 (N=1) with the most abundant year class sampled being 2009. Although more year classes of pallid sturgeon were captured in segment 2 than during the first couple years of sampling, the size structure of the population does not appear to be changing appreciably. The length frequency of the sampled population in 2011 is almost a mirror of that sampled in 2006, the first year sampling occurred. Our data have suggested that as stocked fish get older they tend to migrate downstream and out of segment 3, to the more naturalized areas of segment 3 and 4. Therefore, the majority of the population of pallid sturgeon residing in segment 2 is comprised mainly of fish that are within a couple years of being stocked. This is likely due to the severe impacts Fort Peck Dam and its hypolimnetic releases have on segment 2.

The influence of Fort Peck Dam on segment 2 is also observed in the shovelnose sturgeon population. The vast majority of the population is made up of large and presumably old individuals. Smaller fish of younger age classes are found in downstream segments, but fish under 400 mm in length are rarely encountered in segment 2. However, shovelnose spawning does occur in the upstream portions of segment 2, although water temperatures during the spawning and incubation periods are significantly below optimum.

Due to the large amount of water spilling over Fort Peck Dam's spillway during 2011, entrainment fish from Fort Peck Dam occurred. Walleye *Sander vitreus* tagged in Fort Peck Reservoir were captured in segment 2. Although we don't understand the quantity or the complete composition of fish that were entrained, some of the 2011data give us insight. More young-of-the-year (YOY) smallmouth buffalo *Ictiobus bubalus* and bigmouth buffalo *I. cyprinellus*, as well as walleye and cisco *Coregonus artedi* were sampled in segment 2 than any previous year of sampling. In addition, standard Fort Peck Dredge Cut sampling that has occurred for the past 30 years found that adult walleye were at a 14 year high, with the last peak

occurring in 1998, a year after the last spillway release. Sampling in 2012 under more “normal” flows will hopefully give us further insight into how the relative abundance and species composition of segment 2 changed from the high flows of 2011. However, it may be difficult to tie the findings back to production in the Missouri or Milk Rivers or entrainment from Fort Peck Reservoir.

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Introduction

The sampling year of 2011 in segment 2 of the Missouri River was unique in several ways, including the historic water year, the abbreviated standard sampling seasons and the relatively high flows that occurred in tandem while sampling both the sturgeon and fish community seasons. The Missouri River peaked in segment 2 on June 14th at 90,600 cfs and flows were at or above 30,000 cfs from June 3rd to August 9th. Although standard sampling did not take place during the extreme periods of flow, sampling did occur at flows that were two to three times more than during the previous five years of sampling. Due to the substantially higher than normal flows, our gear efficiencies were likely lower during 2011 than prior years. Therefore, making direct comparisons of CPUE from 2011 to previous years is cautioned.

Background

The U.S. Fish and Wildlife Service (USFWS) listed pallid sturgeon *Scaphirhynchus albus* as endangered in 1990. In response to listing, the USFWS issued a Biological Opinion to the U.S. Army Corps of Engineers (COE), the primary water management entity responsible for the Missouri River mainstem from Fort Peck Dam and Reservoir to its confluence with the Mississippi River. Additionally, an amendment to the 2000 Biological Opinion was issued in 2003. The Amendment listed several Reasonable and Prudent Alternatives (RPA) to address the inability of pallid sturgeon to naturally reproduce and the need to be able to detect changes in their populations and ecosystem trends.

The Pallid Sturgeon Population Assessment Program (program) is guided by the RPA's in the 2003 Amendment to the 2000 Biological Opinion. The program is a comprehensive monitoring plan designed to assess survival, movement, distribution, habitat use, and physical characteristics of these habitats used by wild and hatchery reared juvenile pallid sturgeon (Welker and Drobish 2011). The 2000 Biological Opinion divides the program area into river and reservoir segments and assigns high, moderate, or low priority management action to these segments for pallid sturgeon (Welker and Drobish 2011). The focus of the program is on the high priority management action segments. The Missouri River from Fort Peck Dam downstream to the headwaters of Lake Sakakawea, ND is listed as a high priority action segment.

The program has stratified the Missouri River from Fort Peck Dam to the headwaters of Lake Sakakawea into four study segments based on biological, hydrological and fluvial geomorphological characteristics. The COE contracted Montana Fish, Wildlife & Parks (FWP) to conduct program sampling from Fort Peck Dam downstream to the confluence of the Yellowstone River, which consists of study segments 1 through 3.

The objectives of this program are as follows:

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

Sampling Season and Species

This program has two discrete seasons (sturgeon and fish community), which are primarily segregated by water temperatures. However, the sturgeon season is designed to sample sturgeon with gears that are temperature dependent, such as gill nets. Due to the nature of the majority of habitats in segment 1 through 3, gill nets are not an efficient gear for collecting pallid sturgeon due to debris and swift current and therefore are not used in any segment situated in Montana. Trammel nets and otter trawl are standard gears used in segments 1-4 during sturgeon season, and appear to be an effective method to sample pallid sturgeon.

The fish community season extends from the beginning of July till the end of October and is designed not only to monitor sturgeon, but also monitor other native Missouri River fish populations. Both trammel nets and otter trawls are used during the fish community season, however mini fyke nets are added as a standard gear to more effectively sample shallow water habitats less than 1.2 m in depth and smaller bodied fishes.

Trotlines were used as an evaluation gear in 2009 to evaluate their effectiveness at capturing pallid sturgeon. Trotlines became a standard gear starting in 2010. All randomly selected river bends were sampled once with trotlines throughout the two seasons.

In addition to pallid sturgeon, the program is designed to monitor nine other native Missouri River species labeled "target" species. These include, shovelnose sturgeon *Scaphirhynchus platorynchus*, blue sucker *Cycleptus elongatus*, sauger *Sander canadense*, sturgeon chub *Macrhybopsis gelida*, sicklefin chub *M. meeki*, speckled chub *M. aestivalis*, plains minnow *Hybognathus placitus*, western silvery minnow *H. argyritis*, and sand shiner *Notropis stramineus*. This suite of species was selected for various reasons. First, some species may have similar habitat requirements as pallid sturgeon and therefore by monitoring their populations we may gain further insight into pallid sturgeon habitat and how anthropomorphic and natural changes to the Missouri River affect native fish assemblages. Secondly, it is hypothesized that various chub species and other native fishes are an important component of pallid sturgeon diet, and thereby monitoring pallid sturgeon prey will allow us to better describe their habitat. Thirdly, we wouldn't expect to see an immediate response in a long-lived species like pallid sturgeon would be difficult to measure when environmental conditions change from either favorable or detrimental conditions. Thus, by monitoring short-lived native fishes we may be able to correlate environmental conditions to changes in fish populations on a much shorter time interval and make inferences on how pallid sturgeon populations may be affected.

Study Area

Study Segment 2 of the Missouri River Pallid Sturgeon Population Assessment Program begins at the confluence of the Missouri and Milk Rivers and runs downriver 59 river miles to Wolf Point, Montana (Welker and Drobish 2011). This reach of the Missouri River is impacted by the presence and operations of Fort Peck Dam. Fort Peck Dam inhibits the natural spring pulses and distributes that water more evenly throughout the remainder of the year. Fort Peck Dam draws its water for power production from the hypolimnetic regions of Fort Peck reservoir, which are significantly colder during the summer months and warmer during the winter months, when compared to the Missouri River above the reservoir.

Fort Peck Reservoir traps the sediment loads of the Missouri River and therefore releases sediment free water to the Missouri River. This sediment free high-energy water scours the river of fine sediments and has reduced the amount of sand bars within the river.

Segment 2 is a transitional segment, which exhibits both the characteristics of the hypolimnetic water releases from Fort Peck Dam and of the warmer sediment packed waters of the Milk and Redwater Rivers. The water transitions through segment 2 from very cold and clear in the upper most reaches to warmer and more turbid in the downstream reaches near Wolf Point, MT.

The Milk River is the largest tributary in this segment and its flows can influence water temperature and discharge of the Missouri River (Kapuscinski, 2002). Throughout the spring, the Milk River forms a plume of warm turbid water that mixes with the cold clear waters of the Missouri. When the Milk River is flowing, it results in a warm turbid river on the north side of the channel and a cold clear river on the south side (Gardner and Stewart, 1987). The warm and cold waters do not generally mix until after moving 15 river miles downstream near Frazer Rapids, where the water remains relatively cold and clear (Kapuscinski, 2002). Water withdrawals for irrigation have reduced the Milk Rivers influence on the Missouri River during low water years.

Geologically, the entire segment is surrounded by the Bearpaw Shale formation, where upstream reaches are comprised of gravelly areas, which transition into sandbar habitats farther downstream near Wolf Point (NRIS, 2007). Fish distribution changes throughout the segment in accordance with turbidity, temperature, and substrate.

Methods

Sampling methods for the Pallid Sturgeon Population Assessment Program were conducted in accordance with the Standard Operating Procedures (Welker and Drobish 2011), which was established by representatives from State and Federal agencies involved with pallid sturgeon recovery on the Missouri River. For a detailed description of methodologies please see Welker and Drobish (2009). A general description of those guidelines follows.

Sampling Site Selection and Habitat Description

Montana Fish Wildlife & Parks (FWP) was contracted to sample Segment 1 from Fort Peck Dam (RM 1771.5) to the mouth of the Milk River (RM 1761), Segment 2 from the mouth of the Milk River (RM 1761) to Wolf Point (RM 1701.5) and Segment 3 from Wolf Point (RM 1701.5) to the Montana/North Dakota border (RM 1586.5). Segment 2 consisted of twelve randomly selected bends. All 12 bends were sampled during both the sturgeon season (April 5 through June 28) and the Fish Community Season (July 12 through October 12) during 2010.

Two gears, trammel net and otter trawl were considered standard gears for both the sturgeon and fish community seasons. Both trammel nets and the otter trawl were used in all 12 randomly selected bends during both seasons. Additionally, mini fyke nets were also considered a standard gear for the fish community season and all 12 randomly selected bends were sampled with mini fyke nets.

Trotlines were switched from an experimental gear to a standard gear in 2010. Twelve random trotline bends were selected by moving upstream one river bend from the 12 bends that were randomly selected for sampling by standard gears. This was done to the minimize the possibility of an attractant effect of trotlines to our standard gears and to optimize our time spent on any particular bend, since overnight trotlines require an additional trip to each sampled bend. Trotline bends were only sampled once, as opposed to standard bends, which were sampled by standard gears in both sturgeon season and fish community season. Half (N=6) were sampled with trotline in sturgeon season and half (N=6) were sampled during fish community season.

The Population Assessment Team developed a standard set of habitat classifications for the Missouri River (Appendix B) which consists of three distinct macrohabitats found in every bend, a main channel crossover (CHXO), main channel outside bend (OSB), and main channel inside bend (ISB). Each sampling bend was comprised of these three main macrohabitats. Nine additional macrohabitats were identified that may or may not be present in every bend: large tributary mouths (TRML), small tributary mouths (TRMS), confluence areas (CONF), large and small secondary connected channels (SCCL& SCCS), deranged channels (DRNG), braided channels (BRAD), dendritic channels (DEND) and non-connected secondary channel (SCN).

Mesohabitats were established to further define macrohabitats. Mesohabitats include bars (BARS), pools (POOL), channel border (CHNB), thalweg (TLWG) and island tip (ITIP). Channel borders are situated in areas between the deepest portions of the river up to a depth of 1.2 m. Bars are considered shallow areas (< 1.2 m) where terrestrial and aquatic habitats merge. The thalweg is the deepest portion of the river between the two channel borders where the majority of the flow is directed. Pools are directly downstream of any feature that creates scour, thus creating a habitat of deep (> 1.2 m) slower moving water. Island tips are just downstream of bars or islands where two channels meet where the water is > 1.2 m in depth.

For all analysis, the sampling unit was the river bend, where every river bend has a channel crossover, inside and outside bend. The downstream border of a river bend is the beginning of the next downstream bend's channel crossover.

Sampling Gear

For specific information pertaining to the specific habitats gears are utilized in and physical measurements taken in accordance with sampling the various gears described below see Welker and Drobish (2009).

Trammel Net

The standard trammel net has a length of 38.1 m, an inner mesh wall 2.4 m and two outer mesh walls 1.8 m deep. The inner mesh is made of #139 multifilament twine with a bar mesh size of 25.4 mm. The outer walls are constructed of #9 multifilament twine with a bar mesh size of 203.2 mm. The float line is a 12.7 mm diameter foam core with a lead line of 22.7 kg. Trammel nets were drifted from the bow of the boat and orientated perpendicular to the river flow for a minimum of 75 m and a maximum drift distance of 300 m.

Otter Trawl

The standard otter trawl has a length of 7.6 m, a width of 4.9 m and height of 0.9 m. The otter trawl has an inner mesh (6.35mm bar, #18 polyethylene twine) and outer mesh (38mmbar, #9 polyethylene twine) and a cod end opening of 406.4 mm. The trawl doors were made from 19.1 mm marine plywood and measured 762 mm x 381 mm. The trawl doors are used to keep the

mouth of the trawl open while deployed on the riverbed. The trawl also has a 7.9 m long tickler chain attached to the bottom of the mouth of the trawl, which aids in keeping it orientated on the riverbed and protecting the mouth when snags are encountered. The otter trawl was deployed from the bow of the boat parallel to the current with two 30.5 m ropes and towed downstream slightly faster than current speed for a minimum of 75 m and a maximum distance of 300 m.

Mini Fyke Nets

The standard mini-fyke net consists of two rectangular frames 1.2 m wide and 0.6 m high and two 0.6 m tempered steel hoops. A 4.5 m long and 0.6 m high lead is connected to the first frame. The fyke net was made of 3 mm "ace" style mesh. The lead has small floats attached to the top and lead weights on the bottom. Mini-fyke nets are set with a "T" stake on shore and extend into river as perpendicular to the shoreline as possible or angled slightly downstream where higher velocities existed. Mini-fyke nets were set overnight and checked the following morning.

Trotlines

Trotlines consisted of 32 m nylon rope attached to both upstream and downstream anchors. Octopus style circle hooks were attached to the ropes using 136 kg monofilament line and commercial fishing clips. Twenty 45.7 cm leaders were used on each trotline each with a 3/0 Eagle Claw circle hook. Trotlines were set overnight and checked the next morning.

Data Collection and Analysis

A minimum of eight random subsamples were taken in macrohabitats present at each randomly selected river bend. At least two subsamples (when possible) were taken using each gear in each macro habitat within a bend. More than two subsamples were taken in a macrohabitat for a gear when the number of discrete macrohabitats was less than four or less than four could be effectively sampled. When a pallid sturgeon was captured, we duplicated the sample in a non-random manner. No more than eight duplicates were taken and we would stop taking duplicates whenever two contiguous duplicate subsamples contain no pallid sturgeon.

Although this non-random sampling, it gives us a better understanding of relative abundance and identifies habitats that pallid sturgeon may congregate in.

All fish were measured to the nearest mm. Fork length (FL) was used for pallid and shovelnose sturgeon, while other species were measured to TL, except for paddlefish *Polyodon spathula*, which were measured from the eye to the fork in the caudal fin. The first 25 fish of each species in each subsample were measured, after 25 they were counted.

Time was recorded at the beginning of each sample with all gears and an end time was always recorded when pulling mini fyke net sets. A global positioning satellite (GPS) position was taken at the beginning and end of all otter and beam trawls and trammel net drifts. One GPS location was taken for mini fyke net samples (middle of the seine). All GPS locations were taken using a Garmin GPS 76 unit with Wide Area Augmentation System (WAAS) capability.

Sample depth was determined at the beginning, middle and end of each trawl and drift using a Lowrance X136 sonar unit. One depth was taken for mini fyke nets at the intersection of the frame and floatline using a wading rod.

Water temperature taken near the surface was recorded at every sample using the Lowrance X136 unit for trawls and trammel net drifts and using a hand held thermometer for mini fyke net and bag seine samples.

Habitat samples were collected randomly for 25% of each mesohabitat within each macrohabitat sampled. Velocities (mps) were taken at three depths in the water column for habitats > 1.2 m in depth (bottom, 0.8 of bottom depth and 0.2 of the bottom depth) using a Marsh-McBirney Flo Mate 2000. Velocities for shallow water habitats (< 1.2 m) were taken at the bottom and 0.6 of the bottom depth using the March-McBirney Flo Mate 2000.

Turbidity was recorded in nephelometeric turbidity units (NTU) using a LaMotte 2020 turbidity meter. Turbidity was taken at the midpoint of all samples, except mini fyke sets, where it was taken at the convergence of the rectangular frame and float line.

In addition to 25% of all mesohabitats, habitat measurements were taken whenever a pallid sturgeon was captured.

Genetic Verification

Genetic verification for pallid sturgeon or potential hybrids followed the methods outlined in Welker and Drobish (2009). Two fin pectoral fin clips (~ 2 cm^2) are taken from any

pallid sturgeon of unknown origin. Fin samples are then preserved in 95% non-denatured alcohol for genetic analysis. All samples are sent to the U.S. Fish and Wildlife Service's Lamar Laboratory for analysis and archiving.

Relative Condition

Relative condition (Kn) for all sampled pallid sturgeon was calculated using the following formula: Kn = W / W', where W is the fork length of the specimen and W' is the length-specific mean weight predicted by the weight-length relationship equation calculated for that population. Since no weight length-relationship exists for the hatchery reared pallid sturgeon population in segment 2, we used relative condition factor calculated by Shuman et al. (2011).

Size Classes of Pallid and Shovelnose Sturgeon

We used the length categories proposed by Shuman et al. (2006) for pallid sturgeon and Quist et al. (1998) for shovelnose sturgeon when looking at the total proportion of fish captured by length. Additionally, we broke up sub-stock sizes for both pallid and shovelnose into two groups to aid in determining recruitment of young-of-the-year (YOY) sturgeon. Fork length categories for both species of sturgeon are given in all figures and tables pertaining to size classes.

Analyses

The fundamental sampling unit for the Population Assessment Program is the river bend. Therefore, sample size was equal to the number of bends sampled. Accordingly, all catch-per-unit-effort (CPUE) estimates for each species by gear were made on a bend level and the mean bend CPUE's were averaged to obtain the segment CPUE. Catch-per-unit-effort was stratified by season, depending on the analysis. In addition, stratification by macro- and mesohabitats was performed for each species. All CPUE estimates were performed by the Missouri Department of Conservation.

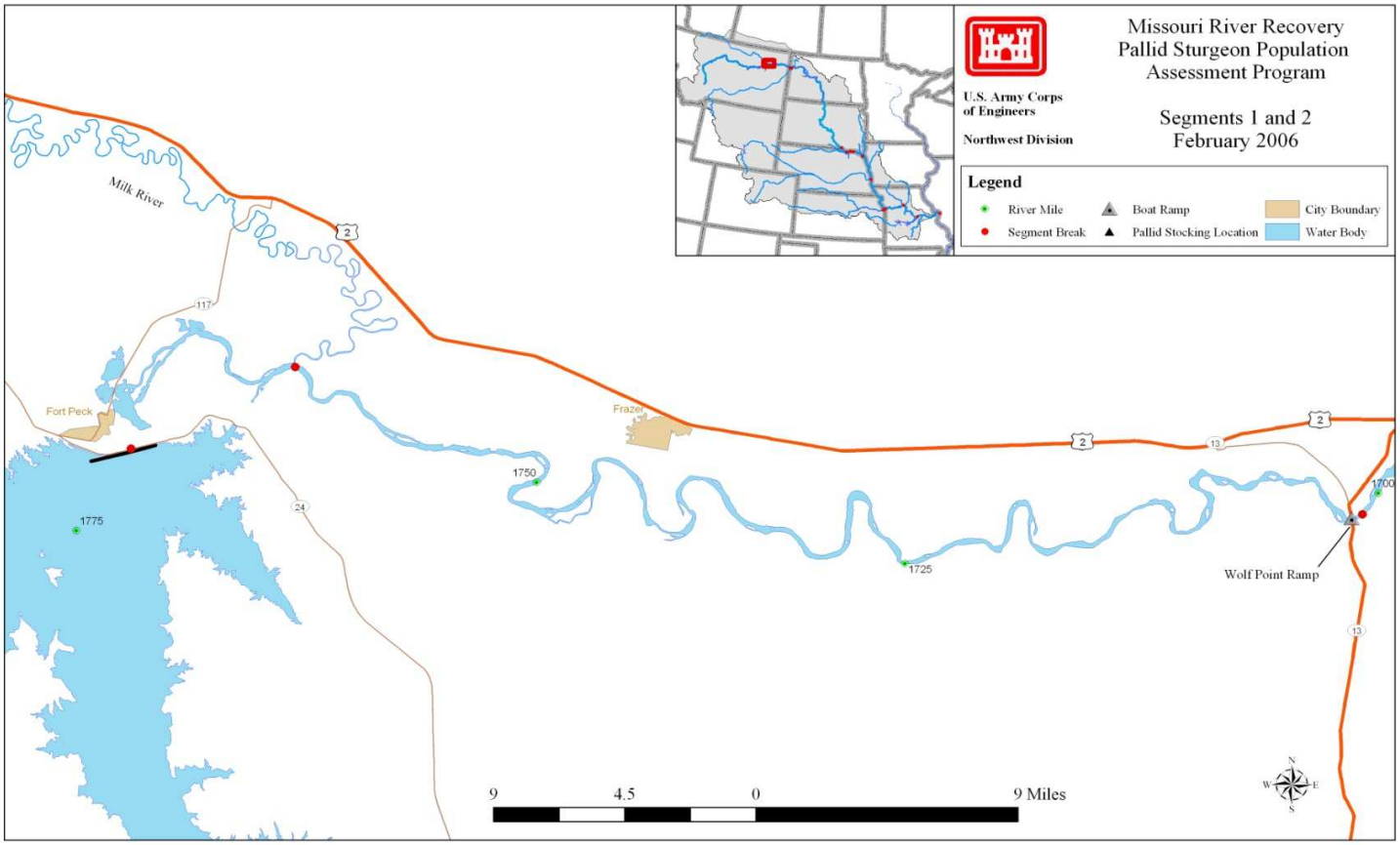

Figure 1. Map of Segment 2 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 2 encompasses the Missouri River from the mouth of the Milk River (River Mile 1761.5) to Wolf Point, MT (River Mile 1701.5).

Results

Effort

In 2011 seven river bends were sampled in segment 2 during sturgeon season (Table 1). Each bend averaged 8.29 deployments for both trammel net and otter trawl, respectively. During fish community season 10 bends were sampled using trammel net, averaging 7.3 deployments per bend, while seven bends were sampled using the otter trawl, averaging 8 deployments per bend. Eight bends were also sampled during fish community season using mini-fyke nets averaging 7.13 deployments per bend. Trotlines were used across both seasons with six bends being sampled and averaging 8 deployments per bend.

Trammel net deployments (N=135) in segment 2 in 2011 accounted for 34.5 km of sampling, 33.6 km of that being for random sampling, while an additional 0.9 km accounted for non-random duplicate sampling. Otter trawl deployments (N=122) resulted in 33.5 km of sampling, 31.4 km of random sampling and 2.1 km of non-random duplicate sampling.

Trotlines were again treated as a standard gear in segment 2 for 2011, as they were in 2010. Each bend was chosen by selecting the immediate adjacent upstream bend for each random bend selected, allowing for each bend to be sampled on the same day trawling and drifting occurred. A total six bends were sampled with the deployment of 8 trotlines per bend, each containing 20 hooks, resulting in the total of 960 hooks being deployed in segment 2 in 2011.

Pallid Sturgeon

Standard sampling within segment 2 during 2011 resulted in the capture of 25 hatchery-reared juvenile pallid sturgeon, which was a substantial decrease of the all time high captured in 2010 (n = 43). However, it was still the third most observed in the six years of sampling (Figure 9). To date, no wild pallid sturgeon have been captured in segment 2. Of the total, nine pallid sturgeon were captured during sturgeon season and16 during the fish community season. Trammel nets captured 10 pallid sturgeon while trotlines and other trawls captured 9 and 6, respectively. Pallid sturgeon were observed throughout segment 2, with some “hotspots” representing the majority of captures, 12 coming from river mile 1722 and five captures at river mile 1747.

While the total number of pallid sturgeon captured was down in 2011 when compared to 2010, CPUE for both trammel nets and trotlines increased. Combined trammel net CPUE was at a six year high of 0.025 fish/100m during 2011(Figure 5). Trammel net CPUE continued to remain variable for the sturgeon season. No pallid sturgeon were captured during the sturgeon season, similar to both 2006 and 2008. However, trammel net CPUE during fish community season reached an all time high of 0.045 fish/100 m.

Contrary to trammel nets, overall otter trawl CPUE dipped slightly in 2011 (0.024 fish/100 m) when compared to 2010, which was at a high of 0.038 fish/100 m (Figure 6). However, total otter trawl CPUE was comparable to years prior to 2010. Although the otter trawl CPUE during sturgeon season was at a six year high of 0.046 fish/100 m in 2011, no pallid sturgeon were captured during the fish community season, which was a first since the program began in 2006.

Trotlines were once again an important sampling tool for segment 2 in 2011, resulting in the capture of 36% (N=9) of the pallid sturgeon catch (Figure 7). Trotline CPUE for combined seasons increased from 0.13 fish/20 hooks in 2010 to 0.19 fish/20 hooks in 2011. CPUE also increased in each season from 2010. Trotline CPUE during sturgeon season increased from 0.08 fish/20 hooks in 2010 to 0.13 fish/20 hooks in 2011, while fish community trotline CPUE increased from 0.17 fish/20 hooks to 0.25 fish/20 hooks.

A total of seven year classes were capture in segment 2 in 2011 (Figure 2). Year classes captured ranged from 2001 (N=1) to 2010 (N=1), with the most abundant year class sampled being 2009. Other year classes include 2005 (N=2), 2006 (N=3), 2007 (N=1) and 2008 (N=5) (Table 3). The 2009 year class accounted for 48% of pallid sturgeon captures. The size structure of pallid sturgeon in segment 2 has slightly changed over the past size years, with more stock size fish being captured and less sub-stock sized fish (Figure 3). In addition, the average size has increased slightly in consecutive years to 369 mm in length and 186 g in weight during 2011. However, the population continues to be dominated by individuals less than 400 mm (Figure 8). Pallid sturgeon in segment 2 in 2011 ranged from 278 mm and 82 g to 625 mm and 800 g. Pallid sturgeon specific year classes are often smaller than fish of the same cohort in other segments. For example, in downstream segment 3 pallid sturgeon averaged 383 mm and 233 g during 2011.

The relative condition (Kn) factor of pallid sturgeon in segment 2 are shown in figure 4. After a three year decline in the relative condition of sub-stock (200-329 mm) sized pallid

sturgeon an increase was observed in 2011. The relative condition of the stock class has continued to show slight improvement since 2009. Pallid sturgeon in the sub-stock (0-199 mm) and greater than stock categories, respectively, were not sampled in segment 2 druing 2011. No fish from the quality or greater categories have been sampled in segment 2 since the Program's inception in 2006.

Of the 25 pallid sturgeon captured in segment 2 during 2011, 23 were of known stocking location. Twenty-two of fish with known stocking locations were stocked in segment 2 while one was stocked in the Yellowstone River at Forsyth. The largest proportion of fish (N=10) captured were stocked at Wolf Point, followed by School Trust (N=7) and Culbertson (N=5). The majority (70%) exhibited net upstream movement. Net upstream movement averaged 77.2 river miles, with the largest upstream movement (415.5 river miles) observed from the fish stocked at Forsyth in 2008. Seven fish exhibited net downstream movements with a much smaller net movement average (19.3 river miles), with the largest net downstream movement of 58.5 river miles from a fish stocked at School Trust in 2010.

The specific habitat measurements for pallid sturgeon captured in random deployments by macro and meso habitat is displayed in Table 2. Additionally, Table 4 through 7 shows the number of pallid sturgeon captured by random deployments by gear and macro habitat, as well aseffort expended in those macro habitats.

Table 1. Number of bends sampled, mean number of deployments, and total number of deployments by macrohabitat for Segment 2 on the Missouri River during the sturgeon season and fish community season in 2011.

Gear	Number of Bends	Mean deploy-ments	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season										
1.0” Trammel Net	7	8.29	15	2	20	16	3	0	0	2
Otter Trawl	7	8.29	19	2	19	14	2	0	0	2
Fish Community Season										
1.0” Trammel Net	10	7.3	20	2	27	20	4	0	0	0
Mini-Fyke Net	8	7.13	12	0	20	3	0	16	4	2
Otter Trawl	7	8	17	0	21	14	2	0	0	2
Both Seasons										
Trot Lines	6	8	14	3	19	9	0	0	3	0

[a] Habitat abbreviations and definitions presented in Appendix B.

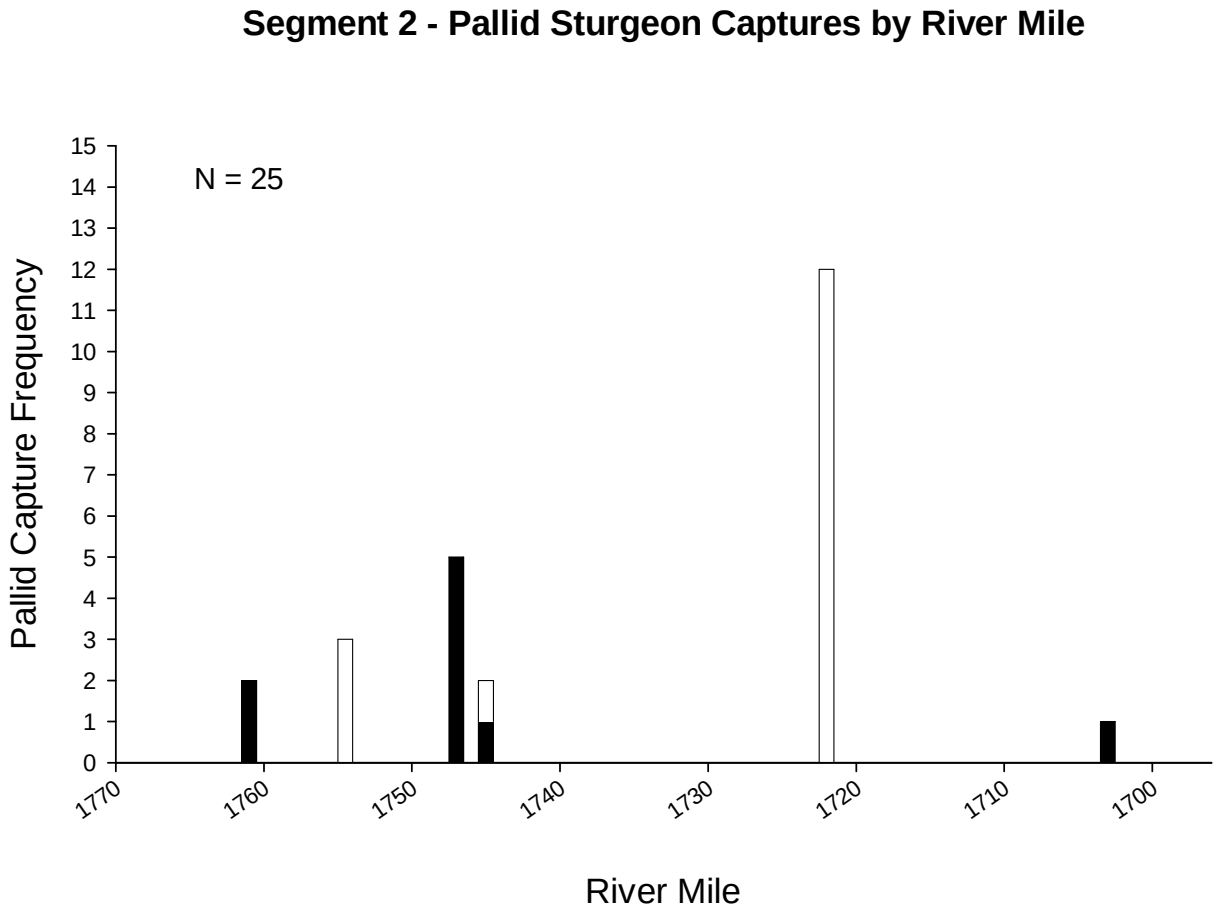

Figure 2. Distribution of pallid sturgeon captures by river mile for Segment 2 of the Missouri River during 2011. White bars represent wild pallid sturgeon captures, gray bars represent hatchery-reared pallid sturgeon and cross-hatched bars represent unknown pallid sturgeon. Figure includes all pallid captures including non-random and wild samples

Table 2. Pallid sturgeon capture summaries for all gears relative to habitat type and environmental variables on the Missouri River during 2011. Means (minimum and maximum) are presented. Habitat definitions and codes presented in Appendix B. Table includes all pallid sturgeon captures including non-random samples.

Macro	Meso	Depth(m) (Effort)	Depth(m) (catch)	Bottom Velocity (m/s) (Effort)	Bottom Velocity (m/s) (catch)	Temp. (Effort)	Temp. (catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (catch)	Total Pallids caught
CHXO	BARS	0.5 (0.2-0.7)		0.00 (0.00-0.00)		14.7 (13.0-18.5)		29 (14-47)		.
	CHNB	2.8 (1.0-5.1)	4.0 (3.6-4.5)	0.77 (0.29-1.00)	0.75 (0.75-0.75)	12.3 (4.2-22.0)	14.4 (10.1-17.8)	414 (13-1774)	300 (19-580)	5
CONF	CHNB	2.8 (1.7-4.2)	2.4 (2.4-2.4)	0.75 (0.73-0.77)	. (.-.)	10.9 (10.3-11.6)	10.5 (10.5-10.5)	583 (583-583)	. (.-.)	1
ISB	BARS	0.4 (0.2-0.6)		0.01 (0.00-0.03)		15.9 (12.9-19.0)		30 (13-50)		.
	CHNB	2.5 (1.0-5.0)	2.4 (1.4-3.3)	0.77 (0.46-1.04)	0.67 (0.46-0.90)	12.5 (4.2-21.1)	12.6 (9.1-15.9)	388 (13-1448)	303 (17-735)	9
OSB	BARS	0.6 (0.5-0.6)		0.00 (0.00-0.00)		16.5 (13.0-20.9)		35 (14-55)		.
	CHNB	3.2 (1.6-6.1)	3.9 (3.3-4.6)	0.75 (0.41-1.36)	0.63 (0.63-0.63)	12.0 (4.2-20.0)	13.5 (13.5-13.5)	391 (18-1830)	24 (24-24)	9
SCCL	BARS	0.4 (0.3-0.6)		. (.-.)		20.8 (20.1-22.0)		. (.-.)		.
	CHNB	2.6 (1.1-4.8)	2.8 (2.8-2.8)	0.52 (0.25-0.69)	0.46 (0.46-0.46)	11.4 (6.0-18.6)	6.0 (6.0-6.0)	431 (18-1040)	1040 (1040-1040)	1
SCCS	BARS	0.5 (0.3-0.8)		0.03 (0.00-0.08)		17.7 (15.9-22.0)		25 (14-50)		.
SCN	BARS	0.4 (0.3-0.5)		0.00 (0.00-0.00)		14.7 (13.0-16.8)		17 (14-19)		.
	CHNB	3.0 (2.6-3.4)		. (.-.)		18.4 (18.3-18.5)		. (.-.)		.
TRML	BARS	0.6 (0.6-0.6)		0.00 (0.00-0.00)		17.6 (17.6-17.6)		49 (49-49)		.
	CHNB	3.5 (2.4-4.0)		0.44 (0.43-0.44)		13.5 (10.5-19.0)		439 (25-646)		.

Table 3. Mean fork length, weight, relative condition factor (Kn) and absolute growth rates for hatchery-reared pallid sturgeon captures by year class at the time of stocking and recapture during 2011 from Segment 2 of the Missouri River. Relative condition factor was calculated using the equation in Shuman et al. (2011). Table includes all hatchery-reared pallid sturgeon captures including non-random and wild samples.

Year Class	N	Length (mm)	Weight (g)	Kn	Length (mm)	Weight (g)	Kn	Length (mm/d)	Weight (g/d)
2001	1	.	.	.	625	800	0.786	.	.
.	.	.	.	.	.	.	.	.	.
2005	2	.	.	.	396	251.5	1.141	.	.
.	.	.	.	.	41	73	0.064	.	.
2006	3	.	.	.	362	144.7	0.879	.	.
.	.	.	.	.	16	34.7	0.084	.	.
2007	1	.	.	.	368	179	1.041	.	.
.	.	.	.	.	.	.	.	.	.
2008	5	272	67	1.075	369	168.4	0.944	0.09	0.073
.	.	.	.	.	33	47.3	0.054	.	.
2009	12	272	75.8	1.132	346	147.6	1.009	0.192	0.178
.	.	25	23.8	0.057	30	36.4	0.066	0.025	0.046
2010	1	305	67	0.732	353	128	0.856	0.302	0.384
.	.	.	.	.	.	.	.	.	.

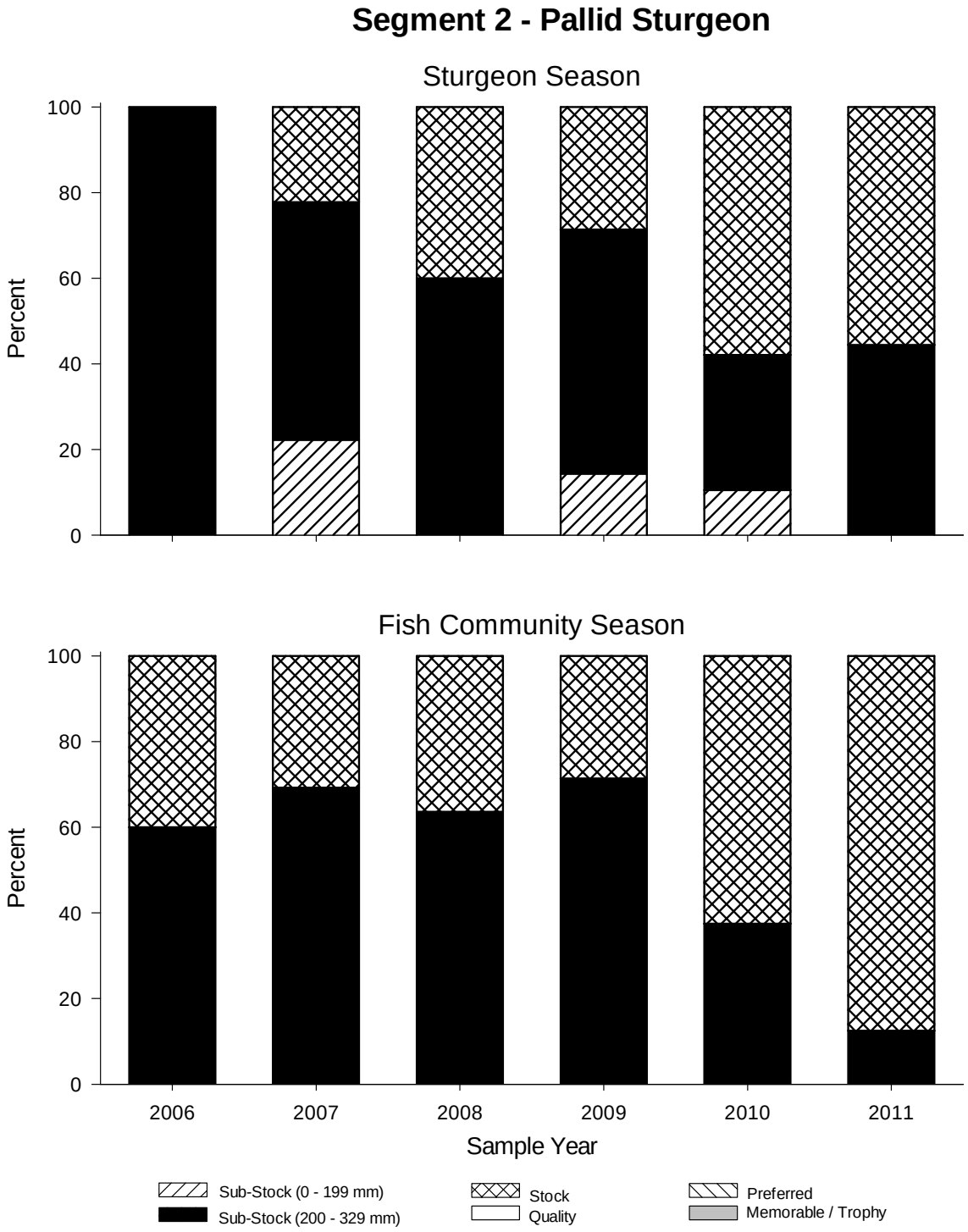

Figure 3. Proportion of total catch for all pallid sturgeon captured with all gear by length category from 2006-2009 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Shuman et al. (2006).

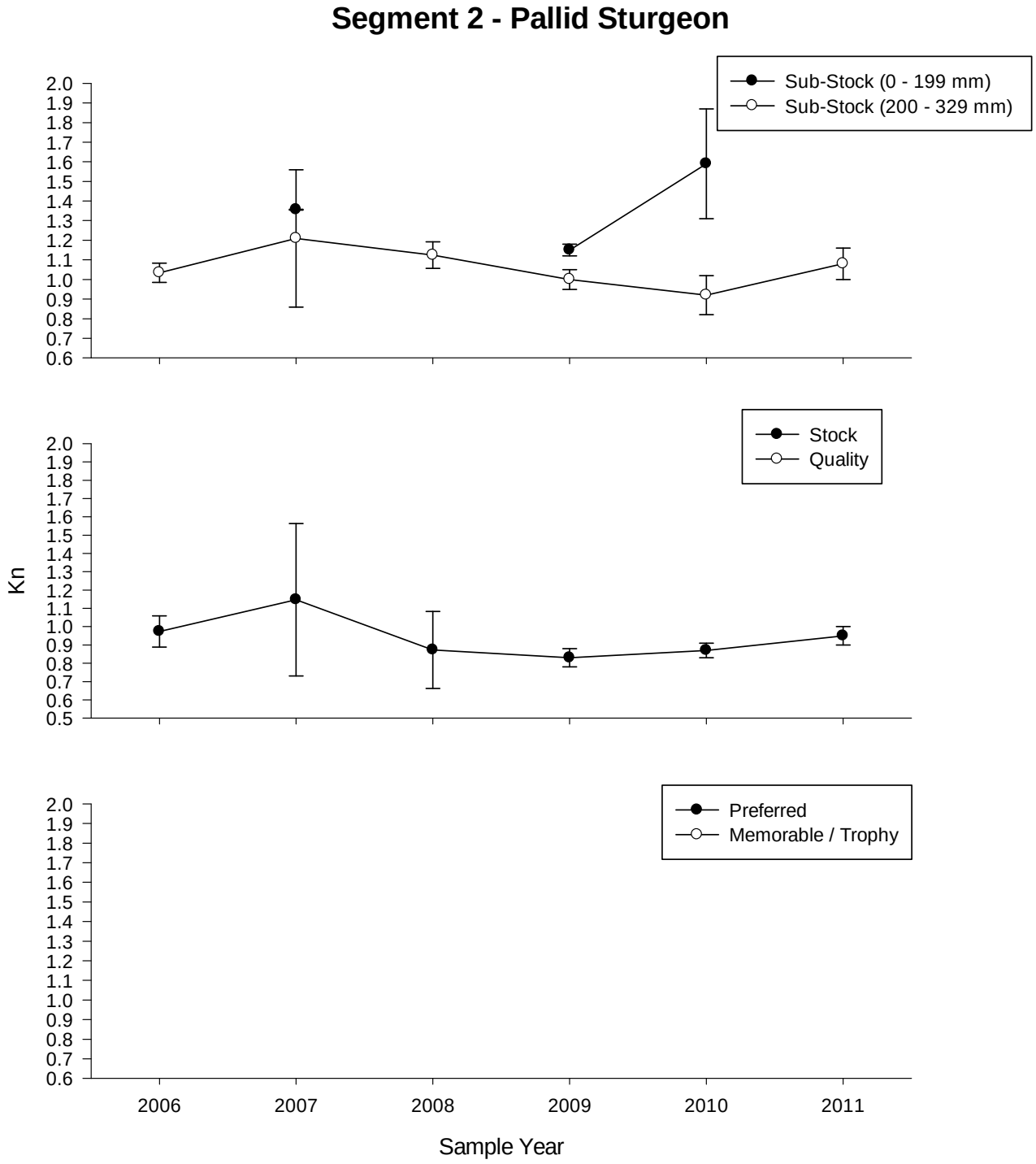

Figure 4. Relative condition factor (Kn) for all pallid sturgeon captured with all gear by incremental relative stock density (RSD) length category from 2006-2011 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Shuman et al. (2006). Relative condition factor was calculated using the equation in Shuman et al. (2011).

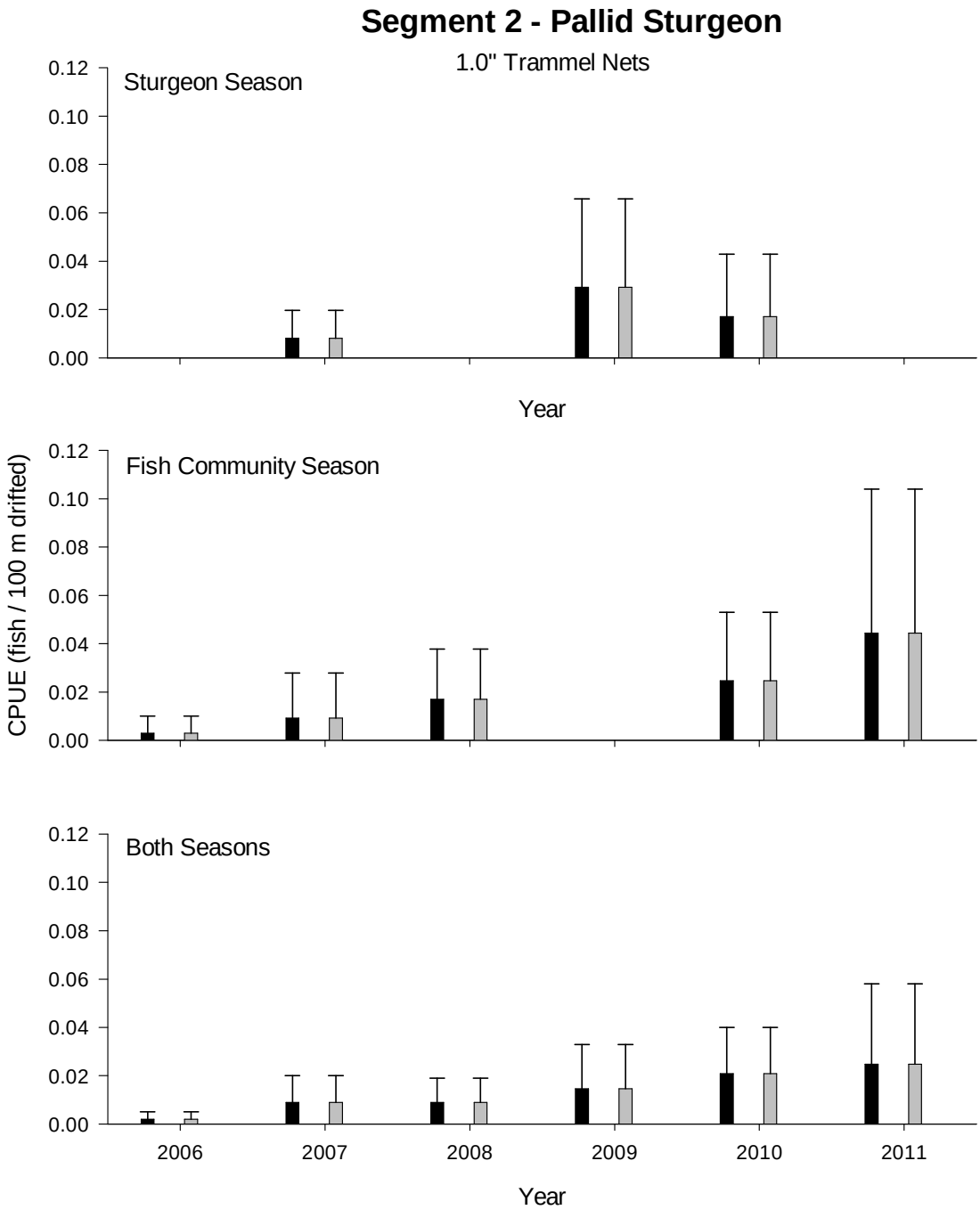

Figure 5. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using 1.0" trammel nets in Segment 2 of the Missouri River from 2006-2011. Pallid sturgeon of unknown origin are awaiting genetic verification.

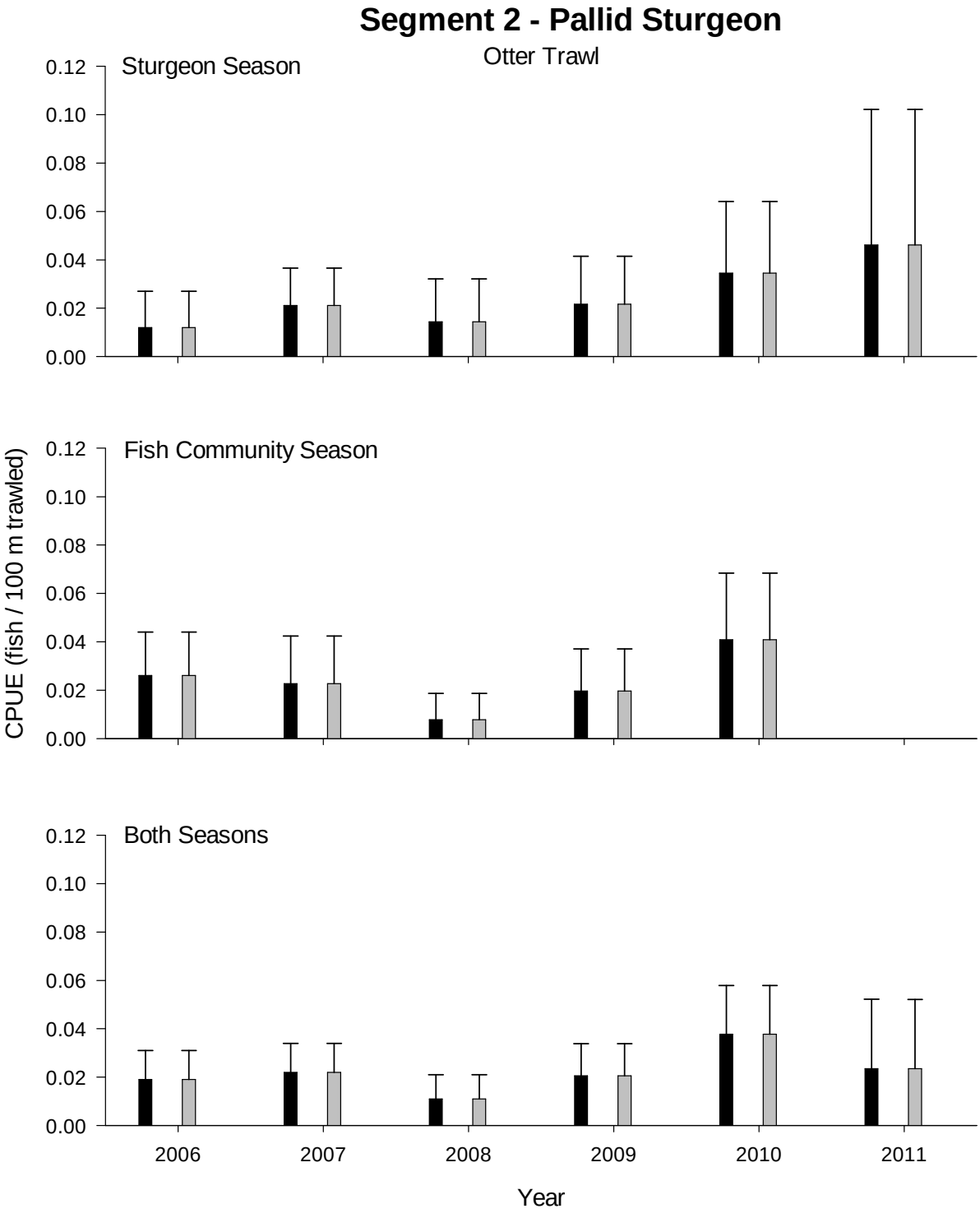

Figure 6. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using otter trawls in Segment 2 of the Missouri River from 2006-2011.

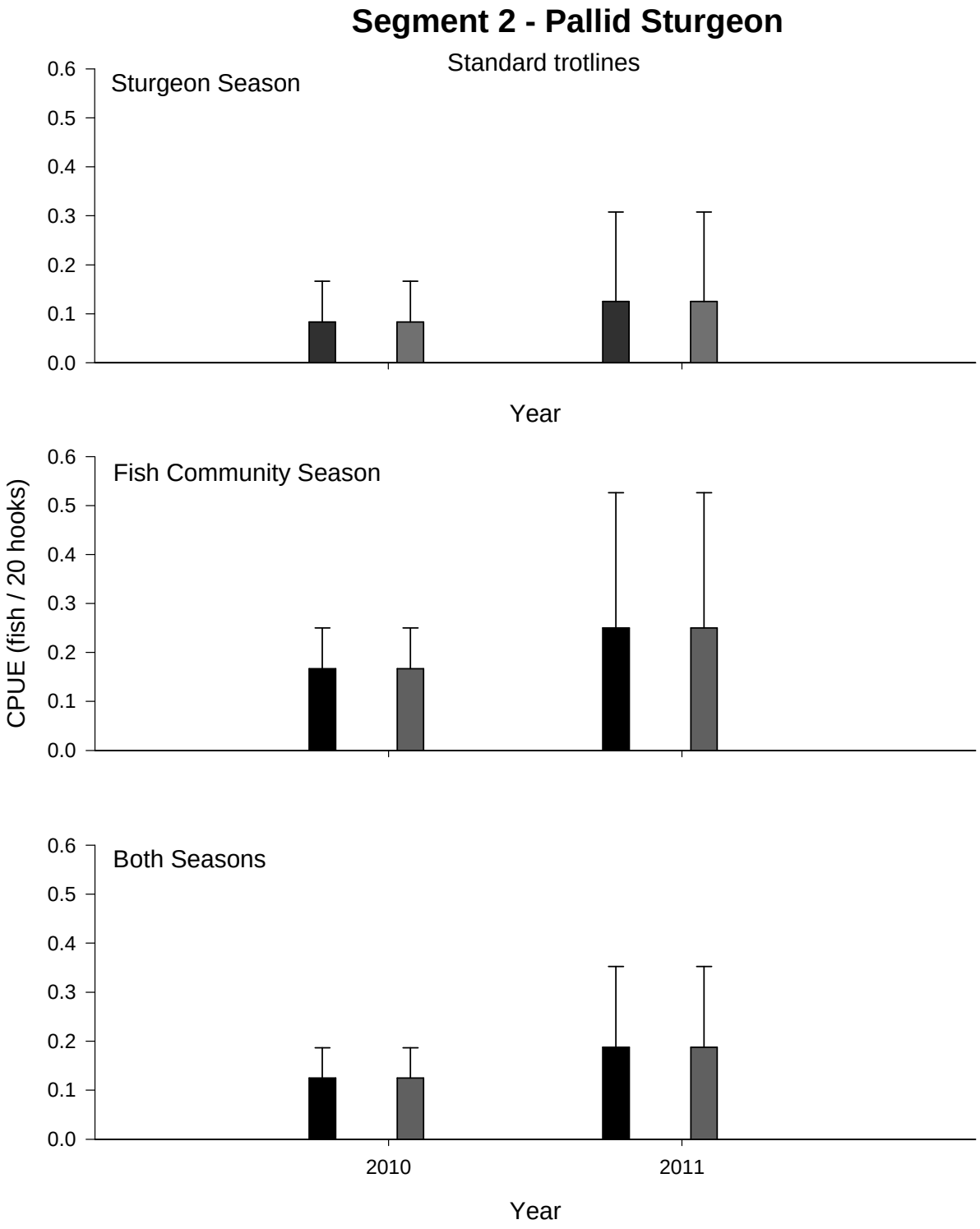

Figure 7. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using trot lines in Segment 2 of the Missouri River from 2009-2011.

Table 4. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2011. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	Macrohabitat[a]								
		BRAD	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season										
1.0” Trammel Net	0	0	0	0	0	0	0	0	0	0
		0	27	3	35	28	3	0	0	4
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		0	32	4	33	24	3	0	0	4
Fish Community Season										
1.0” Trammel Net	0	0	0	0	0	0	0	0	0	0
		0	31	2	36	27	4	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0
		0	21	0	35	5	0	28	7	4
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		0	31	0	38	25	4	0	0	2
Both Seasons										
Trot Lines	0	0	0	0	0	0	0	0	0	0
		0	29	6	40	19	0	0	6	0

Table 5. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2011. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0" Trammel Net	0	0	0	0	0	0	0	0	0
		27	3	35	28	3	0	0	4
Otter Trawl	3	33	0	33	0	33	0	0	0
		32	4	33	24	3	0	0	4
Fish Community Season									
1.0" Trammel Net	0	0	0	0	0	0	0	0	0
		31	2	36	27	4	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		21	0	35	5	0	28	7	4
Otter Trawl	0	0	0	0	0	0	0	0	0
		31	0	38	25	4	0	0	2
Both Seasons									
Trot Lines	1	0	100	0	0	0	0	0	0
		29	6	40	19	0	0	6	0

Table 6. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2011. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		27	3	35	28	3	0	0	4
Otter Trawl	3	67	0	33	0	0	0	0	0
		32	4	33	24	3	0	0	4
Fish Community Season									
1.0” Trammel Net	7	14	0	0	86	0	0	0	0
		31	2	36	27	4	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		21	0	35	5	0	28	7	4
Otter Trawl	0	0	0	0	0	0	0	0	0
		31	0	38	25	4	0	0	2
Both Seasons									
Trot Lines	8	13	0	88	0	0	0	0	0
		29	6	40	19	0	0	6	0

Table 7. Total number of quality size and greater (≥630 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2011. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		27	3	35	28	3	0	0	4
Otter Trawl	0	0	0	0	0	0	0	0	0
		32	4	33	24	3	0	0	4
Fish Community Season									
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		31	2	36	27	4	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		21	0	35	5	0	28	7	4
Otter Trawl	0	0	0	0	0	0	0	0	0
		31	0	38	25	4	0	0	2
Both Seasons									
Trot Lines	0	0	0	0	0	0	0	0	0
		29	6	40	19	0	0	6	0

Table 8. Total number of pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2011. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		27	3	35	28	3	0	0	4
Otter Trawl	6	50	0	33	0	17	0	0	0
		32	4	33	24	3	0	0	4
Fish Community Season									
1.0” Trammel Net	7	14	0	0	86	0	0	0	0
		31	2	36	27	4	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		21	0	35	5	0	28	7	4
Otter Trawl	0	0	0	0	0	0	0	0	0
		31	0	38	25	4	0	0	2
Both Seasons									
Trot Lines	9	11	11	78	0	0	0	0	0
		29	6	40	19	0	0	6	0

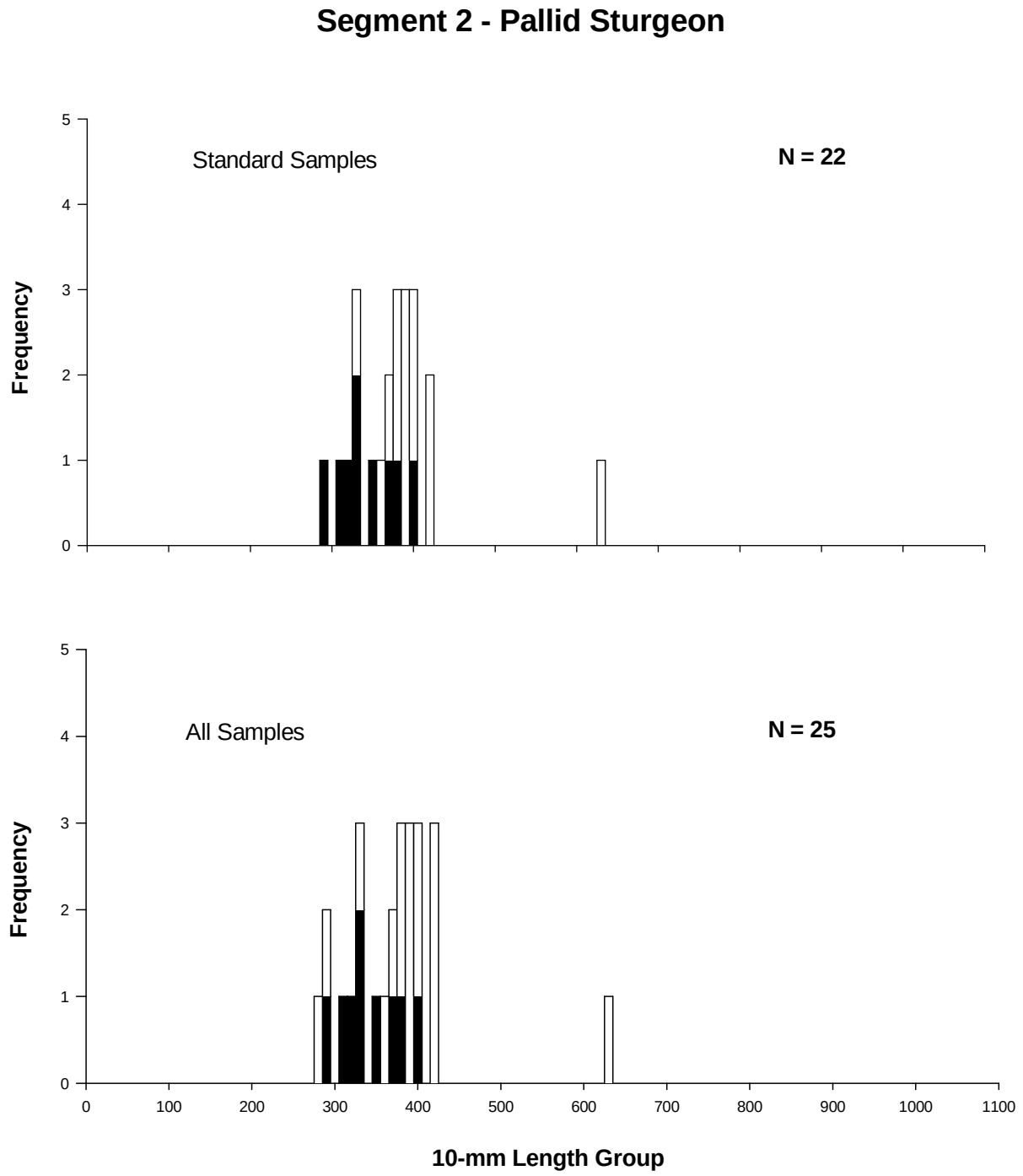

Figure 8. Length frequency of pallid sturgeon captured in Segment 2 of the Missouri River during 2011. White bars represent wild pallid sturgeon captures, gray bars represent hatchery-reared pallid sturgeon and cross-hatched bars represent unknown pallid sturgeon. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2011.

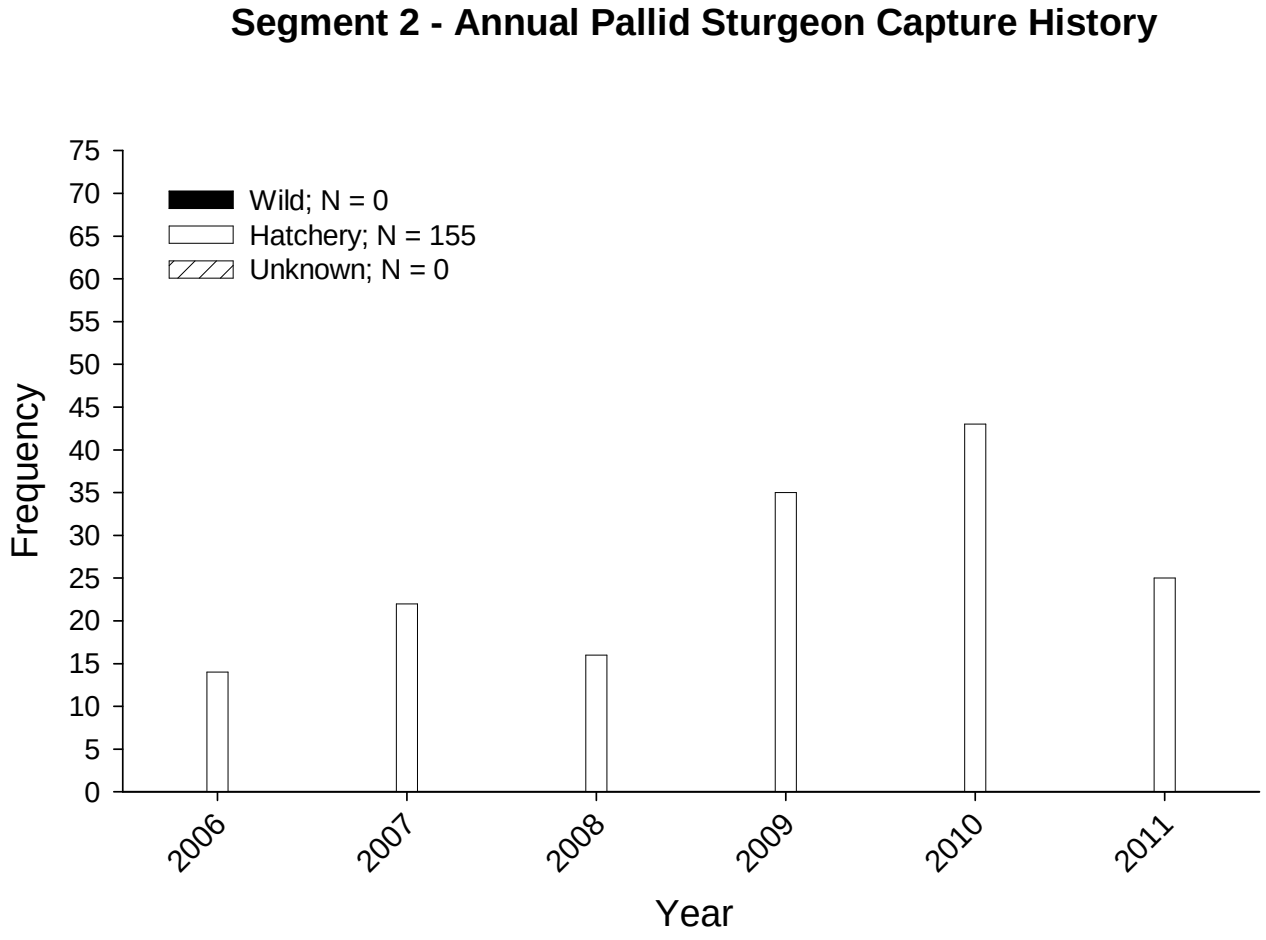

Figure 9. Annual capture history of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon collected in Segment 2 of the Missouri River from 2006-2011. Figure is designed to compare overall pallid sturgeon captures from year to year and is biased by variable effort among years. Figure includes all pallid captures including non-random and wild samples.

Shovelnose X Pallid Sturgeon Hybrids

No shovelnose sturgeon x pallid sturgeon hybrids were collected in segment 2 from 2006-2011.

Targeted Native River Species

Shovelnose Sturgeon

The total catch of shovelnose sturgeon in segment 2 for 2011 (n =419) dropped considerably when compared to 2010 (n =1,085), which was an all time high. Of the 419 shovelnose sturgeon captures, 44% were sampled during sturgeon season, while 56% were sampled during fish community season. Trammel nets, otter trawls and trotlines accounted for 34%, 35% and 31% of the catch, respectively.

CPUE for quality and above sized shovelnose sturgeon as shown in Figure 10 decreased for both trammel net (0.41 fish/100 m compared to 1.03 fish/100 m) as well as trotlines (2.75 fish/20 hooks compared to 5.0 fish/20 hooks) when comparing 2011 and 2010 (Figure 12). While otter trawl CPUE for quality and above sized shovelnose sturgeon stayed essentially equal (Figure 11). Some of the decline in total shovelnose sturgeon captures can be attributed to the decline in CPUE for trammel net and trotline since those gear accounted for 65% of the captures in 201, but most was due to less effort. Stock size CPUE remains very minimal due to the low captures of fish in that size category. The otter trawl is the only gear that captures stock size fish, while fish below stock size remain undetected in segment 2.

Shovelnose sturgeon captured in segment 2 in 2011 averaged 591 mm and 854 g. The population of shovelnose in segment 2 continues to be comprised of mostly older, larger fish, with very few individuals under 400 mm (Figure 13). Relative weight showed a slight increase among all size categories observed, with the most appreciative increase occurring in both the preferred and memorable/trophy categories (Figure 15).

The specific macro habitats where shovelnose sturgeon were sampled by gear and size class is depicted in Tables 9-12. Table 13 shows the total number of shovelnose sampled by gear and macro habitat.

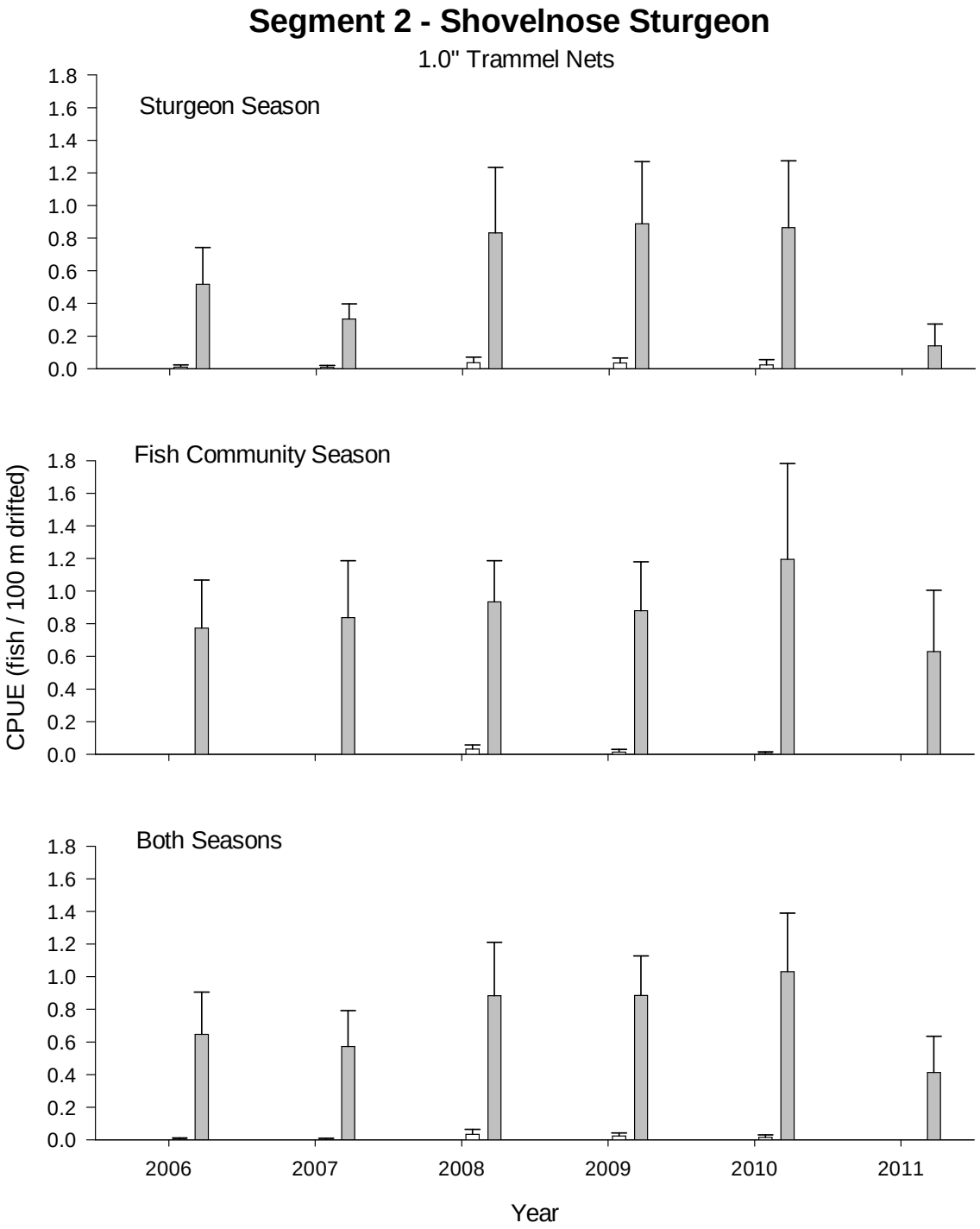

Figure 10. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using 1.0" trammel nets in Segment 2 of the Missouri River from 2006-2011.

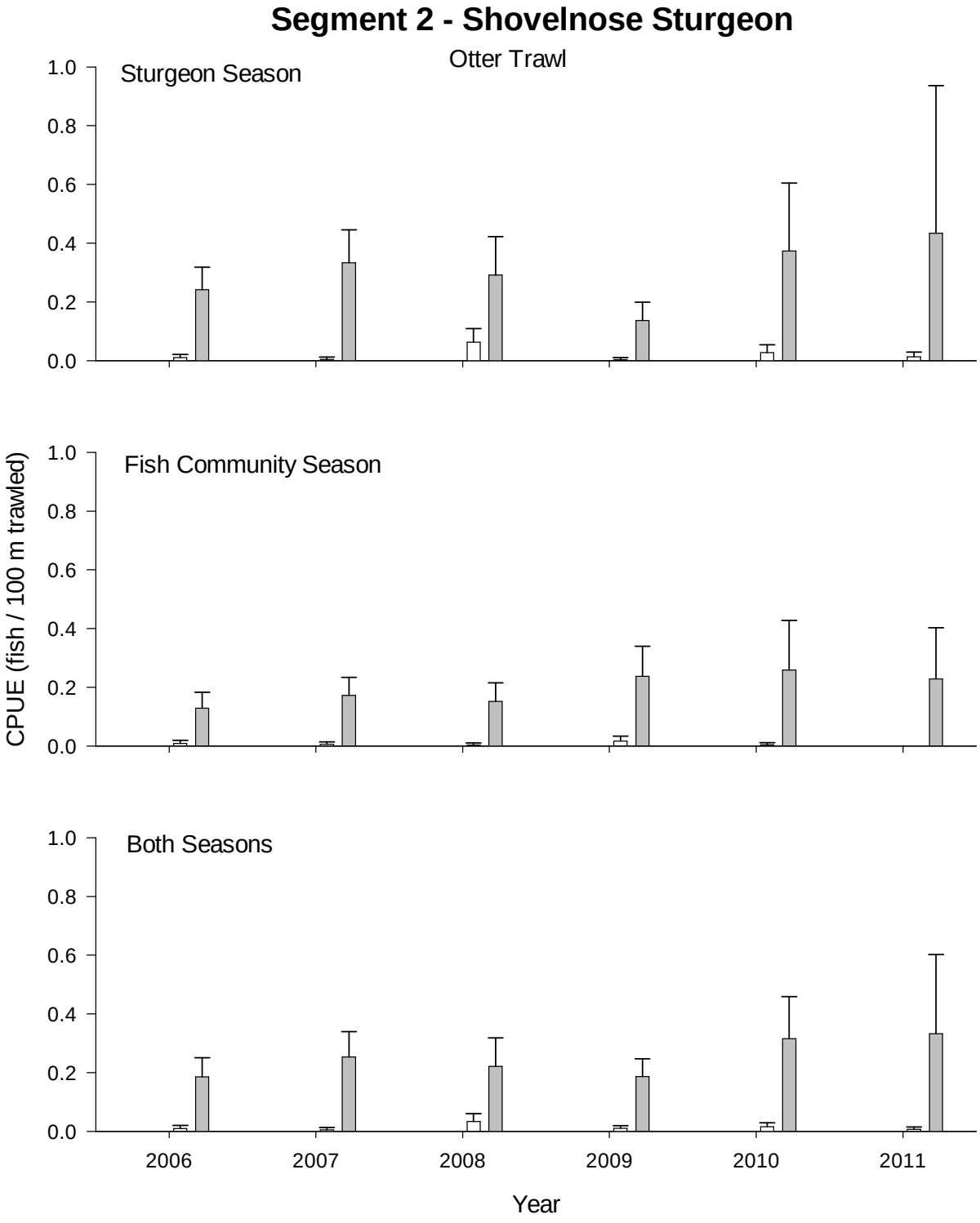

Figure 11. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using otter trawls in Segment 2 of the Missouri River from 2006-2011.

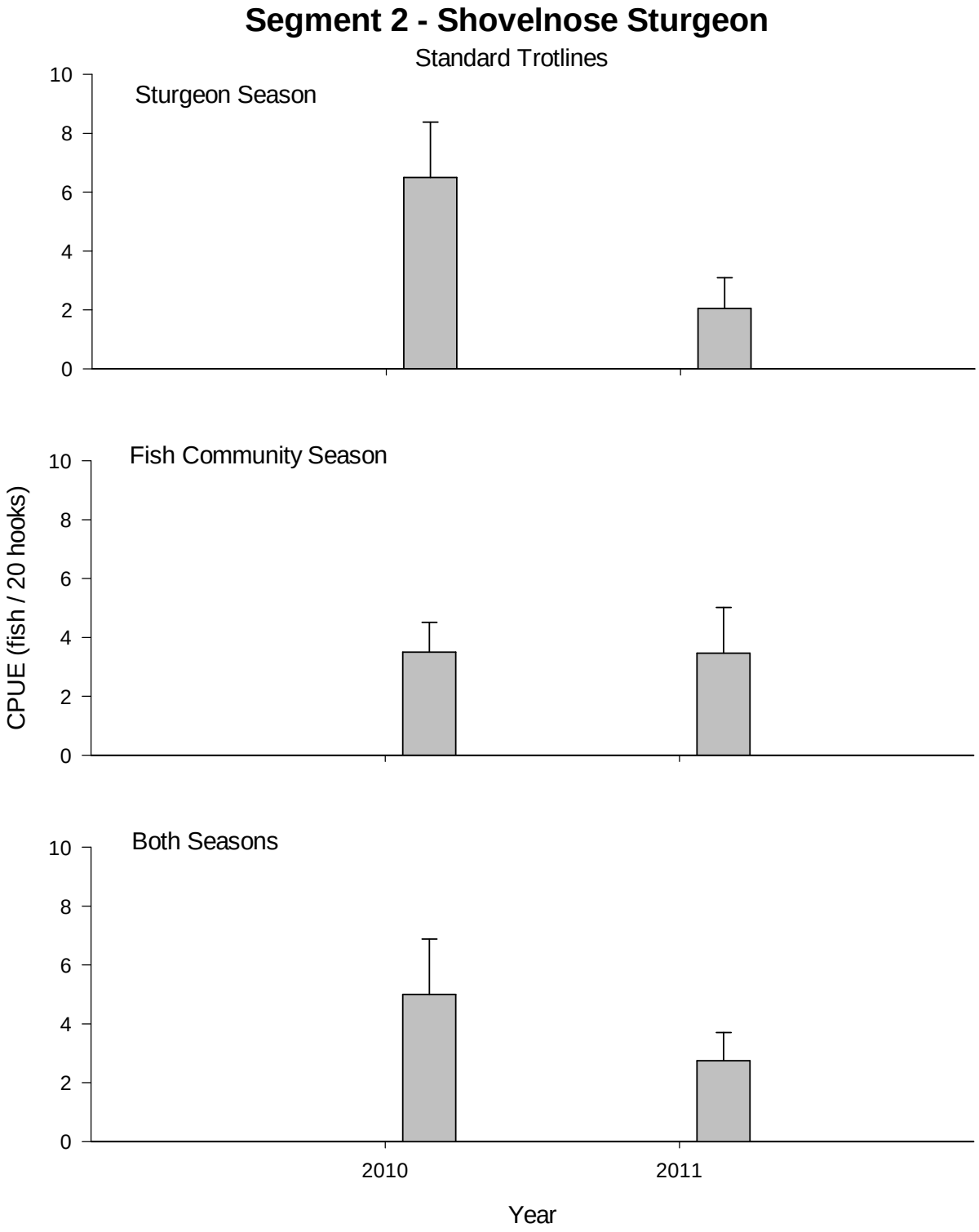

Figure 12. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using trot lines in Segment 2 of the Missouri River from 2009-2011.

Table 9. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2011. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0" Trammel Net	0	0	0	0	0	0	0	0	0
		27	3	35	28	3	0	0	4
Otter Trawl	0	0	0	0	0	0	0	0	0
		32	4	33	24	3	0	0	4
Fish Community Season									
1.0" Trammel Net	0	0	0	0	0	0	0	0	0
		31	2	36	27	4	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		21	0	35	5	0	28	7	4
Otter Trawl	0	0	0	0	0	0	0	0	0
		31	0	38	25	4	0	0	2
Both Seasons									
Trot Lines	0	0	0	0	0	0	0	0	0
		29	6	40	19	0	0	6	0

Table 10. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2011. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		27	3	35	28	3	0	0	4
Otter Trawl	0	0	0	0	0	0	0	0	0
		32	4	33	24	3	0	0	4
Fish Community Season									
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		31	2	36	27	4	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		21	0	35	5	0	28	7	4
Otter Trawl	0	0	0	0	0	0	0	0	0
		31	0	38	25	4	0	0	2
Both Seasons									
Trot Lines	0	0	0	0	0	0	0	0	0
		29	6	40	19	0	0	6	0

Table 11. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2011. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		27	3	35	28	3	0	0	4
Otter Trawl	2	50	0	50	0	0	0	0	0
		32	4	33	24	3	0	0	4
Fish Community Season									
1.0” Trammel Net	0	0	0	0	0	0	0	0	0
		31	2	36	27	4	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		21	0	35	5	0	28	7	4
Otter Trawl	0	0	0	0	0	0	0	0	0
		31	0	38	25	4	0	0	2
Both Seasons									
Trot Lines	0	0	0	0	0	0	0	0	0
		29	6	40	19	0	0	6	0

Table 12. Total number of quality size and greater (≥380 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2011. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	22	18	0	64	14	5	0	0	0
		27	3	35	28	3	0	0	4
Otter Trawl	66	15	0	79	2	3	0	0	2
		32	4	33	24	3	0	0	4
Fish Community Season									
1.0” Trammel Net	103	7	2	62	29	0	0	0	0
		31	2	36	27	4	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		21	0	35	5	0	28	7	4
Otter Trawl	32	44	0	44	13	0	0	0	0
		31	0	38	25	4	0	0	2
Both Seasons									
Trot Lines	132	21	10	47	22	0	0	0	0
		29	6	40	19	0	0	6	0

Table 13. Total number of shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2011. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	22	18	0	64	14	5	0	0	0
		27	3	35	28	3	0	0	4
Otter Trawl	68	16	0	78	1	3	0	0	1
		32	4	33	24	3	0	0	4
Fish Community Season									
1.0” Trammel Net	103	7	2	62	29	0	0	0	0
		31	2	36	27	4	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		21	0	35	5	0	28	7	4
Otter Trawl	32	44	0	44	13	0	0	0	0
		31	0	38	25	4	0	0	2
Both Seasons									
Trot Lines	132	21	10	47	22	0	0	0	0
		29	6	40	19	0	0	6	0

Segment 2 - Shovelnose Sturgeon

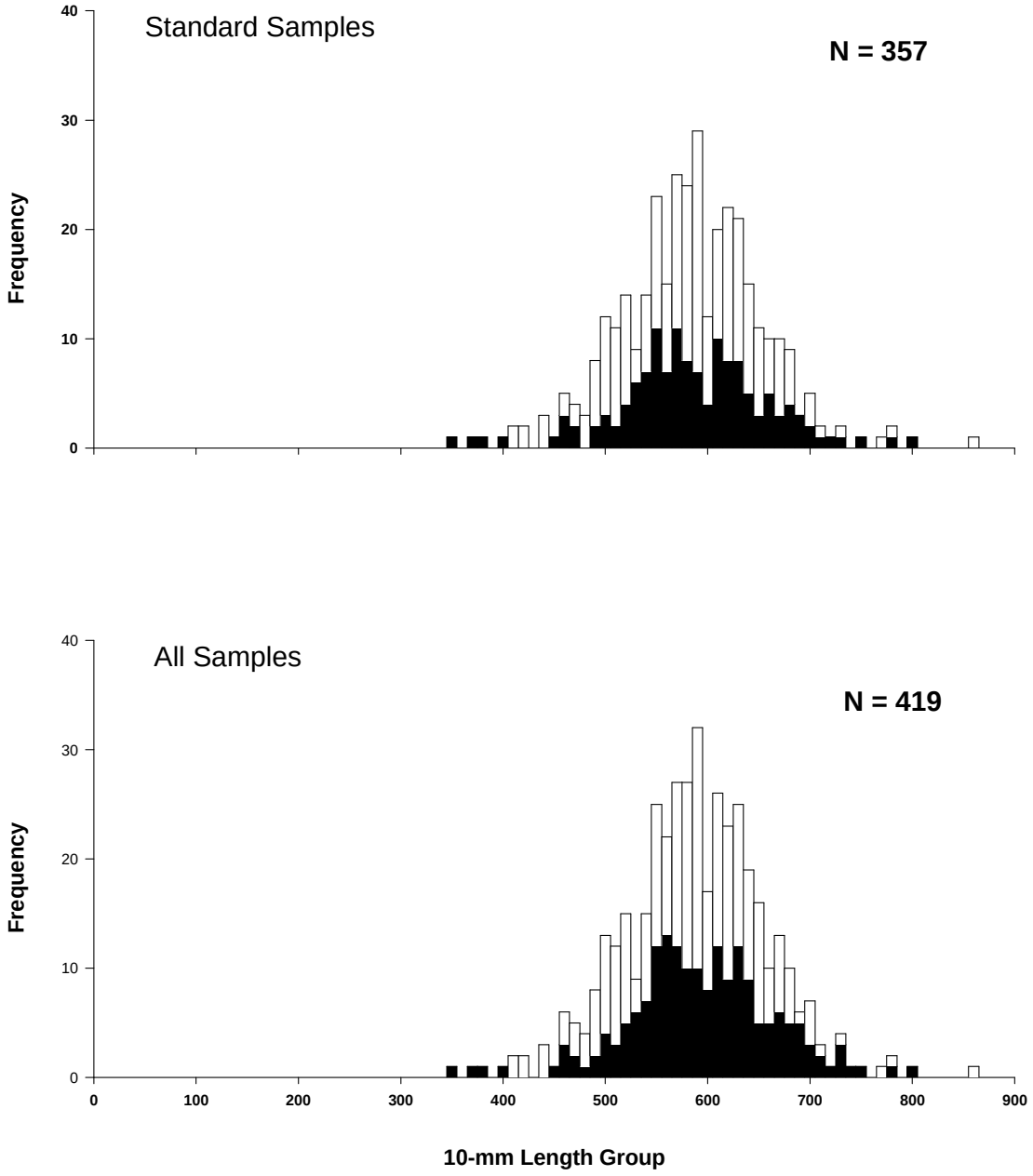

Figure 13. Length frequency of shovelnose sturgeon during the sturgeon season (black bars) and fish community season (white bars) in Segment 2 of the Missouri River during 2011. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2011.

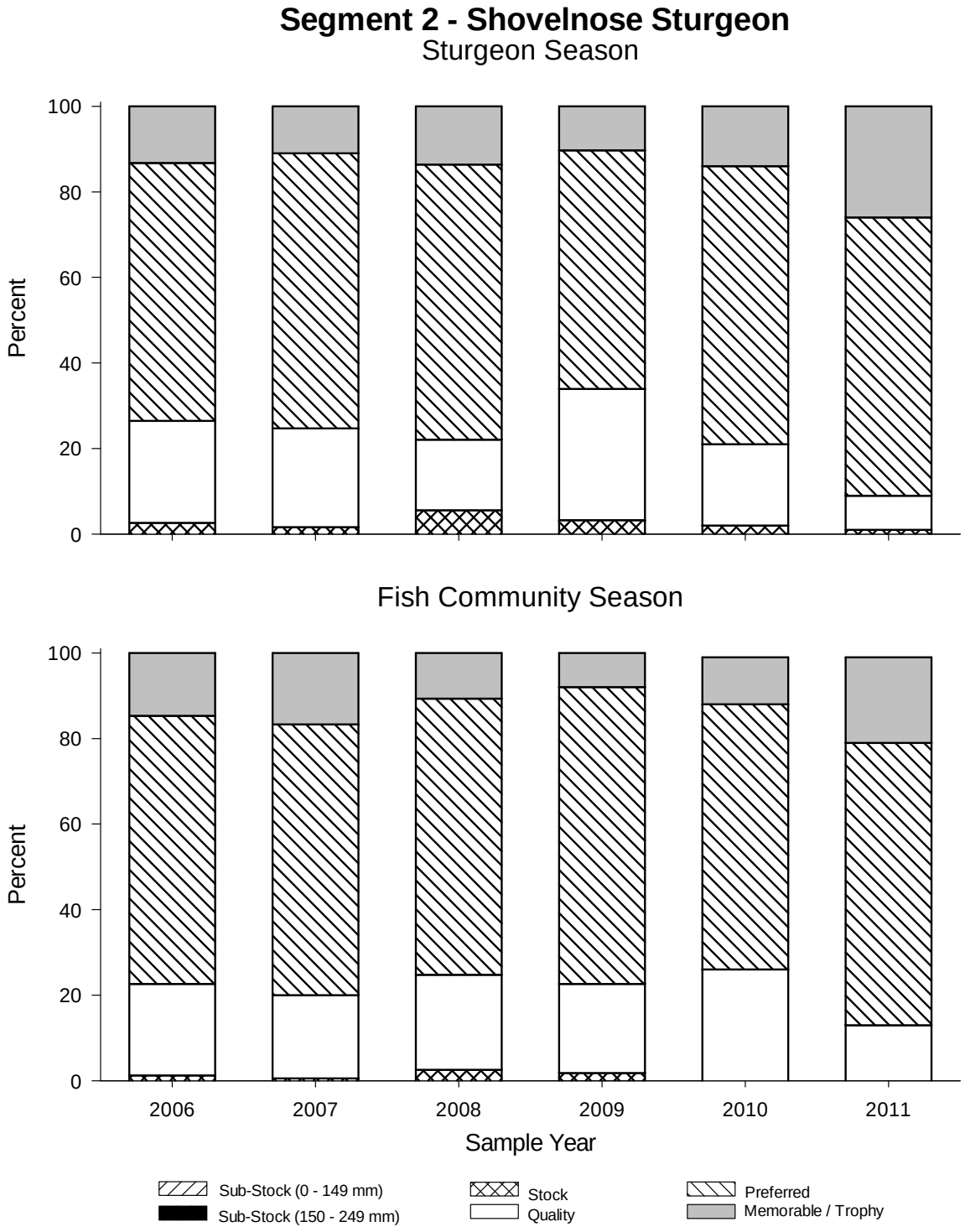

Figure 14. Proportion of total catch for shovelnose sturgeon captured with all gear by length category from 2006-2011 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Quist (1998).

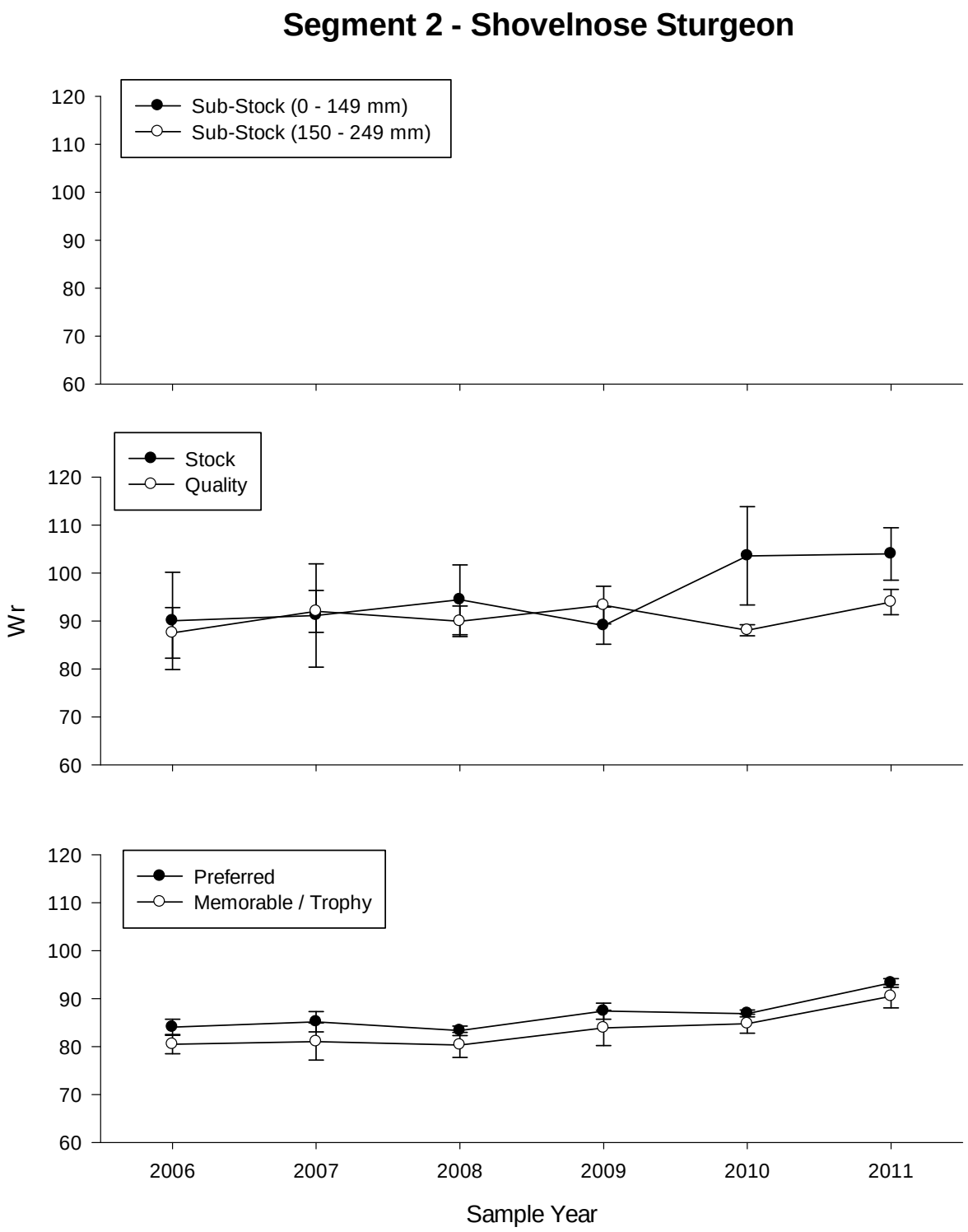

Figure 15. Relative weight (Wr) for all shovelnose sturgeon captured with all gear by incremental relative stock density (RSD) length category from 2006-2011 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Quist (1998).

Sturgeon Chub

A total of 21 sturgeon chubs were sampled in segment 2 in 2011, down from the high of 47 collected in 2010. Otter trawl CPUE for sturgeon chubs was at six year low in 2011 (Figure 16). The CPUE of sturgeon chubs was higher during the sturgeon season (0.12 fish/100m) when compared to the fish community season (0.006 fish/100m). The pattern of higher CPUE during the sturgeon season has been observed in all six years of sampling (Figure 16).

Sturgeon chubs captured in segment 2 during 2011 averaged 77.4 mm, which is similar to 2010 (78.5 mm) and 2009 (72.4 mm). The sturgeon chub population in segment 2 remains to be comprised of mostly adult (Herman et al. 2008a) fish with all but one fish (34 mm) measuring over 65 mm (Figure 17).

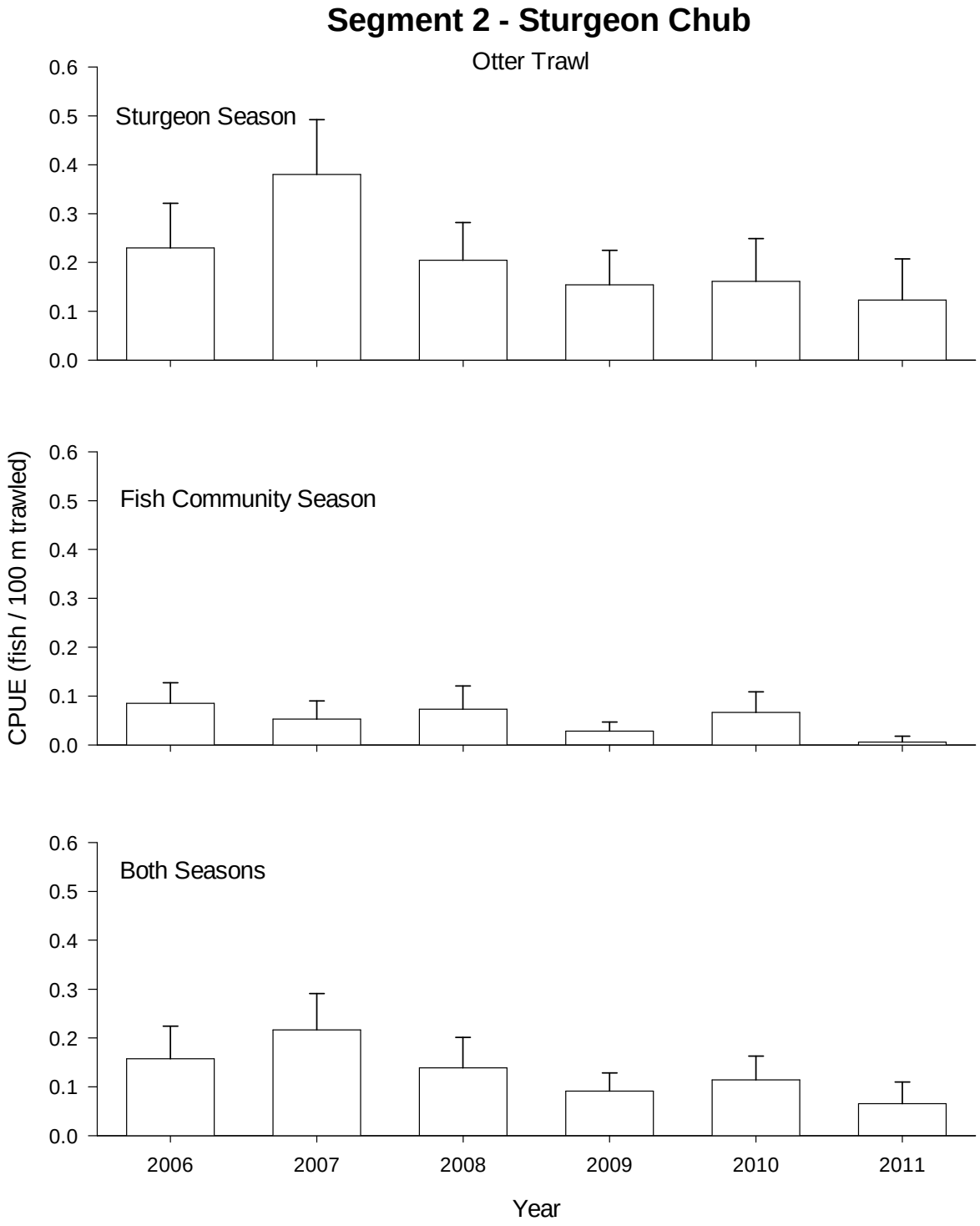

Figure 16. Mean annual catch per unit effort (+/- 2 SE) of sturgeon chub using otter trawls in Segment 2 of the Missouri River from 2006-2011.

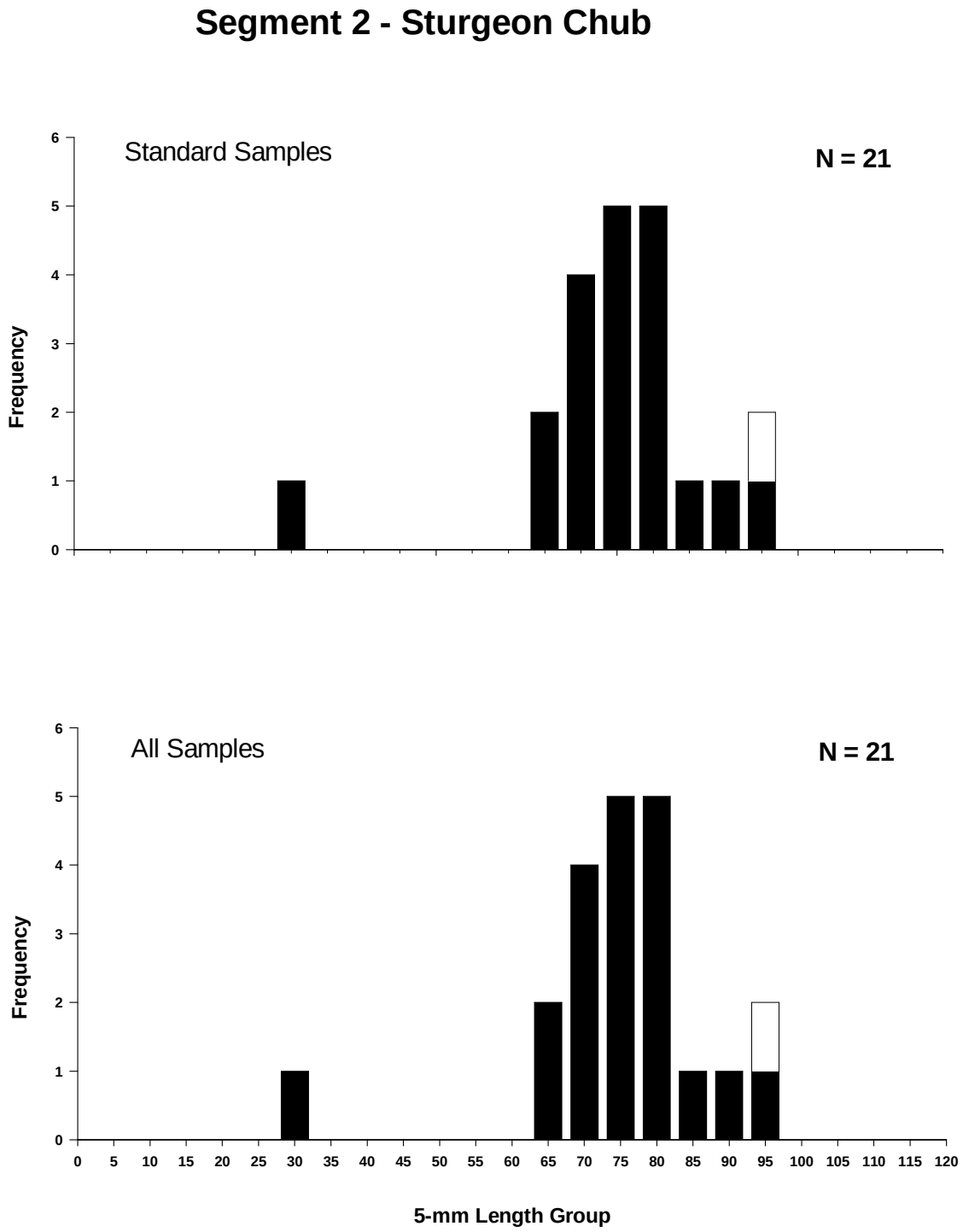

Figure 17. Length frequency of sturgeon chub during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2011. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2011.

Sicklefin Chub

A total of six sicklefin chubs were captured in segment 2 during 2011, all of which were sampled in sturgeon season at river mile 1703. Total captures were identical to 2010, however the previous total for all other years combined was only three fish. Erratic otter trawl CPUE continues to be exhibited in segment 2 due to the small sample size of sicklefin chubs. CPUE of both seasons reached an all time high of 0.013 fish/100 m, which can be attributed to the record high of 0.03 fish/100 m observed during sturgeon season (Figure 18). However, no sicklefin chubs were collected during the fish community season similar to 2008 and 2009.

Sicklefin chubs in segment 2 in 2011 averaged 93.7 mm TL, which was comparable to 2010 (93.8 mm TL). They ranged in size from 63 mm TL to 111 mm TL (Figure 19). The population of sicklefin chubs in segment 2 remains minimal, most likely due to the degraded habitat due to Fort Peck Dam. Sicklefin chub captures are more common in downstream segment 3, in particular the downstream areas that mimic a more naturalized river system.

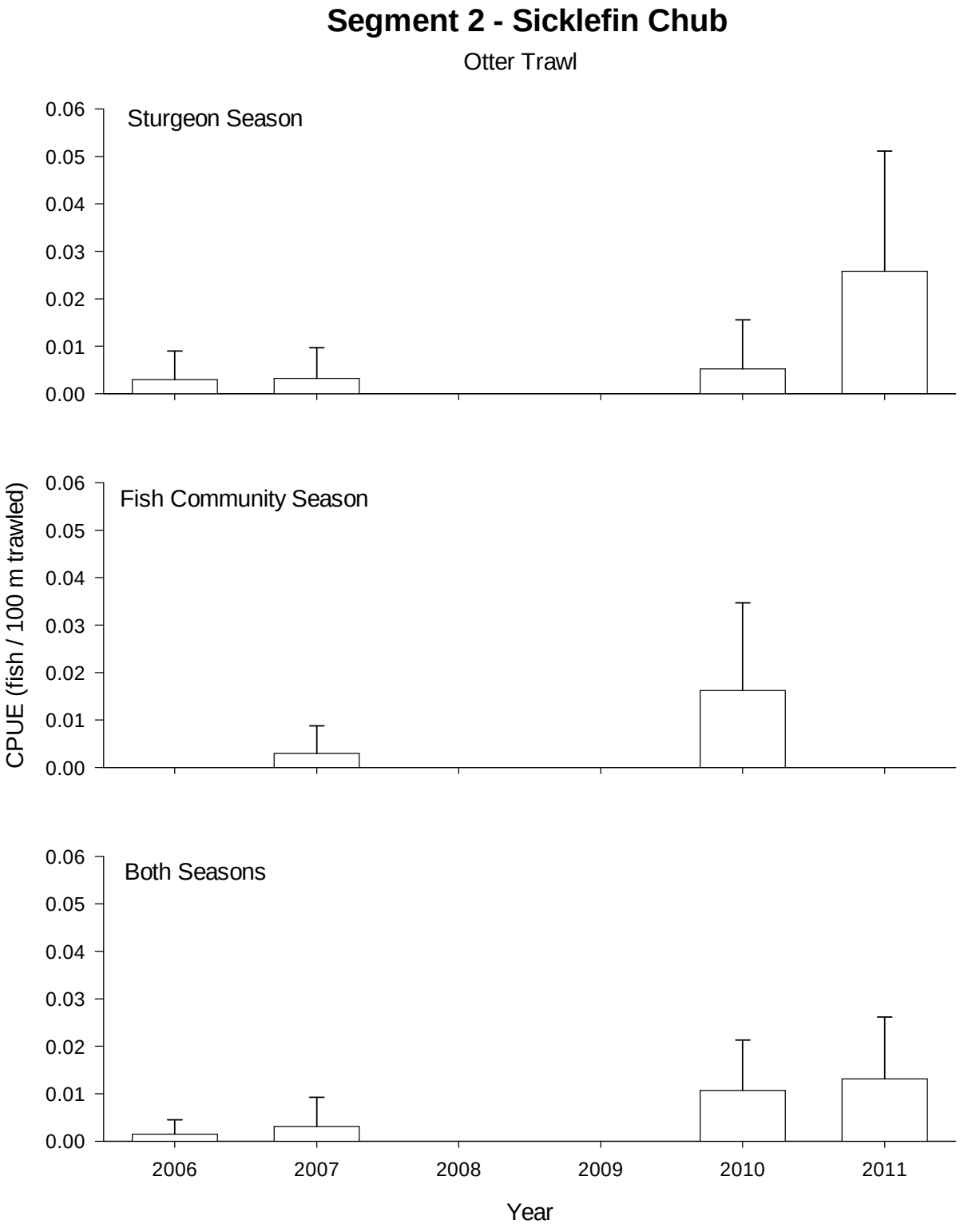

Figure 18. Mean annual catch per unit effort (+/- 2 SE) of sicklefin chub using otter trawls in Segment 2 of the Missouri River from 2006-2011.

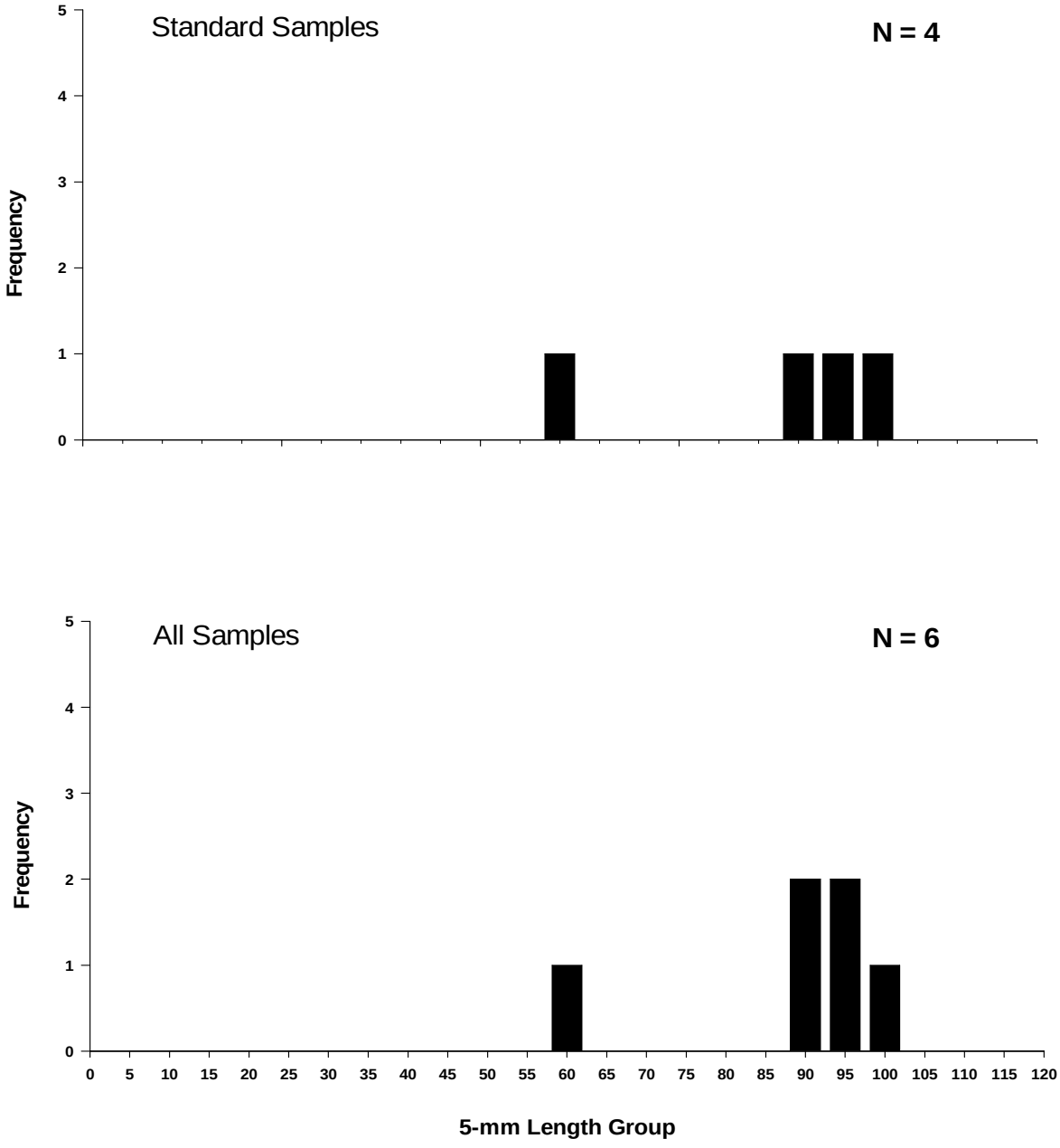

Figure 19. Length frequency of sicklefin chub during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2011. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2011.

Sand Shiner

A total of 41 sand shiners were captured in segment 2 in 2011, all of which were sampled in mini-fyke nets. A large portion (59%) of the captures stemmed from one river bend (RM 1704.5) Sand shiner mini-fyke net CPUE (0.67 fish/net night) was nearly six times lower than the previous record low of 3.98 fish/net night in 2010 (Figure 20).

Sand shiners averaged 43.3 mm TL in 2011, which was similar to 2010 (42.7 mm TL) and slightly smaller than 2009 (49.2 mm TL). A wide variety of sand shiners continue to be sampled in segment 2, ranging from 27 mm TL to 60 mm TL. The length frequency histogram in Figure 21 continues to show similarities to previous years, with the majority of the fish ranging from 35-60 mm TL.

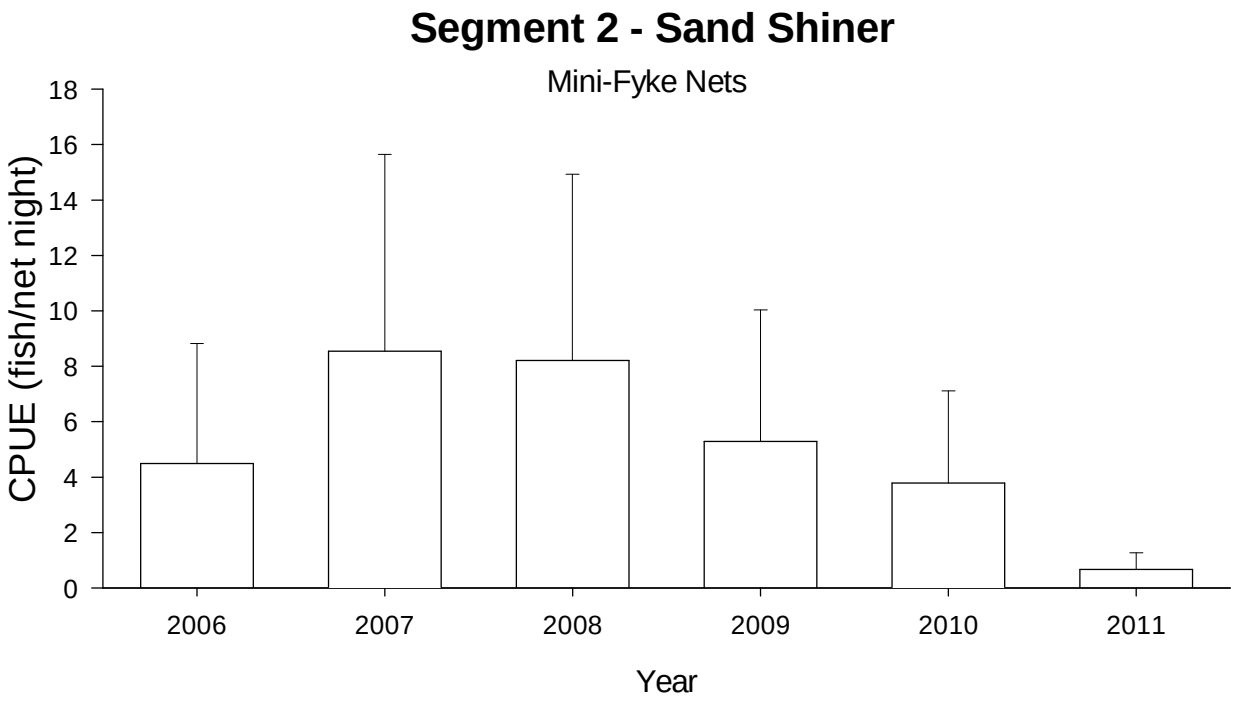

Figure 20. Mean annual catch per unit effort (+/- 2 SE) of sand shiner with mini-fyke nets in Segment 2 of the Missouri River during fish community season 2006-2011.

Segment 2 - Sand Shiner

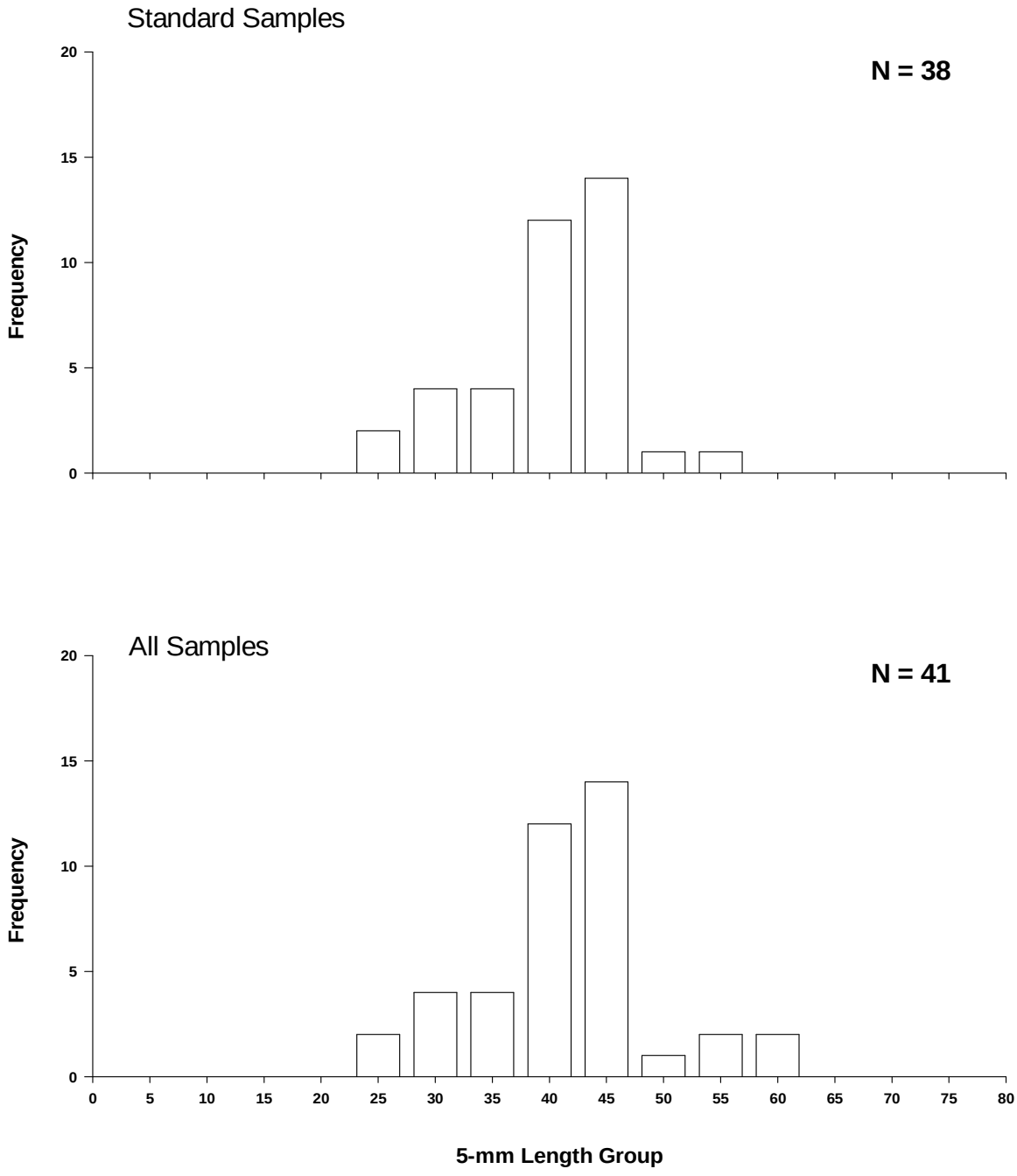

Figure 21. Length frequency of sand shiner during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2011. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2011.

Hybognathus spp.

A total of 14 western silvery minnows were captured in segment 2 in 2011, all of which were captured using mini-fyke nets. Mini-fyke net CPUE fell substantially from 2010 (2.81 fish/net night) to 2011 (0.16 fish/net night), however, CPUE in 2011 was similar to that of 2009 (Figure 22). Western silvery minnow CPUE continues to be driven by "hot spots" which account for high percentages of catch. For example, river mile 1717.5 accounted for 43% of the total captures in 2011.

Western silvery minnows averaged 58.8 mm TL for segment 2 in 2011, which was higher than 2010 (46.0 mm TL) but substantially less than 2009 (90.5 mm TL). Western silvery minnows sampled ranged from 28-113 mm TL, with the majority (64 %) measuring under 60 mm TL. The length frequency histogram in Figure 23 would indicate that the majority of the fish in segment 2 are age-0, indicating rearing of western silvery minnows in segment 2.

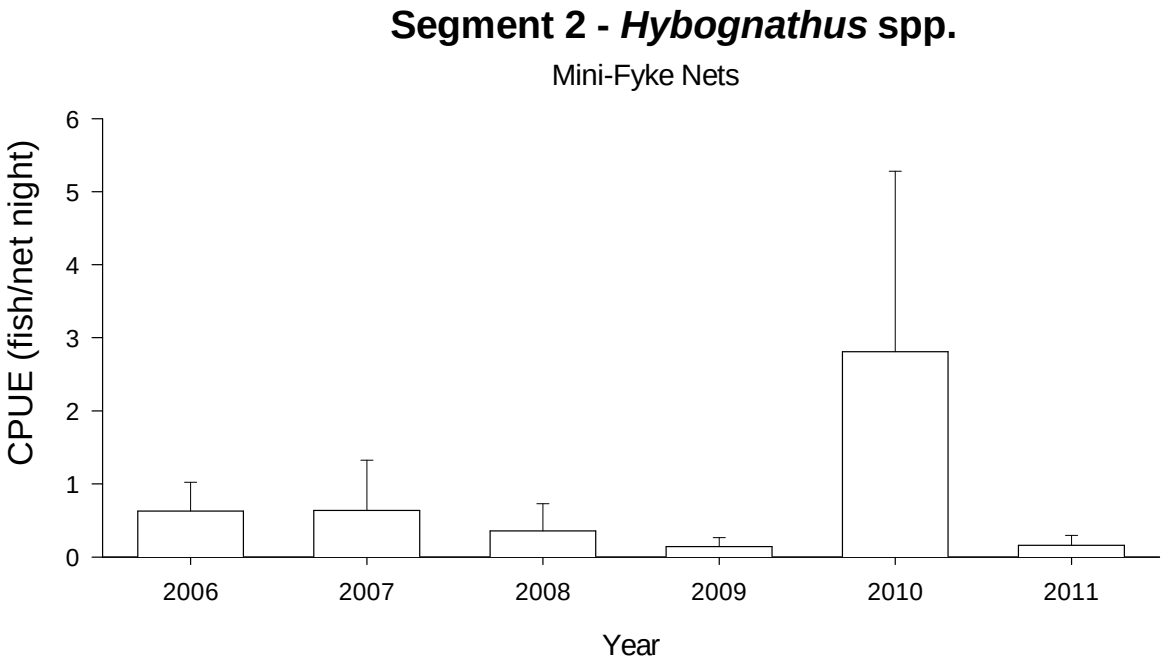

Figure 22. Mean annual catch per unit effort (+/- 2 SE) of *Hybognathus* spp. with mini-fyke nets in Segment 2 of the Missouri River during fish community season 2006-2011.

Segment 2 - *Hybognathus* spp.

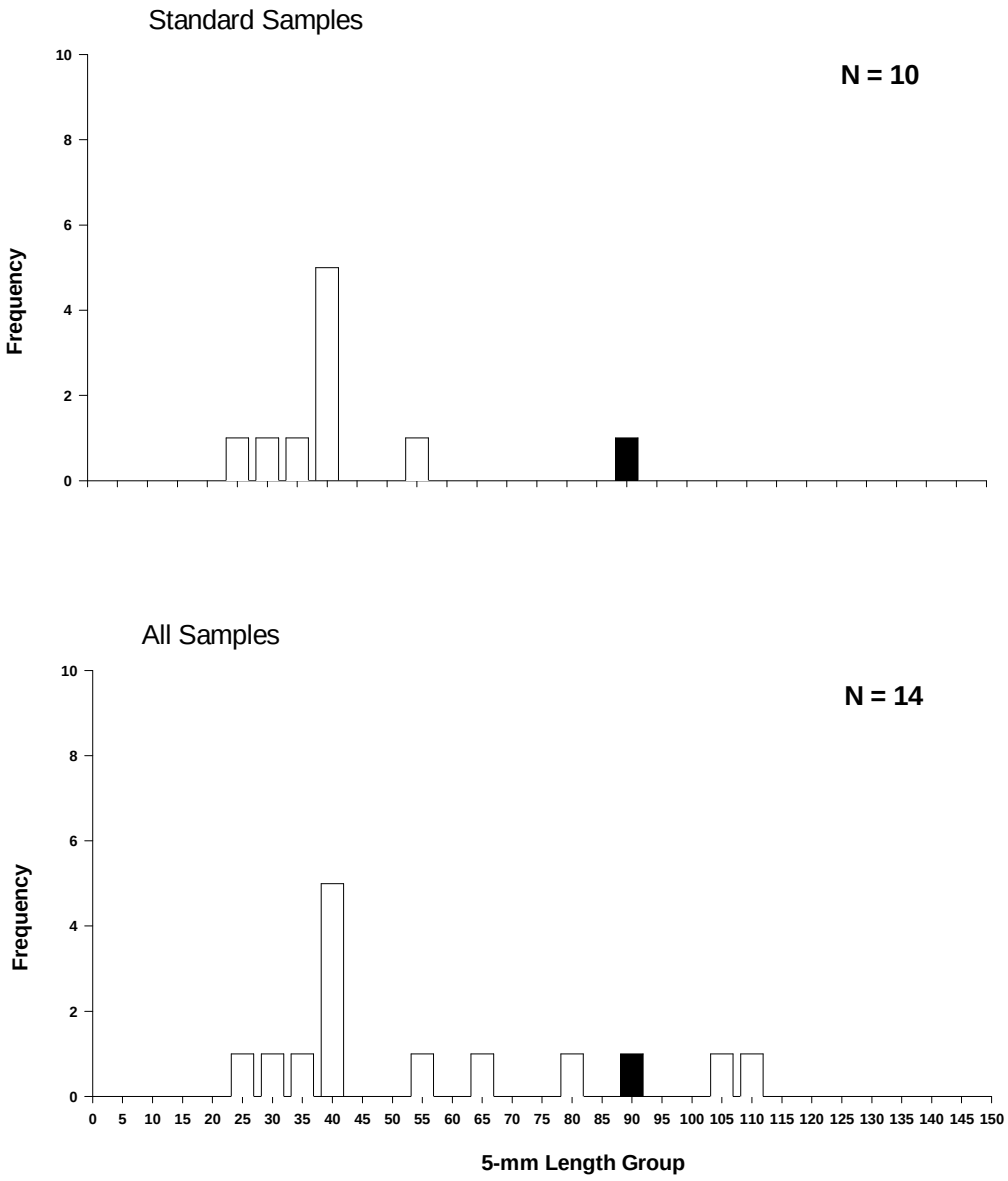

Figure 23. Length frequency of *Hybognathus* spp. caught during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2011. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2011.

Blue Sucker

A total of nine blue suckers were captured in segment 2 in 2011. The majority (n=7) were captured during fish community season. The trammel net has been the best method of detecting blue suckers, while it captured 78% of the total catch during 2011. Overall trammel net CPUE in 2011 (0.018 fish/100 m) was similar to that of 2010 (0.013 fish/100 m) for both seasons (Figure 24). The sturgeon season had the lowest trammel net CPUE (0.006 fish/100 m) of any year sampled, while the fish community season was consistent with previous years.

The otter trawl is not as effective of gear in capturing adult blue suckers. However, it should be capable of collecting YOY and/or juvenile blue suckers if present. During 2011 one presumed YOY blue sucker was collected using the otter trawl at river mile 1761 on August 30th. This is the second year in a row that a YOY blue sucker has been collected in segment 2, while none had been collected in the previous four years of sampling.

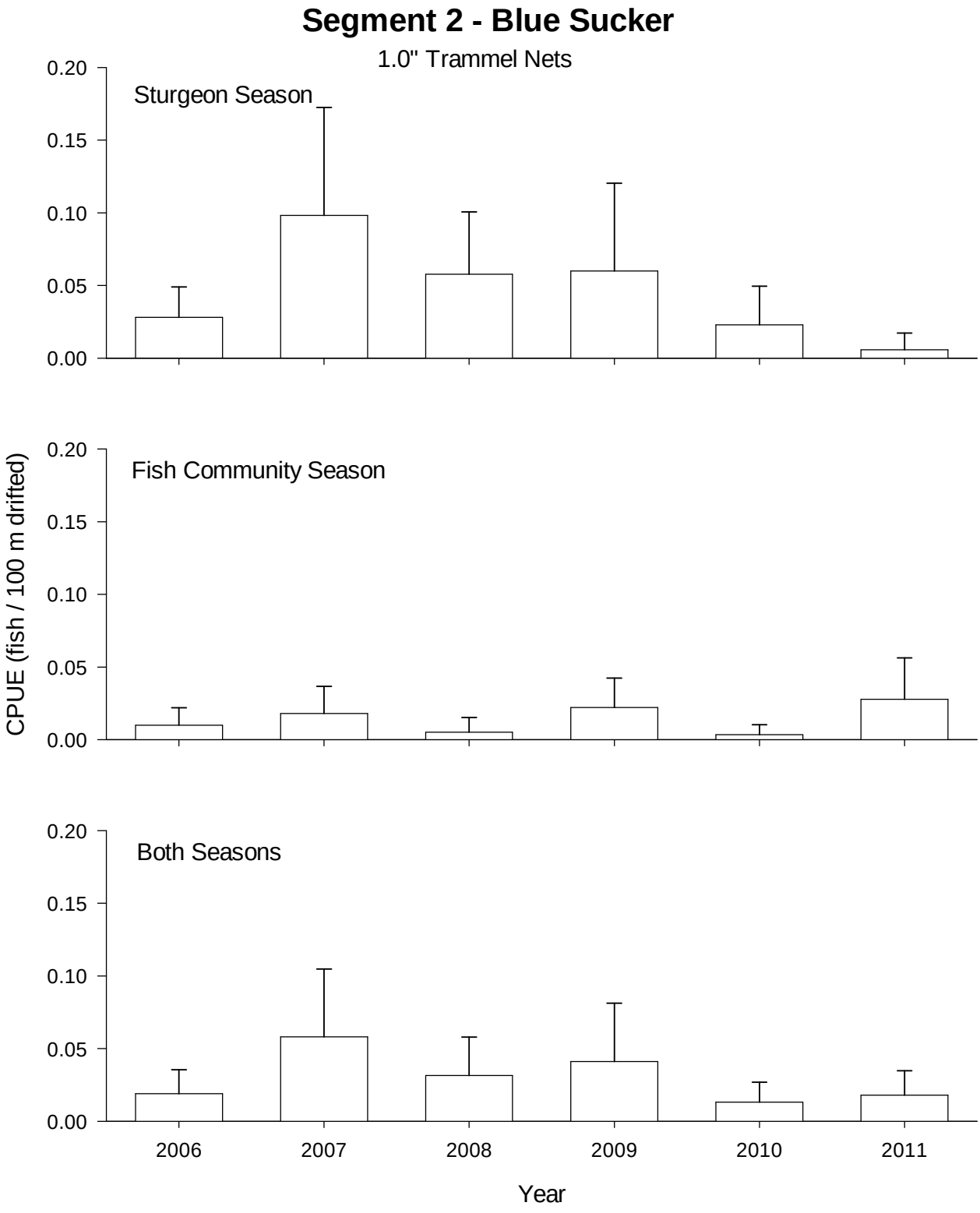

Figure 24. Mean annual catch per unit effort (+/- 2 SE) of blue sucker using 1.0" trammel nets in Segment 2 of the Missouri River from 2006-2011.

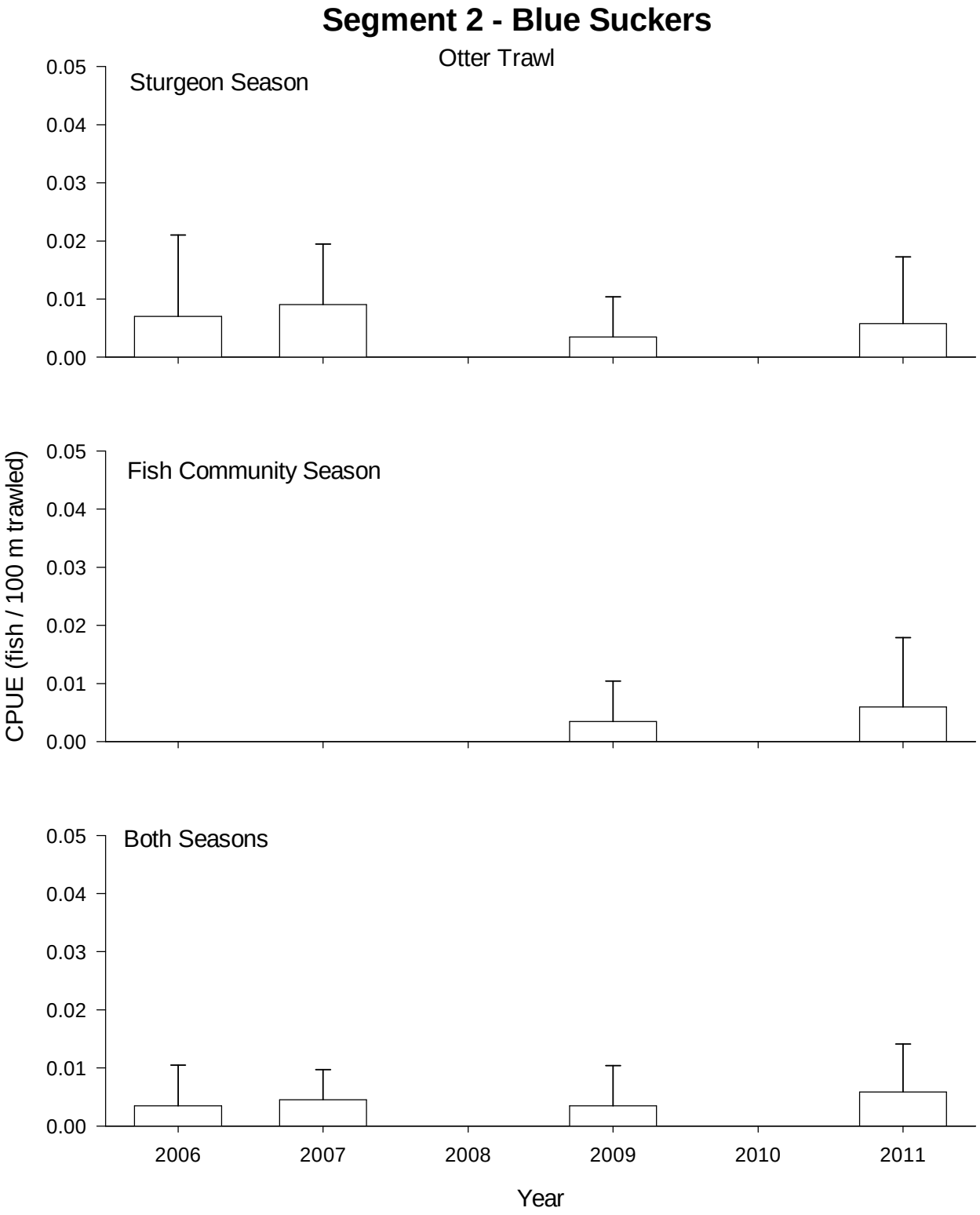

Figure 25. Mean annual catch per unit effort (+/- 2 SE) of blue sucker using otter trawls in Segment 2 of the Missouri River from 2006-2011.

Table 14. Total number of blue suckers captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2011. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	1	0	0	0	0	0	0	0	100
		27	3	35	28	3	0	0	4
Otter Trawl	1	100	0	0	0	0	0	0	0
		32	4	33	24	3	0	0	4
Fish Community Season									
1.0” Trammel Net	6	17	0	33	50	0	0	0	0
		31	2	36	27	4	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0
		21	0	35	5	0	28	7	4
Otter Trawl	1	100	0	0	0	0	0	0	0
		31	0	38	25	4	0	0	2
Both Seasons									
Trot Lines	0	0	0	0	0	0	0	0	0
		29	6	40	19	0	0	6	0

Segment 2 - Blue Sucker

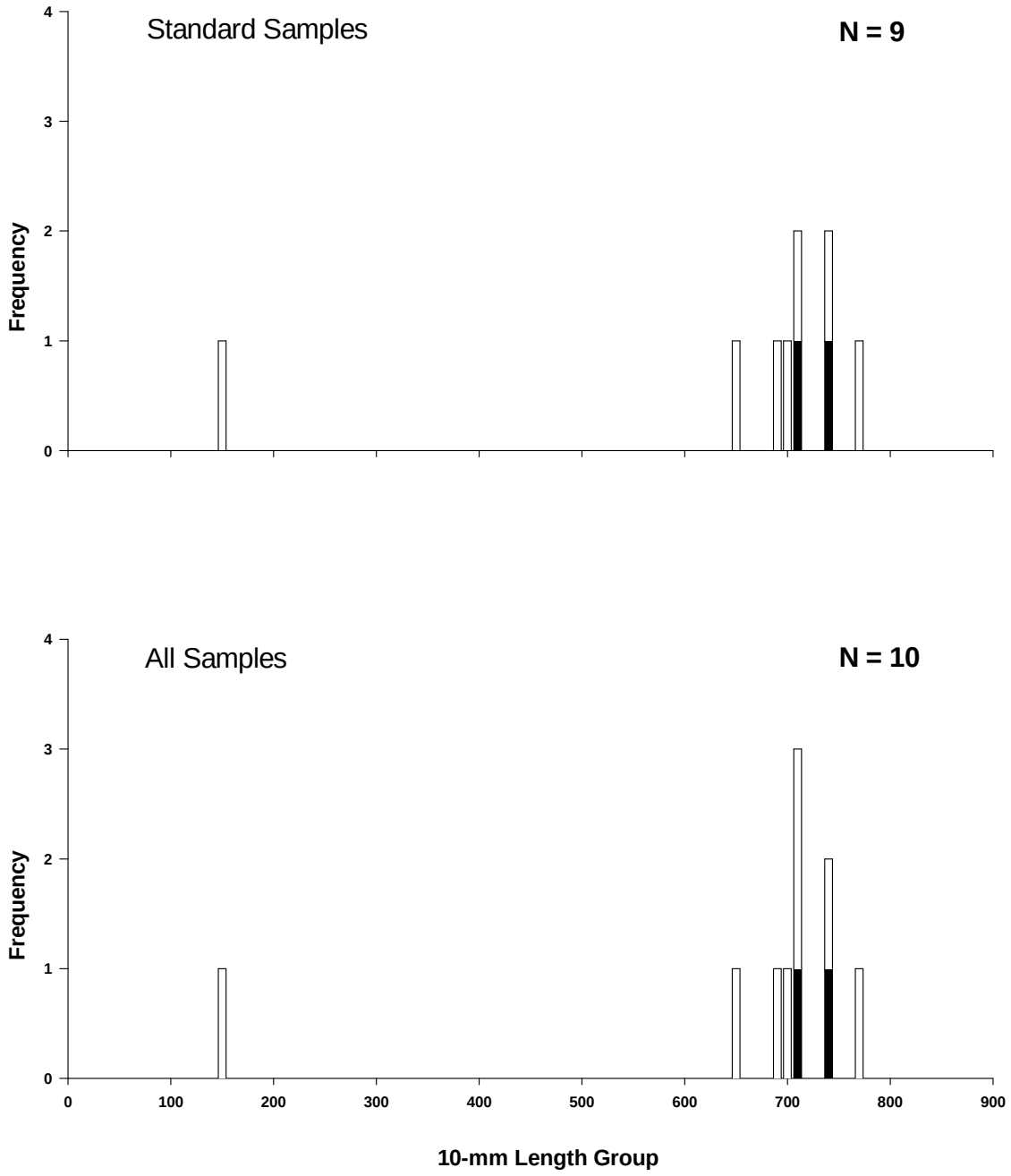

Figure 26. Length frequency of blue sucker during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2011. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2011.

Sauger

Sampling in segment 2 in 2011 resulted in the capture of seventy-five sauger, with 35 being collected during sturgeon season and 40 collected during fish community season. Trammel nets continue to be the most effective gear to sample adult sauger, constituting 71% of the total sauger catch, followed by otter trawl (13%), while mini-fyke net and trotline both resulted in 8% of the catch each.

Overall trammel net CPUE for both seasons has remained relatively unchanged since the inception of the Program in 2006 (Figure 28). During 2011 an all time high CPUE (0.17 fish/100 m) occurred during fish community season and a near all time low CPUE (0.18 fish/100 m) during sturgeon seasons. In most years the sturgeon season is a better estimate of the sauger population in segment 2, since they move upstream to spawn. However, in 2011 limited sampling and high water may have both decreased the total number of sauger captured and lowered CPUE due to lower capture efficiency.

Otter trawl CPUE for both seasons has shown a slight downward trend since 2009 (Figure 29). This downward trend was prevalent in fish community sampling, resulting in an all time low otter trawl CPUE of 0.018 fish/100 m, while the second ever lowest sturgeon season CPUE (0.04 fish/100 m) was witnessed.

Mini-fyke net collections of sauger remain to be a relatively small proportion of total captures, resulting in comparable CPUE from year to year. Mini fyke nets are best to monitor YOY sauger. No YOY sauger were captured in mini fyke nets within segment 2 during 2011.

Sauger captures in segment 2 in 2011 averaged 371.6 mm TL and 420.7 g while ranging from 240 mm TL to 563 mm TL (Figure 30), which remains comparable to previous years. As in years past, trotlines captured the largest individuals (401 mm TL average), while the otter trawl collected the smallest individuals (361 mm TL average).

The specific information related to sauger captures in regard of macrohabitat, season and gear can be found in Table 15.

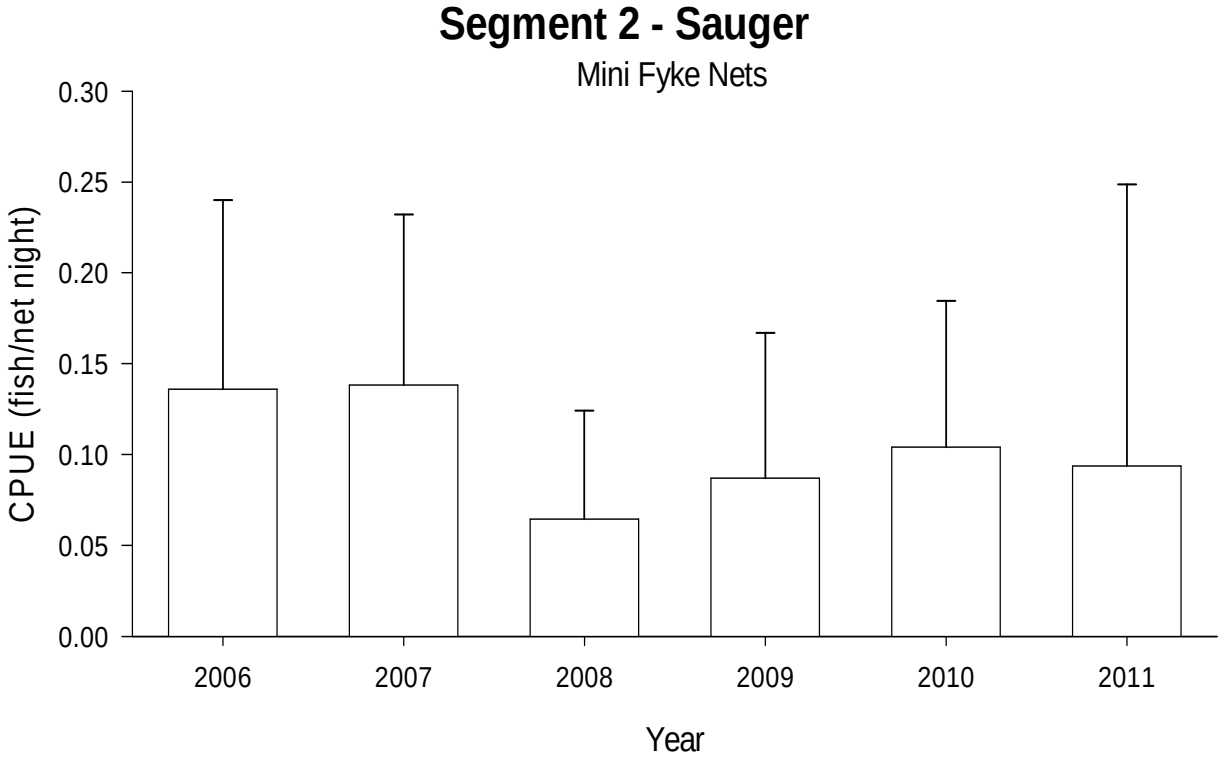

Figure27. Mean annual catch per unit effort (+/- 2 SE) of sauger using mini fyke nets in Segment 2 of the Missouri River from 2006-2011.

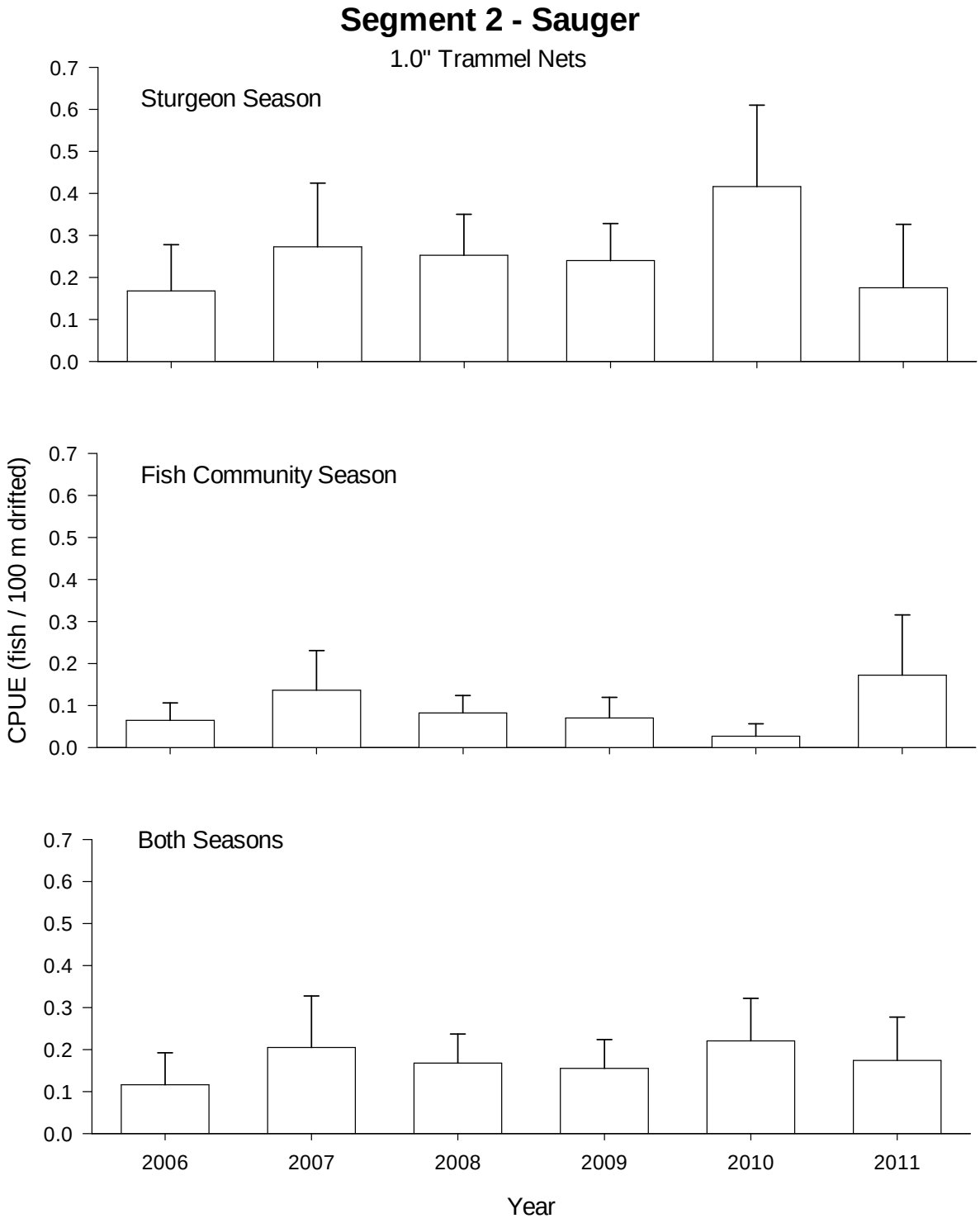

Figure28. Mean annual catch per unit effort (+/- 2 SE) of sauger using 1.0" trammel nets in Segment 2 of the Missouri River from 2006-2011.

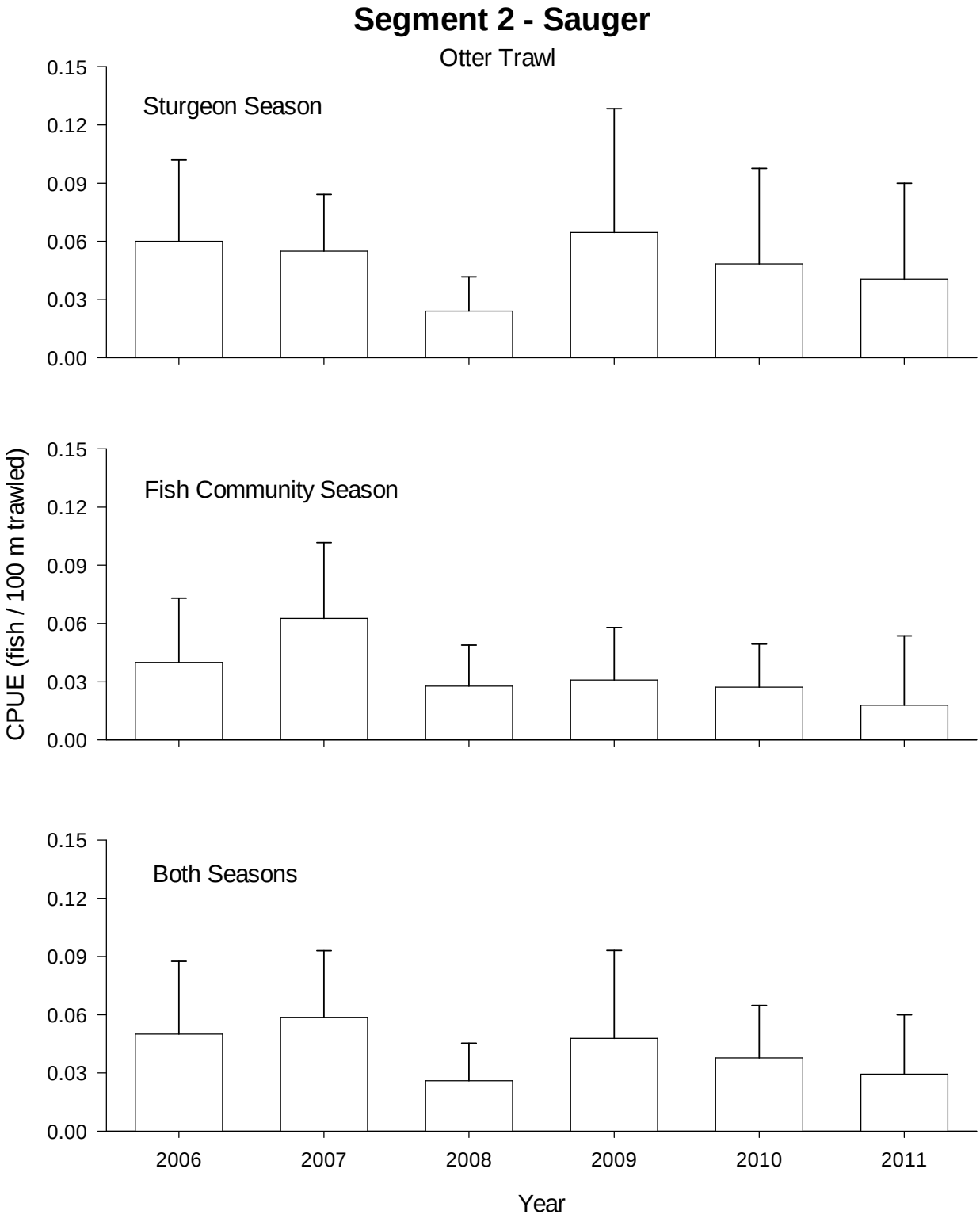

Figure 29. Mean annual catch per unit effort (+/- 2 SE) of sauger using otter trawls in Segment 2 of the Missouri River from 2006-2011.

Table 15. Total number of sauger captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 2 of the Missouri River during 2011. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

Gear	N	CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML
Sturgeon Season									
1.0” Trammel Net	28	25	0	71	4	0	0	0	0
		27	3	35	28	3	0	0	4
Otter Trawl	7	14	0	86	0	0	0	0	0
		32	4	33	24	3	0	0	4
Fish Community Season									
1.0” Trammel Net	24	8	0	58	17	17	0	0	0
		31	2	36	27	4	0	0	0
Mini-Fyke Net	6	0	0	33	50	0	17	0	0
		21	0	35	5	0	28	7	4
Otter Trawl	3	0	0	100	0	0	0	0	0
		31	0	38	25	4	0	0	2
Both Seasons									
Trot Lines	6	50	0	17	33	0	0	0	0
		29	6	40	19	0	0	6	0

Segment 2 - Sauger

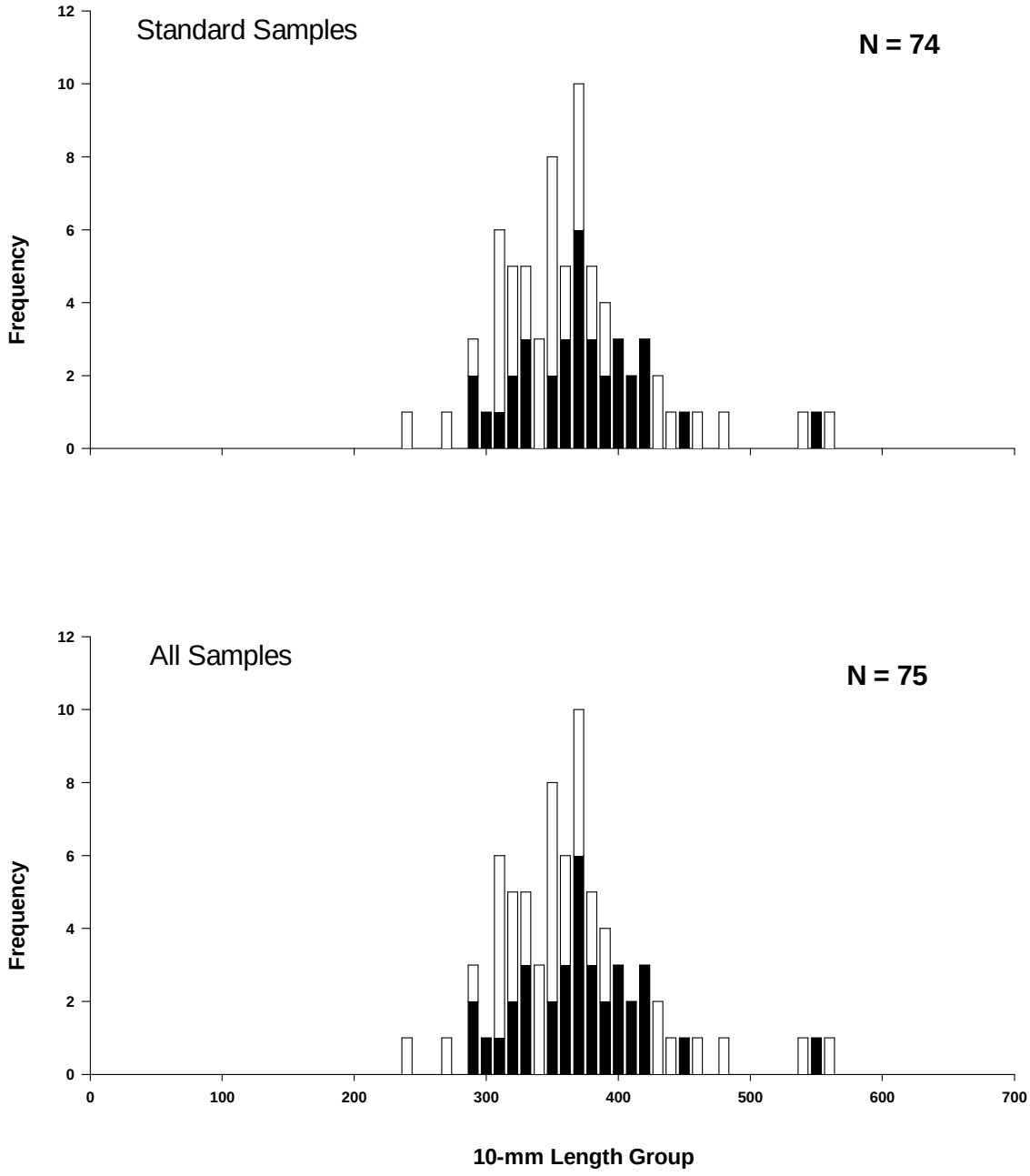

Figure 30. Length frequency of sauger during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2011. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2011.

Missouri River Fish Community

In 2011 a total of 1,398 fish consisting of 33 species were sampled in segment 2, which was by far the lowest total captures since the Program was implemented in 2006. The previous low (N=4,921) was observed in 2010. As was the case in 2010, shovelnose sturgeon once again represented the most abundant species sampled (N=419), however this was a large decrease from 1,085 collected in 2010.

Goldeye *Hiodon alosoides* were the second most abundant fish sampled (N=143), which compared to 285 collected in 2010. Trammel nets were the most effective way to sample goldeye collecting the majority of the fish (N=98), while mini-fyke nets collected the least (N=6). All but one goldeye sampled in mini-fyke nets were age-0 fish.

The third most abundant fish sampled in segment 2 in 2011 was the channel catfish *Ictalurus punctatus* (N=76). Nearly all of the channel catfish collected were captured with the otter trawl (72%) and trotline (24%). Trotlines captured the largest individuals (393 mm average), otter trawls captured the next largest (341 mm TL), while mini-fyke nets caught two age-0 channel catfish averaging 49 mm TL.

Although less fish were collected overall, more smallmouth *Ictiobus bubalus* (n = 96) and bigmouth buffalo *I. cyprinellus* (n = 51) were collected in 2011 than any prior sampling year. However, the vast majority of both species were YOY fish captured using the bag seine and mini fyke nets. This was by far the most YOY smallmouth and bigmouth buffalo that have been collected in segment 2 during the six years of sampling. It is very likely that these fish came from Fort Peck Reservoir, since they were only collected in the upstream portion of segment 2 near where the Fort Peck Dam spillway was running.

Similar to the *Ictiobus spp.* more YOY walleye were collected in segment 2 than all previous sampling years combined. Bag seines, mini fyke nets and the otter trawl captured a total of 12 YOY walleye during 2011. Again, these fish likely came from Fort Peck Reservoir and were entrained by the spillway.

The low total captures of all species in segment 2 in 2011 can be at least be in par be attributed to the lack of fish captured by mini-fyke nets. In previous years captures in mini-fyke nets have ranged from as high as 90% (2008) to as low as 64% (2010) of the total catch. While in 2011, mini-fyke nets accounted for only 16% of the total fish captured in segment 2. In the

previous five years of sampling collections of YOY fishes may have accounted for hundreds or even thousands of the fish sampled in any given bend. These fish included such species as white sucker *Catostomus commersoni*, longnose sucker *C. catostomus* and river carpsucker *Carpiodes carpio*. In 2011, the YOY of these three species accounted for only 26 specimens captured by mini fyke nets.

Due to the substantially higher than normal flows during both the sturgeon and fish community seasons, it is likely that the capture efficiencies of all standard gears were reduced during 2011. Min fyke nets usually make up the majority of the total catch for a year and in 2011 they were relatively ineffective. Higher flows created more velocity along inside bends and filled normally shallow water habitats with significantly deeper water. It is unknown at this time how the high water affected species that are normally captured using mini fyke nets. Sampling during 2012 under more "normal" flows will allow us to better understand the 2011 production of fishes such as sand shiners, flathead chubs *Platygobio gracilis*, white and longnose suckers and others. It will also be interesting if our 2012 data give us some understanding of how segment 2 has changed due to entrainment of fishes from Fort Peck Reservoir. We know that a lot of fish were entrained, but have no idea how that may affect the fish assemblage of segment 2. Careful examination of the data collected in 2012 with prior years should help shed light on the entrainment effects.

Discussion

The 2011 sampling year in segment 2 was extraordinarily different that the previous five years of standard sampling. High water influenced both the effort that was able to be expended and likely our gears abilities to capture fish. Although sampling was difficult, the high flooding flows likely benefitted many species. One of the benefits of a long-term monitoring program is we should be able to evaluate over the next couple years how the 2011 water influenced the fishes of segment 2. Even so, the data collected in 2011 provide some interesting insight into the pallid sturgeon population.

Standard sampling within segment 2 in 2011 resulted in the capture of 25 hatchery-reared juvenile pallid sturgeon *Scaphirhynchus albus*, which was a substantial decrease of the all time high (forty-three) observed in 2010. Since the implementation of the Program in 2006, one hundred fifty-five pallid sturgeon have been captured in segment 2, all of which were hatchery-reared. Even though the total number of pallid sturgeon captured was low, overall trammel net CPUE was at an all time high of 0.025 fish/100 m and trotline CPUE increased from 2010. This was particularly interesting since shovelnose sturgeon CPUE declined in 2011 for both trammel nets and trotlines. Making matters more complicated was the fact that pallid sturgeon CPUE for the otter trawl increased in 2011, while shovelnose sturgeon decreased. However, trammel nets have been a better gear at examining the relative abundance of shovelnose sturgeon in segment 2 when compared to the otter trawl, mainly due most fish being of larger sizes. Never the less, the CPUE of all gears in 2011 should be looked at cautiously, due to the substantially higher flows that occurred during both the sturgeon and fish community sesasons.

A total of seven year classes were capture in segment 2 in 2011. Year classes captured ranged from 2001 (N=1) to 2010 (N=1) with the most abundant year class sampled being 2009. The 2009 year class accounted for 48% of pallid sturgeon captures. Although average size of pallid sturgeon has increased slightly throughout the six years, the size structure of the population has changed little and is still dominated by individuals under 400 mm. In addition, pallid sturgeon from the same year classes are often larger in downstream segments.

After a three year decline in the relative condition of sub-stock (200-329 mm) class of pallid sturgeon, an increase was observed in 2011. Additionally, the stock class also showed slight increases in relative condition in 2011.

Converse to pallid sturgeon size structure, the shovelnose sturgeon population in segment 2 is dominated by fish over 400 mm. Captures of shovelnose sturgeon (N=419) in segment 2 for 2011 fell off considerably when compared to 2010 (N=1,085), which was an all time high. This was due to both drops in CPUE of trammel nets and trotlines and the decreased effort that was expended.

The catch rates were at an all-time low for both total sturgeon chub captures (N=21) and total otter trawl CPUE (0.07 fish/100 m). Conversely, sicklefin chub CPUE, was at an all-time high (0.013 fish/100 m), but since so few sicklefin chubs have been collected in segment 2 very few inferences can be drawn from the data .

Sand shiner mini-fyke net CPUE (0.67 fish/net night) was very low and was likely due to the historic water levels. In addition, western silvery minnow CPUE was 0.16 fish/net night, which was down from an all time high in 2010 (2.81 fish/net night), although remains comparable to years past.

While the overall trammel net CPUE for blue suckers was down in 2011, it was comparable to previous years. For sauger, a total of 75 were sampled in segment 2 in 2011. Sauger CPUE for the trammel net was at the third highest we've observed in six years and would have likely been higher with lower flows and higher gear efficiencies.

In total 33 fish species were sampled within segment 2 in 2011. Many species not normally seen in abundance appeared in sampling gears. Many of these species were in young-of-the year life stages. Cisco, smallmouth bass *Micropterus dolomieu*, walleye and yellow perch *Perca flavescens* were all observed as YOY fish in various gears. Smallmouth and largemouth buffalo YOY also appeared in numbers never before observed. It is uncertain at this time if these rarities came from Fort Peck Reservoir through spill, or were produced in the Milk or Missouri Rivers.

While trammel net, otter trawl and mini fyke nets all appeared to have reduced capture efficiencies during the higher flow throughout the sturgeon and fish community seasons of 2011 for most species, trotline CPUE remained somewhat stable for pallid and shovelnose sturgeon. Although trotlines have their problems with monitoring relative abundance due to them not being

an active gear, they may play an important role in monitoring *Scaphirhynchus spp.* in exceptional flow years, when the capture efficiencies of other active gears are significantly impeded.

Overall, 2011 was a difficult year to monitor the fishes of the Missouri River since conditions differed greatly compared to all other years of sampling in segment 2. However, the floodplain interaction that occurred in conjunction with higher suspended sediment loads and the forming of a new channel most likely had or will have significant effects on the fish assemblage. Sampling in the next few years should shed valuable light on how a flood affects not only pallid sturgeon, but other Missouri River fishes.

Acknowledgments

The U.S. Army Corps of Engineers provided funding for this project. We'd like to thank Tim Welker and George Williams for stewardship of the Population Assessment Program. Ryan Lott lent many hours to pulling gear and driving boats. Bob Lipscomb and Landon Johnson assisted in both the field and shop throughout the year. Thanks to Steve Dalbey for taking care of much needed business while we were on the river. We'd like to thank Dave Fuller for his help in the field and office. Thanks to Pat Braaten of the U.S. Geological Survey for answering any type of question we may have pertaining to the Missouri River and its fishes. Thanks to Ryan Wilson, Zack Sandness, Everett Nelson and Steve Krentz of the U.S. Fish and Wildlife Service for all the collaboration between our offices.

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Appendices

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

Scientific name	Common name	Letter Code
	CLASS CEPHALASPIDOMORPHI-LAMPREYS	
	ORDER PETROMYZONTIFORMES	
	Petromyzontidae – lampreys	
Ichthyomyzon castaneus	Chestnut lamprey	CNLP
Ichthyomyzon fossor	Northern brook lamprey	NBLP
Ichthyomyzon unicuspis	Silver lamprey	SVLP
Ichthyomyzon gagei	Southern brook lamprey	SBLR
Petromyzontidae	Unidentified lamprey	ULY
Petromyzontidae larvae	Unidentified larval lamprey	LVLP
	CLASS OSTEICHTHYES – BONY FISHES	
	ORDER ACIPENSERIFORMES	
	Acipenseridae – 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
	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

Appendix A. (continued).

Scientific name	Common name	Lettter Code
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
Carassius auratus	Goldfish	GDFH
Carassus auratus X Cyprinius carpio	Goldfish-Common carp hybrid	GFCC
Couesius 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	**Shoal chub**	**SKCB***
Macrhybopsis gelida	**Sturgeon chub**	**SGCB***
Macrhybopsis meeki	**Sicklefin chub**	**SFCB***
Macrhybopsis storeriana	Silver chub	SVCB
M. aestivalis X M. gelida	Shoal-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
	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

Appendix A. (continued).

Scientific name	Common name	Letter Code
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 vigilax	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 erythrophthalmus	Rudd	RUDD
Semotilus atromaculatus	Creek chub	CKCB
	Unidentified Cyprinidae	UCY
	Unidentified Asian Carp	UAC
	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 commersonii	White sucker	WTSK
Catostomus platyrhynchus	Mountain sucker	MTSK
Catostomus spp.	Unidentified *Catostomus* spp.	UCA
Cycleptus elongatus	**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
Catostomidae - suckers	Unidentified Catostomidae	UCT
	ORDER SILURIFORMES	
	Ictaluridae – bullhead catfishes	
Ameiurus melas	Black bullhead	BKBH
Ameiurus natalis	Yellow bullhead	YLBH
Ameiurus nebulosus	Brown bullhead	BRBH
Ameiurus spp.	Unidentified bullhead	UBH
Ictalurus furcatus	Blue catfish	BLCF

Appendix A. (continued).

Scientific name	Common name	Letter Code
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 nocturnus	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 clarkii	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	Bonneville 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
	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 diaphanus	Banded killifish	BDKF
Fundulus notatus	Blackstripe topminnow	BSTM
Fundulus olivaceus	Blackspotted topminnow	BPTM
Fundulus sciadicus	Plains topminnow	PTMW

Appendix A. (continued).

Scientific name	Common name	Letter Code
Fundulus zebrinus	Plains killifish	PKLF
	Poeciliidae - livebearers	
Gambusia affinis	Western mosquitofish	MQTF
	Atherinidae - silversides	
Labidesthes sicculus	Brook silverside	BKSS
	ORDER GASTEROSTEIFORMES	
	Gasterosteidae - sticklebacks	
Culaea 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	Sacramento 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 megalotis	Longear sunfish	LESF
Lepomis microlophus	Redear sunfish	RESF
L. cyanellus X L. macrochirus	Green sunfish-bluegill hybrid	GSBG
	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 punctulatus	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 Centrarchidae	UCN
	Percidae - perches	
Ammocrypta asprella	Crystal darter	CLDR

Appendix A. (continued).

Scientific name	Common name	Letter Code
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	Orange throated 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 caprodes	Logperch	LGPH
Percina cymatotaenia	Bluestripe darter	BTDR
Percina evides	Gilt darter	GLDR
Percina maculata	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-walleye 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
	No fish caught	NFSH
	Unidentified larval fish	LVFS
	Unidentified	UNID
	Net Malfunction (Did Not Fish)	NDNF
	Turtles	
Chelydra serpentine	Common Snapping Turtle	SNPT
Chrysemys picta bellii	Western Painted Turtle	PATT
Emydoidea blandingii	Blanding's Turtle	BLDT
Graptemys pseudogeographica	False Map Turtle	FSMT
Trachemys scripta	Red-Eared Slider Turtle	REST
Apalone mutica	Smooth Softshell Turtle	SMST
Apalone spinifera	Spiny Softshell Turtle	SYST
Terrapene ornata ornata	Ornate Box Turtle	ORBT
Sternotherus odoratus	Stinkpot Turtle	SPOT
Graptemys geographica	Map Turtle	MAPT
Graptemys kohnii	Mississippi Map Turtle	MRMT
Graptemys ouachitensis	Ouachita Map Turtle	OUMT
Pseudemys concinna metteri	Missouri River Cooter Turtle	MRCT
Terrapene carolina triunguis	Three-toed Box Turtle	TTBT

Appendix B. Definitions and codes used to classify standard Missouri River habitats in the long-term pallid sturgeon and associated fish community sampling program.

Habitat	Scale	Definition	Code
Braided channel	Macro	An area of the river that contains multiple smaller channels and is lacking a readily identifiable main channel (typically associated with unchannelized sections)	BRAD
Main channel cross over	Macro	The inflection point of the thalweg where the thalweg crosses from one concave side of the river to the other concave side of the river, (i.e., transition zone from one-bend to the next bend). The upstream CHXO for a respective bend is the one sampled.	CHXO
Tributary confluence	Macro	Area immediately downstream, extending up to one bend in length, from a junction of a large tributary and the main river where this tributary has influence on the physical features of the main river	CONF
Dendritic	Macro	An area of the river where the river transitions from meandering or braided channel to more of a treelike pattern with multiple channels (typically associated with unchannelized sections)	DEND
Deranged	Macro	An area of the river where the river transitions from a series of multiple channels into a meandering or braided channel (typically associated with unchannelized sections)	DRNG
Dam Tailwaters	Macro	An area of the river downstream and near mainstem dams that characterized by altered flow and temperature regimes, reduced turbidities, bank armoring, and/or channel bed degradation (incision).	DTWT
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, years used, and catch per unit effort units for collection of Missouri River fishes in Segment 2 for the long-term pallid sturgeon and associated fish community sampling program.

Gear	Code	Type	Season	Years	CPUE units
Trammel Net – 1.0"inner mesh	TN	Standard	Sturgeon	2006 - Present	Fish / 100 m drift
		Standard	Fish Comm.	2006 - Present	Fish / 100 m drift
Otter Trawl – 16 ft head rope	OT16	Standard	Both Seasons	2006 - Present	Fish / 100 m trawled
Mini-Fyke Net	MF	Standard	Fish Comm.	2006 - Present	Fish / net night
Beam Trawl	BT	Standard	Both Seasons	2006	Fish / 100 m trawled
Bag Seine – half arc method pulled upstream	BSHU	Wild	Fish Comm.	2006	Fish / 100 m^2
Bag seine – rectangular method pulled upstream	BSRU	Wild	Fish Comm.	2006 & 2011	Fish / 100 m^2
Bag seine – rectangular method pulled downstream	BSRD	Wild	Fish Comm.	2006 & 2011	Fish / 100 m^2
Push Trawl – 8 ft 4mm x 4mm	POT02	Evaluation	Fish Comm.	2007	Fish / m trawled
Trot Line	TL	Evaluation	Both Season	2009	Fish / hook night
		Standard	Both Seasons	2010 - Present	Fish / hook night

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

State(s)	RPMA	Site Name	Code	River	R.M.
MT	2	Forsyth	FOR	Yellowstone	253.2
MT	2	Cartersville	CAR	Yellowstone	235.3
MT	2	Miles City	MIC	Yellowstone	181.8
MT	2	Fallon	FAL	Yellowstone	124.0
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	Grand Champs	GRC	Missouri	1741.0
MT	2	Wolf Point	WFP	Missouri	1701.5
MT	2	Poplar	POP	Missouri	1649.5
MT	2	Brockton	BRK	Missouri	1678.0
MT	2	Culbertson	CBS	Missouri	1621.0
MT	2	Nohly Bridge	NOB	Missouri	1590.0
ND	2	Confluence	CON	Missouri	1581.5
SD/NE	3	Sunshine Bottom	SUN	Missouri	866.2
SD/NE	3	Verdel Boat Ramp	VER	Missouri	855.0
SD/NE	3	Standing Bear Bridge	STB	Missouri	845.0
SD/NE	3	Running Water	RNW	Missouri	840.1
SD/NE	4	St. Helena	STH	Missouri	799.0
SD/NE	4	Mullberry Bend	MUL	Missouri	775.0
NE/IA	4	Ponca State Park	PSP	Missouri	753.0
NE/IA	4	Sioux City	SIO	Missouri	732.6
NE/IA	4	Sloan	SLN	Missouri	709.0
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
MO/KS	4	Kansas River	KSR	Missouri	367.5
NE	4	Platte River	PLR	Platte	5.0
KS/MO	4	Leavenworth	LVW	Missouri	397.0
MO	4	Parkville	PKV	Missouri	377.5
MO	4	Kansas City	KAC	Missouri	342.0
MO	4	Miami	MIA	Missouri	262.8
MO	4	Grand River	GDR	Missouri	250.0
MO	4	Boonville	BOO	Missouri	195.1
MO	4	Overton	OVT	Missouri	185.1
MO	4	Hartsburg	HAR	Missouri	160.0
MO	4	Jefferson City	JEF	Missouri	143.9
MO	4	Mokane	MOK	Missouri	124.7
MO	4	Hermann	HER	Missouri	97.6
MO	4	Washington	WAS	Missouri	68.5
MO	4	St. Charles	STC	Missouri	28.5

Appendix E. Juvenile and adult pallid sturgeon stocking summary for the Missouri River (RPMA 2).

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
1998	Big Sky Bend	255	1997	8/11/1998	Yearling	PIT Tag	Elastomer
1998	Confluence	40	1997	8/11/1998	Yearling	PIT Tag	Elastomer
1998	Nohly Bridge	255	1997	8/11/1998	Yearling	PIT Tag	Elastomer
1998	Sidney	230	1997	8/11/1998	Yearling	PIT Tag	Elastomer
2000	Culbertson	34	1998	10/11/2000	2 yr Old	PIT Tag	
2000	Fairview	66	1998	10/11/2000	2 yr Old	PIT Tag	
2000	Sidney	66	1998	10/11/2000	2 yr Old	PIT Tag	
2000	Wolf Point	34	1998	10/11/2000	2 yr Old	PIT Tag	
2000	Culbertson	89	1999	10/17/2000	Yearling	PIT Tag	
2000	Fairview	150	1999	10/17/2000	Yearling	PIT Tag	
2000	Sidney	149	1999	10/17/2000	Yearling	PIT Tag	
2000	Wolf Point	90	1999	10/17/2000	Yearling	PIT Tag	
2002	Culbertson	270	2001	7/18/2002	Yearling	CWT	Elastomer
2002	Fairview	270	2001	7/18/2002	Yearling	CWT	Elastomer
2002	Intake	199	2001	7/18/2002	Yearling	CWT	Elastomer
2002	Sidney	271	2001	7/18/2002	Yearling	CWT	Elastomer
2002	Wolf Point	269	2001	7/18/2002	Yearling	CWT	Elastomer
2002	Culbertson	317	2001	7/26/2002	Yearling	PIT Tag	
2002	Fairview	360	2001	7/26/2002	Yearling	PIT Tag	
2002	Intake	97	2001	7/26/2002	Yearling	PIT Tag	
2002	Sidney	427	2001	7/26/2002	Yearling	PIT Tag	
2002	Wolf Point	425	2001	7/26/2002	Yearling	PIT Tag	
2002	Intake	155	2001	9/18/2002	Yearling	PIT Tag	
2003	Culbertson	1033	2002	8/7/2003	Yearling	PIT Tag	Elastomer
2003	Fairview	887	2002	8/7/2003	Yearling	PIT Tag	Elastomer
2003	Intake	1040	2002	8/7/2003	Yearling	PIT Tag	Elastomer
2003	Wolf Point	926	2002	8/7/2003	Yearling	PIT Tag	Elastomer

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
2004	Milk River	821	2003	4/13/2004	Yearling	Elastomer	
2004	Culbertson	523	2003	8/9/2004	Yearling	PIT Tag	Elastomer
2004	Intake	347	2003	8/9/2004	Yearling	PIT Tag	Elasomer
2004	Sidney	397	2003	8/9/2004	Yearling	PIT Tag	Elastomer
2004	Wolf Point	379	2003	8/9/2004	Yearling	PIT Tag	Elastomer
2004	Larval Drift	30000	2004	7/2/2004	Fry		
2004	Larval Drift	50000	2004	7/8/2004	Fry		
2004	Larval Drift	25000	2004	7/20/2004	Fry		
2004	Larval Drift	25000	2004	7/23/2004	Fry		
2004	Larval Drift	25000	2004	7/27/2004	Fry		
2004	Culbertson	3819	2004	9/10/2004	Fingerling	CWT	Elastomer
2004	Sidney	2991	2004	9/10/2004	Fingerling	CWT	Elastomer
2004	Wolf Point	4040	2004	9/10/2004	Fingerling	CWT	Elastomer
2004	Mouth of Milk	3482	2004	10/15/2004	Advanced Fingerling	CWT	Elastomer
2004	Intake	2477	2004	11/18/2004	Advanced Fingerling	CWT	Elastomer
2005	Culbertson	288	2004	4/12/2005	Yearling	CWT	Elastomer
2005	Intake	309	2004	4/12/2005	Yearling	CWT	Elastomer
2005	Wolf Point	271	2004	4/12/2005	Yearling	CWT	Elastomer
2005	Intake	175	2004	8/19/2005	Yearling	PIT Tag	Elastomer
2005	Brockton	229	2005	10/5/2005	Advanced Fingerling	CWT	Elastomer
2005	Culbertson	226	2005	10/5/2005	Advanced Fingerling	CWT	Elastomer
2005	Intake	456	2005	10/5/2005	Advanced Fingerling	CWT	Elastomer
2005	Milk River	232	2005	10/5/2005	Advanced Fingerling	CWT	Elastomer
2005	Sidney	122	2005	10/5/2005	Advanced Fingerling	CWT	Elastomer
2005	Wolf Point	611	2005	10/12/2005	Advanced Fingerling	CWT	Elastomer
2005	Brockton	371	2005	10/13/2005	Advanced Fingerling		

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
2005	Culbertson	1736	2005	10/13/2005	Advanced Fingerling	CWT	Elastomer
2005	Culbertson	182	2005	10/13/2005	Advanced Fingerling		
2005	Intake	313	2005	10/13/2005	Advanced Fingerling		
2005	Milk River	845	2005	10/13/2005	Advanced Fingerling	CWT	Elastomer
2005	Mouth of Milk	371	2005	10/13/2005	Advanced Fingerling		
2005	Sidney	105	2005	10/13/2005	Advanced Fingerling		
2005	Wolf Point	1521	2005	10/13/2005	Advanced Fingerling	CWT	Elastomer
2005	Wolf Point	371	2005	10/13/2005	Advanced Fingerling		
2005	Culbertson	651	2005	10/19/2005	Advanced Fingerling	CWT	Elastomer
2005	Intake	2120	2005	10/19/2005	Advanced Fingerling	CWT	Elastomer
2005	Milk River	485	2005	10/19/2005	Advanced Fingerling	CWT	Elastomer
2005	Sidney	882	2005	10/19/2005	Advanced Fingerling	CWT	Elastomer
2005	Wolf Point	650	2005	10/19/2005	Advanced Fingerling	CWT	Elastomer
2006	Culbertson	235	2005	3/28/2006	Advanced Fingerling	Elastomer	
2006	Intake	327	2005	3/28/2006	Advanced Fingerling	Elastomer	
2006	Mouth of Milk	134	2005	3/28/2006	Advanced fingerling	Elastomer	
2006	Sidney	113	2005	3/28/2006	Advanced Fingerling	Elastomer	
2006	Wolf Point	232	2005	3/28/2006	Advanced Fingerling	Elastomer	
2006	Intake	970	2005	4/3/2006	Yearling	PIT Tag	Elastomer
2006	Sidney	314	2005	4/3/2006	Yearling	PIT Tag	Elastomer

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
2006	Culbertson	844	2005	4/5/2006	Yearling	PIT Tag	Elastomer
2006	Mouth of Milk	1007	2005	4/5/2006	Yearling	PIT Tag	Elastomer
2006	Wolf Point	866	2005	4/5/2006	Yearling	PIT Tag	Elastomer
2006	Culbertson	669	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006	Intake	765	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006	Mouth of Milk	650	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006	Sidney	228	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006	Wolf Point	653	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006		1355	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006	Culbertson	1544	2006	10/24/2006	Advanced Fingerling	Elastomer	
2006	Intake	1680	2006	10/24/2006	Advanced Fingerling	Elastomer	
2006	Mouth Milk	1117	2006	10/24/2006	Advanced Fingerling	Elastomer	
2006	Sidney	586	2006	10/24/2006	Advanced Fingerling	Elastomer	
2006	Wolf Point	1553	2006	10/24/2006	Advanced Fingerling	Elastomer	
2006	School Trust	436	2006	11/8/2006	Advanced Fingerling	Elastomer	
2007	Culbertson	651	2006	4/5/2007	Yearling	PIT Tag	Scute Removed
2007	Fallon	491	2006	4/3/2007	Yearling	PIT Tag	Scute Removed
2007	Forsyth	492	2006	4/3/2007	Yearling	PIT Tag	Scute Removed
2007	Sidney	983	2006	4/3/2007	Yearling	PIT Tag	Scute Removed
2007	School Trust	639	2006	4/5/2007	Yearling	PIT Tag	Scute Removed
2007	Wolf Point	651	2006	4/5/2007	Yearling	PIT Tag	Scute

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark Removed
2007	Wolf Point	428285	2007	7/9/2007	Fry		
2007	Grand Champs	5558	2007	7/13/2007	Fry		
2007	Miles City	13125	2007	7/18/2007	Fry		
2007	Intake	20763	2007	8/9/2007	Fry		
2007	Miles City	13675	2007	8/9/2007	Fry		
2007	Intake	336	2007	8/27/2007	Fingerling		
2007	Miles City	336	2007	8/27/2007	Fingerling		
2007	Wolf Point	672	2007	8/27/2007	Fingerling		
2007	Forsyth	690	2007	8/31/2007	Fingerling	CWT	
2007	Intake	615	2007	8/31/2007	Fingerling	CWT	
2007	School Trust	1160	2007	9/6/2007	Fingerling	CWT	
2007	Intake	293	2007	9/12/2007	Fingerling		
2007	Miles City	293	2007	9/12/2007	Fingerling		
2007	Wolf Point	586	2007	9/12/2007	Fingerling		
2007	Culbertson	6455	2007	9/14/2007	Fingerling	Elastomer	
2007	Fallon	4827	2007	9/14/2007	Fingerling	Elastomer	
2007	Forsyth	5370	2007	9/14/2007	Fingerling	Elastomer	
2007	Intake	7812	2007	9/14/2007	Fingerling	Elastomer	
2007	School Trust	6096	2007	9/14/2007	Fingerling	Elastomer	
2007	Sidney	1934	2007	9/14/2007	Fingerling	Elastomer	
2007	Wolf Point	6455	2007	9/14/2007	Fingerling	Elastomer	
2008	Culbertson	1384	2007	5/7/2008	Yearling	PIT Tag	Scute Removed
2008	Culbertson	643	2007	3/26/2008	Yearling	Elastomer	
2008	Fallon	1307	2007	5/7/2008	Yearling	PIT Tag	Scute Removed
2008	Forsyth	1384	2007	5/7/2008	Yearling	PIT Tag	Scute Removed
2008	Forsyth	106	2007	3/26/2008	Yearling	Elastomer	

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
2008	Intake	2395	2007	5/7/2008	Yearling	PIT Tag	Scute Removed
2008	Intake	103	2007	3/26/2008	Yearling	Elastomer	
2008	School Trust	1325	2007	5/7/2008	Yearling	PIT Tag	Scute Removed
2008	School Trust	654	2007	3/26/2008	Yearling	Elastomer	
2008	Sidney	149	2007	5/7/2008	Yearling	PIT Tag	Scute Removed
2008	Sidney	67	2007	3/26/2008	Yearling	Elastomer	
2008	Wolf Point	1328	2007	5/7/2008	Yearling	PIT Tag	Scute Removed
2008	Wolf Point	416	2007	3/26/2008	Yearling	Elastomer	
2008	Miles City	4797	2008	7/30/2008	Fry		
2008	Grand Champs	24395	2008	7/30/2008	Fry		
2008	Culbertson	15630	2008	9/24/2008	Fingerling	Elastomer	
2008	Fallon	7930	2008	9/29/2008	Fingerling	Elastomer	
2008	Forsyth	7723	2008	9/29/2008	Fingerling	Elastomer	
2008	Intake	12642	2008	9/29/2008	Fingerling	Elastomer	
2008	Sidney	3186	2008	9/29/2008	Fingerling	Elastomer	
2008	Wolf Point	11717	2008	9/24/2008	Fingerling	Elastomer	
2009	Culbertson	1387	2008	4/13/2009	Yearling	PIT Tag	Scute Removed
2009	Fallon	1155	2008	4/13/2009	Yearling	PIT Tag	Scute Removed
2009	Forsyth	1166	2008	4/13/2009	Yearling	PIT Tag	Scute Removed
2009	Intake	2181	2008	4/13/2009	Yearling	PIT Tag	Scute Removed
2009	Sidney	710	2008	4/13/2009	Yearling	PIT Tag	Scute Removed
2009	Wolf Point	2162	2008	4/13/2009	Yearling	PIT Tag	Scute Removed
2009	Miles City	46260	2009	7/31/2009	Fry		
2009	Wolf Point	26175	2009	7/22/2009	Fry		

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stockinga	Primary Mark	Secondary Mark
2009	Culbertson	10238	2009	9/24/2009	Fingerling	Elastomer	
2009	Fallon	5133	2009	9/23/2009	Fingerling	Elastomer	
2009	Forsyth	5386	2009	9/23/2009	Fingerling	Elastomer	
2009	Intake	8374	2009	9/23/2009	Fingerling	Elastomer	
2009	Sidney	1865	2009	9/23/2009	Fingerling	Elastomer	
2009	Wolf Point	9946	2009	9/23/2009	Fingerling	Elastomer	
2009	Intake	8374	2009	9/23/2009	Fingerling	Elastomer	
2009	Sidney	1865	2009	9/23/2009	Fingerling	Elastomer	
2009	Wolf Point	9946	2009	9/23/2009	Fingerling	Elastomer	
2010	Fallon	721	2009	4/15/2010	Yearling	PIT Tag	Scute Removed
2010	Fallon	268	2009	8/3/2010	Yearling	PIT Tag	Scute Removed
2010	Fallon	1000	2010	10/7/2010	Fingerling	Elastomer	
2010	Forsyth	1402	2009	4/15/2010	Yearling	PIT Tag	Scute Removed
2010	Forsyth	268	2009	8/3/2010	Yearling	PIT Tag	Scute Removed
2010	Intake	1890	2009	4/15/2010	Yearling	PIT Tag	Scute Removed
2010	Intake	816	2009	6/4/2010	Yearling	Elastomer	
2010	Intake	541	2009	8/3/2010	Yearling	PIT Tag	Scute Removed
2010	Intake	1000	2010	10/7/2010	Fingerling	Elastomer	
2010	Sidney	331	2009	4/15/2010	Yearling	PIT Tag	Scute Removed
2010	Wolf Point	1309	2009	4/15/2010	Yearling	PIT Tag	Elastomer, Scute
2010	Wolf Point	858	2009	6/4/2010	Yearling	Elastomer	
2010	Wolf Point	425	2009	8/3/2010	Yearling	PIT Tag	Scute Removed
2010	Wolf Point	1000	2010	10/7/2010	Fingerling	Elastomer	
2010	Culbertson	65	2004	9/21/2010	6 Yr Old	PIT Tag	
2010	Culbertson	1337	2009	4/15/2010	Yearling	PIT Tag	Elastomer, Scute

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stockinga	Primary Mark	Secondary Mark
2010	Culbertson	384	2009	6/4/2009	Yearling	PIT Tag	Scute Removed
2010	Culbertson	1000	2010	10/7/2010	Fingerling	Elastomer	
2010	School Trust	1766	2009	4/15/2010	Yearling	PIT Tag	Elastomer, Scute
2011	Culbertson	795	2010	5/5/2011	Yearling	PIT Tag	Scute
2011	Wolf Point	797	2010	5/5/2011	Yearling	PIT Tag	Scute
2011	Fallon	531	2010	5/5/2011	Yearling	PIT Tag	Scute
2011	Forsyth	545	2010	5/5/2011	Yearling	PIT Tag	Scute
2011	Intake	510	2010	5/5/2011	Yearling	PIT Tag	Scute
2011	Culbertson	262	2010	8/22/2011	Yearling	PIT Tag	Scute
2011	Fallon	131	2010	8/22/2011	Yearling	PIT Tag	Scute
2011	Forsyth	174	2010	8/22/2011	Yearling	PIT Tag	Scute
2011	Intake	132	2010	8/22/2011	Yearling	PIT Tag	Scute
2011	Wolf Point	262	2010	8/22/2011	Yearling	PIT Tag	Scute

Appendix F

Appendix F. Total catch, overall mean catch per unit effort (± 2 SE), and mean CPUE (fish/100 m) by Mesohabitat within a Macrohabitat for all species caught with each gear type during sturgeon season and fish community season for Segment 2 of the Missouri River during 2011. 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. 1.0” trammel net: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors on second line.

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB	TRML CHNB
BKBH	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BMBF	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BRBT	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BUSK	**2**	**0.006**	**0.019**	**0**	**0**	**0**	**0**	**0**
		0.008	**0.026**	**0**	**0**	**0**	**0**	**0**
CARP	1	0.004	0	0	0.01	0	0	0
		0.007	0	0	0.02	0	0	0
CNCF	50	0.17	0.009	0.333	0.443	0.012	0.089	0
		0.284	0.019	0	0.809	0.024	0.179	0
CSCO	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
ERSN	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
FHCB	23	0.073	0.019	0	0.11	0.041	0.531	0
		0.042	0.026	0	0.07	0.082	0.613	0
FHMW	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
FWDM	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB	TRML CHNB
GDEY	26	0.11	0	0	0.154	0.016	1.413	0.083
		0.116	0	0	0.261	0.032	1.724	0.167
LKWF	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
LNDC	26	0.078	0.095	0	0.067	0.1	0	0
		0.048	0.08	0	0.06	0.146	0	0
LNSK	15	0.046	0.056	0.167	0.065	0.012	0	0
		0.04	0.094	0.333	0.073	0.024	0	0
NFSH	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
NTPK	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
PDSG	**6**	**0.023**	**0.042**	**0**	**0.018**	**0**	**0.112**	**0**
		0.029	**0.083**	**0**	**0.026**	**0**	**0.223**	**0**
RVCS	1	0.003	0	0.167	0	0	0	0
		0.006	0	0.333	0	0	0	0
SFCB	**4**	**0.013**	**0**	**0**	**0**	**0.026**	**0.195**	**0**
		0.013	**0**	**0**	**0**	**0.036**	**0.23**	**0**
SGCB	**21**	**0.065**	**0.049**	**0.167**	**0.087**	**0.039**	**0.195**	**0**
		0.045	**0.051**	**0.333**	**0.108**	**0.059**	**0.23**	**0**
SGER	**10**	**0.029**	**0.009**	**0**	**0.075**	**0**	**0**	**0**
		0.031	**0.019**	**0**	**0.084**	**0**	**0**	**0**
SHRH	6	0.018	0.038	0.167	0	0	0.089	0
		0.014	0.036	0.333	0	0	0.179	0

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB	TRML CHNB
SMBF	3	0.009	0	0.333	0	0	0.089	0
		0.013	0	0.667	0	0	0.179	0
SMBS	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
SNSG	**100**	**0.339**	**0.257**	**0**	**0.642**	**0.095**	**0.167**	**0.083**
		0.27	**0.237**	**0**	**0.732**	**0.108**	**0.333**	**0.167**
SNSN	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
STCT	3	0.009	0.009	0	0.008	0	0	0.083
		0.01	0.019	0	0.017	0	0	0.167
STSN	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
UIC	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
WLYE	5	0.015	0	0	0.035	0	0.088	0
		0.014	0	0	0.034	0	0.175	0
WSMW	**1**	**0.003**	**0**	**0.167**	**0**	**0**	**0**	**0**
		0.006	**0**	**0.333**	**0**	**0**	**0**	**0**
WTCP	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
WTSK	9	0.026	0.037	0	0.042	0	0	0
		0.024	0.058	0	0.043	0	0	0
YWPH	1	0.003	0	0	0	0	0.089	0
		0.006	0	0	0	0	0.179	0

Appendix F2. Otter trawl: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors on second line.

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB	TRML CHNB
BKBH	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BMBF	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BRBT	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BUSK	**2**	**0.006**	**0.019**	**0**	**0**	**0**	**0**	**0**
		0.008	**0.026**	**0**	**0**	**0**	**0**	**0**
CARP	1	0.004	0	0	0.01	0	0	0
		0.007	0	0	0.02	0	0	0
CNCF	50	0.17	0.009	0.333	0.443	0.012	0.089	0
		0.284	0.019	0	0.809	0.024	0.179	0
CSCO	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
ERSN	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
FHCB	23	0.073	0.019	0	0.11	0.041	0.531	0
		0.042	0.026	0	0.07	0.082	0.613	0
FHMW	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
FWDM	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB	TRML CHNB
GDEY	26	0.11	0	0	0.154	0.016	1.413	0.083
		0.116	0	0	0.261	0.032	1.724	0.167
LKWF	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
LNDC	26	0.078	0.095	0	0.067	0.1	0	0
		0.048	0.08	0	0.06	0.146	0	0
LNSK	15	0.046	0.056	0.167	0.065	0.012	0	0
		0.04	0.094	0.333	0.073	0.024	0	0
NFSH	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
NTPK	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
PDSG	**6**	**0.023**	**0.042**	**0**	**0.018**	**0**	**0.112**	**0**
		0.029	**0.083**	**0**	**0.026**	**0**	**0.223**	**0**
RVCS	1	0.003	0	0.167	0	0	0	0
		0.006	0	0.333	0	0	0	0
SFCB	**4**	**0.013**	**0**	**0**	**0**	**0.026**	**0.195**	**0**
		0.013	**0**	**0**	**0**	**0.036**	**0.23**	**0**
SGCB	**21**	**0.065**	**0.049**	**0.167**	**0.087**	**0.039**	**0.195**	**0**
		0.045	**0.051**	**0.333**	**0.108**	**0.059**	**0.23**	**0**
SGER	**10**	**0.029**	**0.009**	**0**	**0.075**	**0**	**0**	**0**
		0.031	**0.019**	**0**	**0.084**	**0**	**0**	**0**
SHRH	6	0.018	0.038	0.167	0	0	0.089	0
		0.014	0.036	0.333	0	0	0.179	0

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB	TRML CHNB
SMBF	3	0.009	0	0.333	0	0	0.089	0
		0.013	0	0.667	0	0	0.179	0
SMBS	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
SNSG	**100**	**0.339**	**0.257**	**0**	**0.642**	**0.095**	**0.167**	**0.083**
		0.27	**0.237**	**0**	**0.732**	**0.108**	**0.333**	**0.167**
SNSN	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
STCT	3	0.009	0.009	0	0.008	0	0	0.083
		0.01	0.019	0	0.017	0	0	0.167
STSN	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
UIC	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
WLYE	5	0.015	0	0	0.035	0	0.088	0
		0.014	0	0	0.034	0	0.175	0
WSMW	**1**	**0.003**	**0**	**0.167**	**0**	**0**	**0**	**0**
		0.006	**0**	**0.333**	**0**	**0**	**0**	**0**
WTCP	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
WTSK	9	0.026	0.037	0	0.042	0	0	0
		0.024	0.058	0	0.043	0	0	0
YWPH	1	0.003	0	0	0	0	0.089	0
		0.006	0	0	0	0	0.179	0

Appendix F3. Mini-fyke net: overall season and segment summary. Lists CPUE (fish/net night) and 2 standard errors on second line.

	Total	Overall	CHXO	ISB	OSB	SCCS	SCN	TRML
Species	Catch	CPUE	BARS	BARS	BARS	BARS	BARS	BARS
BKBH	1	0.018	0	0.05	0	0	0	0
		0.035	0	0.1	0	0	0	0
BMBF	4	0.07	0	0	0	0.25	0	0
		0.085	0	0	0	0.289	0	0
BRBT	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BUSK	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
CARP	13	0.228	0	0.3	0	0.438	0	0
		0.181	0	0.358	0	0.446	0	0
CNCF	3	0.053	0	0.1	0.333	0	0	0
		0.06	0	0.138	0.667	0	0	0
CSCO	3	0.053	0	0	0	0.188	0	0
		0.078	0	0	0	0.272	0	0
ERSN	9	0.158	0	0.4	0	0.063	0	0
		0.217	0	0.605	0	0.125	0	0
FHCB	9	0.158	0	0.25	0	0.25	0	0
		0.179	0	0.32	0	0.5	0	0
FHMW	21	0.368	0	0.5	0	0.563	0.5	0
		0.295	0	0.533	0	0.774	1	0
FWDM	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0

Species	Total Catch	Overall CPUE	CHXO BARS	ISB BARS	OSB BARS	SCCS BARS	SCN BARS	TRML BARS
GDEY	6	0.105	0	0	0	0	0	3
		0.211	0	0	0	0	0	6
LKWF	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
LNDC	18	0.316	0.083	0.3	0.667	0.438	0.25	0.5
		0.188	0.167	0.255	1.333	0.515	0.5	1
LNSK	6	0.105	0.083	0.15	0	0.125	0	0
		0.096	0.167	0.219	0	0.171	0	0
NFSH	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
NTPK	3	0.053	0.083	0.05	0	0.063	0	0
		0.06	0.167	0.1	0	0.125	0	0
PDSG	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
RVCS	16	0.281	0.083	0.25	1	0.438	0	0
		0.211	0.167	0.32	2	0.515	0	0
SFCB	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
SGCB	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
SGER	**6**	**0.105**	**0**	**0.1**	**1**	**0.063**	**0**	**0**
		0.119	**0**	**0.138**	**2**	**0.125**	**0**	**0**

Species	Total Catch	Overall CPUE	CHXO BARS	ISB BARS	OSB BARS	SCCS BARS	SCN BARS	TRML BARS
SHRH	6	0.105	0	0	0	0.125	1	0
		0.156	0	0	0	0.25	2	0
SMBF	20	0.351	0	0.35	0	0.813	0	0
		0.285	0	0.442	0	0.821	0	0
SMBS	4	0.07	0	0.1	0	0.125	0	0
		0.068	0	0.138	0	0.171	0	0
SNSG	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
SNSN	**38**	**0.667**	**0.333**	**0.65**	**0**	**1.188**	**0.5**	**0**
		0.599	**0.512**	**0.567**	**0**	**1.985**	**1**	**0**
STCT	1	0.018	0	0	0.333	0	0	0
		0.035	0	0	0.667	0	0	0
STSN	2	0.035	0	0.1	0	0	0	0
		0.049	0	0.138	0	0	0	0
UIC	1	0.018	0	0	0	0.063	0	0
		0.035	0	0	0	0.125	0	0
WLYE	10	0.175	0	0.1	0	0.438	0	0.5
		0.143	0	0.2	0	0.407	0	1
WSMW	**9**	**0.158**	**0.333**	**0.2**	**0**	**0.063**	**0**	**0**
		0.14	**0.512**	**0.234**	**0**	**0.125**	**0**	**0**
WTCP	2	0.035	0.167	0	0	0	0	0
		0.049	0.225	0	0	0	0	0

Species	Total Catch	Overall CPUE	CHXO BARS	ISB BARS	OSB BARS	SCCS BARS	SCN BARS	TRML BARS
WTSK	9	0.158	0	0.25	0	0.125	0.5	0
		0.12	0	0.246	0	0.171	1	0
YWPH	4	0.07	0.083	0.05	0	0	0.25	0.5
		0.068	0.167	0.1	0	0	0.5	1

Appendix F4. Trot lines: overall season and segment summary. Lists CPUE (fish/20 hooks) and 2 standard errors on second line.

species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCN CHNB
BKBH	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
BMBF	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
BRBT	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
BUSK	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
CARP	5	0.104	0.071	0	0.105	0	0.667
	.	0.107	0.143	0	0.211	0	0.667
CNCF	18	0.375	0.571	0.667	0.263	0.333	0
	.	0.296	0.748	1.333	0.428	0.471	0
CSCO	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
ERSN	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
FHCB	1	0.021	0	0	0.053	0	0
	.	0.042	0	0	0.105	0	0
FHMW	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
FWDM	1	0.021	0	0	0.053	0	0
	.	0.042	0	0	0.105	0	0
GDEY	23	0.479	0.714	0.333	0.211	0.444	1.333
	.	0.245	0.571	0.667	0.246	0.676	0.667
LKWF	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
LNDC	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
LNSK	5	0.104	0	0.333	0.158	0.111	0
	.	0.089	0	0.667	0.172	0.222	0
NFSH	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
NTPK	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
PDSG	9	0.188	0.071	0.333	0.368	0	0

species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCN CHNB
	.	0.165	0.143	0.667	0.381	0	0
RVCS	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
SFCB	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
SGCB	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
SGER	6	0.125	0.214	0	0.053	0.222	0
	.	0.113	0.309	0	0.105	0.294	0
SHRH	4	0.083	0.071	0	0.158	0	0
	.	0.1	0.143	0	0.23	0	0
SMBF	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
SMBS	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
SNSG	132	2.75	2	4.333	3.263	3.222	0
	.	0.952	1.148	4.055	1.581	3.051	0
SNSN	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
STCT	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
STSN	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
UIC	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
WLYE	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
WSMW	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
WTCP	0	0	0	0	0	0	0
	.	0	0	0	0	0	0
WTSK	9	0.188	0	1	0.263	0	0.333
	.	0.154	0	1.155	0.3	0	0.667
YWPH	0	0	0	0	0	0	0
	.	0	0	0	0	0	0

Appendix G. Hatchery names, locations and abbreviations.

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

Appendix H. Alphabetic list of Missouri River fishes with total catch per unit effort by gear type for the sturgeon season and the fish community season during 2011 for Segment 2 of the Missouri River.

species	ST 1 Inch Trammel Net	ST Otter Trawl	FC 1 Inch Trammel Net	FC Mini Fyke	FC Otter Trawl	BOTH Trotline
BKBH	0.000	0.000	0.000	0.018	0.000	0.000
BMBF	0.011	0.000	0.024	0.070	0.000	0.000
BRBT	0.000	0.000	0.007	0.000	0.000	0.000
BUSK	0.006	0.006	0.028	0.000	0.006	0.000
CARP	0.000	0.000	0.000	0.228	0.007	0.104
CNCF	0.006	0.298	0.000	0.053	0.037	0.375
CSCO	0.006	0.000	0.016	0.053	0.000	0.000
ERSN	0.000	0.000	0.000	0.158	0.000	0.000
FHCB	0.009	0.058	0.135	0.158	0.089	0.021
FHMW	0.000	0.000	0.000	0.368	0.000	0.000
FWDM	0.000	0.000	0.000	0.000	0.000	0.021
GDEY	0.233	0.014	0.555	0.105	0.211	0.479
LKWF	0.000	0.000	0.008	0.000	0.000	0.000
LNDC	0.000	0.142	0.000	0.316	0.012	0.000
LNSK	0.046	0.071	0.013	0.105	0.020	0.104
NFSH	0.000	0.000	0.000	0.000	0.000	0.000
NTPK	0.000	0.000	0.018	0.053	0.000	0.000
PDSG	0.000	0.046	0.044	0.000	0.000	0.188
RVCS	0.136	0.006	0.079	0.281	0.000	0.000
SFCB	0.000	0.026	0.000	0.000	0.000	0.000
SGCB	0.000	0.123	0.000	0.000	0.006	0.000
SGER	0.175	0.040	0.172	0.105	0.018	0.125
SHRH	0.017	0.018	0.043	0.105	0.018	0.083
SMBF	0.020	0.011	0.010	0.351	0.006	0.000
SMBS	0.000	0.000	0.000	0.070	0.000	0.000
SNSG	0.140	0.445	0.629	0.000	0.228	2.750
SNSN	0.000	0.000	0.000	0.667	0.000	0.000
STCT	0.000	0.017	0.000	0.018	0.000	0.000
STSN	0.000	0.000	0.000	0.035	0.000	0.000
UIC	0.000	0.000	0.000	0.018	0.000	0.000
WLYE	0.006	0.000	0.005	0.175	0.031	0.000
WSMW	0.000	0.006	0.000	0.158	0.000	0.000

species	ST 1 Inch Trammel Net	ST Otter Trawl	FC 1 Inch Trammel Net	FC Mini Fyke	FC Otter Trawl	BOTH Trotline
WTCP	0.000	0.000	0.000	0.035	0.000	0.000
WTSK	0.028	0.017	0.035	0.158	0.036	0.188
YWPH	0.000	0.000	0.000	0.070	0.006	0.000

Appendix I. Comprehensive list of bend numbers and bend river miles for Segment 2 of the Missouri River comparing bend selection for both sturgeon season (ST), fish community season (FCS) and high water season (HW) between years from 2003 - 2011.

Bend Number	Bend River Mile	Coordinates		2006	2007	2008	2009	2010	2011
		Lattidude	Longitude						
1	1761	48.05581	106.3205	ST, FC					ST, FC, HW
2	1760								
3	1759	48.04416	106.28819		ST, FC				HW
4	1757.5								HW
5	1756	48.0338	106.25					ST, FC	FC
6	1754.5	48.02680	106.19850			ST, FC		ST, FC	FC, HW
7	1753	48.02938	106.16258		ST, FC	ST, FC			ST, FC
8	1751	48.03120	106.13605			ST, FC	ST, FC		ST, FC, HW
9	1749.5	48.02872	106.12263	ST, FC					ST, FC, HW
10	1747	48.0057	106.109					ST, FC	ST, FC, HW
11	1745	48.0268	106.085				ST, FC	ST, FC	ST, FC
12	1744	48.03534	106.08521	ST, FC	ST, FC	ST, FC	ST, FC		FC
13	1741.5	48.01	106.045				ST, FC	ST, FC	
14	1740	48.00225	106.02761		ST, FC				
15	1738								
16	1736.5	48.0314	106.001		ST, FC		ST, FC		
17	1735	48.0255	105.988			ST, FC			
18	1733	48.0129	105.953	ST, FC					
19	1732	48.0115	105.932	ST, FC	ST, FC				
20	1730.5								
21	1728.5	48.0362	105.896			ST, FC			
22	1727.5								FC
23	1726.5	48.019	105.872	ST, FC	ST, FC		ST, FC	ST, FC	

Bend Number	Bend River Mile	Coordinates		2006	2007	2008	2009	2010	2011
		Lattidude	Longitude						
24	1725.5	48.0086	105.852			ST, FC			
25	1723.5	48.0167	105.83			ST, FC		ST, FC	
26	1722	48.024	105.795		ST, FC				FC, HW
27	1720	48.0462	105.778				ST, FC	ST, FC	HW
28	1719	48.0447	105.767	ST, FC	ST, FC				HW
29	1717.5	48.0264	105.748					ST, FC	FC, HW
30	1716	48.0323	105.717				ST, FC		FC, HW
31	1714	48.0533	105.695				ST, FC	ST, FC	HW
32	1712	48.0531	105.665		ST, FC	ST, FC			
33	1710.5	48.0474	105.662	ST, FC		ST, FC			
34	1710	48.0516	105.642	ST, FC			ST, FC		
35	1709	48.0696	105.648	ST, FC					HW
36	1707.5	48.0765	105.641			ST, FC			
37	1706.5	48.0741	105.621	ST, FC	ST, FC		ST, FC	ST, FC	HW
38	1705.5	48.0773	105.607					ST, FC	
39	1704.5	48.0801	105.586	ST, FC	ST, FC	ST, FC			ST, FC
40	1703	48.0783	105.56				ST, FC		ST, FC, HW