2015 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

By:

John Hunziker, Tyler Haddix & Landon Holte

Montana Fish, Wildlife & Parks
PO BOX 165
Fort Peck, MT 59223

March, 2016

EXECUTIVE SUMMARY

The 2015 sampling year marked the 10th consecutive field season for Pallid Sturgeon Population Assessment crews in Segment 2 of the Missouri River in Montana. After an unexpected, but successful pallid-centric targeted effort in 2014, crews were excited to once again sample Segment 2 in the search for pallid sturgeon. Although localized "hot spots" were not present to the same degree, Segment 2 did not disappoint in 2015.

A total of twelve randomly selected bends were sampled once each during sturgeon and fish community seasons throughout Segment 2 during the 2015 sampling season. A total of 222 trammel net drifts resulted in the sampling of 55.4 km of river channel; while an additional 218 otter trawl deployments accounted for 61.4 km of sampling. Each bend was also subject to standard mini-fyke net deployments (N=8) during fish community season, for a total of 96 overnight mini-fyke net sets. Additionally, trotline sampling across both season, set both in random standard method as well as non-random targeted form, totaled 121 twenty-hook deployments.

A total of 113 pallid sturgeon were captured in Segment 2 during the 2015 field season. Temporally, 47 were observed during sturgeon season, while the other 66 were captured during fish community season. Trotlines were once again a formidable gear for sampling pallid sturgeon in Segment 2 during 2015, capturing the largest proportion of fish (N=54). In comparison, trammel net was the next most effective, capturing 33 pallid sturgeon, while the otter trawl, although least effective, was comparable with 26. It is of importance to note that in recent years, total pallid captures could be weighted by non-random targeted efforts, however, during the 2015 sampling season, only ten additional pallid sturgeon were captured during targeted trotline efforts.

Trammel net catch per unit effort (CPUE) for combined seasons in 2015 was reported at 0.07 fish/100m, which was an all time high for Segment 2. The newly observed high was driven by a fish community season CPUE of 0.10 fish/100m, also a new high for that particular season. In comparison, CPUE during sturgeon season was recorded at 0.03fish/100m. Comparatively, otter trawl CPUE in segment 2 during 2015 was calculated at 0.03 fish/100m when both season's

data was combined. Seasonally, the CPUE was calculated at 0.02 fish/100m and 0.04 fish/100m for sturgeon and fish community seasons, respectively. Additionally, trotline CPUE for Segment 2 during the 2015 field season exhibited a combined season catch rate of 0.45 fish/20 hooks. Seasonally, CPUEs were calculated at 0.56 fish/20 hooks and 0.34 fish/20 hooks for sturgeon and fish community seasons, respectively.

All 113 pallid sturgeon captured in Segment 2 in 2015, representing eleven year classes, were hatchery-reared and of known year class (Table 3). Year classes in rank of abundance were; 2009 (N=35), 2008 (N=29), 2006 (N=14), 2010 (N=12), 2004 & 2005 (N=6), 2007 (N=5), 2013 (N=3) and 2001, 2003 & 2012 (N=1). Of the 113 pallid sturgeon captured, 88 were of known stocking location; all originating in RPMA 2. A comparison shows the largest proportion (78%) of captures originated in the Missouri River, compared to 22% in the Yellowstone. Further analysis of stocking location in order of abundance is as follows; Wolf Point (N=37), Culbertson (N=25), Intake (N=9), School Trust FAS (N=6), Sidney (N=5), Fallon (N=4) and Forsyth & Mouth of the Milk River both with one individual.

Pallid sturgeon captured in Segment 2, all of which were of hatchery origin, during the 2015 field year averaged 418 mm in fork length, and 240 g in weight, with a range of 675 mm TL to 267 mm TL. Although captures of larger size classes (>700 mm FL) of pallid sturgeon have become more common in Segment 2, crews failed to sample any of those fish during 2015. In relation to gear, trotlines, on average, captured the largest individuals (427 mm FL), followed by trammel net (423 mm FL) and otter trawl (391 mm FL). For the second year in a row relative condition (Kn) for the sub-stock category (200-329 mm) of hatchery-reared pallid sturgeon exhibited an sharp increase. However, when looking at the data, the Kn for that particular category in 2015 was based off of one individual (L=267mm, W=152g), and may reflect an error in the data. Relative condition for the stock size-category of pallid sturgeon, after increasing post 2012, seems to be holding nearly steady. Meanwhile, Kn for the quality size-class of individuals appears to have decreased slightly when compared to recent years. No pallid sturgeon were captured in 2015 during Segment 2 sampling that would fall into the preferred or memorable/trophy size classes.

For the first time in the history of the Pallid Sturgeon Population Assessment Program in Segment 2, a shovelnose sturgeon x pallid sturgeon hybrid was captured during 2015 sampling. At the time of capture, field crews determined the fish to a pallid sturgeon with no clear hatchery

markings. The fish was later determined to be a hybrid following the genetic verification methods outlined by the PSPA genetic sampling protocols. The aforementioned hybrid was sampled on July 23, at river mile 1,753 and was captured via trammel net. It was a larger individual with a FL of 995 mm and a weight of 3,500 g. It was also implanted with a radio telemetry tag; should this fish warrant further monitoring or investigation, recapturing should be of more convenience.

Shovelnose sturgeon continue to be highly abundant across Segment 2 of the Missouri River, particularly in the upper reaches. Sampling efforts in 2015 culminated in the capture of 1,298 shovelnose sturgeon. A temporal breakdown of those captures shows that more sturgeon were captured during fish community season (N=810) than during sturgeon season (N=488). At least some portion of the higher fish community catch rates can be attributed to two non-random, pallid-centric targeted trotline efforts held during September and October of 2015. The first targeted effort, which took place on September 21, resulted in the sampling of 193 additional shovelnose sturgeon. A second targeted effort, which was executed on October 22, witnessed 42 additional observations. A comparison of standard gears and their ability to catch shovelnose sturgeon shows that trammel net was the most successful gear with 682 shovelnose sturgeon observations, followed closely by trotline (N=511) and in a distant third, otter trawl (N=105).

Combined-season trammel net CPUE for Segment 2 in 2015 regarding quality and above shovelnose sturgeon was calculated at 1.27 fish/100m. Among seasons, a CPUE of 1.01 fish/100m and 1.53 fish/100m were observed for sturgeon and fish community seasons, respectively. Trammel net CPUE remains very low for the stock and sub-stock categories due to the age structure of shovelnose sturgeon in Segment 2 of the Missouri River. In comparison, otter trawl CPUE across both seasons, for quality and above size class shovelnose sturgeon, was reported at 0.16 fish/100m during the 2015 field season. Temporally, a CPUE of 0.22 fish/100m was recorded during sturgeon season, while a CPUE of 0.10 fish/100m was calculated for fish community season. Like trammel nets, CPUE for stock and sub-stock categories remains low, as the population of shovelnose in Segment 2 of the Missouri River is dominated by adult fish. Additionally, trotline CPUE in Segment 2 during 2015 averaged 4.08 fish/20 hooks for both sturgeon and fish community seasons, leading to a CPUE for combined season also calculated at 4.08 fish/20 hooks. As with otter trawl and trammel net, captures of stock and sub-stock classes remains virtually nonexistent.

The shovelnose sturgeon observed in Segment 2 during the 2015 sampling season averaged 613 mm in fork length and 945 g in weight. These average lengths and weights have remained relatively constant over time. Relative weight (Wr) for both the stock and quality size classes of shovelnose sturgeon remains highly variable with no real discernible pattern, which may be in part to low sample size. In comparison, the Wr for the preferred and memorable/trophy size class of shovelnose sturgeon in Segment 2 has remained much more stable and comparable. In addition, the Wr for the latter size classes has become nearly identical over the past few years.

A total of 15 sturgeon chubs were captured in Segment 2 in 2015, with the majority of observations (67%) occurring during sturgeon season. All sturgeon chubs were captured during random otter trawl deployments. Catch per unit effort for sturgeon chub in Segment 2 in 2015 was recorded as follows; 0.04 fish/100m during sturgeon season, 0.02 fish/100m during fish community season, and a combined season CPUE of 0.03 fish/100m. The sturgeon chubs observed during the 2015 field season in Segment 2 averaged 84 mm in total length, which is identical to the past three field seasons. This reoccurring phenomenon indicates that the population of sturgeon chubs in Segment 2 continues to be dominated by adult fish.
The abundance of sicklefin chubs was once again lacking in Segment 2 during the 2015 field season, with the capture of only two specimens via otter trawl deployments during sturgeon season. Low capture rates continue to cause otter trawl CPUE to hover barely above 0 fish/100m. With both individuals being of larger size, 90 and 102 mm, respectively, what few sicklefin chubs are observed continue to support the pattern of an adult-only population of sicklefin chubs residing in Segment 2 of the Missouri River.

Sampling events occurring in Segment 2 in 2015 resulted in the capture of 242 sand shiners, all of which were observed using mini-fyke nets. The aforementioned captures led to an observed CPUE of 2.52/fish per net night. The average total length for sand shines observed in Segment 2 during the 2015 sampling year was 36 mm, with a range of 19 mm to 56 mm. The average and observed length suggests that Segment 2 of the Missouri River continues to support a population of sand shiners made up of multiple age classes.

A total of 38 *Hybotnathus* spp. were captured in Segment 2 of 2015, all of which were western silvery minnows. The vast majority (all but one) were sampled via mini-fyke net, resulting in a mini-fyke net CPUE calculated at 0.39 fish/net night. The *Hybotnathus* spp. in

Segment 2 during 2015 averaged 77 mm in total length. Average length per year continues to be variable depending on the dominant proportion either being adult sized fish, or in other years, younger age classes. For example, of the *Hybotnathus* spp. observed in 2015, only 13% had a total length less than 50 mm, with the other 87 % ranging from 62 to 97 mm in TL. However, by analyzing the length frequency, it appears multiple age classes were present in 2015.

During the 2015 sampling season a total of 12 blue suckers were observed in Segment 2, all of which were captured drifting trammel nets. Seasonally, nine were captured during sturgeon season, while the other three were sampled during fish community season. Blue sucker CPUE in Segment 2 for trammel net was reported at 0.03 fish/100m when analyzed for the entire 2015 field season. Seasonally, CPUEs of 0.04 fish/100m and 0.01 fish/100m were witnessed during sturgeon and fish community seasons, respectively. Blue suckers that were captured in Segment 2 during the 2015 sampling year averaged 676 mm in TL and 2,896 g in weight. These observed averages in both length and weight are typical of the sampled population of blue suckers inhabiting Segment 2 across all years. However, one particular fish in 2015 was an outlier to the norm; a blue sucker captured on September 9, in bend 27, measured 295 mm TL 163 g. This was only the third blue sucker less than 500 mm TL captured in Segment 2 since the Program began in 2006.

The sampling of Segment 2 in 2015 resulted in the capture of 218 sauger. Sauger observations continue to be common across all standard gears, with rank in order of abundance as follows; trammel net (N=141), otter trawl (N=62), mini-fyke net (N=14) and trotline (N=1). Catch per unit of effort for trammel net sampling of sauger, across both seasons, in Segment 2 during 2015 showed a catch rate of 0.30 fish/100m. Within seasons, a higher CPUE was reported during sturgeon season (0.52 fish/100m) than fish community season (0.08 fish/100m). Comparatively, otter trawl CPUE for combined seasons was calculated at 0.11 fish/100m, with a seasonal variability from 0.19 fish/100 m during sturgeon season, to 0.03 fish/100m during fish community season. Additionally, a mini-fyke net CPUE of 0.15 fish/net night was recorded in Segment 2 during the 2015 fish community season. The average TL for sauger observations during the 2015 field season in Segment 2 was 328 mm, while weight averaged 258 g, with a range of 232 mm to 488 mm.

Evaluating trends, annually or long-term, for target species could potentially be a convoluted subject. Some trends have become more clear as times go on; for example, most of

the native target species become more prevalent in Segment 2 during the sturgeon season in relation to upstream spawning movements. However, the related catch rates to these species are sometimes driven by brief but exceptional events that can occasionally be the result of one sampling event in one bend. Furthermore, even when flows and conditions remain near static downstream of Fort Peck Dam, flow events occurring in the Milk River, either positive or negative, could have tremendous compounding effects reaching far downstream.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Introduction

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

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 (2011). 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 7 through June 16) and the Fish Community Season (July 14 through October 22) during 2015.

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, in 2009, to a standard gear for 2010 in segment 2. 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 (2011).

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 is 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 (2011). 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.

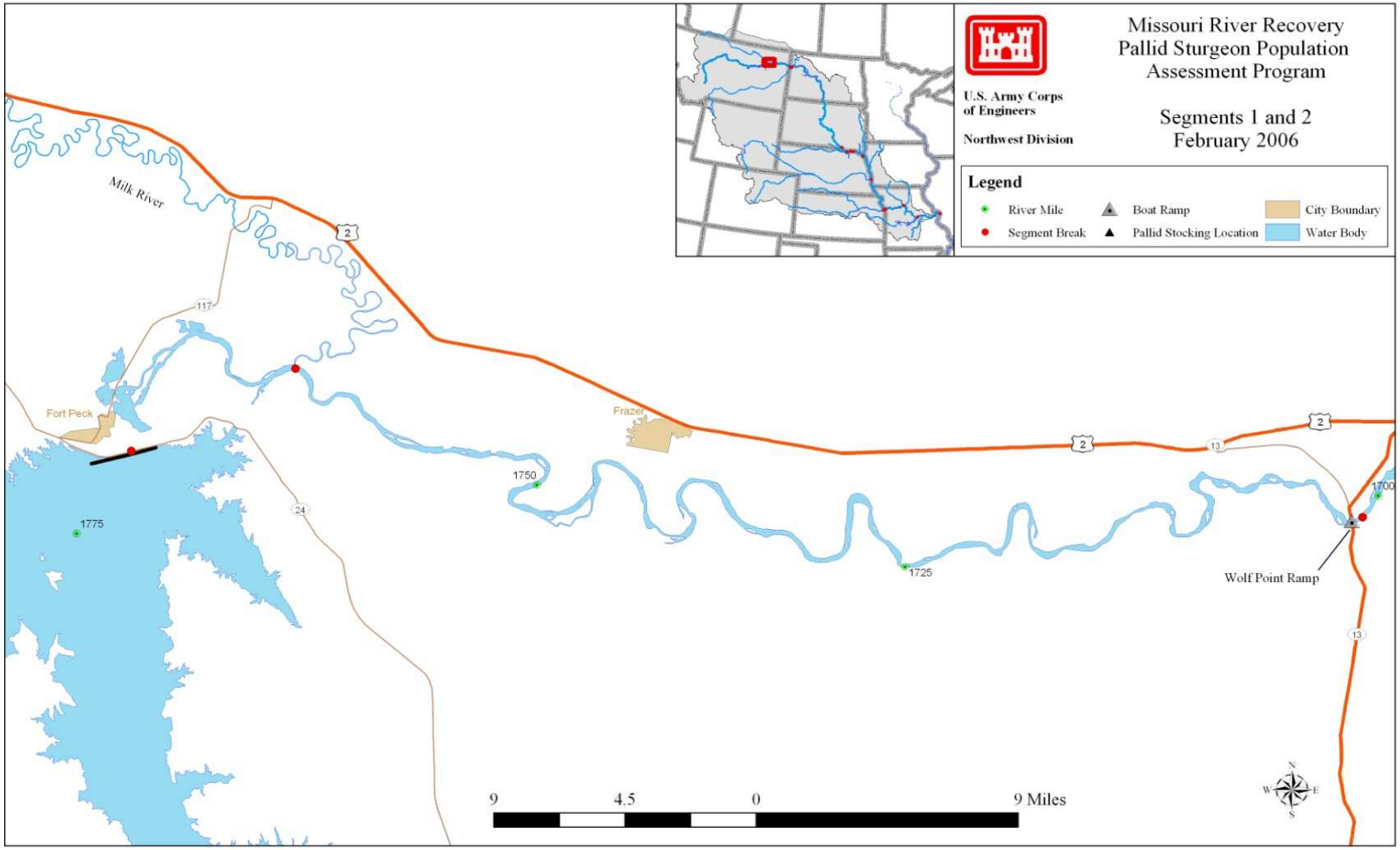

Figure 1. Map of Segment 2 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 2 encompasses the Missouri River from the mouth of the Milk River (River Mile 1761.5) to Wolf Point, MT (River Mile 1701.5).

Results

Effort

A total of 12 randomly selected bends were sampled once each during sturgeon and fish community seasons throughout Segment 2 during the 2015 sampling season. All 12 bends were sampled using the standard trammel net, otter trawl, trotline and mini-fyke gears. While each bend was sampled with trammel net and otter trawl twice, trotlines were deployed once each for all 12 river bends; half of which were deployed during sturgeon season, while the other half were deployed during fish community season. Additionally, each bend was also sampled with mini-fyke net during fish community season.

A total of 222 trammel nets were drifted in Segment 2 in 2015. Those drifts resulted in nearly 55.4 km of the river being sampled. Of those deployments, 24.4 and 30 km of river sampling was performed during sturgeon and fish community seasons, respectively. Of the 222 trammel net drifts, 192 of them were performed in random fashion, which resulted in 47.5 km of sampling. While the remaining 30 drifts, which were performed in non-random fashion, accounted for only 7.9 km of river sampling.

In comparison, the otter trawl was deployed a total of 218 times in Segment 2 during the 2015 field season. Those trawls resulted in 61.4 km of river being sampled. Although slightly more sampling occurred during fish community season (31.3 km), it was very comparable to that of sturgeon season (30.1 km). Similarly to trammel nets, the majority of otter trawl deployments (N=192) occurred in random fashion and resulted in 54.8 km of sampling. Whereas the remaining 26 non-random otter trawl sets accounted for only 7.6 km of sampling.

Using our standard of eight trotlines per bend, while sampling all 12 bends, a total of 96 overnight trotlines were deployed in random fashion in Segment 2 during the 2015 field season. Additionally, non-random targeted efforts accounted for an added 25 trotline sets, all of which took part during the latter part of fish community season.

Like trotlines, mini-fyke nets are standardized at eight overnight sets per bend. With a total of 12 bends being sampled, all of which take place during fish community season, a total of 96 mini-fyke nets were deployed in Segment 2 during the 2015 sampling year.

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 as effort 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 2015. N-E indicates the habitat is non-existent in the segment.

Gear	Number of Bends	Mean Effort	Macrohabitat[a]								
			CHXO	CONF	ISB	OSB	SCCL	SCCS	SCN	TRML	TRMS
Sturgeon Season											
1.0" Trammel Net	12	8	39	2	28	27	0	0	0	0	0
Otter Trawl	12	8	36	2	28	30	0	0	0	0	0
Fish Community Season											
1.0" Trammel Net	12	8	38	0	32	24	0	0	0	2	0
Mini-Fyke Net	12	8	36	2	37	4	1	5	8	2	1
Otter Trawl	12	8	38	0	32	24	0	0	0	2	0
Both Seasons											
Trot Line	12	8.17	43	2	37	14	0	0	0	2	0

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

Pallid Sturgeon

A total of 113 pallid sturgeon (Figure 9) were captured in Segment 2 during the 2015 field season. Temporally, 47 were observed during sturgeon season, while the other 66 were witnessed during fish community season. The difference observed in total catch by season can, in part, be attributed to two different pallid-centric targeting efforts conducted using trotlines. These efforts, which were held on September 21 and October 22, 2015, accounted for an additional 10 pallid sturgeon captures in Segment 2.

Trotlines were once again a formidable gear for sampling pallid sturgeon in Segment 2 during 2015, capturing the largest proportion of fish (N=54). In comparison, trammel net was the next most effective, capturing 33 pallid sturgeon, while the otter trawl, although least effective, was comparable with 26. Recent targeted efforts in attempt to capture more pallid sturgeon have been completed with both trammel net and trotline, with results showing both gears are a legitimate way to capture hatchery-reared juvenile pallid sturgeon residing it Segment 2.

Trammel net catch per unit effort (CPUE) for combined seasons in 2015 was reported at 0.07 fish/100m, which was an all time high for Segment 2. The newly observed high was driven by a fish community season CPUE of 0.10 fish/100m, also a new high for that particular season. In comparison, CPUE during sturgeon season was recorded at 0.03fish/100m. A comparison of trammel net CPUE for all years can be found in Figure 5.

The CPUE for otter trawl in Segment 2 during 2015 was calculated at 0.03 fish/100m when both season's data was combined. Seasonally, the CPUE was calculated at 0.02 fish/100m and 0.04 fish/100m for sturgeon and fish community seasons, respectively. In comparison, otter trawl CPUE did not exhibit near as a drastic change as that witnessed with trammel net sampling. An otter trawl CPUE comparison for all years can be found in Figure 6.

Trotline CPUE for Segment 2 during the 2015 field season exhibited a combined season catch rate of 0.45 fish/20 hooks. Seasonally, CPUEs were calculated at 0.056 fish/20 hooks and 0.34 fish/20 hooks for sturgeon and fish community seasons, respectively. While combined season CPUE exhibits a slightly more stable pattern, CPUE during each season continues to be erratic and highly variable. A complete comparison of trotline CPUE can be observed in Figure 7.

Pallid sturgeon captured in Segment 2, all of which were of hatchery origin, during the 2015 field year averaged 418 mm in fork length, and 240 g in weight, with a range of 675 mm TL to 267 mm TL. Although captures of larger size classes (>700 mm FL) of pallid sturgeon have become more common in Segment 2, crews failed to sample any of those fish during 2015. In relation to gear, trotlines, on average, captured the largest individuals (427 mm FL), followed by trammel net (423 mm FL) and otter trawl (391 mm FL). Further details pertaining to incremental relative stock density (RSD) in Segment 2 can be found in Figure 3, while length frequency can be viewed in Figure 8.

The relative condition (Kn) for pallid sturgeon examined in Segment 2 is shown in Figure 4. For the second year in a row Kn for the sub-stock category (200-329 mm) of hatchery-reared pallid sturgeon exhibited an sharp increase. However, when looking at the data, the Kn for that particular category in 2015 was based off of one individual (L=267mm, W=152g), and may reflect an error in the data. Relative condition for the stock size-category of pallid sturgeon, after increasing post 2012, seems to be holding nearly steady. Meanwhile, Kn for the quality size-class of individuals appears to have decreased slightly when compared to recent years. No pallid sturgeon were captured in 2015 during Segment 2 sampling that would fall into the preferred or memorable/trophy size classes. A full description of Kn dating back to 2006 can be found in Figure 4.

Pallid sturgeon distribution in Segment 2 (Figure 2) remains variable; however, captures of pallid sturgeon in the upper section of Segment 2 are much more common than they were during the initial years of the Program. It is also important to note that while the distribution figure gives an overall visual of where pallid sturgeon were captured in Segment 2, these data can be biased depending on which random bends are selected and where they are located. In addition, recent targeted efforts, regardless of intensity, can also inflate pallid sturgeon catch in localized areas.

All 113 pallid sturgeon captured in Segment 2 in 2015, representing eleven year classes, were hatchery-reared and of known year class (Table 3). Year classes in rank of abundance were; 2009 (N=35), 2008 (N=29), 2006 (N=14), 2010 (N=12), 2004 & 2005 (N=6), 2007 (N=5), 2013 (N=3) and 2001, 2003 & 2012 (N=1). Large stocking events in 2008 and 2009 continue to be reflected in the abundance of those year classes observed in sampling (Appendix E).

Of the 113 pallid sturgeon captured in Segment 2 in 2015, 88 were of known stocking location; all originating in RPMA 2. All pallid sturgeon stocked in RPMA 2 are released in either the Yellowstone or Missouri River. A comparison of those two rivers shows the largest proportion (78%) of captures originated in the Missouri River, compared to 22% in the Yellowstone. Further analysis of stocking location in order of abundance is as follows; Wolf Point (N=37), Culbertson (N=25), Intake (N=9), School Trust FAS (N=6), Sidney (N=5), Fallon (N=4) and Forsyth & Mouth of the Milk River both with one individual.

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 as effort expended in those macro habitats.

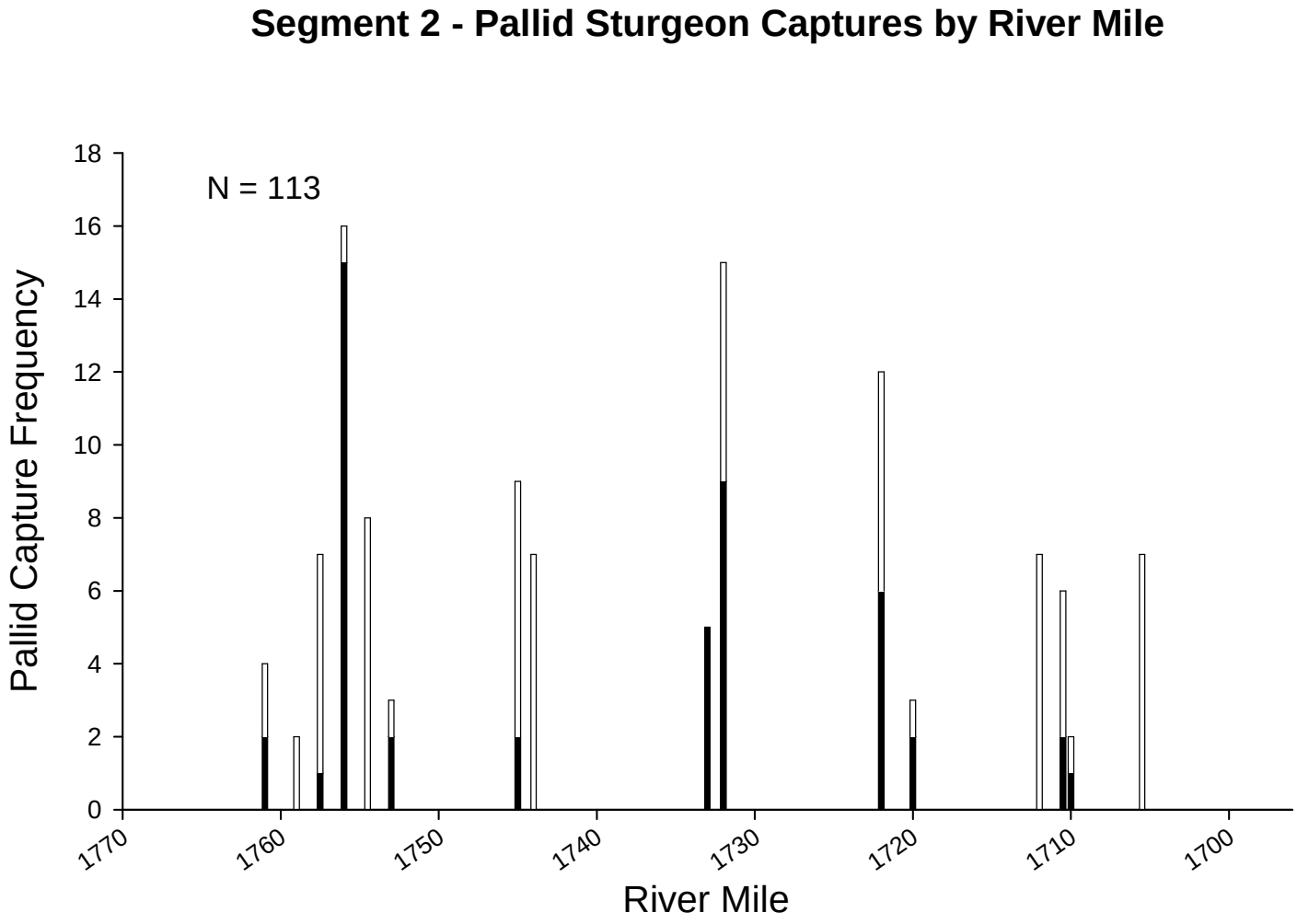

Figure 2. Distribution of pallid sturgeon captures by river mile for Segment 2 of the Missouri River during 2015. Black bars represent pallid sturgeon captures during sturgeon season and white bars represent pallid sturgeon captures during fish community season. Figure includes all pallid captures including 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 2015. Means (minimum and maximum) are presented. Habitat definitions and codes presented in Appendix B. Table includes all pallid sturgeon captures including non-random samples.

Habitat		Depth (m)		Bottom Velocity (m/s)		Temperature (°C)		Turbidity		Total Pallids Caught
MACRO	MESO	Effort	Catch	Effort	Catch	Effort	Catch	Effort	Catch	
CHXO	BARS	0.4 (0.2-0.8)		0.10 (0.00-0.41)		14.7 (12.0-18.2)		55 (7-213)		.
	CHNB	1.8 (1.0-3.6)	1.8 (1.2-3.0)	0.66 (0.00-0.94)	0.62 (0.27-0.87)	11.7 (4.3-17.8)	11.6 (4.3-14.7)	21 (5-70)	17 (6-33)	44
CONF	BARS	0.4 (0.2-0.5)		0.00 (0.00-0.00)		23.1 (20.8-25.3)		21 (21-21)		.
	CHNB	1.9 (1.3-2.6)		. (.-.)		8.9 (5.3-15.0)		44 (38-50)		.
ISB	BARS	0.4 (0.2-0.6)		0.07 (0.00-0.43)		14.7 (12.0-18.9)		50 (9-324)		.
	CHNB	1.7 (1.0-5.4)	1.6 (1.0-2.5)	0.61 (0.36-0.89)	0.60 (0.41-0.82)	11.7 (4.3-17.9)	10.8 (4.3-16.0)	21 (6-75)	24 (6-75)	58
OSB	BARS	0.4 (0.4-0.5)		0.00 (0.00-0.00)		14.1 (12.0-17.6)		13 (13-13)		.
	CHNB	2.2 (0.6-5.2)	1.7 (0.6-2.5)	0.72 (0.27-0.98)	0.58 (0.58-0.58)	11.9 (5.5-17.7)	12.4 (11.3-13.7)	19 (3-70)	12 (8-18)	11
SCCL	BARS	0.4 (0.4-0.4)		. (.-.)		14.4 (14.4-14.4)		. (.-.)		.
	CHNB									.
SCCS	BARS	0.4 (0.3-0.5)		0.09 (0.09-0.09)		13.7 (13.5-13.8)		15 (14-16)		.
	CHNB									.
SCN	BARS	0.4 (0.2-0.6)		0.00 (0.00-0.00)		15.3 (12.0-18.4)		21 (13-30)		.
	CHNB									.
TRIB	BARS									.
	CHNB									.
TRML	BARS	0.5 (0.3-0.6)		0.00 (0.00-0.00)		23.8 (23.3-24.3)		83 (83-83)		.
	CHNB	1.8 (1.3-2.4)		0.59 (0.59-0.59)		12.2 (7.6-21.4)		36 (6-65)		.
TRMS	BARS	0.4 (0.4-0.4)		0.00 (0.00-0.00)		13.0 (13.0-13.0)		10 (10-10)		.
	CHNB									.

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 2015 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	.	.	.	630	764.0	0.833	.	.
.	.	.	.	.	.	.	.	.	.
2003	1	.	.	.	448	247.0	0.827	.	.
.	.	.	.	.	.	.	.	.	.
2004	6	.	.	.	480	366.2	0.935	.	.
.	.	.	.	.	51	140.0	0.091	.	.
2005	6	240	46.4	1.224	436	248.3	0.921	0.060	0.067
.	.	10	7.2	0.356	11	18.1	0.121	0.007	0.011
2006	14	240	48.0	1.196	454	281.3	0.884	0.069	0.078
.	.	43	25.0	0.093	18	40.8	0.050	0.007	0.032
2007	5	280	74.0	1.165	418	239.2	1.009	0.061	0.059
.	.	.	.	.	19	34.2	0.147	.	.
2008	29	246	53.5	1.321	416	231.7	0.966	0.082	0.086
.	.	19	7.1	0.260	13	23.4	0.032	0.011	0.024
2009	35	250	54.1	1.110	396	219.0	1.085	0.082	0.087
.	.	32	24.7	0.099	20	39.4	0.106	0.014	0.019
2010	12	332	138.1	1.231	402	193.4	0.906	0.062	0.058
.	.	9	16.7	0.070	20	31.8	0.042	0.009	0.016
2012	1	337	137.0	1.172	412	214.0	0.944	0.096	0.098
.	.	.	.	.	.	.	.	.	.
2013	3	239	89.3	2.728	339	121.0	1.018	0.193	0.059
.	.	57	9.0	1.486	2	9.5	0.083	0.138	0.042

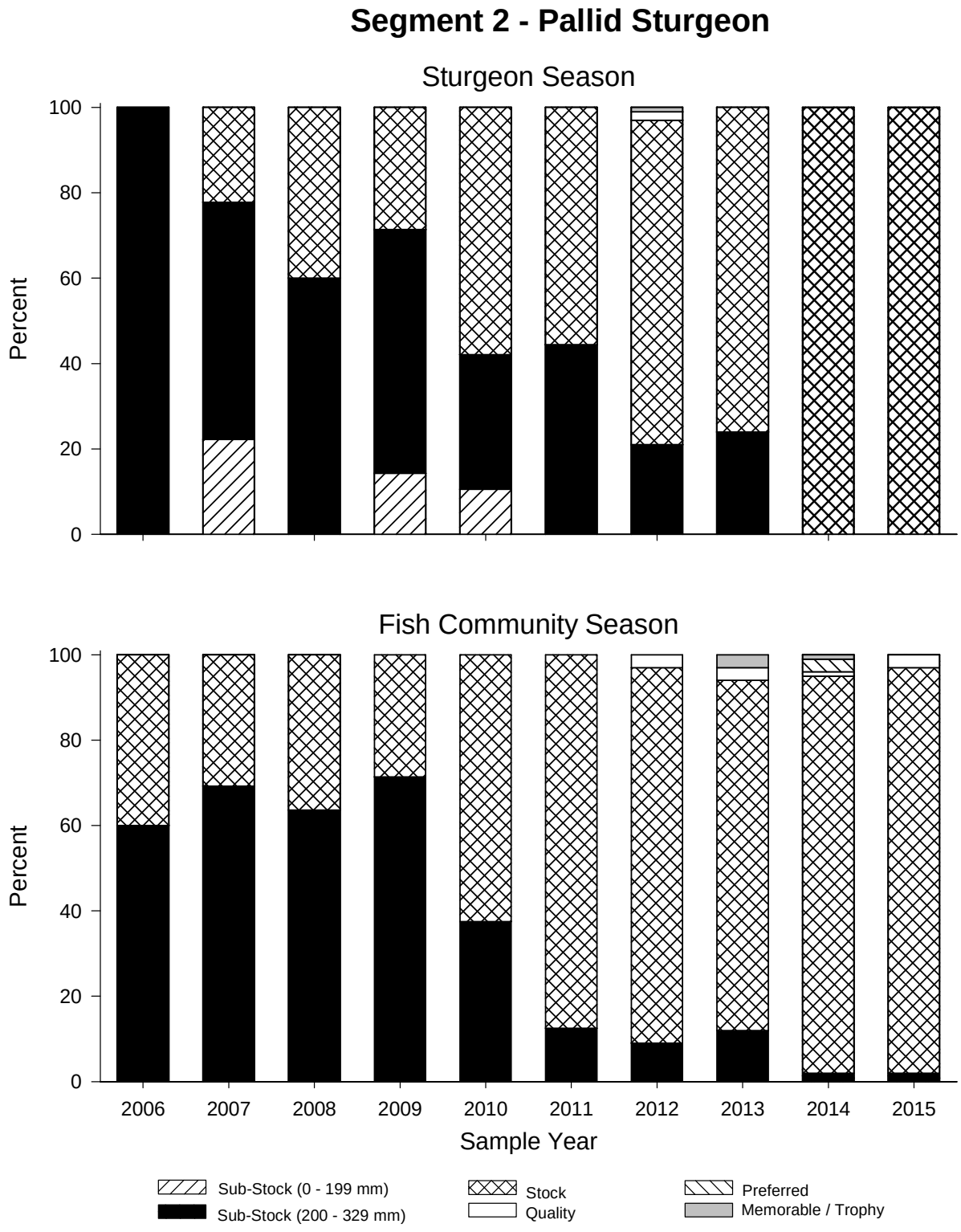

Figure 3. Incremental relative stock density (RSD) for all pallid sturgeon captured with all gear by length category from 2006-2015 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Shuman et al. (2006).

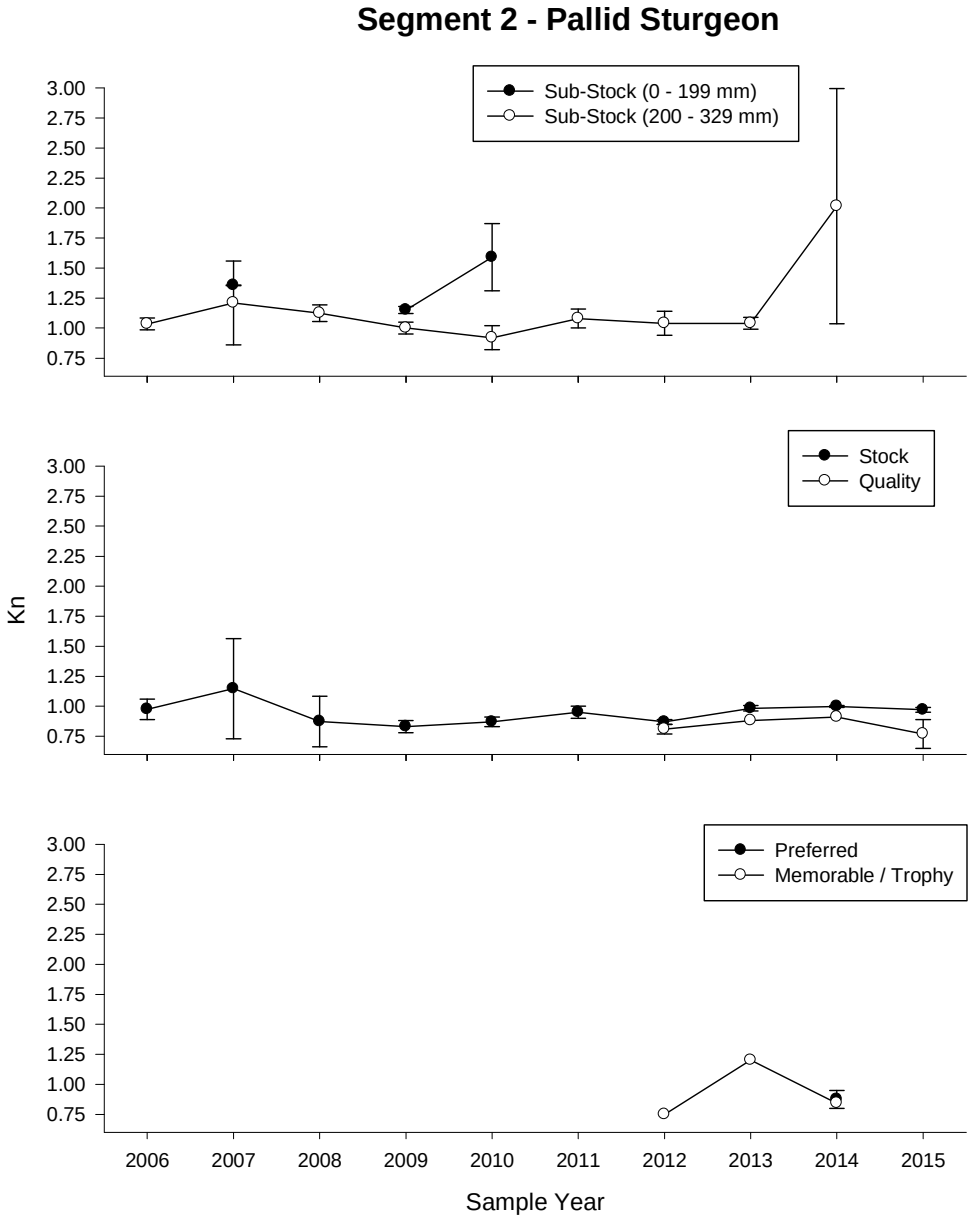

Figure 4. Relative condition factor (Kn) for all pallid sturgeon captured with all gear by incremental relative stock density (RSD) length category from 2006-2015 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Shuman et al. (2006). Relative condition factor was calculated using the equation in Shuman et al. (2011).

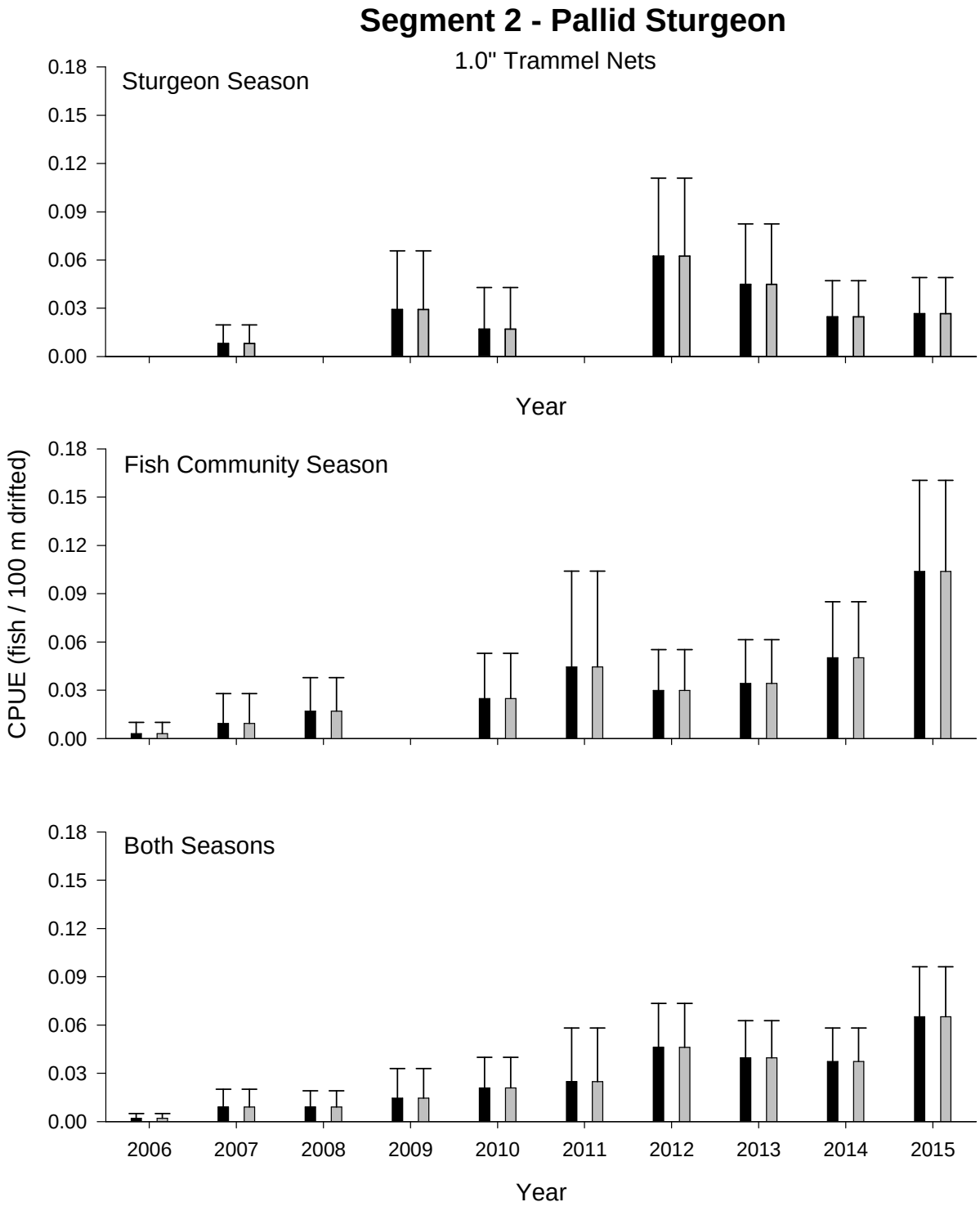

Figure 5. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using 1.0" trammel nets in Segment 2 of the Missouri River from 2006-2015

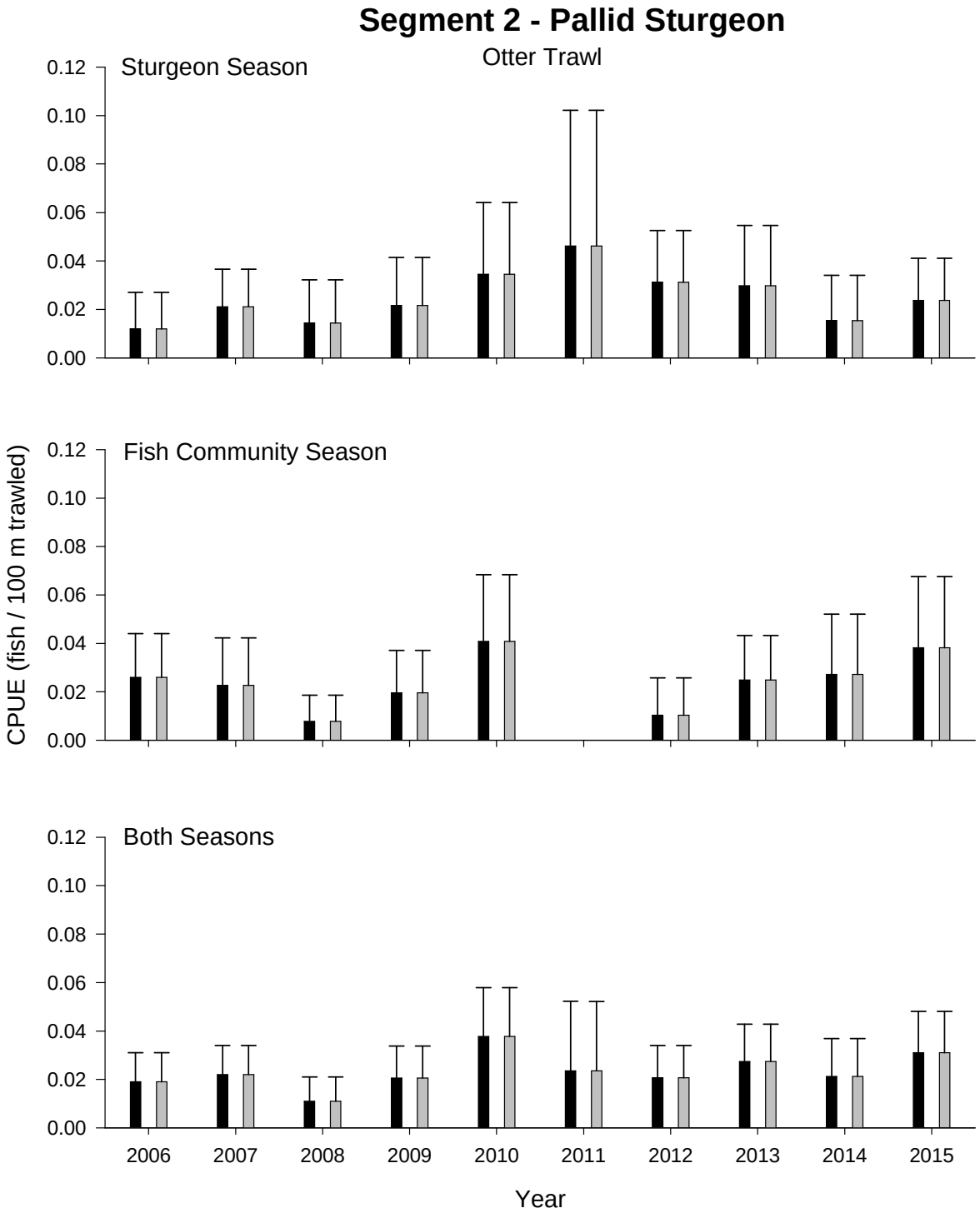

Figure 6. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using otter trawls in Segment 2 of the Missouri River from 2006-2015.

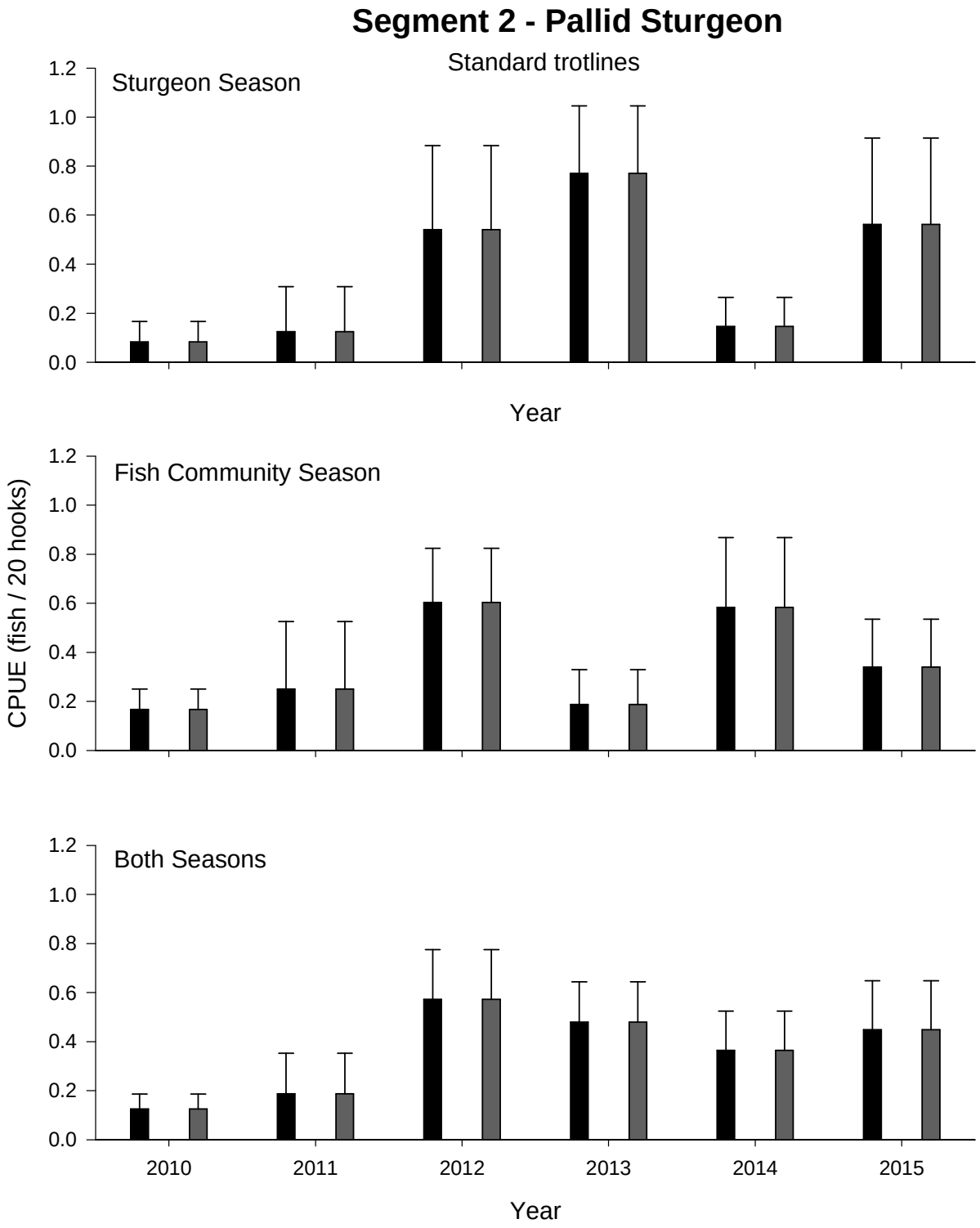

Figure 7. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using trot lines in Segment 2 of the Missouri River from 2010-2015.

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 2015. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]								
Gear	**N**	**CHXO**	**CONF**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**	**TRML**	**TRMS**
					Sturgeon Season					
1.0” Trammel Net	0	0	0	0	0	0	0	0	0	0
		44	1	27	28	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		38	0	29	31	0	0	0	0	0
					Fish Community Season					
1.0” Trammel Net	0	0	0	0	0	0	0	0	0	0
		42	0	33	23	0	0	0	2	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0
		38	2	39	4	1	5	8	2	1
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		40	0	33	25	0	0	0	2	0
					Both Seasons					
Trot Line	0	0	0	0	0	0	0	0	0	0
		44	2	38	14	0	0	0	2	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 2015. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]								
Gear	**N**	**CHXO**	**CONF**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**	**TRML**	**TRMS**
Sturgeon Season										
1.0” Trammel Net	0	0	0	0	0	0	0	0	0	0
		44	1	27	28	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		38	0	29	31	0	0	0	0	0
Fish Community Season										
1.0” Trammel Net	0	0	0	0	0	0	0	0	0	0
		42	0	33	23	0	0	0	2	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0
		38	2	39	4	1	5	8	2	1
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		40	0	33	25	0	0	0	2	0
Both Seasons										
Trot Line	0	0	0	0	0	0	0	0	0	0
		44	2	38	14	0	0	0	2	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 2015. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]								
Gear	**N**	**CHXO**	**CONF**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**	**TRML**	**TRMS**
					Sturgeon Season					
1.0” Trammel Net	7	0	0	0	0	0	0	0	0	0
		44	1	27	28	0	0	0	0	0
Otter Trawl	7	0	0	0	0	0	0	0	0	0
		38	0	29	31	0	0	0	0	0
					Fish Community Season					
1.0” Trammel Net	24	0	0	0	0	0	0	0	0	0
		42	0	33	23	0	0	0	2	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0
		38	2	39	4	1	5	8	2	1
Otter Trawl	11	0	0	0	0	0	0	0	0	0
		40	0	33	25	0	0	0	2	0
					Both Seasons					
Trot Line	43	0	0	0	0	0	0	0	0	0
		44	2	38	14	0	0	0	2	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 2015. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]								
Gear	**N**	**CHXO**	**CONF**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**	**TRML**	**TRMS**
Sturgeon Season										
1.0” Trammel Net	0	0	0	0	0	0	0	0	0	0
		44	1	27	28	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		38	0	29	31	0	0	0	0	0
Fish Community Season										
1.0” Trammel Net	0	0	0	0	0	0	0	0	0	0
		42	0	33	23	0	0	0	2	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0
		38	2	39	4	1	5	8	2	1
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		40	0	33	25	0	0	0	2	0
Both Seasons										
Trot Line	1	0	0	0	0	0	0	0	0	0
		44	2	38	14	0	0	0	2	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 2015. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]								
Gear	**N**	**CHXO**	**CONF**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**	**TRML**	**TRMS**
					Sturgeon Season					
1.0” Trammel Net	7	71	0	29	0	0	0	0	0	0
		44	1	27	28	0	0	0	0	0
Otter Trawl	7	43	0	57	0	0	0	0	0	0
		38	2	29	31	0	0	0	0	0
					Fish Community Season					
1.0” Trammel Net	24	54	0	13	33	0	0	0	0	0
		42	0	33	23	0	0	0	2	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0
		38	2	39	4	5	3	8	2	1
Otter Trawl	11	27	0	55	18	0	0	0	0	0
		40	0	33	25	0	0	0	2	0
					Both Seasons					
Trot Line	44	32	0	66	2	0	0	0	0	0
		44	2	38	14	0	0	0	2	0

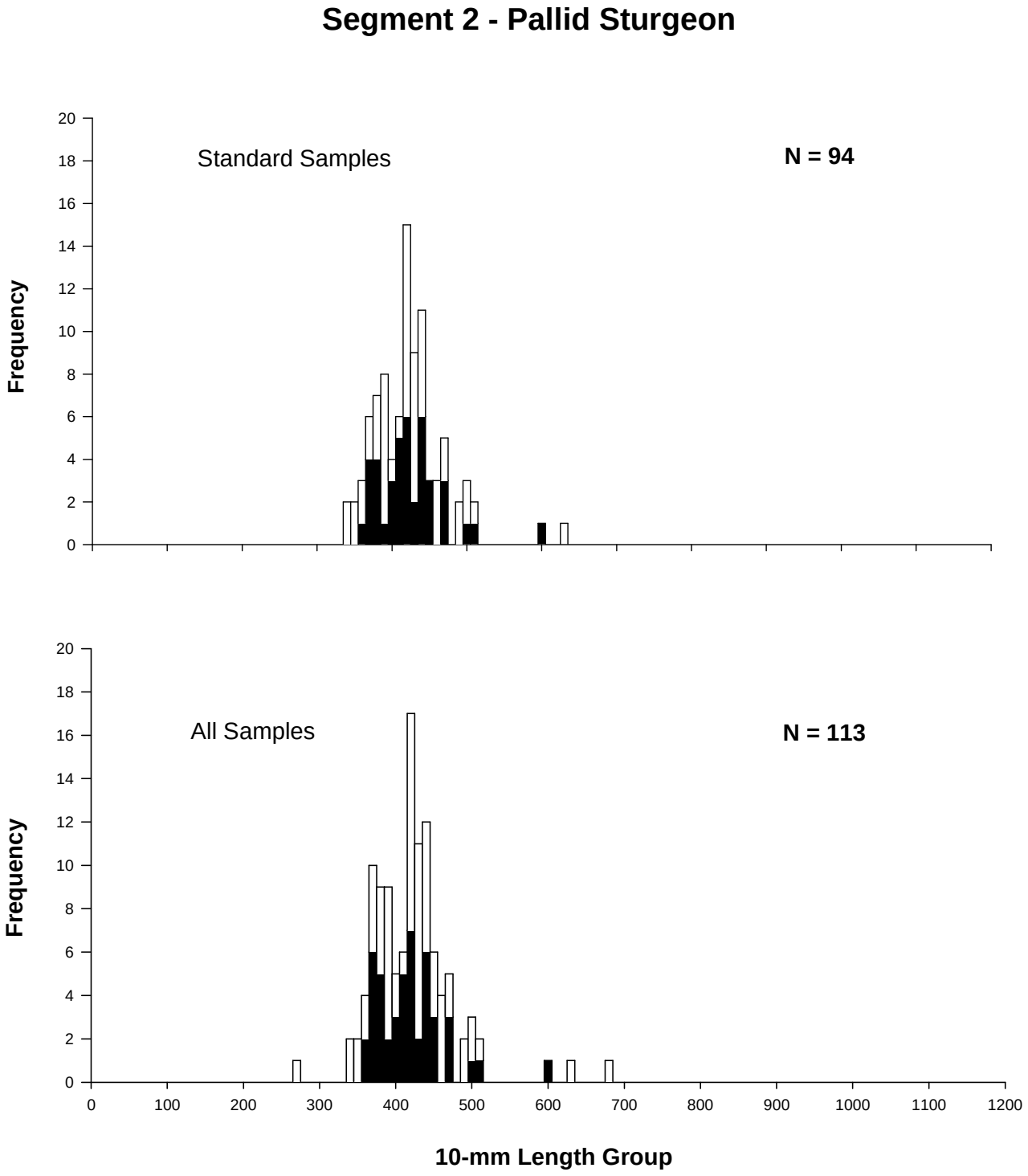

Figure 8. Length frequency of pallid sturgeon captured in Segment 2 of the Missouri River during 2015. Black bars represent captures during sturgeon season, while white bars represent captures during fish community season. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2015.

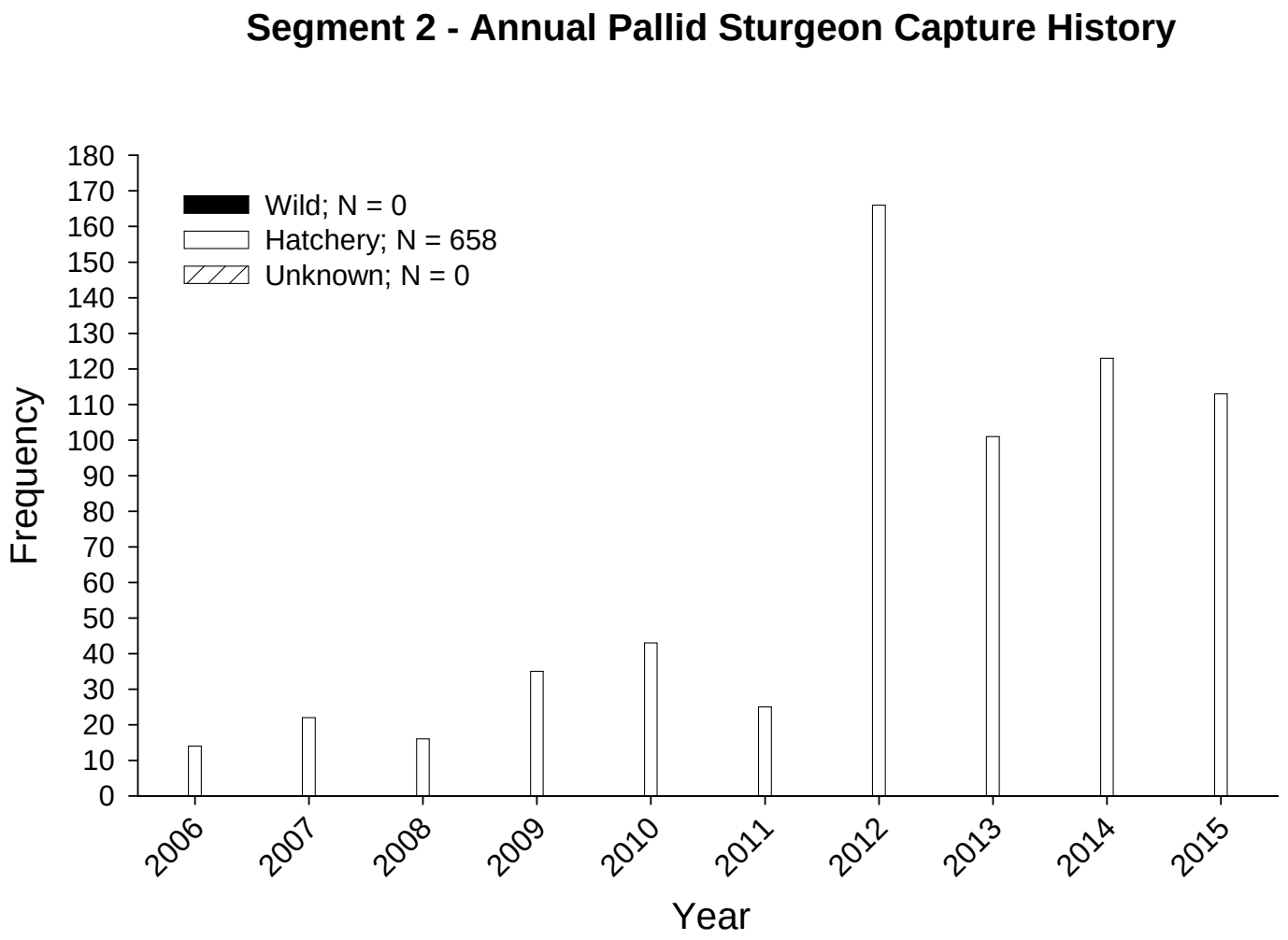

Figure 9. Annual capture history of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon collected in Segment 2 of the Missouri River from 2006-2015. Figure is designed to compare overall pallid sturgeon captures from year to year and is biased by variable effort among years. Figure includes all pallid captures including non-random and wild samples.

Shovelnose X Pallid Sturgeon Hybrids

For the first time in the history of the Pallid Sturgeon Population Assessment Program in Segment 2, a shovelnose sturgeon x pallid sturgeon hybrid was captured during 2015 sampling. At the time of capture, field crews determined the fish to a pallid sturgeon with no clear hatchery markings. The fish was later determined to be a hybrid following the genetic verification methods outlined by the PSPA genetic sampling protocols. The aforementioned hybrid was sampled on July 23, at river mile 1753 and was captured via trammel net. It was a larger individual with a FL of 995 mm and a weight of 3500 g. It was also implanted with a radio telemetry tag; should this fish warrant further monitoring or investigation, recapturing should be of more convenience.

Targeted Native River Species

Shovelnose Sturgeon

Shovelnose sturgeon continue to be highly abundant across Segment 2 of the Missouri River, particularly in the upper reaches. Sampling efforts in 2015 culminated in the capture of 1,298 shovelnose sturgeon. A temporal breakdown of those captures shows that more sturgeon were captured during fish community season (N=810) than during sturgeon season (N=488). At least some portion of the higher fish community catch rates can be attributed to two non-random, pallid-centric targeted trotline efforts held during September and October of 2015. The first targeted effort, which took place on September 21, resulted in the sampling of 193 additional shovelnose sturgeon. A second targeted effort, which was executed on October 22, witnessed 42 additional observations. A comparison of standard gears and their ability to catch shovelnose sturgeon shows that trammel net was the most successful gear with 682 shovelnose sturgeon observations, followed closely by trotline (N=511) and in a distant third, otter trawl (N=105).

Combined-season trammel net CPUE (Figure 10) for Segment 2 in 2015 regarding quality and above shovelnose sturgeon was calculated at 1.27 fish/100m. Among seasons, a CPUE of 1.01 fish/100m and 1.53 fish/100m were observed for sturgeon and fish community seasons, respectively. Trammel net CPUE remains very low for the stock and sub-stock categories due to the age structure of shovelnose sturgeon in Segment 2 of the Missouri River (Figure 13).

Segment 2 otter trawl CPUE (Figure 11) across both seasons, for quality and above size class shovelnose sturgeon, was reported at 0.16 fish/100m during the 2015 field season. Temporally, a CPUE of 0.22 fish/100m was recorded during sturgeon season, while a CPUE of 0.10 fish/100m was calculated for fish community season. Like trammel nets, CPUE for stock and sub-stock categories remains low, as the population of shovelnose in Segment 2 of the Missouri River is dominated by adult fish.

Trotline CPUE in Segment 2 during 2015 averaged 4.08 fish/20 hooks for both sturgeon and fish community seasons. It stands to reason the, that the observed CPUE for combined seasons was also 4.08 fish/20 hooks. As with otter trawl and trammel net, captures of stock and

sub-stock classes remains virtually nonexistent. A complete comparison of trotline CPUE across all years can be found in Figure 12.

A year by year comparison of relative weights (Wr) of shovelnose sturgeon captured in Segment 2 can be found in Figure 15. Wr for both the stock and quality size classes of shovelnose sturgeon remains highly variable with no real discernible pattern, which may be in part to low sample size. In comparison, the Wr for the preferred and memorable/trophy size class of shovelnose sturgeon in Segment 2 has remained much more stable and comparable. In addition, the Wr for the latter size classes has become nearly identical over the past few years.

The shovelnose sturgeon observed in Segment 2 during the 2015 sampling season averaged 613 mm in fork length and 945 g in weight. These average lengths and weights have remained relatively constant over time. A complete length frequency histogram can be viewed in Figure 13. Although, anecdotally, it appeared we captured a larger portion of smaller size classes of shovelnose sturgeon (< 400 mm), when compared to previous years, those fish (N=14) still accounted for only 1% of the total shovelnose sturgeon specimens observed in Segment 2 in 2015. It appears that lower segments (3 and 4) remain the preferred habitat of sub-adult shovelnose sturgeon.

The specific macro habitats where shovelnose sturgeon were sampled in 2015, 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.

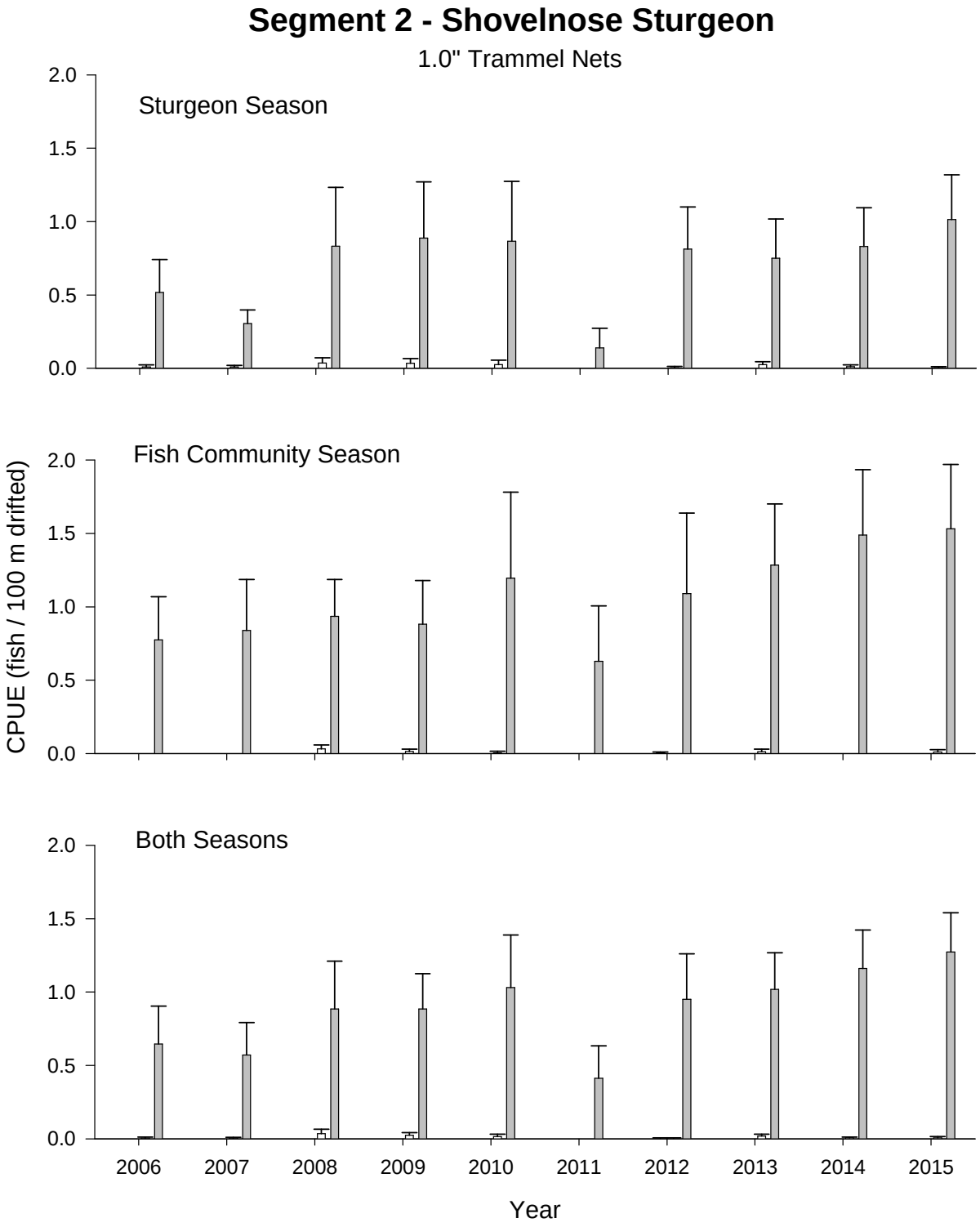

Figure 10. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using 1.0” trammel nets in Segment 2 of the Missouri River from 2006-2015.

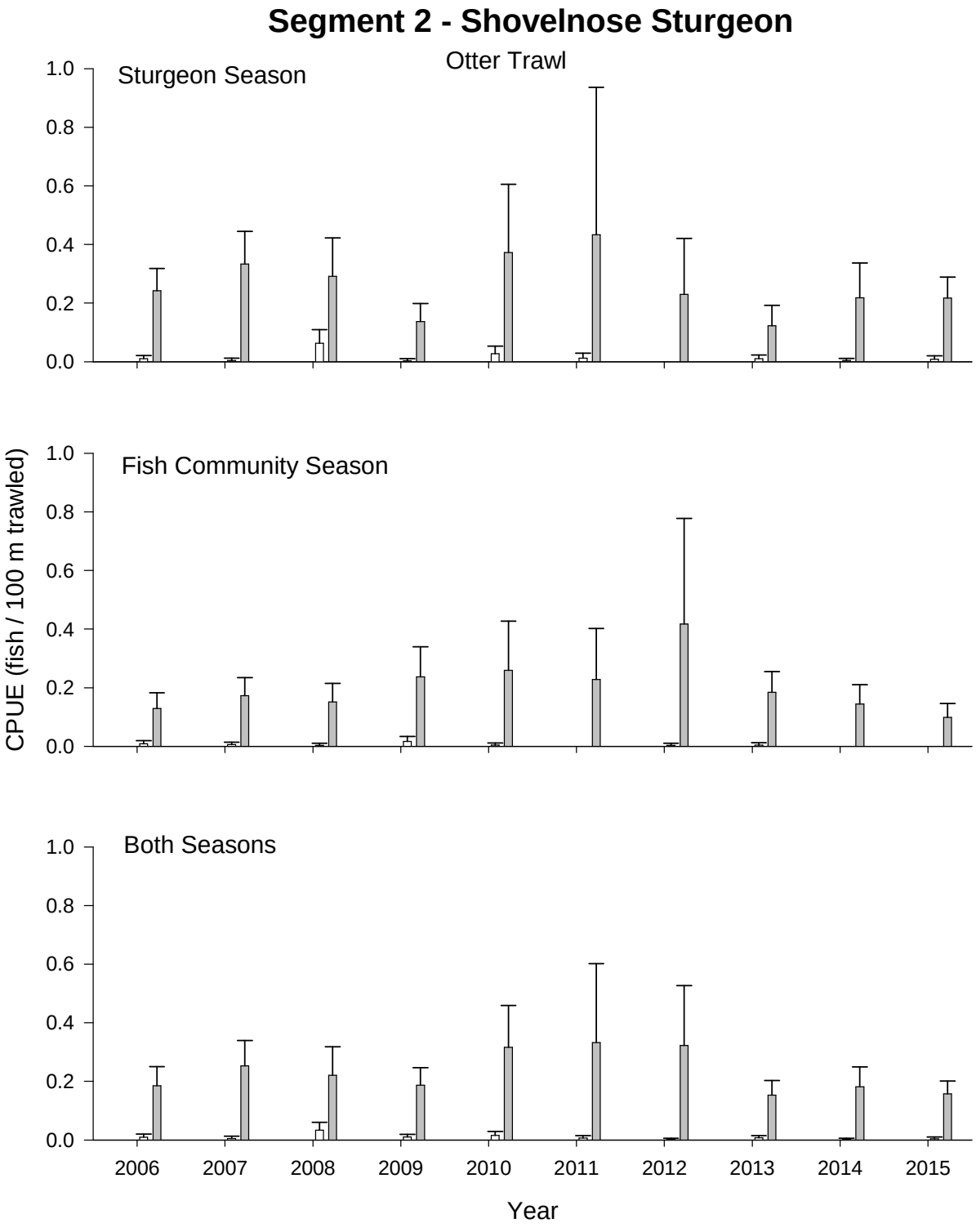

Figure 11. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using otter trawls in Segment 2 of the Missouri River from 2006-2015.

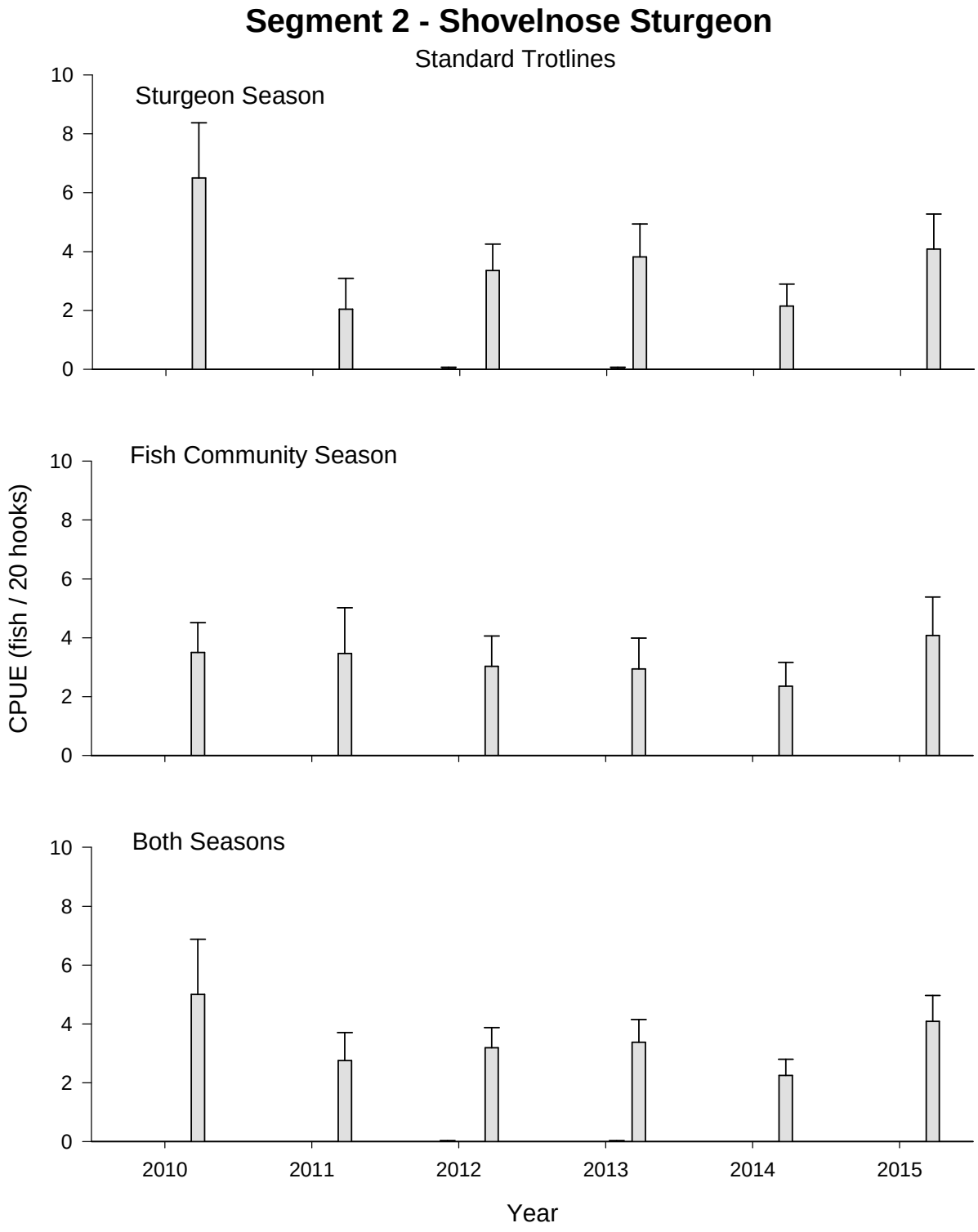

Figure 12. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using trot lines in Segment 2 of the Missouri River from 2010-2015.

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 2015. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]								
Gear	**N**	**CHXO**	**CONF**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**	**TRML**	**TRMS**
					Sturgeon Season					
1.0” Trammel Net	0	0	0	0	0	0	0	0	0	0
		44	1	27	28	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		38	2	29	31	0	0	0	0	0
					Fish Community Season					
1.0” Trammel Net	0	0	0	0	0	0	0	0	0	0
		42	0	33	23	0	0	0	2	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0
		38	2	39	4	1	5	8	2	1
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		40	0	33	25	0	0	0	2	0
					Both Seasons					
Trot Line	0	0	0	0	0	0	0	0	0	0
		44	2	38	14	0	0	0	2	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 2015. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]								
Gear	**N**	**CHXO**	**CONF**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**	**TRML**	**TRMS**
					Sturgeon Season					
1.0” Trammel Net	0	0	0	0	0	0	0	0	0	0
		44	1	27	28	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		38	2	29	31	0	0	0	0	0
					Fish Community Season					
1.0” Trammel Net	0	0	0	0	0	0	0	0	0	0
		42	0	33	23	0	0	0	2	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0
		38	2	39	4	1	5	8	2	1
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		40	0	33	25	0	0	0	2	0
					Both Seasons					
Trot Line	0	0	0	0	0	0	0	0	0	0
		44	2	38	14	0	0	0	2	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 2015. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]								
Gear	**N**	**CHXO**	**CONF**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**	**TRML**	**TRMS**
					Sturgeon Season					
1.0” Trammel Net	1	0	0	100	0	0	0	0	0	0
		44	1	27	28	0	0	0	0	0
Otter Trawl	2	0	0	100	0	0	0	0	0	0
		38	2	29	31	0	0	0	0	0
					Fish Community Season					
1.0” Trammel Net	2	0	0	0	100	0	0	0	0	0
		42	0	33	23	0	0	0	2	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0
		38	2	39	4	1	5	8	2	1
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		40	0	33	25	0	0	0	2	0
					Both Seasons					
Trot Line	0	0	0	0	0	0	0	0	0	0
		44	2	38	14	0	0	0	2	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 2015. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]								
Gear	**N**	**CHXO**	**CONF**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**	**TRML**	**TRMS**
					Sturgeon Season					
1.0" Trammel Net	213	50	0	33	16	0	0	0	0	0
		44	1	27	28	0	0	0	0	0
Otter Trawl	59	46	0	39	15	0	0	0	0	0
		38	2	29	31	0	0	0	0	0
					Fish Community Season					
1.0" Trammel Net	357	46	0	32	22	0	0	0	0	0
		42	0	33	23	0	0	0	2	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0
		38	2	39	4	1	5	8	2	1
Otter Trawl	29	21	0	48	28	0	0	0	3	0
		40	0	33	25	0	0	0	2	0
					Both Seasons					
Trot Line	400	51	1	40	9	0	0	0	0	0
		44	2	38	14	0	0	0	2	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 2015. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]								
Gear	**N**	**CHXO**	**CONF**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**	**TRML**	**TRMS**
					Sturgeon Season					
1.0” Trammel Net	214	50	0	34	16	0	0	0	0	0
		44	1	27	28	0	0	0	0	0
Otter Trawl	61	44	0	41	15	0	0	0	0	0
		38	2	29	31	0	0	0	0	0
					Fish Community Season					
1.0” Trammel Net	359	46	0	32	22	0	0	0	0	0
		42	0	33	23	0	0	0	2	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0
		38	2	39	4	1	5	8	2	1
Otter Trawl	29	21	0	48	28	0	0	0	3	0
		40	0	33	25	0	0	0	2	0
					Both Seasons					
Trot Line	400	51	1	40	9	0	0	0	0	0
		44	2	38	14	0	0	0	2	0

Segment 2 - Shovelnose Sturgeon

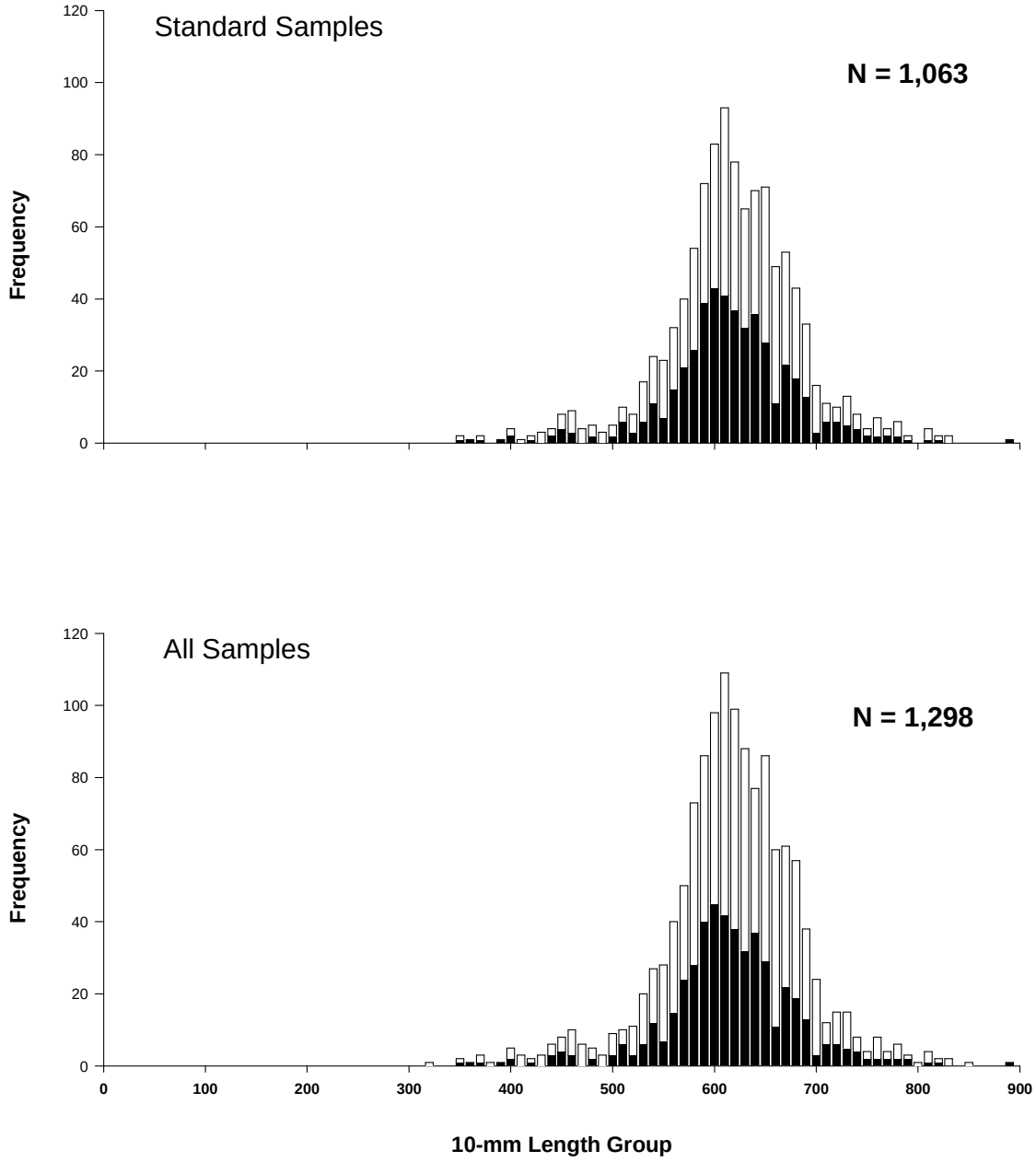

Figure 13. Length frequency of shovelnose sturgeon during the sturgeon season (black bars) and fish community season (white bars) in Segment 2 of the Missouri River during 2015. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2015.

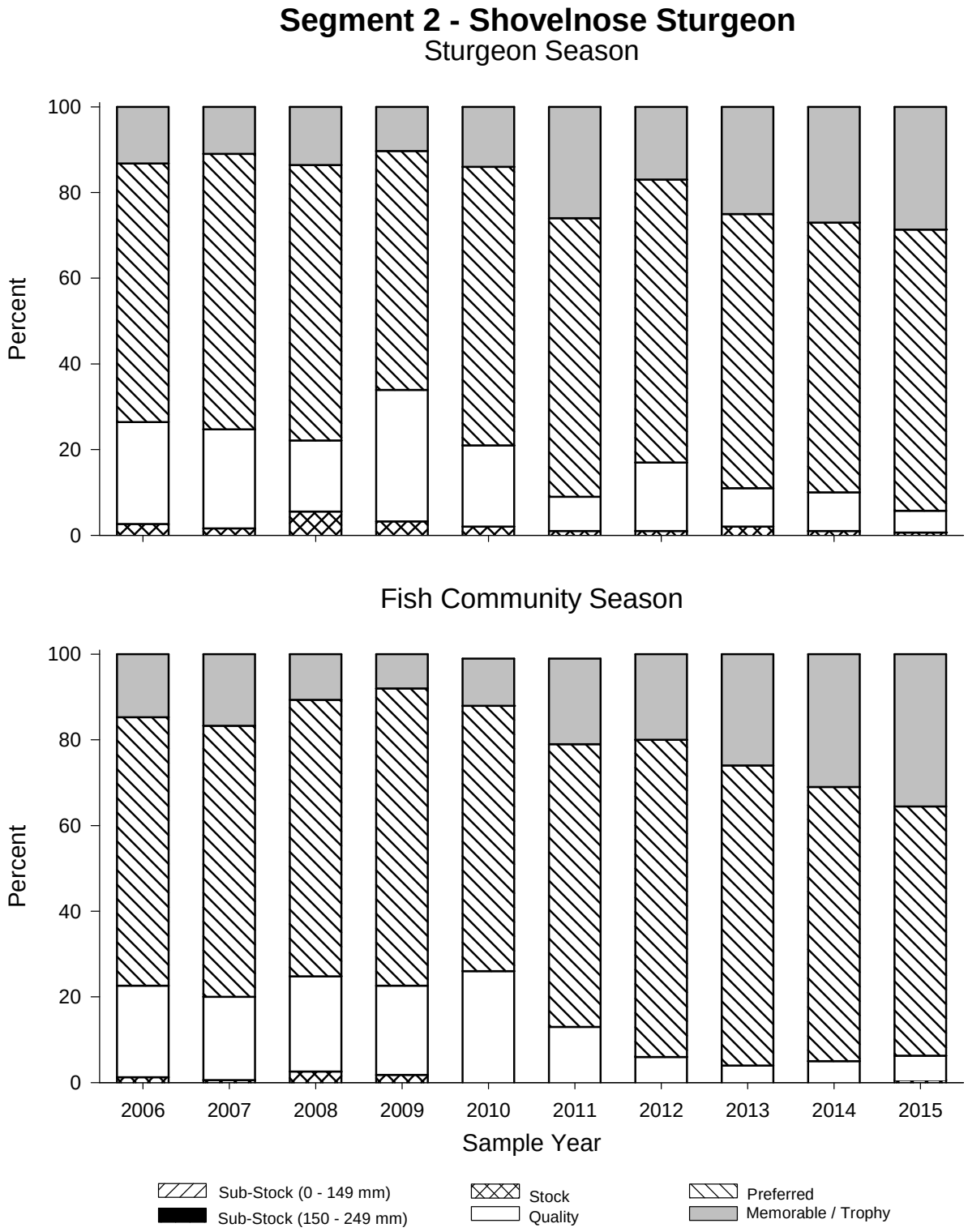

Figure 14. Incremental relative stock density (RSD) for all shovelnose sturgeon captured with all gear by length category from 2006 to 2015 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Quist (1998).

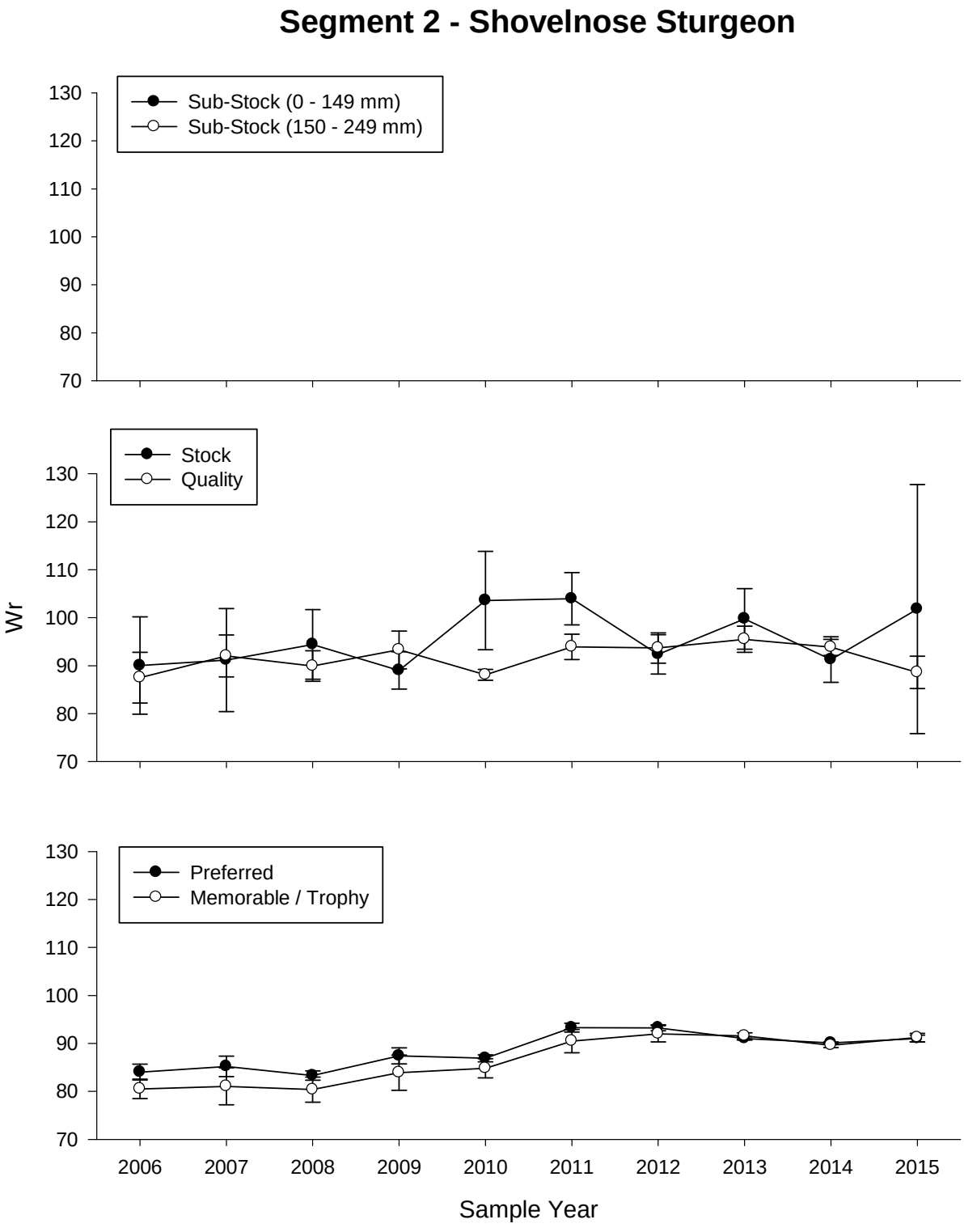

Figure 15. Relative weight (Wr) for all shovelnose sturgeon captured with all gear by incremental relative stock density (RSD) length category from 2006-2015 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Quist (1998).

Sturgeon Chub

A total of 15 sturgeon chubs were captured in Segment 2 in 2015, with the majority of observations (67%) occurring during sturgeon season. Spatially it is typical to have a higher proportion of catch stemming from the downstream reaches of Segment 2, and in 2015 it was no different. The lower ten miles of Segment 2 accounted for 11 (73%) of the sturgeon chub captures. Furthermore, within the aforementioned ten miles, consisting of 10 river bends, only three of these bends were randomly selected to be sampled. All sturgeon chubs were captured during random otter trawl deployments.

Catch per unit effort for sturgeon chub in Segment 2 in 2015 was recorded as follows; 0.04 fish/100m during sturgeon season, 0.02 fish/100m during fish community season, and a combined season CPUE of 0.03 fish/100m. All three of these CPUE's were the second lowest observed catch rates since the Program started in 2006. A full comparison of all years can be seen in Figure 16.

The sturgeon chubs observed during the 2015 field season in Segment 2 averaged 84 mm in total length, which is identical to the past three field seasons. This reoccurring phenomenon indicates that the population of sturgeon chubs in Segment 2 continues to be dominated by adult fish. An illustration of complete size structure can be found in Figure 17.

.

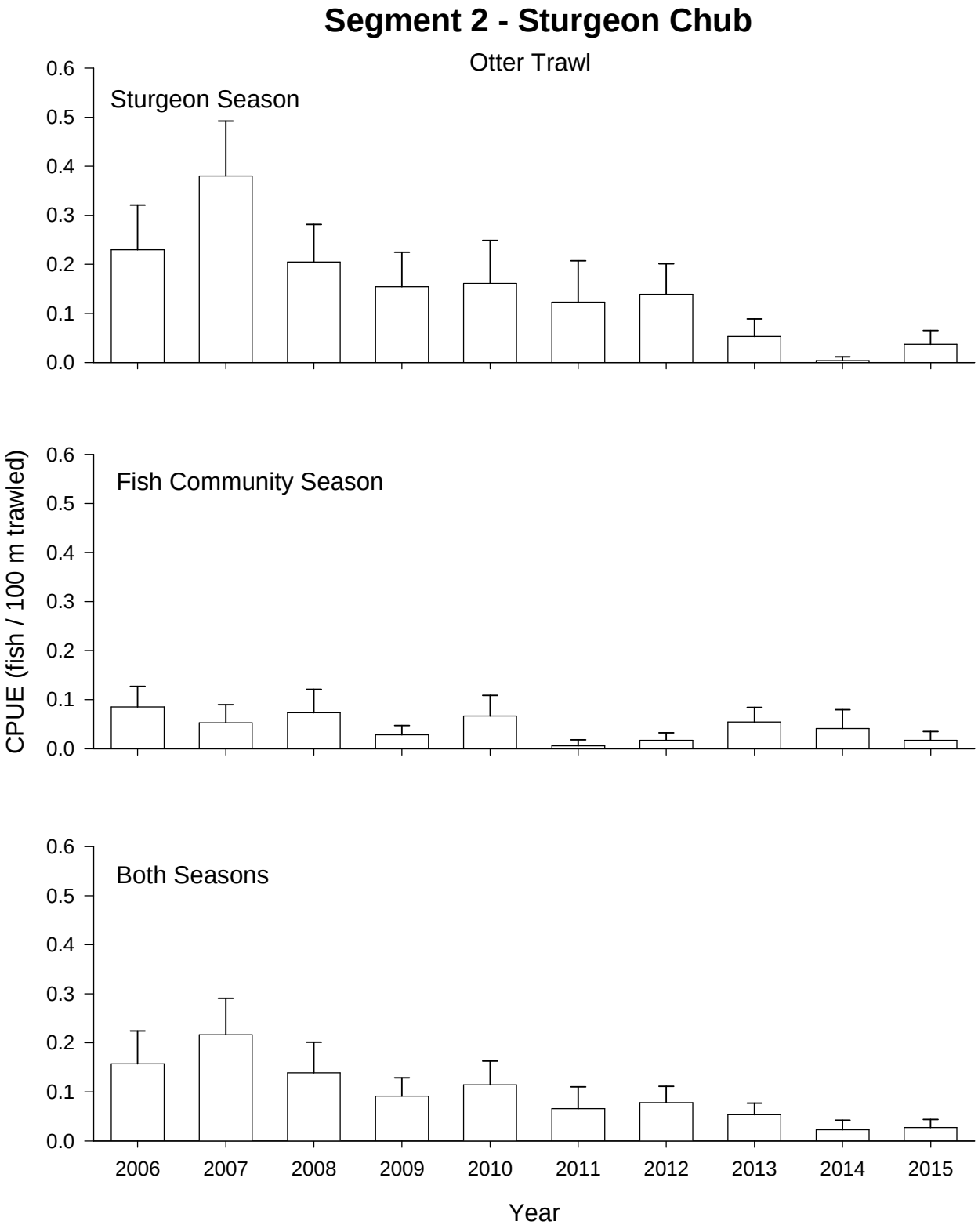

Figure 16. Mean annual catch per unit effort (+/- 2 SE) of sturgeon chub using otter trawls in Segment 2 of the Missouri River from 2006-2015.

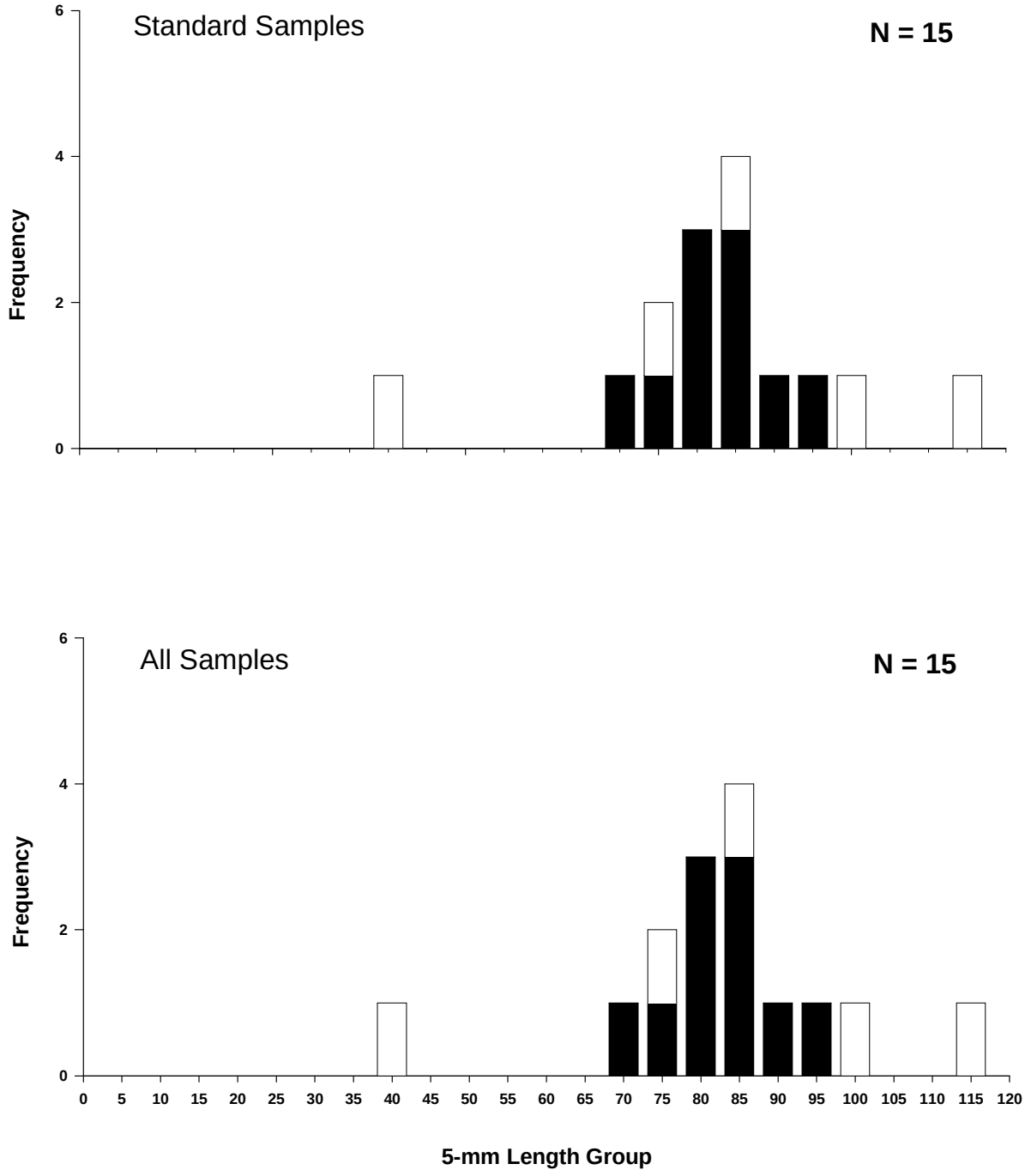

Figure 17. Length frequency of sturgeon chub during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2015. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2015.

Sicklefin Chub

The abundance of sicklefin chubs was once again lacking in Segment 2 during the 2015 field season, with the capture of only two specimens via otter trawl deployments. Although captures have remained quite low throughout time, the few individuals that are witnessed continue to be observed during sturgeon season. With seasonal variability, combined with low catch rates, CPUE patterns continue to be exhibit no real discernible pattern in Segment 2. A full seasonal and combined CPUE comparison can be found in Figure 18.

With both individuals being of larger size, 90 and 102 mm (Figure 19), respectively, what few sicklefin chubs are observed continue to support the pattern of an adult-only population of sicklefin chubs residing in Segment 2 of the Missouri River.

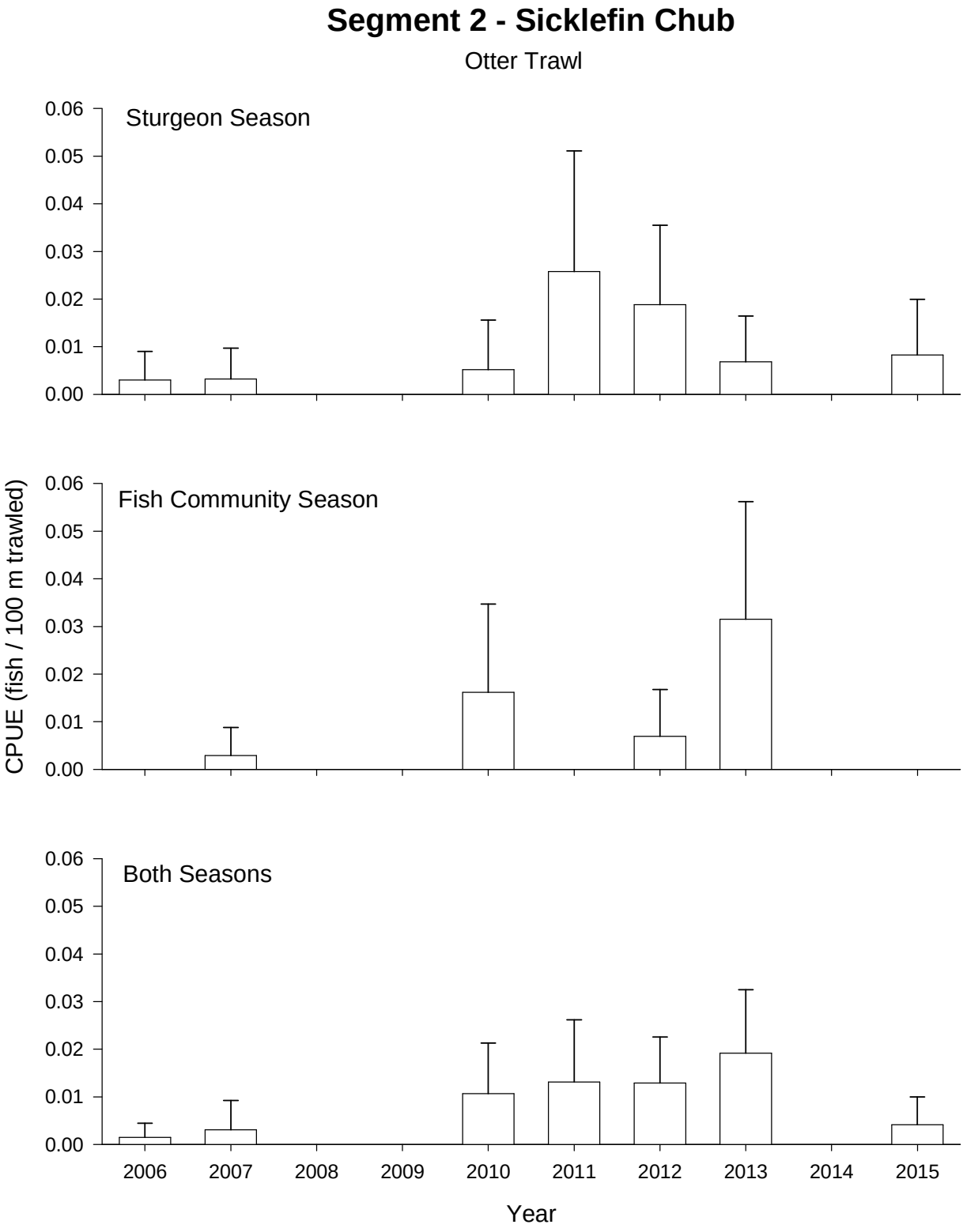

Figure 18. Mean annual catch per unit effort (+/- 2 SE) of sicklefin chub using otter trawls in Segment 2 of the Missouri River from 2006-2015.

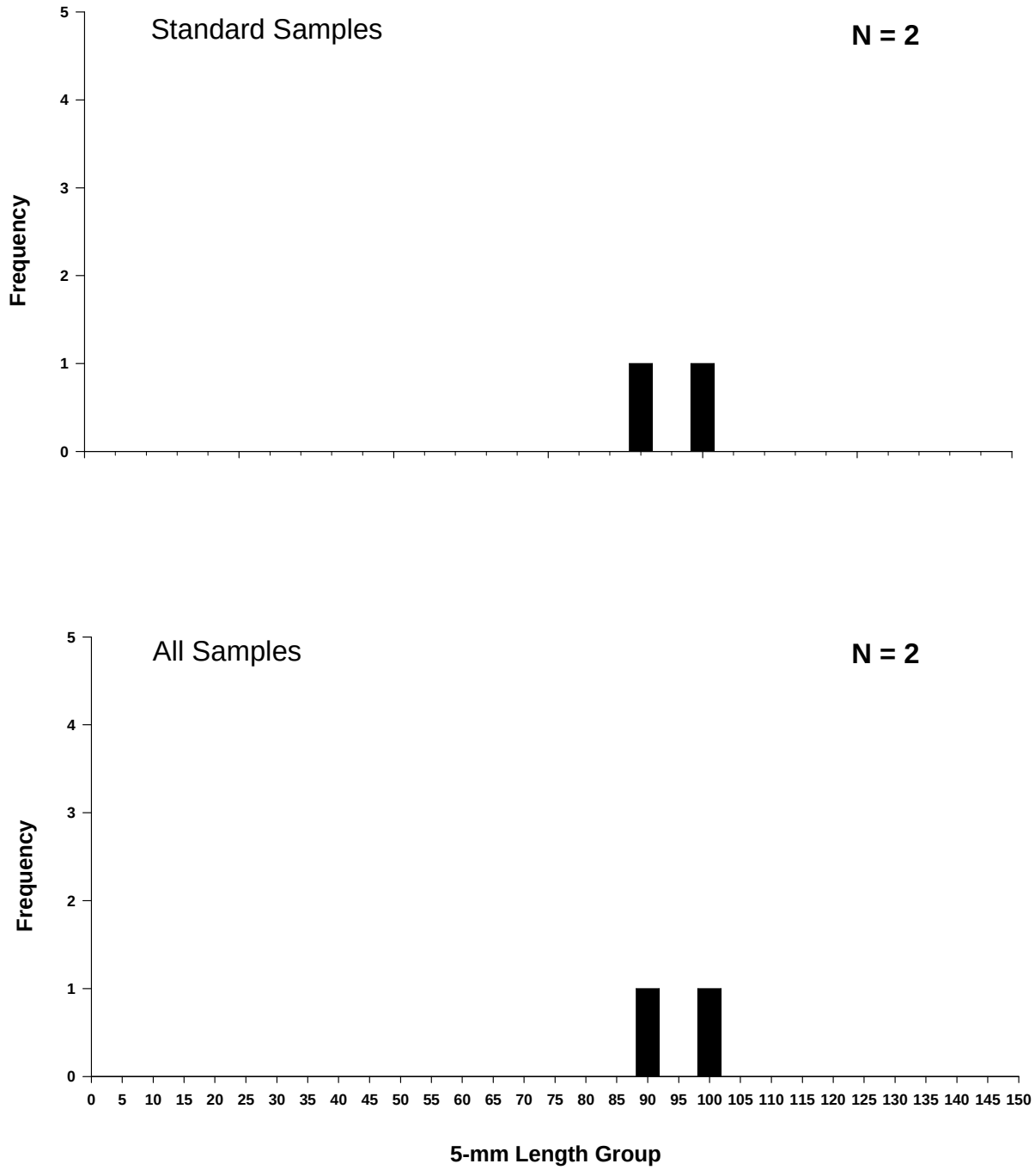

Figure 19. Length frequency of sicklefin chub during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2015. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2015.

Sand Shiner

Sampling events occurring in Segment 2 in 2015 resulted in the capture of 242 sand shiners, all of which were observed using mini-fyke nets. The aforementioned captures led to an observed CPUE of 2.52/fish per net night, which is comparable to the past three field seasons. A complete 10-year CPUE history of sand shiner mini-fyke net CPUE can be view in Figure 20.

The average total length for sand shines observed in Segment 2 during the 2015 sampling year was 36 mm, with a range of 19 mm to 56 mm. The average and observed ranges fit well within the realm of those witnessed in previous years, suggesting that Segment 2 of the Missouri River continues to support a population of sand shiners made up of multiple age classes. A complete length frequency diagram can be witnessed in Figure 21.

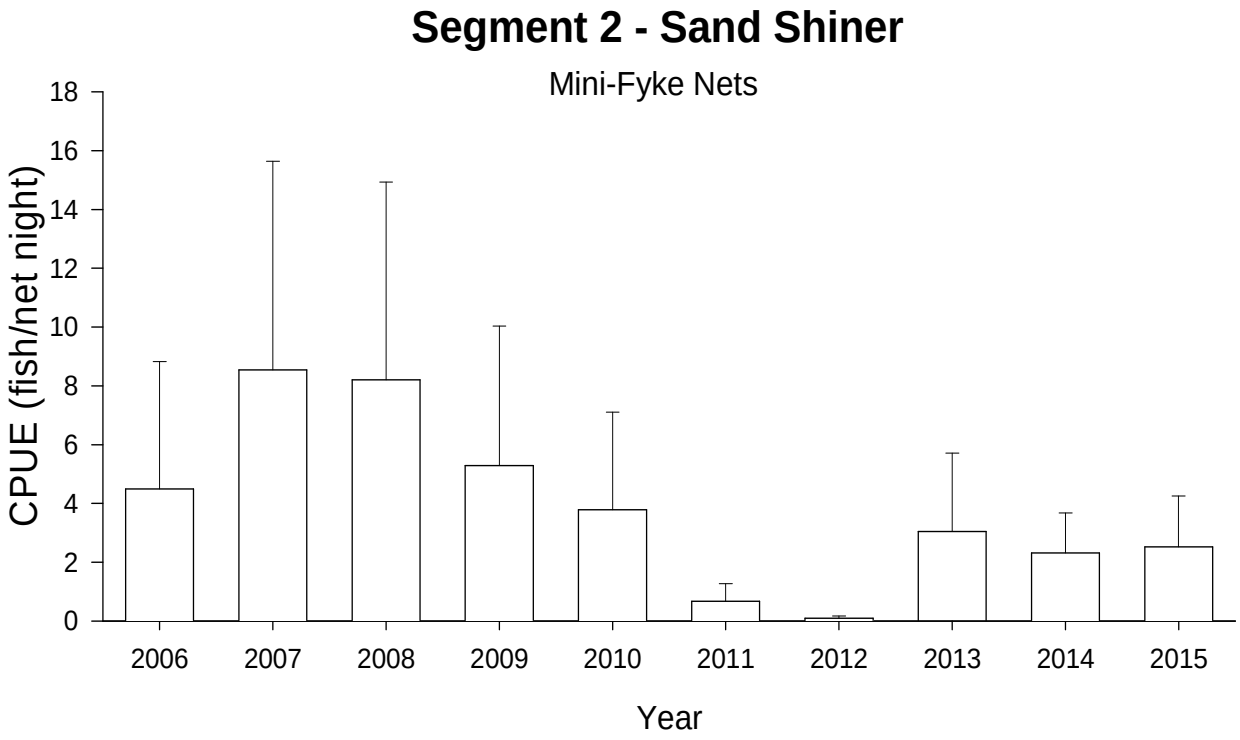

Figure 20. Mean annual catch per unit effort (+/- 2 SE) of sand shiner with mini-fyke nets in Segment 2 of the Missouri River during fish community season 2006-2015.

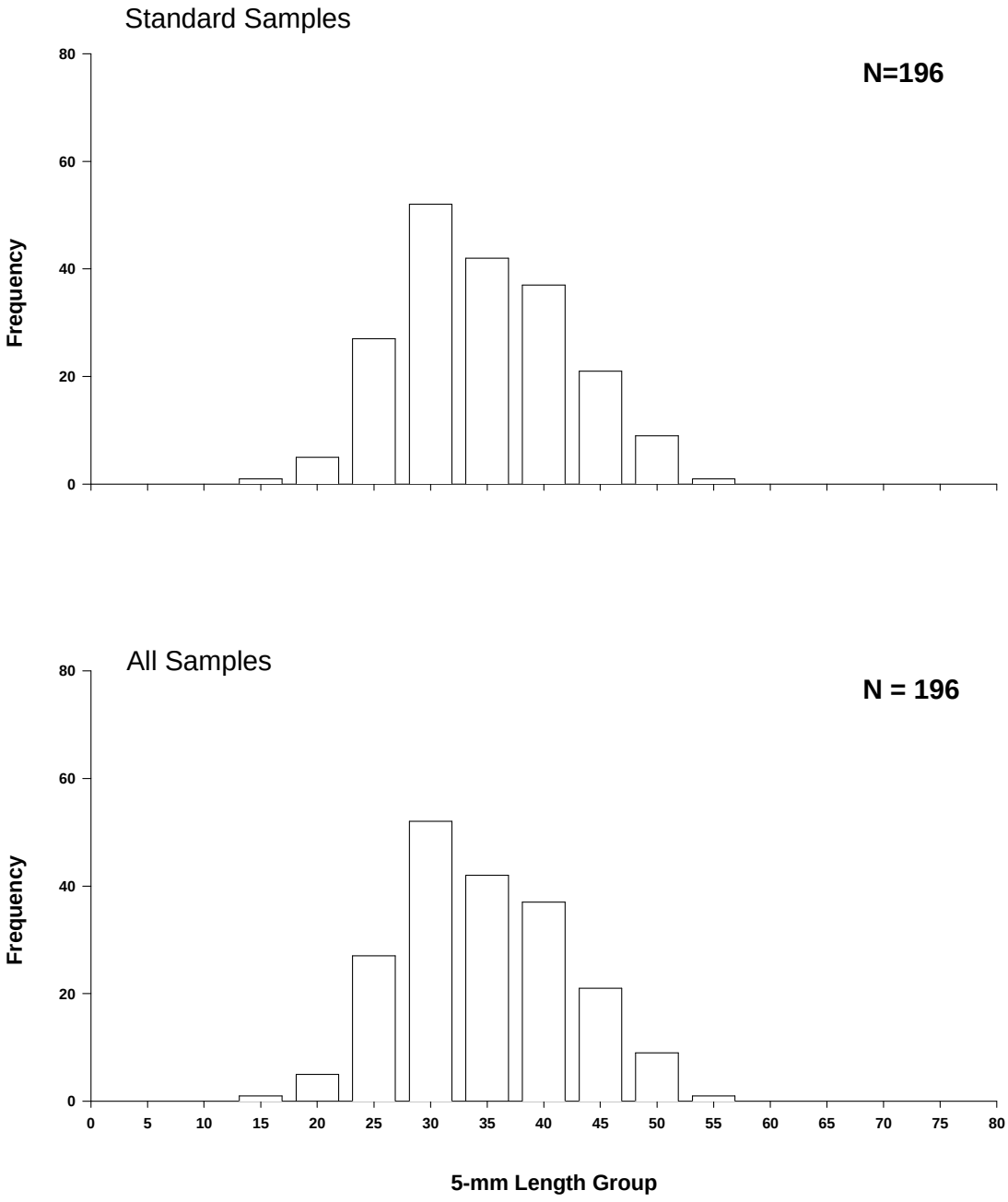

Figure 21. Length frequency of sand shiner during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2015. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2015.

Hybognathus spp.

A total of 38 *Hybotnathus* spp. were captured in Segment 2 of 2015, all of which were western silvery minnows. The vast majority (all but one) were sampled via mini-fyke net. The above mentioned captures led to a mini-fyke net CPUE (Figure 22) calculated at 0.39 fish/net night. Observations of *Hybotnathus* spp., although comparable to 2014 (N=25), continues to be somewhat sporadic within this segment.

The *Hybotnathus* spp. in Segment 2 during 2015 averaged 77 mm in total length. Average length per year continues to be variable depending on the dominant proportion either being adult sized fish, or in other years, younger age classes. For example, of the *Hybotnathus* spp. observed in 2015, only 13% had a total length less than 50 mm, with the other 87 % ranging from 62 to 97 mm in TL. However, by analyzing the length frequency diagram in Figure 23, it appears multiple age classes were present in 2015.

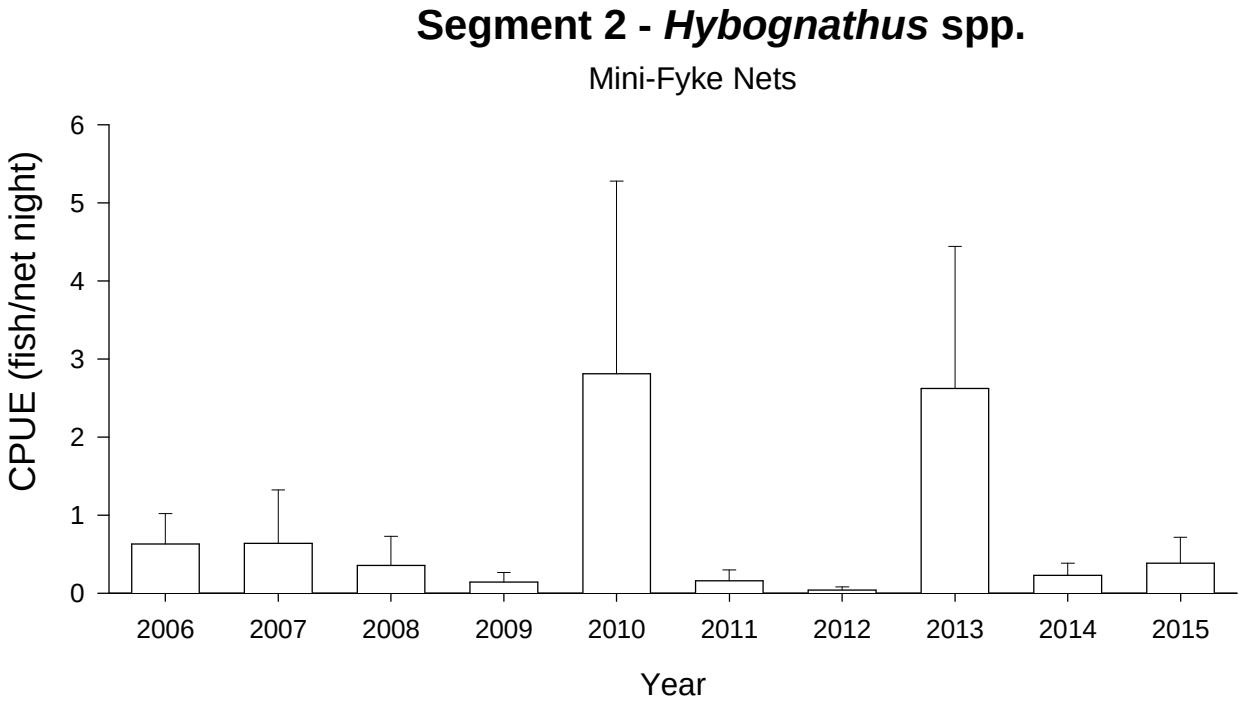

Figure 22. Mean annual catch per unit effort (+/- 2 SE) of *Hybognathus* spp. with mini-fyke nets in Segment 2 of the Missouri River during fish community season 2006-2015.

Segment 2 - *Hybognathus* spp.

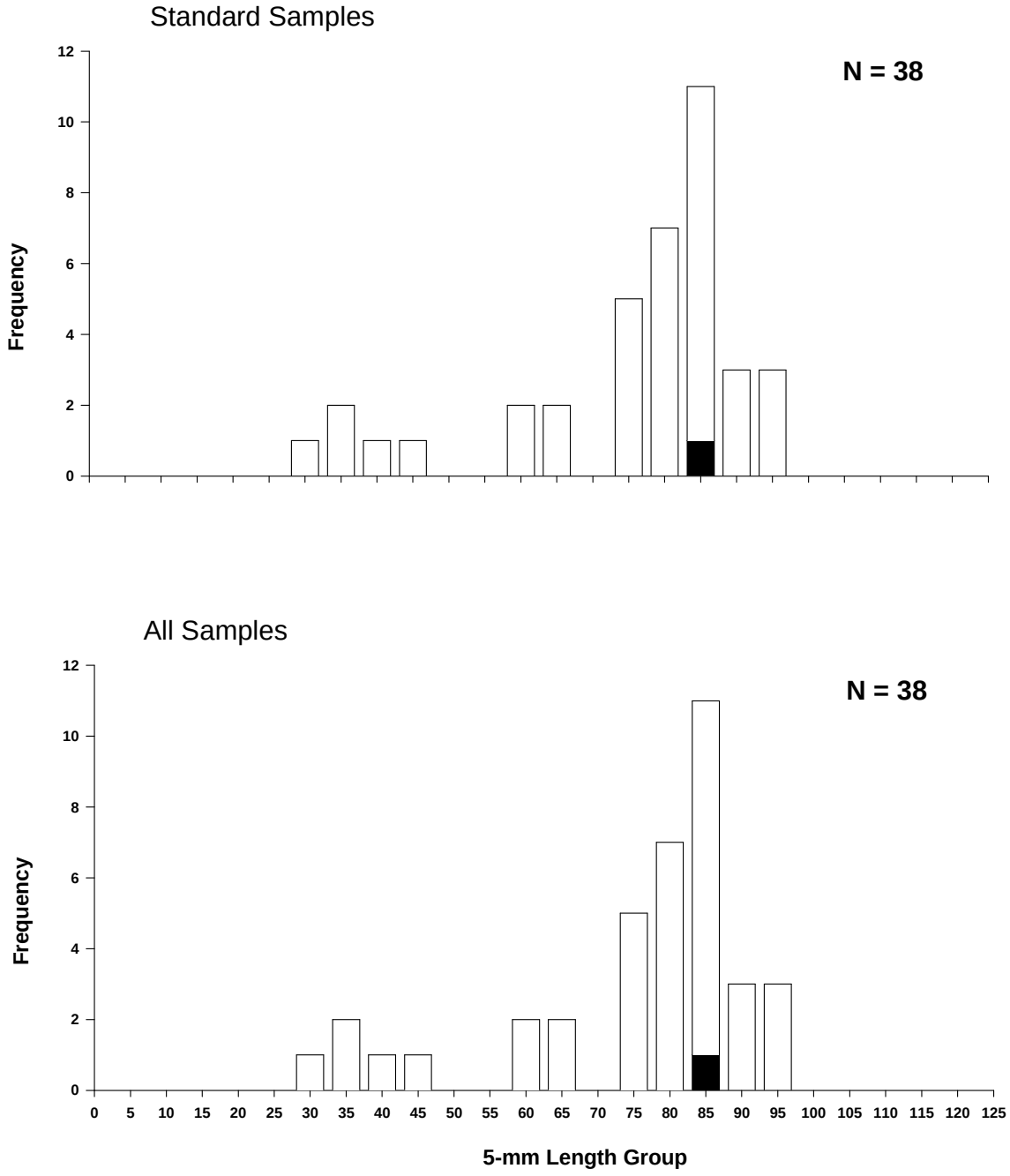

Figure 23. Length frequency of *Hybognathus* spp. caught during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2014. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2015.

Blue Sucker

During the 2015 sampling season a total of 12 blue suckers were observed in Segment 2, all of which were captured drifting trammel nets. Seasonally, nine were captured during sturgeon season, while the other three were sampled during fish community season.

Blue sucker CPUE (Figure 24) in Segment 2 for trammel net was reported at 0.03 fish/100m when analyzed for the entire 2015 field season. Seasonally, CPUEs of 0.04 fish/100m and 0.01 fish/100m were witnessed during sturgeon and fish community seasons, respectively. It is typical to witness increased catch rates during sturgeon season in Segment 2, presumably in relation to spring time spawning movements of blue suckers.

Blue suckers that were captured in Segment 2 during the 2015 sampling year averaged 676 mm in TL and 2,896 g in weight. These observed averages in both length and weight are typical of the sampled population of blue suckers inhabiting Segment 2 across all years. However, one particular fish in 2015 was an outlier to the norm; a blue sucker captured on September 9, in bend 27, measured 295 mm TL 163 g. This was only the third blue sucker less than 500 mm TL captured in Segment 2 since the Program began in 2006. A complete description of size structure can be found in Figure 26.

Further information regarding the specific macro habitat and associated capture information can be viewed in Table 14.

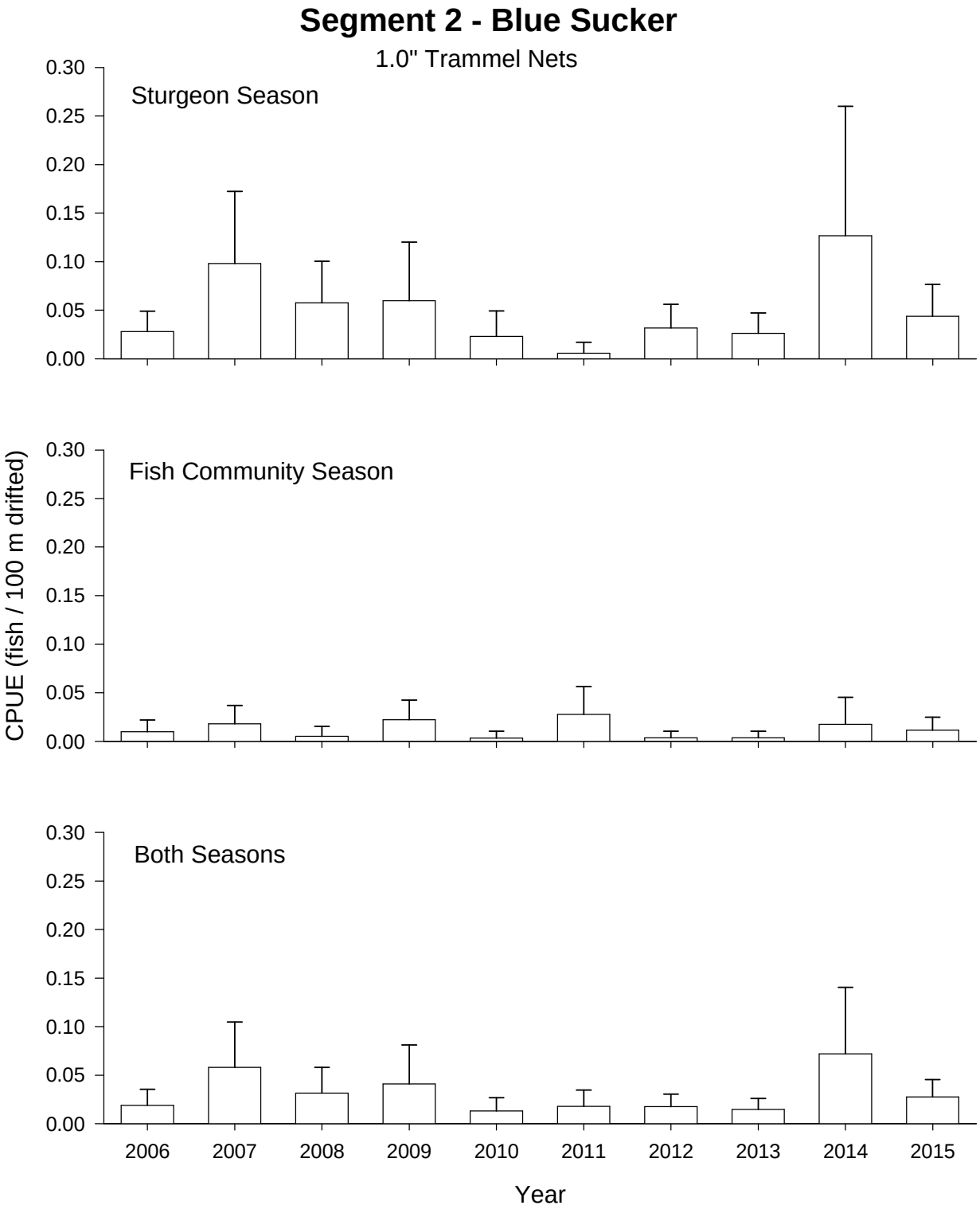

Figure 24. Mean annual catch per unit effort (+/- 2 SE) of blue sucker using 1.0” trammel nets in Segment 2 of the Missouri River from 2006-2015.

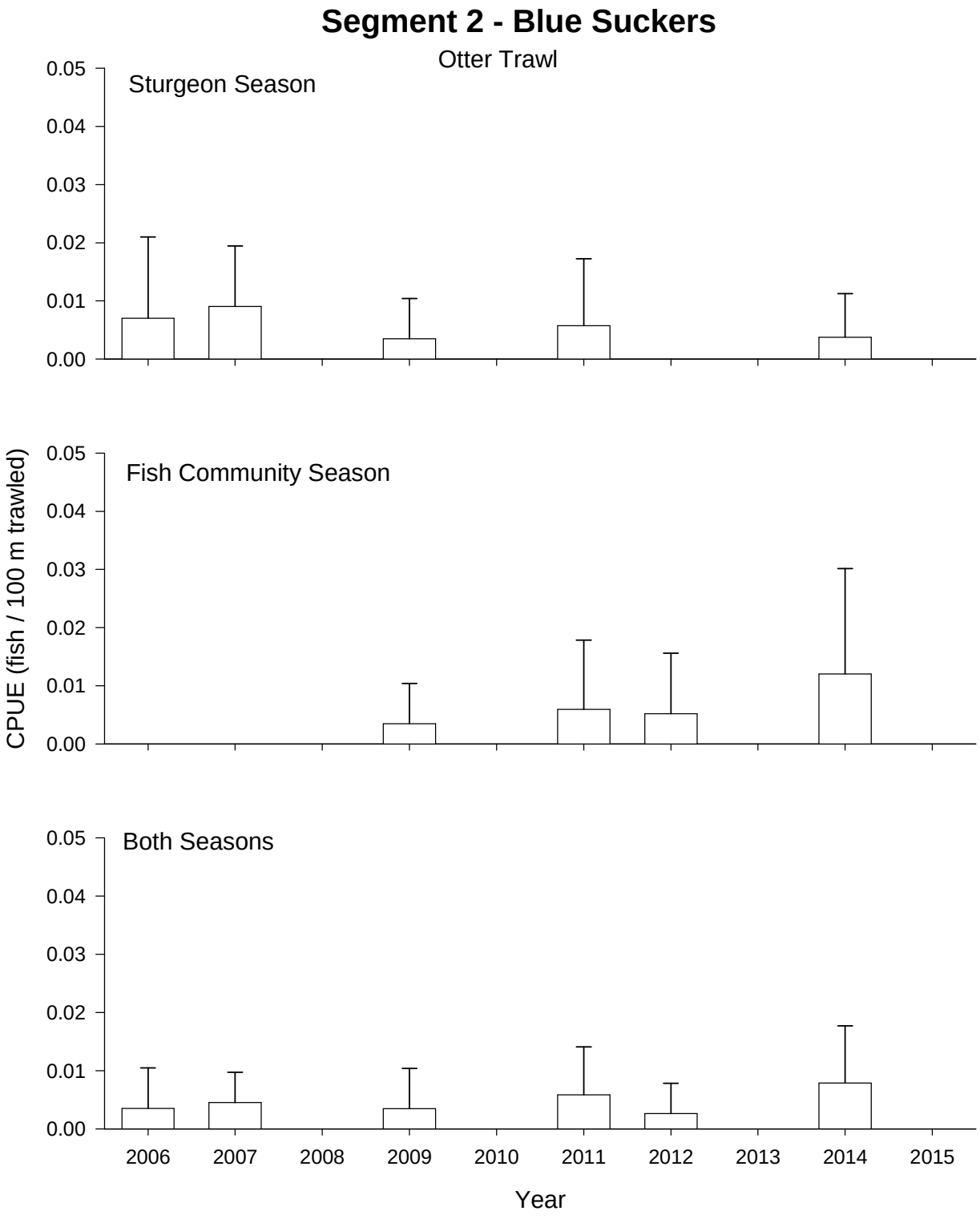

Figure 25. Mean annual catch per unit effort (+/- 2 SE) of blue sucker using otter trawls in Segment 2 of the Missouri River from 2006-2015.

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 2015. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]								
Gear	**N**	**CHXO**	**CONF**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**	**TRML**	**TRMS**
					Sturgeon Season					
1.0” Trammel Net	9	44	11	0	44	0	0	0	0	0
		44	1	27	28	0	0	0	0	0
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		38	2	29	31	0	0	0	0	0
					Fish Community Season					
1.0” Trammel Net	3	0	0	67	33	0	0	0	0	0
		42	0	33	23	0	0	0	2	0
Mini-Fyke Net	0	0	0	0	0	0	0	0	0	0
		38	2	39	4	1	5	8	2	1
Otter Trawl	0	0	0	0	0	0	0	0	0	0
		40	0	33	25	0	0	0	2	0
					Both Seasons					
Trot Line	0	0	0	0	0	0	0	0	0	0
		44	2	38	14	0	0	0	2	0

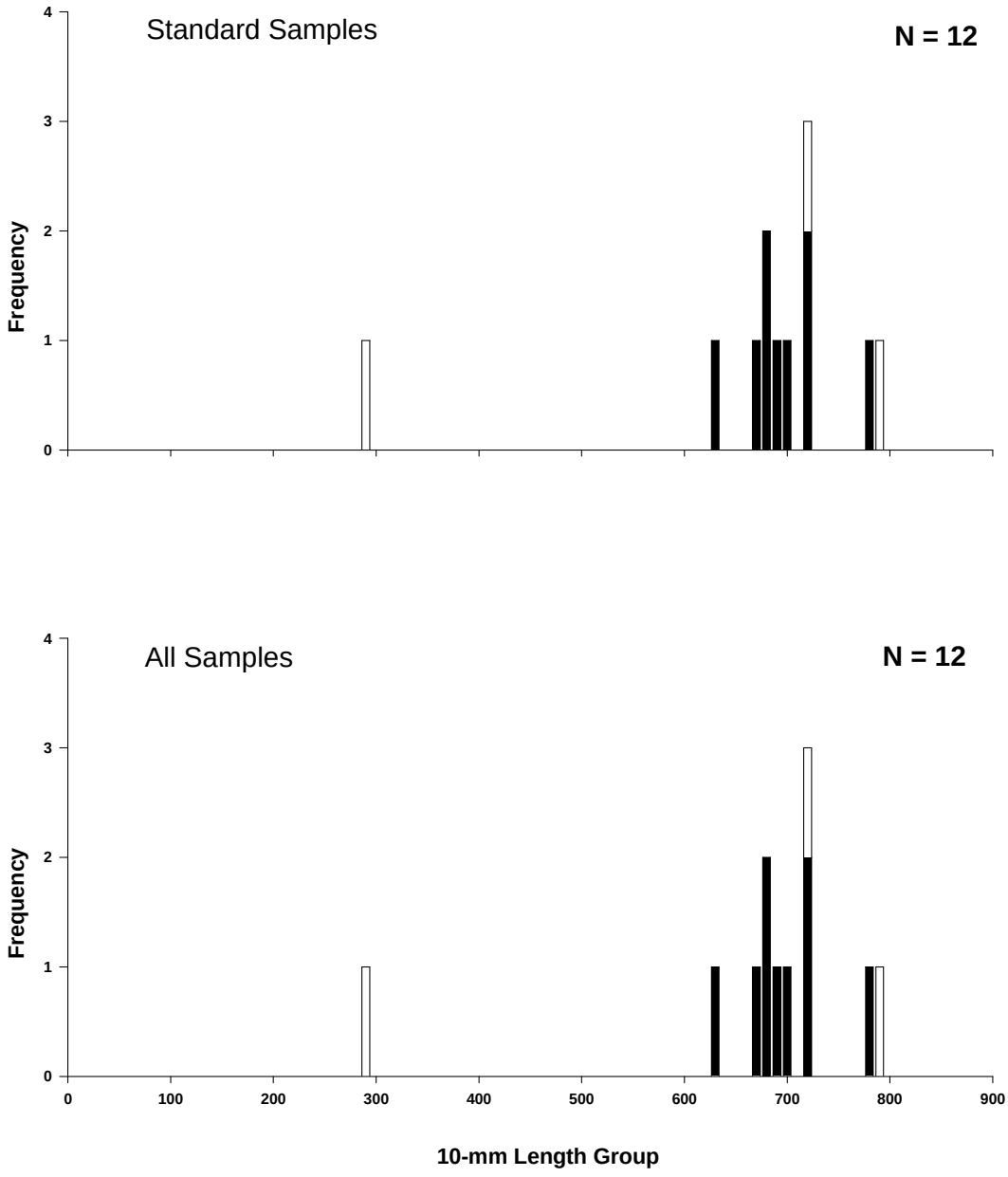

Figure 26. Length frequency of blue sucker during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2015. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2015.

Sauger

The sampling of Segment 2 in 2015 resulted in the capture of 218 sauger. Sauger observations continue to be common across all standard gears, with rank in order of abundance as follows; trammel net (N=141), otter trawl (N=62), mini-fyke net (N=14) and trotline (N=1). When comparing random versus non-random captures, it stands to reason that random deployments witnessed more sauger (N=201) than gears set or duplicates set in non-random fashion (N=17).

Temporally, 166 sauger were observed during sturgeon season, while the remaining 52 were observed during fish community season. Similarly to blue sucker catch rates, sauger captures are typically higher during sturgeon season, suggesting once again an upstream spawning behavior that occurs during sturgeon season.

Catch per unit of effort for trammel net sampling (Figure 28) of sauger, across both seasons, in Segment 2 during 2015 showed a catch rate of 0.30 fish/100m. Within seasons, a higher CPUE was reported during sturgeon season (0.52 fish/100m) than fish community season (0.08 fish/100m. Comparatively, otter trawl CPUE (Figure 29) for combined seasons was calculated at 0.11 fish/100m, with a seasonal variability from 0.19 fish/100 m during sturgeon season, to 0.03 fish/100m during fish community season.

Sauger captures remain to be common occurrence when sampling with mini-fyke nets. A mini-fyke net CPUE of 0.15 fish/net night was recorded in Segment 2 during the 2015 fish community season. The observed CPUE in Segment 2 has remained relatively constant throughout time; a complete comparison of mini-fyke net catch rates regarding sauger can be found in Figure 27.

The average TL for sauger observations during the 2015 field season in Segment 2 was 328 mm, while weight averaged 258 g. With a range of 232 mm to 488 mm (Figure 30), the observed average length is largely driven by the aforementioned upstream migration of adults during the spawning period.

Further information regarding the specific macro habitat and associated capture information can be viewed in Table 15.

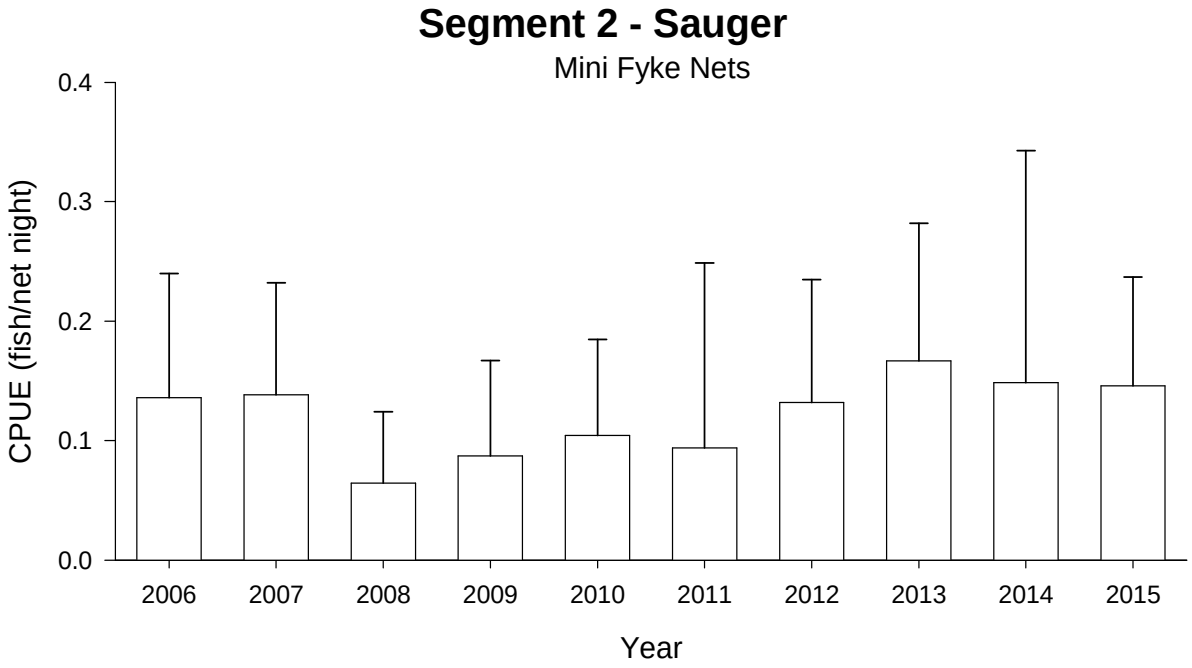

Figure 27. Mean annual catch per unit effort (+/- 2 SE) of sauger using mini-fyke nets in Segment 2 of the Missouri River from 2006-2015.

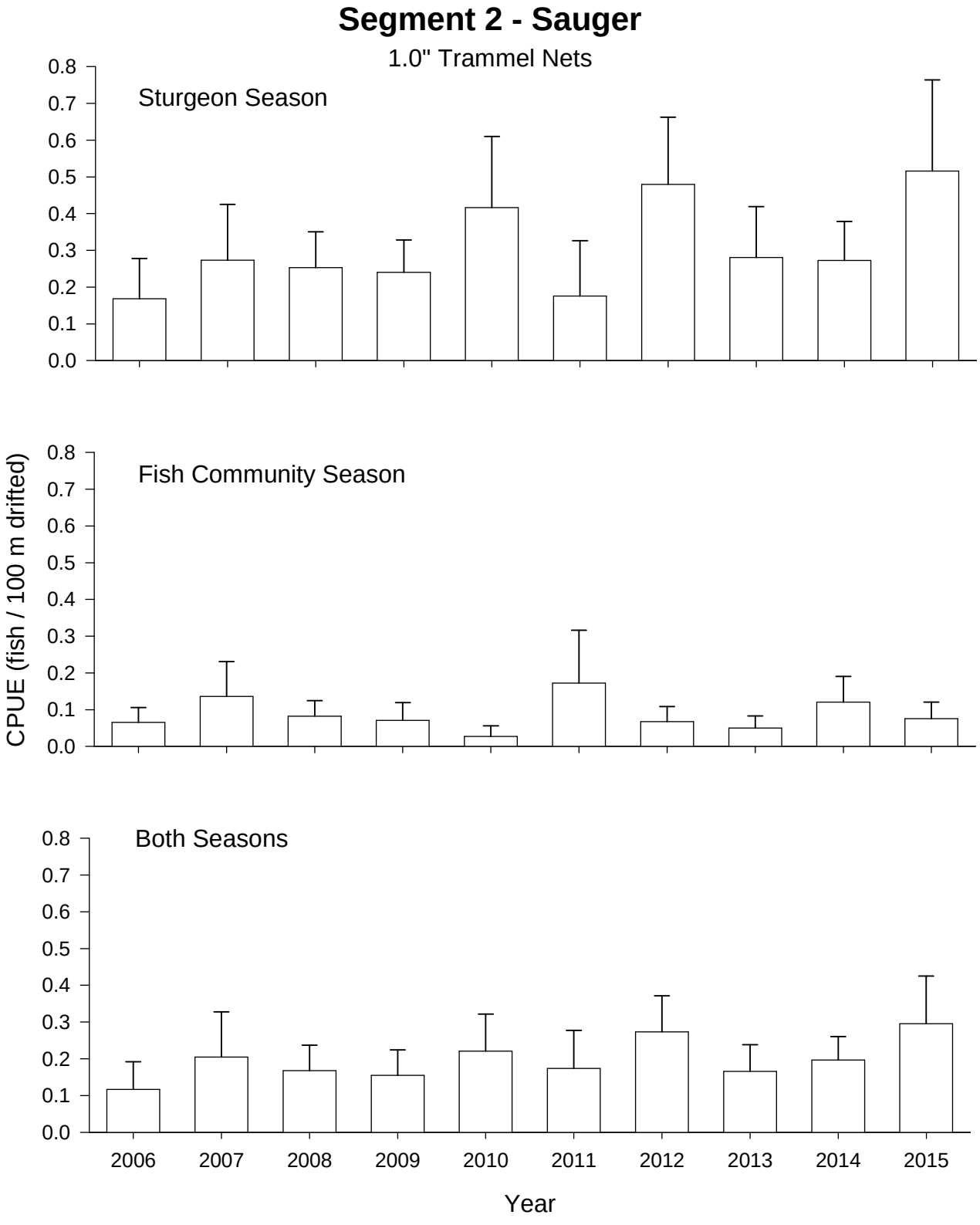

Figure 28. Mean annual catch per unit effort (+/- 2 SE) of sauger using 1.0” trammel nets in Segment 2 of the Missouri River from 2006-2015.

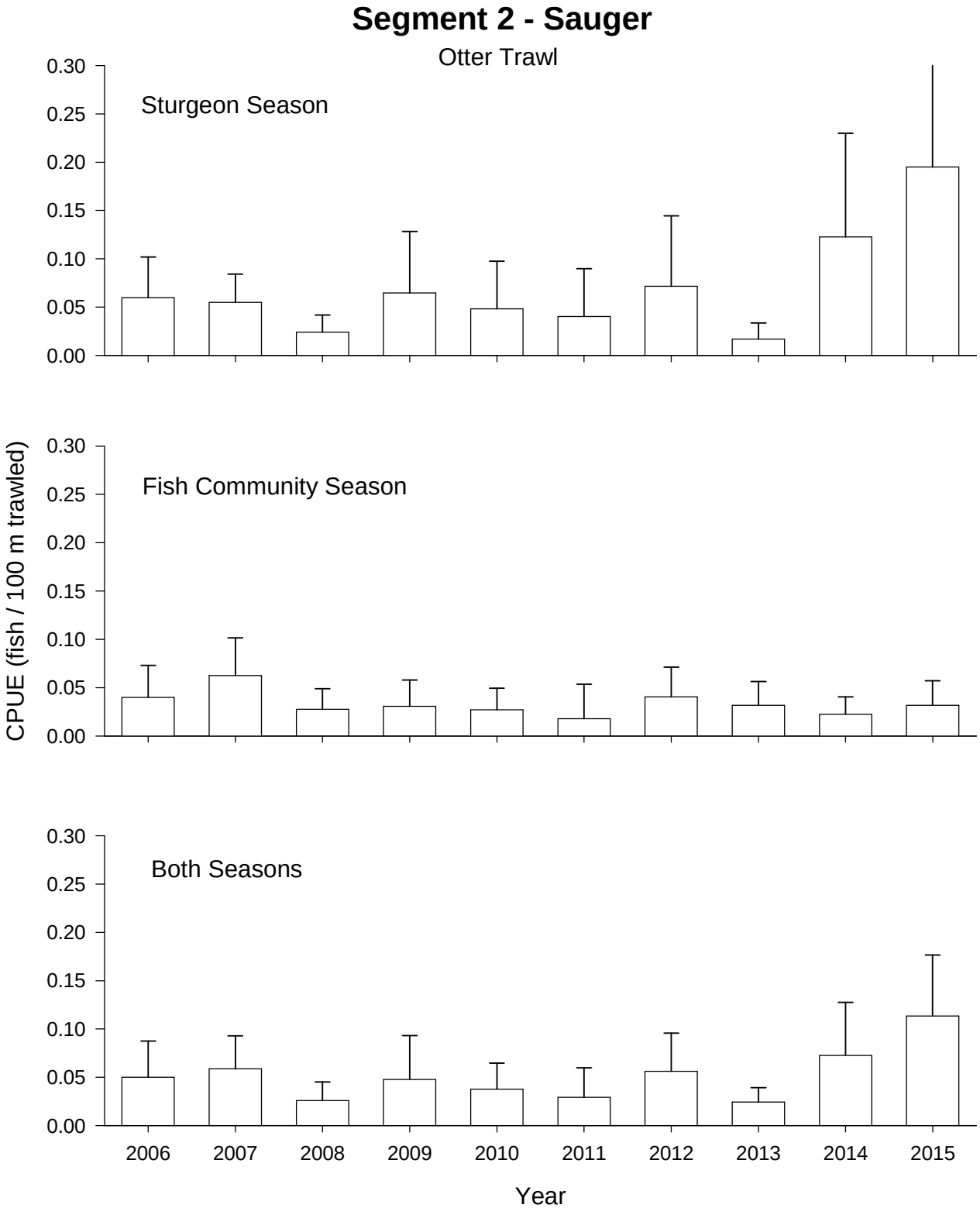

Figure 29. Mean annual catch per unit effort (+/- 2 SE) of sauger using otter trawls in Segment 2 of the Missouri River from 2006-2015.

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 2015. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

		Macrohabitat[a]								
Gear	**N**	**CHXO**	**CONF**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**	**TRML**	**TRMS**
					Sturgeon Season					
1.0” Trammel Net	114	60	1	16	24	0	0	0	0	0
		44	1	27	28	0	0	0	0	0
Otter Trawl	46	13	41	35	11	0	0	0	0	0
		38	2	29	31	0	0	0	0	0
					Fish Community Season					
1.0” Trammel Net	18	50	0	28	11	0	0	0	11	0
		42	0	33	23	0	0	0	2	0
Mini-Fyke Net	14	43	7	21	0	0	0	14	14	0
		38	2	39	4	1	5	8	2	1
Otter Trawl	8	13	0	63	25	0	0	0	0	0
		40	0	33	25	0	0	0	2	0
					Both Seasons					
Trot Line	1	0	0	100	0	0	0	0	0	0
		44	2	38	14	0	0	0	2	0

Segment 2 - Sauger

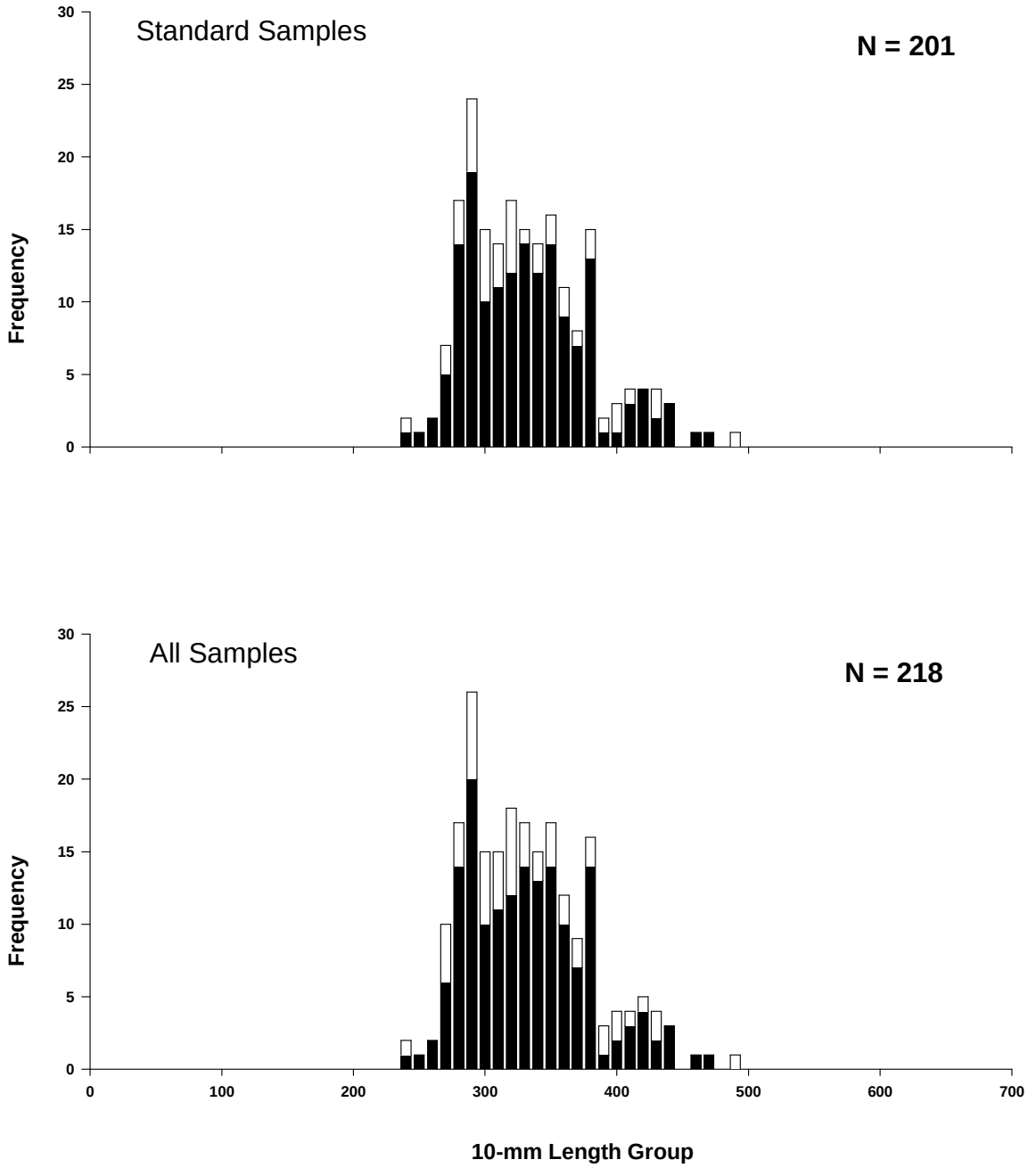

Figure 30. Length frequency of sauger during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2015. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2015.

Missouri River Fish Community

The sampling events that took place throughout Segment 2 in 2015 culminated in the capture of 12,716 individual fish, consisting of 33 different species. Any given, year min-fyke net sampling can exhibit the potential to drive observed species counts within any segment, which was the case in 2015 for Segment 2. The four most abundant species recorded, river carpsucker *Carpiodes carpio* (N=2,699), ermerald shiner *Notropis atherinoides* (N=2,263), fathead minnow *Pimephales promelas* (N=2,232) and white sucker *Catostomus commersoni* (N=1,868), were all heavily influenced by mini-fyke net captures. Furthermore, as little as one fyke net can have profound effects on the total captures of one particular species. For example, one mini-fyke net, set at the confluence with the Milk River in bend 1, produced 2,250 young of the year river carpsuckers.

The fifth most abundant species tallied was shovelnose sturgeon (N=1,298). What is unique about shovelnose sturgeon captures, compared to some other species, is that they are entirely made up of juvenile/adult individuals. It remains common that shovelnose sturgeon are a staple of the Segment 2 fish community, and are readily caught with all standard gears (except fyke net). Captures also tend to be bolstered with the use of trotlines as well as duplicate, non-random sampling.

The sixth most abundant species, longnose sucker *Catostomus catostomus* (N=587), is another species that tends to be influenced by the use of mini-fyke net as a standard gear. Channel catfish *Ictalurus punctatus* (N=295) were the seventh most abundant fish captured in Segment 2 in 2015. Although channel catfish can be observed with all gears, the use of trotlines tends to lead to the most captures. Sand shiner *Notropis stramineus* (N=242), another mini-fyke centric species, was the eight most abundant species captured.

Other species in rank of abundance were sauger (N=218), white crappie *Pomoxis annularis* (N=204), Goldeye *Hiodon alosoides* (N=148), flathead chub *Platygobio gracilis* (N=118) and pallid sturgeon (N=114).

The other 20 species present in the sampling of Segment 2 during the 2015 season, which occurred in lower abundances, were; shorthead redhorse *Moxostoma macrolepidotum*, bigmouth buffalo *Ictiobus cyprinellus*, common carp *Cyprinus carpio*, smallmouth buffalo *Ictiobus bubalus*, longnose dace *Rhinichthys cataractae*, walleye *Sander vitreus*, rainbow trout *Oncorhynchus mykiss*, spottail shiner *Notropis hudsonius*, northern pike *Esox lucius*, burbot *Lota*

lota, stonecat *Noturus flavus*, freshwater drum *Aplodinotus grunniens*, paddlefish *Polyodon spathula*, shortnose gar *Lepisosteus platostomus* and pumpkinseed *Lepomis gibbosus*.

Discussion

The 2015 sampling year marked the 10th consecutive field season for Pallid Sturgeon Population Assessment crews in Segment 2 of the Missouri River in Montana. After an unexpected, but successful pallid-centric targeted effort in 2014, crews were excited to once again sample Segment 2 in the search for pallid sturgeon. Although localized "hot spots" were not present at the same degree, Segment 2 did not disappoint in 2015.

Despite localized areas lacking high densities of hatchery reared pallid sturgeon, 113 of them were captured in Segment 2 during 2015. This total represented the third highest ever recorded in this segment. The 113 pallid sturgeon observed were represented by 11 different year classes and eight different stocking locations. The higher proportion of 2008 and 2009 year class pallid sturgeon observations corresponds well with the stocking strategies from those years, when some of the highest cohorts were stalked into RPMA 2. Although stocking proximities vary in relation to Segment 2, representatives from both the Missouri and Yellowstone River continue to be sampled throughout this segment.

Pallid sturgeon captured in Segment 2 during the 2015 season averaged 418 mm in FL 240 g. The above mentioned length and weight falls in line with the average size of pallid sturgeon captured in previous years, however, what was lacking in 2015 was the presence of larger, older year classes. For example, in 2015, the largest pallid sturgeon captured had a FL 675 mm, while during the 2014 sampling year, five pallid sturgeon were captured in Segment 2 with a greater fork length. Given these larger, older fish are in lower abundance, it does not necessarily mean that those size classes of fish were not utilizing, or present in, Segment 2 waters during 2015.

Trammel net CPUE for pallid sturgeon in Segment 2 during fish community season (0.10 fish/100m) more than doubled the previous high (0.05 fish/100m), which was witnessed in 2014. It is unclear what the mechanism is that has brought pallid sturgeon upstream into Segment 2 during fish community season the past two years. It is possible that the colder, clearer water may be leading to more invertebrate food production and/or could possibly be acting as a temperature refugia as the downstream reaches rise in temperature late into the summer.

Meanwhile, otter trawl CPUE continues to be comparable to the long-term average. Given the minor changes in CPUE over the past 10 years, combined with the ability of trammel

net and trotline to more easily catch pallid sturgeon, the otter trawl may not be the best sampling gear to capture in Segment 2. Furthermore, on average, the otter trawl samples a smaller size class of pallid sturgeon. As these fish, particularly the larger cohorts stocked in the mid to late 2000's, recruit to larger size classes, they may be less likely to be captured using the otter trawl as a sampling gear.

Trotline CPUE appears to have no real discernible pattern in relation to season or year, although in general, if CPUE is high during sturgeon season, it may be lower during fish community season, and vice versa. One potential issue that may arise during fish community season is rising water temps; with rising water temps often leading to more baitless hooks or bycatch of undesired species. Regardless of seasonal CPUE, it remains evident that the trotlines are a legitimate gear to capture pallid sturgeon, particularly in non-random or targeted efforts. Considering the ease and effort it takes to deploy trotlines, coupled with its success as a pallid sturgeon sampling gear, it has readily become a favorite of PSPA crews in Segment 2 of the Missouri River.

Although catch rates continue to illustrate minor differences from season to season, as well as year to year, they often fall within the associated error ranges. These minor changes and error-range overlap, combined with seemingly stochastic patterns, makes catch rate trend observations nearly impossible. It is likely, that given the size and habitat difference of any particular segment, catch rate trends cannot be quantified over an entire reach. Although more fine-scale catch rates have not been calculated, they may lend to more consistent and comparable data. For example, one particular bend may lead to high CPUE for any particular gear within that bend, followed by numerous bends, often within close proximity, that yield "zero" catch rates.

The relative condition (Kn) for the sub-stock category (200-329 mm) of hatchery-reared pallid sturgeon during the last two field seasons in Segment 2 has exhibited an sharp increase, however, when looking at the data, the Kn was based off of a very small sample size (N=3) and it appears a there may be error in those associated fish weights. The best example condition factor may be observed in the stock and quality classes of fish, since these two age classes regularly account for the largest sample size. Following an increase of Kn, post 2012, in the stock size class of pallid sturgeon, relative condition of that size class has remained relatively stable. During that same time, the Kn for the quality size class of pallid sturgeon was also slightly increasing to stable, however, the observed Kn in 2015 seemed to take a slight down

turn. It is important to note, however, that the relative condition of the quality size class of fish is also based on small sample size.

Shovelnose sturgeon continue to be highly abundant across Segment 2 of the Missouri River, particularly in the upper reaches. While they were fifth most abundant species observed in Segment 2 during 2015, it is important to note that they are comprised solely of adult sized class individuals. Conversely, other high-abundance species are often dominated by y-o-y mini-fyke net related catches. Trammel net and trotline also continue to be the most successful gears at capturing shovelnose sturgeon, resulting in 53% and 39% of the total shovelnose catch, respectively. The continual presence of a large population of adult shovelnose sturgeon could become important with the increased usage older age class pallid sturgeon, especially in regards to diet competition. Despite their similarity and close relatedness, it is obvious that the physiological and evolutionary differences between shovelnose and pallid sturgeon differ greatly.

Sturgeon chub CPUE has been, in general, on a decline since the early days of the Program; particularly during sturgeon season, where temporally, most of them are sampled. Although both combined-season and sturgeon season CPUE increased when compared to last year, it is unclear what may be driving this general downward trend in catch rates. These differences in trends are also not aided by the fact that sturgeon chub captures in Segment 2 are a somewhat rare occurrence. Additionally, when sturgeon chubs are witnessed, they are dominated by older, adult sized individuals, lending to the belief that Segment 2 is not a hospitable reach for sturgeon chub rearing.

Similarly, but even more pronounced, catch rates of sicklefin chubs continue to be both dismal and stochastic. There tends to be season, or even hole years (2008, 2009 & 2014), where no sicklefin chubs are observed in Segment 2. It appears that Segment 2 is even less preferred by sicklefin chubs than it is by sturgeon chubs. One might surmise that the lack, or low abundance, of both of these species is due to the highly altered nature of this segment caused by Fort Peck Dam.

Sand shiner catch rates, after crashing in 2012, have remained relatively stable the last three years. Unlike some of the other species, who exhibited positive effects from the high-water year of 2011, sand shiners appeared to be negatively impacted. While catch rates have rebounded, and remained stable, they were not near as high in 2015 (2.52 fish/net night) as the peak witnessed in 2007 (8.54 fish/net night). It appears that the population of sand shiners in

Segment 2 fair much better with the altered, regulated flows of the Missouri River downstream of Fort Peck Dam.

Hybotnathus spp. catch rate in Segment 2 during 2015 was comparable to all years except 2010 and 2013; when they were nearly quadruple the long-term average. It may be unclear what causes such drastic changes in catch rates; however, it is quite possible that higher catch rates can be driven by local mini-fyke net catch, where as little as one net can greatly influence the overall CPUE.

Catch rates of blue suckers in Segment 2 remains comparable but erratic. While year to year patterns may be hard to separate, a seasonal component is easily recognized. In all years, with the exception of 2010, CPUE has been higher during sturgeon season than fish community season. Higher sturgeon season catch rates are thought to occur because of upstream spawning movements, possibly into the Milk River, annually by adult blue suckers. Consequentially, the population of observed blue suckers in Segment 2 is often dominated by larger, adult size class individuals. Furthermore, only three blue suckers smaller than 500 mm TL have been captured in this segment; with one of them (295 mm) coming during the 2015 field season.

Similarly to blue suckers, sauger catch rates are heavily influenced by perceived spring time spawning migrations. During 2015, the above mentioned phenomenon led to an all time high regarding trammel net CPUE (0.52 fish/100m), in turn causing an all time high in combined-season trammel net CPUE (0.30 fish/100m). Additionally, the same pattern was exhibited in otter trawl catch rates, with new record highs reported for both sturgeon season (0.20 fish/100m) and combined-season CPUE (0.11 fish/100m). Although the otter trawl is not as efficient at capturing sauger, when compared to trammel net, the never before seen CPUE for both gears may indicate a rise in abundance of sauger in Segment 2.

Evaluating trends, annually or long-term, for target species could potentially be a convoluted subject. Some trends have become more clear as times go on; for example, most of the native target species become more prevalent in Segment 2 during the sturgeon season in relation to upstream spawning movements. However, the related catch rates to these species are sometimes driven by brief but exceptional events that can occasionally be the result of one sampling event in one bend. Furthermore, even when flows and conditions remain near static downstream of Fort Peck Dam, flow events occurring in the Milk River, either positive or negative, could have tremendous compounding effects reaching far downstream.

Acknowledgments

We would like to thank the U.S. Army Corps of engineers for providing funding to the Pallid Sturgeon Population Assessment Program, especially Tim Welker and George Williams for providing guidance to the work group. Our seasonal employees, Jeff Brown and James Collins, for their countless hours in the field pulling gear as well as in the shop assuring boats were stocked and gear was kept in working order. Marty Etchemendy for his excellent work as an intern. Thanks to Dave Fuller, and his technician Luke Gunderson, for providing assistance in both the field and the office. We would like to thank Steve Dalbey for taking care of the much needed business while we were out in the field. A special thanks to Pat Braaten of the U.S. Geological Survey for answering any type of questions regarding the Missouri River fish community, as well as lending his technician, Billy (who later joined our crew in the fall), when needed. Thanks to Ryan Wilson, Zac Sandness and Steve Krentz of the U.S. Fish and Wildlife Service for all of their collaboration between our offices.

References

Dattilo, J. E., R. R. Dirnberger, P. T. Horner, D. J. Niswonger, M. L. Miller and V. H. Travinchek. 2008a. Three Year Summary Age and Growth Report For Sand Shiner (*Notropis stramineus*). Pallid Sturgeon Population Assessment Project and Associated Fish Community Monitoring for the Missouri River. Missouri Department of Conservation. Chillicothe, MO.

Dattilo, J. E., R. R. Dirnberger, P. T. Horner, D. J. Niswonger, M. L. Miller and V. H. Travinchek. 2008b. Three Year Summary Age and Growth Report For Plains Minnow, Western Silvery Minnow, Brassy Minnow (*Hybognathus spp.*). Pallid Sturgeon Population Assessment Project and Associated Fish Community Monitoring for the Missouri River. Missouri Department of Conservation. Chillicothe, MO.

Galat, D.L., C.R. Berry Jr., E.J. Peters and R.G. White. 2005. Missouri River. Pages 427-480 in A.C. Benke and C.E. Cushing (editors). Rivers of North America, Elesevier, Oxford.

Gardner, W.M. and P.A. Stewart. 1987. The Fishery of the Lower Missouri River. Federal Aid to Fish and Wildlife Restoration Project FW-2-R Job I-b. Montana Fish, Wildlife and Parks. Helena, Montana.

Herman, P., A Plauck, N. Utrup and Tracy Hill. 2008a. Three Year Summary Age and Growth Report For Sturgeon Chub *Macrohybopsis aestivalis*. Pallid Sturgeon Population Assessment Project and Associated Fish Community Monitoring for the Missouri River. United States Fish and Wildlife Service Columbia National Fish and Wildlife Conservation Office, Columbia, MO.

Herman, P., A Plauck, N. Utrup and Tracy Hill. 2008b. Three Year Summary Age and Growth Report For Sicklefin Chub *Macrohybopsis meeki*. Pallid Sturgeon Population Assessment Project and Associated Fish Community Monitoring for the Missouri River. United States Fish and Wildlife Service Columbia National Fish and Wildlife Conservation Office, Columbia, MO.

Labay, S., J. Kral and S. Stukel. 2008. Three Year Summary Age and Growth Report For Blue Sucker. Pallid Sturgeon Population Assessment Project and Associated Fish Community Monitoring for the Missouri River. South Dakota Department of Game, Fish and Parks. Yankton, SD.

Pierce, C. L., C. S. Guy, P. J. Braaten, and M.A. Pegg. 2004. Fish growth, mortality, recruitment, condition, and size structure. Volume 4. Population structure and habitat use of benthic fishes along the Missouri and lower Yellowstone Rivers. U.S. Geological Survey, Cooperative Research Units, Iowa State University, Ames Iowa.

Shuman, D. A. et al. 2009. Pallid Sturgeon Size Structure, Condition, and Growth within the Missouri River Basin. (In Review).

Steffensen, K. and M. Hamel. 2008. Four Year Summary Age and Growth Report For Shovelnose Sturgeon. Pallid Sturgeon Population Assessment Project and Associated Fish Community Monitoring for the Missouri River. Nebraska Game and Parks Commission. Lincoln, NE.

Welker, T. L., and M. R. Drobish. (editors), 2011. Missouri River Standard Operating Procedures for Sampling and Data Collection, Volume 1.6. U.S. Army Corps of Engineers, Omaha District, Yankton, SD.

Webb, M. 2014. Lead Researcher-Blood Analysis. US Fish and Wildlife Service - Bozeman Fish Technology Center, Bozeman, MT.

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
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
Gill Net – 4 meshes, small mesh set upstream	GN14	Standard	Sturgeon	2003 - Present	Fish / net night
Gill Net – 4 meshes, large mesh set upstream	GN41	Standard	Sturgeon	2003 - Present	Fish / net night
Gill Net – 8 meshes, small mesh set upstream	GN18	Standard	Sturgeon	2003 - Present	Fish / net night
Gill Net – 8 meshes, large mesh set upstream	GN81	Standard	Sturgeon	2003 - Present	Fish / net night
Trammel Net – 1.0”inner mesh	TN	Standard	Sturgeon	2003 - Present	Fish / 100 m drift
		Standard	Fish Comm.	2003 - 2009	Fish / 100 m drift
Otter Trawl – 16 ft head rope	OT16	Standard	Both Seasons	2003 - Present	Fish / 100 m trawled
Mini-Fyke Net	MF	Standard	Fish Comm.	2003 - Present	Fish / net night
Beam Trawl	BT	Standard	Both Seasons	2003 - 2004	Fish / 100 m trawled
Hoop Net – 4 ft.	HN	Standard	Both Seasons	2003 - 2004	Fish / net night
Trammel Net – 2.5” inner mesh	TN25	Standard	Sturgeon	2005 – 2006	Fish / 100 m drift
Bag Seine – quarter arc method pulled upstream	BSQU	Standard	Fish Comm.	2003 – 2005	Fish / 100 m^2
Bag Seine – quarter arc method pulled downstream	BSQD	Standard	Fish Comm.	2003 - 2005	Fish / 100 m^2
Bag Seine – half arc method pulled upstream	BSHU	Standard	Fish Comm.	2003 - 2005	Fish / 100 m^2
Bag Seine – half arc method pulled downstream	BSHD	Standard	Fish Comm.	2003 - 2005	Fish / 100 m^2
Bag seine – rectangular method pulled upstream	BSRU	Standard	Fish Comm.	2003 - 2005	Fish / 100 m^2
Bag seine – rectangular method pulled downstream	BSRD	Standard	Fish Comm.	2003 - 2005	Fish / 100 m^2
Otter trawl – 16 ft SKT 4mm x 4mm HB2 MOR	OT01	Evaluation	Fish Comm.	2006	Fish / 100 m trawled
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 Segment 2 of the Missouri River (RPMA 4).

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		
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

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
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
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	

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
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 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	

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
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	
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		
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	

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
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
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 Removed
2011	Wolf Point	797	2010	5/5/2011	Yearling	PIT Tag	Scute Removed
2011	Fallon	531	2010	5/5/2011	Yearling	PIT Tag	Scute Removed
2011	Forsyth	545	2010	5/5/2011	Yearling	PIT Tag	Scute Removed
2011	Intake	510	2010	5/5/2011	Yearling	PIT Tag	Scute Removed

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
2011	Culbertson	262	2010	8/22/2011	Yearling	PIT Tag	Scute Removed
2011	Fallon	131	2010	8/22/2011	Yearling	PIT Tag	Scute Removed
2011	Forsyth	174	2010	8/22/2011	Yearling	PIT Tag	Scute Removed
2011	Intake	132	2010	8/22/2011	Yearling	PIT Tag	Scute Removed
2011	Wolf Point	262	2010	8/22/2011	Yearling	PIT Tag	Scute Removed
2013	Wolf Point	187	2012	4/22/2013	Yearling	PIT Tag	Scute Removed
2013	Culbertson	187	2012	4/22/2013	Yearling	PIT Tag	Scute Removed
2013	Intake	118	2012	4/22/2013	Yearling	PIT Tag	Scute Removed
2013	Fallon	185	2012	4/22/2013	Yearling	PIT Tag	Scute Removed
2014	Culbertson	212	2013	4/15/2014	Yearling	PIT Tag	Scute Removed
2014	Kinsey Bridge	214	2013	4/15/2014	Yearling	PIT Tag	Scute Removed
2014	Powder River Depot	210	2013	4/15/2014	Yearling	PIT Tag	Scute Removed
2014	Wolf Point	211	2013	4/15/2014	Yearling	PIT Tag	Scute Removed
2015	Culbertson	153	2014	4/20/2015	Yearling	PIT Tag	Scute Removed
2015	Fallon	146	2014	4/23/2015	Yearling	PIT Tag	Scute Removed
2015	Intake	109	2014	4/23/2015	Yearling	PIT Tag	Scute Removed
2015	Wolf Point	161	2014	4/20/2015	Yearling	PIT Tag	Scute Removed

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 2015. 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	TRML CHNB
BKCP	0	0	0	0	0	0	0
		0	0	0	0	0	0
BMBF	7	0.019	0.004	1.506	0.006	0	0
		0.032	0.009	3.012	0.011	0	0
BRBT	0	0	0	0	0	0	0
		0	0	0	0	0	0
BUSK	12	0.028	0.017	0.301	0.013	0.051	0
		0.018	0.021	0.602	0.018	0.051	0
CARP	2	0.008	0.004	0	0	0.024	0
		0.013	0.009	0	0	0.048	0
CNCF	31	0.063	0.089	0.602	0.025	0.05	0
		0.032	0.061	1.205	0.025	0.051	0
ERSN	0	0	0	0	0	0	0
		0	0	0	0	0	0
FHCB	56	0.106	0.095	0	0.137	0.093	0
		0.04	0.055	0	0.094	0.063	0
FHMW	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	TRML CHNB
FWDM	0	0	0	0	0	0	0
		0	0	0	0	0	0
GDEY	79	0.174	0.138	0.602	0.244	0.135	0
		0.062	0.06	1.205	0.127	0.149	0
LNDC	0	0	0	0	0	0	0
		0	0	0	0	0	0
LNSK	21	0.065	0.037	0.345	0.087	0.073	0
		0.044	0.028	0.69	0.073	0.133	0
NFSH	0	0	0	0	0	0	0
		0	0	0	0	0	0
NTPK	3	0.006	0.01	0	0	0.007	0
		0.007	0.015	0	0	0.013	0
PDFH	1	0.002	0.004	0	0	0	0
		0.003	0.009	0	0	0	0
PDSG	31	0.065	0.089	0	0.035	0.07	0
		0.031	0.055	0	0.031	0.072	0
PNSD	0	0	0	0	0	0	0
		0	0	0	0	0	0
RBTT	0	0	0	0	0	0	0
		0	0	0	0	0	0

species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	TRML
			CHNB	CHNB	CHNB	CHNB	CHNB
RVCS	32	0.062	0.094	0	0.026	0.062	0
		0.033	0.053	0	0.032	0.085	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	132	0.295	0.414	0.301	0.186	0.237	0.503
		0.129	0.293	0.602	0.123	0.135	1.005
SHRH	29	0.085	0.056	0	0.063	0.152	0.251
		0.049	0.045	0	0.05	0.16	0.503
SMBF	18	0.049	0.013	3.056	0.032	0.008	0
		0.058	0.015	4.732	0.037	0.016	0
SNGR	0	0	0	0	0	0	0
		0	0	0	0	0	0
SNPD	1	0.002	0.004	0	0	0	0
		0.003	0.009	0	0	0	0
SNSG	573	1.279	1.388	0	1.376	1.102	0
		0.268	0.442	0	0.503	0.467	0
SNSN	0	0	0	0	0	0	0
		0	0	0	0	0	0

species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	TRML
			CHNB	CHNB	CHNB	CHNB	CHNB
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
WLYE	10	0.025	0.009	0	0.046	0.025	0
		0.017	0.012	0	0.045	0.029	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	19	0.052	0.032	0	0.11	0	0.503
		0.038	0.029	0	0.11	0	1.005

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

			CHXO	CONF	ISB	OSB	TRML
species	Total Catch	Overall CPUE	CHNB	CHNB	CHNB	CHNB	CHNB
BKCP	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	3	0.005	0.009	0.164	0	0	0
		0.006	0.012	0.328	0	0	0
CNCF	23	0.041	0.049	0.658	0.038	0.012	0
		0.032	0.066	1.316	0.04	0.017	0
ERSN	144	0.291	0.754	0	0	0	0
		0.558	1.447	0	0	0	0
FHCB	22	0.04	0.022	0	0.071	0.033	0
		0.021	0.019	0	0.057	0.028	0
FHMW	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	TRML CHNB
FWDM	1	0.002	0.004	0	0	0	0
		0.003	0.009	0	0	0	0
GDEY	2	0.004	0	0	0.008	0.006	0
		0.006	0	0	0.015	0.012	0
LNDC	5	0.009	0	0	0.017	0.012	0
		0.008	0	0	0.019	0.017	0
LNSK	16	0.028	0.027	0	0.018	0.043	0
		0.018	0.025	0	0.021	0.047	0
NFSH	0	0	0	0	0	0	0
		0	0	0	0	0	0
NTPK	3	0.006	0.004	0	0.012	0	0
		0.006	0.009	0	0.017	0	0
PDFH	0	0	0	0	0	0	0
		0	0	0	0	0	0
PDSG	18	0.031	0.026	0	0.055	0.013	0
		0.017	0.024	0	0.042	0.019	0
PNSD	0	0	0	0	0	0	0
		0	0	0	0	0	0
RBTT	1	0.002	0	0	0	0.006	0
		0.004	0	0	0	0.013	0

species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	TRML
			CHNB	CHNB	CHNB	CHNB	CHNB
RVCS	12	0.023	0.022	0.493	0.013	0.02	0
		0.016	0.027	0.33	0.019	0.029	0
SFCB	2	0.004	0.011	0	0	0	0
		0.006	0.015	0	0	0	0
SGCB	15	0.027	0.018	0	0.029	0.039	0
		0.017	0.018	0	0.03	0.043	0
SGER	54	0.113	0.031	3.12	0.166	0.06	0
		0.063	0.032	0.318	0.123	0.064	0
SHRH	16	0.036	0.011	0.164	0.065	0.037	0
		0.027	0.022	0.328	0.076	0.028	0
SMBF	0	0	0	0	0	0	0
		0	0	0	0	0	0
SNGR	0	0	0	0	0	0	0
		0	0	0	0	0	0
SNPD	0	0	0	0	0	0	0
		0	0	0	0	0	0
SNSG	90	0.162	0.159	0	0.221	0.106	0.166
		0.044	0.066	0	0.1	0.059	0.332
SNSN	0	0	0	0	0	0	0
		0	0	0	0	0	0

			CHXO	CONF	ISB	OSB	TRML
species	Total Catch	Overall CPUE	CHNB	CHNB	CHNB	CHNB	CHNB
STCT	1	0.004	0	0	0	0.016	0
		0.009	0	0	0	0.032	0
STSN	1	0.002	0	0.164	0	0	0
		0.003	0	0.328	0	0	0
WLYE	4	0.007	0	0.164	0.017	0	0
		0.008	0	0.329	0.024	0	0
WSMW	1	0.002	0.005	0	0	0	0
		0.004	0.01	0	0	0	0
WTCP	0	0	0	0	0	0	0
		0	0	0	0	0	0
WTSK	18	0.034	0.014	0	0.025	0.063	0.333
		0.021	0.02	0	0.026	0.06	0.001

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

species	Total Catch	Overall CPUE	CHXO BARS	CONF BARS	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	SCN BARS	TRML BARS	TRMS BARS
BKCP	1	0.01	0	0	0	0	0	0	0.125	0	0
		0.021	0	0	0	0	.	0	0.25	0	.
BMBF	43	0.448	0.556	7	0.081	0.25	0	0.6	0	1	0
		0.395	0.892	2	0.091	0.5	.	0.8	0	2	.
BRBT	4	0.042	0.056	0	0.054	0	0	0	0	0	0
		0.041	0.077	0	0.075	0	.	0	0	0	.
BUSK	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	.	0	0	0	.
CARP	37	0.385	0.333	0	0.27	0	0	0.2	1	3	0
		0.228	0.287	0	0.214	0	.	0.4	2	2	.
CNCF	104	1.083	0.278	41.5	0.135	0	0	0.4	0	2	0
		1.73	0.272	83	0.114	0	.	0.8	0	2	.
ERSN	2119	22.073	36.389	7	8.973	2.75	65	0.2	44.375	0.5	30
		13.675	30.405	12	7.689	3.403	.	0.4	80.386	1	.
FHCB	19	0.198	0.111	4.5	0.162	0	0	0	0	0	0
		0.202	0.155	9	0.145	0	.	0	0	0	.
FHMW	2232	23.25	16.972	200	6.811	16.75	8	33.6	90	0	6
		16.573	22.204	400	5.563	32.837	.	66.202	131.924	0	.

species	Total Catch	Overall CPUE	CHXO BARS	CONF BARS	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	SCN BARS	TRML BARS	TRMS BARS
FWDM	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	.	0	0	0	.
GDEY	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	.	0	0	0	.
LNDC	29	0.302	0.056	7	0.135	0.75	0	0	0.625	0	0
		0.305	0.077	14	0.138	0.957	.	0	0.75	0	.
LNSK	534	5.563	9.333	7	2.946	0.5	0	0.2	9	0	0
		3.519	8.555	14	2.587	1	.	0.4	10.73	0	.
NFSH	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	.	0	0	0	.
NTPK	3	0.031	0.028	0.5	0.027	0	0	0	0	0	0
		0.036	0.056	1	0.054	0	.	0	0	0	.
PDFH	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	.	0	0	0	.
PDSG	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	.	0	0	0	.
PNSD	1	0.01	0	0	0	0	0	0	0.125	0	0
		0.021	0	0	0	0	.	0	0.25	0	.
RBTT	24	0.25	0.167	0.5	0.432	0	0	0.2	0	0	0
		0.151	0.149	1	0.351	0	.	0.4	0	0	.

species	Total Catch	Overall CPUE	CHXO BARS	CONF BARS	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	SCN BARS	TRML BARS	TRMS BARS
RVCS	2648	27.583	0.583	1287.5	0.432	0.5	3	0.2	3.5	1	0
		53.633	0.312	2575	0.315	1	.	0.4	6.164	2	.
SFCB	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	.	0	0	0	.
SGCB	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	.	0	0	0	.
SGER	14	0.146	0.167	0.5	0.081	0	0	0	0.25	1	0
		0.084	0.126	1	0.12	0	.	0	0.327	2	.
SHRH	2	0.021	0	0.5	0	0	0	0	0	0.5	0
		0.029	0	1	0	0	.	0	0	1	.
SMBF	21	0.219	0.083	4.5	0.216	0	0	0	0	0.5	0
		0.178	0.123	1	0.291	0	.	0	0	1	.
SNGR	2	0.021	0.056	0	0	0	0	0	0	0	0
		0.042	0.111	0	0	0	.	0	0	0	.
SNPD	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	.	0	0	0	.
SNSG	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	.	0	0	0	.
SNSN	242	2.521	1.972	11	3.297	0.75	2	3	0.625	0	2
		1.731	2.052	22	3.812	0.957	.	6	0.526	0	.

species	Total Catch	Overall CPUE	CHXO BARS	CONF BARS	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	SCN BARS	TRML BARS	TRMS BARS
STCT	3	0.031	0.028	1	0	0	0	0	0	0	0
		0.046	0.056	2	0	0	.	0	0	0	.
STSN	11	0.115	0	3	0	0	0	0	0	2.5	0
		0.151	0	6	0	0	.	0	0	3	.
WLYE	17	0.177	0.389	0	0.027	0	0	0	0.25	0	0
		0.275	0.723	0	0.054	0	.	0	0.5	0	.
WSMW	37	0.385	0.389	0	0.432	0.25	1	0.2	0.25	0	2
		0.333	0.668	0	0.556	0.5	.	0.4	0.5	0	.
WTCP	204	2.125	4.75	0	0.892	0	0	0	0	0	0
		3.581	9.5	0	1.106	0	.	0	0	0	.
WTSK	1809	18.844	11.639	18	33.838	9.5	1	6.4	3.5	0.5	2
		12.561	9.174	18	30.848	17.692	.	11.324	3.117	1	.

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

species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	TRML CHNB
BKCP	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	2	0.02	0	0	0.027	0.071	0
		0.029	0	0	0.054	0.143	0
BUSK	0	0	0	0	0	0	0
		0	0	0	0	0	0
CARP	7	0.071	0.047	0	0	0.357	0
		0.078	0.065	0	0	0.496	0
CNCF	112	1.143	1.209	4.5	0.324	1.571	8.5
		0.437	0.715	3	0.233	0.954	1
ERSN	0	0	0	0	0	0	0
		0	0	0	0	0	0
FHCB	5	0.051	0.07	0	0.054	0	0
		0.045	0.079	0	0.075	0	0
FHMW	0	0	0	0	0	0	0
		0	0	0	0	0	0

species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	TRML
			CHNB	CHNB	CHNB	CHNB	CHNB
FWDM	1	0.01	0.023	0	0	0	0
		0.02	0.047	0	0	0	0
GDEY	46	0.469	0.395	0	0.568	0.571	0
		0.172	0.283	0	0.252	0.501	0
LNDC	0	0	0	0	0	0	0
		0	0	0	0	0	0
LNSK	12	0.122	0.186	0	0.054	0.143	0
		0.093	0.179	0	0.075	0.286	0
NFSH	0	0	0	0	0	0	0
		0	0	0	0	0	0
NTPK	2	0.02	0.023	0	0.027	0	0
		0.029	0.047	0	0.054	0	0
PDFH	0	0	0	0	0	0	0
		0	0	0	0	0	0
PDSG	44	0.449	0.326	0	0.784	0.071	0
		0.199	0.264	0	0.404	0.143	0
PNSD	0	0	0	0	0	0	0
		0	0	0	0	0	0
RBTT	0	0	0	0	0	0	0
		0	0	0	0	0	0

species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	TRML
			CHNB	CHNB	CHNB	CHNB	CHNB
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	1	0.01	0	0	0.027	0	0
		0.02	0	0	0.054	0	0
SHRH	16	0.163	0.302	0	0.027	0.143	0
		0.09	0.183	0	0.054	0.194	0
SMBF	1	0.01	0	0	0	0	0.5
		0.02	0	0	0	0	1
SNGR	0	0	0	0	0	0	0
		0	0	0	0	0	0
SNPD	0	0	0	0	0	0	0
		0	0	0	0	0	0
SNSG	400	4.082	4.744	1	4.27	2.571	0
		0.88	1.493	2	1.28	1.997	0
SNSN	0	0	0	0	0	0	0
		0	0	0	0	0	0

species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	TRML
			CHNB	CHNB	CHNB	CHNB	CHNB
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
WLYE	2	0.02	0.023	0	0	0.071	0
		0.029	0.047	0	0	0.143	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	12	0.122	0.209	0	0.054	0.071	0
		0.083	0.17	0	0.075	0.143	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 2015 for Segment 2 of the Missouri River.

	Sturgeon Season		**Fish Community Season**			**Both Seasons**
species	1.0” Trammel Net	Otter Trawl	1.0 Trammel Net	Otter Trawl	Mini-Fyke Net	Trotline
BKCP	0.000	0.000	0.000	0.010	0.000	0.000
BMBF	0.031	0.000	0.007	0.448	0.000	0.000
BRBT	0.000	0.000	0.000	0.042	0.000	0.020
BUSK	0.044	0.000	0.012	0.000	0.000	0.000
CARP	0.016	0.007	0.000	0.385	0.003	0.071
CNCF	0.075	0.075	0.051	1.083	0.007	1.143
ERSN	0.000	0.004	0.000	22.073	0.578	0.000
FHCB	0.153	0.059	0.059	0.198	0.021	0.051
FHMW	0.000	0.000	0.000	23.250	0.000	0.000
FWDM	0.000	0.000	0.000	0.000	0.003	0.010
GDEY	0.158	0.008	0.190	0.000	0.000	0.469
LNDC	0.000	0.018	0.000	0.302	0.000	0.000
LNSK	0.047	0.029	0.083	5.563	0.028	0.122
NFSH	0.000	0.000	0.000	0.000	0.000	0.000
NTPK	0.000	0.011	0.012	0.031	0.000	0.020
PDFH	0.000	0.000	0.003	0.000	0.000	0.000
PDSG	0.027	0.024	0.104	0.000	0.038	0.449
PNSD	0.000	0.000	0.000	0.010	0.000	0.000

	Sturgeon Season		Fish Community Season			Both Seasons
species	1.0” Trammel Net	Otter Trawl	1.0 Trammel Net	Otter Trawl	Mini-Fyke Net	Trotline
RBTT	0.000	0.000	0.000	0.250	0.004	0.000
RVCS	0.095	0.039	0.029	27.583	0.008	0.000
SFCB	0.000	0.008	0.000	0.000	0.000	0.000
SGCB	0.000	0.037	0.000	0.000	0.017	0.000
SGER	0.516	0.195	0.075	0.146	0.032	0.010
SHRH	0.110	0.025	0.061	0.021	0.048	0.163
SMBF	0.091	0.000	0.007	0.219	0.000	0.010
SNGR	0.000	0.000	0.000	0.021	0.000	0.000
SNPD	0.000	0.000	0.003	0.000	0.000	0.000
SNSG	1.017	0.225	1.542	0.000	0.098	4.082
SNSN	0.000	0.000	0.000	2.521	0.000	0.000
STCT	0.000	0.009	0.000	0.031	0.000	0.000
STSN	0.000	0.003	0.000	0.115	0.000	0.000
WLYE	0.044	0.010	0.005	0.177	0.004	0.020
WSMW	0.000	0.004	0.000	0.385	0.000	0.000
WTCP	0.000	0.000	0.000	2.125	0.000	0.000
WTSK	0.033	0.055	0.072	18.844	0.014	0.122

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) and fish community season (FCS) between years from 2006 - 2015.

Bend Number	Bend River Mile	Coordinates		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
		Lattidude	Longitude										
1	1761	48.05581	106.32055	ST, FC					ST, FC, HW	ST, FC	ST	ST, FC	ST, FC
2	1760	48.04356	106.30328									ST, FC	
3	1759	48.04416	106.28819		ST, FC				HW				FC
4	1757.5	48.03696	106.25307						HW				ST, FC
5	1756	48.03379	106.24998					ST, FC	FC			ST	ST, FC
6	1754.5	48.02680	106.19850			ST, FC		ST, FC	FC, HW			ST, FC	ST, FC
7	1753	48.02938	106.16258		ST, FC	ST, FC			ST, FC	FC	ST	ST, FC	ST, FC
8	1751	48.03120	106.13605			ST, FC	ST, FC		ST, FC, HW	ST, FC	ST, FC		
9	1749.5	48.02872	106.12263	ST, FC					ST, FC, HW	ST	FC		
10	1747	48.00566	106.10929					ST, FC	ST, FC, HW	ST, FC	ST, FC		ST
11	1745	48.02677	106.08480				ST, FC	ST, FC	ST, FC				ST, FC
12	1744	48.03534	106.08521	ST, FC	ST, FC	ST, FC	ST, FC		FC				ST, FC
13	1741.5	48.00999	106.04510				ST, FC	ST, FC				ST, FC	
14	1740	48.00255	106.02716		ST, FC							ST, FC	
15	1738	48.03068	106.01973								ST	ST, FC	
16	1736.5	48.03137	106.00100		ST, FC		ST, FC			FC	ST, FC		
17	1735	48.02545	105.98821			ST, FC				ST, FC			
18	1733	48.01287	105.95323	ST, FC						ST		ST	ST
19	1732	48.01149	105.93182	ST, FC	ST, FC					ST, FC	FC	ST, FC	ST, FC
20	1730.5	48.01514	105.89578								ST, FC		
21	1728.5	48.03616	105.89557			ST, FC					ST		
22	1727.5	48.03228	105.88458						FC		ST, FC		

Bend Number	Bend River Mile	Coordinates Lattidude	Longitude	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
23	1726.5	48.01900	105.87228	ST, FC	ST, FC		ST, FC	ST, FC			FC		
24	1725.5	48.00855	105.85176			ST, FC					ST, FC		
25	1723.5	48.01666	105.82971			ST, FC		ST, FC		FC			FC
26	1722	48.02402	105.79479		ST, FC				FC, HW	ST, FC	FC	FC	ST, FC
27	1720	48.04621	105.77785				ST, FC	ST, FC	HW	FC	FC	ST, FC	ST, FC
28	1719	48.04468	105.76749	ST, FC	ST, FC				HW	ST		ST, FC	
29	1717.5	48.02643	105.74791					ST, FC	FC, HW	ST, FC	FC	ST, FC	
30	1716	48.03228	105.71736				ST, FC		FC, HW	FC	ST		
31	1714	48.05327	105.69457				ST, FC	ST, FC	HW	FC	ST, FC		
32	1712	48.05313	105.66531		ST, FC	ST, FC				ST, FC	ST, FC		FC
33	1710.5	48.04739	105.66245	ST, FC		ST, FC				ST, FC	ST, FC	ST	ST, FC
34	1710	48.05159	105.64158	ST, FC			ST, FC			FC		ST, FC	ST, FC
35	1709	48.06960	105.64798	ST, FC					HW	ST, FC	FC		
36	1707.5	48.07648	105.64107			ST, FC				ST, FC	FC		
37	1706.5	48.07407	105.62061	ST, FC	ST, FC		ST, FC	ST, FC	HW	FC	ST, FC		
38	1705.5	48.07725	105.60690					ST, FC		ST, FC	ST, FC	FC	FC
39	1704.5	48.08012	105.58631	ST, FC	ST, FC	ST, FC			ST, FC		ST, FC	ST, FC	ST, FC
40	1703	48.07828	105.56033				ST, FC		ST, FC, HW		ST, FC		