2013 Annual Report

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

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

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May 2014

EXECUTIVE SUMMARY

The 2013 sampling year marked the eighth field season for the Pallid Sturgeon Population Assessment Program (Program) crew in Segment 2 of the Missouri River. After some unique observations made during the 2012 field season, crews were in fervent anticipation to sample Segment 2 in 2013. Although many of the records recorded in 2012, such as pallid sturgeon captures and subsequent CPUE of some gears, were not broken, 2013 represented the second highest total in many of these categories. It was clear that the impacts of 2011 were still benefitting Segment 2, particularly for the pallid sturgeon.

A total of twelve randomly selected bends were sampled once each during sturgeon and fish community seasons throughout Segment 2 in 2013, resulting in deployment of 254 trammel nets totaling 61.7 km and 226 otter trawl tows accounting for 62 km of sampling. In addition, sampling included 1,920 worm-baited hooks attached to trotlines and ninety-six overnight mini-fyke net deployments.

Pallid sturgeon captures (N=101) in Segment 2 in 2013, although down from the record high recorded in 2012 (N=166), still by far represent the second highest total observed since the implementation of the Program in 2006. These captures were comprised from a combination of standard gears; with trotlines capturing the largest percentage of fish (45.5%), followed by trammel nets (30.7%) and otter trawls (23.8%).

In relation to these gears, trammel net catch per unit effort (CPUE) across both seasons was recorded at 0.04 fish/100m, while among seasons, trammel net CPUE reported at 0.045 fish/100m and 0.034 fish/100m for sturgeon season and fish community season, respectively. Catch per unit effort for each of these seasons was the second highest ever recorded. The combined otter trawl CPUE for both seasons in Segment 2 for 2013 was documented at 0.027 fish/100m. Between seasons, otter trawl CPUE was reported at 0.03 fish/100m for sturgeon season, while CPUE for fish community season was registered at 0.025 fish/100m. Trotlines, which continue to be the most effective gear at targeting juvenile pallid sturgeon, exhibited a CPUE across both seasons of 0.48 fish/20 hooks. The overall CPUE was balanced out by a record high recording during sturgeon season (0.77 fish/20 hooks) and a near record low recording during fish community season (0.19 fish/20 hooks). It is important to note that even

with the highest efficiency, trotlines are only set once per bend per sampling year, while trammel nets and trawls are used twice per bend, one each during both seasons.

All but two of the pallid sturgeon captured in Segment 2 in 2013 were of known year class, with a total of ten year classes being represented. Year class in rank of abundance were; 2009 (N=39), 2008 (N=20), 2010 (N-15), 2006 (N=7), 2005 (N=7), 2007 (N=6), 2003 (N=2), 2012 (N=1), 2002 (N=1), and 1997 (N=1). Of the 101 pallid sturgeon captured in segment 2 in 2013, eighty-five were from known stocking locations; all originating in RPMA 2. A break down of the captures reveals that seventeen of these fish were stocked in the Yellowstone River, while the other 85 were stocked in the Missouri River. Of the known stocking locations, the largest sample was Wolf Point (N=45), followed by Culbertson (N=17), Intake (N=9), Sidney (N=4), Forsyth (N=3), School Trust (N=2) and the mouth of the Milk River, Nohly and Fallon all had one representative.

Pallid sturgeon captured in Segment 2 during the 2013 field season averaged 387 mm in fork length and 263 g in weight. Sampling in 2013 also represented the second consecutive year in which a fish from the quality and memorable/trophy category, a 1997 year class pallid sturgeon, was handled by population assessment crews. The relative condition (Kn) for pallid sturgeon sub-stock (200-329 mm) category examined in Segment 2 during the high-water year of 2011 sturgeon exhibited an increase in Kn, however since then relative condition for this size class has shown a slow decline. The same increase was noted in the stock category of pallid sturgeon in Segment 2, however after a slight decline in 2012, their relative condition displayed a minute increase again in 2013. Relative condition comparisons for larger size classes of pallid sturgeon in Segment 2 remains difficult since Kn is based on very few observations for these larger fish.

Shovelnose sturgeon continue to be one of the most frequently sampled species across all of Segment 2 of the Missouri River, with sampling in 2013 resulting in the capture of 1,054 individuals. Shovelnose sturgeon within Segment 2 in 2013 averaged 590 mm in fork length and 884 g in weight. Since the commencement of this project in 2006, the population of shovelnose sturgeon in Segment 2 has been dominated by individuals greater than 400 mm in FL, with only two percent measuring smaller than 400 mm in 2013. All standard gears, except mini-fyke nets, remain effective at catching shovelnose sturgeon. Among catch rates for these gears; the combined trammel net CPUE for shovelnose sturgeon in Segment 2 for the 2013 sampling year

was recorded at 1.02 fish/100m, which is very comparable to previous years. The CPUE among seasons was recorded as 0.75 fish/100m and 1.28 fish/100m for the sturgeon and fish communities, respectively. Catch per unit effort for combined and individual seasons (sans 2011) continues to exhibit very small changes and remains relatively constant. 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.

A total of thirty-four sturgeon chubs were sampled in Segment 2 in 2013, which was the second lowest total ever recorded. Like previous years, more sturgeon chubs were captured during sturgeon season (N=19) than during fish community season (N=15). The decreased catch caused record low CPUE to be reached in both the combined-season (0.05 fish/100m) and sturgeon season (0.04 fish/100m), while CPUE for fish community season (0.05 fish/100m) was comparable with previous years. The combined season catch rates continue to exhibit an overall downward trend since record highs were observed in 2007. The average total length for sturgeon chubs captured in Segment 2 in 2013 was 84 mm, and ranged from 72 to 103 mm. The population size structure of sturgeon chubs in Segment 2 continues to be dominated by older, adult fish.

A total of eight sicklefin chubs were captured in Segment 2 in 2013, two of which were caught during sturgeon season, while the other six were sampled during fish community season. Record high otter trawl was observed during both seasons (0.019 fish/100m), as well as fish community season (0.032 fish/100m). In comparison, otter trawl CPUE during sturgeon season was calculated at 0.007 fish/100m. Although catch rates could relate to trends, they remain highly variable due to small sample size. Sicklefin chubs sampled in Segment 2 averaged 106 mm in total length, with all fish ranging between 95 and 120 mm. Given the size structure of the sickelfin chubs that are handled from year to year, the population continues to consist solely of adult fish.

After a dismal catch rate of sand shiners in Segment 2 in 2012 (N=9), captures in 2013 rebounded to a total of 292, all of which were caught in mini-fyke nets. In response, CPUE of sand shiners rose sharply to 3.0 fish/net night in 2013. Of the 292 sand shiners sampled in Segment 2 in 2013, one hundred sixty seven of them had an associated length. The average TL for in 2013 was 33 mm, which was slightly lower than that of 2012 (46 mm). This lower average

TL may be represented by age-0 (<30 mm) fish, which were not represented during the 2012 sampling.

Like sand shiners, captures of *Hybognatus* spp. were up dramatically in Segment 2 for the 2013 field season. A total of 254, with all but two of them sampled in mini-fyke nets, were captured this year. In turn, mini-fyke net CPUE for these species went from 0.04 fish/net night in 2012 to 2.62 fish/net night in 2013, which consequentially marked the second highest recorded CPUE since the Programs inception. Another striking change, when compared to 2012, was the average TL of *Hybognathus* spp. during 2013. Total length average decreased from 94 mm in 2012 to 45 mm in 2013, indicating the presence of age-0 fish, which were not present during 2012 sampling.

A total of nine blue suckers were captured in Segment 2 in 2013. Like previous years, blue sucker captures were more probable during the sturgeon season and using trammel nets as the sampling gear. In fact, in 2013, all but one blue sucker was observed during sturgeon season and all nine were caught using trammel nets. As a result, combined-season CPUE for trammel nets was reported at 0.015 fish/100m. In relation to seasonal catch differences, CPUE remained higher during sturgeon season (0.026 fish/100m) than during fish community season (0.003 fish/100m). The pattern of elevated CPUE during sturgeon season seems to indicate spring spawning movements upstream by adult populations of blue suckers in Segment 2. The average TL for blue suckers handled in Segment 2 during the 2013 field season was 677 mm, which is essentially the same as previous years, indicating the sampled population of blue suckers was once again comprised of adult fish.

Sampling during the 2013 field season in Segment 2 resulted in the capture of 117 sauger; with majority being witnessed during sturgeon season (63%) compared to fish community season (37%). Although combined-season trammel net CPUE fell in 2013 (0.07 fish/100m), compared to 2012 (0.10 fish/100m), no discernible pattern exists regarding CPUE in Segment 2. However, catch per unit effort is consistently much higher during sturgeon season. Case in point, sturgeon season witnessed a CPUE of 0.28 fish/100m while the reported CPUE during fish community season was 0.05 fish/100m. Otter trawl CPUE, like trammel nets, remains comparable across all years. A combined-season CPUE of 0.024 fish/100m was calculated for 2013, while CPUE for each season was 0.017 and 0.032 fish/100m for the sturgeon and fish community seasons, respectively. Although differences are detectable, they remain relatively

small with no real pattern emerging when looking for relative abundance trends. Sauger captures in mini-fyke nets remain a fairly common occurrence in Segment 2. In 2013 there was a new all-time high CPUE calculated for sauger with this gear. A CPUE of 0.17 fish/net night was recorded, eclipsing the previous record of 0.14 fish/net night calculated in 2007. The average TL for sauger within Segment 2 in 2013 was 350 mm, with a range of 54 mm to 531 mm, the former being the smallest sauger ever captured in this segment.

Although total pallid sturgeon captures during 2013 in Segment 2 were down from those witnessed in 2012, the impacts of the high-water year of 2011 and benefits of the Milk River appear to still be valuable to the pallid sturgeon residing in this stretch of the river. With the continual presence of older age classes of pallid sturgeon in Segment 2, and in combination with an already abundant population of adult shovelnose, density dependence issues may arise. Data obtained through this project support the fact that alterations in flow management from the Fort Peck Dam Project can increase the available habitat for pallid sturgeon and other native fishes, in the highly altered stretch of the Missouri River that makes up Segment 2.

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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

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

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

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

The Milk River is the largest tributary in this segment and its flows can influence water temperature and discharge of the Missouri River (Kapuscinski, 2002). Throughout the spring, the Milk River forms a plume of warm turbid water that mixes with the cold clear waters of the Missouri. When the Milk River is flowing, it results in a warm turbid river on the north side of

the channel and a cold clear river on the south side (Gardner and Stewart, 1987). The warm and cold waters do not generally mix until after moving 15 river miles downstream near Frazer Rapids, where the water remains relatively cold and clear (Kapuscinski, 2002). Water withdrawals for irrigation have reduced the Milk Rivers influence on the Missouri River during low water years.

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

Methods

Sampling methods for the Pallid Sturgeon Population Assessment Program were conducted in accordance with the Standard Operating Procedures (Welker and Drobish 2011), which was established by representatives from State and Federal agencies involved with pallid sturgeon recovery on the Missouri River. For a detailed description of methodologies please see Welker and Drobish (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 5 through June 28) and the Fish Community Season (July 12 through October 12) during 2010.

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

a standard gear for the fish community season and all 12 randomly selected bends were sampled with mini-fyke nets.

Trotlines were switched from an experimental gear, 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.

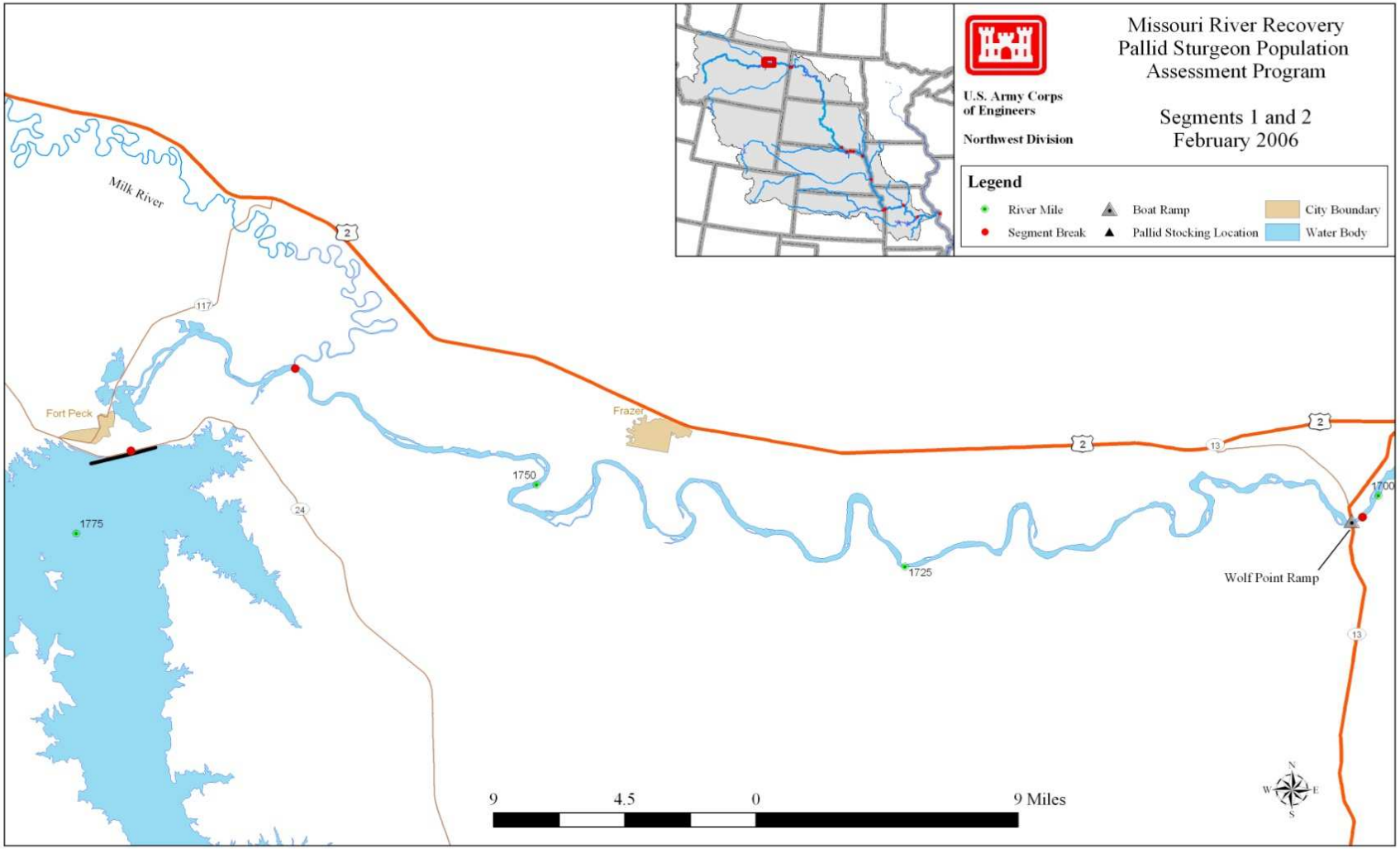

Figure 1. Map of Segment 2 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 2 encompasses the Missouri River from the mouth of the Milk River (River Mile 1761.5) to Wolf Point, MT (River Mile 1701.5).

Results

Effort

A total of twelve randomly selected bends were sampled once each during sturgeon and fish community seasons throughout Segment 2 in 2013 (Table 1). Additionally, 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. Trotline bends are unique in that they are selected by sampling the next immediate upstream bend from the randomly selected bend. Mean deployments was equal for all gears across all seasons (8), which is the minimum number of subsamples that must be performed per bend.

Trammel net drifts (N=254) resulted in 61.7 km of sampling in Segment 2 in 2013, of which 45.3 km was attributed to randomly selected deployments, while the other 16.4 km of sampling was the result of non-random or duplicate sampling. Included in the non-random sampling was a small effort made in the lower end of Segment 2 which targeted some of the known "hot spots" for juvenile pallid sturgeon. Those efforts included the deployment of 27 trammel net drifts on August 29, 2013.

In comparison, the otter trawl was deployed 226 times with a total distance sampled of 62 km. While 52.4 km of sampling was contributed by random deployments, the remaining 9.6 km was conducted during non-random or duplicate sampling.

Using our standard of eight trotlines per bend, while sampling all twelve bends, a total of 96 overnight trotline sets were performed in Segment 2 during the 2013 field season. With each trotline consisting of 20 hooks, a total of 1920 worm-baited hooks were set across Segment 2 in this year.

Like trotlines, mini-fyke nets are also set overnight. With all mini-fyke net sampling taking place during fish community season, each bend was set with eight nets giving us a total of 96 mini-fyke net deployments within Segment 2 during the 2013 sampling year.

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 2013.

Gear	Number of Bends	Mean Effort	Macrohabitat[a]					
			CHXO	ISB	OSB	SCCL	SCCS	SCN
Sturgeon Season								
1.0” Trammel Net	12	8	42	29	25	0	0	0
Otter Trawl	12	8	37	32	26	1	0	0
Fish Community Season								
1.0” Trammel Net	12	8	41	27	28	0	0	0
Mini-Fyke Net	12	8	37	39	9	0	8	3
Otter Trawl	12	8	35	34	27	0	0	0
Both Seasons								
Trot Line	12	8	40	42	8	6	0	0

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

Pallid Sturgeon

Pallid sturgeon captures (N=101) in Segment 2 in 2013, although down from the record high recorded in 2012 (N=166), still by far represent the second highest total observed since the implementation of the Program in 2006 (Figure 9). In comparison, previous to 2012, the highest record for hatchery-reared pallid sturgeon captures was 43 in 2010. Among seasons, 68 pallid sturgeon were observed during sturgeon season, while the remaining 33 were captured during fish community season. As was observed in 2012, more pallid sturgeon were sampled during sturgeon season than fish community season, which marked the second year in a row for this previously unseen event. To date no wild pallid sturgeon have been captured by population assessment crews in Segment 2.

Trotlines again exhibited their efficiency at capturing hatchery-reared juvenile pallid sturgeon amid the 2013 sampling season in Segment 2. Trotlines captured the largest percentage of fish (45.5%), followed by trammel net (30.7%) and otter trawl (23.8%). It is important to note that even with the highest efficiency, trotlines are only set once per bend per sampling year, while trammel nets and trawls are used twice, one each during both seasons.

Trammel net catch per unit effort (CPUE) across both seasons was recorded at 0.04 fish/100m (Figure 5), which was only slightly lower the record CPUE registered in 2012 of 0.046 fish/100m. Among seasons, trammel net CPUE was reported at 0.045 fish/100m and 0.034 fish/100m for sturgeon season and fish community season, respectively. Catch per unit effort for each of these seasons was the second highest ever recorded; with sturgeon season falling below the numbers seen in 2012 (0.062 fish/100m) and fish community season CPUE being bested in 2011 (0.045 fish/100m). However, it is noteworthy that CPUE among seasons remains sporadic, particularly during sturgeon season.

The combined otter trawl CPUE for both seasons in Segment 2 for 2013 was documented at 0.027 fish/100m (Figure 6). Although this was the second highest combined-season CPUE recorded since the Programs implementation in 2006, CPUE has remained comparable with the record high of 0.038 fish/100m and low of 0.011 fish/100m in 2010 and 2008, respectively. Between seasons, otter trawl CPUE was reported at 0.03 fish/100m for sturgeon season, while CPUE for fish community season was registered at 0.025 fish/100m. Although differences are detectable in catch rates, it is important to note that comparisons are based on very small

increases or decreases in CPUE. Furthermore, catch rates seem to be particularly erratic during fish community season.

The Segment 2 trotline CPUE for both seasons in 2013 was reported to be 0.48 fish/20 hooks (Figure 7), which was down slightly from the record high observed in 2012 (0.57 fish/20 hooks). However, the CPUE observed in 2013 was more triple that of 2010 (0.12 fish/20 hooks) and nearly three times higher than 2011 (0.19 fish/20 hooks). The overall CPUE was balanced out by a record high recording during sturgeon season (0.77 fish/20 hooks) and a near record low recording during fish community season (0.19 fish/20 hooks).

Pallid sturgeon captured in Segment 2 during the 2013 field season averaged 387 mm in fork length and 263 g in weight. Average length was down from 2012 (391 mm), however average weight was up from 226 g. Sampling in 2013 also represented the second consecutive year in which a fish from the quality and memorable/trophy classes was handled by population assessment crews (Figure 3). In relation to gear, trammel net captures averaged 418 mm TL, followed by trotlines (384 mm TL) and otter trawls (351 mm TL).

The relative condition (Kn) for pallid sturgeon examined in Segment 2 is shown in Figure 4. During the high-water year of 2011, sub-stock (200-329 mm) pallid sturgeon exhibited an increase in Kn, however since then relative condition for this size class has shown a slow decline. The same increase was noted in the stock category of pallid sturgeon in Segment 2, however after a slight decline in 2012, their relative condition displayed a minute increase again in 2013. Relative condition comparisons for larger size classes of pallid sturgeon in Segment 2 remain difficult since Kn is based on very few observations of larger individuals.

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.

All but two of the pallid sturgeon captured in Segment 2 in 2013 were of known year class (Table 3), with a total of ten year classes being represented. Year class in rank of abundance were; 2009 (N=39), 2008 (N=20), 2010 (N-15), 2006 (N=7), 2005 (N=7), 2007 (N=6), 2003 (N=2), 2012 (N=1), 2002 (N=1), and 1997 (N=1). For the second consecutive year a

1997 year class pallid sturgeon was observed in Segment 2, which was the first year-class of hatchery-reared juvenile pallid sturgeon stocking in RPMA 2.

Of the 101 pallid sturgeon captured in segment 2 in 2013, eighty-five were from known stocking locations; all originating in RPMA 2. A breakdown of the captures reveals that seventeen of these fish were stocked in the Yellowstone River, while the other 85 were stocked in the Missouri River. Of the known stocking locations, the largest sample was from Wolf Point (N=45), followed by Culbertson (N=17), Intake (N=9), Sidney (N=4), Forsyth (N=3), School Trust (N=2) and mouth of the Milk River, Nohly and Fallon all had one representative. The largest net movement was once again recorded from fish that were stocked at Forsyth, MT (RM 253.2) on the Yellowstone River. Two pallid sturgeon, both stocked at Forsyth in 2008, were captured on the same day (9/17/2013) at RM 1730.5 of the Missouri River. The smallest net movement from a pallid sturgeon captured in Segment 2 in 2013 was a fish stocked on 4/18/2013 at Wolf Point (RM 1701.5) and was captured on 7/11/2013 at RM 1703.

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.

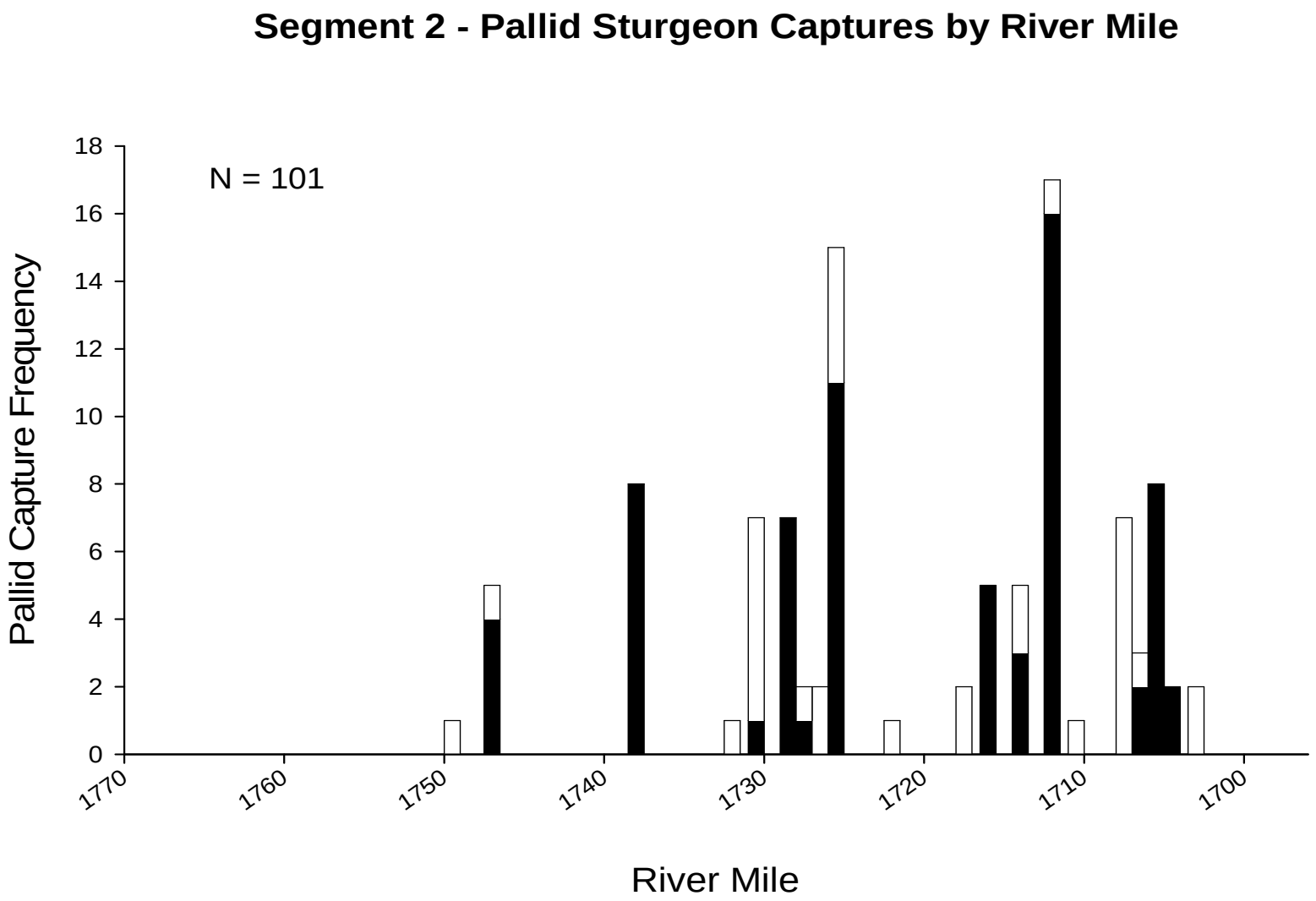

Figure 2. Distribution of pallid sturgeon captures by river mile for Segment 2 of the Missouri River during 2013. Black bars represent pallid sturgeon captures during sturgeon season and white bars represent pallid sturgeon captures during fish community season. Figure includes all pallid captures including 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 2013. 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 (ntu)		Total Pallids Caught
Macro-	Meso-	Effort	Catch	Effort	Catch	Effort	Catch	Effort	Catch	
CHXO	BARS	0.5 (0.2-1.8)		0.04 (0.00-0.30)		15.4 (11.9-17.7)		28 (16-46)		.
	CHNB	1.9 (0.7-4.1)	1.8 (1.0-3.5)	0.70 (0.00-0.90)	0.56 (0.00-0.86)	13.6 (5.0-19.2)	13.4 (8.6-18.4)	90 (9-2000)	57 (11-149)	34
CONF	BARS									.
	CHNB	1.0 (1.0-1.0)				4.9 (4.9-4.9)				.
ISB	BARS	0.4 (0.1-0.6)		0.07 (0.00-0.23)		15.1 (12.7-19.2)		30 (16-65)		.
	CHNB	1.7 (1.0-4.6)	1.7 (1.0-2.7)	0.60 (0.20-0.94)	0.53 (0.31-0.92)	13.9 (4.1-18.5)	13.7 (5.1-18.3)	204 (7-2000)	241 (9-980)	51
OSB	BARS	0.4 (0.3-0.4)		0.06 (0.00-0.14)		15.8 (15.0-17.0)		47 (38-55)		.
	CHNB	2.2 (0.9-4.5)	2.1 (1.0-3.0)	0.67 (0.36-1.01)	0.50 (0.36-0.68)	13.9 (4.3-18.7)	13.8 (5.0-18.6)	135 (9-2000)	204 (18-980)	14
SCCL	BARS									.
	CHNB	1.2 (1.0-1.5)	1.2 (1.1-1.3)	0.63 (0.53-0.72)	0.63 (0.53-0.72)	12.0 (9.0-17.8)	12.0 (12.0-12.0)	14 (14-14)	14 (14-14)	2
SCCS	BARS	0.5 (0.4-0.6)		0.00 (0.00-0.00)		14.7 (12.6-16.7)		24 (16-30)		.
	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 2013 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)
1997	1	.	.	.	1150	8000.0	1.201	.	.
.	.	.	.	.	.	.	.	.	.
2002	1	325	.	.	778	1620.0	0.881	0.122	.
.	.	.	.	.	.	.	.	.	.
2003	2	.	.	.	432	268.0	1.017	.	.
.	.	.	.	.	51	64.0	0.152	.	.
2005	7	233	45.0	1.298	445	284.0	0.965	0.071	0.073
.	.	.	.	.	26	48.9	0.065	.	.
2006	7	243	52.0	1.306	418	211.4	0.882	0.094	0.106
.	.	.	.	.	16	35.1	0.094	.	.
2007	6	.	.	.	417	229.5	0.978	.	.
.	.	.	.	.	30	35.1	0.114	.	.
2008	20	238	47.8	1.210	388	187.8	1.005	0.103	0.100
.	.	35	27.0	0.426	9	11.7	0.038	0.026	0.024
2009	39	266	72.7	1.160	348	134.3	1.019	0.112	0.093
.	.	68	59.0	0.137	9	10.7	0.031	0.018	0.025
2010	15	265	86.3	2.400	346	131.4	0.988	0.129	0.085
.	.	59	47.8	2.659	27	30.0	0.053	0.053	0.024
2012	1	336	125.0	1.080	354	124.0	0.902	0.214	-.012
.	.	.	.	.	.	.	.	.	.

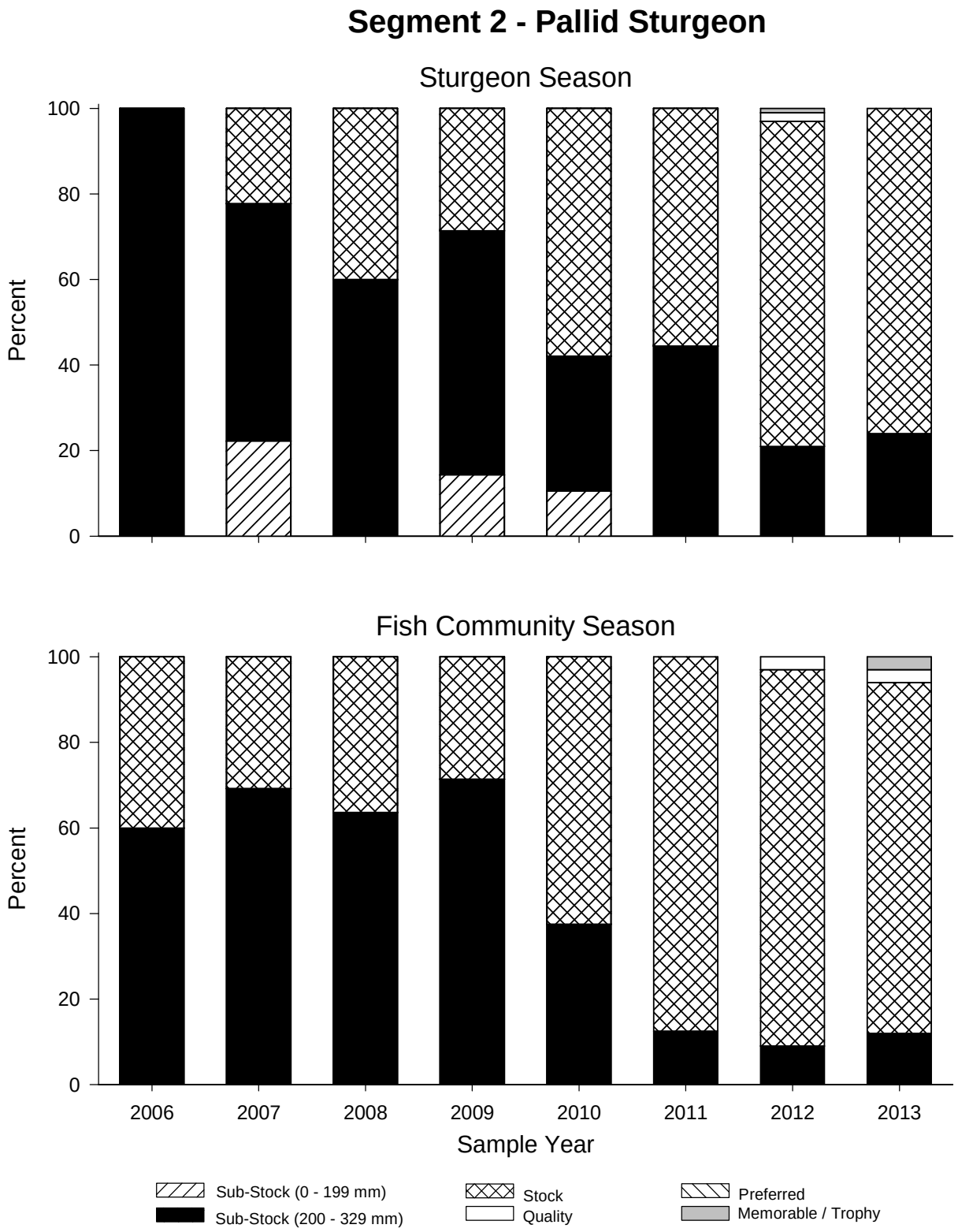

Figure 3. Incremental relative stock density (RSD) for all pallid sturgeon captured with all gear by length category from 2006-2013 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Shuman et al. (2006).

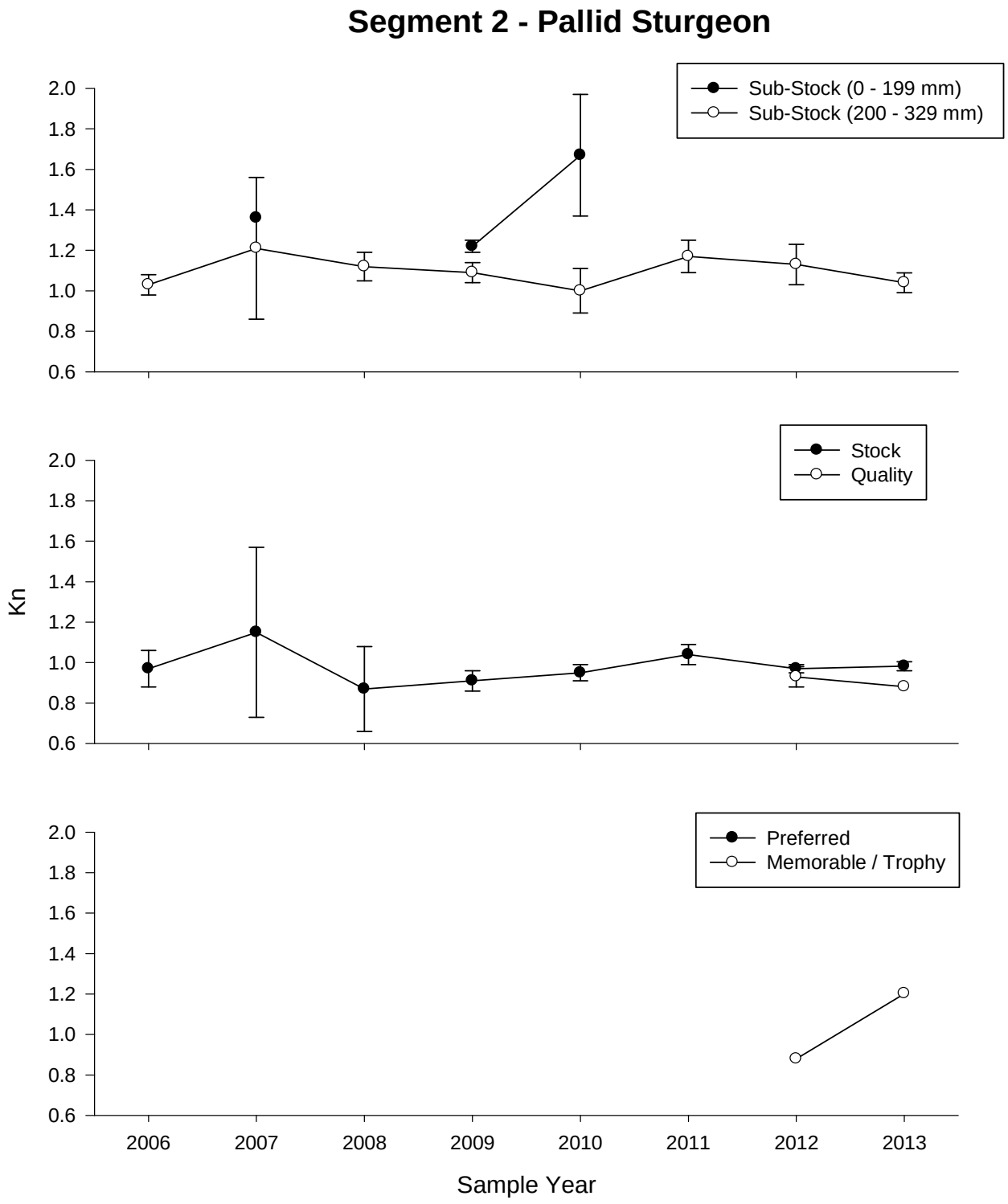

Figure 4. Relative condition factor (Kn) for all pallid sturgeon captured with all gear by incremental relative stock density (RSD) length category from 2006-2013 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Shuman et al. (2006). Relative condition factor was calculated using the equation in Shuman et al. (2011).

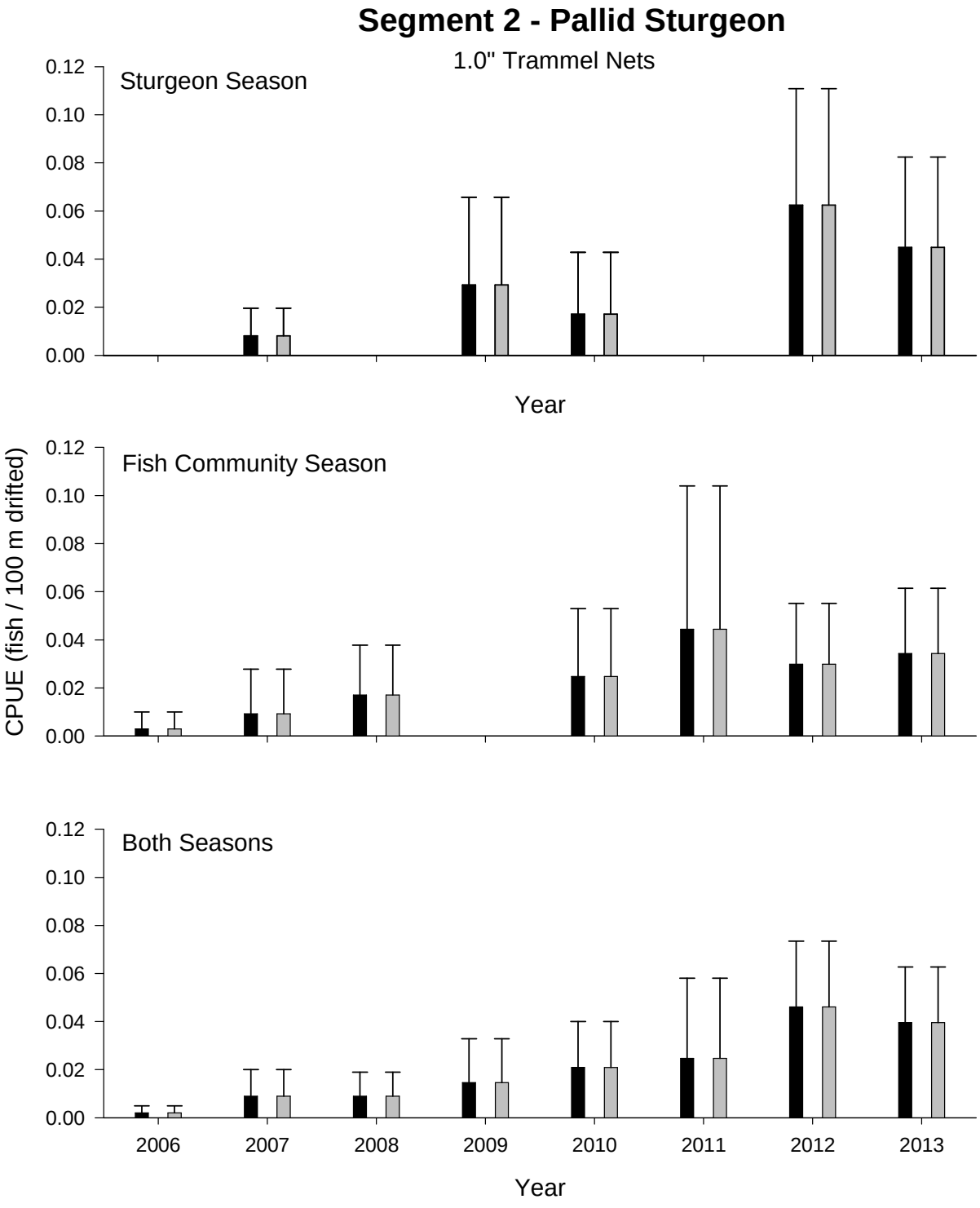

Figure 5. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using 1.0" trammel nets in Segment 2 of the Missouri River from 2006-2013. Pallid sturgeon of unknown origin are awaiting genetic verification.

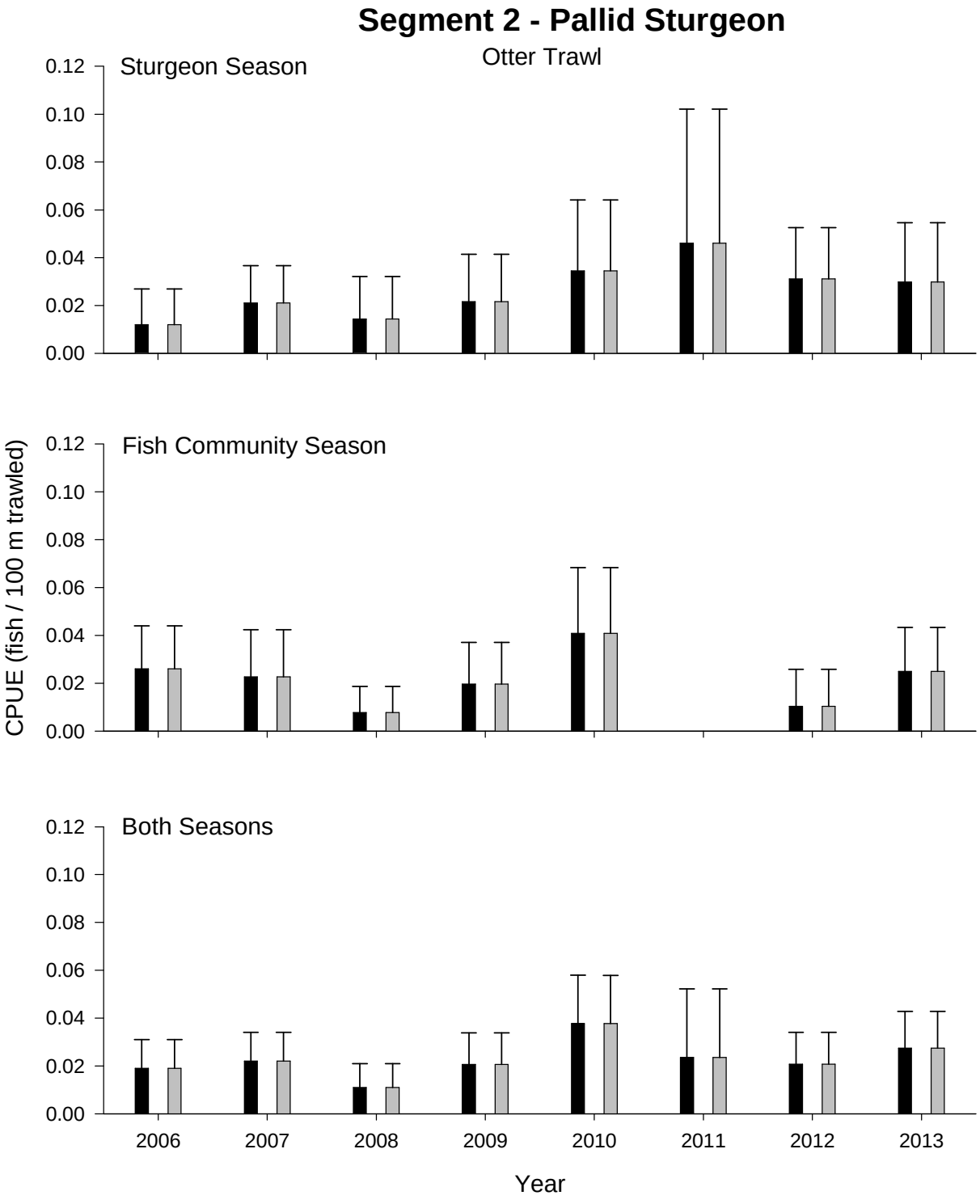

Figure 6. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using otter trawls in Segment 2 of the Missouri River from 2006-2013. Pallid sturgeon of unknown origin are awaiting genetic verification.

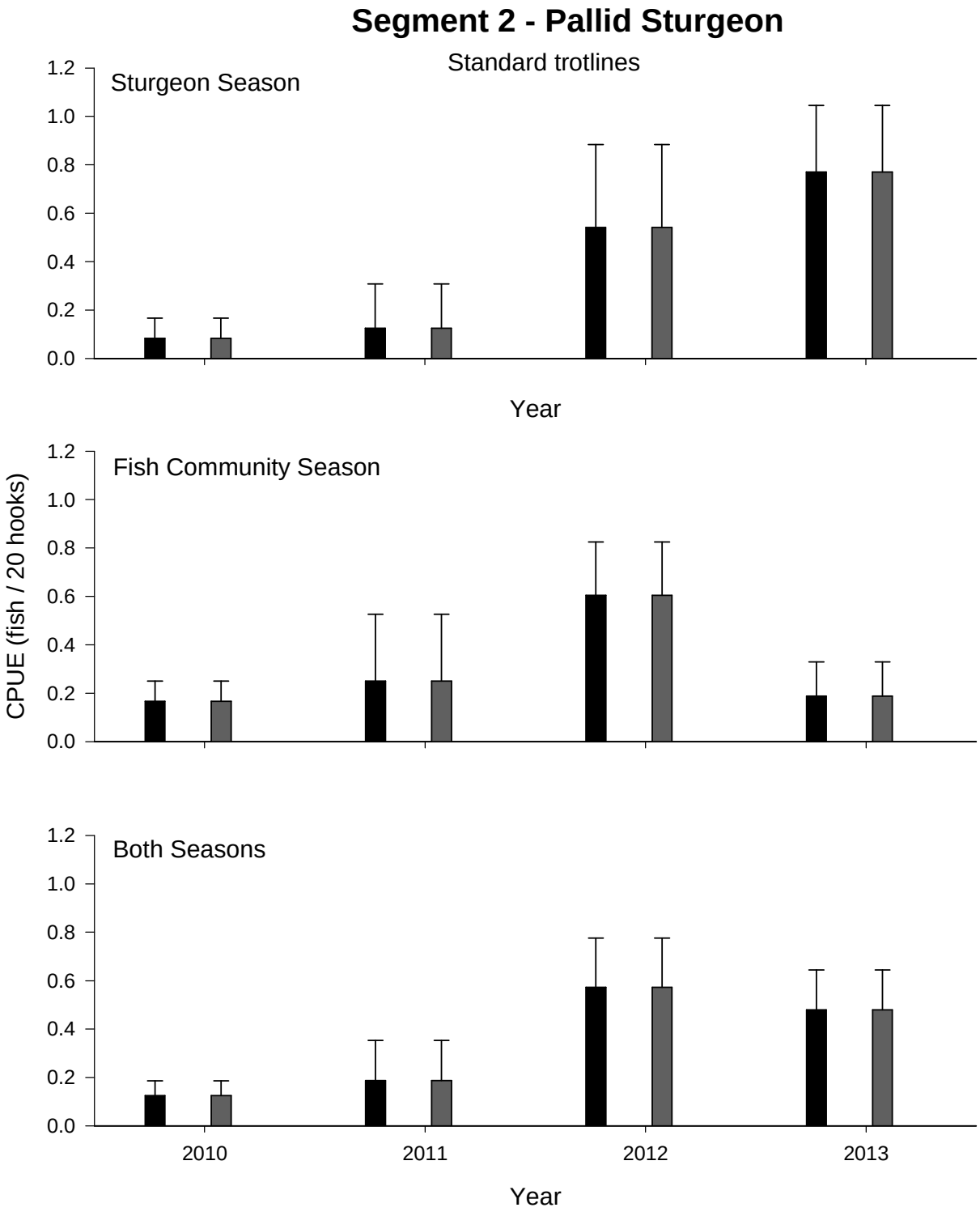

Figure 7. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using trot lines in Segment 2 of the Missouri River from 2010-2013. Pallid sturgeon of unknown origin are awaiting genetic verification.

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 2013. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

		Macrohabitat[a]					
Gear	**N**	**CHXO**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**
				Sturgeon Season			
1.0” Trammel Net	0	0	0	0	0	0	0
		46	30	24	0	0	0
Otter Trawl	0	0	0	0	0	0	0
		41	34	24	1	0	0
				Fish Community Season			
1.0” Trammel Net	0	0	0	0	0	0	0
		45	26	29	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
		39	41	9	0	8	3
Otter Trawl	0	0	0	0	0	0	0
		38	36	26	0	0	0
				Both Seasons			
Trot Line	0	0	0	0	0	0	0
		42	44	8	6	0	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 2013. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

		Macrohabitat[a]					
Gear	**N**	**CHXO**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**
				Sturgeon Season			
1.0” Trammel Net	3	33	33	33	0	0	0
		46	30	24	0	0	0
Otter Trawl	4	50	25	25	0	0	0
		41	34	24	1	0	0
				Fish Community Season			
1.0” Trammel Net	1	0	100	0	0	0	0
		45	26	29	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
		39	41	9	0	8	3
Otter Trawl	2	50	50	0	0	0	0
		38	36	26	0	0	0
				Both Seasons			
Trot Line	6	33	50	17	0	0	0
		42	44	8	6	0	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 2013. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

		Macrohabitat[a]					
Gear	**N**	**CHXO**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**
				Sturgeon Season			
1.0” Trammel Net	6	83	17	0	0	0	0
		46	30	24	0	0	0
Otter Trawl	4	25	75	0	0	0	0
		41	34	24	1	0	0
				Fish Community Season			
1.0” Trammel Net	6	33	0	67	0	0	0
		45	26	29	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
		39	41	9	0	8	3
Otter Trawl	5	20	40	40	0	0	0
		38	36	26	0	0	0
				Both Seasons			
Trot Line	40	30	60	5	5	0	0
		42	44	8	6	0	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 2013. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

		Macrohabitat[a]					
Gear	**N**	**CHXO**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**
				Sturgeon Season			
1.0” Trammel Net	0	0	0	0	0	0	0
		46	30	24	0	0	0
Otter Trawl	0	0	0	0	0	0	0
		41	34	24	1	0	0
				Fish Community Season			
1.0” Trammel Net	2	0	50	50	0	0	0
		45	26	29	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
		39	41	9	0	8	3
Otter Trawl	0	0	0	0	0	0	0
		38	36	26	0	0	0
				Both Seasons			
Trot Line	0	0	0	0	0	0	0
		42	44	8	6	0	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 2013. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

		Macrohabitat[a]					
Gear	**N**	**CHXO**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**
				Sturgeon Season			
1.0” Trammel Net	9	67	22	11	0	0	0
		46	30	24	0	0	0
Otter Trawl	8	38	50	13	0	0	0
		41	34	24	1	0	0
				Fish Community Season			
1.0” Trammel Net	9	22	22	56	0	0	0
		45	26	29	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
		39	41	9	0	8	3
Otter Trawl	7	29	43	29	0	0	0
		38	36	26	0	0	0
				Both Seasons			
Trot Line	46	30	59	7	4	0	0
		42	44	8	6	0	0

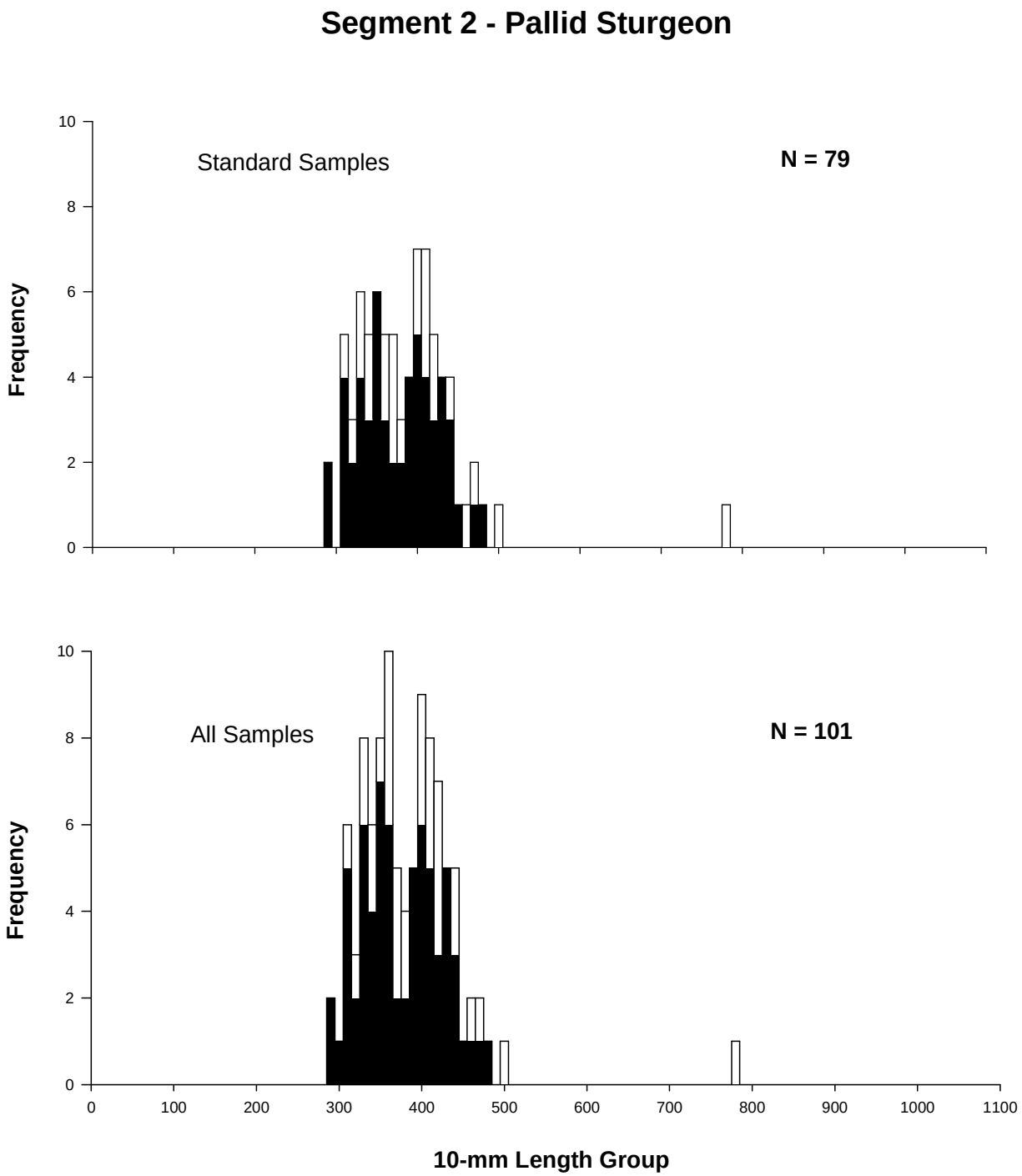

Figure 8. Length frequency of pallid sturgeon captured in Segment 2 of the Missouri River during 2013. Black bars represent captures during sturgeon season, while white bars represent captures during fish community season. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2013. Pallid sturgeon of unknown origin are awaiting genetic verification.

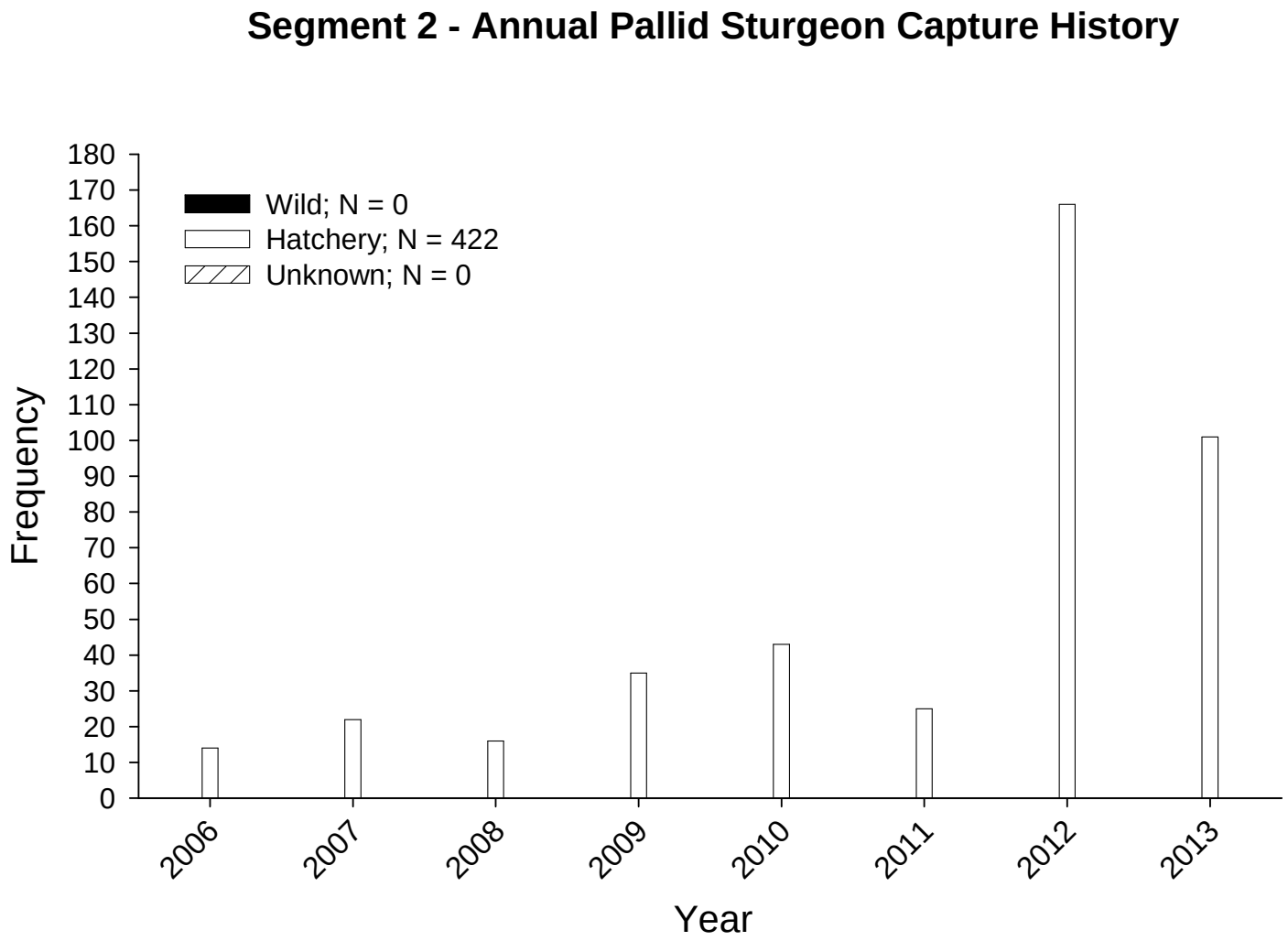

Figure 9. Annual capture history of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon collected in Segment 2 of the Missouri River from 2006-2013. Figure is designed to compare overall pallid sturgeon captures from year to year and is biased by variable effort among years. Figure includes all pallid captures including non-random and wild samples.

Shovelnose X Pallid Sturgeon Hybrids

No shovelnose sturgeon x pallid sturgeon hybrids have been collected in segment 2 from 2006-2013.

Targeted Native River Species

Shovelnose Sturgeon

Shovelnose sturgeon continue to be one of the most frequently sampled species across all of Segment 2 of the Missouri River. Sampling in 2013 resulted in the capture of 1,054 shovelnose sturgeon, which was down from record high observed in 2012 (N=1,264). Shovelnose sturgeon captures remain common across both seasons and among gears. Breaking down captures by season; 41% of shovelnose observations occurred during sturgeon season, while the other 59% transpired during fish community season. The most effective gear at sampling shovelnose sturgeon in Segment 2 in 2013 was the trammel net, capturing 60% of the fish, followed by trotlines (31%) and otter trawl (9%). It is important to note that although trammel net captures nearly doubled that of trotlines, trammel nets are used in each bend twice per sampling year, as opposed to trotlines which are only set once per bend per sampling year.

The combined trammel net CPUE (Figure 10) of quality and larger shovelnose sturgeon in Segment 2 for the 2013 sampling year was recorded at 1.02 fish/100m, which aside from the high-water year of 2011, is very comparable to previous years. The CPUE among seasons was recorded as 0.75 fish/100m and 1.28 fish/100m for the sturgeon and fish communities, respectively. As with the combined seasons, CPUE among seasons (sans 2011) exhibits very small changes and remains relatively constant. 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).

Otter trawl CPUE (Figure 11) for quality and larger reached an all time low in 2013 for both sturgeon season (0.12 fish/100m) and fish community season (0.18 fish/100m), in turn causing the combined-season CPUE (0.15 fish/100m) to fall to a record low. Like trammel nets, otter trawl CPUE for stock and sub-stock remains very low in Segment 2. Knowing that the shovelnose sturgeon population is robust in Segment 2, it is obvious that the otter trawl is not a very effective gear at sampling adult shovelnose sturgeon in this segment.

Trotlines, again in 2013, were an effective gear to sample quality or larger shovelnose sturgeon in Segment 2. Trotline CPUE across both seasons was reported at 3.38 fish/20 hooks (Figure 12.) Breaking it down per season, sturgeon season expressed a CPUE of 3.81 fish/20

hooks, while fish community season reported a CPUE of 2.94 fish/20 hooks. Catch per unit effort remains comparable both among seasons and among years. Like the other two standard gears, CPUE for stock and sub-stock categories is minimal due to the age and size of shovelnose sturgeon in this segment.

Shovelnose sturgeon within Segment 2 in 2013 average 590 mm in fork length and 884 g in weight. Since the commencement of this project in 2006, the population of shovelnose sturgeon in Segment 2 has been dominated by individuals over 400 mm (Figure 13). To exemplify this point, less than 2% of shovelnose sampled in Segment 2 in 2013 were under 400 mm. In contrast, smaller shovelnose sturgeon are much more regularly caught downstream in Segment 3.

The relative weights (Wr) for shovelnose sturgeon in Segment 2 are displayed in Figure 15. The stock size category of shovelnose sturgeon exhibited an all time high Wr in 2011, which was followed by a substantial drop in 2012. However, the Wr in 2013 rose again, nearing those levels witnessed in 2010 and 2011. The Wr for the quality size category also increased during the high-water year of 2011, but unlike the stock size category, the quality group has exhibited a much more stable Wr since then. Both the preferred and memorable/trophy size categories have been experiencing similar patterns as the quality size class, with Wr increasing in 2011 and remained relatively stable since. The only clear pattern emerging pertaining to shovelnose sturgeon in Segment 2 is that, on average, as shovelnose sturgeon recruit to larger size classes their relative weight decreases.

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

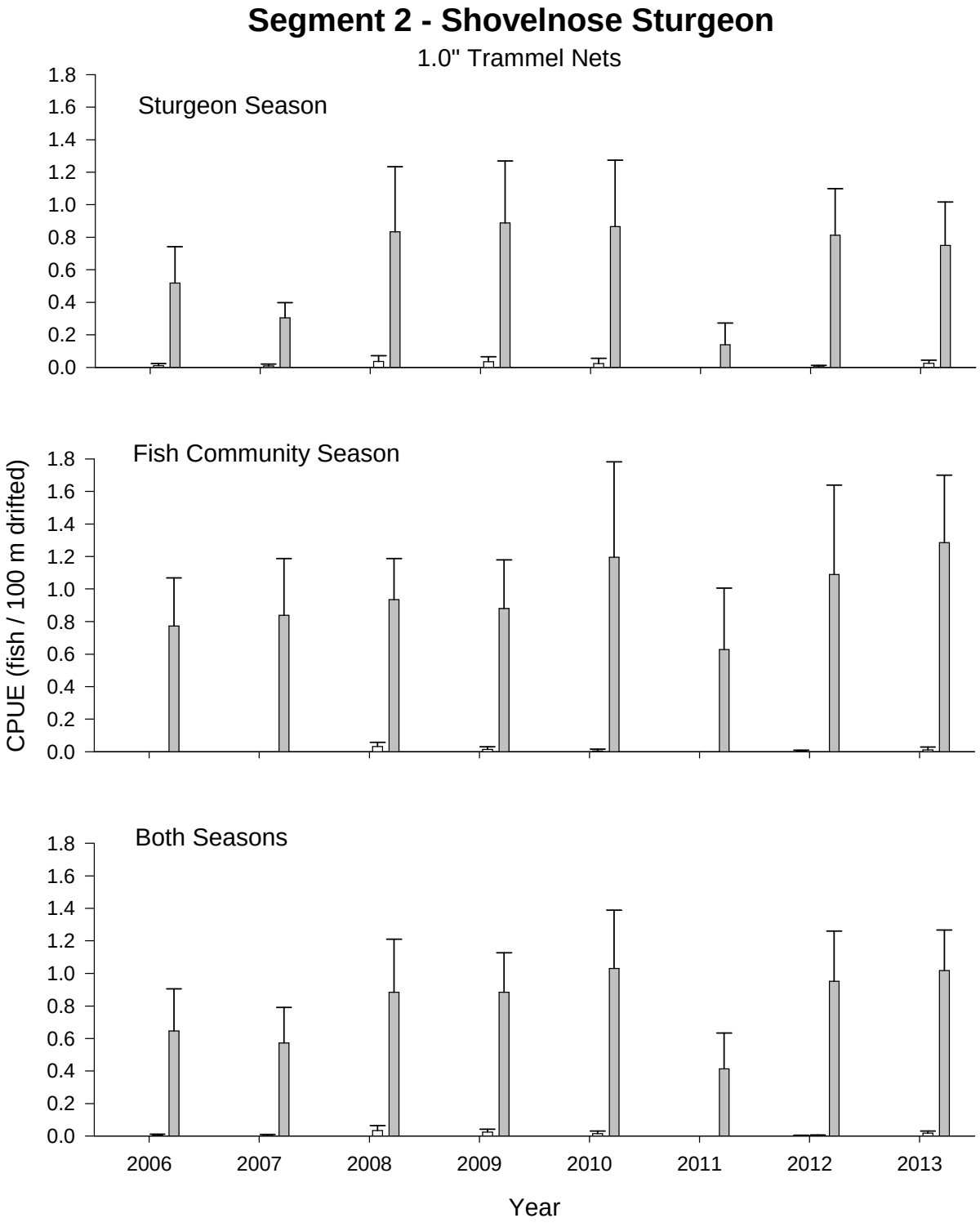

Figure 10. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using 1.0" trammel nets in Segment 2 of the Missouri River from 2006-2013.

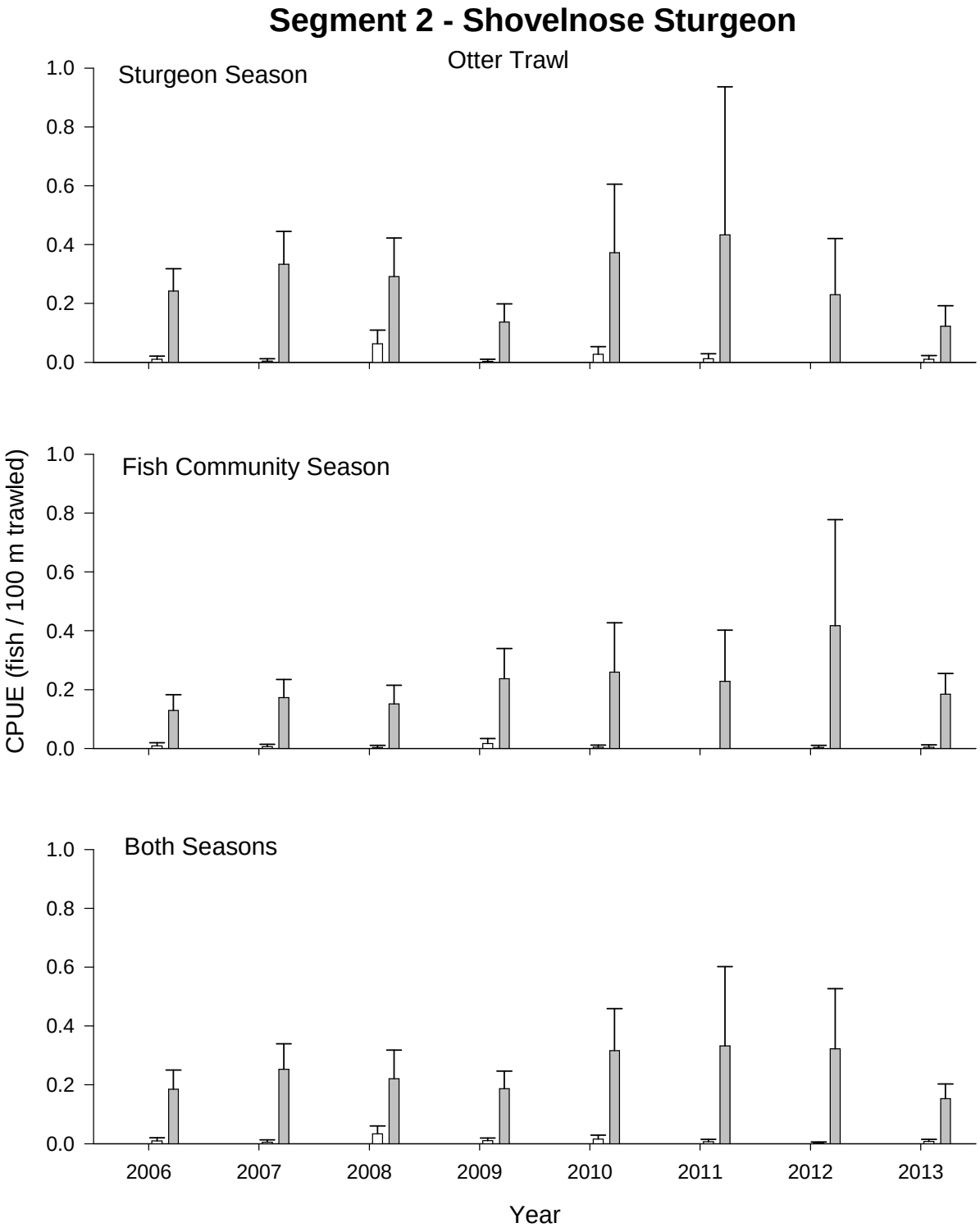

Figure 11. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using otter trawls in Segment 2 of the Missouri River from 2006-2013.

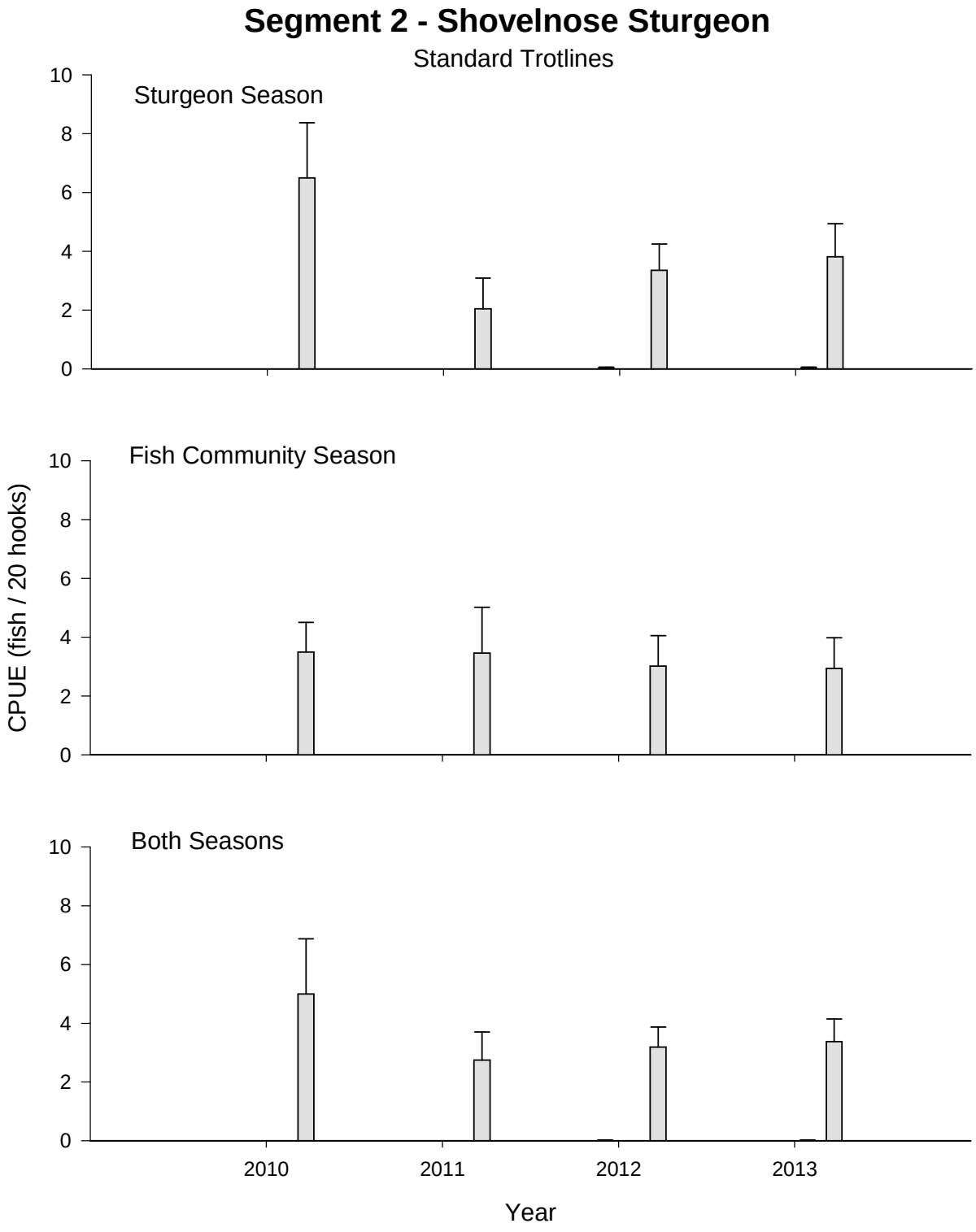

Figure 12. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using trot lines in Segment 2 of the Missouri River from 2010-2013.

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 2013. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

		Macrohabitat[a]					
Gear	**N**	**CHXO**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**
				Sturgeon Season			
1.0” Trammel Net	0	0	0	0	0	0	0
		46	30	24	0	0	0
Otter Trawl	0	0	0	0	0	0	0
		41	34	24	1	0	0
				Fish Community Season			
1.0” Trammel Net	0	0	0	0	0	0	0
		45	26	29	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
		39	41	9	0	8	3
Otter Trawl	0	0	0	0	0	0	0
		38	36	26	0	0	0
				Both Seasons			
Trot Line	0	0	0	0	0	0	0
		42	44	8	6	0	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 2013. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

		Macrohabitat[a]					
Gear	**N**	**CHXO**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**
				Sturgeon Season			
1.0” Trammel Net	0	0	0	0	0	0	0
		46	30	24	0	0	0
Otter Trawl	0	0	0	0	0	0	0
		41	34	24	1	0	0
				Fish Community Season			
1.0” Trammel Net	0	0	0	0	0	0	0
		45	26	29	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
		39	41	9	0	8	3
Otter Trawl	0	0	0	0	0	0	0
		38	36	26	0	0	0
				Both Seasons			
Trot Line	0	0	0	0	0	0	0
		42	44	8	6	0	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 2013. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

		Macrohabitat[a]					
Gear	**N**	**CHXO**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**
				Sturgeon Season			
1.0” Trammel Net	6	33	33	33	0	0	0
		46	30	24	0	0	0
Otter Trawl	3	67	33	0	0	0	0
		41	34	24	1	0	0
				Fish Community Season			
1.0” Trammel Net	2	0	0	100	0	0	0
		45	26	29	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
		39	41	9	0	8	3
Otter Trawl	1	0	0	100	0	0	0
		38	36	26	0	0	0
				Both Seasons			
Trot Line	1	100	0	0	0	0	0
		42	44	8	6	0	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 2013. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

		Macrohabitat[a]					
Gear	**N**	**CHXO**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**
				Sturgeon Season			
1.0” Trammel Net	171	41	34	25	0	0	0
		46	30	24	0	0	0
Otter Trawl	31	16	48	35	0	0	0
		41	34	24	1	0	0
				Fish Community Season			
1.0” Trammel Net	295	35	35	29	0	0	0
		45	26	29	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
		39	41	9	0	8	3
Otter Trawl	45	42	29	29	0	0	0
		38	36	26	0	0	0
				Both Seasons			
Trot Line	324	33	45	10	11	0	0
		42	44	8	6	0	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 2013. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

		Macrohabitat[a]					
Gear	**N**	**CHXO**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**
				Sturgeon Season			
1.0” Trammel Net	177	41	34	25	0	0	0
		46	30	24	0	0	0
Otter Trawl	34	21	47	32	0	0	0
		41	34	24	1	0	0
				Fish Community Season			
1.0” Trammel Net	297	35	35	30	0	0	0
		45	26	29	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
		39	41	9	0	8	3
Otter Trawl	46	41	28	30	0	0	0
		38	36	26	0	0	0
				Both Seasons			
Trot Line	326	33	45	10	11	0	0
		42	44	8	6	0	0

Segment 2 - Shovelnose Sturgeon

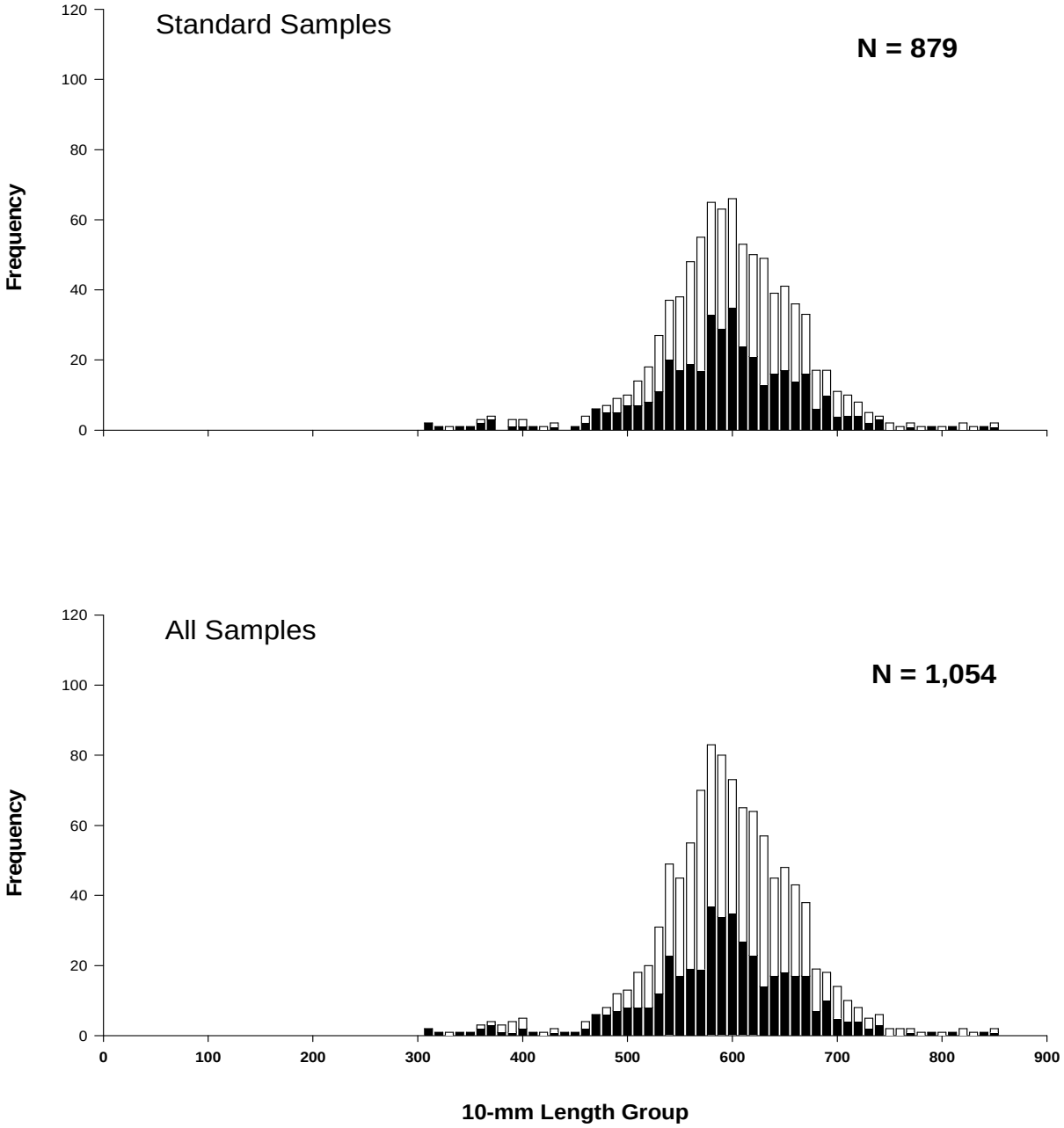

Figure 13. Length frequency of shovelnose sturgeon during the sturgeon season (black bars) and fish community season (white bars) in Segment 2 of the Missouri River during 2013. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2013.

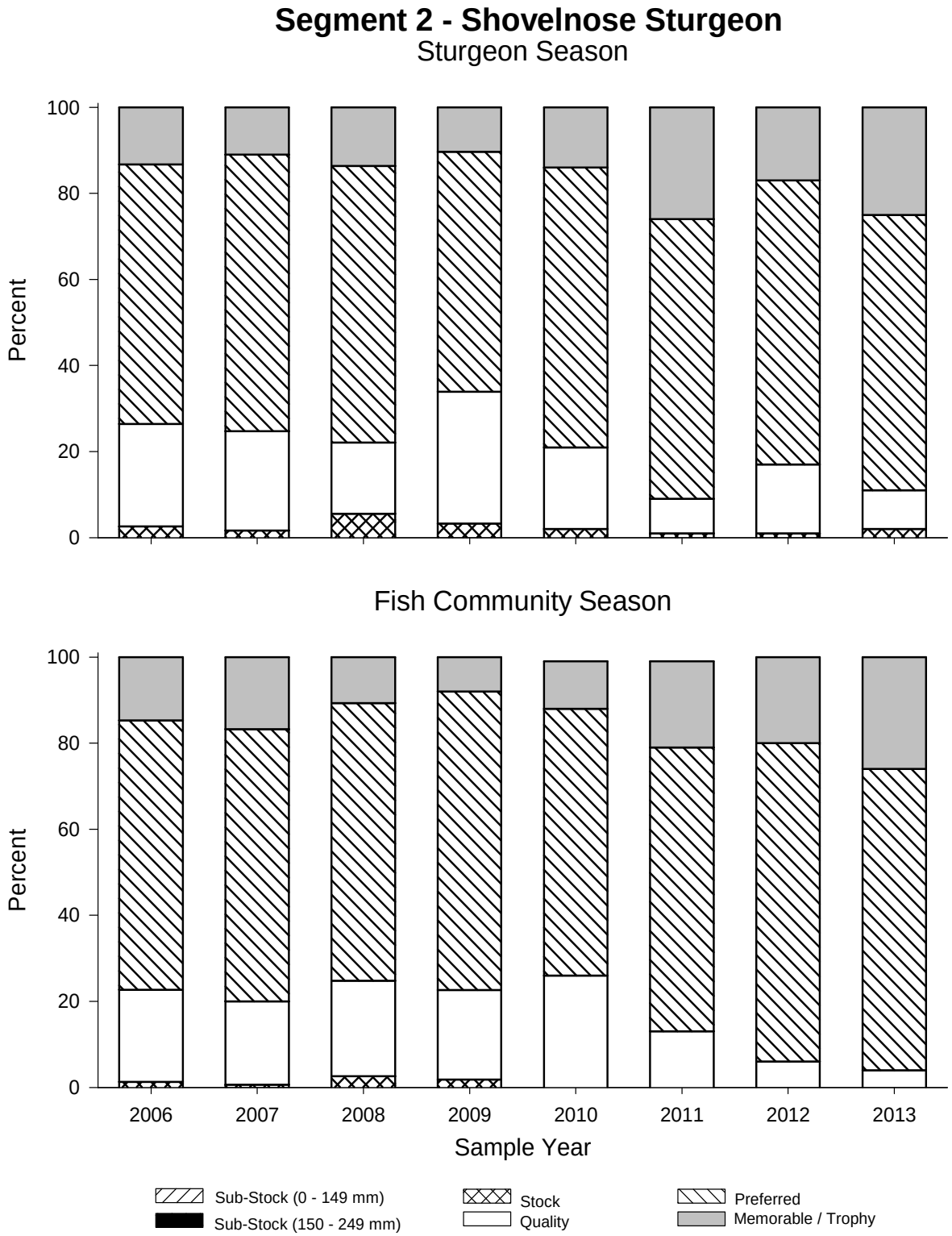

Figure 14. Incremental relative stock density (RSD) for all shovelnose sturgeon captured with all gear by length category from 2006 to 2013 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Quist (1998)

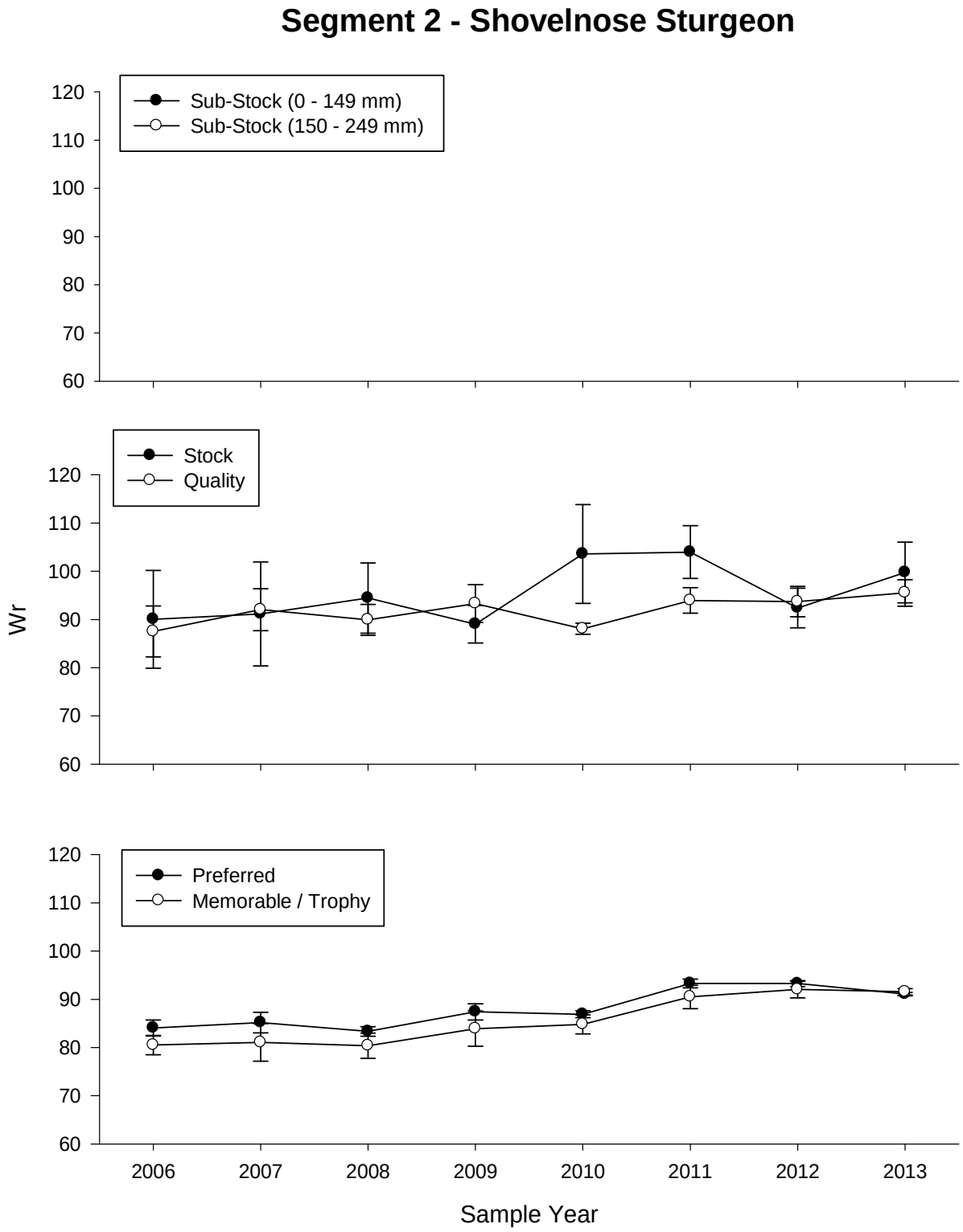

Figure 15. Relative weight (Wr) for all shovelnose sturgeon captured with all gear by incremental relative stock density (RSD) length category from 2006-2013 in Segment 2 in the Missouri River. Length categories determined using the methods proposed by Quist (1998).

Sturgeon Chub

A total of thirty-four sturgeon chubs were sampled in Segment 2 in 2013, which was the second lowest total ever recorded (N=27 in 2011). Like previous years, more sturgeon chubs were captured during sturgeon season (N=19) than during fish community season (N=15). The decreased catch caused record low CPUE to be reached during both the combined-season (0.05 fish/100m) and sturgeon season (0.04 fish/100m), while CPUE for fish community season (0.05 fish/100m) was comparable with previous years. The combined season catch rates continue to exhibit an overall downward trend since record highs were observed in 2007. Another important observation to note is that 2013 marked the first year that sturgeon season CPUE was not significantly higher than the CPUE exhibited during fish community season.

The average total length for sturgeon chubs captured in Segment 2 in 2013 was 84 mm, which was virtually the same as 2012, and exhibits the same pattern as years passed. The population size structure (Figure 17) of sturgeon chubs in Segment 2 continues to be dominated by older adult fish (Herman et al. 2008a). In fact, all the sturgeon chubs captured in 2013 ranged from 72 to 103 mm in total length.

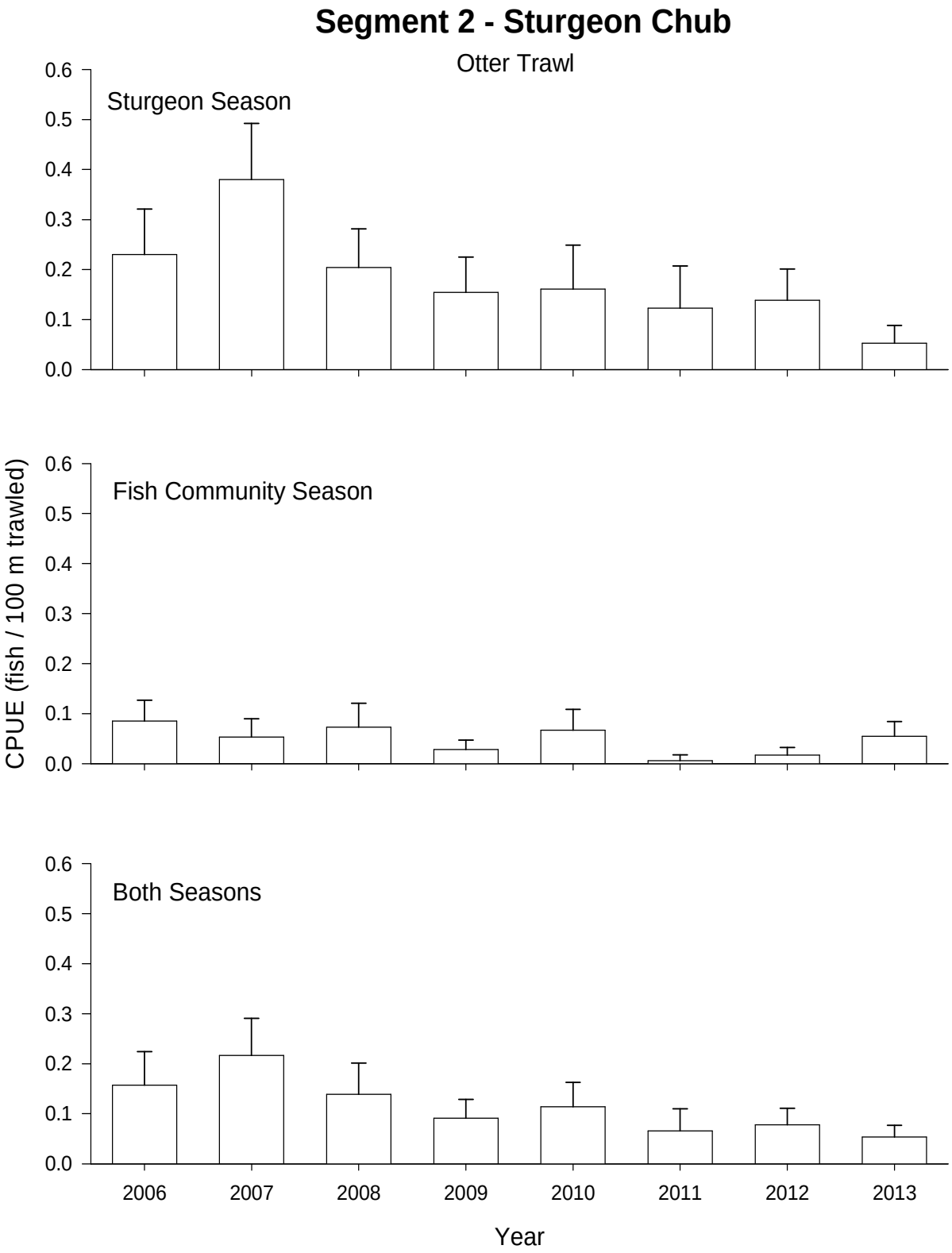

Figure 16. Mean annual catch per unit effort (+/- 2 SE) of sturgeon chub using otter trawls in Segment 2 of the Missouri River from 2006-2013.

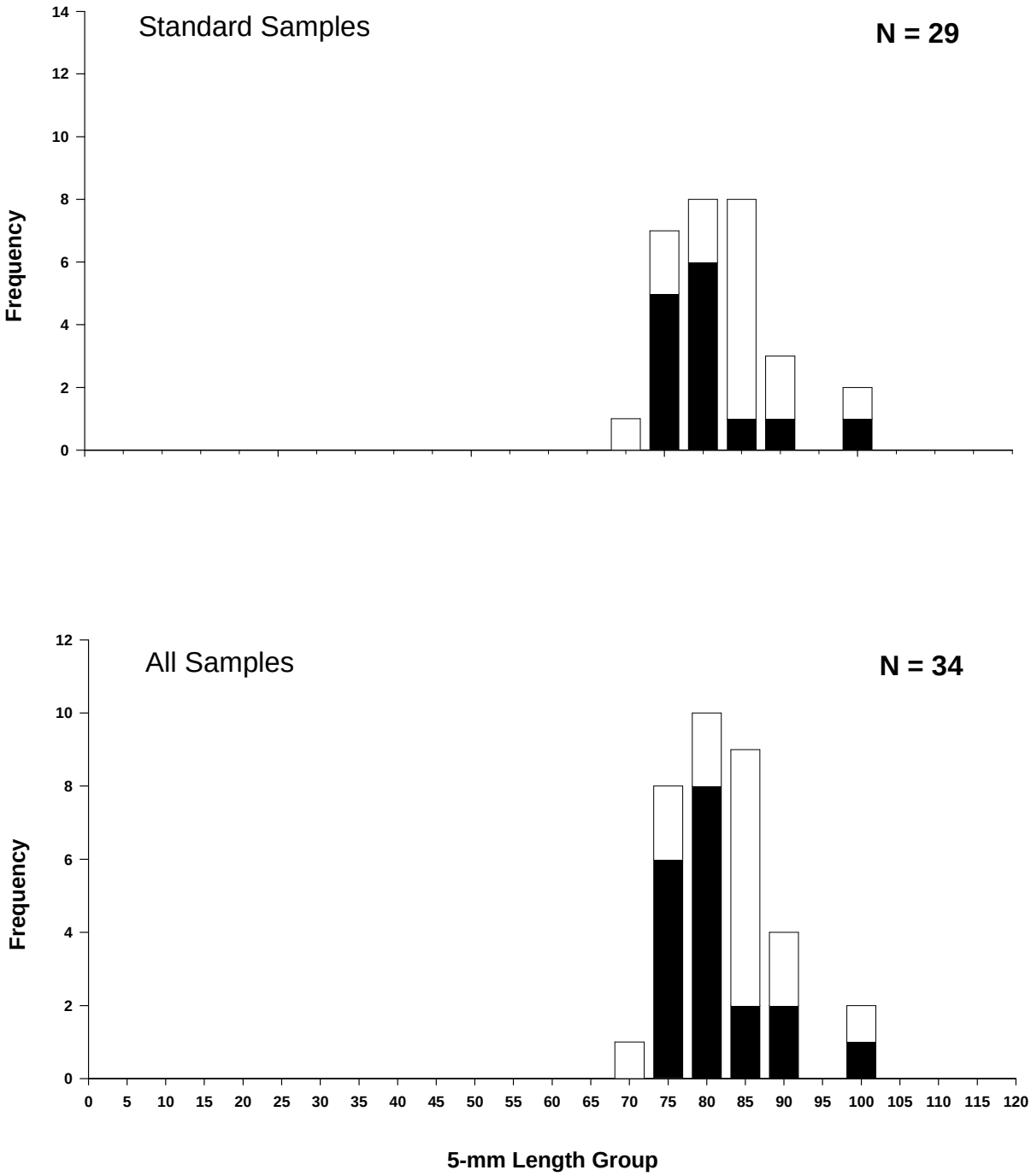

Figure 17. Length frequency of sturgeon chub during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2013. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2013.

Sicklefin Chub

A total of eight sicklefin chubs were captured in Segment 2 in 2013, two of which were caught during sturgeon season, while the other six were sampled during fish community season. This is a contrast to previous seasons when the majority of sicklefin chubs were captured during sturgeon season. However, the two fish represented during sturgeon season were sampled further upstream (RM 1736.5) than those during fish community season, still suggesting possible spawning related movements within Segment 2.

Record high otter trawl CPUE (Figure 18) was observed during both seasons (0.019 fish/100m), as well as fish community season (0.032 fish/100m). In comparison, otter trawl CPUE during sturgeon season (0.007 fish/100m) was down from the previous two years (0.026 fish/100m and 0.019 fish/100m, for 2011 and 2012, respectively). Although catch rates could relate to trends, they remain highly variable due to small sample size.

During the 2013 field season, sicklefin chubs sampled in Segment 2 averaged 106 mm in total length, with all fish ranging between 95 and 120 mm (Figure 19). Given the size structure of the sickelfin chubs that are handled from year to year, the population continues to consist solely of adult fish (Herman et al. 2008b). In addition, the fact that relative abundance of these fish remains very low every year would suggest the suitability of the habitat represented in Segment 2 is poor for sickelfin chubs. In contrast, sickelfin chubs are more frequently captured downstream in the portions of Segment 3 of the Missouri River.

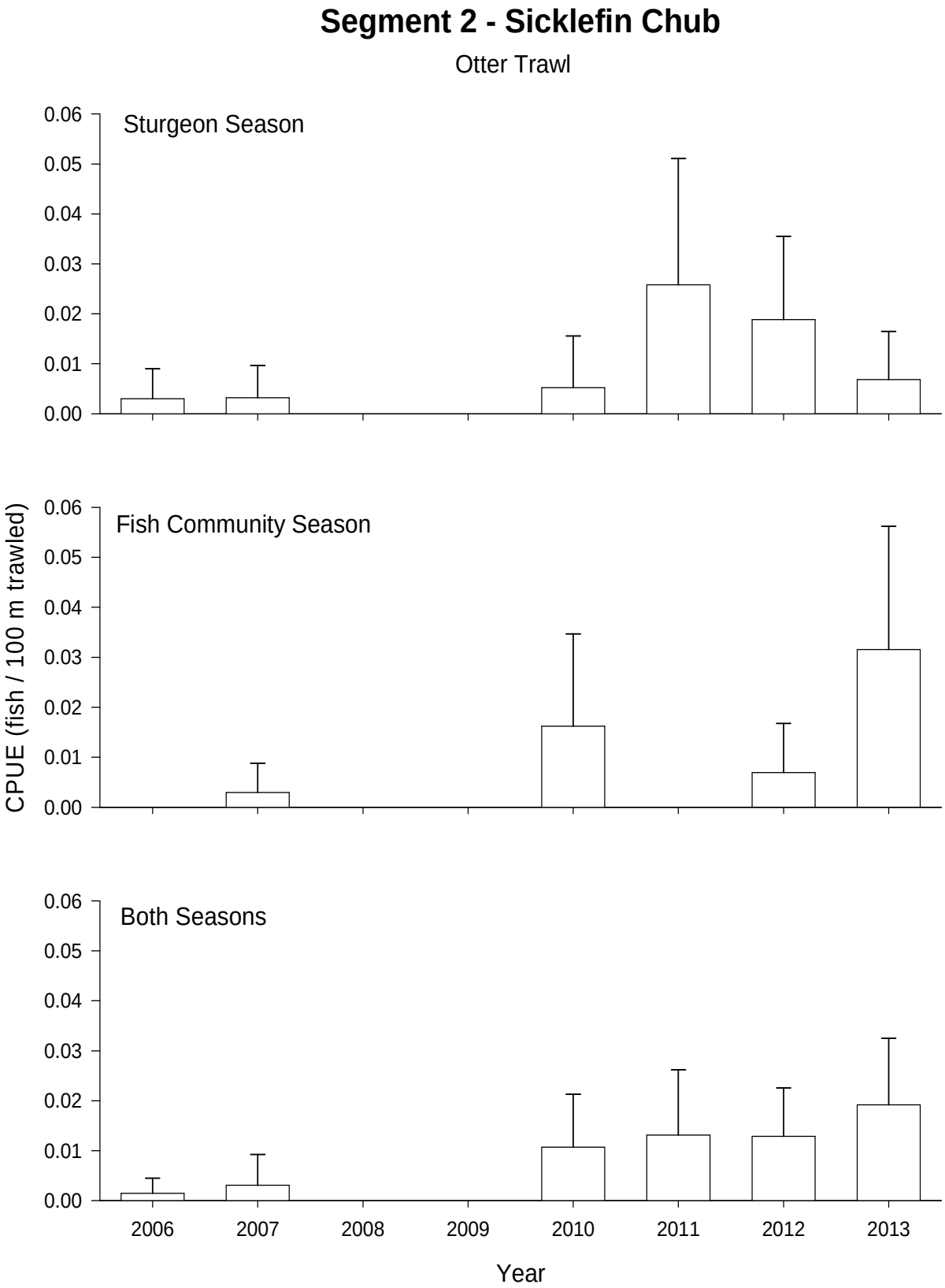

Figure 18. Mean annual catch per unit effort (+/- 2 SE) of sicklefin chub using otter trawls in Segment 2 of the Missouri River from 2006-2013.

Segment 2 - Sicklefin Chub

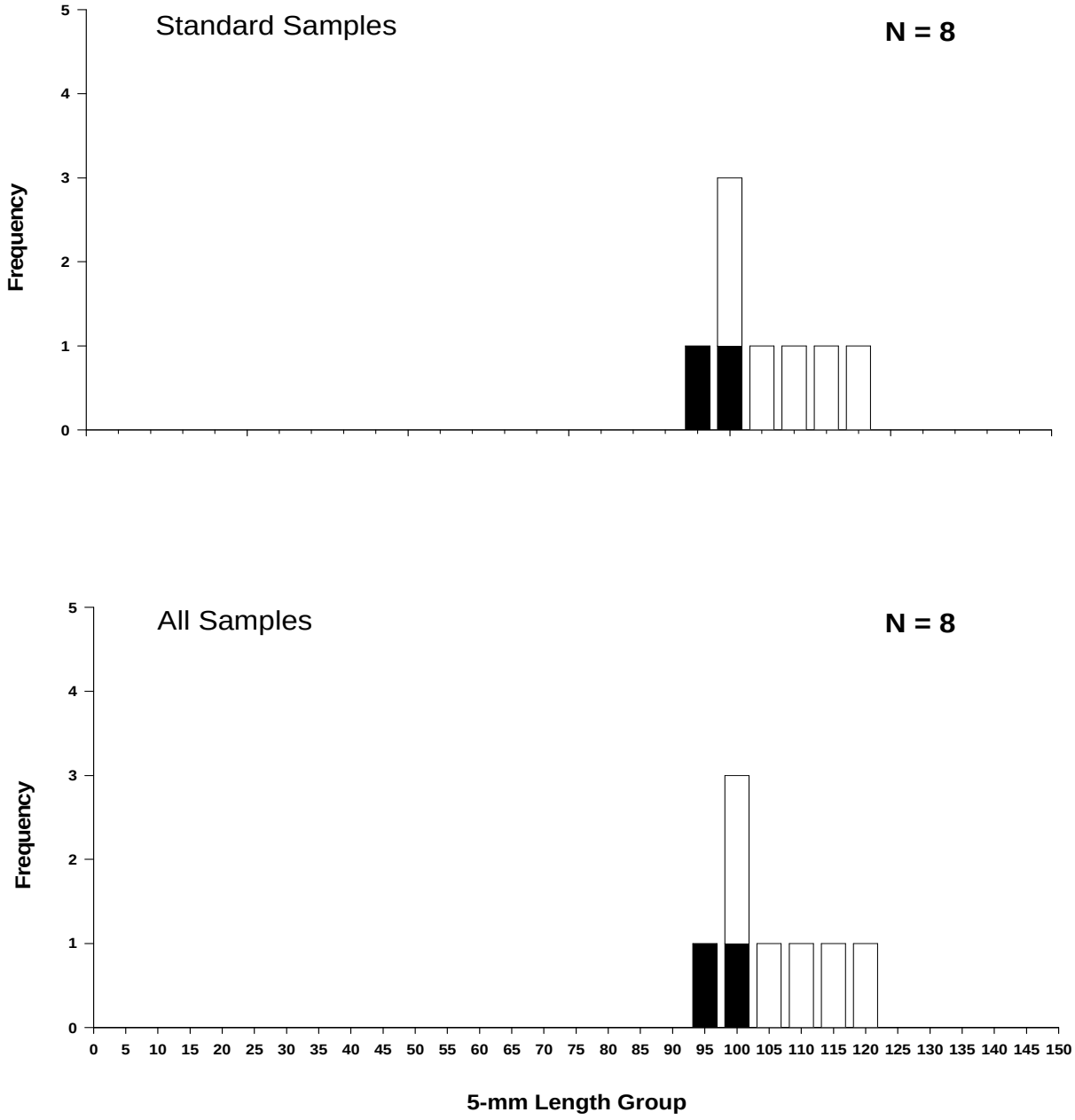

Figure 19. Length frequency of sicklefin chub during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2013. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2013.

Sand Shiner

After a dismal catch of sand shiners in Segment 2 in 2012 (N=9), captures in 2013 rebounded to a total of 292, all of which were caught in mini-fyke nets. In response, CPUE of sand shiners (Figure 20) rose sharply from 0.1 fish/net night in 2012 to 3.0 fish/net night in 2013. This year also represented the first increase in CPUE over the previous year since the 2006 (4.5 fish/net night) to 2007 (8.5 fish/net night) field season. However, even with such a large increase over 2012 catch rates, numbers still remain lower than those witnessed in 2006-2010.

Of the 292 sand shiners sampled in Segment 2 in 2013, one hundred sixty seven of them had an associated length (Figure 21). The average TL for in 2013 was 33 mm, which was slightly lower than that of 2012 (46 mm). This lower average TL may be represented by age-0 (<30 mm) fish, which were not represented during the 2012 sampling (Datillo et al. 2008a).

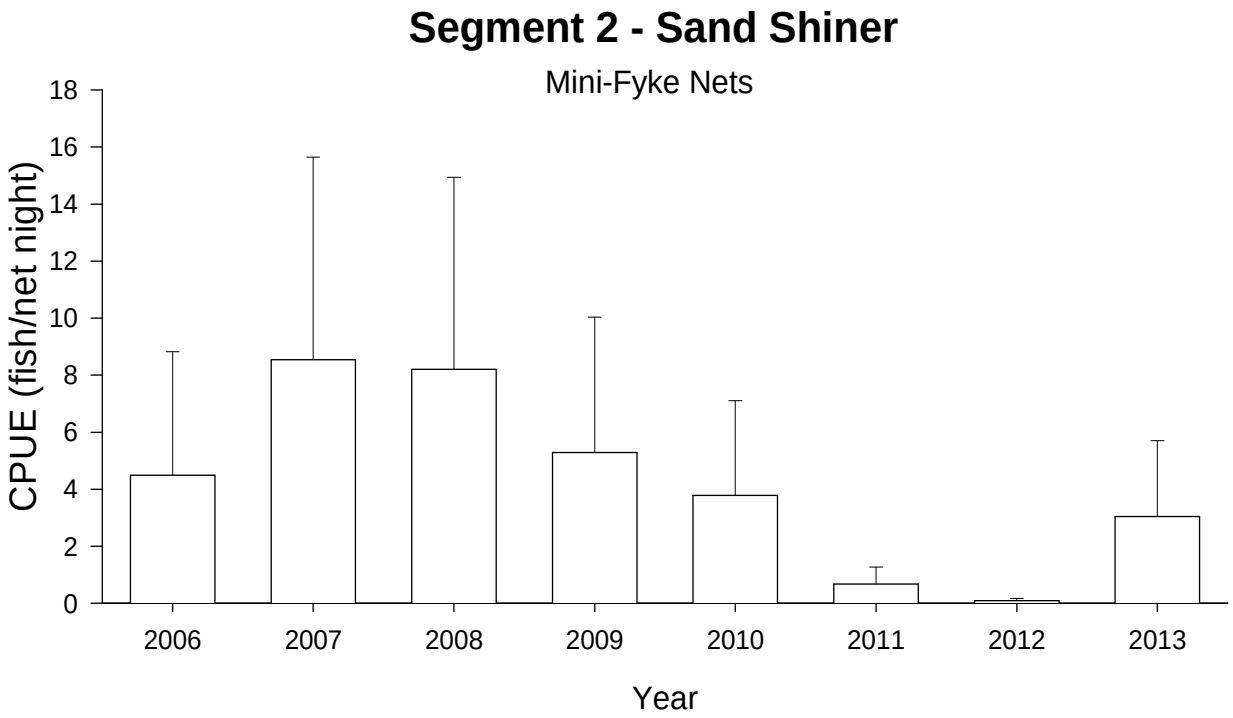

Figure 20. Mean annual catch per unit effort (+/- 2 SE) of sand shiner with mini-fyke nets in Segment 2 of the Missouri River during fish community season 2006-2013.

Segment 2 - Sand Shiner

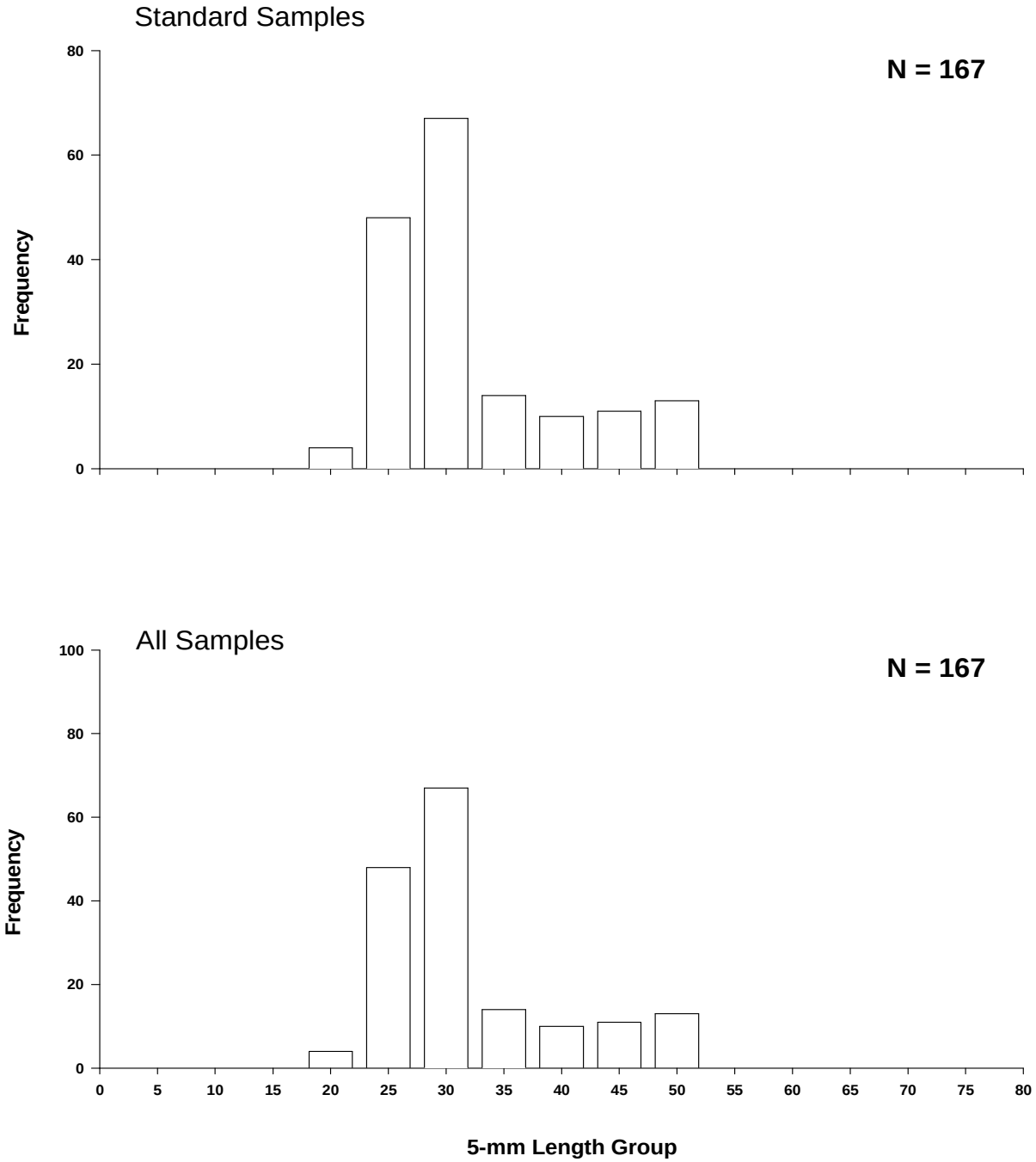

Figure 21. Length frequency of sand shiner during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2013. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2013.

Hybognathus spp.

Like sand shiners, captures of *Hybognatus* spp. were up dramatically in Segment 2 for the 2013 field season. A total of 254, with all but two of them sampled in mini-fyke nets, were captured this year, as compared to only four in 2012. In turn, mini-fyke net CPUE for these species went from 0.04 fish/net night in 2012 to 2.62 fish/net night in 2013 (Figure 22). In comparison, it marked the second highest recorded CPUE since the Programs inception; only being topped in 2010 (2.81 fish/net night).

Another striking change, when compared to 2012, was the average TL of *Hybognathus* spp. during 2013. Total length average decreased from 94 mm in 2012 to 45 mm in 2013, indicating the presence of age-0 fish (Datillo et al. 2008b). A full description of length frequency data can be observed in Figure 23.

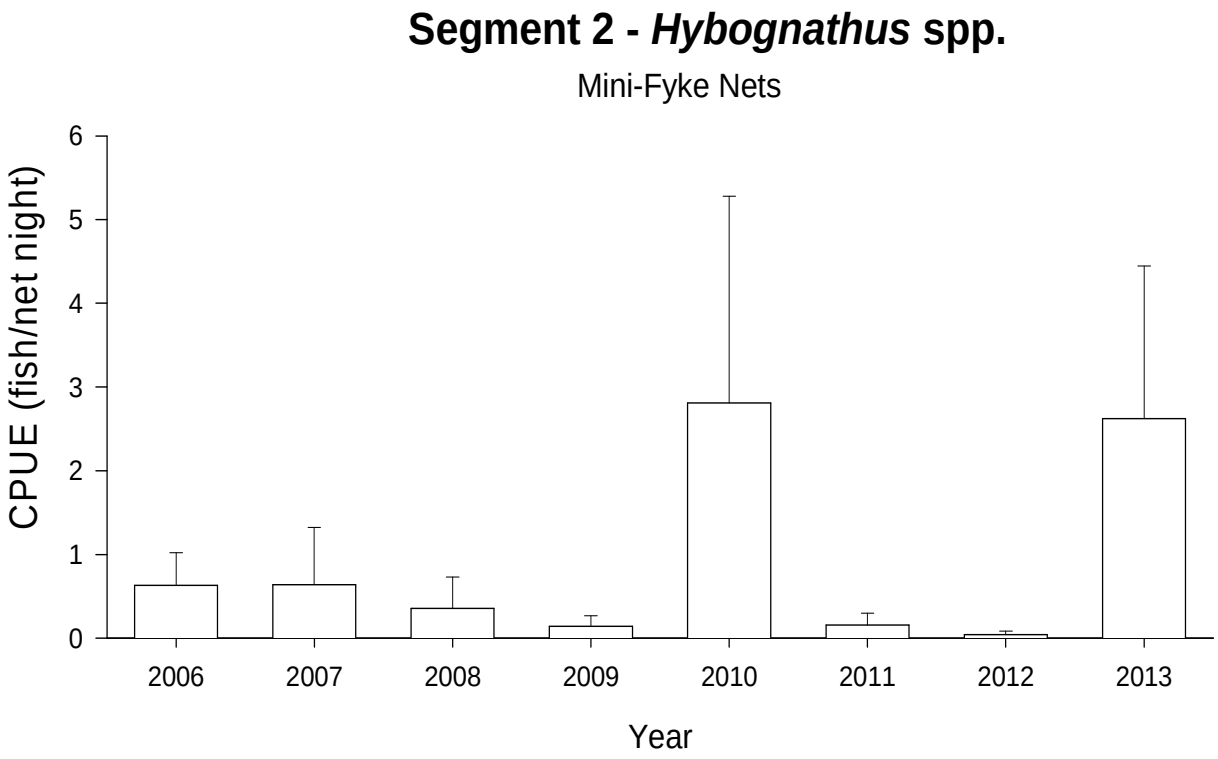

Figure 22. Mean annual catch per unit effort (+/- 2 SE) of *Hybognathus* spp. with mini-fyke nets in Segment 2 of the Missouri River during fish community season 2006-2013.

Segment 2 - *Hybognathus* spp.

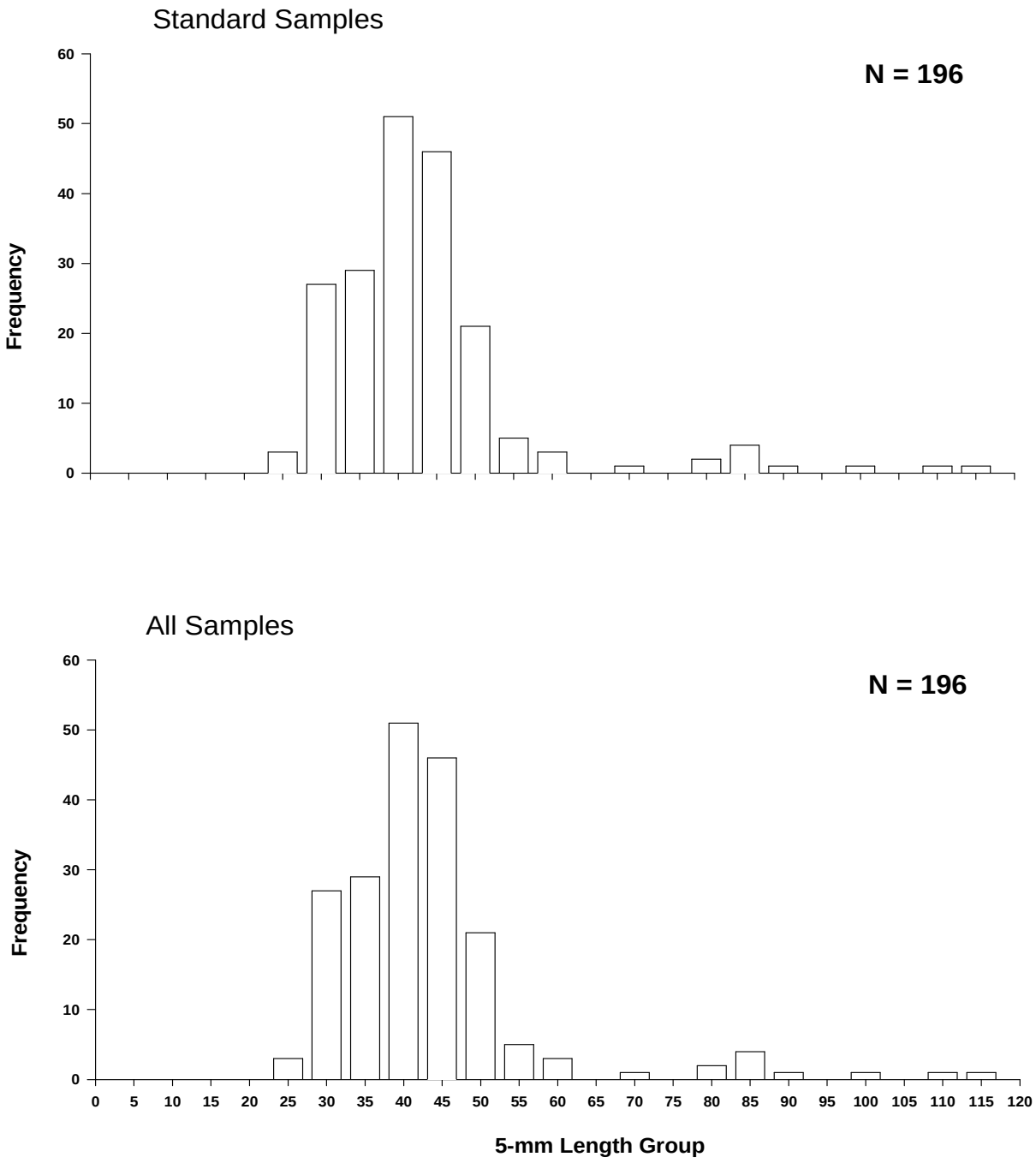

Figure 23. Length frequency of *Hybognathus* spp. caught during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2013. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2013.

Blue Sucker

A total of nine blue suckers were captured in Segment 2 in 2013. To compare, a total of 11 were caught in 2012 and only four in 2011. Like previous years, blue sucker captures were more probable during the sturgeon season and using trammel nets as the sampling gear. In fact, in 2013, all but one blue sucker was observed during sturgeon season and all nine were caught using trammel nets.

Combined-season CPUE for trammel nets (0.015 fish/100m) in 2013 was very comparable to the last three years (Figure 24). In relation to seasonal catch differences, CPUE remained higher during sturgeon season (0.026 fish/100m) than during fish community season (0.003 fish/100m). The pattern of elevated CPUE during sturgeon season seems to indicate spring spawning movements upstream by adult populations of blue suckers in Segment 2.

As with previous years, the otter trawl continued to be a poor gear at detecting relative abundance of blue suckers in Segment 2. No blue suckers were caught during either season in Segment 2 in 2013 using the otter trawl. A full description of blue sucker CPUE for the otter trawl in Segment 2 can be viewed in Figure 25.

The average TL for blue suckers handled in Segment 2 during the 2013 field season was 677 mm, which is essentially the same as previous years. As indicated by the length frequency in Figure 26, the sampled population of blue suckers was once again comprised of adult fish. In fact, only two presumed young of the year blue suckers have been sampled in Segment 2, one each in 2010 and 2011.

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

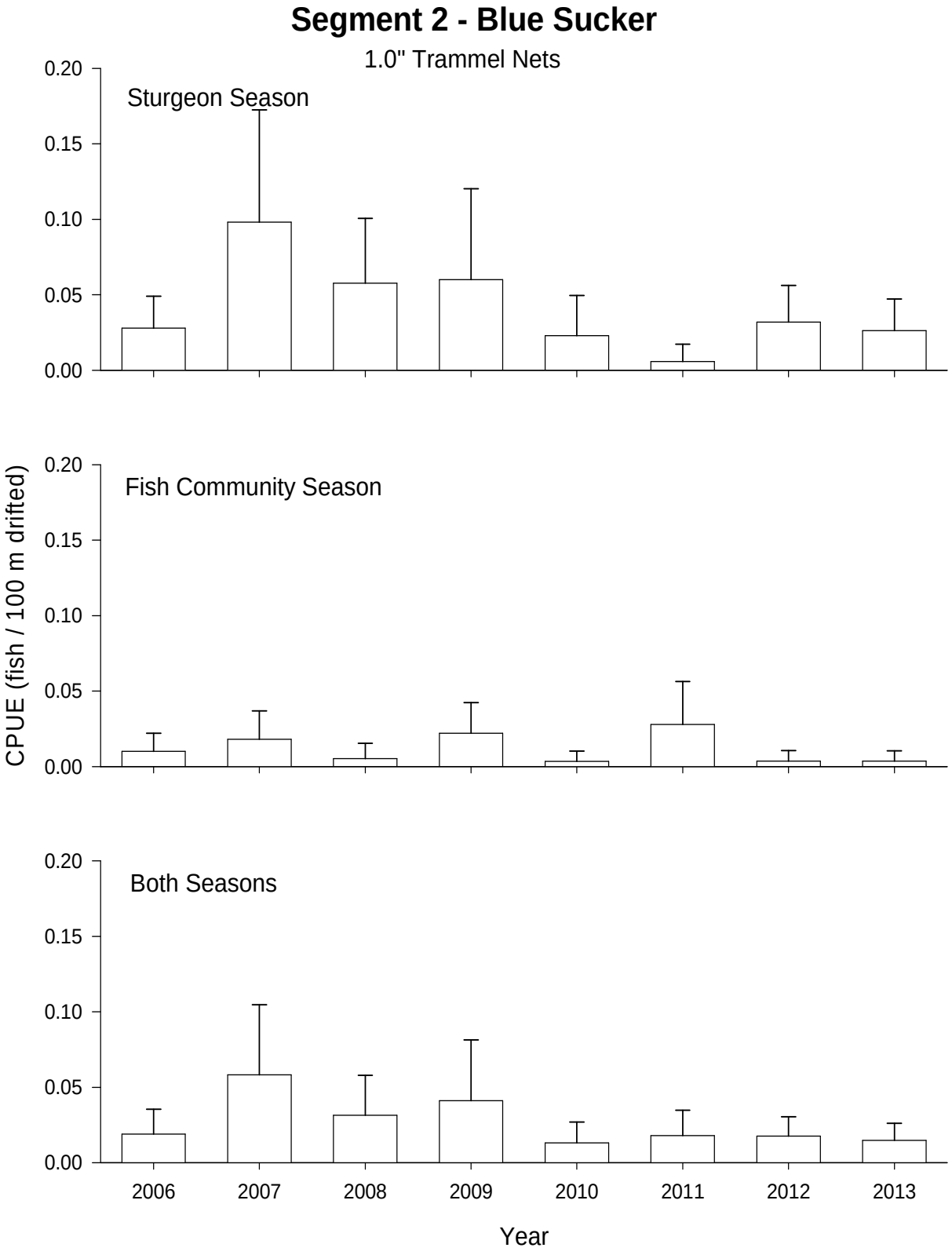

Figure 24. Mean annual catch per unit effort (+/- 2 SE) of blue sucker using 1.0” trammel nets in Segment 2 of the Missouri River from 2006-2013.

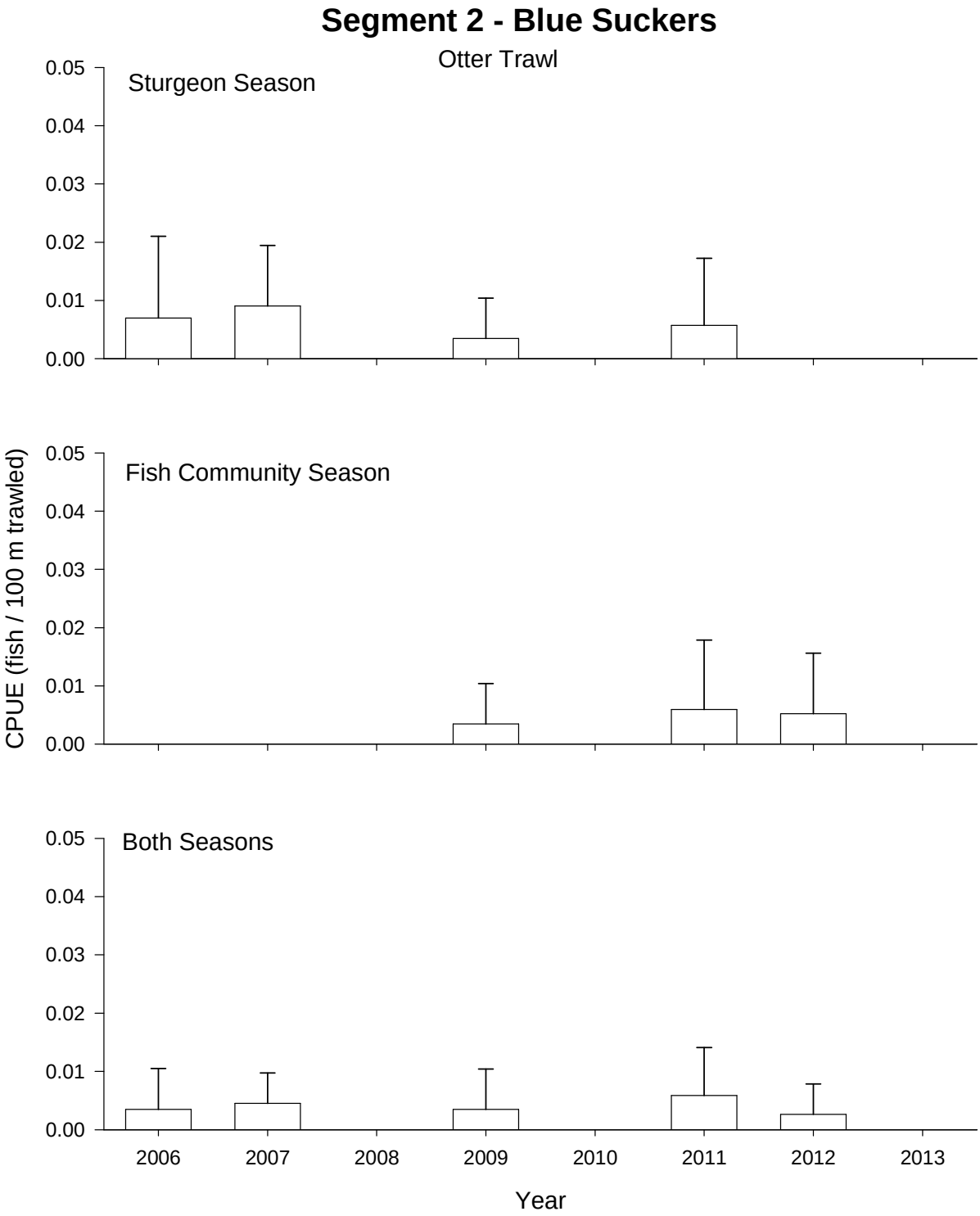

Figure 25. Mean annual catch per unit effort (+/- 2 SE) of blue sucker using otter trawls in Segment 2 of the Missouri River from 2006-2013.

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 2013. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

		Macrohabitat[a]					
Gear	**N**	**CHXO**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**
				Sturgeon Season			
1.0” Trammel Net	6	67	17	17	0	0	0
		46	30	24	0	0	0
Otter Trawl	0	0	0	0	0	0	0
		41	34	24	1	0	0
				Fish Community Season			
1.0” Trammel Net	1	0	0	100	0	0	0
		45	26	29	0	0	0
Mini-Fyke Net	0	0	0	0	0	0	0
		39	41	9	0	8	3
Otter Trawl	0	0	0	0	0	0	0
		38	36	26	0	0	0
				Both Seasons			
Trot Line	0	0	0	0	0	0	0
		42	44	8	6	0	0

Segment 2 - Blue Sucker

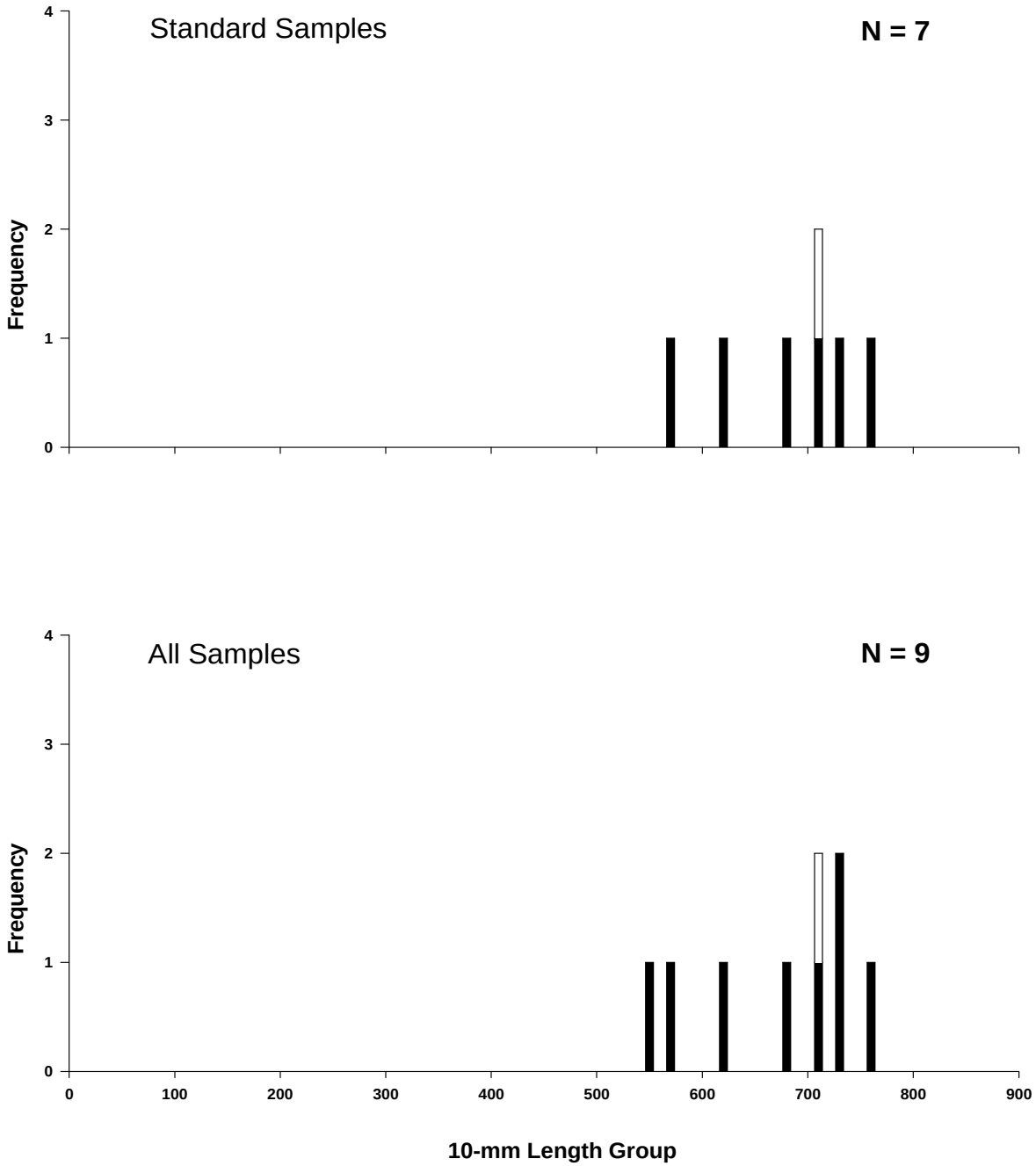

Figure 26. Length frequency of blue sucker during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2013. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2013.

Sauger

Sampling during the 2013 field season in Segment 2 resulted in the capture of 117 sauger; with majority being witnessed during sturgeon season (63%) compared to fish community season (37%). The most effective gear to capture sauger in Segment 2 continued to be the trammel net (N=83), followed by the otter trawl (N=17), mini-fyke net (N=16) and lastly, trotline (N=1).

Although combined-season trammel net CPUE fell in 2013 (0.07 fish/100m), compared to 2012 (0.10 fish/100m), no discernible pattern exists regarding CPUE in Segment 2 (Figure 28). However, a pattern does emerge when comparing catch rates among seasons. Catch per unit effort is consistently much higher during sturgeon season, with 2013 being no different. Sturgeon season witnessed a CPUE of 0.28 fish/100m while the reported CPUE during fish community season was 0.05 fish/100m.

Otter trawl CPUE, like trammel nets, remains comparable across all years (Figure 29). To elaborate on catch rates; a combined-season CPUE of 0.024 fish/100m was calculated for 2013, while CPUE for each season was 0.017 and 0.032 fish/100m for the sturgeon and fish community seasons, respectively. Although differences are detectable, they remain relatively small with no real pattern emerging when looking for relative abundance trends.

Sauger captures in mini-fyke nets remained a fairly common occurrence in Segment 2, the associated CPUE for all years is shown in Figure 27. In 2013 there was a new all-time high CPUE calculated for sauger with this gear. A CPUE of 0.17 fish/net night was recorded, eclipsing the previous record of 0.14 fish/net night calculated in 2007. Moreover, mini-fyke nets serve as the most valuable tool to sample young of the year sauger in Segment 2 of the Missouri River. In this regards, one YOY sauger was captured via mini-fyke on July, 10th at RM 1703.

The average TL for sauger within Segment 2 in 2013 was 350 mm, with a range of 54 mm to 531 mm, which remains comparable with previous years. A complete summary of length frequencies can be found in Figure 30.

The total number of sauger sampled by gear in specific macro habitats is depicted in Table 15.

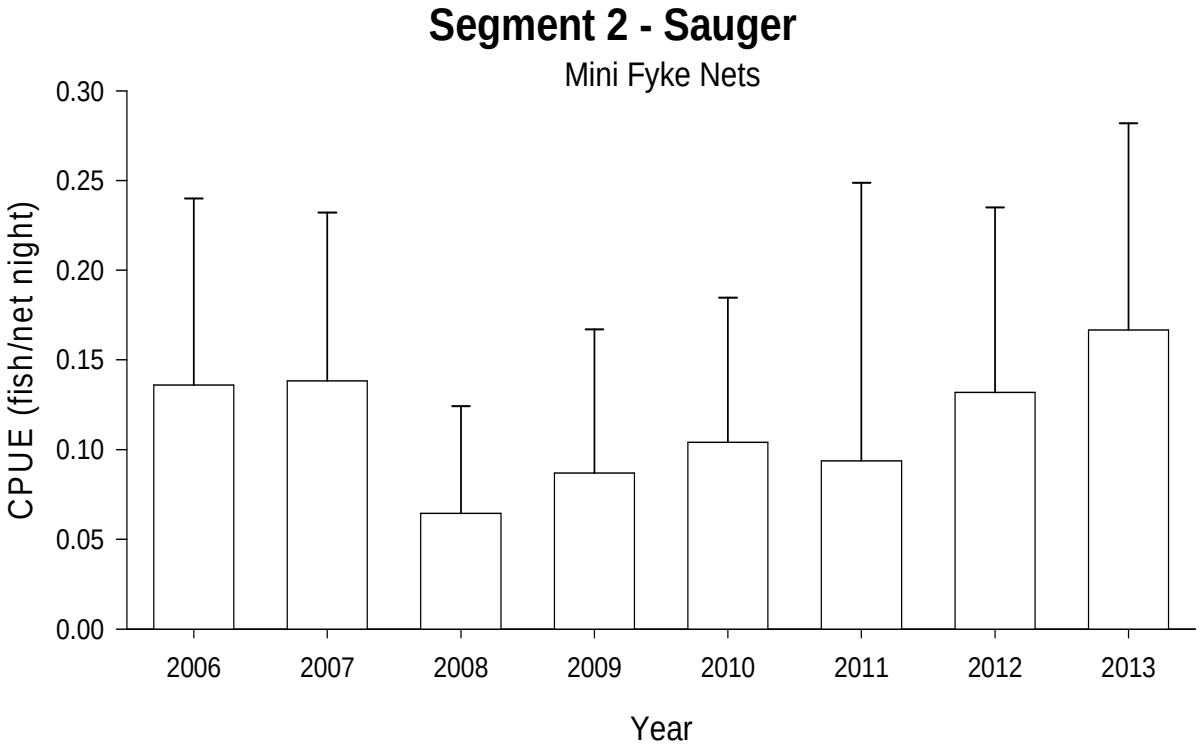

Figure 27. Mean annual catch per unit effort (+/- 2 SE) of sauger using mini-fyke nets in Segment 2 of the Missouri River from 2006-2013.

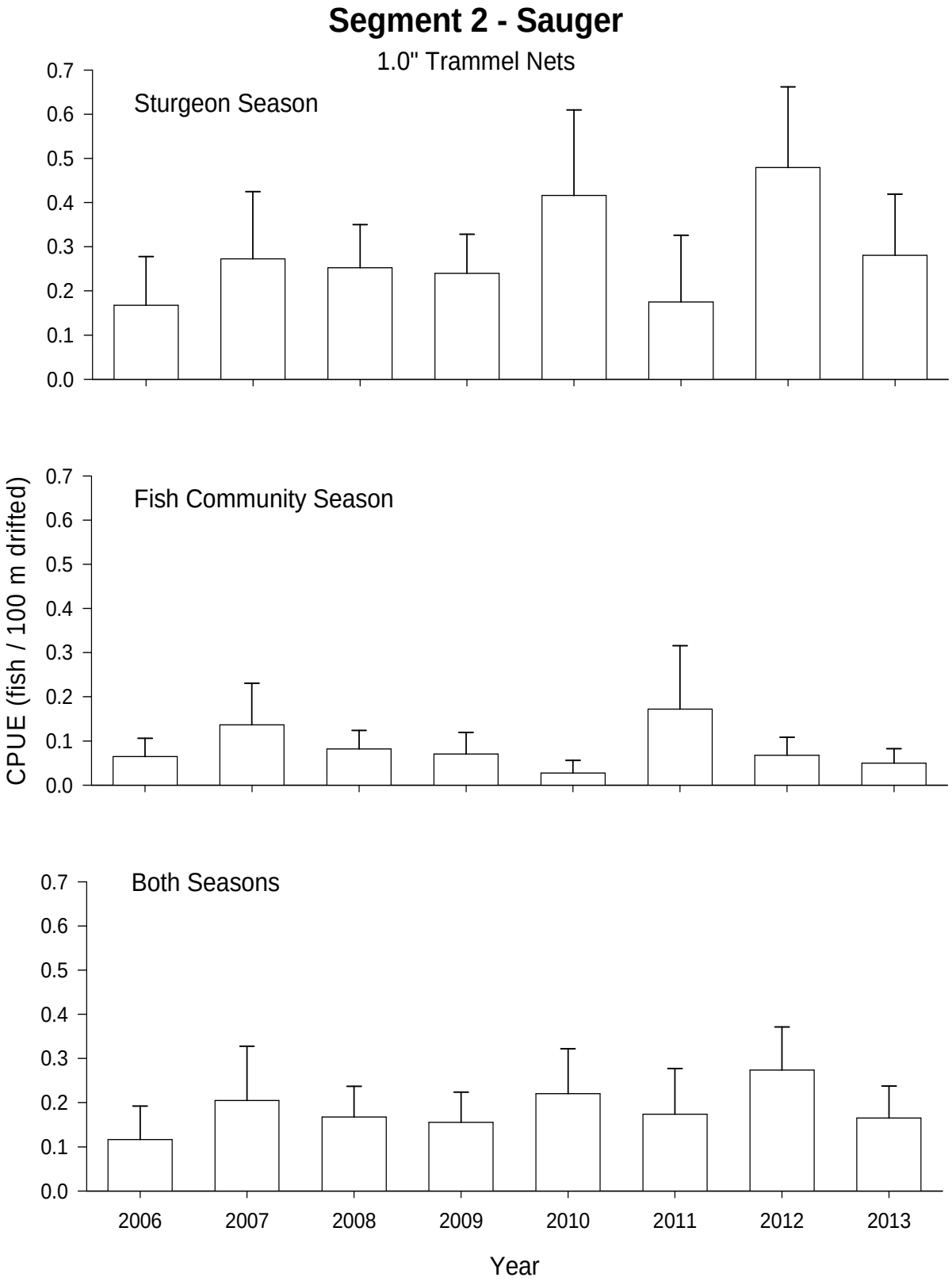

Figure 28. Mean annual catch per unit effort (+/- 2 SE) of sauger using 1.0” trammel nets in Segment 2 of the Missouri River from 2006-2013.

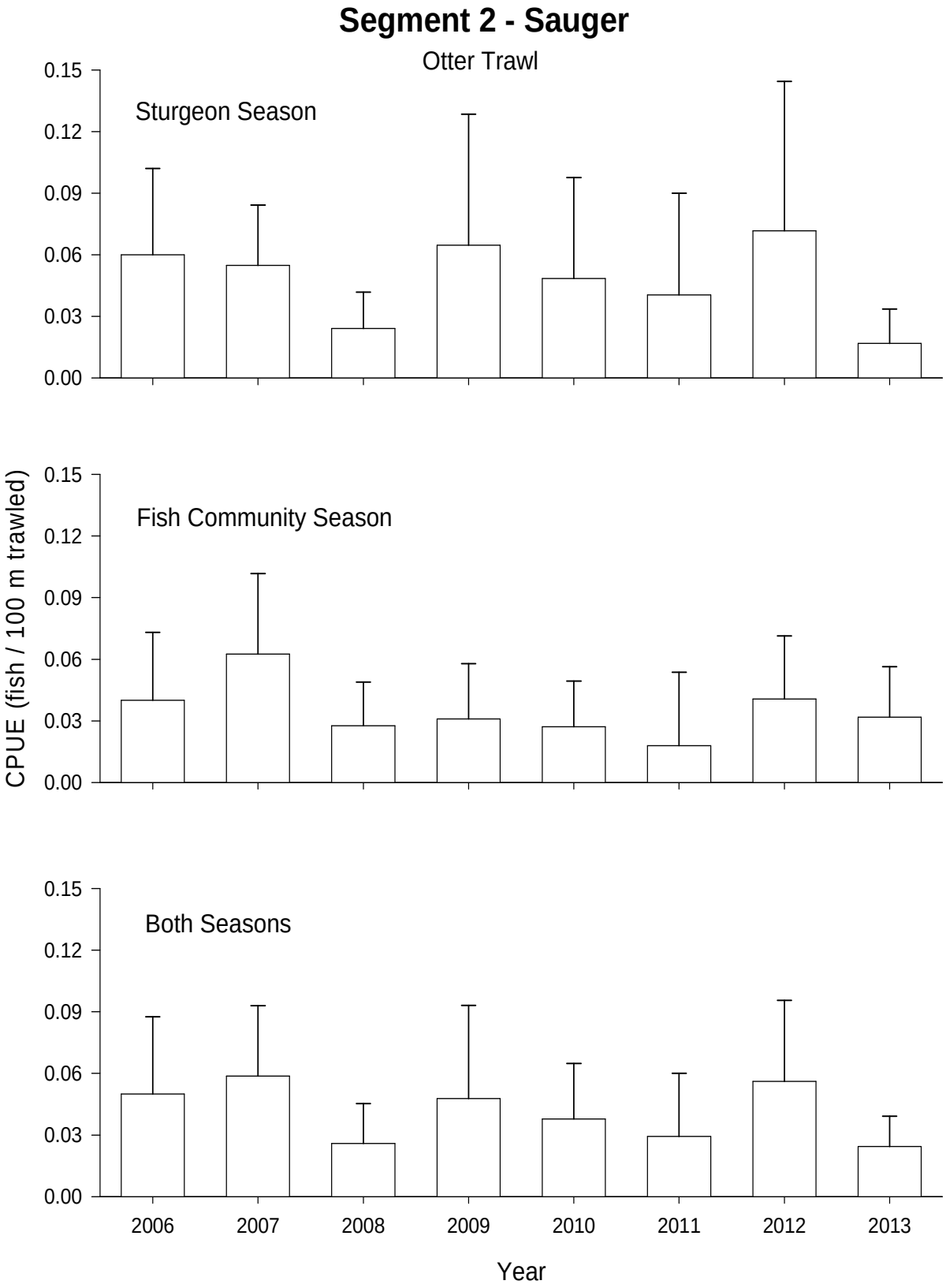

Figure 29. Mean annual catch per unit effort (+/- 2 SE) of sauger using otter trawls in Segment 2 of the Missouri River from 2006-2013.

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 2013. The percent of total effort for each gear in each habitat is presented on the second line of each gear type.

		Macrohabitat[a]					
Gear	**N**	**CHXO**	**ISB**	**OSB**	**SCCL**	**SCCS**	**SCN**
				Sturgeon Season			
1.0” Trammel Net	60	32	38	30	0	0	0
		46	30	24	0	0	0
Otter Trawl	4	25	25	50	0	0	0
		41	34	24	1	0	0
				Fish Community Season			
1.0” Trammel Net	10	50	20	30	0	0	0
		45	26	29	0	0	0
Mini-Fyke Net	16	19	44	13	0	13	13
		39	41	9	0	8	3
Otter Trawl	9	44	56	0	0	0	0
		38	36	26	0	0	0
				Both Seasons			
Trot Line	1	100	0	0	0	0	0
		42	44	8	6	0	0

Segment 2 - Sauger

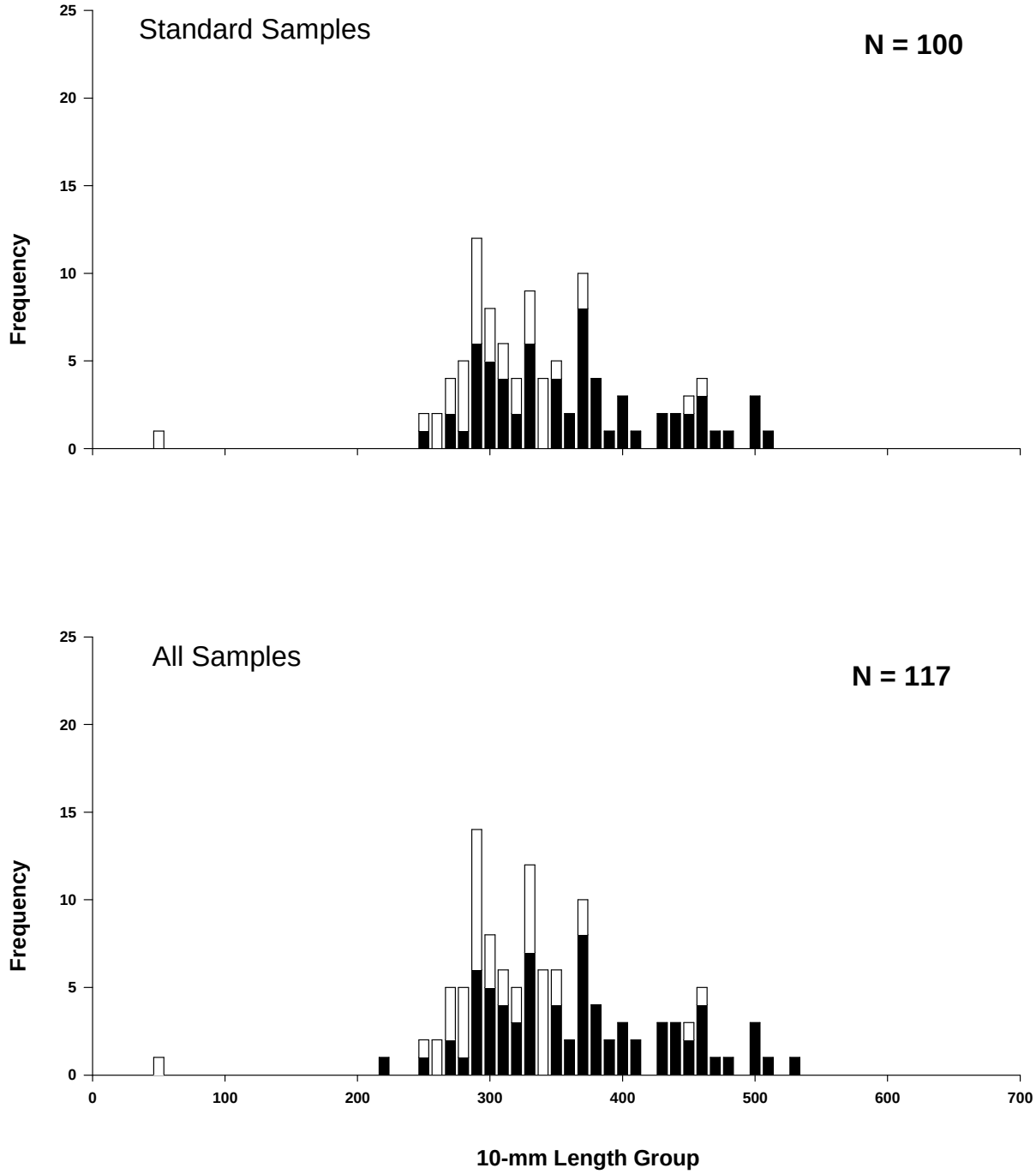

Figure 30. Length frequency of sauger during the sturgeon season (black bars) and the fish community season (white bars) in Segment 2 of the Missouri River during 2013. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2013.

Missouri River Fish Community

Sampling during the 2013 field season in Segment 2 of the Missouri River resulted in the capture of 5,231 fish consisting of thirty-nine different species. Many years, raw fish numbers have been simply be driven by young of the year fish sampled in mini-fyke nets, particularly YOY *Catostomus* spp. During years when those species were abundant in YOY form, thousands could be sampled in just one mini-fyke. Although numerous young of the year of many different species were present in Segment 2 in 2013, overly inflated catch rates were not witnessed on a widespread basis. In turn, the most abundant species sampled in 2013 was shovelnose sturgeon (N=1055). Shovelnose sturgeon remain a staple representative of the fish community in Segment 2 year after year.

The second most abundant species was emerald shiner *Notropis atherinoides,* with 739 observations, and like years past, were nearly all (>99%) sampled in mini-fyke nets. For this reason, emerald shiner captures take place nearly entirely during fish community season, although visual observations can be made near shore throughout the entire field season.

Catostomus spp. continue to be commonly observed species in Segment 2 of the Missouri River. Like years passed white suckers (*C. commersoni*) represent the bulk of the catch (76%), while longnose suckers (*C. catostomus*) make up the other 24%. Represented by both YOY and adult life stages, *Catostomus* spp. were the third most abundant species captured (N=956) during the 2013 field season. However, as noted above, some years this species can number in the tens of thousands depending on young of the year and associated mini-fyke net catch.

Another common species present in Segment 2 on a yearly basis is the river carpsucker *Carpiodes carpio*. Like white suckers, river carpsuckers (N=389) were also collected in both adult and YOY form. Also like white suckers, river carpsuck captures can easily be inflated by YOY captures in mini-fyke nets.

Goldeye *Hiodon alosoides* observations (N=240) continue to be comparable with those witnessed in other years; 2012 (N=184) and 2011 (N=143). Although young of the year are captured in both mini-fyke nets, as well as otter trawls, the majority (77%) are adult fish sampled across all standard gears except mini-fyke nets.

A total of 231 flathead chubs *Platygobio gracilis* were sampled in Segment 2 in 2013, which was nearly identical to 2012 (N=245). Also like 2012, what was notable was the average TL for flathead chubs in Segment 2. With an average TL of 199 mm in 2013 and 201 mm in

2012, the average size continued to be a large increase over the next highest average TL observed in 2010 (118 mm). Large adult flathead chubs continued to show up in both trammel nets and captured on trotlines.

Channel catfish *Ictalurus punctatus* were represented by the capture of 147 individuals, which was up from ninety-eight in 2012. Channel cats during the 2013 field season averaged 345 mm in total length, which was very comparable to previous years, and ranged from 34 mm to 650 mm. Although all gears were able to sample channel catfish, trotlines sampled the largest portion of fish (45%) and also captured the majority (76%) of the larger fish (>400 mm).

Other species present were fathead minnows *Pimephales promelas* (N=236), longnose dace *Rhinichthys cataractae* (N=102), smallmouth *Ictiobus bubalus* and bigmouth buffalo *I. cyprinellus* (N=84, N=29, respectively), shorthead redhorse *Moxostoma macrolepidotum* (N=73), common carp *Cyprinus carpio* (N=33), walleye *Sander vitreus* (N=12), burbot *Lota lota* (N=11) and spottail shiner *Notropis hudsonius* (N=11). Other species of very low abundance included yellow perch *Perca flavescens*, creek chub *Semotilus atromaculatus*, stonecat *Noturus flavus*, brook stickleback *Culaea inconstans*, northern pike *Esox lucius*, freshwater drum *Aplodinotus grunniens*, rainbow trout *Onchorhynchus mykiss*, white crappie *Pomoxis annularis*, lake whitefish *Coregonus clupeaformis*, black bullhead *Ameiurus melas*, shortnose gar *Lepisosteus platostomus*, bluegill *Lepomis macrochirus* and paddlefish *Polyodon spathula*.

Discussion

The 2013 field season was shaping up to be an interesting one; considering that following the record flows observed in 2011 the number of pallid sturgeon observations in 2012 reached an all time high. The pattern of increasing hatchery-reared juvenile pallid sturgeon (HRJPS) abundance in Segment 2 did not hold true in 2013, however, it was the second highest total ever collected. It is probable that the habitat changing flows observed in 2011, combined with substantial Milk River flows in 2013, continue to alter the habitat in Segment 2 to create more favorable conditions for HRJPS. To illustrate this point, prior to 2011 relatively few pallid sturgeon were captured in Segment 2 when compared to Segments 3 and 4. Not only have more pallid sturgeon been observed in the last two field seasons, older year classes of HRJPS continue to be present. In light of these data it has become obvious that changes in flow management from the Fort Peck Dam Project could even further benefit pallid sturgeon residing in Segment 2 of the Missouri River.

Temporally, 68 pallid sturgeon were observed during sturgeon season, while the remaining 33 were captured during fish community season. As was seen in 2012, more pallid sturgeon were sampled during sturgeon season than fish community season, which marked the second year in a row for this previously unseen event. Seasonal movements may be related to improved habitat combined with attractant flows of the Milk River.

Trammel net catch per unit effort for combined seasons, like total captures, expressed the same pattern in 2013. Although the CPUE in 2013 (0.04 fish/100m) fell from the record high reported in 2012 (0.046 fish/100m), it too was the second highest ever calculated in Segment 2. The second highest trammel net CPUE totals were also observed during each individual season. A CPUE of 0.045 fish/100m reported for sturgeon season, which was only bested by that seen in 2012 (0.062 fish/100m), while a CPUE of 0.034 fish/100m was recorded during fish community season, which was topped in 2011 (0.045 fish/100m).

Like trammel nets, otter trawls during both seasons also witnessed the second highest CPUE ever calculated. With a CPUE of 0.027 fish/100m in 2013, catch rates were only better in 2010 (0.038 fish/100m). Between seasons, otter trawl CPUE was reported at 0.03 fish/100m for sturgeon season, while CPUE for fish community season was registered at 0.025 fish/100m. These catch rates remain comparable across all years, with no real obvious pattern in relation to abundance.

Trotline CPUE for both seasons in 2013 was reported to be 0.48 fish/20 hooks which was down slightly from the record high observed in 2012 (0.57 fish/20 hooks). However, the CPUE observed in 2013 was more triple that of 2010 (0.12 fish/20 hooks) and nearly three times higher than 2011 (0.19 fish/20 hooks).

The explanation for differing patterns in catch rates may reside in the size structure of the pallid sturgeon observed in Segment 2. In relation to gear, trammel net captures in 2013 averaged 418 mm TL, followed by trotlines (384 mm TL) and otter trawls (351 mm TL). With average length increasing in recent years (387 mm and 391 mm for 2013 and 2012, respectively), larger pallid sturgeon tend to have a higher capture probability while sampling with trammel nets and trotlines. With otter trawls capturing the smallest average sized fish, patterns are less discernible using this gear.

It is likely that the increased average size witnessed in 2012 and 2013 came from older and larger fish migrating from downstream locations. These fish were most likely draw upstream in 2011 by prolonged flows from both the Milk River and Fort Peck Spillway releases, which in turn created more favorable habitat. In addition, Milk River flows were again exceptional in 2013. During "normal" years, when cold, clear releases dominate the majority of Segment 2, older age classes of pallid sturgeon are found more frequently downstream, residing in the more naturalized portions of Segment 3.

The improved habitat conditions also brought with it changes in relative condition. During the high-water year of 2011 sub-stock (200-329 mm) pallid sturgeon exhibited an increase in Kn, however since then relative condition for this size class has shown a slow decline. The same increase was noted in the stock category of pallid sturgeon in Segment 2, however after a slight decline in 2012, their relative condition displayed a minute increase again in 2013. Relative condition comparisons for larger size classes of pallid sturgeon in Segment 2 remain difficult since Kn is based on very few observations of larger individuals. Even though elevated Milk River flows are beneficial to pallid sturgeon in Segment 2, it appears higher flows in conjunction with spillway releases may be the most favorable changes in regard to these fish.

A total of ten year classes of HRJPS were captured in Segment 2 in 2013, which was the most recorded since the Program started in 2006. Of known year class fish, rank of abundance were; 2009 (N=39), 2008 (N=20), 2010 (N-15), 2006 (N=7), 2005 (N=7), 2007 (N=6), 2003 (N=2), 2012 (N=1), 2002 (N=1), and 1997 (N=1). Although it is logical that different year class

capture probability increases as more stocking occurs, the continued presence of these older age classes is equally responsible.

Shovelnose sturgeon were once again a prevalent species observed in Segment 2 during the 2013 field season. Although shovelnose sturgeon captures (N=1,054) were down from the all time high recorded in 2012 (N=1,264), they were the most abundant species sampled in 2013. Although no major increases or decreases were witnessed in the CPUE of all gears, it is important to note that the population of shovelnose sturgeon in Segment 2 continues to be dominated by adult fish. This 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.

It has become less clear how the presumable beneficial habitat changes since 2011 have affected other native target species. For example, sturgeon chub otter trawl CPUE (0.05 fish/100m) in 2013 for both seasons was calculated to be the lowest ever recorded in Segment 2. The catch rate for both seasons was the result of a record low sturgeon season CPUE (0.04 fish/100m) and an average fish community CPUE of 0.05 fish/100m. Of importance is the fact that in previous years, increased observations were noted during sturgeon season, when compared to fish community season. Increased sturgeon season captures were thought to be attributed to spring migrations in response to spawning.

In contrast, sickelfin chubs exhibited a record high for combined-season CPUE (0.019 fish/100m). However, similarly to the sturgeon chubs, an above average CPUE (0.032 fish/100m) during fish community season compared to an average sturgeon season CPUE (0.007 fish/100m) causes comparisons to be difficult. Especially, like sturgeon chubs, increased sickelfin chub observations during sturgeon season were thought to be caused by spawning movements. Sicklefin chub comparisons in Segment 2 are further hampered by a routinely small sample size.

While large-scale habitat alterations may have benefited some species, it may have been disadvantages to others. Sand shiner mini-fyke net CPUE was at its lowest in 2011 and 2012 (0.67 and 0.09 fish/net night, respectively). However, in 2013 catch rates rebounded to 3.04 fish/net night, which was comparable those years before the high-water of 2011.

Hybognathus spp. showed a similar trend than that of sand shiners. With a mini-fyke net CPUE of 2.81 fish/net night in 2010, those catch rates plummeted to 0.16 and 0.04 fish/net night during 2011 and 2012, respectively, while CPUE rebounded to 2.63 fish/net night in 2013.

However, this pattern may not be quite so obvious when comparing the numbers observed previous to 2010. Despite the fact that CPUE was up before the record flows of 2011, the CPUE observed in 2006-2009 was similar to that witnessed in 2011 and 2012.

In summary, it is obvious that the record flows of 2011, in combination with good Milk River flows, have altered the habitat of Segment 2 in such a way that it is more beneficial to pallid sturgeon. Although it is less clear how changes affect other target species, it will be interesting to observe how future water management/natural flows will affect the population of pallid sturgeon residing here. As the habitat slowly reverts to pre-2011 conditions, it will remain to be seen if pallid sturgeon densities decrease in Segment 2 as the fish, particularly the older age classes, migrate back down stream to the presumably more favorable habitats associated with lower Segment 3 and Segment 4.

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, Amanda Bryson and Cara Holem-Bell 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. Raina Witherite and Eddie Bossert-Lomeli for their excellent work as an intern. Thanks to Dave Fuller 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, Luke Holmquist, when needed. Thanks to Ryan Wilson, Zac Sandness, Everett Nelson, Tyler Berger 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.

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

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 2012. 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	CONF	ISB	OSB	SCCL
			CHNB	CHNB	CHNB	CHNB	CHNB
BKSB	0	0	0	0	0	0	0
		0	0	0	0	0	0
BLGL	0	0	0	0	0	0	0
		0	0	0	0	0	0
BMBF	1	0.002	0	0	0.005	0	0
		0.003	0	0	0.01	0	0
BRBT	1	0.002	0.006	0	0	0	0
		0.004	0.011	0	0	0	0
BUSK	**8**	**0.018**	**0.01**	**0**	**0.027**	**0.02**	**0**
		0.013	**0.014**	**0**	**0.027**	**0.029**	**0**
CARP	2	0.004	0	0	0.007	0	0.06
		0.006	0	0	0.014	0	0.119
CNCF	14	0.028	0.03	0	0.018	0.046	0
		0.018	0.027	0	0.021	0.054	0
CSCO	1	0.002	0.007	0	0	0	0
		0.005	0.014	0	0	0	0
ERSN	0	0	0	0	0	0	0
		0	0	0	0	0	0
FHCB	82	0.16	0.216	0	0.139	0.118	0.222
		0.049	0.09	0	0.09	0.073	0.33
FHMW	0	0	0	0	0	0	0
		0	0	0	0	0	0
FWDM	0	0	0	0	0	0	0
		0	0	0	0	0	0
GDEY	79	0.173	0.122	0	0.324	0.08	0
		0.06	0.063	0	0.154	0.054	0
LKWF	1	0.005	0	0	0.014	0	0
		0.009	0	0	0.027	0	0
LNDC	0	0	0	0	0	0	0
		0	0	0	0	0	0
LNSK	11	0.024	0.042	0.133	0.01	0	0.079
		0.016	0.034	0.267	0.021	0	0.159
NFSH	0	0	0	0	0	0	0
		0	0	0	0	0	0
NTPK	1	0.007	0	0	0	0.028	0
		0.014	0	0	0	0.056	0
PDFH	1	0.003	0	0	0	0.01	0
		0.005	0	0	0	0.021	0

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	OSB	SCCL
			CHNB	CHNB	CHNB	CHNB	CHNB
PDSG	**24**	**0.046**	**0.056**	**0.066**	**0.042**	**0.032**	**0.069**
		0.027	**0.04**	**0.131**	**0.049**	**0.064**	**0.139**
RBTT	0	0	0	0	0	0	0
		0	0	0	0	0	0
RVCS	37	0.104	0.079	0.133	0.129	0.104	0.079
		0.066	0.059	0.267	0.136	0.168	0.159
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	**131**	**0.273**	**0.168**	**0**	**0.358**	**0.313**	**0.46**
		0.098	**0.096**	**0**	**0.235**	**0.166**	**0.583**
SHRH	17	0.043	0.032	0	0.029	0.08	0.056
		0.034	0.026	0	0.044	0.118	0.111
SMBF	3	0.006	0	0	0.005	0.019	0
		0.007	0	0	0.01	0.026	0
SNSG	**390**	**0.955**	**0.84**	**1.621**	**0.856**	**1.277**	**0.181**
		0.31	**0.256**	**1.298**	**0.422**	**1.03**	**0.163**
SNSN	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**
STCT	0	0	0	0	0	0	0
		0	0	0	0	0	0
STSN	0	0	0	0	0	0	0
		0	0	0	0	0	0
UBF	0	0	0	0	0	0	0
		0	0	0	0	0	0
UCA	0	0	0	0	0	0	0
		0	0	0	0	0	0
WLYE	6	0.012	0.018	0	0.017	0	0
		0.01	0.02	0	0.02	0	0
WSMW	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**
WTSK	14	0.041	0.019	0.52	0.039	0.024	0.056
		0.025	0.023	0.637	0.035	0.033	0.111
YWPH	0	0	0	0	0	0	0
		0	0	0	0	0	0

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

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
BKSB	0	0	0	0	0	0	0
		0	0	0	0	0	0
BLGL	0	0	0	0	0	0	0
		0	0	0	0	0	0
BMBF	0	0	0	0	0	0	0
		0	0	0	0	0	0
BRBT	0	0	0	0	0	0	0
		0	0	0	0	0	0
BUSK	**1**	**0.003**	**0**	**0.125**	**0**	**0**	**0**
		0.005	**0**	**0.25**	**0**	**0**	**0**
CARP	4	0.007	0.01	0	0.011	0	0
		0.007	0.014	0	0.015	0	0
CNCF	17	0.031	0.032	0	0.028	0.019	0.136
		0.017	0.025	0	0.025	0.038	0.184
CSCO	0	0	0	0	0	0	0
		0	0	0	0	0	0
ERSN	0	0	0	0	0	0	0
		0	0	0	0	0	0
FHCB	77	0.147	0.26	0	0.141	0.032	0.083
		0.057	0.148	0	0.065	0.033	0.108
FHMW	0	0	0	0	0	0	0
		0	0	0	0	0	0
FWDM	0	0	0	0	0	0	0
		0	0	0	0	0	0
GDEY	2	0.003	0.005	0	0.005	0	0
		0.005	0.01	0	0.011	0	0
LKWF	0	0	0	0	0	0	0
		0	0	0	0	0	0
LNDC	5	0.009	0.015	0	0.005	0	0.041
		0.008	0.017	0	0.011	0	0.082
LNSK	18	0.036	0.03	0.738	0.012	0.024	0
		0.022	0.028	0.276	0.017	0.037	0
NFSH	0	0	0	0	0	0	0
		0	0	0	0	0	0
NTPK	0	0	0	0	0	0	0
		0	0	0	0	0	0
PDFH	0	0	0	0	0	0	0
		0	0	0	0	0	0

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB
PDSG	**11**	**0.021**	**0.022**	**0**	**0.029**	**0.008**	**0.042**
		0.013	**0.022**	**0**	**0.03**	**0.015**	**0.084**
RBTT	0	0	0	0	0	0	0
		0	0	0	0	0	0
RVCS	7	0.014	0.005	0.292	0.02	0	0
		0.012	0.01	0.344	0.023	0	0
SFCB	**7**	**0.013**	**0.017**	**0**	**0.016**	**0.006**	**0**
		0.01	**0.02**	**0**	**0.019**	**0.013**	**0**
SGCB	**41**	**0.078**	**0.106**	**0**	**0.075**	**0.051**	**0.084**
		0.033	**0.06**	**0**	**0.054**	**0.068**	**0.109**
SGER	**28**	**0.056**	**0.022**	**1.333**	**0.065**	**0**	**0**
		0.039	**0.022**	**1.269**	**0.048**	**0**	**0**
SHRH	15	0.033	0.02	0.738	0.022	0.012	0
		0.026	0.02	0.954	0.026	0.025	0
SMBF	1	0.002	0.005	0	0	0	0
		0.003	0.01	0	0	0	0
SNSG	**140**	**0.325**	**0.206**	**2.083**	**0.373**	**0.311**	**0.141**
		0.204	**0.089**	**4.167**	**0.503**	**0.331**	**0.138**
SNSN	**1**	**0.003**	**0**	**0**	**0.011**	**0**	**0**
		0.007	**0**	**0**	**0.022**	**0**	**0**
STCT	1	0.002	0.005	0	0	0	0
		0.004	0.01	0	0	0	0
STSN	1	0.002	0	0	0.005	0	0
		0.003	0	0	0.011	0	0
UBF	0	0	0	0	0	0	0
		0	0	0	0	0	0
UCA	0	0	0	0	0	0	0
		0	0	0	0	0	0
WLYE	3	0.005	0.005	0	0.011	0	0
		0.006	0.01	0	0.015	0	0
WSMW	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**
WTSK	26	0.059	0.024	1.446	0.059	0	0.042
		0.051	0.024	2.021	0.056	0	0.084
YWPH	0	0	0	0	0	0	0
		0	0	0	0	0	0

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	CONF	ISB	SCCL	SCCS	SCN
			BARS	BARS	BARS	BARS	BARS	BARS
BKSB	1	0.011	0.032	0	0	0	0	0
		0.021	0.065	0	0	0	0	0
BLGL	21	0.221	0.032	0	0.559	0	0.071	0
		0.380	0.065	0	1.059	0	0.143	0
BMBF	3	0.032	0	0	0	0.25	0	0
		0.036	0	0	0	0.5	0	0
BRBT	5	0.053	0.065	0	0.088	0	0	0
		0.046	0.09	0	0.099	0	0	0
BUSK	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
CARP	30	0.316	0.161	0	0.059	0	0.929	2.25
		0.319	0.163	0	0.082	0	1.709	4.5
CNCF	15	0.158	0.29	0	0.176	0	0	0
		0.151	0.406	0	0.197	0	0	0
CSCO	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
ERSN	50	0.526	0.613	0	0.588	0.25	0.714	0
		0.351	0.606	0	0.573	0.5	1.429	0
FHCB	16	0.168	0.129	0	0.176	0	0.357	0
		0.126	0.154	0	0.215	0	0.578	0
FHMW	1268	13.347	0.839	0	1.206	0.75	1.857	292.5
		24.614	0.395	0	0.608	1.5	2.676	585
FWDM	1	0.011	0	0	0.029	0	0	0
		0.021	0	0	0.059	0	0	0
GDEY	2	0.021	0	0	0	0	0.143	0
		0.042	0	0	0	0	0.286	0
LKWF	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
LNDC	12	0.126	0.065	0	0.176	0.75	0.071	0
		0.091	0.09	0	0.197	0.957	0.143	0
LNSK	196	2.063	0.194	0	4.971	4	0.286	0.25
		2.188	0.327	0	5.96	8	0.327	0.5
NTPK	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
PDFH	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0

Species	Total Catch	Overall CPUE	CHXO	CONF	ISB	SCCL	SCCS	SCN
			BARS	BARS	BARS	BARS	BARS	BARS
PDSG	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
RBTT	6	0.063	0.032	0.5	0.029	0	0	0
		0.058	0.065	1	0.059	0	0	0
RVCS	571	6.011	5.355	0	3.471	0.25	18.786	5.75
		4.247	4.139	0	2.988	0.5	25.865	11.5
SFCB	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
SGCB	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
SGER	**15**	**0.158**	**0.129**	**0.5**	**0.088**	**0**	**0**	**0.5**
		0.109	**0.154**	**1**	**0.099**	**0**	**0**	**0.577**
SHRH	1	0.011	0	0	0.029	0	0	0
		0.021	0	0	0.059	0	0	0
SMBF	20	0.211	0.226	0	0.235	0	0.357	0
		0.127	0.24	0	0.19	0	0.496	0
SNSG	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
SNSN	**9**	**0.095**	**0.097**	**0**	**0.088**	**0.25**	**0**	**0.5**
		0.074	**0.108**	**0**	**0.13**	**0.5**	**0**	**1**
STCT	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
STSN	19	0.2	0.065	0.5	0.147	0	0.071	2.25
		0.2	0.09	1	0.149	0	0.143	4.5
UBF	23	0.242	0.065	0	0	0	0	5.25
		0.444	0.129	0	0	0	0	10.5
UCA	16	0.168	0	0	0.029	0	1.071	0
		0.296	0	0	0.059	0	1.994	0
WLYE	1	0.011	0	0	0.029	0	0	0
		0.021	0	0	0.059	0	0	0
WSMW	**4**	**0.042**	**0**	**0**	**0.088**	**0**	**0**	**0.25**
		0.041	**0**	**0**	**0.099**	**0**	**0**	**0.5**
WTSK	4327	45.547	44.419	4	76.294	31.75	3.143	39
		48.434	38.844	6	130.635	56.406	3.708	74.686
YWPH	1	0.011	0	0	0.029	0	0	0
		0.021	0	0	0.059	0	0	0

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	SCCL CHNB	TRML CHNB
BKSB	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BLGL	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BMBF	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BRBT	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BUSK	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
CARP	5	0.052	0.034	0	0.108	0	0	0
		0.046	0.069	0	0.104	0	0	0
CNCF	39	0.406	0.172	0	0.378	0.455	0.5	4
		0.174	0.174	0	0.21	0.315	0.577	4
CSCO	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
ERSN	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
FHCB	24	0.25	0.31	0	0.216	0.227	0.5	0
		0.111	0.224	0	0.158	0.261	0.577	0
FHMW	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
FWDM	1	0.01	0	0	0.027	0	0	0
		0.021	0	0	0.054	0	0	0
GDEY	47	0.49	0.345	1	0.486	0.455	1	1.5
		0.154	0.268	0	0.214	0.341	1.414	1
LKWF	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
LNDC	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
LNSK	5	0.052	0.034	0	0.081	0.045	0	0
		0.046	0.069	0	0.091	0.091	0	0
NTPK	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
PDFH	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
PDSG	**55**	**0.573**	**0.483**	**0**	**0.676**	**0.455**	**1.5**	**0**
		0.202	**0.274**	**0**	**0.356**	**0.469**	**1.291**	**0**

Species	Total Catch	Overall CPUE	CHXO CHNB	CONF CHNB	ISB CHNB	OSB CHNB	SCCL CHNB	TRML CHNB
RBTT	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
RVCS	1	0.01	0	0	0.027	0	0	0
		0.021	0	0	0.054	0	0	0
SFCB	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
SGCB	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
SGER	**6**	**0.063**	**0**	**0**	**0.081**	**0.045**	**0.25**	**0.5**
		0.05	**0**	**0**	**0.091**	**0.091**	**0.5**	**1**
SHRH	5	0.052	0	0	0.135	0	0	0
		0.046	0	0	0.114	0	0	0
SMBF	1	0.01	0	0.5	0	0	0	0
		0.021	0	1	0	0	0	0
SNSG	**307**	**3.198**	**3.655**	**9.5**	**2.838**	**3.136**	**1.25**	**1.5**
		0.685	**1.463**	**3**	**0.868**	**1.502**	**0.957**	**3**
SNSN	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
STCT	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
STSN	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
UBF	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
UCA	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
WLYE	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0
WSMW	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	**0**	**0**	**0**	**0**	**0**	**0**
WTSK	21	0.219	0.034	1.5	0.351	0.091	0.5	0
		0.112	0.069	1	0.235	0.125	0.577	0
YWPH	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0

Appendix G. Hatchery names, locations and abbreviations.

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

Appendix H. Alphabetic list of Missouri River fishes with total catch per unit effort by gear type for the sturgeon season and the fish community season during 2012 for Segment 2 of the Missouri River.

Species Code	Sturgeon Season		Fish Community Season			Both Seasons
	1.0" Trammel Net	Otter Trawl	1.0" Trammel Net	Mini-Fyke Net	Otter Trawl	Trot Lines
BKSB	0	0	0	0.011	0	0
BLGL	0	0	0	0.221	0	0
BMBF	0.003	0	0	0.032	0	0
BRBT	0.004	0	0	0.053	0	0
BUSK	**0.032**	**0**	**0.003**	**0**	**0.005**	**0**
CARP	0.008	0.003	0	0.316	0.010	0.052
CNCF	0.026	0.044	0.030	0.158	0.017	0.406
CSCO	0	0	0.005	0	0	0
ERSN	0	0	0	0.526	0	0
FHCB	0.187	0.151	0.133	0.168	0.142	0.250
FHMW	0	0	0	13.347	0	0
FWDM	0	0	0	0.011	0	0.010
GDEY	0.113	0.003	0.233	0.021	0.003	0.490
LKWF	0	0	0.009	0	0	0
LNDC	0	0.007	0	0.126	0.010	0
LNSK	0.012	0.023	0.037	2.063	0.050	0.052
NTPK	0.014	0	0	0	0	0
PDFH	0.005	0	0	0	0	0
PDSG	**0.062**	**0.031**	**0.030**	**0**	**0.010**	**0.573**
RBTT	0	0	0	0.063	0	0
RVCS	0.175	0.028	0.032	6.011	0	0.010
SFCB	**0**	**0.019**	**0**	**0**	**0.007**	**0**
SGCB	**0**	**0.139**	**0**	**0**	**0.017**	**0**
SGER	**0.479**	**0.072**	**0.067**	**0.158**	**0.041**	**0.063**
SHRH	0.081	0.007	0.005	0.011	0.058	0.052
SMBF	0.008	0	0.005	0.211	0.003	0.010
SNSG	**0.816**	**0.229**	**1.093**	**0**	**0.420**	**3.198**
SNSN	0	0.007	0	0.095	0	0
STCT	0	0	0	0	0.004	0
STSN	0	0	0	0.200	0.003	0
UBF	0	0	0	0.242	0	0
UCA	0	0	0	0.168	0	0
WLYE	0.016	0.003	0.008	0.011	0.007	0

Species Code	Sturgeon Season		Fish Community Season			Both Seasons
	1.0” Trammel Net	Otter Trawl	1.0” Trammel Net	Mini-Fyke Net	Otter Trawl	Trot Lines
WSMW	**0**	**0**	**0**	**0.042**	**0**	**0**
WTSK	0.056	0.023	0.027	45.547	0.095	0.219
YWPH	0	0	0	0.011	0	0

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 - 2013.

Bend Number	Bend River Mile	Coordinates		2006	2007	2008	2009	2010	2011	2012	2013
		Lattidude	Longitude								
1	1761	48.05581	106.32055	ST, FC					ST, FC, HW	ST, FC	ST
2	1760										
3	1759	48.04416	106.28819		ST, FC				HW		
4	1757.5	48.03696	106.25307						HW		
5	1756	48.03379	106.24998					ST, FC	FC		
6	1754.5	48.02680	106.19850			ST, FC		ST, FC	FC, HW		
7	1753	48.02938	106.16258		ST, FC	ST, FC			ST, FC	FC	ST
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
11	1745	48.02677	106.08480				ST, FC	ST, FC	ST, FC		
12	1744	48.03534	106.08521	ST, FC	ST, FC	ST, FC	ST, FC		FC		
13	1741.5	48.00999	106.04510				ST, FC	ST, FC			
14	1740	48.00255	106.02716		ST, FC						
15	1738	48.03068	106.01973								ST
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	
19	1732	48.01149	105.93182	ST, FC	ST, FC					ST, FC	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		2006	2007	2008	2009	2010	2011	2012	2013
		Lattidude	Longitude								
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	
26	1722	48.02402	105.79479		ST, FC				FC, HW	ST, FC	FC
27	1720	48.04621	105.77785				ST, FC	ST, FC	HW	FC	FC
28	1719	48.04468	105.76749	ST, FC	ST, FC				HW	ST	
29	1717.5	48.02643	105.74791					ST, FC	FC, HW	ST, FC	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
33	1710.5	48.04739	105.66245	ST, FC		ST, FC				ST, FC	ST, FC
34	1710	48.05159	105.64158	ST, FC			ST, FC			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
39	1704.5	48.08012	105.58631	ST, FC	ST, FC	ST, FC			ST, FC		ST, FC
40	1703	48.07828	105.56033				ST, FC		ST, FC, HW		ST, FC