# 2009 Annual Report

# Pallid Sturgeon Population Assessment and Associated Fish Community Monitoring for the Missouri River: Segment 3

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

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# EXECUTIVE SUMMARY

Montana Fish, Wildlife & Parks sampled 22 random river bends with standard gears in segment 3 of the Missouri River during both the sturgeon and fish community seasons in 2009. In addition, trotlines were deployed in 21 random bends over the entire sampling period. The sampling season began on the 27th of April and ended on the 26th of October. In all, 493 otter trawl samples were deployed averaging 268 m in distance for a total of 131.9 km trawled. Trammel nets were drifted 478 times averaging 229 m per drift for a total of 108.6 km. An additional 176 mini fyke nets were set during the fish community season and 292 trotlines were set over the entire sampling period.

More pallid sturgeon *Scaphirhynchus albus* (n = 190) were captured during 2009 than any previous year of sampling. The total number of pallid sturgeon captured in segment 3 has increased in each year since the inception of the program in Montana. However, the increase in total pallid sturgeon captures has mostly been an artifact of additional effort from standardized, wild and experimental gears and has not been attributed to an increase in CPUE of standard gears. Overall CPUE of pallid sturgeon using trammel nets was slightly lower in 2009 than during 2008, while otter trawl CPUE slightly increased from 2008.

Trotlines proved to be a very effective gear in sampling pallid sturgeon in 2009 with 72 sampled. Of the 72 pallid sturgeon sample, 43 were captured during a three day intensive trotline effort in the lower portions of segment 3. During the three days of sampling nine different year classes of pallid sturgeon were represented from nine separate stocking locations from both the Missouri and Yellowstone Rivers. This lower section of segment 3 is potentially one of the most important rearing areas for hatchery reared juvenile pallid sturgeon in RPMA 2, and further research on why pallid sturgeon abundance is relatively high when compared to upstream areas may be warranted.

In 2009, the first wild pallid sturgeon was captured using standard gears in the four years of sampling. This adult pallid sturgeon measured 1,370 mm FL and was captured at rivermile 1625.5 on August 10th in a trammel net.

Over the past four years of sampling the size structure of pallid sturgeon sampled in segment 3 has changed. A higher proportion of larger fish are being sampled during both the fish community and sturgeon seasons when compared to the first year of sampling. A total of 11

year classes of pallid sturgeon were sampled in segment 3 during 2009. The 2005 through 2008 year classes dominated with 88% of the total catch. Additionally, pallid sturgeon from 11 different stocking locations within the Missouri and Yellowstone Rivers were sampled. On average the growth rates of recaptured pallid sturgeon are higher in segment 3 than its upstream counterpart, segment 2.

During 2009 a total of 375 shovelnose sturgeon were sampled in segment 3 of the Missouri River, very similar to the 378 sampled in 2008. Shovelnose sturgeon catch rates in 2009 as well as previous years are significantly lower in segment 3 when compared to upstream in segment 2. Trammel net CPUE for quality and above sized shovelnose sturgeon in segment 3 was one-sixth that of segment 2. Overall otter trawl CPUE of stock size and larger shovelnose sturgeon in segment 3 was similar in 2009 to the three previous years. However, all shovelnose sturgeon sampled over the past four years in both segments 2 and 3 that were smaller than 300 mm FL were sampled in segment 3. Nevertheless, during 2009 we did not capture any shovelnose sturgeon smaller than 268 mm FL in 2009, which again was the first year that these smaller size classes were absent from the catch.

Although the relative abundance of shovelnose sturgeon in higher in segment 2 than 3, on average the relative weights of shovelnose sturgeon are higher in segment 3 when compared to segment 2. With the increase in pallid sturgeon catch in segment 3, the total ratio of shovelnose to pallid sturgeon was 2:1 during 2009 a decrease from the 3:1 ratio observed during 2006, the first year of sampling.

A likely young-of-the-year blue sucker was sampled via the otter trawl on August 24$^{th}$ at rivermile 1591. This fish measured 96 mm TL and was the first evidence of recent recruitment to the blue sucker population that the population assessment team has found in four years of sampling segments 1-3 in Montana.

Overall during 2009 a total of 9,461 fish consisting of 33 species were collected in segment 3 of the Missouri River. Mini fyke nets collected 68% of all fish sampled, followed by otter trawls (15%), trammel nets (10%) and trotlines (7%). Species like sturgeon chubs *Macrhybopsis gelida* and sicklefin chubs *M. meeki* are more abundant in segment 3 when compared to segment 2. In addition, many native fishes follow a similar pattern to pallid sturgeon with an increase in relative abundance as you go downstream in segment 3. The downstream portions of segment 3 are the most naturalized portions of the Missouri River

downstream of Fort Peck within Montana. Continued evaluations of habitat features and fish community structure on both large and finer scales may allow us to better understand the specific factors that are allowing pallid sturgeon and other native fishes to do comparably better in these areas when compared to the more altered habitats upstream.

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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 2009). 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 2009). 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 North Dakota border, 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 flows and swift current and therefore they 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 < 1.2 m in depth.

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

Montana Fish, Wildlife & Parks samples three segments on the Missouri River below Fort Peck Dam to its confluence with the Yellowstone River in accordance with the Pallid Sturgeon Population Assessment Program. Study segment 3 of the Missouri River Pallid Sturgeon Population Assessment Program encompasses 119 river miles from Wolf Point, MT to the confluence of the Missouri and Yellowstone Rivers in North Dakota. In this large section, the river has completely transitioned from a cold clear cobble substrate river in segment 2 to a warm turbid prairie river, more similar to its natural characteristics (Galat et al, 2005). The aggrading streambed of segment 3 is flanked by stream deposited sediment of the Fort Union Formation (NRIS, 2007). This stretch of river is slightly less flow regulated than upstream segments due to the tributaries and runoff events. There are five major tributaries that influence this section of river, which include the Milk River, Redwater River, Poplar River, Big Muddy Creek, and Prairie Elk Creek. These sediment packed tributaries flush their warmer turbid waters into the Missouri River increasing flows and suspended sediment, which in turn enables sandbar and island formation. Turbidities in this stretch of river are greater than that of segment 2 and discharge constantly changes with precipitation events and tributary discharge. The species composition of this stretch of river is vastly different from the uppermost segment just below Fort Peck Dam. The non-native fish stocked for recreation are much less prevalent and the prevalence of native, non-sport fish is increased (Gardner and Stewart, 1987). This stretch of

ever-changing river is diverse with over 36 species of fish, many of which are benthic specialists, exhibiting streamlined bodies and well-developed chemosensory organs for surviving the sometimes high flows and ever-turbid waters (Galat et al, 2005; Berry et al. 2004). This stretch of river can be highly dynamic and is more reminiscent of what the Missouri River looked like before it became one of the most regulated and impounded rivers in the United States (Galat et al, 2005). However, due to the extremely low spring and summer flows that we've experienced in the past three years due to the operations of Fort Peck Dam, habitat formation is not occurring as it might have during the high runoff years of the 1990's.

# Methods

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

### Sampling Site Selection and 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 3 consisted of 22 randomly selected bends. All 22 bends were sampled during both the sturgeon season (April 1 through June 30) and the Fish Community Season (July 10 through October 28) during 2008.

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 22 randomly selected bends during both seasons. Additionally, mini fyke nets were also considered

a standard gear for the fish community season and all 22 randomly selected bends were sampled with mini fyke nets.

Trotlines were used in segment 3 during 2009 as an experimental gear with the intent to further evaluate its use as a pallid sturgeon gear. Twenty-one randomly chosen river bends were sampled using trotlines, 10 during the sturgeon season and 11 during the fish community season. Random river bends for trotlines were chosen by moving one river bend upstream from the randomly chosen river bends for standard gears. This was done to minimize the influence of trotlines on our standard gears and make logistics easier. Since trotlines are a gear that requires attending a river bend on two consecutive days, it is logistically better to be able to set trotlines on the same day as otter trawling or drifting trammel nets occurs. We also wanted to make sure that one gear wasn't influencing the catch of other gears and by sampling the next river bend upstream we believe we achieved this. No marked pallid sturgeon captured in standard gears or trotlines were subsequently captured in different gear at an adjacent bend within the same sampling period in 2009.

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, please see Welker and Drobish (2009).

#### Trammel Net

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

#### Otter Trawl

The standard otter trawl has a length of 7.6 m, a width of 4.9 m and height of 0.9 m. The otter trawl has an inner mesh (6.35mm bar, #18 polyethylene twine) and outer mesh (38mmbar, #9 polyethylene twine) and a cod end opening of 406.4 mm. The trawl doors were made from 19.1 mm marine plywood and measured 762 mm x 381 mm. The trawl doors are used to keep the mouth of the trawl open while deployed on the riverbed. The trawl also has a 7.9 m long tickler chain attached to the bottom of the mouth of the trawl, which aids in keeping it orientated on the riverbed and protecting the mouth when snags are encountered. The otter trawl was deployed from the bow of the boat parallel to the current with two 30.5 m ropes and towed downstream slightly faster than current speed for a minimum of 75 m and a maximum distance of 300 m.

#### Mini Fyke Nets

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

## Trotlines

Trotlines consisted of 32 m nylon rope attached to both upstream and downstream anchors. Octopus style circle hooks were attached to the ropes using 136 kg monofilament line and commercial fishing clips. Twenty 45.7 cm leaders were used on each trotline each with a 3/0 Eagle Claw circle hook. Experimental 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 either a Current AA Price Meter and sounding reel or a Marsh-McBirney Flo Mate 2000. Velocities for shallow water habitats (< 1.2 m) were taken at the bottom and 0.6 of the bottom depth using the March-McBirney Flo Mate 2000.

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

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

## Genetic Verification

Genetic verification for pallid sturgeon or potential hybrids followed the methods outlined in Welker and Drobish (2009). Two fin pectoral fin clips (~ 2 $cm^2$) are taken from any pallid sturgeon of unknown origin. Fin samples are then preserved in 95% non-denatured alcohol for genetic analysis. All samples are sent to the U.S. Fish and Wildlife Service's Lamar Laboratory for analysis and archiving.

## Relative Condition

Relative condition (Kn) for all sampled pallid sturgeon was calculated using the following formula: Kn = W / W', where W is the fork length of the specimen and W' is the

length-specific mean weight predicted by the weight-length relationship equation calculated for that population. Since no weight length-relationship exists for the hatchery reared pallid sturgeon population in segment 2, we used the weight-length relationship [$\log_{10} W = -6.378 + 3.357 \log_{10} L$ ($r^2 = 0.9740$)] derived by Keenlyne and Evanson (1993) for pallid sturgeon throughout their range.

### 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.

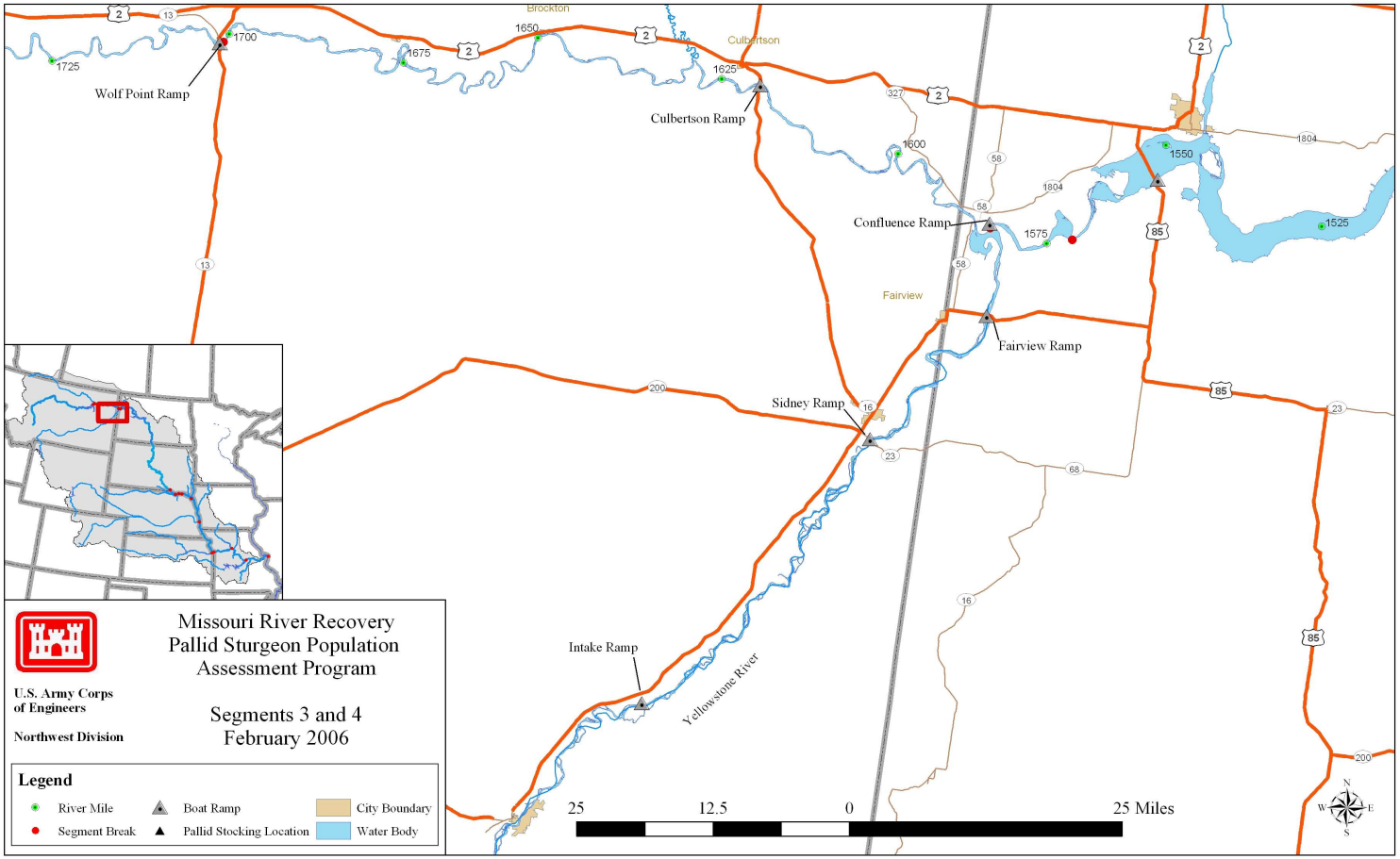


Figure 1. Map of segment 3 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 3 encompasses the Missouri River from Wolf Point, MT (River Mile 1701.0) to the confluence with the Yellowstone River (River Mile 1582.0).

# Results

## Effort

A total of 22 randomly selected river bends were sampled using trammel nets and the otter trawl during the sturgeon season of 2009. Each gear had an average of 8 random deployments (Table 1). In addition, 32 non random otter trawl and 14 trammel net deployments were made as duplicate passes subsequent to capturing pallid sturgeon. Trotlines were used in 10 randomly selected bends during the sturgeon season, each with eight subsamples.

During the fish community season the same 22 randomly selected bends were sampled with trammel nets and the otter trawl as well as mini fyke nets. Otter trawl and trammel nets had an additional 58 and 47 non-random duplicate subsamples deployed after catching a pallid sturgeon. Trotlines were set in 11 random river bends during the fish community season.

From August 24$^{th}$ through 26$^{th}$ non-random trotline samples as well as otter trawl and trammel nets deployments were made in non-random river bends to increase our pallid sturgeon catch. The increased numbers will be used to populate survival estimates of pallid sturgeon released into RPMA 2.

## Pallid Sturgeon

During 2009 a total of 189 pallid sturgeon were sampled in segment 3 of the Missouri River, which was more than any of the three previous sampling years (Figure 9). All but one pallid sturgeon sampled were of hatchery origin. The one wild pallid sturgeon was an adult measuring 1,370 mm FL captured at rivermile 1625.5 on August 10$^{th}$ in a trammel net. This was the first wild pallid sturgeon sampled using the standardized protocols of the Population Assessment Program during the four years the Program has been implemented in Montana. Over the four year span a total of 460 pallid sturgeon have been sampled in segment 3.

Pallid sturgeon were captured throughout the length of segment 3, however the highest catches occurred in the downstream portions of the segment starting at about rivermile 1620 (Figure 2). Experimental trotlines sample 72 pallid sturgeon, more than any other gear. For the standard gears, the otter trawl sampled 70 pallid sturgeon, while trammel nets caught 47. Mini

fyke nets did not capture a pallid sturgeon. More pallid sturgeon were sampled in the fish community season (n = 148) than during the sturgeon season (n = 41).

The proportion of pallid sturgeon sampled by length group has subtly changed since 2006. In 2009 a few fish from the quality and larger size groups were seen in the catch. Little change has been observed during the sturgeon season, where the last three years of sampling have consisted of sub-stock and stock sized fish. The subtle change that has occurred has occurred during the fish community season, where a few larger fish of quality size and above have been captured the past two years. Most of these larger sized pallid sturgeon have been sampled using trotlines.

Eleven different year classes of pallid sturgeon were sampled during 2009, an increase from 11 year classes sampled in 2008. The 2007 year class was the most abundant year class sampled with 47 captured, followed by 2008 (n = 45), 2006 (n = 38), 2005 (n = 32), 2004 (n = 5), 2002 (n = 5), 2001 (n = 5), 2009 (n = 3), 1998 (n = 2), 1997 (n = 2) and 2003 (n = 1).

The relative condition of pallid sturgeon within a size class has remained similar between years of sampling. However, a pattern of decreasing relative condition is seen as fish move from smaller to larger size classes (Figure 4). The one wild adult captured had a high relative condition when compared to its hatchery counterparts.

Although the total number of pallid sturgeon sampled has increased over the past four years of sampling, this pattern has not been manifested in the CPUE data for either trammel nets or the otter trawl (Figures 6 and 7). Overall trammel net CPUE of pallid sturgeon was slightly lower in 2009 than in 2008 and 2006 (Figure 6). While the CPUE for the otter trawl was higher in 2009 than during 2008, it was still slightly lower than the 2007 estimate. With the high variance associated with the estimates no conclusions can be made at this time about the relative abundance of pallid sturgeon using this gear. Interestingly, the pattern of overall CPUE for the trammel net and otter trawl have been opposite of one another over the past four years. For instance, overall trammel net CPUE was higher in 2006 then lower in 2007 then back to higher in 2008 and lower in 2009. Otter trawl CPUE showed an opposite pattern being lower in 2006 then higher in 2007 then lower in 2008 and higher in 2009.

Trotlines proved to be a very effective gear at sampling pallid sturgeon in 2009. From August 24$^{th}$ through 26$^{th}$ we implemented an intensive trotlining effort which consisted of setting 16 trotlines at a time as both an overnight and timed sets between rivermiles 1594 to 1587. A

total of 43 pallid sturgeon representing 9 distinct year classes were sampled. These fish originated from nine separate stocking sites within RPMA 2 including sites on both the Missouri and Yellowstone River. This sampling effort captured many of the largest pallid sturgeon seen throughout the entire year of sampling.

For specific environmental variables associated with pallid sturgeon captures by macro and macro habitat types see Table 2. For the proportion of pallid sturgeon captured by gear in macro habitat and the proportion those habitats were sampled by pallid sturgeon size class see Tables 4 through 7 and for all sizes of pallid sturgeon combined see Table 8.

Table 1. Number of bends sampled, mean number of deployments, and total number of deployments by macrohabitat for Segment 3 on the Missouri River during the sturgeon season and fish community season in 2009. N-E indicates the habitat is non-existent in the segment.

| Gear | Number of Bends | Mean deploy-ments | Macrohabitat[a] | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BRAD | CHXO | CONF | DEND | DRNG | ISB | OSB | SCCL | SCCS | SCN | TRIB | TRML | TRMS | WILD |
| **Sturgeon Season** | | | | | | | | | | | | | | | | |
| 1.0" Trammel Net | 22 | 7.95 | N-E | 56 | N-E | N-E | N-E | 55 | 55 | 9 | 0 | 0 | N-E | N-E | 0 | N-E |
| Gill Net | | | | | | | | | | | | | | | | |
| Otter Trawl | 22 | 8.00 | N-E | 52 | N-E | N-E | N-E | 56 | 50 | 18 | 0 | 0 | N-E | N-E | 0 | N-E |
| **Fish Community Season** | | | | | | | | | | | | | | | | |
| 1.0" Trammel Net | 22 | 8.00 | N-E | 56 | N-E | N-E | N-E | 62 | 53 | 5 | 0 | 0 | N-E | N-E | 0 | N-E |
| Mini-Fyke Net | 23 | 7.57 | N-E | 51 | N-E | N-E | N-E | 56 | 2 | 22 | 37 | 4 | N-E | N-E | 2 | N-E |
| Otter Trawl | 22 | 8.00 | N-E | 59 | N-E | N-E | N-E | 61 | 48 | 8 | 0 | 0 | N-E | N-E | 0 | N-E |

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

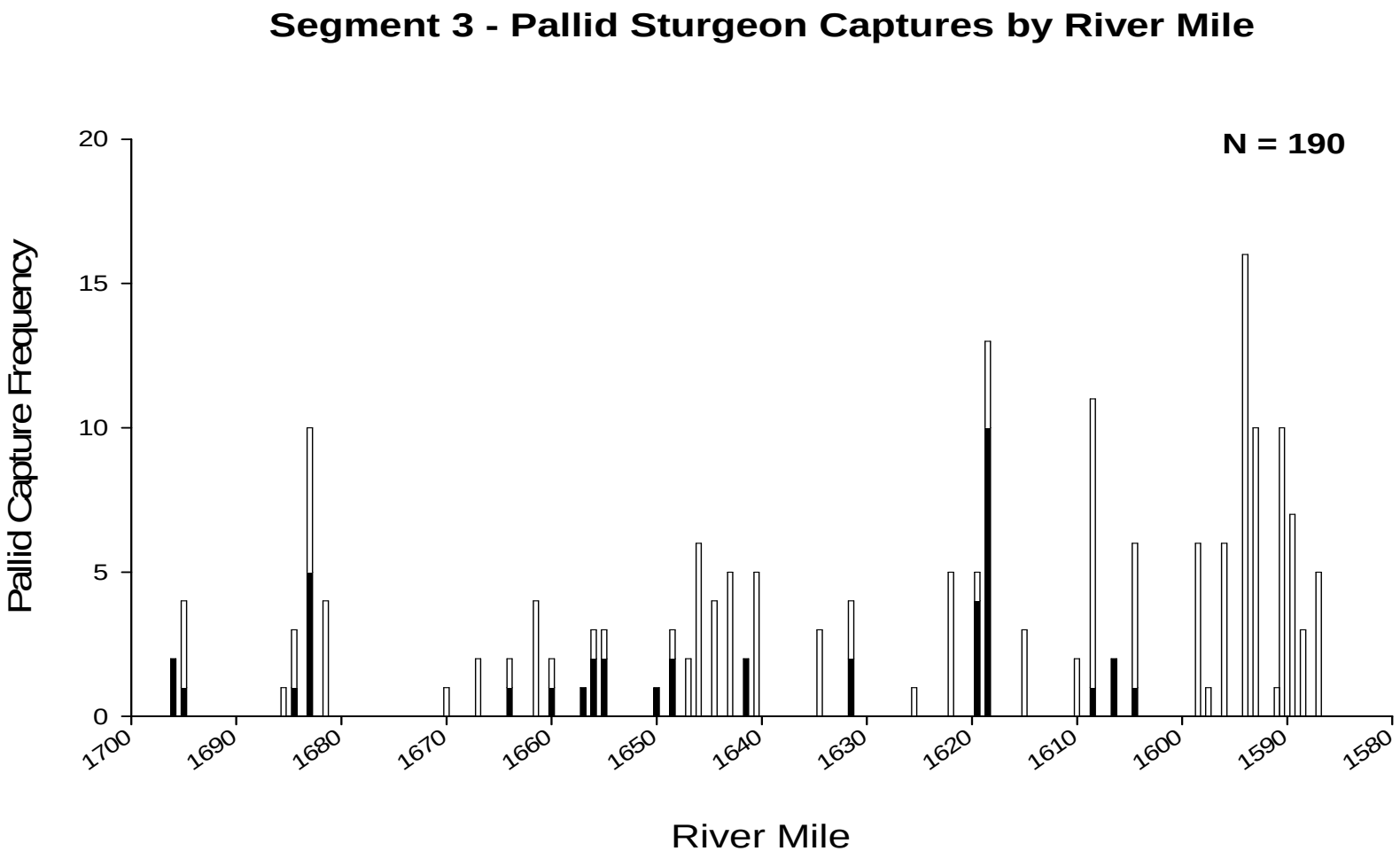


Figure 2. Distribution of pallid sturgeon captures by river mile for Segment 3 of the Missouri River during 2009. Black bars represent pallid captures during the sturgeon season and white bars during the fish community season. Figure includes all pallid captures including non-random and wild samples.

Table 2. Pallid sturgeon capture summaries for all gears relative to habitat type and environmental variables on the Missouri River during 2009. Means (minimum and maximum) are presented. Habitat definitions and codes presented in Appendix B.

| Habitat | | Depth (m) | | Bottom Velocity (m/s) | | Temperature ($^{o}$C) | | Turbidity (ntu) | | Total pallids caught |
|---|---|---|---|---|---|---|---|---|---|---|
| Macro- | Meso- | Effort | Catch | Effort | Catch | Effort | Catch | Effort | Catch | |
| BRAD | BARS | | | | | | | | | |
| | CHNB | | | | | | | | | |
| | DTWT | | | | | | | | | |
| | ITIP | | | | | | | | | |
| | POOL | | | | | | | | | |
| | TLWG | | | | | | | | | |
| CHXO | BARS | 0.4 (0.1-0.6) | | 0.06 (0.00-0.15) | | 13.9 (2.6-21.6) | | 39 (16-75) | | |
| | CHNB | 1.5 (0.7-3.9) | 1.5 (0.9-2.8) | 0.65 (0.11-0.95) | 0.59 (0.11-0.83) | 16.0 (2.6-22.8) | 15.5 (2.8-22.5) | 99 (14-1424) | 115 (15-1408) | 72 |
| | DTWT | | | | | | | | | |
| | ITIP | | | | | | | | | |
| | POOL | | | | | | | | | |
| | TLWG | | | | | | | | | |
| CONF | BARS | | | | | | | | | |
| | CHNB | | | | | | | | | |
| | DTWT | | | | | | | | | |
| | ITIP | | | | | | | | | |
| | POOL | | | | | | | | | |

| Habitat | | Depth (m) | | Bottom Velocity (m/s) | | Temperature ($^{o}$C) | | Turbidity (ntu) | | Total pallids caught |
|---|---|---|---|---|---|---|---|---|---|---|
| Macro- | Meso- | Effort | Catch | Effort | Catch | Effort | Catch | Effort | Catch | |
| | TLWG | | | | | | | | | |
| DRNG | BARS | | | | | | | | | |
| | CHNB | | | | | | | | | |
| | DTWT | | | | | | | | | |
| | ITIP | | | | | | | | | |
| | POOL | | | | | | | | | |
| | TLWG | | | | | | | | | |
| ISB | BARS | 0.4 (0.1-1.1) | | 0.04 (0.00-0.13) | | 14.7 (2.7-22.0) | | 40 (18-77) | | |
| | CHNB | 1.4 (0.5-3.6) | 1.4 (0.5-3.4) | 0.64 (0.14-0.86) | 0.58 (0.14-0.82) | 16.4 (2.5-28.0) | 16.0 (2.8-21.1) | 99 (14-1460) | 104 (14-360) | 75 |
| | DTWT | | | | | | | | | |
| | ITIP | | | | | | | | | |
| | POOL | | | | | | | | | |
| | TLWG | | | | | | | | | |
| OSB | BARS | 0.3 (0.2-0.3) | | 0.02 (0.02-0.02) | | 3.8 (3.8-3.8) | | 50 (50-50) | | |
| | CHNB | 2.2 (0.8-6.3) | 1.7 (0.8-3.2) | 0.71 (0.28-0.96) | 0.63 (0.33-0.79) | 15.8 (2.6-22.8) | 15.2 (2.7-21.3) | 92 (13-1420) | 186 (19-1360) | 22 |
| | DTWT | | | | | | | | | |
| | ITIP | | | | | | | | | |
| | POOL | | | | | | | | | |
| | TLWG | | | | | | | | | |

| Habitat | | Depth (m) | | Bottom Velocity (m/s) | | Temperature ($^{o}$C) | | Turbidity (ntu) | | Total pallids caught |
|---|---|---|---|---|---|---|---|---|---|---|
| Macro- | Meso- | Effort | Catch | Effort | Catch | Effort | Catch | Effort | Catch | |
| SCCL | BARS | 0.4 (0.2-0.7) | | 0.07 (0.00-0.14) | | 13.6 (2.7-20.1) | | 46 (12-82) | | |
| | CHNB | 1.3 (0.6-4.0) | 1.3 (0.9-2.4) | 0.58 (0.02-0.83) | 0.44 (0.02-0.60) | 15.4 (2.7-22.5) | 16.1 (2.7-22.3) | 93 (18-377) | 107 (18-352) | 21 |
| | DTWT | | | | | | | | | |
| | ITIP | | | | | | | | | |
| | POOL | | | | | | | | | |
| | TLWG | | | | | | | | | |
| SCCS | BARS | 0.4 (0.2-0.9) | | 0.05 (0.00-0.20) | | 17.8 (2.9-24.5) | | 34 (7-71) | | |
| | CHNB | | | | | | | | | |
| | DTWT | | | | | | | | | |
| | ITIP | | | | | | | | | |
| | POOL | | | | | | | | | |
| | TLWG | | | | | | | | | |
| SCN | BARS | | | | | | | | | |
| | CHNB | | | | | | | | | |
| | DTWT | | | | | | | | | |
| | ITIP | | | | | | | | | |
| | NULL | 0.5 (0.3-0.6) | | 0.01 (0.01-0.01) | | 19.1 (15.2-23.0) | | 48 (32-64) | | |
| | TLWG | | | | | | | | | |
| TRIB | BARS | | | | | | | | | |

| Habitat | | Depth (m) | | Bottom Velocity (m/s) | | Temperature ($^{o}$C) | | Turbidity (ntu) | | Total pallids caught |
|---|---|---|---|---|---|---|---|---|---|---|
| Macro- | Meso- | Effort | Catch | Effort | Catch | Effort | Catch | Effort | Catch | |
| | CHNB | | | | | | | | | |
| | DTWT | | | | | | | | | |
| | ITIP | | | | | | | | | |
| | POOL | | | | | | | | | |
| | TLWG | | | | | | | | | |
| TRML | BARS | | | | | | | | | |
| | CHNB | | | | | | | | | |
| | DTWT | | | | | | | | | |
| | ITIP | | | | | | | | | |
| | POOL | | | | | | | | | |
| | TLWG | | | | | | | | | |
| TRMS | BARS | 0.6 (0.4-0.7) | | 0.01 (0.01-0.01) | | 25.0 (25.0-25.0) | | 74 (74-74) | | |
| | CHNB | | | | | | | | | |
| | DTWT | | | | | | | | | |
| | ITIP | | | | | | | | | |
| | POOL | | | | | | | | | |
| | TLWG | | | | | | | | | |

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 2009 from Segment 3 of the Missouri River. Relative condition factor was calculated using the equation in Shuman et al. (In review).

| Year class | N | Stock Data | | | Recapture Data | | | Growth Data | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length (mm) | Weight (g) | $K_n$ | Length (mm) | Weight (g) | $K_n$ | Length (mm/d) | Weight (g/d) |
| 1997 | 2 | | | | 653 | 928.5 | 789 | | |
| | | | | | 1 | 49.0 | 0.046 | | |
| 1998 | 2 | 540 | | | 866 | 2405.0 | 0.789 | 0.100 | |
| | | 0 | | | 35 | 440.0 | 0.038 | 0.011 | |
| 2001 | 5 | 220 | | | 417 | 238.0 | 0.858 | 0.070 | |
| | | 40 | | | 40 | 100.1 | 0.079 | 0.008 | |
| 2002 | 5 | 286 | | | 600 | 714.2 | 0.792 | 0.136 | |
| | | 18 | | | 43 | 162.8 | 0.021 | 0.016 | |
| 2003 | 1 | 255 | | | 344 | 139.0 | 1.013 | 0.049 | |
| 2004 | 5 | | | | 341 | 127.6 | 0.956 | | |
| | | | | | 8 | 7.9 | 0.044 | | |
| 2005 | 32 | 259 | 40.0 | 1.413 | 339 | 122.5 | 0.929 | 0.081 | 0.045 |
| | | 20 | | | 8 | 9.2 | 0.030 | 0.017 | |
| 2006 | 38 | 263 | 78.0 | 1.356 | 328 | 110.7 | 0.920 | 0.108 | 0.065 |
| | | 15 | 19.7 | 0.133 | 12 | 11.7 | 0.036 | 0.014 | 0.020 |
| 2007 | 47 | 243 | 68.5 | 1.207 | 305 | 99.8 | 1.033 | 0.183 | 0.108 |
| | | 29 | 35.5 | 0.142 | 16 | 17.4 | 0.075 | 0.030 | 0.033 |
| 2008 | 45 | 287 | 81.9 | 1.081 | 232 | 45.8 | 1.086 | 0.382 | 0.146 |
| | | 16 | 15.4 | 0.077 | 18 | 9.6 | 0.056 | 0.081 | 0.098 |
| 2009 | 3 | | | | 282 | 68.3 | 0.928 | | |
| | | | | | 61 | 41.5 | 0.118 | | |

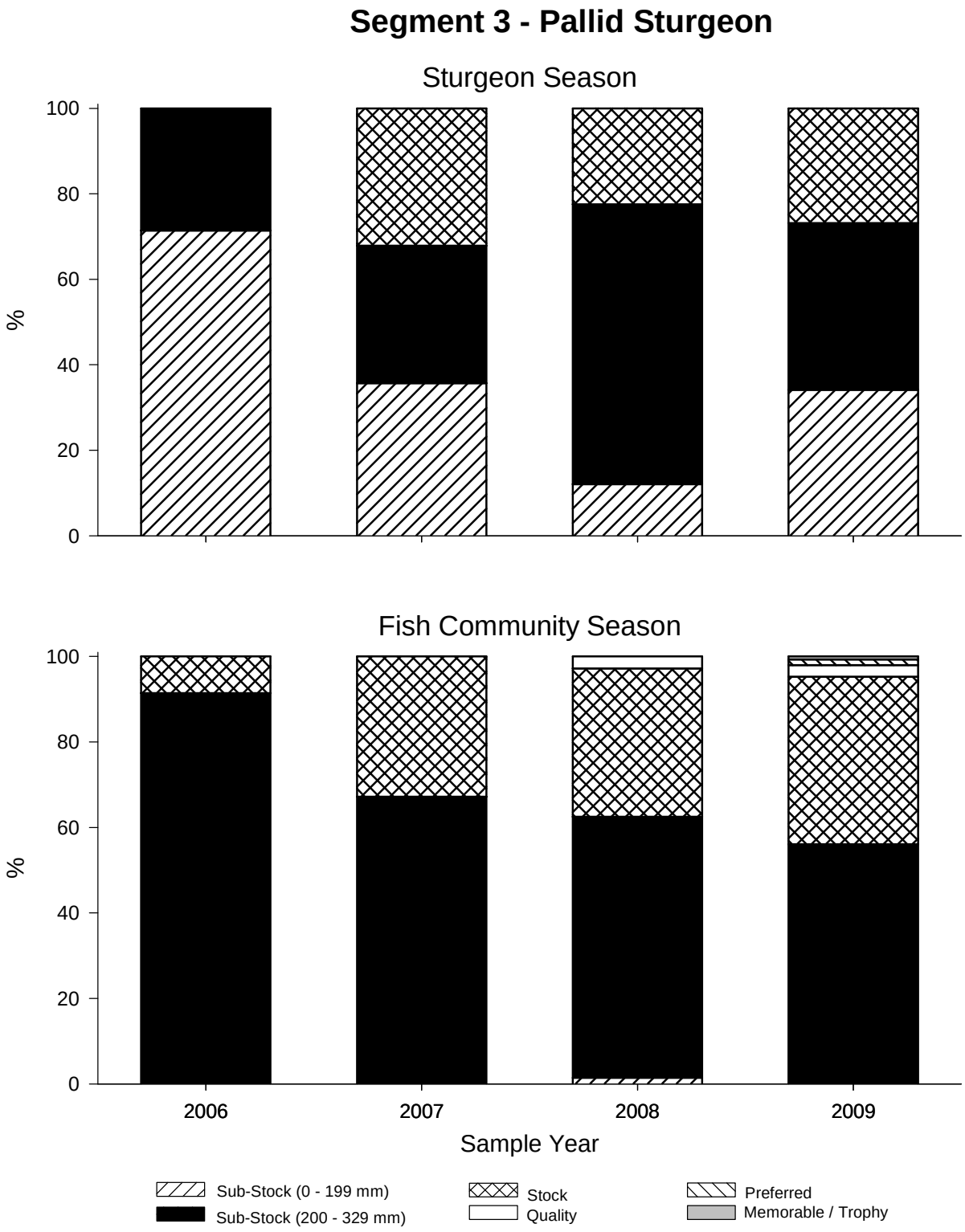


Figure 3. Proportion by length group for all pallid sturgeon captured with all gear by length category from 2005-2009 in Segment 10 in the Missouri River. Length categories determined using the methods proposed by Shuman et al. (2006).

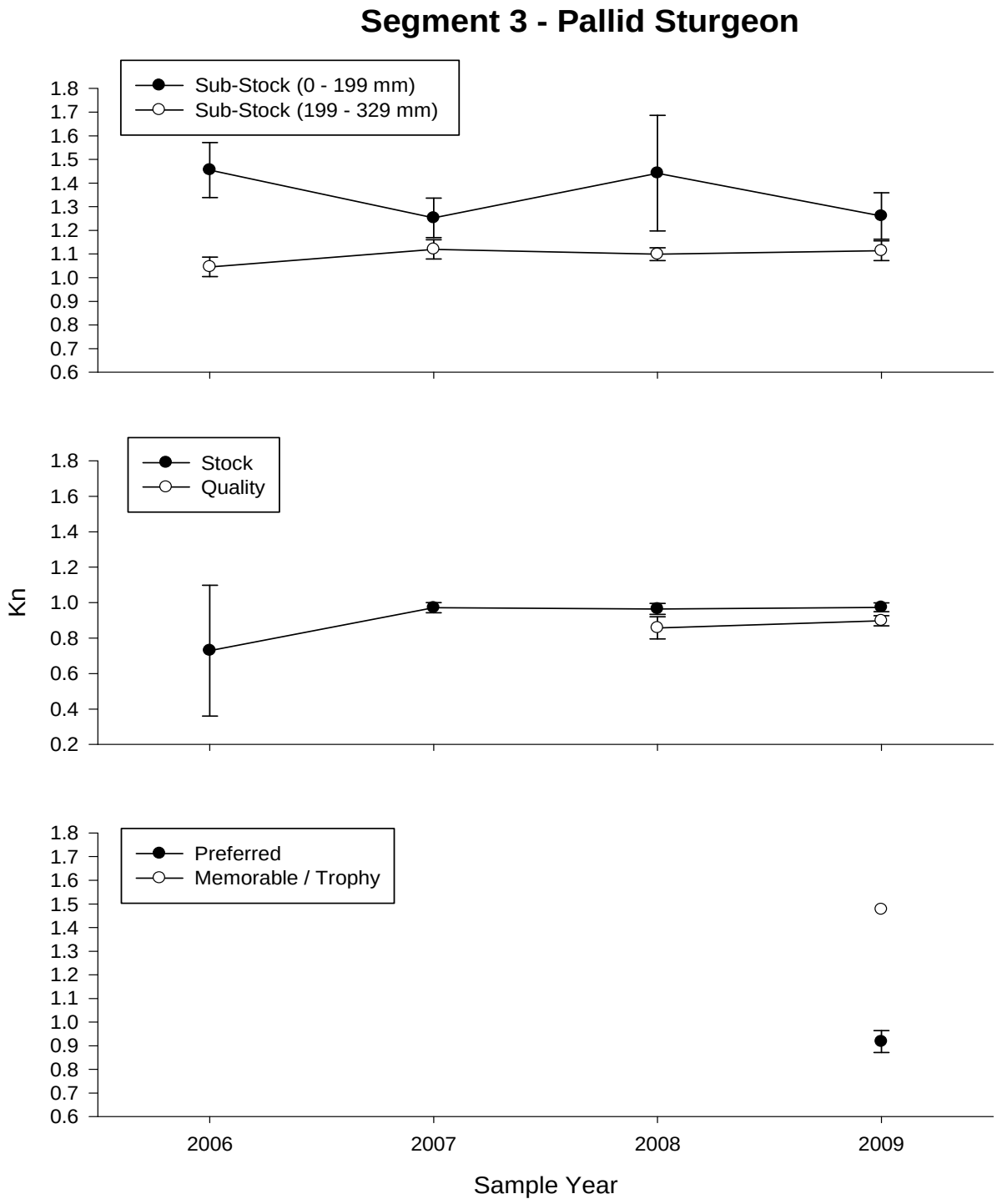


Figure 4. Relative condition factor (Kn) for all pallid sturgeon captured with all gear by incremental relative stock density (RSD) length category from 2006-2009 in Segment 3 in the Missouri River. Length categories determined using the methods proposed by Shuman et al. (2006). Relative condition factor was calculated using the equation in Shuman et al. (In review).

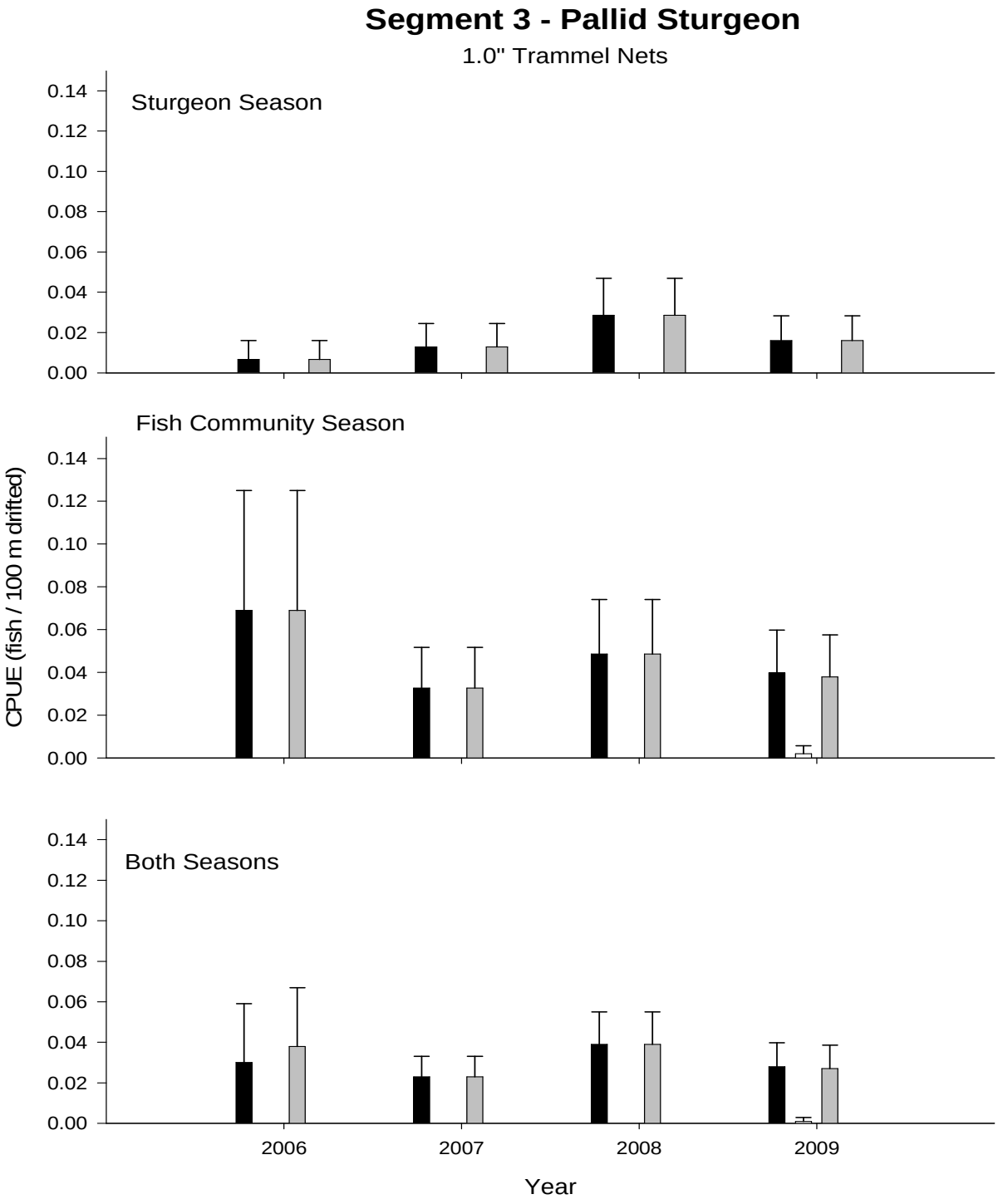


Figure 6. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using 1.0" trammel nets in Segment 3 of the Missouri River from 2006-2009. Pallid sturgeon of unknown origin are awaiting genetic verification.

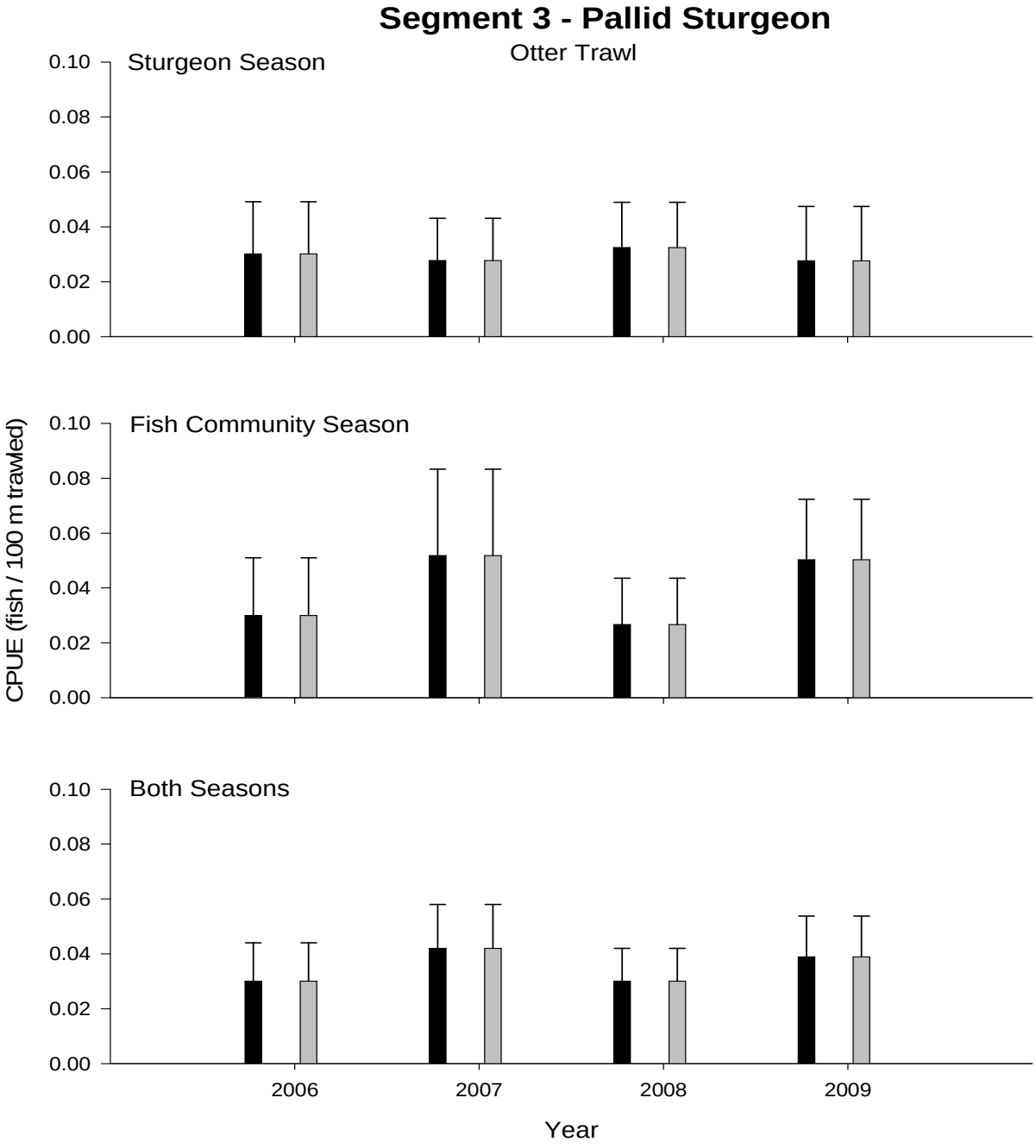


Figure 7. Mean annual catch per unit effort (+/- 2 SE) of all (black bars), wild (white bars), hatchery reared (gray bars), and unknown origin (cross-hatched bars) pallid sturgeon using otter trawls in Segment 3 of the Missouri River from 2006-2009. Pallid sturgeon of unknown origin are awaiting genetic 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 3 of the Missouri River during 2009. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

| Gear | N | Macrohabitat[a] | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BRAD | CHXO | CONF | DEND | DRNG | ISB | OSB | SCCL | SCCS | SCN | TRIB | TRML | TRMS | WILD |
| **Sturgeon Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 37 | 0 | 0 | 0 | 28 | 30 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gill Net | | | | | | | | | | | | | | | |
| Otter Trawl | 7 | 0 | 57 | 0 | 0 | 0 | 29 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 31 | 0 | 0 | 0 | 32 | 27 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Fish Community Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 36 | 0 | 0 | 0 | 34 | 27 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mini-Fyke Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 29 | 0 | 0 | 0 | 32 | 1 | 13 | 21 | 2 | 0 | 0 | 1 | 0 |
| Otter Trawl | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 34 | 0 | 0 | 0 | 34 | 26 | 5 | 0 | 0 | 0 | 0 | 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 3 of the Missouri River during 2009. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

| Gear | N | Macrohabitat[a] | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BRAD | CHXO | CONF | DEND | DRNG | ISB | OSB | SCCL | SCCS | SCN | TRIB | TRML | TRMS | WILD |
| **Sturgeon Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 5 | 0 | 80 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 37 | 0 | 0 | 0 | 28 | 30 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gill Net | | | | | | | | | | | | | | | |
| Otter Trawl | 3 | 0 | 33 | 0 | 0 | 0 | 33 | 33 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 31 | 0 | 0 | 0 | 32 | 27 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Fish Community Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 8 | 0 | 50 | 0 | 0 | 0 | 25 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 36 | 0 | 0 | 0 | 34 | 27 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mini-Fyke Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 29 | 0 | 0 | 0 | 32 | 1 | 13 | 21 | 2 | 0 | 0 | 1 | 0 |
| Otter Trawl | 15 | 0 | 27 | 0 | 0 | 0 | 47 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 34 | 0 | 0 | 0 | 34 | 26 | 5 | 0 | 0 | 0 | 0 | 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 3 of the Missouri River during 2009. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

| Gear | N | Macrohabitat[a] | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BRAD | CHXO | CONF | DEND | DRNG | ISB | OSB | SCCL | SCCS | SCN | TRIB | TRML | TRMS | WILD |
| **Sturgeon Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 37 | 0 | 0 | 0 | 28 | 30 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gill Net | | | | | | | | | | | | | | | |
| Otter Trawl | 1 | 0 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 31 | 0 | 0 | 0 | 32 | 27 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Fish Community Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 6 | 0 | 67 | 0 | 0 | 0 | 17 | 0 | 17 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 36 | 0 | 0 | 0 | 34 | 27 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mini-Fyke Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 29 | 0 | 0 | 0 | 32 | 1 | 13 | 21 | 2 | 0 | 0 | 1 | 0 |
| Otter Trawl | 9 | 0 | 33 | 0 | 0 | 0 | 56 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 34 | 0 | 0 | 0 | 34 | 26 | 5 | 0 | 0 | 0 | 0 | 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 3 of the Missouri River during 2009. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

| Gear | N | Macrohabitat[a] | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BRAD | CHXO | CONF | DEND | DRNG | ISB | OSB | SCCL | SCCS | SCN | TRIB | TRML | TRMS | WILD |
| **Sturgeon Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 37 | 0 | 0 | 0 | 28 | 30 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gill Net | | | | | | | | | | | | | | | |
| Otter Trawl | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 31 | 0 | 0 | 0 | 32 | 27 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Fish Community Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 2 | 0 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 36 | 0 | 0 | 0 | 34 | 27 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mini-Fyke Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 29 | 0 | 0 | 0 | 32 | 1 | 13 | 21 | 2 | 0 | 0 | 1 | 0 |
| Otter Trawl | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 34 | 0 | 0 | 0 | 34 | 26 | 5 | 0 | 0 | 0 | 0 | 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 3 of the Missouri River during 2009. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

| Gear | N | Macrohabitat[a] | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BRAD | CHXO | CONF | DEND | DRNG | ISB | OSB | SCCL | SCCS | SCN | TRIB | TRML | TRMS | WILD |
| **Sturgeon Season** | | | | | | | | | | | | | | | |
| 1.0" Trammel Net | 7 | 0 | 57 | 0 | 0 | 0 | 0 | 43 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 37 | 0 | 0 | 0 | 28 | 30 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gill Net | | | | | | | | | | | | | | | |
| Otter Trawl | 11 | 0 | 55 | 0 | 0 | 0 | 27 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 31 | 0 | 0 | 0 | 32 | 27 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Fish Community Season** | | | | | | | | | | | | | | | |
| 1.0" Trammel Net | 16 | 0 | 63 | 0 | 0 | 0 | 19 | 13 | 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 36 | 0 | 0 | 0 | 34 | 27 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mini-Fyke Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 29 | 0 | 0 | 0 | 32 | 1 | 13 | 21 | 2 | 0 | 0 | 1 | 0 |
| Otter Trawl | 24 | 0 | 29 | 0 | 0 | 0 | 50 | 17 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 34 | 0 | 0 | 0 | 34 | 26 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |

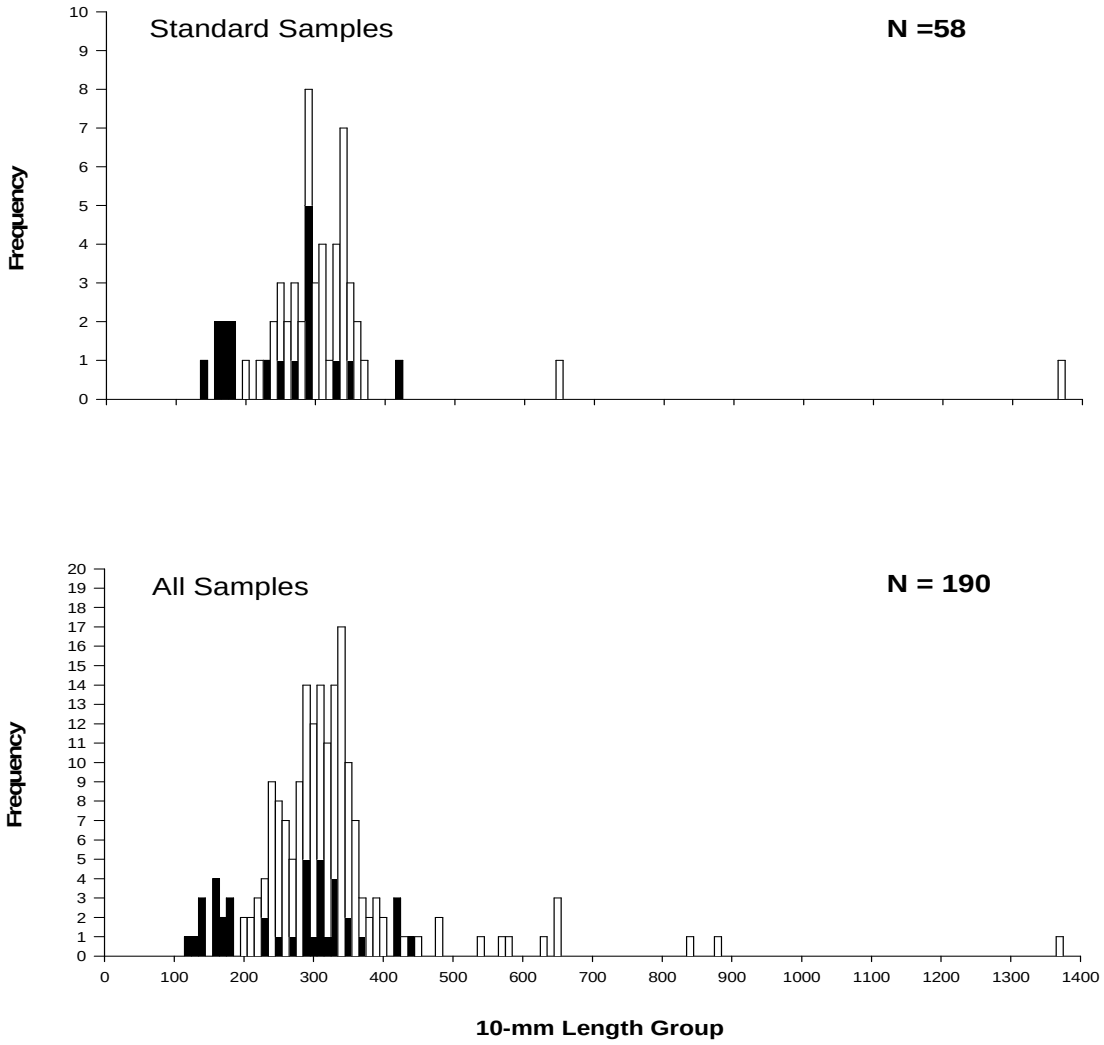


Figure 8. Length frequency of pallid sturgeon captured during the sturgeon season (black bars) and fish community season (white bars) in Segment 3 of the Missouri River during 2009. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2009.

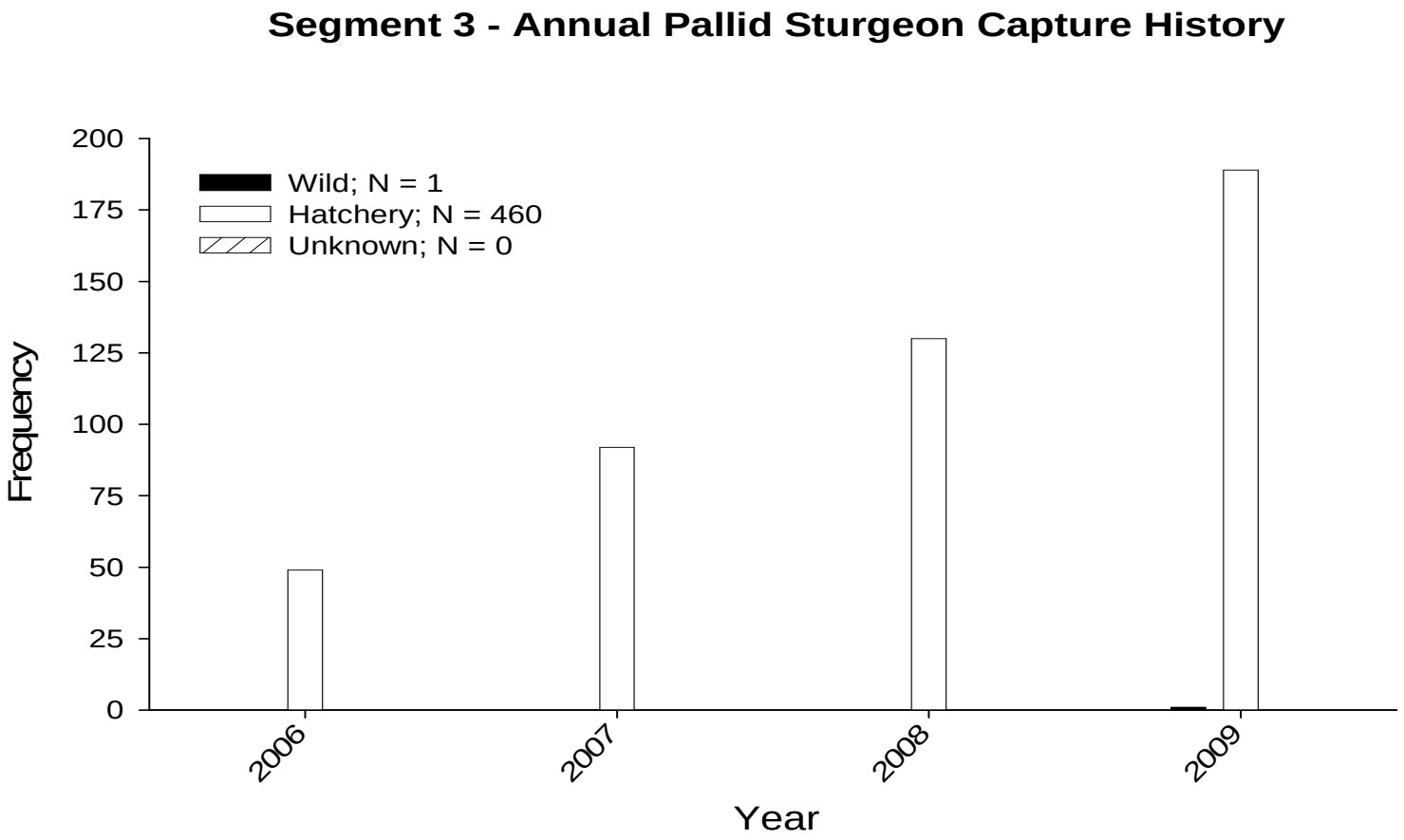


Figure 9. Annual capture history of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon collected in Segment 3 of the Missouri River from 2006-2009. Figure is designed to compare overall pallid sturgeon captures from year to year and is biased by variable effort among years. Figure includes all pallid captures including non-random and wild samples.

### Shovelnose X Pallid Sturgeon Hybrids

No shovelnose x pallid sturgeon hybrids were collected in segment 3 during 2009 or during the previous three years of sampling.

## Targeted Native River Species

### Shovelnose Sturgeon

During 2009 a total of 375 shovelnose sturgeon were sampled in segment 3 of the Missouri River, very similar to the 378 sampled in 2008. More were sampled during the fish community season (n = 272) than the sturgeon season (n = 103). Trammel nets captured more shovelnose sturgeon (n = 202) than all other gears combined, while trotlines sampled 105 and the otter trawl 68.

Over the past four years of sampling trammel net CPUE of shovelnose sturgeon has been considerably higher during the fish community season compared to the sturgeon season (Figure 11). Very few shovelnose sturgeon smaller than stock size have been captured using trammel nets in all four sampling years. Trammel net CPUE of stock size and larger shovelnose sturgeon has remained relatively constant over the four years of sampling.

The otter trawl did not capture any shovelnose sturgeon smaller than stock size in 2009, which was the first year that these smaller size classes were absent from the catch (Figure 12). Overall otter trawl CPUE of stock size and larger shovelnose sturgeon was similar in 2009 to the three previous years.

The shovelnose sturgeon catch was relatively evenly distributed throughout the length of segment 3. While no smaller (sub-stock) sized shovelnose were found in 2009, the overall size distribution of shovelnose captured was similar to past years since very few smaller fish have been captured in any year of sampling (Figure 14).

Shovelnose sturgeon averaged 510 mm FL and 539 g in segment 3 during 2009. The largest and smallest fish measured 815 and 250 mm FL, respectively. No pattern has been observed in the relative weight of shovelnose sturgeon within a size class over the four sampling seasons (Figure 15). However, the stock sized group has consistently had the highest on average relative weight of all size classes sampled, while the preferred size class has had the lowest.

The specific macro habitats where different size classes of shovelnose sturgeon were sampled by gear and the proportion that those habitats were sampled can be found in Tables 9 through 12. For the macro habitats where all shovelnose sturgeon combined were sampled is in Table 13.

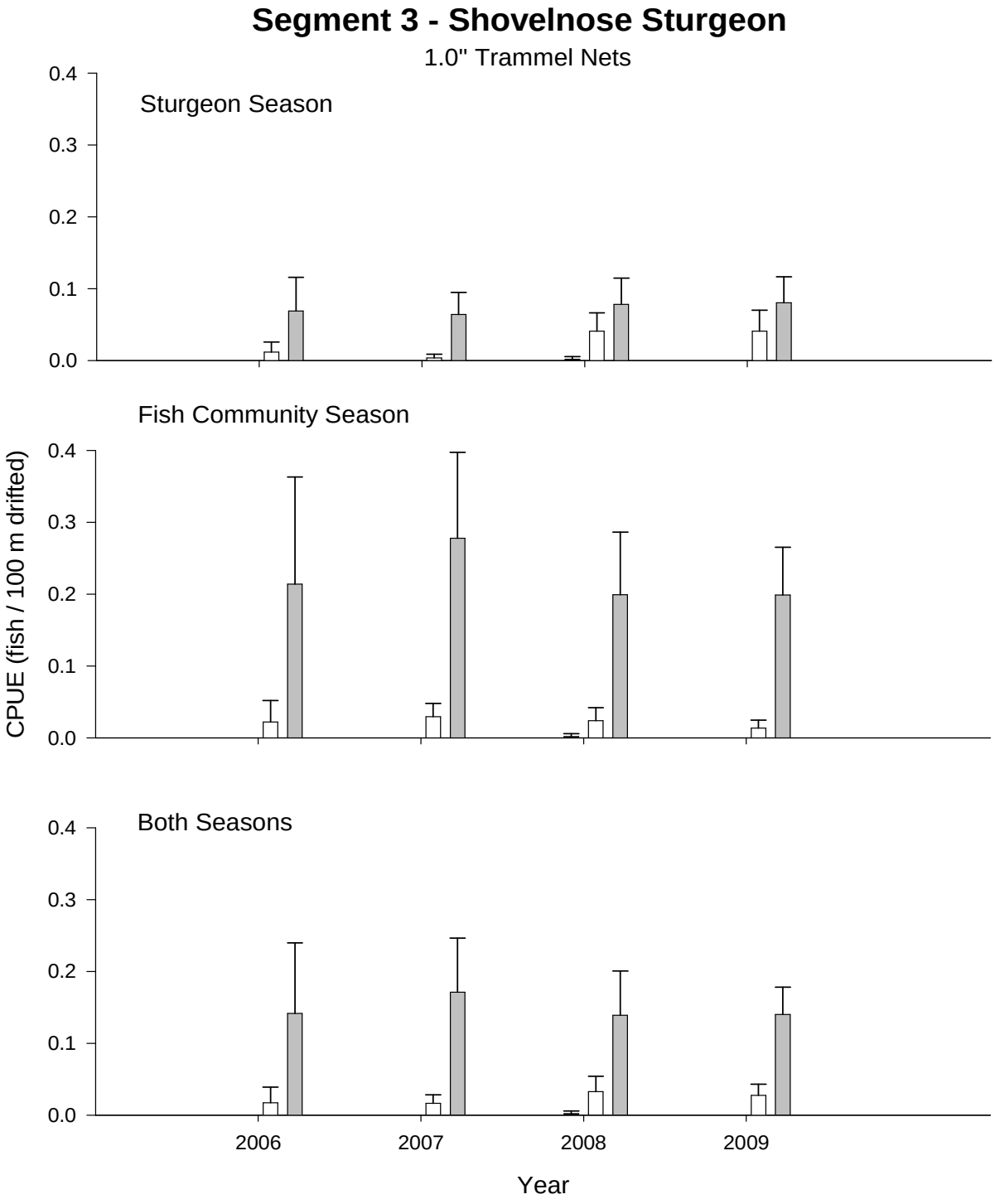


Figure 11. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using 1.0" trammel nets in Segment 3 of the Missouri River from 2006-2009.

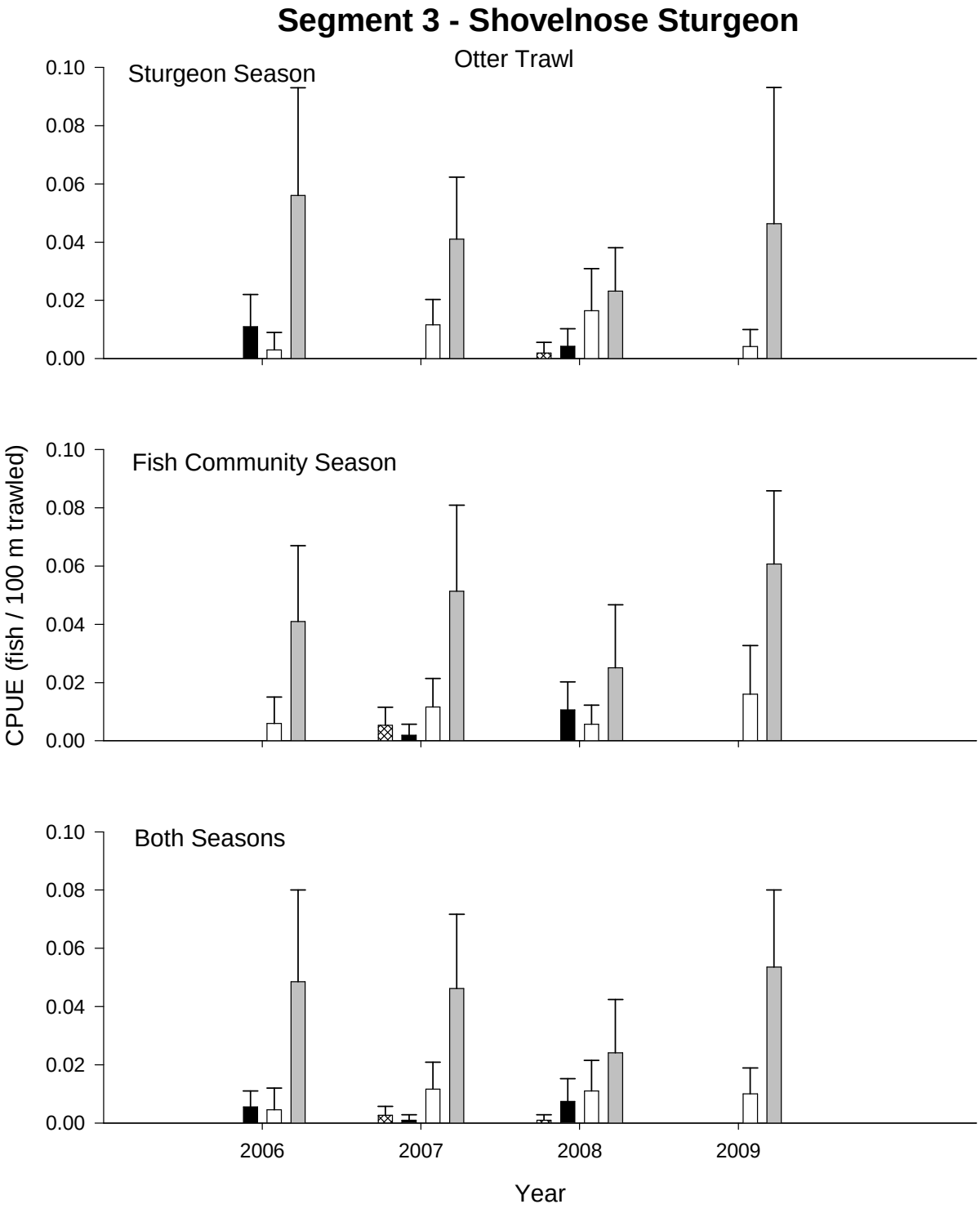


Figure 12. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; cross-hatched bars), sub-stock size (150-249 mm; black bars), stock size (250-379 mm; white bars), and quality and above size (> 380 mm; gray bars) shovelnose sturgeon using otter trawls in Segment 3 of the Missouri River from 2006-2009.

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 3 of the Missouri River during 2009. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

| Gear | N | Macrohabitat[a] | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BRAD | CHXO | CONF | DEND | DRNG | ISB | OSB | SCCL | SCCS | SCN | TRIB | TRML | TRMS | WILD |
| **Sturgeon Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 37 | 0 | 0 | 0 | 28 | 30 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gill Net | | | | | | | | | | | | | | | |
| Otter Trawl | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 31 | 0 | 0 | 0 | 32 | 27 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Fish Community Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 36 | 0 | 0 | 0 | 34 | 27 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mini-Fyke Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 29 | 0 | 0 | 0 | 32 | 1 | 13 | 21 | 2 | 0 | 0 | 1 | 0 |
| Otter Trawl | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 34 | 0 | 0 | 0 | 34 | 26 | 5 | 0 | 0 | 0 | 0 | 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 3 of the Missouri River during 2009. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

| Gear | N | Macrohabitat[a] | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BRAD | CHXO | CONF | DEND | DRNG | ISB | OSB | SCCL | SCCS | SCN | TRIB | TRML | TRMS | WILD |
| **Sturgeon Season** | | | | | | | | | | | | | | | |
| 1.0" Trammel Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 37 | 0 | 0 | 0 | 28 | 30 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gill Net | | | | | | | | | | | | | | | |
| Otter Trawl | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 31 | 0 | 0 | 0 | 32 | 27 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Fish Community Season** | | | | | | | | | | | | | | | |
| 1.0" Trammel Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 36 | 0 | 0 | 0 | 34 | 27 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mini-Fyke Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 29 | 0 | 0 | 0 | 32 | 1 | 13 | 21 | 2 | 0 | 0 | 1 | 0 |
| Otter Trawl | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 34 | 0 | 0 | 0 | 34 | 26 | 5 | 0 | 0 | 0 | 0 | 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 3 of the Missouri River during 2009. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

| Gear | N | Macrohabitat[a] | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BRAD | CHXO | CONF | DEND | DRNG | ISB | OSB | SCCL | SCCS | SCN | TRIB | TRML | TRMS | WILD |
| **Sturgeon Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 13 | 0 | 31 | 0 | 0 | 0 | 38 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 37 | 0 | 0 | 0 | 28 | 30 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gill Net | | | | | | | | | | | | | | | |
| Otter Trawl | 2 | 0 | 0 | 0 | 0 | 0 | 50 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 31 | 0 | 0 | 0 | 32 | 27 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Fish Community Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 6 | 0 | 33 | 0 | 0 | 0 | 17 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 36 | 0 | 0 | 0 | 34 | 27 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mini-Fyke Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 29 | 0 | 0 | 0 | 32 | 1 | 13 | 21 | 2 | 0 | 0 | 1 | 0 |
| Otter Trawl | 5 | 0 | 0 | 0 | 0 | 0 | 40 | 60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 34 | 0 | 0 | 0 | 34 | 26 | 5 | 0 | 0 | 0 | 0 | 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 3 of the Missouri River during 2009. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

| Gear | N | Macrohabitat[a] | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BRAD | CHXO | CONF | DEND | DRNG | ISB | OSB | SCCL | SCCS | SCN | TRIB | TRML | TRMS | WILD |
| **Sturgeon Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 30 | 0 | 43 | 0 | 0 | 0 | 27 | 27 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 37 | 0 | 0 | 0 | 28 | 30 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gill Net | | | | | | | | | | | | | | | |
| Otter Trawl | 13 | 0 | 38 | 0 | 0 | 0 | 31 | 23 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 31 | 0 | 0 | 0 | 32 | 27 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Fish Community Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 78 | 0 | 54 | 0 | 0 | 0 | 31 | 14 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 36 | 0 | 0 | 0 | 34 | 27 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mini-Fyke Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 29 | 0 | 0 | 0 | 32 | 1 | 13 | 21 | 2 | 0 | 0 | 1 | 0 |
| Otter Trawl | 29 | 0 | 34 | 0 | 0 | 0 | 24 | 28 | 14 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 34 | 0 | 0 | 0 | 34 | 26 | 5 | 0 | 0 | 0 | 0 | 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 3 of the Missouri River during 2009. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

| Gear | N | Macrohabitat[a] | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BRAD | CHXO | CONF | DEND | DRNG | ISB | OSB | SCCL | SCCS | SCN | TRIB | TRML | TRMS | WILD |
| **Sturgeon Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 43 | 0 | 40 | 0 | 0 | 0 | 30 | 28 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 37 | 0 | 0 | 0 | 28 | 30 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gill Net | | | | | | | | | | | | | | | |
| Otter Trawl | 15 | 0 | 33 | 0 | 0 | 0 | 33 | 27 | 7 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 31 | 0 | 0 | 0 | 32 | 27 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Fish Community Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 84 | 0 | 52 | 0 | 0 | 0 | 30 | 17 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 36 | 0 | 0 | 0 | 34 | 27 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mini-Fyke Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 29 | 0 | 0 | 0 | 32 | 1 | 13 | 21 | 2 | 0 | 0 | 1 | 0 |
| Otter Trawl | 34 | 0 | 29 | 0 | 0 | 0 | 26 | 32 | 12 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 34 | 0 | 0 | 0 | 34 | 26 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |

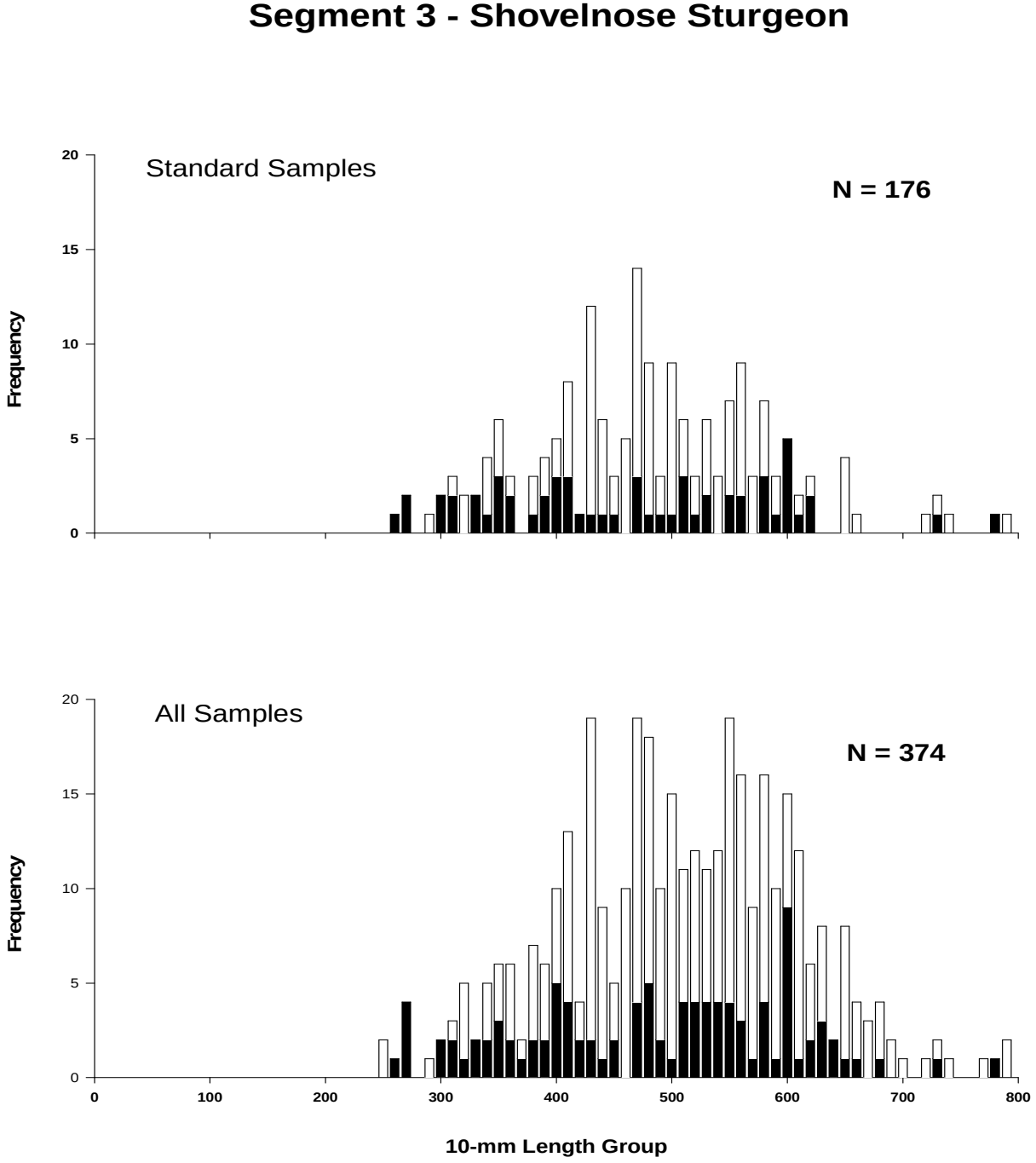


Figure 13. Length frequency of shovelnose sturgeon during the sturgeon season (black bars) and fish community season (white bars) in Segment 3 of the Missouri River during 2009. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2009.

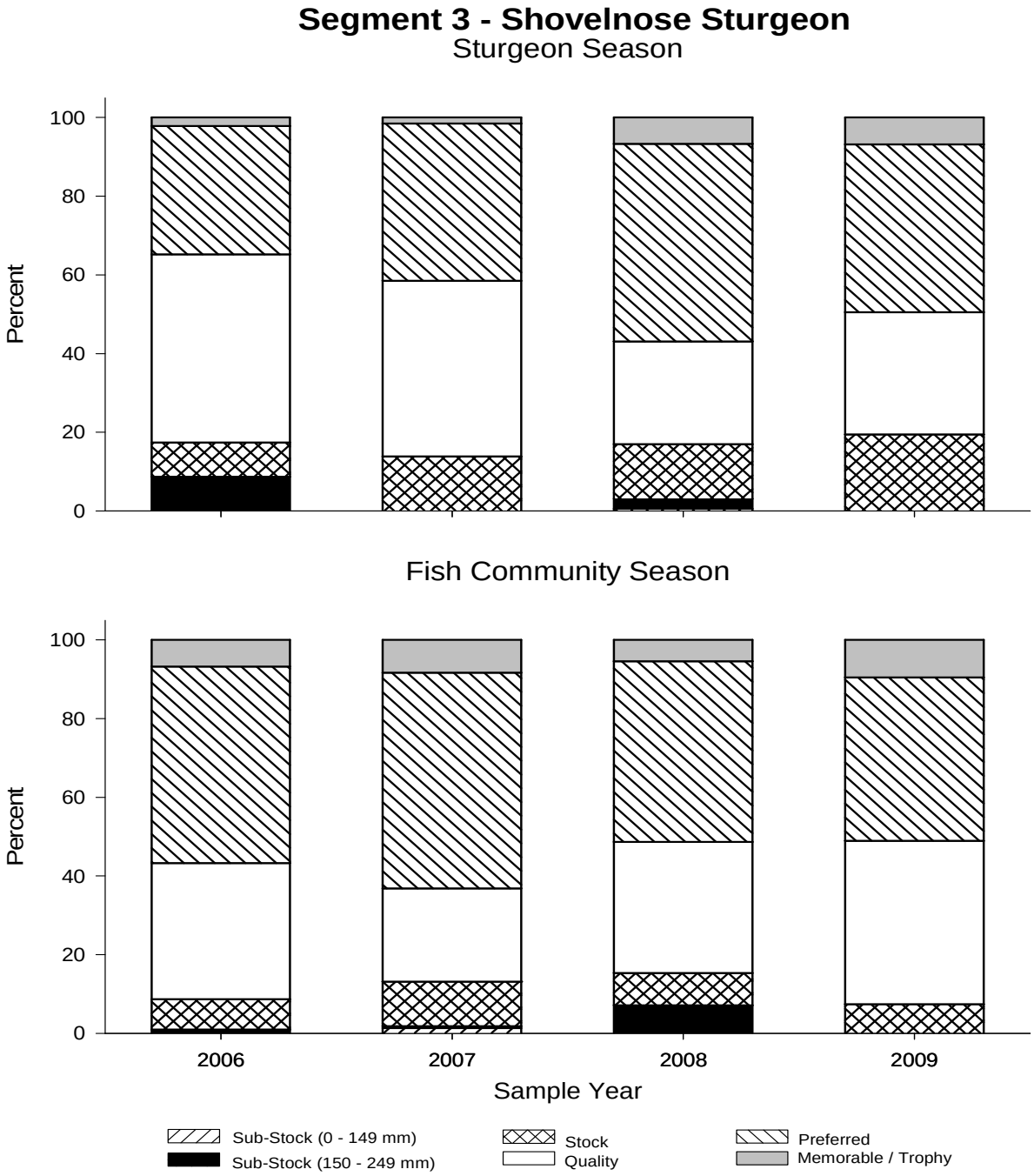


Figure 14. Proportion by length group for all shovelnose sturgeon captured with all gear by length category from 2006 to 2009 in Segment 3 in the Missouri River. Length categories determined using the methods proposed by Quist (1998).

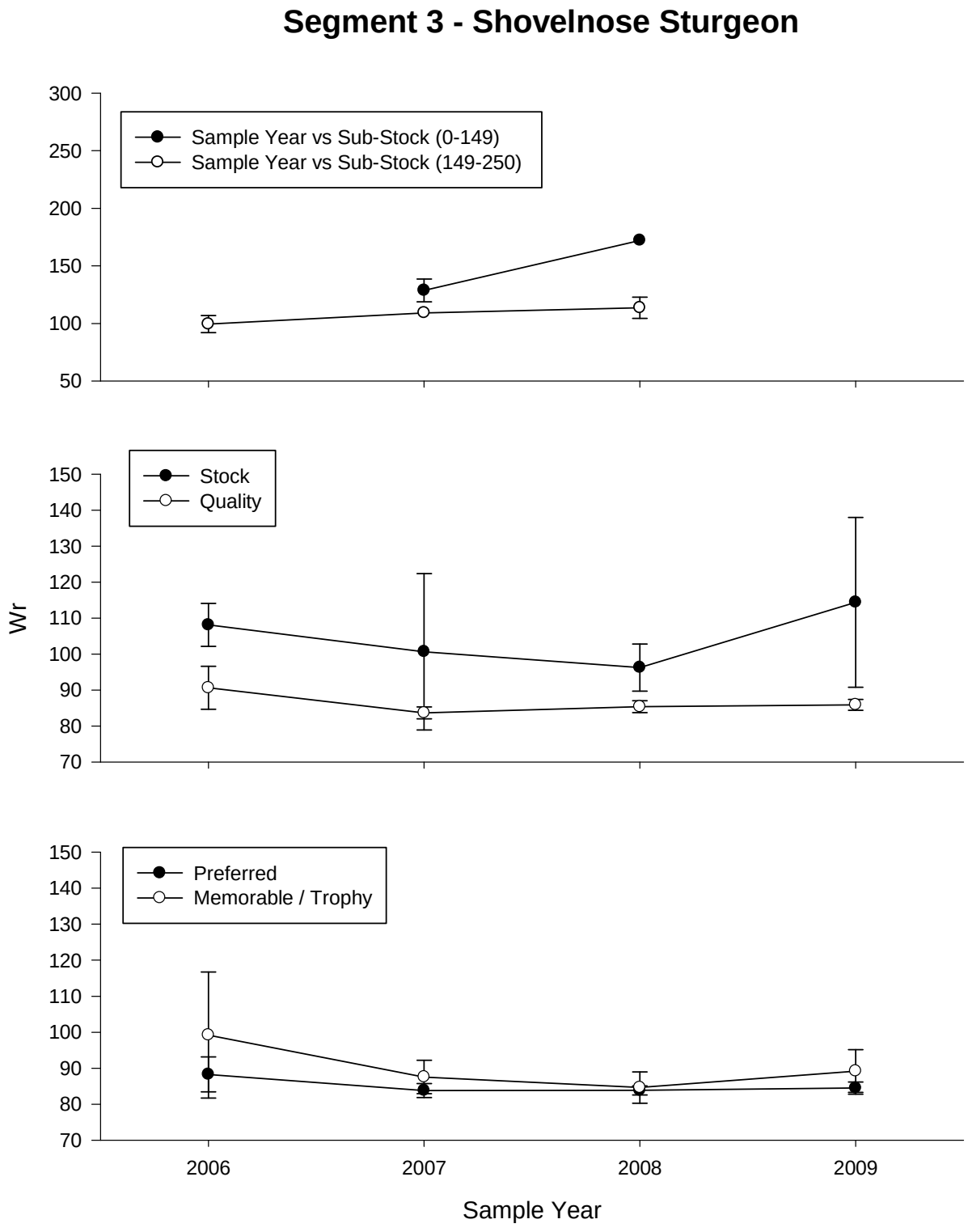


Figure 15. Relative weight (Wr) for all shovelnose sturgeon captured with all gear by incremental relative stock density (RSD) length category from 2006-2009 in Segment 3 in the Missouri River. Length categories determined using the methods proposed by Quist (1998).

**Sturgeon Chub**

A total of 242 sturgeon chubs were collected in 2009, a substantial decrease from 2008 when 663 were sampled. More sturgeon chubs were collected during the fish community season (n = 165) than during the sturgeon season (n = 77). All sturgeon chubs were sampled using the otter trawl.

Overall otter trawl CPUE of sturgeon chubs was considerably lower in 2009 than the three previous sampling seasons (Figure 16). Up until 2009 CPUE had remained relatively constant.

Sturgeon chubs averaged 67 mm TL in 2009, which was larger than the 2008 average of 50 mm TL. There was an obvious void in the length frequency histogram of sturgeon chubs in 2009 when compared to 2008. Very few sturgeon chubs smaller than 50 mm TL were captured in 2009, whereas during 2008 the vast majority were smaller than 50 mm TL (Figure 17). Based on Herman et al. 2008a the strong year class in 2008 was age-1 fish, while few age-0 fish were observed. During 2009 we saw very few age-1 fish and again few age-0 fish, while the majority of fish captured were age-2.

Although sturgeon chubs were present throughout the majority of segment 3, they were most abundant between rivermiles 1640.5 and 1644.5. This is somewhat interesting since in the past the abundance of sturgeon chubs for the most part has been greater as you go downstream in segment 3.

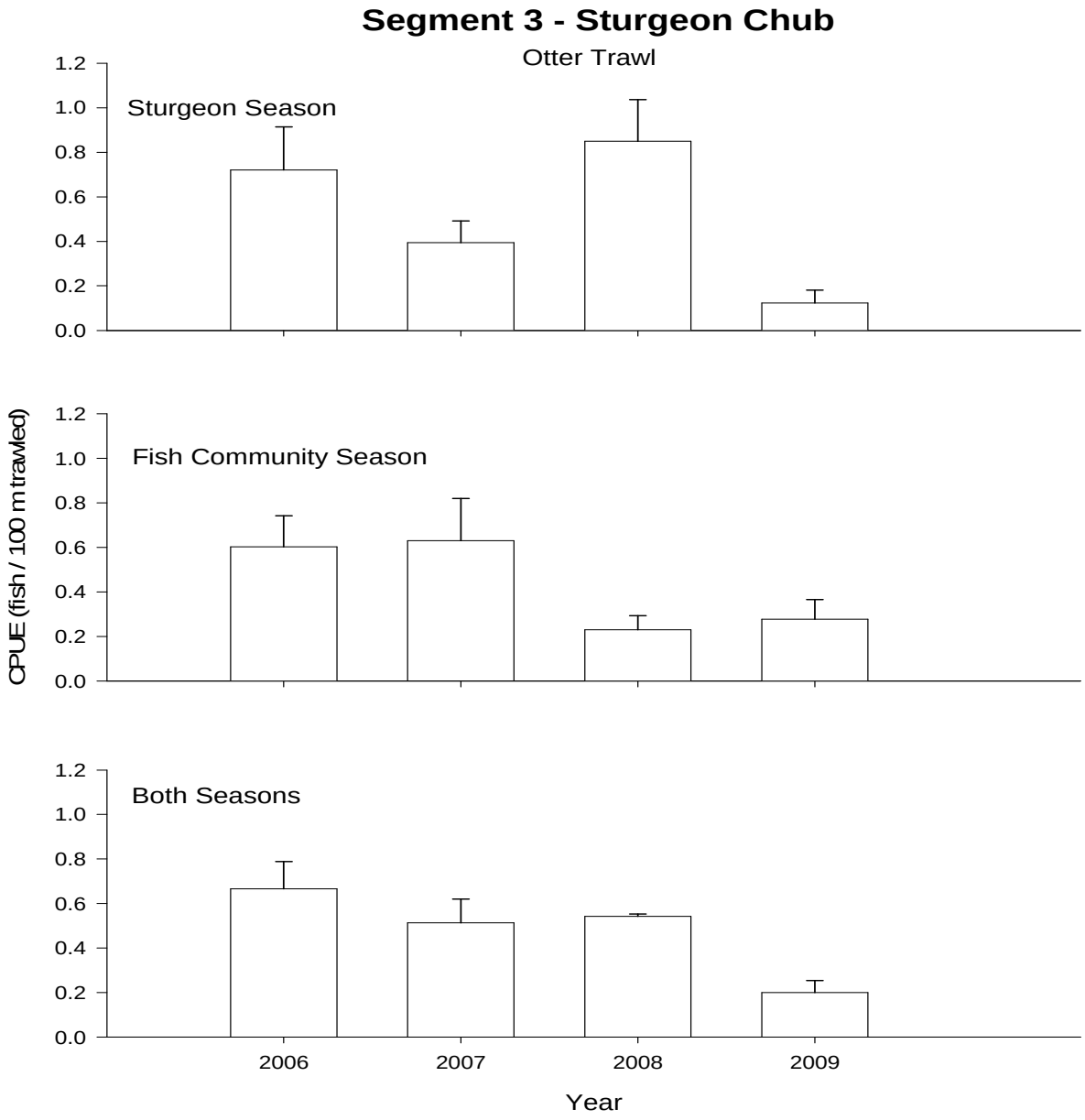


Figure 16. Mean annual catch per unit effort (+/- 2 SE) of sturgeon chub using otter trawls in Segment 3 of the Missouri River from 2006-2009.

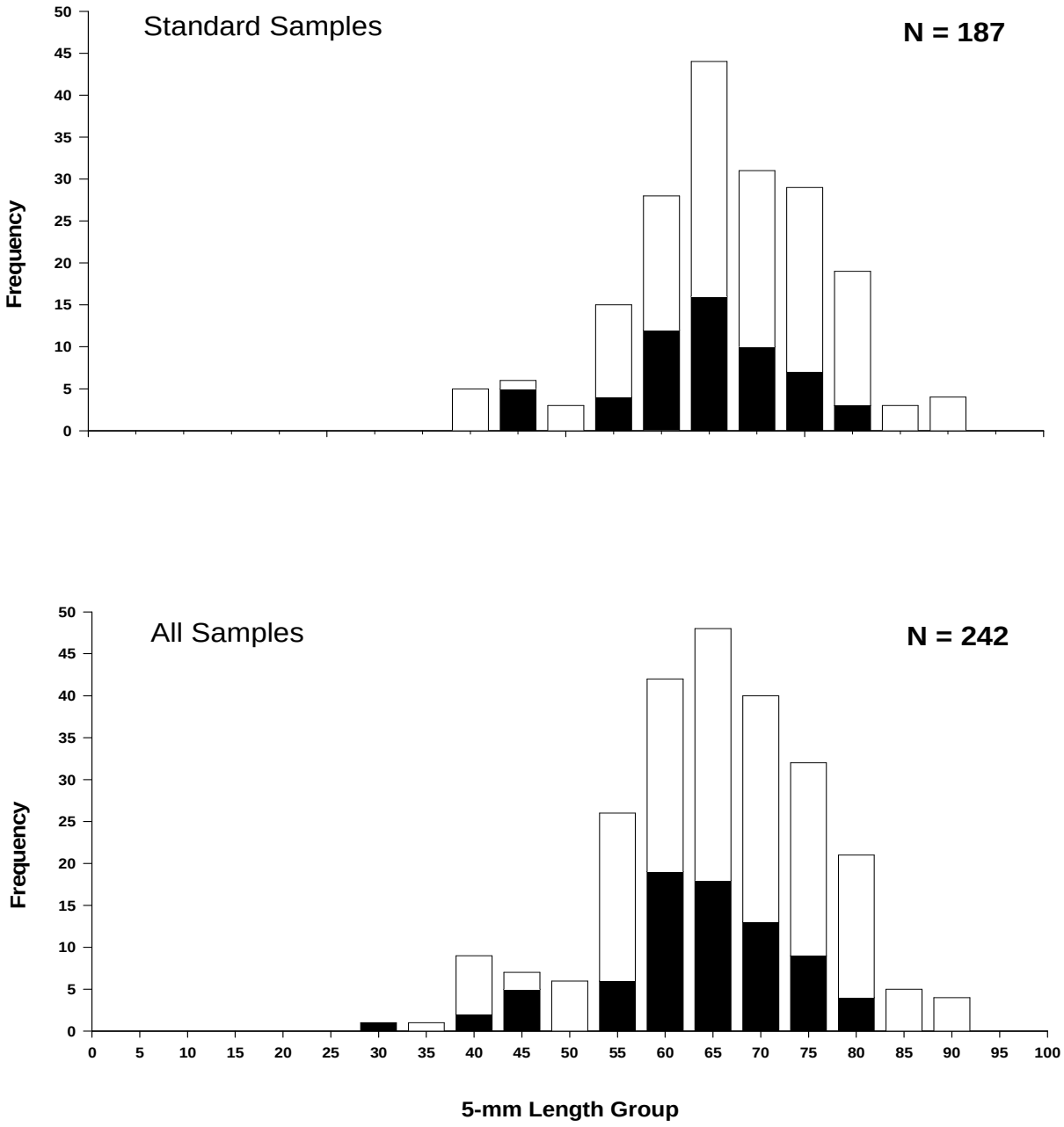


Figure 17. Length frequency of sturgeon chub during the sturgeon season (black bars) and the fish community season (white bars) in Segment 3 of the Missouri River during 2009. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2009.

**Sicklefin Chub**

A total of 163 sicklefin chubs were collected in segment 3 during 2009, an increase from 2008 when 85 were sampled. More sicklefin chubs were collected during the fish community season (n = 146) than during the sturgeon season (n = 17). All sicklefin chubs were sampled in the otter trawl.

The total increase in sicklefin chubs captured was not manifested in the CPUE estimates. Otter trawl CPUE of sicklefin chubs was only slightly higher in 2009 when compared to 2008 and has been similar throughout the four years of sampling (Figure 18). Non-random subsamples accounted for 78 of the total 163 sicklefin chubs captured, which are not used to look at relative abundance and are not included in the CPUE estimates. The increase in non-random subsamples comes from both more duplicate subsamples do to the increase in pallid sturgeon catch and non-random sampling for pallid sturgeon using the otter trawl.

Sicklefin chubs averaged 83 mm TL in 2009 with the largest and smallest specimens measuring 106 and 62 mm TL, respectively. The 2009 average length was similar to the 2008 average of 86 mm TL. The size frequency histogram of sicklefin chubs differed in 2009 to that of 2008 (Figure 19). In 2008 very few fish smaller than 75 mm TL were observed, whereas in 2009 this size class made up a large proportion of the total. The majority of these fish are likely age-1 fish (Herman et al. 2008b). In 2009 few if any age-0 fish were observed, but both age-1 and age-2 were abundant and again similar to 2008 few age-3 fish were found.

Similar to previous years of sampling, sicklefin chubs were more abundant in the downstream most river bends in segment 3. The furthest upstream rivermile where sicklefin chubs were sampled was rivermile 1667.

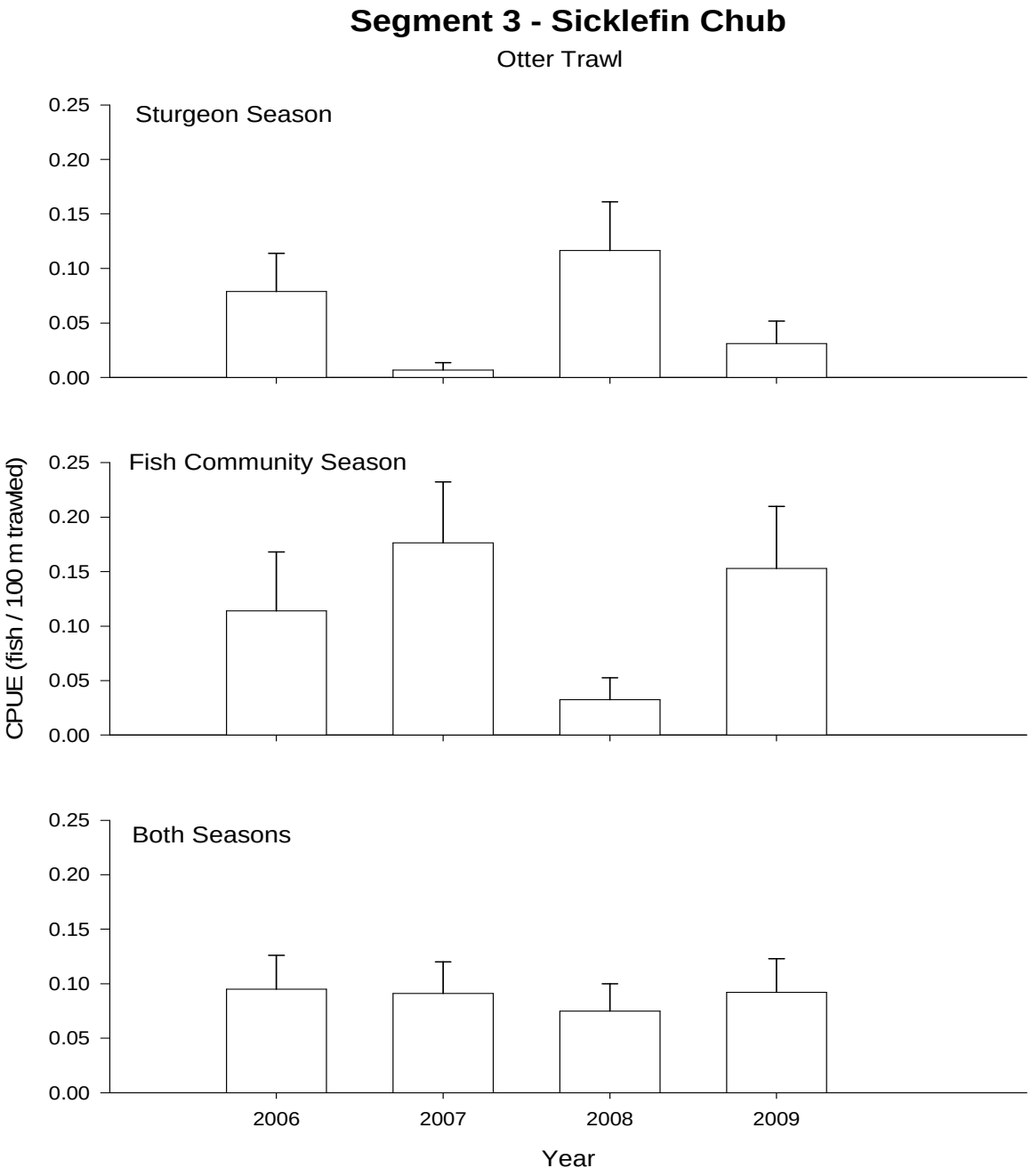


Figure 18. Mean annual catch per unit effort (+/- 2 SE) of sicklefin chub using otter trawls in Segment 3 of the Missouri River from 2006-2009.

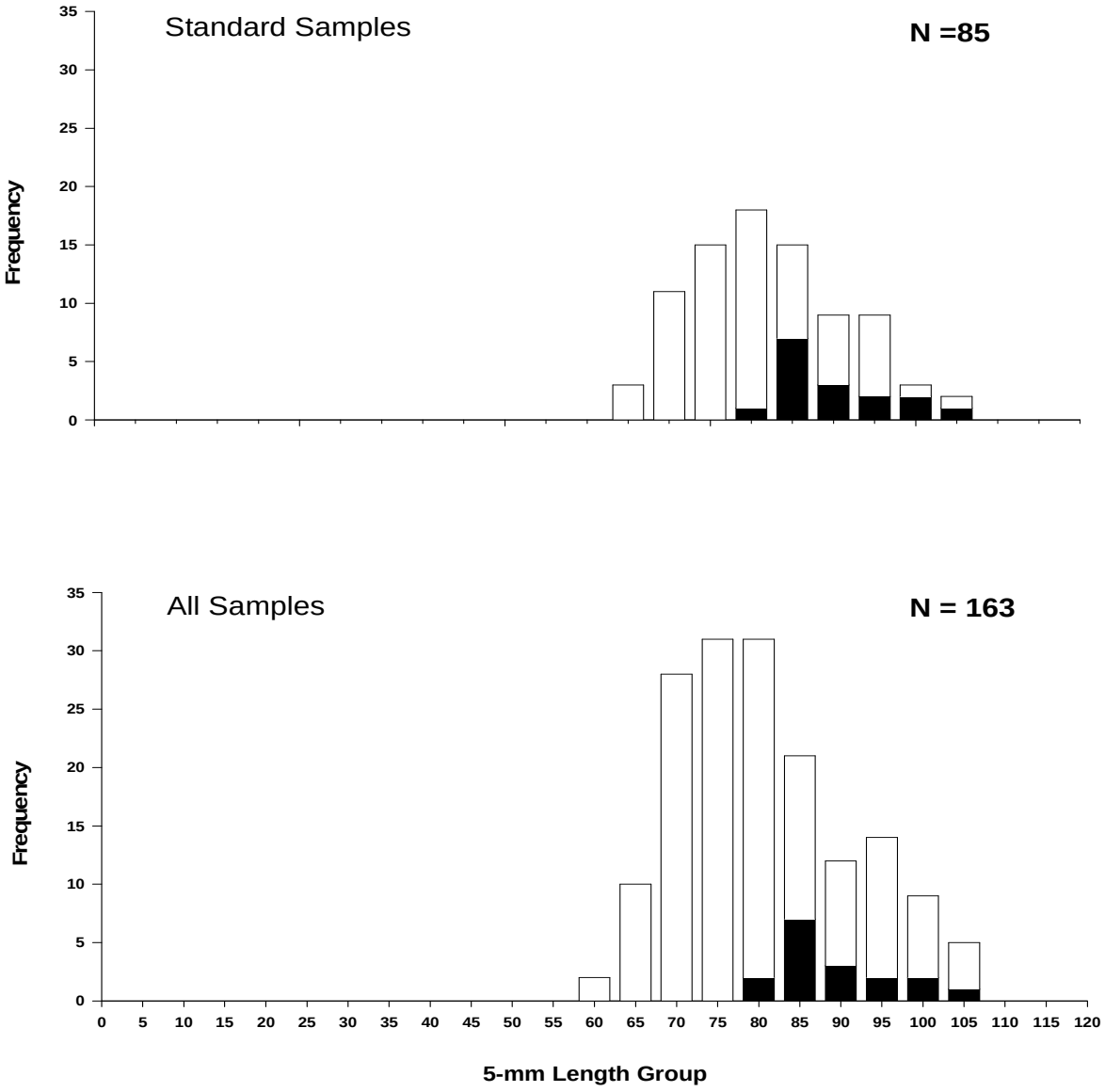


Figure 19. Length frequency of sicklefin chub during the sturgeon season (black bars) and the fish community season (white bars) in Segment 3 of the Missouri River during 2009. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2009.

**Sand Shiner**

A total of 820 sand shiners were sampled in segment 3 during 2009, a slight decrease from 2008 when 918 were collected. All sand shiners were collected during the fish community season and all but one were sampled using mini fyke nets. Sand shiner CPUE in mini fykes was 4.7 fish/net night in 2009. Although sand shiner CPUE in 2009 was similar to 2008 (5.7 fish/ net night) and 2007 (5.6 fish/net night), it was as a four year low (Figure 22). From 2007 to 2009 sand shiner CPUE has been less than half of the CPUE recorded in 2006 (13.7 fish/ net night).

Sand shiners averaged 38.5 mm TL in 2009, slightly smaller than the 2008 average of 41.8 mm TL. The 2009 sand shiner length frequency histogram indicate similar ages of fish sampled in the past four years (Figure 23). However, during 2009 a slightly higher proportion of age-0 fish occurred in the catch compared to age -1 fish, while in 2008 both year classes were about equal. During both 2009 and 2008 sand shiners were comprised of age-0 and age-1 fish (Datillo et al. 2008a).

Sand shiners were collected throughout the length of segment 3, although their abundance was somewhat patchy. We collected sand shiners in all types of macro habitats that were sampled using mini fyke nets.

## Segment 3 - Sand Shiner

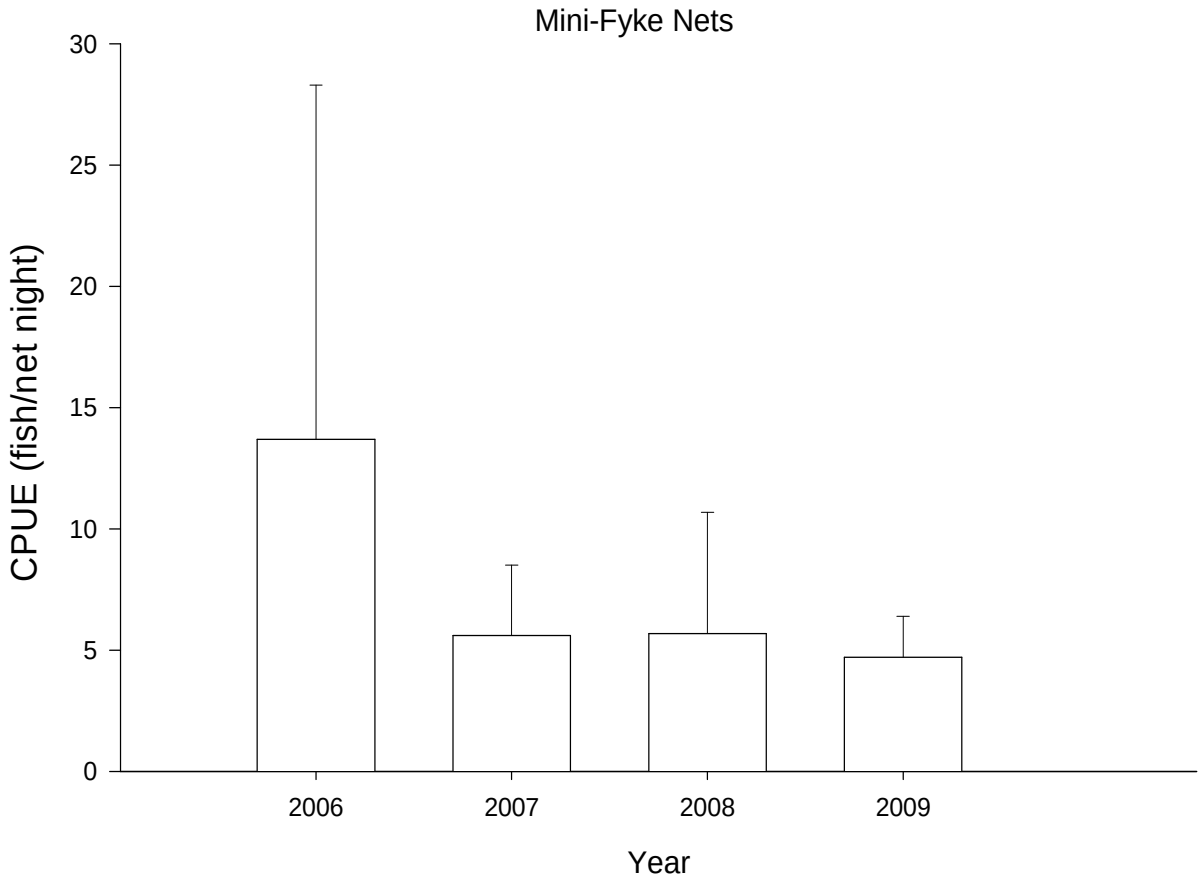


Figure 22. Mean annual catch per unit effort (+/- 2 SE) of sand shiner with mini-fyke nets in Segment 3 of the Missouri River during fish community season 2006-2009.

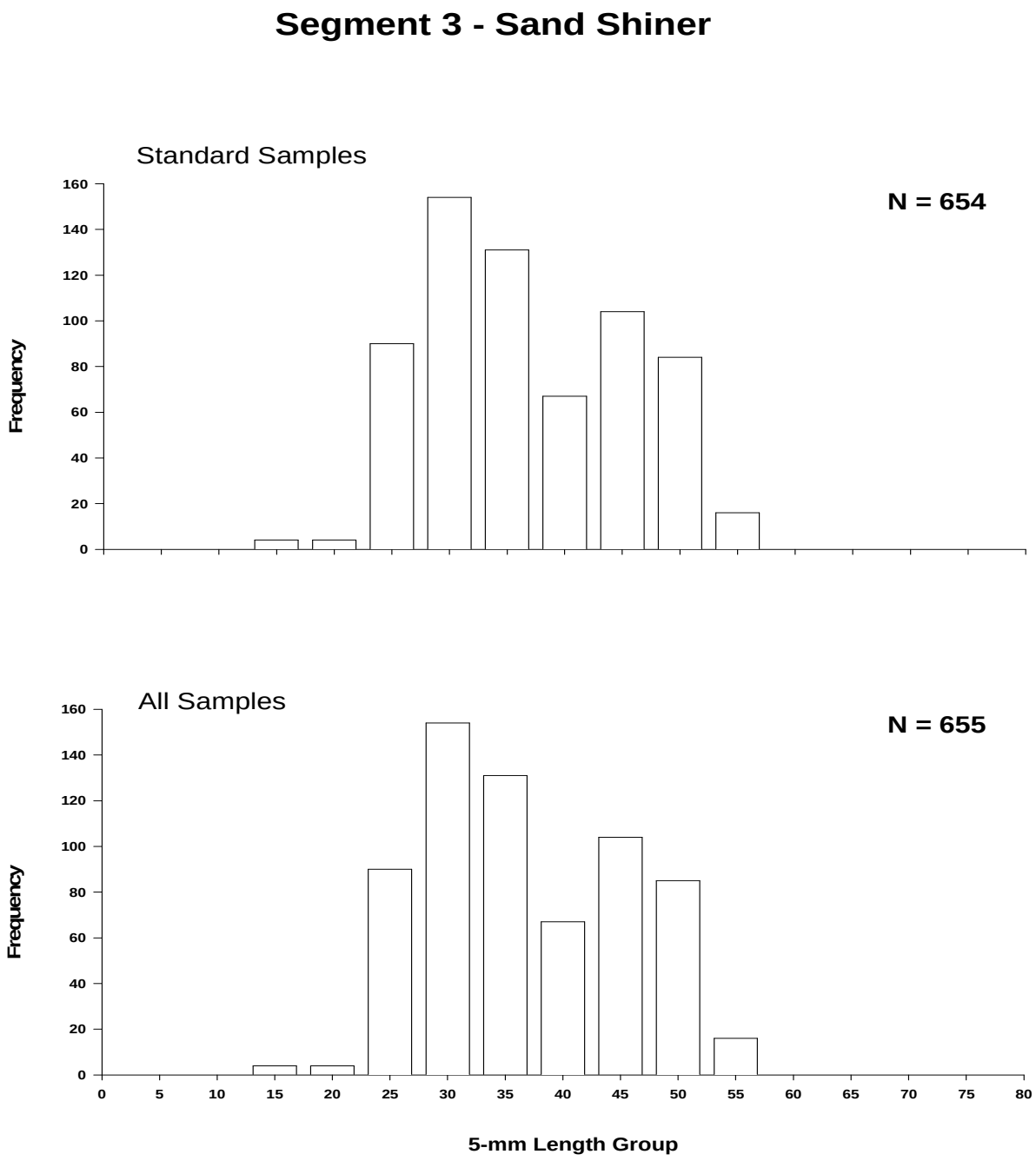


Figure 23. Length frequency of sand shiner during the sturgeon season (black bars) and the fish community season (white bars) in Segment 3 of the Missouri River during 2009. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2009.

***Hybognathus* spp**.

All *Hybognathus spp.* collected in 2009 were identified as western silvery minnow *Hybognathus argyritis*. In the field we take a subsample of all *Hybognathus spp.* collected and open their heads up to look at the basioccipital process to identify them between western silvery and plains minnows *Hybognathus placitus*. In addition, general phenotype is also used to identify suspected plains minnows. In the past four years we've had only two confirmed plains minnows identified, which could be a slight under representation of this species abundance in the Missouri River downstream of Fort Peck Dam. Additionally, we have not collected any brassy minnows *Hybognathus hankinsoni* in all three years of sampling.

During 2009 we identified a total of 22 *Hybognathus* specimens, 15 identified as western silvery minnows and 5 samples identified just to genus. This was a substantial decrease from the previous years of sampling. For instance, during 2008 at total of 377 western silvery minnows were sampled. Western silver minnow CPUE using mini fyke nets was at a four year low in 2009 at 0.1 fish/net night (Figure 24). From 2006 to 2008 CPUE had steadily increased to a high in 2008 at 2.8 fish/net night. While 2007 and 2008 had relatively high variance associated with the estimates, the 2009 catch had low variance and is likely attributed to a decline in the population.

Western silver minnows averaged 40.5 mm TL in 2009, which was significantly lower than the 2008 average of 70.2 mm TL. The length frequency histogram of western silvery minnows in 2009 suggests the age structure was comprised of almost all age-0 fish, with few age-1 fish present and one possible age-2 fish (Datillo et al. 2008b). This is in contrast to 2008 when about equal numbers of age-0 and age-1 fish were present with a few fish were possibly of age-2.

The relatively few western silvery minnows that were sampled in 2009 were captured throughout the length of segment 3, with no distinct spatial pattern in abundance.

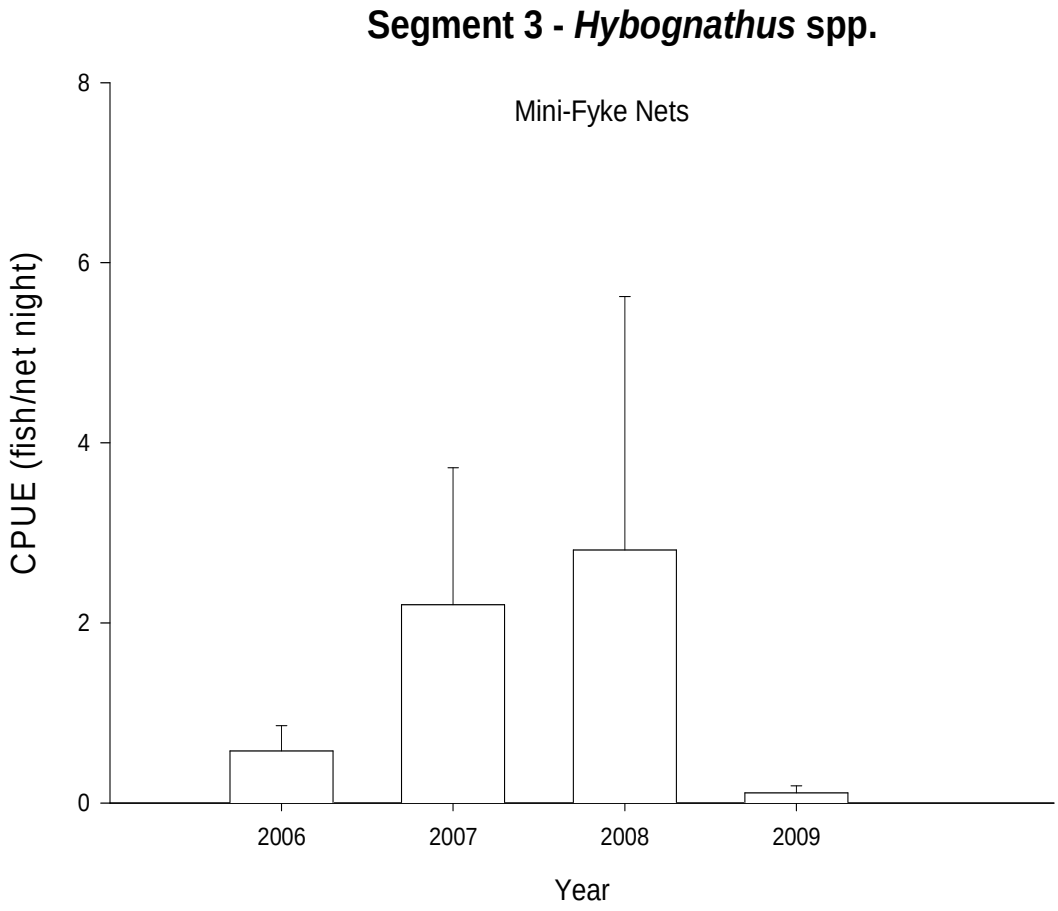


Figure 24. Mean annual catch per unit effort (+/- 2 SE) of *Hybognathus* spp. with mini-fyke nets in Segment 3 of the Missouri River during fish community season 2006-2009.

## Segment 3 - *Hybognathus* spp.

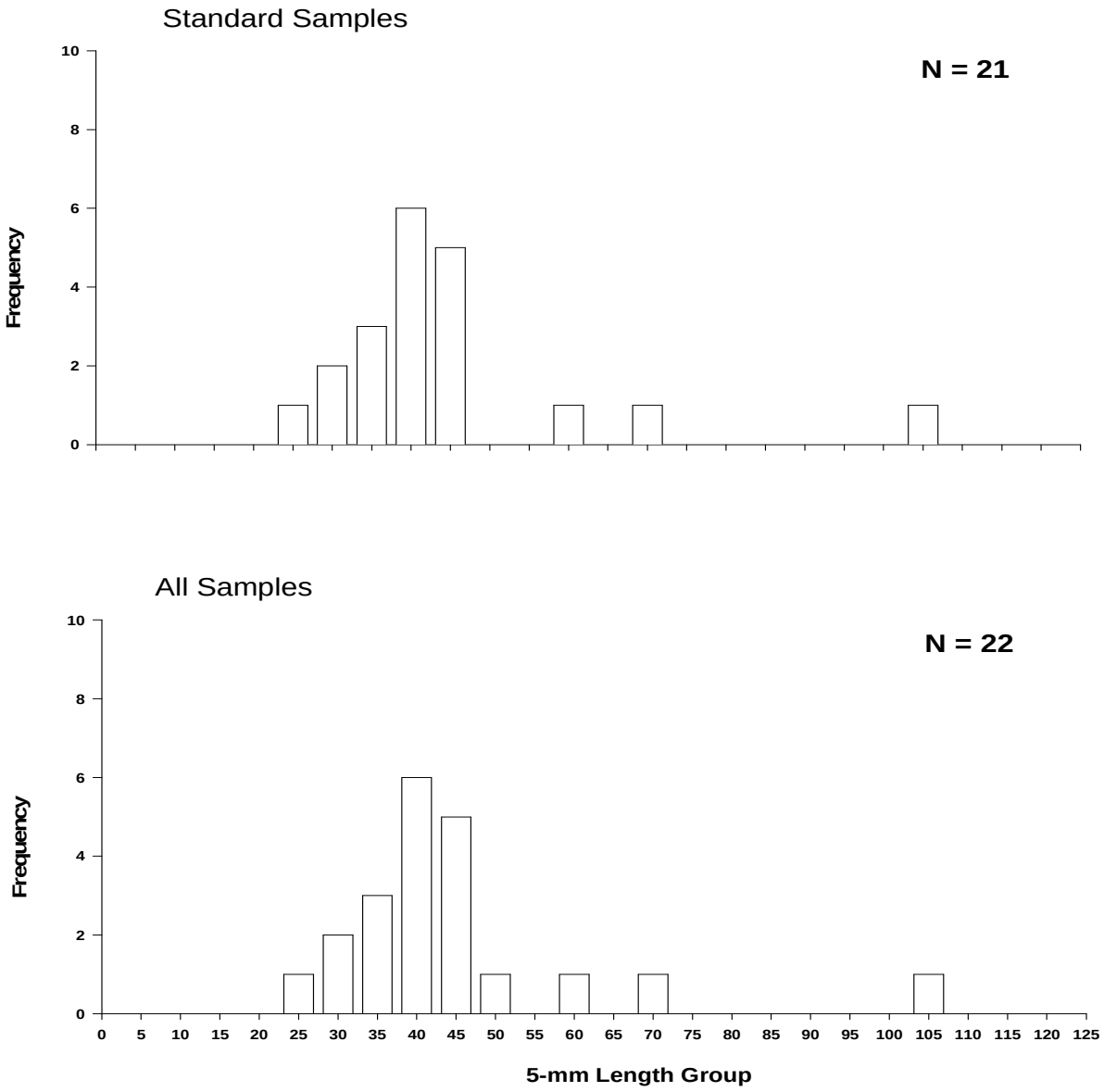


Figure 25. Length frequency of *Hybognathus* spp. caught during the sturgeon season (black bars) and the fish community season (white bars) in Segment 3 of the Missouri River during 2009. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2009.

**Blue Sucker**

A total of 23 blue suckers were sampled in segment 3 during 2009, 21 and 2 during the fish community and sturgeon seasons, respectively. Trammel nets captured 22 blue suckers, while the otter trawl captured one. The one blue sucker sampled in the otter trawl was 96 mm TL, which is the smallest blue sucker collected in the four years of the population assessment program in Montana. Previously the smallest blue sucker captured was 576 mm TL collected in 2007. Before 2009, we had no evidence from the population assessment data that blue sucker recruitment had been occurring in the Missouri River downstream of Fort Peck Dam. This likely age-0 blue sucker was captured on August 24$^{th}$ at rivermile 1591 in a non-random subsample using the otter trawl.

The total number of blue suckers sampled in 2009 was up from that of 2008 (n = 14), 2007 (n = 10) and 2006 (n = 4). Overall trammel net CPUE for blue suckers has also risen over the past four years to a high in 2009 of 0.02 fish/100 m, which is still relatively low compared to other fishes sampled (Figure 27). The general pattern over the last four years for slightly higher catch rates to occur during the fish community season when compared to the sturgeon season (Figure 27). The otter trawl has not been an effective gear at monitoring relative abundance of adult blue sucker, although it is the gear we would expect to see recruitment of age-0 fish as was seen in 2009 (Figure 28).

Blue suckers were sampled throughout much of the length of segment 3, with similar catches occurring throughout the sampling area. For the specific macro habitats that blue suckers were sampled by gear see Table 14.

Except for the one YOY blue sucker collected in 2009, the length frequency histogram looks similar to past years will all other fish being larger than 500 mm TL (Figure 29).

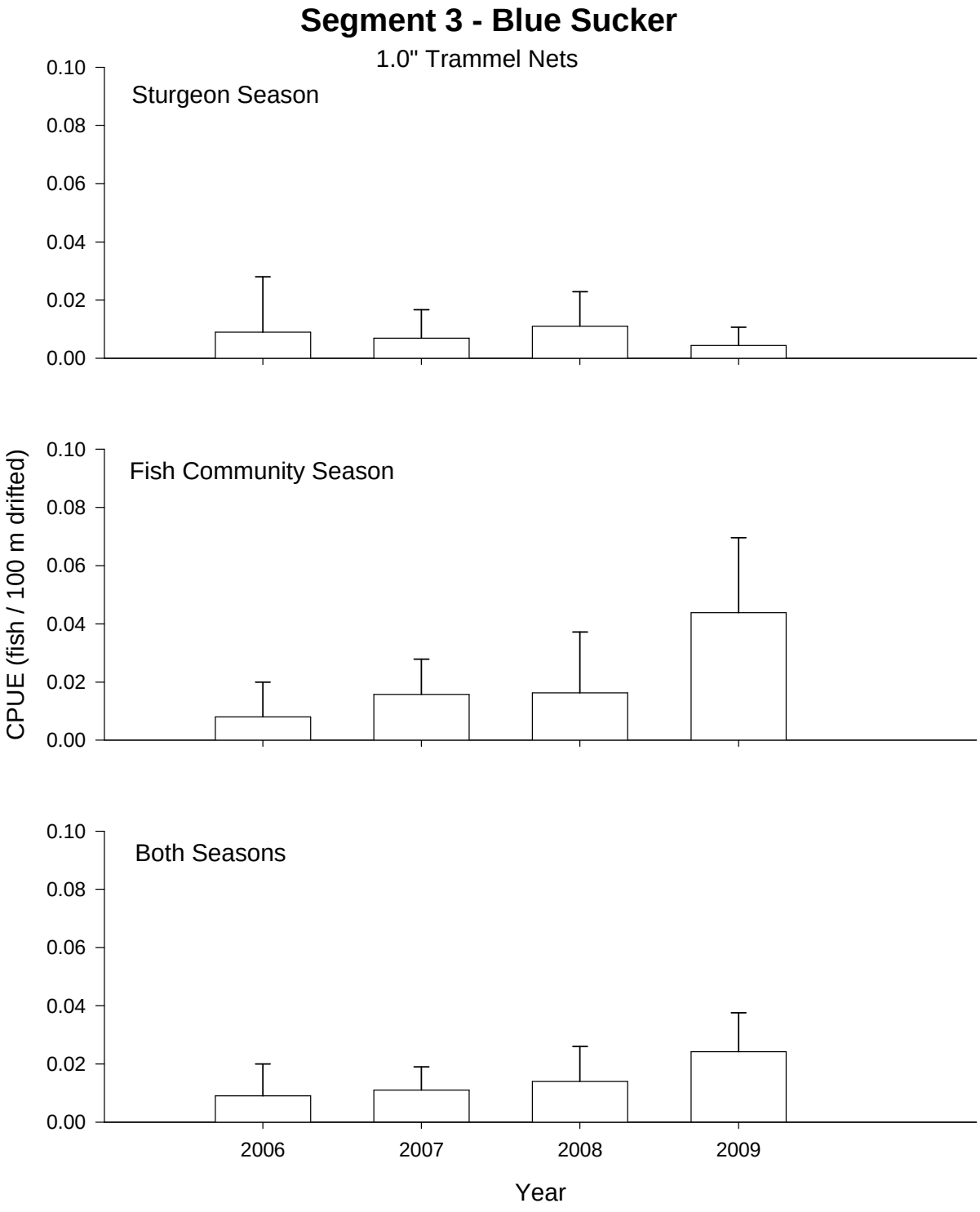


Figure 27. Mean annual catch per unit effort (+/- 2 SE) of blue sucker using 1.0” trammel nets in Segment 3 of the Missouri River from 2006-2009.

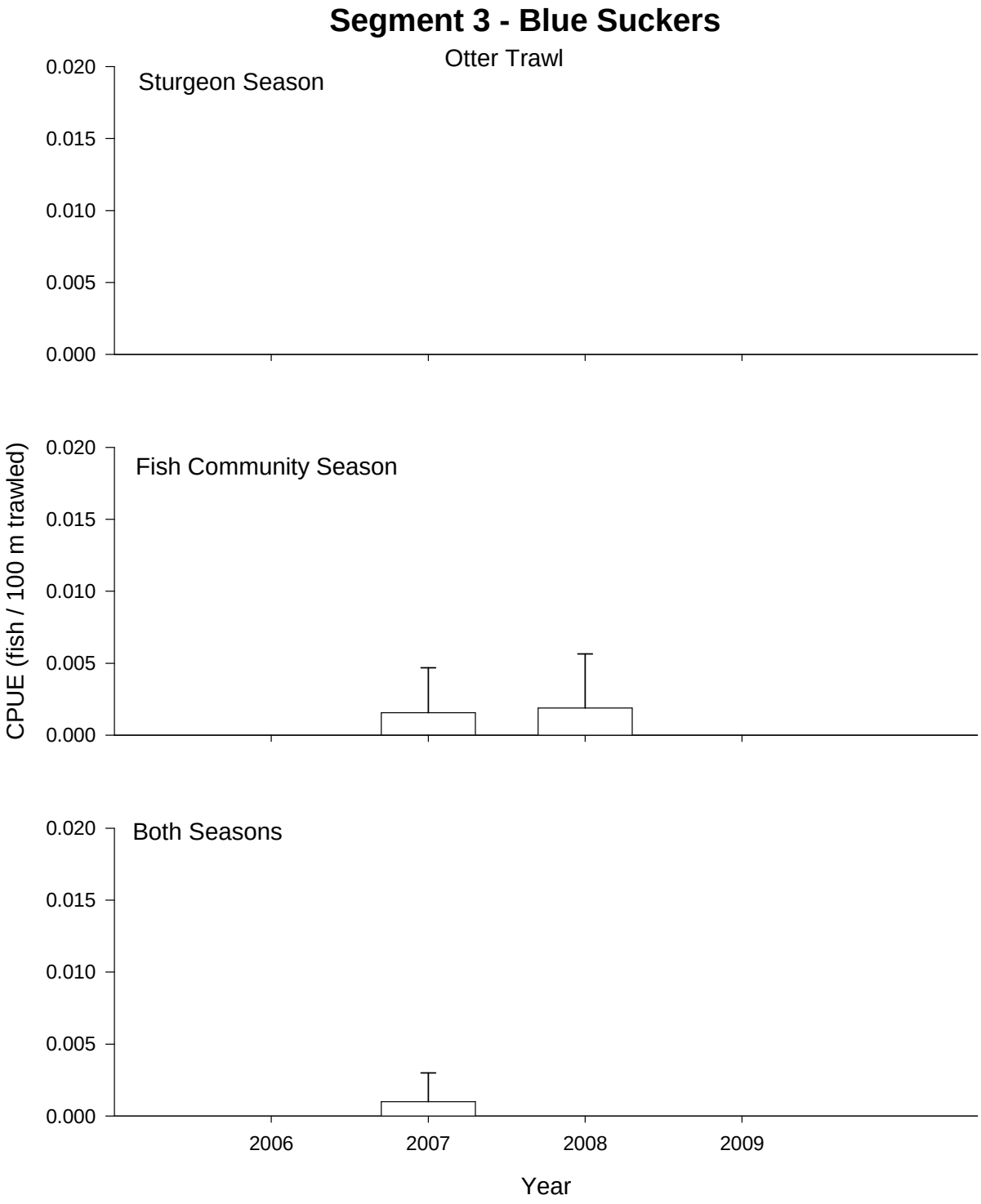


Figure 28. Mean annual catch per unit effort (+/- 2 SE) of blue sucker using otter trawls in Segment 3 of the Missouri River from 2006-2009.

Table 14. Total number of blue suckers captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 3 of the Missouri River during 2009. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

| Gear | N | Macrohabitat[a] | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BRAD | CHXO | CONF | DEND | DRNG | ISB | OSB | SCCL | SCCS | SCN | TRIB | TRML | TRMS | WILD |
| **Sturgeon Season** | | | | | | | | | | | | | | | |
| 1.0" Trammel Net | 2 | 0 | 50 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | . | 0 | 37 | 0 | 0 | 0 | 28 | 30 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gill Net | | | | | | | | | | | | | | | |
| Otter Trawl | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | . | 0 | 31 | 0 | 0 | 0 | 32 | 27 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Fish Community Season** | | | | | | | | | | | | | | | |
| 1.0" Trammel Net | 16 | 0 | 31 | 0 | 0 | 0 | 31 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | . | 0 | 36 | 0 | 0 | 0 | 34 | 27 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mini-Fyke Net | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | . | 0 | 29 | 0 | 0 | 0 | 32 | 1 | 13 | 21 | 2 | 0 | 0 | 1 | 0 |
| Otter Trawl | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | . | 0 | 34 | 0 | 0 | 0 | 34 | 26 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |

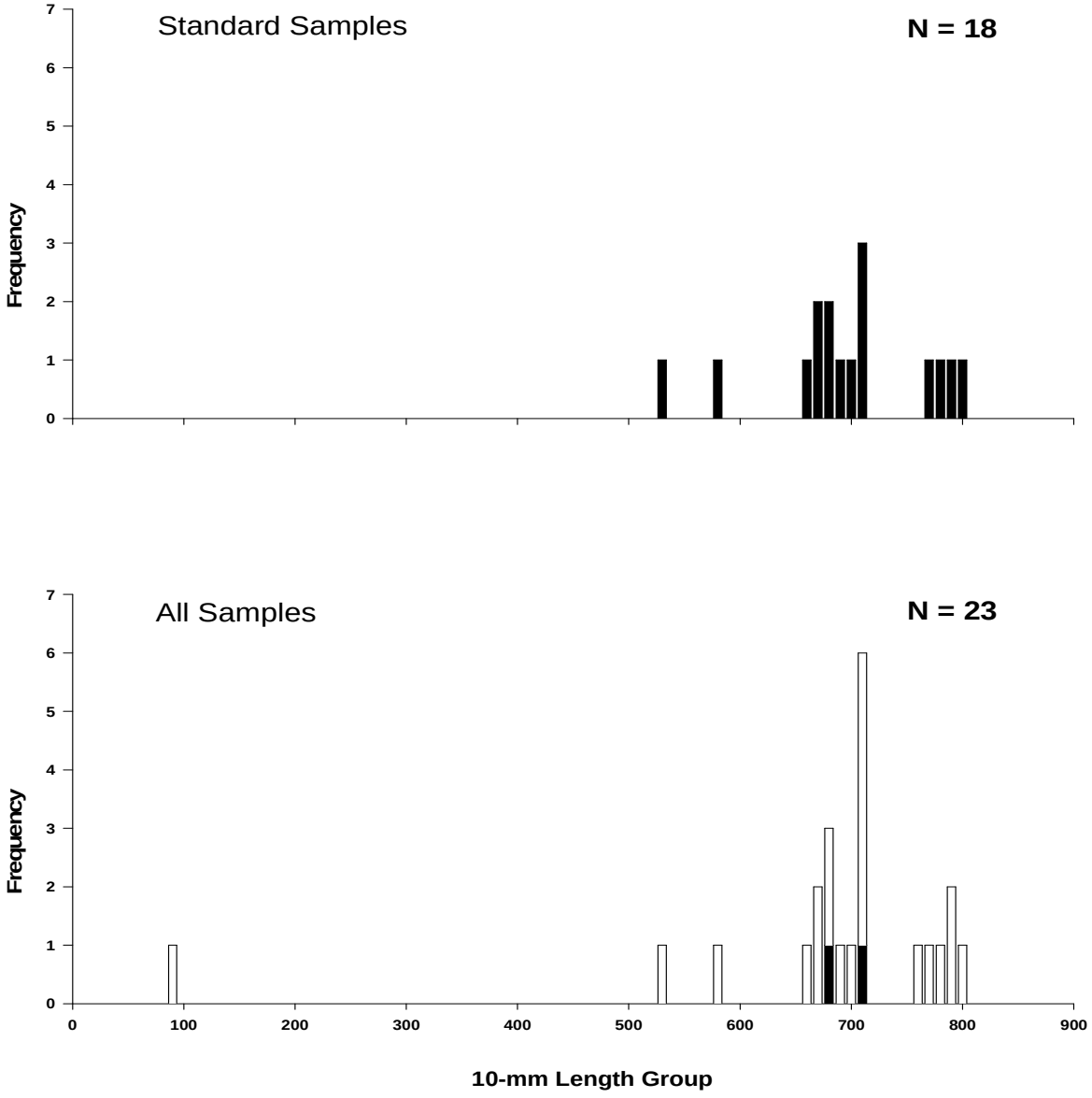


Figure 29. Length frequency of blue sucker during the sturgeon season (black bars) and the fish community season (white bars) in Segment 3 of the Missouri River during 2009. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2009.

**Sauger**

A total of 253 sauger were sampled in segment 3 during 2009, 153 and 100 during the fish community and sturgeon seasons, respectively. This was an overall decrease from 296 sampled during 2008. During 2008 trammel nets caught 165 sauger, while the otter trawl captured 66, mini fyke nets 14 and trotlines 8. On average trotlines captured the largest sauger (mean TL = 425 mm), followed by trammel nets (mean TL = 347 mm), otter trawl (mean TL = 314 mm) and mini fyke nets (mean TL = 273 mm).

Overall trammel net CPUE was slightly lower in 2009 (0.17 fish/100 m) when compared to 2008 (0.21 fish/100 m), but was still higher than 2006 and 2007 (Figure 21). During the past two years sauger CPUE in trammel nets has been considerably higher during the sturgeon season when compared to the fish community season. Trammel nets have been the most effective gear in sampling adult sauger in segment 3 over the past four years of sampling.

Overall sauger CPUE using the otter trawl was similar to 2008 with 0.05 fish/100 m (Figure 32). With such low catch rates the otter trawl doesn't seem to be nearly as effective at monitoring the relative abundance of sauger as trammel nets.

Mini fyke nets have been the main gear to monitor the abundance of age-0 sauger in segment 3 during the past four years. In 2009 few if any age-0 sauger were sampled using mini fyke nets. The smallest sauger sampled measured 174 mm and was caught on August 11$^{th}$, therefore this fish was likely age-1. The overall mini fyke net CPUE of sauger decreased in 2009 to a four year low of .07 fish/net night, a substantial decrease from a high in 2006 of 0.24 fish/net night (Figure 30).

Sauger where captured throughout both seasons and the length of segment 3. However, the largest catches occurred during both May through early June and October. During the spring three river bends between river miles 1648.5 and 1695 had significantly higher catches of sauger than other river bends sampled during the spring. Similarly, during October three river bends between river miles 1640.5 and 1644.5 had higher catches than other river bends sampled during the fall.

The length frequency histogram for sauger sampled in 2009 looks very similar to that of 2008, with the exception that zero YOY sauger were sampled in 2009 while approximately eight were sampled in 2008. The sauger rearing habitat that occurs in segment 3 is in the downstream

most portions of the segment and therefore random bend selection can have an influence on the detection of YOY sauger within a given year. Segment 4, which is downstream of segment 3 is a better indicator of YOY sauger abundance than either segment 3 or 2.

For the specific marco habitats where sauger where sampled by gear in segment 3 during 2009 see Table 15.

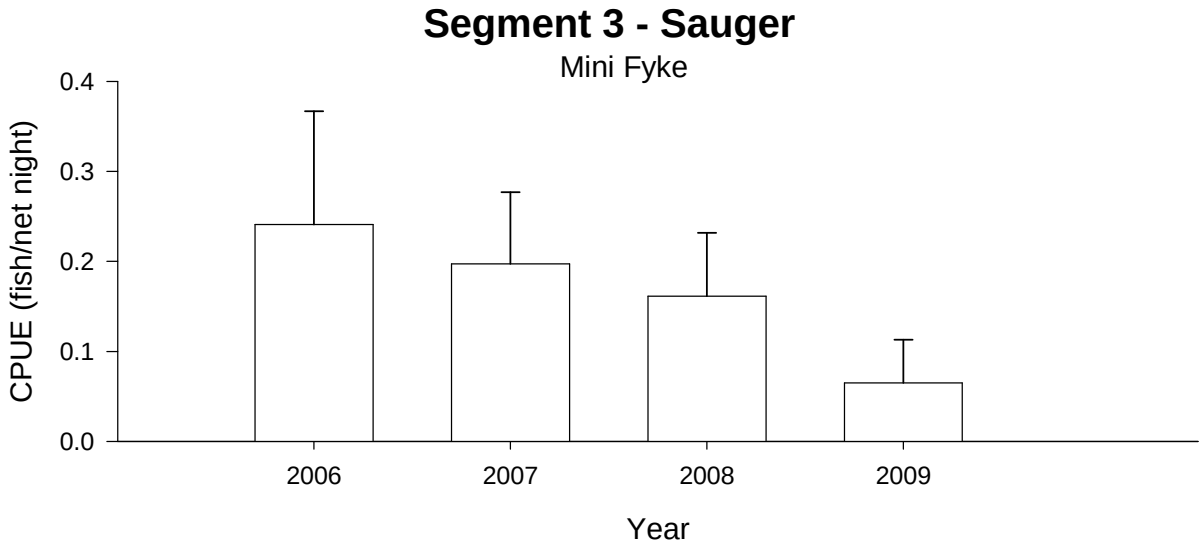


Figure 30. Mean annual catch per unit effort (+/- 2 SE) of sauger using mini fyke nets in Segment 3 of the Missouri River from 2006-2009.

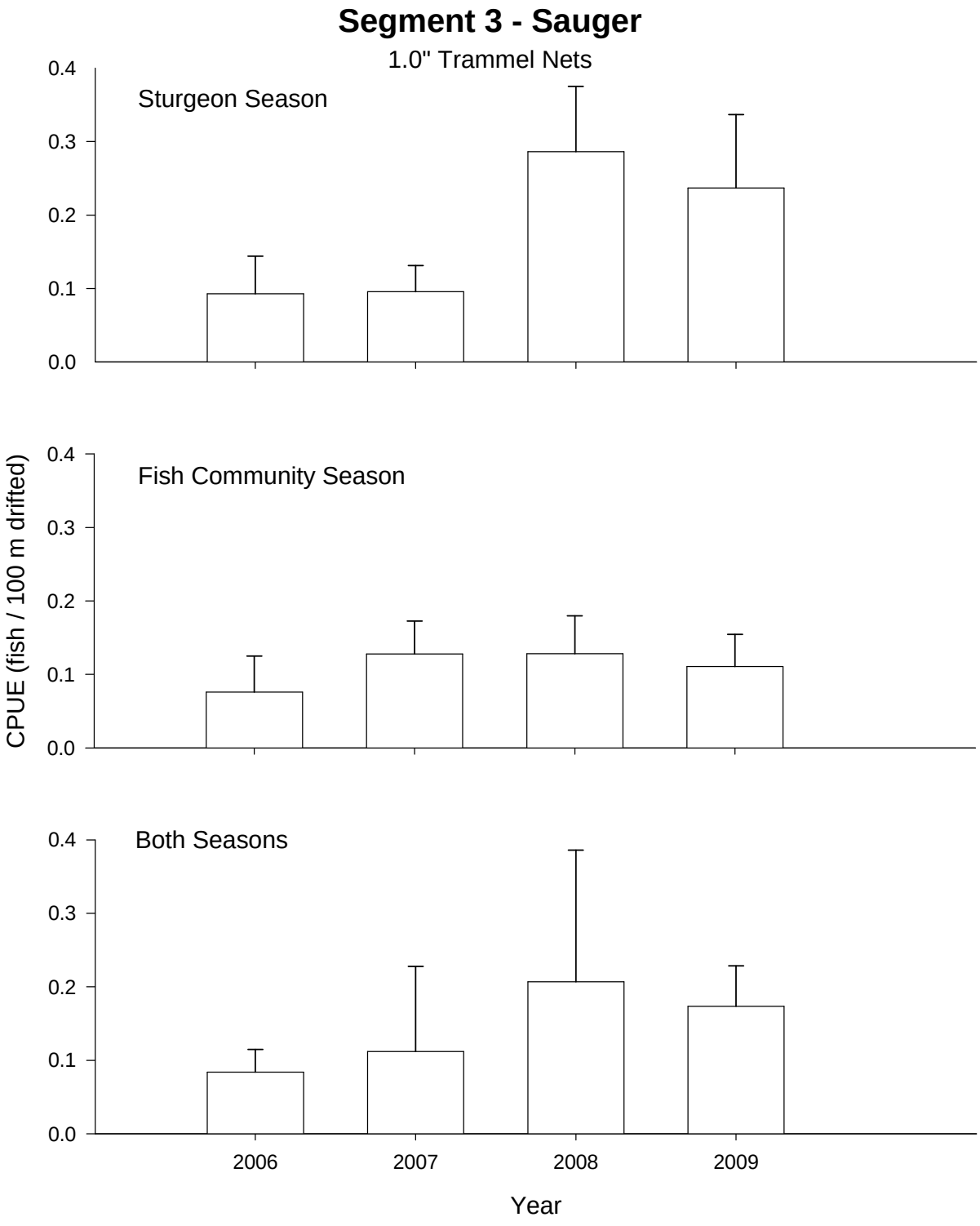


Figure 31. Mean annual catch per unit effort (+/- 2 SE) of sauger using 1.0” trammel nets in Segment 3 of the Missouri River from 2006-2009.

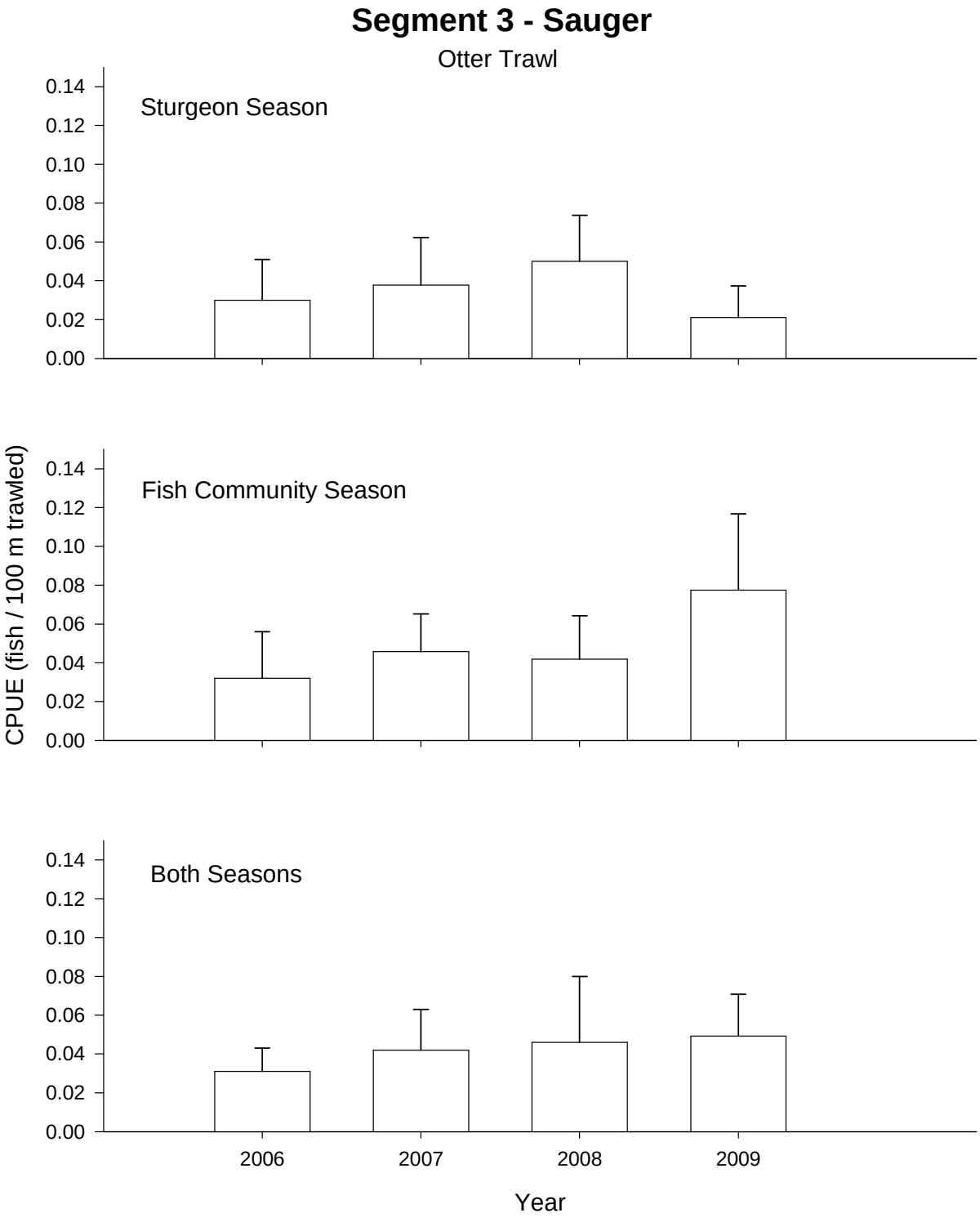


Figure 32. Mean annual catch per unit effort (+/- 2 SE) of sauger using otter trawls in Segment 3 of the Missouri River from 2006-2009.

Table 15. Total number of sauger captured for each gear during each season and the proportion caught within each macrohabitat type in Segment 3 of the Missouri River during 2009. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

| Gear | N | Macrohabitat[a] | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BRAD | CHXO | CONF | DEND | DRNG | ISB | OSB | SCCL | SCCS | SCN | TRIB | TRML | TRMS | WILD |
| **Sturgeon Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 80 | 0 | 43 | 0 | 0 | 0 | 16 | 39 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | . | 0 | 37 | 0 | 0 | 0 | 28 | 30 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gill Net | | | | | | | | | | | | | | | |
| Otter Trawl | 8 | 0 | 38 | 0 | 0 | 0 | 13 | 38 | 13 | 0 | 0 | 0 | 0 | 0 | 0 |
| | . | 0 | 31 | 0 | 0 | 0 | 32 | 27 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Fish Community Season** | | | | | | | | | | | | | | | |
| 1.0” Trammel Net | 42 | 0 | 33 | 0 | 0 | 0 | 24 | 38 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| | . | 0 | 36 | 0 | 0 | 0 | 34 | 27 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mini-Fyke Net | 14 | 0 | 21 | 0 | 0 | 0 | 29 | 0 | 14 | 14 | 21 | 0 | 0 | 0 | 0 |
| | . | 0 | 29 | 0 | 0 | 0 | 32 | 1 | 13 | 21 | 2 | 0 | 0 | 1 | 0 |
| Otter Trawl | 36 | 0 | 31 | 0 | 0 | 0 | 25 | 17 | 28 | 0 | 0 | 0 | 0 | 0 | 0 |
| | . | 0 | 34 | 0 | 0 | 0 | 34 | 26 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |

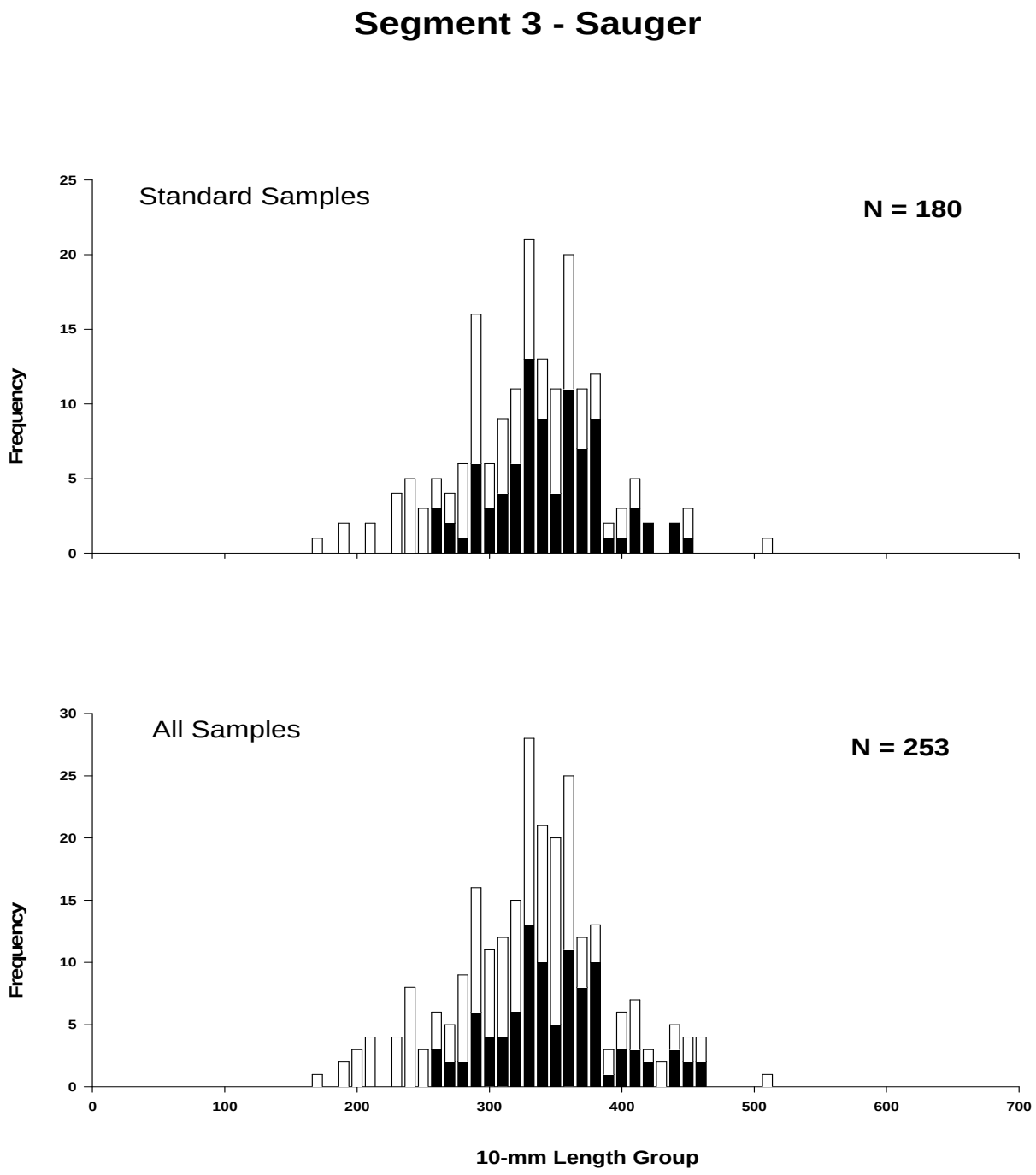


Figure 33. Length frequency of sauger during the sturgeon season (black bars) and the fish community season (white bars) in Segment 3 of the Missouri River during 2009. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2009.

# Missouri River Fish Community

During 2009 a total of 9,461 fish consisting of 33 species were collected in segment 3 of the Missouri River. Mini fyke nets collected 68% of all fish sampled, followed by otter trawls (15%), trammel nets (10%) and trotlines 7%. For this section, I will only talk about fish that had a sample size of greater than 50 and are not a target species within the population assessment program.

Fathead minnows *Pimephales promelas* were the most abundant fish in 2009 with 1,621, all of which were sampled using mini fyke nets. Seventy-two percent (1,166) of all fathead minnows sampled where found in two subsamples within one river bend (river mile 1695).

River carpsuckers *Carpiodes carpio* were the second most abundant fish sampled with 1,141 sampled. Mini fyke nets caught the majority of river carpsuckers (n = 1,069), almost all of which were YOY. Trammel nets captured 54 adults and the otter trawl caught 18. River carpsuckers averaged 34 mm TL in mini fyke nets, 406 mm TL in otter trawls and 454 mm TL in trammel nets. Both adult and YOY river carpsuckers were sampled throughout the length of segment 3. The 2009 river carpsucker catch was up from 2008 when 820 were sampled.

Emerald shiners were the third most abundant fish sampled in 2009 with 1,028 caught in mini fyke nets and 15 in the otter trawl. The total catch of emerald shiners was less than half the 2008 catch of 2,754. Emerald shiners were found throughout the length of segment 3, with patchy abundance. Emerald shiners averaged 70.1 mm TL in 2009, larger than the 2008 average of 65.5 mm TL.

A total of 965 fathead chubs *Platygobio gracilis* were collected in segment 3 during 2009, an increase from 2008 when 450 were sampled. Flathead chubs were collected in all gears, although the otter trawl and mini fyke nets were the two most effective gears sampling 532 and 367, respectively. The otter trawl sampled on average larger flathead chubs (mean TL = 126 mm) than mini fyke nets (mean TL = 76 mm). Flathead chubs were sampled throughout the length of segment 3 with patchy abundance.

The abundance of white suckers in mini fyke nets increased in 2009 (n = 634) from 2008 (n = 220). Mini fyke nets captured all but seven of the total sampled in 2009. White suckers sampled in mini fyke nets averaged 52 mm TL. Adult white suckers that were sampled in trammel nets (n = 3) averaged 318 mm TL. Although white suckers were sampled throughout

the length of segment 3, the vast majority (n = 561) were sampled in one river bend at river mile 1695.

Common carp *Cyprinus carpio* were sampled throughout the length of segment 3, with a total of 568 sampled. The majority (97%) were young-of-the-year sampled in mini fyke nets. The remaining 3% of the total carp catch was divided between all other gears that were deployed. The total carp catch was more than double in 2009 when compared to 2008 (n = 274).

Goldeye *Hiodon alosoides* were relatively evenly distributed throughout segment 3 in 2009 with a total of 419 sampled. Trammel nets caught more goldeye (n = 294) than trotlines (n = 211) and the otter trawl (n = 14), while none were sampled using mini fyke nets. Goldeye averaged 296 mm TL with the smallest sample measuring 108 mm and the largest 404 mm. No young-of-the-year goldeye were sampled in 2009, whereas nine were sampled in 2008.

A total of 366 channel catfish *Ictalurus punctatus* were sampled during 2009, an increase from 272 sampled in 2009. Channel catfish were sampled in all gears except for mini fyke nets. Trotlines were the most effective gear in capturing channel catfish with a total of 196 sampled. For standard gears the otter trawl captured 107 and trammel nets 63. On average trotlines captured the largest catfish while the otter trawl sampled the smallest. Overall, channel catfish averaged 315 mm TL, with a minimum length of 121 mm and a maximum of 672 mm. The channel catfish catch was for the most part evenly distributed throughout the length of segment 3.

During 2009 a total of 364 shorthead redhorse *Moxostoma macrolepidotum* were sampled in segment 3. This was a substantial increase from 2008 when 74 were sampled. Of the 2009 total, 251 were sampled in mini fyke nets, 63 in otter trawls, 33 with trammel nets and 17 on trotlines. Mini fyke nets mainly sampled young-of-the-year shorthead redhorses that averaged 47 mm in length, whereas all other gears sampled adults.

Stonecats *Noturus flavus* were sampled throughout most the length of segment 3, with a total of 80 sampled. Trotlines were the most effective gear at sampling stonecats (n = 4), followed by the otter trawl (n = 30) and mini fyke nets (n = 6), while none were sampled using trammel nets.

Other species sampled that had a sample size of less than 50 included white crappie *Pomoxis annularis* (n = 38), longnose sucker *Catostomus catostomus* (n = 26), burbot *Lota lota* (n = 16), bigmouth buffalo *Ictiobus cyprinellus* (n = 16), smallmouth buffalo *I. Bubalus* (n = 16), walleye *Sander vitreus* (n = 13), northern pike *Esox lucius* (n = 9), lake whitefish *Coregonus*

*clupeaformis* (n = 7), green sunfish *Lepomis cyanellus* (n = 4), freshwater drum *Aplodinotus grunniens* (n = 4), longnose dace *Rhinichtys cataractae* (n = 2), pumpkinseed *Lepomis gibbosus* (n = 2), brook stickleback *Culaea inconstans* (n = 1) and spottail shiner *Notropis hudsonius* (n = 1).

# Discussion

While the total catch of pallid sturgeon in segment 3 has increased over the past four years of sampling, CPUE data for both trammel nets and otter trawls have not. Conversely, overall trammel net CPUE was lower in 2009 than during 2006, while the overall otter trawl CPUE was lower than during 2007. The increase in the total number of pallid sturgeon sampled has mainly been attributed to the increase in effort of all gears and the implementation of trotlines.

Trotlines were a very effective gear in 2009 at catching both gross numbers of pallid sturgeon as well as sampling a variety of year classes. During a three day intensive trotline effort in the lower area of segment 3 (river miles 1587-1594) 96 trotlines were set, which consisted of 1,920 hooks. A total of 43 pallid sturgeon were captured on trotlines during this effort, which represented 9 different year classes originating from 9 different stocking locations from both the Missouri and Yellowstone Rivers. Due to the success of this effort, it will be expanded in 2010 to both gain more information that can be used in deriving survival estimates as well as attempting to quantify how far this "hot" zone of pallid sturgeon occupancy occurs.

Although pallid sturgeon have been captured throughout the length of segment 3 over the four years of sampling, it has become apparent that their densities are the greatest in the lower portions of the segment. From our data, we have observed that fish stocked upstream in segment 3 and 2 and fish stocked into the Yellowstone River are using the lower section of the segment 3. That coupled with the fact that all age classes have been found in this section lend evidence that this is an extremely important rearing area for pallid sturgeon. For the most part, as you go upstream a higher proportion of the catch is comprised of younger year classes of fish. Although we do not fully understand why this area is being chosen by pallid sturgeon over upstream areas, there are some likely candidates. First, this section of river is the most naturalized in terms of summer water temperatures and suspended sediment loads. Secondly, this section of river has greater abundance of many native minnow species such as sturgeon and sicklefin chubs when compared to upstream reaches. Lastly, due to the nutrient inputs from both tributaries as well as the uplands, this area may contain higher macro invertebrate abundance than the more nutrient poor areas upstream. A better understanding of the specific habitat attributes that are causing pallid sturgeon to choose this area over upstream areas should be a research priority.

The first wild pallid sturgeon sampled in four years of random sampling was captured during 2009 in a trammel net at rivermile 1625.5 on August 10th. The collection of this fish complies with radio telemetry data of wild pallid sturgeon in RPMA 2 that has shown that a small portion of the wild adult population do use the Missouri River above the confluence of the Yellowstone River during portions of the year.

Due to the large numbers of pallid sturgeon stocked into RPMA 2 over the past 12 years it is important to not only monitor pallid sturgeon, but other fishes that might either compete with or act as a prey source for pallid sturgeon. However, when monitoring the relative abundance of multiple species the results are often difficult to interpret. For instance, sturgeon chub catch using the otter trawl has decreased since 2006 to a low in 2009. On the contrary, sicklefin chub catch has remained relatively constant. Due to the small numbers sampled for both of these species it is too early to make any concrete conclusions on the overall relative abundance of either of these species. In addition, many of the native minnow species have large fluctuations in abundance from year to year and determining a trend may take several more years of sampling. For example, western silvery minnow abundance went up substantially from 2006 to 2008 and then was at a four year low in 2009. River discharge, water temperature, suspended sediment and overall dam operations might all be abiotic factors affecting the production of various species within segment 3. Additionally, predator abundance and completion with other small bodied fishes may also affect the abundance of these populations. More years of data should allow us to better understand how these variables affect year class strength of many of these small bodied fishes.

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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*** | **Speckled chub** | **SKCB*** |
| ***Macrhybopsis gelida*** | **Sturgeon chub** | **SGCB*** |
| ***Macrhybopsis meeki*** | **Sicklefin chub** | **SFCB*** |
| *Macrhybopsis storeriana* | Silver chub | SVCB |
| *M. aestivalis X M. gelida* | Speckled-Sturgeon chub hybrid | SPST |
| *M. gelida X M. meeki* | Sturgeon-Sicklefin chub hybrid | SCSC |
| *Macrhybopsis* spp. | Unidentified chub | UHY |
| *Margariscus margarita* | Pearl dace | PLDC |
| *Mylocheilus caurinus* | Peamouth | PEMT |
| *Nocomis biguttatus* | Hornyhead chub | HHCB |
| *Notemigonus crysoleucas* | Golden shiner | GDSN |
| *Notropis atherinoides* | Emerald shiner | ERSN |
| *Notropis blennius* | River shiner | RVSN |
| *Notropis boops* | Bigeye shiner | BESN |
| *Notropis buchanani* | Ghost shiner | GTSN |
| *Notropis dorsalis* | Bigmouth shiner | BMSN |
| *Notropis greenei* | Wedgespot shiner | WSSN |
| | **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. Three habitat scales were used in the hierarchical habitat classification system: Macrohabitats, Mesohabitats, and Microhabitats.

| Habitat | Scale | Definition | Code |
|---|---|---|---|
| Braided channel | Macro | An area of the river that contains multiple smaller channels and is lacking a readily identifiable main channel (typically associated with unchannelized sections) | BRAD |
| Main channel cross over | Macro | The inflection point of the thalweg where the thalweg crosses from one concave side of the river to the other concave side of the river, (i.e., transition zone from one-bend to the next bend). The upstream CHXO for a respective bend is the one sampled. | CHXO |
| Tributary confluence | Macro | Area immediately downstream, extending up to one bend in length, from a junction of a large tributary and the main river where this tributary has influence on the physical features of the main river | CONF |
| 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 3 for the long-term pallid sturgeon and associated fish community sampling program. Long-term monitoring began in 2006 for Segment 3.

| Gear | Code | Type | Season | Years | CPUE units |
|---|---|---|---|---|---|
| Gillnet – 4 meshes, small mesh set upstream | GN14 | Standard | Sturgeon | Not Used | fish/net night |
| Gillnet – 4 meshes, large mesh set upstream | GN41 | Standard | Sturgeon | Not Used | fish/net night |
| Gillnet – 8 meshes, small mesh set upstream | GN18 | Standard | Sturgeon | Not Used | fish/net night |
| Gillnet – 8 meshes, large mesh set upstream | GN81 | Standard | Sturgeon | Not Used | fish/net night |
| Mini-fyke net | MF | Standard | Fish Comm. | 2006 - 2009 | fish/net night |
| Push Trawl – 8 ft 4mm x 4mm | POT02 | Wild | Fish Comm. | 2007 | fish/ m trawled |
| Trammel net – 1 inch inner mesh | TN | Standard | All | 2006 - 2009 | fish/100 m drift |
| Trot Line – Circle hooks* | TLC_ | Wild | Sturgeon | Not Used | fish/hook night |
| Trot Line – Octopus hooks* | TLO_ | Wild | Sturgeon | 2007 - 2009 | fish/hook night |
| Trot Line – O'Shaughnessy hooks* | TLS_ | Wild | Sturgeon | Not Used | fish/hook night |
| Otter trawl – 16 ft head rope | OT16 | Standard | All | 2006 - 2009 | fish/100 m trawled |
| Otter trawl – 16 ft SKT 4mm x 4mm HB2 MOR | OT01 | Wild | Fish Comm. | Not Used | fish/100 m trawled |
| Beam trawl – 6.4 ft width, 1/8 inch inner mesh | BT | Wild | All | 2006 | Fish/100 m trawled |

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 3 of the Missouri River (RPMA 2)

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

| Year | Stocking Site | Number Stocked | Year Class | Stock Date | Age at Stocking[a] | Primary Mark | Secondary Mark |
|---|---|---|---|---|---|---|---|
| 2004 | Wolf Point | 379 | 2003 | 8/9/2004 | Yearling | PIT Tag | Elastomer |
| 2004 | Larval Drift | 30000 | 2004 | 7/2/2004 | Fry | | |
| 2004 | Larval Drift | 50000 | 2004 | 7/8/2004 | Fry | | |
| 2004 | Larval Drift | 25000 | 2004 | 7/20/2004 | Fry | | |
| 2004 | Larval Drift | 25000 | 2004 | 7/23/2004 | Fry | | |
| 2004 | Larval Drift | 25000 | 2004 | 7/27/2004 | Fry | | |
| 2004 | Culbertson | 3819 | 2004 | 9/10/2004 | Fingerling | CWT | Elastomer |
| 2004 | Sidney | 2991 | 2004 | 9/10/2004 | Fingerling | CWT | Elastomer |
| 2004 | Wolf Point | 4040 | 2004 | 9/10/2004 | Fingerling | CWT | Elastomer |
| 2004 | Mouth of Milk | 3482 | 2004 | 10/15/2004 | Advanced Fingerling | CWT | Elastomer |
| 2004 | Intake | 2477 | 2004 | 11/18/2004 | Advanced Fingerling | CWT | Elastomer |
| 2005 | Culbertson | 288 | 2004 | 4/12/2005 | Yearling | CWT | Elastomer |
| 2005 | Intake | 309 | 2004 | 4/12/2005 | Yearling | CWT | Elastomer |
| 2005 | Wolf Point | 271 | 2004 | 4/12/2005 | Yearling | CWT | Elastomer |
| 2005 | Intake | 175 | 2004 | 8/19/2005 | Yearling | PIT Tag | Elastomer |
| 2005 | Brockton | 229 | 2005 | 10/5/2005 | Advanced Fingerling | CWT | Elastomer |
| 2005 | Culbertson | 226 | 2005 | 10/5/2005 | Advanced Fingerling | CWT | Elastomer |
| 2005 | Intake | 456 | 2005 | 10/5/2005 | Advanced Fingerling | CWT | Elastomer |
| 2005 | Milk River | 232 | 2005 | 10/5/2005 | Advanced Fingerling | CWT | Elastomer |
| 2005 | Sidney | 122 | 2005 | 10/5/2005 | Advanced Fingerling | CWT | Elastomer |
| 2005 | Wolf Point | 611 | 2005 | 10/12/2005 | Advanced Fingerling | CWT | Elastomer |
| 2005 | Brockton | 371 | 2005 | 10/13/2005 | Advanced fingerling | | |
| 2005 | Culbertson | 1736 | 2005 | 10/13/2005 | Advanced Fingerling | CWT | Elastomer |
| 2005 | Culbertson | 182 | 2005 | 10/13/2005 | Advanced Fingerling | | |
| 2005 | Intake | 313 | 2005 | 10/13/2005 | Advanced Fingerling | | |
| 2005 | Milk River | 845 | 2005 | 10/13/2005 | Advanced Fingerling | CWT | Elastomer |
| 2005 | Mouth of Milk | 371 | 2005 | 10/13/2005 | Advanced Fingerling | | |
| 2005 | Sidney | 105 | 2005 | 10/13/2005 | Advanced Fingerling | | |
| 2005 | Wolf Point | 1521 | 2005 | 10/13/2005 | Advanced Fingerling | CWT | Elastomer |
| 2005 | Wolf Point | 371 | 2005 | 10/13/2005 | Advanced Fingerling | | |
| 2005 | Culbertson | 651 | 2005 | 10/19/2005 | Advanced Fingerling | CWT | Elastomer |
| 2005 | Intake | 2120 | 2005 | 10/19/2005 | Advanced Fingerling | CWT | Elastomer |
| 2005 | Milk River | 485 | 2005 | 10/19/2005 | Advanced Fingerling | CWT | Elastomer |

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

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

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

[a]Age of fish when stocked: Fry, Fingerling, Yearling, 1yo, 2yo, 3yo, etc…

# 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 3 of the Missouri River during 2009. 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 F2. 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 | | SCCS | TRML |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CHNB | POOL | CHNB | POOL | CHNB | POOL | CHNB | POOL | CHNB | ITIP | ITIP | TLWG |
| BKSB | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| BMBF | 4 | 0.005 | 0.008 | | | | 0.004 | | 0.003 | | 0 | | | |
| | | 0.005 | 0.011 | | | | 0.009 | | 0.006 | | 0 | | | |
| BRBT | 2 | 0.003 | 0.005 | | | | 0.003 | | 0 | | 0 | | | |
| | | 0.004 | 0.01 | | | | 0.006 | | 0 | | 0 | | | |
| **BUSK*** | **18** | **0.024** | **0.018** | | | | **0.021** | | **0.037** | | **0** | | | |
| | | **0.013** | **0.015** | | | | **0.023** | | **0.033** | | **0** | | | |
| CARP | 2 | 0.002 | 0.006 | | | | 0 | | 0 | | 0 | | | |
| | . | 0.004 | 0.012 | | | | 0 | | 0 | | 0 | | | |
| CNCF | 45 | 0.062 | 0.068 | | | | 0.073 | | 0.031 | | 0.151 | | | |
| | | 0.025 | 0.049 | | | | 0.05 | | 0.026 | | 0.164 | | | |
| ERSN | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| FHCB | 14 | 0.018 | 0.015 | | | | 0.019 | | 0.015 | | 0.052 | | | |
| | | 0.01 | 0.015 | | | | 0.022 | | 0.015 | | 0.071 | | | |
| FHMW | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| GDEY | 219 | 0.298 | 0.274 | | | | 0.367 | | 0.252 | | 0.262 | | | |
| | | 0.07 | 0.105 | | | | 0.143 | | 0.121 | | 0.182 | | | |
| GNSF | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| **HBNS*** | **0** | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| | | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| LKWF | 4 | 0.004 | 0.006 | | | | 0 | | 0.004 | | 0.024 | | | |
| | | 0.004 | 0.008 | | | | 0 | | 0.008 | | 0.048 | | | |
| LNDC | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| LNSK | 1 | 0.002 | 0 | | | | 0.006 | | 0 | | 0 | | | |
| | | 0.004 | 0 | | | | 0.012 | | 0 | | 0 | | | |

| Species | Total Catch | Overall CPUE | CHXO | | CONF | | ISB | | OSB | | SCCL | | SCCS | TRML |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CHNB | POOL | CHNB | POOL | CHNB | POOL | CHNB | POOL | CHNB | ITIP | ITIP | TLWG |
| NFSH | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| NTPK | 2 | 0.003 | 0.01 | | | | 0 | | 0 | | 0 | | | |
| | | 0.005 | 0.015 | | | | 0 | | 0 | | 0 | | | |
| **PDSG*** | **23** | **0.028** | **0.048** | | | | **0.016** | | **0.021** | | **0.024** | | | |
| | | **0.012** | **0.025** | | | | **0.018** | | **0.019** | | **0.048** | | | |
| PNSD | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| RVCS | 42 | 0.06 | 0.071 | | | | 0.054 | | 0.041 | | 0.156 | | | |
| | | 0.023 | 0.042 | | | | 0.036 | | 0.034 | | 0.265 | | | |
| **SFCB*** | **0** | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| | | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| **SGCB*** | **0** | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| | | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| **SGER*** | **122** | **0.174** | **0.179** | | | | **0.116** | | **0.24** | | **0.102** | | | |
| | | **0.055** | **0.063** | | | | **0.053** | | **0.154** | | **0.09** | | | |
| SHRH | 23 | 0.035 | 0.035 | | | | 0.036 | | 0.024 | | 0.125 | | | |
| | | 0.019 | 0.031 | | | | 0.032 | | 0.027 | | 0.251 | | | |
| SMBF | 8 | 0.013 | 0.003 | | | | 0.025 | | 0.007 | | 0.041 | | | |
| | | 0.011 | 0.006 | | | | 0.029 | | 0.011 | | 0.082 | | | |
| **SNSG*** | **127** | **0.167** | **0.201** | | | | **0.194** | | **0.108** | | **0.133** | | | |
| | | **0.043** | **0.085** | | | | **0.085** | | **0.05** | | **0.182** | | | |
| **SNSN*** | **0** | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| | | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| STCT | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| STSN | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| UCA | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| UCY | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |

| Species | Total Catch | Overall CPUE | CHXO | | CONF | | ISB | | OSB | | SCCL | | SCCS | TRML |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CHNB | POOL | CHNB | POOL | CHNB | POOL | CHNB | POOL | CHNB | ITIP | ITIP | TLWG |
| UNID | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| WLYE | 1 | 0.001 | 0 | | | | 0.003 | | 0 | | 0 | | | |
| | | 0.002 | 0 | | | | 0.006 | | 0 | | 0 | | | |
| **WSMW*** | **0** | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| | | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| WTCP | 1 | 0.001 | 0.003 | | | | 0 | | 0 | | 0 | | | |
| | | 0.002 | 0.006 | | | | 0 | | 0 | | 0 | | | |
| WTSK | 1 | 0.001 | 0 | | | | 0 | | 0.004 | | 0 | | | |
| | | 0.003 | 0 | | | | 0 | | 0.009 | | 0 | | | |

Appendix F3. 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 | | CONF | | ISB | | OSB | | SCCL | | SCCS | TRML |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CHNB | POOL | CHNB | POOL | CHNB | POOL | CHNB | POOL | CHNB | ITIP | ITIP | TLWG |
| BKSB | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| BMBF | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| BRBT | 5 | 0.005 | 0.003 | | | | 0.007 | | 0.003 | | 0.013 | | | |
| | | 0.005 | 0.006 | | | | 0.01 | | 0.007 | | 0.026 | | | |
| **BUSK*** | **0** | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| | | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| CARP | 2 | 0.002 | 0.003 | | | | 0 | | 0.003 | | 0 | | | |
| | | 0.003 | 0.006 | | | | 0 | | 0.007 | | 0 | | | |
| CNCF | 76 | 0.09 | 0.068 | | | | 0.096 | | 0.09 | | 0.155 | | | |
| | | 0.028 | 0.037 | | | | 0.053 | | 0.052 | | 0.155 | | | |
| ERSN | 7 | 0.008 | 0.005 | | | | 0.014 | | 0.003 | | 0.013 | | | |
| | | 0.008 | 0.011 | | | | 0.019 | | 0.007 | | 0.026 | | | |
| FHCB | 363 | 0.379 | 0.439 | | | | 0.408 | | 0.142 | | 0.89 | | | |
| | | 0.134 | 0.312 | | | | 0.189 | | 0.074 | | 0.815 | | | |
| FHMW | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| GDEY | 10 | 0.01 | 0.003 | | | | 0.013 | | 0.012 | | 0.026 | | | |
| | | 0.009 | 0.006 | | | | 0.013 | | 0.024 | | 0.051 | | | |
| GNSF | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| **HBNS*** | **0** | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| | | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| LKWF | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| LNDC | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| LNSK | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| NFSH | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| NTPK | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| **PDSG*** | **35** | **0.039** | **0.051** | | | | **0.047** | | **0.022** | | **0.015** | | | |
| | | **0.015** | **0.034** | | | | **0.026** | | **0.02** | | **0.031** | | | |
| PNSD | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |

| Species | Total Catch | Overall CPUE | CHXO | | CONF | | ISB | | OSB | | SCCL | | SCCS | TRML |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CHNB | POOL | CHNB | POOL | CHNB | POOL | CHNB | POOL | CHNB | ITIP | ITIP | TLWG |
| RVCS | 15 | 0.022 | 0.006 | | | | 0.014 | | 0.03 | | 0.098 | | | |
| | | 0.015 | 0.008 | | | | 0.02 | | 0.032 | | 0.12 | | | |
| **SFCB*** | **85** | **0.092** | **0.126** | | | | **0.082** | | **0.075** | | **0.051** | | | |
| | | **0.031** | **0.07** | | | | **0.05** | | **0.045** | | **0.08** | | | |
| **SGCB*** | **187** | **0.2** | **0.218** | | | | **0.161** | | **0.233** | | **0.169** | | | |
| | | **0.054** | **0.097** | | | | **0.084** | | **0.117** | | **0.15** | | | |
| **SGER*** | **44** | **0.049** | **0.045** | | | | **0.036** | | **0.042** | | **0.154** | | | |
| | | **0.021** | **0.028** | | | | **0.026** | | **0.041** | | **0.182** | | | |
| SHRH | 39 | 0.047 | 0.036 | | | | 0.032 | | 0.056 | | 0.127 | | | |
| | | 0.025 | 0.056 | | | | 0.028 | | 0.047 | | 0.114 | | | |
| SMBF | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| **SNSG*** | **49** | **0.064** | **0.075** | | | | **0.046** | | **0.07** | | **0.072** | | | |
| | | **0.028** | **0.073** | | | | **0.029** | | **0.041** | | **0.097** | | | |
| **SNSN*** | **0** | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| | | **0** | **0** | | | | **0** | | **0** | | **0** | | | |
| STCT | 14 | 0.018 | 0.003 | | | | 0.016 | | 0.029 | | 0.051 | | | |
| | | 0.013 | 0.006 | | | | 0.027 | | 0.024 | | 0.076 | | | |
| STSN | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| UCA | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| UCY | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| UNID | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| WLYE | 6 | 0.006 | 0.009 | | | | 0.011 | | 0 | | 0 | | | |
| | | 0.007 | 0.018 | | | | 0.013 | | 0 | | 0 | | | |
| **WSMW*** | **1** | **0.001** | **0** | | | | **0** | | **0** | | **0.013** | | | |
| | | **0.002** | **0** | | | | **0** | | **0** | | **0.026** | | | |
| WTCP | 0 | 0.001 | 0 | | | | 0 | | 0.003 | | 0 | | | |
| | | 0.002 | 0 | | | | 0 | | 0.007 | | 0 | | | |
| WTSK | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | | |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | | |

Appendix F4. 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 | | OSB | | SCCL | | SCCS | TRMS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BARS | POOL | CHNB | POOL | BARS | POOL | BARS | POOL | BARS | ITIP | BARS | BARS |
| BKSB | 1 | 0.006 | 0 | | | | 0 | | 0 | | 0 | | 0.027 | 0 |
| | | 0.011 | 0 | | | | 0 | | 0 | | 0 | | 0.054 | 0 |
| BMBF | 9 | 0.052 | 0.02 | | | | 0.018 | | 0 | | 0 | | 0.162 | 0.5 |
| | | 0.041 | 0.039 | | | | 0.036 | | 0 | | 0 | | 0.165 | 1 |
| BRBT | 4 | 0.023 | 0.039 | | | | 0.036 | | 0 | | 0 | | 0 | 0 |
| | | 0.023 | 0.055 | | | | 0.05 | | 0 | | 0 | | 0 | 0 |
| **BUSK*** | **0** | **0** | **0** | | | | **0** | | **0** | | **0** | | **0** | **0** |
| | | **0** | **0** | | | | **0** | | **0** | | **0** | | **0** | **0** |
| CARP | 549 | 3.155 | 1.255 | | | | 0.5 | | 0 | | 0.682 | | 9.514 | 25.5 |
| | | 2.825 | 0.706 | | | | 0.342 | | 0 | | 0.463 | | 12.874 | 45 |
| CNCF | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | 0 | 0 |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | 0 | 0 |
| ERSN | 1028 | 5.908 | 10.843 | | | | 3.732 | | 0 | | 6.318 | | 3.351 | 0 |
| | | 3.659 | 11.77 | | | | 2.428 | | 0 | | 6.191 | | 2.094 | 0 |
| FHCB | 367 | 2.109 | 1.667 | | | | 1.214 | | 2.5 | | 0.682 | | 5.243 | 0 |
| | | 2.075 | 1.308 | | | | 0.764 | | 3 | | 0.381 | | 9.548 | 0 |
| FHMW | 1621 | 9.316 | 1.353 | | | | 3.429 | | 0 | | 0.682 | | 34.73 | 1 |
| | | 9.41 | 0.643 | | | | 2.793 | | 0 | | 0.609 | | 43.424 | 2 |
| GDEY | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | 0 | 0 |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | 0 | 0 |
| GNSF | 4 | 0.023 | 0.039 | | | | 0.018 | | 0 | | 0.045 | | 0 | 0 |
| | | 0.023 | 0.055 | | | | 0.036 | | 0 | | 0.091 | | 0 | 0 |
| **HBNS*** | **6** | **0.034** | **0** | | | | **0.071** | | **0** | | **0.045** | | **0.027** | **0** |
| | | **0.049** | **0** | | | | **0.143** | | **0** | | **0.091** | | **0.054** | **0** |
| LKWF | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | 0 | 0 |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | 0 | 0 |
| LNDC | 2 | 0.011 | 0.02 | | | | 0 | | 0 | | 0 | | 0.027 | 0 |
| | | 0.016 | 0.039 | | | | 0 | | 0 | | 0 | | 0.054 | 0 |
| LNSK | 24 | 0.138 | 0.039 | | | | 0.036 | | 0 | | 0.045 | | 0.514 | 0 |
| | | 0.165 | 0.055 | | | | 0.05 | | 0 | | 0.091 | | 0.762 | 0 |
| NFSH | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | 0 | 0 |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | 0 | 0 |
| NTPK | 2 | 0.011 | 0 | | | | 0 | | 0 | | 0.045 | | 0 | 0 |
| | | 0.016 | 0 | | | | 0 | | 0 | | 0.091 | | 0 | 0 |
| **PDSG*** | **0** | **0** | **0** | | | | **0** | | **0** | | **0** | | **0** | **0** |
| | | **0** | **0** | | | | **0** | | **0** | | **0** | | **0** | **0** |

| Species | Total Catch | Overall CPUE | CHXO | | CONF | | ISB | | OSB | | SCCL | | SCCS | TRMS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BARS | POOL | CHNB | POOL | BARS | POOL | BARS | POOL | BARS | ITIP | BARS | BARS |
| PNSD | 2 | 0.011 | 0 | | | | 0 | | 0 | | 0 | | 0.054 | 0 |
| | | 0.016 | 0 | | | | 0 | | 0 | | 0 | | 0.075 | 0 |
| RVCS | 1069 | 6.144 | 1.961 | | | | 3.679 | | 0.5 | | 2.364 | | 15.757 | 8 |
| | | 3.131 | 1.145 | | | | 2.988 | | 1 | | 2.266 | | 12.761 | 16 |
| **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*** | **14** | **0.08** | **0.059** | | | | **0.071** | | **0** | | **0.091** | | **0.054** | **0** |
| | | **0.05** | **0.087** | | | | **0.086** | | **0** | | **0.182** | | **0.075** | **0** |
| SHRH | 251 | 1.443 | 0.667 | | | | 0.911 | | 0 | | 0.227 | | 4.243 | 1 |
| | | 1.054 | 0.657 | | | | 0.973 | | 0 | | 0.261 | | 4.575 | 2 |
| SMBF | 3 | 0.017 | 0.02 | | | | 0 | | 0 | | 0 | | 0.054 | 0 |
| | | 0.026 | 0.039 | | | | 0 | | 0 | | 0 | | 0.108 | 0 |
| **SNSG*** | **0** | **0** | **0** | | | | **0** | | **0** | | **0** | | **0** | **0** |
| | | **0** | **0** | | | | **0** | | **0** | | **0** | | **0** | **0** |
| **SNSN*** | **819** | **4.707** | **6.588** | | | | **3.643** | | **1.5** | | **2.273** | | **5.892** | **1** |
| | | **1.687** | **4.097** | | | | **2.889** | | **3** | | **2.483** | | **3.013** | **2** |
| STST | 6 | 0.034 | 0.078 | | | | 0.036 | | 0 | | 0 | | 0 | 0 |
| | | 0.032 | 0.094 | | | | 0.05 | | 0 | | 0 | | 0 | 0 |
| STSN | 1 | 0.006 | 0 | | | | 0 | | 0 | | 0.045 | | 0 | 0 |
| | | 0.011 | 0 | | | | 0 | | 0 | | 0.091 | | 0 | 0 |
| UCA | 7 | 0.04 | 0.039 | | | | 0.054 | | 0 | | 0.091 | | 0 | 0 |
| | | 0.047 | 0.078 | | | | 0.107 | | 0 | | 0.182 | | 0 | 0 |
| UCY | 1 | 0.006 | 0 | | | | 0 | | 0 | | 0 | | 0.027 | 0 |
| | | 0.011 | 0 | | | | 0 | | 0 | | 0 | | 0.054 | 0 |
| UNID | 3 | 0.017 | 0 | | | | 0.054 | | 0 | | 0 | | 0 | 0 |
| | | 0.034 | 0 | | | | 0.107 | | 0 | | 0 | | 0 | 0 |
| WLYE | 0 | 0 | 0 | | | | 0 | | 0 | | 0 | | 0 | 0 |
| | | 0 | 0 | | | | 0 | | 0 | | 0 | | 0 | 0 |
| **WSMW*** | **14** | **0.08** | **0.059** | | | | **0.107** | | **0** | | **0.182** | | **0.027** | **0** |
| | | **0.047** | **0.067** | | | | **0.098** | | **0** | | **0.214** | | **0.054** | **0** |
| WTCP | 36 | 0.207 | 0.039 | | | | 0.054 | | 0 | | 0.091 | | 0.595 | 1.5 |
| | | 0.162 | 0.055 | | | | 0.079 | | 0 | | 0.182 | | 0.704 | 1 |
| WTSK | 634 | 3.644 | 0.294 | | | | 0.357 | | 0 | | 0.682 | | 15.405 | 0.5 |
| | | 4.557 | 0.252 | | | | 0.276 | | 0 | | 0.749 | | 21.185 | 1 |

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 2009 for Segment 3 of the Missouri River. Species codes are located in Appendix A. Asterisks and bold type denote targeted native Missouri River species.

| | **Sturgeon Season** | | **Fish Community Season** | | |
|---|---|---|---|---|---|
| Species Code | Otter Trawl | 1.0" Trammel Net | Otter Trawl | 1.0" Trammel Net | Mini-Fyke Net |
| BKSB | 0 | 0 | 0 | 0 | 0.006 |
| BMBF | 0 | 0.002 | 0 | 0.008 | 0.052 |
| BRBT | 0.007 | 0.006 | 0.004 | 0 | 0.023 |
| **BUSK*** | **0** | **0.004** | **0** | **0.044** | **0** |
| CARP | 0.002 | 0 | 0.002 | 0.004 | 3.155 |
| CNCF | 0.096 | 0.078 | 0.084 | 0.045 | 0 |
| ERSN | 0 | 0 | 0.017 | 0 | 5.908 |
| FHCB | 0.081 | 0.017 | 0.677 | 0.019 | 2.109 |
| FHMW | 0 | 0 | 0 | 0 | 9.316 |
| FWDM | 0 | 0 | 0 | 0 | 0 |
| GDEY | 0 | 0.254 | 0.021 | 0.341 | 0 |
| GNSF | 0 | 0 | 0 | 0 | 0.023 |
| **HBNS*** | **0** | **0** | **0** | **0** | **0.034** |
| LKWF | 0 | 0 | 0 | 0.008 | 0 |
| LNDC | 0 | 0 | 0 | 0 | 0.011 |
| LNSK | 0 | 0 | 0 | 0.004 | 0.138 |
| NFSH | 0 | 0 | 0 | 0 | 0 |
| NTPK | 0 | 0.003 | 0 | 0.004 | 0.011 |
| **PDSG*** | **0.028** | **0.016** | **0.05** | **0.04** | **0** |
| PNSD | 0 | 0 | 0 | 0 | 0.011 |
| RVCS | 0.022 | 0.084 | 0.022 | 0.035 | 6.144 |
| **SFCB*** | **0.031** | **0** | **0.153** | **0** | **0** |
| **SGCB*** | **0.123** | **0** | **0.277** | **0** | **0** |
| **SGER*** | **0.021** | **0.237** | **0.077** | **0.111** | **0.08** |
| SHRH | 0.019 | 0.031 | 0.075 | 0.039 | 1.443 |
| SMBF | 0 | 0.013 | 0 | 0.013 | 0.017 |
| **SNSG*** | **0.05** | **0.122** | **0.077** | **0.212** | **0** |
| **SNSN*** | **0** | **0** | **0** | **0** | **4.707** |
| STCT | 0.023 | 0 | 0.014 | 0 | 0.034 |
| STSN | 0 | 0 | 0 | 0 | 0.006 |
| UCA | 0 | 0 | 0 | 0 | 0.04 |
| UCY | 0 | 0 | 0 | 0 | 0.006 |
| UNID | 0 | 0 | 0 | 0 | 0.017 |

| Species Code | Sturgeon Season | | Fish Community Season | | |
|---|---|---|---|---|---|
| | Otter Trawl | 1.0" Trammel Net | Otter Trawl | 1.0" Trammel Net | Mini-Fyke Net |
| WLYE | 0.004 | 0 | 0.009 | 0.002 | 0 |
| **WSMW*** | **0** | **0** | **0.002** | **0** | **0.08** |
| WTCP | 0 | 0 | 0.002 | 0.002 | 0.207 |
| WTSK | 0 | 0.003 | 0 | 0 | 3.644 |

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 - 2009.

| Bend Number | Bend River Mile | Coordinates* Latitude | Longitude | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| 1 | 1701.5 | | | | | | |
| 2 | 1700 | | | | | | |
| 3 | 1698.5 | | | | | | |
| 4 | 1697.5 | | | | | | |
| 5 | 1696 | | | | | | |
| 6 | 1695 | 48.0895 | 105.439 | | ST, FC | | ST, FC |
| 7 | 1693.5 | | | | | | |
| 8 | 1692 | 48.0913 | 105.373 | | ST, FC | ST, FC | |
| 9 | 1690.5 | | | | | | |
| 10 | 1689 | 48.0824 | 105.324 | | ST, FC | | |
| 11 | 1687.5 | | | | | | |
| 12 | 1685.5 | 48.0887 | 105.253 | | | ST, FC | |
| 13 | 1684.5 | 48.0912 | 105.248 | | ST, FC | | ST, FC |
| 14 | 1683 | 48.0852 | 105.225 | ST, FC | | | ST, FC |
| 15 | 1681.5 | | | | | | ST, FC |
| 16 | 1680 | 48.0664 | 105.2 | ST, FC | | | |
| 17 | 1678.5 | 48.0902 | 105.184 | | ST, FC | | |
| 18 | 1677 | 48.1027 | 105.174 | | ST, FC | | |
| 19 | 1675.5 | 48.0932 | 105.171 | | | ST, FC | |
| 20 | 1674 | 48.0769 | 105.164 | | | ST, FC | |
| 21 | 1672.5 | | | | | | |
| 22 | 1671 | | | | | | |
| 23 | 1670 | | | | | | |
| 24 | 1668.5 | | | | | | |
| 25 | 1667 | | | | | | ST, FC |
| 26 | 1666 | 48.0656 | 105.05 | | | ST, FC | ST, FC |

| Bend Number | Bend River | Coordinates* Latitude | | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| 27 | 1665 | | | | | | |
| 28 | 1664 | | | | | | ST, FC |
| 29 | 1663 | | | | | | |
| 30 | 1661.5 | | | | | | |
| 31 | 1660 | | | | | | ST, FC |
| 32 | 1659 | 48.0687 | 104.999 | ST, FC | | | |
| 33 | 1657 | 48.0953 | 104.981 | ST, FC | | | |
| 34 | 1656 | | | | | | ST, FC |
| 35 | 1655 | 48.1006 | 104.965 | | | ST, FC | ST, FC |
| 36 | 1654 | | | | | | |
| 37 | 1653 | 48.0952 | 104.94 | | ST, FC | ST, FC | |
| 38 | 1651 | 48.1281 | 104.924 | | ST, FC | ST, FC | |
| 39 | 1650 | | | | | | |
| 40 | 1648.5 | 48.1488 | 104.898 | | ST, FC | | ST, FC |
| 41 | 1647 | | | | | | |
| 42 | 1646 | | | | | | ST, FC |
| 43 | 1644.5 | | | | | | ST, FC |
| 44 | 1643 | | | | | | ST, FC |
| 45 | 1641.5 | | | | | | |
| 46 | 1640.5 | | | | | | ST, FC |
| 47 | 1639.5 | 48.113 | 104.735 | | ST, FC | ST, FC | |
| 48 | 1638.5 | 48.1191 | 104.716 | | ST, FC | ST, FC | |
| 49 | 1637.5 | | | | | | |
| 50 | 1636.5 | 48.104 | 104.682 | ST, FC | | | |
| 51 | 1635.5 | | | | | | |
| 52 | 1634.5 | 48.1072 | 104.659 | | ST, FC | | |
| 53 | 1633.5 | 48.1119 | 104.634 | | | ST, FC | ST, FC |

| Bend Number | Bend River | Coordinates* Latitude | | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| 54 | 1632.5 | | | | | | |
| 55 | 1631.5 | | | | | | ST, FC |
| 56 | 1630.5 | 48.1398 | 104.605 | ST, FC | | | |
| 57 | 1629.5 | 48.1403 | 104.604 | | | ST, FC | |
| 58 | 1628.5 | | | | | | |
| 59 | 1627 | | | | | | |
| 60 | 1625.5 | 48.1182 | 104.567 | | ST, FC | | ST, FC |
| 61 | 1624 | | | | | | |
| 62 | 1623 | 48.1116 | 104.51 | ST, FC | | | |
| 63 | 1622 | | | | | | |
| 64 | 1620.5 | 48.1233 | 104.472 | | ST, FC | ST, FC | |
| 65 | 1619.5 | | | | | | |
| 66 | 1618.5 | | | | | | ST, FC |
| 67 | 1617.5 | 48.0966 | 104.444 | | ST, FC | ST, FC | |
| 68 | 1616.5 | 48.0813 | 104.415 | ST, FC | | | |
| 69 | 1615 | 48.0764 | 104.393 | | ST, FC | | |
| 70 | 1613.5 | 48.0746 | 104.371 | | | ST, FC | |
| 71 | 1612 | | | | | | |
| 72 | 1611 | 48.0461 | 104.327 | | | ST, FC | |
| 73 | 1610 | | | | | | |
| 74 | 1608.5 | 48.0483 | 104.283 | | ST, FC | ST, FC | ST, FC |
| 75 | 1606.5 | 48.035 | 104.251 | ST, FC | | ST, FC | |
| 76 | 1604.5 | 48.0357 | 104.207 | ST, FC | | | ST, FC |
| 77 | 1603 | 48.0446 | 104.199 | | | ST, FC | |
| 78 | 1598.5 | 48.046 | 104.184 | ST, FC | | ST, FC | |
| 79 | 1597.5 | 48.0362 | 104.175 | | | ST, FC | |
| 80 | 1596 | | | | | | ST, |

| Bend Number | Bend River | Coordinates* Latitude | | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| | | | | | | | FC |
| 81 | 1595 | 48.0532 | 104.141 | | ST, FC | ST, FC | |
| 82 | 1594 | 48.0378 | 104.124 | | ST, FC | | |
| 83 | 1593 | 48.0296 | 104.103 | | FC | ST, FC | |
| 84 | 1592 | | | | | | |
| 85 | 1591 | 48.021 | 104.098 | | | ST, FC | |
| 86 | 1590.5 | 48.0202 | 104.1 | | ST, FC | | |
| 87 | 1589.5 | 48.0052 | 104.102 | | ST, FC | | |
| 88 | 1588.5 | | | | | | |
| 89 | 1587 | | | | | | |
| 90 | 1585.5 | | | | | | |
| 91 | 1583.5 | | | | | | |