2008 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 and Parks has been conducting pallid sturgeon *Scaphirhynchus albus* population assessment sampling in segment 3 for the past three years (2006-2008). We have captured more pallid sturgeon in every year of sampling, both due to increased level of effort and more pallid sturgeon in the river. During 2008 only 20% of all pallid sturgeon captured were from the 2007-year class, which was a significant decrease from 2007 where the 2006-year class made up 43% of the total catch and 2006 when 82% of the catch was from the 2005-year class. Although we have not observed large increased in pallid sturgeon CPUE of our standard gears, the fact that a larger proportion of the fish we are catching have been residing in the river longer is evidence that the stocking program is producing viable fish that are recruiting to older age classes. A total of 130 hatchery reared pallid sturgeon were sampled in segment 3 during 2008, an increase from 92 and 49 pallid sturgeon sampled in 2007 and 2006, respectively. Additionally, nine different year classes of pallid sturgeon were sampled in segment 3 during 2008 and increase from six-year classes in 2007 and four in 2006. While it is evident that the propagation efforts are increasing the total number and year classes of pallid sturgeon in the Missouri River, it is important to note that no wild pallid sturgeon have been sampled in all three years of sampling, which further supports the hypothesis that no natural recruitment is occurring in the Missouri River downstream of Fort Peck Dam.

While trammel nets and otter trawls have been effective gears for collecting juvenile pallid sturgeon, trotlines were employed with more effort in 2008 and were a very successful complimentary gear. During 2008 we deployed trotlines once in 23 river bends, which is less effort than we expend with trammel nets and otter trawls (both gears are used to sample each river bend twice a year). In this effort we collected 30 pallid sturgeon, however trotlines captured the four largest pallid sturgeon sampled in 2008 and all four were from older age classes that have not shown up in the catch of our standard gears in all three years of sampling. Until the trotline effort of 2008 we were not sure any of the 1997, 1998, or 1999-year classes of stocked pallid sturgeon had survived in segment 3.

Pallid sturgeon distributed throughout the length of segment 3, with slightly higher densities in the downstream most areas. Pallid sturgeon stocked into segment 3 on average move less than fish stocked in the more altered waters of segment 2 upstream. This may suggest this is higher quality habitat than the more altered sections directly downstream of Fort Peck Dam. Pallid sturgeon stocked into RPMA 2 of the Missouri River and recaptured in segment 3 have shown a general trend of decreasing growth rates as they age. Similarly, we see a decrease in the relative condition of hatchery reared pallid sturgeon as they grow into larger size classes. However, our sample size of older age classes of pallid sturgeon is small and we would expect that once they reach larger sizes and they become more piscivores both their growth rates and relative condition might increase. Furthermore, although the Missouri River downstream of Fort Peck Dam is highly altered, hatchery reared juvenile pallid sturgeon stocked in this section of the Missouri River have shown to have higher survival rates than their counterparts stocked into the more pristine Yellowstone River (Hadley and Rotella 2009). Lending further evidence that this reach of rive is an important component in the recovery of pallid sturgeon in the Upper Basin.

The shovelnose sturgeon *Schaphirhynchus platorynchus* population in segment 3 seems to be healthy. In the past three years we've collected a large variety of size classes of shovelnose sturgeon and have seen evidence of YOY and age-1 rearing. Although shovelnose sturgeon are recruiting into the population, we have only found YOY and age-1 fish in the downstream most portions of segment 3 where the river is somewhat more naturalized when compared to the highly altered upstream portions closer to Fort Peck Dam. In all we observed a shovelnose to pallid sturgeon ration of 2.9:1 in segment 3 during 2008, a decrease from 3.2:1 in 2007 and 3.1:1 in 2006. These data should not be taken as less shovelnose sturgeon are occupying segment 3, but rather that due to the propagation efforts more pallid sturgeon are now residing in the river.

Similar to the distribution of juvenile shovelnose sturgeon, YOY and age-1 sauger *Sander canadesis* are only found in the downstream portions of segment 3. Additionally, the abundance of sicklefin chubs *Macrhybopsis meeki* and sturgeon chubs *M. gelida* seems to be directly tied to how altered the river is and are more abundant in the downstream less altered areas. Other native fishes such as river carpsuckers *Carpiodes carpio* and flathead chubs *Platygobio gracilis* seem to show a positive response to higher Missouri and Milk River flows.

During 2007 the Missouri River had discharge peaks that far surpassed both 2006 and 2008 and the Milk River contributed large amounts of suspended sediment in 2007 and very little in 2006 or 2008. The relative abundance of YOY river carpsuckers and flathead chubs were much greater in the higher water year of 2007, when compared to 2006 and 2008. We have also seen the spatial distribution of some native minnows respond to increases in suspended sediment, where fish tend to be move further upstream than during low suspended sediment times when the Milk River is not flowing. Other fishes such as fathead minnows *Pimephales promelas,* white suckers *Catostomus commersoni* and longnose suckers *C. catostomus* seem to have the opposite response to higher flows, where their juvenile abundance was highest in the lowest flow year of 2006. More years of fish abundance data and differing operations of Fort Peck Dam and varying water years from the Milk River will help us better understand the relationship between flow, suspended sediment and fish production in the Missouri River.

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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 (Drobish 2008). 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 (Drobish 2008). 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 (Drobish 2008), 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 Drobish (2008). A general description of those 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 2008 as a wild gear with the intent to begin evaluating its use as a pallid sturgeon gear. Twenty-three randomly chosen river bends were sampled in total, 11 during the sturgeon season and 12 during the fish community season. Random river bends for trotlines were chosen by moving one river bend upstream from the 24 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 2008.

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 Drobish (2008).

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. Two hook sizes were used, size 2/0 and 2 circle hooks, Each trotline used one hook size and each hook size was used at least once in each macrohabitat sampled. 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 Drobish (2008). 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.

Incremental Stock Density

Incremental stock density (RSD) was used to describe the size structure of pallid and shovelnose sturgeon sampled in segment 2. We used the length categories proposed by Shuman et al. (2006) for pallid sturgeon and Quist et al. (1998) for shovelnose sturgeon. 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 RSD.

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.

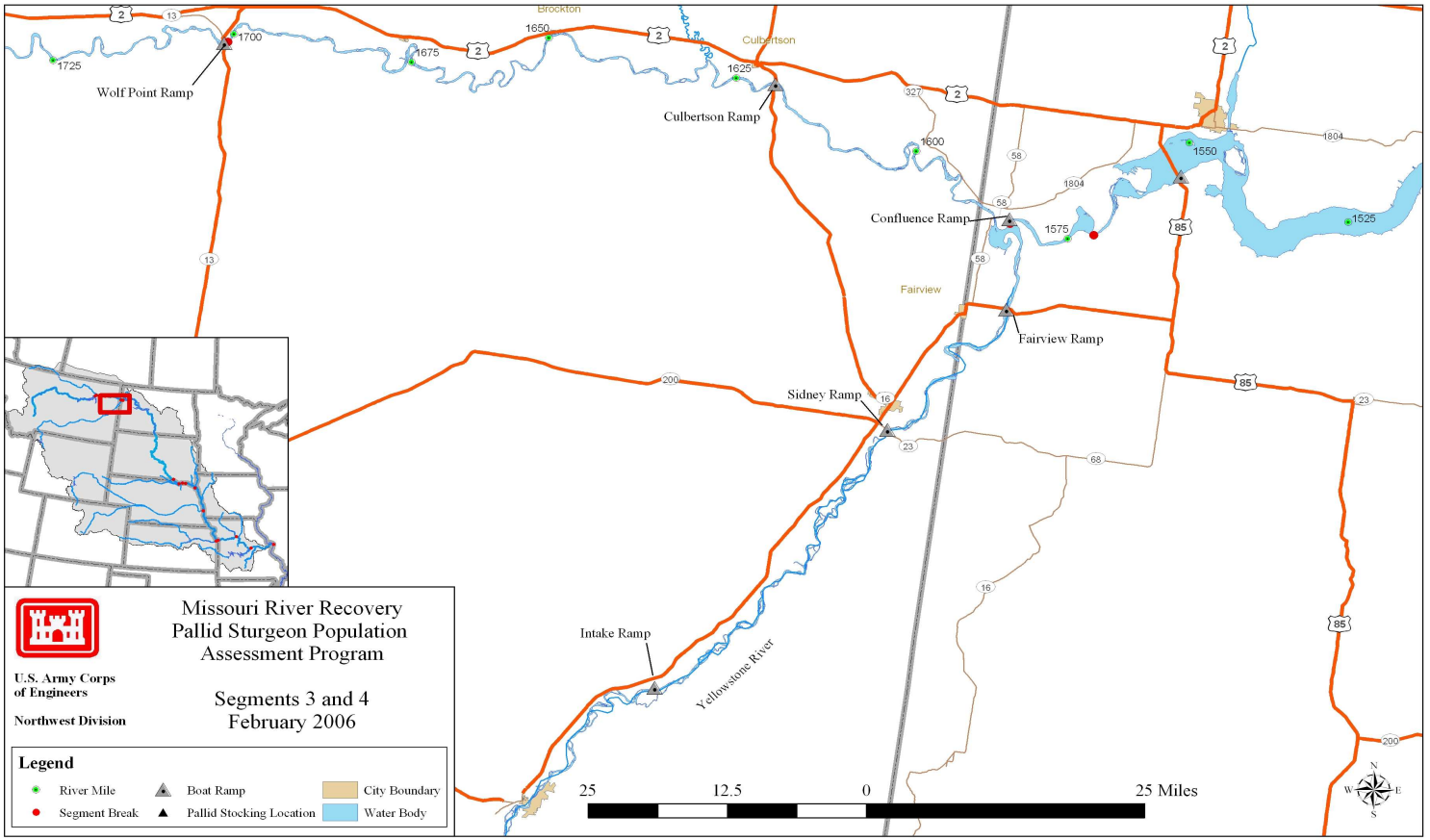

Figure 1a. Map of segment 3 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 3 encompasses the Missouri River from Wolf Point, MT (River Mile 1701.0) to the confluence with the Yellowstone River (River Mile 1582.0).

Results

Pallid Sturgeon

A total of 130 hatchery reared pallid sturgeon were sampled in segment 3 during 2008, 58 during the sturgeon season and 72 in the fish community season. This was an increase from 92 and 49 pallid sturgeon sampled in 2007 and 2006, respectively (Figure 9). From 2006 through 2008 no wild pallid sturgeon have been captured in segment 3. Nine separate year classes of hatchery produced pallid sturgeon made up the catch in 2008, an increase from seven in 2007 and 4 in 2006. The year classes of pallid sturgeon captured in 2008 were as follows, 2007 (n = 24), 2006 (n = 34), 2005 (n = 47), 2004 (n = 3), 2002 (n = 2), 2001 (n = 8), 1999 (n = 1), 1998 (n = 2) and 1997 (n = 1) (Table 6). Pallid sturgeon were sampled throughout the length of segment 3 with more being captured in the downstream portions (Figure 1b), which was a similar pattern to 2007 and 2006. The increase in total catch of pallid sturgeon in segment 3 over the past three years is likely due to two factors, 1) an increase in effort both in the numbers of river bends sampled and new gears being added and 2) recruitment of hatchery reared pallid sturgeon into the population through stocking.

During 2008, trammel nets captured the majority pallid sturgeon (n = 62), with the otter trawl (n = 38) and trotlines (n = 30) catching the remainder, whereas mini fyke nets did not capture any. Overall pallid sturgeon averaged 310.9 mm FL and weighed 122.5 g. However, the average size of pallid sturgeon sampled varied by gear with the largest caught by trotlines (mean FL = 374.3 mm), then trammel nets (mean FL = 303.5 mm) while on average the otter trawl caught the smallest (mean FL = 272.7 mm). The four largest pallid sturgeon in the total catch were sampled with trotlines. This is important since these four fish consisted of the 1997 (n = 1), 1998 (n = 2) and 1999 (n = 1) years classes, which had not been seen during 2006 or 2007. Furthermore, standard gears have not captured any pallid sturgeon of these year classes in all three years of sampling from 2006 to 2008.

Of the total pallid sturgeon catch, 128 out of 130 were sampled in randomly selected bends. However, of those 128, 93 were sampled in random subsamples, while the remaining 35 were sampled in non-random duplicate samples. The large amount of pallid sturgeon captured in duplicate samples indicates the strong affinity for these fish to group up in

specific habitats. This is a pattern that has been observed during all three years of sampling in segment 3.

Over the past three years of sampling catch rates have been higher during the fish community season when compared to the sturgeon season for both the otter trawl and trammel net (Figures 2-5). During the sturgeon season, otter trawl CPUE has remained relatively constant from 2006 through 2008 (Figure 2). While trammel net CPUE has also remained low during the sturgeon season, an increasing trend has been observed (Figure 3). Trammel net CPUE during the sturgeon season has approximately doubled every year from 0.007 fish/100 m in 2006 to 0.013 fish/100 m in 2007 and yet again increased to 0.029 fish/100 m in 2008 (Figure 3). However, while CPUE of both gears has been higher during the fish community season, we have not seen a pattern similar to the sturgeon season. Fish community season trammel net CPUE was at a high in 2006 at 0.07 fish/100 m and dipped to 0.03 fish/100 m in 2007 and slightly rose again to 0.05 fish/100 m in 2008. On the other hand, otter trawl CPUE was at a high in 2007 at 0.05 fish/100 m and was slightly lower at 0.03 fish/100 m in both 2006 and 2008.

The length frequency distribution of pallid sturgeon in segment 3 has slightly been changing over the past three years of sampling. During 2006 no pallid sturgeon over 370 mm FL were sampled, whereas 14 were and 15 were sampled in 2007 and 2008, respectively. While the number of pallid sturgeon captured under 200 mm FL has remained relatively constant with 10 in 2006 and 2007 and 8 in 2008, the proportion of fish under 200 mm FL has decreased in every subsequent sampling year. In general the length frequency histogram of the hatchery reared pallid sturgeon population is slowly shifting to the right, indicating fish are recruiting into larger size classes.

The growth rates of hatchery reared pallid sturgeon in segment 3 a showing a general trend of decreasing growth as the fish age (Table 6). However, with very limited data, we saw a slight increase in growth rate from the 2001 age class fish (N = 8) to the 1998-year class (N = 2). Similarly, we see a decrease in the relative condition of hatchery reared pallid sturgeon as they grow into larger size classes (Table 7).

More pallid sturgeon were sampled in inside bends (N = 52) than channel crossovers (N = 40), large secondary connected channels (N = 21), or outside bends (N = 17) (Table 3). Table 3 also shows the average depth, velocity and turbidity where pallid sturgeon were

sampled by habitat and the average of those parameters for the overall effort. For the specific habitats that pallid sturgeon were sampled in by gear and size see Tables 9 through 16.

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 sturgeon season and fish community season in 2008 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
Fall through Spring – Sturgeon Season																
1 Inch Trammel Net	22	8.00	N-E	53	N-E	N-E	N-E	55	54	14	0	0	0	0	0	N-E
Gill Net																
Otter Trawl	22	8.14	N-E	52	N-E	N-E	N-E	53	51	23	0	0	0	0	0	N-E
Summer – Fish Community Season																
1 Inch Trammel Net	22	8.00	N-E	55	N-E	N-E	N-E	59	52	10	0	0	0	0	0	N-E
Mini-Fyke Net	21	7.67	N-E	41	N-E	N-E	N-E	47	4	24	39	6	0	0	0	N-E
Otter Trawl	22	8.00	N-E	54	N-E	N-E	N-E	53	51	18	0	0	0	0	0	N-E

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

Table 2. Number of bends sampled, mean number of deployments, and total number of deployments by mesohabitat for segment 3 on the Missouri River during sturgeon season and fish community season in 2008. N-E indicates the habitat is non-existent in the segment.

Gear	Number of bends	Mean deploy-ments	Mesohabitat[a]					
			BARS	CHNB	DTWT	ITIP	POOL	TLWG
Fall through Spring – Sturgeon Season								
1 Inch Trammel Net	22	8.00	0	174	N-E	2	N-E	N-E
Gill Net								
Otter Trawl	22	8.14	0	178	N-E	1	N-E	N-E
Summer – Fish Community Season								
1 Inch Trammel Net	22	8.00	0	176	N-E	0	N-E	N-E
Mini-Fyke Net	21	7.67	161	0	N-E	0	N-E	N-E
Otter Trawl	22	8.00	0	176	N-E	0	N-E	N-E

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

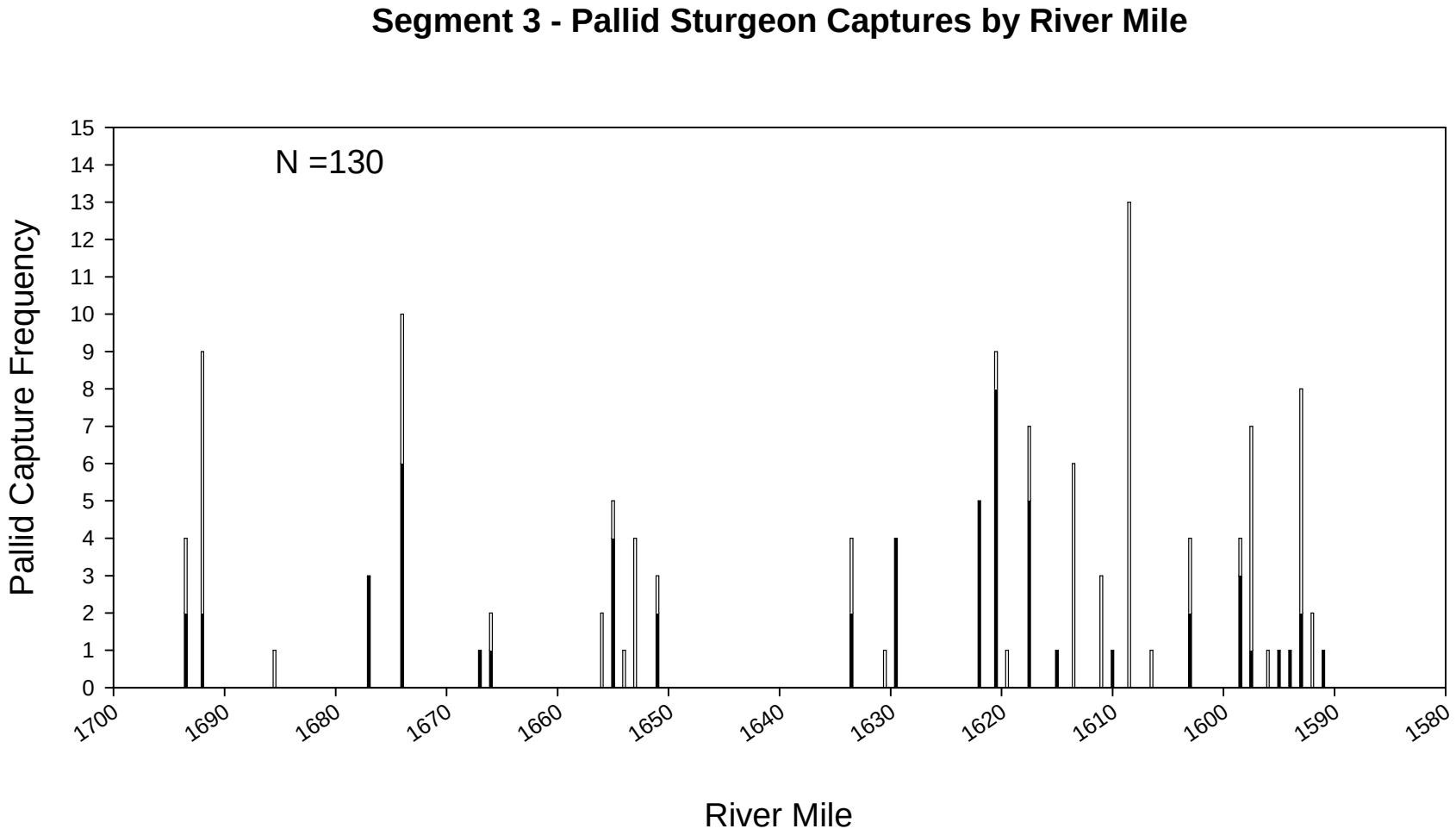

Figure 1b. Distribution of pallid sturgeon captures by river mile for segment 3 of the Missouri River during 2008. Black bars represent pallid captures during sturgeon season and white bars during fish community season. Figure includes all pallid captures including non-random and wild samples.

Table 3. Pallid sturgeon capture summaries for all gears relative to habitat type and environmental variables on the Missouri River during 2008. Means (minimum and maximum) are presented. Habitat definitions and codes presented in Appendix B.

Habitat		Depth		Bottom Velocity (m/s)		Temperature		Turbidity (ntu)		
Macro-	Meso-	Effort	Catch	Effort	Catch	Effort	Catch	Effort	Catch	Total pallids caught
CHXO	BARS	0.4 (0.1-1.4)		0.06 (0.00-0.15)		19.8 (11.6-24.1)		45.4 (17.0-85.0)		.
	CHNB	1.5 (0.2-4.2)	1.4 (0.9-3.1)	0.68 (0.08-1.04)	0.67 (0.27-1.02)	16.5 (2.7-24.0)	17.1 (6.7-23.9)	84.4 (13.0-1200)	41.3 (15.0-107)	40
	ITIP									
ISB	BARS	0.4 (0.1-1.0)		0.08 (0.03-0.16)		19 (10.5-24.1)		49.1 (19.0-100)		.
	CHNB	1.5 (0.6-4.5)	1.6 (0.8-3.3)	0.62 (0.00-0.92)	0.54 (0.00-0.83)	16.4 (2.8-24.1)	16.2 (2.9-23.0)	88.4 (10.0-1200)	73.3 (10.0-300)	52
	ITIP									
OSB	BARS	0.4 (0.1-0.7)		0.08 (0.02-0.13)		19 (15.9-22.0)		29 (22.0-36.0)		.
	CHNB	2.2 (0.8-5.9)	2 (1.0-5.3)	0.7 (0.40-0.99)	0.69 (0.56-0.80)	16 (3.3-24.0)	15.4 (3.6-23.5)	90.8 (13.0-1200)	69.9 (13.0-150)	17
	ITIP									
SCCL	BARS	0.4 (0.2-0.6)		0.04 (0.00-0.09)		19.6 (13.2-25.0)		55 (16.0-169		.
	CHNB	1.3 (0.5-4.5)	1.1 (0.6-2.1)	0.62 (0.23-0.85)	0.54 (0.29-0.82)	16.1 (6.8-23.6)	14.4 (11.6-21.2)	136 (12.0-1200)	48.9 (19.0-116)	21
	ITIP	1.5 (0.7-1.9)		0.45 (0.24-0.65)		14.4 (14.1-14.8)		25.5 (22.0-29.0)		.
SCCS	BARS	0.4 (0.2-0.7)		0.04 (0.00-0.15)		20.9 (10.0-25.5)		50.6 (13.0-90.0)		.
	CHNB	1.2 (1.2-1.2)				20 (20.0-20.0)				
	ITIP									

Table 6. Mean fork length, weight, relative condition factor (Kn), and absolute growth rates for all hatchery-reared pallid sturgeon captures by year class at the time of stocking and recapture during 2008 from segment 3 of the Missouri River. Relative condition factor was calculated using the equation in Keenlyne and Evanson (1993). Standard error (+/- 2 SE) was calculated where N>1 and is represented on second line of each year.

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	1	.	.	.	599	727.0	0.824	.	.
		.	.	.	.	.	.	.	.
1998	2	525	.	.	743	1352.0	0.044	0.077	.
		(10)	.	.	(7)	(140)	(0.054)	(0.006)	.
1999	1	360	.	.	602	655.0	0.730	(0.083)	.
		.	.	.	.	.	.	.	.
2001	8	237	.	.	366	157.0	0.892	0.052	.
		(13)	.	.	(29)	(49.5)	(0.033)	(0.004)	.
2002	2	300	.	.	404	210.0	0.900	0.063	.
		.	.	.	(22)	(12.0)	(0.215)	.	.
2004	3	.	.	.	347	136.3	0.968	.	.
		.	.	.	(32)	(28.9)	(0.114)	.	
2005	47	244	37.4	1.260	314	96.6	0.947	0.109	0.063
		(17)	(8.2)	(0.047)	(9)	(9.3)	(0.036)	(0.010)	(0.020)
2006	34	260	77.1	1.337	295	86.2	1.121	0.168	0.089
		(19)	(21.0)	(0.118)	(15)	(10.6)	(0.278)	(0.012)	(0.016)
2007	24	251	69.1	1.103	253	64.8	1.112	0.319	0.167
		(32)	(44)	(0.064)	(27)	(26)	(0.084)	(0.114)	(0.092)

Table 7. Incremental relative stock density (RSD)[a] and relative condition factor (Kn) for all pallid sturgeon captured with all gear by a length category during 2008 in the Missouri River. Length categories[b] determined using the methods proposed by Shuman et al. (2006). Relative condition factor was calculated using the equation in Keenlyne and Evanson (1993).

Length Category	N	RSD	K_n (+/- 2 SE)
Sturgeon Season			
Sub-stock (0-199 mm)	7	.	2.277 (1.255)
Sub-stock (200-329 mm)	38	.	1.043 (0.035)
Stock	13	100	0.868 (0.050)
Quality	0	.	0
Preferred	0	.	0
Memorable	0	.	0
Trophy	0	.	0
Overall K_n	.	.	1.152 (0.182)
Fish Community Season			
Sub-stock (0-199 mm)	1	.	1.230
Sub-stock (200-329 mm)	44	.	0.992 (0.036)
Stock	25	93	0.879 (0.034)
Quality	2	7	0.744 (0.054)
Preferred	0	.	0
Memorable	0	.	0
Trophy	0	.	0
Overall K_n	.	.	0.949 (0.030)

[a] RSD = (# of fish of a specified length class / # of fish ≥ minimum stock length fish) * 100.
[b] Length categories based on the percentage of the largest known pallid sturgeon: Sub-stock FL < 330 mm (20 %), Stock FL =330 - 629 mm (20 – 36 %), Quality FL = 630 – 839 mm (36 – 45 %), Preferred FL = 840 – 1039 mm (45 – 59 %), Memorable FL = 1040 – 1269 mm (59 – 74 %), Trophy FL > 1270 mm (>74 %).

Segment 3 - Pallid Sturgeon / Sturgeon Season

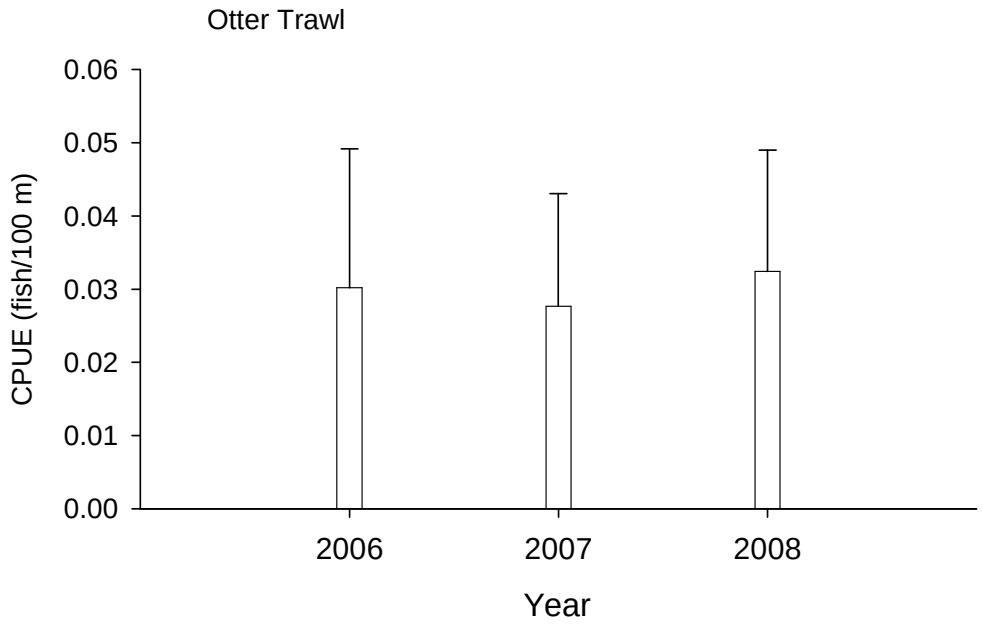

Figure 2. Mean annual catch per unit effort (+/- 2 SE) of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon using gill nets and otter trawls in segment 3 of the Missouri River during sturgeon season 2006-2008. Pallid sturgeon of unknown origin are awaiting genetic verification.

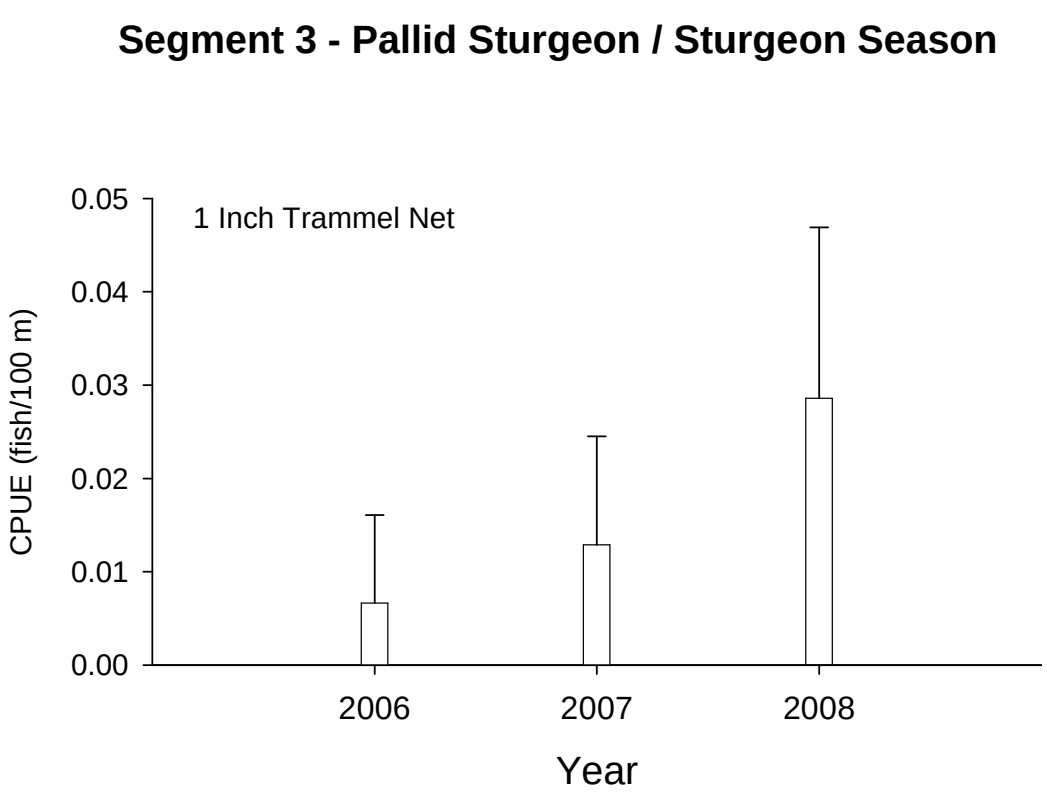

Figure 3. Mean annual catch per unit effort (+/- 2 SE) of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon using 1 inch trammel nets in segment 3 of the Missouri River during sturgeon season 2006-2008.

Segment 3 - Pallid Sturgeon / Fish Community Season

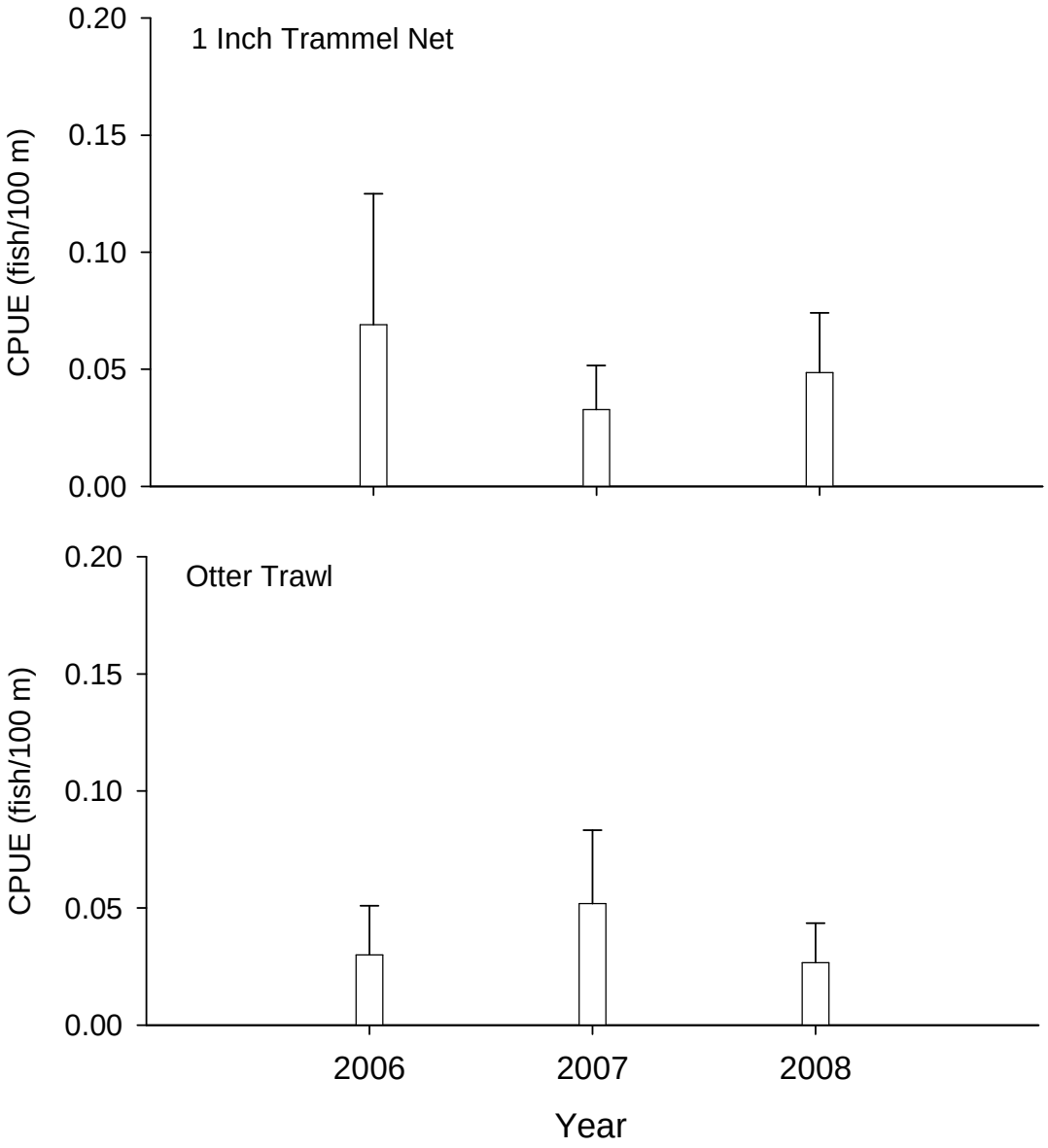

Figure 5. Mean annual catch per unit effort (+/- 2 SE) of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon using 1 inch trammel nets and otter trawls in segment 3 of the Missouri River during fish community season 2006-2008.

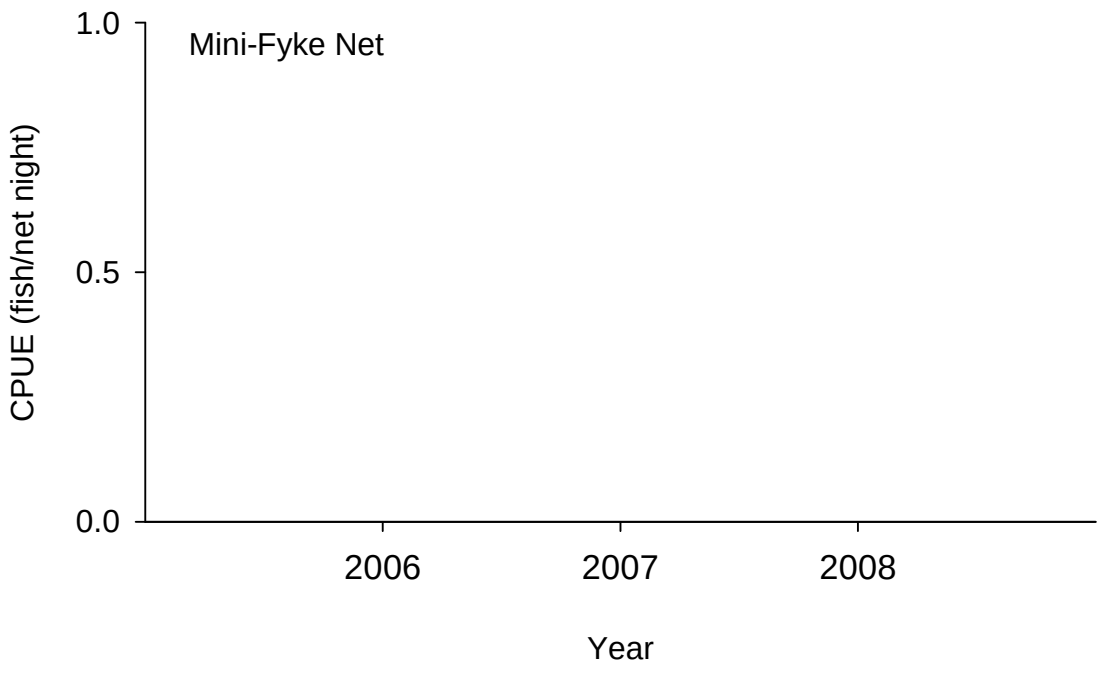

Figure 7. Mean annual catch per unit effort (+/- 2 SE) of wild (black bars), hatchery reared (white bars), and unknown origin (cross-hatched bars) pallid sturgeon using mini-fyke nets in segment 3 of the Missouri River during fish community season 2006-2008.

Table 9. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 3 of the Missouri River during 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat[a]													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	2	N-E	0	0	N-E	N-E	50	50	0	0	0	0	0	0	N-E
	.	0	(32)	0	0	0	(31)	(29)	(8)	0	0	0	0	0	0
Gill Net		N-E			N-E	N-E									N-E
Otter Trawl	3	N-E	33	0	N-E	N-E	0	33	33	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(27)	(12)	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(33)	0	0	0	(33)	(28)	(5)	0	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(25)	0	0	0	(29)	(2)	(15)	(24)	(4)	0	0	0	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(29)	(10)	0	0	0	0	0	0

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

Table 10. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 3 of the Missouri River during 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	2	0	100	N-E	0	N-E	N-E
	.	0	(99)	0	(1)	0	0
Gill Net				N-E			
Otter Trawl	3	0	100	N-E	0	N-E	N-E
	·	0	(100)	0	0	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	N-E	N-E
	·	(100)	0	0	0	0	0
Otter Trawl	0	0	0	N-E	0	N-E	N-E
	·	0	(100)	0	0	0	0

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

Table 11. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 3 of the Missouri River during 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat[a]													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	9	N-E	22	0	N-E	N-E	56	11	11	0	0	0	0	0	N-E
	.	0	(32)	0	0	0	(31)	(29)	(8)	0	0	0	0	0	0
Gill Net		N-E			N-E	N-E									
Otter Trawl	12	N-E	33	0	N-E	N-E	58	8	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(27)	(12)	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	11	N-E	27	0	N-E	N-E	36	18	18	0	0	0	0	0	N-E
	.	0	(33)	0	0	0	(33)	(28)	(5)	0	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(25)	0	0	0	(29)	(2)	(15)	(24)	(4)	0	0	0	0
Otter Trawl	12	N-E	75	0	N-E	N-E	25	0	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(29)	(10)	0	0	0	0	0	0

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

Table 12. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 3 of the Missouri River during 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	9	0	100	N-E	0	N-E	N-E
	.	0	(99)	0	(1)	0	0
Gill Net				N-E		N-E	N-E
Otter Trawl	12	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	11	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	N-E	N-E
	.	(100)	0	0	0	0	0
Otter Trawl	12	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0

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

Table 13. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 3 of the Missouri River during 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat[a]													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	2	N-E	100	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(32)	0	0	0	(31)	(29)	(8)	0	0	0	0	0	0
Gill Net		N-E			N-E	N-E									N-E
Otter Trawl	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(27)	(12)	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	10	N-E	50	0	N-E	N-E	20	0	30	0	0	0	0	0	N-E
	.	0	(33)	0	0	0	(33)	(28)	(5)	0	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(25)	0	0	0	(29)	(2)	(15)	(24)	(4)	0	0	0	0
Otter Trawl	1	N-E	100	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(29)	(10)	0	0	0	0	0	0

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

Table 14. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 3 of the Missouri River during 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat[a]					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	2	0	100	N-E	0	N-E	N-E
	.	0	(99)	0	(1)	0	0
Gill Net				N-E		N-E	N-E
Otter Trawl	1	0	100	N-E	0	N-E	N-E
	·	0	(100)	0	0	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	10	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	N-E	N-E
	.	(99)	(1)	0	0	0	0
Otter Trawl	1	0	100	N-E	0	N-E	N-E
	·	0	(100)	0	0	0	0

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

Table 15. 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 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat[a]													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(32)	0	0	0	(31)	(29)	(8)	0	0	0	0	0	0
Gill Net		N-E			N-E	N-E									N-E
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(27)	(12)	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(33)	0	0	0	(33)	(28)	(5)	0	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(25)	0	0	0	(29)	(2)	(15)	(24)	(4)	0	0	0	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(29)	(10)	0	0	0	0	0	0

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

Table 16. Total number of quality size and greater (≥630 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 3 of the Missouri River during 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat[a]					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	N-E	N-E
	.	0	(99)	0	(1)	0	0
Gill Net				N-E		N-E	N-E
Otter Trawl	0	0	0	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	N-E	N-E
	.	(100)	0	0	0	0	0
Otter Trawl	0	0	0	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0

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

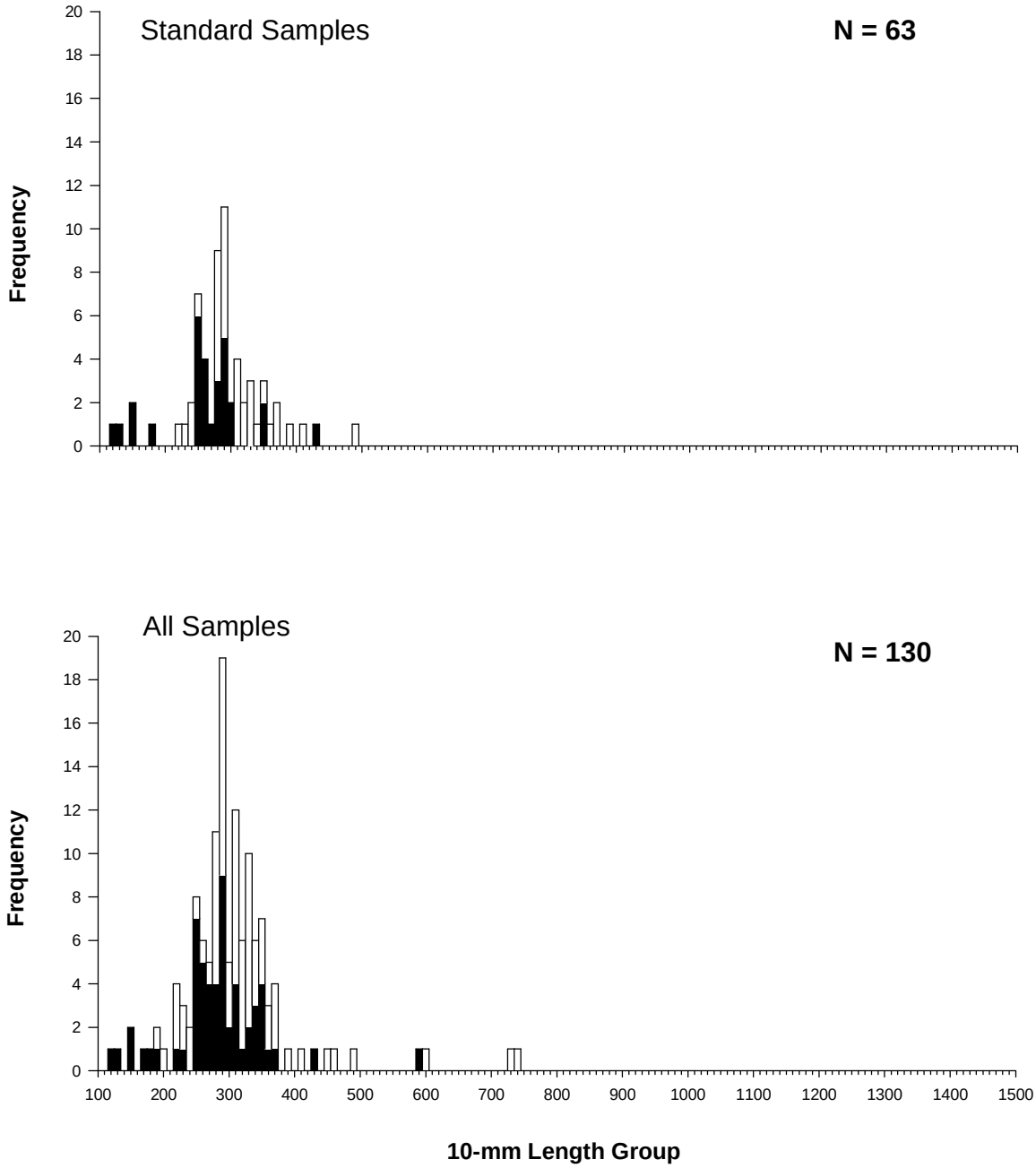

Figure 8. Length frequency of pallid sturgeon captured during fall through spring (sturgeon season; black bars) and summer (fish community season; white bars) in segment 3 of the Missouri River during 2008. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2008.

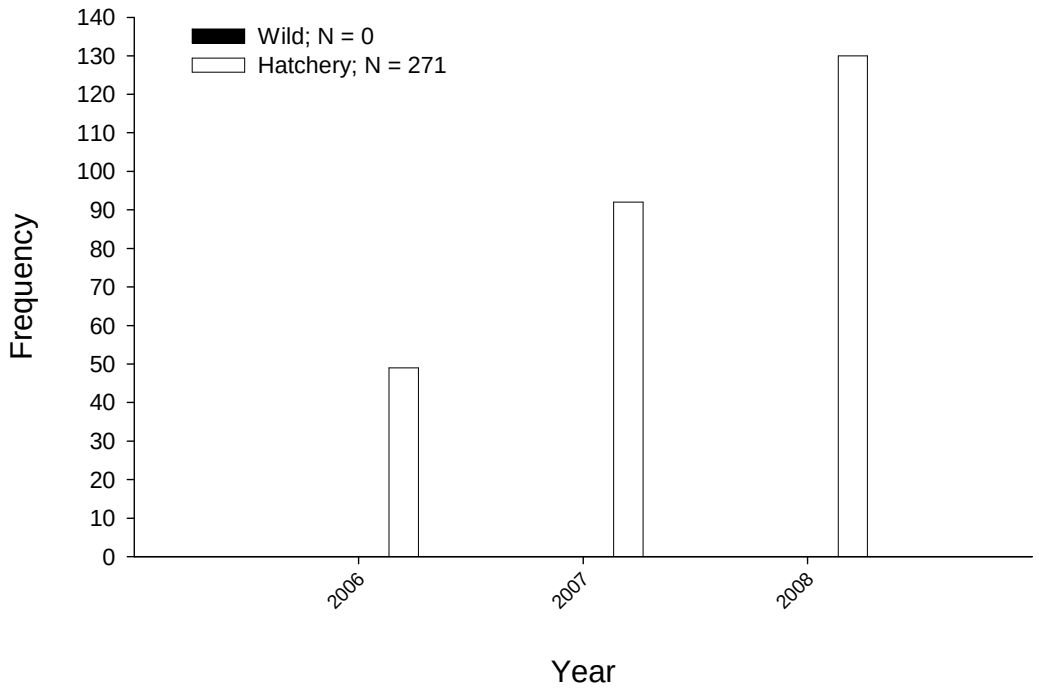

Figure 9. Annual capture history of wild (black bars) and hatchery reared (white bars), a pallid sturgeon collected in segment 3 of the Missouri River from 2006 to 2008. Figure is designed to compare overall pallid sturgeon captures from year to year and is biased by variable effort among years. Figure includes all pallid captures including non-random and wild samples.

Shovelnose X Pallid Sturgeon Hybrids

No shovelnose X pallid sturgeon hybrids have been sampled in segment 3 of the Missouri River in all three years of sampling (2006-2008).

Targeted Native River Species

Shovelnose Sturgeon

In all 378 shovelnose sturgeon were sampled in segment 3 during 2008, an increase from 293 in 2007 and 150 in 2006. Slightly more shovelnose sturgeon were sampled during the sturgeon season (N = 195) than during the fish community season (N = 183). The large increase in total numbers from 2006 to 2008 is most likely related to an increase in effort and the addition of trotlines. In 2008 trammel nets captured 216 shovelnose sturgeon, while trotlines captured 107 and the otter trawl 55. Mini fyke nets have not captured any shovelnose sturgeon in all three years of sampling. For both seasons combined, trammel net CPUE was at 0.17 fish/100 m in 2007 compared to 0.19 fish/100 m in 2007 and 0.16 fish/100m in 2006. Overall otter trawl CPUE remained relatively constant from 2006 (CPUE = 0.06 fish/100m) to 2007 (CPUE = 0.06 fish/100 m) and went slightly down in 2008 (CPUE = 0.04 fish/100 m).

Trammel net CPUE has been much higher for both quality and above and stock sized fish during the fish community season when compared to the sturgeon season in all three years of sampling (Figure 12 and 14). In contrast, otter trawl CPUE has remained similar between the sturgeon and fish community seasons. The CPUE for quality and above sized shovelnose sturgeon is much higher than for all smaller size categories for both trammel nets and otter trawls during both seasons. Although trammel net CPUE of larger shovelnose sturgeon is higher during both seasons, it is lower for the smallest size classes when compared to the otter trawl.

Overall in 2008 shovelnose sturgeon averaged 498.0 mm FL and 505.6 g, with a minimum length of 127 mm and a maximum of 789 mm. The average length of shovelnose sturgeon was similar to that of 2007 when it was 496.0 mm, but both years were slightly smaller than 511.1 mm in 2006. The length frequency histograms in Figure 17 indicate that our gears are effective at capturing a wide range of shovelnose sturgeon. However, it is unclear if few age-0, age-1 or age-2 shovelnose are in the system or if our gears are not as efficient at capturing them when compared to older year classes. All gears in combination sampled age-0 to shovelnose

age-8 and older (Steffensen and Hamel 2008). In general, the relative weight of shovelnose sturgeon in segment 3 declines as fish grow into larger size classes, while there was no noticeable difference in the relative weight of size classes between the sturgeon and fish community seasons (Table 25).

Shovelnose sturgeon were distributed throughout the length of segment 3 during 2008. However, during and the three years of sampling a total of 15 shovelnose sturgeon smaller than 200 mm FL have been collected and all but 1 were sampled at river mile downstream of river mile 1605. This is approximately the last 20 river miles of the Missouri River above its confluence with the Yellowstone River. A pattern of young shovelnose rearing in the lower most portions of the river and gradually moving upstream as they grown has been seen in all years of sampling.

Overall, the highest shovelnose sturgeon CPUE for both trammel nets and otter trawls occurred in large secondary connected channels (Appendix F). For trammel nets, large secondary connected channels had an overall CPUE of 0.73 fish/ 100m, with inside bends at 0.16 fish/100 m, outside bends 0.13 fish/ 100 m and channel crossovers at 0.12 fish/ 100m (Appendix F2). Similarly, otter trawl CPUE was 0.06 fish/ 100m in large secondary connected channels, 0.05 fish/100 m in inside bends and channel crossovers and 0.03 in outside bends (Appendix F4). For detailed macro and meso habitat use of shovelnose sturgeon by size class and the effort expended in those habitats by gear see Tables 17 through 24.

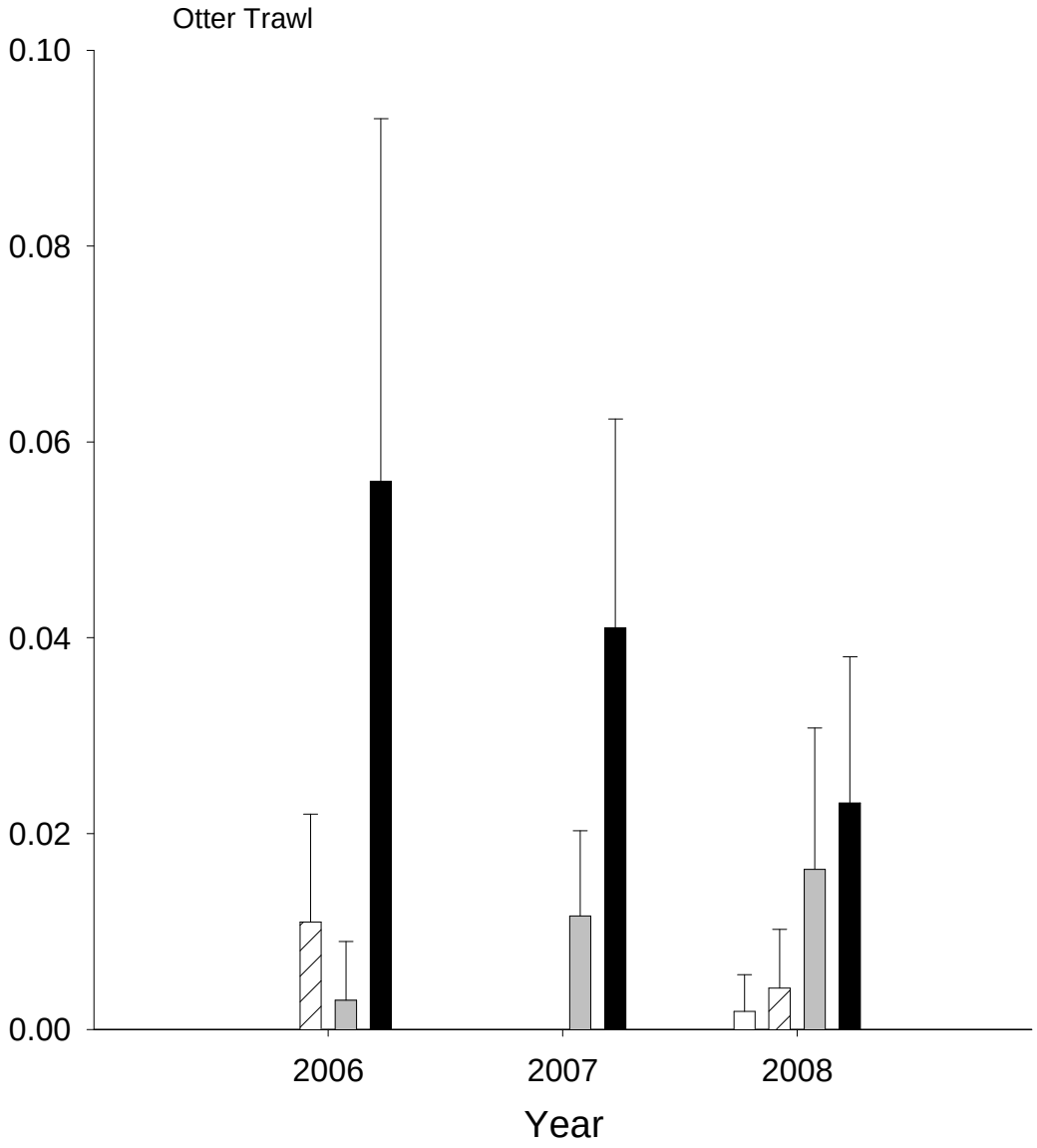

Figure 11. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249 mm; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using otter trawls in segment 3 of the Missouri River during sturgeon season 2006-2008.

Segment 3 - Shovelnose Sturgeon / Sturgeon Season

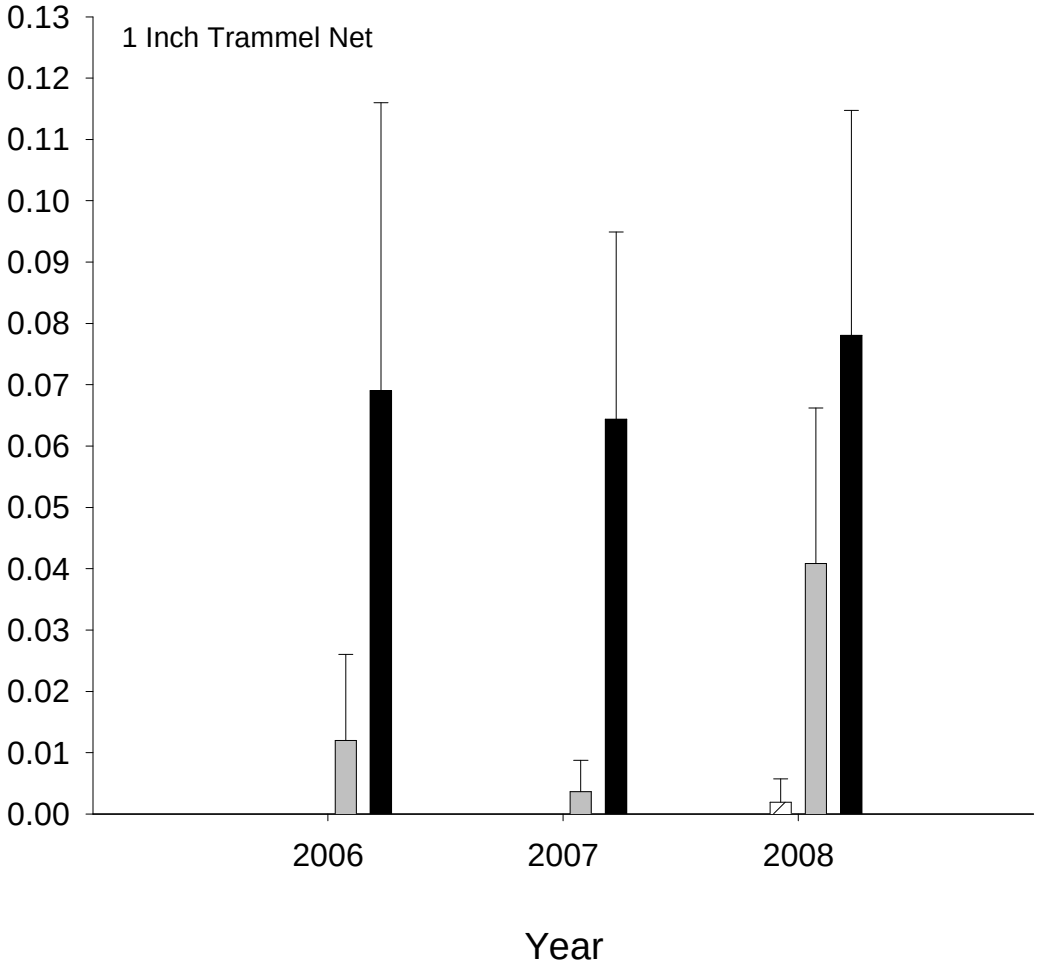

Figure 12. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249 mm; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using 1 inch trammel nets in segment 3 of the Missouri River during sturgeon season 2006-2008.

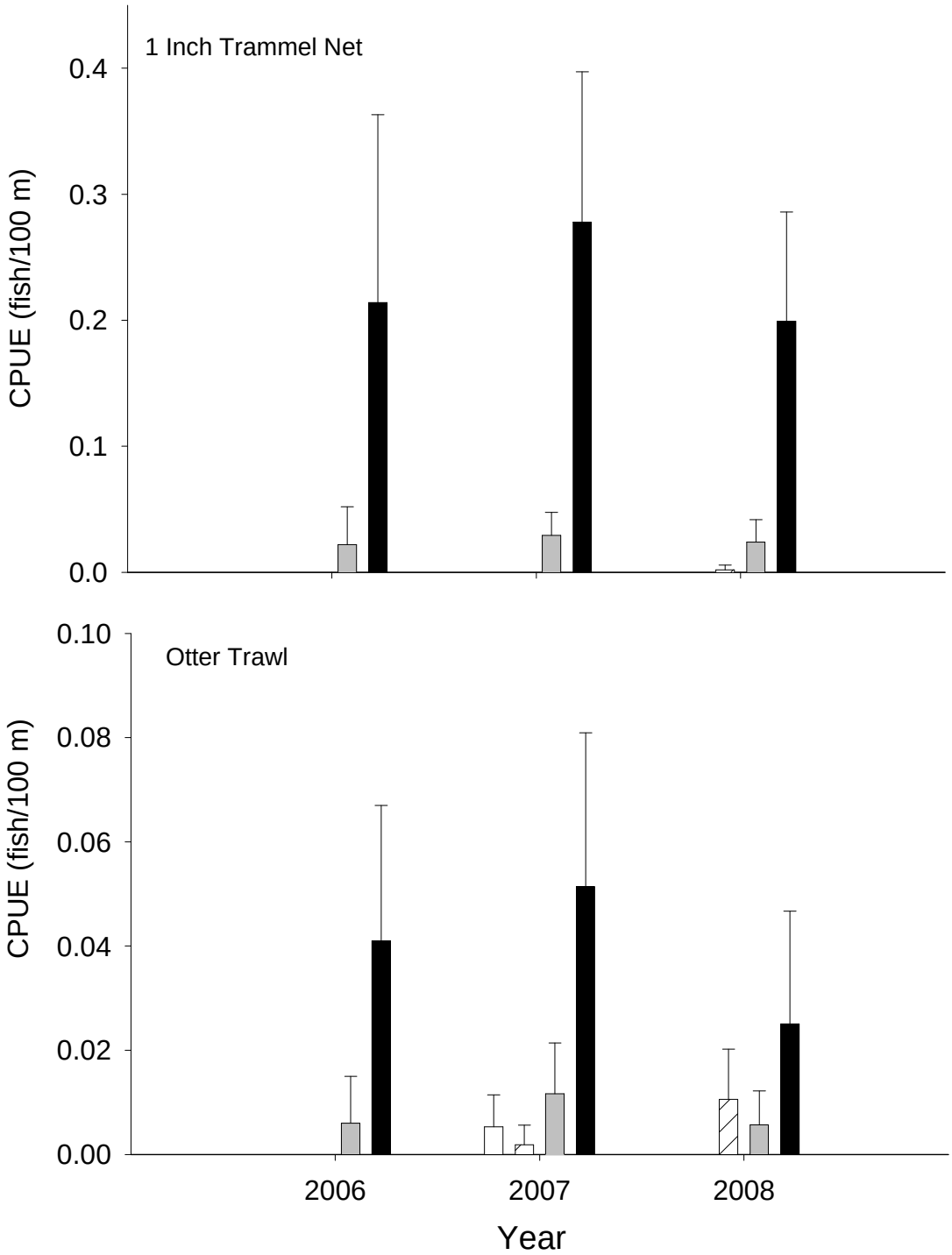

Figure 14. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249 mm; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using 1 inch trammel nets and otter trawls in segment 3 of the Missouri River during fish community season 2006-2008. Note the different scales of they Y-axis'.

Segment 3 - Shovelnose Sturgeon / Fish Community Season

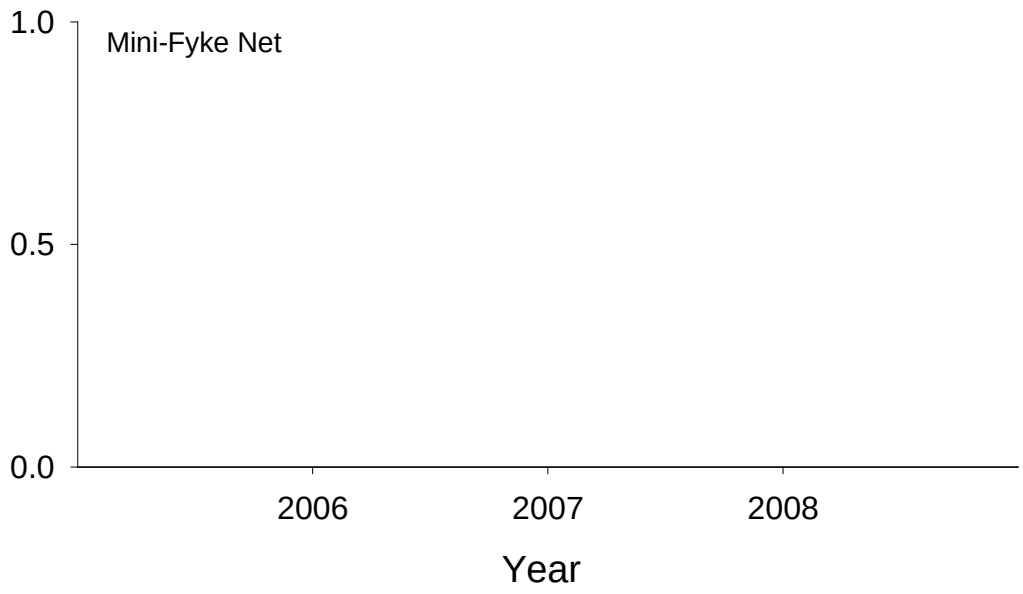

Figure 15. Mean annual catch per unit effort (+/- 2 SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249 mm; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using mini-fyke nets in segment 3 of the Missouri River during fish community season 2006-2008.

Table 17. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 3 of the Missouri River during 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat[a]													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(32)	0	0	0	(31)	(29)	(8)	0	0	0	0	0	0
Gill Net		N-E			N-E	N-E									N-E
Otter Trawl	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(27)	(12)	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(33)	0	0	0	(33)	(28)	(5)	0	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(25)	0	0	0	(29)	(2)	(15)	(24)	(4)	0	0	0	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(29)	(10)	0	0	0	0	0	0

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

Table 18. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 3 of the Missouri River during 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat[a]					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	N-E	N-E
	.	0	(99)	0	(1)	0	0
Gill Net				N-E		N-E	N-E
Otter Trawl	1	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	N-E	N-E
	.	(100)	0	0	0	0	0
Otter Trawl	0	0	0	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0

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

Table 19. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 3 of the Missouri River during 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat[a]													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	N-E
	.	0	(32)	0	0	0	(31)	(29)	(8)	0	0	0	0	0	0
Gill Net		N-E			N-E	N-E									N-E
Otter Trawl	2	N-E	100	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(27)	(12)	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	N-E
	.	0	(33)	0	0	0	(33)	(28)	(5)	0	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(25)	0	0	0	(29)	(2)	(15)	(24)	(4)	0	0	0	0
Otter Trawl	5	N-E	40	0	N-E	N-E	60	0	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(29)	(10)	0	0	0	0	0	0

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

Table 20. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 3 of the Missouri River during 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat[a]					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	1	0	100	N-E	0	N-E	N-E
	.	0	(99)	0	(1)	0	0
Gill Net				N-E		N-E	N-E
Otter Trawl	2	0	100	N-E	0	N-E	N-E
	·	0	(100)	0	0	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	1	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	N-E	N-E
	.	(100	0	0	0	0	0
Otter Trawl	5	0	100	N-E	0	N-E	N-E
	·	0	(100)	0	0	0	0

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

Table 21. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 3 of the Missouri River during 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat[a]													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	15	N-E	13	0	N-E	N-E	60	13	13	0	0	0	0	0	N-E
	.	0	(32)	0	0	0	(31)	(29)	(8)	0	0	0	0	0	0
Gill Net		N-E			N-E	N-E									N-E
Otter Trawl	7	N-E	43	0	N-E	N-E	29	29	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(27)	(12)	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	9	N-E	22	0	N-E	N-E	0	44	33	0	0	0	0	0	N-E
	.	0	(33)	0	0	0	(33)	(28)	(5)	0	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(25)	0	0	0	(29)	(2)	(15)	(24)	(4)	0	0	0	0
Otter Trawl	3	N-E	33	0	N-E	N-E	33	33	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(29)	(10)	0	0	0	0	0	0

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

Table 22. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 3 of the Missouri River during 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat[a]					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	15	0	100	N-E	0	N-E	N-E
	.	0	(99)	0	(1)	0	0
Gill Net				N-E		N-E	N-E
Otter Trawl	7	0	100	N-E	0	N-E	N-E
	·	0	(100)	0	0	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	9	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	N-E	N-E
	.	(100)	0	0	0	0	0
Otter Trawl	3	0	100	N-E	0	N-E	N-E
	·	0	(100)	0	0	0	0

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

Table 23. 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 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat[a]													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	32	N-E	41	0	N-E	N-E	38	6	16	0	0	0	0	0	N-E
	.	0	(32)	0	0	0	(31)	(29)	(8)	0	0	0	0	0	0
Gill Net		N-E			N-E	N-E									N-E
Otter Trawl	12	N-E	33	0	N-E	N-E	50	0	17	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(27)	(12)	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	77	N-E	19	0	N-E	N-E	27	22	31	0	0	0	0	0	N-E
	.	0	(33)	0	0	0	(33)	(28)	(5)	0	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(25)	0	0	0	(29)	(2)	(15)	(24)	(4)	0	0	0	0
Otter Trawl	13	N-E	8	0	N-E	N-E	15	38	38	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(29)	(10)	0	0	0	0	0	0

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

Table 24. Total number of quality size and greater (≥380 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 3 of the Missouri River during 2008. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat[a]					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	32	0	100	N-E	0	N-E	N-E
	.	0	(99)	0	(1)	0	0
Gill Net				N-E		N-E	N-E
Otter Trawl	12	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	77	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	N-E	N-E
	.	(100)	0	0	0	0	0
Otter Trawl	13	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0

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

Segment 3 - Shovelnose Sturgeon

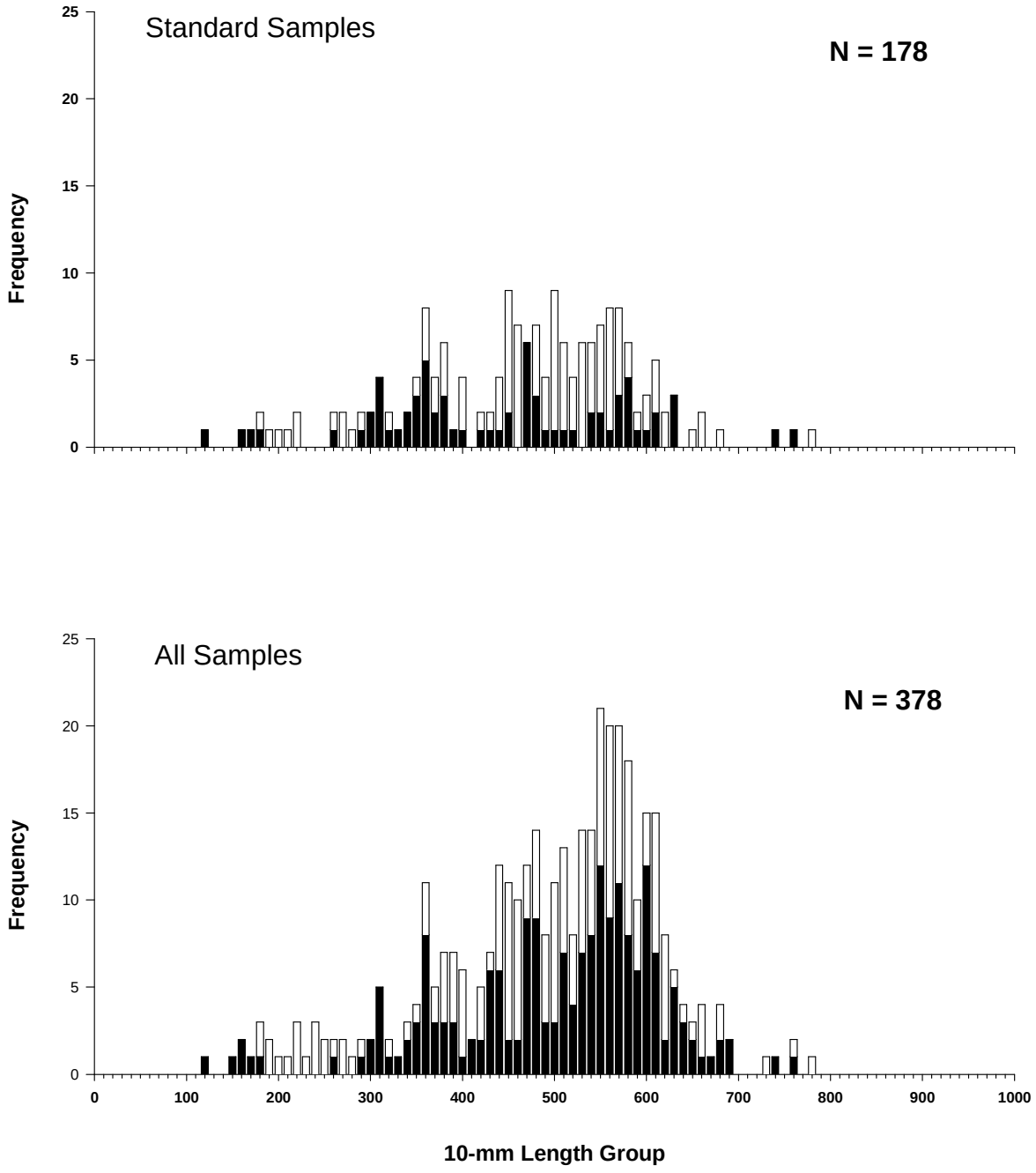

Figure 17. Length frequency of shovelnose sturgeon during fall through spring (sturgeon season; black bars) and summer (fish community season; white bars) in segment 3 of the Missouri River during 2008. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2008.

Table 25. Incremental relative stock density (RSD)[a] and mean relative weight (Wr) by a length category for shovelnose sturgeon in segment 3 of the Missouri River captured during 2008. Length categories[b] determined using methods proposed by Quist (1998).

Length category	N	RSD	Wr (+/- 2 SE)
Sturgeon Season			
Sub-stock (0-149 mm)	1	.	172.0
Sub-stock (150-249 mm)	3	.	119.1 (27.31)
Stock	22	33	94.73 (10.39)
Quality	21	32	85.46 (2.890)
Preferred	21	32	80.61 (3.542)
Memorable	2	3	97.57 (28.01)
Trophy	0	.	0
Overall Wr	.	.	89.94 (4.843)
Fish Community Season			
Sub-stock (0-149 mm)	0	.	0
Sub-stock (150-249 mm)	6	.	108.3 (18.37)
Stock	12	12.	102.9 (12.17)
Quality	40	39	85.46 (2.070)
Preferred	45	44	84.96 (2.699)
Memorable	5	5	84.84 (6.690)
Trophy	0	.	0
Overall Wr	.	.	88.43 (2.547)

[a] RSD = (# of fish of a specified length class / # of fish ≥ minimum stock length fish) * 100.
[b] Length categories based on the percentage of the largest known shovelnose sturgeon: Sub-stock FL < 250 mm (20 %), Stock FL =250-379 mm (20 – 36 %), Quality FL = 380 – 509 mm (36 – 45 %), Preferred FL = 510 - 639 mm (45 – 59 %), Memorable FL = 640 – 809 mm (59 – 74 %), Trophy FL > 810 mm (>74 %).

Sturgeon Chub

A total of 663 sturgeon chubs were sampled during 2008 in segment 3, 662 in the otter trawl and the remaining one in a mini fyke net. The total catch of 2008 was lower than in 2007 when a total of 1,241 sturgeon chubs were sampled. However, the push trawl was used in 2007, which captured 444 sturgeon chubs and was not used during 2008. Although the push trawl was an excellent gear for catching smaller sturgeon chubs, it was discontinued after an evaluation period where it was decided it did not benefit the power of the overall program. In 2008, the majority of sturgeon chubs (N = 549) were sampled during the sturgeon season compared to the fish community season (N = 114). This is interesting, since during 2007 the sturgeon chub catch in the otter trawl was 246 during the sturgeon season and 532 during the fish community season.

The sturgeon chub CPUE for otter trawls was the higher during the sturgeon season in 2008 than it was during either season in any year (Figures 18 and 19). The CPUE of 0.85 fish/ 100 m during the sturgeon season was more than double that of 0.39 fish/ 100m in 2007 and was slightly higher than 0.72 fish/100 m of 2006. In sharp contrast, the fish community season CPUE of sturgeon chubs in the otter trawl was the lowest at 0.23 fish/100 m than any other year for either season sampled (Figures 18 and 19). This was approximately only one-third of the CPUE of 0.63 and 0.60 fish/ 100 m in 2007 and 2006, respectively.

The average size of sturgeon chubs was 50.5 mm TL, similar to the average of 49.4 mm in 2007, but smaller than 2006 when they averaged 58.2 mm. Sturgeon chubs averaged 48.7 mm in length during the sturgeon season, which was smaller than the 59.2 mm average of the fish community season. Additionally, although sturgeon chubs were collected throughout the length of segment 3, they showed a general pattern of being larger in the upstream portions of the river and smaller in the lower sections. So few sturgeon chubs have been caught in mini fyke nets over the three years of sampling comparing the years is not very meaningful. Age-1 sturgeon chubs dominated the 2008 catch with a age-2 fish being the second most dominant age class and age-0 and age-3 fish only having a couple of samples (Herman et al. 2008a).

A higher proportion of sturgeon chubs were sampled in inside bend (42%) than in channel crossovers (36%), outside bends (16%), or large connected secondary channels (6%) (Table 26). The proportion of catch in both inside bends and channel crossovers was higher than the proportion those habitats were sampled.

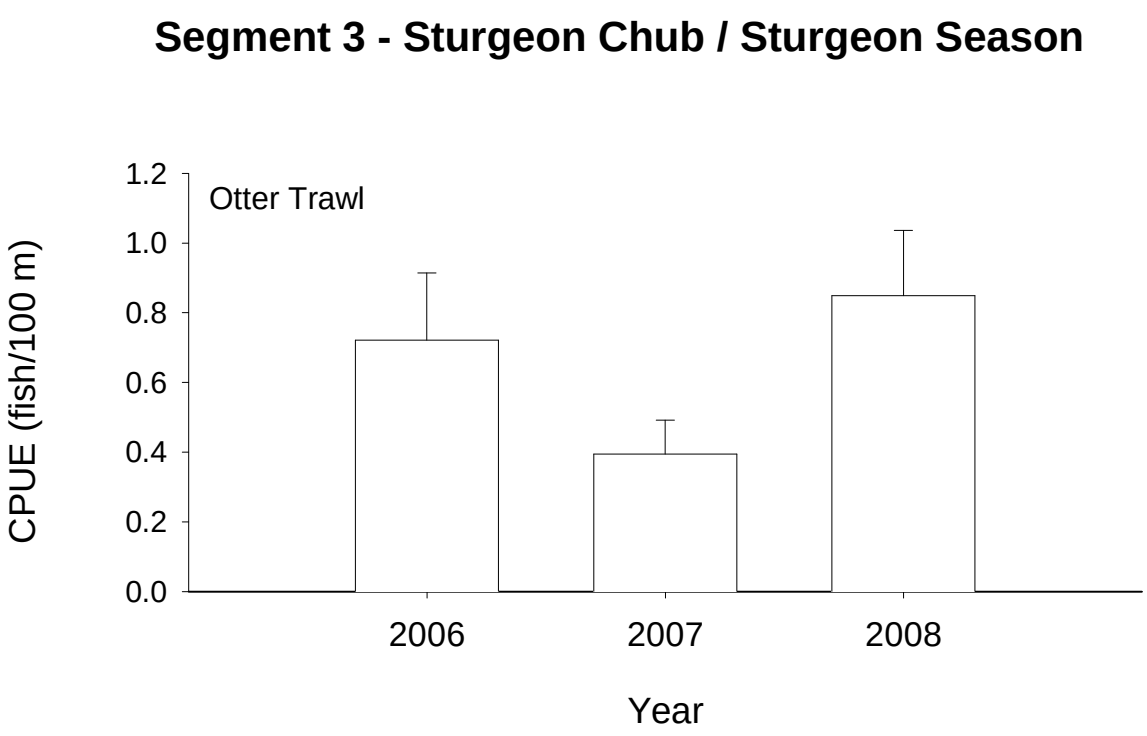

Figure 18. Mean annual catch per unit effort (+/- 2 SE) of sturgeon chub using otter trawls in segment 3 of the Missouri River during sturgeon season 2006-2008.

Segment 3 - Sturgeon Chub / Fish Community Season

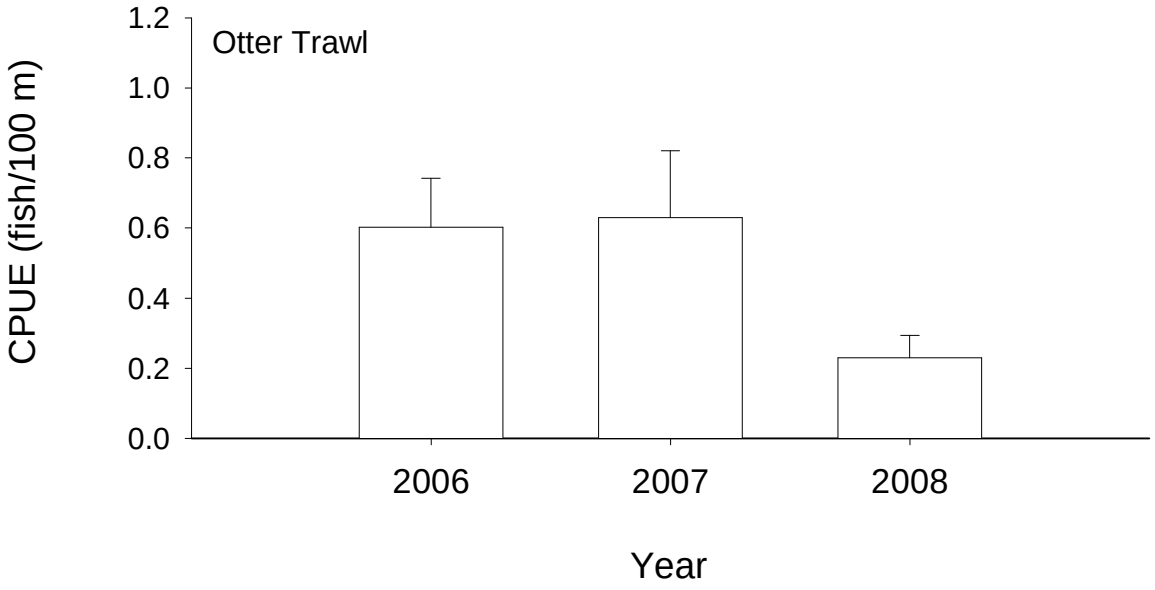

Figure 19. Mean annual catch per unit effort (+/- 2 SE) of sturgeon chub using otter trawls in segment 3 of the Missouri River during fish community season 2006-2008.

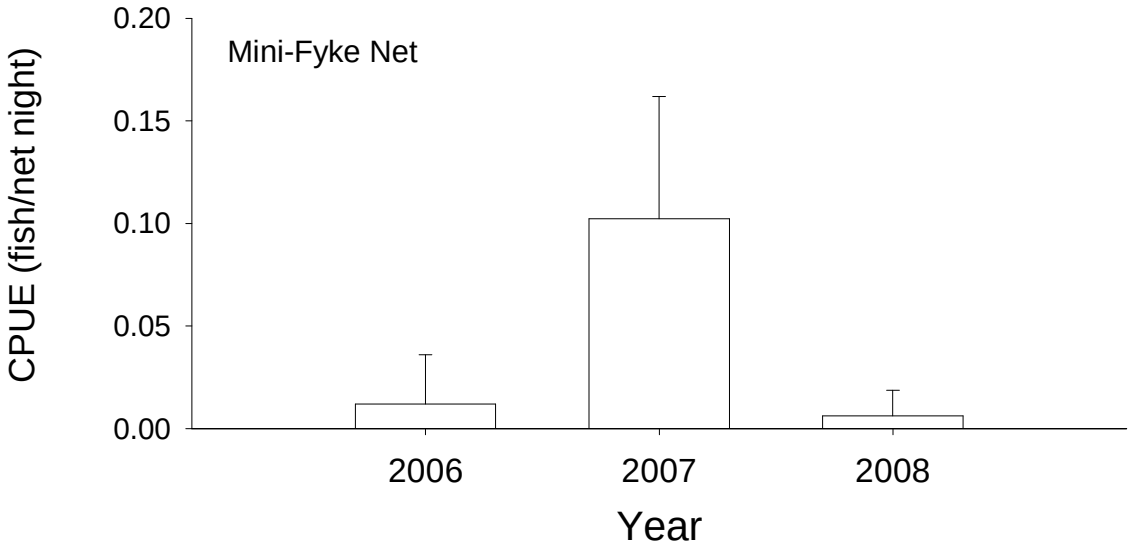

Figure 20. Mean annual catch per unit effort (+/- 2 SE) of sturgeon chub using mini-fyke nets in segment 3 of the Missouri River during fish community season 2006-2008.

Table 26. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 3 of the Missouri River during 2008. 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 (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(32)	0	0	0	(31)	(29)	(8)	0	0	0	0	0	0
Gill Net		N-E			N-E	N-E									N-E
Otter Trawl	422	N-E	36	0	N-E	N-E	42	16	6	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(27)	(12)	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(33)	0	0	0	(33)	(28)	(5)	0	0	0	0	0	0
Mini-Fyke Net	1	N-E	100	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(25)	0	0	0	(29)	(2)	(15)	(24)	(4)	0	0	0	0
Otter Trawl	106	N-E	30	0	N-E	N-E	24	29	17	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(29)	(10)	0	0	0	0	0	0

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

Table 27. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segment 3 of the Missouri River during 2008. 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	Mesohabitat[a]					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	N-E	N-E
	.	0	(99)	0	(1)	0	0
Gill Net				N-E		N-E	N-E
Otter Trawl	422	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Mini-Fyke Net	1	100	0	N-E	0	N-E	N-E
	.	(100)	0	0	0	0	0
Otter Trawl	106	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0

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

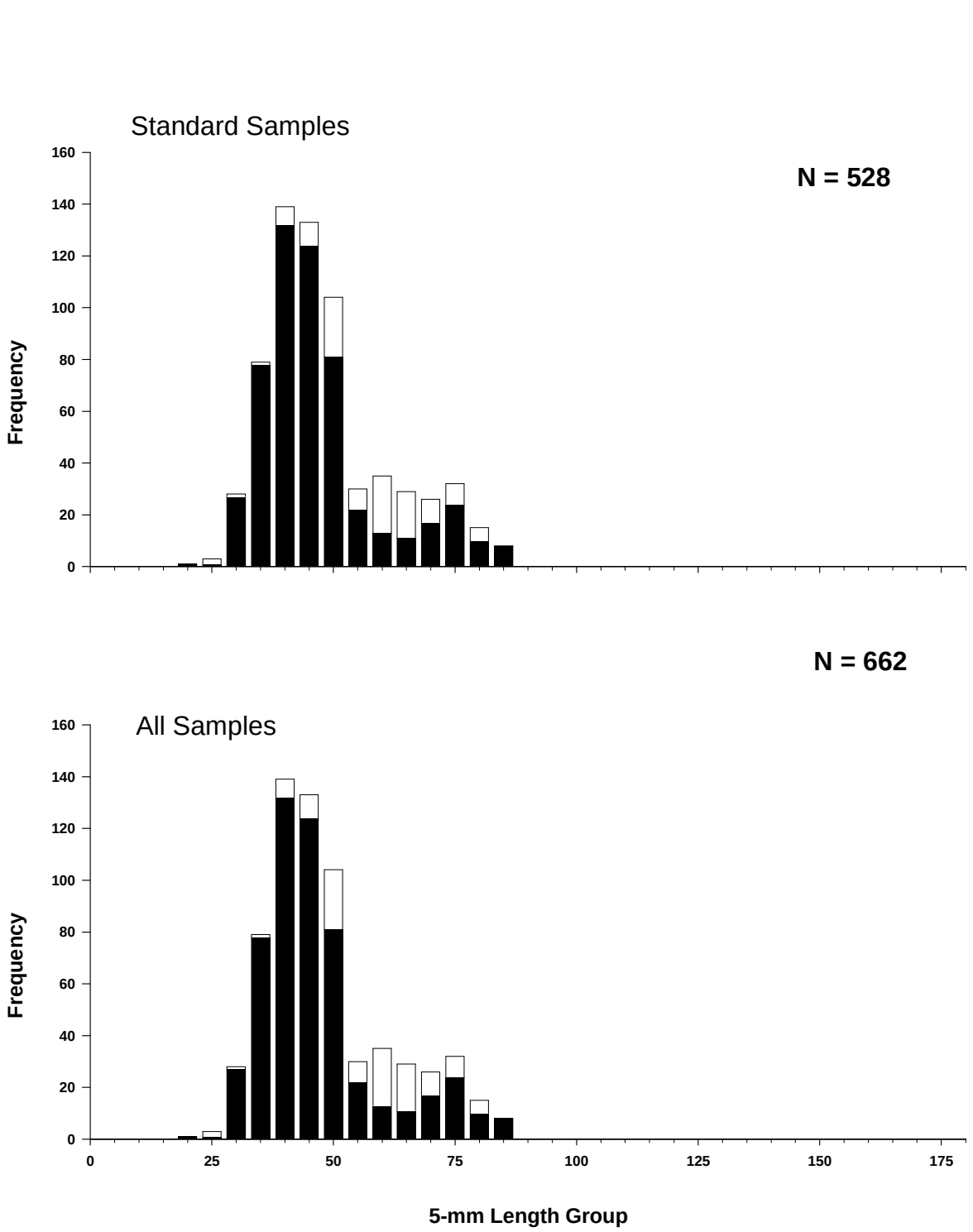

Figure 21. Length frequency of sturgeon chub during fall through spring (sturgeon season; black bars) and summer (fish community season; white bars) in segment 3 of the Missouri River during 2008. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2008.

Sicklefin Chub

A total of 85 sicklefin chubs were collected in 2008, all in the otter trawl. This was a decrease from 2007 and 2006 when 141 and 122 were sampled, respectively. Although the beam trawl was used in 2006 and the push trawl in 2007, the otter trawl alone captured 109 and 123, during 2006 and 2007, respectively. Of the total sicklefin chub catch in 2008, 66 were sampled during the sturgeon season and 19 during the fish community season. The abundance of sicklefin chubs in the trawl during the sturgeon season equated to the highest CPUE during that season for all three years sampled. Sturgeon season CPUE was 0.12 fish/100 m in 2008, compared to 0.007 and 0.08 fish/100 m in 2007 and 2006, respectively (Figure 22). Conversely, the low numbers sampled in the fish community season during 2008 equated to the lowest CPUE for all three sampling seasons. During 2008 otter trawl CPUE in the fish community season was at 0.03 fish/100 m, while in 2007 it was at a high of 0.18 fish/100 m and 0.11 fish/100 m in 2006 (Figure 23). Overall CPUE (both seasons combined) was at a three year low in 2008 at 0.08 fish/100 m, down from both 0.09 and 0.1 fish/100 m in 2007 and 2006, respectively.

Sicklefin chubs averaged 86.2 mm TL during 2008 and were slightly larger during the fish community season (mean TL = 87.4 mm) when compared to the sturgeon season (mean TL = 85.8 mm). The majority of sicklefin chubs sampled were likely age-2, with a smaller proportion of age-1 and age-3 fish represented (Figure 25) (Herman et al. 2008b).

Similar to sturgeon chubs, sicklefin chubs were more often sampled in channel crossovers (41%) and inside bends (36%) when compared to outside bends (21%) and large secondary connected channels (2%). Additionally, the proportion of the catch found in channel crossovers and inside bends was higher than the proportion of total effort in those two habitat types.

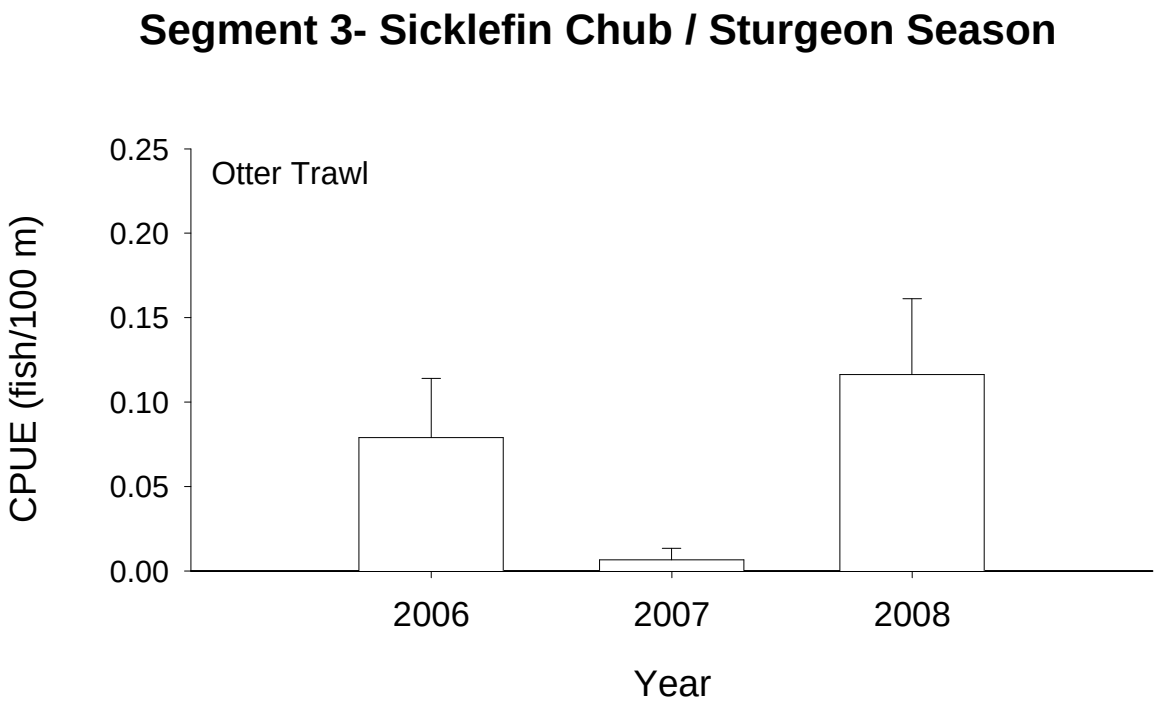

Figure 22. Mean annual catch per unit effort (+/- 2 SE) of sicklefin chub using otter trawls in segment 3 of the Missouri River during sturgeon season 2006-2008.

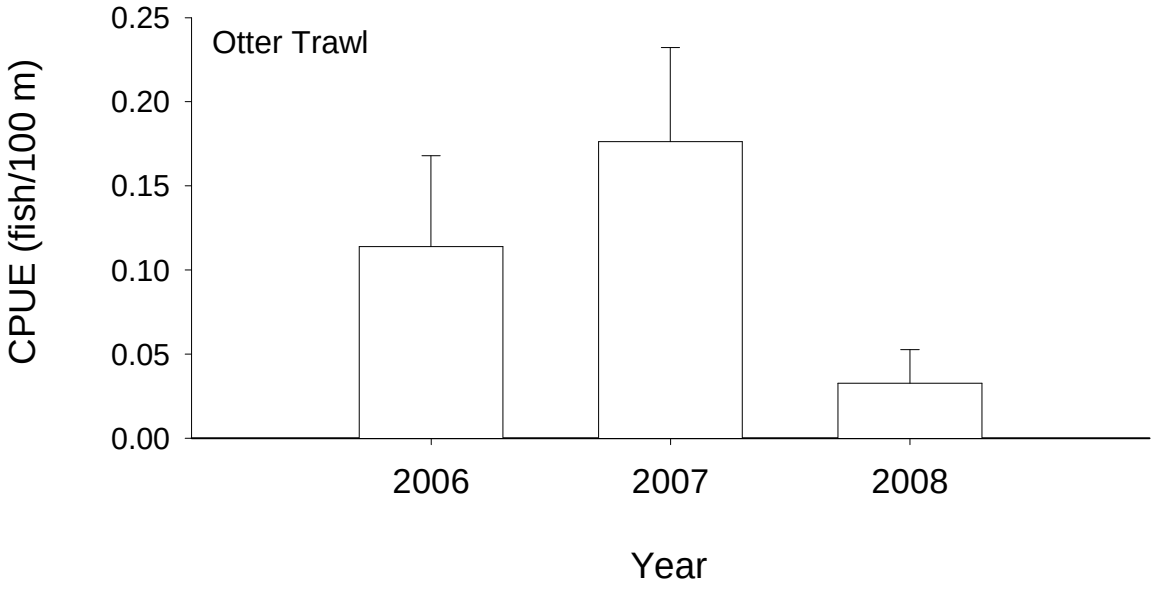

Figure 23. Mean annual catch per unit effort (+/- 2 SE) of sicklefin chub using otter trawls in segment 3 of the Missouri River during fish community season 2006-2008.

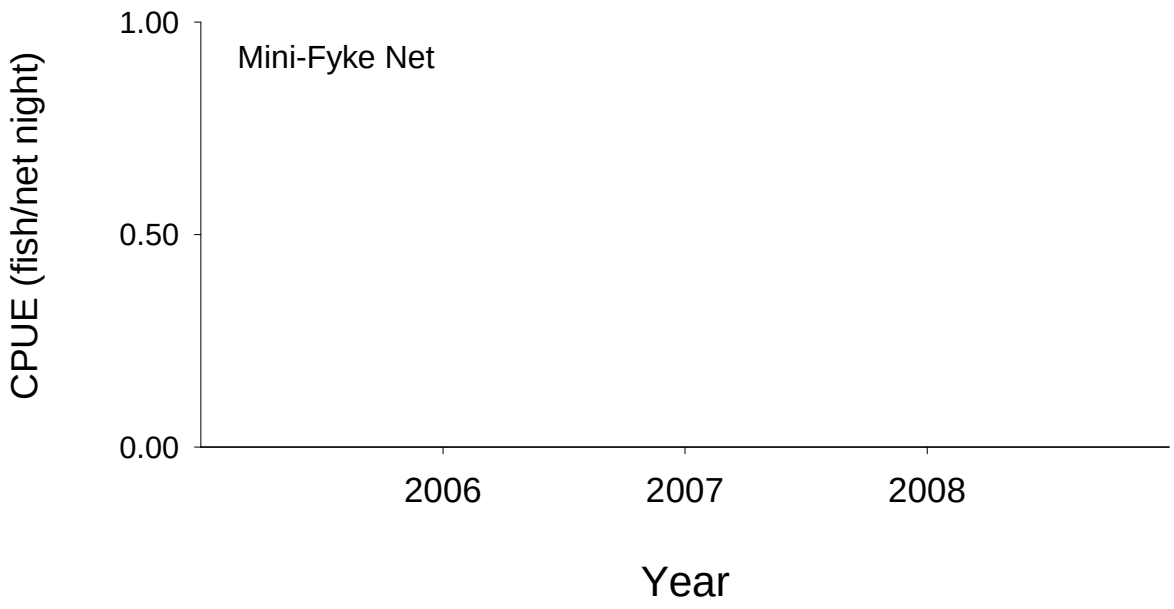

Figure 24. Mean annual catch per unit effort (+/- 2 SE) of sicklefin chub using mini-fyke nets in segment 3 of the Missouri River during fish community season 2006-2008.

Table 28. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 3 of the Missouri River during 2008. 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 (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(32)	0	0	0	(31)	(29)	(8)	0	0	0	0	0	0
Gill Net		N-E			N-E	N-E									N-E
Otter Trawl	58	N-E	41	0	N-E	N-E	36	21	2	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(27)	(12)	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(33)	0	0	0	(33)	(28)	(5)	0	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(25)	0	0	0	(29)	(2)	(15)	(24)	(4)	0	0	0	0
Otter Trawl	18	N-E	39	0	N-E	N-E	22	28	11	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(29)	(10)	0	0	0	0	0	0

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

Table 29. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segment 3 of the Missouri River during 2008. 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	Mesohabitat[a]					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	N-E	N-E
	.	0	(99)	0	(1)	0	0
Gill Net				N-E		N-E	N-E
Otter Trawl	58	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	N-E	N-E
	.	(100)	0	0	0	0	0
Otter Trawl	18	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0

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

Segment 3 - Sicklefin Chub

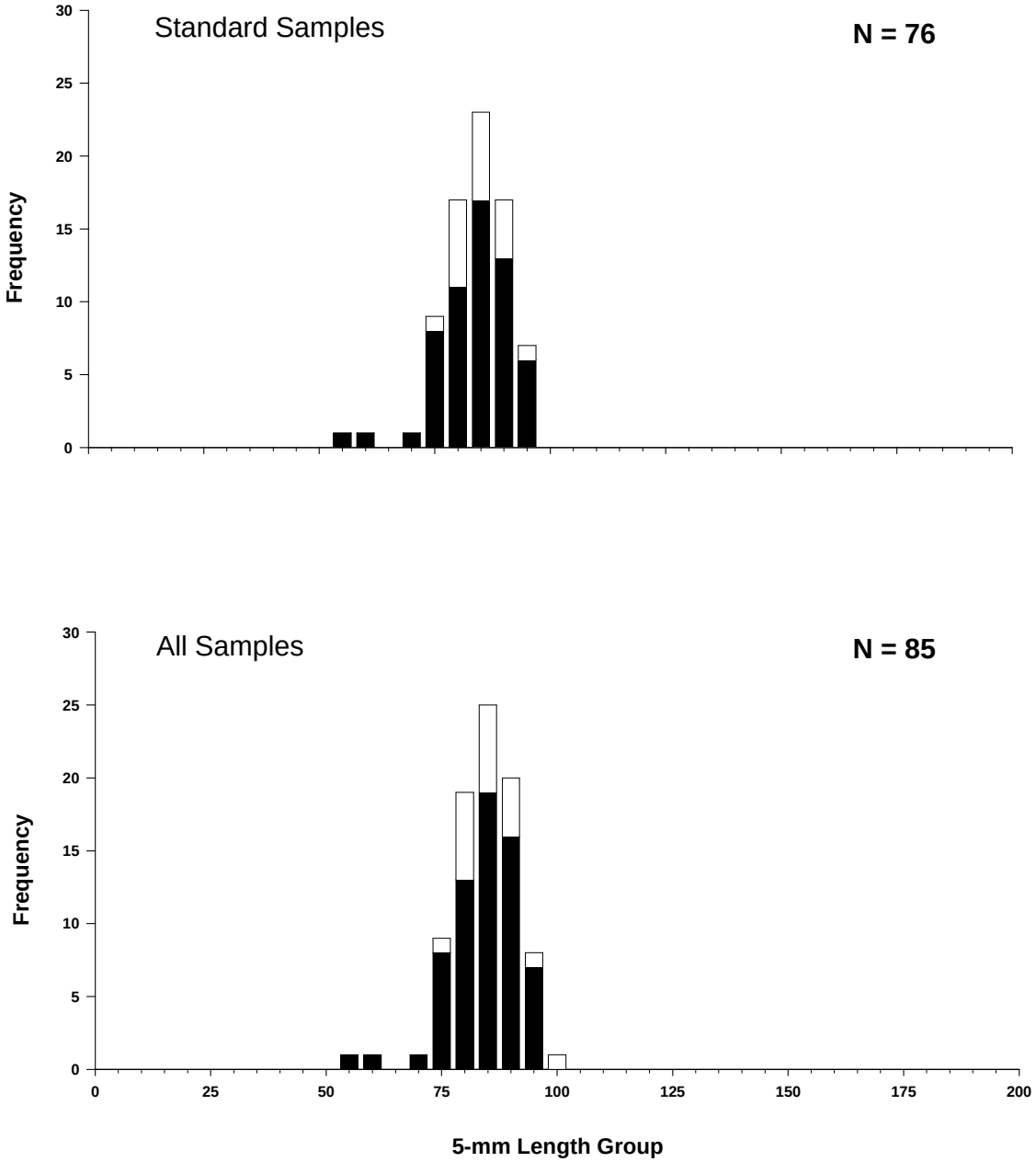

Figure 25. Length frequency of sicklefin chub during fall through spring (sturgeon season; black bars) and summer (fish community season; white bars) in segment 3 of the Missouri River during 2008. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2008.

Sand Shiner

A total of 918 sand shiners were sampled during 2008, all but one during the fish community season. Mini fyke nets collected 916 sand shiners while the otter trawl sampled only two. The total catch of sand shiners was at a three year low in 2008. However, the overall CPUE of sand shiners in mini fyke nets was similar in 2008 at 5.7 to 5.6 fish/net night in 2007, but both years were substantially less than 13.7 fish/net night in 2006 (Figure 32). So few sand shiners are sampled in the otter trawl that evaluating trends in CPUE are meaningless.

Sand shiners averaged 41.8 mm TL in 2008, with a minimum size of 21 mm and a maximum sample of 62 mm. The 2008 sample consisted of age-0 and age-1 fishes with both being about equally represented (Dattilo et al. 2008a).

Sand shiners were distributed throughout the length of segment 3, although one bend a river mile 1653 accounted for 59% of the total 2008 catch. Sand shiners were most often found in large connected secondary channels, with 67% of the total catch even though this habitat made up only 15% of the habitats sampled (Table 32). The other habitats where sand shiners were found in order of abundance were inside bends (12%), channel crossovers (9%), small connected secondary channels (8%), outside bends (3%), and non-connected side channels (2%). The proportion of sand shiners captured compared to the proportion those habitats were sampled were less for all habitat types except large connected secondary channels.

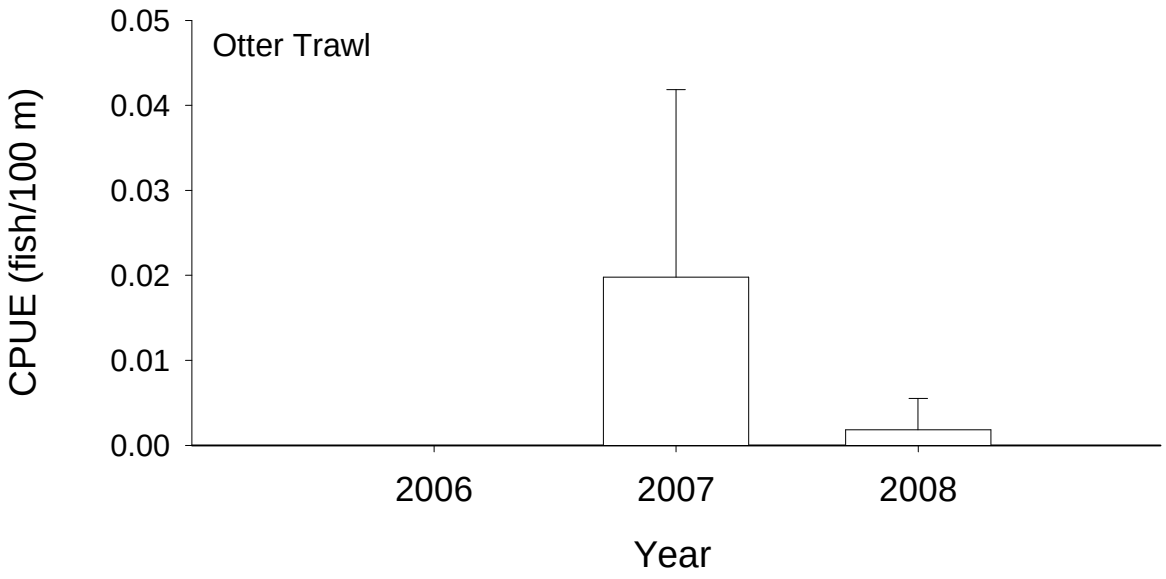

Figure 30. Mean annual catch per unit effort (+/- 2 SE) of sand shiner with otter trawls in segment 3 of the Missouri River during sturgeon season 2006-2008.

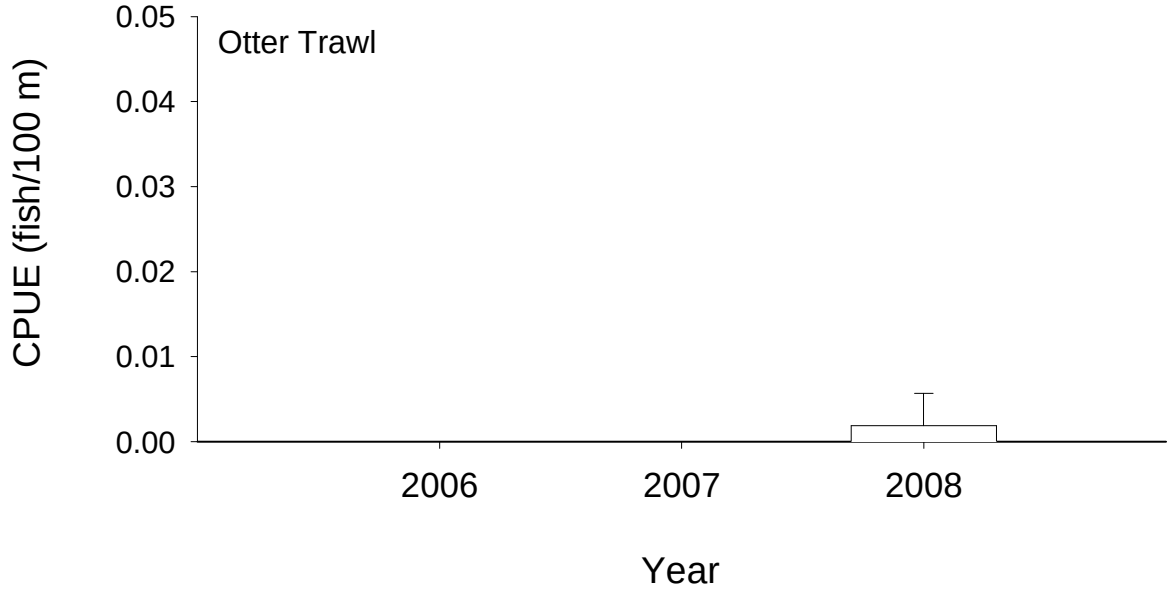

Figure 31. Mean annual catch per unit effort (+/- 2 SE) of sand shiner with otter trawls in segment 3 of the Missouri River during fish community season 2006-2008.

Segment 3 - Sand Shiner / Fish Community Season

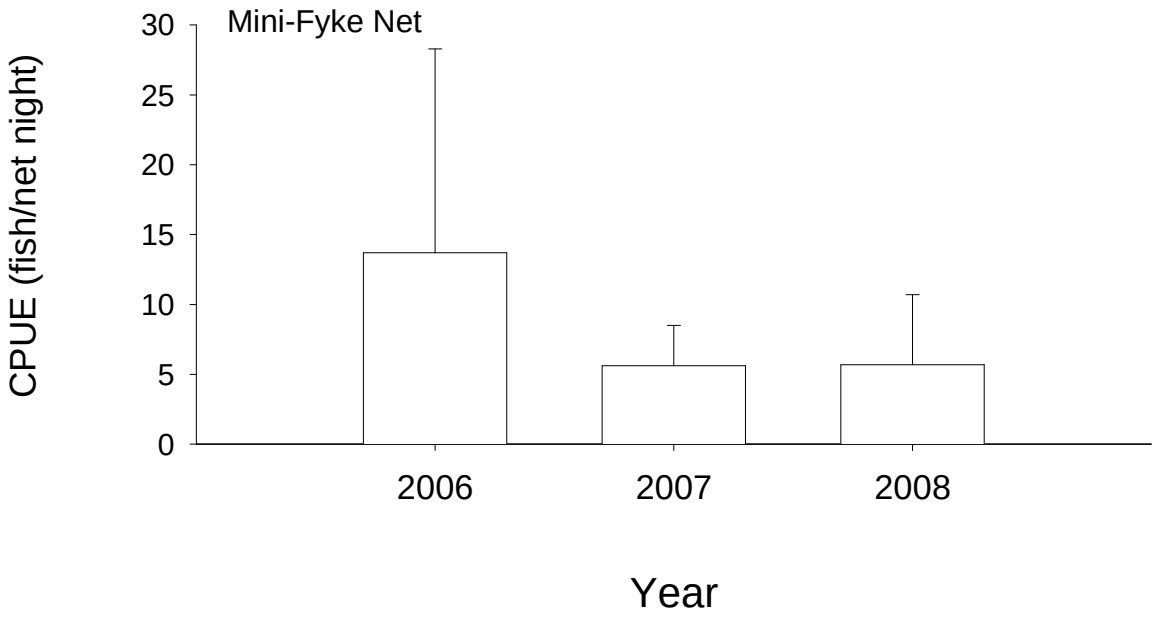

Figure 32. Mean annual catch per unit effort (+/- 2 SE) of sand shiner with mini-fyke nets in segment 3 of the Missouri River during fish community season 2006-2008.

Table 32. Total number of sand shiners captured for each gear during each season and the proportion caught within each macrohabitat type in segment 3 of the Missouri River during 2008. 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 (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(32)	0	0	0	(31)	(29)	(8)	0	0	0	0	0	0
Gill Net		N-E			N-E	N-E									N-E
Otter Trawl	1	N-E	100	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(27)	(12)	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(33)	0	0	0	(33)	(28)	(5)	0	0	0	0	0	0
Mini-Fyke Net	916	N-E	9	0	N-E	N-E	12	3	67	8	2	0	0	0	N-E
	.	0	(25)	0	0	0	(29)	(2)	(15)	(24)	(4)	0	0	0	0
Otter Trawl	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(29)	(10)	0	0	0	0	0	0

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

Table 33. Total number of sand shiners captured for each gear during each season and the proportion caught within each mesohabitat type in segment 3 of the Missouri River during 2008. 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	Mesohabitat[a]					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	N-E	N-E
	.	0	(99)	0	(1)	0	0
Gill Net				N-E		N-E	N-E
Otter Trawl	1	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Mini-Fyke Net	916	99	1	N-E	0	N-E	N-E
	.	(100)	0	0	0	0	0
Otter Trawl	1	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0

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

Segment 3 - Sand Shiner

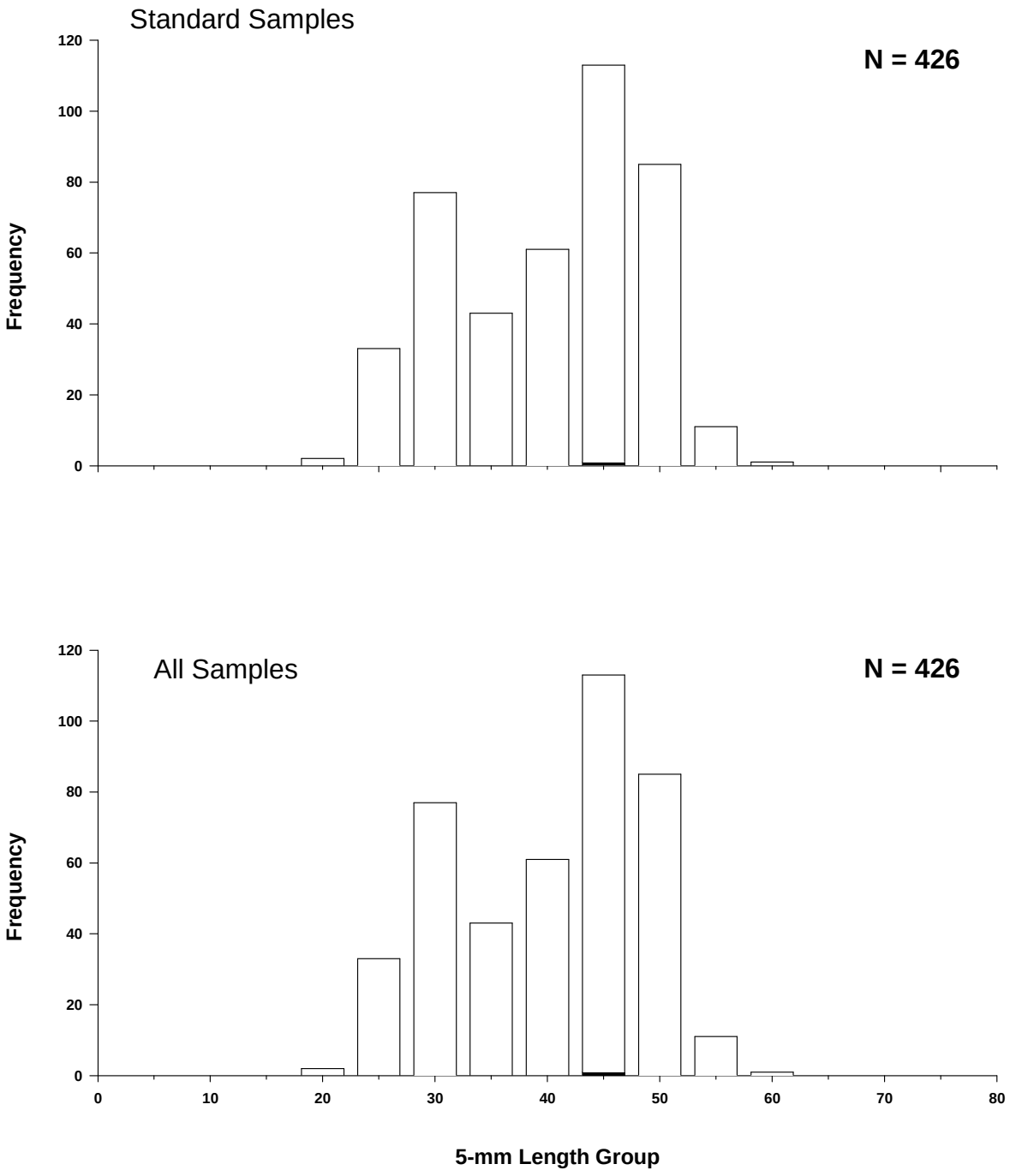

Figure 33. Length frequency of sand shiner during fall through spring (sturgeon season; black bars) and summer (fish community season; white bars) in segment 3 of the Missouri River during 2008. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2008.

***Hybognathus* spp**.

All *Hybognathus spp.* collected in 2008 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 three 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. In any manner, all trend graphs and tables referring to *Hybognathus spp.* are only referring to western silver minnows during 2008.

During 2008 we sampled 377 western silvery minnows, 372 during the fish community season and 5 in the sturgeon season. Mini fyke nets are our best gear for comparing relative abundance of western silver minnow between years, in 2008 mini fyke nets collected 371 of the 377 specimens, while otter trawls collected the remaining six. Overall mini fyke net CPUE of western silver minnows has increased in every year of sampling since 2006 (Figure 36). Western silvery minnows were sampled at an average rate of 2.8 fish/net night in 2008, and 2.2 and 0.58 fish/net night in 2007 and 2006, respectively. The variability in the catch has also increased throughout the three years of sampling. Since so few western silver minnows are sampled in the otter trawl, using its CPUE data for relative abundance is meaningless.

Western silver minnows averaged 70.2 mm TL, with a minimum sample of 30 mm and a maximum of 102 mm. The length frequency histogram data for western silver minnows collected in 2008 indicates that our samples consisted mainly of age-0 and age-1 fish, with a few potential age-2 specimens (Datillo et al. 2008b).

Western silver minnows were collected throughout the length of segment 3 with highly variable abundance. More western silver minnow were sampled in non-connected side channels (67%) than any other habitat (Table 34). However, 66% (n = 244) of the total western silver minnow catch in mini fyke nets was sampled in one net in a non-connected side channel, therefore significantly influencing the catch proportions. Never the less, non-connected side channels have been rare in the Missouri River in segment 3 during the past three years with discharge being so low and this may be an indication of their importance to species like the western silver minnow.

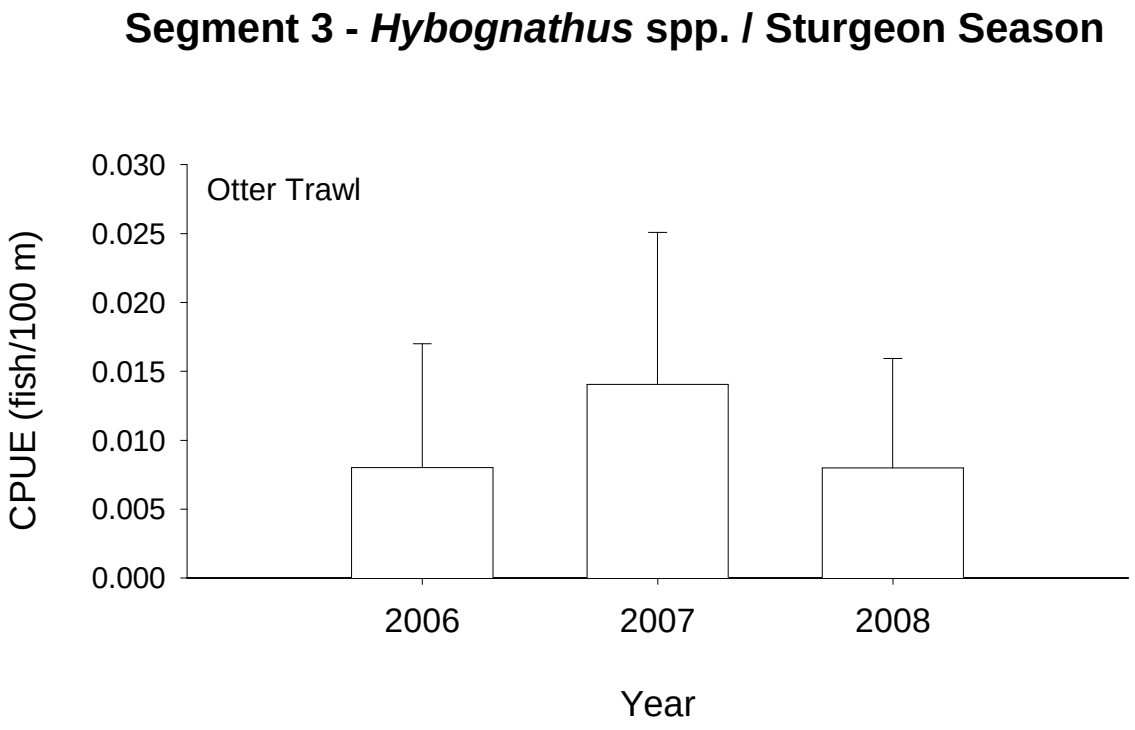

Figure 34. Mean annual catch per unit effort (+/- 2 SE) of *Hybognathus* spp. with otter trawls in segment 3 of the Missouri River during sturgeon season 2006-2008.

Segment 3 - *Hybognathus* spp. / Fish Community Season

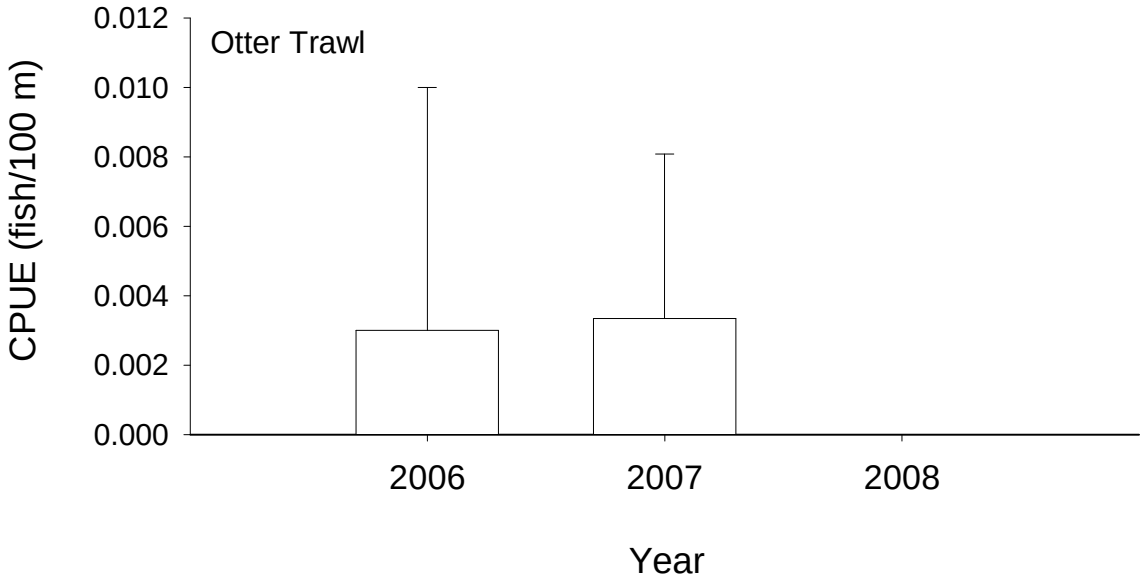

Figure 35. Mean annual catch per unit effort (+/- 2 SE) of *Hybognathus* spp. with otter trawls in segment 3 of the Missouri River during fish community season 2006-2008.

Segment 3 - *Hybognathus* spp. / Fish Community Season

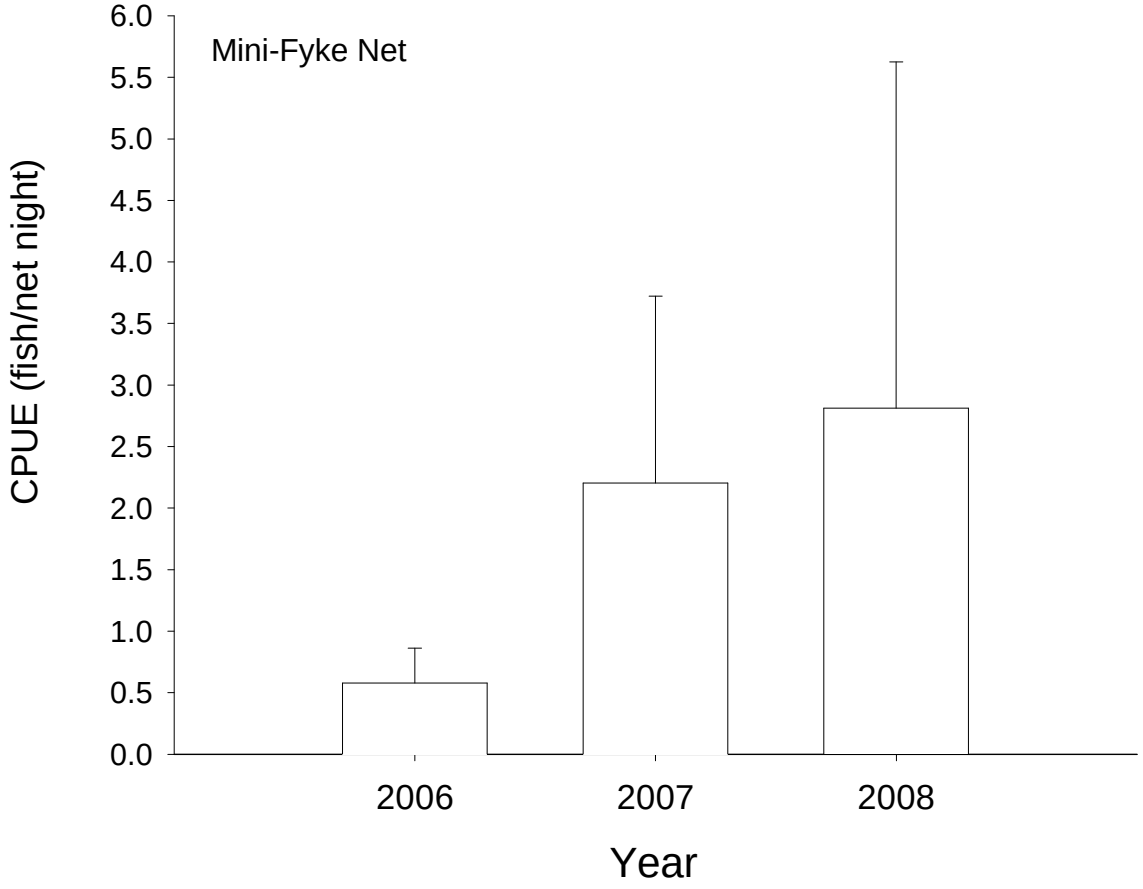

Figure 36. Mean annual catch per unit effort (+/- 2 SE) of *Hybognathus* spp. with mini-fyke nets in segment 3 of the Missouri River during fish community season 2006-2008.

Table 34. Total number of *Hybognathus* spp. captured for each gear during each season and the proportion caught within each macrohabitat type in segment 3 of the Missouri River during 2008. 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 (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(32)	0	0	0	(31)	(29)	(8)	0	0	0	0	0	0
Gill Net		N-E			N-E	N-E									N-E
Otter Trawl	4	N-E	0	0	N-E	N-E	50	25	25	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(27)	(12)	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(33)	0	0	0	(33)	(28)	(5)	0	0	0	0	0	0
Mini-Fyke Net	372	N-E	10	0	N-E	N-E	11	0	8	4	67	0	0	0	N-E
	.	0	(25)	0	0	0	(29)	(2)	(15)	(24)	(4)	0	0	0	0
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(29)	(10)	0	0	0	0	0	0

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

Table 35. Total number of *Hybognathus* spp. captured for each gear during each season and the proportion caught within each mesohabitat type in segment 3 of the Missouri River during 2008. 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	Mesohabitat[a]					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	0	0	0	N-E	0	N-E	N-E
	.	0	(99)	0	(1)	0	0
Gill Net				N-E		N-E	N-E
Otter Trawl	4	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	0	0	0	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Mini-Fyke Net	372	100	0	N-E	0	N-E	N-E
	.	(100)	0	0	0	0	0
Otter Trawl	0	0	0	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0

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

Segment 3 - *Hybognathus* spp.

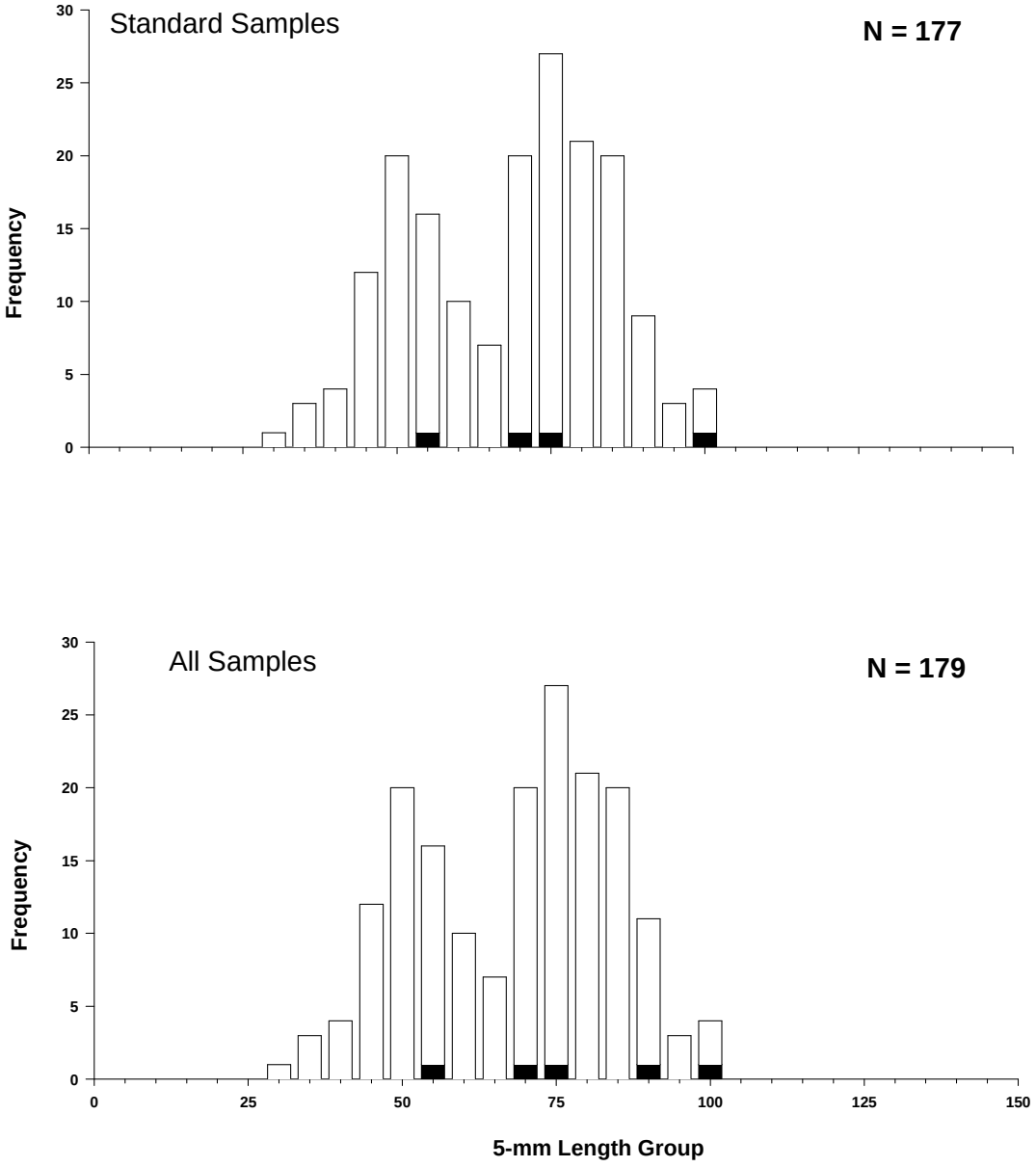

Figure 37. Length frequency of *Hybognathus* spp. caught during fall through spring (sturgeon season; black bars) and summer (fish community season; white bars) in segment 3 of the Missouri River during 2008. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2008.

Blue Sucker

A total of 14 blue suckers were sampled in segment 3 during 2008, 7 each in the sturgeon and fish community seasons. Trammel nets captured 13 blue suckers while the otter trawl captured only one. The overall CPUE using trammel nets for the past three year has been low, but very consistent. The overall blue sucker trammel net CPUE for all three years has been 0.01 fish/ 100m. Over the past three years of sampling a pattern has emerged as to when blue suckers are captured. For the most part, blue suckers are consistently captured during the sturgeon season before the middle of June and during the fish community season they are not caught until the middle of August with the majority of the fish captured late into the fall. We have seen no spatial pattern of where blue suckers are captured in segment 3.

In general, blue sucker abundance in trammel nets has been slightly higher during the fish community season than during the sturgeon season in the past three years, although all CPUE estimates are low (Figures 39 and 41). The mean length of blue suckers in 2008 was 713.4 mm TL, with a minimum of 646 mm and a maximum of 780 mm. The length frequency histogram in Figure 44 is similar to the previous two years of sampling, supporting little to no recruitment in recent years. The smallest blue sucker sampled in the past three years of sampling was 576 mm in 2007. This fish was likely at least age-7 or older (Labay et al.2008). No evidence of recent recruitment into the adult population has been seen in the Missouri River downstream of Fort Peck Dam in Montana over the past several years with all the Montana Fish, Wildlife and Parks projects (Mike Ruggles, FWP Biologist, personal communication). So few blue suckers are sampled in the otter trawl that its long-term data is meaningless at this point, especially with the sizes of fish that we are currently finding. If juvenile blue sucker begin using this stretch of river the otter trawl may be the ideal gear to monitor their abundance.

Since minimal numbers of blue suckers are sampled in segment 3, making inferences based on the habitats we sampled them in would be pointless. For the specific habitats that blue suckers were sampled by gear see Tables 36 and 37.

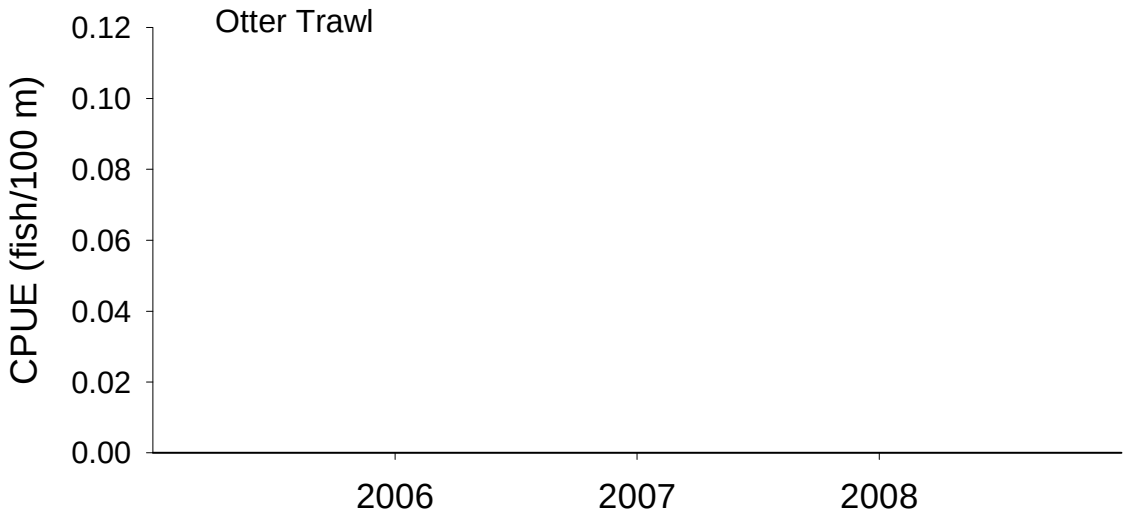

Figure 38. Mean annual catch per unit effort (+/- 2 SE) of blue sucker with gill nets and otter trawls in segment 3 of the Missouri River during sturgeon season 2006-2008.

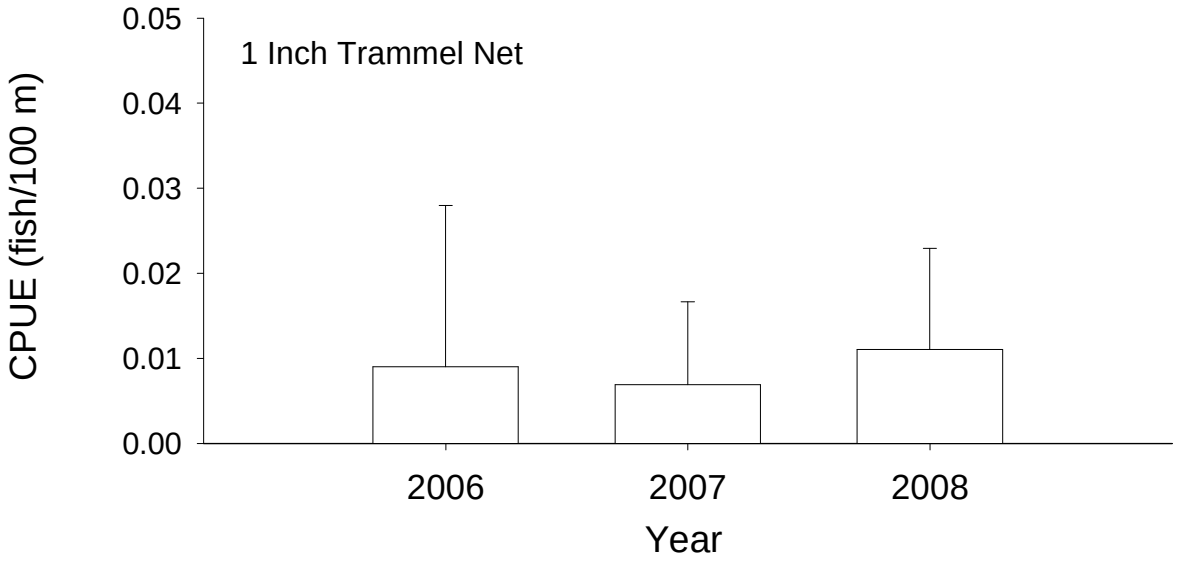

Figure 39. Mean annual catch per unit effort (+/- 2 SE) of blue sucker with 1 inch trammel nets in segment 3 of the Missouri River during sturgeon season 2006-2008.

Segment 3 - Blue Sucker / Fish Community Season

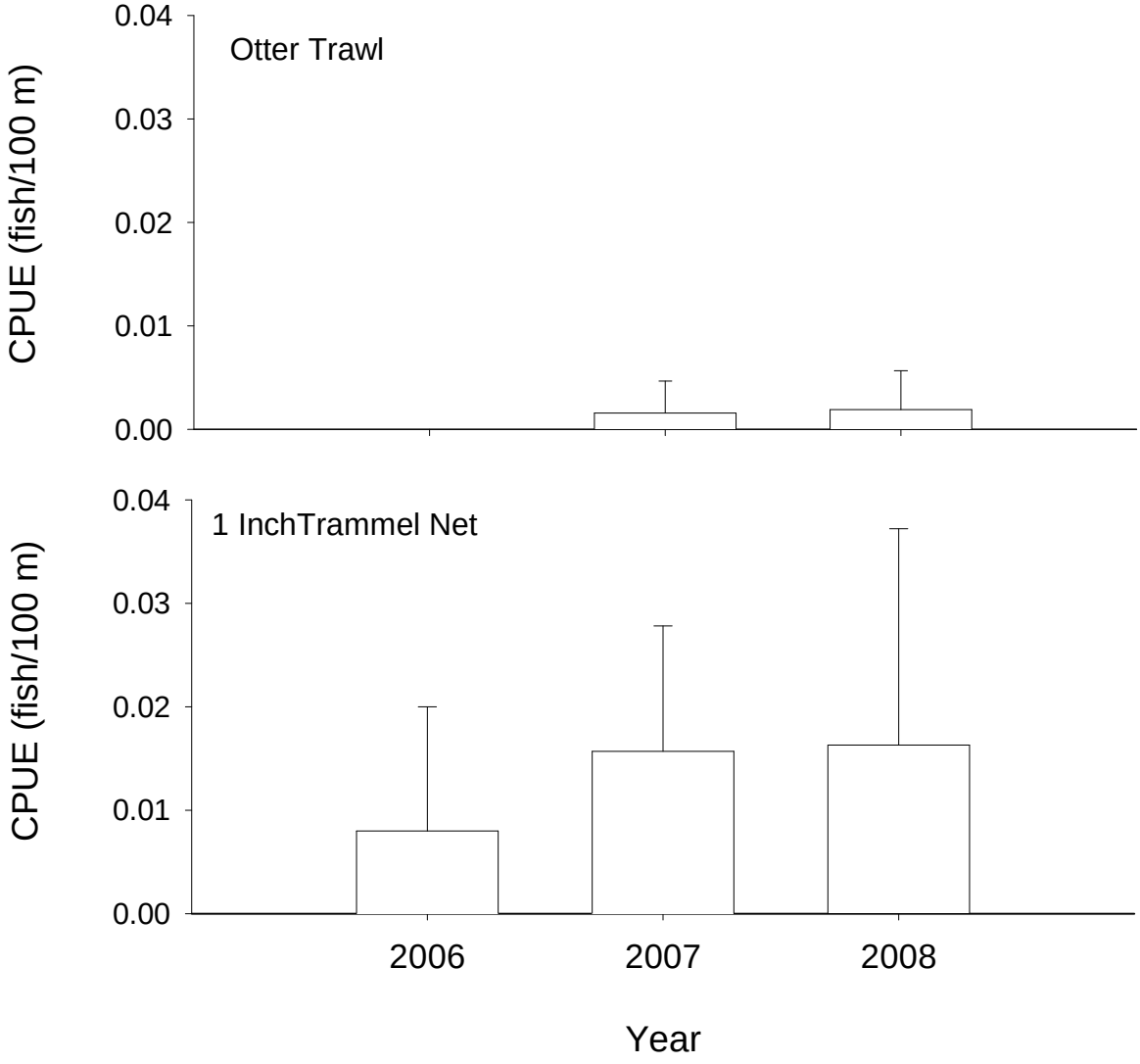

Figure 41. Mean annual catch per unit effort (+/- 2 SE) of blue sucker using otter trawls and 1 inch trammel nets in segment 3 of the Missouri River during fish community season 2006-2008.

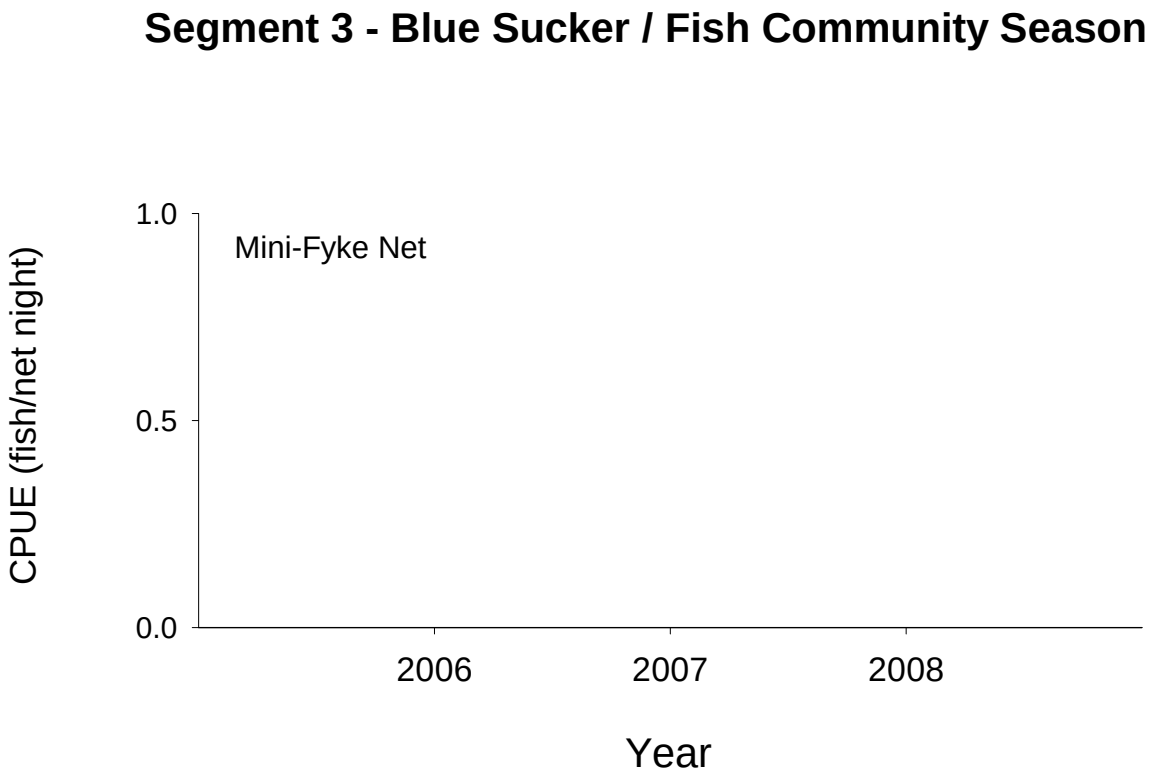

Figure 42. Mean annual catch per unit effort (+/- 2 SE) of blue sucker using mini-fyke nets in segment 3 of the Missouri River during fish community season 2006-2008.

Table 36. 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 2008. 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 (Fall through Spring)															
1 Inch Trammel Net	4	N-E	25	0	N-E	N-E	50	0	25	0	0	0	0	0	N-E
	.	0	(32)	0	0	0	(31)	(29)	(8)	0	0	0	0	0	0
Gill Net		N-E			N-E	N-E									N-E
Otter Trawl	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(27)	(12)	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	6	N-E	17	0	N-E	N-E	17	67	0	0	0	0	0	0	N-E
	.	0	(33)	0	0	0	(33)	(28)	(5)	0	0	0	0	0	0
Mini-Fyke Net	0	N-E	0	0	N-E	N-E	0	0	0	0	0	0	0	0	N-E
	.	0	(25)	0	0	0	(29)	(2)	(15)	(24)	(4)	0	0	0	0
Otter Trawl	1	N-E	0	0	N-E	N-E	100	0	0	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(29)	(10)	0	0	0	0	0	0

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

Table 37. Total number of blue suckers captured for each gear during each season and the proportion caught within each mesohabitat type in segment 3 of the Missouri River during 2008. 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	Mesohabitat[a]					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	4	0	100	N-E	0	N-E	N-E
	.	0	(99)	0	(1)	0	0
Gill Net				N-E		N-E	N-E
Otter Trawl	0	0	0	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	6	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0
Mini-Fyke Net	0	0	0	N-E	0	N-E	N-E
	.	(100)	0	0	0	0	0
Otter Trawl	1	0	100	N-E	0	N-E	N-E
	.	0	(100)	0	0	0	0

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

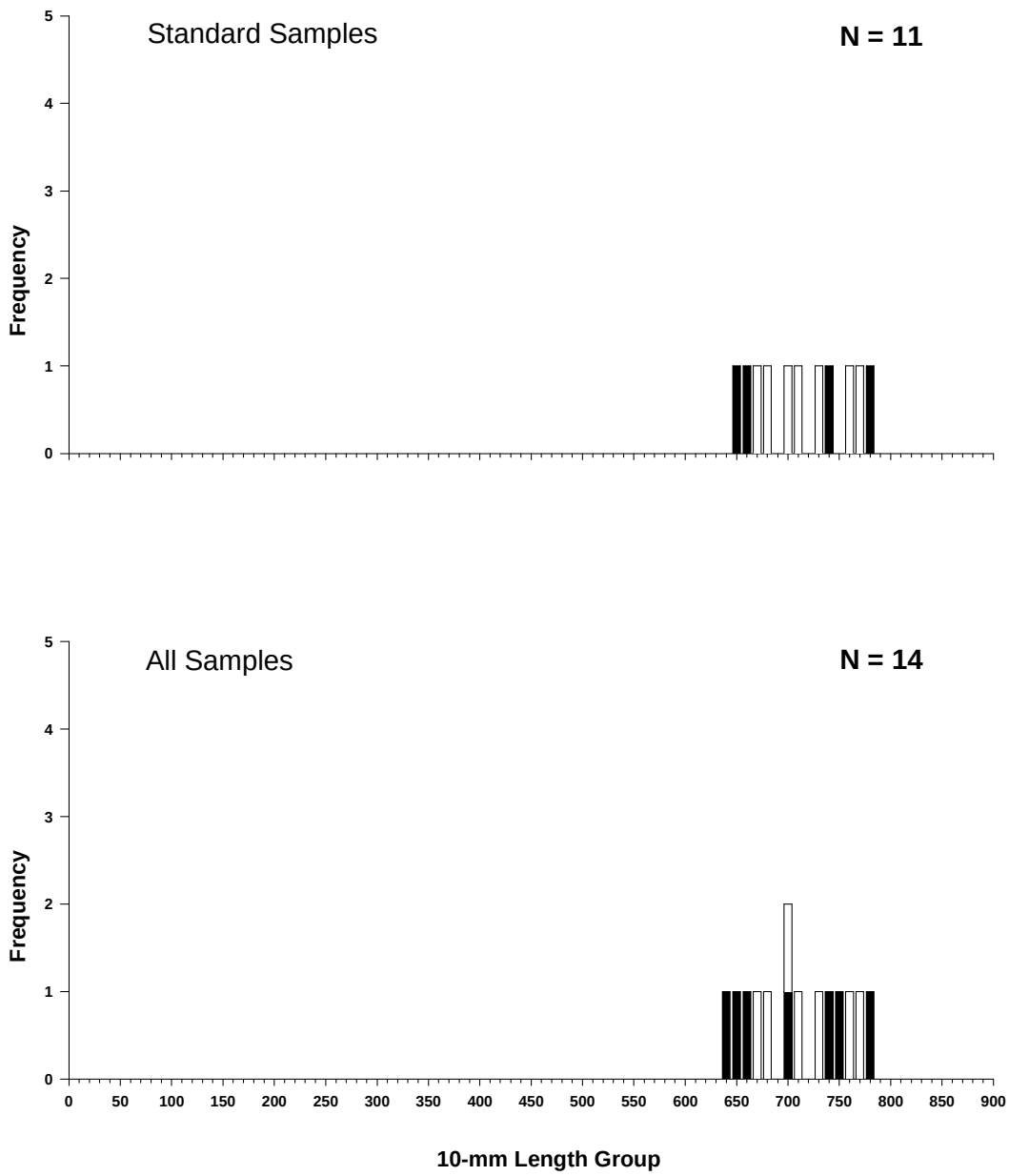

Figure 44. Length frequency of blue sucker during fall through spring (sturgeon season; black bars) and summer (fish community season; white bars) in segment 3 of the Missouri River during 2008. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2008.

Sauger

A total of 296 sauger were sampled in segment 3 during 2008, 163 during the sturgeon season and 133 in the fish community season. This was a substantial increase over the past two years when a 195 and 125 were sampled in 2007 and 2006, respectively. All gears used captured sauger, but trammel nets sampled the bulk with 219 specimens. The other gears in their order of sauger catch were otter trawl (n = 43), mini fyke nets (n = 26), trotlines (n = 6) and angling (n = 2). The relative abundance of sauger was at a three-year high in 2008 at almost twice the estimate of 2007 and more than double the 2006 estimate. Overall trammel net CPUE was estimated at 0.21 fish/100m in 2008, 0.11 fish/ 100m in 2007 and 0.08 fish/100 m in 2006. Although the trend was not as obvious, the overall otter trawl sauger CPUE was higher in 2008 (CPUE = 0.05 fish/100 m) than in both 2007 (CPUE = 0.04 fish/100 m) and 2006 (0.03 fish/100 m).

Seasonally, the sauger CPUE was higher for both trammel nets and otter trawls during the sturgeon season when compared to the fish community season (Figures 45-47). Sturgeon season CPUE for trammel nets was estimated at 0.29 fish/ 100 m, whereas the fish community season CPUE was 0.13 fish/100m). The otter trawl CPUE was 0.05 fish/100m during the sturgeon season and 0.04 fish/ 100 m in the fish community season. Interestingly, mini fyke net CPUE has progressively decreased since 2006 (Figure 49). The sauger mini fyke net CPUE for 2006 was at a high of 0.24 fish/net night and decreased to 0.20 fish/net night in 2007 and again to 0.16 fish/net night in 2008.

The average length of sauger sampled in 2008 was 327.3 mm, with a minimum sample of 67 mm and a maximum of 526 mm. There was a considerable difference in the mean lengths of sauger captured by gear. Trotlines sampled the largest sauger with an average of 409.5 mm, with trammel nets averaging 337.0 mm, otter trawl 315.8 mm, and mini fyke nets 239.5. More age-0 fish were sampled in 2008 than during 2007, although the sample size was still small. The length frequency histogram in Figure 51 shows a population made up of age-0 through likely age-5 fish, with the majority being in the age-2 to age-3 range (Dattilo et al. 2008c).

Sauger were relatively evenly distributed throughout the length of segment 3 in 2008. However, no sauger less than 150 mm were sampled in any river mile above 1629.5 and the majority (75%) were found at or downstream of river mile 1613.5. This is a pattern that has been seen in all three years of sampling, where all age-0 fish are found in the downstream portions of segment 3. At the river bend level, sauger were distributed relatively equally among macro

habitats to the proportion macro habitats were sampled. To see details on the habitats where sauger were sampled see Tables 38 and 39.

Segment 3 - Sauger / Sturgeon Season

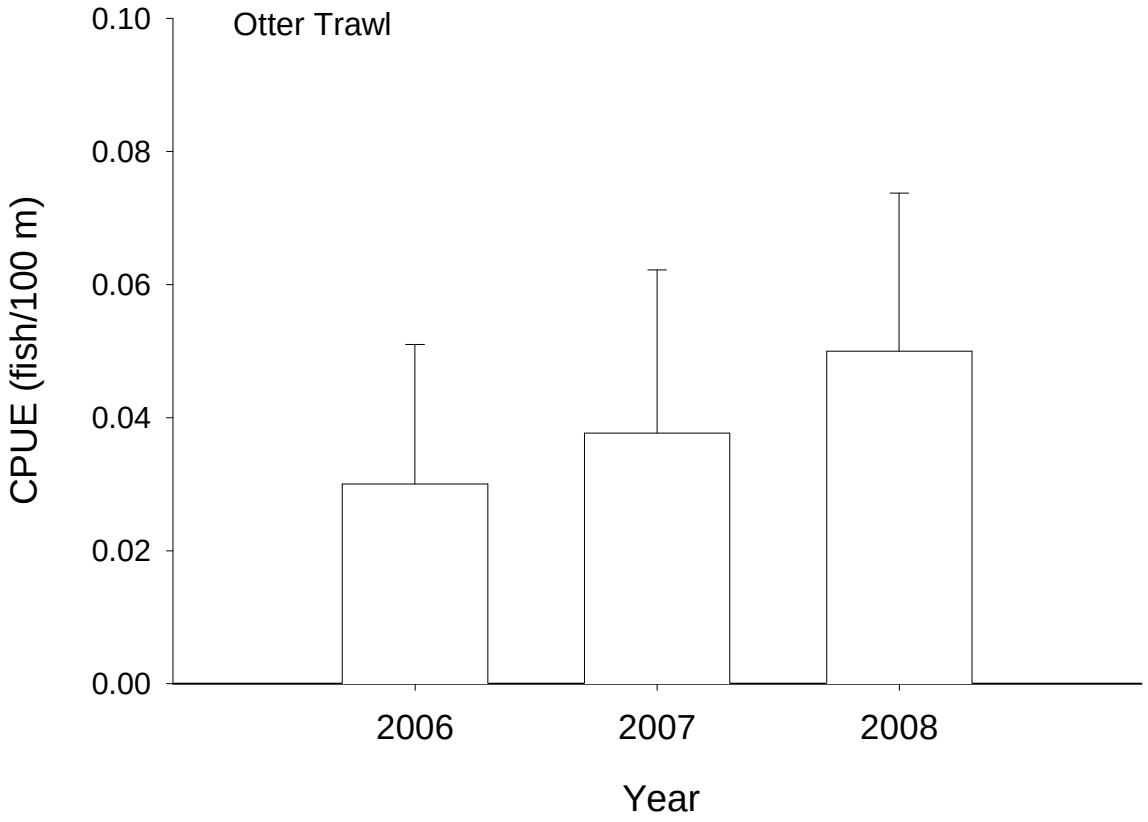

Figure 45. Mean annual catch per unit effort (+/- 2 SE) of sauger using gill nets and otter trawls in segment 3 of the Missouri River during sturgeon season 2006-2008.

Segment 3 - Sauger / Sturgeon Season

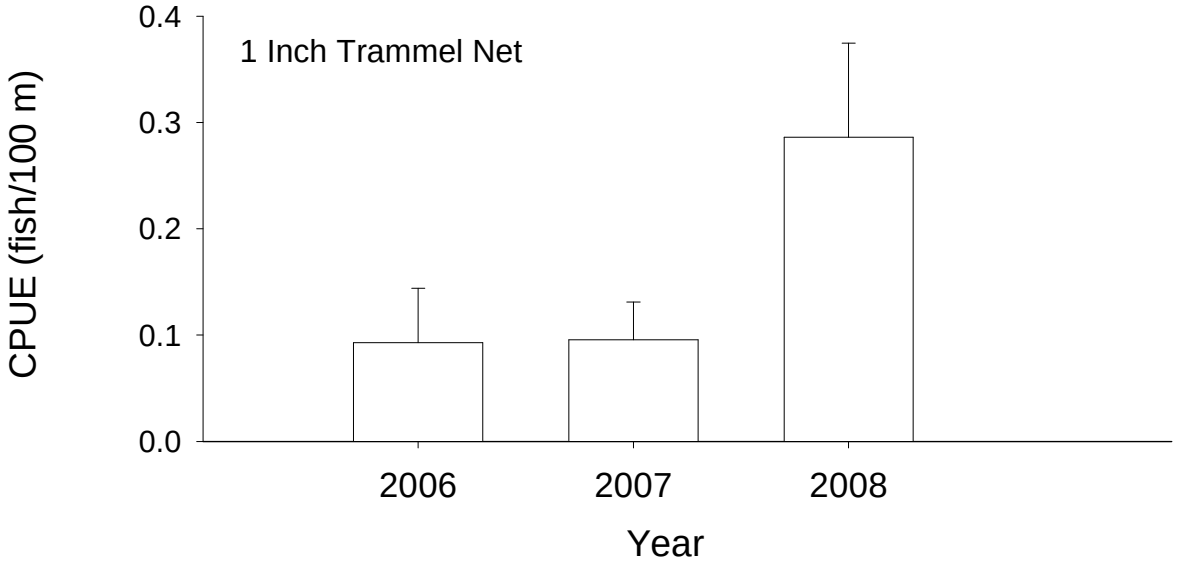

Figure 46. Mean annual catch per unit effort (+/- 2 SE) of sauger using 1 inch trammel nets in segment 3 of the Missouri River during sturgeon season 2006-2008.

Segment 3 - Sauger / Fish Community Season

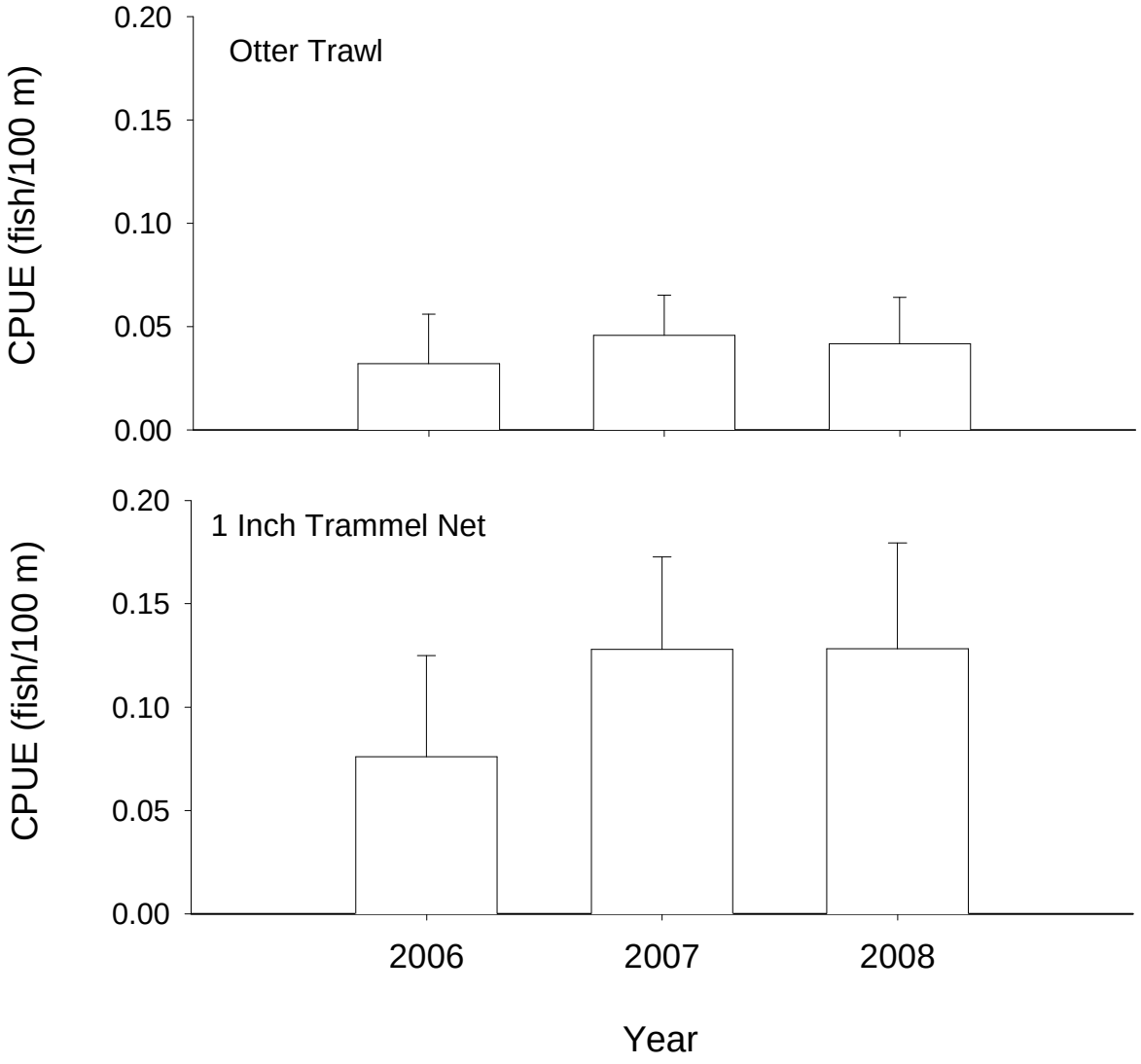

Figure 48. Mean annual catch per unit effort (+/- 2 SE) of sauger using otter trawls and 1 inch trammel nets in segment 3 of the Missouri River during fish community season 2006-2008.

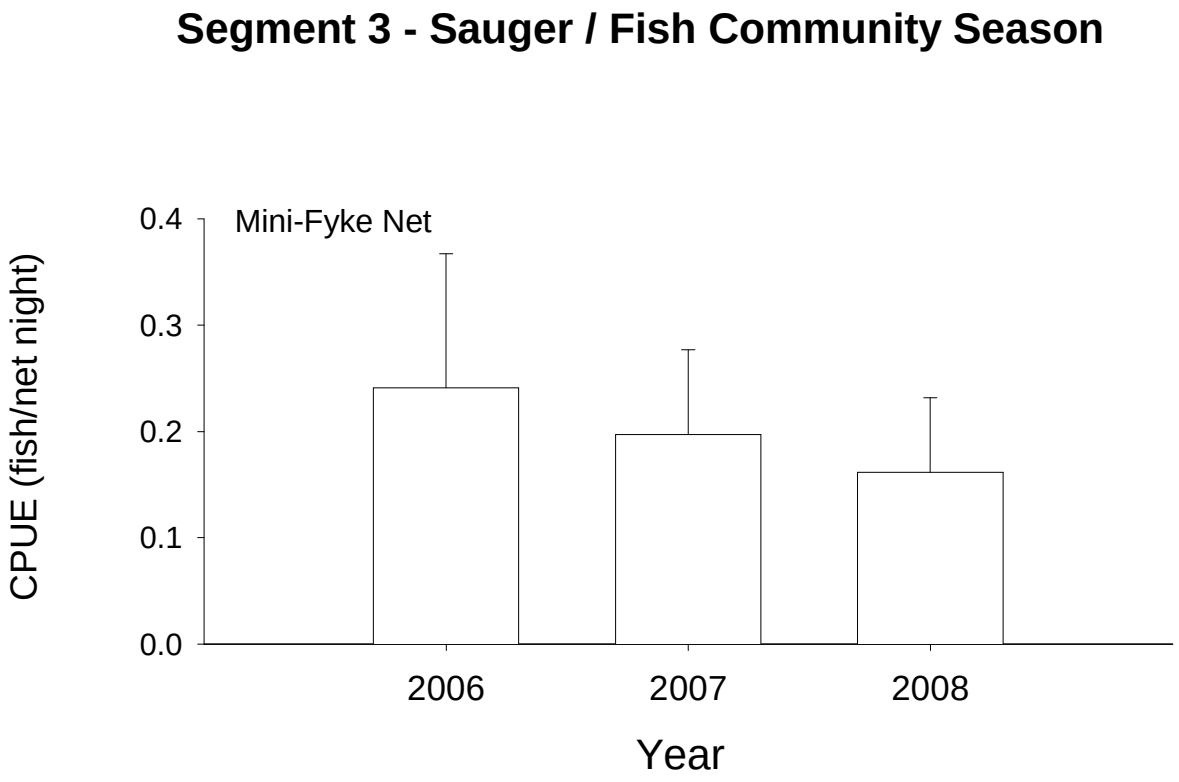

Figure 49. Mean annual catch per unit effort (+/- 2 SE) of sauger using mini-fyke nets in segment 3 of the Missouri River during fish community season 2006-2008.

Table 38. Total number of saugers captured for each gear during each season and the proportion caught within each macrohabitat type in segment 3 of the Missouri River during 2008. 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 (Fall through Spring)															
1 Inch Trammel Net	102	N-E	27	0	N-E	N-E	29	30	13	0	0	0	0	0	N-E
	.	0	(32)	0	0	0	(31)	(29)	(8)	0	0	0	0	0	0
Gill Net		N-E			N-E	N-E									N-E
Otter Trawl	22	N-E	36	0	N-E	N-E	27	23	14	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(27)	(12)	0	0	0	0	0	0
Fish Community Season (Summer)															
1 Inch Trammel Net	50	N-E	34	0	N-E	N-E	26	30	10	0	0	0	0	0	N-E
	.	0	(33)	0	0	0	(33)	(28)	(5)	0	0	0	0	0	0
Mini-Fyke Net	26	N-E	23	0	N-E	N-E	38	0	8	23	8	0	0	0	N-E
	.	0	(25)	0	0	0	(29)	(2)	(15)	(24)	(4)	0	0	0	0
Otter Trawl	20	N-E	10	0	N-E	N-E	45	30	15	0	0	0	0	0	N-E
	.	0	(31)	0	0	0	(30)	(29)	(10)	0	0	0	0	0	0

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

Table 39. Total number of saugers captured for each gear during each season and the proportion caught within each mesohabitat type in segment 3 of the Missouri River during 2008. 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	Mesohabitat[a]					
		BARS	CHNB	DTWT	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)							
1 Inch Trammel Net	102	0	98	N-E	2	0	N-E
	.	0	(99)	0	(1)	0	0
Gill Net				N-E			N-E
Otter Trawl	22	0	100	N-E	0	0	N-E
	.	0	(100)	0	0	0	0
Fish Community Season (Summer)							
1 Inch Trammel Net	50	0	100	N-E	0	0	N-E
	.	0	(100)	0	0	0	0
Mini-Fyke Net	26	100	0	N-E	0	0	N-E
	.	(100)	0	0	0	0	0
Otter Trawl	20	0	100	N-E	0	0	N-E
	.	0	(100)	0	0	0	0

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

Segment 3 - Sauger

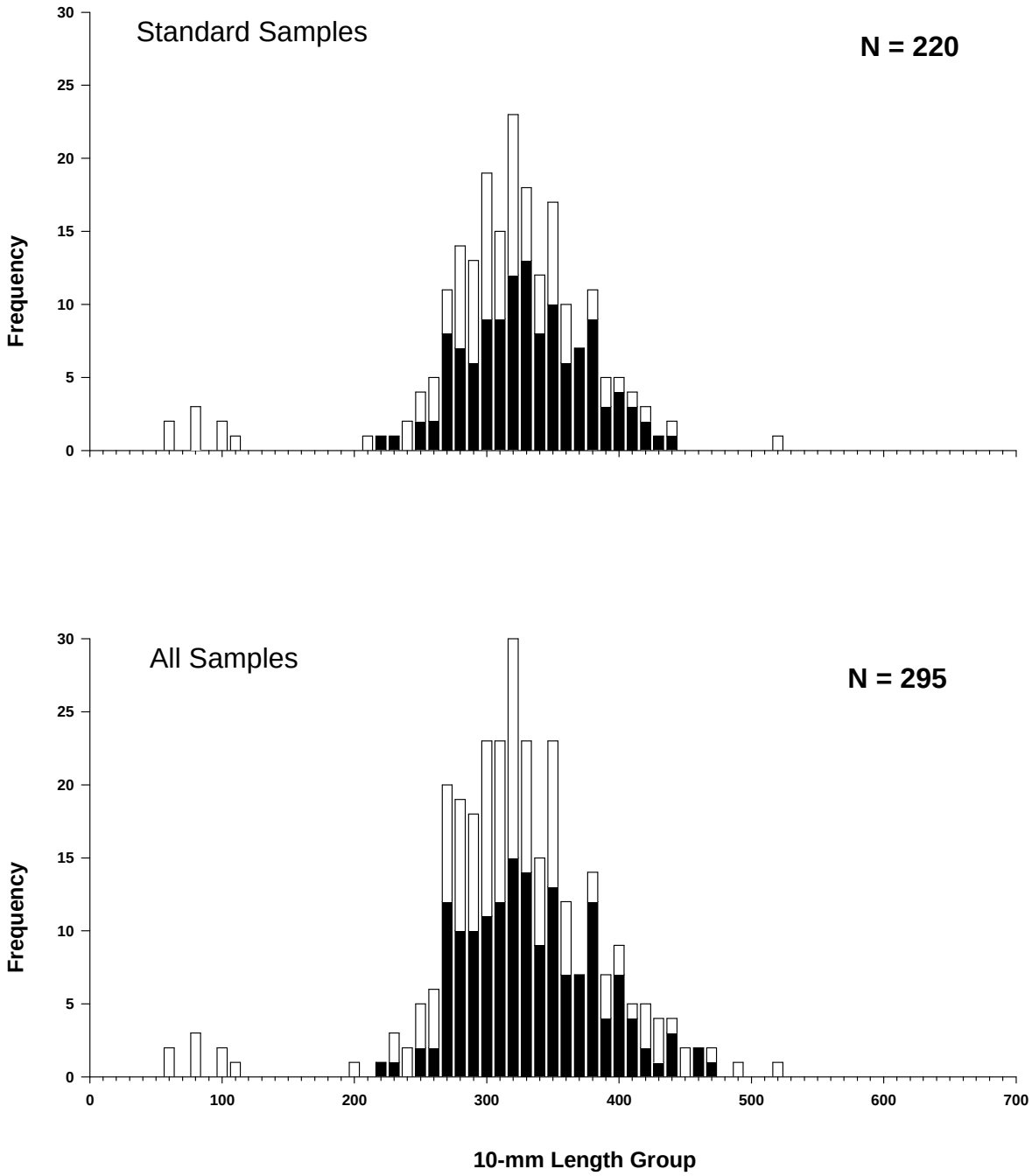

Figure 51. Length frequency of sauger during fall through spring (sturgeon season; black bars) and summer (fish community season; white bars) in segment 3 of the Missouri River during 2008. Standard samples include standard gears, random bends, and random subsamples. All samples include all sampling conducted during 2008.

Missouri River Fish Community

A total of 9,572 fish consisting of 32 species were sampled in segment 3 during 2008. Mini fyke nets sampled the bulk of the fish (72%), while the otter trawl (13%), trammel nets (10%), trotlines (4%) and angling (0.4%) made up the remainder. This was a decrease in the total number of fish captured from 2007 (n = 13,733) and 2006 (n = 17,180). Of the 2008 total, emerald shiners *Notropis atherinoides* were the most abundant species with 2,754 sampled, followed by fathead minnows *Pimephales promelas* (n = 1,227), sand shiner (n = 918), river carpsucker *Carpiodes carpio* (n = 820), sturgeon chub (n = 663), flathead chub *Platygobio gracilis* (n = 450), shovelnose sturgeon (n = 378), western silvery minnow (n = 377), goldeyes (n = 336), sauger (n = 296), common carp *Cyprinus carpio* (n = 274), channel catfish *Ictalurus punctatus* (n = 272), white sucker *Catostomus commersoni* (n = 223), pallid sturgeon (n = 130), stonecat *Noturus flavus* (n = 92), sicklefin chub (n = 85), shorthead redhorse *Moxostoma macrolepidotum* (n = 74) and white crappie *Pomoxis annularis* (n = 55). Other species that were collected but sample size was under 50 in their order of abundance included walleye *Sander vitreum*, longnose sucker *Catostomus catostomus*, burbot *Lota lota*, blue suckers, bigmouth buffalo *Ictiobus cyprinellus*, smallmouth buffalo *I. Bubalus*, northern pike *Esox lucius*, longnose dace *Rhinichthys cataractae*, green sunfish *Lepomis cyanellus*, freshwater drum *Aplodinotus grunniens*, ciscoe *Coregonus artedi*, lake whitefish *C. clupeaformis*, black bullhead *Ameiurus melas* and white bass *Morone americana*.

The abundance of many fishes in segment 3 has fluctuated greatly over the past three years of sampling. Emerald shiners were the most abundant fish captured in 2008 with a mini fyke net CPUE of 17.0 fish/net, while the 2007 CPUE was similar at 15.0 fish/net night the abundance in 2006 was much lower at only 6.9 fish/net night. Conversely, river carpsuckers were at a three year low in 2008 with a mini fyke net CPUE of 4.5 fish/net night. This was a sharp decline from 30.8/net night in 2007 and was still much lower than the 2006 estimate of 17.5/net night. Similarly, the abundance of flathead chubs was at a three year low in 2008 at 1.5/net night, a decrease from the high of 8.8/net night in 2007 and less than half of the 2006 CPUE of 3.3/net night. The abundance of fathead minnows went up in 2008 (7.6/net night) from 2007 (CPUE = 3.1/net night), but was still substantially lower than 2006 (CPUE = 24.0/net night).

Fluctuations in the abundance of shallow water YOY and age-1 fishes may be related to river discharge, which is for the most part dependent on how the U.S. Army Corps of Engineers manages Fort Peck Reservoir and the discharge out of the Milk River, which is managed by the Bureau of Reclamation. The higher abundances of river carpsuckers and flathead chubs in 2007 when compared to both 2008 and 2006 could be due to the relatively higher river discharge during the spring of that year in both rivers. During 2007 the Missouri River at Wolf Point (upstream boundary of segment 3) peaked at over 11,000 cfs twice, once in late May and once in early June and again surpassed 10,000 cfs in the middle of June. For comparison, during 2006 the highest flow recorded was at just over 9,000 cfs in June with no other peak exceeding 8,300 cfs. Similarly, during 2008 the river peaked at just over 9,500 cfs for a very short period in the middle of June, but was kept at or under 8,000 cfs during most of May. Interestingly, during 2006, which was the lowest water year of the three years sampled, some species like fathead minnows and white suckers had their highest relative abundance. Additionally, the Milk River had its highest discharge in 2007 with three peaks over 4,250 cfs in late May through late June, had the highest while 2007 had one peak near only 3,000 cfs in mid-June and the Milk River did not exceed 250 cfs during most of May and all of June during 2006. More years of sampling and a variety of water conditions in both the Missouri and Milk Rivers should help us understand how discharge is influencing the production of many of these species.

Some game fishes that are not considered target species within the population assessment program and were sampled in segment 3 of the Missouri River include channel catfish, burbot, walleye, and northern pike. A total of 272 channel catfish were sampled in segment 3 during 2008, averaging 301.4 mm TL with a maximum of 670 mm and a minimum of 57 mm. Trotlines captured 157 channel catfish, while the otter trawl sampled 77, trammel nets 29 and angling sampled 9. On average, the channel catfish caught by angling were the largest (338.7 mm, followed by trotlines (330.4 mm), trammel nets (318.4 mm) and otter trawl (232.5 mm). Overall channel catfish CPUE has remained relatively constant in the otter trawl from 2006 (CPUE = 0.83 fish/100 m) to 2007 (CPUE = 0.67 fish/100 m) and 2008 (0.74 fish/100 m). The same has been true for trammel nets, where channel catfish CPUE was 0.03 fis/100 m in 2008, 0.05 fish/1oo m in 2007 and 0.03 fish/100 m in 2006. Channel catfish were captured throughout the length of segment 3, but all but two that were less than 100 mm came from at or downstream of river mile 1595. This is a pattern that has been seen in all three years of sampling, where YOY and age-1 channel catfish seem to be rearing in the downstream most portions of segment 3. Due to the large number of channel catfish captured on trotlines in 2008 and the fact that about

half the bend level effort was used with trotlines, trotlines may be the preferred gear of the gears we use for estimating channel catfish relative abundance in the future.

Seventeen burbot were sampled in both 2008 and 2007 and 20 during 2006. All gears except angling captured at least one burbot in 2008. Since so few burbot are captured our data is likely not going to be very beneficial for trend information unless there are drastic changes in the burbot population. Nevertheless, burbot averaged 389.2 mm TL, with a maximum of 549 mm and a minimum of 161 mm. Burbot were sampled in small numbers throughout the length of segment 3.

During 2008 we sampled five northern pike, three in mini fyke nets and two in trammel nets. We only captured one northern pike in 2007 and none in 2006. The largest northern pike measured in 2008 was 810 mm and was captured in a trammel net, while the smallest was 163 mm and was sampled in a mini fyke net. To few northern pike have been sampled to make comments on their abundance, however due to the multitude of gears being deployed, we should be able to detect large changes in their population size if one occurs.

Discussion

Although we haven't seen a general trend of increasing CPUE for pallid sturgeon in our standard gears over the past three years, we have captured more pallid sturgeon in each year sampled. For the most part this has been due to an increase in effort and the addition of trotlines to our sampling regiment. Another possible reason that our CPUE hasn't gone up in the same manner as our total catch is due to pallid sturgeon stocking. For instance, during 2006 82% of pallid sturgeon captured were from the 2005-year class, which were stocked in fall of 2005 and the majority were stocked in the spring and summer of 2006. These fish affect the overall CPUE estimate by biasing it high. Since these fish haven't spent much time in the river and many of them haven't over wintered, they most likely haven't been subjected to some of the forces that may reduce their population size, such as predation and starvation. From a recent pallid sturgeon survival report (Hadley and Rotella 2009) it is known that pallid sturgeon stocked into RPMA 2 have a high mortality rate during their first winter in the system (yearlings 69% to 78%) and their mortality rates gradually get smaller with subsequent years in the wild. In 2007 the proportion of 2006-year class fish captured went down to 43% and again in 2008 went down to just 20%. Therefore, over the three years of sampling a smaller proportion of the total catch has been made up of fish stocked in that sampling year or the previous fall. In other words, more of the fish in 2007 and more again in 2008 that were sampled had spent more time out in the wild, suggesting survival is occurring. But, since so many fish in 2006 were captured that hadn't spent much time in the wild, it may have biased our CPUE high during that year when compared to the 2007 and 2008 estimates. For a better representation of the relative abundance of pallid sturgeon in segment 3 we would recommend eliminating any stocked pallid sturgeon that has not yet spent at least one winter in the wild from the CPUE analysis.

Trotlines baited with earthworms were used in segment 3 during 2008. Each bend was sampled just once with trotlines as opposed to twice with our standard gears. We found that the CPUE of trotlines was approximately 1.3 pallid sturgeon per river bend sampled, only slightly lower than 1.4 pallid sturgeon/river bend with trammel nets, but higher than otter trawls, which captured on average 0.8 pallid sturgeon/river bend. These data suggest that trotlines are an efficient gear in detecting the presence of pallid sturgeon in a river bend. Especially when you take into account that using trammel nets and otter trawls that 37 of the total 100 pallid sturgeon that were captured in our standard gears were sampled in non-random duplicate subsamples. That is, when a pallid sturgeon is captured in the otter trawl or trammel net we duplicate our

subsample until two consecutive passes have been made where no pallid sturgeon are captured or a total of nine subsamples is completed. We do not repeat trotline deployments in areas that pallid sturgeon are captured. Additionally, only truly random subsamples can be used to calculate our CPUE data for trend analysis, so when all non-random subsamples are thrown out trotlines look even stronger in comparison to trammel nets and the otter trawl. We also caught age classes of pallid sturgeon using trotlines that haven't been seen in all three years of sampling with our standard gears. All our gears show differences in the sizes of pallid sturgeon captured, which is important in truly describing the existing population. Therefore, all three gears have their place, but trotlines may be another important component of the population assessment program, especially after another year of evaluation, which is taking place in 2009.

River discharge is likely affecting the fish community of segment 3. We have seen large differences in the abundance of many native fishes within the three years of sampling and all years have been different in their flow regime. More years of data will help us better understand how both the Missouri and Milk Rivers are influencing the production of many native fishes. These data will also be invaluable when temperatures and flows from Fort Peck Dam are manipulated for the mini and full flow tests as outlined in the Biological Opinion.

A common trend is seen in many native fishes and especially for YOY and age-1 fishes in segment 3. The abundance of many native fishes increases as you move downstream away from Fort Peck Dam. Sauger and shovelnose sturgeon juveniles are only found in the lower most portions of segment 3 and key indicator species such as sturgeon chubs and sicklefin chubs are more abundant in the lower sections as well. These patterns are likely due to the influence of Fort Peck Dam on suspended sediment, temperature and habitat formation. Additionally, we've seen a general pattern of many fishes moving further upstream when the Milk River is delivering suspended sediment to the Missouri River making it more turbid than normal. Future efforts to rehabilitate the native fishes of the Missouri River below Fort Peck Dam should take into account not only temperature, but suspended sediment and flows that create and maintain aquatic habitats.

Acknowledgments

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APPENDICES

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

Scientific name	Common name	Letter Code
	CLASS CEPHALASPIDOMORPHI-LAMPREYS	
	ORDER PETROMYZONTIFORMES	
	Petromyzontidae – lampreys	
Ichthyomyzon castaneus	Chestnut lamprey	CNLP
Ichthyomyzon fossor	Northern brook lamprey	NBLP
Ichthyomyzon unicuspis	Silver lamprey	SVLP
Ichthyomyzon gagei	Southern brook lamprey	SBLR
Petromyzontidae	Unidentified lamprey	ULY
Petromyzontidae larvae	Unidentified larval lamprey	LVLP
	CLASS OSTEICHTHYES – BONY FISHES	
	ORDER ACIPENSERIFORMES	
	Ascipenseridae – sturgeons	
Acipenser fulvescens	Lake sturgeon	LKSG
Scaphirhynchus spp.	Unidentified Scaphirhynchus	USG
Scaphirhynchus albus	**Pallid sturgeon**	**PDSG***
Scaphirhynchus platorynchus	**Shovelnose sturgeon**	**SNSG***
S. albus X S. platorynchus	Pallid-shovelnose hybrid	SNPD
	Polyodontidae – paddlefishes	
Polyodon spathula	Paddlefish	PDFH
	ORDER LEPISOSTEIFORMES	
	Lepisosteidae – gars	
Lepisosteus oculatus	Spotted gar	STGR
Lepisosteus osseus	Longnose gar	LNGR
Lepisosteus platostomus	Shortnose gar	SNGR
	ORDER AMMIFORMES	
	Amiidae – bowfins	
Amia calva	Bowfin	BWFN
	ORDER OSTEOGLOSSIFORMES	
	Hiodontidae – mooneyes	
Hiodon alosoides	Goldeye	GDEY
Hiodon tergisus	Mooneye	MNEY
	ORDER ANGUILLIFORMES	
	Anguillidae – freshwater eels	
Anguilla rostrata	American eel	AMEL

Appendix A. (continued).

Scientific name	Common name	Lettter Code
	ORDER CLUPEIFORMES	
	Clupeidae – herrings	
Alosa alabame	Alabama shad	ALSD
Alosa chrysochloris	Skipjack herring	SJHR
Alosa pseudoharengus	Alewife	ALWF
Dorosoma cepedianum	Gizzard shad	GZSD
Dorosoma petenense	Threadfin shad	TFSD
D. cepedianum X D. petenense	Gizzard-threadfin shad hybrid	GSTS
	ORDER CYPRINIFORMES	
	Cyprinidae – carps and minnows	
Campostoma anomalum	Central stoneroller	CLSR
Campostoma oligolepis	Largescale stoneroller	LSSR
Carassus auratus	Goldfish	GDFH
Carassus auratus X Cyprinius carpio	Goldfish-Common carp hybrid	GFCC
Couesis plumbens	Lake chub	LKCB
Ctenopharyngodon idella	Grass carp	GSCP
Cyprinella lutrensis	Red shiner	RDSN
Cyprinella spiloptera	Spotfin shiner	SFSN
Cyprinus carpio	Common carp	CARP
Erimystax x-punctatus	Gravel chub	GVCB
Hybognathus argyritis	**Western slivery minnow**	**WSMN***
Hybognathus hankinsoni	Brassy minnow	BSMN
Hybognathus nuchalis	Mississippi silvery minnow	SVMW
Hybognathus placitus	**Plains minnow**	**PNMW***
***Hybognathus* spp.**	**Unidentified Hybognathus**	**HBNS***
Hypophthalmichthys molitrix	Silver carp	SVCP
Hypophthalmichthys nobilis	Bighead carp	BHCP
Luxilus chrysocephalus	Striped shiner	SPSN
Luxilus cornutus	Common shiner	CMSN
Luxilus zonatus	Bleeding shiner	BDSN
Lythrurus unbratilis	Western redfin shiner	WRFS
Macrhybopsis aestivalis	**Speckled chub**	**SKCB***
Macrhybopsis gelida	**Sturgeon chub**	**SGCB***
Macrhybopsis meeki	**Sicklefin chub**	**SFCB***
Macrhybopsis storeriana	Silver chub	SVCB
M. aestivalis X M. gelida	Speckled-Sturgeon chub hybrid	SPST
M. gelida X M. meeki	Sturgeon-Sicklefin chub hybrid	SCSC
Macrhybopsis spp.	Unidentified chub	UHY
Margariscus margarita	Pearl dace	PLDC
Mylocheilus caurinus	Peamouth	PEMT
Nocomis biguttatus	Hornyhead chub	HHCB
Notemigonus crysoleucas	Golden shiner	GDSN
Notropis atherinoides	Emerald shiner	ERSN
Notropis blennius	River shiner	RVSN
Notropis boops	Bigeye shiner	BESN
Notropis buchanani	Ghost shiner	GTSN
Notropis dorsalis	Bigmouth shiner	BMSN
Notropis greenei	Wedgespot shiner	WSSN

Appendix A. (continued).

Scientific name	Common name	Letter Code
	Cyprinidae – carps and minnows	
Notropis heterolepsis	Blacknose shiner	BNSN
Notropis hudsonius	Spottail shiner	STSN
Notropis nubilus	Ozark minnow	OZMW
Notropis rubellus	Rosyface shiner	RYSN
Notropis shumardi	Silverband shiner	SBSN
Notropis stilbius	Silverstripe shiner	SSPS
Notropis stramineus	**Sand shiner**	**SNSN***
Notropis topeka	Topeka shiner	TPSN
Notropis volucellus	Mimic shiner	MMSN
Notropis wickliffi	Channel shiner	CNSN
Notropis spp.	Unidentified shiner	UNO
Opsopoeodus emiliae	Pugnose minnow	PNMW
Phenacobius mirabilis	Suckermouth minnow	SMMW
Phoxinus eos	Northern redbelly dace	NRBD
Phoxinus erythrogaster	Southern redbelly dace	SRBD
Phoxinus neogaeus	Finescale dace	FSDC
Pimephales notatus	Bluntnose minnow	BNMW
Pimephales promelas	Fathead minnow	FHMW
Pimephales vigilas	Bullhead minnow	BHMW
Platygobio gracilis	Flathead chub	FHCB
P. gracilis X M. meeki	Flathead-sicklefin chub hybrid	FCSC
Rhinichthys atratulus	Blacknose dace	BNDC
Rhinichthys cataractae	Longnose dace	LNDC
Richardsonius balteatus	Redside shiner	RDSS
Scardinius erythrophtalmus	Rudd	RUDD
Semotilus atromaculatus	Creek chub	CKCB
	Unidentified Cyprinidae	UCY
	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 commersoni	White sucker	WTSK
Catostomus platyrhyncus	Mountain sucker	MTSK
Catastomus spp.	Unidentified *Catastomus* spp.	UCA
Cycleptus elongates	**Blue sucker**	**BUSK***
Hypentelium nigricans	Northern hog sucker	NHSK
Ictiobus bubalus	Smallmouth buffalo	SMBF
Ictiobus cyprinellus	Bigmouth buffalo	BMBF
Ictiobus niger	Black buffalo	BKBF
Ictiobus spp.	Unidentified buffalo	UBF
Minytrema melanops	Spotted sucker	SPSK
Moxostoma anisurum	Silver redhorse	SVRH
Moxostoma carinatum	River redhorse	RVRH
Moxostoma duquesnei	Black redhorse	BKRH
Moxostoma erythrurum	Golden redhorse	GDRH
Moxostoma macrolepidotum	Shorthead redhorse	SHRH
Moxostoma spp.	Unidentified redhorse	URH

Appendix A. (continued).

Scientific name	Common name	Letter Code
Catostomidae - suckers	Unidentified Catostomidae	UCT
	ORDER SILURIFORMES	
	Ictaluridae – bullhead catfishes	
Ameiurus melas	Black bullhead	BKBH
Ameiurus natalis	Yellow bullhead	YLBH
Ameiurusnebulosus	Brown bullhead	BRBH
Ameiurus spp.	Unidentified bullhead	UBH
Ictalurus furcatus	Blue catfish	BLCF
Ictalurus punctatus	Channel catfish	CNCF
I. furcatus X I. punctatus	Blue-channel catfish hybrid	BCCC
Ictalurus spp.	Unidentified *Ictalurus* spp.	UCF
Noturus exilis	Slender madtom	SDMT
Noturus flavus	Stonecat	STCT
Noturus gyrinus	Tadpole madtom	TPMT
Noturus nocturnes	Freckled madtom	FKMT
Pylodictis olivaris	Flathead catfish	FHCF
	ORDER SALMONIFORMES	
	Esocidae - pikes	
Esox americanus vermiculatus	Grass pickerel	GSPK
Esox lucius	Northern pike	NTPK
Esox masquinongy	Muskellunge	MSKG
E. lucius X E. masquinongy	Tiger Muskellunge	TGMG
	Umbridae - mudminnows	
Umbra limi	Central mudminnow	MDMN
	Osmeridae - smelts	
Osmerus mordax	Rainbow smelt	RBST
	Salmonidae - trouts	
Coregonus artedi	Lake herring or cisco	CSCO
Coregonus clupeaformis	Lake whitefish	LKWF
Oncorhynchus aguabonita	Golden trout	GDTT
Oncorhynchus clarki	Cutthroat trout	CTTT
Oncorhynchus kisutch	Coho salmon	CHSM
Oncorhynchus mykiss	Rainbow trout	RBTT
Oncorhynchus nerka	Sockeye salmon	SESM
Oncorhynchus tshawytscha	Chinook salmon	CNSM
Prosopium cylindraceum	Bonniville cisco	BVSC
Prosopium williamsoni	Mountain whitefish	MTWF
Salmo trutta	Brown trout	BNTT
Salvelinus fontinalis	Brook trout	BKTT
Salvelinus namaycush	Lake trout	LKTT
Thymallus arcticus	Arctic grayling	AMGL

Appendix A. (continued).

Scientific name	Common name	Letter Code
	ORDER PERCOPSIFORMES	
	Percopsidae – trout-perches	
Percopsis omiscomaycus	Trout-perch	TTPH
	ORDER GADIFORMES	
	Gadidae - cods	
Lota lota	Burbot	BRBT
	ORDER ATHERINIFORMES	
	Cyprinodontidae - killifishes	
Fundulus catenatus	Northern studfish	NTSF
Fundulus daphanus	Banded killifish	BDKF
Fundulus notatus	Blackstripe topminnow	BSTM
Fundulus olivaceus	Blackspotted topminnow	BPTM
Fundulus sciadicus	Plains topminnow	PTMW
Fundulus zebrinus	Plains killifish	PKLF
	Poeciliidae - livebearers	
Gambusia affinis	Western mosquitofish	MQTF
	Atherinidae - silversides	
Labidesthes sicculus	Brook silverside	BKSS
	ORDER GASTEROSTEIFORMES	
	Gasterosteidae - sticklebacks	
Culea inconstans	Brook stickleback	BKSB
	ORDER SCORPAENIFORMES	
	Cottidae - sculpins	
Cottus bairdi	Mottled sculpin	MDSP
Cottus carolinae	Banded sculpin	BDSP
	ORDER PERCIFORMES	
	Percichthyidae – temperate basses	
Morone Americana	White perch	WTPH
Morone chrysops	White bass	WTBS
Morone mississippiensis	Yellow bass	YWBS
Morone saxatilis	Striped bass	SDBS
M. saxatilis X M. chrysops	Striped-white bass hybrid	SBWB
	Centrarchidae - sunfishes	
Ambloplites rupestris	Rock bass	RKBS
Archoplites interruptus	Sacremento perch	SOPH
Lepomis cyanellus	Green sunfish	GNSF
Lepomis gibbosus	Pumpkinseed	PNSD
Lepomis gulosus	Warmouth	WRMH
Lepomis humilis	Orangespotted sunfish	OSSF
Lepomis macrochirus	Bluegill	BLGL
Lepomis magalotis	Longear sunfish	LESF
Lepomis microlophus	Redear sunfish	RESF
L. cyanellus X L. macrochirus	Green sunfish-bluegill hybrid	GSBG

Appendix A. (continued).

Scientific name	Common name	Letter Code
	Centrarchidae - sunfishes	
L. cyanellus X L. humilis	Green-orangespotted sunfish hybrid	GSOS
L. macrochirus X L. microlophus	Bluegill-redear sunfish hybrid	BGRE
Lepomis spp.	Unidentified *Lepomis*	ULP
Micropterus dolomieu	Smallmouth bass	SMBS
Micropterus punctatus	Spotted sunfish	STBS
Micropterus salmoides	Largemouth bass	LMBS
Micropterus spp.	Unidentified *Micropterus* spp.	UMC
Pomoxis annularis	White crappie	WTCP
Pomoxis nigromaculatus	Black crappie	BKCP
Pomoxis spp.	Unidentified crappie	UCP
P. annularis X P. nigromaculatus	White-black crappie hybrid	WCBC
Centrarchidae	Unidentified centrarchid	UCN
	Percidae - perches	
Ammocrypta asprella	Crystal darter	CLDR
Etheostoma blennioides	Greenside darter	GSDR
Etheostoma caeruleum	Rainbow darter	RBDR
Etheostoma exile	Iowa darter	IODR
Etheostoma flabellare	Fantail darter	FTDR
Etheostoma gracile	Slough darter	SLDR
Etheostoma microperca	Least darter	LTDR
Etheostoma nigrum	Johnny darter	JYDR
Etheostoma punctulatum	Stippled darter	STPD
Etheostoma spectabile	Orangethroated darter	OTDR
Etheostoma tetrazonum	Missouri saddled darter	MSDR
Etheostoma zonale	Banded darter	BDDR
Etheostoma spp.	Unidentified Etheostoma spp.	UET
Perca flavescens	Yellow perch	YWPH
Percina caproides	Logperch	LGPH
Percina cymatotaenia	Bluestripe darter	BTDR
Percina evides	Gilt darter	GLDR
Percina maculate	Blackside darter	BSDR
Percina phoxocephala	Slenderhead darter	SHDR
Percina shumardi	River darter	RRDR
Percina spp.	Unidentified Percina spp.	UPN
	Unidentified darter	UDR
Sander canadense	**Sauger**	**SGER***
Sander vitreus	Walleye	WLEY
S. canadense X S. vitreus	Sauger-walley hybrid/Saugeye	SGWE
Sander spp.	Unidentified *Sander* (formerly *Stizostedion*) spp.	UST
	Unidentified Percidae	UPC
	Sciaenidae - drums	
Aplodinotus grunniens	Freshwater drum	FWDM
	NON-TAXONOMIC CATEGORIES	
	Age-0/Young-of-year fish	YOYF
	Lab fish for identification	LAB
	No fish caught	NFSH
	Unidentified larval fish	LVFS
	Unidentified	UNID
	Net Malfunction (Did Not Fish)	NDNF

Appendix B. Definitions and codes used to classify standard Missouri River habitats in the long-term pallid sturgeon and associated fish community sampling program. Three habitat scales were used in the hierarchical habitat classification system: Macrohabitats, Mesohabitats, and Microhabitats.

Habitat	Scale	Definition	Code
Braided channel	Macro	An area of the river that contains multiple smaller channels and is lacking a readily identifiable main channel (typically associated with unchannelized sections)	BRAD
Main channel cross over	Macro	The inflection point of the thalweg where the thalweg crosses from one concave side of the river to the other concave side of the river, (i.e., transition zone from one-bend to the next bend). The upstream CHXO for a respective bend is the one sampled.	CHXO
Tributary confluence	Macro	Area immediately downstream, extending up to one bend in length, from a junction of a large tributary and the main river where this tributary has influence on the physical features of the main river	CONF
Dendric	Macro	An area of the river where the river transitions from meandering or braided channel to more of a treelike pattern with multiple channels (typically associated with unchannelized sections)	DEND
Deranged	Macro	An area of the river where the river transitions from a series of multiple channels into a meandering or braided channel (typically associated with unchannelized sections)	DRNG
Main channel inside bend	Macro	The convex side of a river bend	ISB
Main channel outside bend	Macro	The concave side of a river bend	OSB
Secondary channel-connected large	Macro	A side channel, open on upstream and downstream ends, with less flow than the main channel, large indicates this habitat can be sampled with trammel nets and trawls based on width and/or depths > 1.2 m	SCCL
Secondary channel-connected small	Macro	A side channel, open on upstream and downstream ends, with less flow than the main channel, small indicates this habitat cannot be sampled with trammel nets and trawls based on width and/or on depths < 1.2 m	SCCS
Secondary channel-non-connected	Macro	A side channel that is blocked at one end	SCN
Tributary	Macro	Any river or stream flowing into 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

Appendix B. (continued).

Habitat	Scale	Definition	Code
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
Dam Tailwaters	Meso	Immediate downstream of a dam	DTWT
Thalweg	Meso	Main channel between the channel borders conveying the majority of the flow	TLWG
Island tip	Meso	Area immediately downstream of a bar or island where two channels converge with water depths > 1.2 m	ITIP

Appendix C. List of standard and wild gears (type), their corresponding codes in the database, seasons deployed (Fall-Spring, Summer, or all), years used, and catch per unit effort units for collection of Missouri River fishes in 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 - Present	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 - Present	fish/100 m drift
Trot Line – Circle hooks*	TLC_	Wild	Sturgeon	Not Used	fish/hook night
Trot Line – Octopus hooks*	TLO_	Wild	Sturgeon	2007 - Present	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 - Present	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

*Code ends with line length in feet (1 = 105 ft, 2 = 205 ft, 3 = 305 ft, 4 = 405 ft). Hooks are placed between 5 and 10 feet apart.

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

State(s)	RPMA	Site Name	Code	River	RM
MT	2	Above Intake	AIN	Yellowstone	70 +
MT	2	Intake	INT	Yellowstone	70.0
MT	2	Sidney	SID	Yellowstone	31.0
MT	2	Big Sky Bend	BSB	Yellowstone	17.0
ND	2	Fairview	FRV	Yellowstone	9.0
MT	2	Milk River	MLK	Milk	11.5
MT	2	Mouth of Milk	MOM	Missouri	1761.5
MT	2	Wolf Point	WFP	Missouri	1701.5
MT	2	Poplar	POP	Missouri	1649.5
MT	2	Brockton	BRK	Missouri	1678.0
MT	2	Culbertson	CBS	Missouri	1621.0
MT	2	Nohly Bridge	NOB	Missouri	1590.0
ND	2	Confluence	CON	Missouri	1581.5
SD/NE	3	Sunshine Bottom	SUN	Missouri	866.2
SD/NE	3	Verdel Boat Ramp	VER	Missouri	855.0
SD/NE	3	Standing Bear Bridge	STB	Missouri	845.0
SD/NE	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	Decatur	DCT	Missouri	691.0
NE/IA	4	Boyer Chute	BYC	Missouri	637.4
NE/IA	4	Bellevue	BEL	Missouri	601.4
NE/IA	4	Rulo	RLO	Missouri	497.9
NE/MO/KS	4	Kansas River	KSR	Missouri	367.5
NE	4	Platte River	PLR	Platte	5.0
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)

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
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

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

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
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		
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
2008	Culbertson	643	2007	3/26/2008	Yearling	Elastomer	
2008	Fallon	1307	2007	5/7/2008	Yearling	PIT Tag	Scute
2008	Forsyth	1384	2007	5/7/2008	Yearling	PIT Tag	Scute
2008	Forsyth	106	2007	3/26/2008	Yearling	Elastomer	
2008	Intake	2395	2007	5/7/2008	Yearling	PIT Tag	Scute
2008	Intake	103	2007	3/26/2008	Yearling	Elastomer	
2008	School Trust	1325	2007	5/7/2008	Yearling	PIT Tag	Scute
2008	School Trust	654	2007	3/26/2008	Yearling	Elastomer	
2008	Sidney	149	2007	5/7/2008	Yearling	PIT Tag	Scute
2008	Sidney	67	2007	3/26/2008	Yearling	Elastomer	

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking[a]	Primary Mark	Secondary Mark
2008	Wolf Point	1328	2007	5/7/2008	Yearling	PIT Tag	Scute
2008	Wolf Point	416	2007	3/26/2008	Yearling	Elastomer	
2008	Miles City	4797	2008	7/30/2008	Fry		
2008	Grand Champs	24395	2008	7/30/2008	Fry		
2008	Culbertson	15630	2008	9/24/2008	Fingerling	Elastomer	
2008	Fallon	7930	2008	9/29/2008	Fingerling	Elastomer	
2008	Forsyth	7723	2008	9/29/2008	Fingerling	Elastomer	
2008	Intake	12642	2008	9/29/2008	Fingerling	Elastomer	
2008	Sidney	3186	2008	9/29/2008	Fingerling	Elastomer	
2008	Wolf Point	11717	2008	9/24/2008	Fingerling	Elastomer	

[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 2007-2008. 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 Inch Trammel Net: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors in brackets.

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
BESN	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
BHCP	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
BHMW	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
BKCP	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
BKBH	1	0.001 [0.003]	0 [0]				0.004 [0.009]		0 [0]		0 [0]	0 [0]		
BLCF	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
BLGL	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
BMBF	3	0.004 [0.005]	0.003 [0.006]				0 [0]		0.011 [0.015]		0 [0]	0 [0]		
BNMW	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
BRBT	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
BUSK*	**10**	**0.014 [0.012]**	**0.007 [0.01]**				**0.013 [0.017]**		**0.02 [0.033]**		**0.019 [0.038]**	**0 [0]**		
CARP	4	0.006 [0.006]	0.003 [0.007]				0.004 [0.008]		0.011 [0.016]		0 [0]	0 [0]		
CLSR	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
CNCF	21	0.026 [0.016]	0.006 [0.009]				0.035 [0.026]		0.038 [0.042]		0.018 [0.037]	0 [0]		
CNLP	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
CSCO	1	0.001 [0.002]	0 [0]				0.003 [0.006]		0 [0]		0 [0]	0 [0]		
ERSN	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
FHCB	12	0.021 [0.013]	0.021 [0.026]				0.017 [0.017]		0.028 [0.032]		0 [0]	0 [0]		
FHCF	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
FHMW	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
FWDM	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
GDEY	208	0.247 [0.055]	0.15 [0.067]				0.341 [0.098]		0.223 [0.121]		0.38 [0.262]	0 [0]		
GDRH	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
GNSF	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
GSCP	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
GZSD	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
HBNS*	**0**	**0** **[0]**	**0** **[0]**				**0** **[0]**		**0** **[0]**		**0** **[0]**	**0** **[0]**		
HFCS	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
LGPH	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
LKCB	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
LKWF	1	0.001 [0.002]	0 [0]				0 [0]		0.003 [0.006]		0 [0]	0 [0]		
LMBS	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
LNDC	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
LNGR	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
LNSK	4	0.004 [0.004]	0.006 [0.009]				0 [0]		0.007 [0.009]		0 [0]	0 [0]		
MMSN	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
MNEY	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
MQTF	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
NFSH	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
NTPK	2	0.003 [0.004]	0 [0]				0.004 [0.008]		0 [0]		0.023 [0.045]	0 [0]		
PATT	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
PDFH	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
PDSG*	**34**	**0.039 [0.016]**	**0.042 [0.028]**				**0.039 [0.026]**		**0.02 [0.02]**		**0.111 [0.125]**	**0 [0]**		
RBTT	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
RVCS	64	0.079 [0.036]	0.081 [0.074]				0.054 [0.029]		0.095 [0.082]		0.09 [0.125]	0.463 [0.926]		
SFCB*	**0**	**0 [0]**	**0 [0]**				**0 [0]**		**0 [0]**		**0 [0]**	**0 [0]**		
SGCB*	**0**	**0 [0]**	**0 [0]**				**0 [0]**		**0 [0]**		**0 [0]**	**0 [0]**		
SGER*	**152**	**0.207 [0.052]**	**0.179 [0.088]**				**0.195 [0.082]**		**0.207 [0.101]**		**0.346 [0.241]**	**0.926 [1.852]**		
SHRH	14	0.018 [0.011]	0.009 [0.011]				0.036 [0.028]		0.003 [0.007]		0.039 [0.054]	0 [0]		
SMBF	7	0.009 [0.009]	0.003 [0.007]				0.007 [0.009]		0.018 [0.027]		0 [0]	0 [0]		
SNSG*	**135**	**0.173 [0.054]**	**0.116 [0.06]**				**0.158 [0.067]**		**0.134 [0.073]**		**0.733 [0.611]**	**0 [0]**		
SNSN*	**0**	**0 [0]**	**0 [0]**				**0 [0]**		**0 [0]**		**0 [0]**	**0 [0]**		
STCT	1	0.001 [0.002]	0 [0]				0.003 [0.006]		0 [0]		0 [0]	0 [0]		
UST	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
UCA	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
UCY	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
UNID	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
WLYE	7	0.009 [0.007]	0.011 [0.012]				0.006 [0.009]		0.012 [0.016]		0 [0]	0 [0]		
WSMW*	**0**	**0 [0]**	**0 [0]**				**0 [0]**		**0 [0]**		**0 [0]**	**0 [0]**		

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
WTCP	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
WTSK	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
YWPH	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		

Appendix F4. Otter Trawl: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors in brackets.

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
BESN	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
BHCP	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
BHMW	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
BKCP	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
BKBH	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
BLCF	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
BLGL	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
BMBF	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
BNMW	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
BRBT	6	0.006 [0.005]	0.006 [0.009]				0.003 [0.006]		0.003 [0.007]		0.018 [0.026]	0		
BUSK*	**1**	**0.001 [0.002]**	**0 [0]**				**0.003 [0.006]**		**0 [0]**		**0 [0]**	**0**		
CARP	2	0.002 [0.003]	0 [0]				0.004 [0.008]		0.004 [0.008]		0 [0]	0		
CLSR	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
CNCF	69	0.074 [0.023]	0.081 [0.038]				0.06 [0.037]		0.088 [0.053]		0.058 [0.061]	0		
CNLP	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
CSCO	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
ERSN	15	0.016 [0.014]	0.009 [0.011]				0.038 [0.044]		0.003 [0.007]		0.009 [0.018]	0		
FHCB	144	0.149 [0.04]	0.131 [0.056]				0.189 [0.074]		0.081 [0.045]		0.268 [0.228]	0		
FHCF	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0 [0]		
FHMW	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
FWDM	1	0.001 [0.002]	0 [0]				0 [0]		0.004 [0.008]		0 [0]	0		
GDEY	11	0.011 [0.008]	0.003 [0.006]				0.017 [0.017]		0.003 [0.007]		0.035 [0.042]	0		
GDRH	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
GNSF	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
GSCP	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
GZSD	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
HBNS*	**0**	**0 [0]**	**0 [0]**				**0 [0]**		**0 [0]**		**0 [0]**	**0**		
HFCS	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
LGPH	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
LKCB	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
LKWF	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
LMBS	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
LNDC	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
LNGR	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
LNSK	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
MMSN	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
MNEY	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
MQTF	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
NFSH	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
NTPK	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
PATT	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
PDFH	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
PDSG*	**29**	**0.03** **[0.012]**	**0.05** **[0.028]**				**0.038** **[0.024]**		**0.008** **[0.011]**		**0.009** **[0.018]**	**0**		
RBTT	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
RVCS	13	0.013 [0.009]	0.006 [0.009]				0.021 [0.022]		0.007 [0.009]		0.008 [0.017]	0.909		
SFCB	**76**	**0.075** **[0.025]**	**0.102** **[0.062]**				**0.076** **[0.041]**		**0.065** **[0.037]**		**0.025** **[0.037]**	**0**		
SGCB	**528**	**0.542** **[0105]**	**0.597** **[0.214]**				**0.674** **[0.226]**		**0.401** **[0.137]**		**0.42** **[0.236]**	**0**		
SGER	**42**	**0.046** **[0.016]**	**0.034** **[0.021]**				**0.055** **[0.032]**		**0.047** **[0.036]**		**0.053** **[0.047]**	**0**		
SHRH	11	0.011 [0.007]	0.008 [0.011]				0.01 [0.012]		0.01 [0.011]		0.025 [0.036]	0		
SMBF	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
SNSG	**43**	**0.043** **[0.016]**	**0.045** **[0.024]**				**0.047** **[0.026]**		**0.032** **[0.026]**		**0.058** **[0.089]**	**0**		
SNSN	**2**	**0.002** **[0.003]**	**0.003** **[0.006]**				**0.003** **[0.006]**		**0** **[0]**		**0** **[0]**	**0**		
STCT	43	0.052 [0.039]	0.019 [0.017]				0.018 [0.018]		0.133 [0.13]		0.028 [0.033]	0		
UST	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
UCA	1	0.001 [0.002]	0 [0]				0.003 [0.006]		0 [0]		0 [0]	0		
UCY	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
UNID	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
WLYE	9	0.009 [0.007]	0.006 [0.009]				0.014 [0.018]		0.007 [0.01]		0.008 [0.017]	0		
WSMW	**4**	**0.004** **[0.004]**	**0** **[0]**				**0.007** **[0.009]**		**0.004** **[0.008]**		**0.008** **[0.017]**	**0**		

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
WTCP	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		
WTSK	1	0.001 [0.002]	0.003 [0.006]				0 [0]		0 [0]		0 [0]	0		
YWPH	0	0 [0]	0 [0]				0 [0]		0 [0]		0 [0]	0		

Appendix F6. Mini-fyke Net: overall season and segment summary. Lists CPUE (fish/net night) and 2 standard errors in brackets.

species	Total Catch	Overall CPUE	CHXO BARS	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	SCN BARS
BKBH	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
BMBF	8	0.05	0.049	0.064	0	0	0.077	0
	.	0.058	0.098	0.128	0	0	0.154	0
BRBT	5	0.031	0.024	0.064	0	0	0.026	0
	.	0.027	0.049	0.072	0	0	0.051	0
BUSK	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
CARP	248	1.54	1.268	0.426	0.75	0.375	4.103	0.667
	.	0.655	0.835	0.27	1.5	0.336	2.358	0.422
CNCF	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
CSCO	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
ERSN	2736	16.994	7.732	5.723	0.75	5.083	4.744	306.667
	.	20.76	6.408	2.509	1.5	2.356	4.106	544.665
FHCB	241	1.497	1.439	1.064	2.5	2.875	1.154	1.333
	.	0.483	0.759	0.521	2.887	2.538	0.552	1.978
FHMW	1227	7.621	1.195	1.362	1	41.292	1.692	8.833
	.	8.601	0.678	0.837	1.414	56.6	1.668	7.684
FWDM	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
GDEY	10	0.062	0.049	0	0	0.042	0.077	0.667
	.	0.052	0.068	0	0	0.083	0.113	0.989
GNSF	2	0.012	0	0	0	0	0.026	0.167
	.	0.018	0	0	0	0	0.051	0.333
HBNS	1	0.006	0.024	0	0	0	0	0
	.	0.012	0.049	0	0	0	0	0
LKWF	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
LNDC	2	0.012	0	0.021	0	0.042	0	0
	.	0.018	0	0.043	0	0.083	0	0
LNSK	16	0.099	0.049	0.064	0	0.208	0.128	0.167
	.	0.059	0.098	0.072	0	0.24	0.131	0.333
NFSH	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
NTPK	3	0.019	0.024	0.021	0	0.042	0	0
	.	0.021	0.049	0.043	0	0.083	0	0
PATT	1	0.006	0.024	0	0	0	0	0
	.	0.012	0.049	0	0	0	0	0
PDSG	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
RVCS	721	4.478	1.439	3.957	2.5	6.5	3.769	27.167
	.	1.822	0.838	2.881	5	7.227	2.165	23.004
SFCB	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0

species	Total Catch	Overall CPUE	CHXO BARS	ISB BARS	OSB BARS	SCCL BARS	SCCS BARS	SCN BARS
SGCB	1	0.006	0.024	0	0	0	0	0
	.	0.012	0.049	0	0	0	0	0
SGER	26	0.161	0.146	0.213	0	0.083	0.154	0.333
	.	0.07	0.112	0.171	0	0.115	0.117	0.667
SHRH	14	0.087	0.049	0.021	0	0.208	0.051	0.667
	.	0.062	0.068	0.043	0	0.169	0.072	1.333
SMBF	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
SNSG	0	0	0	0	0	0	0	0
	.	0	0	0	0	0	0	0
SNSN	916	5.689	1.902	2.298	7.75	25.583	1.795	2.5
	.	4.993	1.46	1.707	10.145	32.514	1.132	3.642
STCT	10	0.062	0.073	0.085	0	0.042	0.051	0
	.	0.042	0.108	0.082	0	0.083	0.072	0
UCA	21	0.13	0.122	0.106	0	0	0.282	0
	.	0.109	0.2	0.125	0	0	0.367	0
UCY	1	0.006	0	0.021	0	0	0	0
	.	0.012	0	0.043	0	0	0	0
UNID	3	0.019	0	0.064	0	0	0	0
	.	0.028	0	0.094	0	0	0	0
UST	4	0.025	0	0	0	0	0.103	0
	.	0.03	0	0	0	0	0.123	0
WLYE	5	0.031	0.024	0.043	0	0	0.051	0
	.	0.027	0.049	0.06	0	0	0.072	0
WSMW	371	2.304	0.854	0.851	0	1.292	0.41	41.5
	.	2.812	0.748	0.784	0	1.271	0.491	73.455
WTCP	54	0.335	0.171	0.043	0	0.167	0.308	4.833
	.	0.335	0.183	0.085	0	0.333	0.234	8.492
WTSK	220	1.366	0.268	0.021	0.5	1	4.077	3.833
	.	1.788	0.21	0.043	1	0.843	7.319	4.455

Appendix G. Hatchery names, locations, and abbreviations.

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

Appendix H. Alphabetic list of Missouri River fishes with total catch per unit effort by gear type for sturgeon season (fall through spring) and fish community season (summer) during 2007-2008 for segment 3 of the Missouri River. Species codes are located in Appendix A. Asterisks and bold type denote targeted native Missouri River species.

Species Code	**Sturgeon Season (Fall through Spring)**			**Fish Community Season (Summer)**			
	Gill Net	Otter Trawl	1 Inch Trammel Net	Otter Trawl	Push Trawl	1 Inch Trammel Net	Mini-Fyke Net
ALSD							
ALWF							
AMEL							
AMGL							
BCCC							
BDDR							
BDKF							
BDSN							
BDSP							
BESN							
BHCP							
BHMW							
BKBF							
BKBH		0.000	0.003	0.000		0.000	0.000
BKCP							
BKRH							
BKSB							
BKSS							
BKTT							
BLCF							
BLGL							
BMBF		0.000	0.006	0.000		0.002	0.050
BMSN							
BNDC							
BNMW							
BNSN							
BNTT							
BPTM							
BRBT		0.006	0.000	0.006		0.000	0.031

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)			Fish Community Season (Summer)			
	Gill Net	Otter Trawl	1 Inch Trammel Net	Otter Trawl	Push Trawl	1 Inch Trammel Net	Mini-Fyke Net
BSDR							
BSMN							
BSTM							
BTDR							
BUSK*		**0.000**	**0.011**	**0.002**		**0.016**	**0.000**
BVSC							
BWFN							
CARP		0.005	0.004	0.000		0.007	1.540
CHSM							
CKCB							
CLDR							
CLSR							
CMSN							
CNCF		0.061	0.035	0.087		0.017	0.000
CNLP							
CNSM							
CNSN							
CSCO		0.000	0.002	0.000		0.000	0.000
CTTT							
ERSN		0.024	0.000	0.008		0.000	16.994
FCSC							
FHCB		0.144	0.015	0.154		0.026	1.497
FHCF							
FHMW		0.000	0.000	0.000		0.000	7.621
FKMT							
FSDC							
FTDR							
FWDM		0.000	0.000	0.002		0.000	0.000
GDEY		0.018	0.226	0.004		0.269	0.062
GDFH							

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)			Fish Community Season (Summer)			
	Gill Net	Otter Trawl	1 Inch Trammel Net	Otter Trawl	Push Trawl	1 Inch Trammel Net	Mini-Fyke Net
GDTT							
GFCC							
GLDR							
GDRH							
GDSN							
GN*?							
GNSF		0.000	0.000	0.000		0.000	0.012
GSBG							
GSCP							
GSDR							
GSOS							
GSPK							
GSTS							
GTSN							
GVCB							
GZSD							
HBNS*		**0.000**	**0.000**	**0.000**		**0.000**	**0.006**
HFCS							
HHCB							
IODR							
JYDR							
LESF							
LGPH							
LKCB							
LKSG							
LKTT							
LKWF		0.000	0.000	0.000		0.002	0.000
LMBS							
LNDC		0.000	0.000	0.000		0.000	0.012
LNGR							

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)			Fish Community Season (Summer)			
	Gill Net	Otter Trawl	1 Inch Trammel Net	Otter Trawl	Push Trawl	1 Inch Trammel Net	Mini-Fyke Net
LNSK		0.000	0.006	0.000		0.002	0.099
LSSR							
LTDR							
LVLP							
MDSP							
MMSN							
MNEY							
MQTF							
MSDR							
MSKG							
MTSK							
MTWF							
NBLP							
NFSH		0.000	0.000	0.000		0.000	0.000
NHSK							
NRBD							
NTPK		0.000	0.000	0.000		0.005	0.019
NTSF							
OSSF							
OTDR							
OZMW							
PATT		0.00	0.00	0.000		0.000	0.006
PDFH							
PDSG*		**0.032**	**0.029**	**0.027**		**0.049**	**0.000**
PEMT							
PKLF							
PLDC							
PNMW*							
PNSD							
PTMW							
QLBK							

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)			Fish Community Season (Summer)			
	Gill Net	Otter Trawl	1 Inch Trammel Net	Otter Trawl	Push Trawl	1 Inch Trammel Net	Mini-Fyke Net
RBDR							
RBST							
RBTT							
RDSN							
RDSS							
RKBS							
RRDR							
RUDD							
RVCS		0.014	0.105	0.012		0.053	4.478
RVRH							
RVSN							
RYSN							
SBLR							
SBSN							
SBWB							
SCSC							
SDBS							
SDMT							
SESM							
SFCB*		**0.116**	**0.000**	**0.033**		**0.000**	**0.000**
SFSN							
SGCB*		**0.849**	**0.000**	**0.229**		**0.000**	**0.006**
SGER*		**0.050**	**0.286**	**0.042**		**0.128**	**0.161**
SGWE							
SHDR							
SHRH		0.008	0.007	0.014		0.029	0.087
SJHR							
SKCB*							
SLDR							
SMBF		0.000	0.008	0.000		0.009	0.000

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)			Fish Community Season (Summer)			
	Gill Net	Otter Trawl	1 Inch Trammel Net	Otter Trawl	Push Trawl	1 Inch Trammel Net	Mini-Fyke Net
SMBS							
SMMW							
SNGR							
SNPD							
SNSG*		**0.046**	**0.121**	**0.041**		**0.225**	**0.000**
SNSN*		**0.002**	**0.000**	**0.002**		**0.000**	**5.689**
SPSK							
SPSN							
SPST							
SRBD							
SSPS							
STBS							
STCT		0.100	0.000	0.004		0.002	0.062
STGR							
STPD							
STSN							
SVCB							
SVCP							
SVLP							
SVMW							
SVRH							
TFSD							
TPMT							
TPSN							
TTPH							
UAC							
UBF							
UCA		0.000	0.000	0.002		0.000	0.130
UCF							
UCN							
UCS							

Appendix H. (continued).

Species Code	Sturgeon Season (Fall through Spring)			Fish Community Season (Summer)			
	Gill Net	Otter Trawl	1 Inch Trammel Net	Otter Trawl	Push Trawl	1 Inch Trammel Net	Mini-Fyke Net
UCT							
UCY		0.000	0.000	0.000		0.000	0.006
UDR							
UET							
UHY							
ULP							
ULY							
UNID		0.000	0.000	0.000		0.000	0.019
UNO							
UPC							
UPN							
URH							
USG							
UST		0.000	0.000	0.000		0.000	0.025
WLYE		0.004	0.010	0.014		0.007	0.031
WRFS							
WRMH							
WSMW*		**0.008**	**0.000**	**0.000**		**0.000**	**2.304**
WSSN							
WTBS							
WTCP		0.000	0.000	0.000		0.000	0.335
WTPH							
WTSK		0.002	0.000	0.000		0.000	1.366
YLBH							
YWBS							
YWPH							

Appendix I. Comprehensive list of bend numbers and locations for segment 3 of the Missouri River comparing bend selection for both sturgeon season (ST) and fish community season (FC) between years from 2006-2008.

Bend Number	Bend River Mile	Coordinates* Latitude	Longitude	2006	2007	2008
1	1701.5					
2	1700					
3	1698.5					
4	1697.5					
5	1696					
6	1695	48.0895	105.4386		ST, FC	
7	1693.5					
8	1692	48.0913	105.3734		ST, FC	ST, FC
9	1690.5					
10	1689	48.0824	105.324		ST, FC	
11	1687.5					
12	1685.5	48.0887	105.25348			ST, FC
13	1684.5	48.0912	105.2475		ST, FC	
14	1683	48.0852	105.2247	ST, FC		
15	1681.5					
16	1680	48.0664	105.1997	ST, FC		
17	1678.5	48.0902	105.1836		ST, FC	
18	1677	48.1027	105.1735		ST, FC	
19	1675.5	48.0932	105.17146			ST, FC
20	1674	48.0769	105.16399			ST, FC
21	1672.5					
22	1671					
23	1670					
24	1668.5					
25	1667					
26	1666	48.0656	105.05026			ST, FC
27	1665					
28	1664					
29	1663					
30	1661.5					
31	1660					
32	1659	48.0687	104.9993	ST, FC		
33	1657	48.0953	104.9813	ST, FC		

34	1656					
35	1655	48.10060	104.96497			ST, FC
36	1654					
37	1653	48.0952	104.9395		ST, FC	ST, FC
38	1651	48.1281	104.9239		ST, FC	ST, FC
39	1650					
40	1648.5	48.1488	104.8982		ST, FC	
41	1647					
42	1646					
43	1644.5					
44	1643					
45	1641.5					
46	1640.5					
47	1639.5	48.113	104.735		ST, FC	ST, FC
48	1638.5	48.1191	104.7156		ST, FC	ST, FC
49	1637.5					
50	1636.5	48.104	104.6821	ST, FC		
51	1635.5					
52	1634.5	48.1072	104.6587		ST, FC	
53	1633.5	48.11188	104.63362			ST, FC
54	1632.5					
55	1631.5					
56	1630.5	48.1398	104.6045	ST, FC		
57	1629.5	48.14028	104.60405			ST, FC
58	1628.5					
59	1627					
60	1625.5	48.1182	104.5667		ST, FC	
61	1624					
62	1623	48.1116	104.5103	ST, FC		
63	1622					
64	1620.5	48.1233	104.4721		ST, FC	ST, FC
65	1619.5					
66	1618.5					
67	1617.5	48.0966	104.4437		ST, FC	ST, FC
68	1616.5	48.0813	104.4154	ST, FC		
69	1615	48.0764	104.3929		ST, FC	
70	1613.5	48.07458	104.37111			ST, FC

71	1612					
72	1611	48.04614	104.32671			ST, FC
73	1610					
74	1608.5	48.0483	104.2829		ST, FC	ST, FC
75	1606.5	48.035	104.2509	ST, FC		ST, FC
76	1604.5	48.0357	104.2071	ST, FC		
77	1603	48.04455	104.19884			ST, FC
78	1598.5	48.046	104.1837	ST, FC		ST, FC
79	1597.5	48.03620	104.17513			ST, FC
80	1596					
81	1595	48.0532	104.1413		ST, FC	ST, FC
82	1594	48.0378	104.1241		ST, FC	
83	1593	48.0296	104.1027		FC	ST, FC
84	1592					
85	1591	48.02101	104.09789			ST, FC
86	1590.5	48.0202	104.1002		ST, FC	
87	1589.5	48.0052	104.1017		ST, FC	
88	1588.5					
89	1587					
90	1585.5					
91	1583.5					

* Coordinates represent the upper most point of the bend (i.e., the top of the bend going upstream).