Sturgeon Management in the Platte River, Nebraska

Annual Performance Report

Project No. F-180-R

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Study Objective

Gain an understanding of shovelnose sturgeon populations in the Platte River System for proper sportfish management. The specific objective of this project is to establish shovelnose sturgeon abundance, distribution, and population dynamics data for the Platte River. This objective will include an estimate of population size using new and existing data for future long-term population trend information, modeling the effects of angler harvest from angler creel survey based harvest data and population dynamics data (e.g., survival, recruitment, growth, etc.), and investigate techniques for effectively catching larval and young-of-year sturgeon in the Platte River. This study will also use Platte River data collected during subsequent years, concurrent studies (e.g., Platte River Implementation Recovery projects), and data from previous studies (e.g., Peters and Parham 2008) to build habitat availability and use patterns for identification and management of future habitat needs. Finally, this study will begin to evaluate the inter-dependence of Platte River and Missouri River sturgeon populations in collaboration with concurrent work on the Missouri River through mark-recapture and genetics efforts.

Introduction

Sturgeon populations around the world have experienced significant declines over the past 100 years. These declines are believed to be largely the result of anthropogenic activities. Sturgeon have a conservative life-history in that they typically do not spawn until they are many years old, do not spawn annually when sexually mature, and live to reach relatively old ages (Secor et al. 2002). These traits, while well adapted for species persistence over a geologic timeframe because they are not as dependent on successful annual recruitment, can make sturgeon susceptible to factors that influence population dynamics over a shorter time frame (i.e., decadal scale). Most of these shorter temporal effects have been a direct result of overharvest and habitat loss that have reduced numbers of viable adults or precluded access to spawning habitats for most sturgeon species (Van Winkle 2002).

Harvest of sturgeon for meat and caviar by recreational and commercial angling has been a primary concern for fisheries managers and has recently led to the near demise of several sturgeon species. For example, harvest of beluga sturgeon (*Huso huso*), Russian sturgeon (*Acipenser gueldenstaedti*) and stellate sturgeon (*A. stellatus*) in the Caspean Sea was officially closed in 2001 due to overharvest issues (Secor et al. 2002). Closing these and other fisheries have not reduced the demand for sturgeon products, especially caviar, making other species and populations susceptible to overharvest.

Shovelnose sturgeon (*Scaphirhynchus platorynchus*) populations are no exception to the loss of habitat and continued exposure to harvest pressure concerns. Shovelnose sturgeon is the most widely distributed sturgeon species in North America, historically found in most of the Mississippi River Basin. The present distribution of shovelnose sturgeon is truncated however, due to lack of connectivity from dams or other flow control structures that block movements to keep some areas populated (summarized in Keenlyne 1997). The present status of this species is largely unknown or reported as declining in much of the 24 states that have extant shovelnose sturgeon populations (Keenlyne 1997). Shovelnose sturgeon populations in the Missouri River and its tributaries are also experiencing

population declines. For example, gill net catch data from Missouri River monitoring efforts in Nebraska suggest a decline in relative abundances of shovelnose sturgeon since 2003 below the Platte River, Nebraska confluence (Steffensen and Hamel 2007).

Shovelnose sturgeon populations also face considerable fishing pressure from angling. Much of the recent concern has centered on commercial fishing harvest throughout their distribution. Commercial fishing is a concern because it is allowed in seven states and potential overharvest could have resounding effects on sturgeon populations beyond the commercial harvest areas (Quist et al. 2002). However, recreational fishing is also allowed in 12 states (Keenlyne 1997) and may have an effect on shovelnose sturgeon populations if already in decline. Shovelnose sturgeons are recreationally caught along the Platte River, Nebraska and areas having concentrated sturgeon angling had a nearly 50% harvest rate for shovelnose sturgeon that were caught (Peters and Parham 2007). However, little is known about the localized and regional influences angler harvest has on sturgeon populations and population dynamics. The increasing demand for caviar may have an indirect influence on these declines so it is important to understand current population dynamics to develop sound management practices.

Shovelnose sturgeon responses to recreational fishing harvest is not well understood, in part, because having accurate information on population size, age distribution, and other important factors that influence populations dynamics are not known. This situation is especially true in systems like the Platte River where angling activities may compound anthropogenic stressors already established in the system. The Platte River sturgeon populations are also believed to be integrally connected to those in the Missouri River, but little empirical information exists to explore these linkages.

Methods

Shovelnose sturgeon information was collected from the Platte River between the Loup River confluence with the Platte River near Columbus, Nebraska to the confluence with the Missouri River near Plattsmouth, Nebraska. This stretch of river was further divided into two sampling segments to distribute sampling effort in areas known to have higher abundances. The lower sampling segment (segment 1) is characterized by continuous but variable flows year round with a significant portion of the base flow coming from the groundwater-fed Loup and Elkhorn rivers (Galat et al. 2005). The upper sampling segment (segment 2) also has continuous flow; however, base flows are more variable due to the production of hydroelectricity in the Loup River Power Canal. Therefore, sampling effort was weighted towards the lower segment, which is where previous studies have had the most success in capturing shovelnose sturgeon (Peters and Parham 2007, 2008). Within each segment, fish data collection focused on randomly sampling selected reaches. Specifically, the study area was delineated into 1-km reaches (hereafter referred to as “sites”) from which fish collection efforts were based. Sample sites were selected using a stratified random sampling approach. In 2009, we randomly selected 20 sites below and 10 sites above the Elkhorn River confluence for each season. Beginning in 2010, we chose an even distribution of sampling sites within segments 1 and 2 (i.e., 20 sites above and below the Elkhorn River confluence). The spring sampling season began in March after ice flows retreated from the river and went through the end of May. Summer surveys took place June through August and fall

surveys were from September until early November. This report summarizes all sampling that occurred during the spring, summer, and fall of 2009 and the spring of 2010. Fish collection methods followed Peters and Parham (2007) and Drobish (2007) for drifted trammel nets and trotline sampling. Seven trammel nets were drifted in ideal sturgeon habitats at each site. Similarly, seven stationary trotlines baited with nightcrawlers (*Lumbricus terrestris*) were fished at each site overnight. Trammel nets were constructed from monofilament nylon with a depth of 1.8-m and length of 38.1-m. The outside mesh panels were 15.0-cm bar mesh and inside panels were 2.5-cm bar mesh. Trotlines consisted of a 30.5-m main line with 20, 3/0 O'Shaughnessy hooks attached at 1.5-m intervals.

Habitat data were randomly collected on 30% of all samples for each site (i.e., 2 of 7 samples). Variables used to describe habitat include water velocity, turbidity, conductivity, and dissolved oxygen. Other habitat parameters that were collected for every sample include water temperature, mean water depth, substrate type, presence of woody debris or other structures, and presence of above water structures like overhanging trees.

All fish collected were identified to species, measured for total or fork length and mass, and released. Shovelnose sturgeon were marked with both T-bar anchor tags (Floy Tag & Mfg. Company) and Passive Integrated Transponder (PIT; Biomark 125 kHz, unencrypted) tags for future recapture information on movement and population estimates. Calcified structures (i.e., fin rays) were collected for age and growth analysis from all captured shovelnose sturgeon from the beginning of March through the end of June. Fin rays were not collected during July and August due to recommendations by Whiteman et al. (2004). Age analysis of samples collected in 2009 and 2010 is currently in progress. Pectoral fin rays were cleaned in the lab and sectioned using a Buehler IsoMet precision saw. Fin rays were prepared using methods outlined in Pegg et al. (1998) and Koch and Quist (2007) where the fin ray is embedded in an epoxy-resin solution and then cross-sectioned once the epoxy has hardened. Fin ray cross-sections were then mounted on glass slides and photographed using a high resolution camera. In future efforts, digital images will be imported into image analysis software for manual aging and measuring of annuli distances. This will facilitate back-calculation estimates and obtain length-at-age values.

Catch per unit effort (CPUE) was calculated for trammel nets and trotlines for all fish captured in segment 1 and 2. CPUE for trammel nets was reported as the number of fish collected per 100 meters drifted and CPUE for trotlines was reported as the number of fish collected per 20-hook nights. Shovelnose sturgeon were placed into length categories provided by Gabelhouse (1984) for size structure analyses. For each size category, relative stock density (RSD), relative weight (Wr), and CPUE were calculated. Finally, length frequency histograms were generated for shovelnose sturgeon that were collected in each segment as well as for each sampling gear type.

Results

2009 Sampling

A total of 2,420 fish were collected in 1,476 gear deployments during 2009. The most commonly captured species were shovelnose sturgeon (n=1,324), channel catfish (*Ictalurus punctatus*; n=332), and river carpsucker (*Carpiodes carpio*; n=163; Table 1). Trammel nets caught the most diverse fish

assemblage catching 22 different species, while only 12 species were represented by trotlines. Trammel nets caught similar fish species between segment 1 and 2; however, CPUE of these species varied (Figures 1, 3, 5). Shovelnose sturgeon was the most abundant species sampled in segment 1 and river carpsucker, quillback (*Carpiodes cyprinus*) and channel catfish were the most abundant fish species in segment 2. Trotlines were fairly specific to sturgeon and channel catfish throughout both segments; however, CPUE of shovelnose sturgeon was much higher in segment 1 (Figures 2, 4, 6).

Shovelnose Sturgeon

We captured 1,324 shovelnose sturgeon throughout segment 1 and 2 ranging in size from 228 mm to 869 mm (Figure 7). Both sampling gears caught a diverse array of adult-sized shovelnose sturgeon; however, very few small size fish were sampled (i.e., < 400-mm). Trammel nets were most effective at collecting individuals less than 500-mm. Both sampling gears caught more shovelnose sturgeon during the spring and fall in segment 1 (Figure 8). During the summer sampling season, trammel nets were much more effective at capturing shovelnose sturgeon in segment 1. Trotline CPUE was similar between segments during this period. Shovelnose sturgeon appear to be much more abundant in segment 1 than segment 2 (Figure 9); we captured 1,191 shovelnose sturgeon in segment 1 compared to only 133 in segment 2. Although abundance varies between segments, the distribution of shovelnose sturgeon appears to be relatively uniform throughout each segment. All randomly selected sites had at least one capture of shovelnose sturgeon in segment 1. In addition, there were two locations of high capture frequency that were located near the confluence of the Missouri River and near rkm 20. Historically, high catch rates have occurred near the mouth of the Platte River; however, it is unknown why capture frequencies were much higher near rkm 20. Shovelnose sturgeon were found through the entire reach of segment 2, but were not represented at every randomly selected site.

There was only one shovelnose sturgeon collected in either of the sub-stock size ranges (0-149 mm and 150-249 mm) during 2009 (i.e., 228 mm). Eleven individuals in the stock size (250-379 mm) class were collected in segment 1 (Figure 8). All other shovelnose sturgeon were at least in the quality and above size class ranges. Preferred size shovelnose sturgeon composed 79% in segment 1 and 77% in segment 2 of all sturgeon sampled (Table 2). Mean relative weight (Wr) for shovelnose sturgeon was 80 in segment 1 and 82 in segment 2. The Wr estimates appeared to decline as fish attained larger sizes; however, there was a lot of variability in condition of older fish, which may be related to spawning condition (e.g., ripe vs. spent females, energy-depleted males, etc.); (Table 2). These values are similar to those reported from previous work in the Platte River (Shuman et al. 2007) and in the middle Missouri River (Steffensen and Hamel 2007; Hamel and Steffensen 2007). Length-weight relations indicate variability in growth and condition among size classes of shovelnose sturgeon throughout the sample area (Figure 10). This variability may be caused by differences in season (i.e., prespawn, spawn, postspawn) or may be a result from an overlap of various age classes represented in the same length range (i.e., due to slow growth).

There were 1,228 shovelnose sturgeon implanted with both T-bar anchor tags and PIT tags during the 2009 sampling season. Throughout the year, we were able to recapture 12 of these tagged individuals; seven shovelnose sturgeon were recaptured with both anchor and PIT tags present and five had shed

their PIT tag but retained the anchor tag. In addition, we recaptured 53 Missouri River-tagged shovelnose sturgeon throughout the 2009 sampling season. The fall had the most recaptures (n=27), followed by the summer (n=18) and spring (n=8). Nebraska Game and Parks Commission crews were responsible for tagging 51 of these individuals and the remaining two were tagged from Missouri Department of Conservation crews. Original capture location data is pending.

Pallid Sturgeon

We captured 69 pallid sturgeon with both trammel nets and trotlines in segments 1 and 2 (Table 3). Pallid sturgeon catch locations were evenly distributed throughout segment 1 (Figure 11); 77% of all sites yielded a pallid sturgeon capture. There were only three pallid sturgeon captures in segment 2, which were located at rkm 67.3, 75.9, and 84.9. We captured 9 pallid sturgeon during the spring, 17 during the summer, and 32 during the fall sampling seasons; however, only one-third the sampling effort was put forth during the spring due to weather restraints, gear malfunctions, and learning how to sample in a shallow, highly braided river system. Trotlines were always more successful at capturing pallid sturgeon than trammel nets, regardless of season (Figure 12). However, two of three captures in segment 2 were collected with trammel nets. Both sampling gears captured pallid sturgeon throughout a wide range of temperature and discharge ranges.

Of the 69 pallid sturgeon that were captured, 48 were of hatchery origin and were representatives of the 1997, 2001-2003, and 2005-2008 year classes. There were 19 pallid sturgeon that were captured with an absence of any hatchery marking (i.e., internal or external tag) and are currently classified as unknown origin and are awaiting genetic confirmation. The remaining two individuals had previously been captured by crews from the Missouri River. These crews had genetic testing conducted and were later confirmed as wild origin individuals.

Pallid sturgeon sizes ranged from 334 mm to 995 mm in segment 1 and 690 mm to 1,045 mm in segment 2 (Figure 13). Hatchery reared individuals ranged in size from 334 mm to 907 mm, while both wild fish were greater than 900 mm (957 mm and 1,045mm, respectively); (Figure 14). Unknown origin pallid sturgeon more closely resembled length frequency distributions of hatchery origin fish; however, there were two individuals that were > 900 mm, indicating that they may be of wild origin. There was a wide distribution of pallid sturgeon sizes caught during the fall period (Figure 13), which corresponds to a variety of hatchery year classes. We caught fewer individuals (i.e., year classes) during the spring and summer.

<u>Movement</u>

Hatchery reared individuals have specific markings or tags that link the fish to the hatchery it originated from, the year it was produced, and the location of stocking. All hatchery reared pallid sturgeon that were captured in the Platte River were originally stocked at various locations throughout the Missouri River. Pallid sturgeon exhibited substantial movement patterns from their stocking to capture location and traveled both upstream and downstream in the Missouri River before entering the Platte River. We were able to locate stocking information from 38 pallid sturgeon and the mean distance moved from the original stocking location to the capture location in the Platte was 207 km. We collected pallid sturgeon from eight different stocking locations, including one that was from the riverine section of the Missouri

River above Lewis and Clark Lake (Standing Bear Bridge, rkm 1,353). This individual had to pass through Gavin's Point Dam before heading downstream 396 km to where we captured it in the Platte River.

2010 Sampling

A total of 997 fish were collected in 559 gear deployments during the spring of 2010. The most commonly captured species were shovelnose sturgeon (n=554), channel catfish (n=153), and goldeye (*Hiodon alosoides*; n=94; Table 4). Trammel nets caught the most diverse fish assemblage catching 15 different species, while trotlines were represented by 11 species. Trammel nets caught similar fish species between segment 1 and 2; however, CPUE of these species varied (Figures 1, 3, 5). Shovelnose sturgeon was the most abundant species sampled in segment 1 and goldeye and channel catfish were the most abundant fish species in segment 2. Trotline catch was very similar to results from 2009 (Figures 2, 4, 6).

Shovelnose Sturgeon

We captured 554 shovelnose sturgeon throughout segment 1 and 2 ranging in size from 334 mm to 764 mm (Figure 15). Both sampling gears caught a diverse array of adult-sized shovelnose sturgeon; however, very few small size fish continue to be sampled (i.e., < 400-mm). Trammel net catch rates for shovelnose sturgeon were nearly identical to 2009; however, trotline catch rates in segment 1 increased nearly two-fold over the spring of 2009 (Figure 8).

There was no shovelnose sturgeon collected in either of the sub-stock size ranges (0-149 mm and 150-249 mm) during the spring of 2010. One individual in the stock size (250-379 mm) class was collected in both segment 1 and 2 (Table 5). All other shovelnose sturgeon were at least in the quality and above size class ranges. Preferred size shovelnose sturgeon composed 89% in segment 1 and 78% in segment 2 of all sturgeon sampled. Mean relative weight (Wr) for shovelnose sturgeon was 87 in segment 1 and segment 2.

There were 442 shovelnose sturgeon implanted with both T-bar anchor tags and PIT tags during the spring of 2010. Throughout the spring, we were able to recapture 13 shovelnose sturgeon that were previously tagged in 2009. Of these tagged individuals; six shovelnose sturgeon were recaptured with both anchor and PIT tags present and seven had shed their PIT tag but retained the anchor tag. In addition, we recaptured 23 Missouri River-tagged shovelnose sturgeon throughout the spring sampling season, which brings the total number of Missouri River recaptures to 86. Original capture location data is pending.

Pallid Sturgeon

We captured 24 pallid sturgeon with trotlines in segments 1 and 2 (Table 3). The use of trammel nets did not result in a pallid sturgeon capture during the spring of 2010. Pallid sturgeon catch locations were evenly distributed throughout segment 1. There were only three pallid sturgeon captures in segment 2, which were located at rkm 52.4, 54.0, and 158.3. All three of these individuals were of hatchery origin and were less than 700 mm in length.

Of the 24 pallid sturgeon that were captured, 15 were of hatchery origin and were representatives of the 2001, 2002, and 2005-2008 year classes. There were 8 pallid sturgeon that were captured with an absence of any hatchery marking (i.e., internal or external tag) and are currently classified as unknown origin and are awaiting genetic confirmation. The remaining individual had previously been captured by crews from the Missouri River. These crews had genetic testing conducted and later confirmed this individual as wild. This fish was caught during the spring spawning period and was transported to Blind Pony National Fish Hatchery. A reproductive assessment was conducted, which confirmed that this individual was a wild male that was producing viable milt. The sperm was collected from this fish and was used for the Missouri River pallid sturgeon broodstock program.

Deviations from Proposal

Stationary gill nets have been dropped from the standardized sampling regime. A comparison of species composition and length frequency histograms indicated that these sampling gears result in duplicate catch. In addition, the Pallid Sturgeon Handling Protocols state that overnight gill net sets are not to be used when water temperatures exceed 12.8°C, which vastly limits the time frame in which this sampling gear can be used. Future sampling will continue with overnight trotline sets and drifted trammel nets.

Beginning in the spring of 2010, we chose to implement an even distribution of sampling sites within Segments 1 and 2 (i.e., 20 sites above and below the Elkhorn River confluence). This sampling approach will allow us to further examine the population status of sturgeon in segment 2. To accomplish this task, we reduced the total number of sub-samples at each site from 10 to 7.

Program Plan

The Nebraska Game and Parks Commission is concerned about the potential decline in shovelnose sturgeon populations and the ensuing decline in sport fishing opportunities in the Platte River. This project will help document potential factors affecting the recruitment of shovelnose sturgeon populations and how these factors interact with angling pressure throughout the river. Information gained on the factors driving population dynamics of sturgeon will be important for increased effectiveness of management activities for these species in riverine systems throughout the state of Nebraska and the remaining shovelnose sturgeon distribution to maintain viable populations.

This project will provide an in depth analysis of shovelnose sturgeon population dynamics along the Platte River. This information is vital to understanding dynamic systems such as the Platte River because external forces are putting a high demand on water quantity issues throughout the basin. Further, little is known about the interaction of sturgeon populations among river systems like the Platte River and Missouri River; thus, all information gained on movement and contribution between these rivers will be an important contribution to the general knowledge of managing highly mobile riverine species like shovelnose sturgeon. Development of a working model for population dynamics of shovelnose sturgeon in the Platte River will also be a vital tool for understanding fish ecology in large, shallow rivers.

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Table 1. Total species and abundance captured in both sampling gears in the Platte River, Nebraska during spring (March–May), summer (June-August), and fall (September-November) 2009.

Fish Species	Number of Individuals
Pallid sturgeon	69
Shovelnose sturgeon	1324
Longnose gar	44
Shortnose gar	21
Goldeye	139
Gizzard shad	1
Silver chub	2
Grass carp	10
Common carp	58
Silver carp	9
River carpsucker	163
Quillback	110
Blue sucker	42
Smallmouth buffalo	32
Bigmouth buffalo	1
Shorthead redhorse	1
Blue catfish	5
Channel catfish	332
Flathead catfish	11
White bass	4
Sauger	24
Walleye	1
Freshwater drum	17
Total	2420

Table 2. Incremental relative stock density (RSD)[a] and mean relative weight (Wr) by length category for shovelnose sturgeon in segment 1 and 2 of the Platte River captured during the spring (March-May), summer (June-August), and fall (September-November) 2009. Length categories[b] determined using methods proposed by Quist et al. (1998).

Length Category	N	RSD	Wr (+/- 2 SE)
Segment 1			
Sub-stock (0-149 mm)	0		
Sub-stock (150-249 mm)	1		71
Stock (250-379 mm)	11		83 (9)
Quality (380-509 mm)	241	99	90 (2)
Preferred (510-639 mm)	894	79	83 (1)
Memorable (640-809 mm)	40	3	71 (4)
Trophy (>810 mm)	1		
Overall Wr			80 (7)
Segment 2			
Sub-stock (0-149 mm)	0		
Sub-stock (150-249 mm)	0		
Stock (250-379 mm)	0		
Quality (380-509 mm)	31	100	88 (5)
Preferred (510-639 mm)	98	77	83 (2)
Memorable (640-809 mm)	4	3	76 (15)
Trophy (>810 mm)	0		
Overall Wr			82 (7)

[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(20%), stock (20-36%), quality (36-45%), preferred (45-59%), memorable (59-74%), and trophy (>74%).

Table 3. Total numbers of pallid sturgeon captures with trotlines and 1.0" trammel nets during the spring, summer, and fall sampling seasons in segments 1 and 2 of the Platte River, Nebraska during 2009.

Season	Segment 1	Segment 2
Spring		
Trotlines	8	1
Trammel Nets	0	0
Summer		
Trotlines	10	0
Trammel Nets	6	1
Fall		
Trotlines	33	0
Trammel Nets	9	1

Table 4. Total species and abundance captured in both sampling gears in the Platte River, Nebraska during spring (March-May) 2010.

Fish Species	Number of Individuals
Lake sturgeon	1
Pallid sturgeon	24
Shovelnose sturgeon	554
Longnose gar	15
Shortnose gar	8
Goldeye	94
Gizzard shad	1
Grass carp	3
Common carp	31
River carpsucker	35
Quillback	32
Blue sucker	32
Smallmouth buffalo	6
Bigmouth buffalo	2
Channel catfish	153
Flathead catfish	1
Sauger	4
Freshwater drum	2
Total	997

Table 5. Incremental relative stock density (RSD)[a] and mean relative weight (Wr) by length category for shovelnose sturgeon in segment 1 and 2 of the Platte River captured during the spring (March-May), 2010. Length categories[b] determined using methods proposed by Quist et al. (1998).

Length Category	N	RSD	Wr (+/- 2 SE)
Segment 1			
Sub-stock (0-149 mm)	0		
Sub-stock (150-249 mm)	0		
Stock (250-379 mm)	1		
Quality (380-509 mm)	49	99	95 (7)
Preferred (510-639 mm)	369	89	86 (1)
Memorable (640-809 mm)	38	8	79 (3)
Trophy (>810 mm)	0		
Overall Wr			87 (9)
Segment 2			
Sub-stock (0-149 mm)	0		
Sub-stock (150-249 mm)	0		
Stock (250-379 mm)	0		
Quality (380-509 mm)	31	99	89 (5)
Preferred (510-639 mm)	98	78	85 (2)
Memorable (640-809 mm)	4	4	87 (12)
Trophy (>810 mm)	0		
Overall Wr			87 (2)

[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(20%), stock (20-36%), quality (36-45%), preferred (45-59%), memorable (59-74%), and trophy (>74%).

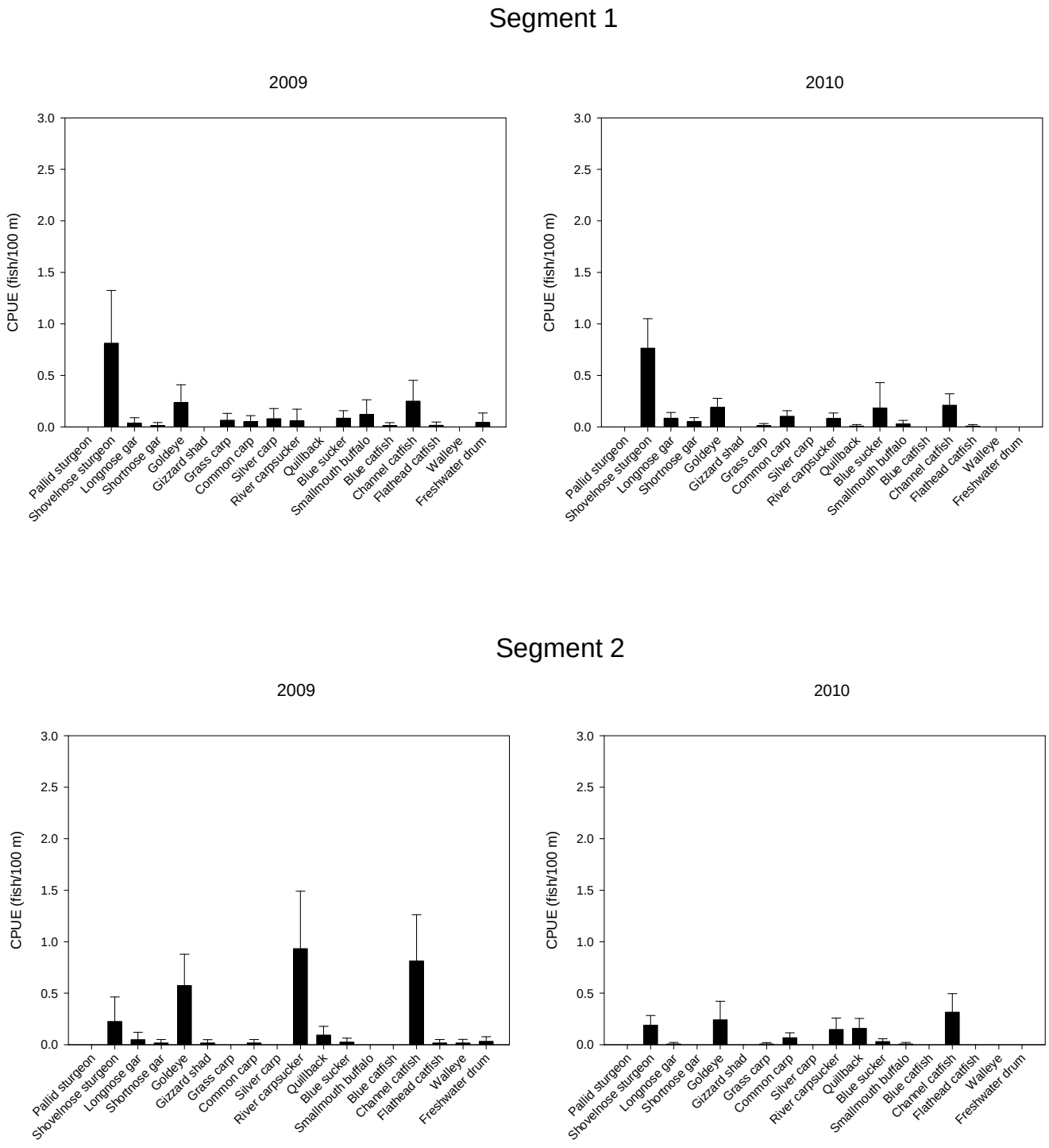


Figure 1. Mean catch per unit effort (CPUE) of all species sampled during the spring sampling season (March-May) with 1.0" trammel nets in segment 1 and 2 of the Platte River, Nebraska during 2009 and 2010.

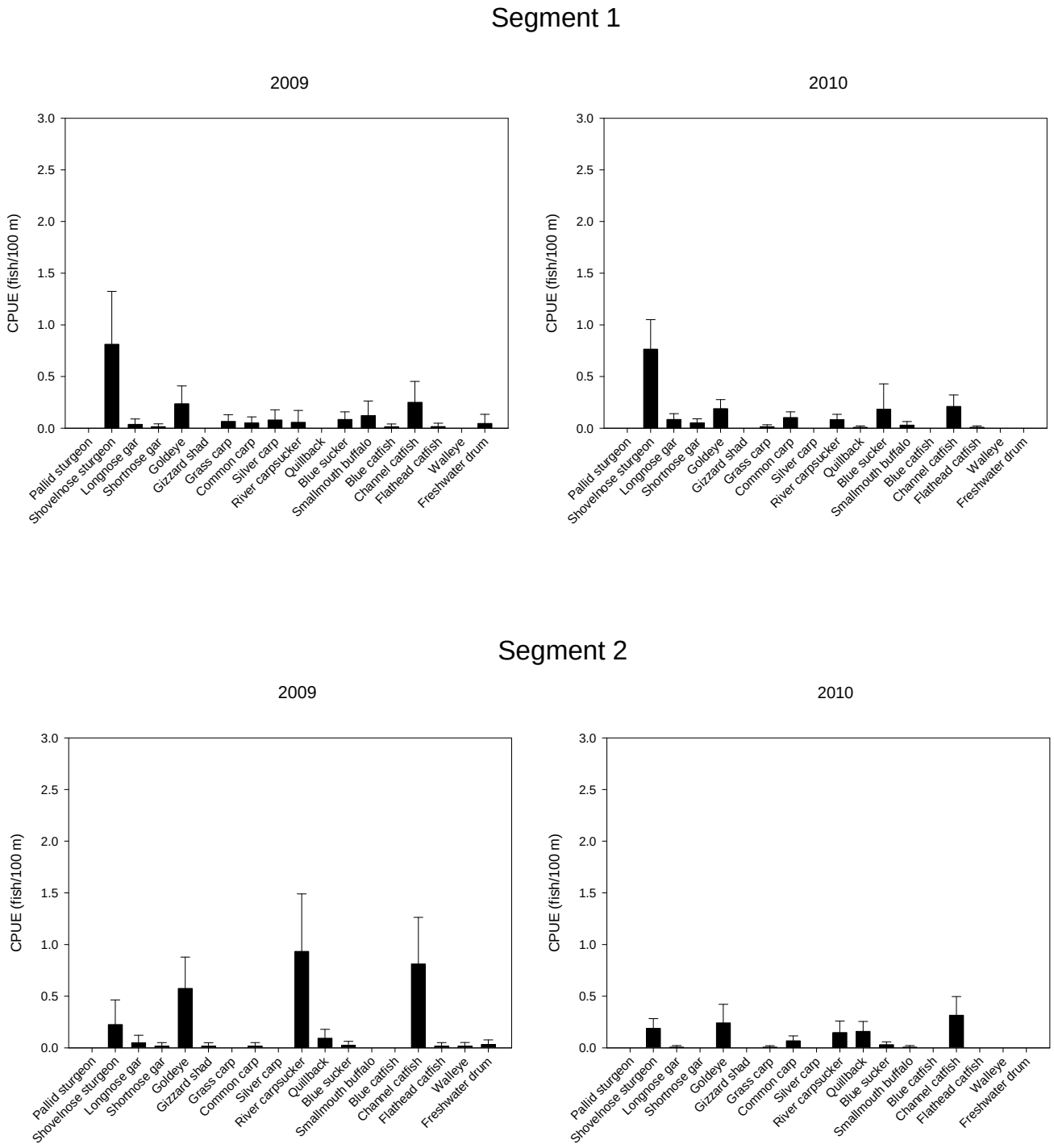


Figure 2. Mean catch per unit effort (CPUE) of all species sampled during the spring sampling season (March-May) with 1.0" trammel nets in segment 1 and 2 of the Platte River, Nebraska during 2009 and 2010.

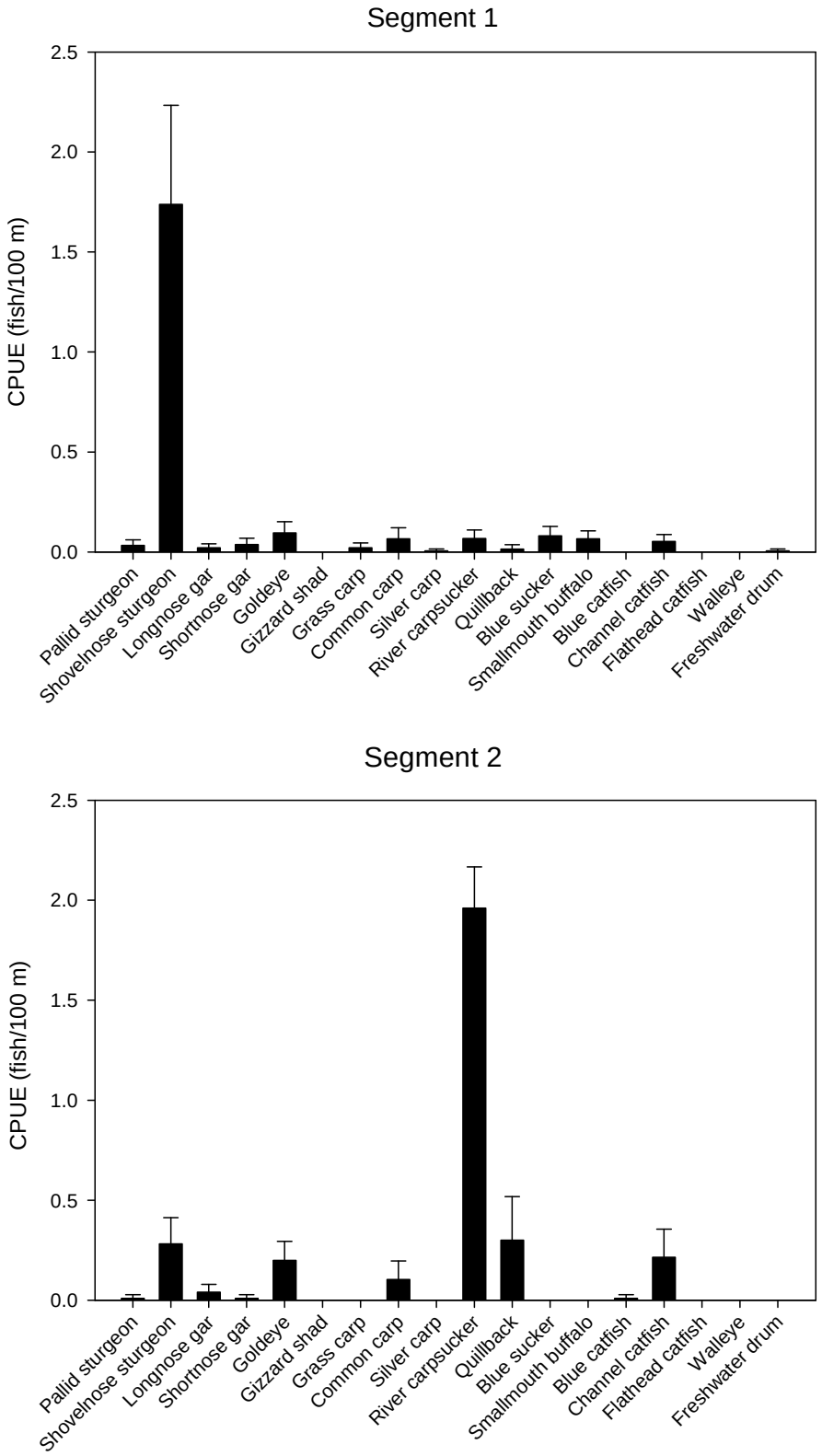


Figure 3. Mean catch per unit effort (CPUE) of all species sampled during the summer sampling season (June-August) with 1.0" trammel nets in segment 1 and 2 of the Platte River, Nebraska during 2009.

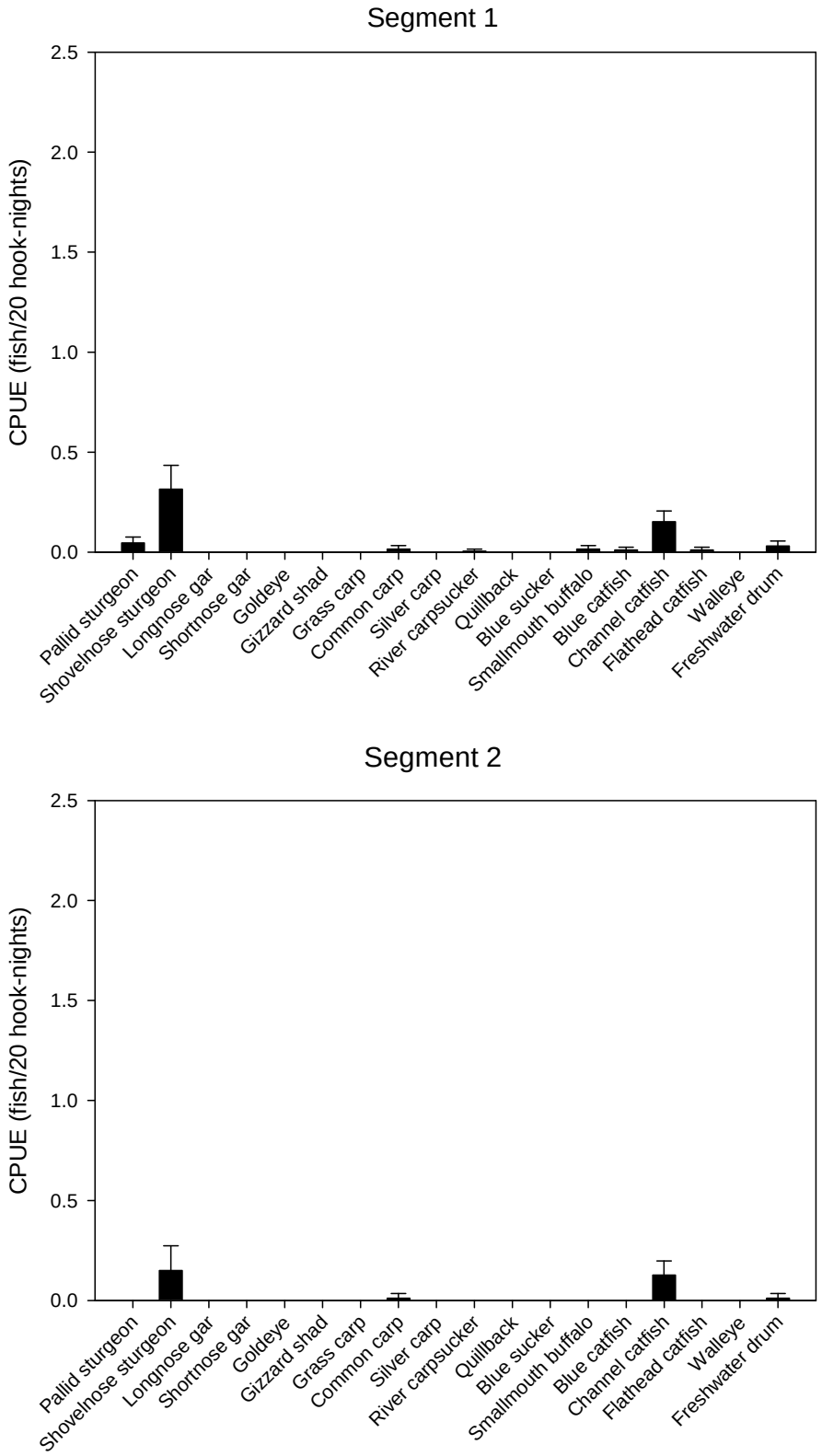


Figure 4. Mean catch per unit effort (CPUE) of all species sampled during the summer sampling season (June-August) with trotlines in segment 1 and 2 of the Platte River, Nebraska during 2009.

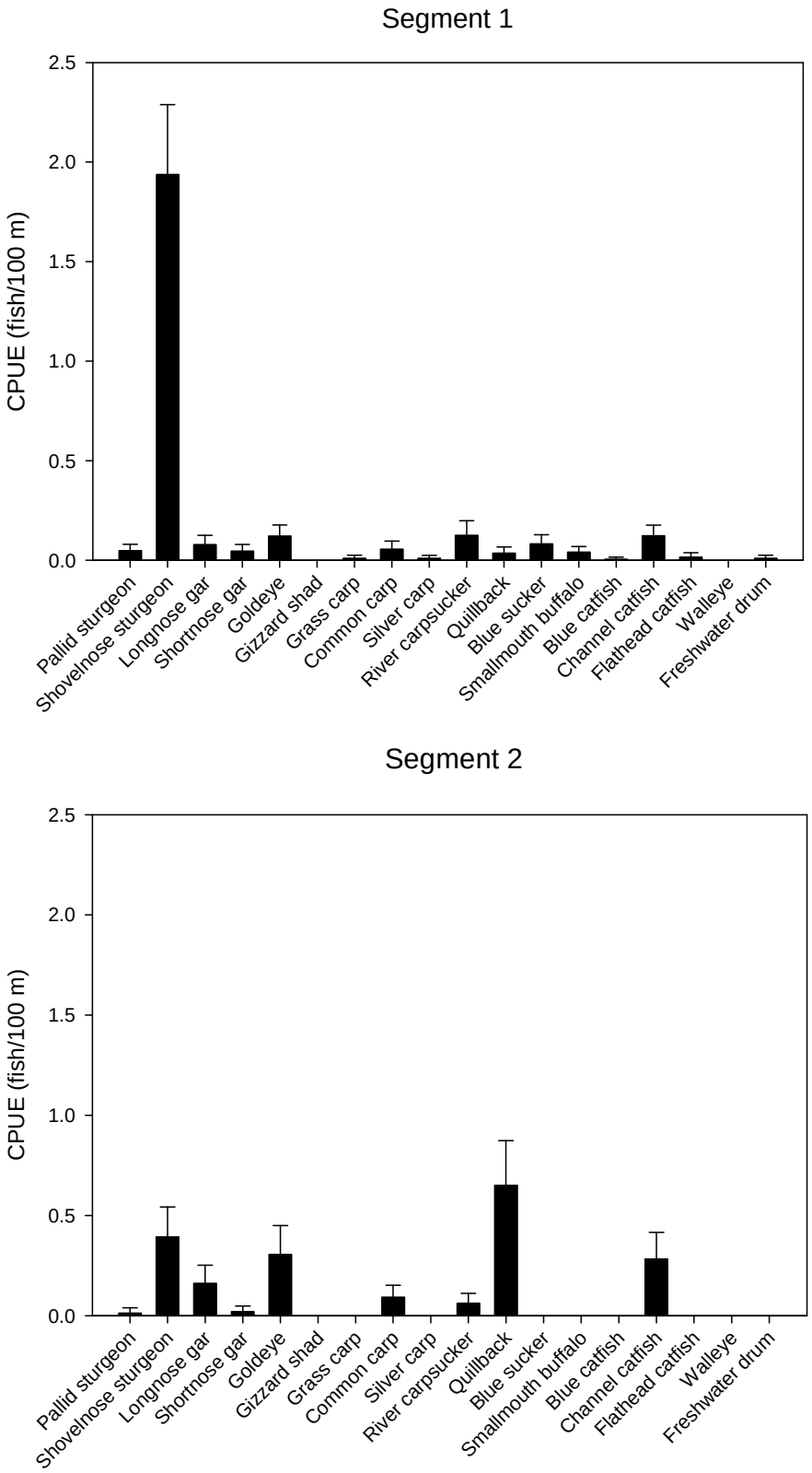


Figure 5. Mean catch per unit effort (CPUE) of all species sampled during the fall sampling season (September-November) with 1.0" trammel nets in segment 1 and 2 of the Platte River, Nebraska during 2009.

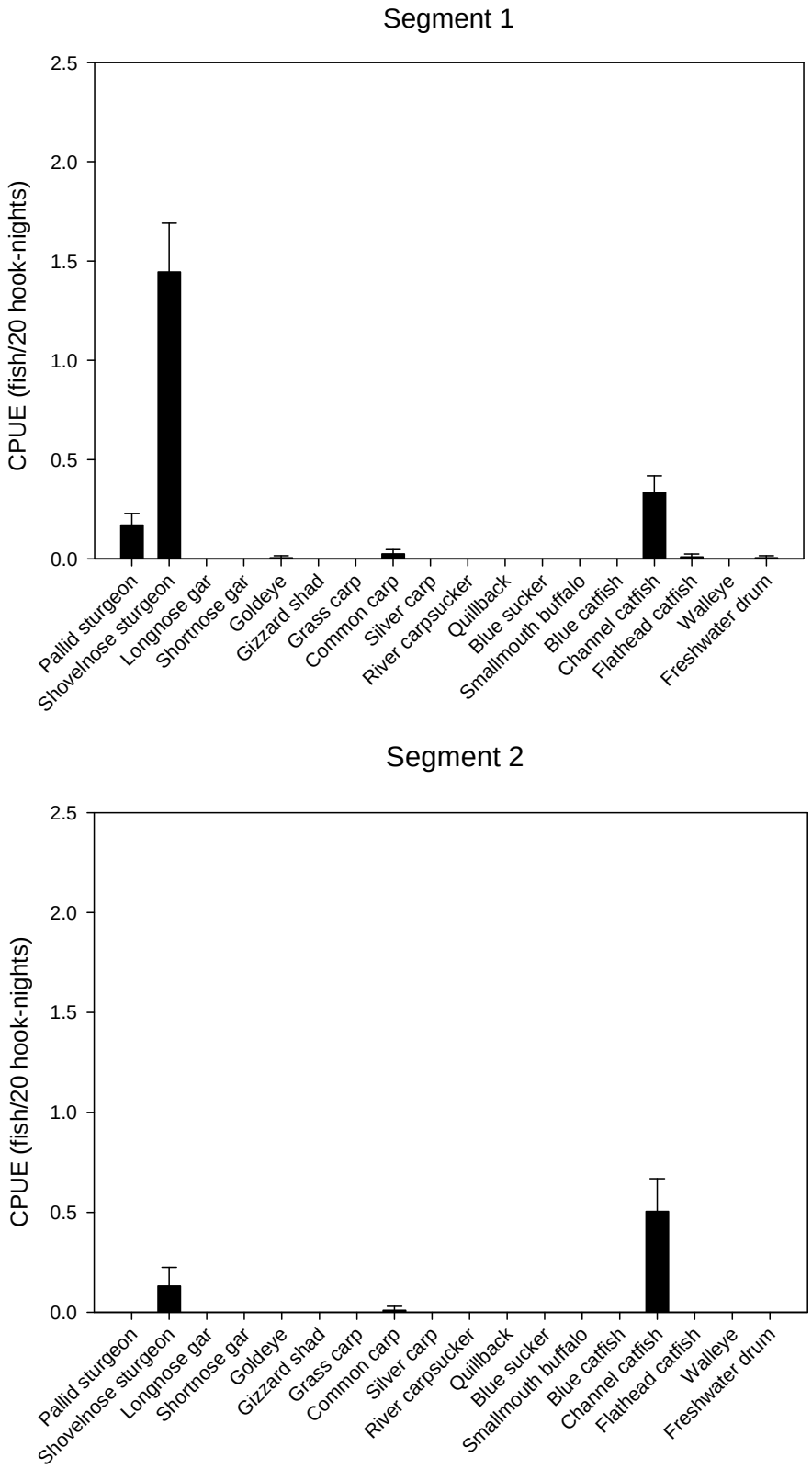
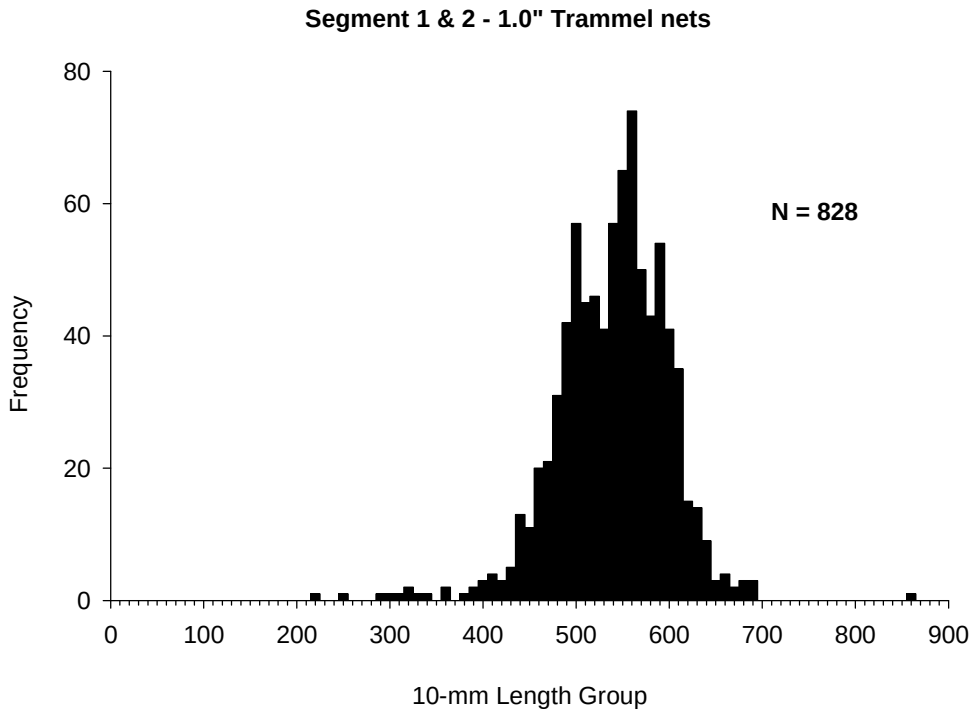


Figure 6. Mean catch per unit effort (CPUE) of all species sampled during the fall sampling season (September-November) with trotlines in segment 1 and 2 of the Platte River, Nebraska during 2009.



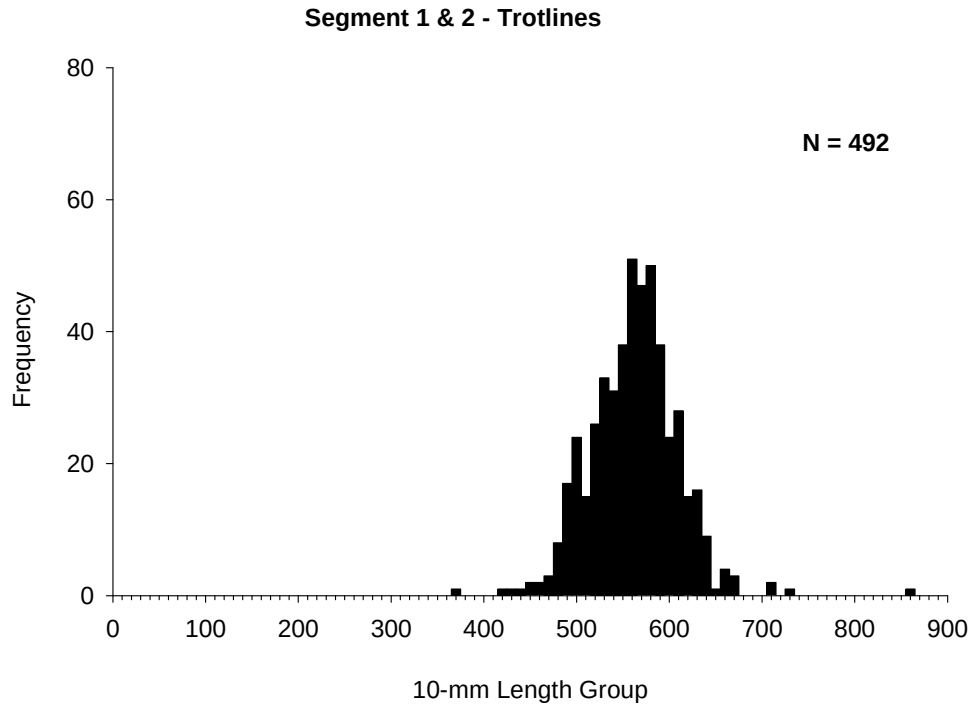


Figure 7. Length frequency of shovelnose sturgeon captured with 1.0" trammel nets (top) and trotlines (bottom) during the spring (March-May), summer (June-August), and fall (September-November) sampling season in segments 1 and 2 of the Platte River, Nebraska during 2009.

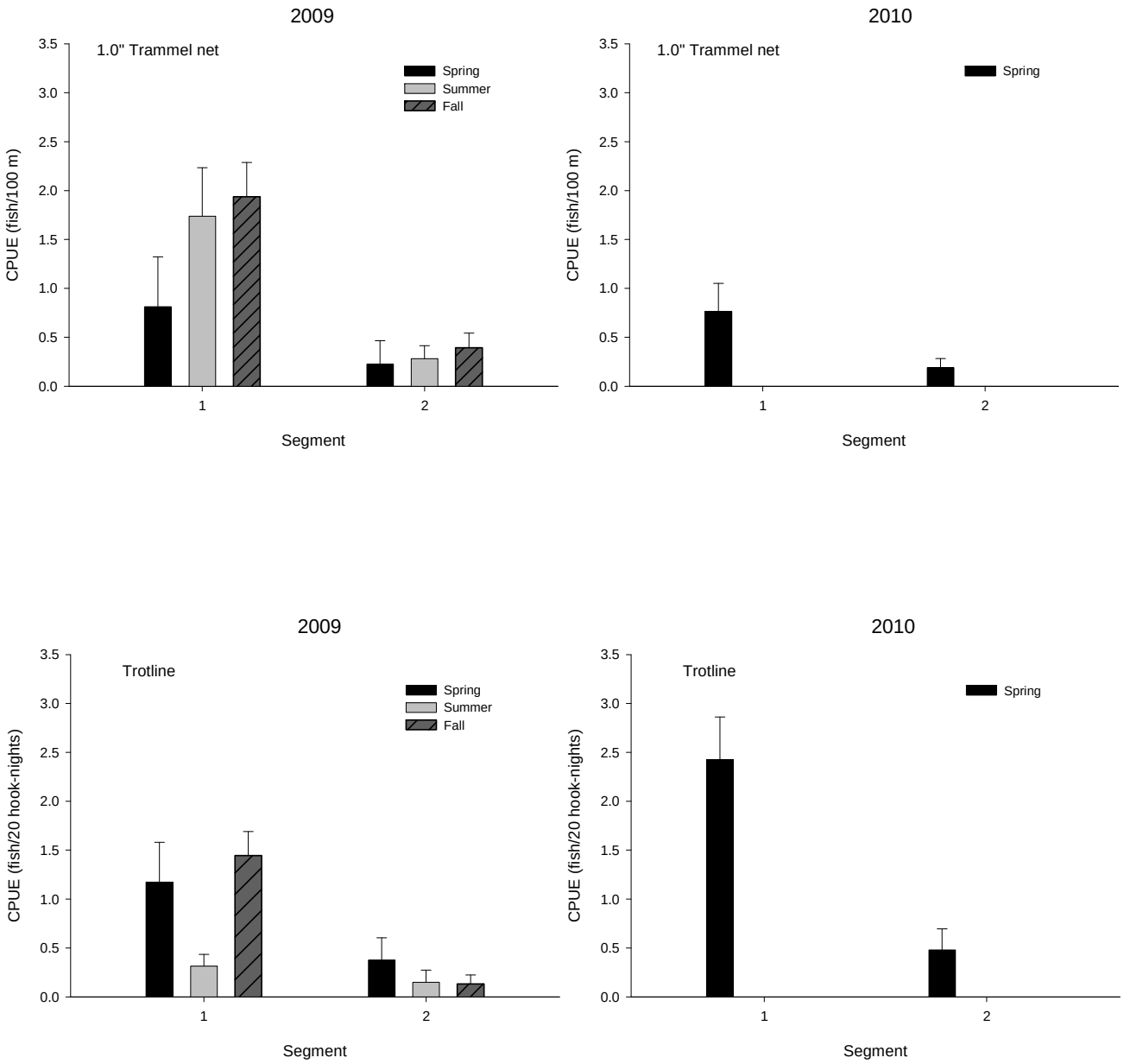


Figure 8. Mean catch per unit effort (CPUE; +/- 2 SE) of shovelnose sturgeon captured with 1.0" trammel nets and trotlines in segments 1 and 2 of the Platte River, Nebraska during the spring (black bars), summer (light grey bars), and fall (dark gray, hatched bars) in 2009 and spring in 2010.

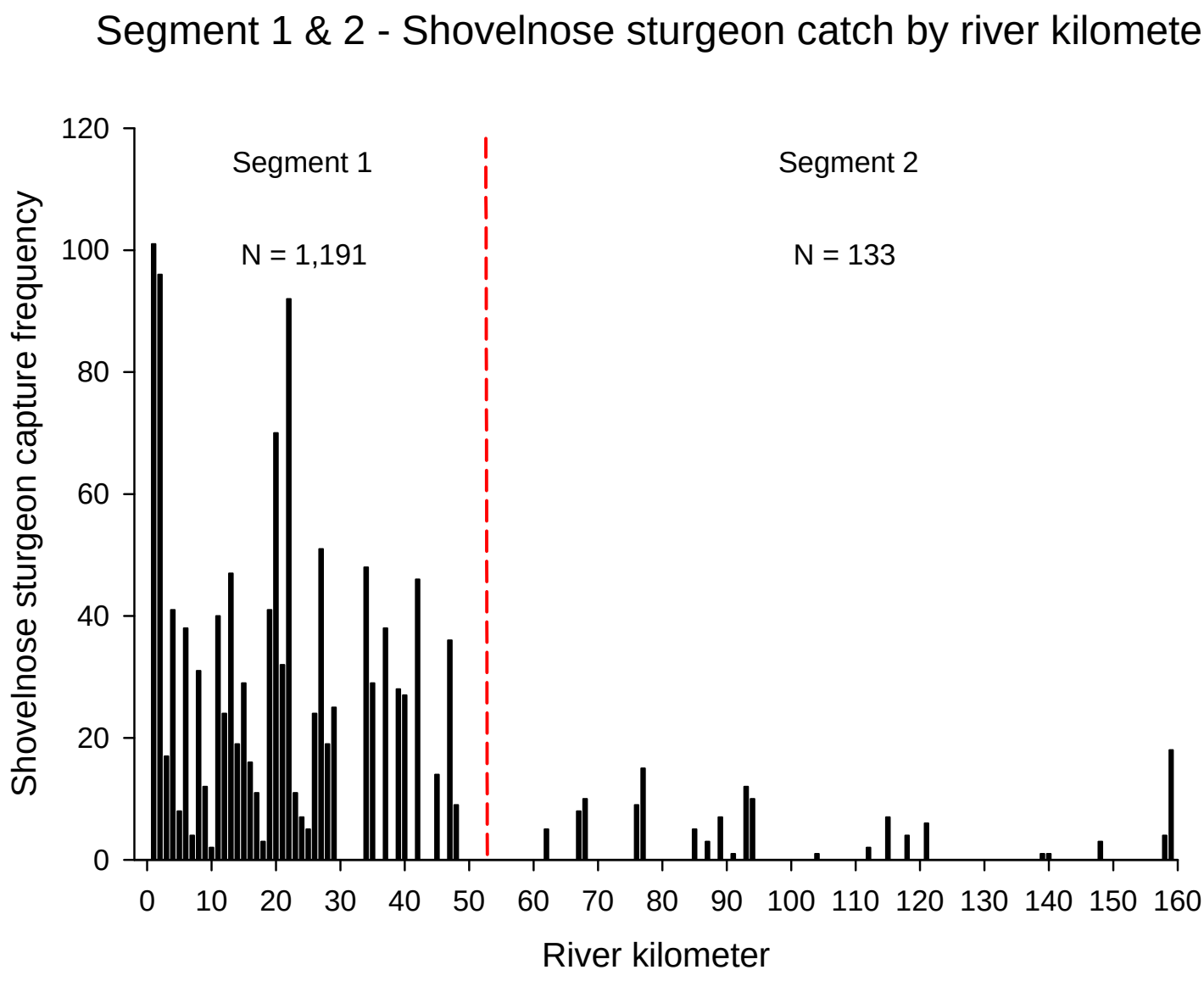


Figure 9. Distribution of shovelnose sturgeon captures by river kilometer for segments 1 and 2 in randomly selected sites of the Platte River, Nebraska during the spring, summer, and fall sampling seasons in 2009. The dashed line represents the Elkhorn River confluence, which is the physiogeographical border between segment 1 and 2.

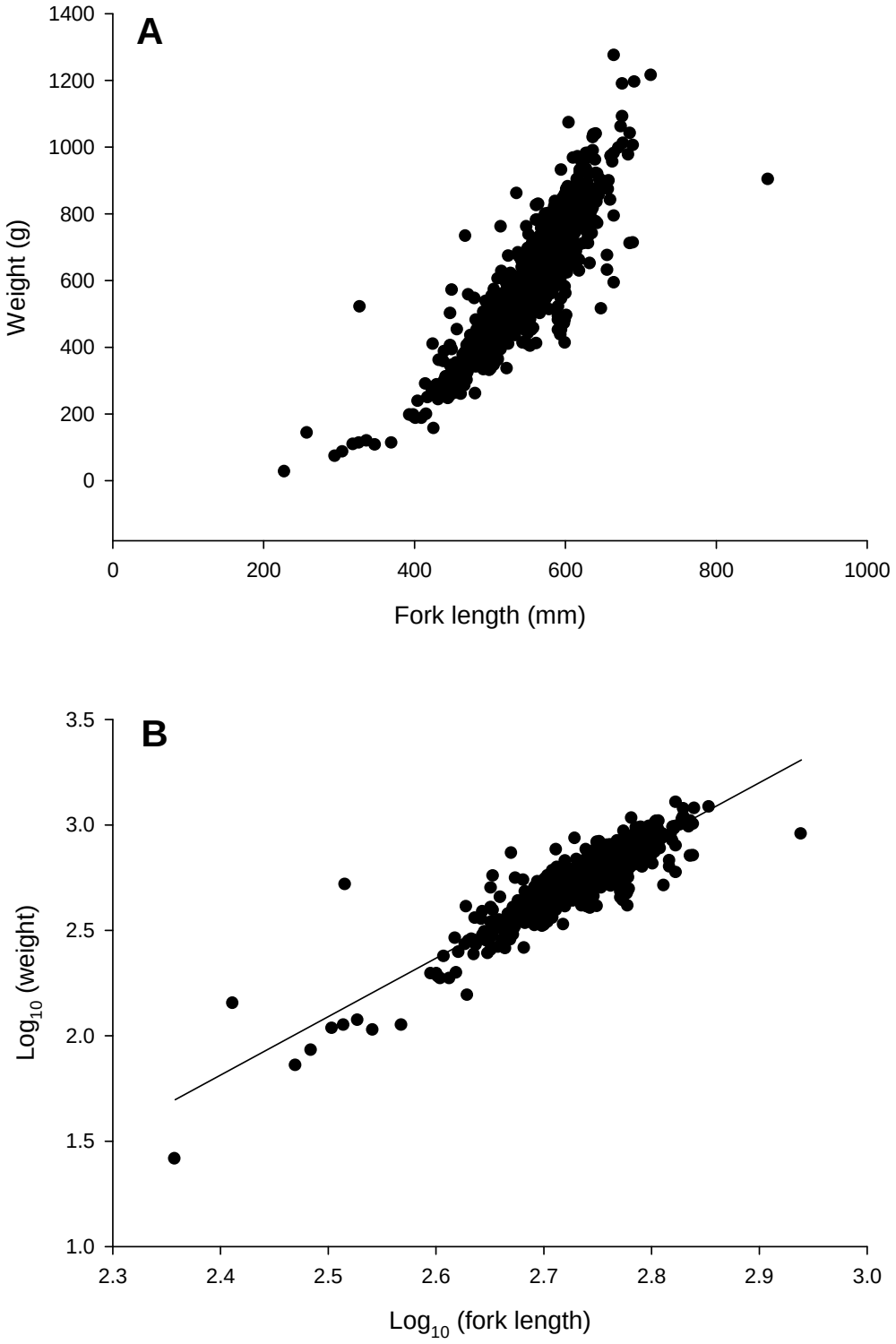


Figure 10. Length-weight relation of (A) untransformed length-weight shovelnose sturgeon caught by all sampling gears in the Platte River, Nebraska during the spring (March-May), summer (June-August), and fall (September-November) sampling seasons of 2009 versus (B) the same data after $\log_{10}$ transformation.

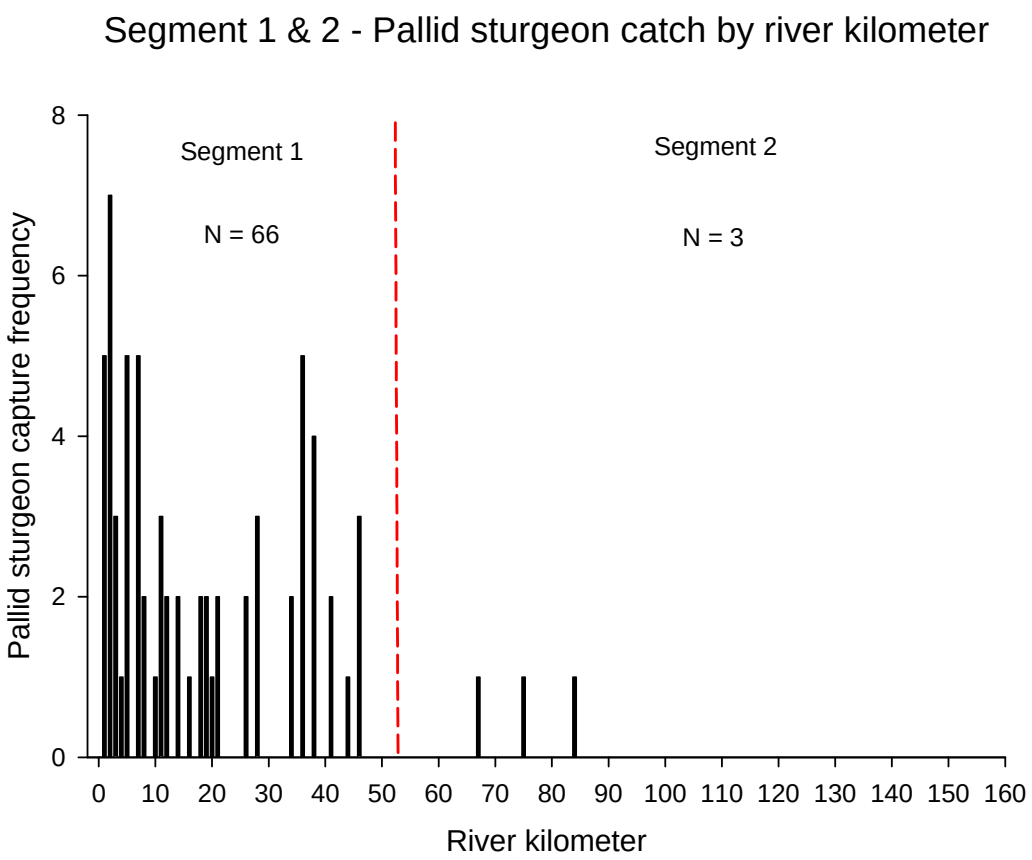


Figure 11. Distribution of pallid sturgeon captures by river kilometer for segments 1 and 2 in randomly selected sites of the Platte River, Nebraska during the spring, summer, and fall sampling seasons in 2009. The dashed line represents the Elkhorn River confluence, which is the physiogeographical border between segment 1 and 2.

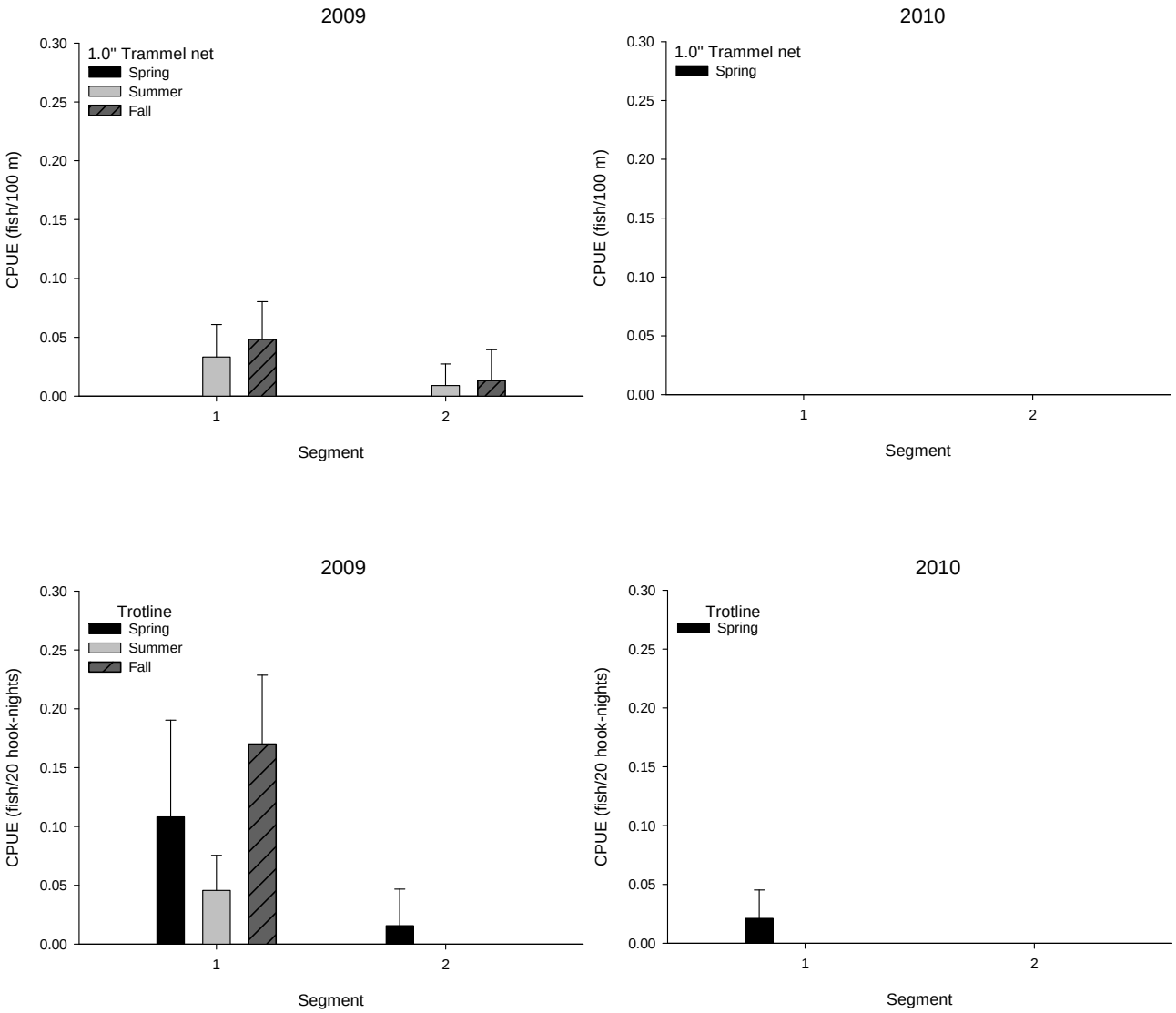


Figure 12. Mean catch per unit effort (CPUE; +/- 2 SE) of pallid sturgeon captured with 1.0" trammel nets and trotlines in segments 1 and 2 of the Platte River, Nebraska during the spring (black bars), summer (light grey bars), and fall (dark gray, hatched bars) 2009 and the spring in 2010. No bars represent zero captures of pallid sturgeon.

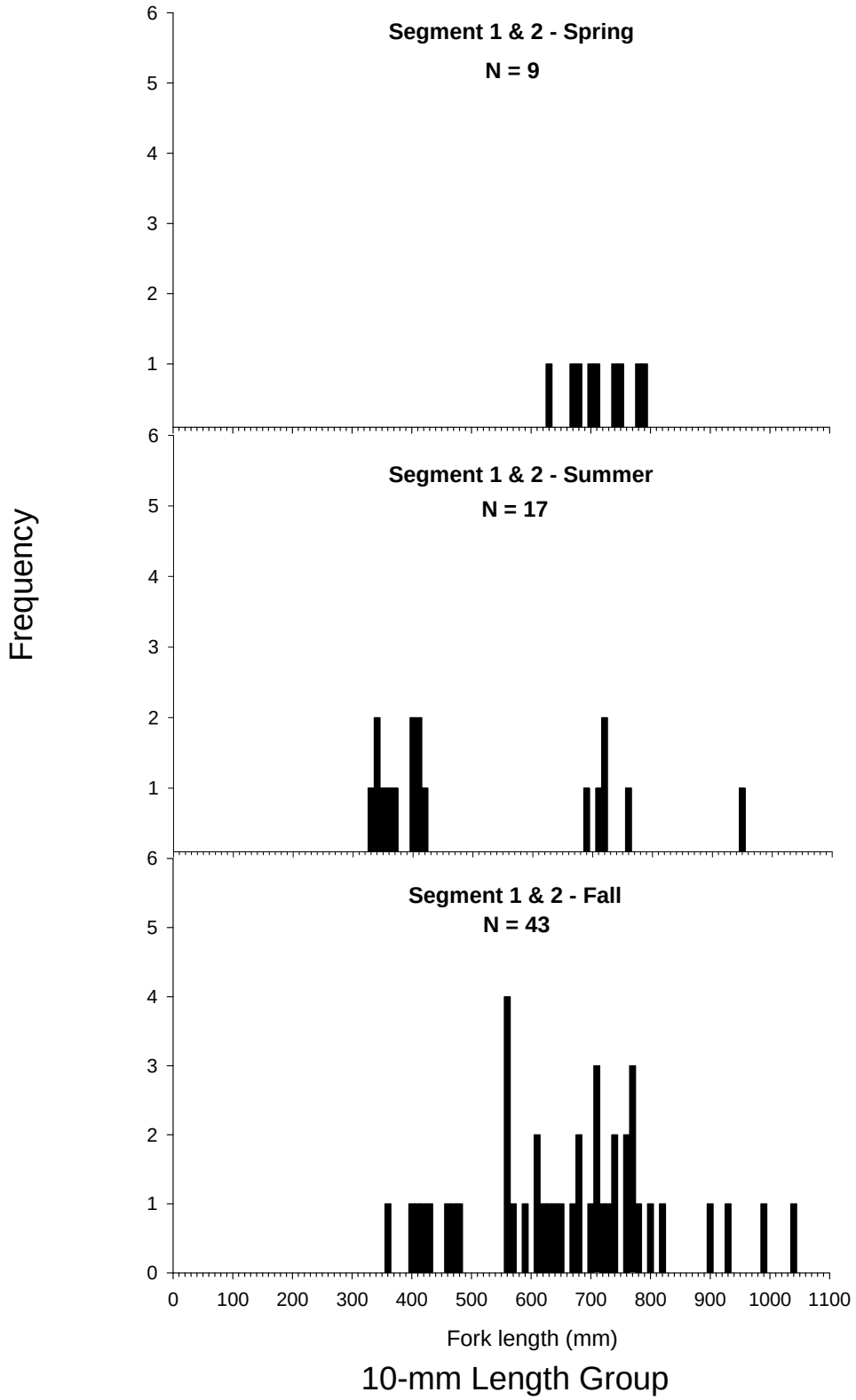


Figure 13. Length frequency of pallid sturgeon captured with both sampling gears during the spring, summer, and fall sampling seasons in segments 1 and 2 of the Platte River, Nebraska during 2009.

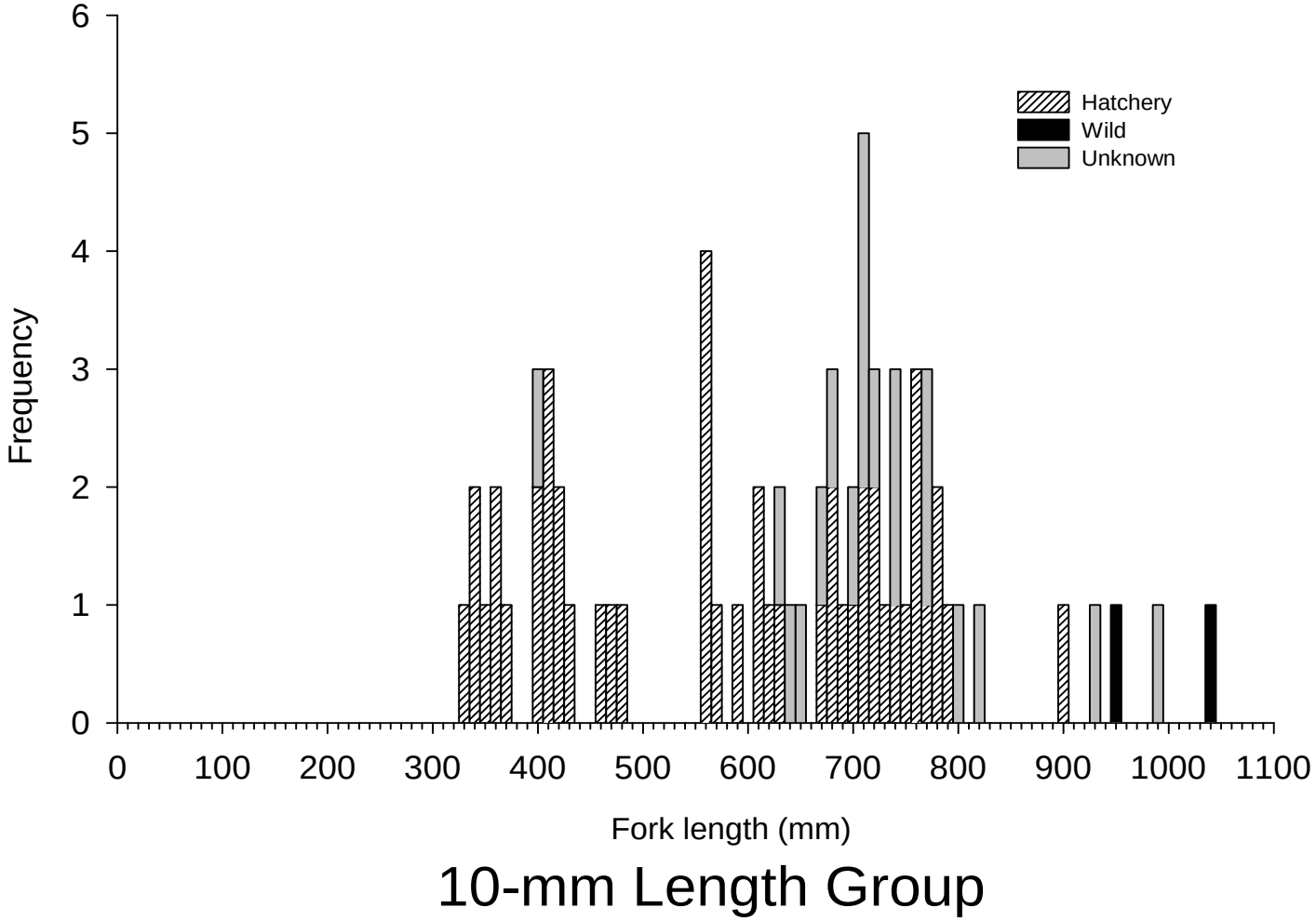
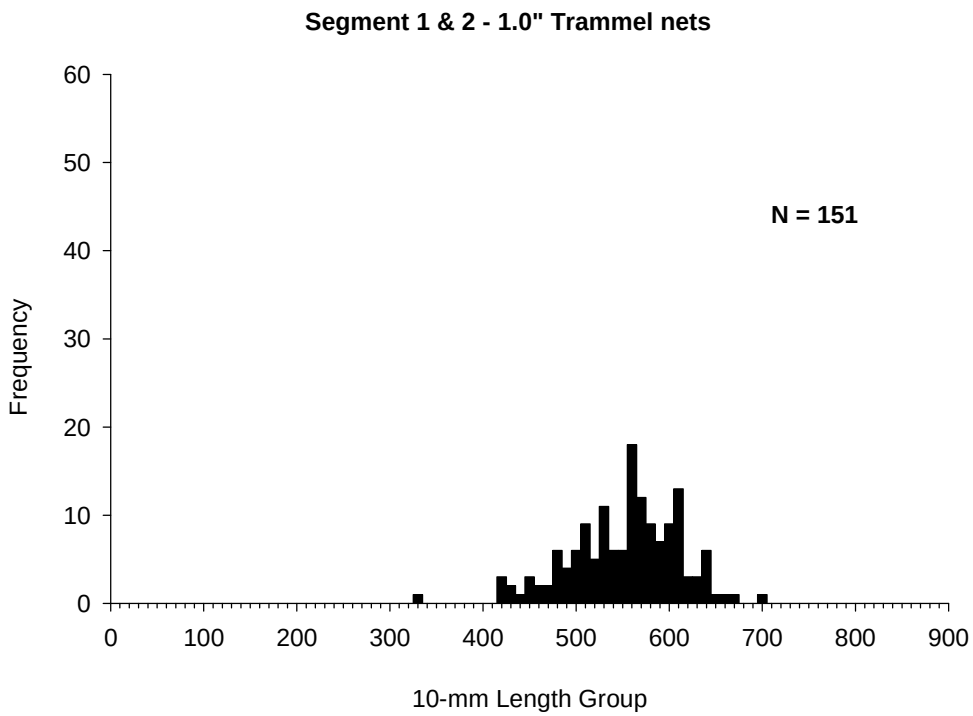


Figure 14. Length frequency of pallid sturgeon captured with both sampling gears in segments 1and 2 of the Platte River, Nebraska during 2009.



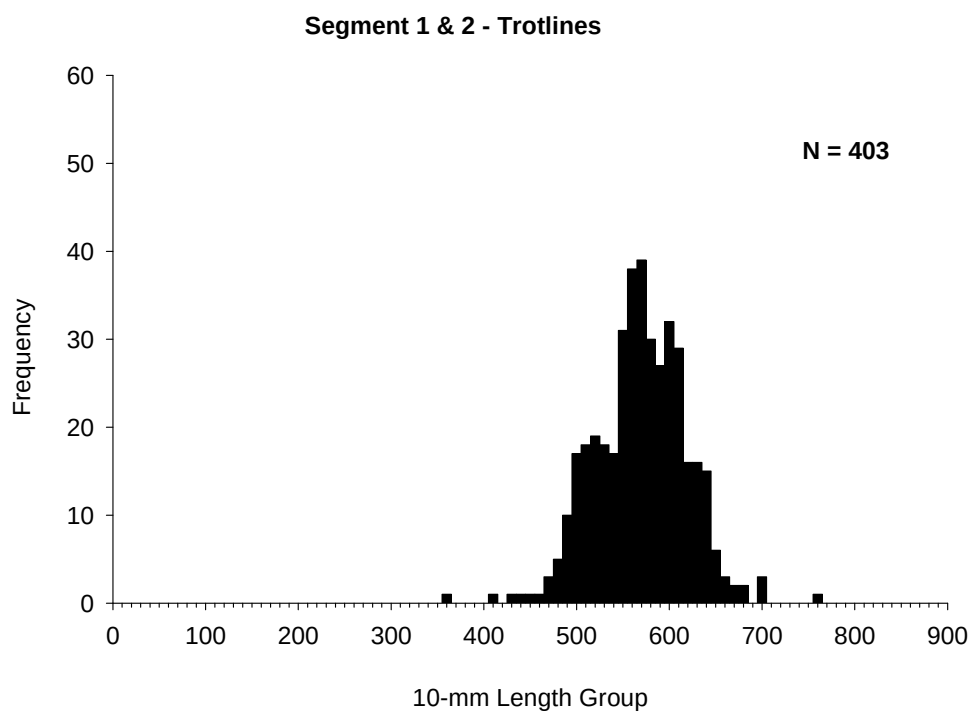


Figure 15. Length frequency of shovelnose sturgeon captured with 1.0" trammel nets (top) and trotlines (bottom) during the spring (March-May) sampling season in segments 1 and 2 of the Platte River, Nebraska during 2010.