

**Enclosure 3. Fifteen Year Review, Nebraska Game and Parks Commission's
Instream Flow Appropriations, For The Central and Lower Platte River.**

Platte River Catfish Population Dynamics and Tagging Study

Annual Performance Report

Project No. F-176-R Segment 5

Authors:

Aaron J. Blank
School of Natural Resources
University of Nebraska-Lincoln

Mark A. Pegg
School of Natural Resources
University of Nebraska-Lincoln

January, 2012

TABLE OF CONTENTS

	Page
Study Objectives.....	4
Introduction.....	4
Methods.....	6
Results.....	7
Program Plan.....	9
Literature Cited.....	10

LIST OF TABLES

Table 1. Total species and abundance captured in all gears in the Platte River, Nebraska during 2011.....	12
Table 2. Total number of catfish tagged by season.....	13
Table 3. Total number of catfish recaptures by season and recapture method.....	14

LIST OF FIGURES

Figure 1. Standard sampling length-frequency distribution of channel catfish caught in all gears in the Platte River, Nebraska during 2011.....	15
Figure 2. Standard sampling length-frequency distribution of channel catfish captured by 25-mm hoop net, electrofisher (15Hz), and electrofisher (60Hz) in the Platte River, Nebraska during 2011.....	16
Figure 3. Standard sampling channel catfish mean catch per unit effort (CPUE) of 25-mm (4-hoop) hoop nets, electrofisher (15 Hz), and electrofisher (60 Hz) deployed in the Platte River, Nebraska during 2011.....	17
Figure 4. Standard sampling longitudinal channel catfish mean catch per unit effort (CPUE) of 25-mm (4-hoop) hoop nets, electrofisher (15Hz), and electrofisher (60 Hz) in the Platte River, NE during 2011.....	18
Figure 5. Length-frequency distribution of tagged channel catfish caught in all gears in the Platte River, Nebraska during 2011.....	19
Figure 6. Length-frequency distribution of tagged channel catfish captured at Columbus, Fremont, and Louisville in the Platte River, Nebraska during 2011.....	20
Figure 7. Mean catch per unit effort (CPUE) of tagged channel catfish captured by 25-mm (4-hoop) hoop net, and 25-mm (7-hoop) hoop net in the Platte River, Nebraska during 2011.....	21

Figure 8. Length-frequency distribution of tagged flathead catfish captured by all gears, captured at Fremont and Louisville in the Platte River, Nebraska during 2011.....22

Figure 9. Mean catch per unit effort (CPUE) of tagged flathead catfish captured by 25-mm (4-hoop) hoop net, and 25-mm (7-hoop) hoop net in the Platte River, Nebraska during 2011....23

Study Objective

Monitor status of channel catfish and flathead catfish populations in the central and lower Platte River following protocols described in Barada (2009). Determine population size, angler affects, as well as movement of channel and flathead catfish in the Platte River at Fremont and Louisville, Nebraska.

Introduction

Recreational fishing in the United States is a popular sport industry, consisting of 30 million anglers and generating a total of \$42 billion per year (USFWS 2006). The 2006 USFWS national survey found that 45% of anglers fished rivers and streams, and that catfish were the third most sought after fish (23%). Nebraska anglers alone spent \$181,280,000 on fishing expeditions during their 2,913,000 days on the water in 2006 (USFWS 2006). We can therefore conclude that a catfish fishery contributes to local and state economies.

Fishing for channel catfish *Ictalurus punctatus* and flathead catfish *Pylodictus olivaris* has been a popular pastime in Nebraska. For example, more than 50% of Nebraska anglers fished for catfish in 1981 and 1982 (Zuerlein 1984) and 57% of Nebraska anglers fished for catfish during 2002 (Hurley and Duppong-Hurley 2005). Similarly, river and stream fisheries play a substantial role in Nebraska angling activities. In 1982, 29% of fishing days were on Nebraska rivers and streams (Zuerlein 1984), even though much of the river and stream systems are encompassed by private land. The majority of fishing took place on the Platte River (35%) and the Missouri River (23%) (Zuerlein 1984).

The Platte River runs through central Nebraska spanning from the West edge of the state to the confluence at the Missouri River and has been a historic high use catfishing area (Holland and Peters 1994). Holland and Peters (1994) found that channel catfish represented 67% of total catch in the Lower Platte River by anglers in 1992, and 73% of the total catch in 1993. A 2009 angler survey in the Lower Platte concluded that 53% of anglers targeted catfish in the Platte River (Marty Hamel, UNL, personal communication). Areas that have historically been heavily fished in the Platte River were near Louisville, Two Rivers state lakes, Leshara, and Fremont (Holland and Peters 1994). Therefore, the Platte River, specifically the lower Platte River, has considerable angling pressure.

Understanding catfish population dynamics in any system is imperative to being able to effectively manage that catfish population. Several studies have investigated channel catfish population dynamics in the Platter River. From these studies, we have learned much about habitat preferences (Peters et al. 1989, Peters and Holland 1994), growth rates (Holland and Peters 1992b, Barada 2009), size structure (Holland and Peters 1992b, Barada 2009), survival (Holland and Peters 1992b, Barada 2009), and age structure (Holland and Peters 1992b, Barada 2009). Research by Barada (2009) found that growth rates were variable throughout the river, however, slower growth rates were observed in the lower Platte River compared to the central Platte River. Size structure ranged from 19-970mm, with a mean length of 286mm in 2007 and 241mm in 2008. Mortality rates also varied between reaches; the central Platte River exhibited an instantaneous mortality rate of 0.312, while in the lower Platte River mortality rate was 0.596.

Fish ages ranged from 0-13 with the majority of fish in the 2 to 3 year old range. Barada (2009) recommended continued monitoring of the Platte River to gain a better understanding of the system.

Complimentary to monitoring, is the need to understand the localized and regional effects of angling on catfish populations. We know anglers tend to harvest a lot of their catch. For example, Holland and Peters (1994) found that catfish were the most harvested fish in the Platte River. Similarly, Parham et al. (2005) reported catfish as the most sought after species in the lower Platte River. Additionally, a 2009 creel survey found that anglers harvested 78% of the catfish they caught during April and May (Marty Hamel, UNL, Personal communication). Therefore, gaining a better understanding of angler harvest rates and how they influence catfish population dynamics on the Platte River is essential to better manage the system.

There are many ways to examine angler harvest rates, such as creel surveys, mail surveys, or mark-recapture data. Creel surveys like those by Holland and Peters (1994), and Hamel (personal communication, 2009) give us an idea of angler pressure, harvest, harvest rates, size structure, and angler success. Mail surveys provide a better understanding of the angler population in terms of their socio-demographic characteristics, participation patterns, management preferences, and angling satisfaction (Ditton and Hunt 2001). Mail surveys also avoid bias inherent in face-to-face surveys due to unpredictable differences in how people respond to interviewers of varied appearances, personalities, and skills (Hudgins and Malvestuto 1985). Surveys seem to be more effective at determining angler dynamics; however, mark-recapture data provide an alternative and possibly a more in depth look at not only harvest rates, but how harvest affects survival, size structure, recruitment, and age structure.

Capture-recapture surveys have been used as a general sampling and analysis method to assess population status and trends in many biological populations (Burnham et al. 1996). Leg banding on waterfowl may be the best example of mark-recapture studies over the past few decades. Information gained from these studies help biologists to better estimate populations, mortality rates, and facilitate setting harvest limits based on population estimates over time. Numerous mark-recapture studies have been conducted to gain a better understanding of fish dynamics (Muoneke 1994, Gerhardt and Hubert 1991, Billman and Crowl 2007). Muoneke (1994) used a mark-recapture design to assess a heavily exploited white bass population in Texas. Muoneke (1994) looked at angler harvest by seasonal time frames, and found that white bass are much more susceptible to angling during the spring spawn. Catfish studies have also been conducted using mark-recapture. Gerhardt and Hubert (1991) used anchor tags to gain a better understanding of channel catfish fishing mortality in the Powder River system in Montana and Wyoming. Newcomb (1989) used a tagging approach to study overwintering habitats of catfish in the Missouri River. Barada (2009) also used a mark-recapture study in an enclosed side channel in the Platte River to assess gear selectivity and bias.

There have been no mark-recapture studies done to assess the Platte River catfish population. Valuable information could be gained by a mark-recapture study on the Platte River because it would provide estimates on population size, mortality and survival rates, angler harvest, and look at seasonal fishing effects. The pressure that anglers exert on catfish populations has been identified as a potential cause for differences in size structure, condition,

and growth in the Platte River (Barada 2009). Therefore, it is imperative to take a closer look at angler harvest rates and the effects harvest may be having on the catfish population on the Platte River, specifically the lower portion of the river.

Methods

1. Platte River Catfish Standard Sampling

We used a fixed site sampling approach for the catfish monitoring. Sampling locations were identified along the central and lower Platte River to assess catfish populations throughout the Platte River. Sites in the central Platte River included Elm Creek (site 10; River kilometer (Rkm) 370), Bassway Strip (site 9; north channel, Rkm 328), Wild Rose Ranch (site 8; Rkm 290) and Clarks (site 7; Rkm 219). Sites in the lower Platte River include Columbus (site 6; Rkm 161), Schuyler (site 5; Rkm 132), North Bend (site 4; Rkm 113), Leshara (site 3; Rkm 77), Louisville (site 2; Rkm 35), and Plattsmouth (site 1; Rkm 1).

Hoop nets and pulsed DC electrofisher were used to sample fish populations during spring (March-May) of 2011. Standard effort per site per season consisted of 20, 25-mm hoop nets; five, 10-minute high frequency (60Hz) DC electrofishing runs and five, 10-minute low frequency (15 HZ) DC electrofishing runs. Hoop nets were set in pools and runs along banklines and available in-stream habitat. Hoop nets were baited with cheese using 3-mm mesh nylon bags. Electrofishing was conducted using a cataraft mounted electrofishing unit. Electrofishing was conducted in a downstream fashion sampling bank habitat and any in-stream structure.

All captured fish were measured (total length), weighed, and returned to the water. Pectoral spines were removed from a subsample of channel and flathead catfish for age and growth analysis. We attempted to collect ten spines from channel catfish and flathead catfish for each 10-mm length interval per site. Pectoral spines and otoliths were also collected from catfish caught during area fishing club tournaments to examine length classes that were not captured with our standard sampling gears.

Age analyses of samples collected in 2011 are currently in progress. Pectoral spines used for age determination were cleaned in the lab and sectioned using a Buehler IsoMet saw. Spines were prepared using methods from Koch and Quist (2007) where the spine is embedded in epoxy to reduce damage and facilitate manipulation during sectioning. Spine cross-sections were mounted on glass slides and photographed using a high resolution digital camera. The digital images were imported into image analysis software for manual aging and measuring of annuli distances. Back-calculations were performed to obtain length-at-age values. Otoliths taken from tournament fish were prepared according to Buckmeier et al. (2002) photographed and aged/measured in a similar approach to the spine cross sections.

General physical and chemical data were collected each day a sampling site was visited. We measured water temperature, turbidity, dissolved oxygen and conductivity. Discharges from the nearest USGS gauging station was also recorded each day spent in field. General habitat characteristics (i.e., pools, runs, revetted banks, woody cover, etc.) were also recorded for each gear deployment or electrofishing run.

2. Angler Harvest and Population Estimate (Tagging Study)

Sampling sites are at Fremont and Louisville, Nebraska. These sites were chosen because they represent known angler concentrations through creel data by Holland and Peters (1994) and informal interaction with angling clubs during previous sampling. Our sampling area will be concentrated ± 5 km from each site's boat ramp. We will also be tagging catfish at the Loup River power canal near Columbus, NE in the fall to test suspicions of catfish using this area as an over-wintering area.

Tagging events were based on three month time frames to provide seasonal angling pressure data. Tagging events were identified as: March-May, June-August, September-November, and December-February. Target sample sizes per season were as followed for each site: March-May (N>150), June-August (N>650), September-November (N>650). December-February weren't sampled. Sample numbers were determined through consultation with Dr. Larkin Powell (UNL, 2010).

Fish were captured using high (60 pulses/sec) and low frequency (15 pulses/sec) pulsed DC electrofishing as well as 4 or 7 hoop, 25-mm mesh hoop nets. Captured fish ≥ 200 -mm were measured, weighed, adipose fin clip, tagged with a T-bar anchor tag (Floy type), then released. Each Floy tag had a unique identifier number, along with contact information so that anglers can return the tag along with other information such as date of capture, capture location, and whether or not the fish was harvested.

Recapture data will provide angler catch and harvest rates, and movements. These data will then be used to estimate population sizes and survival rates for the populations using program MARK. These population data will then be incorporated into harvest and management simulations using standard stock-recruitment models (e.g., Beverton-Holt) in Fisheries Analyses and Simulation Tools (FAST) software (Slipke and Maceina 2001). This software program provides a flexible means to simulate population viability under user-defined values for initial population size, mortality, and harvest rates. This analysis will assist fishery managers with recreational harvest issues by modeling the current populations under relevant management schemes (e.g., creel limits, size limits, slot limits, etc.) as needed.

Results

A total of 6,817 fish were collected in 1,543 gear deployments during 2011. The most commonly captured species were channel catfish, red shiners, and sand shiners (Table 1). A total of 5,554 channel catfish and 256 flathead catfish were collected (Table 1).

Platte River Catfish Standard Sampling

A total of 1,477 channel catfish were captured in the spring of 2011. Channel catfish sizes ranged from 59 to 704-mm (total length) (Figure 1). The 25-mm hoop nets typically caught fish between 200 to 300-mm, and had the highest mean length (282-mm) (Figure 2).

Electrofishing caught the broadest size range of catfish (9 to 590-mm TL), however, smaller fish, <200-mm, were typically caught (Figure 2).

Catch rates varied among sampling methods. The 25-mm mesh hoop nets collected the most channel catfish followed by low frequency electrofishing, and finally high frequency electrofishing (Figure 2). High frequency electrofishing catch per unit effort (CPUE) was significantly different compared to low frequency electrofishing (Figure 3).

Relative abundance estimates varied longitudinally along the river (Figures 4). Sites 6, 5, and 3 mean CPUE were the highest for 25-mm (4-hoop) hoop net data. Catch rates also varied longitudinally for low and high frequency electrofishing, however, no patterns were apparent.

Angler Harvest and Population Estimate (Tagging Study)

Tagging

A total of 3,269 channel and flathead catfish were tagged in 2011 (Table 2). Fremont had the largest number of total catfish tagged (N = 1,720), followed by Louisville (N = 1,321) (Table 2). I tagged more catfish in the fall (N = 1,628) than any other season (Table 2). We had a total of 231 recaptures in 2011 (Table 3). Anglers caught and reported 81 tagged fish, 70 more than in 2010, while we recaptured 150 while sampling in 2010 (Table 3). The summer season had the greatest number of recaptures (N = 104), while Fremont had the highest number of recaptures (N = 138) (Table 3).

Channel Catfish

A total of 3,000 channel catfish ranging from 200 to 730-mm were captured in 2011 (Figure 5). Fremont had the greatest number channel catfish captured (N = 1,595), followed by Louisville (N = 1,181) and Columbus (N = 224) (Figure 6). Channel catfish mean lengths were highest at Louisville (311-mm), followed by Fremont (296-mm) (Figure 6).

Catch rates varied among sampling methods, however, 25-mm (7-hoop) hoop nets had higher mean CPUE of channel catfish greater than 200-mm than 25-mm (4-hoop) hoop nets. Significant difference in catch rates among sites was shown for (4-hoop) hoop nets ($p < 0.001$), however, no difference was observed in (7-hoop) hoop nets. Electrofishing samples were excluded due to low sample sizes.

Flathead Catfish

A total of 248 flathead catfish ranging from 200 to 1150-mm were tagged in 2011 (Figure 8). Louisville had the greatest number of flathead catfish captured (N = 148), followed by Fremont (N = 100) (Figure 8). Flathead catfish mean lengths were greatest at Louisville (408-mm), followed by Fremont (390-mm) (Figure 8). Flathead catfish captured at Columbus were not represented in Figure 8 due to small sample size (N = 3).

Catch rates varied among sampling methods for flathead catfish. The 25-mm (7-hoop) hoop nets had significantly higher mean CPUE of channel catfish greater than 200-mm than 25-mm (4-hoop) hoop nets ($P < 0.05$; Figure 9), however, no differences were found between sites within each gear.

Program Plan

This project will provide an in depth analysis of catfish population dynamics and angler affects along the Platte River, specifically near Louisville and Fremont. Information gained on catfish population dynamics and angler affects will be important in aiding management decisions for the popular and economically important Platte River catfish fishery. Additionally, data collected during this study may be useful to guide management activities for other riverine systems throughout Nebraska and the Great Plains.

Literature Cited

- Barada, T. J. 2009. Catfish population dynamics in the Platte River, Nebraska. M.S. Thesis. University of Nebraska, Lincoln.
- Billman, E. J., and T. A. Crowl. 2007. Population dynamics of a June Sucker refuge population. *Transactions of the American Fisheries Society* 2007; 136: 959-965
- Burnham, K. P. D. R. Anderson, and G. C. White. 1994. Evaluation of the Kullback-Leibler discrepancy for model selection in open population capture-recapture models. *Biometrical Journal* 36: 299-315
- Ditton, R.B. and Hunt, K.M. 2001. Combining creel intercept and mail survey methods to understand the human dimensions of local freshwater fisheries. *Fisheries Management and Ecology* 8: 295-301.
- Gerhardt, D.R. and W.A. Hubert. 1991b. Population dynamics of a lightly exploited channel catfish stock in the Powder River system, Wyoming-Montana. *North American Journal of Fisheries Management* 11:200-205.
- Hurley, K.L. and K. Duppong Hurley. 2005. 2002 licensed angler survey summarized results. Nebraska Game and Parks Commission, Lincoln.
- Holland, R.S. and E.J. Peters. 1992b. Age and growth of channel catfish (*Ictalurus punctatus*) in the lower Platte River, Nebraska. *Transactions of the Nebraska Academy of Sciences* 19:32-42.
- Holland, R.S. and E.J. Peters. 1994. Biological and economical analyses of the fish communities in the Platte River: creel survey fishing pressure along the lower Platte River. Final Report to Nebraska Game and Parks Commission, Federal Aid in Fish Restoration Project F-78-R.
- Hudgins, M. D., and S. P. Malvestuto. 1985. An evaluation of factors affecting creel clerk performance. *Proceedings of the Annual Conference Southeastern Association of Fish and Wildlife Agencies* 36(1982):252-263.
- Hurley, K.L. and K. Duppong Hurley. 2007. Nebraska catfish anglers: descriptions and Insights derived from the 2002 Nebraska licensed angler survey. Nebraska Game and Parks Commission, Lincoln.
- Muoneke, M. I. 1994. Dynamics of a heavily exploited Texas white bass population. *North American Journal of Fisheries Management* 14:415-422.
- Parham, J.E., J.J. Olnes, C.N. Reade, and E.J. Peters. 2005. Ecology and management of pallid sturgeon and sturgeon chub in the lower Platte River, Nebraska. Final Report to Nebraska Game and Parks Commission, Federal Aid Project F-141-R.

- Quist, M.C., C.S. Guy, M.A. Pegg, P.J. Braaten, C.L. Pierce, and V.T. Travnichek. 2002. Potential Influence of harvest on shovelnose sturgeon populations in the Missouri River System: a case for pro-active management. *North American Journal of Fisheries Management* 22:537-549.
- Shoup, D.E., R.E. Carlson, R.T. Heath, and M.W. Kershner. 2003. Comparison of the species composition, catch rate, and length distribution of the catch from trap nets with three different mesh and throat size combinations. *North American Journal of Fisheries Management* 23:462-469.
- Slipke, J.W. and M.J. Maceina. 2001. *Fisheries Analysis and Simulation Tools (FAST 2.0)*. Auburn University, Auburn, Alabama.
- Stauffer, K.W. and B.D. Koenen. 1999. Comparison of methods for sampling flathead catfish in the Minnesota River. Rabeni, H.L. Schramm, Jr., and T. Coon, editors. *Catfish 2000: proceedings of the international ictalurid symposium*. American Fisheries Society, Symposium 24, Bethesda, Maryland.
- Vokoun, J.C. and C.F. Rabeni. 2001. A standardized sampling protocol for channel catfish in prairie streams. *North American Journal of Fisheries Management* 21:188-197.
- U.S. Fish and Wildlife Service. 2007. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. U.S. Fish and Wildlife Service, Arlington, Virginia.
- Zuerlein, G. 1984. Nebraska Statewide fishing survey. Final Report to Nebraska Game and Parks Commission, Federal Aid in Sportfish Restoration Project F-73-R.

Table 1. Total species and abundance captured in all gears in the Platte River, Nebraska during 2011.

Species	Count	Species	Count
Shovelnose sturgeon	6	Smallmouth Buffalo	2
Longnose gar	42	Walleye	5
Shortnose gar	65	River carpsucker	96
Goldeye	16	Quillback carpsucker	1
Gizzard shad	8	White sucker	2
Flathead Chub	3	Blue sucker	1
Creek Chub	5	Shorthead redhorse	23
Red Shiner	178	Black bullhead	9
Emerald Shiner	12	Yellow bullhead	10
River Shiner	125	Blue Catfish	33
Sand Shiner	67	Channel Catfish	5,554
Plains Minnow	2	Flathead Catfish	256
Suckermouth Minnow	22	Stonecat	2
Fathead Minnow	1	White perch	2
Grass carp	3	White bass	4
Common Carp	155	Green sunfish	8
White crappie	1	Bluegill	3
Black crappie	2	Largemouth bass	3
Freshwater drum	86		

Table 2. Total number of catfish tagged by season in 2011. *Columbus only sampled in the Fall.

Tagging Totals				
Site	Spring	Summer	Fall	All Seasons
Fremont	327	681	712	1720
Louisville	172	461	688	1321
Columbus	N/A	N/A	228	228
Totals	499	1142	1628	3269

Table 3. Total numbers of catfish recaptures by season and recapture methods in 2011.

Site	Recapture Totals			All Seasons	Recapture Methods	
	Spring	Summer	Fall		Sampling	Angler
Fremont	23	73	42	138	98	40
Louisville	12	29	50	91	52	39
Columbus	0	2	0	2	0	2
Totals	35	104	92	231	150	81

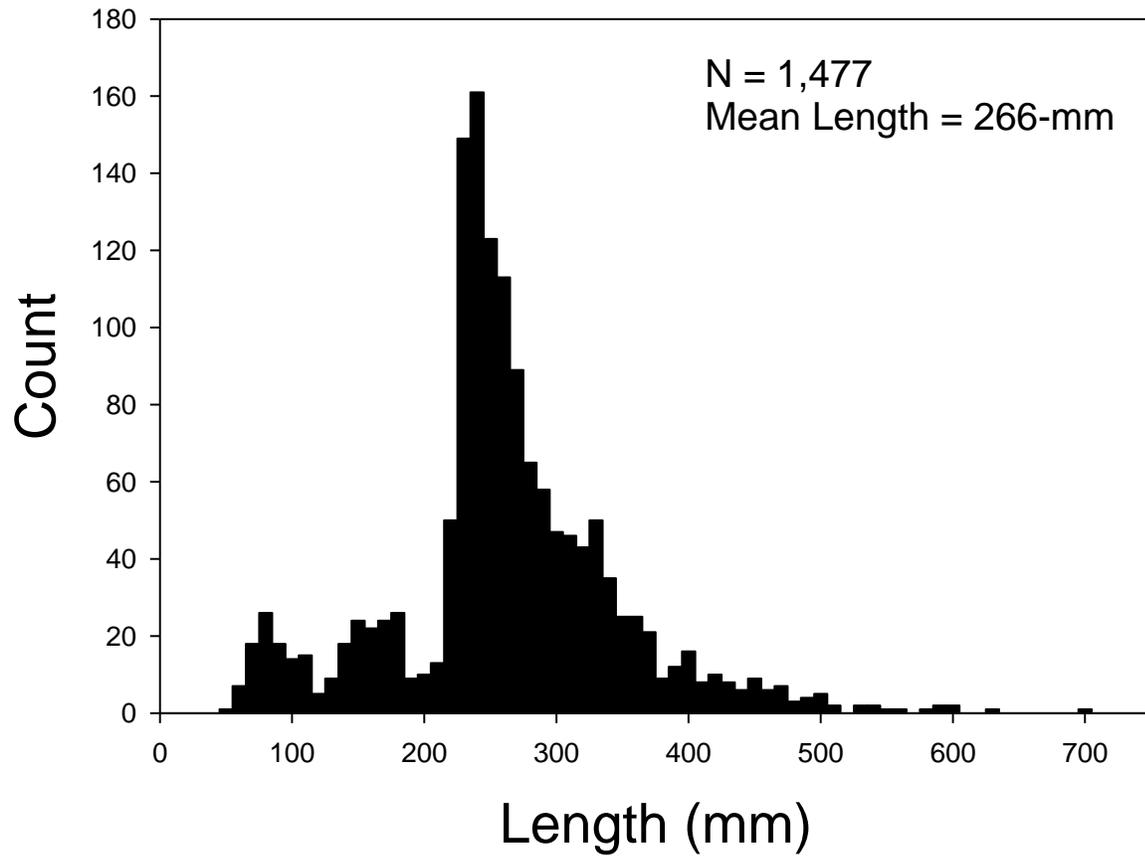


Figure 1. Standard sampling length-frequency distribution of channel catfish caught in all gears in the Platte River, Nebraska during 2011.

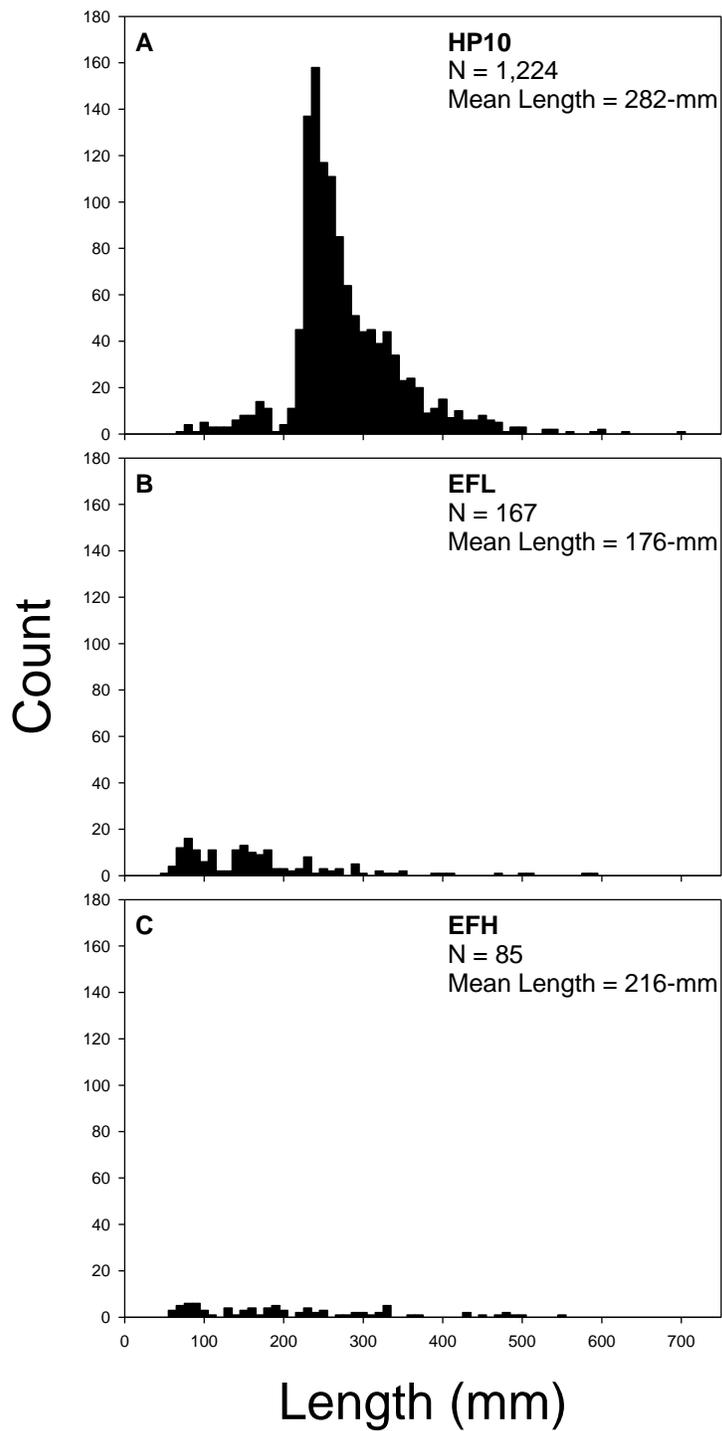


Figure 2. Standard sampling length-frequency distribution of channel catfish captured by 25-mm hoop net (HP10) (A), low (EFL) and high (EFH) pulsed electrofisher (B) in the Platte River, Nebraska during 2011.

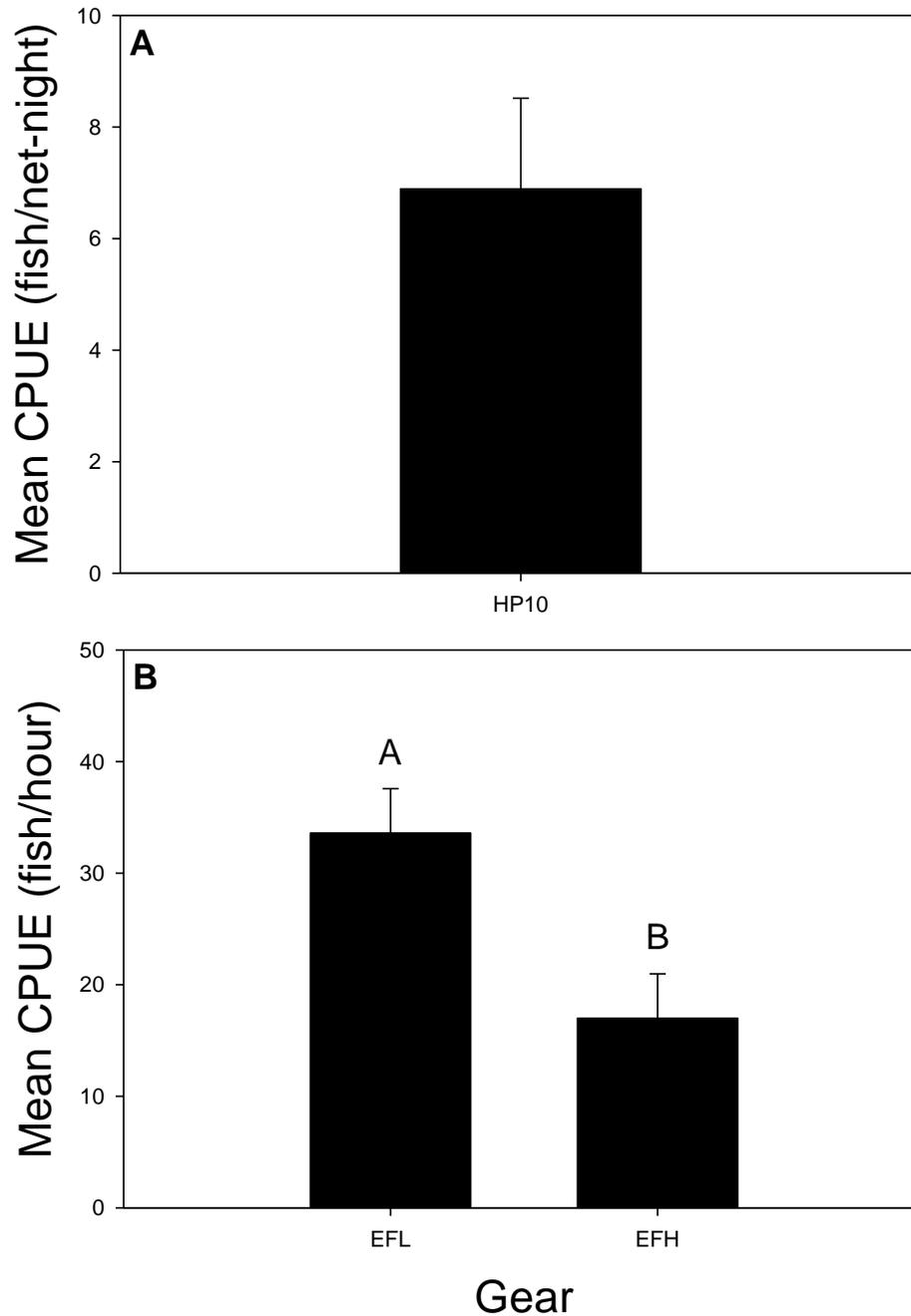


Figure 3. Standard sampling channel catfish mean catch per unit effort (CPUE) of 25-mm hoop nets (HP10) (A), low (EFL) and high (EFH) pulsed electrofisher (B) deployed in the Platte River, Nebraska during 2011. Different uppercase letters above plots indicate differences among electrofishing gears (B).

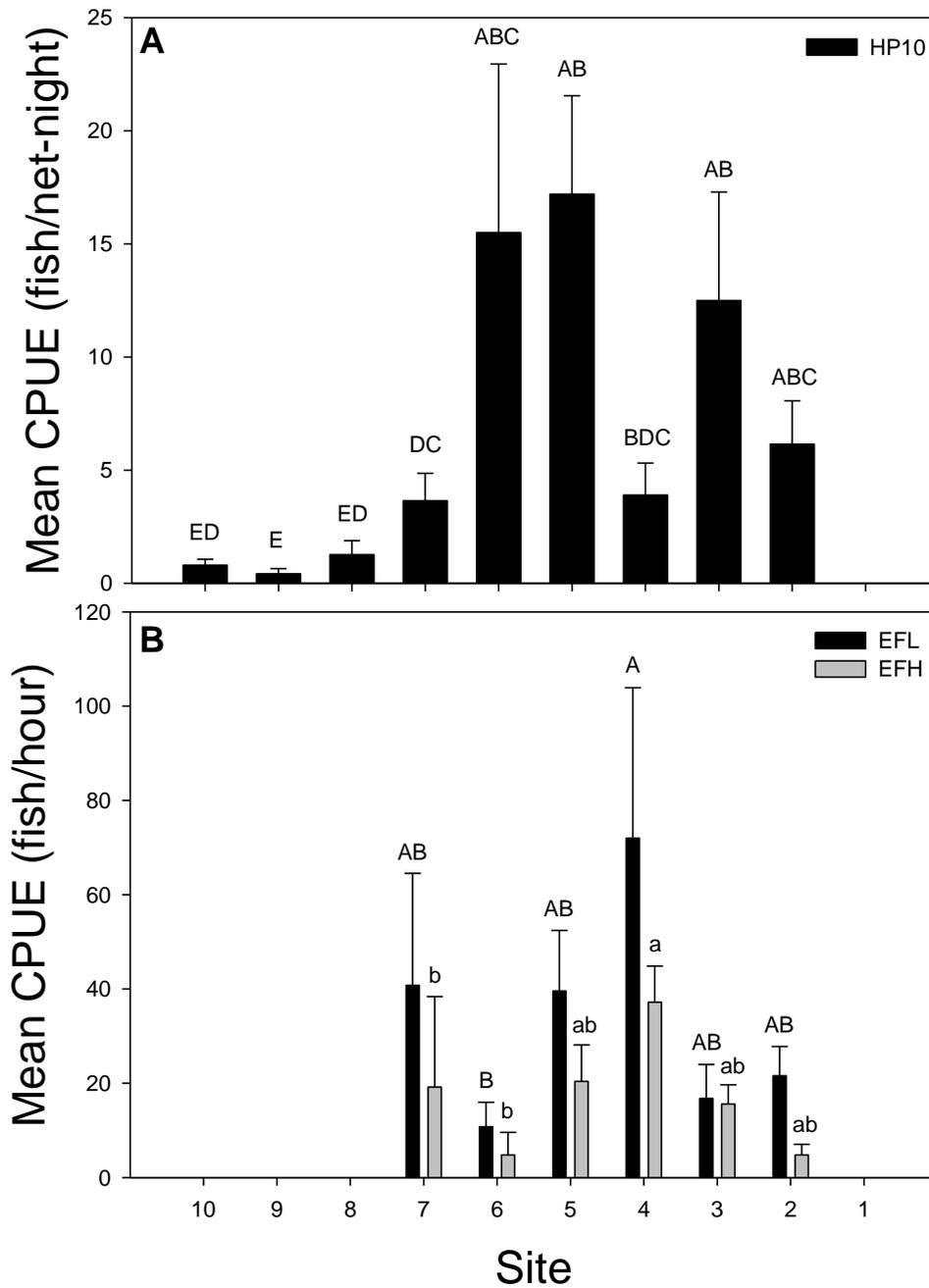


Figure 4. Standard sampling longitudinal channel catfish mean catch per unit effort (CPUE) of 25-mm (HP10) hoop nets (A), low (EFL; B) and high (EFH; B) pulsed electrofisher (B) in the Platte River, NE during 2011. Different uppercase letters above plots indicate differences among HN10 (A) or EFL(B) CPUE and different lowercase letters indicate differences among EFH (B) CPUE. *Sites 1, 8, 9, and 10 were not sampled with electrofisher.

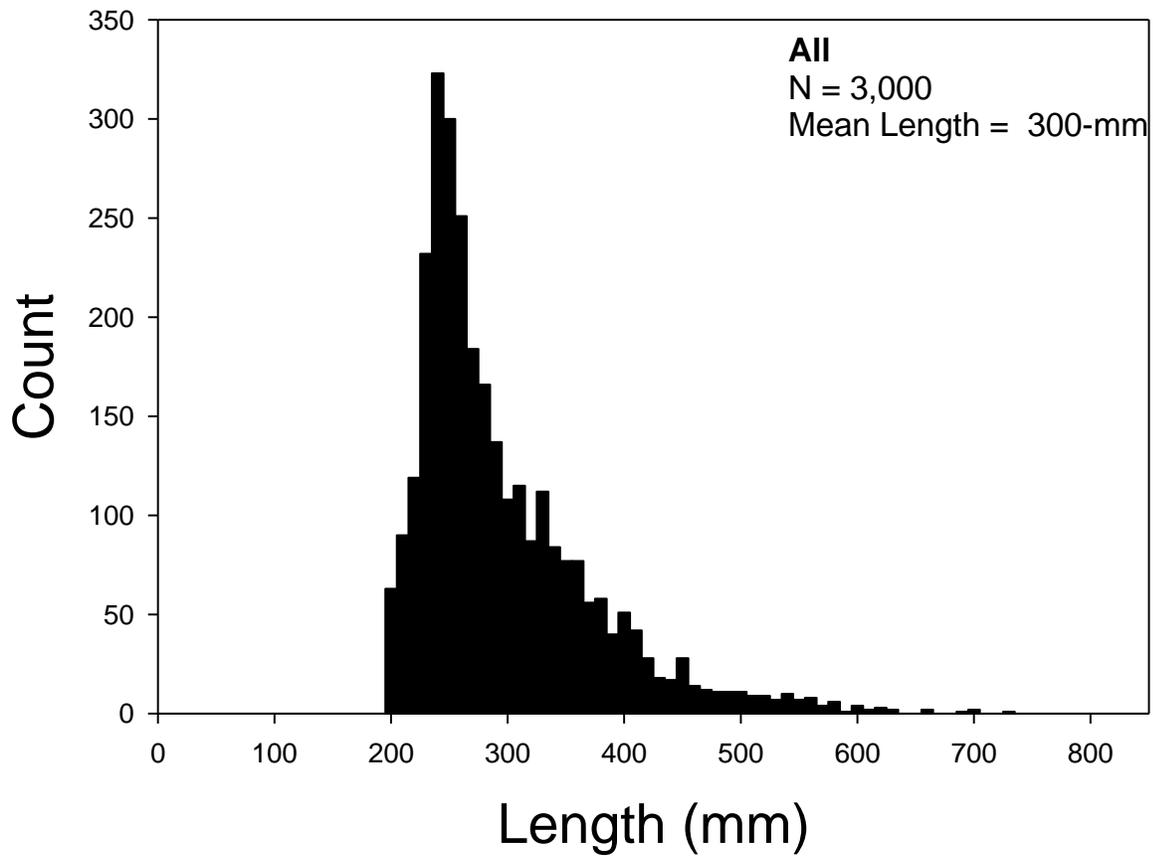


Figure 5. Length-frequency distribution of tagged channel catfish caught in all gears in the Platte River, Nebraska during 2011.

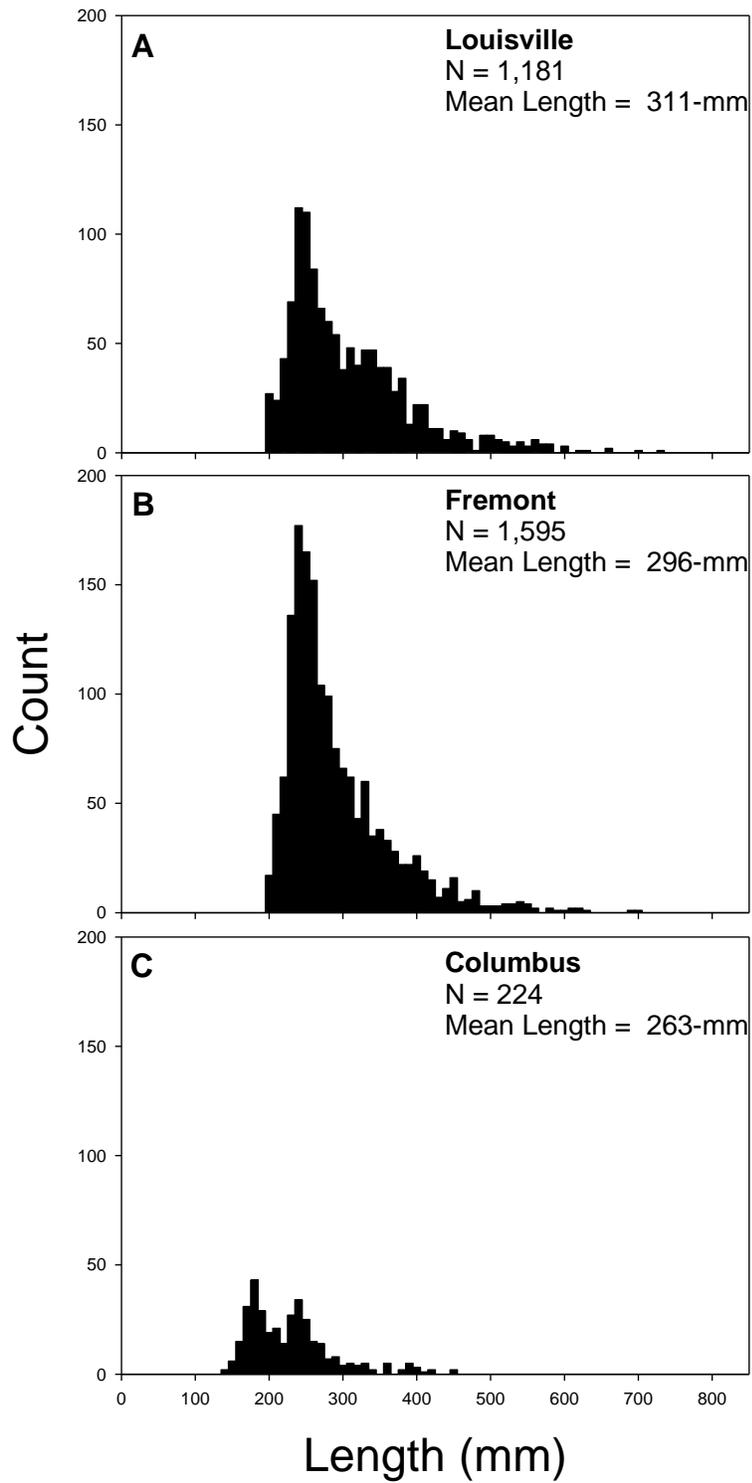


Figure 6. Length-frequency distribution of tagged channel catfish captured at Louisville (A), Fremont (B), and Columbus (C) in the Platte River, Nebraska during 2011.

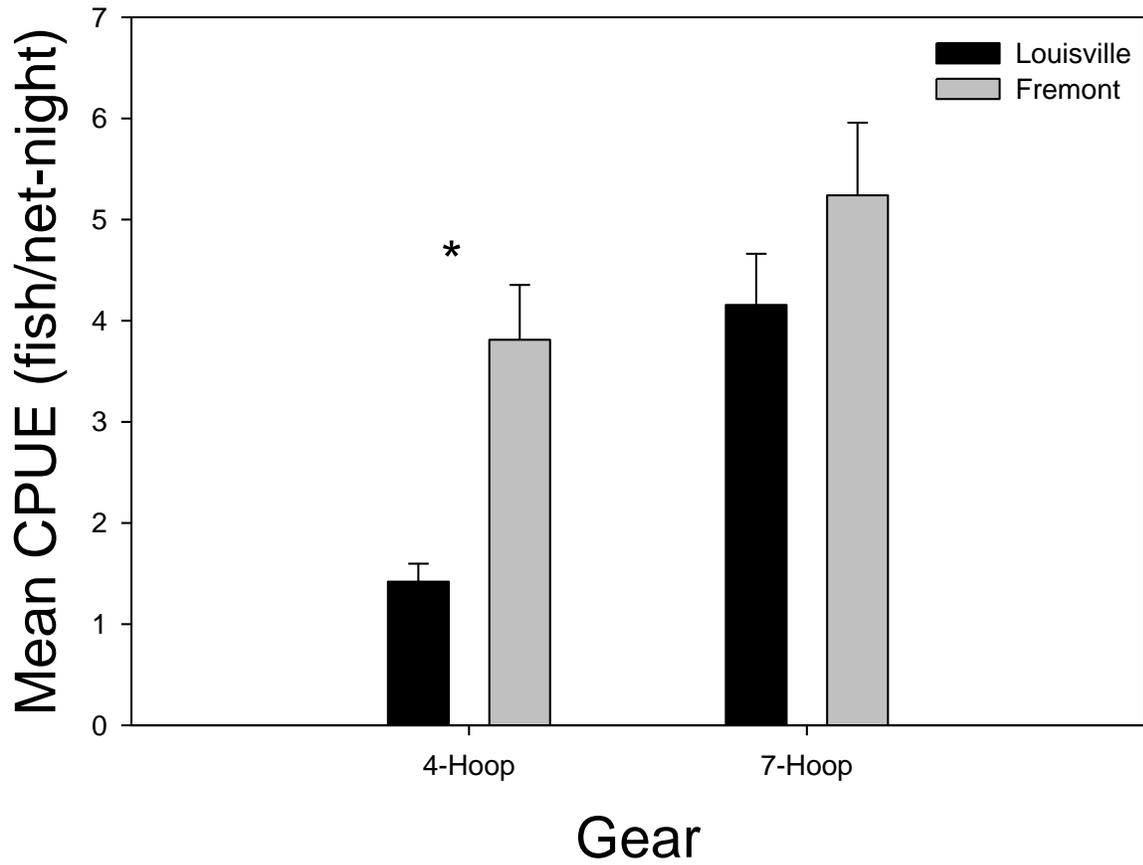


Figure 7. Mean catch per unit effort (CPUE) of tagged channel catfish captured by 25-mm (4-hoop) hoop net, 25-mm (7-hoop) hoop net in the Platte River, Nebraska during 2011. An (*) represents a significant difference in catch rates between sites.

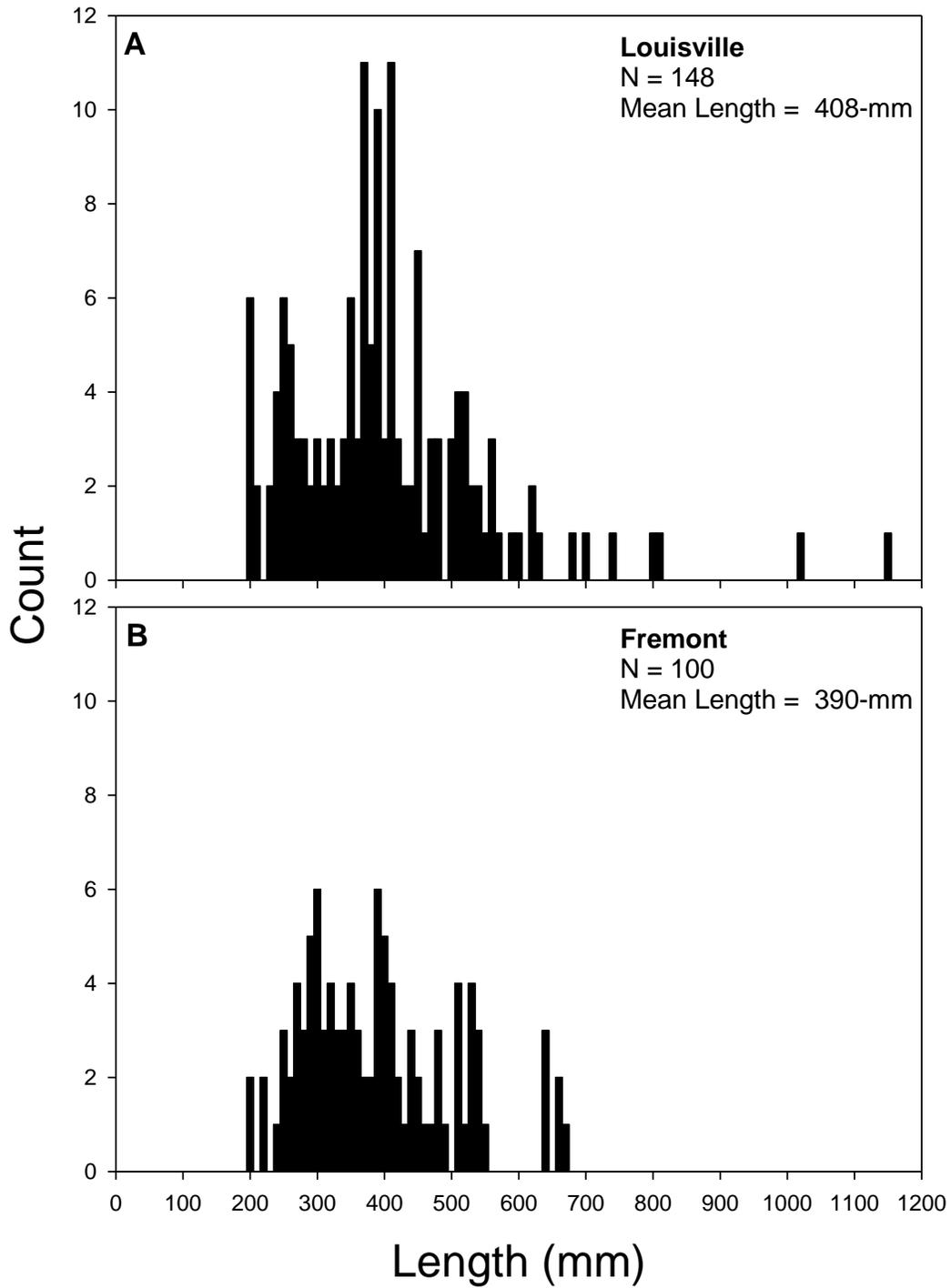


Figure 8. Length-frequency distribution of tagged flathead catfish captured by all gears at Louisville (A), and Fremont (B) in the Platte River, Nebraska during 2011.

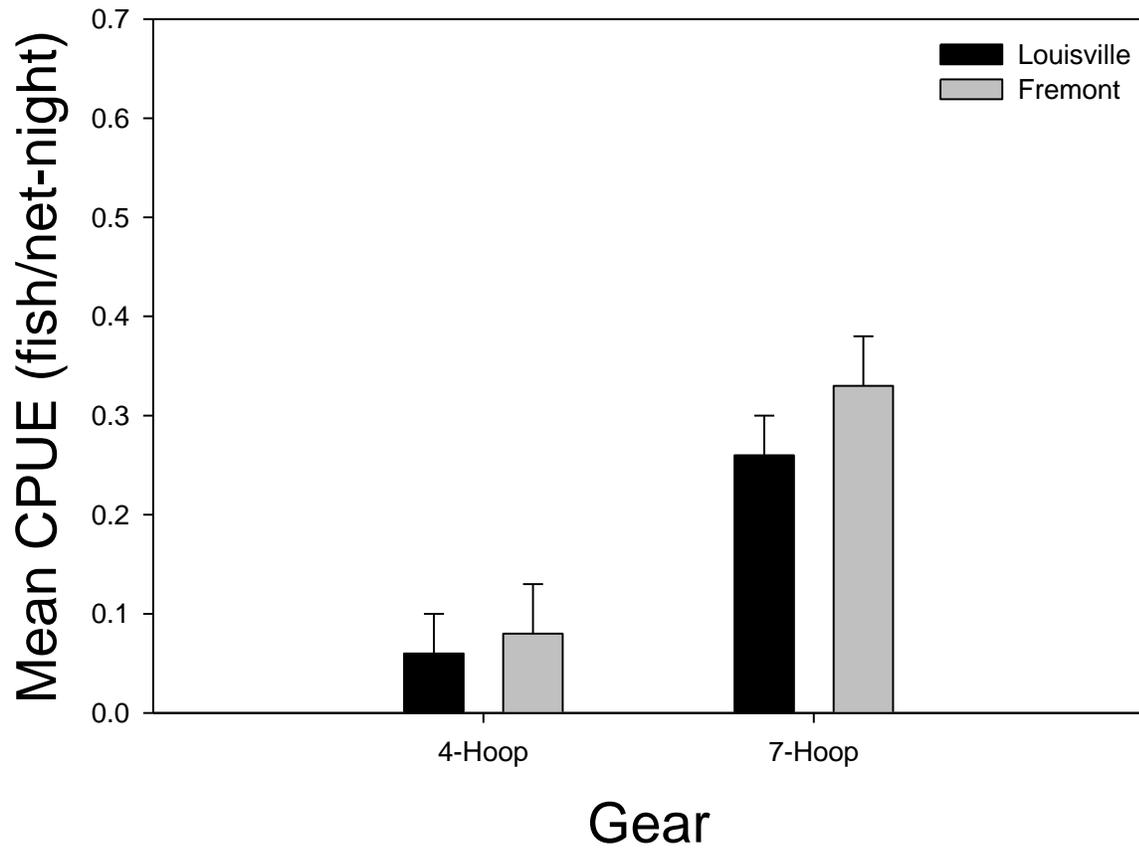


Figure 9. Mean catch per unit effort (CPUE) of tagged flathead catfish captured by 25-mm (4-hoop) hoop net, 25-mm (7-hoop) hoop nets in the Platte River, Nebraska during 2011.