

Performance Report  
Evaluation of the trophy potential for flathead catfish in the Kansas River

Project No. F-50-R-1  
Period Covered January 2005 – December 2005

Fisheries and Wildlife Division  
Kansas Department of Wildlife and Parks

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**Study Title:** Evaluation of the trophy potential for flathead catfish in the Kansas River

**Objectives:**

1. Determine the distribution and size structure of flathead catfish in the Kansas River from Junction City to Kansas City, Kansas.
2. Evaluate movement of flathead catfish in the Kansas River to determine if management of the species can be site specific.
3. Determine age, growth, and mortality of flathead catfish in the Kansas River from Junction City to Kansas City, Kansas.
4. Determine the effects of various management alternatives (e.g., minimum length limits) of flathead catfish populations in the Kansas River through modeling (i.e., FAST).

**Narrative:**

*Sampling design*

The Kansas River from Junction City to the confluence of the Missouri River in Kansas City was divided into 5 roughly 50 km reaches based upon logistical access ([rkm = river kilometer], reach 1, rkm 0-43.3; reach 2, rkm 43.4-83.5; reach 3, rkm 83.6-162.4; reach 4, 162.5-218.7; reach 5, rkm 218.8-276.8; Table 1). Each individual reach was then divided into approximately 5-16 km subunits with the goal being to sample one of these subunits per day. Within each 5-16 km subunit, a minimum of three 1.6 km segments were randomly selected to represent the single subunit of an individual reach. Within each 1.6 km segment, a minimum of three electrofishing stations were completed for each of three different shoreline habitats; mud bank, rip-rap, and log jams (see figure 1 for complete schematic). Only one habitat type was sampled for each electrofishing station. Each low-pulse electrofishing station was run for a minimum of 300 seconds or until completion of the entire habitat type (150-320 Volts, 1-5 Amps, 15-20 pulses/second). Electrofishing sampling was conducted from May 19 – Aug. 19 2005. However, data collected between June 2-19 was omitted from analysis due to rain and subsequent high water levels. Habitat measurements (depth, water temperature) were logged at top, middle, and bottom transects of each electrofishing station using an Eagle Fish Elite 480 recording depthfinder. Transects were recorded perpendicular from the shoreline to the middle of the channel at a distance of approximately 30 m determined by a rangefinder; a distance we judged to be the extended range of our electrofishing capability. Each transect was stored on the depthfinder and downloaded in the office for future analysis.

In an effort to increase the number of marked flathead catfish, hoop nets and high-pulse electrofishing were employed in 2005. Hoop nets (7-ring, 3' diameter, 1" mesh,

12' long) were deployed from July 9 – Aug. 18 2005, during high water temperatures (22-28°C). A minimum of 10 (range 10-13) unbaited nets were placed in each of the five reaches near logistic river access points and fished for approximately 24 hours and pulled. We also created a series of 6 fixed high-pulse electrofishing sites (300-490 Volts, 10-15 Amps, 40-60 pulses/second) throughout the Kansas River; each site was selected based on logistic access near major cities and sampled seasonally (Manhattan, Wamego, Topeka, directly above and below Bowersock Dam in Lawrence, and Kansas City). Six electrofishing stations were sampled per fixed site for a total of 36 sample stations per season. Flathead catfish were collected during these additional sampling events and handled as stated below.

### *Fish handling and collection*

All captured fish were identified to species, measured for total length (TL), and weighed (g). All fish were released near the original site of capture. Flathead catfish > 305 mm TL were tagged with individually numbered Floy tags for future growth and movement analysis and given adipose fin clips for future determination of tag loss.

We also removed the left pectoral spine from flathead catfish captured with electrofishing and hoop netting for age and growth determination. In the laboratory, pectoral spines were cut as close to the basal articulation as possible using an isomet saw. A minimum of 2 sections of each spine were cut, depending on the fish size. Pectoral spines were read and annuli counted using ImagePro analysis system. A sub-sample of 45 spines was aged by 2 independent readers; disagreements between readers were solved with concert reads. Flathead catfish that were not aged were assigned ages using an age-length key.

### *Analysis*

Preliminary analysis included comparing population parameters (catch rates, mean length at age, relative weights) among the 5 river reaches. For the purposes of this report, we included the flathead catfish only collected during the summer random low-pulse electrofishing for relative abundance analysis. Catch per unit effort (CPUE; number of flathead catfish collected per hour of electrofishing) was used to determine relative abundance. Age, growth, movement, and condition (relative weight) analyses used all flathead catfish collected from 2005 summer random and fixed site electrofishing stations, and summer hoop nets. Growth was determined by back-calculating mean length at age using the Fraser-Lee method with an *a* value of 25 mm. Mean relative weight was used to assess condition for different ages of flathead catfish.

## **Results and Analysis:**

### *Electrofishing*

In 2005, we captured 478 flathead catfish ranging between 68-1,170 mm TL (Figure 2); 158 flatheads from the 2005 seasonal fixed site sampling, and 320 from the summer random sampling. Further analysis of flathead catfish catch rates in this report

will only represent the data collected during the summer random sampling period (May 19-Aug. 19, 2005).

In the summer of 2005, we collected fish from a total of 316 individual electrofishing stations throughout the entire Kansas River (rkm 2.1 to rkm 276.2). A total of 1,491 fish were captured representing 11 families (Table 2). Mean TL of flathead catfish differed between reaches (ANOVA,  $P < 0.0001$ ; Figure 3), but this may reflect the timing of sampling, especially in the upper reaches of the river. Reaches 4 and 5 were sampled on May 25-28, prior to the warmest ( $> 22^{\circ}\text{C}$ ) river temperatures, and June 20-24, after river water levels stabilized following a three week-long flood event. Flathead catfish catch per hour (CPUE) differed among reaches (ANOVA,  $P < 0.0001$ ), with the highest catches in reach 2 and 3 (Figure 4). Mean flathead catfish CPUE across the entire Kansas River was 2.29 fish/hour and ranged between 0.20 to 5.51; the highest catch rates focused around Topeka (Figure 5). We observed differences in catch rates of stock-sized flathead catfish among reaches (ANOVA,  $P < 0.0001$ ), whereas quality, preferred and memorable flathead catfish appeared to be relatively uniform across all river reaches ( $P = 0.183, 0.309, 0.572$ , respectively; Figure 6).

A total of 2 flathead catfish were recaptured during 2005 (one angler return, one fixed site electrofishing). The angler-returned fish was tagged during the March fixed site electrofishing at rkm 237.4 and caught on a bank line at rkm 237.7, at the confluence of the Big Blue and Kansas rivers approximately 0.3 km downstream. The fish was sacrificed by the angler. The other recaptured flathead catfish was first tagged during the June fixed site electrofishing at rkm 124.6 in Topeka at a TL of 359 mm. The fish was recaptured during the September fixed site electrofishing in the same station originally captured at a TL of 371 mm.

A total of 362 pectoral spines were removed and aged (28 from hoop nets, 334 from electrofishing); ages ranged between 0-21 for the 320 fish from the summer random electrofishing (Figure 7). Mean lengths at age were calculated for 1-4 year old flathead catfish and compared among river reaches; we observed differences for 1-3 year olds ( $P = 0.011, 0.018, 0.036$ , respectively) but no difference was seen in 4 year old fish ( $P = 0.393$ ). In general, faster growth of flathead catfish was observed in the upper reaches of the Kansas River (Figure 8). We compared catch rates of age 1-4 flathead catfish among reaches (age 1,  $< 190$  mm; age 2, 191-310 mm; age 3, 311-480 mm; age 4, 481-600 mm). One and two-year old flathead catfish were more abundant in reaches 2 and 3 (ANOVA,  $P < 0.0001$ ), than the other reaches whereas three and four-year old fish were equally captured among all reaches (ANOVA,  $P = 0.236$ ; Figure 9). Relative weights for age 1 flatheads were consistently higher than older fish across all river reaches (ANOVA,  $P < 0.0001$ ); no difference in relative weight was observed among reaches within the individual ages (ANOVA,  $P = 0.341$ ; Figure 10).

### **Future directions:**

In the summer of 2006 we will complete an additional field season using the random summer sampling design discussed above. This sampling will be more focused upon targeting flathead catfish during the warmest river water temperatures ( $> 22^{\circ}\text{C}$ , June – August). The goal with this sampling will be to increase the overall number of flathead

catfish captured as well as add to the number of recaptures for growth and movement analysis. Captured flathead catfish will be handled similarly to those captured in 2005.

We will also complete objective 4 of the project concerning the FAST modeling of the river to evaluate various length limits of flathead catfish populations in the Kansas River. The data collected will be incorporated into the model to determine if specific reaches of the Kansas River need to be established and managed separately to preserve the trophy potential of the flathead catfish population.

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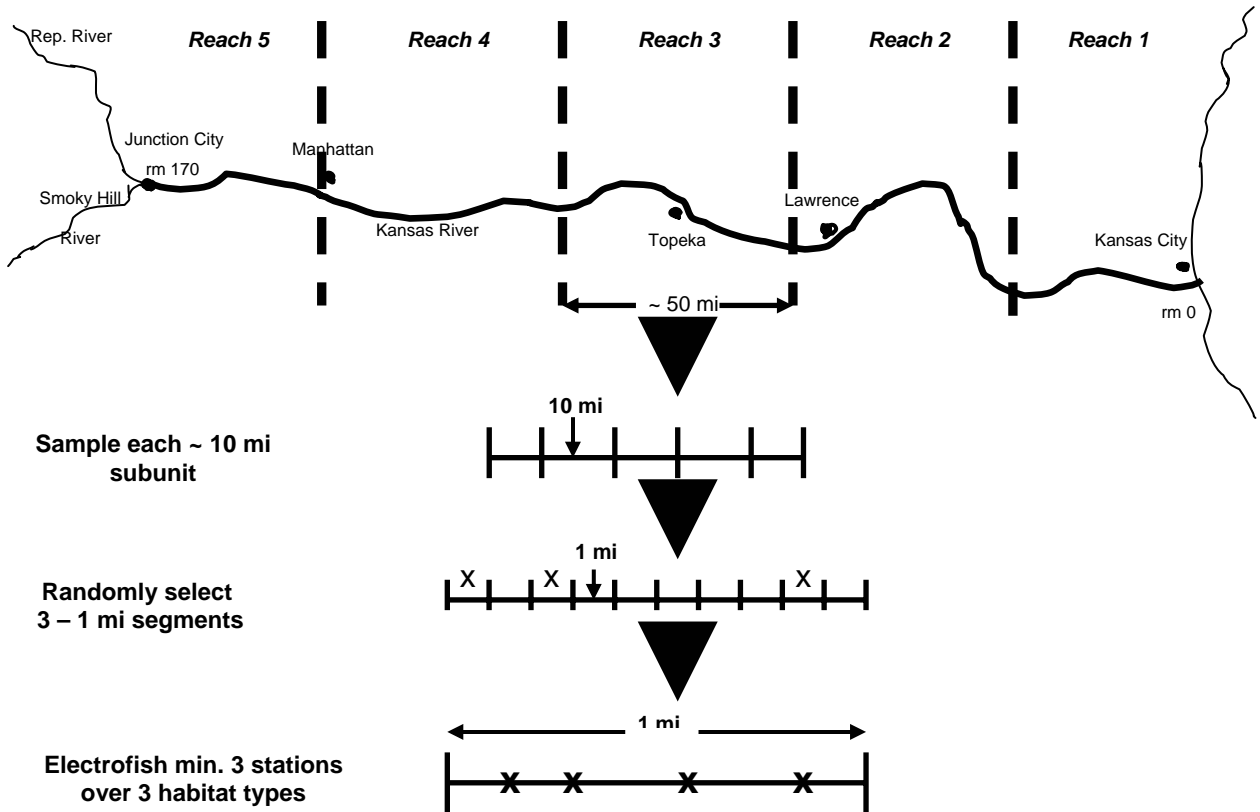
Total Study Costs: \$136,547

**Table 1.** Kansas River electrofishing reaches, associated river kilometers (rkm), and nearest towns associated with electrofishing reaches, 2005. BWSD = Bowersock Dam, a low-head dam on main channel of river in Lawrence.

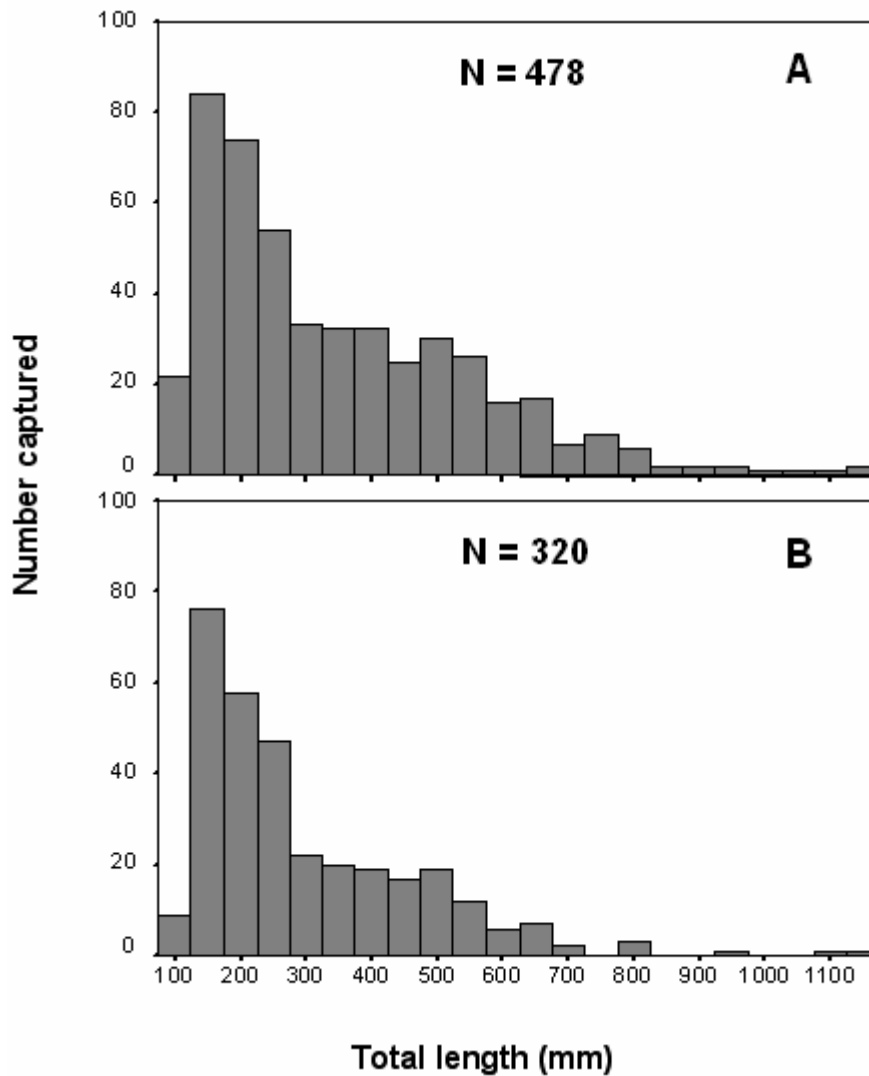
<b>Reach</b>	<b>River kilometer (range)</b>	<b>Approximate location</b>
1	0.0 – 43.3	Kansas City to Bonner Springs
2	43.4 – 83.5	Bonner Springs to Lawrence (below BWSD)
3	83.6 – 162.4	Lawrence (above BWSD) to Maple Hill
4	162.5 – 218.7	Maple Hill to St. George
5	218.8 – 276.8	St. George to Ft. Riley

**Table 2.** Common name, scientific name, family, and number of each fish species captured during 2005 Kansas River summer random electrofishing sampling.

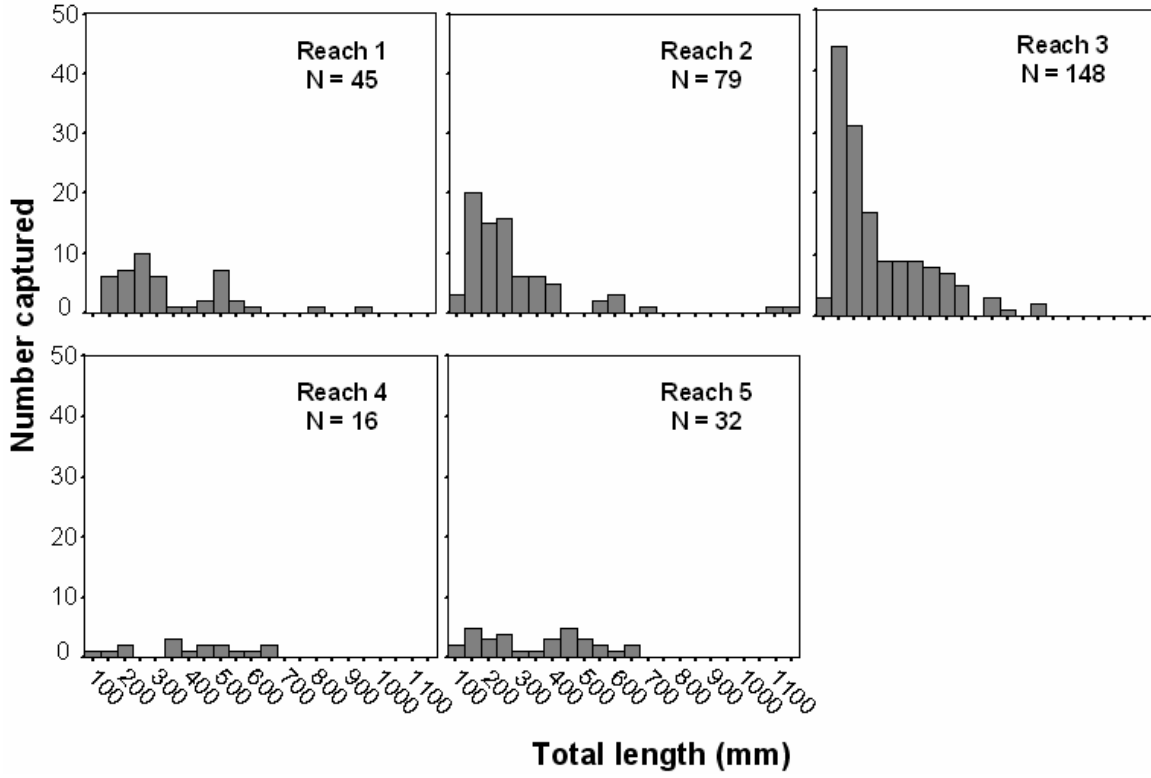
<b>Common name</b>	<b>Scientific name</b>	<b>Family</b>	<b>Number captured</b>
Bigmouth buffalo	<i>Ictiobus cyprinellus</i>	Catostomidae	5
Smallmouth buffalo	<i>Ictiobus bubalus</i>	Catostomidae	65
Blue sucker	<i>Cycleptus elongatus</i>	Catostomidae	67
Quillback	<i>Carpiodes cyprinus</i>	Catostomidae	3
River carpsucker	<i>Carpiodes carpio</i>	Catostomidae	198
Shorthead redhorse	<i>Moxostoma macrolepidotum</i>	Catostomidae	5
Common carp	<i>Cyprinus carpio</i>	Cyprinidae	82
Silver carp	<i>Hypophthalmichthys molitrix</i>	Cyprinidae	1
Grass carp	<i>Ctenopharyngodon idella</i>	Cyprinidae	3
Red shiner	<i>Cyprinella lutrensis</i>	Cyprinidae	135
Sand shiner	<i>Notropis stramineus</i>	Cyprinidae	6
Emerald shiner	<i>Notropis atherinoides</i>	Cyprinidae	11
Bullhead minnow	<i>Pimephales vigilax</i>	Cyprinidae	4
Bluntnose minnow	<i>Pimephales notatus</i>	Cyprinidae	4
Largemouth bass	<i>Micropterus salmoides</i>	Centrarchidae	4
Smallmouth bass	<i>Micropterus dolomieu</i>	Centrarchidae	2
Bluegill sunfish	<i>Lepomis macrochirus</i>	Centrarchidae	15
Green sunfish	<i>Lepomis cyanellus</i>	Centrarchidae	13
Longear sunfish	<i>Lepomis megalotis</i>	Centrarchidae	1
Orangespotted sunfish	<i>Lepomis humilis</i>	Centrarchidae	2
White crappie	<i>Pomoxis annularis</i>	Centrarchidae	6
Flathead catfish	<i>Pylodictis olivaris</i>	Ictaluridae	320
Blue catfish	<i>Ictalurus furcatus</i>	Ictaluridae	6
Channel catfish	<i>Ictalurus punctatus</i>	Ictaluridae	73
Slender madtom	<i>Noturus exilis</i>	Ictaluridae	2
Longnose gar	<i>Lepisosteus osseus</i>	Lepisosteidae	77
Shortnose gar	<i>Lepisosteus platostomus</i>	Lepisosteidae	53
Gizzard shad	<i>Dorosoma cepedianum</i>	Clupeidae	27
Walleye	<i>Sander vitreus</i>	Percidae	1
Freshwater drum	<i>Aplodinotus grunniens</i>	Sciaenidae	209
Goldeye	<i>Hiodon alosoides</i>	Hiodontidae	12
White bass	<i>Morone chrysops</i>	Moronidae	5
Shovelnose sturgeon	<i>Scaphirhynchus platyrhynchus</i>	Acipenseridae	37



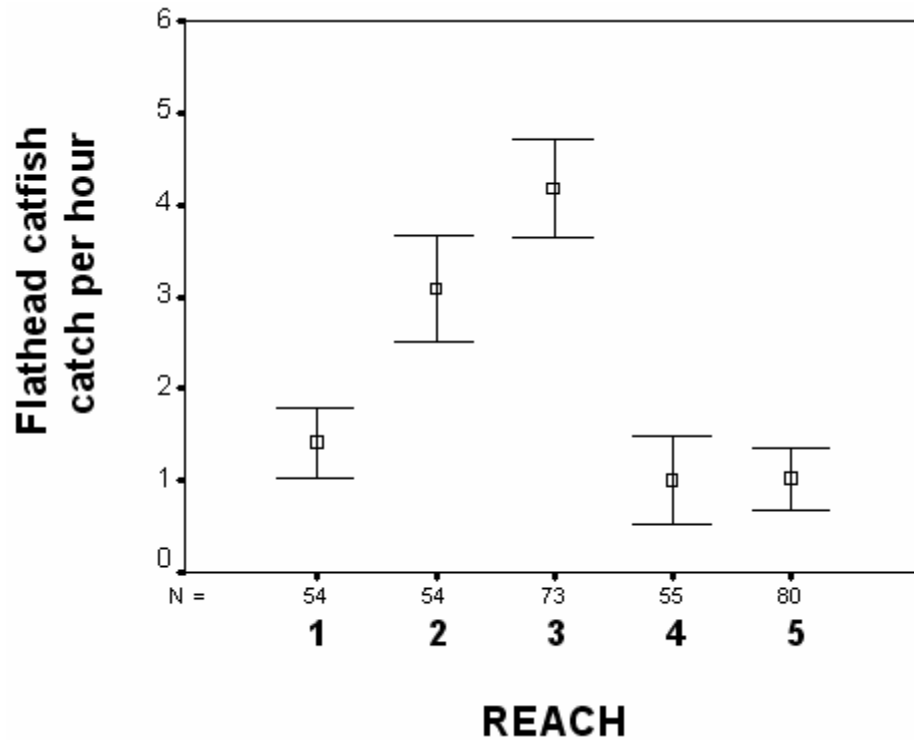
**Figure 1.** Sampling design schematic of summer random electrofishing sampling completed in 2005. X denotes electrofishing stations.



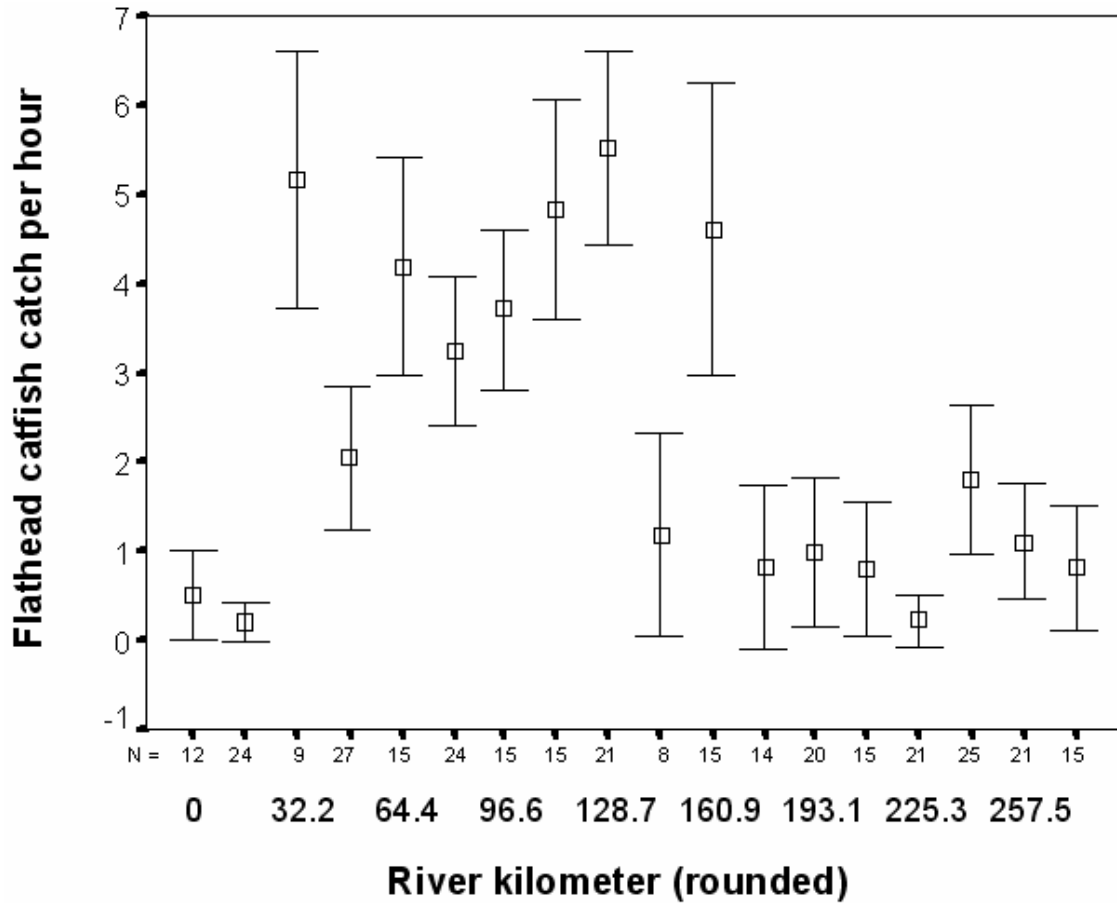
**Figure 2.** Length frequency histogram of all flathead catfish captured in 2005; Kansas River, KS. (A) Data collected from fixed site and summer random electrofishing and hoop net sampling; (B) Data collected only from summer random electrofishing. N = number of flathead catfish collected.



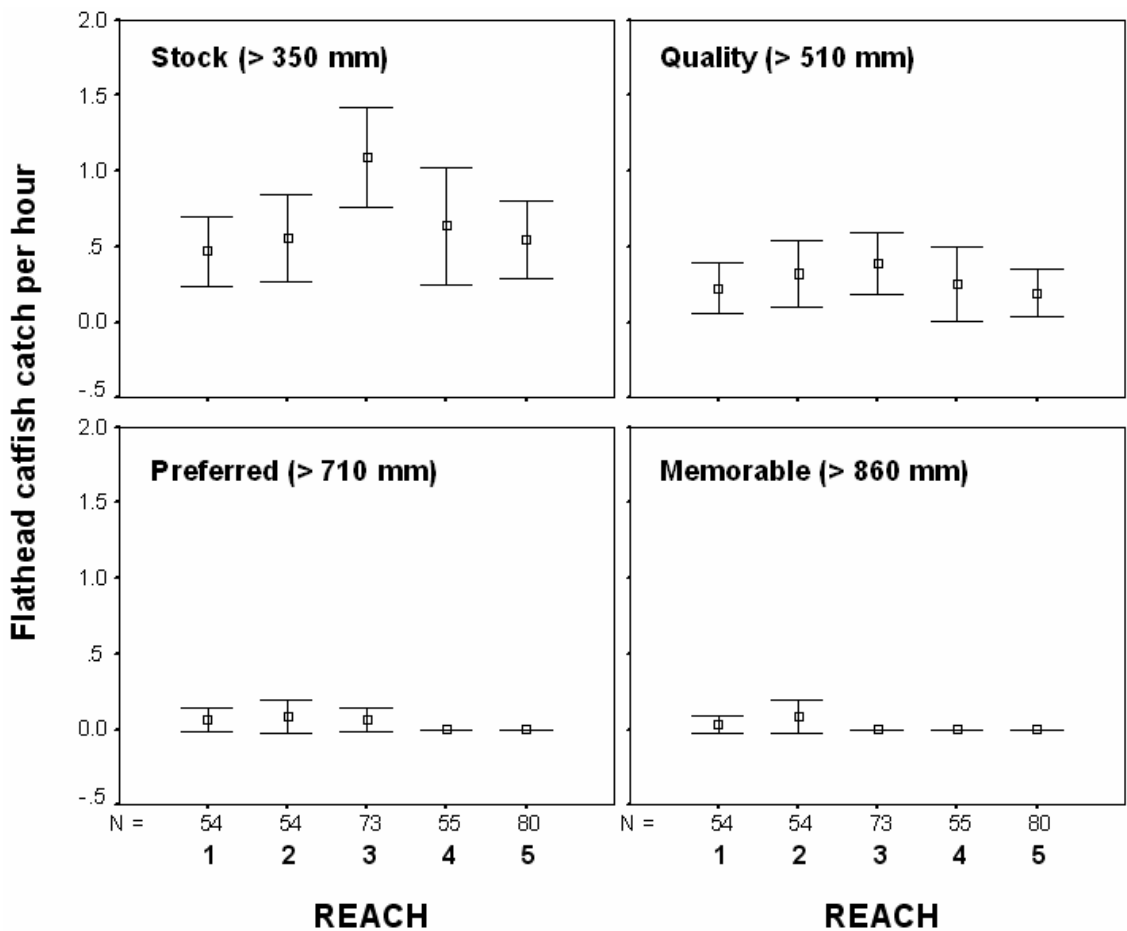
**Figure 3.** Length frequency histograms of flathead catfish captured in 2005; Kansas River, KS. Data collected from summer random site electrofishing.



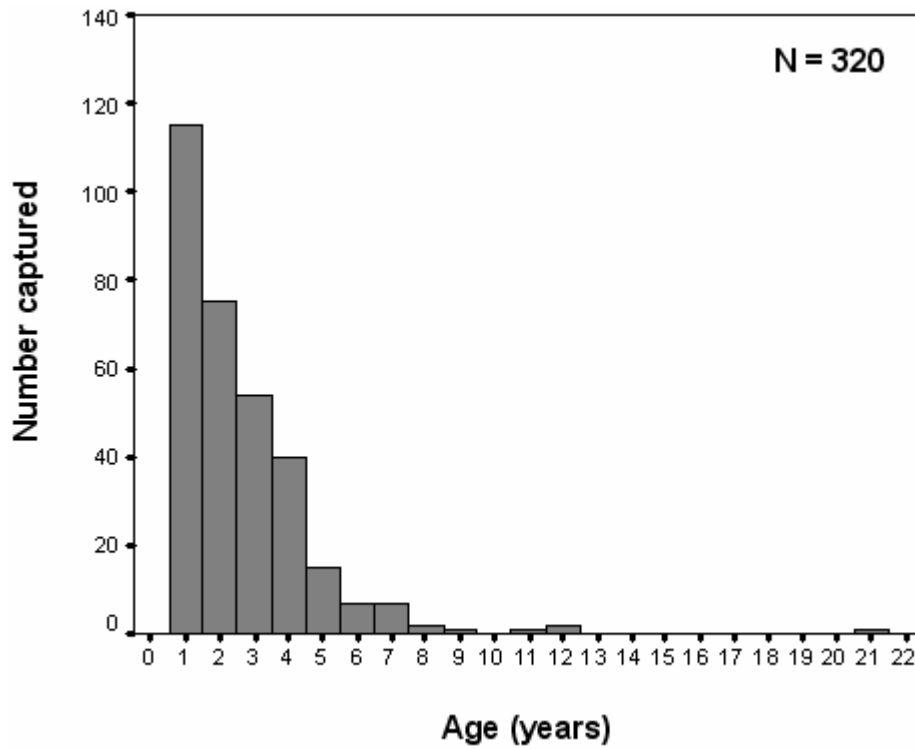
**Figure 4.** Flathead catfish catch per hour by river reach during summer random sampling, 2005. Reach 1, rkm 0-43.3; reach 2, rkm 43.4-83.5; reach 3, rkm 83.6-162.4; reach 4, rkm 162.5-218.7; reach 5, rkm 218.8-276.8. Bars represent 95% confidence intervals of the means; N = number of electrofishing stations sampled per river reach.



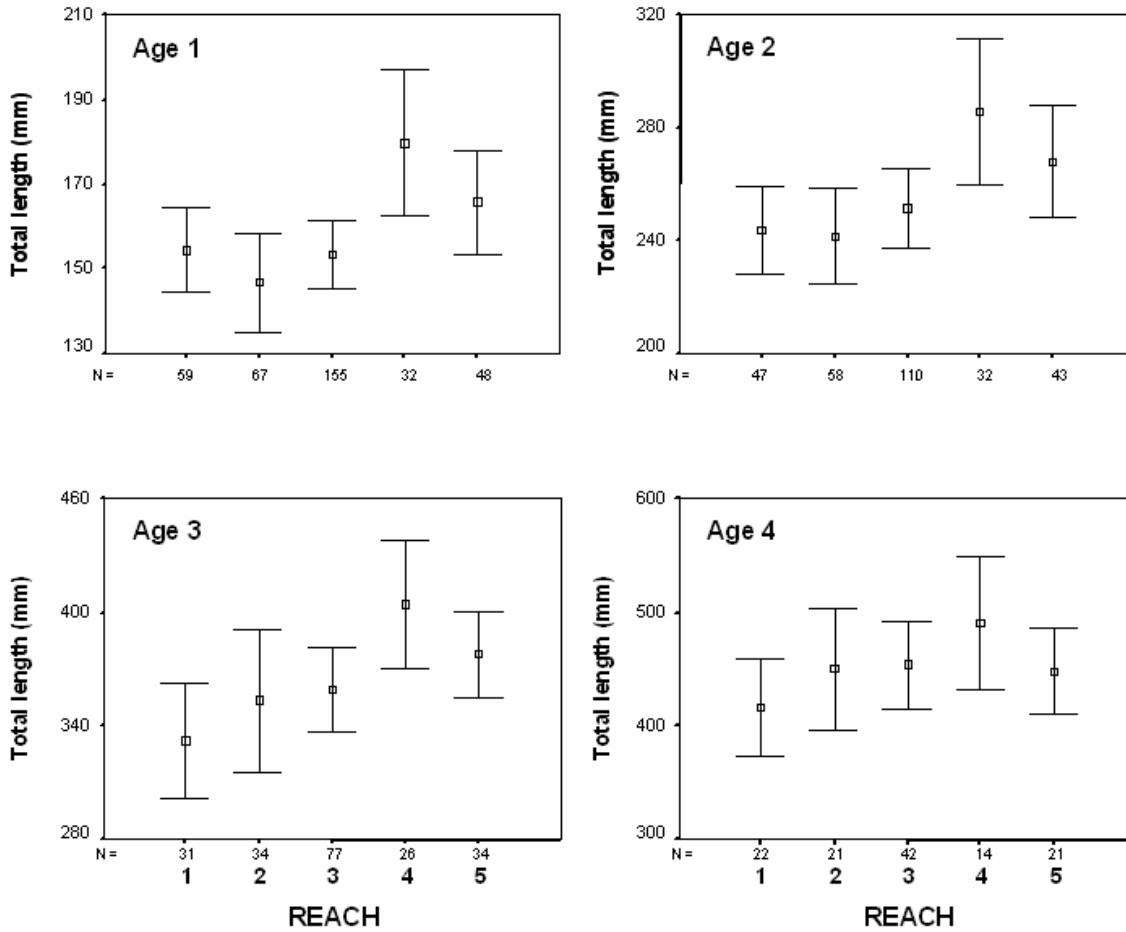
**Figure 5.** Mean flathead catfish catch per hour of by rounded kilometer (nearest tenth). Data collected from summer random electrofishing sampling, 2005; Kansas River, KS. Bars represent 95% confidence intervals of the means; N = number of electrofishing stations sampled per rounded river kilometer.



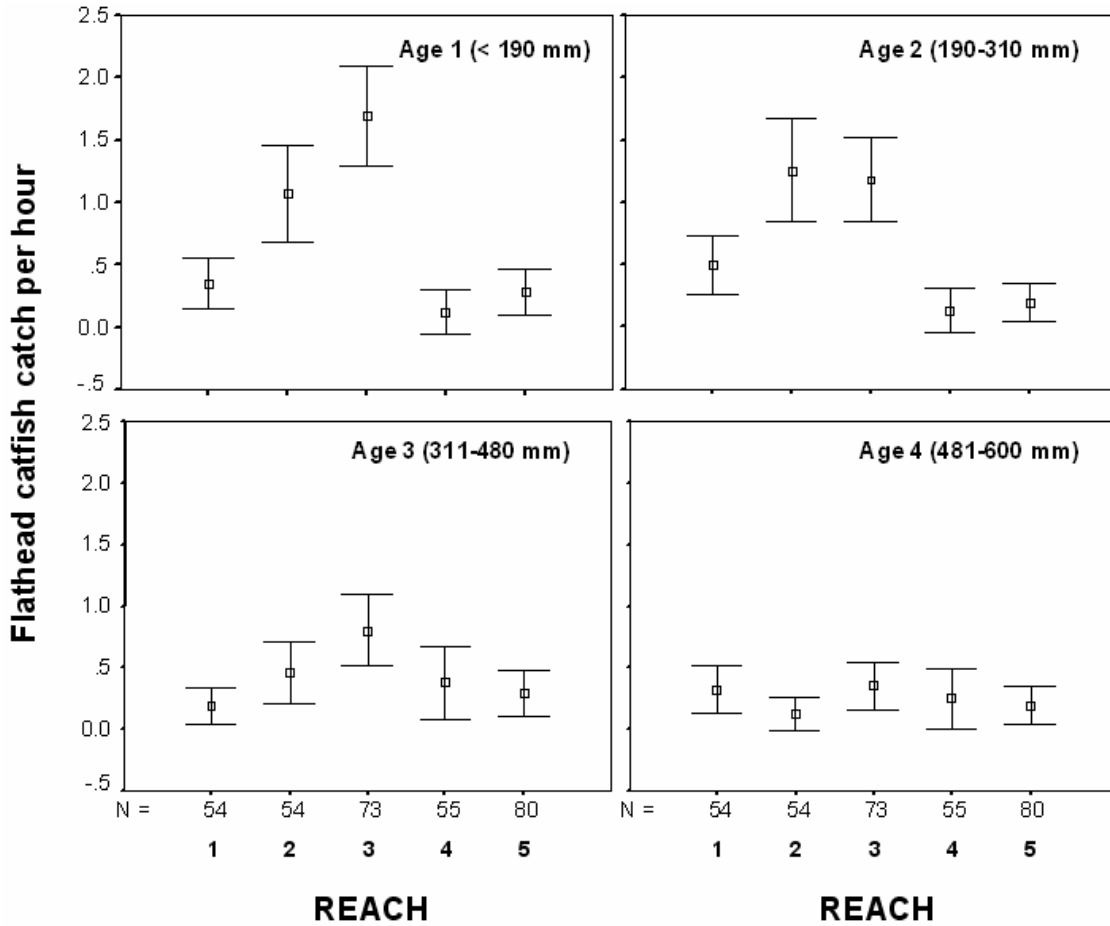
**Figure 6.** Catch per hour of stock, quality, preferred, and memorable sized flathead catfish in 2005; Kansas River, KS. Data collected from summer random electrofishing sampling. Bars represent 95% confidence intervals of the means; N = number of electrofishing stations sampled per river reach.



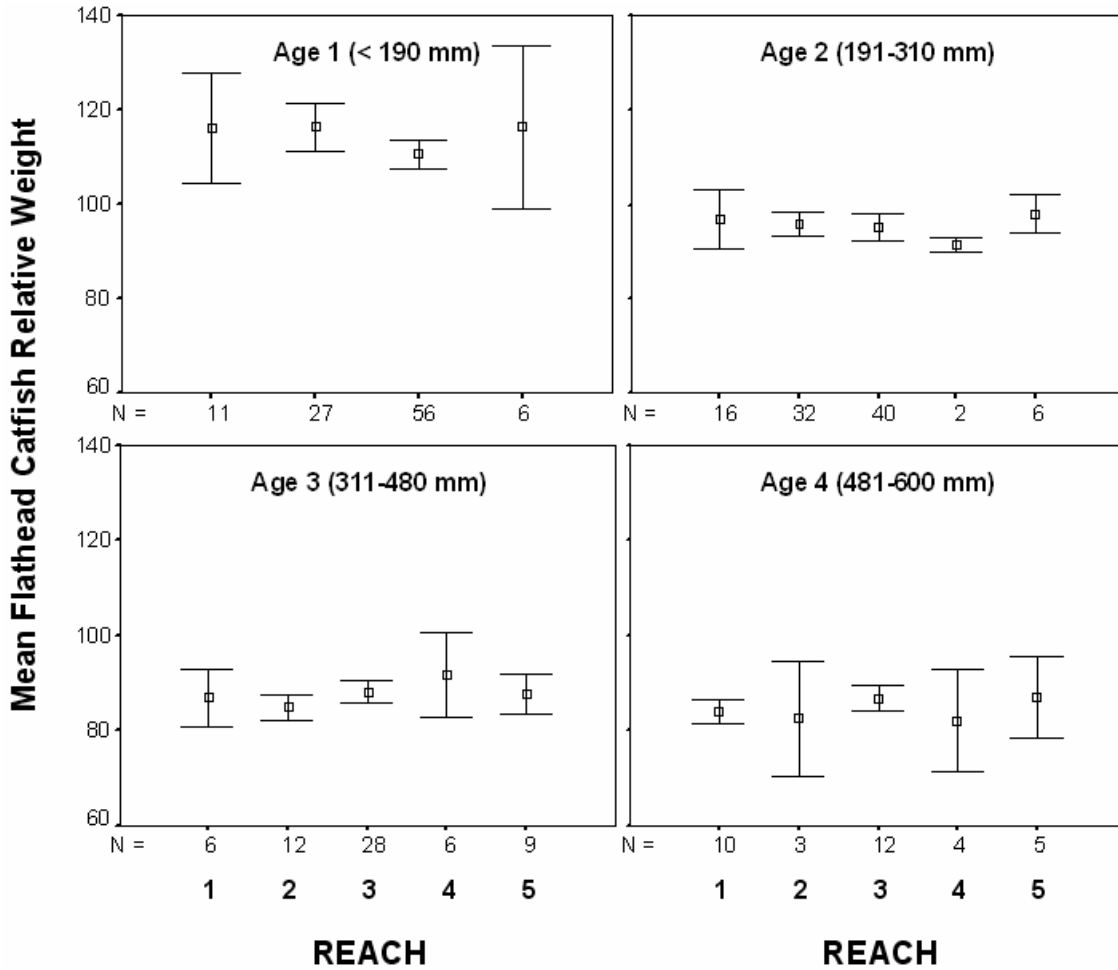
**Figure 7.** Age frequency of flathead catfish from the Kansas River, KS, 2005. Data collected from summer random electrofishing. Ages determined from pectoral spine sections.



**Figure 8.** Mean lengths at age for 1-4 year old flathead catfish by river reach; Kansas River, KS. Data includes flathead catfish captured electrofishing and hoop netting from 2005. Ages based upon pectoral spine data. Note differences in total length values for the various ages. Bars represent 95% confidence intervals of the means; N = number of flathead catfish of given age captured within each river mile.



**Figure 9.** Catch per hour of age 1 to 4 flathead catfish collected in 5 reaches of the Kansas River, Kansas, in summer of 2005. Ages based upon pectoral spines. Bars represent 95% confidence intervals of the mean; N = number of electrofishing stations sampled per river reach.



**Figure 10.** Mean relative weight of 1-4 year old flathead catfish by river reach in 2005; Kansas River, KS. Data collected from summer random electrofishing sampling. Ages based upon pectoral spines. Bars represent 95% confidence intervals of the means; N = number of flathead catfish of given age captured within each reach.