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Bycatch of pallid sturgeon in a commercial fishery for shovelnose sturgeon



Submitted To

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Executive Summary

1. State and federal agencies have been pursuing the recovery of pallid sturgeon, a federally listed endangered species in the Missouri River and Mississippi River, since it was first listed by the USFWS in 1990.
2. There is indirect evidence that commercial fishing is hampering recovery efforts. For instance, pallid sturgeon stocks in the middle Mississippi River, where commercial fishing for shovelnose sturgeon is allowed, exhibit truncated age and size structure and high annual mortality. Conversely, pallid sturgeon stocks in river reaches not open to commercial sturgeon fishing (e.g., the lower Mississippi River) are characterized by larger, older fish with lower mortality rates.
3. Tennessee supports an active and growing commercial fishery for shovelnose sturgeon caviar and no information was available to describe the extent, if any, of pallid sturgeon bycatch in commercial gear targeting shovelnose sturgeon.
4. We quantified the bycatch of pallid sturgeon by accompanying fishers and monitoring their catch on five dates in spring 2007. Fishers could keep or discard any sturgeon they captured using gillnets and trotlines; we collected meristic and morphometric data and tissue samples from suspected pallid sturgeon.
5. Fishers removed 327 live sturgeon from their gear in our presence, of which 93 were harvested; we also obtained the carcasses of 20 sturgeon harvested out of our sight.
6. Two of the 113 harvested sturgeon were pallid sturgeon based on microsatellite DNA analyses. Fishers also gave us five pallid sturgeon that were alive when removed from their gear. Thus, fishers mistakenly harvested 29% of the pallid sturgeon they caught.
7. Based on the incidental harvest rate of pallid sturgeon we observed (~2% of all harvested sturgeon), at least 169 adult pallid sturgeon were harvested in the preceding two years by commercial fishers in the Tennessee waters of the Mississippi River.
8. We watched a fisher remove 53 moribund sturgeon from a ghost gillnet that was lost for only one day; one of the dead fish was a pallid sturgeon.
9. Shovelnose and pallid sturgeon are similar in appearance, especially at small sizes, and we misidentified several pallid sturgeon in the field using external traits and a multiple regression model of meristic and morphometric data.

FOREWORD

Two abbreviations that appear throughout the text are *i.e.* (from the Latin "*id est*"), meaning "that is", and *e.g.* (from the Latin *exempli gratia*) meaning "for example".

All units of measurement are metric, unless otherwise indicated.

- To convert Celsius (^{o}C) to Fahrenheit (^{o}F), multiply ^{o}C by 9/5 and add 32.
- One hectare equals 2.47 acres, and one km equals 0.621 miles.
- To convert length in millimeters (mm) to length in inches, divide by 25.4.
- One kilogram (kg) = 1,000 grams (g) = 2.2 pounds

Most of the information presented herein will appear in a manuscript entitled *"Bycatch of the endangered pallid sturgeon (Scaphirhynchus albus) in a commercial fishery for shovelnose sturgeon (S. platorynchus)"*, which is scheduled to be published online by the Journal of Applied Ichthyology (Blackwell Publishing) as early as January 2009**.**

Cover photos (clockwise from upper left): A genetically confirmed pallid sturgeon correctly identified (and released) by a commercial fisherman; research team monitors the commercial harvest and prepares to collect data on the bycatch; some of the 53 dead sturgeon captured in a single ghost net; commercial fisherman and his helper prepare to retrieve a gill net on the Mississippi River. All photos by P. Bettoli (USGS) and R. Bisch (TTU).

Coauthor Michelle Casto-Yerty with a Scaphirhynchus *spp. sturgeon captured in commercial gear on the Mississippi River*

INTRODUCTION

The Mississippi River basin is home to the river sturgeons (shovelnose sturgeon *Scaphirhynchus platorynchus* and pallid sturgeon *S. albus*) and lake sturgeon *(Acipenser fulvescens)*. Being sturgeons, they belong to one of the most primitive orders of fishes, the Acipenseriformes. The shovelnose sturgeon is the smallest and one of the most abundant sturgeons in North America, seldom exceeding 3 kg in weight or reaching lengths of 1 m. Conversely, the pallid sturgeon is one of the largest, and rarest, fishes inhabiting the Mississippi River basin, with a maximum size of more than 40 kg. All three species are long-lived, with life spans in unexploited populations measured in decades.

Habitat alteration in the form of dams, channelization, and dredging have been implicated in the demise of many large river fish species including pallid sturgeon, a species listed as endangered by the U.S. Fish and Wildlife Service in 1990. However, there is mounting evidence that the illegal take of pallid sturgeon in commercial fisheries targeting shovelnose sturgeon for their caviar is hampering efforts to recover, and ultimately delist, pallid sturgeon (Colombo et al. 2007; U.S. Fish and Wildlife Service [USFWS] 2007). The impact of fishing activity and illegal take on the demographics of pallid sturgeon has been inferred indirectly by noting differences in population structure in reaches of the Mississippi River with commercial shovelnose sturgeon fishing (e.g., Missouri and Illinois waters) and without commercial shovelnose sturgeon fishing (Mississippi and Louisiana waters) (Killgore et al. 2007). Bycatch has long been suspected of adversely impacting sturgeon populations in other waters of North America (ASMFC 1990; Collins et al. 1996), especially Atlantic sturgeon on the east coast of the United States (Stein et al. 2004). Pallid sturgeon carcasses are occasionally observed in fish processing facilities, markets, or in the possession of fishers (Sheehan et al. 1997; USFWS 2007; Dan Burleson, Special Agent, U.S. Fish and Wildlife Service; personal communication). However, the extent of bycatch and harvest of pallid sturgeon in fisheries targeting shovelnose sturgeon is unknown. Such information is vital because populations of late-maturing species such as pallid sturgeon are incapable of sustaining anything other than low levels of exploitation, be it unintentional as bycatch or due to poaching (Boreman 1997; Secor et al. 2002).

In locales where the two species are sympatric, distinguishing shovelnose sturgeon from pallid sturgeon based on external characteristics can be difficult (Murphy et al. 2007; Schrey et al. 2007), especially when specimens are small (i.e., < 250 mm standard length; Kuhajda et al. 2007). Possession of a single pallid sturgeon carries a maximum civil penalty of $25,000 and criminal penalties up to $100,000 and/or one year imprisonment. Despite severe penalties and known difficulties in distinguishing the two species based solely on external characteristics, fishing pressure on shovelnose sturgeon (and the bycatch of pallid sturgeon) is not expected to abate because prices for shovelnose (i.e., “hackleback”) sturgeon caviar remain high (~US$35 per 50 g, retail).

The shovelnose sturgeon fishery in the Tennessee waters of the Mississippi River was largely unregulated through 1999. Beginning in 2000, a season was established (November 1 through April 23) and fishers were required to report their monthly sturgeon harvest to the Tennessee Wildlife Resources Agency (TWRA); they were also required to record the fork length (FL) of harvested fish and whether or not roe was taken from each fish (i.e., whether it was a gravid female). About 16% of the sturgeon harvest in the 2001-2002 season (based on measurements provided by fishers) exceeded the maximum observed length for shovelnose sturgeon in the lower Mississippi River (823 mm FL; Morrow et al. 1998); some fishers reported harvesting sturgeon as large as 991 mm FL. The TWRA was concerned that these larger fish could have been pallid sturgeon; therefore, a 762-mm maximum size limit was established before the 2002-2003 season commenced. In 2003, the season was shortened by 15 days (November 15 through April 23) to align the sturgeon season with the paddlefish (*Polyodon spathula)* season.

Tennessee liberalized their sturgeon regulations in 2005 as part of a multi-state (Illinois, Kentucky, Missouri, and Tennessee) sturgeon management plan for the Mississippi River. Although the October 15-May 15 season and 610-813 mm FL harvest slot limit was less restrictive for Tennessee waters, this multi-state management effort offered sturgeon more protection in waters that previously did not have a size limit or season.

The reported sturgeon harvest from Tennessee waters of the Mississippi River in 2005-2006 (5,319 fish) and 2006-2007 (4,052 fish) was substantially higher than in each of the previous five seasons (mean: 1,358 fish per season). Although this increase was expected given the rising prices offered worldwide for sturgeon caviar, it amplified concerns regarding the sustainability of the shovelnose sturgeon fishery and the incidental or deliberate take of pallid sturgeon. Thus, our objectives were to (1) describe the occurrence of pallid sturgeon in the commercial catch of shovelnose sturgeon in the waters of Tennessee, and (2) estimate the rate at which pallid sturgeon are illegally retained by fishers.

TWRA biologists sampling sturgeon with trotlines on the Mississippi River.

METHODS

We accompanied six commercial fishers as they retrieved their gear on five dates between 19 April and 9 May 2007. A typical "day" for the fishers on the water was only a few hours of retrieving and re-deploying their gear (note: sturgeon could not be legally processed for their roe on the water). We targeted fishers who regularly ranked in the top five commercial sturgeon fishers (based on total reported sturgeon harvest each season) in Tennessee since 2000. Fishers that we accompanied used trotlines, standard monofilament gill nets with 76-mm bar-measure webbing, and "sturgeon nets" that consisted of 76-mm monofilament webbing whereby the top *and* bottom of the net were attached to the lead line (i.e., there was no float line); this design formed a loop of webbing that lay along the substrate when the net was deployed. All of the fishing activity we observed occurred between Mississippi River km 1,240 and 1,422; the most upriver catches we observed were actually collected in Kentucky waters several km above the Tennessee state line (although those fishers launched their boats in Tennessee waters). On three occasions we observed fishers retrieving all of the nets they had deployed the previous day and the number of nets fished per fisher averaged 6.3 (range: 4-8).

On those five dates, and over the course of several hours on each date, we usually had an observer on the fisher's boat. When we were not on their boats, we were drifting close by. When a washtub filled up with illegally sized shovelnose sturgeon (i.e., under or over the harvest slot size) or legal fish that were not thought to be gravid females (note: most sturgeon are harvested because fishers thought they were gravid females), we would off-load those fish into our boat for processing (FL [mm]; weight [g]; fin ray sample for aging). If a fisher handled a fish that he thought might be a pallid sturgeon or a hybrid (note: hybrids were illegal to keep), the fish was given to us for processing.

If a sturgeon possessed most of the external characteristics of a pallid sturgeon (e.g., offset barbel insertions; ventral squamation absent or nearly so; outer barbels much longer than inner barbels; elongated rostrum), we endeavored to collect morphometric and meristic data needed to calculate a Character Index (CI; Sheehan et al. 1999; Wills et al. 2002), especially if the fish was large (> 813 mm FL; note: 2 of 7 large fish were not scored). We also scored most of the sturgeon that we observed being harvested, regardless of their external traits. The CI is a multiple regression character index that required the following measurements and counts: lengths of each barbel; head length (HL); mouth-to-inner barbel distance (MIB; measured from the midline of the edge of the cartilaginous ridge anterior to the proboscis to the anterior insertion of the right inner barbel); tip of rostrum to anterior insertion of the right outer barbel (i.e., interrostrum length, IL); dorsal fin ray count (note: all fully formed and rudimentary rays were counted with the aid of a dissecting probe); anal fin ray count (following same procedure as dorsal fin ray count). Head length was measured using a flexible tape; all other measurements were made using calipers. We mismeasured HL, MIB, and IL on 24 fish scored in the field; we subsequently took those measurements off of digital images (lateral and ventral) taken of the heads of those fish and recalculated their CI scores. The CI scores typically range from about -1.5 to 1.5. Strongly negative scores are indicative of pallid sturgeon and scores from -0.45 to 0.51 suggest possible hybrids according to Sheehan et al. (1999). We collected a caudal fin clip for possible genetic analysis before releasing fish that we scored. Although we assigned CI scores to 114 sturgeon, we performed genetic analyses on only 18 of 22 fish with a negative CI score.

Genomic DNA was isolated using the DNeasy Tissue Kit (Qiagen, Valencia CA) and stored at –20 °C. Sixteen disomic microsatellite markers developed in *Scaphirhynchus* by McQuown et al. (2000) were scored using an ABI 377 automated DNA analyzer equipped with fragment analysis software (PE Applied Biosystems). We compared the genotype of each sturgeon to a baseline of 94 pallid and 85 shovelnose sturgeon from the Mississippi River that were identified based on genetic and morphological criteria as described in Schrey et al. (2007). We used the WhichRun software package of Banks and Eichert (2000) to calculate the likelihood of generating each sturgeon's genotype in either the pallid or shovelnose gene pools. We then calculated the LOD score as the $\log_{10}$ of the ratio of likelihoods of generating a genotype in the pallid gene pool compared to the shovelnose gene pool. We set an *a priori* minimum of LOD = 2 for designating a fish a pallid sturgeon, meaning that the genotype had to be at least 100x more likely to have been generated in the pallid gene pool. This criterion was conservative in that it was likely to classify some good pallids as "intermediates".

In addition to the sturgeon we directly observed being caught and harvested, we obtained the carcasses of 20 sturgeon that were harvested by a fisher out of our sight while we were with another fisher that day. Those 20 fish had already been processed (i.e., the eggs were removed) before we took possession of them, but we were able to collect all of same morphometric and meristic data (including fin clips). Finally, we observed the retrieval of a "ghost net" that the fisher we were accompanying had set two days earlier.

We also accompanied a TWRA Region I sampling crew on 16-18 April 2007 as they deployed and retrieved trotlines set overnight (trotlines were constructed and set using similar methods as a commercial fisher) between Mississippi River km 1392 and 1397 (near Tiptonville, TN). Sturgeons were processed in the same manner discussed above (i.e., fish with external characteristics suggestive of pallid sturgeon were scored using the CI model; fish with negative scores were genetically assayed).

After obtaining counts, measurements, and a tissue sample, Michelle Casto-Yerty releases a pallid sturgeon captured in commercial gear.

RESULTS

We observed the capture of 327 *Scaphirhynchus* spp. in the overnight sets of gillnets (n = 293; mean FL = 658 mm; SE = 4.3; range:413 - 925) and trotlines (n = 34; mean FL = 664 mm; SE = 17.2; range:331 – 822) and fishermen chose to keep 93 of those fish. The harvested sturgeon ranged in size from 578 mm FL (for a fish that was missing the tip of its rostrum) to 782 mm FL. Most (90%) of the sturgeon were captured in gillnets because only one of the fishers we accompanied fished trotlines (and only on one of the two days we accompanied him). Water temperatures ranged from 9.2 ^{o}C to 19.5 ^{o}C and all sturgeon in both gears were alive when gear that soaked overnight was retrieved. We were able to assign CI scores to 63 of the 93 harvested fish. One of the 93 sturgeon that we saw fishers harvest from their overnight sets scored as a pallid sturgeon and two scored in the range between pallid sturgeon and intergrades on the CI scale**.**

We scored all 20 of the sturgeon carcasses we retrieved from a fisherman whom we did not witness retrieving his gear and none of those fish scored as a pallid sturgeon based on CI scores. Adding these 20 fish to the 93 fish we saw fishers harvest equals 113 harvested sturgeon that we handled on those five dates. We scored six of the 53 sturgeon removed from the ghost net, one of which was harvested (for a total of 114 harvested sturgeon); one of the other scored fish from the ghost net was a putative pallid sturgeon based on its CI score.

Genetic analysis of 18 commercially caught fish with negative CI scores confirmed that pallid sturgeon were regularly encountering fishing gear and that pallid sturgeon were being harvested (Table 1). One confirmed pallid sturgeon (a male, 834 mm FL) was removed (dead) from the ghost net and commercial fishers caught seven more confirmed pallid sturgeon in the gear they fished overnight. Fishers harvested two of those seven pallid sturgeon (both females, 683 and 756 mm FL); thus, pallid sturgeon represented 1.8% (2 of 114) of all harvested sturgeon.

The reported harvest of shovelnose sturgeon in Tennessee during the 2005-2006 and 2006-2007 seasons was 9,371 fish. If the pallid sturgeon harvest rate we observed (1.8%) was the same in the past two seasons, commercial fishing activity resulted in the take of 169 adult (and probably egg-bearing) pallid sturgeon since 2005. The eight pallid sturgeon we observed in the commercial catch (including the ghost net catch) represented 2.0% of all (n = 400) sturgeon we handled from all commercial sources on those five dates.

The commercial catch of all *Scaphirhynchus* spp. was dominated by fish between 500 and 750 mm FL (Figure 1). Genetically confirmed pallid sturgeon tended to be the largest fish captured. It is difficult to discriminate between shovelnose and pallid sturgeon at small sizes (Kuhajda et al. 2007) and small pallid sturgeon would have been less likely than large pallid sturgeon to be identified (and scored) in the field and have a tissue sample taken for DNA analysis.

The TWRA biologists we accompanied collected 105 *Scaphirhynchus* spp. in their trotlines; those fish averaged 633 mm FL (SE = 5.9; range: 498-845 mm; Figure 2). Due to mistakes in taking some of the required morphological measurements, valid CI scores were available for only four sturgeon caught in the TWRA gear. Three of those fish had negative scores and we were able to obtain tissue samples from two of those three fish with negative scores; both of those fish were pallid sturgeon based on microsatellite DNA analysis (i.e., ~ 2% of the sturgeon collected by TWRA were pallid sturgeon).

We generated CI scores for 118 *Scaphirhynchus* spp. that we handled in the course of accompanying commercial fishers and TWRA biologists. The CI scores for the 20 fish subjected to genetic testing indicated close agreement on the number of pallid sturgeon in that subsample of 20 fish. That is, there were 11 pallid sturgeon in that 20-fish subsample based on low (less than -0.45) CI scores versus 10 pallid sturgeon based on the microsatellite DNA analysis. However, the error rates of omission (false negative; CI score did not identify genetically-confirmed pallid sturgeon) and commission (false positive; CI score indicated that an intermediate or hybrid form was a “good” pallid sturgeon) were high. Only six of the 10 genetically confirmed pallid sturgeon had the low CI scores associated with pallid sturgeon and five putative pallid sturgeon based on their CI scores were actually hybrids or intermediate forms between pallid sturgeon and shovelnose sturgeon according to the DNA analyses.

Maturing ovaries of a shovelnose sturgeon

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Ripe ovaries of a shovelnose sturgeon.

DISCUSSION

Our estimate of the number of mature pallid sturgeon harvested the previous two seasons (n = 169) in the Tennessee waters of the Mississippi River is probably a minimum estimate because we do not (and cannot) know the behavior of fishers when observers are not present. That is, fishers may be less likely to discard a large (i.e. potentially egg-bearing and valuable) pallid sturgeon when they are unobserved. The waters of the Mississippi River plied by the fishers we accompanied are remote and it is difficult for law enforcement personnel to enforce commercial fishing regulations and the Endangered Species Act (F. Couch, Commercial Fisheries Law Enforcement officer, TWRA, personal communication). Similarly, we do not know how many gill nets or trotlines are lost each year, but we observed how effective a ghost net can be in capturing sturgeon, including pallid sturgeon. Several nets were lost on our trips with commercial fishers (i.e., fishers reported losing a net on at least 4 of the 5 trips when we accompanied them), prompting some fishers to comment that it was not uncommon for nets to be lost each spring if/when the Mississippi River rises several feet overnight. Ghost nets have long been recognized as a threat to aquatic species, including the white sturgeon *Acipenser transmontanus* in the Columbia River (Kappenman and Parker 2007); those authors located and retrieved 33 ghost nets containing 121 dead and five live white sturgeon. The negative consequences of ghost nets to pallid sturgeon restoration efforts are unknown but potentially serious because of the long life span of a ghost net (~ 7 years on average in the Columbia River) and the ecology of sturgeon species that renders them particularly susceptible to collapsed, lost gillnets (e.g., poor eyesight [Kynard and Horgan 2001]; benthic orientation; reliance on olfactory cues for locating prey [Kappenman and Parker 2007]). Finally, our estimate of illegal take of pallid sturgeon is likely a minimum estimate because we genetically assayed only three of the 114 harvested sturgeon that we handled.

Encounters between commercial fishing gear and endangered pallid sturgeon were commonplace in the Tennessee (and near-Tennessee) waters of the Mississippi River. Stein et al. (2004) noted that it is wrong to assume that despite their reputed hardiness, sturgeon released alive from gillnets will not suffer postrelease injury or mortality. In a typical day of handling 50 to 100 shovelnose sturgeon in their gear, we would expect commercial fishers to handle 1 or 2 pallid sturgeon. That 2% encounter rate was confirmed by the concurrent sampling of TWRA biologists in April 2007. If commercial fishers were 100% accurate in identifying pallid sturgeon and immediately returning them to the water, law enforcement and conservation concerns would be limited to prohibited activities listed in the Endangered Species Act that do not result in the death of the animal (e.g., wounding or harassing the species). However, others have also documented that pallid sturgeon are being taken (i.e., killed) either intentionally or accidentally in the course of pursuing shovelnose sturgeon for their caviar. This finding is inconsistent with long running, extensive pallid sturgeon recovery efforts throughout the Mississippi River basin and may explain why the age and size structures of pallid sturgeon stocks reflect commercially exploited shovelnose sturgeon populations (Killgore et al. 2007). Others have also noted that bycatch mortality in commercial gillnet fisheries seriously hampers efforts to recover other sturgeon species (e.g., Atlantic sturgeon; Stein et al. 2004).

Our modest efforts at utilizing morphometric and meristic data to determine which fish to subject to genetic analysis confirmed what other researchers have noted. Namely, multiple regression models such as the Character Index (Wills et al. 2002) are incapable of definitively identifying all pallid sturgeon, especially in the lower Mississippi River. In the absence of genetic data, positive identification of pallid sturgeon requires collecting numerous measurements and counts and subjecting them to sophisticated statistical models such as sheared principal components analysis (Kuhajda et al. 2007; Murphy et al. 2007). With that said, the CI scoring criteria we employed was a very useful method for objective deciding how to allocate scarce funds for subsequent genetic testing of putative pallid sturgeon.

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Coauthors M. Casto-Yerty and G. Scholten with research technician R. Bisch processing the bycatch of a commercial sturgeon fisherman while anchored on the bank of the Mississippi River.

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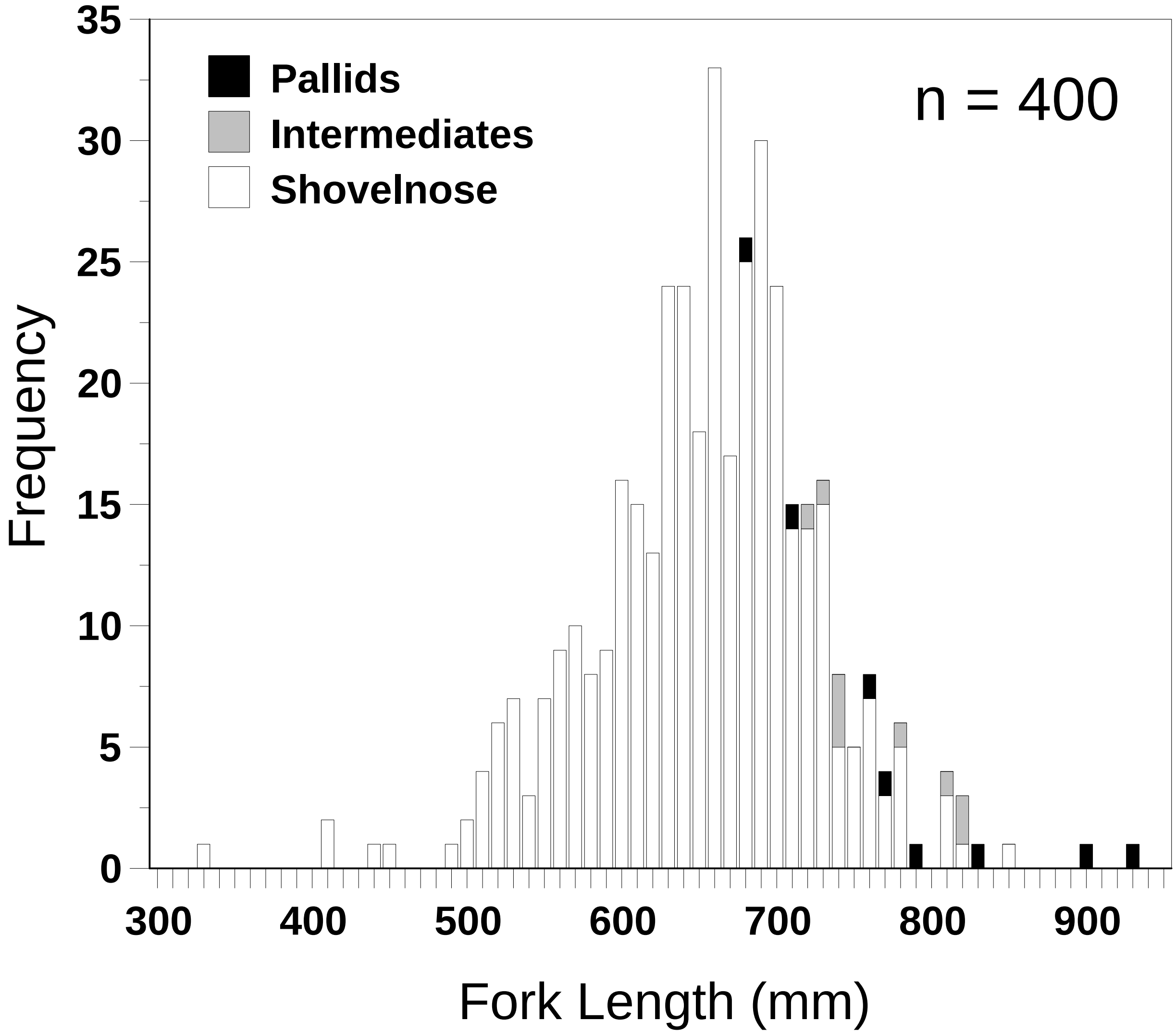

Figure 1. Fork length-frequency histogram for shovelnose sturgeon, pallid sturgeon, and intermediate specimens captured by commercial fishers in the Tennessee and near-Tennessee waters of the Mississippi River. Species identifications were based on microsatellite DNA analysis; specimens were chosen for DNA analysis based on negative Character Index scores (Wills et al. 2002). Note: the two largest shovelnose sturgeon specimens depicted (822 and 851 mm FL) were not scored or genetically assayed.

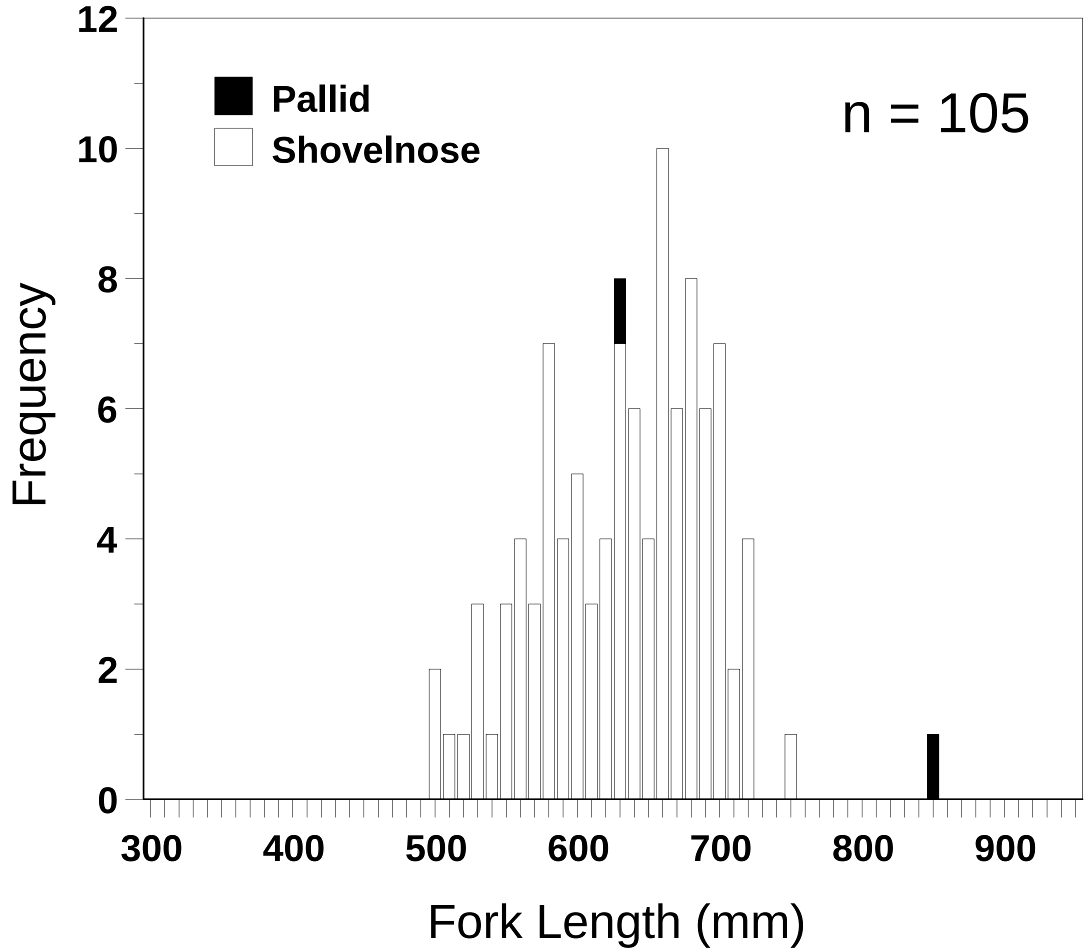

Figure 2. Fork length-frequency histogram for shovelnose sturgeon and pallid sturgeon captured in trotlines deployed by TWRA biologists, April 16-18 2007, in the Tennessee waters of the Mississippi River. Four of the fish were scored using a Character Index (Wills et al. 2002) and two of the three fish with negative scores were genetically assayed; both of those fish were subsequently determined to be pallid sturgeon based on microsatellite DNA analysis.

Table 1. Species designation based on microsatellite DNA analysis for 20 *Scaphirhynchus* spp. captured in commercial gear in the lower Mississippi River between river km 1,240 and 1,422 in April-May 2007, character Index (CI) scores, ratio of the probabilities of generating the genotype of each fish from either a pallid sturgeon or shovelnose sturgeon gene pool [P(pallid)/P(shovelnose)], fork length (FL), weight, sex, source of fish (OGN = overnight commercial gillnet; Ghost = ghost gillnet; TROT= TWRA trotline), the fate of each fish (R = released; H = harvested; DIN = dead in net), and the approximate latitude and longitude of each capture. All fish were captured in gillnets set by commercial fishers except for two fish caught on trotlines set by TWRA biologists. The ghost net was a commercial gillnet that could not be found after soaking for 24 hours, but was subsequently recovered after soaking for ~ 48 hours. Asterisks indicate fish that were designated as being a pallid sturgeon based on their CI scores (Wills et al. 2002).

Genetic Species Designation	Date	CI Score	P (pallid)/ P (shovelnose)	FL (mm)	Weight (g)	Sex	Source	Fate	Latitude	Longitude
Pallid	27 April	-1.77*	2.12×10^{7}	925	.	.	OGN	R	35.9874	89.7084
Pallid	9 May	-1.53*	3.00×10^{6}	895	.	.	OGN	R	35.7348	89.8763
Pallid	17 April	-0.38	2.00×10^{6}	631	848	M	TROT	R	36.3526	89.5279
Pallid	27 April	-1.37*	2.90×10^{4}	756	.	F	OGN	H	35.9874	89.7084
Pallid	9 May	-0.15	2.60×10^{4}	711	.	.	OGN	R	35.7348	89.8763
Pallid	27 April	-0.01	2.00×10^{4}	773	.	.	OGN	R	35.9874	89.7084
Pallid	17 April	-0.65*	1.90×10^{4}	845	2357	M	TROT	R	36.3646	89.5182
Pallid	8 May	-1.34*	1.81×10^{3}	834	.	M	Ghost	DIN	35.9966	89.7093
Pallid	27 April	-0.15	8.86×10^{2}	683	.	F	OGN	H	35.9967	89.7093
Pallid	27 April	-1.66*	1.27×10^{2}	791	.	.	OGN	R	35.9966	89.7093
Intermediate	8 May	-0.77*	35.74	732	1750	.	OGN	R	36.0101	89.7114
Intermediate	26 April	-0.41	27.47	721	1582	.	OGN	R	36.5743	89.5254
Intermediate	8 May	-0.07	8.93	743	.	M	Ghost	DIN	35.9966	89.7093
Intermediate	27 April	-1.96*	8.30	821	.	.	OGN	R	35.9966	89.7093
Intermediate	27 April	-0.57*	6.77	808	.	.	OGN	R	35.9874	89.7084
Intermediate	8 May	-0.32	0.97	780	.	F	Ghost	DIN	35.9966	89.7093
Intermediate	27 April	-0.63*	0.87	743	.	.	OGN	R	35.9966	89.7093
Intermediate	9 May	-0.29	0.27	815	.	.	OGN	R	35.6889	89.9382
Intermediate	27 April	-1.27*	0.24	744	.	.	OGN	R	35.9874	89.7084
Shovelnose	27 April	-0.10	6.67×10^{-5}	717	.	F	OGN	H	35.9874	89.7084

Using calipers, morphometric data are about to be collected on a sturgeon removed alive, but wounded, from commercial fishing gear on the Mississippi River; DNA testing later confirmed that it was a pallid sturgeon.

Michelle Casto-Yerty counts dorsal fin rays on a suspected pallid sturgeon that was removed from commercial fishing gear on the Mississippi River.