PNNL-17582

Summary of the 2006 Annual Synthesis Report

Pallid Sturgeon Population Assessment Project and Associated Fish Community Monitoring for the Missouri River

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August 2008

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Prepared for the

Missouri River Recovery – Integrated Science Program

U.S. Army Corps of Engineers

Yankton, South Dakota

Pacific Northwest National Laboratory
Operated by Battelle for the U.S. Department of Energy

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Introduction

Pallid sturgeon, *Scaphirhynchus albus*, which have adapted to life in the turbid river systems of the Missouri, Yellowstone, and Mississippi rivers, have declined in numbers to the point where they are in danger of extinction. On November 30, 2000, the U.S. Fish and Wildlife Service (USFWS) completed the "Biological Opinion on the Operation of the Missouri River Main Stem System, Operation and Maintenance of the Missouri River Bank Stabilization and Navigation Project, and Operation of the Kansas River Reservoir System" (2000 BiOp). In response to the BiOp, the U. S. Army Corps of Engineers (Corps) developed monitoring and restoration projects to avoid jeopardizing pallid sturgeon populations. As part of their Implementation Plan, the Corps is working with USFWS, state and federal agencies, and universities to develop and conduct a Pallid Sturgeon Population Assessment Project (PAP). The objectives of the PAP include evaluating population characteristics, geographic distribution, and habitat use of pallid sturgeon and a select group native fish species.

The PAP objectives are addressed by developing and implementing a monitoring and assessment scheme for the entire Missouri River Basin. The PAP has organized the monitoring and assessment efforts into distinct geographic segments, with state and federal resource management agencies possessing primary responsibility for one or more segment. To date, the results from annual monitoring have been reported for individual PAP segments. However, monitoring results have not been summarized or evaluated for larger spatial scales, encompassing more than one PAP segment. Thus, the Pacific Northwest National Laboratory evaluated PAP data from multiple segments, and reported the findings in the following synthesis report:

> Oldenburg, E.W., T.P. Hanrahan, R.A. Harnish, B.J. Bellgraph, J.P. Duncan, and C.H. Allwardt. 2008. 2006 Annual Synthesis Report, Pallid Sturgeon Population Assessment Project and Associated Fish Community Monitoring for the Missouri River. PNNL-17583. Pacific Northwest National Laboratory, Richland, WA.

The present report is a summary of the pallid sturgeon and targeted native fish species data contained in the aforementioned synthesis report, to which the reader is referred for additional information.

Summary

Pallid sturgeon and the associated fish community were randomly sampled in the Missouri River from Fort Peck Dam downstream to the headwaters of Lake Sakakawea (upper basin monitoring area), Fort Randall Dam downstream to the headwaters of Lewis and Clark Lake, and Gavins Point Dam downstream to the confluence with the Mississippi River (the latter two reaches are hereafter referred to as the lower basin monitoring area) with standardized gears and protocols during the 2006 sampling year (i.e., fall of 2005 to the fall of 2006). Among the standard gears utilized in this study during the 2006 sampling year, trammel nets were used to sample 396.1 km while otter trawls sampled 468.9 km within the upper and lower basin monitoring areas of the Missouri River (Table 1). A total effort of 1,024 net nights was put forth with mini-fyke nets, also within this area. Further, 2,121 net nights of gill net effort was applied within the lower basin monitoring area (Table 1). As a result of the great amount of effort applied within the Missouri River, 123,638 fish were sampled within the upper basin monitoring area representing 53 individual species and 91,713 fish were sampled within the lower basin monitoring area representing 97 individual species during the 2006 sampling year.

Two hundred twenty-two pallid sturgeon were sampled in the Missouri River during the 2006 sampling year (upper basin monitoring area $N = 88$, lower basin monitoring area $N = 134$). At this time, little information can be deduced regarding the long term trends in pallid sturgeon relative abundance within the upper monitoring area as only one segment was sampled in this area in 2005 (Figure 1). However, relative abundance of hatchery-reared pallid sturgeon appears to be much greater in the upper basin monitoring area as compared to the lower basin monitoring area for sampling conducted with both trammel nets and otter trawls (Figures 1 and 2). Although the sampling regime was not fully implemented within the lower basin monitoring area until 2005, a trend of increasing relative abundance of hatchery-reared pallid sturgeon was observed in this area from 2003 – 2006. Interestingly, the annual cumulative number of pallid sturgeon stocked in the lower basin monitoring area is similar to the annual trend in relative abundance of hatchery-reared pallid sturgeon in this area, suggesting that most stocked fish are recruiting to the size that they are efficiently sampled by the gears used in this study (Figures 2 and 3). Few wild pallid sturgeon were sampled in the Missouri River from 2003 – 2006 (Figures 1, 2, and 3).

Pallid sturgeon appear to be distributed relatively uniformly throughout the upper basin monitoring area as well as from Fort Randall Dam downstream to river mile 500 within the

lower basin monitoring area. Relative abundance upstream of river mile 500 appears to be greater than below this location based on random sampling with trammel nets and otter trawls (Figure 4). However, random sampling with gill nets yielded a uniform distribution of pallid sturgeon throughout the lower basin monitoring area, suggesting a uniform geographic distribution of pallid sturgeon throughout the study area. These findings also suggest that trammel nets and otter trawls may not fish as efficiently in the lower reaches as compared to the upper reaches of the lower basin monitoring area (Figure 5).

Pallid sturgeon were captured in most macrohabitat types that were sampled in 2006. However, inside bend, large and small connected secondary channels, and braided channels appear to be used by pallid sturgeon more frequently than other macrohabitat types. Channel border and pool mesohabitat appear to be among the mesohabitat types most frequented by pallid sturgeon. The mean length of pallid sturgeon sampled in the lower basin monitoring area was greater than in the upper basin monitoring area; albeit, two individuals were sampled in the upper monitoring area that were 40 cm larger than the largest individual sampled in the lower monitoring area (Figure 6).

In addition to pallid sturgeon, nine native Missouri River fish species were targeted for assessment: shovelnose sturgeon *Scaphirhynchus platorynchus*, sturgeon chub *Macrhybopsis gelida*, sicklefin chub *Macrhybopsis meeki*, speckled chub *Macrhybopsis aestivalis*, blue sucker *Cycleptus elongatus*, sauger *Sander canadense*, western silvery minnow *Hybognathus argyritis*, plains minnow *Hybognathus placitus* (the two *Hybognathus* species were pooled for analyses and collectively termed *Hybognathus* spp.), and sand shiner *Notropis stramineus*. Although trends in annual relative abundance for each specis were variable by gear type, there was no strong evidence that any of the target native species were declining in abundance in the upper basin monitoring area from 2005 – 2006 or in the lower basin monitoring area from 2003 – 2006. The only consistent evidence for a change in abundance was for sauger in the lower basin monitoring area where sampling with all four standard gears (i.e., trammel net, gill net, otter trawl, and mini-fyke net) yielded an increase in relative abundance from 2005 - 2006. Thus, based on the sampling conducted during this project from 2003 - 2006, it appears that all target native species populations were relatively stable within the Missouri River during this time. No anomalies were observed in any of the other parameters measured for the target native species with the exception of blue sucker population structure. Interestingly, very few blue suckers less

than 50 cm were sampled during the 2006 sampling year (Figure 7). This could be indicative of a population that is in senescence; however, it is more likely that blue suckers less than 50 cm rear in tributaries or other areas not sampled in this project, or that blue suckers do not recruit to any of the gears used in this project until they are about 50 cm. Although the latter examples are the more likely causes for the irregularity in blue sucker population structure, further investigation is warranted.

Table 1. Sampling effort for random sampling with standard gear types conducted in the upper basin and lower basin monitoring areas of the Missouri River in 2006.

Monitoring area	Gear	Number of bends sampled	Number of deployments	Total distance fished (km)
Upper Basin	Trammel net	36	635	142.2
	Otter trawl	36	601	153.5
	Mini-fyke net	36	272	N/A
Lower Basin	Trammel net	94	1,774	253.9
	Otter trawl	94	1,744	315.4
	Mini-fyke net	93	752	N/A
	Gill net	106	2,121[a]	N/A

[a]Gill net deployments using 100 foot gill nets counted as one deployment, gill net deployments using 200 foot gill nets counted as two deployments.

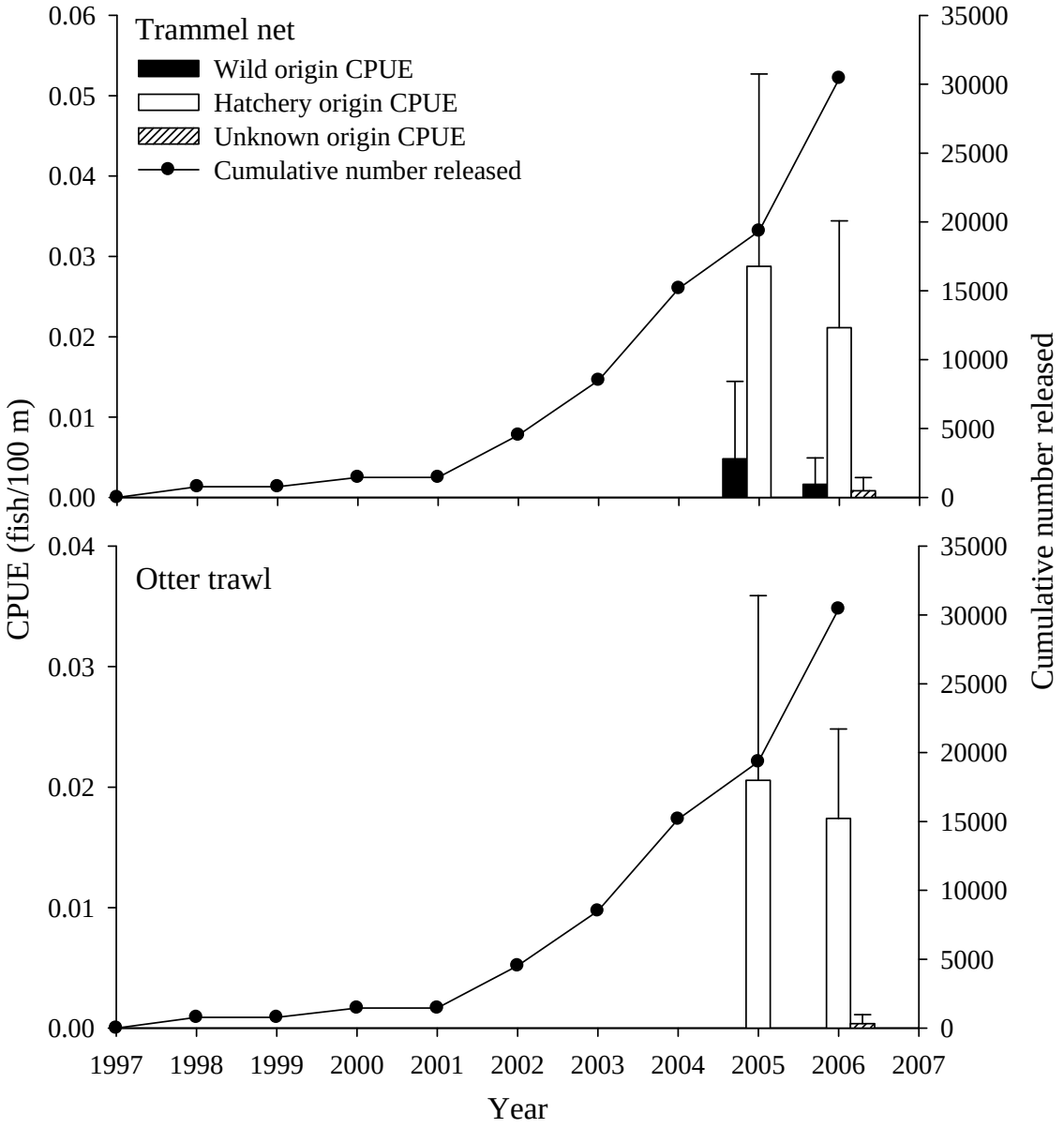

Figure 1. Mean annual catch per unit effort (± 2 SE) for wild, unknown, and hatchery reared pallid sturgeon using one-inch trammel nets and otter trawls for 2005 and 2006, and cumulative annual stocking history [fingerlings counted as yearling equivalents (number of fingerlings released/4)] in the upper basin monitoring area of the Missouri River from 1997 – 2006.

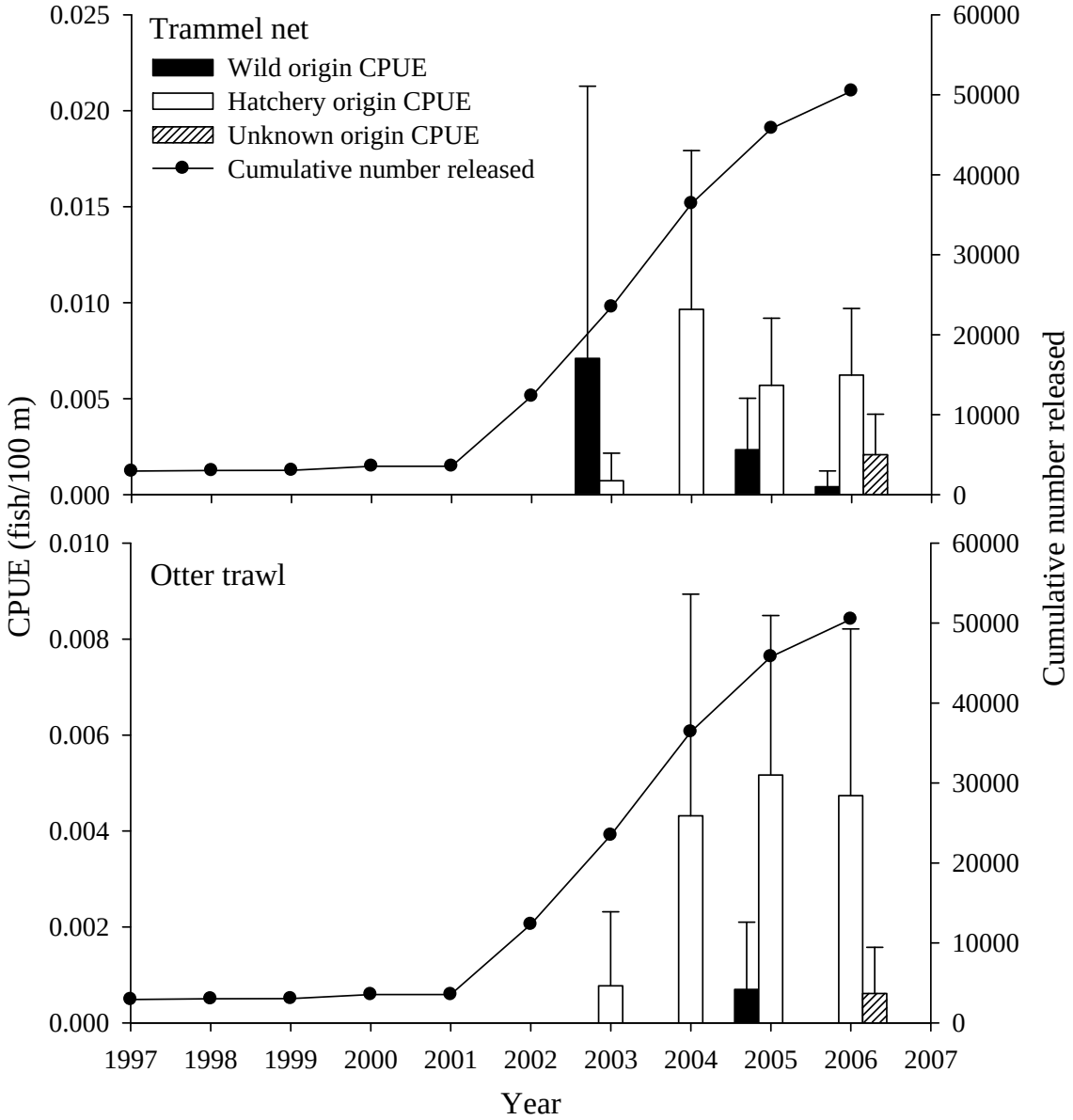

Figure 2. Mean annual catch per unit effort (± 2 SE) for wild, unknown, and hatchery reared pallid sturgeon using one-inch trammel nets and otter trawls from 2003 - 2006, and cumulative annual stocking history [fingerlings counted as yearling equivalents (number of fingerlings released/4)] in the lower basin monitoring area of the Missouri River from 1997 – 2006.

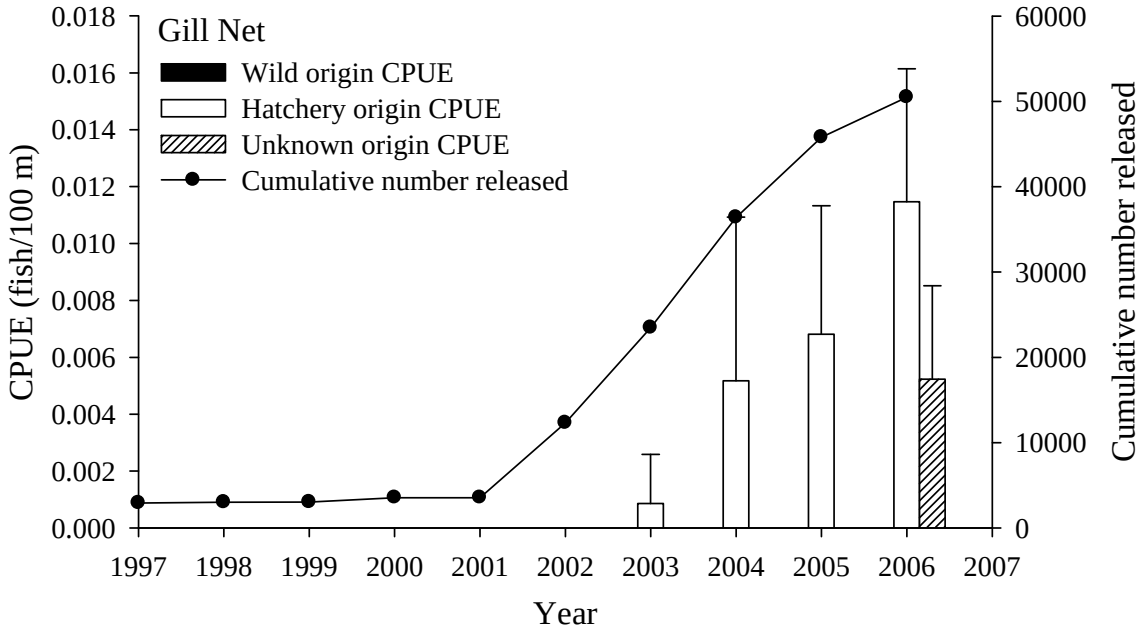

Figure 3. Mean annual catch per unit effort (± 2 SE) for wild, unknown, and hatchery reared pallid sturgeon using gill nets from 2003 - 2006, and cumulative annual stocking history [fingerlings counted as yearling equivalents (number of fingerlings released/4)] in the lower basin monitoring area of the Missouri River from 1997 – 2006.

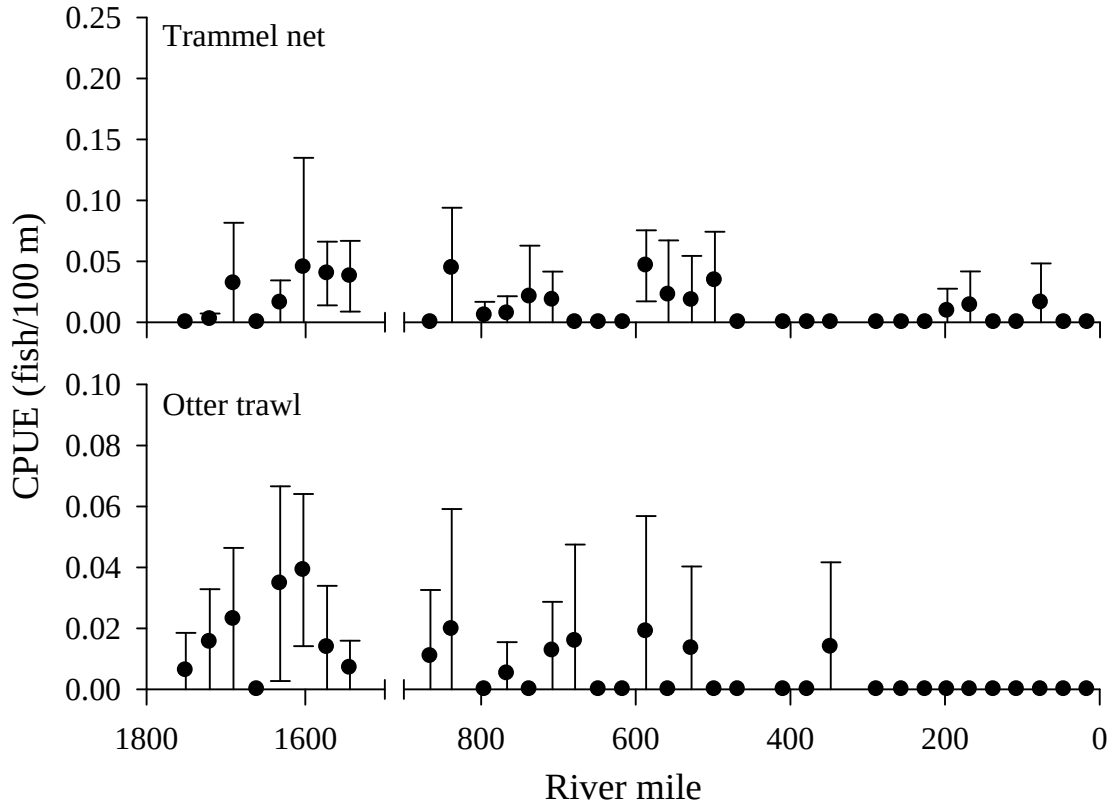

Figure 4. Geographic distribution [mean annual catch per unit effort (± 2 SE) by river mile (30-mile bins)] of pallid sturgeon in the upper and lower basin monitoring areas of the Missouri River in 2006. Data obtained through random sampling using one-inch trammel nets and otter trawls.

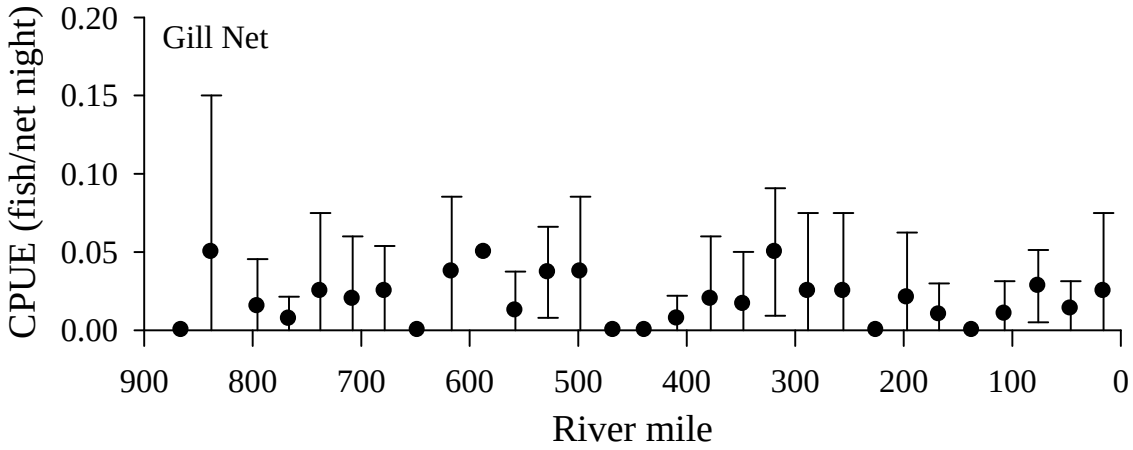

Figure 5. Geographic distribution [mean annual catch per unit effort (± 2 SE) by river mile (30-mile bins)] of pallid sturgeon in the lower basin monitoring area of the Missouri River in 2006. Data obtained through random sampling using gill nets.

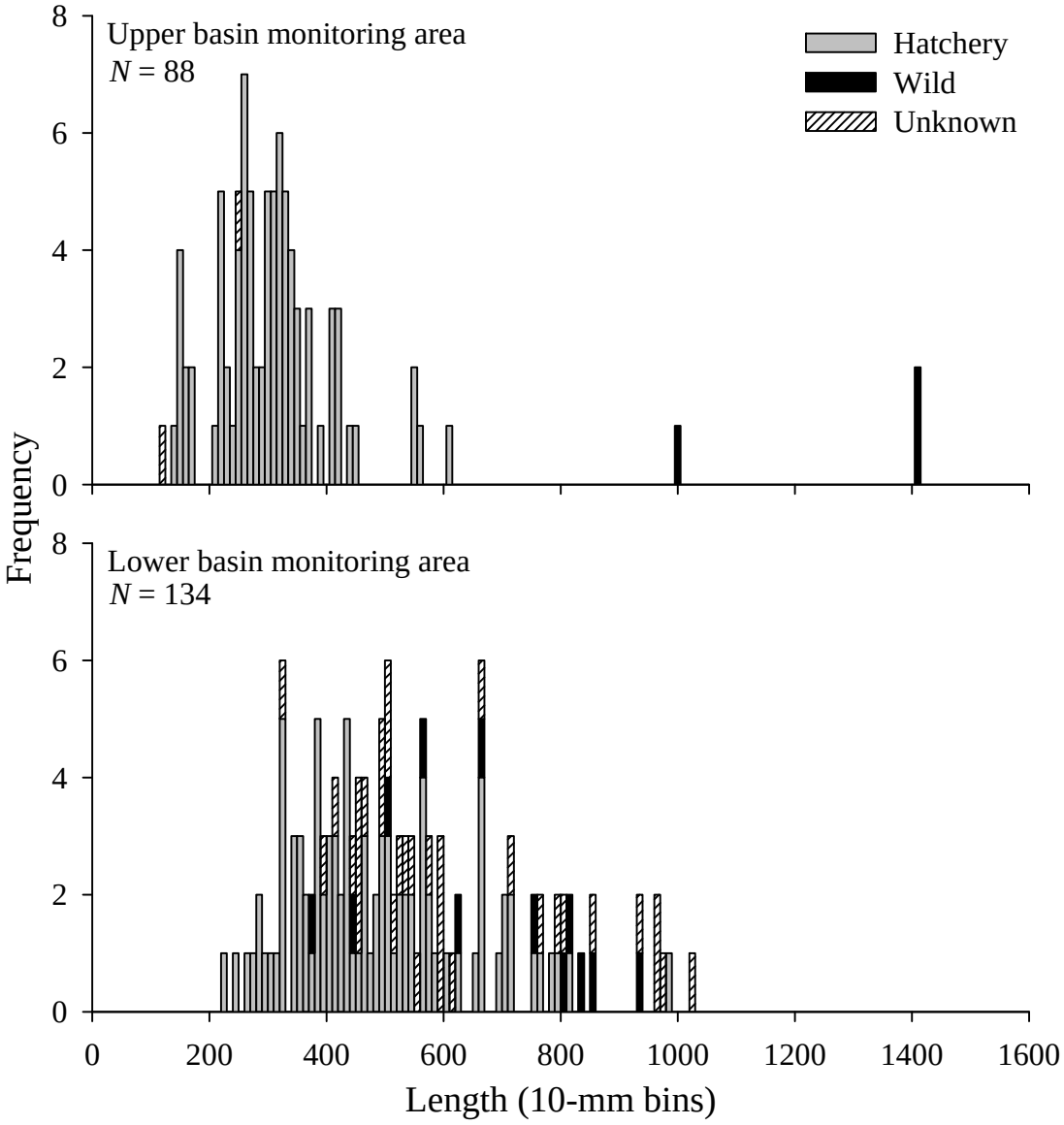

Figure 6. Length frequency distribution of pallid sturgeon of hatchery, wild, and unknown origin captured in the upper and lower basin monitoring areas of the Missouri River during the 2006 sampling year using standard and wild gears with random and non-random sampling.

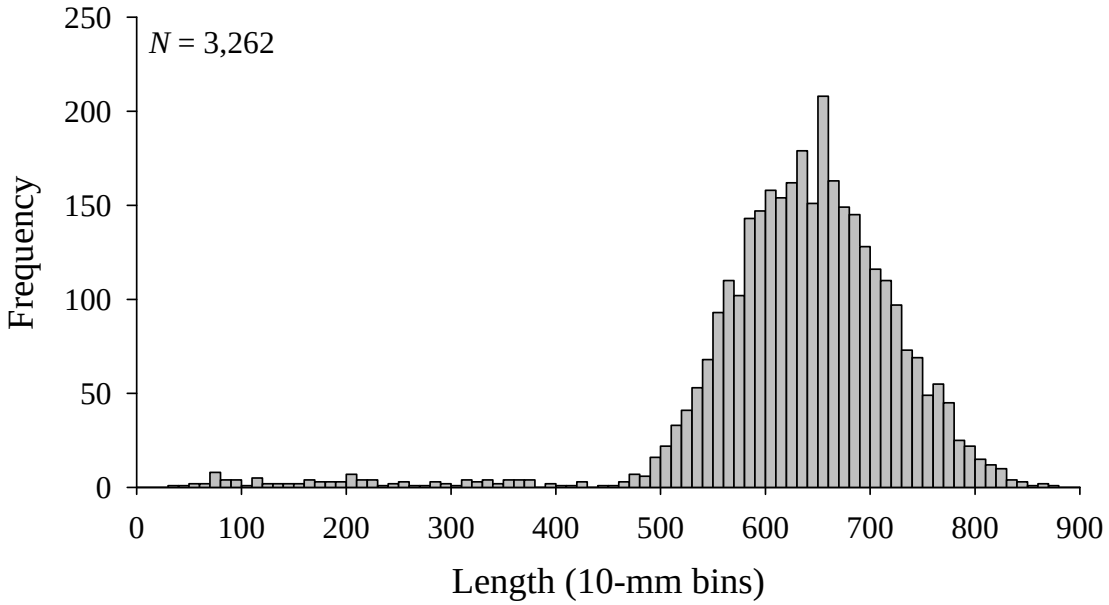

Figure 7. Length frequency distribution of blue suckers captured in the upper and lower basin monitoring areas of the Missouri River during the 2006 sampling year using standard and wild gears with random and non-random sampling