Wabash River Catfish Population Demographics and Management Implications

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Executive Summary

Catfish are a major component of the Wabash River fish assemblage and are commercially fished below river mile (RM) 311. From river mile 200 through 310 the commercial fishery is subjected only to Indiana regulations. In this reach of river there is a 10 inch minimum length limit on both sport and commercially harvested catfish. Bellow RM 200, the Wabash forms the state boundary of Indiana and Illinois. In this region of river there are two different length limits on commercially harvested catfish. Indiana maintains its 10 inch limit, while Illinois commercial fishers are subjected to a 15 inch minimum size limit, however, there is no length limit on sport harvest of catfish by Illinois anglers. The primary objective of this study was to assess the general population dynamics of the three catfish species, channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), and blue catfish (*I. furcatus*) and determine how their dynamics differ under various sport and commercial fishing regulations. We divided the lower 343 miles of the Wabash River into three treatment reaches. The two lowest reaches were commercially fished (IN & IL: RM 0-200; IN: RM 244-311), whereas the northernmost reach was not (NON: RM 311-343). This report summarizes all survey work accomplished during 2001 through 2004.

Both three-phase AC electrofishing and baited hoop nets (both 1- and 1.25-inch bar mesh) were used to sample fish during each fall of each year. Density was standardized within each gear type as catch per unit effort by river reach. To assess differences in the condition and growth of the catfish between the three different

treatment reaches, we measured and weighed each fish. A pectoral spine was removed from all fish except for the largest flathead catfish. Relative weights were calculated and von Bertalanffy models were used to estimate growth rate, whereas catch curves were used to estimate mortality.

Each gear type had a species- and size-specific bias. Both gear types caught predominantly channel catfish. Therefore, most of our analysis was restricted to harvest impact on this species. Within each reach, three-phase AC electrofishing sampled larger fish compared to either of the two meshes of hoop nets. One-inch mesh hoop nets sampled the smallest catfish among the gear types. Because of this gear-specific selectivity, we analyzed the data for density and mortality by treating the catch from each gear type independently. Overall, a total of 2556 channel catfish, 218 flathead, and 33 blue catfish were caught during this study.

The density of the largest channel catfish was lower in the commercially fished reaches compared to the unfished reach (Chapter 1). However, no difference in the density of the small young channel catfish occurred among the river reaches. Length frequency distributions differed among reaches, with the unfished reach having the highest mean length among treatment reaches. These differences were reflected in the stock indices. The PSD and RSD-P indices were higher in the non-commercially fished reach (NON) compared to both the IN & IL and the IN treatment reaches which were both commercially fished. Potentially, more abundant large fish in the NON treatment reach reduced individual body size due to intraspecific competition. Similarly, condition of channel catfish was lower in the NON treatment reach where the density of large individuals was high.

The proportion of old channel catfish in the commercially exploited reaches was low compared to the NON reach (Chapter 2). Both electrofishing and hoop netting revealed higher mortality rates in the commercially fished reaches. Judging by the higher mortality in the IN & IL treatment reach than in the IN one, harvest is likely greatest in this reach shared by Indiana and Illinois. Overall, compared to the Upper Mississippi River population of channel catfish, the mortality in all treatment reaches of the Wabash River was fairly low and growth rates were high. Increased mortality and reduced density in the commercial fishing reaches apparently enhanced individual growth rates in these reaches. Reduced intraspecific competition, a compensatory population response, likely was responsible. Aging of channel catfish indicated recruitment in every year, although the 1993 and 2000 year classes were relatively weak.

We quantified the water and habitat quality of the Wabash River (Chapter 3). All water quality parameters (temperature, dissolved oxygen, conductivity, ph, and secchi depth) were within the tolerance limits for the three species of catfish inhabiting the Wabash. Habitat quality estimated using the Qualitative Habitat Evaluation Index (QHEI) varied with treatment reach. The highest QHEI scores for habitat occurred in the most upstream treatment reach (NON), followed by the boundary fishery (IN & IL). Abundance of large individuals estimated from electrofishing correlated positively with habitat quality. However, it is difficult to tease apart the impact of habitat quality and fishing on the density among reaches, given that no commercially fished reach with equivalent habitat quality to the NON reach were sampled.

The spring commercial harvest was assessed by INDNR's personnel during three of the four years of the study. Overall, Illinois commercial fishers harvested larger

channel catfish than did their Indiana counterparts. Differing length limits on the Wabash River (IN&IL reach: combined 10-15 inch minimum between states; IN reach: 10-inch minimum only) were responsible. Mean length of channel catfish harvested by the Illinois commercial fishers occurred at 21.4 inches, which coincided well with the sharp decline in the frequency of catfish of greater than or equal to this length in the shared IN & IL treatment reach. The mean length of channel catfish harvested by Indiana commercial fishers (15.5 in) was lower than the Illinois commercial fishers, however only 10% of the harvest data was from the Indiana commercial fishers. Although IN harvest data were limited, selective harvest for intermediate sized channel catfish in the IN reach likely allowed a greater proportion of individuals to survive to larger sizes and older age classes. There is currently no information regarding harvest from recreational anglers.

To understand how management strategies affect size-dependent population yield, mean length of channel catfish harvested, and spawning potential ratio (SPR), we modeled the population using the Beverton-Holt yield-per-recruit model, exploring the potential effects of 10, 13, and 15 inch minimum length limits. At the current level of harvest and size limits, harvest of channel catfish appears to be sustainable. The model suggested that if both Indiana and Illinois adopted a 10-inch minimum length requirement for sport and commercial fishing, recruitment and growth overfishing may occur with even a moderate increase in harvest. If a 13-inch minimum length limit was implemented by both states, a larger range of harvest and a greater mean length could be sustained before the population became overfished. At this length limit, maximum yield would increase by about 10%, while producing larger catfish for the sport fishery. At the

modeled 15-inch minimum length limit, recruitment overfishing was not reached at any of the conditional fishing mortalities and harvestable mean lengths were the greatest.

With the current minimum length limits occurring in the Wabash River, total yield would decline with modest increases in harvest rates. As such, all harvested reaches require monitoring so that overharvest of reproductively viable adults does not occur. It is important to note that all of these modeling scenarios do not incorporate compensatory responses (e.g., dynamic changes in recruitment and growth rates) as a function of changes in density. Our comparison across reaches suggests that demographic parameters are highly responsive to density changes, which may alter modeling responses. Further, the current modeling scenario assumes equal harvest probability of all individuals above the minimum length limit, although it is likely that intermediate-size "fiddler" catfish may be selectively removed by commercial fishers. More detailed information about size-dependent harvest rates would improve model predictions.

Several questions have been answered during this study. And, of course, new gaps in our knowledge have been uncovered. A refined, reach-specific maturation schedule and size-dependent fecundity relationships for channel catfish in the Wabash River are needed to better refine our predictions. Furthermore, reach-specific sport and commercial fishing effort and harvest will allow for the determination of reach-specific management protocols. Teasing apart the contribution of commercial and recreational harvest to fishing mortality will improve estimates of fishing and natural mortality and allow refinement of the models. All of our interpretations rely on the assumption that catfish remain largely stationary within each reach. Size-dependent movement among

the treatment reaches and between the Wabash River and adjacent systems (e.g., the White River and the Ohio River) would greatly alter our conclusions and recommendations. Many of these questions are currently being addressed by the Indiana Department of Natural Resources which will lead to an improved understanding of the dynamics of catfish populations in the Wabash River.