Illini Muskies Alliance

Project Green Gene

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EVALUATION OF GROWTH AND SURVIVAL OF DIFFERENT GENETIC STOCKS OF MUSKELLUNGE: IMPLICATIONS FOR STOCKING PROGRAMS IN ILLINOIS AND THE MIDWEST

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Final Report Summary

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By the late 60's existing natural muskie populations in the Illinois portion of Lake Michigan, the Fox River watershed and the Mississippi River watershed had been irradiated by pollution, over harvest and the destruction of spawning habitat. Except for a few private lakes with stocked fish, the muskie fishery had disappeared from Illinois. In an effort to reintroduce muskie to public bodies of water, a committee of the Chicagoland Muskie Hunters, Chapter of Muskies, Inc., called Project Illini, was formed in the early 70's. Through private donations, funds were provided to purchase muskie fingerlings from a private hatchery in Wisconsin, and the first public bodies of water in Illinois were stocked.

Initial stockings of muskies in Illinois were made with fingerlings. There fingerlings were either purchased from various sources or were fish traded from numerous states across the muskie range, including MN, WI, MI, IA, IN, OH, PA, KY, TN and NY. These collected sources of muskies eventually established a unique “Illinois strain” of fish in Spring Lake North, which the IDNR then used as their brood stock lake. Fish were collected from Spring Lake North, spawned and stocked from then on throughout Illinois. However, the yearly Illinois stockings were supplemented periodically by other strains purchased by some of the IMA clubs, or fish obtained by the IDNR to replace lost hatchery fish due to disease or predation.

As the muskellunge range is artificially expanded by more widespread stocking, it becomes increasingly important to understand the potential impacts of muskellunge introduction on existing fisheries and aquatic communities. Further, there was a concern among some anglers that the genetically mixed strain being introduced may not be the best particular strain to meet Illinois’ unique climate and lake habitat.

With these concerns in mind the, Central Illinois Muskie Hunters, Chapter of Muskies, Inc., approached the Illinois Department of Natural Resources with a proposed study to address these concerns. Along with support from the Illinois Natural History Survey, the University of Illinois, the US Fish and Wildlife Service, various Illini Muskies Alliance member clubs and Muskies, Inc., a long term study known as Project Green Gene, was launched.

The final 71 page report is the source of this article. I have copied the report extensively, using some of my own words to help explain to the reader many of the scientific terms and methods used in the report in a simplified summary. Those wanting a more thorough summary, including all the numerous charts, graphs and references are urged to obtain the full document by contacting the INHS.

The study was originally planned as a six year series of ongoing projects to address the above concerns. Along the way, the initial questions led to other questions and the study was expanded and continued for an additional four years. The study began stocking muskie fingerlings in three project lakes, selected to represent Illinois' unique climate, diverse range of lake make-up and forage base. Such a long term study is rare in the scientific community and provided an opportunity for several students to complete their thesis and eventually move on to successful careers elsewhere. The IMA would like to thank these dedicated students, the project leadership, the IDNR, the varied sources of financial support and all of the concerned individuals for making this possible.

Project Green Gene (PGG) was broken up into four major jobs.

The first job was to evaluate the growth of different stocks of muskellunge.
The objective was to determine differences in growth among various stocks and populations of muskellunge in Illinois waters.

Muskellunge from the Upper Mississippi River drainage strain, the Ohio River drainage strain, and the Illinois North Spring Lake mixed strain were stocked into Mingo, Pierce, and Sam Dale Lakes and compared in this job and all other jobs in the project. Populations were sampled by electrofishing and modified fyke net surveys during spring. Data was compiled from all years to describe long-term trends in growth and survival of muskellunge stocks in Illinois. Across years and lakes, the Ohio River drainage stock and the Illinois stock generally appear to have similar growth rates through age-1, and beyond. Few Upper Mississippi River drainage stock were available for growth comparisons and there is a need to continue to collecting these fish in the future. Analysis indicates that, to date, the fish from the Upper Mississippi River drainage stock are consistently leaner than those of the other stocks.

The second job was to evaluate survival of the different stocks of muskellunge.
The objective was to investigate survival of various stocks and populations of muskellunge in Illinois waters.

In experimental ponds, the Ohio River drainage stock grew faster than the Illinois stock and the Upper Mississippi River drainage stock muskellunge. These survival results were very similar to lake evaluations showing greater survival of Ohio River Drainage stock and Illinois stock muskellunge than the Upper Mississippi River Drainage stock.

The results of the reservoir experiment suggest similar survival between the Illinois stock and the Ohio River drainage stock muskellunge and much lower survival for the Upper Mississippi River drainage stock in all lakes. During spring netting surveys of adult muskellunge, the Illinois stock and the Ohio River drainage stock were consistently represented at similar levels in catches. In contrast, few Upper Mississippi River drainage stock muskellunge have been sampled beyond age-1 in all three lakes. The recapture rate of Upper Mississippi River drainage stock muskellunge, in most cases, was too low to allow quantitative comparisons with the other

stocks. Long-term data will allow us to detect any biologically significant differences in longevity or survival between the distinct stocks of muskellunge in Illinois lakes.

Results from lake introductions suggest that after the first summer following stocking, the Ohio River drainage stock and Illinois stock typically have similar rates of survival, both of which are higher than the Upper Mississippi River drainage stock. This pattern led to consistently lower survival of Upper Mississippi River drainage stock year classes to adulthood as well. The Ohio River drainage stock and Illinois stock show similar survival both to adulthood and annually through adult age classes. The specific mechanism responsible for differences in survival rate among stocks is still unknown. Year classes will need to be monitored over additional years to further assess potential differences in long-term growth, maximum length, and survival among stocks, particularly in Lake Sam Dale, where adult muskellunge from the Upper Mississippi River drainage stock have been recaptured with greater consistency.

The third job was to determine the diet composition of muskellunge.
The objective in evaluating the diet composition of muskellunge was to study the potential of direct and indirect interactions between muskellunge and other, mainly fish eating, fishes.

Despite the increasing trend of muskellunge introduction there is little information on the effects of muskellunge introductions on lake ecosystems and existing fisheries. Although muskellunge introduction has led to the development of successful fisheries, it has sparked considerable controversy among angling groups over fears that they will compete with and/or prey upon resident species and impact alternative existing fisheries. Specific concerns regarding muskellunge introductions include the predatory effects that these introduced populations may have on other ecologically and recreationally important fishes and the potential for negative interactions with resident fish predators. Although muskellunge are providing new and exciting fisheries in Illinois waters, it is essential to consider their potential effects on other recreationally and ecologically important sportfish populations both to better guide management actions and to address public concerns. In this job, we tested for effects of introduced muskellunge on resident fish populations representing several recreationally and ecologically important species across eight Illinois lakes.

Diet samples were collected from muskellunge between May 2007 and May 2012 across seven Illinois lakes (Lakes Mingo, Otter, Pierce, Ridge, Sam Dale, Shelbyville, and Lake of the Woods).

On the individual lake scale largemouth bass populations exhibited significant changes in relative abundance in three lakes and significant changes in size structure in four lakes. In all three cases (Johnson Lake, Wheel Lake, and Shovel Lake) where largemouth bass relative abundance showed statistically significant changes after muskellunge introduction, the effect represented a relative increase. Similarly in all four cases (Johnson Lake, Ridge Lake, Shovel Lake, and Wheel Lake) where significant changes in size structure were detected, effected sizes were positive representing relative increases in size structure after muskellunge introduction. Across five lake pairs for which data were available gizzard shad populations showed no significant changes for any parameter including relative abundance, size structure and condition at the scale of individual lake pairs.

Muskellunge diet information showed a consistent pattern of little predation on largemouth bass or other game species in lakes where gizzard shad are present. Diet information from Lakes Mingo, Pierce, Sam Dale, Otter, and Shelbyville indicates that gizzard shad make up the bulk of muskellunge diet wherever they are available. These findings are similar to other studies that

have shown gizzard shad to be the dominant prey item in Ohio impoundments and that muskellunge prefer gizzard shad and other soft rayed fishes when present. This suggests that muskellunge are not responsible for significant amounts of direct predation on most popular game species where gizzard shad are present.

However our data set is limited to spring and fall seasons when muskellunge are vulnerable to capture. Our results show no negative effects of muskellunge introduction on largemouth bass relative abundance. In contrast we found that largemouth bass catch-per-hour increased significantly relative to controls in three of the eight lake pairs examined and the effected sizes were positive for seven of the eight cases. With the exception of crappie populations, we found little evidence for predatory impacts of introduced muskellunge on important prey species in these systems including bluegills, redear sunfish and gizzard shad. We found evidence for a potentially strong positive interaction between introduced muskellunge and largemouth bass populations when generalizing across eight Illinois lakes, which we feel warrant further study of the interactions between these species. In addition we found evidence that muskellunge may influence the size structure and/or abundance of crappie populations although these findings are from a smaller number (four) of the twenty-nine lakes systems. The known preference for muskellunge to consume gizzard shad combined with the lack of population responses by this species suggests that muskellunge may be utilizing an abundant and potentially underutilized forage base in these systems.

Thus far, food habits data has shown that where present, gizzard shad dominate muskellunge diet in both numbers and biomass across all size classes and seasons. Gizzard shad are not present in Ridge Lake where muskellunge diets consist primarily of bluegill, although a small percentage of the samples contained largemouth bass. Results from diet analysis are conclusive in that where available gizzard shad are the primary forage of muskellunge in Illinois lakes followed by bluegill. This pattern is generally consistent between seasons, although there is some evidence that bluegill become a slightly more important prey item in the spring. With the exception of decreasing white crappie abundance in a small percentage, (fourteen) of the lake systems compared, muskellunge introductions had either non-negative or positive effects on size structure and abundance of sport and prey fishes including bluegill, redear sunfish and crappie. Muskellunge introductions appear to have very little impact on common carp or gizzard shad populations.

The fourth job of the study was analysis and reporting.
The objective was to prepare annual and final reports summarizing information and develop guidelines for proper selection of muskellunge populations for stocking in Illinois impoundments.

In particular, these long-term data will be used to examine attributes such as longevity, maximum size-at-age, and size-at-maturity. Results of this study can be used to develop guidelines for future muskellunge stockings that maximize growth, survival, and angler satisfaction in lakes throughout Illinois. Understanding intraspecific variation in muskellunge growth rate and survival as well as the effects of these predator fishes on the existing aquatic community contribute to a more informed and scientific approach to muskellunge management in Illinois and the lower Midwest.

Comments.

While the study itself does not recommend any changes in muskie management in Illinois, the results lead to obvious conclusions. The ultimate decisions on the management of muskie in Illinois, is the responsibility of the IDNR. An informal response from the IDNR representatives

present (including Debbie Bruce the Chief of the Division of Fisheries) at the annual meeting of the IMA/IDNR, where this final report was presented by Matt Diana, indicates that muskie stocking using the Illinois mixed-strain will continue for the present time. However, as the study suggests, the study lakes will continue to be stocked and sampled to determine some of the still unanswered questions addressed, such as ultimate growth of muskie in Illinois. While the three distinct strains will not be stocked on an annual basis, I feel that some of the IMA member clubs will continue to provide Upper Mississippi River drainage stocks (Leech Lake strain) for some specifically selected Illinois lakes on a periodic basis.

When you consider the costs involved in stocking privately raised fingerlings, this prediction may seem foolhardy. However, independent research by myself and another, along with private research from one of the IMA member clubs, indicate that a majority of the larger Illinois muskies captured (fifty inches or larger) have been Leech Lake strain fish. What is even more surprising is the fact that these Leech lake strain fish have only been stocked (periodically) in four of the twelve Illinois lakes which have produced these larger fish.

As indicated earlier, the original study was expanded to address other concerns, which became apparent over the course of the research. One of these concerns will be continued by Matt Diana, hopefully to its conclusion (or at least as long as funding is available). That particular concern is one that plagues many, if not most, of the impoundments throughout the muskie range. Specifically, that concern is escapement of muskie and other species over dams during periods of water flow. Preliminary research indicates an alarming escapement of about an estimated twenty percent of the three to five year old muskie fingerlings in that body of water, during the brief high water discharge periods. Since many of these incidents happen in water systems containing discharge into intermittent bodies of water (streams or creeks), poaching, predation or suffocation is the ultimate result, unless timely rescues occur.