IOWA DEPARTMENT OF NATURAL RESOURCES

Sport Fish Restoration Research Findings

The Production and Consumption Dynamics of Major Fish Species, and the Estimated Carrying Capacity of Major Fish Piscivores in Spirit Lake, Iowa

Project Duration: 1995-1998
Location: Spirit Lake (Dickinson County)
Study Number: 7015

Natural Lakes Fisheries Research Team:
Joe G. Larscheid, Fisheries Biologist
Ed Thelen, Fisheries Technician
Michael J. Hawkins, Fisheries Technician

For more information, please contact the Spirit Lake Fish Hatchery at 712-336-1840.

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Knowledge of the production and consumption dynamics of fisheries is key to develop effective management plans. Currently, fisheries in Iowa are managed without knowledge of the carrying capacity of various systems. This lack of information limits the realization of management goals. In Spirit Lake, management objectives were established at 2 broodstock Walleye per acre in 1990. This study tried to determine if these management goals exceeded carrying capacity limits for Spirit Lake.

Goals

- Describe production and consumption dynamics of major fish species in Spirit Lake
- Develop a comprehensive plan to manage sport fish in Spirit Lake based on the production and consumption dynamics of the system

Results

- Seine hauls collected 142,179 fish representing 25 species over three years.
- Density and biomass estimates were calculated for 12 fish species and these estimates varied widely by month and year.
- Stomach contents were examined from over 3,000 fish that contained over 41 recognizable prey taxa. Of those, six invertebrate and 10 fish taxa were considered to be major prey items.
- Yellow perch were the most abundant species in the lake and in the creel. They were also the primary fish consumed each year and accounted for 78% of the total fish consumed.
- Walleye and yellow perch were the dominant piscivores and consumed the majority of fish.
- Other major piscivores accounted for only a relatively small portion of fish consumed.

Conclusions

Studies have found that intensive stocking of piscivores may lead to reductions and even a collapse in the abundance of major forage species. This study found that Yellow Perch were the most consumed prey fish of all major piscivores in Spirit Lake and were the preferred prey species for both Walleye and Northern Pike, regardless of Yellow Perch abundance. Contrary to other published work, this study found that Walleyes did not prey heavily on soft-rayed fishes, such as Spottail Shiners, even though they were available during some periods. The available Yellow Perch forage in the littoral zone appeared to be inadequate to meet current or future consumption demands of piscivorous fish; a related study found a substantial biomass of forage fish in the limnetic zone. This study concluded that the current management objective for Walleye did not negatively impact Yellow Perch populations in Spirit Lake. Even when Walleye broodstock densities were high, Yellow Perch were still the most abundant fish.