

Public Angling as a Method of Triploid Grass Carp Removal

by
Craig T. Mallison,¹ Arnold H. Lingle, Jr.,¹ Bruce V. Jagers,¹ and Lowell L. Trent¹

Introduction

Triploid grass carp (*Ctenopharyngodon idella*) have been used in Florida for aquatic plant management since 1984 (Trent et al. 1992). Triploid grass carp are an attractive biological control for aquatic plants because they (a) prefer hydrilla (*Hydrilla verticillata*), which is the most problematic submersed plant in Florida (Hinkle 1986; Langeland 1990), (b) can provide long-term (greater than 3 years) control (Sutton and Vandiver 1986; Wiley, Tazik, and Sobaski 1987; Trent et al. 1992), and (c) are often more economical than alternative methods (Sutton and Vandiver 1986; Wiley, Tazik, and Sobaski 1987). Management has been very successful where eradication of aquatic vegetation is desirable and/or the water body is less than 2 ha in surface area (Trent et al. 1992). However, use of these fish in large lakes has been limited because of potential damage to habitat (Langeland 1990). Triploid grass carp readily consume many native aquatic plant species when hydrilla is not available (Sutton and Vandiver 1986; Langeland 1990), occasionally to the extent of eradication of all submersed and emergent vegetation (Wiley, Tazik, and Sobaski 1987). This can be a problem where aquatic plants serve as important fisheries habitat (Wiley, Tazik, and Sobaski 1987; Porak et al. 1990).

Vegetation growth and the amount of plant control required change over time as a result of changes in water levels, weather patterns, lake and watershed uses, and grass carp feeding behavior and preferences (Osborne and Sassic 1981; Sutton and Vandiver 1986; Wiley, Tazik, and Sobaski 1987). Because of these factors, there is not a stocking formula

that applies to all situations (Sutton and Vandiver 1986), and aquatic plant management using triploid grass carp often results in either elimination of nontarget plants as well as targets or insufficient control of target vegetation. This is popularly referred to as the "all or nothing" dilemma of plant management using triploid grass carp.

Selective aquatic plant management using triploid grass carp requires the ability to manipulate the amount of vegetation control (i.e., the number of triploid grass carp). Supplemental stockings can be used to increase the amount of plant control, but an efficient and practical method of triploid grass carp removal to decrease the amount of plant control has not been developed (Hestand, Thompson, and Phippen 1987; Trent et al. 1992; Bonar et al. 1993). Removal of triploid grass carp from overstocked lakes can aid lake restoration projects by reducing grazing pressure on planted aquatic vegetation. In addition, future habitat destruction may be prevented by removing fish before desirable native plants are eradicated. This paper presents a research project with the objective of restoring native vegetation through triploid grass carp removal. The removal technique public angling was explored as a future management option.

Study Area

Lake Mills is a 94-ha, tannin-stained, lake located in Seminole County, Florida. By 1985, infestation of hydrilla had reached 52-percent areal coverage and management was required to restore recreational uses of the lake. The Lake Mills Homeowners Association (LMHOA) implemented an integrated

¹ Florida Game and Fresh Water Fish Commission, Fisheries Research Laboratory, Eustis, FL.

aquatic plant management program that consisted of stocking 1,800 triploid grass carp (19 fish/hectare) in January 1986 followed by a fluridone treatment in May 1986. The integrated plant management program resulted in near eradication of aquatic plants. By June 1989, all detectable submersed vegetation was eliminated, and LMHOA requested assistance from the Florida Game and Fresh Water Fish Commission (GFC) with removal of triploid grass carp. The objective was to remove triploid grass carp to allow regrowth of the native plant community, primarily maidencane (*Panicum hemitomon*), eel grass (*Vallisneria americana*), and stonewort (*Nitella* sp.), to 20-percent areal coverage while maintaining control of hydrilla.

Methods

The GFC has attempted many methods to capture grass carp (Hestand, Thompson, and Phippen 1987; Trent et al. 1992). Angling was determined to be the only practical method for potential removal of triploid grass carp from Lake Mills. Annual permits were issued to 23 interested anglers (possession of triploid grass carp is otherwise illegal in Florida). Four automatic fish feeders that dispensed floating feed pellets were installed to attract triploid grass carp into convenient fishing areas. The most common fishing baits were live worms, dry dog food, bread, and dough balls.

Aquatic vegetation surveys were conducted quarterly to evaluate the response of the plant community to triploid grass carp removal. Surveys consisted of observing emergent plants along the shoreline and sampling submersed plants with a weed hook around the perimeter of the lake. Total areal coverage was based on occurrence of submersed plants in grab samples and observation of emergent plants.

Results

During 16 months of public fishing, 242 triploid grass carp (3 to 9 kg) were removed by angling (96 percent) and bowfishing (4 percent).

This represents 13 percent of the number stocked and 2.6 fish/hectare. Twelve of the twenty-three permitted anglers captured at least one fish, five people caught 10 or more, and three people combined for 170 removals (70 percent of total). More than half of the triploid grass carp removed (126 fish or 53 percent) were captured during the first 2 months of the program. The decreasing catch rates reflect a high initial effort by fishermen in addition to declining catch per unit effort that may have resulted from fewer triploid grass carp present as well as fish presumably becoming wary of boats and anglers. Although effort was not measured by participants, they reported that the fish became much harder to catch as time progressed.

At the beginning of the removal program, there was 1-percent coverage of emergent vegetation and no detectable submersed vegetation. By January 1990 (7 months into the program), 169 triploid grass carp had been removed, and plants began to re-establish in canals and scattered locations along the shoreline. In 1991, total vegetation coverage was 6 percent (2-percent emergent plants, 4-percent submersed plants) and dominated by filamentous algae (*Lyngbya* sp. and *Spirogyra* sp.) and water moss (*Fontinalis* sp.).

Discussion

The number of triploid grass carp in Lake Mills was estimated using a mortality rate of 15 percent for the first year after stocking and 5 percent for the following years (Hestand, Thompson, and Clapp 1990). Adding mortality from the public angling program, the estimated number of triploid grass carp in Lake Mills in January 1992 was 962 (Figure 1). Without a removal program, the estimated number would have been 1,184. Based on this, the 16-month program may have accelerated mortality of the triploid grass carp by 4 years (965 estimated fish in 1996). The project objective of 20-percent coverage of aquatic plants was not attained during the study period. Although the observed vegetation regrowth from 1 to 6 percent may have been accelerated by removal of 242 triploid

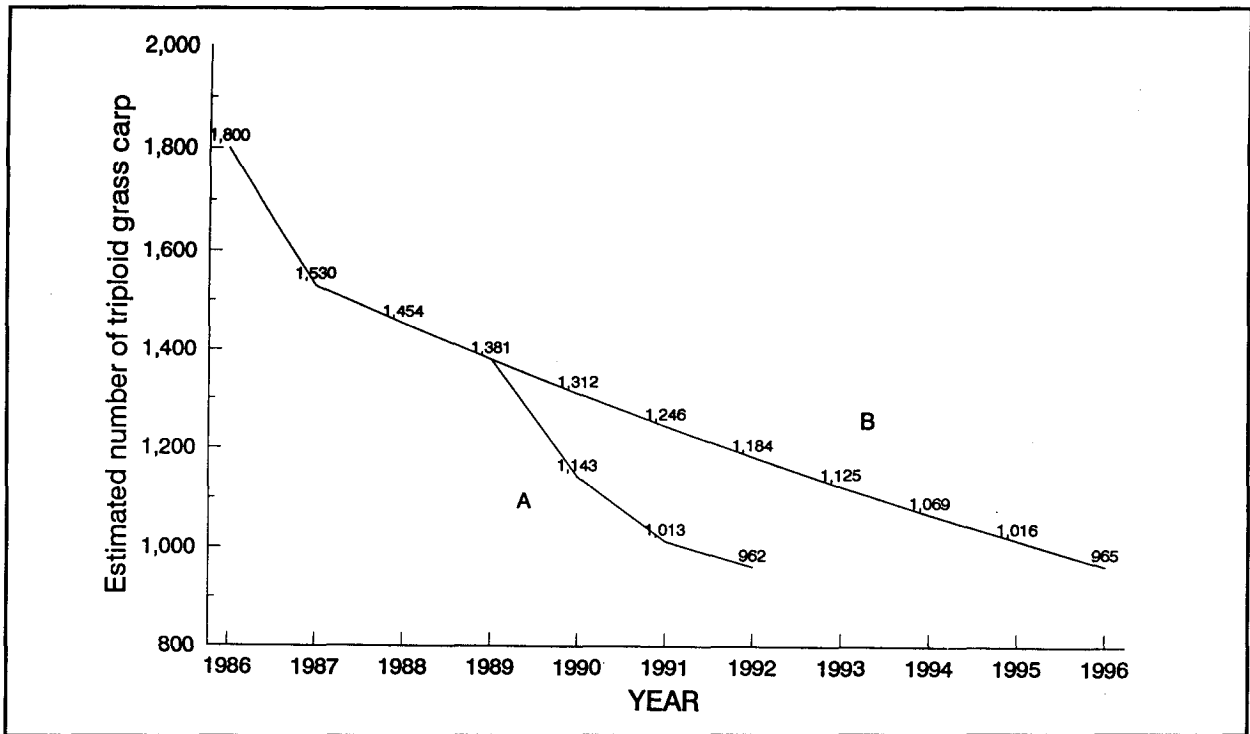


Figure 1. Estimated number of triploid grass carp in Lake Mills with angling (A) and projected without angling (B). Estimate is based on 15-percent mortality for the first year and 4 percent thereafter

grass carp, regrowth may have occurred even without the removal program.

Dedicated fishermen can remove a significant number of triploid grass carp, as demonstrated by three Lake Mills anglers who removed a total of 170 fish. Terrel and Fox (1974) reported angling removal of 429 grass carp in a Georgia lake (3.6 ha) over a period of 13 months. Although the fish were extremely crowded (253/hectare), this illustrates that up to 50 percent of the stocked population can be removed by angling.

Successful angling may be limited to lakes lacking abundant amounts of preferred food plants, such as Lake Mills. Results from an angling study in Washington (Bonar et al. 1993) demonstrated success in such lakes. However, grass carp were not attracted into baited areas nor were any caught in lakes containing abundant preferred food plants.

Some aspects of angling success on Lake Mills were comparable with those of smaller scale programs conducted on Lakes Waunatta

and Winnemisett (Trent et al. 1992). On Lake Waunatta, a 27-ha private lake in Orange County, Florida, homeowners removed a total of 16 fish over a 4-month period. Catch rates were similarly higher initially, with 15 fish being caught during the first 3 weeks. As on Lake Mills, a small number of participants were responsible for the majority of the fish caught. Three individuals were responsible for a total of 13 fish. There were only three other successful anglers.

There were several notable points in the Lake Waunatta program. Although only 16 of the target of 50 fish were caught during the study period, the program was considered a success because plants preferred by triploid grass carp increased detectably during the study. A catch-per-unit effort of 0.5 fish per man-hour was achieved even though there were detectable levels of preferred food plants in the lake. Typical baits were successful, the exception being one fish caught on a strawberry.

On Lake Winnemisett, a 66-ha private lake in Volusia County, Florida, a total of 103 triploid

grass carp were removed, 70 by angling. A small number of participants, 4 out of a total of 10, were responsible for all 70 fish removed by angling. The remaining 33 fish were removed later by bowfishing and, incidentally, in a shiner lift net.

Public fishing is currently the most cost-effective triploid grass carp removal technique used by the GFC. This method may be useful in cases where a relatively small number of fish (less than 500) must be removed from a lake with low levels of preferred food plants, provided that there is sufficient angler participation. However, a more efficient and effective technique must be developed for removal of large numbers of fish, such as would be required in most lakes over 100 ha.

References

- Bonar, S. A., Vecht, S. A., Bennett, C. R., Pauley, G. B., and Thomas, G. L. (1993). "Capture of grass carp from vegetated lakes," *Journal of Aquatic Plant Management* 31, 168-174.
- Hestand, R. S., III, Thompson, B. Z., and Clapp, D. F. (1990). "Annual progress report for herbivorous fish project," State of Florida Game and Fresh Water Fish Commission, Tallahassee, FL.
- Hestand, R. S., Thompson, B. Z., and Phippen, K. W. (1987). "Final report for methods of capture and/or removal of triploid grass carp," State of Florida Game and Fresh Water Fish Commission, Tallahassee, FL.
- Hinkle, J. (1986). "A preliminary literature review on vegetation and fisheries with emphasis on the largemouth bass, bluegill, and hydrilla," *Aquatics*, December 1986, 9-14.
- Langeland, K. A. (1990). "Hydrilla: A continuing problem in Florida waters," Institute of Food and Agricultural Sciences, University of Florida, Gainesville.
- Osborne, J. A., and Sassic, N. M. (1981). "The size of grass carp as a factor in the control of hydrilla," *Aquatic Botany* 11, 129-136.
- Porak, W. F., Crawford, S., Renfro, D., and Cailteux, R. L. (1990). "Largemouth bass population responses to aquatic plant management strategies. Completion Report, 1987-1990," State of Florida Game and Fresh Water Fish Commission, Tallahassee, FL.
- Sutton, D. L., and Vandiver, V. V., Jr. (1986). "Grass carp: A fish for biological management of hydrilla and other aquatic weeds in Florida," Institute of Food and Agricultural Sciences, University of Florida, Gainesville.
- Terrell, J. W., and Fox, A. C. (1974). "Food habits, growth, and catchability of grass carp in the absence of aquatic vegetation." *Proceedings of the Southeast Association of Fish and Wildlife Agencies* 8, 251-259.
- Trent, L. L., Jagers, B. V., Mallison, C. T., Lingle, A. H., Jr., and Phillippy, C. L. (1992). "Project completion report for northwest, northeast, and central regions aquatic plant management," State of Florida Game and Fresh Water Fish Commission, Tallahassee, FL.
- Wiley, M. J., Tazik, P. P., and Sobaski, S. T. (1987). "Controlling aquatic vegetation with triploid grass carp," Circular 57, Illinois Natural History Survey.