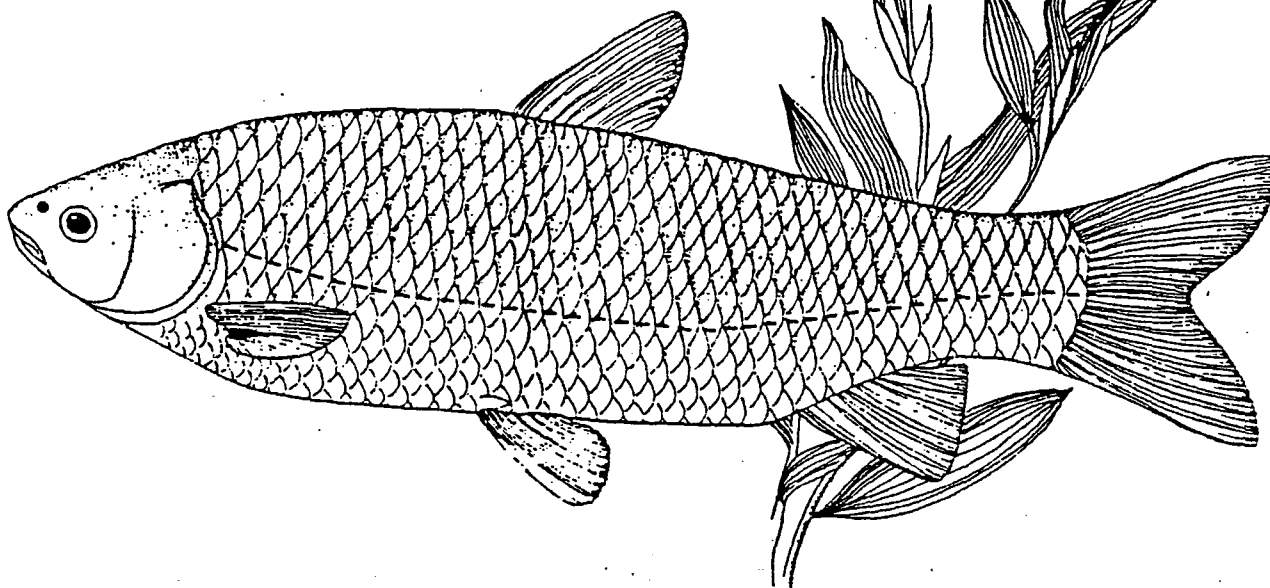


GRASS CARP
(White Amur)

As a management tool



SHOULD WE USE THE GRASS CARP TO REMOVE WEEDS IN MICHIGAN LAKES?

State Representative Margaret O'Connor introduced a bill to permit use of the white amur, (*Ctenopharyngodon idella*) or grass carp to remove weeds in Michigan lakes.

In this four part document, I'll first offer my opinions and the problems I see with the objections. The second part will be a description of the Lake Conroe problem in Texas which is often used to justify not using grass carp in Michigan lakes. The third part will be a description of the grass carp. The fourth part will be excerpts from letters Representative O'Connor's office received from various state fishery managers.

PART 1. MY COMMENTS.

- After listening to and reading about the pro's and con's, and as a limnologist studying Michigan lakes and riparian problems, I feel we should consider studying the use of the grass carp to control weeds in Michigan lakes. The best evidence of their effectiveness is the many states already using them, including Ohio and Illinois, which have climates similar to ours.
- The best reason to consider using the grass carp to remove weeds in Michigan lakes is it seems to be working. 31 states are currently using them in some fashion, (see map below) and according to letters received by State Representative Margaret O'Connor's office, the bill's sponsor, few reported problems. Most problems related to use of too many fish, a problem easily solved.
- The grass carp is an alternative to the widespread and increasing use of aquatic herbicides which many people strongly object to. As I go about my business of studying

than carefully controlled DNR grass carp introduction studies would be.

- Another objection is the grass carp may get into the Great Lakes.

The grass carp already has reproducing populations in the Mississippi River, and those populations probably came from states like Missouri and Arkansas, which permit stocking of fertile (diploid) fish. And the Chicago sewage canal, which was constructed to allow Chicago sewage treatment plant effluent to be discharged into the Mississippi River rather than into Lake Michigan, drains water from Lake Michigan into the Mississippi River, the flow being about 3000 cubic feet per second. This canal provides easy access to Lake Michigan from the Mississippi River for the grass carp, and these fish are fertile, diploid fish, not the sterile triploid fish required under Representative O'Connor's bill.

- Objectors point to problems with the zebra mussel, the alewife, and the sea lamprey as examples of reasons why non-native species should not be introduced in Michigan. However, they fail to point out successful introductions of non-native species such as the tomato, the horse and the coho salmon. In other words, some introduced species work very well, and given the number of states already using the grass carp, indications are they will probably work well too.

- Although some think the fish will take over our lakes, and remove all the weeds, some fisheries biologists feel about 30 percent of stocked fish die each year, so if weed control is to be maintained, continuous stocking will be required.

- Although the grass carp is not a cure-all, there are some lakes which I feel would benefit from it. For example; Big Walters Lake in Oakland county, a 77 acre, 21 foot maximum depth natural lake about 80 percent filled with broad-leaf pondweed; Sutton's Lake, a 66-acre, 37-foot-deep impoundment in Washtenaw County about 66 percent filled with native milfoil (not eurasian water milfoil); and Round Lake, a 42 acre, 21-foot-deep natural lake in Oakland County which is about 40 percent filled with pondweeds.

- Some objectors suggested the grass carp would add nutrients to the water. They don't. Since they eat weeds already in the lake, they only recycle nutrients already there. And since they remove about 50 percent of the nutrients from the weeds they eat and incorporate those nutrients into their own bodies, they actually remove nutrients from the water column and bottom sediments, unlike the practice of killing weeds with herbicides, where none of the nutrients are removed.

● Dr. Don Garling (MSU & Cooperative Extension Service) told the senate environmental committee he receives 3 to 4 requests per week asking how to get rid of grass carp from lakes. However, when Representative O'Connor's office requested copies of the requests he'd received in the prior 10 weeks, he suggested he mis-spoke, and that he actually gets 3-4 requests per year. I suspect he gets far more calls than that regarding how to remove weeds from lakes.

● The DNR suggested O'Connor's bill was unnecessary because procedures and policies already exist to allow the introduction of grass carp into Michigan lakes. When O'Connor's office wrote requesting an application form and the procedures for doing this, the DNR admitted those policies and procedures did not exist.

● Triploidy (three sets of chromosomes, rather than the normal two sets) can be guaranteed. A Coulter Counter can measure the size of the blood cell nuclei of the fish. The triploid (sterile) grass carp blood cell nuclei are 1.5 times larger than the diploid (fertile) blood cell nuclei. It should be noted that triploidy does not guarantee sterility. Under experimental conditions, a very small number of triploid sperm (about 60 out of one billion) have been able to fertilize diploid (fertile) female eggs, but most embryos were deformed and did not survive. The few fish fry that hatched died within a month. (Remember, this experiment involved triploid male sperm and diploid female eggs.) All the fish introduced in the lakes to control weeds are triploid.

I can assure you that any population will die out quickly if the male produces only 60 viable sperm out of every one billion, and all the females around are sterile.

● Another objection is that since testing fish for triploidy is expensive, only a sample of the fish will be tested, so some fertile diploids might slip by.

This is incorrect. Every fish is tested for triploidy, and only those that pass the test are sold. The procedure costs about 20 cents per fish.

● According to Jim Merna, a recently retired DNR fisheries biologist, the grass carp reproduce in rivers, not lakes. The eggs are laid in the headwaters, and then must be carried down the stream, bouncing along the bottom, for about 30 hours, until they hatch. If the eggs settle out in a lake or reservoir, they die, probably from lack of oxygen. Merna found there was only one such river in Michigan, the Detroit River.

● The DNR (Merna and others) proposed a program to study the grass carp, but dropped it when Tom Washington (MUCC) opposed it. The reason they dropped the proposal was not

because they thought it was a bad idea, but because the DNR tries to work with MUCC.

PART 2. THE LAKE CONROE PROBLEM

The problems experienced by the introduction of grass carp into Lake Conroe in Texas are often used by herbicide applicators and others as reasons for not permitting its use in Michigan. Here's what Representative O'Connor's staff found.

5 April 1990. I spoke with Joyce Johnson, Aquatic Habitat Director (512 389-4858) Texas Parks and Wildlife division regarding the use of grass carp in Texas, and specifically at Lake Conroe. This is the lake bass fishermen, herbicide applicators and others opposed to the use of grass carp have used as an example of the horrendous destruction caused when use of the triploid grass carp is permitted.

A brief history of what occurred at Lake Conroe. In 1981, the Texas Legislature approved the use of **DIPLOID** grass carp in Lake Conroe. Conroe is a 21,000 acre man-made lake, and a favorite of bass fishermen.

Conroe was choked by hydrilla, an exotic weed brought into the U.S. in the 1960's through Florida. In an effort to control the lake's 9,000 acres (40% of the lake) being smothered by this weed, the Texas Legislature permitted the use of the DIPLOID grass carp, stocked at a rate of 30 fish per acre.

The carp was a success according to some. It accomplished the purpose of its introduction. In two years, there was no hydrilla left, and fishing had improved. The problem was there was little or no vegetation of any kind and the bass population eventually declined. Some authorities say this was caused not only by the diploid grass carp. Cold weather, muddy water and chemicals may also have contributed to the decline. Today, nine years after the introduction of the diploid grass carp into Lake Conroe, a few still remain, there is little vegetation, and some bass. Most grass carp have been killed through die-off.

Those who feel the experiment was not a success include fishermen who say there's too few bass, (Ed. note. This author has never heard of a lake with too many bass.) and fishing guides who don't know where to find the fish. I have requested a copy of the Lake Conroe study written by Dr. Wallace Kussman, Texas A&M Department of Wildlife (409 845-5777). Presently grass carp are prohibited in Texas.

In 1989 a bill was introduced to allow use of the triploid grass carp in Texas. Although the bill was defeated, a settlement was reached wherein the legislature funded a

two-year research program using the triploid fish exclusively, with the fish being introduced into three lakes. The research was to be conducted by Texas A&M and Texas Parks and Wildlife Department.

Michigan's DNR should be ashamed that they are not getting into this exciting research on alternative methods of weed control for the many lakes in our state suffering from weed problems.

PART 3. WHAT ARE GRASS CARP?

The following was taken from Publication 364, GRASS CARP (WHITE AMUR), Ohio Department of Natural Resources, Division of Wildlife; and Allen, S.K, et al, *Triploid Grass Carp: Status and Management Implications*. Fisheries, Vol. 12, No. 4, Jul-Aug 87.

Grass carp (white amur or *Ctenopharyngodon idella*) are members of the minnow family. In China, their natural home, they have been reported to grow to 100 pounds and to live up to 15 years. They bear little resemblance to the common carp which is often found in Michigan lakes and streams, except for the large scales on their sides. The grass carp are longer and more slender than the common carp, and have no barbels at the corners of their mouths as do the common carp.

Although native to China and Russia, grass carp have been introduced into more than 50 countries. Of these countries, it has been established in fewer than five, including the United States (Louisiana and Arkansas). Grass carp were first introduced into the U.S. in 1963 by the U.S. Fish and Wildlife Service. Today, they have been stocked--legally and illegally--in most states east of the Rocky Mountains. Allen (1987) reports 15 states permit any and all forms of grass carp, 12 states permit only 100% triploid grass carp, Four states permit experiments with grass carp. 19 states still technically prohibit the grass carp, but several are experimenting with triploids to determine of a change in policy is appropriate.

Generally grass carp require large rivers for successful egg hatching. However, young and adult fish can thrive when stocked into other habitats having adequate food and water quality.

Leafy, rooted aquatic plants, such as pondweed and coontail, are the preferred food of grass carp. Lacking these, they will consume floating duckweed, green algae, and even cattails.

Although cultured in Asia as a source of food, the grass carp is of primary interest in the U.S. to control aquatic vegetation, especially where it is desirable to avoid the use of chemical herbicides. However, many fishery managers

are concerned that reproducing populations of grass carp could become established in river systems where their vegetation consumption could alter the habitat of other species of fish or waterfowl.

To accommodate the increasing demand for grass carp and avoid the possibility of their becoming established in systems where they are not wanted, a sterile triploid form was developed. The triploid form differs from the natural, fertile, diploid form in having an extra set of chromosomes in each cell. Although this prevents them from reproducing, it does not otherwise affect their vitality. Thus many states have legalized the sale and use of triploid grass carp for vegetation control, while prohibiting the sale or use of diploid grass carp, although some states permit use of the diploid fish.

The most common method of inducing triploidy is to expose the fertilized eggs to very high pressure (ie. 7000 psi) then reduce it quickly.

STOCKING TRIPLOID GRASS CARP

Type and quantity of vegetation are the two most important factors to consider when deciding whether or not to stock triploid grass carp, and how many to stock. If the vegetation is primarily milfoil, marsh grass, pondweed or niad, the following stocking rates are advised.

<u>PERCENT OF POND COVERED BY PLANTS</u>	<u>NUMBER OF FISH PER ACRE</u>
0-20	None
20-40	5
40-60	10
over 60	20

If the vegetation is primarily coontail, the stocking rates above should be doubled.

Fish provided for stocking are frequently 8-10 inches long. If largemouth bass or other large predators are present, the grass carp stocked should not be smaller than 8 inches.

Grass carp have a natural tendency to migrate out of lakes to moving water. Pond owners who have inflows or outflows to their ponds should install barriers prior to stocking grass carp.

BIBLIOGRAPHY

Allen, S. K. & Wattendorf, R.J. *Triploid Grass Carp: Status and Management Implications*. Fisheries, Vol. 12, No. 4. July-August 1987.

Publication 364, GRASS CARP (WHITE AMUR), Ohio Department of Natural Resources, Division of Wildlife or from Allen, S.K, et al, *Triploid Grass Carp: Status and Management Implications*. Fisheries, Vol. 12, No. 4, Jul-Aug 87.

PART 4. LISTED BELOW ARE THE RESPONSES FROM VARIOUS STATE FISHERY MANAGERS REGARDING THE WHITE AMUR (GRASS CARP).

ALABAMA

Alabama has had considerable experience with the white amur. Alabama does not require the exclusive use of the triploid. (Emphasis added.)

I think you will find from your survey that those states which allow the use of triploid amur for aquatic plant control are pleased with the results.

/s/ Charles D. Kelley, Director, Alabama Department of Conservation and Natural Resources

The Game and Fish Division has no plans to discontinue the grass carp weed control program in Alabama.

/s/ Fred R. Harders, Chief of Fisheries

ARKANSAS

The Arkansas Game and Fish Commission has had considerable experience with the white amur and is knowledgeable in the results and effects of various varieties of the fish, such as hybrids and triploids.

...the state has no immediate plans to discontinue the use of grass carp in its weed control program.

/s/ Randall Mathis, Director, Arkansas Department of Pollution Control and Ecology

CALIFORNIA

The triploid has been very effective in weed control in the limited areas of California where it is legal to be used.

We have no plans to discontinue use of triploid grass carp for (aquatic) weed control in California. It has been very effective in controlling aquatic weeds...

/s/ Gordon K. Van Vleck, California Secretary for Resources

COLORADO

Colorado has allowed the use of both diploid and triploid grass carp on a limited basis since 1982. The majority of fish used for vegetation control in this state have been diploid fish. (Emphasis added.)

/s/ Hamlet J. Barry III, Executive Director, Colorado
Department of Natural Resources

Colorado has no plans at this time to discontinue the use of grass carp or triploid grass carp as aquatic weed control agents.

/s/ Eddie Kochman, State Aquatic Wildlife Manager

FLORIDA

The triploid grass carp has been very effective in controlling not only the exotic species hydrilla but has successfully maintained a number of desirable native species at reduced levels.

Triploid grass carp can be distinguished using a Coulter Counter to measure the volume of red blood cell nuclei. Every grass carp shipped into Florida and sold in the state must be tested for triploidy by individual producers. The fish must also be certified triploid and healthy by either the U.S. Fish and Wildlife Service or an approved organization before shipment to Florida.

Several studies have indicated that triploid grass carp are functionally sterile. They do develop rudimentary gonads and sexes can be distinguished; however, they will not successfully reproduce.

/s/ Dennis E. Holcomb, Director, Florida Division of Fisheries.

GEORGIA

We plan to continue the use of triploid grass carp in our weed control program.

/s/ Leon Kirkland, Georgia Department of Natural Resources

IDAHO

We have no plans at this time to discontinue or change our policy allowing triploid grass carp for weed control in Idaho.

/s/ Kenneth D. Norris, Assistant Director, Idaho Fish & Game

ILLINOIS

...triploid grass carp are effective in controlling aquatic vegetation, techniques exist that can ensure commercially

supplied triploid grass carp are triploids, and triploid grass carp are functionally sterile.

/s/ Karen A Witter, Director, Illinois Department of Energy and Natural Resources.

To the best of my knowledge, there is no plan to discontinue (the grass carp weed control) program.

/s/Lewis L. Osborne, Director, Illinois Center for Aquatic Ecology

IOWA

The Fisheries staff in the Iowa DNR is very satisfied with the use of grass carp for aquatic vegetation control. Certainly their use has been more desirable than the continued use of herbicides.

The Iowa Department of Natural Resources anticipates the continued use of grass carp for aquatic vegetation control...

/s/ Larry Wilson, Director, Iowa Department of Natural Resources

KENTUCKY

To date, our experience with the grass carp has been a positive one. It has proven to be effective in controlling many species of rooted aquatics and some forms of algae.

Please be advised that the Kentucky Department of Fish and Wildlife Resources has no plans to discontinue its grass carp program.

/s/Peter W. Pfeiffer, Director, Division of Fisheries

MISSISSIPPI

I am not aware of any plans or authority our agency has to limit or restrict the use of (grass carp).

/s/ Philip Bass, Laboratory Director, Mississippi Department of Natural Resources.

The Grass Carp have been used in our state for a number of years by both the private pond owners and commercial catfish farmers with apparent success.

/s/ Harry Barkley, Fisheries Coordinator, Mississippi Department of Wildlife, Fisheries and Parks.

MISSOURI

The use of DIPLOID (emphasis added) grass carp has been legal in Missouri since 1980. This action was taken because

of widespread introduction by private individuals and by accidental introductions into flowing waters....

/s/ James P. Fry, Chief, Division of Fisheries, Missouri Department of Conservation

We do not have any plans to discontinue the use of grass carp for aquatic vegetation in Missouri.

/s/Marlyn L. Miller, Fisheries Programs Coordinator

NEW MEXICO

... triploid grass carp have been effective in reducing or eliminating nuisance aquatic vegetation in many New Mexico waters, both public and private.

/s/ Bill Montoya, Director, Department of Game and Fish.

New Mexico Department of Game and Fish does not plan to discontinue the triploid grass carp weed control program.

/s/ Michael Hatch, Project Leader, Fisheries Management Division.

NORTH CAROLINA

North Carolina plans to continue using grass carp for weed control where this method is most cost-effective and environmentally acceptable.

/s/ William W. Cobey, Jr., Secretary, Department of Environmental Health and Natural Resources

SOUTH CAROLINA

... within the last five years that the grass carp have been allowed in South Carolina, we feel our program has been successful overall.

/s/ Hal Beard, Fisheries Biologist, South Carolina Wildlife and Marine Resources Department.

... there are no plans to discontinue the grass carp weed control program in South Carolina.

/s/ Patrick T. Walker, Director, South Carolina Division of Mining and Reclamation, Land Resources Conservation Commission

TENNESSEE

We do not plan to discontinue the use of triploid grass carp in private lakes and ponds in Tennessee.

/s/ C. Wayne Pollock, Chief, Fish Management Division

VIRGINIA

We've administered the state's triploid white amur program and have been pleased with the fish. The fish has provided reasonable alternatives to chemical and mechanical techniques for aquatic weed control and is a valuable tool in lake and pond management.

... All suppliers of fish must provide us with a valid U.S. Fish and Wildlife Service Inspection record prior to any shipments to pond or lake owners. We also plan random spot checks of Virginia shipments to ensure compliance with our regulations.

/s/ James A Remington, Director, Virginia Department of Game and Inland Fisheries

WEST VIRGINIA

We are well satisfied with our current (triploid grass carp weed control) program and have no plans to discontinue it.

/s/ J. Edward Hamrick III, Director, West Virginia Department of Commerce, Labor and Environmental Resources

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October 2, 1991