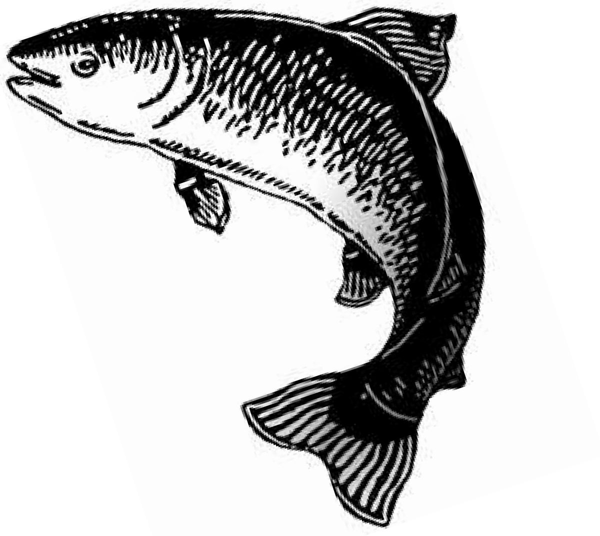
White Amur (Grass Carp)

(Ctenopharyngodon idella)



Supporting Literature:

Extracts on Effectiveness, Impacts & Biology

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"From the results we have seen on the use of grass carp to control nuisance aquatic plants over many years, their effect has been mostly beneficial and we are not aware of any adverse effects resulting from the use of grass carp provided stocking levels are not excessive. While potential risks need to be assessed, we consider that there are benefits in using grass carp compared to other methods and these benefits should also be considered when processing applications.

Other aquatic weed control methods such as the use of herbicides and mechanical removal of nuisance weeds result in considerable loss of aquatic life and can result in degradation of the habitat through rotting vegetation and disturbance of sediments. These methods do not require approvals from any agencies, provide temporary respite and require frequent applications over the warmer months.

MFish considers grass carp should be the preferred method for aquatic weed control, for sites where aquatic weed control is required and:

- *the extensive growth of aquatic weeds interferes with the main functions of the site (eg stormwater management, water sports),*
- *carp can be contained within the site,*
- *the water quality is suitable for survival of carp."*

Ministry of Fisheries (April, 2011) *Comments on SOP procedures for the transfer of Aquatic Life,* Auckland.

"No evidence has been produced that the fish (Grass Carp) have significant harmful effects on either the native biota or the introduced salmonoids. All studies suggest that the impacts of Grass Carp are far less damaging than weed removal either by mechanical draglines or by herbicides".

" Stanley et al. reported that, in general, fish populations increased where grass carp were present. This was probably related to the opening up of space in the littoral zone of lakes, and to changes in food chain bases from weed bed faunas to benthic faunas. Declines in fish populations have occurred mainly in species dependent on weed bed areas for food, protection, or spawning, and have also occurred in predatory fish dependent on such species (Fedorenko and Fraser 1978)."

***Note:** *In New Zealand lakes and reservoirs, fish populations likely to decline could include perch, rudd, tench, and goldfish, which all spawn in weed beds - All these species are exotic, with most noted as undesirable by the Department of Conservation.*

Rowe, D. K., & Schipper, C. M. (1985). *An assessment of the impact of grass carp (Ctenopharyngodon idella) in New Zealand waters*. Rotorua N.Z.: Fisheries Research Division, Ministry of Agriculture and Fisheries.

"No evidence has been produced that the fish (white amur) have direct harmful effects upon either native biota or introduced salmonids. All studies suggested that the known impacts of white amur were less than or no more damaging than weed removal by other common methods such as the use of excavators or the use of chemicals.

Impacts on exotic fish

Weed removal by white amur (or by any other method) may affect introduced coarse fish species, such as rudd, tench, goldfish and perch, which require weed beds for spawning. In New Zealand, this is not generally considered an adverse impact.

Interactions between white amur and trout are generally limited because carp prefer warmer feeding waters. In rivers carp prefer the warmer lower reaches. Trout prefer cool, flowing water in areas further upstream. In lakes, both species will occupy the littoral zone but feeding areas and food will differ because trout are carnivorous and carp are essentially herbivorous. Opponents of the use of white amur suggest impacts may occur following removal of plant species in the littoral zone, which could expose juvenile trout to predation. The importance or otherwise of exotic aquatic plants for juvenile trout survival in lakes has in fact, never been demonstrated.

9.4 Impacts on native fish

Rowe and Schipper (1985) discussed the potential impacts of grass carp. The fish did not prey upon fish except when trout fry were fed to starved juvenile fish in bare aquariums (Edwards & Moore XX). Eels, bullies, smelt and galaxiids survived and grew well in trial lakes denuded of vegetation and stocked in shallow aquaculture ponds which lacked protective cover, but contained large, starved grass carp (Mitchell pers obs). Bullies attained pest densities under these conditions. Although some galaxiids require briefly flooded marginal vegetation for spawning, this would not in reality be accessible to grass carp. Grass carp cannot survive in 15 ppt salinity (50 % seawater); even lower levels are likely to repel fish. Native fish in lakes and ponds stocked with white amur displayed faster growth, large size at maturity and high survival (Mitchell 1986).

As white amur are herbivorous it is unlikely that predation on native fish would occur. White amur could consume eggs of indigenous species adhering to aquatic plants. However, apart from common bullies, native species generally do not lay eggs on plants and those that do, spawn in tidal or briefly flooded terrestrial vegetation. And in fact, common bullies were found to develop to pest densities in white amur aquaculture ponds. Because they cannot tolerate saline water, white amur are not considered any threat to the ecology of estuaries."

Mitchell, C. P. (2009). *Profile of White Amur and Silver Amur from the Results of Releases in New Zealand.* Raglan: Charles Mitchell and Associates Biological Consultants.

"though grass carp in lakes will be herbivorous, they will occasionally ingest snails, insects, and crustaceans present on stems and leaves of aquatic plants. In comparison, trout are carnivorous and food resources of these fish species are therefore different. Even snails, which are the main invertebrate on weed beds and which are eaten both by grass carp and trout, would be a minor, almost accidental, component of the grass carp diet. Although snails are eaten by trout, they are rarely an important component of the diet of these fish in New Zealand lakes (Smith 1959, Fish 1966, Mylechreest 1978, Rowe 1984b)."

"they (Grass Carp) have been introduced to many Northern Hemisphere countries including Taiwan, Japan, Philippines, USA, Mexico, India, Malaysia, Netherlands, Switzerland, Czechoslovakia, Yugoslavia, Denmark, Sweden, Romania, U.S.S.R. (western), Poland, Italy, Australia, West Germany, France, United Kingdom, and Venezuela. In the Southern Hemisphere they have been introduced to Fiji, New Zealand, Argentina, and South Africa. Grass carp are known to have spawned and established self-reproducing populations in only six of the many larger Northern Hemisphere rivers into which they have been stocked. Their failure to establish populations in other rivers suggests that they have quite specific reproductive requirements, which are found only in these six rivers."

Rowe, D. K., & Schipper, C. M. (1985). *An assessment of the impact of grass carp (Ctenopharyngodon idella) in New Zealand waters*. Rotorua N.Z.: Fisheries Research Division, Ministry of Agriculture and Fisheries.

"Grass Carp are not a pest fish in New Zealand; rather they are a "restricted fish" under s26ZQA of the Conservation Act. They have been in New Zealand since 1966, and have been approved by government for use as weed control agents. They have also been subject to risk assessment which concluded they were unlikely to breed in New Zealand or able to form self sustaining populations".

Department of Conservation (2005) *Media Release, http://www.doc.govt.nz/about-doc/news/media-releases/2008/the-big-fish-that-didnt-get-away/*

Supplied by Gavin Rodley, Private Secretary for Conservation, Office of the Hon Kate Wilkinson 30/08/2012

"In New Zealand, grass carp interactions with trout, bullies, smelt, tench, rudd, and galaxiids were studied in Lake Parkinson and in the Waihi reservoir. Eels, bullies, smelt, and galaxiids have survived and grown in the presence of large (> 250 mm) grass carp. Bullies have been observed to spawn successfully in ponds which contained high densities of feeding grass carp."

Department of Conservation (1999) *Some issues in risk assessment reports on grass carp and silver carp*.

" *The Waikato River represents the only waterbody within New Zealand where there is thought to be potential for feral grass carp to breed...We consider that a detailed review of the need for sterile grass carp (Triploids) in the lower Waikato River catchment or elsewhere is not warranted. Any increase in water temperatures and in flood events related to climate change may increase the risk of escape and potential spawning by grass carp. However, in the event of successful spawning, the lack of nursery habitats for prolarvae and entrainment potential would be critical factors mitigating against successful recruitment by this species. The global experience is that grass carp reproduction in rivers outside their natural range is both rare and precarious.....*"

Clayton, J. S., Rowe, D., McDowall, R., & Wells, R. (1999). Cumulative impacts of multiple grass carp releases. Wellington, N.Z.: Dept. of Conservation, P2-5

"*Trends in TLI were analysed for 18 lakes over ten years since 2000. Three of these lakes (17%) had deteriorated significantly and one lake (6%) had improved significantly (Lake Omapere). Trends were analysed for 68 lakes for five years since 2005.*"

*** Lake Omapere was the only site in this evaluation that was stocked with Grass Carp ***

Verburg, P., Hamill, K., Unwin, M., & Abell, J. (2010). *Lake water quality in New Zealand 2010 status and trends*.. Wellington, N.Z.: Ministry for the Environment.

HAWKES BAY LAKES: Biosecurity New Zealand Stakeholder Updates:

Hydrilla Eradication Response Update: 8 February 2010
"As you can see from the photo, the jetty area is almost free of weed growth, with the lake bottom clearly visible.... Anecdotal reports from fishers spoken to at Lake Tutira indicate good quality trout are being caught, with the lowered hydrilla weed beds reducing the number of snagged lines."

Hydrilla Eradication Response Update: 11 June 2010
"The annual monitoring of the hydrilla lakes has been completed by NIWA, with great results. Perhaps most significant is the part that reads "No hydrilla weed beds were recorded from the profile sites in any of the three lakes (Tutira, Waikopiro and Opouahi). Hydrilla where present, was limited to a few plants and was small in stature. This is a significant change from the autumn 2009 survey when Lakes Tutira and Opouahi still had extensive weed beds." Importantly, the report also notes that "In all three lakes the shallow water turf community is similar in composition to pre-grass carp impact and is dominated by native species. Amongst the native flora, Myriophyllum triphyllum in Lake Tutira and Chara globularis in Lake Tutira and Opouahi appear to be species less preferred by grass carp. C.globularis is now the dominant submerged species in Lake, Opouahi."

There is more good news. The numbers of invertebrate species found are much the same as previous years, with more of individuals of some species and fewer of others. Mussels were present mainly in shallow water in all lakes. Juvenile mussels were seen throughout Lake Waikopiro this year compared with last year when only a few adult mussels were found at a single site. This may be a recolonisation of the area previously covered by the hydrilla beds."

Hydrilla Eradication Response Update: August 2011 - Monitoring Brings Good News.
"NIWA has completed its annual monitoring and surveillance of the hydrilla affected Lakes Tutira, Waikopiro and Opouahi, and the news continues to be good. No hydrilla weed beds were recorded in any of the lakes. The only hydrilla found was a few small plants amongst Myriophyllum triphyllum in Lake Tutira and some vegetative turions in Lakes Tutira and Waikopiro. In all three lakes shallow water turf plants and marginal emergent plants continue to be found, including in areas previously occupied by the hydrilla beds. With the spate of high lake levels, there are signs that grass carp have been browsing the marginal plants now that their preferred food, hydrilla, is all but gone.

Grass carp continue to be challenging to catch even for NIWA, however, the two caught in Lake Waikopiro indicate that they are continuing to grow even though they have relatively little to eat. The number of macroinvertebrate species in the lakes is much the same as in past years, although population numbers have changed. There are more mites, fewer water-boatmen and more mussels. The continued presence and increase in juvenile mussel numbers is particularly exciting, as they are now being found at depths where only dead mussels or empty shells were found previously. Juvenile mussels are also being found at more sites around Lake Tutira, this year at 13 of the 15 survey sites. Mussels are filter feeders that remove suspended material from the water, helping to maintain water quality. Not much is known about freshwater mussel reproductive patterns and reports tell us that juvenile mussels are a rare find and increases are often sporadic. While it is possible that the removal of hydrilla beds has provided more prime mussel habitat, further monitoring will better track the development of mussel populations.

Bird species and numbers on all three lakes have fluctuated over the last four years. This year fewer bird species were noted than in 2010, but numbers are similar to those recorded in 2008, before the response began. Once again, the number of some species went up, such as shags, whilst others declined, such as black swans."

Lamb, V. (2009-2011) *Stakeholder Updates: Hydrilla Eradication Response. Wellington:* MAF Biosecurity New Zealand.