AQUATIC WEED CONTROL

Grass carp: an effective option for aquatic weed control?

Rohan Wells

What are the pros and cons of using grass carp for weed control in water bodies? And what are the alternatives?

GRASS CARP are now commercially available to water-body managers for the control of aquatic weeds in New Zealand. Their use is subject to approval from the Minister of Conservation (provided that there is a low risk of significant environmental impacts), the Ministry of Fisheries, and from the regional Fish and Game Council (if release is to the habitat of sportsfish or gamebirds). Consultation with Iwi and the public is also required. Silver carp are available through the same procedure.

Grass carp have been promoted, at times, as a cost-effective weed-control option that is "natural" and has no undesirable environmental impacts. Silver carp are sometimes promoted for use with grass carp to maintain water quality. NIWA has received many enquiries regarding the use of both species. This article is intended to provide an overview of the options for aquatic weed control in New Zealand with particular emphasis on grass carp, so that managers can make better informed choices of weed control measures.

Weed control using fish

MAF Freshwater Fisheries Section, Rotorua (now NIWA), originally imported silver carp and grass carp from Hong Kong into New Zealand in the early 1970s to evaluate their potential for biological control of aquatic weeds and suspended algae (green water) respectively.

Silver carp

Silver carp have been used overseas to control planktonic algal blooms. However, there is evidence from China that water clarity in eutrophic lakes can be increased by reducing the numbers of silver carp, since these fish are known to graze on large zooplankton which also eat algae. Compared to grass carp, silver carp have received little attention in New Zealand. One trial resulted in a reduction in an algal bloom but there were no data on how sustainable the effect was. There have been no assessments in New Zealand of silver carp impacts in natural water bodies. Therefore it is likely that any silver carp releases would be trials in areas of little significance, and that they would be accompanied by detailed monitoring to assess their effects.

Grass carp

Grass carp have been the subject of much research in New Zealand and overseas and their potential benefits for aquatic weed control and risks to the aquatic environment are well known.

There have been some satisfied users in New Zealand but others have had unrealistic expectations and have found grass carp inappropriate for their requirements. Grass carp can be controversial as they often remove all aquatic vegetation and can have major impacts on aquatic life. In a multi-use water body, the effects of grass carp may conflict with values such as fisheries, wildlife and conservation. For example, Iwi and groups such as the Forest and Bird Protection Society have strong ecological interests and have been known to view grass carp as an unnecessary risk to our environment. For these reasons it is important that managers weigh up the risks versus the benefits before choosing grass carp as an aquatic-vegetation management method.

Note that grass carp are often confused with koi carp. The latter are common throughout the Waikato region where they (together with rudd) are implicated in the loss of much aquatic vegetation and habitat in lakes. In the Rotorua Lakes District, notices at boat ramps carry illustrations of koi carp and warn of the threat they pose to the lakes if introduced. Koi carp can breed in our waterways whereas grass carp are extremely unlikely to do so.

Grass carp pros and cons

Advantages of grass carp

- Grass carp can remove all submerged aquatic vegetation at sites suitable for the fish.
- They can control a wide range of aquatic weeds, including species such as *Hydrilla verticillata* that are not easily controlled by alternative means.
- They can be effective for a long time over large areas.
- Eradication is possible for weed species that reproduce vegetatively, especially where reinfestation is unlikely. For example, lake restoration was achieved in Lake Parkinson (a small dune lake south of Auckland) where *Egeria densa* was eradicated. All fish (including unwanted coarse fish) were removed subsequently by treating the whole lake with rotenone (a fish toxin). Native plants re-established naturally and native fish were re-introduced.
- Grass carp can be cost-effective. For example, for total vegetation control as used in Lake Parkinson the cost was approximately $1100 per hectare for stocking with 44 fish (>250 mm long) per vegetated hectare. Note that this indicative figure excludes site security, environmental impact assessments, consultation and application costs.
- Grass carp are very unlikely to form self-sustaining populations in New Zealand.

Disadvantages of grass carp

- Grass carp can die from a variety of causes including low dissolved oxygen, acid pH, toxic substances, starvation and predation.
- Total vegetation removal (including marginal habitat) is a likely outcome, particularly in small water bodies. This can happen very rapidly once the fish start eating vegetation at a faster rate than the plants are growing. Partial control of weeds (i.e., maintenance of intermediate densities) has rarely been documented except for short periods.
- Fish re-capture is difficult and usually costly. The use of a rotenone pellet (Prentox®) is under evaluation for use in this country and may provide a solution. (Refer to pages 15–17 of this issue.)
- The fish require warm temperatures (>15–17°C) before they will feed actively. They start feeding intensively at 20–23°C, and can consume up to 100% of their body weight per day.
- Grass carp have feeding preferences and will feed on characean meadows of *Nitella* and *Chara* spp (New Zealand's most common native water plants) before all target species. Even low densities of grass carp can quickly remove these native plants.
- The effects of grass carp or of any major weed removal on the quality of coarse fishing are uncertain.
- Grass carp or other forms of weed control can indirectly alter the feeding habitats and spawning behaviour of some coarse fish