CASE STUDY:
Native fish predators as a biological control method for carp
Case study on the identification of carp spawning

Introduction:
In the last 40 years, carp have become widespread and abundant in Australia’s river systems, becoming a potential food source for birds, fish, reptiles, invertebrates and mammals. Relative decreases in numbers of native prey fish coupled with increasing carp numbers means that carp are now a readily available food for Murray cod and possibly other native fish predators. However, the extent to which these predators influence carp populations is not well understood.

One study found Murray cod (Maccullochella peeli peelii) predation on carp was relatively common as carp were found in 35% of Murray cod gut samples. Golden perch (Macquaria ambigua) were also reported to consume carp as a small proportion of their diet. It has been suggested that stocking native fish predators known to prey on carp, combined with conventional control methods, may be a potential carp management option.

Native predators, such as Murray cod and golden perch, are stocked in waterways in Queensland, New South Wales and Victoria – mainly to enhance populations for recreational fisheries. Little is known of the impacts of these stocked fish on carp populations. A major concern with enhancing the abundance of native predators for carp management is that they may have detrimental impacts on native prey species through over-predation.

To examine the utility of using native fish predators in controlling carp, we need to understand the following attributes of native fish predators and their prey, which may influence carp predation potential:

- habitat preferences
- behaviours
- size and shape.

Aims:
An Invasive Animals Cooperative Research Centre (IA CRC) project, in partnership with the University of Queensland, looked at predation on carp by native fish in laboratory tanks, in enclosed ponds, and in the wild. The research aimed to determine whether:

- native predatory fish (Murray cod, golden perch and Australian bass) have a size preference for carp in tank trials
- native predatory fish have a preference for carp when other native species are available in tank trials
- the relative abundance of carp influences the preferences of native predators when native prey is also available in tank trials
- prey (including carp) have behavioural responses to predators in tank trials
- native predatory fish have a preference for carp under semi-natural enclosed conditions in pond trials
- habitat types influence predators’ preferences of native fish in pond trials
- overlapping habitat preferences of carp and native predators results in carp being vulnerable to predation by native predators in the wild.
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- native predatory fish have any dietary preferences in the wild.

**Research results:**

**In the tank trials:**
- Australian bass (*Macquaria novemaculeata*) preferred small carp (20-60 mm) over large carp and had no preference for either carp or shrimp when offered native prey and carp at the same abundance.
- Murray cod did not show any size or other type of preference for carp when carp were offered with native prey, or offered at a high abundance.
- Golden perch had a preferred small over large carp and did not show any preference for carp when carp were offered with native prey, or offered at a high abundance.

**In the ponds:**
- Murray cod did not have a significant preference for carp over native prey.
- The type of a habitat in which a predator foraged influenced its prey selection, but no particular habitat type increased a Murray cod’s preference for carp.

**In the wild:**

Fish were sampled using a range of methods including electrofishing, fyke netting, and bait traps set in lagoons, anabranches and main river channel habitats. Juvenile carp that were at the right size for a predator to consume tended to be found in warm, shallow and slow flowing backwaters and lagoons. In these habitats, food was abundant and there were no, or few, predators, so carp could grow rapidly. Native predators were found in the deeper pools of the main river channel. By the time carp were ready to enter areas where predators were abundant, they were generally too large to be consumed.

As a result, native predators were unlikely to have a significant effect on overall carp populations. Stomach contents of native predators caught in the wild showed high proportions of yabbies and shrimp, and only a small amount of carp. These results were consistent with the findings of the tank and pond trials.

**Implications for pest fish management:**

Small carp that are vulnerable to predation tend to prefer shallow, inundated plants, often in lagoons and backwater habitats. Their predators tend to be located in the deeper sections of a river. Enhancing the abundance of predatory fish populations through stocking is likely to be ineffective and other carp control methods that work in the habitat of small carp, such as wetland drawdown, targeted poisoning, physical removal or wetland screens should be used.

Predators’ prey preferences suggest that crustaceans are their prey of choice, with occasional consumption of fish including carp. Increasing native predator populations in rivers is unlikely to reduce carp populations, and may in fact pose a risk to non-target species. Therefore, native predatory species should be managed in such a way that their populations remain stable for recreational and commercial fishing purposes. The occasional opportunity for predation on carp should be regarded as a complimentary side-effect.

**Further information:**