Biocontrol of invasive carp: Risks abound

Introduced common carp (*Cyprinus carpio*) infest many Australian waterways and dominate their ecosystems (*1*). To reduce carp numbers and aid native species recovery, the Australian Government has proposed the release of cyprinid herpesvirus 3 (CyHV-3; koi herpesvirus) (*2*). This virus, presumed to be absent from Australia, can devastate farmed carp (*3*, *4*). Due to its economic impact, the World Organization for Animal Health requires notification when the virus is identified (*5*). Safety concerns have been raised over the release of CyHV-3, including potential infection of threatened native fish and environmental damage due to decomposing carp (*4*, *6*). However, our knowledge of CyHV-3 pathogenesis, carp biology, and Australian river ecology suggests that a more likely problem is low efficacy.

Resistance-conferring genetic polymorphisms have been described in carp (*7*). CyHV-3 virulence also shows strong environmental dependence: Disease develops at 16° to 28°C, whereas temperatures above 30°C block infection and lead to immunity (*8*). Infected carp seek out warm water refuges, which are abundant in Australian rivers *(9*). The high fecundity of carp may then allow rapid repopulation of any depleted waterways by immune or genetically resistant individuals. Moreover, there is little published evidence that Australian carp are currently free of the virus: Genetic analysis indicates that CyHV-3 was infecting carp elsewhere prior to their introduction into Australia, and the lack of recorded CyHV-3-associated mass carp deaths in Australia may simply reflect a lack of environmental co-factors. Of note, CyHV-3 monitoring in Japanese rivers since 2004, when there was mass carp death in Lake Biwa, has shown a continued high prevalence of infection without obvious ill-effects (*10*).

Before large-scale CyHV-3 release, which would be costly and irreversible, further assessments should include gaining convincing evidence that the virus is not already present in Australia and that, through contained, small-scale field trials, it can achieve sustainable reductions in free-living Australian carp populations without harming native ecosystems. We also support development of alternative approaches, including the release of daughterless fish, for long-term control of invasive carp populations (*11*).

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