Conservation of native pond fishes — How is the growth and condition of native crucian carp *Carassius carassius* affected by feral goldfish *C. auratus* ?

Gordon H. Copp & Michael Godard
Centre for Environment Fisheries and Aquaculture Science (Cefas), Lowestoft, UK
www.cefas.co.uk

Ali Serhan Tarkan
Mugla University, Turkey

Julien Cucherousset
Bournemouth University, UK

Introduction

Ponds are important ecosystems for some native fish species (e.g. crucian carp), but they also receive unwanted aquarium and garden pond fishes, especially the goldfish. Despite its long history of introductions in Europe, and its demonstrated adverse genetic impact on crucian carp, the biology and ecological impacts of goldfish remain little studied. Here, we examine the growth of these two species living in sympatry and allopatry in ponds of Epping Forest (London, England).

Figure 1. Study area: Location in southern England where populations were sampled in 2007 and 2008.

A)

B)

C)

Pond photos — A) goldfish only (Johnsons pond), B) crucian carp only (Hawcock pond), C) crucian + goldfish (Earl's Path pond)

Results

The growth trajectories in allopatric and sympatric populations revealed much faster growth of goldfish in sympatry than allopatry (Fig. 2). Crucian carp growth trajectories were similar in allopatry and sympatry but crucian body condition (Fulton's) values were significantly higher (t-test, $P < 0.001$) in sympatry (mean = 3.4) than in allopatry (mean = 3.2). The growth of UK goldfish is slow relative to Italian, Turkish and most Australian introduced populations (Fig. 3).

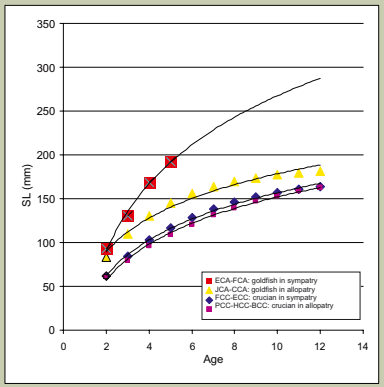
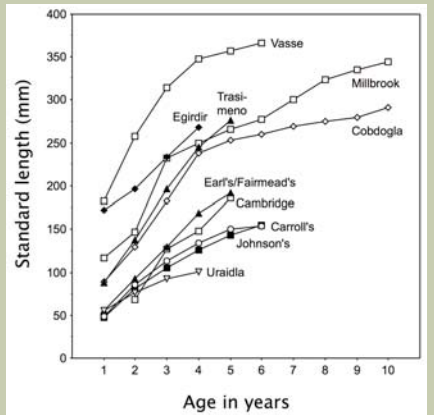


Figure 2. Growth trajectories (von Bertalanffy models) of goldfish and crucian carp standard length (SL) at age in sympatry (Fairmead & Earls Path ponds) and in allopatry (goldfish only: Johnsons & Carrols ponds; crucian only (Rizzole pits, Hawcock ponds + Bayfordbury Lake, from Copp et al. 2008).

Figure 3. Mean back-calculated SL of goldfish from various locations around the world: Cambridge (Canada), Lake Trasimeno (Italy), Lake Eğirdir (Turkey), Alma-Gol & Ala-Gol wetlands (Iran), Cobdogla oxbow (Australia), River Vasse (Australia), Uraidla and Millbrook reservoirs (Australia).



Conclusions

These results may simply reflect differences among ponds in food availability. However, co-existence of these congener species appears to incite a maximisation of growth potential in goldfish, which could have ramifications for reproductive output and thus facilitate the displacement of crucian carp.

Related bibliography:

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For further information please contact gordon.copp@cefas.co.uk