DENSITY AND DISPERSAL OF INTRODUCED PUMPKINSEED (Lepomis gibbosus) IN SMALL ENGLISH STREAMS: INTERACTIONS WITH NATIVE FISHES AND POSSIBLE CONTROL MEASURES

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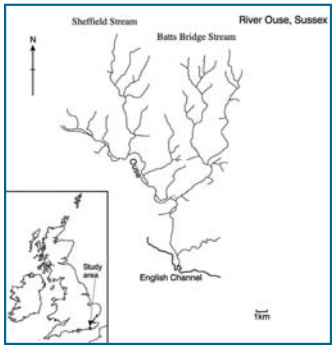
Introduction

The sunfish, pumpkinseed, was introduced to the UK at approximately the same time as Continental Europe (end of 19th/early 20th century) but established populations exist in southern and southwestern England only (counties of East and West Sussex, Somerset, and possibly in the London area). Studies on the species in England began in the 1990s to assess growth, diet, morphology and life-history variations (Copp *et. al.* 2002, 2004). The aim of the present study is to examine the dispersal behaviour, and interactions with native species, of pumpkinseed in small streams of Southern England where the species occurs regularly, and consider possible control measures.

Figure 1 – Distribution:

Sheffield and Batts Bridge streams of the River Ouse (Sussex, England) are amongst the few water courses in the UK that contain pumpkinseed – escapees from upstream on-line ponds.



Pumpkinseed *(Lepomis gibbosus)* *Photo by Saulius Stakėnas*

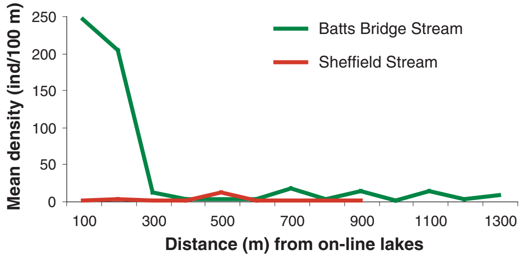


Figure 2 – Role of pond outlet to stream:

Similar pumpkinseed densities in ponds of upper Batts Bridge Stream (41.1 ind. CPUE) and Sheffield Stream (46.5 ind CPUE). Following a spate in summer 2004, recaptures of tagged fish confirmed pumpkinseed escapes to streams, and revealed fish densities 26.2 and 30.4 times greater in Batts Bridge Stream (screened pipe outlet) than Sheffield Stream (standing pipe outlet), respectively.

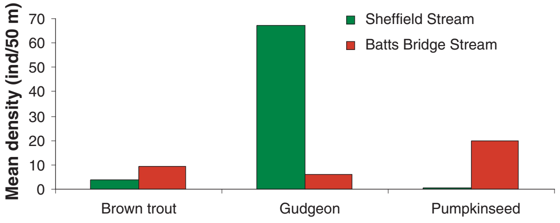


Figure 3 – Overall fish densities:

Brown trout *Salmo trutta*, pumpkinseed and gudgeon *Gobio gobio* densities were significantly different in stretches of Batts Bridge Stream and Sheffield Stream (Students' *t*-test, n = 46, $P<0.05$).

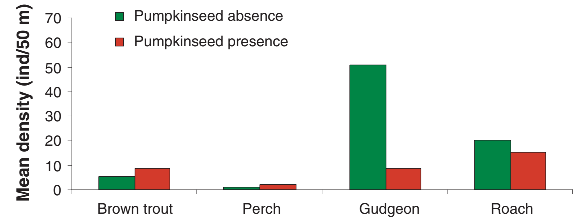


Figure 4 – Potential influence of pumpkinseed on native fish density:

Where pumpkinseed were present, densities of brown trout and perch *Perca fluviatilis* were significantly higher (ANOVA, n = 46, $Ps<0.05$), and those of gudgeon significantly lower ($P<0.05$). (Roach *Rutilus rutilus* densities did not differ). The same pattern of significant differences exists when data are analysed for each stream separately.

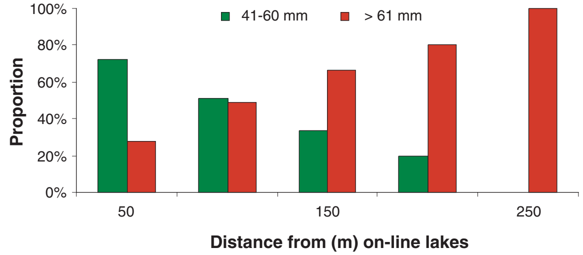


Figure 5 – Pumpkinseed size-distribution:

The proportion of smaller pumpkinseed declines, and that of larger pumpkinseed increases, with increasing distance from pond-to-stream outlets.

Conclusions:

A) "Standing pipe' type of pond outlet (e.g. upper Sheffield Stream) appears to impede pumpkinseed escape (**Figure 2**);

B) Lower densities of gudgeon and higher densities of brown trout (**Figure 3**) may be due (in part) to pumpkinseed presence (**Figure 4**). However, lower escape rates (conclusion A) and differences in fishery practices in the on-line ponds of the upper Sheffield Stream (coarse fishery) and Batts Bridge Stream (stocked trout fishery) could explain these patterns.

C) Pumpkinseed size distributions (**Figure 5**) may simply reflect size-dependent escape (fish escape when small and increase in size with age and downstream movement). However, predation by native species may also play a role. A large brown trout and two eels *Anguilla anguilla* captured near on-line lake outlet after a spate event contained 34 pumpkinseed (40-50 mm TL, one of ≈ 95 mm TL) and no other prey species.

D) Because pumpkinseed have not been observed to reproduce in English streams, their numbers could be controlled by:

- i) Use of standing pipe outlets.
- ii) Stream habitat enhancement to increase the size of pools (where appropriate) and the amount of refuge habitat for large trout and eels. This is an indirect form of biomanipulation, possibly preferable to simple stocking, which would be expected to be unsustainable without increasing the 'habitat' carrying-capacity of the stream. The increase in predator numbers could have adverse effects on native species as well, so this option requires more study.

Brown Trout *(Salmo trutta)* *Photo by Steve Kittleson*

Related bibliography:

Copp, G.H., Fox, M.G. & Kovác, V. 2002. Growth, morphology and life history traits of a coolwater European population of pumpkinseed *Lepomis gibbosus*. *Arch. Hydrobiol.* **155**, 585-614.

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