

The interlopers

Kathleen Beyer gets covered in slime discovering how two alien fish species threaten the locals.



All over the world, invasive species damage the environment and worry scientists, policy-makers and the public. Introduced fish are one of the greatest threats to fish communities in England. England and Wales only have 27 native freshwater fish species and every year about 1.5 million live fish are introduced into our waters.

Most of the introduced species are from the cyprinid family. I am studying the sunbleak (*Leucaspis delineatus*) and the topmouth gudgeon (*Pseudorasbora parva*) for my PhD project. Sunbleak and topmouth gudgeon are native to most of mainland Europe and South-East Asia respectively. They were accidentally introduced to England in the mid-1980s via the aquaculture trade. They only grow to about 8cm long. Because they mature after one year and reproduce several times in one season, they can establish large populations within a few years and spread rapidly.

Since 2000, Rodolphe Gozlan at the Centre for Ecology & Hydrology has been leading research into these two fishes—their life history, the sunbleak's early life development and spawning behaviour and where the topmouth gudgeon is in England. However, we need to find out

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more about how they might affect and threaten native fishes. This is the focus of my PhD.

I aimed to assess the fishes' role as hosts of new diseases and how they can change the structure of fish communities in selected UK waters. I had four objectives: to find out how the fish

disperse from a source population and to quantify their effect on native fish communities; to find out how many harboured exotic parasites and establish how much of a threat they are to native fishes; to find out how our native fish resist them, including how intensely native fish feed on them; and to examine whether the invader occupies an 'empty niche' or if they are stealing natives' food and habitats.

I began in 2003 with fishing surveys in lakes and streams in south-west England to find out where the two non-native fishes were. Thanks to Roldolphe's previous work, I knew where my two aliens had been introduced, including fisheries. This also meant that I could investigate how they escape from the fisheries through the outflows into streams and rivers. To catch larval as well as adult fish drifting downstream, I used drift nets over 24-hour cycles. From this I can characterise the two alien fish species'

daily pattern of drift downstream into natural rivers. Fishing surveys downstream of the fishery provided information on how those alien escapees were spreading. After being covered in fish slime and scales during this work, I confirmed that topmouth gudgeon seem to establish in the natural river just below the initial source population. The further away from it I fished the fewer I found.

Alien species may carry parasites that could threaten native wildlife. With a team of parasitologists from the Centre for Environment Fisheries and Aquaculture Science (CEFAS), Weymouth, I looked at the sunbleak's parasites. It appeared to carry, among others, two tiny copepods that originate from Asia and continental Europe. They may pose a risk to native species. Researchers are very worried that these non-native parasites will spread rapidly across Britain, as the sunbleak is doing. What makes this issue even more important is a recent discovery by Rodolphe Gozlan and fellow researchers from Idaho State University, Oregon State University and CEFAS Weymouth. They found that topmouth gudgeon carries an intracellular disease, similar to the rosette agent found in North America, which stops the European sunbleak spawning. It may help explain why European fish species have declined so rapidly since the topmouth gudgeon arrived. The rosette agent kills Atlantic salmon and brown trout. And infected topmouth gudgeon now live in waters connected to the River Test, an important river with Atlantic salmon and brown trout.

The fact that topmouth gudgeon doesn't spread far in natural rivers downstream from the source population led us to wonder if it had become the prey of choice for native predators. I analysed the gut contents of trout and chub, the two most abundant fish predators below the topmouth gudgeon source population, to provide a quantitative relationship between drift, natural predation and spread.

As introduced species often compete with the natives for space and food, I also looked at overlaps in habitat and diet. I sampled in waters where both sunbleak and topmouth gudgeon were living. Preliminary results showed a considerable

overlap between native fish species and both alien species. Such competition could eventually result in native species disappearing. I also used these data to understand the social grouping between the natives and the interlopers, for example if they shoal together, at what age and how often. I found that sunbleak is more strongly interconnected with the native fish during early life than the natives are with each other. This may indicate a characteristic of successful invasions, relating to the speed of alien fish diseases spreading among native shoals.

Back in the native lands of the sunbleak, they get eaten by people. This fact and their reproduction speed got me thinking of a new business – using sunbleak to popularise whitebait in the south-west and fill a niche in the market . . . or not? But until January 2006 I've got to spend most of my life in front of the computer writing up my PhD . . . do you envy me already?

The introduction to and movement of fish in English and Welsh waters are regulated by legislation such as the Diseases of Fish Acts of 1937 & 1983, the Salmon & Freshwater Fisheries Act (SFFA) 1975, the Wildlife and Countryside Act (WCA) 1981 and the Import of Live Fish Act (ILFA) of 1980. The latter includes the Prohibition of Keeping or Release of Live Fish (Specified Species) Order of 1998 and displays a list of species that threaten natives. Both fish species I studied are on this list.



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