

Science for Environment Policy

Mapping fish invasions in European freshwaters

Detailed analysis of the patterns of invasion of alien fish species in Austria and Germany has highlighted how drivers of invasion, such as the animal trade, can change over time. The researchers who conducted the analysis warn that climate change may be a key cause in changing invasion patterns in the future.

The invasion of alien fish species is known to be a major threat to the [biodiversity of freshwater](#) ecosystems. In Europe, fish invasions have increased as a result of imports for commercial fisheries, accidental releases and a highly connected network of waterways. However, despite the economic and ecological importance of these invasions, data describing patterns of invasion in detail are rare.

For this study, records of alien fish species from 1981 to 2007 were collected from databases in Austria and Germany. In addition, climatic and environmental factors, such as temperature and river flow, that might influence alien fish invasion, were assessed.

Fifteen alien fish species were considered as 'established' in both German and Austrian freshwaters, constituting 14 and 17% of freshwater fish in the two countries, respectively. The largest rivers in the region (the Danube and Rhine) have the highest numbers of invasive species and are both important waterways, acting as gateways for new invasions.

In both countries, six other alien species are present but not established, while the status of five alien species in Germany and three in Austria remain unknown. Until the 1980s, North America and Asia were the main sources of alien fish species, however, recently there have been more invasions from eastern Europe, partly reflecting the influence of the Danube-Main canal, which opened in 1992. This shows how the relative importance of invasion routes can change over time.

The results also highlighted the changing nature of the drivers of invasion. Using data from Austria, the researchers showed that the alien fish species which were introduced early via commercial fisheries, such as the rainbow and brook trout, were also the most widespread, found at 67% and 29% of sites respectively. However, they have shown no increase in spatial distribution in recent years. Conversely, fish such as the pumpkinseed sunfish and bighead goby introduced via the animal trade (e.g. via the pet trade, not including commercial fisheries) and through waterways (i.e. spreading into new areas via well-connected rivers or canals), have shown more recent increases in rates of spread.

The researchers warn that the patterns of invasion are also likely to change if temperatures rise under [climate change](#). The amount of habitat suitable for coldwater species may fall, leading to declines, and increases in numbers of invasive species adapted to warm water may occur.

Possible mitigation methods include effective management, as well as raising awareness at both national and European levels. The study's authors note that several invasive fish show a preference for waterways that have been modified (often deepened and straightened) by humans. They therefore recommend restoring natural ecosystems by employing ecosystem-based management, as endorsed by the EU's Water Framework Directive¹.



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1. <http://ec.europa.eu/environment/water/water-framework/>