

## ALIENFISHMIGRATIONS

**Assessing the risk and understanding the processes of invasion by non-native fish species within and between river catchments**

### The Challenge

With increased trade in the expanded EU and between the EU and the rest of the world, alien species introductions are a growing concern to national governments and international organizations. Protocols are being developed to assess the risks and impacts of alien fishes, but these require knowledge of the processes and mechanisms associated with the four phases of biological invasion: Introduction, Establishment, Dispersion, and Impact. Of these, dispersion is least understood for alien freshwater fishes. The knowledge gained through this project will contribute to international efforts in biodiversity and species conservation through the understanding of the dispersion processes of invasive freshwater fishes such as the sedentary omnivorous North American sunfish and two top European predators.

### Project Objective

The primary aims of ALIENFISHMIGRATIONS are to determine the dispersion potential of predatory fishes, in particular of the wels catfish *Silurus glanis* and the pikeperch *Sander lucioperca*, with specific reference to the frequency and timing of salt/brackish water incursions by pikeperch; and to assess the seasonal and diel dispersal potential in river catchments of the omnivorous North American sunfish, pumpkinseed *Lepomis gibbosus*, which is generally believed to be a sedentary species. The objectives were addressed using mark-recapture, telemetry and otolith microchemistry techniques in the laboratory and the field.

### Output Highlights

A number of peer reviewed publications on the findings of the project have been published from outcomes of the second objective. The outcomes from the first objective will be submitted for publication in the near future.

#### State of the art

- Improvement in the understanding of pan-European patterns in non-native species legislation regarding freshwater fishes.
- Improvement in the understanding of the environmental biology of non-native fishes to inform the risk analysis process and policy implementation.
- Improvement in the understanding of the dispersal of alien freshwater fishes in general, and in the UK in particular.
- Overall, the project has led to a greater awareness of issues associated with alien species, aiming to reduce illegal releases of alien species into the wild and thus posing threats to the environment.

### EATiP Thematic Area of Relevance

**TA1:** Product Quality, Consumer Safety and Health

**TA2:** Technology and Systems

**TA3:** Managing the Biological Lifecycle

**TA4:** Sustainable Feed Production

**TA5:** Integration with the Environment

**TA6:** Knowledge Management

**TA7:** Aquatic Animal Health and Welfare

**TA8:** Socio-Economics and Management

### Key Words

Alien fish, native fish, environment, biodiversity

### Project Information

**Contract number:**

501750

**Contract type:**

Marie Curie actions-Intra-European Fellowships

**Duration:**

24 months (01/01/2004 – 31/12/2005)

**Coordinator:**

Prof. Gordon H. Copp  
Centre for Environment, Fisheries and Aquaculture Science Salmon and Freshwater Group Pakefield Road Lowestoft, Suffolk (UK)

**Tel:**

+44-1502527751

**E-mail:**

[gordon.copp@cefass.co.uk](mailto:gordon.copp@cefass.co.uk)

**Project website:**

<http://www.cefass.defra.gov.uk/4200.aspx>



### Risk analysis

The outcomes of this project contributed to the risk analysis process associated with these species. In both of the main study species, pikeperch and pumpkinseed, outcomes from the project, which indicated lower risk than generally perceived, resulted in lower risk scores in pre-screening assessments than those provided for the same species by assessors not involved in the project. As the outcomes of the project become more widely known, they are expected to lead to better informed risk assessments of these species.

### The Full Report:

For a description of the research project or copies of the publications, contact the project coordinator (gordon.copp@cefas.co.uk).

## Next Steps – Suggested Actions/Follow On



### Environment

- There is still much to be learned about the risks and potential impacts posed by non-native species, and therefore a better understanding is needed of the environmental biology of non-native fishes to inform the risk analysis process as well as the implementation of non-native fish species policy. The present study answered important questions relevant to current policy in the UK as regards controls on the spread of pikeperch. Introduced into the UK in the mid-1800s, the pikeperch was subsequently introduced into a few drainage catchments between the 1960s and 1980s. Since then, government policy has been to prohibit introductions of the species into waters of drainage basins where the species current does not exist. Because the pikeperch is capable of tolerating seawater concentrations of salinity, the pikeperch could potentially expand into other drainage basins by migrating along the coast and thus make the current policy a nonsense. The present study assessed whether or not pikeperch actually exploits its natural physiological potential to migrate through salt waters and found that the species actively avoided salt waters, and therefore the migration between drainage basins is likely only by human intervention. As such, current policy is both appropriate and likely to be effective in controlling the spread of pikeperch.
- Similarly, the research on pumpkinseed demonstrated that the species is much more mobile than was previously believed, undertaking migrations both up- and downstream, especially during the spring and summer seasons. The outcome of this research provided the basis for a subsequent Marie Curie post-doctoral fellowship (PIEF-GA-2008-219707; Alienfish&climchange: Modelling of non-native fish species responses to climate change), which demonstrated to that pumpkinseed are likely to benefit from the warmer conditions predicted in climate change scenarios, resulting in higher recruitment and therefore a higher likelihood of fish escaping into water courses. The present project provided the evidence that once pumpkinseed enter water courses, they are both able and likely to expand greatly their current distribution range within river catchments, where currently they are very localized in occurrence. As pumpkinseed in the UK currently has not demonstrated the capacity to reproduce within water courses, future research should examine the risk of the species acquiring this ability, which is already demonstrated in warmer parts of its introduced European range.

## Related Publications/Projects

A series of scientific review papers have been published:

To be, or not to be, a non-native freshwater fish? Copp, G.H., Bianco, P.G., Bogutskaya, N., Erős, T., Falka, I., Ferreira, M.T., Fox, M.G., Freyhof, J., Gozlan, R.E., Grabowska, J., Kováč, V., Moreno-Amich, R., Naseka, A.M., Peñáz, M., Povž, M., Przybylski, M., Robillard, M., Russell, I.C., Stakėnas, S., Šumer, S., Vila-Gispert, A. & Wiesner, C. 2005c. *Journal of Applied Ichthyology* 21, 242–262. (doi: 10.1111/j.1439-0426.2005.00679.x)

Interpopulaton variation in the growth and life history traits of the introduced sunfish, pumpkinseed *Lepomis gibbosus*, in Southern England. Villeneuve, F., Copp, G.H., Fox, M.G. & Stakėnas, S. 2005. *Journal of Applied Ichthyology* 21, 275–281. (doi: 10.1111/j.1439-0426.2005.00690.x)

The incidence of non-native fishes in water courses: example of the United Kingdom. Copp, G.H., Stakėnas, S. & Davison, P. 2006. *Aquatic Invasions* 1, 72–75.

Dispersion potential of pikeperch *Sander lucioperca* in the upper Thames estuary. Stakėnas, S., Copp, G.H., Scott, D. & Brown, J.A. & Wesley, K.J. 2007. (Oral communication, FSBI conference, Exeter, July 2007)

Pikeperch (*Sander lucioperca*) dispersion through brackish waters — Can they and do they? Scott, D. Brown, A. Stakėnas, S. Wilson, R. & Copp, G.H. 2007. Annual Main Meeting of the Society for Experimental Biology, Glasgow, Scotland, 31 March – 4 April, 2007. Abstract published in: *Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology* 146 (Suppl. 1), S77

Tagging effects on three non-native fish species in England (*Lepomis gibbosus*, *Pseudorasbora parva*, *Sander lucioperca*) and of native *Salmo trutta*. Stakėnas, S., Copp, G.H. & Scott, D.M. 2009. *Ecology of Freshwater Fish* 18, 167–176. (doi: 10.1111/j.1600-0633.2008.00339.x)

Calibration of FISK, an invasive-ness screening tool for non-native freshwater fishes. Copp, G.H., Vilizzi, L., Mumford, J., Fenwick, G.V., Godard, M.J. & Gozlan, R.E. 2009. *Risk Analysis* 29, 457–467. (doi: 10.1111/j.1539-6924.2008.01159.x)

Voracious invader or benign feline? A review of the environmental biology of European catfish *Silurus glanis* in its native and introduced range. Copp, G.H., Britton, J.R., Cucherousset, J., García-Berthou, E., Kirk, R., Peeler, E.J. & Stakėnas, S. 2009. *Fish & Fisheries* 10, 252–282. (online: doi: 10.1111/j.1467-2979.2008.00321.x)

Life-history traits and potential invasiveness of introduced pumpkinseed *Lepomis gibbosus* populations in northwestern Europe. Cucherousset, J., Copp, G.H., Fox, M.G., Sterud, E., van Kleef, H.H., Verreycken, H. & Záhorská, E. 2009. *Biological Invasions* 11, 2171–2180. (doi: 10.1007/s10530-009-9493-5)

Aliens vs. the natives: interactions between introduced *Lepomis gibbosus* and indigenous *Salmo trutta* in small streams of southern England. Copp, G.H., Stakėnas, S. & Cucherousset, J. 2010. pp. 347–370 In: K.B. Gido & D. Jackson (eds.) *Community Ecology of Stream Fishes: Concepts, Approaches and Techniques*. American Fisheries Society, Bethesda, Maryland.

Non-native fishes and climate change: predicting species responses to warming temperatures in a temperate region. Britton, J.R., Cucherousset, J., Davies, G.D., Godard, M.J. & Copp, G.H. 2010. *Freshwater Biology* 55, 1130–1141. (doi: 10.1111/j.1365-2427.2010.02396.x)

Recent releases and dispersal of non-native fishes in England and Wales, with emphasis on sunbleak *Leucispius delineatus*. Zięba, G., Copp, G.H., Davies, G.D., Stebbing, P., Wesley, K.J. & Britton, J.R. 2010. *Aquatic Invasions* 5, 155–161. (doi: 10.3391/ai2010.5.2.04)

The effect of elevated temperature on spawning frequency and spawning behaviour of introduced pumpkinseed *Lepomis gibbosus* in Europe. Zięba, G., Fox, M.G. & Copp, G.H. 2010. *Journal of Fish Biology* 77, 1850–1855. (doi:10.1111/j.1095-8649.2010.02778.x)

Seasonal reproductive allocation and influence of productivity on growth and life history traits of introduced pumpkinseed (*Lepomis gibbosus*) in Southern England. Fox, M.G., Villeneuve, F. & Copp G.H. 2011. *Fundamental & Applied Limnology* 178, 231–243. (doi: 10.1127/1863-9135/2011/0178-0231)