

GLOBAL RE-INTRODUCTION PERSPECTIVES

Re-introduction case-studies from around the globe



**Edited by
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Cover photo: Clockwise starting from top-left:

- Formosan salmon stream, Taiwan
- Students in Madagascar with tree seedlings
- Virgin Islands boa

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The re-introduction of the burbot to the United Kingdom and Flanders

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Introduction

The burbot (*Lota lota*) has a northern circumpolar distribution, inhabiting fresh and some brackish waters of continental Eurasia and North America, southward to about 40°N. Despite its extensive range, over much of its distribution burbot populations are threatened or face extirpation (Paragamian & Willis, 2000). In the UK and Flanders the species is thought to be extinct with the last confirmed captures in the two countries 1969 and 1957 respectively. In the UK the burbot is listed as a Biodiversity Action Plan (BAP) Species and is given special protection under Schedule 5 of the Wildlife and Countryside Act 1981. Adult burbot are usually 30 - 60 cm in length, but in parts of Siberia and Alaska may reach 120 cm and 32 kg in weight (Maitland & Lyle, 1991). Burbot are the only fully freshwater member of the *Gadidae* and are generally classified as opportunist piscivores. Burbot are found in both lentic and lotic environments, with spawning taking place at low water temperatures during the winter period (December to February).

Goals

- Goal 1: Assess the feasibility of re-introducing the burbot to Flanders and the United Kingdom.



- Goal 2: If feasible, create a self sustaining population within the species' former range in Flanders and the UK.

- Goal 3: Develop understanding to improve methodologies and protocols for species re-introductions, especially in relation to fish.

Success Indicators

- Indicator 1: Survival in the wild of released individuals.
- Indicator 2: Breeding in the wild of released individuals.

Burbot (*Lota lota*)

- Indicator 3: Expansion of species' range from initial release sites.

Project Summary

Feasibility: Despite similar overall aims of re-establishing viable burbot populations in its former range within the UK and Flanders (a part of Belgium), the two projects are currently at different stages. In the UK, the feasibility of re-introduction is still to be determined, whereas implementation and post-release monitoring is underway in Flanders. The overarching aim of the UK feasibility study is to identify the causes of the burbot's extinction, determine whether these causal factors persist, and assess future risks that may threaten any successful implementation. In order to achieve this, the former distribution and abundance of the species within UK Rivers must be estimated, and the time-scale of the species' decline in abundance to the point of extinction described. This will enable identification of factors that led to the extirpation of the burbot from the UK. Potential reasons include over-harvest, pollution, habitat modification and loss, and climate change. A key component of the study is to identify habitat suitability indices and assess the quantity of suitable habitat available in the former range. There is also a need to predict how environmental conditions may change in the future and how this would impact burbot viability within the UK. Identification of temperatures required for spawning appears particularly pertinent as this cold-water adapted species may require low temperatures in January and February to trigger reproduction.

Spawning trials will be conducted to investigate whether viable burbot progeny can be cultured over a range of temperatures that represent best and worse case scenarios under climate change predictions (UKCIP, 2002). To facilitate selection of the potential source populations for any future re-introduction, genetic samples from preserved burbot specimens of known British provenance will be compared with the known phylogenetic distribution of the species'. As an apex predator, burbot have a key role in ecosystem function. The views of key stakeholders, including angling groups and conservation organizations, on a possible re-introduction will be considered.

Based on the outcomes of this research, which examines the species' biological and ecological requirements, genetic lineage, critical life history traits as well as the public perception of a possible re-introduction, the feasibility of re-introducing the burbot to the UK will be determined.

Implementation: The Flemish burbot re-introduction project was launched in 1999. The feasibility study consisted of a genetic study, a habitat suitability study and a captive breeding program. Genetic



Artificially spawned burbot larvae

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Typical burbot habitat

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research using mitochondrial DNA distinguished two subspecies for burbot: *Lota lota lota*, found in Eurasia and Alaska, and *Lota lota maculosa*, found in North America. Within Europe four distinct phylogenetic clades were identified (Baltic and Northern, Central and Western European) (van Houdt *et al.*, 2003). The research using microsatellite markers showed that French burbot populations (part of the Western European clade) were closest genetically to the original Belgian stock and therefore a good source population for the re-

introduction project. By studying populations in a reference biotope (the French river “La Bar”) similar to Flemish lowland rivers, the habitat requirements of the burbot were identified for a number of its life stages. Based on this data, habitat suitability models were developed to assess potential re-introduction sites in Belgium. Concurrently a breeding program was developed to spawn and rear burbot in captivity to provide enough individuals of known genetic origin for the re-introduction. The fish culture program started in 1999 and due to improvements in hatchery techniques has become increasingly successful in terms of larval survival with time.

Post-release monitoring: In spring 2005 more than two million cultured burbot larvae of French origin were re-introduced to several tributaries of the River Grote Nete and the River Bosbeek. However, this re-introduction is thought to have failed as no juvenile burbot were recaptured during post-release monitoring. During the autumn of the same year 2,000 and 1,000 larger (0+ age-class) burbot were released at several locations in the River Grote Nete and in the River Bosbeek respectively. After re-introduction, the stocking sites were regularly sampled by electrofishing with recaptured burbot showing good growth and condition in both rivers. The percentage of recaptured burbot ranged between 4% and 12%. During sampling in December 2007 sexually mature males and females in spawning condition, were captured in the River Grote Nete. However it should be noted that further evaluation of survival, growth, maturation and natural recruitment is necessary to see if a self-sustaining population can be established. Due to the positive results of the earlier re-introductions, juvenile burbot have subsequently been released at other suitable locations in the Rivers Maarkebeek, Abeek and in the River Ijse.

Major difficulties faced

- Lack of baseline data on burbot population size prior to extinction.
- Difficult to quantify causes of extinction due to deficits in the time-scale of environmental monitoring.

- Securing adequate funding for all project phases.
- Developing a methodology to import burbot to the UK without compromising the UK's disease status.

Major lessons learned

None

Success of project

Highly Successful	Successful	Partially Successful	Failure
		√	

Reasons for success/failure:

1. Two years after re-introduction burbot are still present on the release sites.
2. Recaptured burbot show good growth and are in good condition. In winter of 2007 sexually mature females and males, in spawning condition, were observed
3. Further evaluation is necessary to see if natural recruitment has taken place.

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