HUMBER NATURE FORUM MEETING
Wednesday 2nd December 2015
Humber Room, The Ropewalk, Barton upon Humber

Lamprey in the Humber

Dr. Anita Franco

Institute of Estuarine and Coastal Studies, University of Hull

Just to introduce myself....

The Institute of Estuarine and Coastal Studies (IECS, University of Hull)

ESTUARINE & MARINE ORNITHOLOGY

Ornithologist/Seabird surveyor (Anna Stephenson)

Field Surveyors (Casual)

Senior Coastal Ecologist (Krystal Hemingway)

Senior Ornithologist (Lucas Mander)

Deputy Director & Senior Ornithologist (Nick Cutts)*1

GIS Specialist & Coastal Geographer (Shona Thomson)

SOCIO-ECONOMICS & GOVERNANCE

Assistant Environmental Economist (Dr. Natasha Bhatia)

Estuarine Ecologist & Socio-Economist (Daryl Burdon)

Marine Policy Specialist (Steve Barnard)

Senior Coastal Geographer & Governance Specialist (Sue J. Boyes)

Director (Prof. Mike Elliott)*1

Director - Designate (Dr. Rodney Forster)

Administrator/ Secretary (Karen Nicholson)*3

ESTUARINE & MARINE ECOLOGY

Senior Fish Ecologist (Dr. Anita Franco)

Senior Benthic Ecologist & Seabed Surveyor (Dr. James Strong)

Senior Benthic Ecologist (Dr. Krysia Mazik)

Marine Ecophysiologist (Dr. Katie Smyth)

FIELD & LABORATORY SCIENCE

Lab. & Field Survey Manager (Ann Leighton)*2

Estuarine Taxonomist & Benthic Survey Coordinator (Michael Bailey)

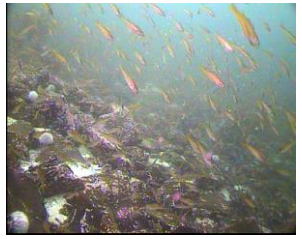
Marine Taxonomist & Sedimentologist (Oliver Dawes)

Senior Marine Taxonomist (Will Musk)

Benthic technicians (casual)

Estuarine Taxonomist & Technical Systems Operator (Chris Baulcomb)

IECS Staff Structure:
Four themed areas each with a Theme Leader (boxes in bold);*1 IECS Line managers for all staff; *2 IECS Line manager for lab. & field staff; *3 links to all staff for admin. tasks. Workflow between themes, between staff in different themes and within themes is depending on projects (NB. HoS is Overall Line Manager for all staff).



Lamprey in the Humber

- Why lamprey?
- Biology and life cycle
- Lamprey in the Humber
- Fisheries
- Threats and management

Why lamprey?

In Europe…

EC Directive on the conservation of natural habitats and of wild fauna and flora ("Habitats Directive")

- Lamprey are included in the list of species of community interest whose conservation requires the designation of special areas of conservation (Annex II)
- Some lamprey species (e.g. River lamprey) are included amongst species whose exploitation and taking in the wild may be subject to management measures (Annex V)
- Conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within the European territory

Also listed in Bern Convention (signatory countries to take 'appropriate and necessary legislative and administrative measures' to ensure their protection)

UK BAP priority species (being the most threatened and requiring conservation action under the UK Biodiversity Action Plan)

In the Humber… Lamprey are qualifying feature of the Humber Estuary Special Area of Conservation (SAC) and of the Yorkshire Derwent SAC

Lampreys are ecologically important in helping to process nutrients in rivers as well as being a food source for fish and birds, such as herons and sawbill ducks

Lamprey: biology and life cycle

- Eel-like fish (can range from 10 to approx. 100 cm in length)
- They have no bones (skeleton being made of strong, flexible cartilage)
- Very poorly developed fins
- Scaleless skin
- They have just one nostril on top of the head and a row of seven breathing holes (gill pores) on each side of the head ("nine-eyed eels“)
- They typically live 7 to 9 years

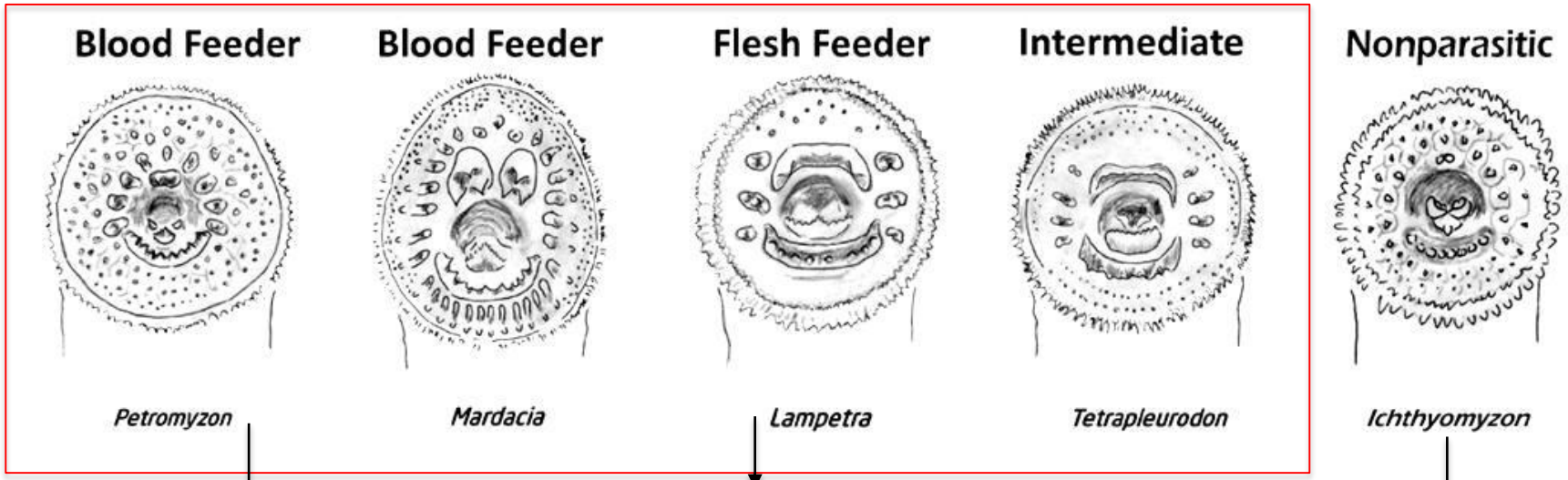
Lamprey: biology and life cycle

Lamprey belong a group called Agnatha or 'jawless fish' (Family Petromyzontidae), the most primitive of all living vertebrates (fossils dating back to 450 million years ago)

Unlike “regular” fish, they have no lower jaws
The mouth is surrounded by a round, sucker-like disc within which, in the adults, are strong, rasping teeth (their size, shape, number and position varies among species and depends also on their feeding habits)

Lamprey: biology and life cycle

There are at least 40 species of lampreys, most of them are parasitic animals (as adults)



Lamprey species in Britain:

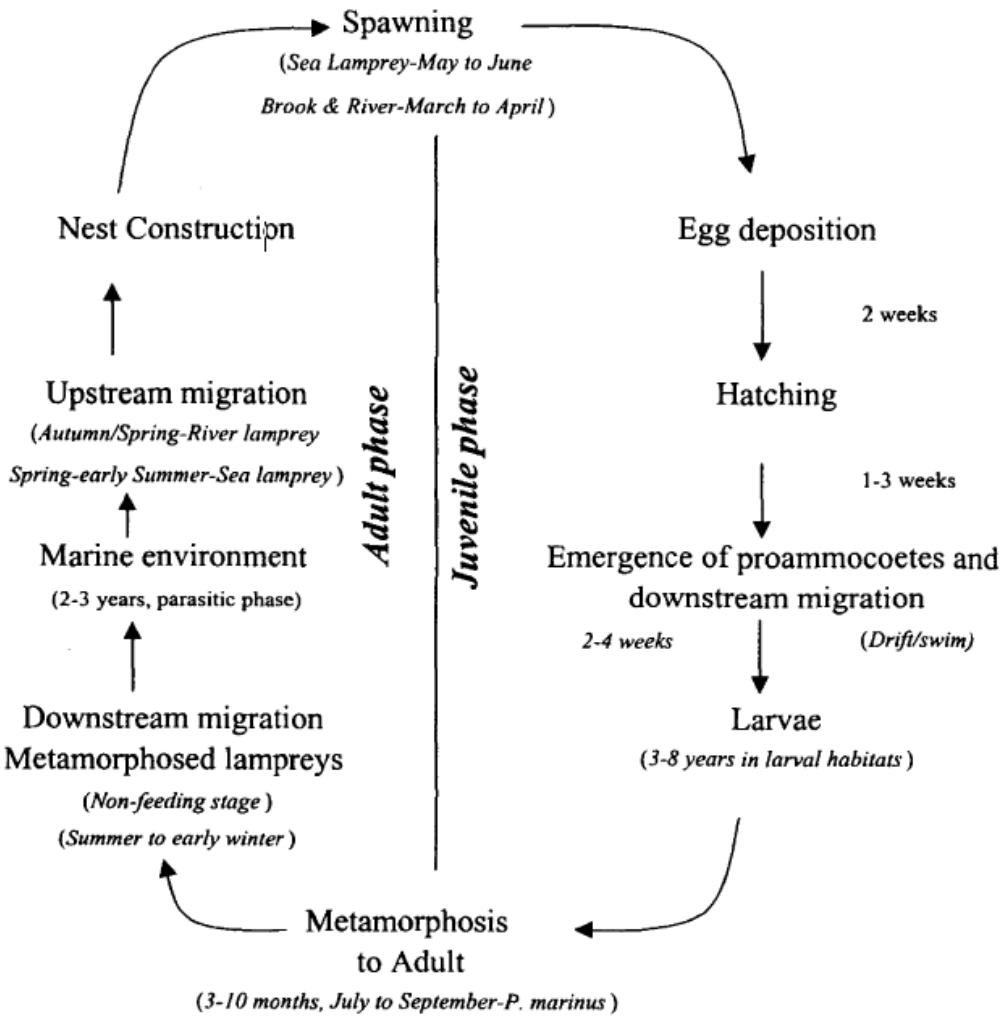
Sea lamprey (*Petromyzon marinus*)

River lamprey (*Lampetra fluviatilis*)

Brook lamprey (*Lampetra planeri*)

Lamprey: biology and life cycle

The majority of lamprey species are anadromous fish which spawn in freshwater but complete part of their life cycle in the sea

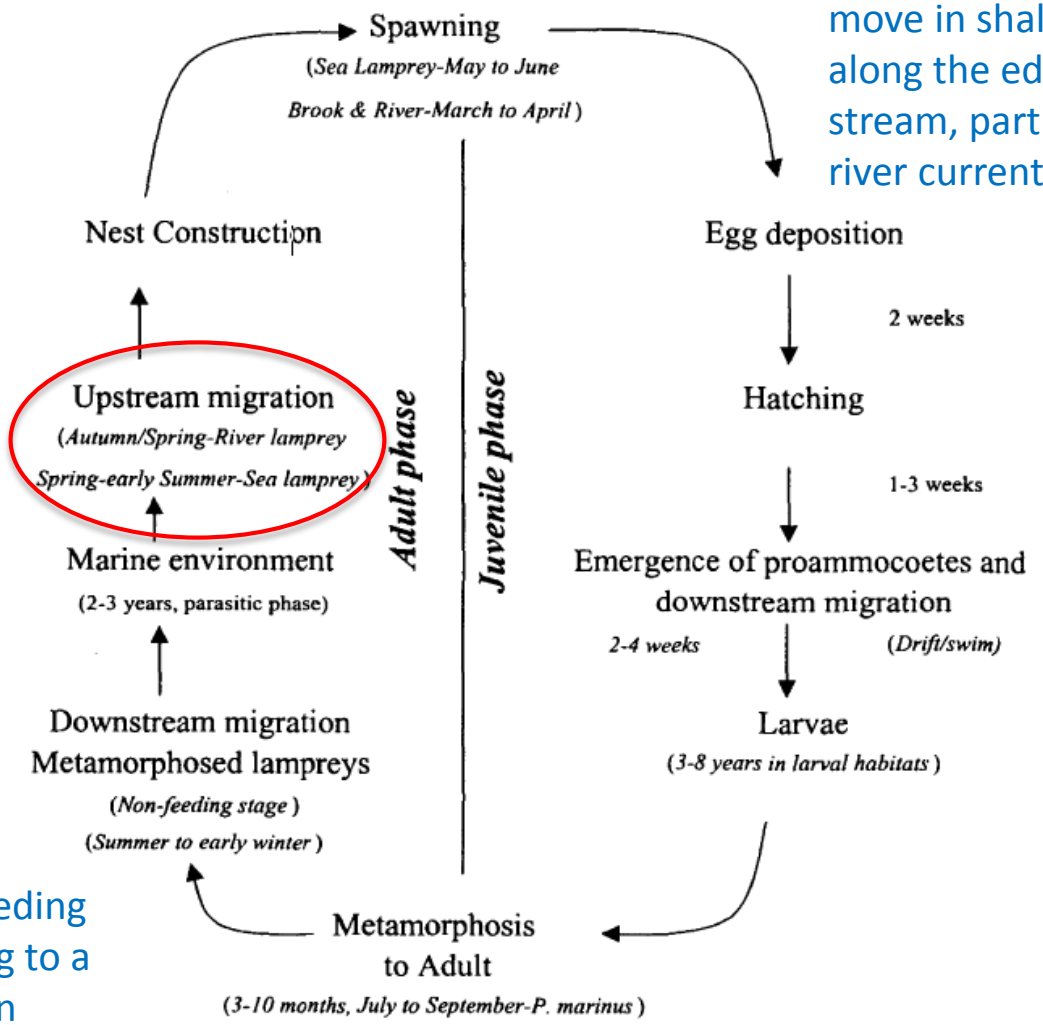


Lamprey: biology and life cycle

- Adults migrate upstream into rivers to reach the spawning areas

- The river upstream migration takes place almost exclusively at night, with adults being sedentary during the daytime, resting under rocks and riverbanks, and its timing varies with latitude, temperature and discharge

- During the upstream spawning migration, no feeding activity takes place, leading to a period of natural starvation

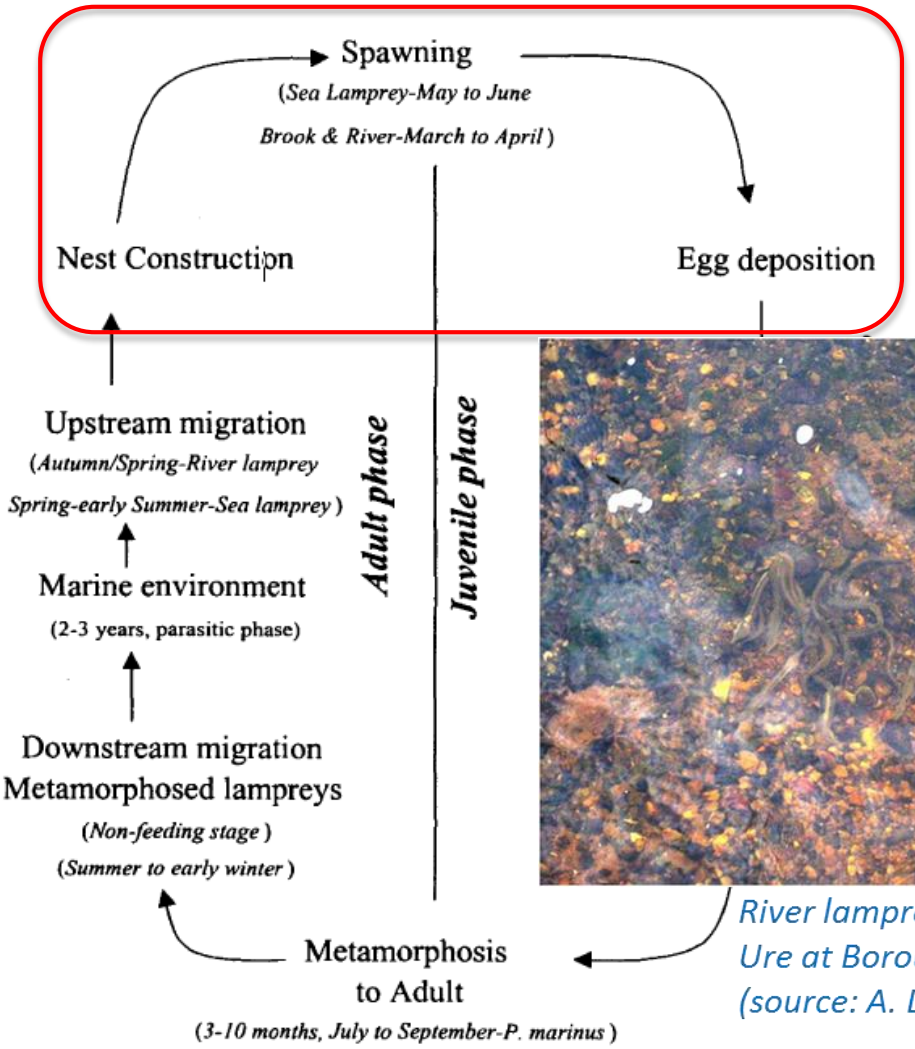


- Being poor swimmers, migrating lampreys generally move in shallow waters, along the edges of the main stream, particularly when the river current is strong

- When faced by barriers along the river, they exhibit sustained exploratory movements, passing backwards and forwards along the surface in search of a passage

Lamprey: biology and life cycle

- Water temperature is the decisive factor in determining the onset of spawning
- Adults spawn in pairs or groups, laying eggs in crude nests or shallow depressions in alluvial material
- The lamprey spawning habitat requires a gravel bed with swift-running water and nearby backwaters with muddy bottoms for the larvae

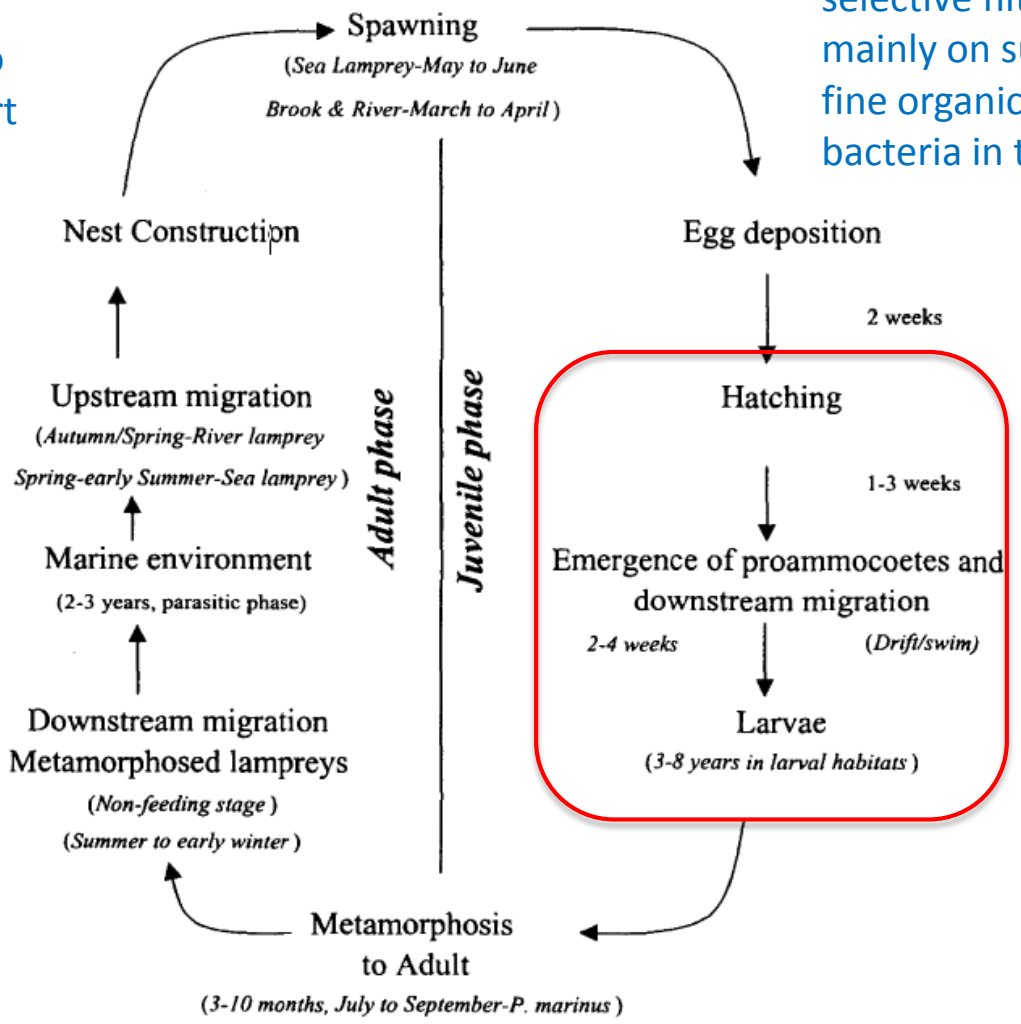


- The eggs are laid in a nest excavated by both males and females
- Most adults die shortly after a single spawning

River lamprey spawning in the River Ure at Boroughbridge on 14 April 2011 (source: A. D. Nunn)

Lamprey: biology and life cycle

- Newly born lampreys called ammocoets have no eyes and spend a large part of their early life in the river they were born in
- After hatching, ammocoetes emerge from the spawning substrata and drift downstream, where they burrow into silt beds in sheltered areas
- The downstream movement of larvae is seasonal, temperature-dependent and mainly nocturnal



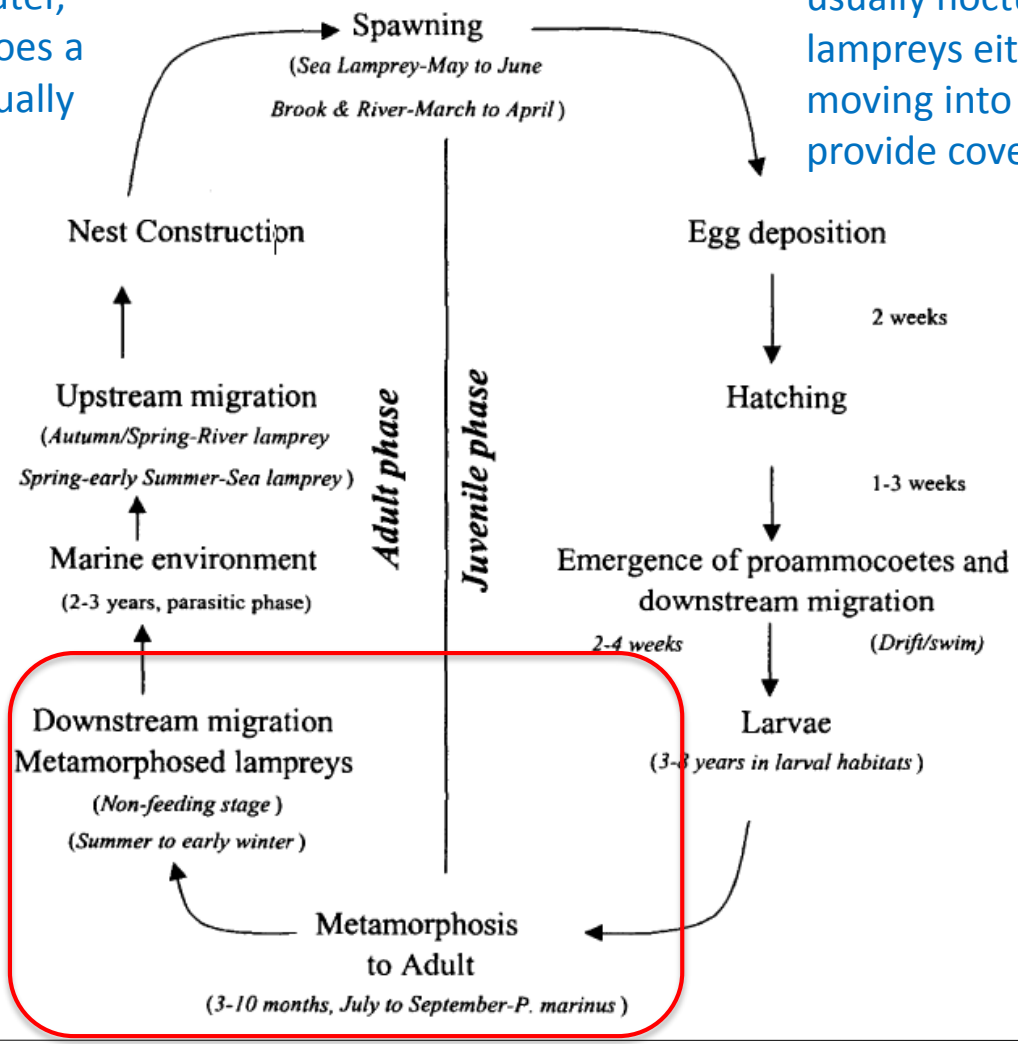
- Larval lampreys are non-selective filter feeders, feeding mainly on suspended material, fine organic particles and bacteria in the mud
- Due to their burrowing behaviour, the mortality rates for lamprey larvae are relatively low and uniform throughout the greater part of larval life

Lamprey: biology and life cycle

- After a period in freshwater, the larval lamprey undergoes a metamorphosis into a sexually mature non-feeding stage (young adults, called macrophthalmia)

- This transformation usually occurs when ammocoetes are between 9 and 15 cm in length

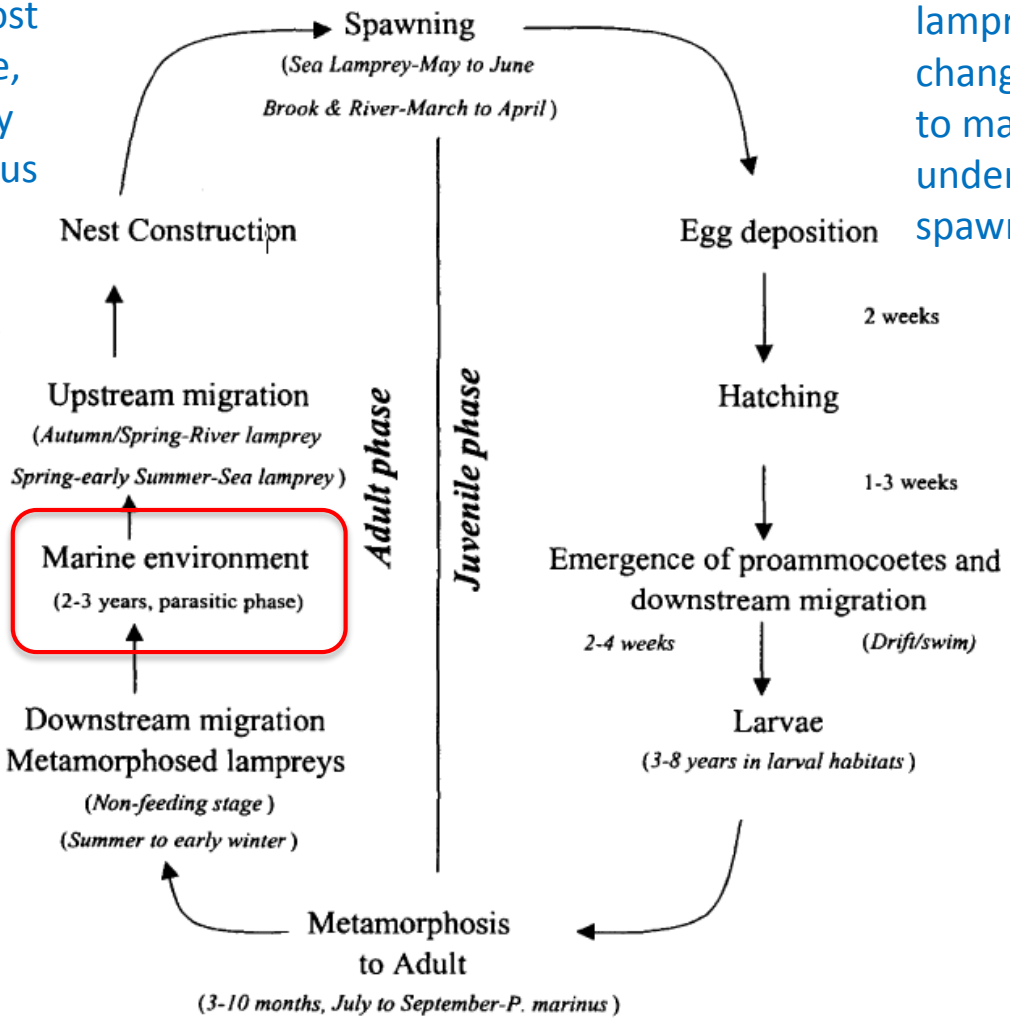
- The newly metamorphosed lampreys migrate downstream to estuaries and coastal regions



- The downstream migration is usually nocturnal, the young lampreys either burrowing or moving into protected areas that provide cover during daylight

Lamprey: biology and life cycle

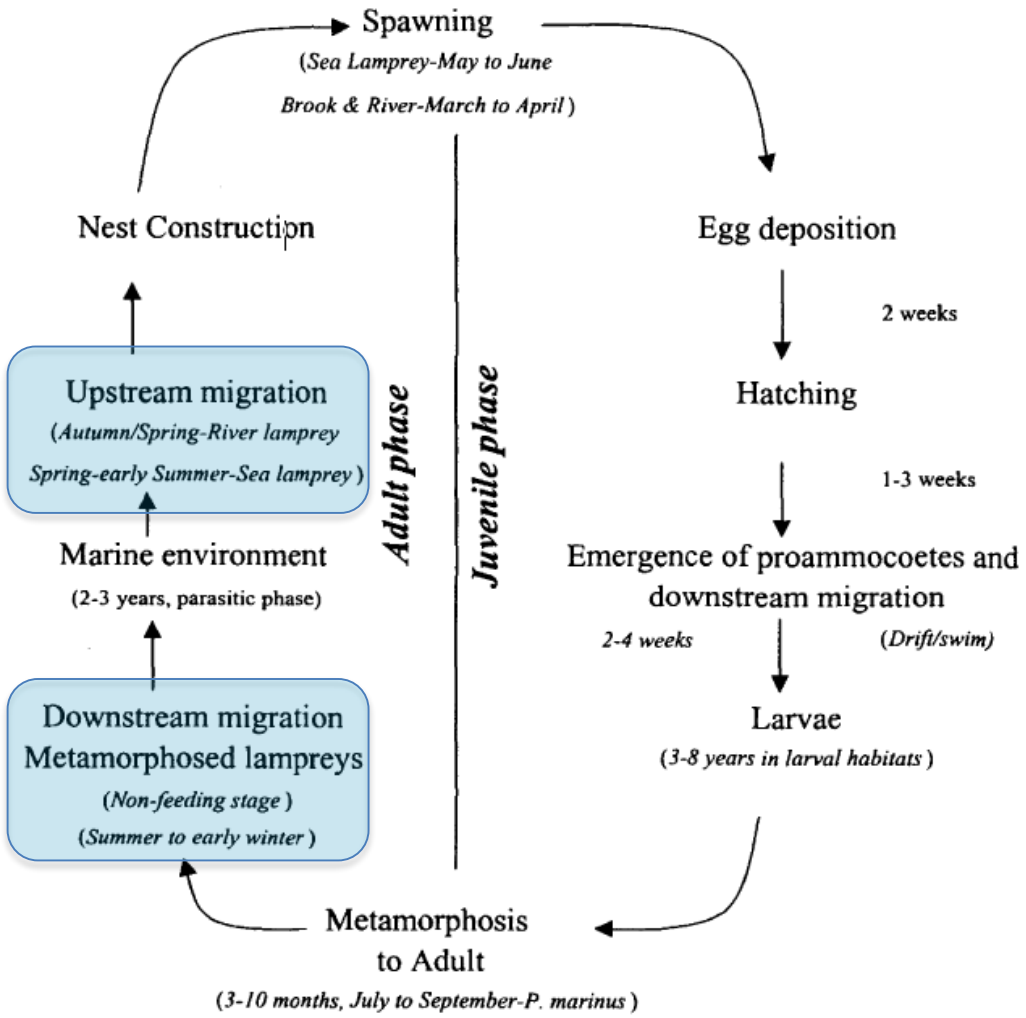
- The marine phase of most lampreys is a parasitic one, as adults feed on the body tissues and blood of various species of marine and anadromous fish (e.g. sea trout, salmon, shads, cod, haddock), but also…



- The feeding phase lasts 1-2 years; after that lamprey stop feeding, change colour and begin to mature sexually before undertaking the upstream spawning migration

Lamprey: biology and life cycle

Lamprey in estuaries



Lamprey in the Humber

Sea lamprey (*Petromyzon marinus*)

The largest of all lamprey species (60 to 90 cm, up to 120 cm; approximately 2-2.5 kg)
Migratory, anadromous

River lamprey (*Lampetra fluviatilis*)

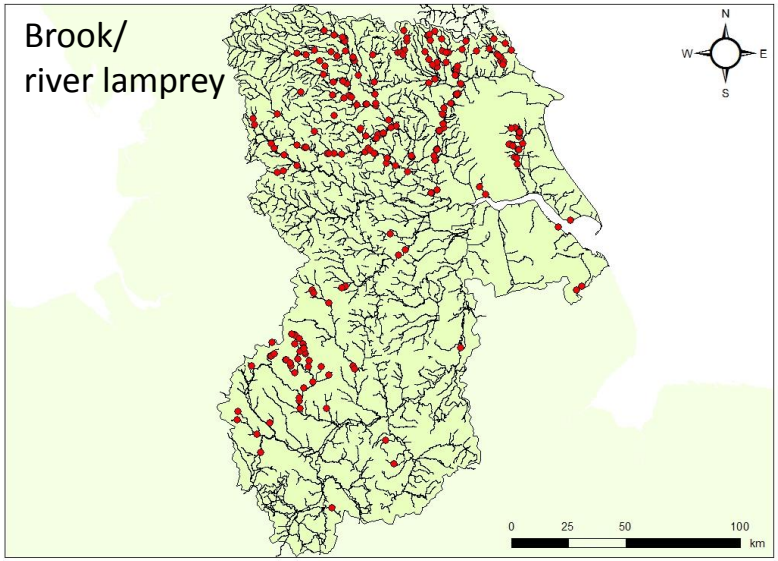
Intermediate size (adults 20-50 cm long, rarely >45 cm)
Migratory, anadromous

Brook lamprey (*Lampetra planeri*)

Smaller size (adults 10–17 cm long)
Resident freshwater species (not found in the estuary)
Morphologically similar to river lamprey (ammocoetes virtually indistinguishable in the field)

Lamprey in the Humber

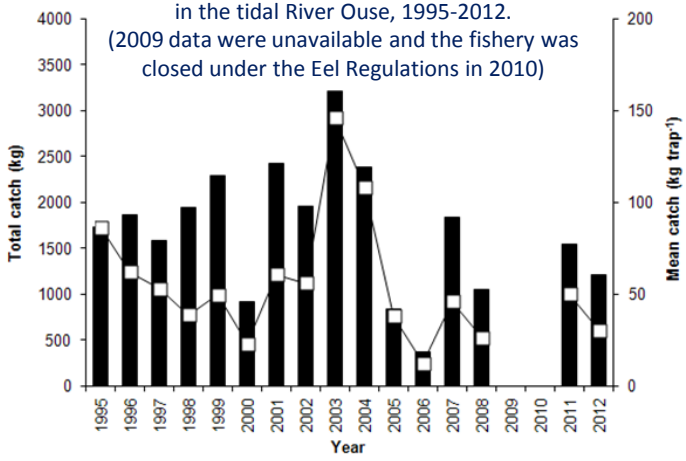
Freshwater reaches of the Humber catchment, data 1981-2012



- Records from upper reaches of the Rivers Trent, Don and Aire are most likely brook lamprey
- Both species can be present in parts of the Ouse catchment (brook lamprey in upper reaches, river lamprey further downstream)
- The Yorkshire Ouse catchment is believed to support one of the most important river lamprey populations in the UK

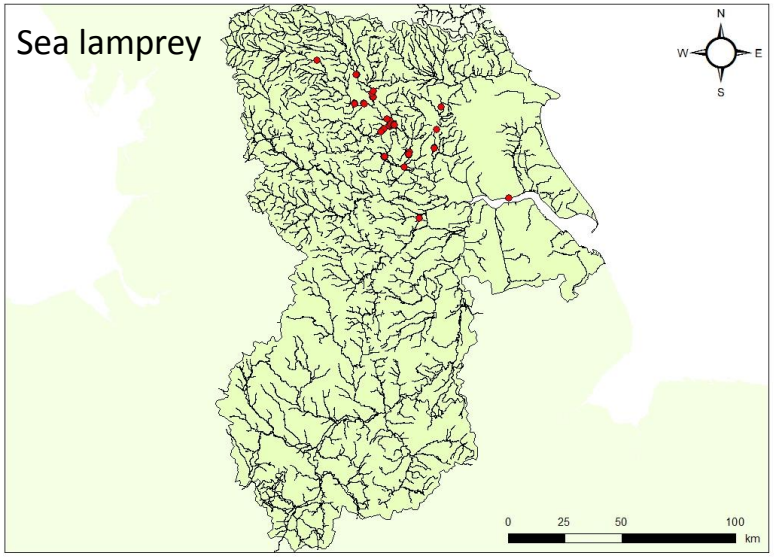
- Returns from the commercial river lamprey fishery in the tidal Ouse show no clear trend in total or mean catches (but fluctuations may be due to changes in fishing effort)
- Anecdotal evidence suggests that catches from commercial river lamprey fishery on the Trent have increased in recent years

Total (black bars) and mean (white squares) catches of adult river lamprey reported by the commercial fisheries in the tidal River Ouse, 1995-2012.
(2009 data were unavailable and the fishery was closed under the Eel Regulations in 2010)



Lamprey in the Humber

Freshwater reaches of the Humber catchment, data 1981-2012

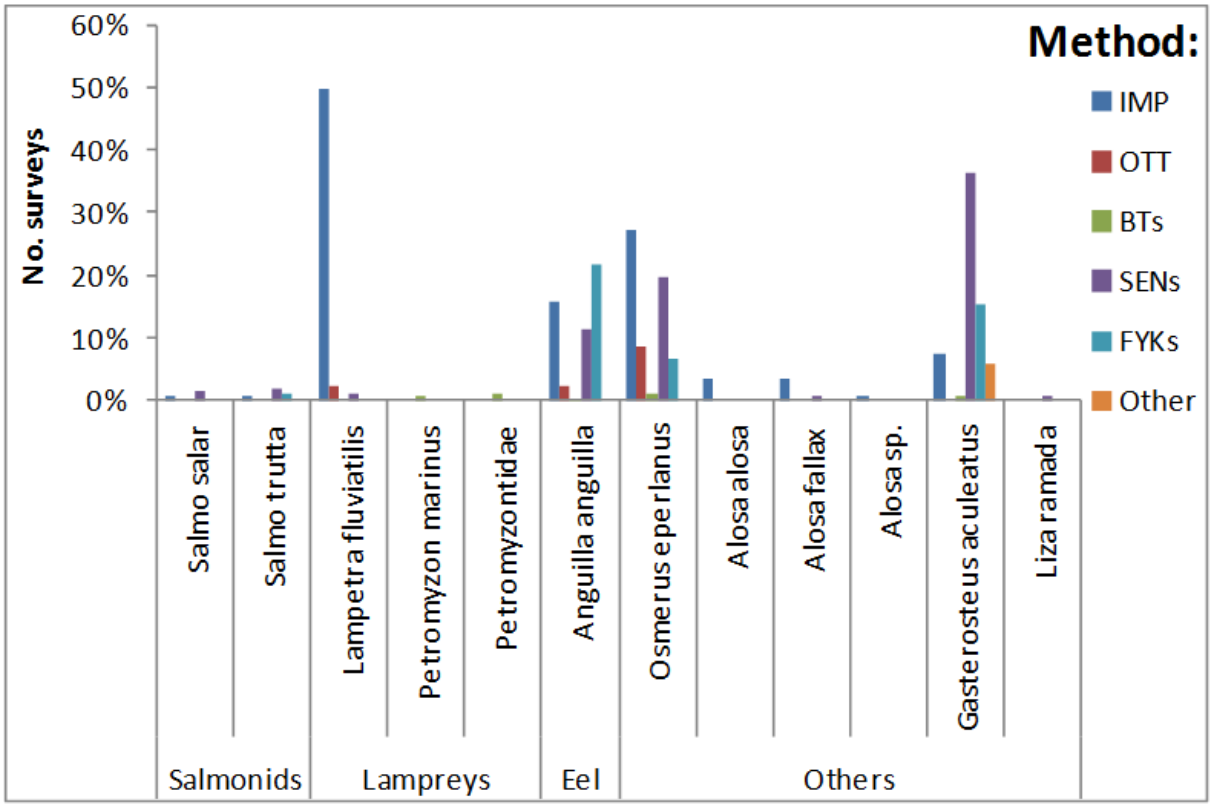


- Almost entirely restricted to the Ouse catchment (Rivers Ouse, Swale, Ure and Wharfe)
- No sea lamprey were captured during ammocoete surveys in the lower reaches of the Rivers Swale, Ure, Nidd, Wharfe and Yorkshire Derwent in 2004, suggesting that populations of this species were in unfavourable condition

- Sea lamprey do spawn in all of the Dales rivers, but the long-term viability and conservation status of their populations is a concern due to their low abundance and the apparent irregularity of successful spawning
- However, a successful return of river lamprey to the Ouse system after an absence of more than 40 years suggests that recovery of the sea lamprey populations may also be possible

Lamprey in the Humber *Humber Estuary, data 2000-2012*

The most consistent recordings of lamprey within the Humber Estuary come from power station impingement data



Frequency of occurrence of diadromous species in the estuarine surveys by sampling method.
Sampling methods are grouped by type:
IMP, impingement;
OTT, otter trawl;
BTs, beam trawls (4 types);
SENs, seine nets (2 types);
FYKs, fyke nets (2 types);
Other, other methods, including push net, bottle traps and epibenthic sledge.

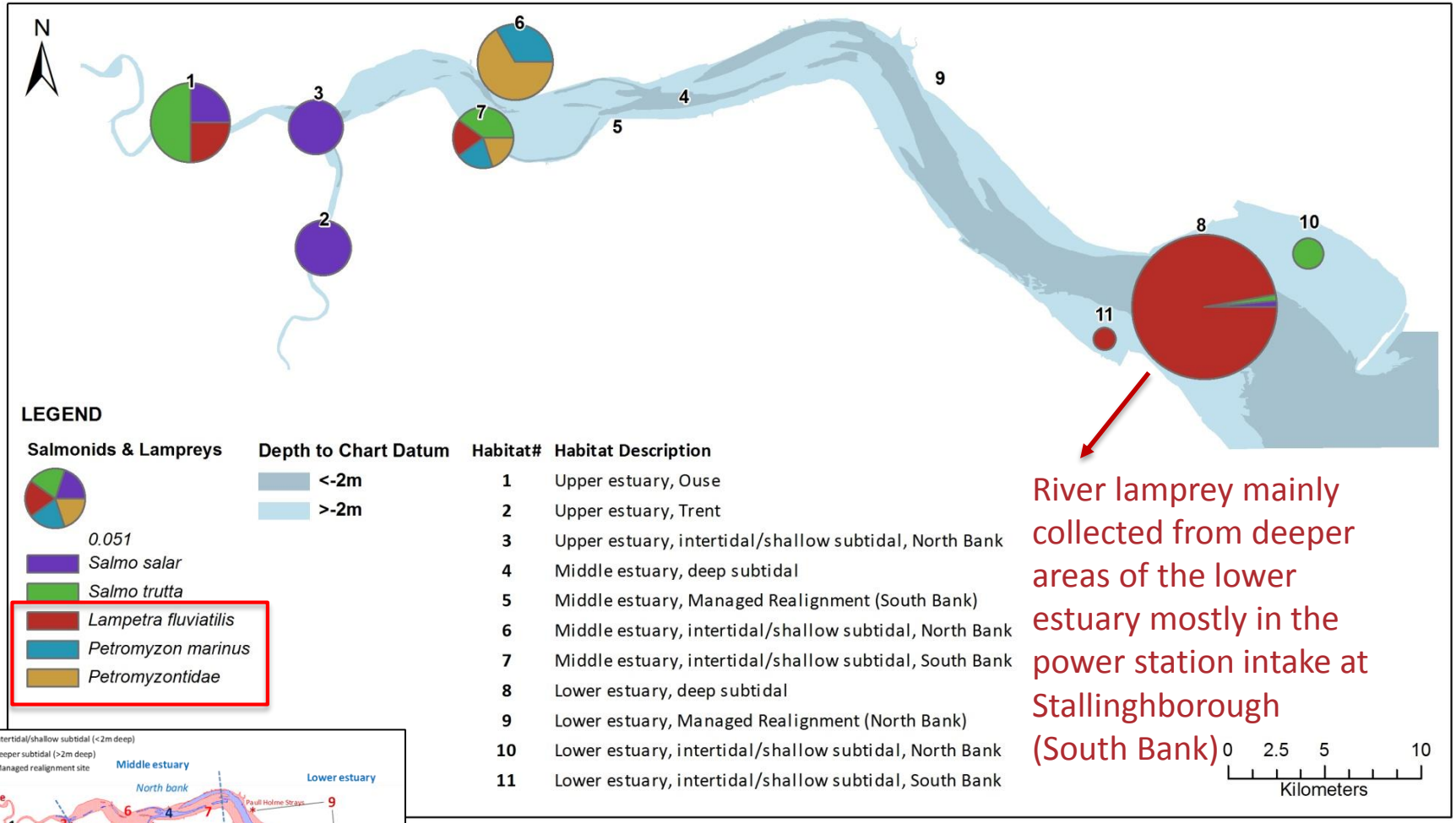
Lamprey in the Humber *Humber Estuary, data 2000-2012*

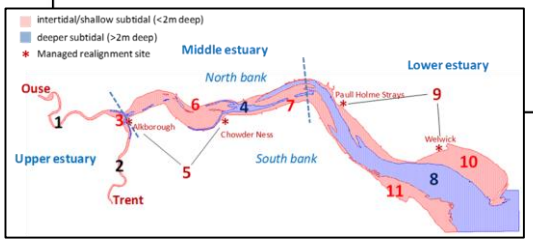
- River lamprey is the most frequent of lampreys in Humber Estuary catches, with 616 individuals caught during 2000-2012 (body size ranging 86-372 mm)

- Only 2 individuals of Sea lamprey were recorded in the catches between 2000 and 2012

Lamprey in the Humber *Humber Estuary, data 2000-2012*

Frequency of anadromous fish species in the estuarine catches 2000-2012

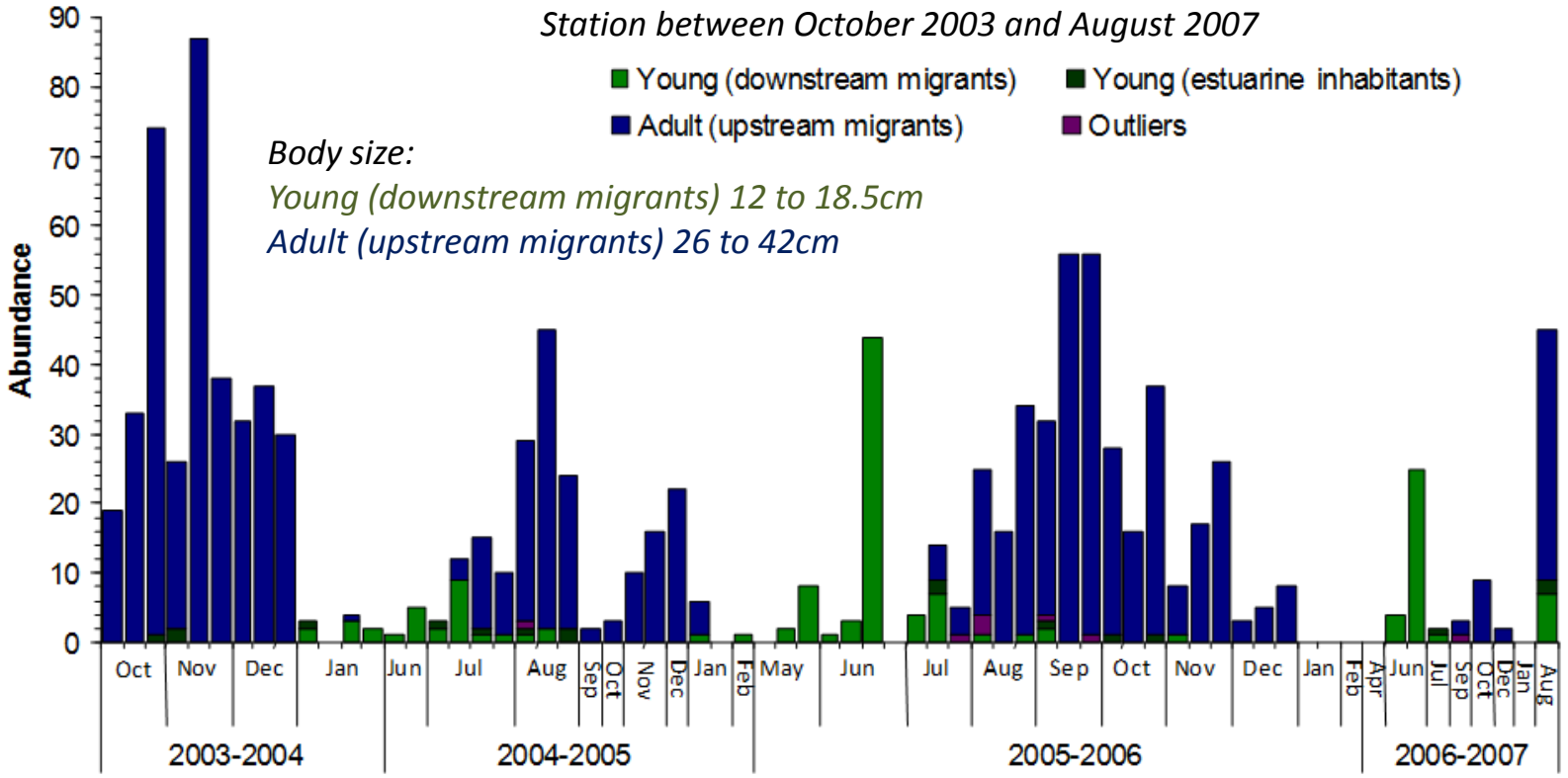




Lamprey in the Humber *Humber Estuary, data 2000-2012*

Most of the individuals caught during 2000-2012 are adults in their upstream migration to the spawning grounds. In the Humber basin, river lamprey mainly enter the rivers from the estuary in autumn and then spawn in April; downstream migration of young lampreys occurs in early summer

Total number of river lamprey impinged over 30h sampling periods at the South Humber Bank Power Station between October 2003 and August 2007



Lamprey fisheries

- Lampreys have been regarded as a luxury food throughout history. They are still eaten throughout much of Europe, but in Britain lampreys are not popular as a food. Lamprey have long been used as a fishing bait in freshwater fishing

- There are licensed river lamprey fisheries in the tidal Ouse and Trent
  An average of 1700 kg per year (range 378-3208 kg) was landed between 1995 and 2012 in the tidal Ouse

- Catches have decreased over time
  Estimated catch by the historic fishery in the tidal Ouse:
  25,000-50,000 individuals in early 1900s
  9,000-30,000 individuals in early 2000s

- A quota system (a total fishery catch of 1000 kg per year) and shorter commercial season (1 November-10 December) were introduced in 2011 following concerns that the river lamprey population in the Ouse catchment was potentially threatened by an unregulated increase in fishing

Threats and management

Lamprey population declines in many parts of Europe have been attributed to pollution, overfishing and physical barriers to migrations

Threats and management

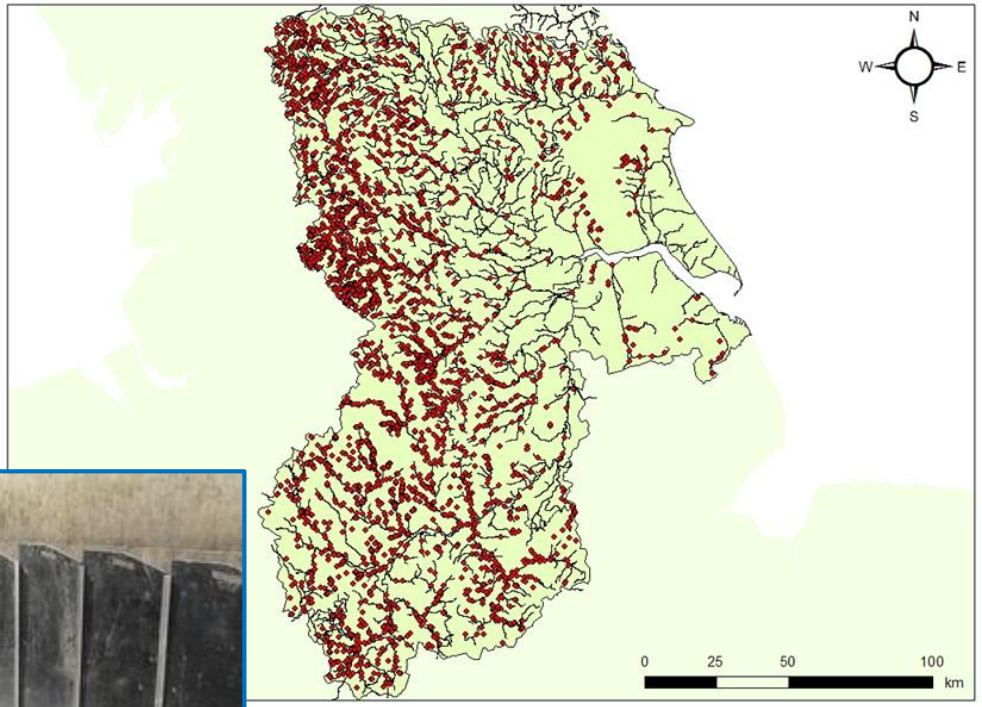
Lamprey population declines in many parts of Europe have been attributed to pollution, overfishing and physical barriers to migrations

In the Humber…

Migration barriers (weirs etc.)

Need to facilitate upstream passage at potential physical obstructions:

- Removal of river structures like weirs
- Lamprey tiles



The distribution of potential migration barriers in the freshwater reaches of the Humber catchment

Lamprey tiles at fish pass at Buttercrambe weir, River Derwent

Threats and management

Lamprey population declines in many parts of Europe have been attributed to pollution, overfishing and physical barriers to migrations

In the Humber…

- Impingement and entrainment
  (power station and other large water extractions)

- Commercial exploitation
  (high vulnerability of sea and river lamprey; impact on sustainability is being investigated in the tidal Ouse)

- Water quality (generally good in the Ouse catchment, although poor-quality inputs from the Rivers Aire (and Calder) and Don may pose a barrier to migration under some circumstances, especially for sea lamprey during low-flow conditions in early summer)

- Fishery management (e.g. quota system and shorter commercial season)
- WQ control/treatment

Threats and management

Lamprey population declines in many parts of Europe have been attributed to pollution, overfishing and physical barriers to migrations

In the Humber…

"Now that water quality has improved and some of these barriers have been removed we are seeing lampreys return to the upper reaches of rivers such as the Ouse, Trent, and Derwent, where they were absent as recently as 30 years ago"
(Simon Toms, Environment Agency)

Thank you
for your attention