

Life in the big blue box: studying the marine life of European eels

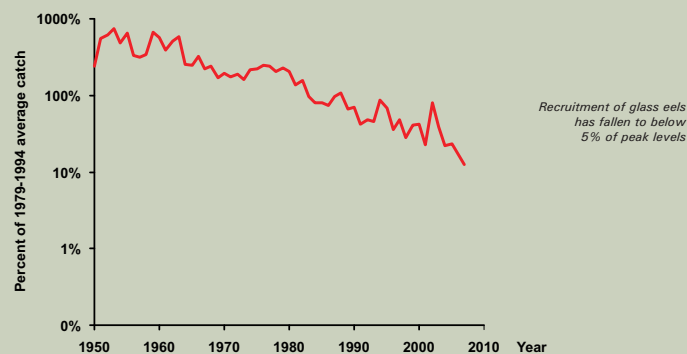


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Introduction

The European eel (*Anguilla anguilla*) is commercially and ecologically important. It has a remarkable catadromous lifecycle: mature adult eels spawn in the sea from which the resulting larvae migrate to the rivers of Europe, grow to partial maturity in freshwater for a period of 5 to 15 years (although sometimes much longer), then return once again to the marine environment to make their second long-distance migration to spawning grounds, where they die after reproduction. So, whilst most of the eel population's growth and production occurs in freshwater, the key life history events of reproduction and recruitment take place in the marine environment. However, despite more than a century of research, much of the ecology, life history and biology of European eels remains a mystery because traditional methods of research have not proved reliable or cost-effective. To solve some of this mystery, the EU has co-funded a large project called **eeliad** that brings together several cutting-edge technologies and research laboratories across Europe.

The importance of European eels



Eel fisheries generate a total income of ~€200 million Euro, and involves over 25,000 European citizens in 15 countries. The European eel stock is in decline. Recruitment of glass eels has fallen to below 5% of peak levels (measured from the 1970s onwards) and catches of yellow and silver eels have declined from 40,000t in the 1960s to less than 20,000t today. The stock is judged to be outside safe biological limits, but the root causes of the decline are not known. To protect eel stocks, the EU has established an eel management plan in an attempt to conserve and recover European stocks.

Without knowledge of the marine phase of eel biology, efforts to conserve and manage eel stocks are 'partially sighted' because the effectiveness of proposed management measures in rivers and estuaries can only be estimated. The knowledge generated by the **eeliad** project will be of direct use in policies aimed at conservation of European eel stocks because it will help to assess some of the potential reasons for the recent decline in stocks.

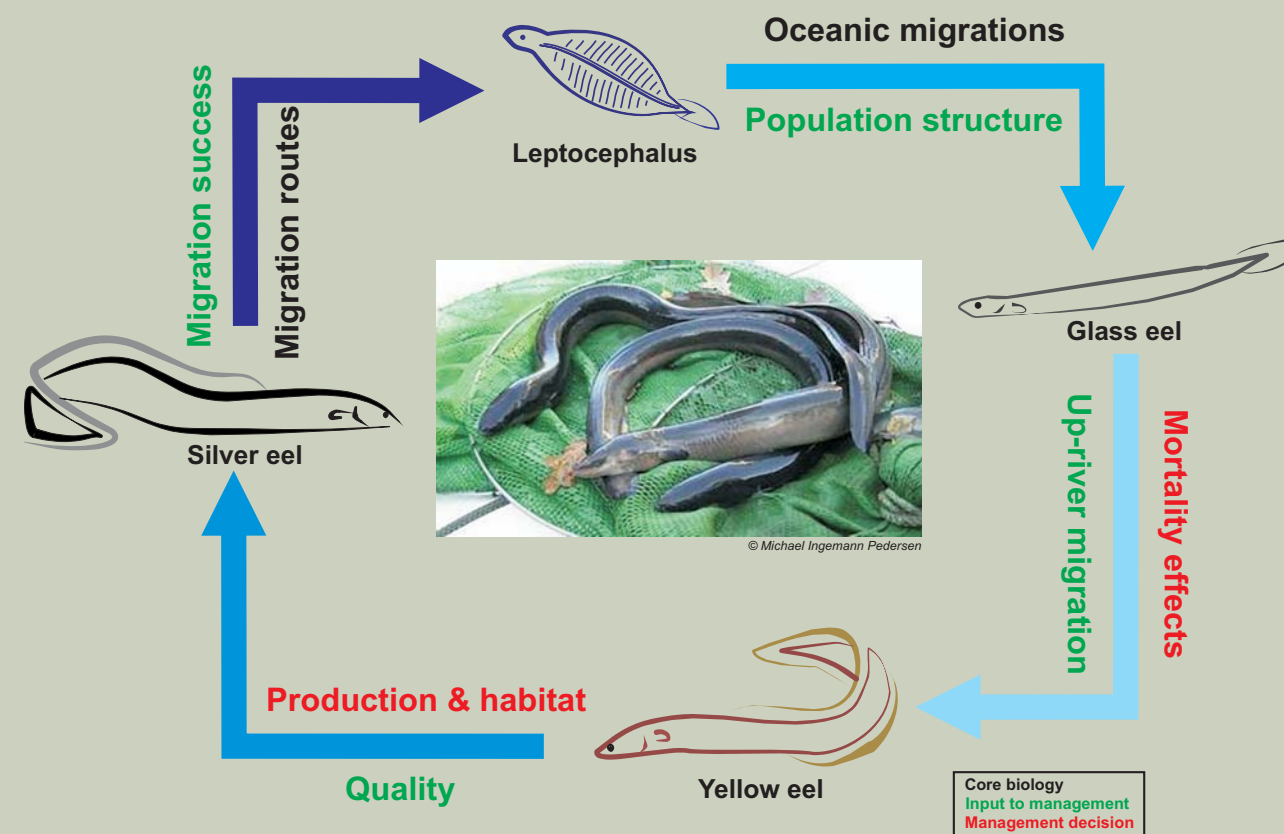
The mystery of the eel

The spawning migration of the European eel from rivers and brackish waters in Europe to presumed spawning grounds in the Sargasso Sea is one of the most impressive feats of animal migration and orientation, yet it is a mystery that over 2000 years of study has not fully solved. This is because studying the migrations and distribution of individuals or groups of eel at sea is technologically challenging and extremely expensive.

Many questions remain unanswered:

- Do eels travel to one spawning ground, or many different ones?
- Does spawning take place at only one time of year or over an extended period?
- What routes do eels take to their spawning grounds and what ocean currents do they use to 'hitch a lift'?
- How long do eels take to get to their spawning grounds?
- How many of the eels that leave Europe reach their destination to spawn and how many die (and why) on their journey?
- How many eels migrate from Europe to the spawning grounds each year, and which rivers do the majority of these eels come from?
- What routes do eel larvae take to get back to Europe?

Life in the big blue box: the key stages and questions the eeliad project will be addressing



The eeliad project and life in the big blue box

In the **eeliad** project, rather than describe this lack of knowledge as a 'black box' we have coined the term '**the big blue box**' because of the colour of the oceans that eels swim through to get to and from their spawning sites. The tagging programme within the **eeliad** project aims to change all that by mapping the migration routes and migratory behaviour of silver eels after they leave their rivers. Pop-off satellite tags will be attached to over 200 eels caught from a number of European rivers. The tags will collect information on the depths and temperature that the eels experience and, when the data from the tags are recovered through the Argos satellite system, we will compare this information with what we know about the oceans and be able to map the movements of eels as they travel.

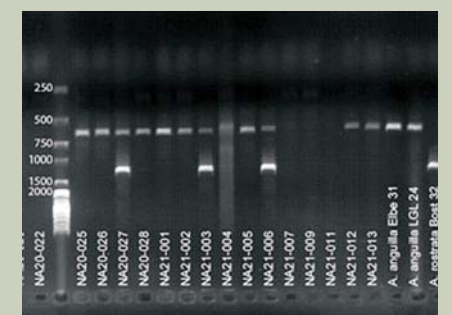
The tagging studies in **eeliad** will be supported by the use of cutting edge molecular techniques to determine population structure and eel 'quality', and innovative modelling approaches that will incorporate these data into fishery management models. In addition, these different studies will be linked to studies and observations undertaken in other cooperative projects such as INDICANG which is a network of monitoring programmes that report on the status and the development of eel populations over a large area (e.g. Atlantic Area). By helping to answer some of the fundamental questions about eel biology, the **eeliad** project will provide important inputs to the development of the EU eel management plan.



The Microwave Telemetry X-tag (actual size).



Eel otolith
© Environment Agency



Results of a DNA microsatellite analysis of eel larvae
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Partners in the eeliad project



The EU is co-funding the eeliad project with national governments

