

A Post-doctoral fellowship in aquatic ecology - Analysis and synthesis of the dynamics of glass eel recruitment in the Camargue delta

Context

The European eel is a species classified as critically endangered since 2008 by the IUCN (International Union for the Conservation of Nature). Since 2007, national Eel Management Plans have been established in accordance with the European Regulation (No. 1100/2007). The Vaccarès system is the only lagoon Index chosen by the French Eel Management Plan to monitor the status of the European eel population. This plan together with the Rhône Mediterranean migratory fish management plan set objectives for monitoring glass eel recruitment and silver eel escapement. Various scientific surveys carried out using nets or trap passes now provide several substantial data sets to better understand the dynamics of glass eel recruitment at different points in the Rhône delta.

The migratory behaviour of glass eels within lagoon systems, where the salinity gradient may vary unevenly across space, remains unknown. Unlike an estuary where salinity generally follows an upstream-downstream gradient, lagoon environments such as the Vaccarès system have freshwater inflows, which can be located both in the immediate vicinity of the connection with the sea or at much more remote points. This type of lagoon can also present areas of hypersalinity, at least temporarily. A hydro-thermo-saline model of the Vaccarès hydrosystem, developed under Telemac 2D by the Tour du Valat, simulates several hydraulic (volume of water exchanged, water height, flow velocity) and physico-chemical (temperature, salinity) variables at fine spatial (up to the order of one meter) and temporal (typically hourly scale) resolutions.

Objectives

Two main objectives will be addressed in this postdoctoral fellowship: (1) a meta-analysis of the dynamics of glass eel recruitment at different points in the delta, and (2) a characterization of the upstream migration of glass eels within the delta using matrix-type modelling tools. The results will enable to better visualize the different migration dynamics and propose an optimized management strategy to promote recruitment within the delta.

The first objective will consist in exploiting and pooling as much as possible all the scientific data acquired on the delta, on a monthly and continuous basis since 1993 or more episodically, in order to characterize the dynamics of glass eel recruitment, which may be different depending on the location (pertuis of the fourcade (Crivelli et al. 2008; Lambremon et al. 2019) / former saltworks / pumping systems of the Rhône river (Poizat

et al. 1999) / Vigueirat system). The influences of the Rhone river flow and the effects of variabilities related to hydrological (current velocity, water level) and physico-chemical (temperature, salinity) conditions will be in particular examined using statistical modelling tools.

The second objective of the project is to better understand and predict the upstream migration of glass eels inside the delta. The migratory flow of elvers will be modelled at the scale of the Vaccarès hydrosystem using a hydro-thermo-saline modelling in combination with matrix modelling (Beaulaton & Briand 2007). This approach will enable to assess the density of glass eels in predefined areas (e.g. Vittecoq et al. 2017) according to environmental conditions. This part will enable to better interpret the differences of recruitment observed between the trap pass located at the main connection to the sea (pertuis de la Fourcade) and the nets positioned in the northeast of the Vaccarès pond (at la Capelière) over the past 15 years (2004-2018). The former saltworks site located at the south-east of the delta will be included in the modelled area from 2017 onwards, when experimental data will be available. Mark-and-recapture data of glass eels carried out in 2004 and 2005 between the pertuis de la Fourcade and the Capelière (Bevacqua et al. 2019), as well as available pigment stage data, will be used to calibrate the models.

Partners involved

- Tour du Valat (Delphine Nicolas, Olivier Boutron)
- Association Migrateurs Rhône Méditerranée (MRM - Jordane Lambremon, Pierre Campton)
- Irstea Bordeaux EABX (Hilaire Drouineau, Patrick Lambert)

Requested profile

- PhD in Aquatic Ecology
- Mastery of statistical tools and R programming ;
- In-depth knowledge of aquatic and fisheries ecology;
- Population Dynamics Skills
- Some knowledge of hydraulics (natural flow), as well as knowledge of the Python language would be a plus.
- Motivated, rigorous, applied, relational person;
- Fluency in oral and written scientific English and ability to communicate in an international environment.

Practical information

The post-doctorate is scheduled for a period of 18 months, with a start of the contract at the very end of 2019 / beginning of 2020 being desired. The post-doctoral fellowship will be based at the Tour du Valat in the Species Department. He will occasionally stay in Irstea Bordeaux as part of the Aquatic Ecosystems and Global Changes unit - Functioning and

Restoration of Estuarine Ecosystems and Amphihaline Migratory Fish Populations team. The remuneration will be between 2490 and 2600€ gross depending on the experience.

How to apply ?

Send the application form to nicolas@tourduvalat.org with :

- A cover letter ;
- A curriculum vitae ;
- Two references related to previous professional experiences.

The pre-selected candidates will be invited for an interview on site or by videoconference.

Contact

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References

Beaulaton L., Briand C. 2007. *Effect of management measures on glass eel escapement*. ICES J Mar Sci 64:1402–1413. doi: 10.1093/icesjms/fsm071

Bevacqua D., Melià P., Schiavina M., Crivelli A.J., De Leo G.A., Gatto M. 2019. *A demographic model for the conservation and management of the European eel: an application to a Mediterranean coastal lagoon*. Durif C, editor. ICES J Mar Sci:fsz118. doi: 10.1093/icesjms/fsz118

Crivelli A.J., Auphan N., Chauvelon P., Sandoz A., Menella J.-Y., Poizat G. 2008. *Glass eel recruitment, *Anguilla anguilla* (L.), in a Mediterranean lagoon assessed by a glass eel trap: factors explaining the catches*. Hydrobiologia 602:79–86. doi: 10.1007/s10750-008-9283-6

Lambremon J., Nicolas D., Georgeon M., Crivelli A.J., Contournet P., Lebel I. 2019. *Etude du recrutement en civelles et de leur devenir dans l'étang du Vaccarès. Cohorte 2017- 2018*. Arles, France.

Poizat G., Chauvelon P., Rosecchi E., Crivelli A.J., Contournet P. 1999. *Passage de poissons du Rhône par les pompes d'irrigation de Camargue : premiers résultats*. Bull Fr Pêche Piscic:31–43. doi: 10.1051/kmae:1999019

Vittecoq M., Gauduin H., Oudart T., Bertrand O., Roche B., Guillemain M., Boutron O. 2017. *Modeling the spread of avian influenza viruses in aquatic reservoirs: A novel hydrodynamic approach applied to the Rhône delta (southern France)*. Sci Total Environ 595:787–800. doi: 10.1016/j.scitotenv.2017.03.165



The Tour du Valat is a private foundation working for the research and conservation of Mediterranean wetlands. Founded in 1954 by Dr Luc Hoffmann and based in the Camargue, it is at the cutting edge of multidisciplinary fields of research, building bridges between science, management and public policies. The main objective for the Tour du Valat is to change the behavior and decisions made by governments and the wider society in the Mediterranean basin to achieve that wetlands are conserved and sustainably managed towards the future.

The Tour du Valat has internationally recognized scientific expertise, and provides practical responses to problems regarding the conservation and sustainable management of natural resources. The Tour du Valat's projects are carried out in the Camargue and around the Mediterranean basin.

For further information: <http://www.tourduvalat.org/en>