

Post doctoral opportunity

Subject title: Analysis of Allis shad population dynamics in the Gironde basin using modelling approach

Laboratory

Estuarine ecosystem and diadromous fish Research unit
Cemagref Bordeaux
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Supervisor:

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Schedule

Early 2008, lasting for 18 months

Required skills

Diadromous fish ecology - population dynamics - process-based modelling - data analysis

Position

The position is open until filled. It is limited to 18 months, and will be paid according to the *Cemagref clauses* (e.g. monthly gross salary: 2150 €)

The appointee will join the Estuarine ecosystems and diadromous fish research unit, based in Bordeaux, which comprise 6 PhD students, 1 Post-doctoral fellows and 15 research engineers and scientists staff, working on a broad range of topics from conservation biology and fisheries science to community ecology and estuarine ecosystem management.

For more details visit: <http://www.bordeaux.cemagref.fr/rabx/index.html>

Application procedure:

Please send your application, preferably by email, with the usual material (expression of interest, CV, copies of certificates if available, representative reprints of published work) including a short statement of personal research aims and interests, and a summary of the PhD thesis, ideally not later than **March 31th** to:

Paul Gonthier paul.gonthier@cemagref.fr

Patrick Lambert patrick.lambert@cemagref.fr

Feel free to contact us for any further information about the project and related issues.

Description

Allis shad *Alosa alosa* Linné 1758 is a diadromous clupeid. Its distribution area has shrunk since the 19th century. It is now listed as vulnerable species in Europe (Maurin & Keith 1994). The Gironde Allis shad population has increased from the end of the 90 onward (Castelnaud, *et al.* 2001) and at the present time it is for sure, the most abundant of the species. Nevertheless, a decrease of the spawning stock was observed since 2002 (Chanseau, *et al.* 2005) and counting at the first dam on the Garonne (Fig 1) exhibited a drastic decline with a minimum in 2007. The same trend has been also recorded in the juveniles abundance in the Gironde estuary since 1998 (Girardin, *et al.* 2005). Among the multiple

hypothesised causes, one can mention the recent development of a marine fishery, the high exploitation rate of the estuarine commercial fishery and the negative impact of recent meteorological events. Today, 150 professional fishermen are catching Allis shad spawners during their estuarine migration (400 T in 2003 for 1,2 M€ from Girardin, *et al.* 2005), without any regulations. Recreation fishery is in rapid development.

Martin Vandembulcke (1999) proposed a model based on the Allis shad life cycle. This population dynamics model was age, sex and spatial compartment structured. Biological processes – ageing, growth, sexual maturation, reproduction, natural and anthropogenic mortality- were fitted independently using data on the 1989-1990 and 1991 cohorts. A simplified model (without a stock-recruitment relationship) is able to predict the number of spawners migrating the year n based on juvenile number estimations in estuary the years $n-3$ to $n-7$. In addition, elements for a management tool were recently proposed (Wuillez & Rochard 2003).

The knowledge of the biological processes underlying the model has been refined. The evolution of catches in different compartments of the watershed was specified by Castelnaud *et al.* (2001) and Girardin *et al.* (2005). Ages at spawning migration were recalculated for cohorts 1989, 1990 and 1991 (Lambert, *et al.* 2001). The homing level of the Gironde shad population was estimated using results from both genetic and otolith micro-chemistry analyses (Tomas, *et al.* 2005).

A PhD thesis about the downstream migration of young-of-the-year shads (Lochet 2006) gave elements about the timing of the settlement phase in the estuary, that are useful for juvenile abundance estimation.

In the meantime, our team has continued the biological survey of spawners runs using samples from the commercial fishery until 2000 (Gazeau, *et al.* 2001). Four new cohorts' (1992 to 1995) life histories could therefore be reconstituted. Others datasets probably could extend the numbers of cohorts to take into account. All these results will be used to validate the model. At last, process formulations proposed in the inland population dynamics of European eel (Lambert & Rochard 2007) could be adapted to improve Martin-Vandembulcke's model.

The aim of this work is to design a new version of the population dynamics model of Allis shad in the Gironde basin. Three steps could be defined:

- A new formulation of the biological processes with a special attention to the stock-recruitment relationship (Megrey, *et al.* 2005, Sakuramoto 2005) and the mean to integrate environmental factors (temperature, flood) and inter-cohort density regulation (Crecco & Savoy 1986, Aprahamian & Aprahamian 2001) in this relation.
- The calibration and the validation of the model (Grimm, *et al.* 1996, Mullon, *et al.* 2003) with possibly a Bayesian approach (Rivot, *et al.* 2004).
- The projection of Allid shad population evolution for the next years. An exploration plan will be designed (Amblard, *et al.* 2003) in order to test relative importance of possible causes for stock depletion. Different management scenarios could also be tested.

References

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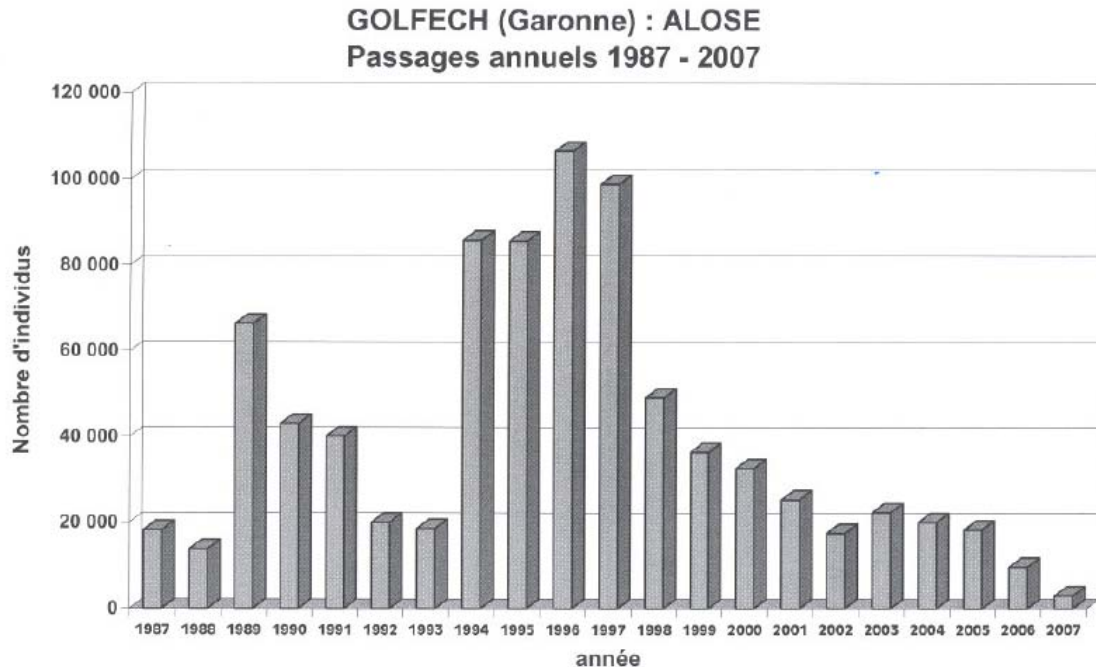


Fig1. Evolution of the number of Allis shad recorded in the fish lift of the first dam on the Garonne river.