

# Multiscale exploration of European eel population dynamics with simulation tools

European eel, *Anguilla anguilla*, is a diadromous fish whose unique European stock is outside safe security limit. We propose to use modelling to study (i) the eel population dynamics within a watershed and (ii) the mechanisms of estuarine glass eel migration.

The development of a matrix model aims to answer the first point. This model is structured by development stage, sex and age. It integrates the main biological processes, ageing, recruitment, sexual differentiation, sex determinism, silvering, moving and natural mortality. It has been possible to identify 18 parameter sets, equivalent to 18 life history traits combinations, compatible with the paradigm of eel stock working in a watershed. The simulated dynamics emphasize the importance of characteristics and processes in the downstream part of a watershed, specially when resource is rare.

The second point led to implement an individual-based model of glass eel movements in Gironde estuary (France). This model mimics the selective tidal stream transport steered by an endogenous clock. Thinking before model implementation led us to reconsider the advantage of systematically crossing the estuary. Migration simulation with free running or synchronized by low slack waters clock gives results which disagree with the present phenomenon description. Therefore we need to precise mechanisms of tidal transport stop. Theoretic exploration of the molecular working of an endogenous clock highlights a putative increase of activity duration with a clock synchronised by tides. This result could sensibly modify simulation outputs.

At last the contribution of these modelling tries to eel ecology knowledge are reviewed.

Patrick Lambert April 2005