Post-doc position: Trajectometry and freshwater fish behavior

Freshwater fish ecology; Movement ecology; Statistics; Habitat modelling

Post-doc: Trajectométrie et comportement des poissons

Ecologie des poissons d'eau douce; Ecologie du mouvement; Statistiques; Modélisation de l'habitat.

18 months, starting between January & February 2016 (position open until filled)
Based in Lyon, France, Irstea, laboratoire Maly/dynam "Dynamiques et Modèles en Ecohydrologie" (http://www.irstea.fr/dynam), with visits in Bordeaux.
Net salary 2060 €/month

Send a CV and short e-mail/letter to herve.capra@irstea.fr.

Individual tracking of fish in rivers generally aims to study spatial repartition and to describe functional habitat used by fish for alimentation, reproduction, displacements (Ovidio & Philippart, 2002; Le Pichon et al., 2006). The extent of the home range is often estimated at the individual level or for a given species (e.g. kernels method; Worton, 1989) mainly using static and descriptive statistical approaches (e.g. Ovidio et al., 2007). Advances in telemetry equipment enable auto-recording the locations for numerous individuals at a very fine time scale (a few seconds; Jonsen et al., 2013). The network of 32 acoustic hydrophones deployed into the Rhône River during the summer 2009 (Bergé et al., 2012) belongs to this new generation of technology (precision in fish locations < 5 m; tag period of emission ≈ 3 sec.). This equipment enables us to calculate the velocity and directions of fish displacements, to detect acceleration phases and fine scale directional changes, almost in real time. Such methods for recording individual behavior and novel data analysis recently revolutionized behavioral ecology (Cagnacci et al., 2010; Jonsen et al., 2003) and a new field was formalized by Nathan et al. (2008): movement ecology.

Movement ecology is now developing fast (Nathan et al., 2008; Giuggioli & Bartumeus, 2010) and aims to study the interplay between individuals and environments in their movement through the analysis of observed trajectories (e.g. velocity, orientation, direction changes) of individuals (Joo et al., 2013; McClintock et al., 2012; Nams, 2014). In their movement ecology paradigm, Nathan et al. (2008) assume that an individual movement is the result of four components: its internal state (why it is moving), its navigation capacity (when and where it is moving), its motion capacity (how it is moving) and the influence of environments. States-based models can analyze this interplay (Joo et al., 2013; Jonsen et al., 2013), and permitting relationships among environment/ behavior/ trajectory (e.g. avoidance behavior probability increases when discharge increases) to be modelled.

The post-doctorate position will start a detailed review of the most recent literature on behavioral and movement ecology and on trajectometry with a fish ecology perspective (e.g. Goodwin et al., 2014; White et al., 2014). The candidate will work mainly on data (for three holobiotic species: Squalius cephalus, Barbus barbus &
Silurus glanis) from the telemetry experiment carried out in the Rhône River in 2009 (with possibility to work on a similar data set, but recorded in a lake). Integrating intra- and inter-species variability (endemic vs exotic), the first step will be to classify the main behavior types (e.g. static swimming, foraging movements, avoiding) and propose suitable trajectory indicators (absolute velocity, angular velocity, acceleration, etc.) to discriminate those behavioral states. Then, through the development of models of trajectories, the selected candidate will describe the relationship between environment (temperature and hydraulics simulated with a 2D hydraulic model; Capra et al., 2011) and behavioral states, and finally will derive habitat suitability maps with respect to different scenarios of water discharge. Such trajectory models will then be tested as indicators of fish response to environmental changes.

The candidate will have the opportunity to visit and exchange with a supervision committee, which includes a specialist of data analysis, the researchers that collected and/or organized the ecological datasets. This position will be based in Lyon, France, in a research team specialized in ecohydrology and modelling, with the possibility to visit the supervising committee in Bordeaux. The position is financed by the "Hynes" joint team project (Edf and Irstea).

Potential candidates must have skills in complex data analysis, statistical modelling and programming, with preferably some experience in aquatic ecology. She/he should be interested in the ecological questions involving fish behavior associated with the statistical developments.

Supervision committee

H. Capra (Fish ecology; Irstea Lyon) - Main supervisor
H. Drouineau (Fishery sciences; Irstea Bordeaux) - Main supervisor
H. Pella (Geomatician; Irstea Lyon) - supervisor
M. Ovidio (Fish behaviour; University of Liège)
C. Le Pichon (Fish and landscape ecology; Irstea Paris)
N. Lamouroux (Habitat modelling; Irstea Lyon)
J. Nunez (Physiologist; IRD Montpellier)

References


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