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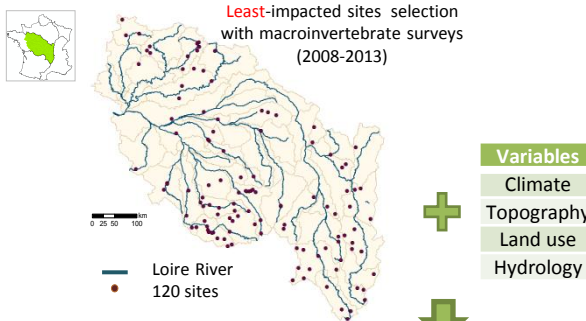
Coupled modelling of macroinvertebrate communities and river hydraulic habitat under climate change scenarios for the Loire river basin, France

Marie-Line Merg¹, Jérémy Piffady¹, Nicolas Lamouroux², Éric Sauquet³, Yves Souchon¹

1-Introduction

Human induced-physical habitat alterations are the main threat to aquatic ecosystems. In a context of climate change, these alterations could be exacerbated by **extreme low flows aggravation**. Changes in low flow regime should affect macroinvertebrates hydraulic habitats (e.g. **bottom shear stress** described by FST-hemispheres (Statzner *et al.*, 1989)), inducing modifications of **community structure** (richness and functional traits). In this study, we point out ecological responses to **shifts in habitat availability**, regardless of other pressures (e.g. water pollution, abstraction) and highlight the most **sensitive taxa**. Thus, we provide a map of ecological sensitivity to low flows aggravation in connection with the natural hydromorphological features.

2-Methods



1 Hydrological model

Scenarios of low flow alterations by 2100 in 47 subcatchments in the Loire River watershed (Moatar *et al.*, 2010)

3 SDM*

Prediction of taxa composition in a given reach

*Species Distribution Model

REACH SCALE

LOCAL SCALE

SHEAR STRESS

2 Hydraulic models

Simulation of shear stress distribution in a reach for a given discharge (Lamouroux *et al.*, 1992)

mean width → mean depth → FST

4 Biological model

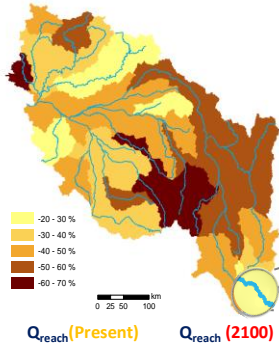
Simulation of habitat value in function of shear stress for a given species (Dolédéc *et al.*, 2007; Méricoux *et al.*, 2009)

5 Habitat model

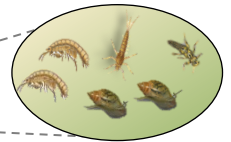
Prediction of habitat alteration for a given taxon at the reach scale

3-Expected Results

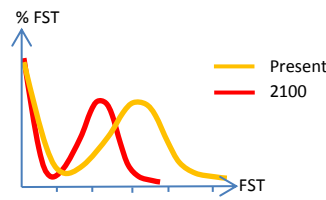
1 Q90 low flow scenario for 2100



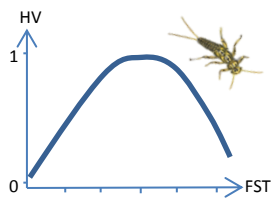
3 Community composition



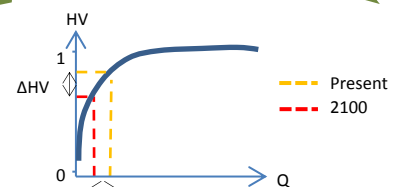
2 FST distribution in the reach



4 FST preference curve



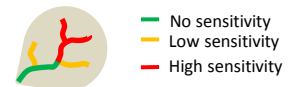
5 Habitat value alteration



6 Identify sensitive taxa

High Habitat Loss ($\Delta HV < 0$) Low Habitat Loss ($\Delta HV < 0$) Habitat Gain ($\Delta HV > 0$)

7 Identify local sensitivity



4-Conclusion & Perspectives

Thanks to these results, we provide a frame for further studies to better understand how the effects of climate change on macroinvertebrate community could be exacerbated (or not) by other anthropogenic pressures (e.g. water abstraction).

Anthropogenic pressures
Climate change sensitivity

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