# Assessing the environmental control on fish life cycle: case of temperature, discharge and photoperiod control on shad reproduction (Alosa alosa)

Alexis Paumier, Hilaire Drouineau, Patrick Lambert

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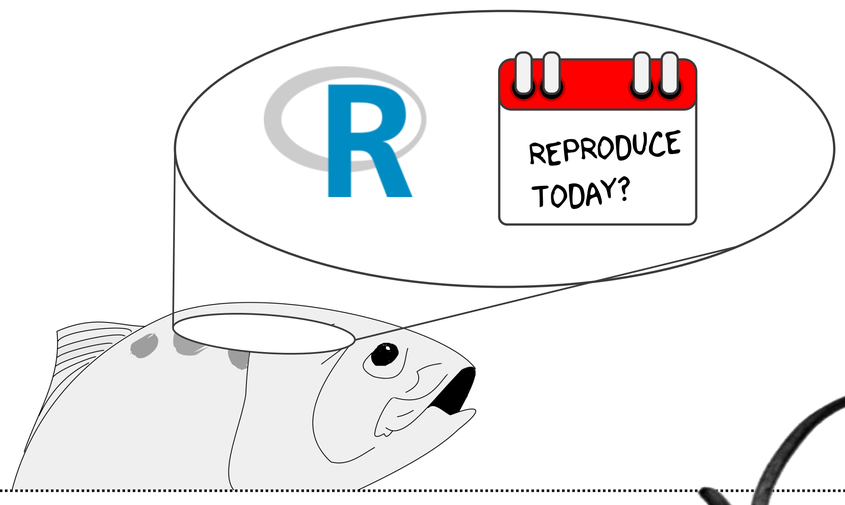
## Context

- Dramatic declines observed in North Atlantic shads (Limburg and Waldman, 2009).
- Global warming threatens the recovery of diadromous population (Lassalle et al., 2008).

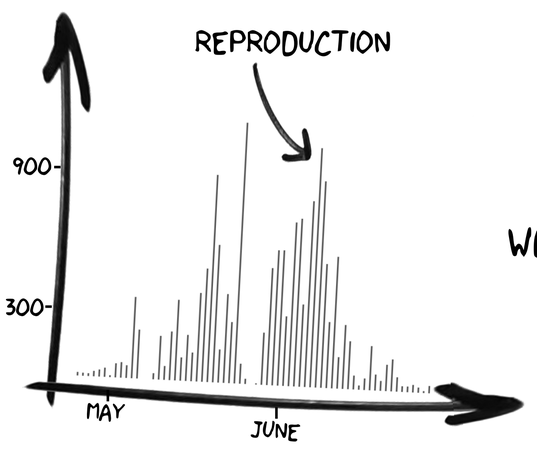
IS SHAD REPRODUCTION TRIGGERED BY
**ENVIRONMENTAL CUES**
THAT MAY BE DISRUPTED BY GLOBAL WARMING?



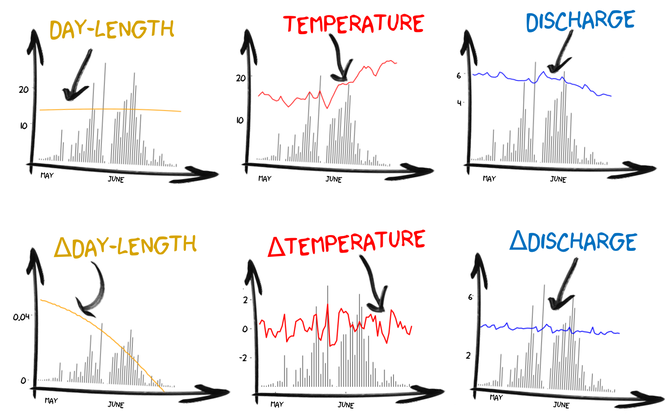

## Data and Method

**14 years** of field monitoring in two French rivers


EXAMPLE IN THE GARONNE RIVER IN 2003



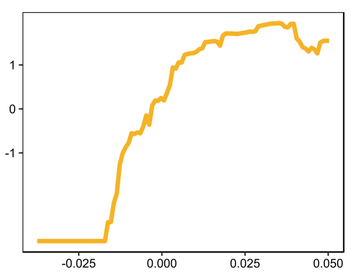

WITH

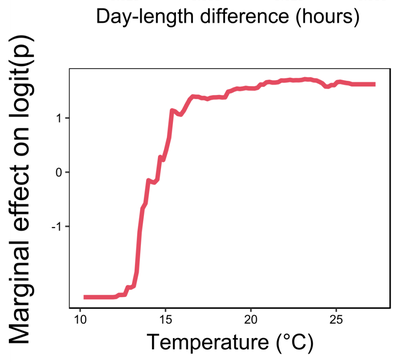


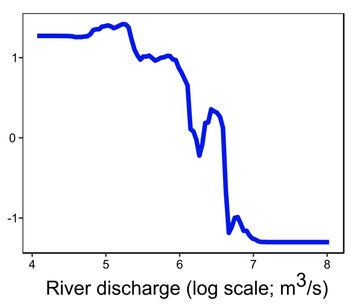

**Ecological niche modeling** to define the occupied niche (Pearson, 2010) during the reproduction

- A **Boosted Regression Trees** (BRT) computes spawning probability based on environmental factors
- Dependence plots were used to explore the environmental control on spawning probability considering the interactions (Elith et al., 2008)

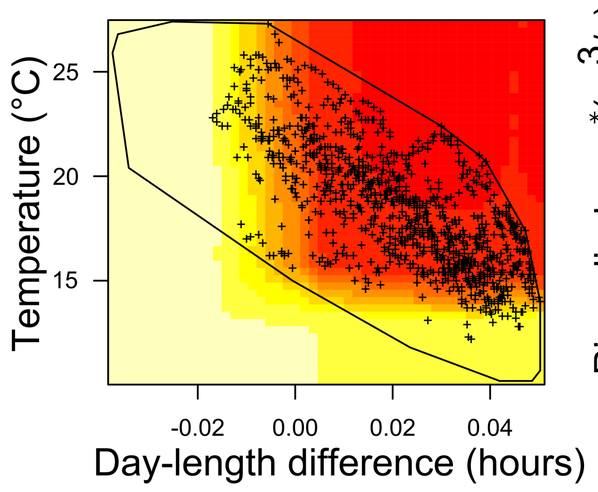
2D-DEPENDENCE PLOTS

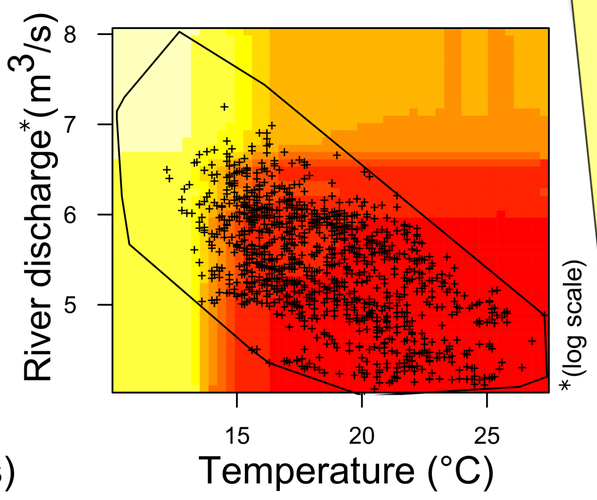


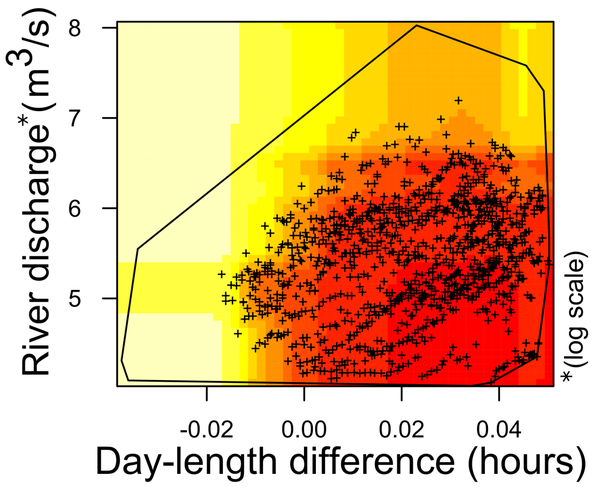



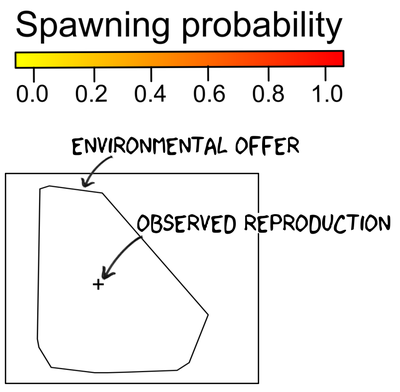




3D-DEPENDENCE PLOTS



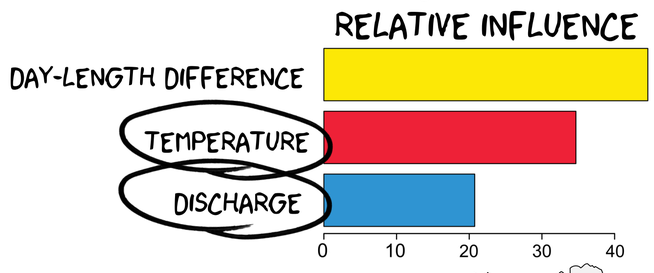




CONCLUSION

3 MAIN TRIGGERS: DAY-LENGTH DIFFERENCE, TEMPERATURE AND DISCHARGE

- SHAD REPRODUCTION STARTS AT 15°C
- SHAD START TO REPRODUCE WITH HIGH AND POSITIVE DAY-LENGTH DIFFERENCE
- HIGH DISCHARGE STOPS REPRODUCTION

STRONG CUMULATIVE INFLUENCE OF 2 ENVIRONMENTAL CUES POSSIBLY DISRUPTED BY THE GLOBAL WARMING

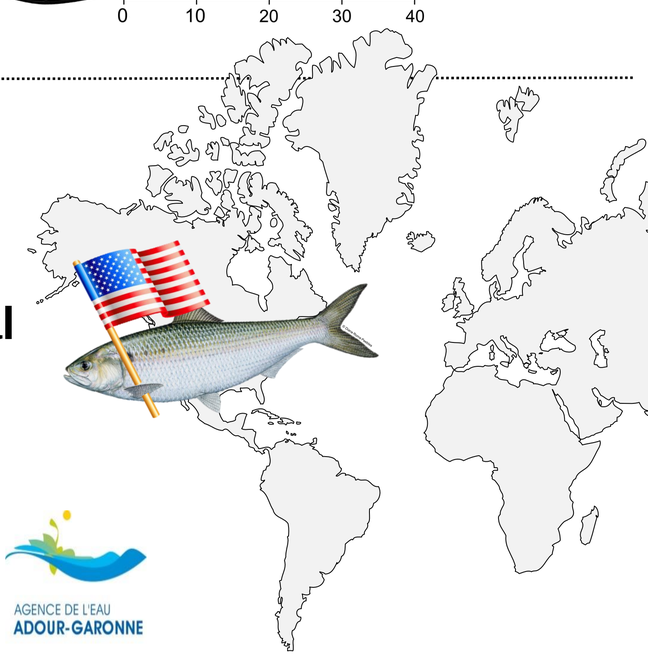



## Perspectives

(i) Use the BRT model to predict the reproduction of shad under global warming scenario.

(ii) Compare the niche during the reproduction for another **shad species or/and geographical area**, as the American shad (*Alosa sapidissima*).

(iii) Post-doctoral position ☺



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