

Recent range contraction of the endangered Pyrenean desman (*Galemys pyrenaicus*) in the French Pyrenees



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Background

- The effects of global change on semi-aquatic mammals is little known in spite of a large number of endangered species
- Most Species Distribution Model (SDM) studies consider climate change alone but other components of global change can contribute to species range shifts
- In SDM studies applied to freshwater taxa, the hydrology is frequently overlooked due to the lack of data at large spatial scale but fine resolution
- Stream flow variables can be simulated using hydrological models, and then included in SDMs through an integrated modeling approach

Research questions

- Do hydrological variables explain the distribution of a semi-aquatic mammal at broad scale and fine resolution?
- Do SDMs accounting for climate, land-use and hydrological changes that have occurred during the last 25 years predict accurately the species distribution shift?

Material & methods

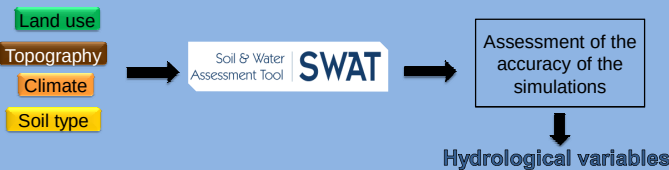
Biological model: the Pyrenean desman (*Galemys pyrenaicus*)

- Increasingly endangered
- Endemic to the Pyrenees and the Iberian Peninsula
- Uses streams in mountainous regions
- Lives in aquatic habitats and feed on aquatic invertebrates

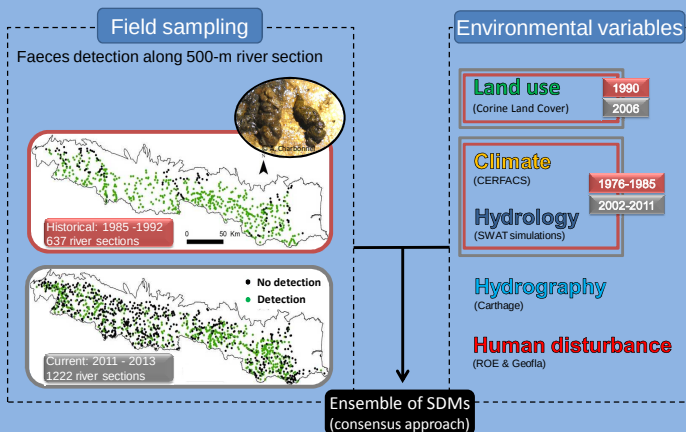


Study area: French Pyrenees

Simulation of stream flow:

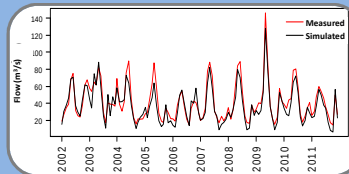


Species Distribution Models:



Results

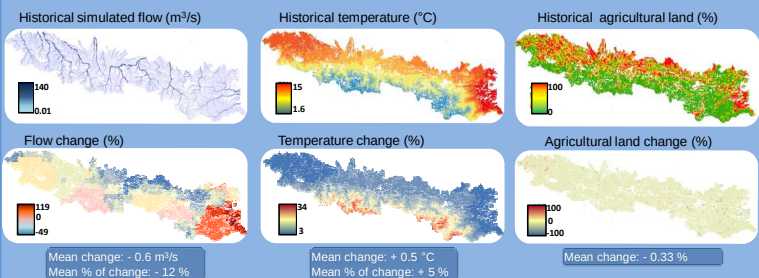
Accurate simulation of hydrology both in time and space



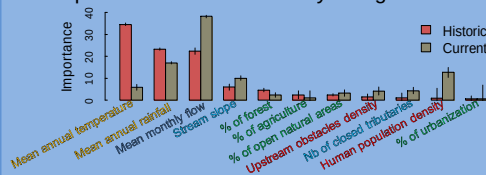
Example of simulated and recorded stream flow at the measuring station "Pont de Rieulhes", at a monthly time step.

Substantial climatic and hydrological changes over the last 25 years, but negligible land use change

Examples of variables:

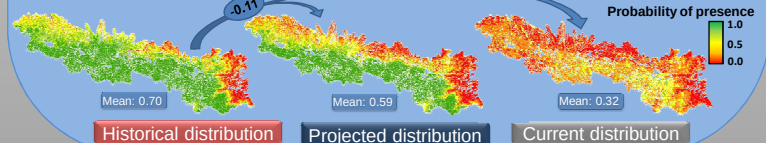


Importance of climatic and hydrological variables



Contribution of the environmental variables to the distribution of the Pyrenean Desman.

- Climatic and hydrological changes have led to a decline in the probabilities of presence (cf. projected distribution)
- The stronger range contraction modeled (cf. current distribution) suggests that climatic and hydrological changes are not the sole drivers of this contraction



Conclusions

- Coupling hydrological models with SDMs enables to account for the effect of hydrological changes on range shifts of freshwater species
- Both climate and hydrology are important drivers of the Pyrenean desman distribution, suggesting that this species is sensitive to global change
- Other factors (e.g. predation) may have contributed to the rapid range contraction of the species