

Ecology and Aquatic Biology

Emmanuel Castella

Our vision and aims

Our group focuses on the diversity of invertebrate assemblages in two contexts:

- i) **freshwater invertebrates in running waters and their associated floodplains**
- ii) **terrestrial invertebrates in various settings** including suburban agricultural landscapes.

The invertebrates we are mostly concerned with include insects, molluscs and crustaceans.



Two adult hoverflies (Diptera): *Sphiximorpha subessilis* (top) and *Volucella inflata* (center) (pictures M.C.D. Speight) and a cased caddisfly larvae *Oecetis notata* (bottom) (picture P. Marle).

Major research topics

- The medium-term (i.e. 10 - 20 years) **monitoring of large-scale river and floodplain restoration**. How does the diversity of invertebrate assemblages react to hydrological restoration measures? Are there confounding reasons for change in biodiversity following restoration (e.g. the spread of alien species, climate change, contaminants)? How do priority species behave in this context? Can we develop tools to inform future fluvial restorations?

- The use of one family of flies (Diptera, **Syrphidae, or Hoverflies**) to assess **the role of productive, as well as non-productive, habitats of agricultural landscapes** i) in sustaining a diverse fraction of the regional species pool, ii) in providing services beneficial to crop production (pollination, predation on other phytophagous insects).



Emmanuel Castella



Hélène Mayor



David McCrae



Pierre Marle

and current master students: Marie Bessat, Laetitia Brossin, Abby Gaëlle de Carvalho, Jean-David Faye, Vinciane Monod, Aurélia Passaseo, Pablo Timoner.

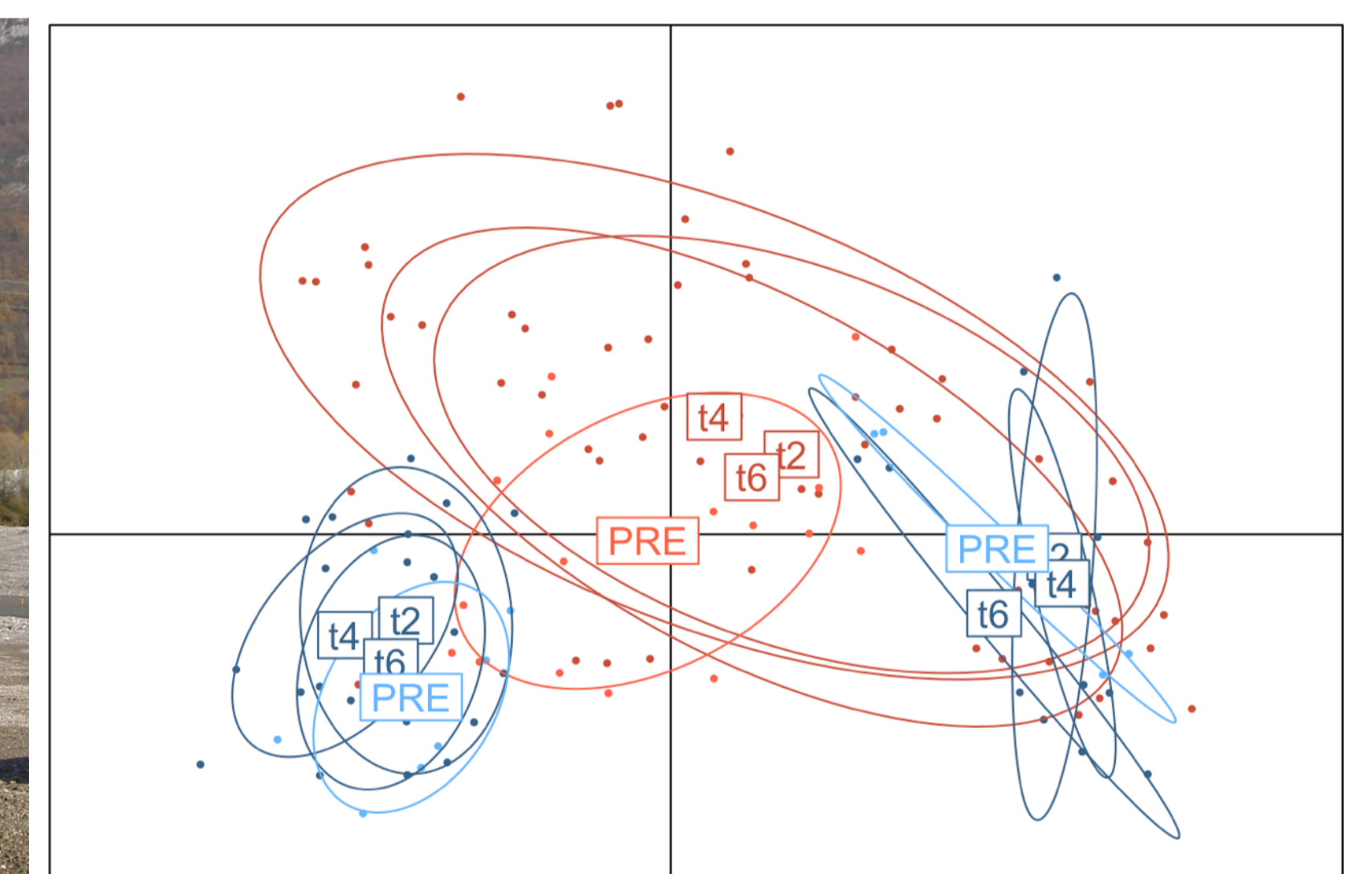
Our approach and tools

Our work on invertebrates incorporates a dual perspective:

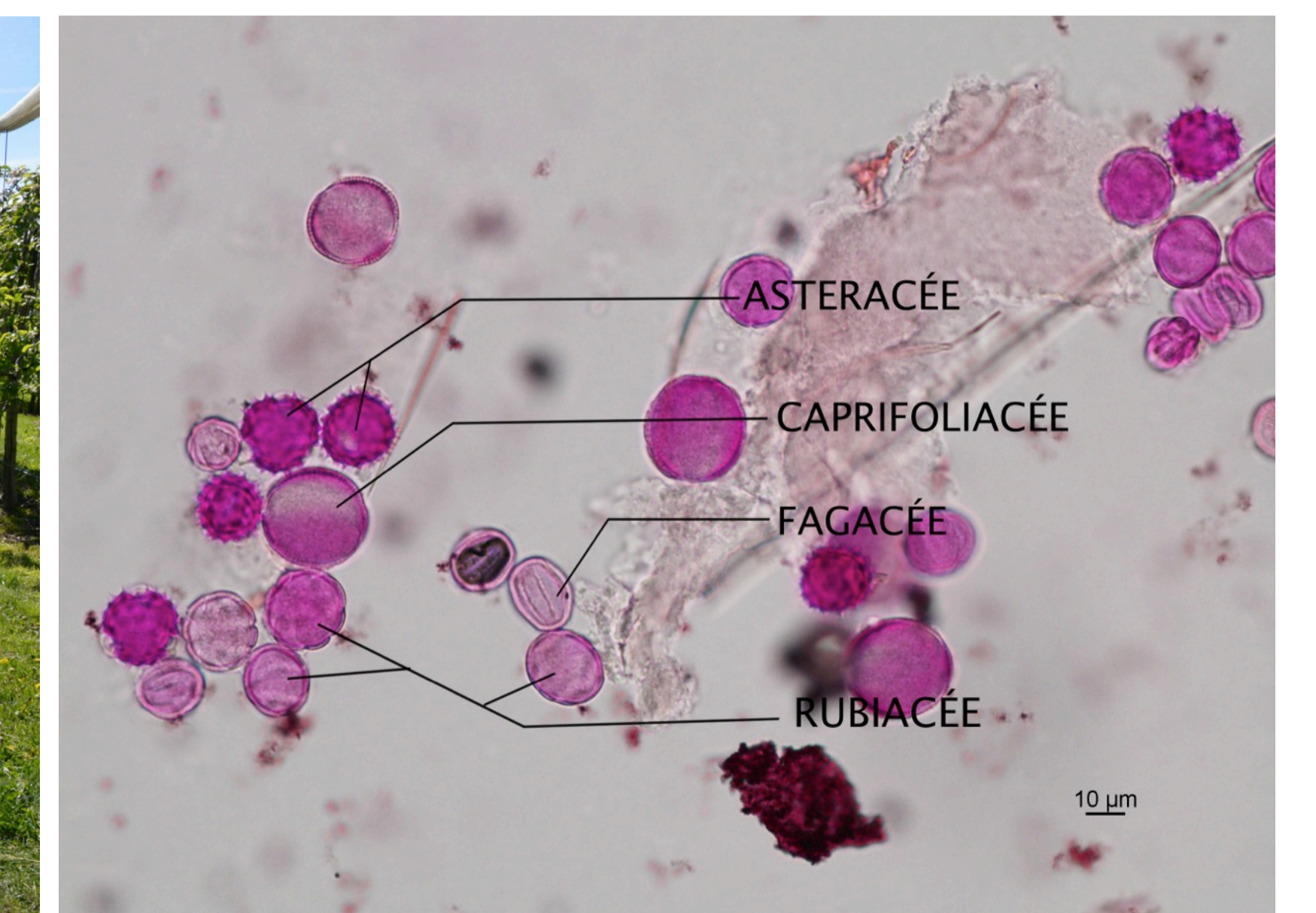
- **The roles of invertebrates in ecosystem functions and services**. Invertebrates are able to process a fraction of organic matter that is not accessible for other animals. They are essential prey for many birds, fish and mammal species. They play key roles in plant pollination and as auxiliaries for many crops.
- **The use of invertebrates as tools in ecosystem monitoring, assessment and conservation**. Given their diversity and association with all types of freshwater and terrestrial habitats, invertebrates can be used to assess habitat "quality" and to monitor habitat change.



Various sampling devices in the Rhône floodplain: Top left: installing a light trap to catch adult caddisflies; top right: trace of a benthic sample in a *Lemna*-covered water body; bottom left: sampling trace metals with DGT installed *in-situ*.



The restoration of the Rhône floodplain resulted in an increase in the diversity of invertebrate assemblages at the landscape scale, as shown by the increase in size of the red ellipses grouping restored sites before (PRE) and after restoration (two to six years after restoration). Blue ellipses are control sites.



Adult Hoverflies are caught by passive sampling devices, such as emergence traps installed here in an apple orchard (left). They feed upon pollens and nectar produced by flowers. They are active pollinators that do not use the same resources as bees. The analysis of pollen grains contained in their gut (right, picture A.G. de Carvalho) reveals their use of plant resources in the agricultural landscape.

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