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Phytoplankton communities in French large rivers: a comparative study of the ability of different metrics to highlight anthropogenic pressures

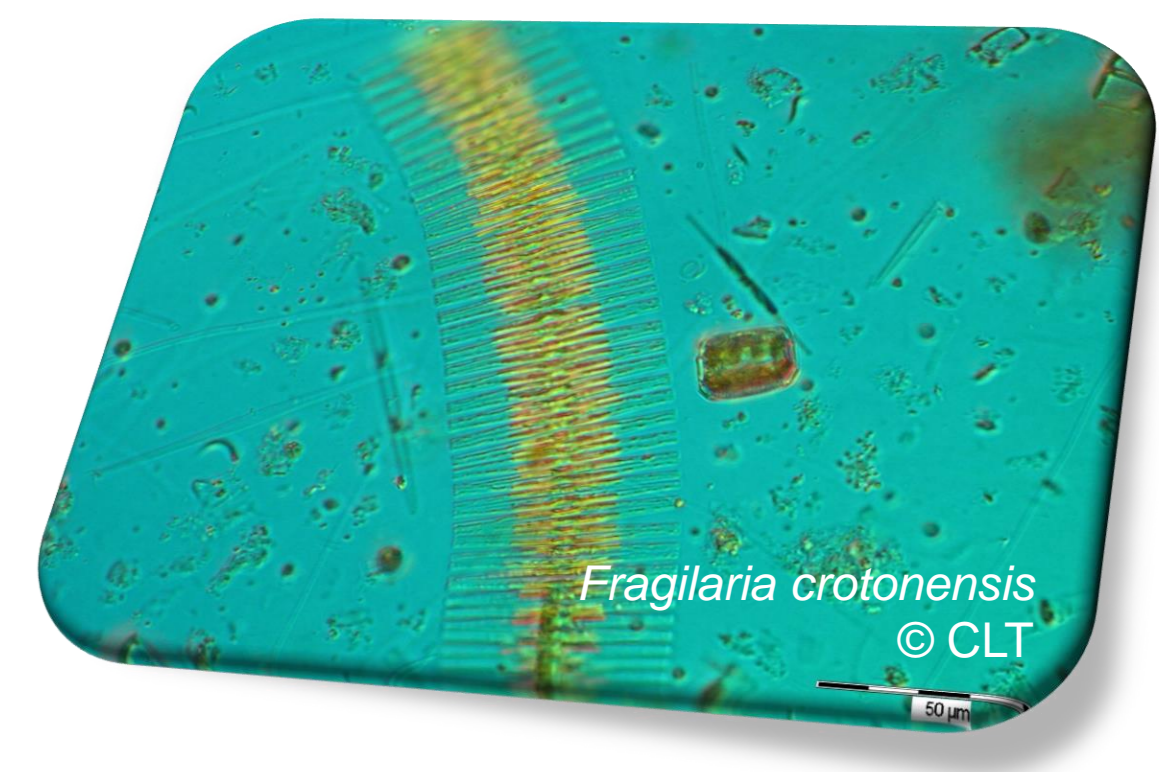
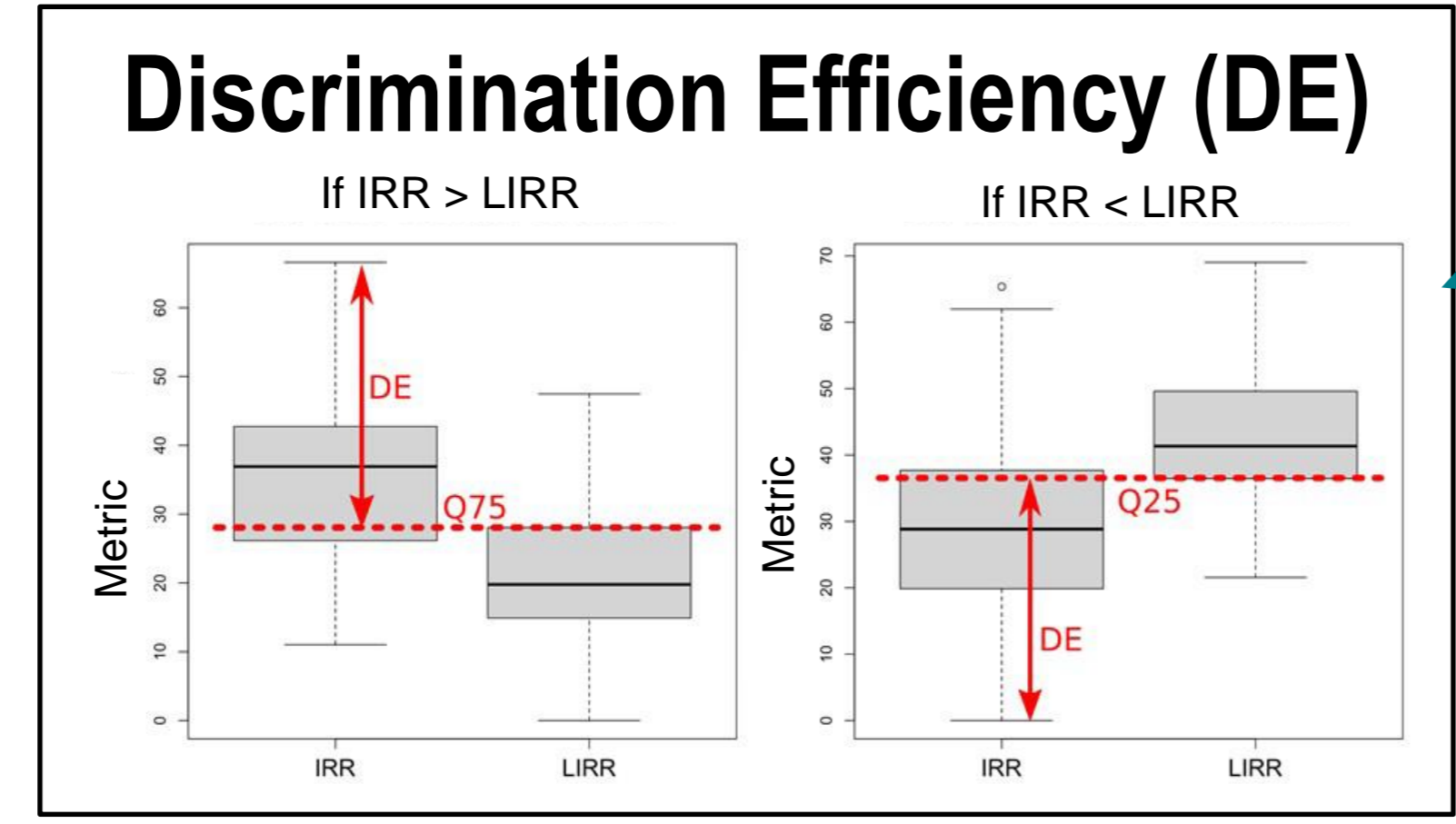
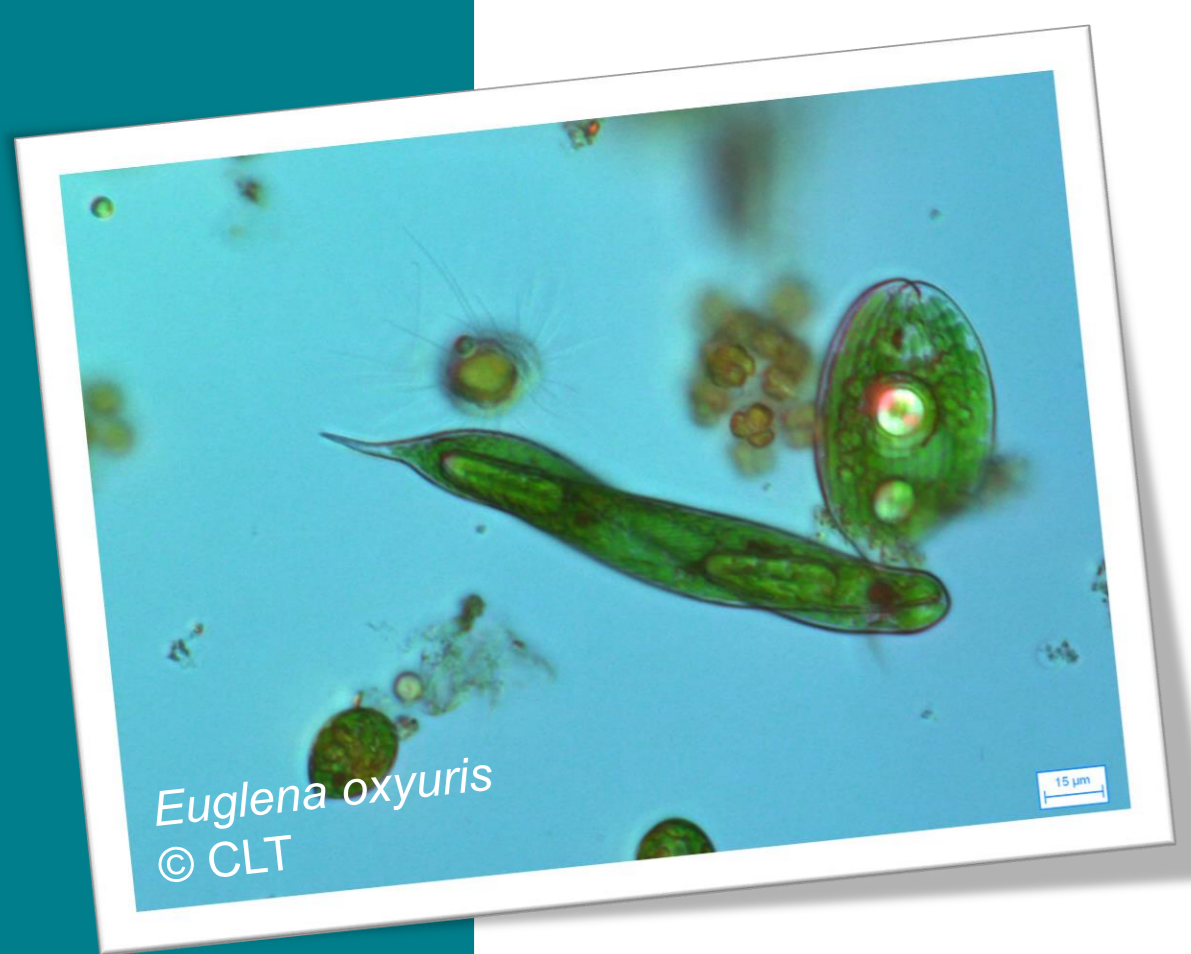
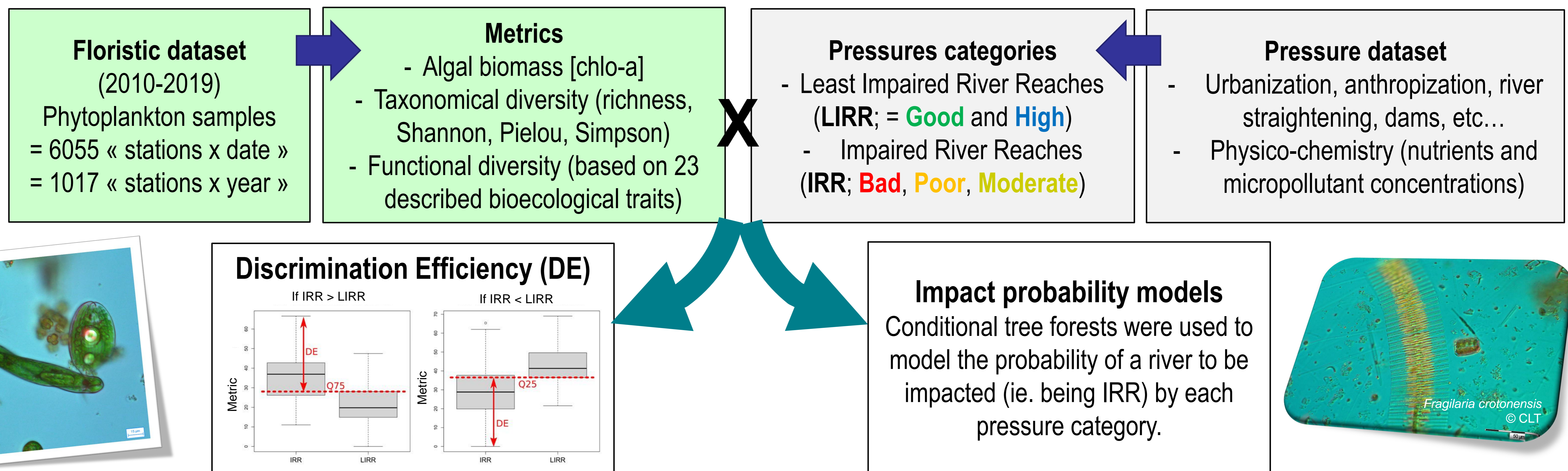
Les communautés phytoplanctoniques dans les grands cours d'eau de France métropolitaine : quelle est la capacité de différentes métriques à identifier diverses pressions anthropiques ?

Context

Phytoplankton communities are a pertinent biological compartment for the evaluation of the ecological status of water bodies where they can thrive, such as large rivers. Phytoplankton are usually considered as a potent bioindicator of nutrient concentrations in the water column.

In French large rivers, phytoplankton communities are monitored yearly since 2010. This routine monitoring allowed for the creation of a large dataset, including more than **6000** phytoplankton sampling events. In the context of the **Water Framework Directive**, a new phytoplankton-based index is currently being developed using this new dataset. As part of this development, we tried to highlight if phytoplankton communities can be used to **highlight diverse anthropogenic pressure categories: trophic, toxic** and linked to **stream physical degradation**.

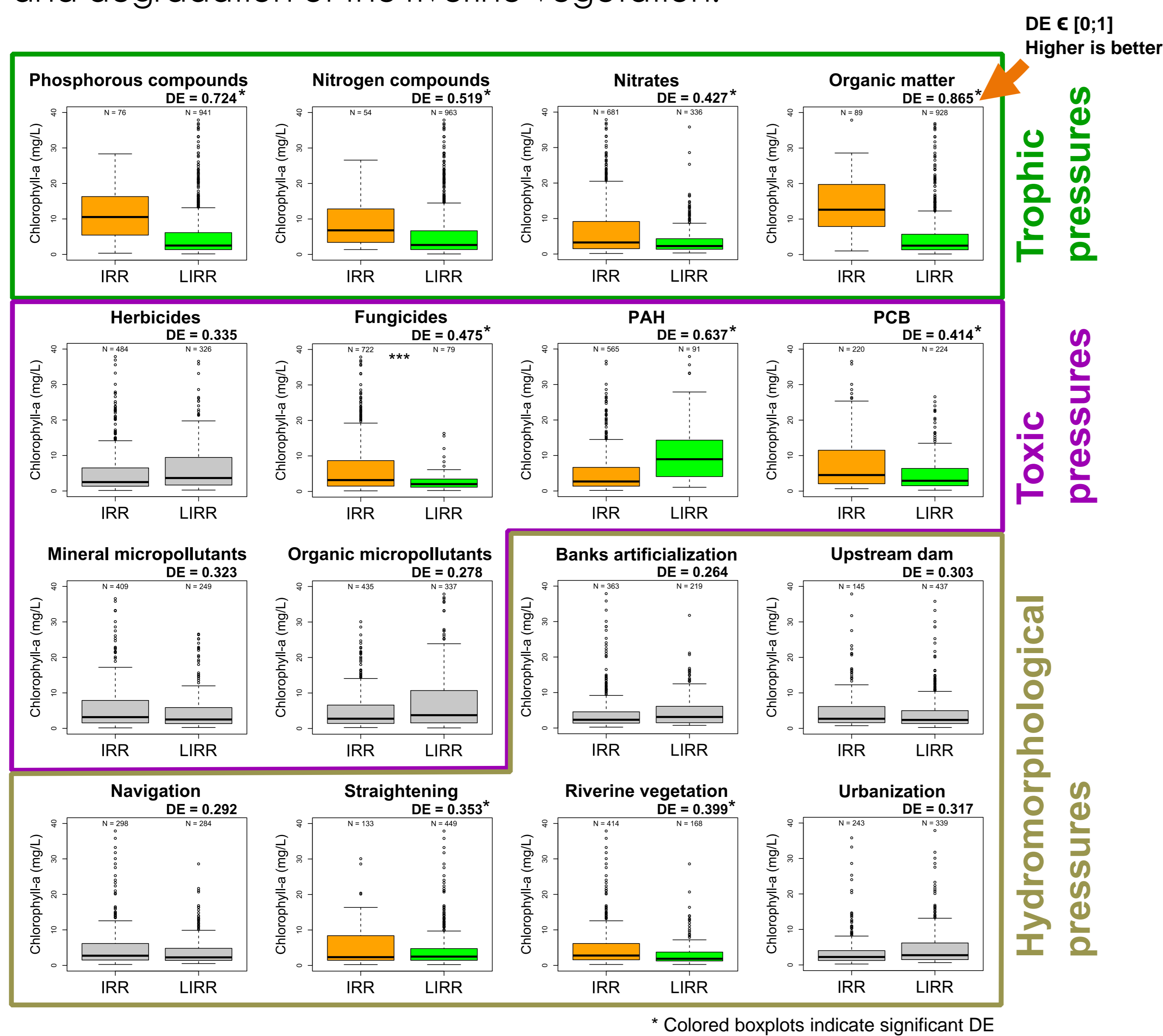
Data & Results



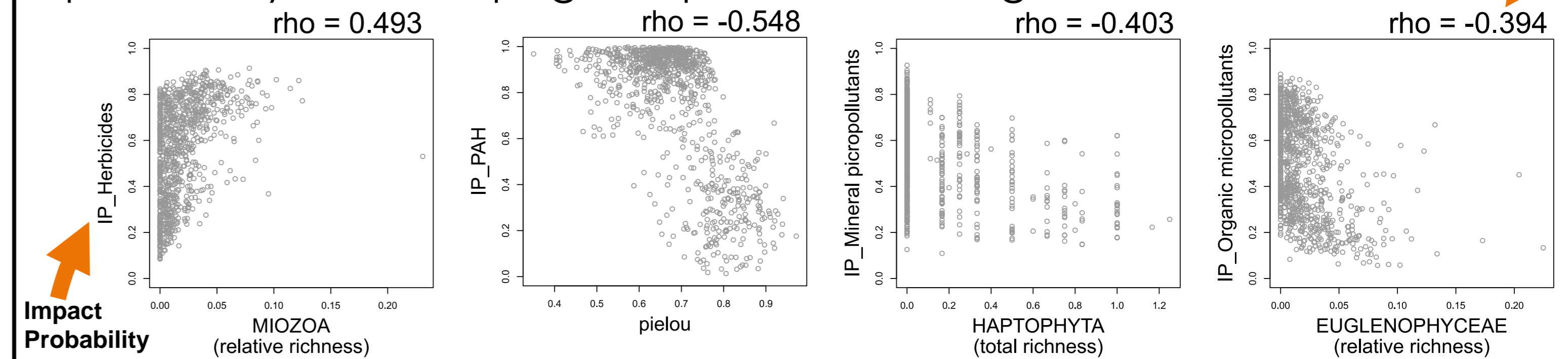
As expected, **algal biomass** does exhibit **significant responses** to **trophic pressures** (such as nitrogen and phosphorus compounds).

Nevertheless, algal biomass can also be used to **efficiently discriminate** between impaired and less impaired situations for **toxic pressures**, such as Fungicides and PAH.

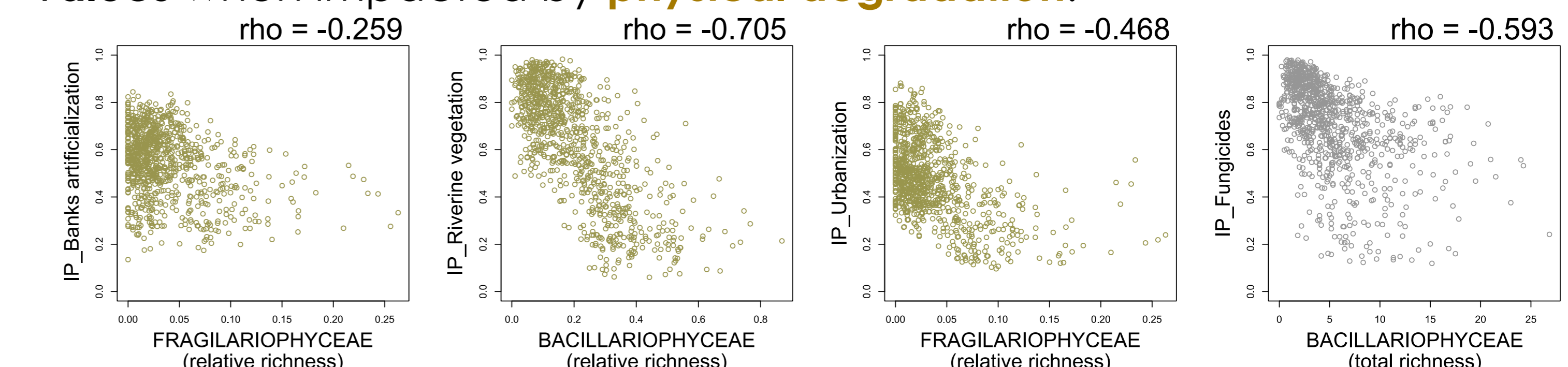
Last, algal biomass also exhibit **responses of interest** to several pressures linked to **stream physical degradation**, such as channel straightening and degradation of the riverine vegetation.



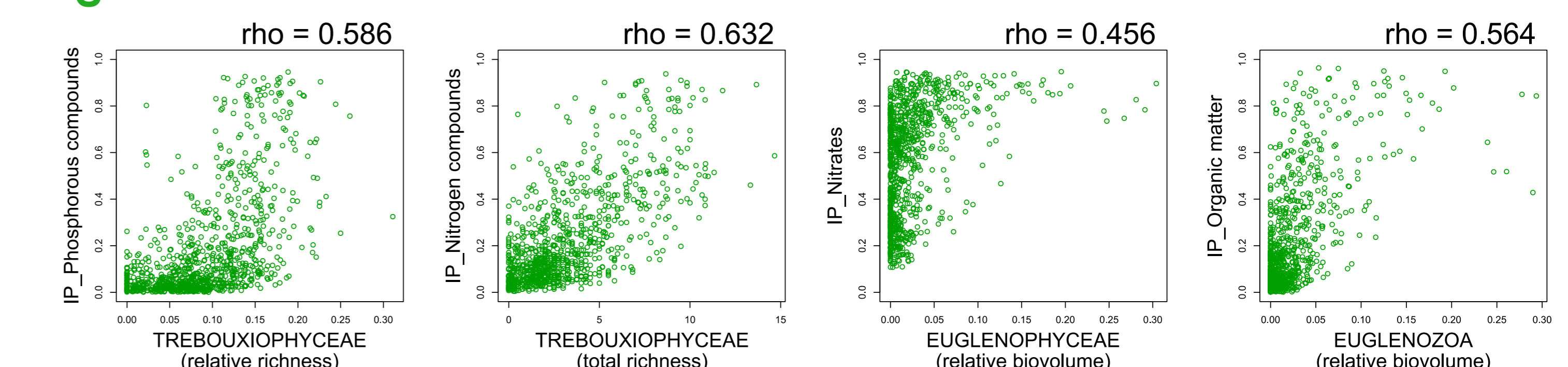
Several metrics exhibit a good potential for modeling the impact probability of anthropogenic pressures on large rivers.



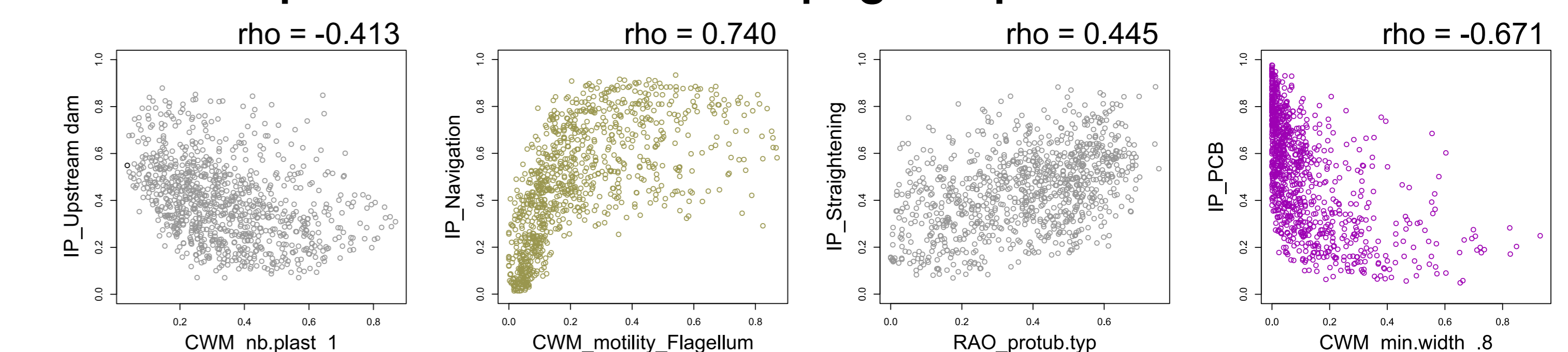
Overall, metrics based on **polluo-sensitive** taxonomic groups, such as diatoms (**Bacillariophyceae** and **Fragilariophyceae**), exhibit **lower values** when impacted by **physical degradation**.



Metrics based on **polluo-tolerant** taxa such as **Euglenophyceae** exhibit **higher values** when exposed to higher concentrations of **nutrients** and **organic matter**.



A couple of **traits**, such as **motility** and **min. width**, exhibit **ecologically relevant responses** to several anthropogenic pressures.



Conclusion & perspectives

Our results show that phytoplankton communities and their bioecological traits exhibit **robust** and **ecologically pertinent responses** to **numerous anthropogenic pressures** impacting French **large rivers**. Such responses could be used to **build potent bioindication tools**.

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