# Assessing anthropogenic pressures on stream communities: new modelling approaches based on traits of macroinvertebrates, diatoms and fishes

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**Abstract**

Identifying the anthropogenic pressures impairing ecosystems is a challenging task, especially in streams that integrate multiple pressures (related to water quality, land use and hydromorphology) from their catchment. The impacts of those pressures can be assessed investigating the communities inhabiting the systems. However, traditional biomonitoring methods such as biological indices mainly aim at assessing the impairment magnitude of pressures, and not at estimating the respective importance of the involved pressure categories.

In streams, assemblages of macroinvertebrates, benthic diatoms and fishes are characterized by different combinations of attributes related to life history, dispersal, resistence and resilience strategies. They integrate variations in environmental conditions over various time-scales (from weeks to years) and space scales (from microhabitat to watershed). Such differences may result in contrasted – and potentially complementary - responses to different categories of pressures. Moreover, habitats act as a templet on which characteristic combinations of species attributes are selected. In this context, examining combinations of trait-based metrics can help to assess the ecological impact of specific anthropogenic pressure categories on ecosystems.

Using the random forest algorithms, we have built models exclusively (invertebrates) or predominantly (diatoms and fishes) based on trait descriptors of communities. Most of these models have demonstrated a good efficiency for identifying specific pressures related to water quality degradation (e.g. nutrient, pesticide or metal contamination) and/or hydromorphological alteration (e.g. degradation of riverine vegetation, hydrological instability, clogging risk) even under multi-stress scenario. These complementary tools represent a further step in stream ecological diagnostic and can support stakeholders in decision-making processes.

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