



## Biodiversity and ecological status assessment

In the Water Framework Directive (WFD), ecological status is defined as an expression of the quality of the structure and functioning of aquatic systems. The issue of biodiversity is integrated within this directive through its requirements for assessment of ecological status and is mentioned specifically for some quality elements like macroinvertebrates. In addition, the WFD supports the registration of protected areas needed to ensure the conservation status of habitats and species of EU importance under the Natura 2000 network of sites.

Ecological status in the WFD is assessed through the analysis of various characteristics of the aquatic flora and fauna (quality elements). After selecting the metric or metrics to be used to assess the condition of the quality elements one of five quality classes is assigned. However the assignment of these classes is to be harmonized across Europe to match the class definitions laid out in the WFD, this is ensured through an intercalibration process led by the JRC.

In support of this process the JRC Institute for Environment and Sustainability, through the action European Ecological Water Quality Assessment and Intercalibration, carries out research to understand aquatic systems functioning and ultimately to develop indicators for assessing ecological status and biodiversity.

Examples of recent and ongoing research projects in this area are:

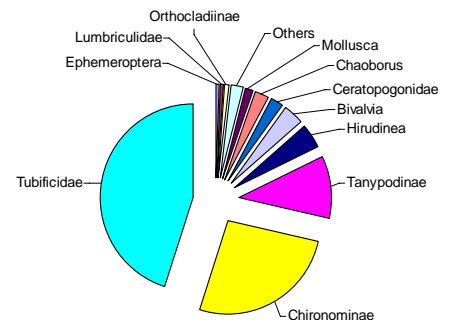
**Development of a benthic macroinvertebrates multimetric assessment tool for sub-Alpine lakes (Austria , Germany and Italy) for eutrophication pressure.** Data on benthic macroinvertebrates and supporting environmental parameters was successfully collected from 45 sub-alpine lakes. Based on this data fourteen biological indices were calculated to investigate their potential use in assessing the lakes, including several diversity indexes. The approach used in this research has a wide applicability and can be followed by member states in developmental work for the WFD.



Sub-Alpine Lake in Trentino, North Italy



Some common lake macroinvertebrates



Relative abundance of macroinvertebrate taxa found in 45 sub-Alpine lakes.

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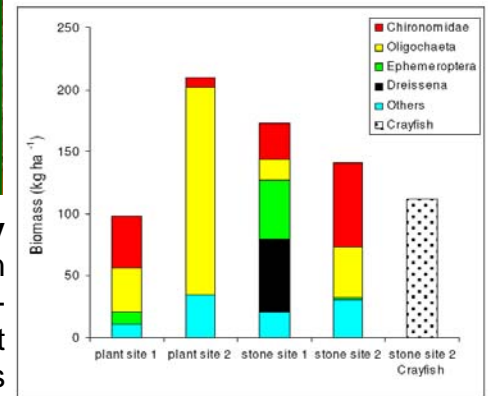
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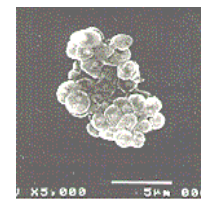


The alteration of lake ecosystems by alien species. A case study on a potential keystone species: *Orconectes limosus*. Invasive alien species are considered to be amongst the biggest threats to biodiversity. A study of the crayfish populations in lake Varese was carried out to determine 1) whether modification of the hydromorphological features of the shoreline habitats may promote higher densities of non-indigenous crayfish; 2) to examine the biomass of crayfish relative to other macroinvertebrates to infer their relative importance in the lake ecosystem, and 3) to propose a simple sampling method to allow among lake comparisons useful in the interpretation of crayfish as a biological pressure.

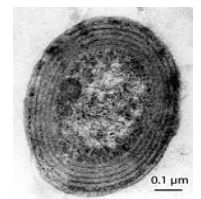


Crayfish biomasses were comparable to that of other macroinvertebrates indicating their importance in the structure and functioning of the lake ecosystem.

Molecular tools to detect impacts of anthropogenic perturbations on biodiversity of aquatic organisms. Aiming to develop new, rapid, and sensitive molecular tools (e.g. Real Time Quantitative PCR) to detect changes in the biodiversity of pelagic microbial communities due to natural (seasonal, spatial) variability, and anthropogenic pressures such as nutrients loading and eutrophication, impacts of selected toxic substances, and climatic change. These tools are to be compared and validated with conventional microscopic techniques to assess biodiversity changes of planktonic microbial communities factors.



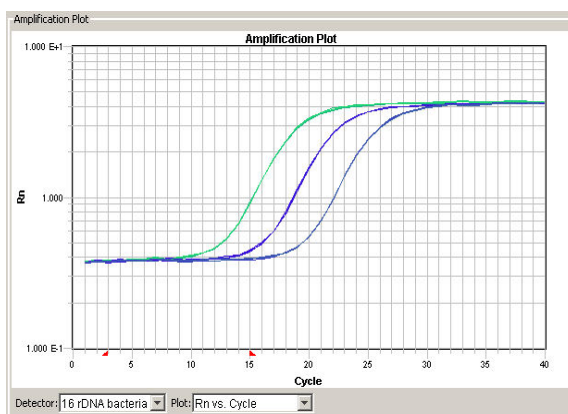
Geobacter



Prochlorococcus



Synechococcus



Real Time Quantitative PCR