

## What do we know about the effects of multiple stressors and community responses on aquatic ecosystems?

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Currently most freshwater systems in Europe are threatened by a variety of stressors of diverse nature (organic and inorganic pollution, geomorphological alterations, changes in land uses, climate change, salinization, water abstraction, invasive species and pathogens). The impacts stressors may produce on organisms and ecosystems depend on their intensity, timing and duration. Some stressors operate at small scales, such as excess nutrients, use of salts as deicing agents for roads, irrigation, or chemicals. Others, including droughts, mining, rising saline water tables as a result of vegetation change (dryland salinity), floods or damming, have effects at larger scales. The temporal scales at which stressors affect are also different. Short stresses such as toxic pulses can produce effects on organism physiology or in community composition, but most of these will likely be transient. Large-scale stressors likely produce more persistent effects on organisms, whose responses will progressively transmit from individuals to populations, communities and ecosystems. Usually stressors can operate at multiple scales; e.g. salinization can either result in pulses of rises in salinity, e.g. de-icing, erosion of stockpiles of salt associated with mining, or gradual rises in salinity, e.g. dryland salinity. However, most ecosystems are exposed simultaneously to several stressors, in the so-called multiple-stress situations. In some cases stressors may act independently to each other, in some others they interact, thus leading to synergistic/antagonistic effects (e.g. the interaction between salts and metal toxicity). A variety of single-species studies illustrated that the combined impact of stressors often induce effect qualities and/or intensities which are not predicted from the effects of the single stressors. However, currently a coherent conceptual framework for the diagnostic or predictive assessment of the cumulative impact of multiple stressors on the chemical and ecological status of water bodies, on ecosystem functioning and community responses is missing.

Water scarcity is one of the main stressors acting on aquatic ecosystems and it will be exacerbated in the future due to climate change and increased water demand. Water scarcity threatens ecosystem health and also impacts directly citizens and economic sectors relying on water, such as agriculture, tourism, industry, energy and transport. Water scarcity can also drive the effects of other stressors acting upon river ecosystems, e.g. it can amplify the effects of salinization and pollution by reducing the natural diluting capacity of rivers. Water scarcity leads to intermittency in water flow, and therefore has implications for hydrologic connectivity, negative side-effects on biodiversity, water quality, and river ecosystem functioning. The relevance of water scarcity and salinization as stressors are most important in semi-arid regions such as Mediterranean, Australia, southern Africa and parts of North America, South America and southern and central Asia characterized by highly variable river flows and the periodic occurrence of low flows and even no-flows, as well as high TDS. The recently EU funded project GLOBAQUA together with the SCARCE Iberian funded project and the recently formed SETAC Advisory Group on freshwater salinization (salinization AG) are addressing the issues indicated above. The GLOBAQUA consortium is formed by 21 scientific groups from European Union, Morocco and Canada; while the salinization AG includes experts around the world and welcomes everyone to join. Presentations will describe studies utilizing chemical, biological, modelling and hydrological approaches on aquatic ecosystems under water scarcity to address the following questions: What do we know about the interaction of multiple stressors on aquatic communities and aquatic ecosystems functioning? What do we know about the anthropogenic and climate change increases of salinization of fresh waters and their impacts on aquatic ecosystems? Which is the importance of salinization of freshwaters during droughts? What can we do to bridge pollution and effects on aquatic communities in river ecosystems under water scarcity? How can we secure aquatic ecosystem services under water scarcity?

**SESSION TYPE:** Platform and Poster