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Editorial

Safeguarding life in our waters

Policy measures to protect biodiversity must be scientifically sound in order to deal with the complexity of nature and the human pressures on nature. This thematic issue reports on research which can help policy makers understand biodiversity in water and different ways in which human activity can be managed to ensure both wildlife and humans benefit from healthy aquatic and marine ecosystems.

In Europe, the Black Sea represents a significant case of how an intricate array of human pressures has cumulatively damaged a complex ecosystem with a huge catchment area. Intense fishing pressure has eradicated a number of important species, including tuna and swordfish. Introduced jellyfish species have outcompeted and preyed upon small fish. Agricultural pollution has led to intense algal blooms, depleting oxygen levels in the water and resulting in the collapse of seabed habitats. Economic collapse of the surrounding socialist republics in the early 1990s actually provided an opportunity for the Black Sea ecosystem to begin to recover, as agricultural activity slowed. Now the challenge is to balance growing economic needs with ecosystem recovery.

Rebuilding an ecosystem, such as the Black Sea's, is a huge challenge and understanding the role that social and political factors play in ecosystem health could help underpin recovery. In a recent study, researchers suggest that social and environmental needs must be prioritised alongside or above immediate, local, economic needs if the Black Sea is to recover, as detailed in the article '**The socioeconomics behind ecosystem collapse: the case of the Black Sea**'. This cross-disciplinary, integrated approach to understanding and managing biodiversity is essential.

Fisheries constitute, at present, the most important single pressure exerted on marine biodiversity. New ways of protecting marine ecosystems, while ensuring food security and the survival of jobs in fisheries, are needed and the EU's Common Fisheries Policy is currently undergoing drastic reform in order to achieve this delicate balance. Marine Protected Areas (MPAs) are widely touted as a tool for marine ecosystem protection and in 2002, the World Summit of Sustainable Development called for a worldwide commitment to establish networks of well managed MPAs by 2012. However, their role is still under discussion. Can MPAs sufficiently protect biodiversity and promote sustainable fishing?

US researchers suggest that MPAs can provide greater benefits for biodiversity and fisheries if they are organised into a network. Citing evidence from MPA networks in the USA and Australia, they provide clear recommendations for networking MPAs. For example, they suggest that around one-third of a region should be placed in an MPA network to receive simultaneous multiple benefits. More details are in '**Marine reserve networks could benefit fishing and conservation**'.

What happens outside MPA borders can enhance or reduce the effectiveness of the MPAs themselves - there are no obstacles for fish and other life in the seas as they move between different parts of the interconnected marine system. Research conducted in the North-East Atlantic suggests that proposals for future deep water MPAs may not be effective in protecting deep sea biodiversity unless commercial fishing is also controlled in the surrounding area. The study, described in '**Impacts of commercial fishing may reach deep sea waters**' documented a decline in deep sea species in recent decades, probably caused by fishing in shallower waters.

Eutrophication is a widespread problem for both marine and aquatic ecosystems, caused by excess levels of nutrients. With increasingly intensified agriculture, high levels of phosphorus and nitrogen from fertilisers and manure are reaching water bodies, and shallow, small lakes are especially at risk. Danish policies for tackling this problem are analysed in the article '**Eutrophication: small-scale, targeted approach the way forward**', which suggests that measures should be tailored to individual sites in order to ensure further improvements to water quality. Undertaking a site-oriented approach involves exploring the specific history of a water body, such as a lake, either by looking at sediment records or long-term changes in water quality.

The economic value of biodiversity is an increasing consideration for policy makers, and understanding the public's willingness to pay (WTP) for biodiversity may reflect its social value. In a recent UK survey, 27 per cent of those questioned were willing to pay towards improved river biodiversity, via higher energy prices from the resulting drop in hydro-electricity power output. 43 per cent were not willing to pay at all. Among those willing to pay, beliefs and motives should be distinguished and considered in management decisions, such as ethical and social norms. For more details, see: '**Bringing social values into the economic value of water biodiversity**'.

The final article in this thematic issue, '**Assessing the status of riparian zones through satellite images**', describes a new indicator based on vegetation cover to assess the status of river and lake banks. Under the Water Framework Directive all EU surface waters must reach a good status by 2015 and this status includes the condition of banks with ecotones (transition areas) important to biodiversity as they provide breeding grounds and act as corridors for species. They are also areas where considerable leaching of pollution or erosion might occur. Using this indicator, the researchers demonstrated that agri-environmental measures, such as leaving undergrowth in olive groves, can improve the status of banks.

To further improve the policies that protect water and biodiversity, such as the EU's Marine Strategy Framework Directive, the Water Framework Directive and the Biodiversity Strategy, we must continue to ensure that they draw upon research that accounts for the complexity of nature. The research should consider an ecosystem as a whole and account for different levels of the food chain, as well as non-biological drivers and human processes. It must also understand how aquatic or terrestrial ecosystems

are connected to their surroundings. We also need research, which considers long-term (historical) data or makes broad comparisons between different types of ecosystems.

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