



SECTORAL REVIEWS: COASTAL MARINE ECOSYSTEMS

"Global warming may dominate headlines today. Ecosystem degradation will do so tomorrow."

Corporate Ecosystem Services Review, World Resources Institute, 2008

"...biodiversity underpins the functioning of the ecosystems on which we depend for food and fresh water, health and recreation, and protection from natural disasters. Its loss also affects us culturally and spiritually."

Ban Ki-moon, Secretary General of the United Nations

The SIMBIOSYS Project

Biodiversity and associated ecosystem services are fundamental to humanity but are increasingly threatened by human activity in a range of sectors. The SIMBIOSYS project addressed impacts of human activity in three key sectors: bioenergy crop cultivation, road landscaping and aquaculture. Impacts of these sectors on genetic, species and landscape biodiversity were assessed. The effect of sectoral activities on the delivery of ecosystem services, including carbon sequestration, pollination, pest control via natural enemy predation and resistance to alien species invasion were also investigated. This was done by combining large-scale field-based surveys with focused smaller-scale experiments. By understanding the relationships between biodiversity and the delivery of ecosystem services, policy and management strategies within each sector can be optimized.

www.tcd.ie/research/simbiosys

Project Details

Start Date: 01/04/2008
Duration: 54 months
Funding: € 1.6 million
Coordinator: TCD
Partners: UCD, UCC, NUIG

Sectoral Reviews

In addition, part of the SIMBIOSYS project involved carrying out in-depth policy-orientated reviews of bioenergy crop production, road landscaping, aquaculture and wind farms on biodiversity and ecosystem services, and reviewed sectoral impacts on coastal marine ecosystems. A summary of the coastal marine review is overleaf, and the full review is available at:

www.tcd.ie/research/simbiosys/outputs/strategicreviews/index.php



SECTORAL IMPACTS ON BIODIVERSITY AND ECOSYSTEM SERVICES

Coastal marine ecosystems

Ireland's coastal waters are very important to its society and its economy. A wide range of activities impinge on them, with potential to affect biodiversity and the provision of ecosystem services. This assessment of potential impacts on coastal marine ecosystems of pressures associated with sectoral activities involved a systematic review of the literature and consultation with appropriate experts. The first step was to map pressures to sectors of human activity. We then categorised the resistance of each focal habitat to potential impacts of each pressure on extent and quality and assessed the likely time to recovery (resilience).

Key Messages

- Habitat loss or change/direct physical disturbance have the most direct and irreparable impacts on habitats, particularly sedimentary ones. Such pressures are exerted by fisheries and aquaculture, the construction industry, shipping, leisure, tourism and energy sectors.
- Sedimentary habitats have limited resistance to changes in water flow and/or tidal emergence regimes, which are also caused by physical installations.
- Exposed rocky reefs are comparatively resistant to physical pressures, but less so to chemical contaminants or biological pressures such as harvesting and non-indigenous species. Sheltered reefs are also vulnerable to physical pressures such as siltation. If pressures are removed and there is an appropriate source of larvae, most rocky substrata can be recolonised within 10 to 15 years.
- Inorganic nutrients and organic matter (derived from agricultural and industrial discharges, sewage and aquaculture) lead to eutrophication and deoxygenation, and cause changes to many habitats, particularly muddy sands, seagrass and sheltered rocky reefs.
- Shipping, leisure boating and aquaculture are the main sources of non-indigenous species, some of which become invasive and cause substantial changes to marine ecosystems with little scope for recovery.
- The most extensive industries with potential to influence coastal marine biodiversity are agriculture, fisheries and aquaculture. These activities occur in many SACs and SPAs. Finding an acceptable balance between their economic and social benefits and the achievement of conservation objectives presents a significant challenge.

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Key areas for future research

1. Effects of introduction and spread of invasive non-indigenous species and resistance of ecosystems to them.
2. The influence of sectoral activities on maërl and seagrass.
3. Assessment of the compatibility of aquaculture with conservation objectives of SACs and SPAs to inform management plans.
4. Understanding links between changes in biodiversity, ecosystem functioning and services to assess how activities influence the flow of economic and societal services from ecosystems.
5. Effect of combinations of multiple sectoral pressures on ecosystems and how they are modified by global changes to climate and pH and carbonate chemistry of the oceans.
6. Resilience – the capacity of ecosystems to recover after impact.
7. Tipping points into alternative states from which recovery may be unlikely.
8. Long-term sampling, which could be built around compliance monitoring required under the EU Directives.