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Cumulative impact assessment as a key conservation planning tool: An application on Posidonia oceanica meadows in Greek waters of the Aegean Sea

Vassiliki Vassilopoulou

Hellenic Centre for Marine Research, Greece, E-mail: celia@hcmr.gr

Abstract

Cumulative consequences assessment is a computational tool for calculating and visualizing the consequences of a combination of pressures effect by human activities on ecosystem components. It is a fundamental process in Conservation Planning and Marine Spatial organizing efforts based on an Ecosystem-Based Approach. For assessing the sum of impacts on ecosystem components, a well-developed approach that takes into consideration the presence/absence grid data of human activities and ecosystem components has been used. This approach requires a thorough knowledge of human activities (intensity, location) and ecosystem components (i.e. vulnerability, resilience) to assess their collective impacts. In this study, a key ecosystem component for the Mediterranean, the Posidonia oceanica meadows, has been selected aiming to identify areas where the status of this priority habitat is threatened and hence deserve the attention of the management authorities. As a first step, geospatial data of human activities and existing management measures were collected and processed.

Effective ecosystem-based management requisite understanding ecosystem retaliation to multiple human threats, rather than focusing on single threats. To recognize ecosystem reaction to anthropogenic threats holistically, it is compulsory to know how threats affect various components within ecosystems and ultimately alter ecosystem functioning. We used a case study of a Mediterranean seagrass (Posidonia oceanica) food web and specialist knowledge elicitation in an application of the beginning steps of a framework for assessment of aggregate human impacts on food webs. We produced a conceptual seagrass food web model, set on the primary trophic relationships, identified the main threats to the food web components, and assessed the elements' vulnerability to those threats.

An impact score representing the per-pixel (1 km*1 km cell) average of Posidonia oceanica meadows vulnerability-weighted stressor intensities was calculated and mapped. According to the impact score, the total pressure on this ecosystem component was very low (79.8%) in the vast majority of the area where Posidonia oceanica extends (Figure 1). However, certain locations where the exerted pressures on sea grasses seemed to be rather high were identified in the sea regions of Chalkidiki, Attica, Southern Aegean Sea and Crete. These pressures appeared to be mainly connected to drivers such as small scale fishing, urbanization, ports and agricultural run-off. The latter suggest that aside from truly marine activities (e.g. small scale fishing), the importance of land sea interactions is also crucial for determining the status of coastal ecosystems.

Biography

Vassiliki Vassilopoulou (PhD) is a Research Director at Hellenic Centre for Marine Research, Greece. She is involved in research works in the field of ecosystem formed fisheries management. Since 2009, she has been occupied in Maritime Spatial Planning research issues through her implication in several EU projects. In the last years, she is also working on issues related to the development of a more structured interface between policy needs and scientific advice through interaction with key stakeholders. She has proceed as chairperson or moderator, and/or was an invited speaker, in sessions dedicated to topics of her proficiency in international conferences and workshops, and has been giving pertinent postgraduate presentation in the Universities of Athens and Thessaloniki. She is member of International Scientific Committees and has recently joined the Commission on Ecosystem Management (CEM) of the IUCN. She has more than 150 publications and presentations in international scientific journals and conferences.

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