Towards ecosystem-based management: Identifying operational food-web indicators for marine ecosystems

Modern approaches to Ecosystem-Based Management and sustainable use of marine resources must account for the myriad of pressures (interspecies, human and environmental) affecting marine ecosystems. The network of feeding interactions between co-existing species and populations (food webs) are an important aspect of all marine ecosystems and biodiversity. Here we describe and discuss a process to evaluate the selection of operational food-web indicators for use in evaluating marine ecosystem status. This process brought together experts in food-web ecology, marine ecology, and resource management, to identify available indicators that can be used to inform marine management. Standard evaluation criteria (availability and quality of data, conceptual basis, communicability, relevancy to management) were implemented to identify practical food-web indicators ready for operational use and indicators that hold promise for future use in policy and management. The major attributes of the final suite of operational food-web indicators were structure and functioning. Indicators that represent resilience of the marine ecosystem were less developed. Over 60 potential food-web indicators were evaluated and the final selection of operational food-web indicators includes: the primary production required to sustain a fishery, the productivity of seabirds (or charismatic megafauna), zooplankton indicators, primary productivity, integrated trophic indicators, and the biomass of trophic guilds. More efforts should be made to develop thresholds-based reference points for achieving Good Environmental Status. There is also a need for international collaborations to develop indicators that will facilitate management in marine ecosystems used by multiple countries.