

New approach to managing marine ecosystems

April 28 2014, by Cathy Winterton

Ways to manage natural resources have been under development for decades, driven by an increasing need to understand the effect of man-made impacts on ecosystems. Often, it has been assumed that management could be based on the population dynamics of an individual species but new research shows how in the marine environment whole ecosystems need to be assessed individually rather than benchmarked against all other ecosystems.

Even where two systems share physical characteristics, but are in different ocean basins, the research found that the individual systems required respective management approaches. Only when ecosystems are similar in type and share a location, for example, may a single approach suit both ecosystems.

The new study published today in *PLOS ONE* found that ecosystem traits—such as type (for example lagoon, estuary or bay), size, depth and location—need to be taken in to account when assessing an ecosystem's environmental status or health. The study also found that the structure and function of ecosystems differ from one to the next, posing more challenges to managing marine resources.

"This paper (Global patterns in ecological indicators of marine food webs: a modelling approach) is among the first to analyse a large variety of models from different systems in an organised and systematic way," said lead author Dr Sheila Heymans, who is also head of the ecology department at the Scottish Association for Marine Science (SAMS).

"It presents the largest meta-analysis of the structural and functional indicators of marine food webs to date and adds to the general theory of [marine food web](#) dynamics and its use for ecosystem conservation and management.

Food webs show the interaction between species at different feeding levels and consequently show the flow of energy and matter in ecosystems. These predator-prey interactions are a main regulator of [ecosystem dynamics](#), and they contribute to the way ecosystems respond to natural and human impact such as fishing, habitat degradation or environmental forces.

Food web models are simplified representations of natural systems, which help us understand how biodiversity and ecosystems respond to changes. Creating food web models typically calls for quantitative modelling, integrating food web dynamics and external factors such as environmental change or fishing.

This paper analysed 105 published marine food web models representing [ecosystems](#) from coastal lagoons to the deep sea in all the world's oceans, and from past and recent timeframes to find out whether there were general patterns in ecological traits of marine [food webs](#). Uniquely, this paper included statistical analyses to address the variation and uncertainty thrown up by all the different model strategies and structures used in those 105 publications. The study posed new and advanced analyses on the key species concept.

More information: Heymans JJ, Coll M, Libralato S, Morissette L, Christensen V (2014) "Global Patterns in Ecological Indicators of Marine Food Webs: A Modelling Approach." *PLoS ONE* 9(4): e95845. [DOI: 10.1371/journal.pone.0095845](https://doi.org/10.1371/journal.pone.0095845)

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