Trophic dynamics analysis and ecosystem structure of the northern Oman Sea

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Abstract:
In the present study, a trophic structure model for some fish species of the northern Oman Sea has developed through using the mass balance modeling software Ecopath with Ecosim (EwE). In this model, we simulated 16 functional groups spread across an area of 3998.20 km^2, and the study was conducted from 2017 to 2018. The mean trophic level of the present study area was 3.49. The values of the system omnivory and connectance indices calculated 0.42 and 0.44, respectively. However, the values of ecotrophic efficiency in the model were high (>0.5) for most consumers of high trophic levels except for sharks and rays because of their high fishing mortality. Accordingly, mixed trophic impact, the phytoplankton, and detritus positively impacted on almost all the ecological groups. Also, the bentho pelagics, medium demersals, benthos, and crustaceans have a very negative impact on themselves due to cannibalism. Furthermore, the highest realized trophic level obtained was 4.34 for sharks. The maximum omnivory index has calculated as 0.99 for medium demersals by feeding on a wide variety of preys. Also, the average catch per net primary production, i.e., the gross efficiency of the system obtained was around 0.000198 (lower than the global average) indicating a fishery harvesting fishes high in the food chain. The primary production/respiration (PP/R) ratio was found to be 3.57 and the values of ascendancy (45.40%) and overhead (54.60%) showed the

stability of the ecosystem. Thus, the northern Oman Sea can be classified as an immature ecosystem (in the developmental stage), although it has some kind of system maturity. Accordingly, the food web of the northern Oman Sea has consisted mostly of detritivorous, planktivorous, and carnivorous. Besides, Ecopath with Ecosim (EwE) software can be an excellent option to examine the interactions among ecological groups, and the impact of fishing in the northern Oman Sea which will be unquestionably helpful to develop concrete management strategies. The proper ecosystem-based fisheries management practice can improve the efficiency of this overexploited ecosystem.

Keywords: Connectance index, Ecopath, Ecotrophic efficiency, Fishery management, Omnivory index, mixed trophic impact.