Characterization of Trophic Interactions in Pangani Estuary and Comparison of Trophic Flow Indicators among the Tropical Estuarine Ecosystems

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Abstract

The function of mangrove-fringed estuarine ecosystems are considered to be affected by mangrove degradation, high fishing pressure and fresh water abstraction for multi-uses including damming and irrigation activities in the upstream. The present study aimed at describing the food web structure and trophic interactions for the Pangani estuarine ecosystem using Ecopath modeling tool. The study compared Pangani estuarine model outputs with other 6 available tropical estuarine Ecopath models in order to provide a broader picture of the variations in structure and functioning of tropical estuaries. The model was built based on the pre-defined 27 functional groups including commercially important individual fish species or groups of species, shrimps and crabs.

Despite the high mean trophic transfer efficiency for the entire ecosystem (15%) relative to the theoretical value (10%), the overall Pangani model reliability indicators were generally within the acceptable range. Fishery catches were dominated by the pre-adult predatory fish positioned at trophic level III and the ecosystem was predominantly relying on phytoplankton and microphytobenthos food web pathways. The keystone index and mixed trophic impact analyzed showed that Mudskipper and Arius africanus were the key biological groups with high impact in the estuarine food web. Although the ecosystem structural and functional indices of the model were significantly similar to other tropical estuarine indices (PERMANOVA, pseudo-$F$=1.5; $p > 0.05$), Pangani estuary indicated less complex food web. Like other estuarine ecosystem models, the ecosystem maturity indices proved that Pangani estuarine ecosystem was still developing. These observations call upon effective management practices for maintaining the health and productive estuarine ecosystem.

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