# Modeling the coastal ecosystem complex: present situation and challenges

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To enhance numerical modeling of the coastal ecosystem complex (CEC), we reviewed the CEC and related concepts along with the current coastal ecosystem model framework in this study. We identified two model implementation paths from the initial objectives to numerical models: specific model building, and the use of existing model frameworks. As the CEC is still at the conceptual stage, both paths are possible. Four important ecological features of CEC modeling (population connectivity, habitat heterogeneity, ontogeny of organisms, and trophic interactions) were also identified. Models for population connectivity, species distributions, life histories, and food webs were categorized using these features. We found that some previously established concepts (between–habitat interactions, coastal ecosystem mosaic, and seascape nursery) overlap with the CEC concept. Several existing integrated model frameworks were reviewed, focusing on their potential to simulate CEC processes. Building specific models for the CEC at the current conceptual stage will be challenging, and modification of existing models will be needed if they are to be used for CEC modeling. Habitat function, ontogenetic development in early life stages, and recruitment variability are important factors when modifying existing models for the development of CEC models. Although model complexity should become high to reproduce observed ecoclogical processes, an intermediate level of model ccomplexity is feasible to decrease parameter uncertainty in models for fisheries management.

Keywords: Coastal Ecosystem Complex, Population connectivity, Habitat heterogeneity, Ontogeny, Trophic interaction