

Coupled hydrodynamic and habitat suitability models jointly reveal suitable area for stock enhancement and release of marine organism larvae in Liaodong Bay

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Abstract

Stock enhancement can effectively increase population sustainability and improve fishery resources, making it crucial to discern the suitable habitats for stock enhancement based on efficiency considerations. In this paper, a comprehensive model was established to simulate environmental characteristics in the Liaodong Bay. A habitat suitability model was developed by considering the optimal growth conditions of the *Portunus trituberculatus* larvae (PTL). The coupled model showed that the optimal area for stock-enhancement with PTL occurs in late June, and the initial suitable habitat area identified represents 17.12% of the whole Liaodong Bay. Based on the larval migration model of PTL, the deviation between the larvae and the suitable habitat, as well as the actual available area for stock enhancement, were further determined after larval release in the initial suitable habitat. Only 33.67% of the larvae fulfilled the criteria of remaining within the suitable habitat for 95% of the time, and these larvae represented 6.19% of the whole area of Liaodong Bay. These findings means that the truly area available for stock enhancement is likely to be a very small portion of the entire bay, and more precise release of larvae will be necessary to ensure survival rates after release. Our study actually provides a methodological framework for the identification of suitable environment of stock enhancement. This methodology can provide technical guidance for the stock enhancement of marine larvae with same applicability for other bays, which in turn contributes to the sustainable use of marine ecosystem services and fisheries resources.