



INSTITUTIONEN FÖR MARINA VETENSKAPER

Evaluation of suitable nursery areas for penaeid shrimps in shallow water systems in Southern Mozambique

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Abstract

Tropical shallow water habitats such as estuaries, mangrove forests and seagrass beds are important nursery areas for juveniles of many commercially important species including penaeid shrimp. Penaeids are one of the most important fishery resources worldwide, and in Mozambique they are the basis of a profitable commercial fishery, landing hundreds of tons per year. Ecological knowledge concerning habitat use and factors driving the distribution and abundance of shrimp in nursery areas, and regarding the successful movement of juveniles from the nurseries to adult grounds, are critical to characterize productive nurseries for penaeid shrimp and provide important information for a sustainable management of their fishery. In this thesis I used a combination of stable isotope methods, ecotoxicology techniques and extensive field studies to assess feeding behaviour and factors affecting density and distribution of four shrimp species (*Metapenaeus monoceros*, *M. stebbingi*, *Penaeus indicus* and *P. japonicus*) in three estuaries (Espírito Santo, Maputo river and Incomati river) and two coastal marine areas (Bembe and Inhaca Island) in Maputo Bay, the second greatest shrimp fishing ground in Mozambique, to assess their values as nursery areas for the fishery.

Stable isotope analyses showed that the assessed shrimp species were mainly using seagrass beds and shallow sand and mud flats as feeding grounds, whereas only *P. indicus* appeared to also feed within the mangrove habitat. The analysis of metals concentration in shrimp showed no indication of elevated levels, and although levels for pesticides in the water exceed environmental thresholds in some of the nursery areas, only a localized effect of insecticides was detected in *P. indicus* in Espírito Santo estuary.

In Maputo Bay, juvenile shrimp were found to use many different types of coastal environments as nursery areas, including both estuarine and coastal marine areas, where different environmental and landscape factors appeared to control shrimp densities in seemingly similar nursery areas. Overall, the amount of benthic microalgae, turbidity and the extent of shallow water habitats appeared to be the most important factors explaining variation in shrimp density within and between nursery areas, whereas the extent of mangroves and contamination in the nursery areas was found to be less important. This caused the surprising results that the most exploited and contaminated nursery area, Espírito Santo estuary, showed the overall the highest abundance of juvenile shrimp. Taking all in consideration, productive mud- and sand flats, with or without fringing mangroves, appear to constitute key nursery habitats for penaeid shrimp in the study area, where the Bembe area, Espírito Santo and Maputo River estuaries were identified as the most important nursery areas for the dominant fishing ground of penaeid shrimp in Maputo Bay. This information could guide conservation and provide support for an ecosystem management approach of the shrimp fishery southern Mozambique.

Keywords: Tropics; Southeast Africa; Shallow water; Estuaries; Nursery ground value; Decapods; Penaeidae; Carbon and nitrogen isotopes; Diet; Acetyl cholinesterase, Butyryl cholinesterase, Metals.