The Stocks Status Of Two Dominant Species (Metapenaeus Monoceros And Fenneropenaeus Indicus) From Tanzanian Coastal Waters

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Background

The knowledge on growth and mortality of fish population is essential in understanding the dynamics of fish populations. There are dynamic mathematical models such as Beverton and Holt used in prediction of future yields and stock biomass at different levels of fishing strategies, which are important in defining management strategies. The development of the length-based stock assessment methodologies by Pauly it is possible to investigate population dynamics of fish stocks in tropical waters. The penaeid prawns have discontinuous growth pattern at individual levels which occurs by moulting process. As the prawn undergoes relatively higher number of moults per year thus continuous growth models such as von Bertalanffy growth model are appropriate for their assessment. This study therefore was intended to assess the stock of two penaeid prawns Metapenaeus monoceros and Fenneropenaeus indicus occurring within Tanzania coastal waters by first establish biological reference points of those dominant prawn species and secondly estimate the growth and mortality parameters and exploitation rates.

Method

In order to determine the population dynamics of the two species the length-based stock assessment model was used. Data for this collected from December 2017 to December 2019 from land based sites Bagamoyo and Nyamisati of which they were visited on 5 days on monthly basis. The collected length frequency and length-weight relationship data for were used as input data to the von Bertalanffy growth function to determine the growth parameters and mortality parameters. Length-Based Spawning Potential Ratio (LBSPR) model was also used to address two issues: simulating the expected length composition, growth curve, and SPR and yield curves and, Fitting to empirical length data to provide an estimate relative apical fishing mortality and spawning potential ratio of the two species.

Results

The average exploitation rates (E) of prawns from the survey of 0.47 and 0.52 for F. indicus in zone I and II respectively, were below the optimization (E opt) criterion of 0.5 for sustainable exploitation of fisheries. The other dominant species M. monoceros average exploitation level of 0.59 at zone I exceeded the optimum value for a healthy
stock. The results from LBSPR model shows that the spawning potential ratio (SPR) of F. indicus is 0.1 from Bagamoyo indicating that the reproductive potential of the stock F. indicus at Bagamoyo is below the limit reference (LRF) point (SPR= 0.2). The F. indicus stock is susceptible to fishery fished at a length of 26.57 cm, which is above its length at sexual maturity at 26.300 cm. On the the relative fishing mortality index of fishing pressure suggests that F. indicus is fished at high pressure (F/M > 1: 4.1) that cannot support sustainable exploitation of the stock.

Stock status of Metapenaeus monocerous in Bagamoyo coastal waters. The spawning potential ratio (SPR) of M. monocerous is 0.51 indicating that the reproductive potential of the stock M. monocerous at Bagamoyo is above the target reference (TRF) point (SPR= 0.4). The M. monocerous stock is susceptible to fishery fished at a length of 16.76 cm, that was below its length at sexual maturity at 27.0 cm. The relative fishing mortality observed for M. monocerous stock is fished at low pressure (F/M < 1: 0.41) of which can support a sustainable exploitation of the stock.

Conclusion
The higher E-values of the two species in zone I and II exceeding the optimum exploitation value of E = 0.5, indicates that overfishing is occurring. These values suggest that the prawns stock is not sustainably exploited. Generally, though the stock of F. indicus is fished at higher pressure (Fopt >M) the fact that, the length at first capture (LC = 26.6 cm) is above the size at sexual maturity (Lm = 6.3 cm) and that SPR 0.1 is below the LRP suggest that the stock may be susceptible to recruitment overfishing. Regardless of the stock of M. monocerous fished at low pressure (Fopt