English Abstract

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Title: A Socio-Ecological and Time Series Approach to Coastal Fishery Resource Management

Abstract:

Marine resources are being overfished due to the increasing demand for seafood. A significant amount of research has been directed towards commercially valuable marine resources. As a result, the depletion of commercially viable stocks has led to a notable rise in the capture of alternative species, including *S. squammosus*. However, there is insufficient data on this species to enable its effective management, unlike the more profitable species.

This study investigates the decline in the catch of *S. squammosus* fishery in Amami-Oshima, Japan, and utilizes a socio-ecological approach and time series analysis to tackle the lack of information and data on the species. The goal is to establish management measures that are both efficient and sustainable.

The investigation commences by scrutinising the status of the fishery, its management, and the patterns in catch landed. Several methods were used to handle deficiencies in biological research data and stock information through socio-ecological systems. A fuzzy cognitive model (Gray et al., 2013) that considered various social, ecological, biological, economic, and environmental factors was utilised. Additionally, I conducted a time-series analysis to predict future catch and monthly trends.

The results of this case studies demonstrate a 73.7% decline in catch at Setouchi (2015-2020) and a 32.8% reduction in catch at Naze (2012-2022). The main drivers of this fishery are sea surface temperature (SST) and COVID-19, with COVID-19 having an impact solely in 2020. The fuzzy cognitive model offers valuable insight into the decline of the fishery. Although SST exhibits pronounced seasonal fluctuation, its effect on the catch is negligible. Developing management measures for this species is a challenge considering the scarcity of global information and the paucity of accurate stock biomass data gleaned from a mere handful of selective studies in the vicinity. A time series analysis was conducted to predict monthly catch landings, integrating catch trends and seasonality. Monthly catch landing was forecast for potential scenarios, with a 95% confidence interval, from 2021 to 2024, which can be used by managers.

This study is a valuable contribution to coastal marine resource management, examining the decline of *S. squammosus* in detail and proposing a socio-ecological framework and validated forecasting model. The implications of this work extend beyond this specific case and call for a reevaluation of current fisheries management strategies to ensure the sustainability of alternative species in the face of increasing demand and depletion of commercially viable marine resources. Looking ahead, the future of *S. squammosus* resources necessitates a proactive approach. It is imperative to implement conservation measures, closely monitor spawning biomass, and employ sustainable harvesting practices. Additionally, there is a need for ongoing research to understand the species' ecological requirements and its role within the broader marine ecosystem. By incorporating these considerations into future management strategies, we can work towards ensuring the resilience and abundance of *S. squammosus* resources for generations to come.