The impact of climate variability on the winter catches rate and distribution of threadfin in the Taiwan Strait

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Abstract

Threadfin is one of the most important commercial species of fish in the coastal fisheries of Taiwan. The catch of threadfin exhibiting a peak in 1988 and its population has rapidly declined. However, direct studies related to fishery oceanography of threadfin in Taiwan Strait are scarce. In this study, we collected the annual landing data of threadfin in the Taiwan Strait from 1958~2013 and the total tonnages of trawl vessel from fisheries yearbook and daily logbook data from coastal gillnet fisheries to construct different temporal and spatial fishery data. Furthermore, we also collected climate indices and sea surface temperature data to investigate the influences of marine variations on catch rate by using time series wavelet analysis and suitability index at different multiple time scales.

The result showed the major fishing season is in the winter and also showed the seasonal variations in the latitudinal catch percentage of threadfin in the Taiwan Strait. In addition, the landing data of threadfin distribution revealed the northward migrated trend. The time series analysis displayed the significant correlation among the catch rate and autumn PDO, autumn SST, winter Nino3.4, winter SOI, winter WP, which PDO, SST, Nino3.4, SOI have 4 to 6-year periodicity in 1975~1995. PDO and Nino3.4 were positively correlated to the catch rate, while the SOI and SST were negative correlated. Additionally, the catch rate and WP showed fairly good positive correspondence and have 4 to 8-year periodicity during the study period. Furthermore, the high suitability range (SI>0.8) of SST were in the range between 21.42~22.18℃. When El Nino or WP positive phase occurred which led to the winter SST rises in Taiwan Strait, thus expanding the high suitability habitat of threadfin increased and the annual catch rate approximately 17.63% and 19.21% respectively than in the nominal events. In contrast, La Niña or WP negative phase resulting the winter SST decrease in Taiwan Strait, thus the high suitability habitat of threadfin shrinking, however, its impact on the catch rate is not obvious.