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Productivity of Small Pelagics in Korean Waters

Chang Ik Zhang, Jae Bong Lee*, Young Il Seo, Sung Il Lee, Man Woo Lee, Sun Kil Lee, Sang Chul Yoon, Kyum Jun Park, Yeong Gong
Pukyong National University, *National Fisheries Research and Development Institute

Introduction

Competitive species have the same spatial distribution (habitat) and foraging behavior (niche), while non-competitive species have either different feeding behavior or spatial distribution. Therefore, ecological segregation among species of fish results from differences in foraging behavior and spatial distribution (Allen, 1984; Zhang 1988). To explore these ecological strategies among major small fish pelagics in Korean waters, distribution of CPUE in the Korean large purse seine fishery were examined. The objective of this study is to describe fisheries productivity during the last four decades in Korean fisheries, and compare ecological structures and functions of small pelagics in Korean waters ecosystem.

Data and Methodology

Pelagic fishes divided into small and large pelagic fish and analyzed for productivity, such as average catch, catch proportions, coefficient of variation, of the top 7 small pelagic fishes in Korean waters. Catch data was used from the Ministry of Maritime Affairs and Fisheries (MOMAF) database during the period of 1961-2000.

CPUEs (Catch per unit effort, kg/haul) of common mackerel (*Scomber japonicus*), horse mackerel (*Trachurus japonicus*) and Pacific sardine (*Sardinops melanostictus*) in the Korean large purse seine fishery as relative biomass of major small pelagics were used as a proxy of habitat, and compared to biomass and recruitment of them during the period of 1980-1998, before bilateral fishery agreements around Korean waters.

Korean waters were divided into 3 areas, that is, East Sea, East China Sea, and Yellow Sea, to analyze ecosystem structures of the waters.

Results and Discussion

Average fisheries production of small pelagics was 537,078 mt, rating at 45.9% of total production of 1,170,936 mt in Korean waters. Comparing the production by marine area in Korean waters, small pelagics was productive in the East China Sea and East Sea, rating respectively at 52.8% and 51.9% of total production in the seas. Proportions of small pelagics out of total productions were increasing continuously from 37.0% in 1960s to 52.9% in 1990s. This demonstrated that productivity of small pelagics is getting important in Korean waters.

CPUEs of common mackerel, horse mackerel, and Pacific sardine were very significantly correlated with biomass of the major small pelagics in the following year ($r=0.622$, 0.616 and 0.719, $P<0.001$). Therefore, CPUEs of the major small pelagics were statistically explained variations in biomass of them in Korean waters. Based on the distribution of habitat of the major small pelagics, habitat overlap was estimated proportion of the number of fishing block weighted by CPUE of each small pelagics. Common mackerel mostly shared a habitat area with both of horse mackerel and Pacific sardine as 35.7% of its habitat, while shared with either horse mackerel as 28.6% or Pacific sardine as only 3.1%. Common mackerel of 32.6% resided at its habitat by herself in Korean waters. Horse mackerel largely shared with common mackerel as 63.4% of its habitat. While horse mackerel shared with both of common mackerel and Pacific sardine as 36.6%, she did'nt neither share with Pacific sardine nor reside by hersel. Pacific sardine of 52.9% existed at the common habitat with common and horse mackerel, while of only 8.2% was isolated from two small pelagics in Korean waters.

Mean trophic level and niche overlap were calculated, as well as ecological strategies were discussed on the basis of relationship between habitat and niche of small pelagics in Korean waters.

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