

Declining catch of Japanese sandeels

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Sandeels are important fisheries target species in Japan. In addition, sandeels are important forage species for many piscivorous predators and key species in the coastal marine food web. Sandeels habitat on/in gravelly sand sediments and therefore their distribution shift is limited by the distribution of sandy sea floor. That unique characteristic might make sandeels vulnerable to climate variability and climate change. Recently, the catch of sandeels in Japan has decreased. To detect the geographical characteristics of sandeel catch decline, prefectural catch data from Statistics of Agriculture, Forestry and Fisheries was analyzed. Sandeel catches in 38 ocean-facing prefectures from 1956 to 2015 were used. The catch data was firstly log plus one transformed and then anomaly normalized by standard deviation was calculated in each prefecture to avoid the influence of fishery effort differences between prefectures. Since Kochi prefecture has no catch during the analyzed period, we applied principal component analysis to the normalized anomaly data of 37 prefectures. The contribution of the first principal component (PC1) was 28.6% and its score showed a decreasing trend since 1975. The contribution of the second principal component (PC2) was 12.2% and its score showed an increasing trend during 1956-1980 and a decreasing trend during 1995-2015. There are 12 prefectures (e.g. Okayama) which showed positive sing for PC1 and negative sing for PC2, hence sandeel catch drastically declined after 1975. There are 10 prefectures (e.g. Hyogo) which showed positive sings both for PC1 and PC2, hence sandeel catch gradually declined after 1975. Recently, it was reported three species of *Ammodytes* (*A. japonicus*, *A. heian* and *A. hexapterus*) distributed around Japan. It was impossible to divide the three species in the historical fisheries catch data, however it is an urgent task to elucidate life histories and distributions of each *Ammodytes* species to develop sustainable management of sandeels in Japan.

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