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A challenge to investigate environmental factors which determine spawning migration variability of small pelagic.

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In recent years, lower trophic ecosystem models, which represent phyto and zoo-plankton, have been coupled to fish growth-migration models. These coupled models enable to elucidate fish response to climate variability. However, mechanisms of fish migration has not been well clarified. Especially the mechanisms of spawning migration, by which spawner fish can home on to their spawning grounds, are one of the most difficult behavior to represent by a numerical model. Using realistic initial and boundary condition, an Euler-type model of Pacific saury was applied to investigate environmental factors which determine spawning migration variability. The initial distribution of Pacific saury was defined by synoptic surface trawl surveys and satellite derived environmental conditions were used as forcing; sea surface temperature (SST), prey density estimated from surface chl-a concentration and surface current speed. Growth of Pacific saury was calculated by a fish bioenergetics model (NEMURO.FISH). A fitness algorithm was applied for feeding migration in which the fish are assumed to be moving towards a place with optimal growth condition. A larvae fitness algorithm was applied for spawning migration in which the spawning fish moves to a place of the optimal growth of larvae. For spawning migration, westward migration was added to reproduce realistic spawning grounds around Japan Islands. Strength of the westward migration was adjusted to realize observed variability of saury migration to fishing grounds. The adjusted westward migration variability showed high correlation with basin wide SST in the North Pacific. This result suggested a strong influence of climate to fish spawning migration.

Keywords: ecosystem model, fish growth-migration model, Pacific saury, ocean environment