3-4. Production Trends and Carrying Capacity of Salmon (Oral-28)

Population Dynamics of Asian Chum Salmon in Relation to Climate Change during 1943-2005

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To clarify the effect of climate change to the population dynamics of chum salmon (*Oncorhynchus keta*) in the North Pacific, we examined the causal linkage between growth and survival of Asian chum salmon in relation to climate change index (PDO; Pacific Decadal Oscillation) in past 6 decades. Variability in growth at age-1 to -4 of chum salmon was estimated by back-calculation method using scales of age-4 adult returning to the Ishikari River (Kaeriyama et al. 2007) in Japan during 1943-2005 and the Namdae River (Seo et al. 2006) in Korea during 1984-1998. Japanese chum salmon migrates to the Okhotsk Sea after short residing in coastal waters of Japan. Their survival rate would be decided by body size at the seaward migration and growth in the Okhotsk Sea (Kaeriyama et al. 2007). They stay in the Bering Sea during summer and fall, from age-2 until maturation age (Urawa 2000). Growth anomaly at age-1 of Japanese population had negative values during periods of the mid-1940s and the 1970s, but positive values during period of the 1980-1990s. Growth anomalies at age-2 and -3 in the Bering Sea showed opposite trends to that of age-1. Their population size was positively correlated with growth at age-1 (r=0.54**), and negatively with growth at age-2 (r=-0.48**) and -3 (r=-0.61**). However, fork length of adult was negatively correlated with growth at age-1 (r=-0.39*), and positively with growth at age-2 (r=0.64**) and -3 (r=0.78**). The PDO was correlated with growth at age-1 (cross-correlation; r=0.43**) and -3 (r=-0.43**) without time-lag, but not correlated with growth at age-2 significantly (r=-0.05NS). Results of the multiple regression analysis, however, indicated that the survival rate was affected by growth at age-1 (partial regression coefficient: 0.2*) relating to the size-related mortality (Beamish and Mahnken 2001) despite irrelevance with the PDO (-0.03NS). On the contrary, their growth at age-3 was influenced by population size (partial regression coefficient; -0.06**) relating to the survival, but not affected by PDO (-0.25NS), indicating density-dependent effect (Kaeriyama 1998, Kaeriyama et al. 2007). In age-3, Japanese chum salmon had less growth than Korean population, despite no differences in growth at age-1, -2, and -4. Namely, Japanese chum salmon showed stronger population density-dependent effect than Korean salmon did. The survival of Asian chum salmon, therefore, will be affected by climate change in the first marine life period, and the subsequent growth may be influenced by population density-dependent effect in the Bering Sea.