

Possible Effects of Ocean Currents on Survival of Japanese Chum Salmon during their First Winter in the North Pacific Ocean

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A number of studies have indicated that the survival of salmon was affected by several environmental factors in the ocean. However, even if there were significant correlation between the survival of salmon and sea surface temperature or the Aleutian Low index, the mechanism between them has not been well examined. Previously, we found that immature chum salmon swim against wind driven currents to maintain their position within preferred temperatures during their first winter in the North Pacific Ocean using the salmon migration model. We examined the interannual changes in wind driven current during the first ocean year in the North Pacific Ocean. The southward wind driven current velocity in winter, which transports immature chum salmon southward, was the smallest in 1971 and the largest in 1977 during the past 38 years. The velocity of the currents in 1971 was about one third in 1977. We are interested in how these changes in wind driven currents relate to the energetic costs of swimming and the mortality of chum salmon during winter in the first ocean year. The metabolic costs in the first winter were estimated by the salmon migration model and the relationship between the metabolic costs and return rates of Japanese chum salmon was examined. The standard deviation of energetic costs during winter was larger than other seasons. However, there is not a relationship between the metabolic costs during the first winter and return rates of Japanese chum salmon (Fig. 1). This result indicates that, although the ocean conditions affect the energetic costs of salmon during winter, they do not seem to influence the survival of salmon directly.

Fig. 1. Relationship between metabolic cost and return rate of Japanese chum salmon.

