

Effects of the temperature and fish size on metabolism and swimming performance of Pacific chub mackerel *Scomber japonicus* in the Northwest Pacific

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Pacific chub mackerel (*Scomber japonicus*) is a small pelagic and important commercial fish species widely distributed throughout the coastal areas of the Northwestern, Northeastern, and Southeastern Pacific. Swimming energetic and metabolic data of Northwestern stock at two growth stage (young juvenile of 6.1 ± 0.3 cm and immature of 16.5 ± 1.4 cm fork length) were measured under various temperature (18°C and 24°C for young juvenile, 14°C and 18°C for immature) using a variable-speed swim-tunnel respirometer, and the new data were compared with the previous data from Northeastern Pacific stocks. For young juveniles, the maximum sustainable swimming speeds (U_{\max}) was 50.0 ± 6.5 cm s⁻¹ at 24°C , significantly higher than at 18°C of 30.7 ± 2.5 cm s⁻¹. For the immature individuals, U_{\max} showed no significant increase while temperature changed from 14 to 18°C , and did not vary significantly from Northeastern Pacific individuals within the same size range. At a given temperature of 18°C , U_{\max} of immatures was significantly higher than those of young juveniles. For all individuals, the mass-specific oxygen consumption rate (V_{O_2}) increased exponentially with swimming speed (U , in cm s⁻¹). At a given speed, V_{O_2} increased with temperature; at a given temperature of 18°C , V_{O_2} of immature individuals were lower than those of young juveniles. These effects of the temperature and fish size on V_{O_2} were consistent with previous studies of chub mackerel of Northeastern stocks, however, compared with Northeastern stocks within the same size range, V_{O_2} of Northwestern individuals acclimated to 14°C did not vary at a given speed, while those acclimated to 18°C showed higher V_{O_2} , indicating the Northwestern stock was more sensitive for temperature on metabolism.

Keywords: Pacific chub mackerel, *Scomber japonicus*, swimming speed, metabolism, respirometer