Metabolism and Physiology During Ontogeny of Cultured Yellowtail Kingfish (*Seriola lalandi* Carangidae)

by

Damian Moran

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Abstract

Various aspects of metabolism and physiology were investigated during the ontogeny of yellowtail kingfish (*Seriola lalandi*), a fish of growing aquaculture importance in both New Zealand and other countries. Incubation experiments between 18-24°C showed that developing eggs and larvae were heavily influenced by temperature. It appeared that at warmer temperatures larvae hatched smaller but grew on the yolk sac, whereas at cooler temperatures larvae grew inside the chorion. Oxygen consumption data supported this, with a negative correlation found between total embryonic oxygen consumption and temperature. A mechanism was proposed to explain the differential effect of temperature on ontogeny and growth. Like other marine fish with pelagic eggs, yellowtail kingfish were found to be heavily reliant on free amino acids as a source of energy. At 23°C the pattern of substrate utilisation in eggs was considerably different from that at 17-21°C, indicating that 23°C exceeded the tolerance for normal development. Inter-individual aggression by large individuals was associated with the development of size heterogeneity in juveniles. Although this aggression also affected the survival of smaller juveniles, it was not the primary agent of much of the mortality that occurs during this phase, as many of these individuals were on a degenerate developmental trajectory. Yellowtail kingfish fingerlings used for ongrowing were robust to the stressors imposed by live transport. The ontogenetic development of metabolic rate from 0.6 mg-2.2 kg did not follow the same scaling exponent as that observed for mammalian models of allometry, and has implications for interspecific studies of mass-dependent metabolism.

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List of Abbreviations

AIC	Akaike information criterion
ANOVA	analysis of variance
BP	break point
DPH	days post hatch
HPF	hours post fertilisation
LS	least squares
NIWA	National Institute of Water and Atmospheric Research
$\dot{M}O_2$	mass oxygen consumption rate (e.g. mg O_2/unit time)
$\dot{N}NH_3$	molar ammonia excretion rate (e.g. mmol NH_3/unit time)
$\dot{N}O_2$	molar oxygen consumption rate (e.g. nmol O_2/unit time
NQ	nitrogen quotient
RSS	residual sum of squares
SIC	Schwarz information criterion
$\dot{V}O_2$	volumetric oxygen consumption rate (e.g. ml O_2/unit time)

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