REPRODUCTIVE BIOLOGY AND EARLY LIFE HISTORY OF

YELLOWTAIL KINGFISH SERIOLA *LALANDI LALANDI*

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EXTENDED ABSTRACT ONLY- DO NOT CITE

The National Institute of Water and Atmospheric Research (NIWA) Ltd and various collaborators are conducting underpinning research to develop techniques for yellowtail kingfish (*Seriola lalandi lalandi*) aquaculture in New Zealand. Among other attributes, kingfish are being targeted as an aquaculture species due their fast growth, excellent flesh quality and significant market opportunities internationally. To date we have established a breeding population of captive kingfish which spawn spontaneously and provide eggs on a daily basis during the spawning season. The resulting eggs have been reared through larval and juvenile stages and successfully ongrown to 3 kg in 12 months. While we have moved forward quickly in establishing basic rearing techniques and information of kingfish biology, we have also identified the following technological barriers to commercial kingfish aquaculture: sub optimal egg quality, high larval mortality soon after first feeding and jaw deformities.

To establish egg collection techniques and ultimately refine breeding control, we collected information on the reproductive biology and endocrinology of wild populations. Our research indicated that kingfish have multiple group synchronous gamete development; spawn in spring/summer (October to January); and first reach reproductive maturity at 750 and 775 mm FL for males and females respectively (Poortenaar et al., 2001). In females, blood plasma concentrations of testosterone and estradiol peaked during vitellogenesis and concentrations of 17α20β-dihydroxy-4-pregnen-3-one (17,20βP) were elevated during final oocyte maturation. In males, plasma concentrations of 17,20βP did not change with testis development, however, concentrations of testosterone and 11-ketotestosterone were elevated in partially and fully spermiated males (Poortenaar et al., 2001). Reproductive profiles from natural cycles provide:

a benchmark to gauge reproductive health in broodstock; and a basis for phototherm control.

Our routine assessments of egg production cycles and egg quality indicate that egg viability is on average 35%, and a significant proportion of viable eggs have blastomere deformities. Possible causes of poor egg quality include stress and sub optimal nutrition. We assessed plasma: cortisol; lactate; and pH and blood: glucose and hematocrit in response to capture, transport, confinement and handling. While stress responses to these routine husbandry practices were similar to other marine teleosts, we could not confidently determine the resting status of our captive broodstock, because the logistics involved in sampling the fish induced a stress response.

In the absence of running costly feed trials, we formulated a broodstock diet based on information on related species, and will continue to refine the diet as biochemical and physiological data on kingfish becomes available. For example, in future studies we will examine egg and larval energetics and metabolism, and we are currently assessing protein and fatty acid profiles during egg and larval development. This information will also contribute to the development of a larval feeding regime, intended to improve larval survival. By staining for bone and cartilage, we hope to identify the onset and nature of jaw deformities (Figure 1) as a basis for confirming the cause.

Recent larval rearing trials indicate that kingfish larvae are much more prone to bacterial pathology compared to our experience with other species. The use of antibiotics enhanced survival, most likely by limiting bacterial abundance and diversity introduced with food organisms. Future rearing protocols will include greenwater culture, antibiotic, and possibly probiotic procedures specifically related to the optimum feeding strategy. The influence of these procedures on gut flora and digestive enzymology will be considered.

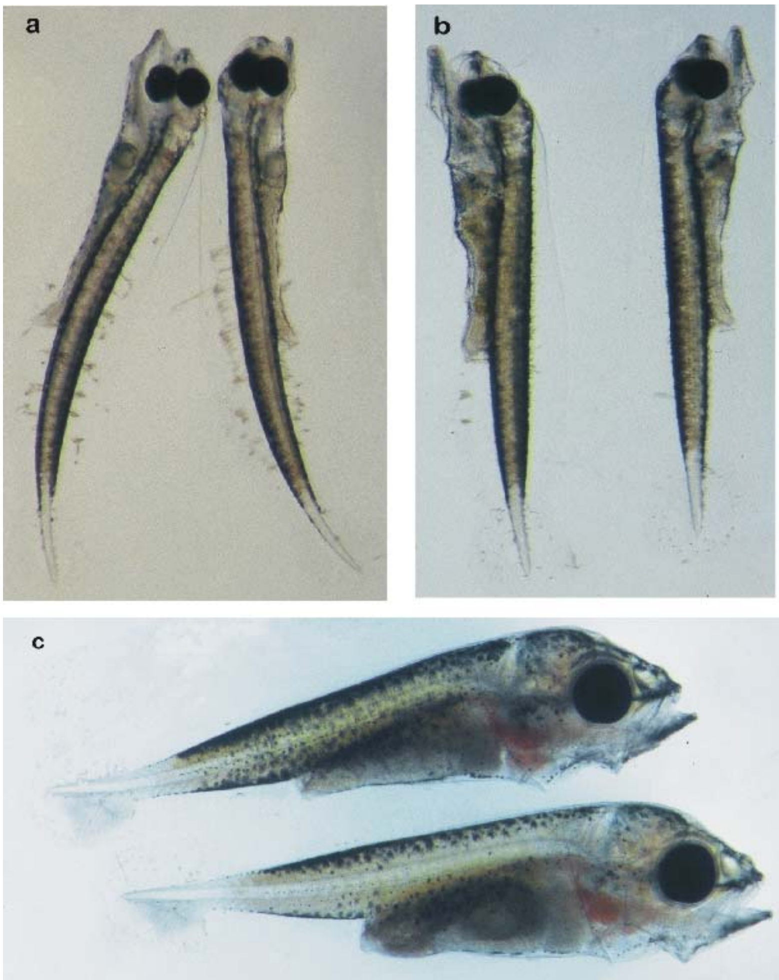

Figure 1. Examples of jaw deformities in kingfish larvae at 4, 8 and 15 days post hatch for a, b and c respectively.

Additional research is also being conducted on the sensory ontogeny of kingfish larvae, with particular reference to the visual and lateral line sensory systems. Of primary interest is how light intensity and spectral sensitivity influence feeding success. Results to date indicate that superficial neuromasts of the lateral line system are present 2 days post hatch (DPH), and most likely function in the detection of predators; provision of input into the M-cell escape response; and prey capture if visual conditions are poor. Retinal pigmentation is complete 4 DPH and co-incides with depletion of yolk reserves, indicating 'sensory readiness' for the switch to exogenous feeding.

References

Poortenaar, C.W., Hooker, S.H. and Sharp, N. 2001. Assessment of yellowtail kingfish (*Seriola lalandi lalandi*) reproductive physiology, as a basis for aquaculture development. Aquaculture 201: 271-286.

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