Yellowtail Kingfish, *Seriola lalandi*, is a carnivorous finfish species valued in aquaculture for its fast growth rate and excellent meat quality. The aquaculture industry is reducing fish oil and fish meal content in formulated feeds. Alterations to lipid storage and the effects on liver structure need to be considered when reducing fish oil (FO) (lipid) and fish meal (FM) (protein) content in formulated diets for commercial Yellowtail Kingfish. Changes in either or both protein and lipid level have the potential to alter liver structure, the levels of essential fatty acids, bile acids, amino acids, and other nutrients such as the cholesterol required for maintaining animal health and growth. In this thesis is the first report of gross and somatic indices, liver histology, bile acid and taurine concentrations, liver enzyme concentration and blood biochemistry for wild caught Yellowtail Kingfish from South Australian waters. These data provide a point of reference for the development and further optimisation of formulated feeds for this commercially important species. In this thesis I report on liver structure and energy reserves, concentrations of enzymes involved in cholesterol and bile acid metabolism and blood biochemistry in both wild and cultured Yellowtail Kingfish.

Yellowtail Kingfish may be able to be fed diets with up to 30% crude lipid (CL) and 48% crude protein (CP) without affecting total bile acid synthesis, storage and liver lipid storage. Yellowtail Kingfish fed a 30% wild-derived FM (wd-FM) diet may be fed diets where the FM can be replaced by up to 66.67% FM by-product, 33.3% poultry meal (PM) or 33.3% soy protein concentrate (SPC) without any significant impact on total bile acid synthesis, storage and excretion and liver lipid storage. However, severe bile duct proliferation and periductular fibrosis was observed in the livers of fish fed diets with wd-FM replacement with 10% PM or 10% SPC.

Yellowtail Kingfish may be fed a formulated diet containing either: 1) ~25% dietary lipid level (2.12 g $100g^{-1}$ of ΣLC n-3 PUFA) with up to 100% of the fish oil (FO) component replaced by poultry oil (PO); or 2) ~25% dietary lipid level (2.12 g $100g^{-1}$ of ΣLC n-3 PUFA) with up to

100% of PO with canola oil without an apparent negative impact on any of the parameters measured in this study. Emulsifiers may be required if bile acid production decreases from inclusion of alternative oil sources. The additional of a commercial emulsifier at 40 mg lipid kg^{-1} in diets with different levels of CL (~30 g 100 g^{-1} and ~20 g 100 g^{-1}) presents no benefit for the production of Yellowtail Kingfish.

Yellowtail Kingfish have nutritional plasticity enabling them to grow and maintain enterohepatic function on a variety of diet formulations. Much of this capacity is due to their livers, the organ foremost responsible for cholesterol regulation and synthesis of bile that enables emulsification and uptake of nutrients. Therefore, should an adverse environmental or biological event occur challenging the animals' health further, the impacts this might also have on the liver or whole animal is unknown.