PARASITE INTERACTIONS BETWEEN WILD AND FARMED YELLOWTAIL KINGFISH (*SERIOLA LALANDI*) IN SOUTHERN AUSTRALIA

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Kate Hutson
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Cover image: A 24.3 kg wild yellowtail kingfish (*Seriola lalandi*) captured at Port Augusta by Craig Pillion
Photo: Kate S. Hutson

Publications during the tenure of my PhD candidacy

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Reggie Godfrey netting yellowtail kingfish from *Beez Neez* in Port Patterson
Photo: Bronwyn M. Gillanders

DEDICATION

To my Pop, Ian Cox

Who shines so much light on my life. He gave me my first guinea-pigs, taught me how to drive in his ute at his Hereford farm and took me fishing for flathead from Blairgowrie pier. Pop died peacefully on January 6, 2007.

And,

To Reggie Godfrey

Reggie was regarded in the fishing community as an authority on yellowtail kingfish and was frequently in demand for his fishing expertise. A true-blue Aussie bloke, Reggie followed in the footsteps of his father, fishing in upper Spencer Gulf between the 1950s to mid 80s. Over the past ten years he assisted the collection of yellowtail kingfish brood stock for aquaculture. More recently, Reggie helped to facilitate the research presented in this thesis. He was instrumental to Chapter Six which presents results from the only tag and release programme ever conducted on large wild yellowtail kingfish in South Australia. Reggie died suddenly on October 21, 2006 while assisting me in the field. I miss his fishing yarns and will never forget the friendship and knowledge he shared with me.

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Appendix

The two images of the ´yellowtail kingfish 'weigh your catch' ruler´ should be omitted from the thesis as copyright remains with Mr Scott Gray, Fishcare Victoria.

ABSTRACT

Metazoan parasites threaten the development and expansion of yellowtail kingfish (*Seriola lalandi*) sea-cage aquaculture in Australia. There is international speculation that parasite transmission from farmed to wild fish leads to increased incidence of parasitism in wild fish. Conversely, transfer of parasites from wild fish to farmed fish can negatively impact upon the health of farmed fish. Baseline information on the parasite assemblage of wild *S. lalandi* in Australia will: 1) allow informed judgments to be made in order to responsibly monitor, and perhaps remedy, potentially negative impacts and; 2) enable identification of parasite species of potential harm to the Australian *S. lalandi* aquaculture industry.

I collected wild *Seriola* spp. (Carangidae) throughout southern Australia and examined them for metazoan parasites. Fifty-six metazoan parasite species are identified, including one new species. A taxonomic listing is provided for the metazoan parasites found. Taxonomic descriptions are made for the blood fluke *Paradeontacylix godfreyi* n. sp. (Digenea: Sanguinicolidae) and a redescription is provided for the parasitic copepod *Naricolax chrysophryenus* (Cyclopoida: Bomolochidae).

A qualitative risk assessment was devised for the metazoan parasite taxa identified for the sea-cage aquaculture of *S. lalandi* in South Australia. Risk was interpreted considering the likelihood and consequence of parasite establishment and proliferation. The monogeneans *Benedenia seriolae* and *Zeuxapta seriolae* were considered extremely likely to establish and proliferate. *Benedenia seriolae* also poses high potential negative consequences for cost-effective *S. lalandi* sea-cage farming. However, the absence of potential mitigation methods and parasite management for *Paradeontacylix* spp. (Digenea), *Kudoa* sp. and *Unicapsula seriolae* (Myxozoa) indicates that these species may also present high negative consequences for *S. lalandi* aquaculture in Australia.

The nature of wild *Seriola* migrations is critical for an understanding of the potential impact of disease and parasite interactions between wild and farmed fish. A small-scale tagging programme of wild-caught *S. lalandi* and *S. hippos* in South Australia provided insight into the movements of these species. Recapture results indicate that large *S. lalandi* remain in, or return to, northern Spencer Gulf. *S. lalandi* also move past sea-cage farms in Fitzgerald Bay, northern Spencer Gulf, which is an important consideration in view of potential expansion of the *S. lalandi* sea-cage industry in Spencer Gulf.

There is surprisingly little experimental assessment on parasite transmission from farmed fish to wild fish. Studies assessing parasite interactions between wild and cultured fish employ models to quantify parasite population levels of cultured, wild and escaped fish, while others carry out comparative surveys of parasite prevalence and intensity over time, in areas close to and distant from farming activity. I provide preliminary data on ectoparasite prevalence and intensity on wild *S. lalandi* in areas close to, distant from and where there is no sea-cage farming in southern Australia. I review methods employed in the northern hemisphere to assess sea-louse transfer between wild and farmed salmon and propose methods for assessing monogenean parasite transmission from farmed to wild *S. lalandi* in Australia.

In summary, this thesis provides insight into the potential for parasite interactions between wild and farmed *S. lalandi*. I document the parasite assemblage of wild and farmed *S. lalandi* and wild *S. hippos* and provide baseline data on 'natural' parasite prevalence and intensity. I provide a taxonomic description of a new species of blood fluke. I indicate the likelihood of parasite transfer from wild fish to farmed *S. lalandi*, and identify parasite taxa with potentially negative consequences for sea-cage aquaculture. I provide the first firm data that wild *S. lalandi* move past one area where kingfish are farmed in sea-cages in South Australia. Finally, I propose procedures to better understand the potential for monogenean parasite transmission from farmed *S. lalandi* to wild fish. This thesis reports new information that is important when considering and managing expansion of the *S. lalandi* sea-cage aquaculture industry throughout Australia. It

also provides baseline data on natural parasite levels to enable ongoing monitoring of the potential impacts of the industry on wild fish populations.

ACKNOWLEDGMENTS

This thesis is the result of the encouragement, enthusiasm and help of many people. It has been an exhilarating journey, with a heady mix of triumphs and failures, new friends and old friends, early mornings and late nights, fish guts and seasickness. The fieldwork was extremely challenging. I was away from home for long periods at a time chasing wild yellowtail kingfish, a species that is not especially common and is difficult to catch. Fortunately, I was able to work with some of the most remarkable people in the Australian fishing industry. The laboratory work was also challenging and involved identification of a diverse range of parasite fauna. Again, I was fortunate to work with some of the most pre-eminent parasite specialists in the world. Without this help I wouldn't have made it. Thank you.

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Scott Gray gave me hope (and fish from Victoria) when I had none. In Warrnambool I felt healthy and inspired, and I had a lot of fun. Thank you to Brian Atkins, Troy Duthie, Brion Rafferty and Scott Salzman for assistance collecting specimens from Killarney. Michael Bettanin was an incredible help processing specimens. Craig Hartwich provided use of George's Lane Laboratories, and made microscope work so much more interesting!

Calypso Star Charter put me in pursuit of some big kings in wild waters. The 6 to 8 metre swell as we steamed out of Thorny Passage took my heart and breath away, as well as most of my lunch. Despite five days in walls of water at Greenly and Rocky Island, I did not see one kingfish. However, I got some good parasite samples from Samson fish thanks to Seth Boag, Rolf Czabayski, Michael McMahon and Shane Mensforth. My first aid course came in handy when one client's braided line caught around his finger at the same moment a tuna ran with his lure. The line cut his finger to the bone, nearly severing it. I pushed his finger back together and bandaged it. The doctor back in Port Lincoln reckons it healed well. I was a super-hero. I considered wearing my undies on the outside of my pants.

Thank you to tournament director Sam Roccati of the Game Fishing Club of South Australia, for inviting me to the Kangaroo Island Tournament. This event demonstrated that it was not only me who experienced difficulties catching the elusive kingfish. One fish was landed by George Flourentzou and kindly donated to my research.

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When I wasn't working independently at Arno Bay, Clinton Chambers and Brad Smith provided much appreciated assistance. Neil from Port Neil and Clint Green made working the sea-cages at Arno a huge laugh. I'm glad they warned me about my silver watch (i.e. lure) before I jumped into a sea-cage on snorkel with 100 kg+ brood stock tuna! However, they didn't warn me that the builders got the hot and cold shower taps around the wrong way back on site. After three days at sea, having had no shower and reeking of fish guts, I was sprung trying to have a shower in the sink. Thank you to the Stehr Group for providing technical support in Arno Bay.

Whyalla! Only three wild kingfish were boated. Thank you to Whyalla Sea Rescue who provided a tow-in when *Congoli* conked out. Fortunately, Carlo Possagno introduced me to the excellent by-catch to be had in the region, so this site wasn't a complete write off (unlike *Congoli*). Melt in your mouth snapper, and my PB mulloway (fishers' lingo for personal best) at around 8 kilos (well maybe more like 5 kg - fishers tend to exaggerate). Ingo Ernst, Clinton Chambers, Simon Jones, Brad Mansell and Brad Smith were very helpful with fieldwork. Thank you to South Australian Aquaculture Management and Southern Star Aquaculture for technical assistance.

Port Augusta was humming and the mullet were jumping. The power station opposite the Spencer Gulf kingfish hatchery fried my brains while I fished - but at least the fish were there. Thanks to all the staff at Spencer Gulf Hatchery for technical assistance. Special thanks to John Bills, Clinton Chambers, Robbie Chenda, Travis Dymmott, Ingo Ernst, Anthony Everett, Darren, Kate and Jeanne

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Throughout this work Bradley Smith (aka *bradsmithi*) motivated me before first light, taught me to master the idiosyncrasies of *Thallasia*, dried my underwear on the stove (and burnt it), showed me how to catch big fish and helped me count parasites into the night. He helped me smile in times of immense sadness. Without him, this thesis wouldn't be what it is.