Movement, connectivity and population structure of *Acanthopagrus australis* (Yellowfin Bream) along the New South Wales coast

Holly Gunton

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under the supervision of Prof. David Booth, Dr. Ashley Fowler (NSW DPI) and Dr. John Stewart (NSW DPI)

University of Technology Sydney

Faculty of Science

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Certificate of original authorship

I, Holly Gunton declare that this thesis, is submitted in fulfilment of the requirements for the award of Master of Science (Research), in the School of Life Sciences at the University of Technology Sydney. This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis. This document has not been submitted for qualifications at any other academic institution. This research is supported by the Australian Government Research Training Program.

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Abstract

In this thesis, I investigate the population structure of Yellowfin Bream, *Acanthopagrus australis*, an important and popular fish species in eastern Australia. Archival collections of otoliths (ear stones) and long-term tag-recapture data were used to examine movement and potential stock segregation in New South Wales (NSW) at a range of spatial and temporal scales.

In Chapter 2, cooperative tag-recapture data was examined using generalized additive models, to assess potential environmental and intrinsic drivers of *A. australis* movement. Over 24 000 individuals were tagged along ~ 800 km of the NSW coastline, with anglers recapturing 2036 (8.2 %) individuals during a 19-year period. A broad range of movements were observed (up to 832 km), however a substantial proportion (37%) of individuals were recaptured at their release location, with only 8.6 % of individuals moving further than 100 km. Fish were more likely to move if they spent greater time at liberty, were of larger body length at release, or were released during Autumn. Fish that spent greater time at liberty and those released at more southerly latitudes were more likely to move a greater distance, with those that travelled in a northerly direction (61.5%) significantly more likely to move a greater distance.

In Chapter 3, connectivity of *A. australis* among estuaries was examined during recent life history using otolith elemental edge signatures, and throughout life history using otolith shape indices. Archived otoliths (n = 355) from estuaries covering ~850 km of the NSW coastline were examined using Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) and Elliptical Fourier Analysis. The results indicate complex stock structure of *A. australis*, with considerable differences in elemental edge signatures among a range of estuaries and sites at a variety of spatial and temporal scales. Differences in

elemental signatures from the juvenile region of adult otoliths were consistent with patterns of adult separation, suggesting they were established early in life. Differences in otolith edge signatures revealed at both the smallest (sites within estuaries) and largest scale of investigation (100s of km) highlight the importance of investigating multiple spatial scales.

The use of multiple techniques provided a more holistic understanding of population structure of *A. australis* in NSW. Overall, the results indicate that movement of *A. australis* is likely restricted over spatial scales considerably smaller than that of fisheries management in the region.

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