Department of Primary Industries

Department of Primary Industries Student Conservation Award

2017 John Holliday Award Applicant Summaries

Picture: Left to right Dr Natalie Moltschaniwskyj (Director Fisheries Research), Joshua van Lier holding John Holliday award, Sue Holliday (wife of late John Holliday).

More information

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DPI Fisheries, a branch of NSW Department of Primary Industries (DPI), is aware of the diverse range of research that is being done each year by university post-graduate students, and encourages the communication of the results of this work to assist the management of fisheries resources and aquatic habitats in NSW.

The John Holliday Student Conservation Award is offered by DPI to encourage post-graduate students to share their research findings on topics of interest to the Department. The winning entrant for the 2017 John Holliday award received a cash award of $3,000. The Award is named in honour of the late Dr John Holliday, a former Senior Conservation Manager who pioneered the Department's involvement in aquatic habitat and fish conservation issues.

The 2017 John Holliday award was open to post-graduate students who were enrolled at an Australian University during 2017 and who undertook research of relevance to DPI Fisheries in NSW. The applicant's summaries are listed below.

2017 Winning Project Summary

Importance of soft canopy structure for labrid fish communities in estuarine mesohabitats

Joshua van Lier, The Australian National University, Email: joshua.vanlier@anu.edu.au

Understanding how different habitats, and how particular aspects of those habitats, influence differences in fish communities is central to conserving and protecting our marine resources. Using underwater visual surveys, I sought to identify whether different habitat types supported different fish communities, and what aspects of those habitat types best predicted fish diversity in an estuary. I found that sponge and macroalgae habitats support their own unique fish communities, while soft coral supports what appears to be a subset of sponge-associated fish community. Canopy height and percentage cover of the local canopy-forming organism were the best predictors of fish diversity across all habitats. This study adds to the growing literature on fish relationships with soft-structure complexity, and shows that conducting a survey of canopy height may provide a quick and cost-effective surrogate monitoring method for evaluating fish diversity and determining the status of fish habitats.

Other Project Summaries

School Prawn (*Metapenaeus macleayi*) abundance in a recovering estuarine wetland

Craig Hart, University of Newcastle, Email: Craig.Hart@uon.edu.au

School Prawn (*Metapenaeus macleayi*) are an important commercial species to NSW fisheries that utilize saltmarsh wetlands for habitat. Modifications to hydrological flow for anthropogenic purposes has degraded the quality of saltmarsh wetlands, threatening School Prawn fisheries. Quantitative information that links research to restoration effort will ensure that future investment to promote fisheries productivity will be more efficient and cost effective. This study has aimed to establish quantitative School Prawn abundances of School Prawn within a recovering wetland. School Prawn abundance was estimated using a gear-efficient benthic sled across the wetland over six sampling events. School Prawn abundance

was consistent yet highly disproportionate throughout the surveys. Approximate average abundance levels showed 200 School Prawn 100 m^{-2} across all events, however average abundance at an upstream site was 1016 School Prawn 100 m^{-2}. The results show the probability that Hexham wetland is supporting large abundances of juvenile School Prawn, and demonstrates the importance of conservation and restoration effort to the wetland for fisheries productivity.

3D habitat mapping: Fish response to structure and infrastructure

Augustine 'Gus' Porter, University of Sydney, Email: augustine.porter@sydney.edu.au

From mangroves to reefs to Fish Aggregation Devices, fish love structure. Humans deploy extensive infrastructure in aquatic environments worldwide, with varying effects on fish populations. And with a growing desire to mitigate anthropogenic impacts, there are opportunities to enhance fish stocks by building the right structures. But the details of these fish-structure relationships are not well understood, impeding ecoengineering, mitigation and stock enhancement efforts.

This study quantified fish assemblages and captured 3D maps at breakwalls, rocky reefs and coral reefs at 12 sites across NSW. By deploying a novel low-cost mapping system, 2 cm resolution full 3D models of the ocean floor were captured and compared to the distribution of fishes. This allowed comparisons of fish assemblages to structural aspects of the reefs (overhangs, general complexity, slope and the size of features a reef was made of).

The large features and steep slope of breakwall habitat support exceptionally diverse and abundant fish assemblages, often double the number of fish at rocky and coral reef transects. But due to their engineered homogeneity, breakwalls support very uniform assemblages of fish, resulting in low beta diversity.

This study suggests that while marine infrastructure supports highly abundant and diverse fish assemblages, it could be improved by varying the shape or layout of the structure. Additionally, the size of features that a habitat is made up of (rocks, coral, concrete blocks, tetrapods) appears to effect different classes of fish in different ways. This work will inform the construction or modification of artificial reefs and aquatic infrastructure by linking structural features to fish assemblages, and providing structurally explicit engineering guidance.

Reducing recreational fishing debris by the development of a natural polymer based biodegradable product to replace soft plastic fishing lures in saltwater.

Skye Matthaei, Sourthern Corss University, Email: s.matthaei.14@student.scu.edu.au

What would you rather your catch of the day to be, that you take home to feed your family? A fish that has ingested plastic or a fish that has ingested a food like substance? This research project aims to produce and test different food based polymers to be used as an alternative, to the PVC soft plastic lures currently available for anglers. Literature indicates that ingested lost or discarded PVC soft plastic lures pose a significant health risk to marine life, and the environment due to their inability to biodegrade (Raison, Nagrodski, Suski and Cooke, 2014). There is currently only one Australian biodegradable soft plastic lure available on the market (Salt Strong, 2015). The expected outcome of this project is the production of a single use biodegradable fishing lure made from renewable materials that meet the voluntary Australian

Standard 4736-2006; is attractive to commonly fished species in Northern NSW, Australia and meets the necessities of recreational anglers. By achieving this outcome, this product will intern reduce marine debris and health risks to marine life and potentially human health in the future.

Improving management of tailor – an iconic fishing species

Hayden Schilling, University of NSW, Email: h.schilling@unsw.edu.au

Tailor (*Pomatomus saltatrix*) is an iconic recreational fish species with a global distribution, which has anecdotally declined in abundance over recent decades in eastern Australia. Unfortunately, very little is known about the biology and ecology of this important species, which hampers management efforts. My research has aimed to fill in these gaps in the tailor life cycle, to find out how fast they grow, where they spawn, where they grow up, and what they eat. I did this using a combination of regular samples from commercial fishers, donations of fish from recreational fishers, and targeted sampling of estuarine juveniles. While tailor can grow fast (up to 60cm in 3 years), the majority of the fishery is young (1 – 2 years old), suggesting that we are missing the larger, older fish compared with other populations globally. I have found evidence of an extended spawning period that is not restricted to South-east Queensland as previously thought, but extends 500km further south to Central NSW. Elemental analysis of otoliths (ear-bones which have rings like trees and record influences of the environment surrounding the fish) revealed that juvenile tailor are not restricted to estuarine nursery habitats as was suspected, but use both estuarine and coastal marine environments as juveniles. Dietary analysis found juveniles consume crustaceans while the adult diet is dominated by fish. The improved biological and ecological understanding of tailor in this region has resulted in the re-classification of the east coast tailor fishery from 'data deficient' to 'sustainable' under the FRDC guidelines, and promises to aid management in the future.

Assessing patterns of fine-scale genetic diversity and population structure of the Eastern Rock Lobster, *Sagmariasus verreauxi*, within NSW Waters

Laura Wooding, La Trode University, Bundoora, Email: 17869067@students.latrobe.edu.au

Conserving genetic diversity and genetic structure of exploited species is essential for species to retain high adaptive potential and resilience. Without prior knowledge of an exploited species stock structure and genetic diversity, management plans can be inappropriate for the species genetic structure and can inadvertently cause population fragmentation and reduce genetic diversity. One such commercially important species without baseline genetic knowledge is the Eastern Rock Lobster, *Sagmariasus verreauxi,* which is currently managed in NSW as a single stock. The aim of this study is to use novel next-generation sequencing to discover neutral and putatively adapted genetic markers, in the form of Single Nucleotide Polymorphisms (SNPS), which will be used to assess the population structure and genetic diversity of *S. verreauxi* from four inshore and three offshore locations within the NSW Rock Lobster Fishery. Population genetic analyses detected moderate genetic diversity for NSW *S.verreauxi,* with South West Rocks (SWR) reporting slightly higher genetic diversity than the other offshore locations. Most locations consisted of a single neutral genetic stock, however there may be some extremely shallow population differentiation between Forster and the other offshore locations. Weak putatively adaptive divergence was detected between SWR

and the other offshore locations, indicating that SWR individuals may potentially be locally adapted, however further analyses are required. Results indicate NSW *S. verreauxi* stock could continue to be managed as a panmictic unit. There is some evidence SWR could be an evolutionary significant unit, additional seascape genetic analyses will provide more clarity. As the genetic diversity of NSW *S. verreauxi* is moderate, ongoing genetic monitoring is recommended to detect and respond to any possible future declines in genetic diversity.