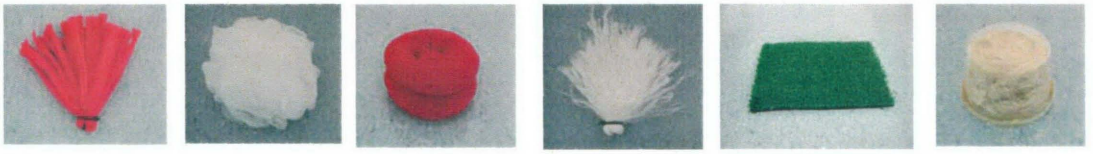
Biodiversity of Amphipods in the Solitary Islands New South Wales, Australia



Mallacoota malua Lowry & Springthorpe 2005

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A thesis submitted for the degree of Doctor of Philosophy of the University of New England

Certificate of Authenticity

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification.

I certify that any help received in preparing this thesis, and all sources used, have been acknowledged in this thesis.

Lauren Elizabeth Hughes

Abstract

The biodiversity of amphipods in the Solitary Islands, New South Wales, Australia, was investigated using an experimental approach. A series of ecological experiments explored: 1) the variation in amphipod assemblages on natural habitats with depth; 2) colonization of a range of artificial substrate unit (ASU) types (all comprising small, complex plastic units), over deployment times ranging from one to sixteen weeks; and 3) variation in amphipod assemblages with different habitat architectures of the ASU types. The results from these experiments were then used to develop an efficient, ASU-based sampling package for rapidly assessing and cataloguing epifaunal amphipod biodiversity. Finally, taxonomic descriptions are given for new species collected during the study.

The initial experiment indicated that trends in amphipod species richness along a depth gradient (4–14 m) varied with exposure and location. At Split Solitary Island, shallow depths generally supported the highest species richness, while at Korffs Islet, this occurred at greater depths. Though trends differed between sampling sites, species richness showed bimodality for most locations; samples from 10 m, however, were most often associated with the highest species richness.

Following this, a series of six different ASU types were deployed at 10 m for colonization periods of one, two, four, eight and sixteen weeks at four locations (North Solitary Island, North West Solitary Island, Muttonbird Island and Korffs Islet). Amphipods readily colonized ASUs, with different ASU types colonized at different rates and, again, with variable trends across locations. Overall, samples from the four-week deployment supported the most species-rich assemblages across locations.

Using data from the four-week deployment period, I next investigated the differences in assemblages between ASU type with the objective of assembling an optimum package for rapidly sampling the available amphipod biodiversity at a location. While significant differences were found between ASU types within locations, recruiting assemblages more

closely reflected location-specific differences when compared across the four island locations. A combination of five of the original six ASU types (Onion bag, Shower poofie, Rope fibre and Astro turf) proved to be the most efficient package that consistently collected the highest species richness across all locations. In addition, this ASU sampling package consistently collected more amphipod species than were found in extensive collections of natural habitats at each location. Assemblages recruiting to the sampling package were strongly representative of the local and regional species pool when compared to master lists compiled from all available records (including museum records and data from previous studies in the region).

To further test the use of the ASU sampling package, an additional deployment was made in cooler temperate waters at Bare Island, Botany Bay (~ 3°S of the Solitary Islands). Within a different benthic environment, the ASU sampling package again proved successful in collecting a highly representative sample of epifaunal amphipods.

Overall, this ASU sampling package represents an efficient means of rapidly assessing epifaunal amphipod biodiversity. It clearly has potential as a standardized method for cataloguing and monitoring epifaunal amphipod biodiversity in different regions and areas with different benthic habitats. While its wider application needs further, rigorous testing, the results presented here suggest that this ASU sampling package will be a useful addition to the suite of methods providing data to assist with the assessment and management of marine biodiversity, especially in areas where records are currently poor.

The final section of this thesis provides taxonomic descriptions of new species collected during the experimental work. Description are provided for: *Protohyale solitaire* n. sp. (Hyalidae); *Ericthonius rodneyi* n. sp. and *Ericthonius forbesii* n. sp. (Ischyroceridae); *Liljeborgia polonius* n. sp. (Liljeborgiidae); *Elasmopus arrawarra* n. sp. and *Hoho cornishi* n. sp. (Melitidae); *Gammaropsis legoliath* n. sp. (Photidae); and *Telsosynopia trifidilla* n. sp. (Synopiidae). Other important taxonomic outcomes from this study include: the subgenus *Telsosynopia* Karaman, 1986 being given generic status; and the reporting of *Protohyale pusilla* (Chevreux, 1907) from Australia for the first time.

Acknowledgements

The first acknowledgement and thank you goes to my supervisors Ass. Prof. Steve Smith and Prof. Rod Simpson, who have been extremely supportive throughout my candidature, particularly through the grim death that was the final stretch of this thesis. As my primary supervisor Steve has been a friend and mentor throughout this project. Much appreciation is owed to Keith Cornish and Rod Forbes who provided technical assistance at the beginning and end of the project, respectively. Keith taught me common sense, which has been invaluable. To my honorary supervisor Dr Mike Rule (aka 'Dr. Furious Aquatic/Dr FAQ,') who was instrumental in establishing much of the field deployments and during interesting times as this thesis was being written, you are greatly appreciated.

Thank you to the postgrad students at the NMSC, Jennifer Rowland, Matt Harrison, Beth Hastie, Andrew Dingle, Paul Butcher, Terri-Ann Bell, Anna Scott, Claire-Louise Martin and Rhys Edwards, a supportive social working body and many of whom worked as a buddy on diving trips. A special mention goes to Cristiana Damiano who travel with me to Sydney for the Bare Island work in Sydney. Work in Sydney would not have been achieved without the valuable information and equipment graciously made available by Dr Alistair Poore, University of New South Wales, Sydney. Nicole Hill and Dave Roberts also provided great help with diving and logistics in Sydney.

Thank you to Murray Liddel who helped me sought out maps and graphs. Ceridwin Fraser, Jane Hall, Kelly Merrin & Damon Parker read through many manuscripts for typos and glitches. Charlotte Dehollian bravely helped rough sort holdfast samples as part of a practical research experience.

Much appreciation goes to my dear and wonderful friend Lawrie Duck for his wisdom. To Joel Quintal, it will always be one big thank you for everything. To my girlfriends and ladies too numerous to mention, through their friendship they have provided me with much support and happiness. The past two and a half years working in the subbasement

at the Australian Museum has been extremely joyous with thanks to the 'driftwood loungers'. The museum is a valued learning environment with such a wealth of mentors.

I would like to thank Helen Stoddart who has sat behind me these last two and a half years, answering many questions and offering cheerful words as the world crashed about me.

..And last but not least, to my external supervisor Dr Jim Lowry who has patiently guided me through the ways of taxonomy and even more patiently supported me in achieving this goal.

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