
Translocation of the
southern rock lobster, *Jasus
edwardsii*, to improve yield
and marketability

PhD thesis by
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the Degree of Doctor of Philosophy



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Photo: Shane Fava

Jasus edwardsii (Hutton, 1875)

“It is not the strongest of the species that survive, not the most intelligent, but those who are the most adaptive to change.”

— Charles Darwin —

Declarations

Statement of originality

This thesis contains no material that has been accepted for a degree or diploma by the University or any other institution. To the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due acknowledgment is made in the text.

Arani Chandrapavan

Statement of authority of access

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Abstract

The Tasmanian southern rock lobster (*Jasus edwardsii*) fishery has a single Tasmania-wide management system despite large spatial variations in the biology (growth) and market traits (shell colour, body shape and live transport condition). This has created uneven distribution of harvest rates around the State where red, fast-growing, shallow-water lobsters are heavily targeted by fishers due to their high market demand, while pale, slow-growing, deep-water rock lobsters have a much lower rate of exploitation. In an attempt to improve yield, marketability and value of deep-water southern rock lobsters, translocation of lobsters between regions was examined as a supplementary management strategy for the Tasmanian rock lobster fishery. Adult deep-water lobsters were moved inshore to shallow-water reefs where changes to growth, market traits and body condition were monitored through recapture surveys.

Red pigmentation in shell colour decreased with depth across southern Australia. Most of the catch is sold into Asian live markets where there is a preference for red lobsters. This market preference has led to the price discounting of lobsters,



which was estimated at a total of AUS\$6.67 million / year for the Tasmanian Rock Lobster Fishery. Morphological market traits of leg length and abdomen shape were also different between deep and shallow-water *J. edwardsii* populations and between the sexes in each population. Nutritional indicators of condition did not differ among adult deep-water, shallow-water and translocated male lobsters, however fatty acid profiles indicated dietary differences between deep and shallow-water lobsters. Haemolymph condition indices detected significant differences in the post-harvest condition between deep-water and shallow-water lobsters.

Translocating small, pale adult lobsters into a shallow water habitat resulted in a number of changes important to the yield and value of the fishery. Growth rates of translocated adult lobsters increased at their first moult in their new habitat, exceeding that of resident deep-water lobsters from the original site. Growth of translocated females exceeded resident shallow-water females in the first year post-release. Translocation changed the pale colouration of deep-water lobsters into the bright red grade most sought after by the Asian market, however changes in morphology were only partial and may require several moults for a complete change in shape. Dietary fatty-acid



profiles of translocated lobsters matched those of the resident lobsters, while significant levels of essential omega-3 fatty acids in the muscle tissue of translocated lobsters suggest enhanced nutritional condition after translocation. The post-harvest condition of resident shallow-water lobsters and translocated lobsters were similar when recaptured 12 months later.

Translocation could be an effective management tool to add value to the less marketable deep-water southern rock lobsters. These results on the magnitude and timing of improvements in market traits will now contribute towards the economic and biological evaluation of the feasibility of translocation as a fisheries enhancement strategy for the Tasmanian Rock Lobster Fishery.



Statement of co-authorship

Chapters 2-6 of this thesis have been prepared as scientific manuscripts as identified on the title page for each chapter. In all cases sample design, data analyses, interpretation of results and manuscript preparation were the primary responsibility of the candidate, but were carried out in consultation with supervisors, and with the assistance of co-authors whose contributions are outlined below:

Dr Caleb Gardner

Dr Gardner (Tasmanian Aquaculture and Fisheries Institute (TAFI), University of Tasmania (UTAS)) provided the role of a principal supervisor for this PhD program. He provided the initial funding and financial support for all aspects of this investigation and his research team at TAFI provided technical support for all related field work. He provided advice relating to experimental design, lobster biology and fishery management, and on statistical analyses of results on all chapters of this thesis.

Dr Bridget S Green

Dr Green is a research fellow (TAFI, UTAS) and co-investigator on the translocation project and provided the role of a co-supervisor for this PhD program. She provided advice on the statistical analyses of results, manuscript preparation for Chapters 3, 4, 5, 6 and the overall structure of thesis.

Dr Adrian Linnane

Dr Linnane leads the Rock Lobster Sub-Program at the South Australian Research and Development Institute (SARDI) and was responsible for the co-ordination of the translocation field trials in South Australian waters. He provided shell colour data from South Australian commercial lobster catches for analyses in Chapter 2 and also provided lobster samples and digital image data for morphometric analyses in Chapter 3.



Mr David Hobday

Mr Hobday led the Invertebrate Section at Fisheries Victoria at the Department of Primary Industries, and was responsible for the co-ordination of the translocation field trials in Victorian waters. He provided shell colour data from Victorian commercial lobster catches for analyses in Chapter 2 and also provided lobster samples and digital image data for morphometric analyses in Chapter 3.

Dr Michaela A Guest

Dr Guest was a post-doctoral fellow affiliated with UTAS, TAFI and CSIRO. She provided advice on the subject matter of diet as it relates to lipid profiles of invertebrates, statistical analyses and had the role of research supervisor for this component of the thesis.

Dr Peter D Nichols

Dr Nichols leads the Food Futures Flagship program at CSIRO (Commonwealth Scientific and Industrial Research Organisation) and provided laboratory space, equipment and instrumentation for the lipid and fatty acid analyses in Chapter 4. His specialised knowledge of lipid biochemistry and analytical techniques assisted in the interpretation of the data.

We the undersigned on behalf of all co-authors agree with the above statement of co-authorship for each of the published or submitted peer-reviewed manuscripts contributing to this thesis:

Signed:.....Date:.....

Dr Caleb Gardner – principal supervisor (TAFI/UTAS)

Signed:.....Date:.....

Dr Bridget S Green – co-supervisor (TAFI/UTAS)



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