The threat of non-indigenous marine species towards Tasmanian marine protected areas

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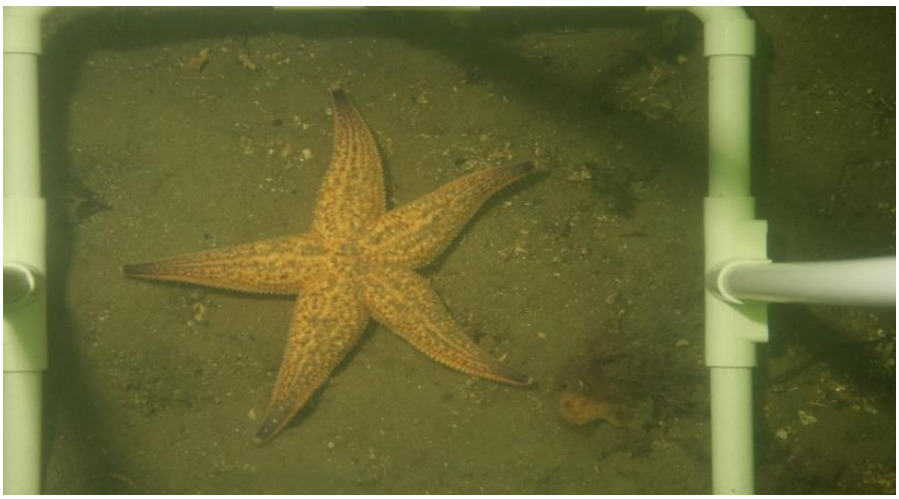
A thesis submitted in fulfilment of the requirements for the Degree of

Master of Philosophy



National Centre for Marine Conservation and Resource Sustainability

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This work contains research (Chapter 3) that was conducted under approval from the University of Tasmania's Social Science Human Research Ethics Committee (Ethics reference number H10546).

Abstract

Marine Protected Areas (MPAs) are one of the most widely used protection methods for vulnerable marine species and ecosystems. An indirect drawback of many MPAs is that they often attract large numbers of people to the MPAs and its surrounds, which increases the potential for detrimental human-mediated impacts. The introduction of non-indigenous species to terrestrial protected areas is a well established hazard directly associated with increased human visitation rates. Similarly, an increased human visitation rate to islands is correlated with higher levels of coastal invasions. Whether this trend exists in marine systems is unknown; with the potential that invasion risk will increase if the people that use the MPA and surrounds are unaware of non-indigenous marine species (NIMS) and their impacts. This thesis aims to explore whether NIMS are a threat to three MPAs in Tasmania, Australia, using two techniques: a qualitative ecological survey to detect NIMS in the selected MPAs; and face-to-face surveys of recreational marine users to see if their activities and their self-rated knowledge of NIMS represents a marine biosecurity issue.

The three MPAs selected for this study were: 1) the Bay of Fires Abalone Research Area (41.11 °S 148.28°E), where collection of abalone is either not allowed or restricted in parts; 2) Governor Island Marine Reserve in Bicheno(41.36°S 148.05.°E), where diving and snorkelling are the only activities allowed; and 3) Tinderbox Marine Reserve(43.11.°S .147.29°E), which is 25.5km south of Hobart and allows diving and snorkelling activities only, but has a boat ramp and boat moorings within the MPA and therefore increased visitation inside the MPA.

A qualitative ecological survey with a nested sampling design was used to detect NIMS within and outside the three study MPAs. There were five haphazardly chosen sites within and immediately outside each MPA; within these sites five randomly placed 10m transects were laid out and on each transect, five 0.10m^2 quadrats were photographed for qualitative analysis upon return to the laboratory. Qualitative methods (photo-quadrats) were selected to minimise impact via destructive sampling, within the protected areas.

A difference between the prevalence of NIMS between MPAs; inside MPAs and outside MPAs; and IUCN categories was found during the photographic survey. Although the sampling methods used covered a large area in order to find NIMS at randomly located sites, a more targeted approach may have been more useful to find NIMS in more vulnerable areas (e.g. boat ramps, moorings jetties etc..) Also more destructive sampling techniques that allow for laboratory analysis of the species in the quadrats would give more certain results for future research on how human could be a vector for NIMS entering MPAs.

A survey instrument (questionnaire) was used to determine the recreational marine activities that occur at boat ramps close to the three study MPAs and to assess the marine recreational users awareness level of four target NIMS (*Undaria pinnatifida*, *Asterias amurensis*, *Maoricolpus roseus*, and *Carcinus maenas*) that are already found in Tasmanian waters. The majority (70%) of questionnaire respondents stated that they are aware of NIMS in Tasmania. Yet the accuracy of identification was very low with the average respondent accurately identifying less than 50% of the target NIMS in the questionnaire. This indicates that there is a potential for recreational marine users to inadvertently transfer NIMS into MPAs because their self-rated awareness was inaccurate, or that they are unaware of the NIMS concept (30% of the respondents). If people are unaware that their actions may be contributing to a problem then the management of this problem needs to address this issue. Therefore, increased use of awareness raising campaigns should be a top priority incorporated into managing the spread of introduced species, especially into areas such as MPAs.

This research aimed to assess the threat of NIMS to three Tasmanian MPAs. After analysing marine recreational user group awareness of NIMS in Tasmania, there appears to be a threat of spread based on the inability of these user groups to accurately identify four well known NIMS that are already well established in Tasmania. Photographic analysis revealed all three sites had been invaded at varying degrees by NIMS. I suggest that a thorough risk analysis that uses semi-

quantitative sampling data linked with a vector analysis for each MPA site would provide direction for improving the management of the threat of NIMS entering MPAs in Tasmania.

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