Abstract

Understanding the capture process in trap fisheries presents challenges because of the complexity generated by social interactions occurring between targeted species in addition to predation by non-targeted species. This thesis examines the impact of these interactions on the formation of groups of rock lobster (Jasus edwardsii) within traps. An assessment was made of how intraspecific and interspecific interactions operate and what approaches and relationships were useful for characterising behaviour and predicting the composition of trapped animals.

To avoid confusion brought on by inconsistencies and poor documentation in the literature, it was necessary to develop a conceptual framework to provide a transparent and sufficient description of the practical components of studying and describing trap capture dynamics. Simulation modelling was used to reconstruct the distribution of the number of lobsters encountering a trap across a set of traps by using the distribution of observed catch levels in traps and a hypothesised relationship between encounter and catch levels. Simulation modelling was also used to investigate the relationship between catch frequency patterns in traps and the encounter and entry patterns that could hypothetically give rise to them.

Catch frequency patterns observed in the Taroona reserve in Tasmania, Australia were used to examine the temporal variation in the pairing between trapped lobsters (J. edwardsii) of the same or mixed gender. In this analysis, the impact of animal size was pooled. Our observations indicated that female lobsters of all sizes independently paired with another female present in the trap in all bi-months with the exception of avoidance behaviour in January-February. The formation of male pairs
exhibited cyclic seasonal change varying from attraction in January to April to avoidance in July-August and a return to attraction in November-December.

The development of group compositions in traps was characterised by analysing a decadal long time-series of seasonal catch data on the observed frequency of traps containing different combinations of gender, size, and within-trap densities of *J. edwardsii* captured in the Taroona reserve. By comparing the relative frequency of different combinations of lobsters, inferences were possible with regard to the behavioural response to trapped conspecifics.

Depensatory mortality in the Tasmanian rock lobster fishery was examined by investigating whether octopus (*Octopus maorum*) killed a higher proportion of lobster in traps when the daily-average number of *J. edwardsii* per trap was lower. Octopus predation was found to be inversely related to lobster catches, suggesting there was some potential benefit from aggregation.