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**The Feeding Ecology and Behaviour of a
predatory shore crab *Ozius truncatus*
(Decapoda: Xanthidae)**

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Abstract

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This thesis documents some aspects of the population ecology, feeding biology and behaviour of the shore crab *Ozius truncatus* (Decapod: Brachyura: Xanthidae), both in laboratory experiments and field sampling. Field research was carried out at Echinoderm Reef near the University of Auckland's Leigh Marine Laboratory in north-eastern New Zealand.

O. truncatus is a predator, sparsely distributed in patches of cobbles in mid to upper regions of the shore. Its distribution overlaps with a wide range of food items in the habitat, including other crabs, coiled gastropods, limpets and chitons. It forages primarily within the cobble patches. Prey species in this habitat on Echinoderm Reef appear to be abundant and crab numbers are considered too low to have a major impact on prey populations.

The crab size most frequently encountered on Echinoderm Reef was between 20-45 mm carapace length (CL) but there was no clear size structure to indicate particular age groups. Strong recruitment occurred from January to March 1997 and was much higher in 1997 than in the corresponding period of 1996. Ovigerous females were observed from October 1996 to February 1997, with a peak in November 1996.

The chelipeds of male and female *O. truncatus* are dimorphic, as in most other molluscivorous crabs, and are used to break open the shells of prey. Laboratory feeding experiments were conducted using crabs ranging from 20-40 mm CL. The prey species used in these experiments were four species commonly found in or adjacent to the cobble habitat: *Nerita atramentosa*, *Melagraphia aethiops*, *Lepsiella scobina* and *Turbo smaragdus*. In the laboratory, all *O. truncatus* preferentially ate the smallest size class of all prey species offered. However, there was high variability in species preference among crabs. Critical prey size for all species increased with crab size, with the size increasing in the order of *Nerita* > *Lepsiella* > *Melagraphia* > *Turbo*. Shell architecture of these prey species, with regard to their vulnerability to

the predator was also studied. *Nerita* shells have a short spire and unique internal shell structure, *Lepsiella* shells have a high spire and terminal axial varices, *Turbo* and *Melagraphia* have more or less the same globose shape. Energy content of the prey species increased with increased shell height. Handling time varied considerably between and within crabs. Overall, the longest handling time was observed for *Turbo*, shortest for *Lepsiella* and *Nerita*, and intermediate for *Melagraphia*.

O.truncatus displayed a rhythm of behaviour which was apparently controlled by an endogenous physiological pacemaker. Under constant conditions in the laboratory, *O.truncatus* exhibited tidal rhythmicity; the mean free-running period of the rhythm was 12.57 h. Actogram results showed peak activity at 11-13 h intervals around high tide, but with some degree of variability. Time series analysis indicated that the tidal clock of *O.truncatus* supports the simple "single pacemaker" model proposed to describe tidal clocks in intertidal animals.

Although there was no significant difference between the behaviour demonstrated by freshly collected and starved crabs, starved crabs spent much more time on feeding and foraging. In the laboratory, *O.truncatus* began activity between 1-2 h before the times of high water in the field, this may help to maximise the time of foraging, avoid desiccation and avoid predation. Further, the temporal activity of *O.truncatus* is likely to be controlled by environmental variables like wave action and hydrostatic pressure in conjunction with an endogenous timing system.

In many aspects investigated *O.truncatus* showed considerable variability within and among individuals, suggesting that this species is flexible and opportunistic in its behaviour and feeding ecology. If this is the case, strictly deterministic models such as the optimal foraging theory are unlikely to be useful in describing or predicting how this crab behaves in its natural habitat.

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