TRADE-OFFS BETWEEN INVERTEBRATE FISHERIES CATCHES AND ECOSYSTEM IMPACTS IN COASTAL NEW ZEALAND[23]

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ABSTRACT

Invertebrate catches are increasing globally following the depletion and collapses of many finfish stocks (Anderson et al. 2011a; Anderson et al. 2011b), however stock assessments and management plans for invertebrates are rare. Recent fisheries research has aimed to understand fisheries impacts at the ecosystem scale, rather than traditional single-species approaches. We have employed an ecosystem modeling approach to explore the tradeoffs between invertebrate fisheries catches and their impacts on the associated reef ecosystem for an area on the south coast of Wellington, New Zealand. Fisheries for lobster (*Jasus edwardsii*), abalone (*Haliotis australis* and *Haliotis iris*), and urchin (*Evechinus chloroticus*) exist in this region, as well as traditional finfish fisheries.

We simulated exploitation for each of these groups over a range of depletion levels, from no depletion to local extinction, to estimate catches and associated ecosystem impacts, using a food web model representing the Wellington south coast, New Zealand (Figure 1; Eddy et al. 2014) and developed using the Ecopath with Ecosim (EwE) approach (Christensen and Walters 2014). In all three fisheries, the current exploitation level is estimated to be greater than that which produces maximum sustainable yield, and a reduction of current depletion of the commercial invertebrates is predicted to increase catches, with less impact on other species in the ecosystem. We found that similar catches could be made at approximately half of the present levels of depletion, which would strongly reduce ecosystem impacts. Exploitation of lobster showed the strongest ecosystem effects, followed by abalone and urchin, respectively.

Ecosystem indicators - relative abundance and keystoneness - for invertebrate groups were useful for predicting the magnitude of ecosystem impacts under exploitation scenarios. Our ecosystem approach has implications for the conservation and management of marine invertebrate resources on broader scales since they can play strong ecosystem roles.

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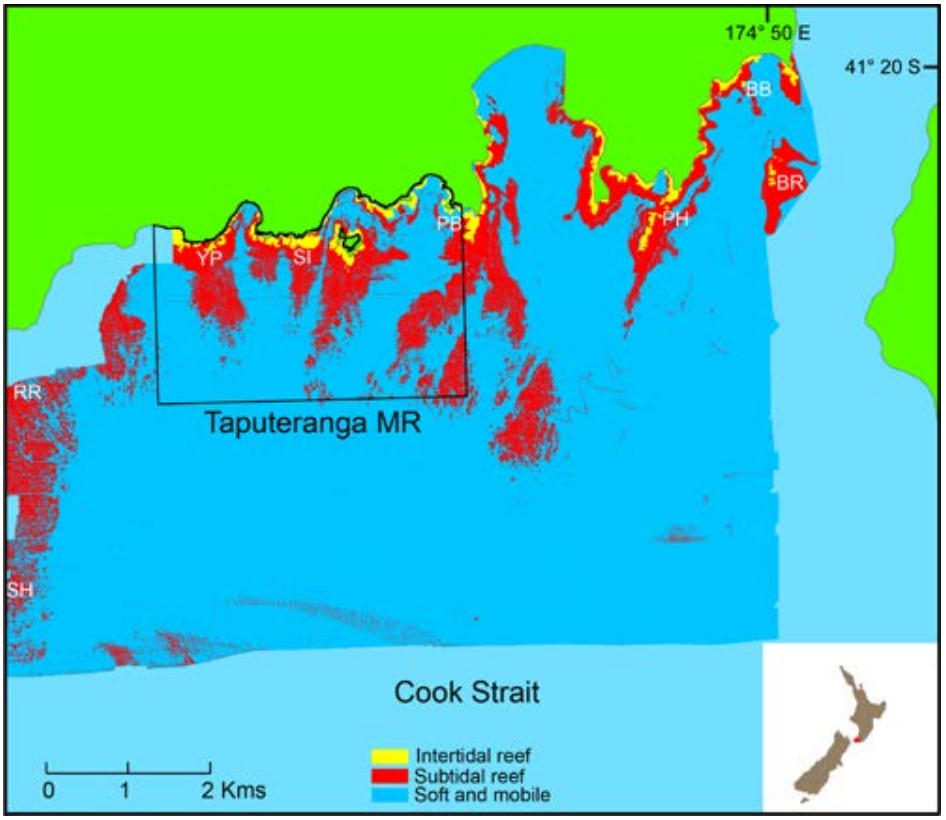

Figure 1. Map of Taputeranga Marine Reserve (black box, labelled Taputeranga MR), and area of the Wellington south coast area for which an EwE model was developed. The location of Taputeranga MR within New Zealand is shown as a red square in bottom right insert. The model area is characterised by different substrate types: intertidal reef (yellow); subtidal reef (red); and soft and mobile substrates (darker blue).