Habitats of Rangatira Reef

How might a breakwater effect the reef?

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Prepared for Napier City Council
Rangatira Reef

- Patch reef complex of boulders/cobbles
- 5.5ha of intertidal and subtidal reef area
- Highly dynamic, physically dominated environment
- High species diversity
- Widely valued reef system
Introduction

• Sth Westshore coastal protection programme
• Ecological implications for Rangatira Reef
• Classification & mapping of habitats
• Assessment of Environmental Effects
Research Aims

● What habitats comprise subtidal Rangatira Reef?
● How can these habitats be characterised?
● Where do these habitats occur?
● What are the likely effects of a breakwater on the reef?
Methodology

- Underwater survey with integrated GPS location data – GIS approach
- Digital photo and video transects of reef
- 0.25m² quadrats used to assess habitat types (n = 182)
- Habitat map produced using interpolation of photopoints
Photo transects
Video transects
Results

• High species diversity in general
• Reef complex variously comprised of cobbles, pebbles, gravel, sand and mud
• 6 representative habitat types identified
  – Turfing algae
  – Encrusting invertebrate
  – Shallow Carpophyllum
  – Cobbles
  – Sand
  – Red foliose algae
Cobble (CO)

- Generally in shallower areas
- Unstable, high levels of agitation
- Crustose coralline algae
- High cover of bare rock and sand
- Large brown algae generally absent
- c. < 0.5m diam. cobbles
Sand (SA)

- Generally occurs in shallower areas
- Absence of hard reef substrate
- Coarse sand dominant
- Rippled - indicative of high mobility
- Few macrofaunal species
Red Foliose algae (RF)

- Substratum predominantly covered by red foliose algae
- Karengo (*Porphyra* sp.) and *Pterocladia lucida*
- Low numbers of large brown algae
- Reef substratum mainly boulders with some cobbles
Shallow Carpophyllum (SC)

- Dominated by Carpophyllum maschalocarpum.
- Cystophora spp. also common
- Substratum mainly stable aggregations of cobbles and pebbles
Turfing Algae (TA)

- Turfing algae (e.g. articulated corallines) >30% cover
- Low numbers of large brown algae
- Reef substratum mainly pebbles and gravel with few cobbles
Encrusting invertebrate (EI)

- Substratum mainly covered with ascidians/anemones
- Horse mussels common
- Large brown algae absent
- Reef substratum: gravelly mud interspersed with cobbles
- Generally occurs in deeper areas
Habitat locations
Habitat frequency & diversity

![Bar chart showing habitat frequency and diversity across photo transects.]

- **A.** % frequency by photo transect:
  - Transect 1: 50%, 30%, 20%, 10%, 0%
  - Transect 2: 40%, 30%, 20%, 10%, 0%
  - Transect 3: 30%, 30%, 20%, 10%, 0%
  - Transect 4: 20%, 30%, 20%, 10%, 0%
  - Transect 5: 10%, 30%, 20%, 10%, 0%

- **B.** Mean # spp / hab type (+1SE):
  - **Habitat type**
    - Cobble: 2.5 ± 0.5
    - Sand: 1.5 ± 0.5
    - Encrusting invertebrate: 3.0 ± 0.5
    - Shallow C. carrhythum: 2.0 ± 0.5
    - Red foliose algae: 1.5 ± 0.5
    - Laminaria algae: 3.5 ± 0.5
Summary

- Physically dominated, frequently disturbed environment
- Elevated species diversity among SC, RF, TA and EI habitats
- General ordering of habitats along gradients of disturbance frequency and intensity
Atrina zelandica (Horse mussel) beds

• Habitat modifier
  – Refugia for juvenile fish
  – Alters boundary flows
  – Source of biodeposits

• Beds may potentially incr. abundance and species richness
Breakwater Proposal
## Breakwater Effects

- Significant area of reef lost to breakwater and created beach

<table>
<thead>
<tr>
<th></th>
<th>Area (m²)</th>
<th>Relative area of the reef lost (Rangatira Reef = 54,930 m²)</th>
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</thead>
<tbody>
<tr>
<td>Proposed Breakwater</td>
<td>4,320</td>
<td>7.9%</td>
</tr>
<tr>
<td>Created beach</td>
<td>9,586</td>
<td>17.5%</td>
</tr>
<tr>
<td>Total</td>
<td>13,906</td>
<td>25.4%</td>
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</tbody>
</table>
Breakwater effects

- Cobble habitat loss likely to be largest
- Some direct loss of SC, TA, RF, and El habitat including an *Atrina* bed
- Re-ordering of habitats along margin of breakwater over time
- Some sediment related effects likely during construction
**Effects Assessment**

- Significant loss of habitat
- Biodiversity loss considered minor
  - Surveyed species common on neighbouring reefs
- Low risk of sediment related problems during construction
  - Highly dynamic environment results in high sediment mobility
Response measures

• Implement sediment control measures during construction
• Follow up surveys to monitor effects on ecology
Conclusions

• Rangatira Reef is a valued and unique resource
• A significant area of habitats will be lost with the construction of a breakwater
• Effects on benthic ecology are likely to be minor if habitats can re-establish over time