

# Marine environments of Kawau Bay and beyond

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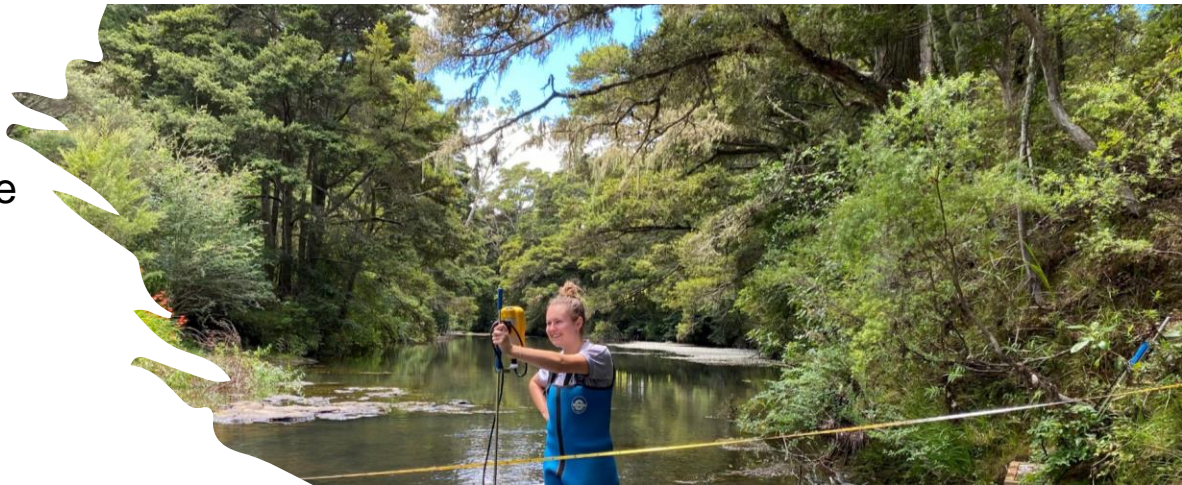
# Talk structure

- Background
  - RIMU – who we are & what we do
  - Recent State of the Environment reporting
- General marine ecology
- Pressures affecting marine environments
- RIMU marine monitoring
- Habitats of Kawau Bay
- Questions

# Research & Evaluation Unit (RIMU)

# RIMU

- Multi-disciplinary research and monitoring unit
  - Spatial Analysis & Modelling
  - Social and Economic
  - Hydrology & Environmental Data Management
  - Water Quality
  - Air, Land & Biodiversity
- Auckland Plan Strategy and Research (APSR) Department within CPO
- Our primary function is to provide robust evidence to inform policy and strategy development and evaluate council activities







# State of the Environment Monitoring

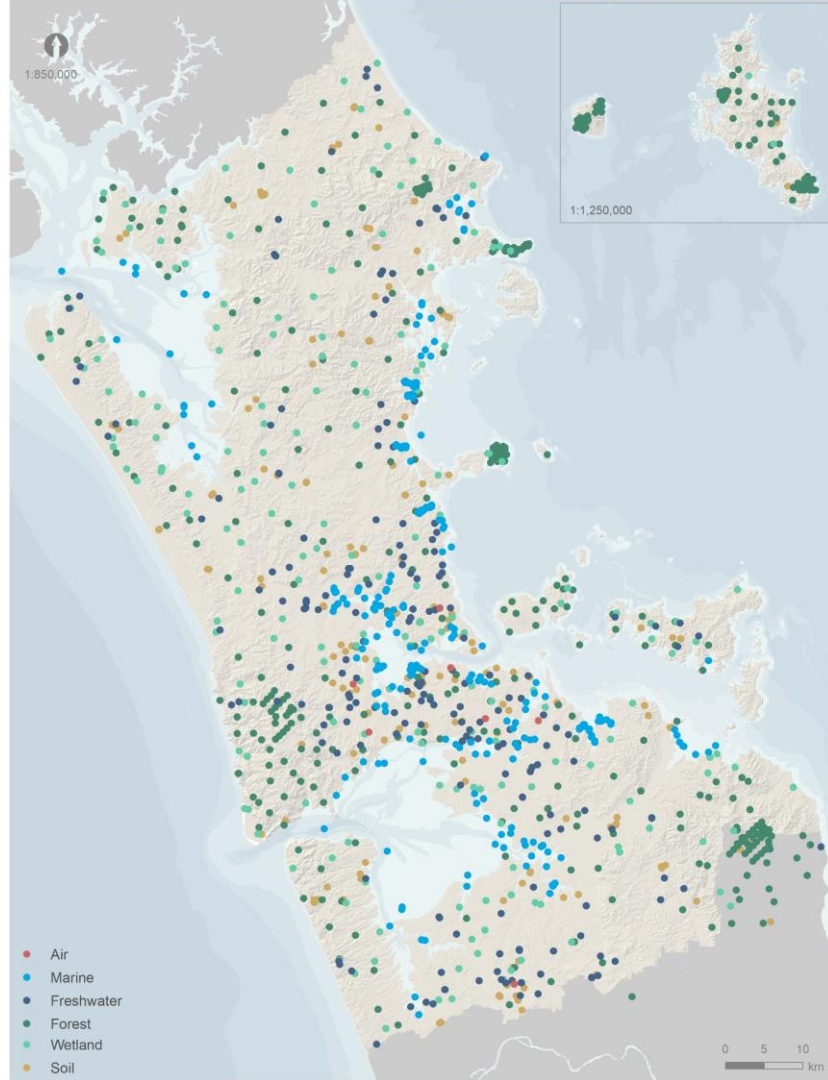
- Section 35 RMA specifies duty to gather information, monitor and keep records
- Systematic process - planned and repeated collection of data
  - Regional cover
  - Representativeness
  - Length of data record
  - Statistical design and analysis
- Monitoring occurs every day across the region, some data collected continuously, others weekly, monthly or annually



# Regional monitoring network

**RIMU monitors and researches the Auckland region's natural resources, including:**

- Freshwater - streams, lakes & groundwater
- Marine - harbours, estuaries, reefs & beaches
- Soil - erosion, contaminants, nutrients & quality
- Land - forests, scrub, dunelands & wetlands
- Greenhouse Gas (GHG) emissions
- Air - particulates, NO<sub>2</sub>, SO<sub>2</sub>, O<sub>3</sub>, CO, other contaminants







**FORESTS & WETLANDS**  
[2009 +]

**RAINFALL**  
[ALBERT PARK 1872 +]

**AIR QUALITY**  
[1993 +]

**AQUIFERS**  
[1977-1997 +]

**LAKES**  
[1988 +]

**TIDES**  
[WAITEMATA 1898 +]

**RIVER WATER QUALITY**  
[CASCADES, WAIROA, OPUNUKU 1907 +]

**CONTAMINANTS IN SEDIMENTS**  
[1998 +]

**RIVER ECOLOGY**  
[MCI 1999 +]  
[SEV 2009 +]

**MARINE ECOLOGY**  
[MANUKAU HARBOUR 1987 +]

**RIVER FLOW**  
[1969 +]

**SOILS**  
[1995 – 2001]  
[2005 +]

# Technical reports underpinning synthesis report

Ecological integrity  
of forests (2009 –  
2019)

Diversity,  
abundance, and  
distribution of birds  
(2010- 2019)

Groundwater  
quality state and  
trends (2010-2019)

Lake water quality  
state and trends  
(2010-2019)

Marine sediment  
contaminant state  
and trends (2004-  
2019)

River ecology state  
and trends (2010-  
2019)

River flow and  
groundwater level  
state and trends  
(2010-2019)

River water quality  
state and trends  
(2010-2019)

Marine ecology  
state and trends (to  
2019)

Coastal and  
estuarine water  
quality state and  
trends (2010-2019)

Greenhouse Gas  
Inventory (to 2018)

Air quality (2006-  
2018 *published in*  
2019)

Soil quality and  
trace elements  
(1995-2017  
*published in 2019*)

All reports available at <https://knowledgeauckland.org.nz/>



# Context

- 2015 SOE showed ongoing environmental decline
  - History of land change
  - Increasing and changing population
  - Expanding and changing land use
  - Climate change
- Main changes since 2015 have been in our policy frameworks and responses
  - Auckland Unitary Plan made operative
  - Refresh of the Auckland Plan
  - Introduction of targeted rates
  - *Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan*
- National reporting and monitoring requirements





## 2020 SOE in summary

- Air quality is generally good and improving but has declined in the CBD.
- Minor improvements in water quality in some places, however improvements are mostly small, slow and are not occurring region wide.
- Improvements in native forest and birds where we put in substantial investment and management.





# 2020 SOE in summary

- Small improvements, but still, plenty of work to do to address historical degradation and build resilience in our environment
- It will take time and continued effort by all
- Challenges for the environment in Tāmaki Makaurau remain large, with continued population growth and the impacts of climate change
- Monitoring and reporting is a critical part of navigating these challenges and opportunities

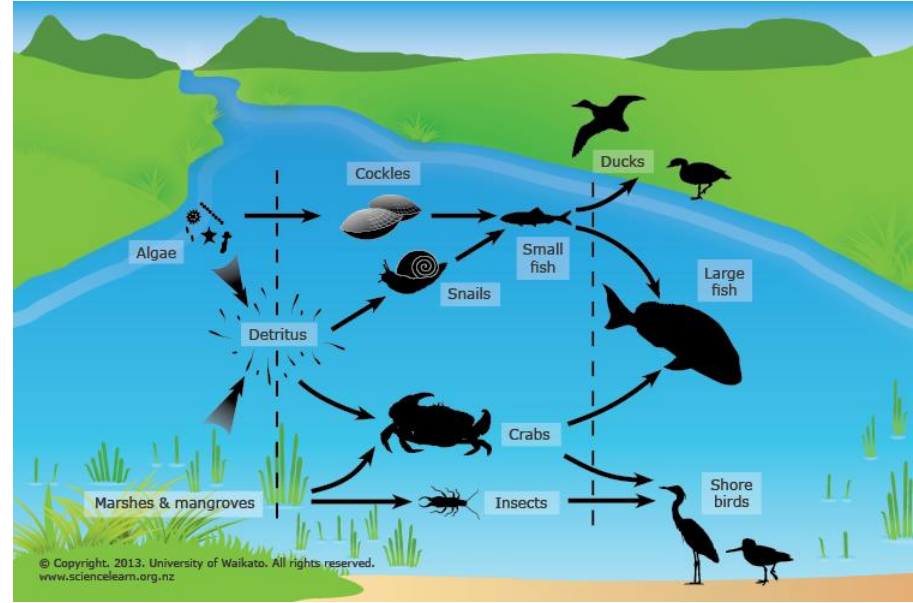


# General marine ecology



# What is marine ecology?

- The study of the relationships between marine organisms and their environment, and the balance between these relationships
- “The first law of ecology is everything is connected to everything else”



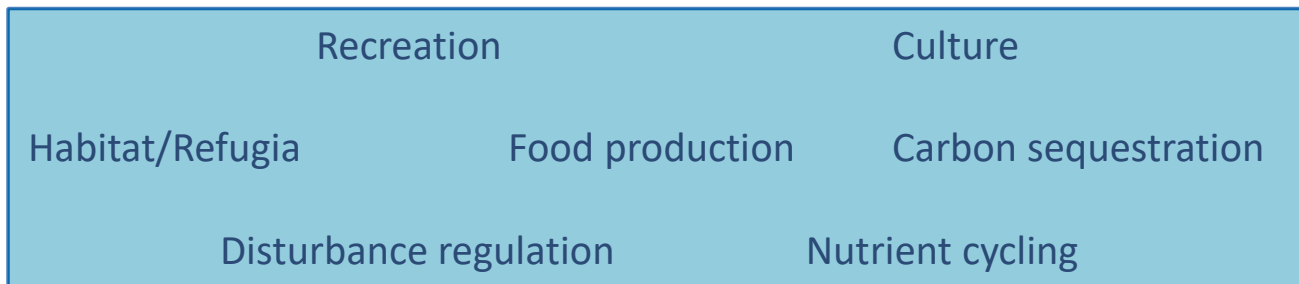
# What is marine ecology?

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# Why is marine ecology important?

## ***Ecosystem services***





Recreation

Habitat/Refugia

Food production

Disturbance regulation



Culture

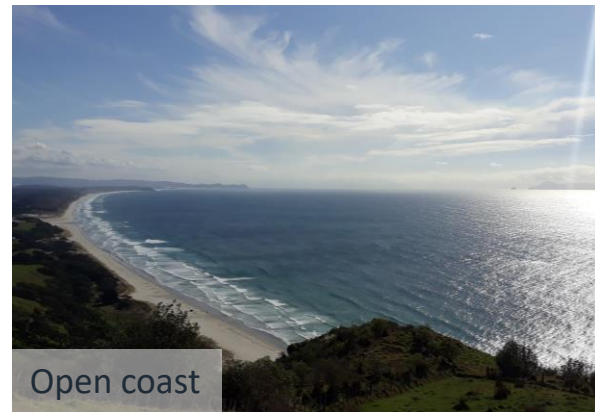
Carbon sequestration

Nutrient cycling



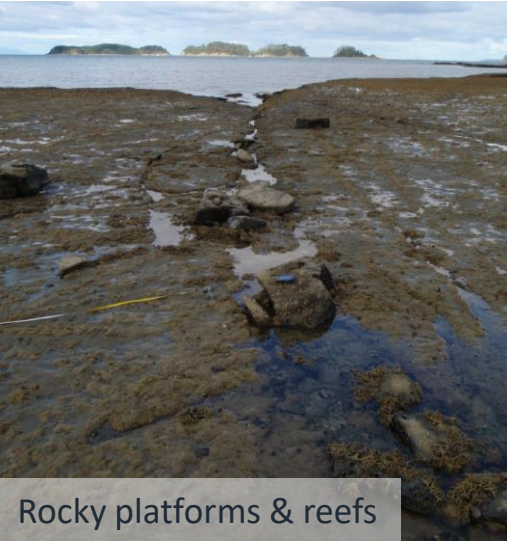


# Varied coastal ecosystems





# Varied coastal habitats



Rocky platforms & reefs



Shellfish beds



Sandflats



Mangroves



Seagrass



Wetlands

# Pressures affecting marine ecology

# Pressures



Diagram credit: [www.waikatoregion.govt.nz](http://www.waikatoregion.govt.nz)



# Pressures

- **Excess sediment**
  - Reduces water clarity (increased turbidity)
  - Smothers filter feeding organisms
  - Increases muddiness of sandflats



# Pressures

- **Contaminants**
  - Toxic to some marine organisms
  - Metals – mostly urban sources
  - Organic contaminants – medicines, personal care products
  - Emerging contaminants – some organic chemicals, microplastics



# Pressures

- **Excess nutrients**
  - Promote nuisance algal blooms
  - Reduces light availability for seafloor primary producers
  - Deposited on sandflats & beaches
  - Decomposition has social & ecological impacts



# Pressures

- **Invasive species**

- Displace native species
- Disrupt ecological functions
- *Sabella* (Mediterranean fanworm),  
*Styela* (clubbed tunicate/Asian  
sea squirt) and  
*Eudistoma* (droplet tunicate)  
known to occur in local area





# Pressures

- **Habitat loss/disturbance**

- Boats anchoring
- Coastal development
- Sedimentation
- Dredging
- Reduced diversity of habitats & hence ecological communities



# Pressures

- **Climate change**
  - Sea level rise
  - Warmer waters and air temperature
  - Coastal acidification – decreasing pH
  - Decreasing nutrients
  - Alterations to wind and current patterns
  - Extreme rainfall events – sediment input
- Intertidal habitats due to coastal squeeze
- Subtidal rocky reefs and kelp forests
- Marine shellfish also highly sensitive
- Climate driven impacts interacting with existing anthropogenic impacts.
- Need to focus on resilience and ability for systems to move

<https://knowledgeauckland.org.nz/media/1083/tr2019-015-climate-change-risk-marine-freshwater-final.pdf>



# RIMU marine monitoring

# Marine monitoring programmes

- Marine ecology & benthic health
- Sediment contaminants
- Coastal water quality
- Marine habitats
- Reef ecology
- Beach profiling
- Sea & shorebirds

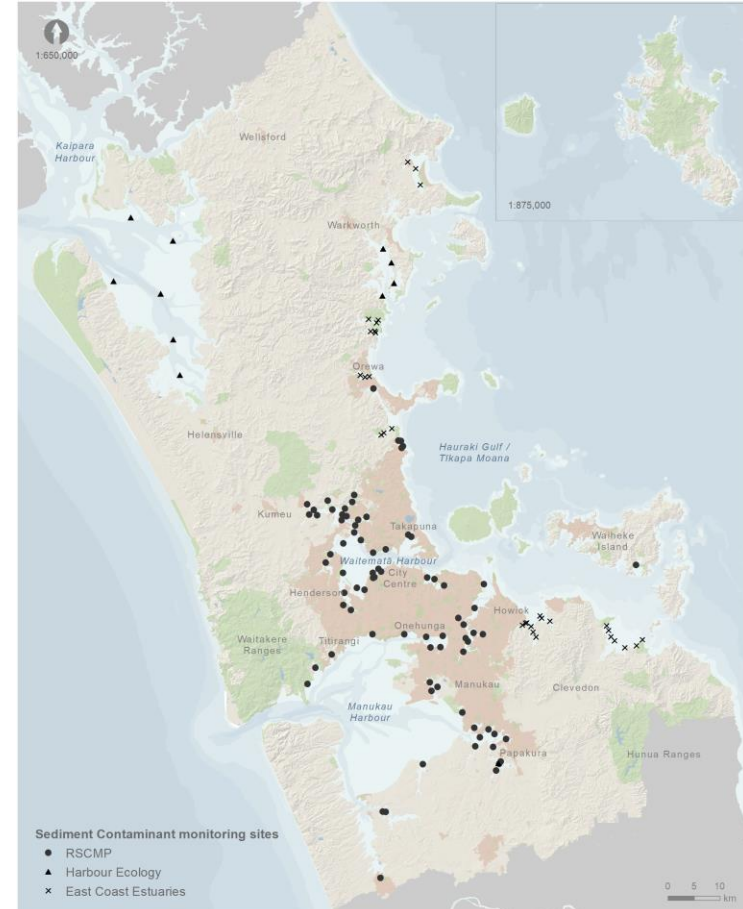






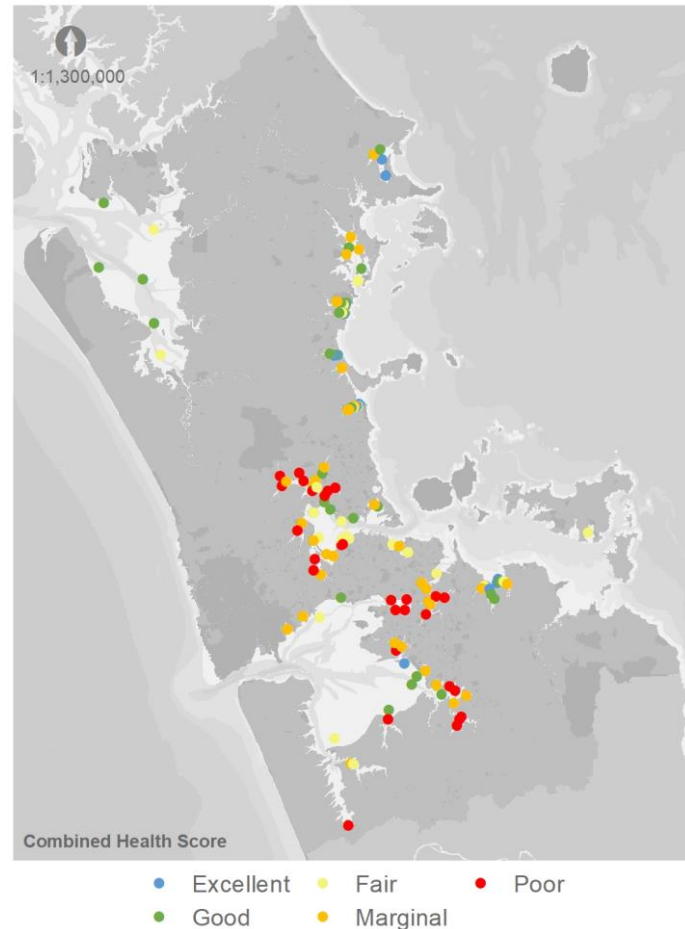
# Regional marine condition

- Sediment contaminants
  - 120 sites across the region
  - Most sites have relatively low levels of contaminants
  - Muddy estuaries & sheltered tidal creeks in intensively urbanised or industrialised catchments tend to have highest levels of contamination



# Regional marine condition

- Marine ecology & benthic health
  - 110 sites across harbours & estuaries
  - Focus on the animal communities living in & on the sediments
  - Health indices calculated based on the species present & their abundances
- Pattern of improving health as distance from major urban centres increases
- Impacts from sedimentation have been detected in all harbours/estuaries
- Metals also affect health across the region but not as prevalent



**Marine Ecology State and Trends in Tāmaki Makaurau / Auckland to 2019. State of the Environment Reporting**

Tam P. Drylie

February 2021

Technical Report 2021/09

# Habitats of Kawau Bay



# Habitats

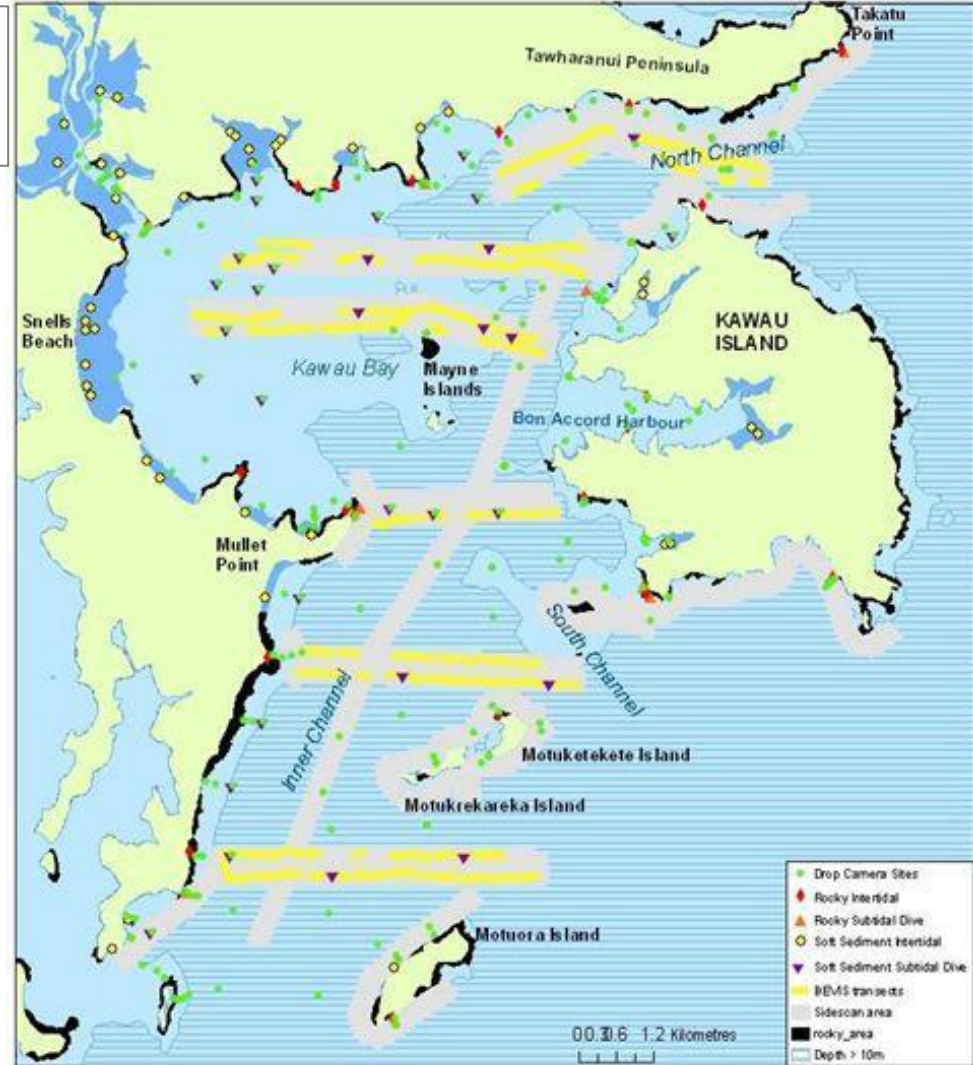
## Benthic Marine Habitats and Communities of Kawau Bay

August 2008

TR 2008/006

Survey had 3 components:

- Large-scale sampling of subtidal areas by video & side-scan sonar
- Transect sampling of intertidal & subtidal by video
- Point sampling of intertidal & subtidal using quadrats & cores



# Habitats

## Benthic Marine Habitats and Communities of Kawai Bay

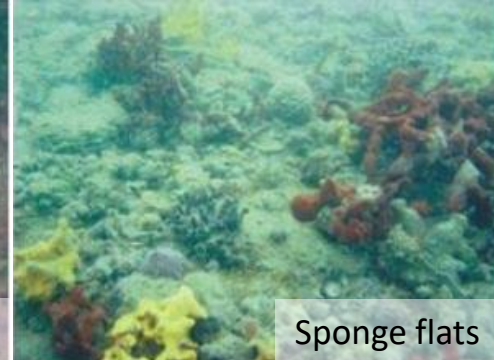
August 2008

TR 2008/006

- Area of high habitat diversity
- Communities vary from those dominated by large macroalgae to dense epifauna
- High taxonomic diversity, particularly in soft-sediment subtidal areas
- Many species are large, long-lived & include those associated with more pristine environments
- A range of community types representing different ecological functions



Mixed epifauna



Sponge flats



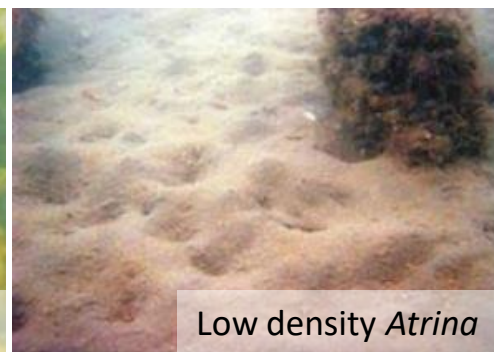
Sponge & scallop



*Carpophyllum* forest



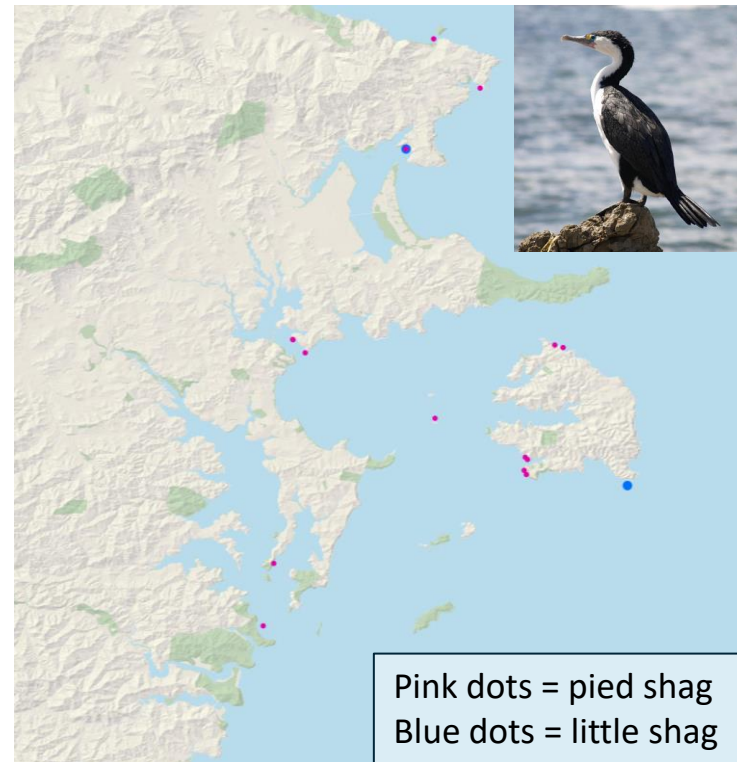
*Ecklonia* forest



Low density *Atrina*

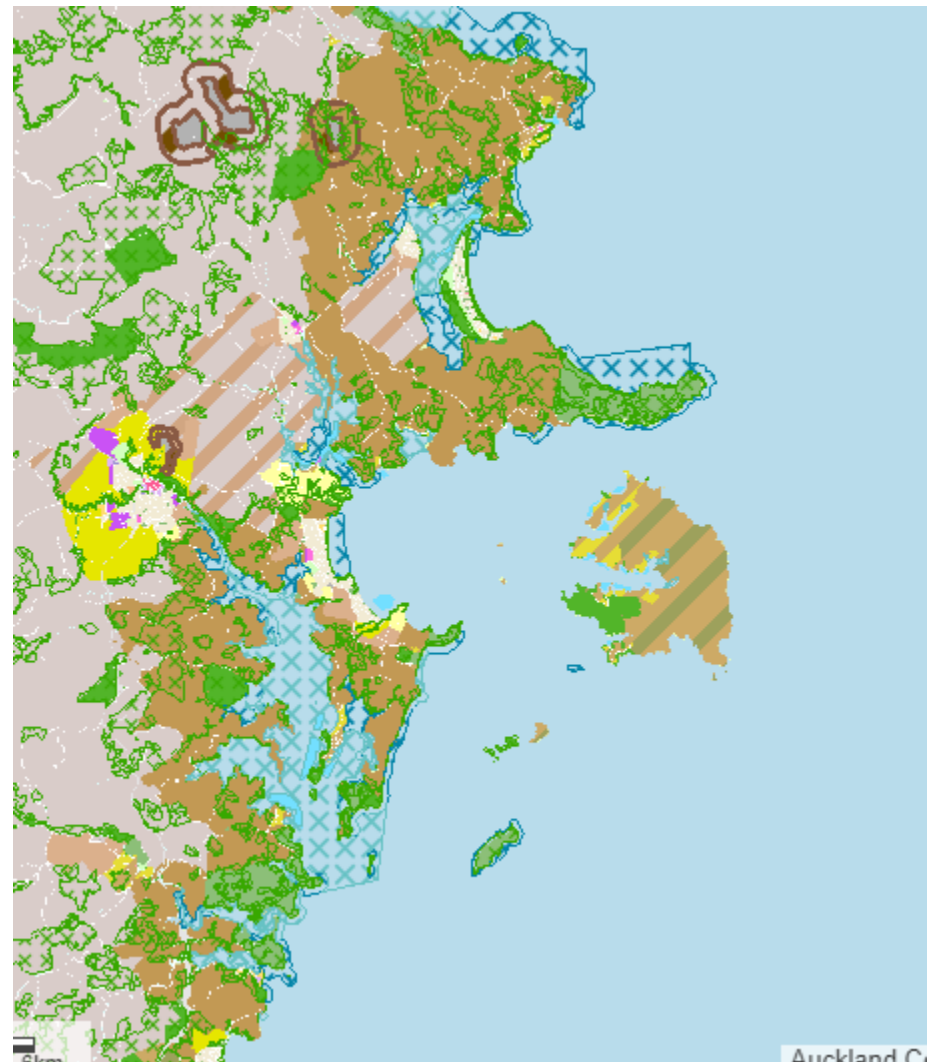
# Seabird monitoring

- Monitoring of east coast for shag colonies
- 2 colonies found in Mahurangi Harbour
- 1 colony and 1 roosting spot in Sandspit
- 3 colonies and 3 roosts on Kawau Island
- Sandspit colony selected as an indicator for the area



# Significant Ecological Areas Marine – (Schedule 4)

- SEA\_M1
  - Martins Bay – ecotone
  - Mullet Point – sequence
  - Snells beach seagrass
  - Matakana River mouth
  - Specific areas of Mahurangi
  - Specific areas of Whangateau
  - Ti-point
  - Behive Island Kawau Bay
- SEA\_M2
  - All of Mahurangi Harbour
  - Matakana River and Sandpit
  - Whangateau Harbour
  - Upper North Cove and Bon Accord Harbour, Kawau Island



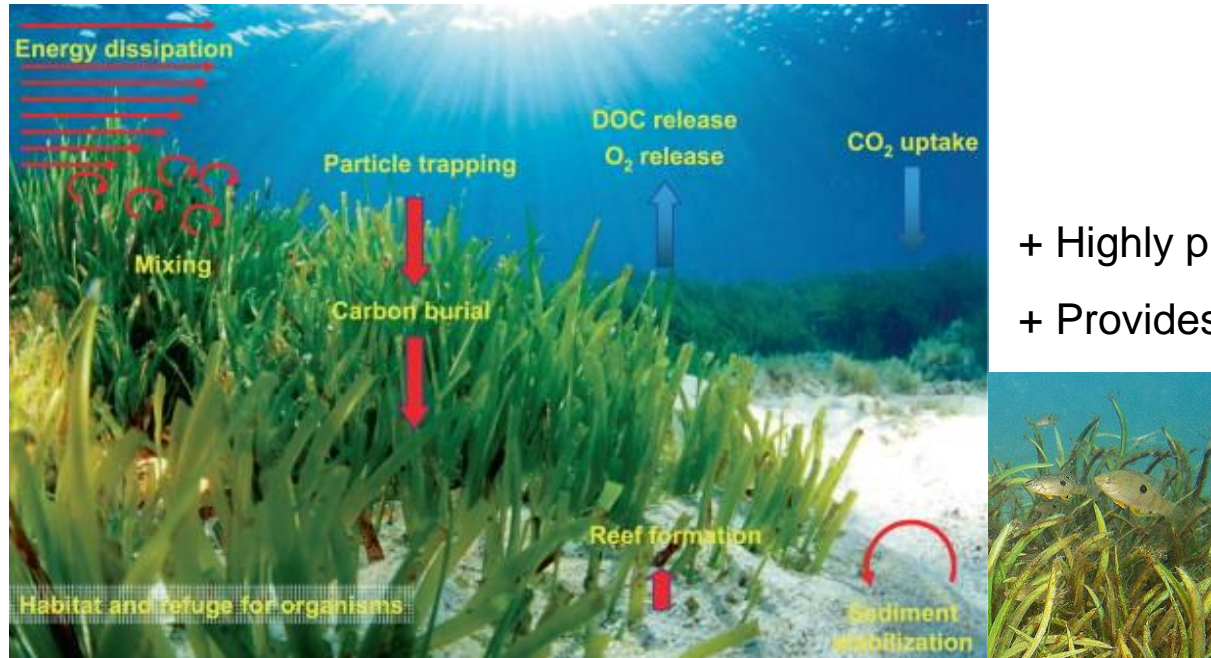


# Seagrass

- *Zostera muelleri*
- Flowering marine plant
- Native to New Zealand & Australia
- Only seagrass species in NZ
- Adapts to local conditions



# Seagrass



- + Highly productive
- + Provides nursery habitat for fish

# Seagrass

- Used to be prevalent across the region (& the country)
- Major die-offs between 1930s and '70s, particularly of subtidal meadows
  - Wasting disease?
  - Sedimentation?
- Return to Kawau Bay
  - Improvements in water clarity?
  - Long-term cycles &/or slow recovery from wasting disease?



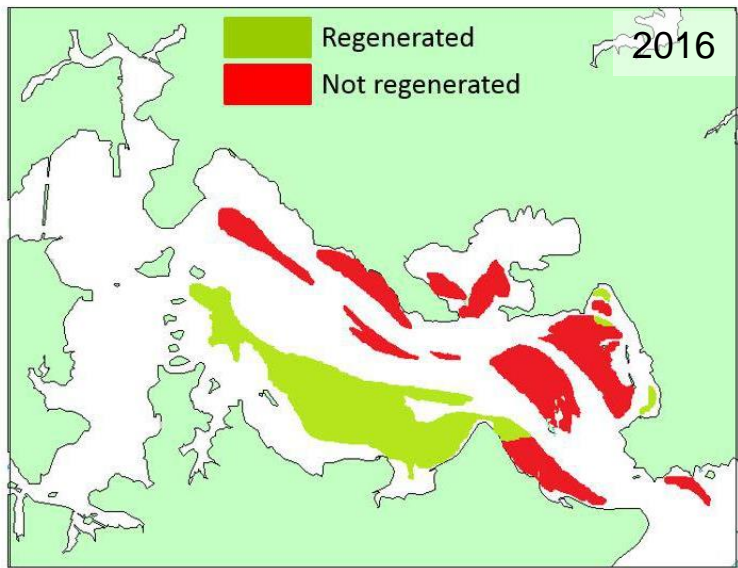


# Seagrass



- Restoration efforts
  - Whangarei Harbour
    - Declines in 1960s
    - Changes to industrial discharge & harbour dredging practices led to improvements in water clarity
    - Successful transplants in 2008
  - Porirua Harbour, Wellington
    - Declines in 1980s due to sediment pollution
    - No improvement to sediment condition
    - Failed transplants in 2015

<https://seagrassrestorationnetwork.com/zostera-restoration-in-nz>





# Further information

- Knowledge Auckland
  - <http://www.knowledgeauckland.org.nz/>
- Environment Auckland Data Portal
  - <https://environmentauckland.org.nz/>
  - [rimu@aucklandcouncil.govt.nz](mailto:rimu@aucklandcouncil.govt.nz)
- Questions?
  - [Megan.Carbines@aucklandcouncil.govt.nz](mailto:Megan.Carbines@aucklandcouncil.govt.nz)
  - [Tarn.Drylie@aucklandcouncil.govt.nz](mailto:Tarn.Drylie@aucklandcouncil.govt.nz)

