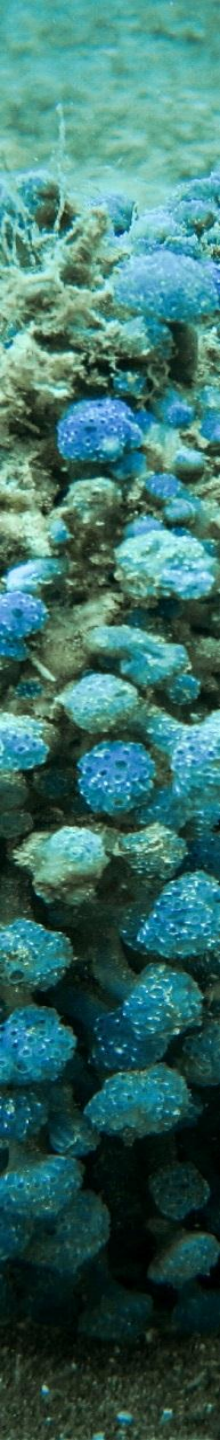


# 2014 Hauraki Gulf SoE Report:

## Biodiversity

Shane Kelly



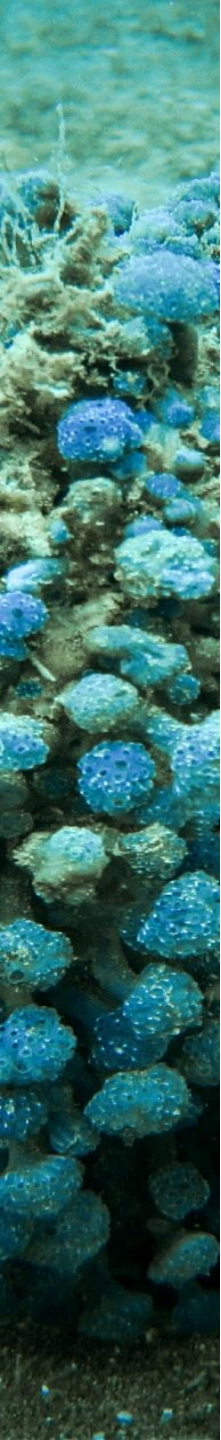
# Outline

- Key lessons in relation to biodiversity
- Four types of activity pose the greatest challenge (plus threatened species)
  - Climate change excluded (global)
  - Scale and magnitude of effects



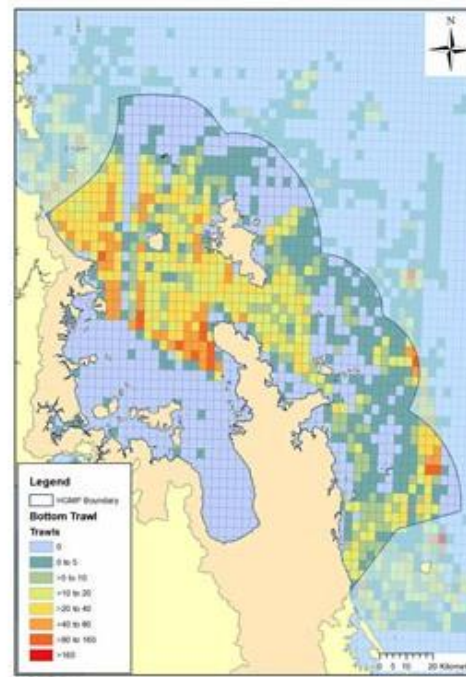
# Key challenges

- Fishing
- Rural land management
- Activities that facilitate the introduction, growth and spread of invasive species
- Urbanisation and coastal development
- Threatened species

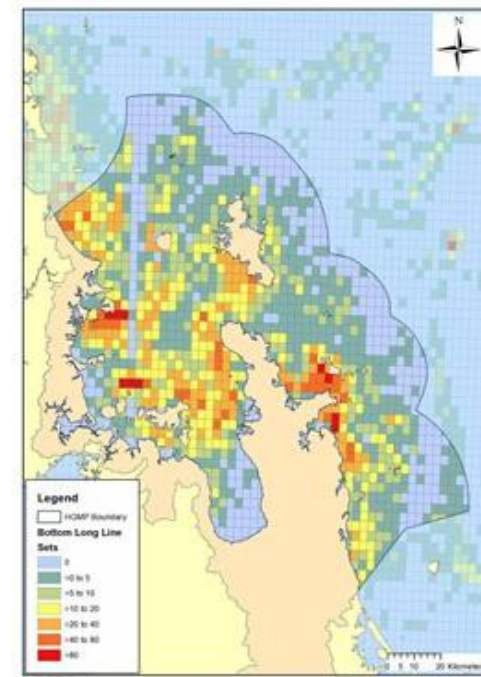


# Fishing scale: Finfish

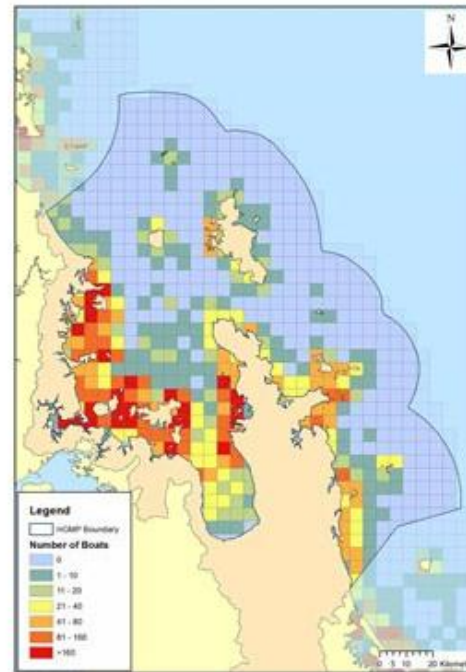
a.



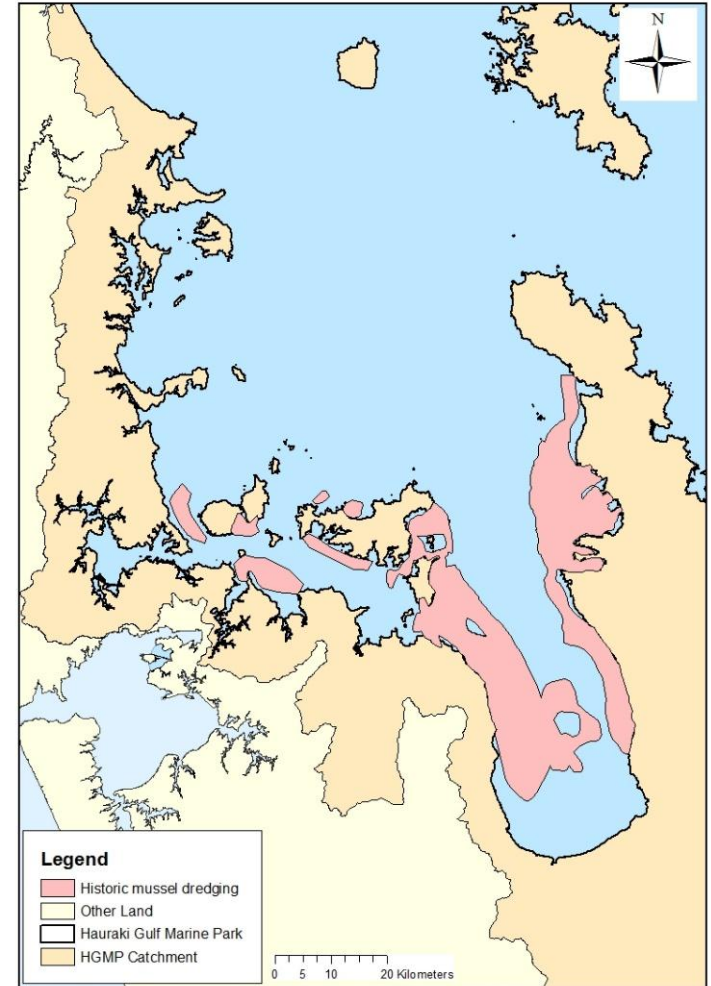
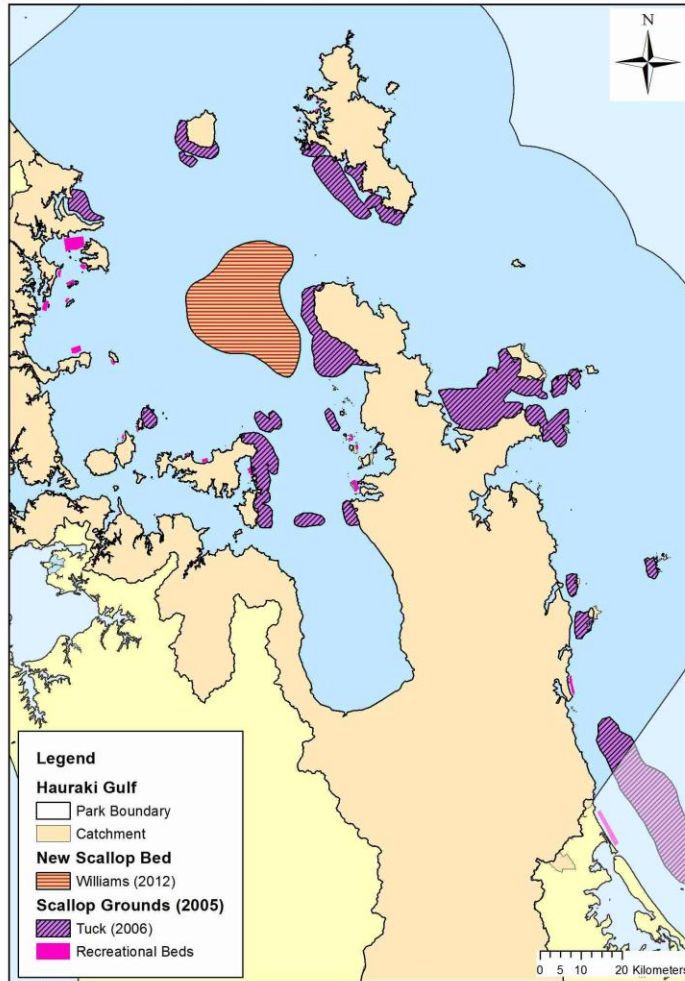
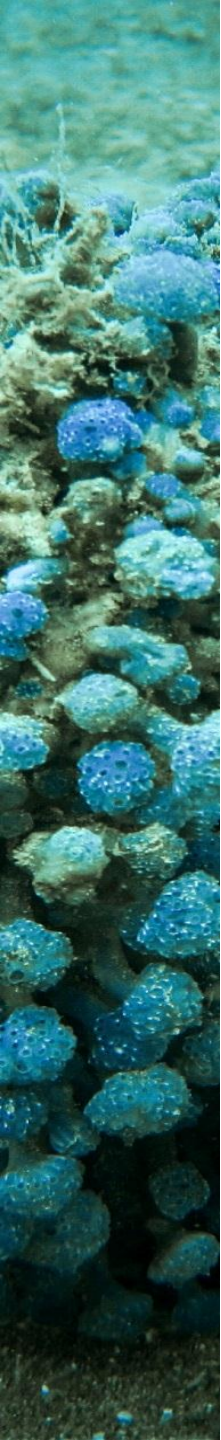
b.



c.



# Fishing scale: Shellfish dredging

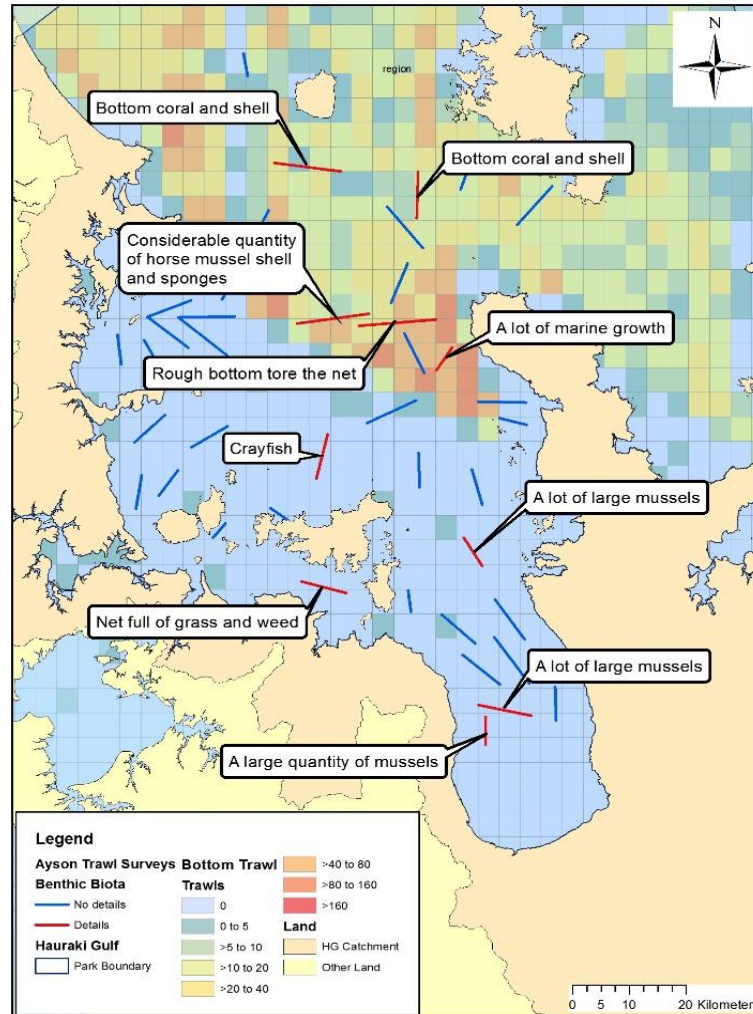
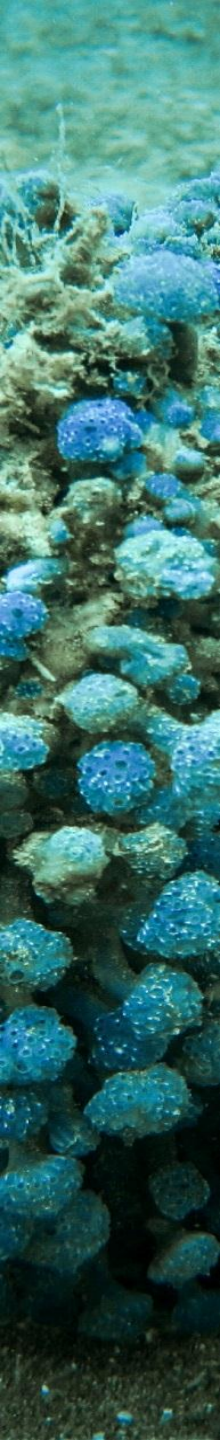




# Fishing magnitude: Bottom disturbance

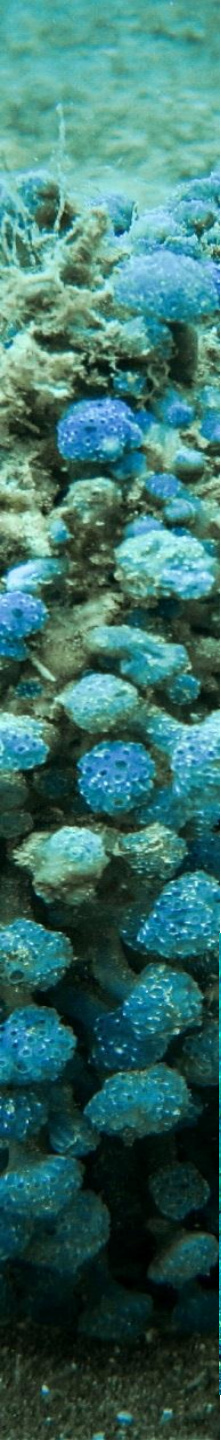
- NZ marine scientists rank trawling 3<sup>rd</sup> equal and dredging 7<sup>th</sup> of 65 identified threats to marine habitats.
- This is consistent with the fact that important biogenic features in the Gulf have already lost
- 12,450 bottom trawls between 2011 and 2013, and 27,600 commercial scallop dredge tows between 2010 and 2012.

# Fishing magnitude: Historic features



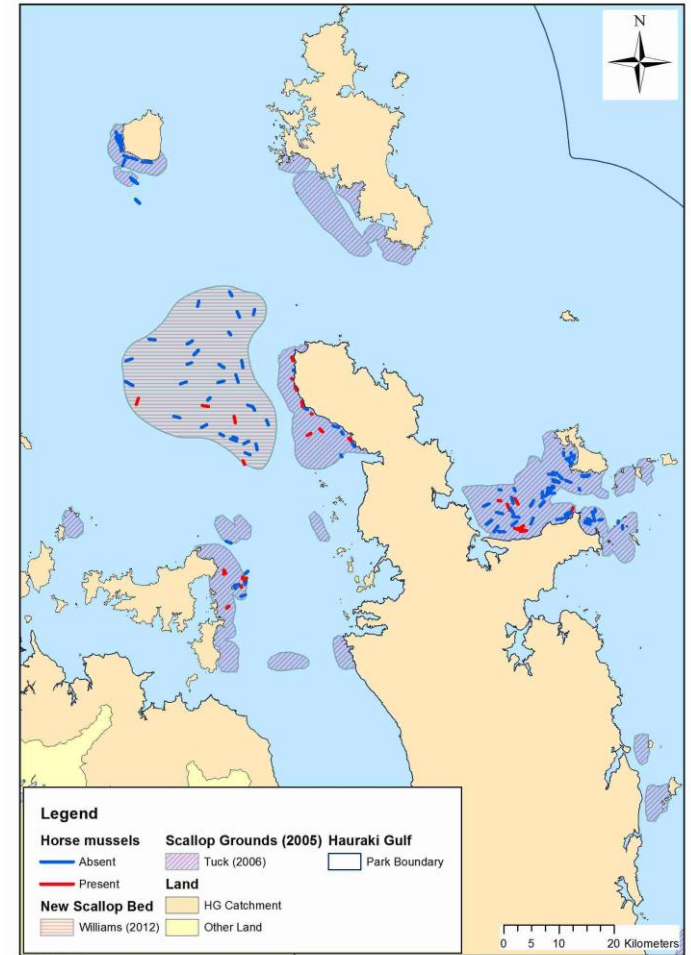
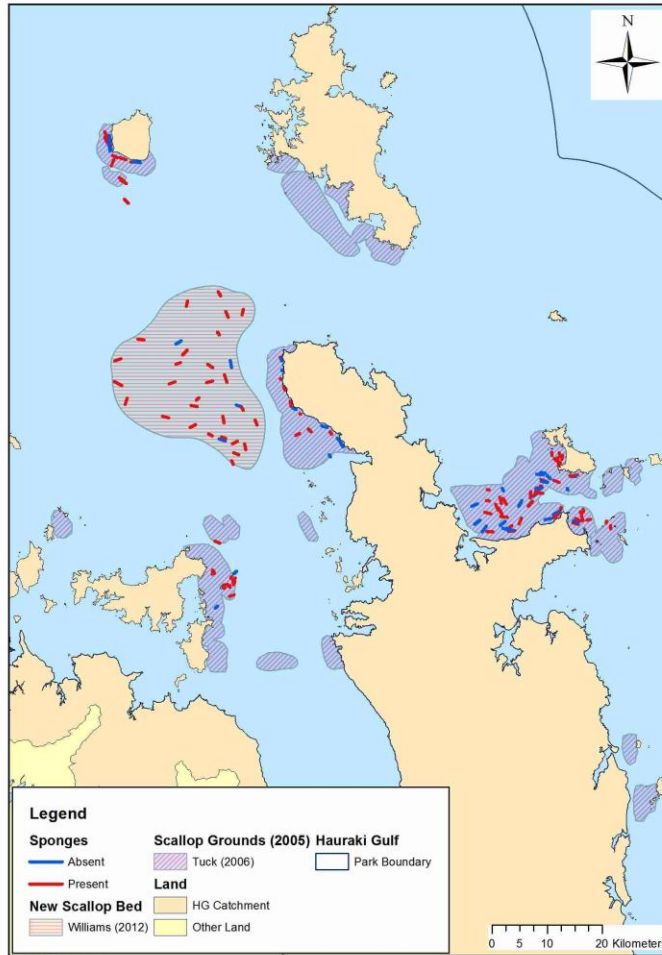
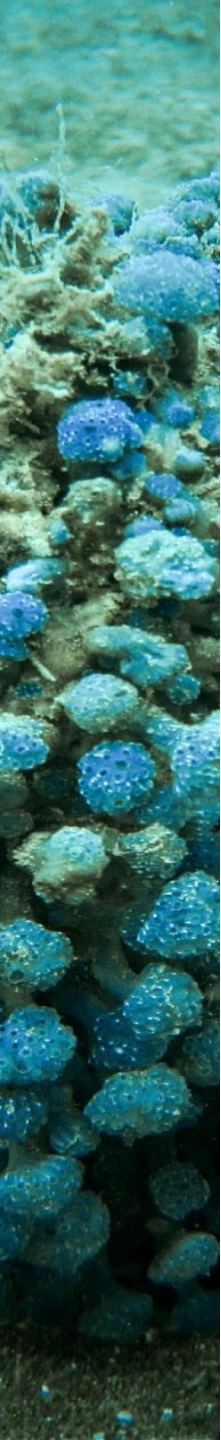
# Fishing magnitude: Sensitive marine habitats

- Beds of large bivalve molluscs (scallops, horse mussels and dog cockles)
- Sponge gardens
- Macro-algal beds

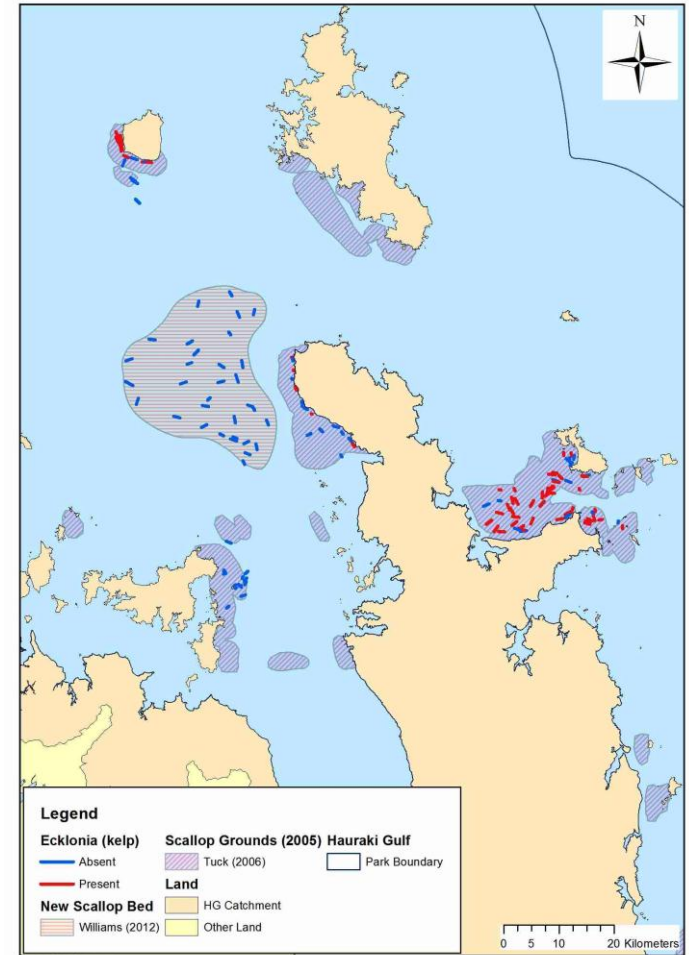
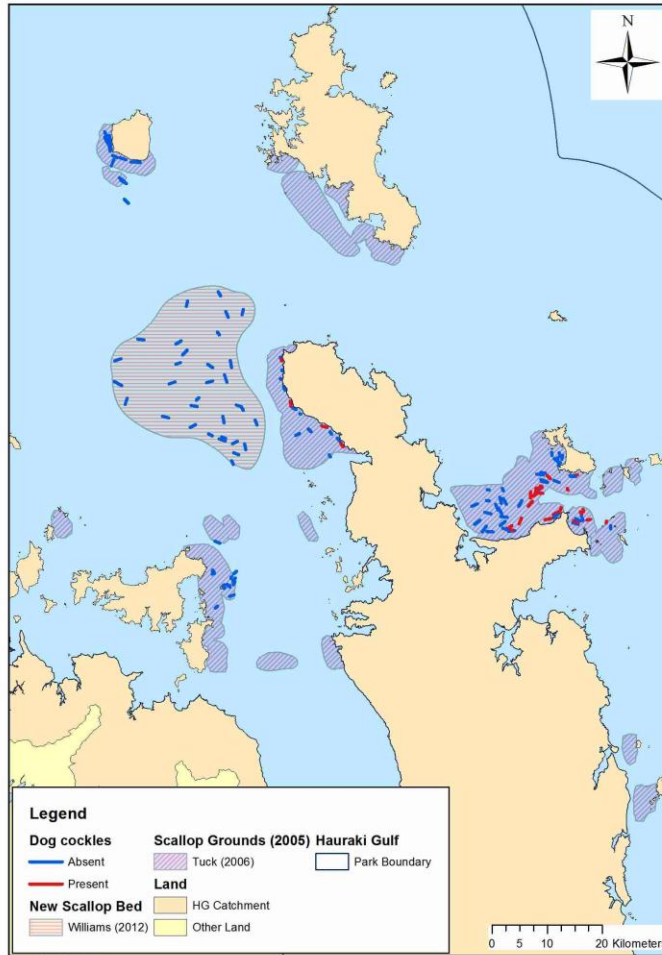
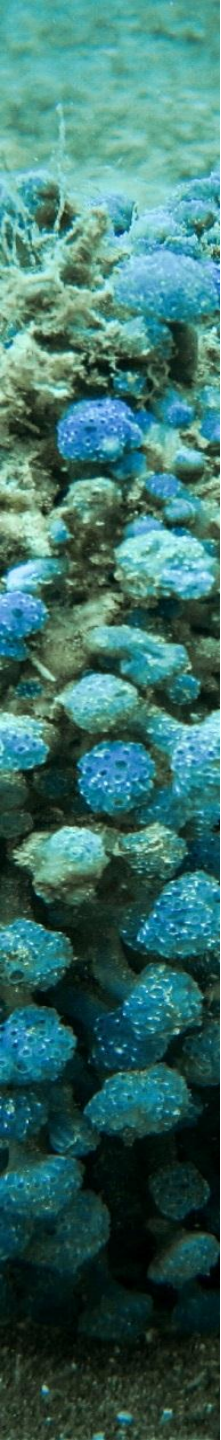




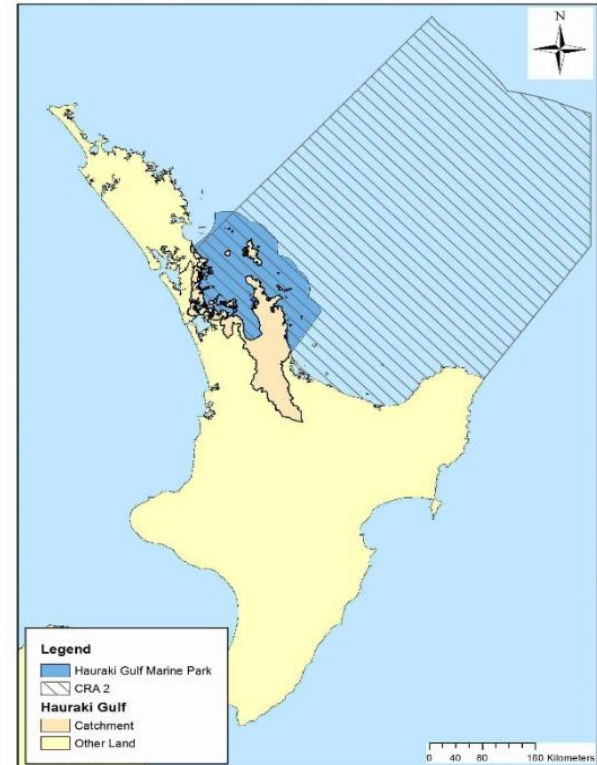
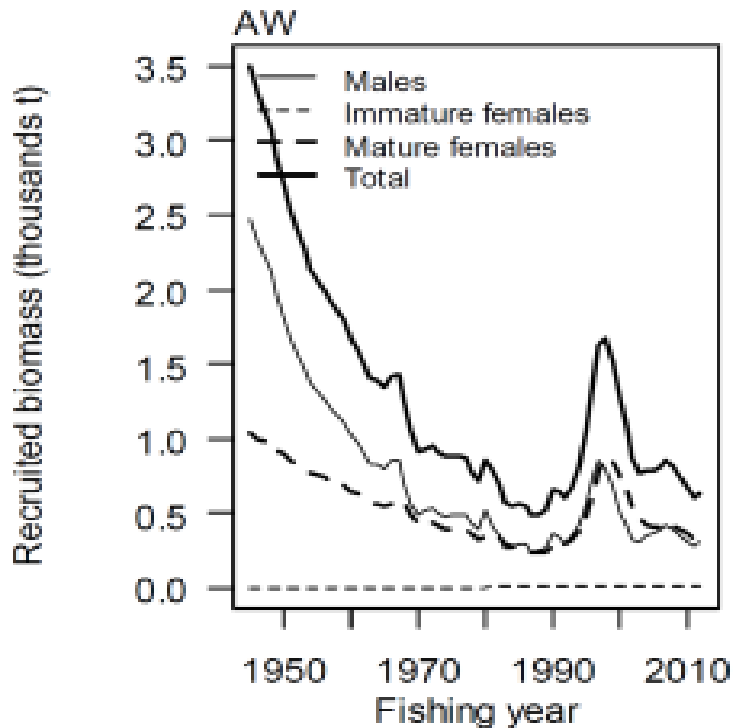
# Fishing magnitude: Overlap of scallop dredging and sensitive marine habitats



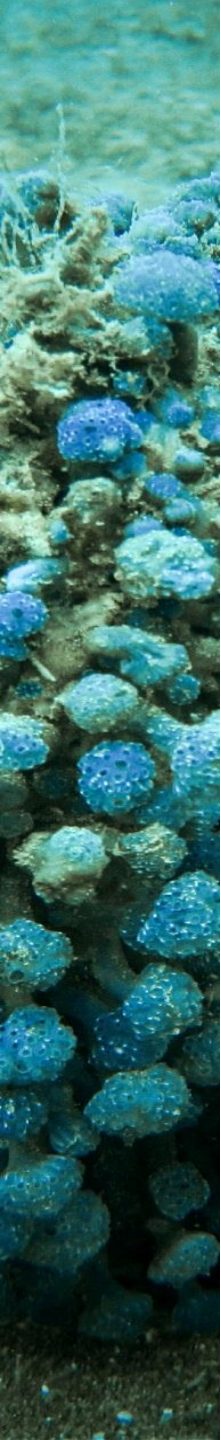
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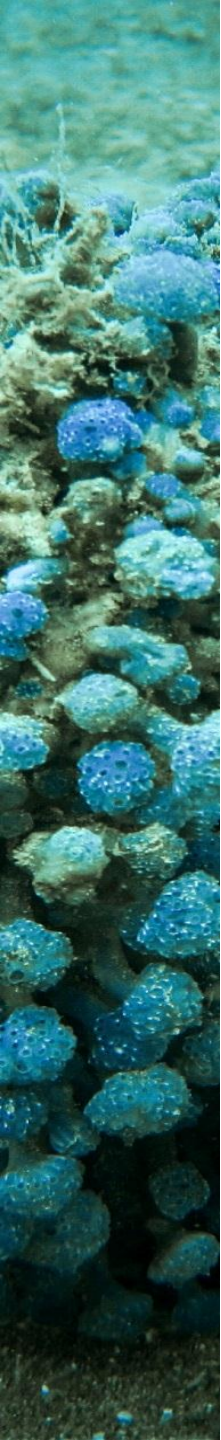
# Fishing magnitude: Target species Crayfish



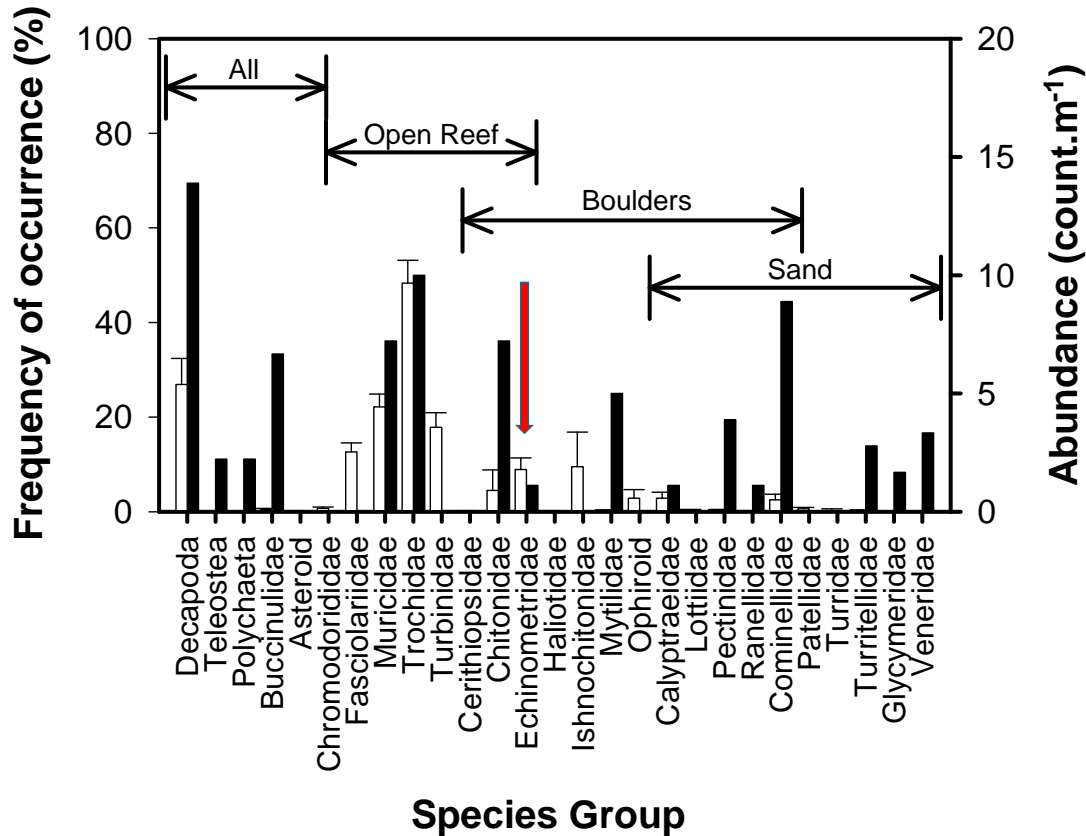
# Natural behaviours and habitat utilisation



# Ecosystem linkages

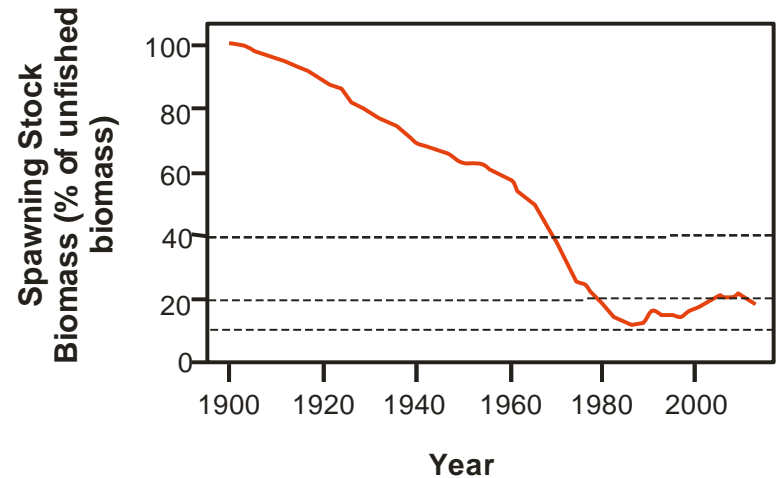
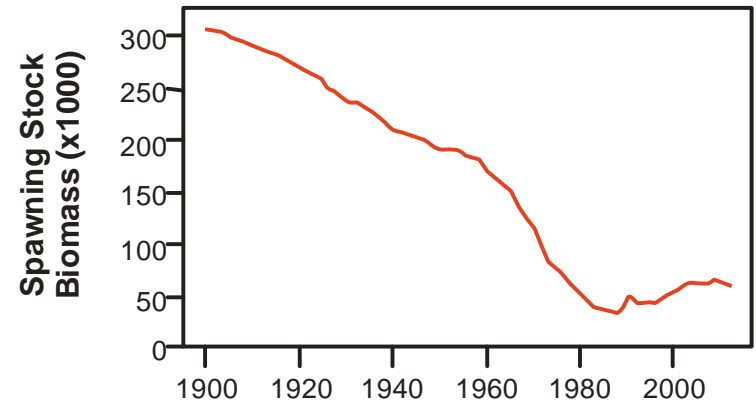


# Lobster prey

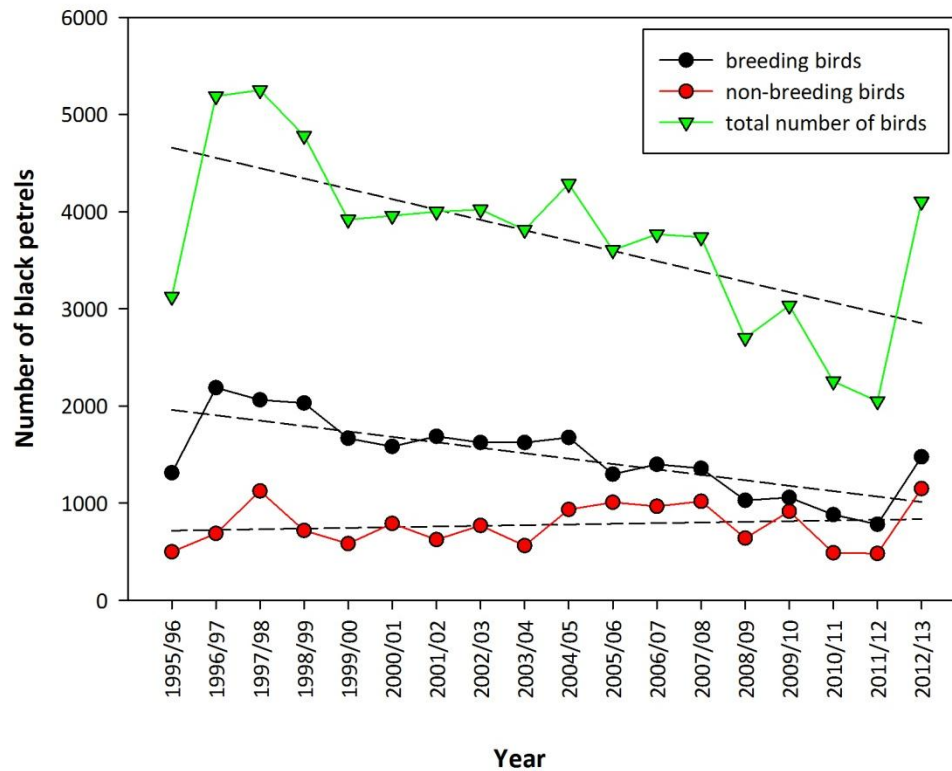


# Snapper

- Dominant demersal fish species
- Large reduction in biomass and changes in age/size structure of snapper populations
- Influence reef community structure
- Utilise a wide range of habitats
- Biogenic habitats like horse mussels and seagrass are important
- Behaviour, habitat use, and foraging change as they age
- Effects of depleting snapper populations are compounded by the effects of catching them



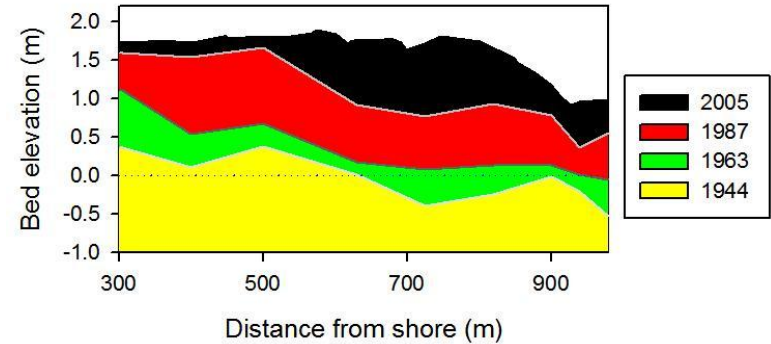
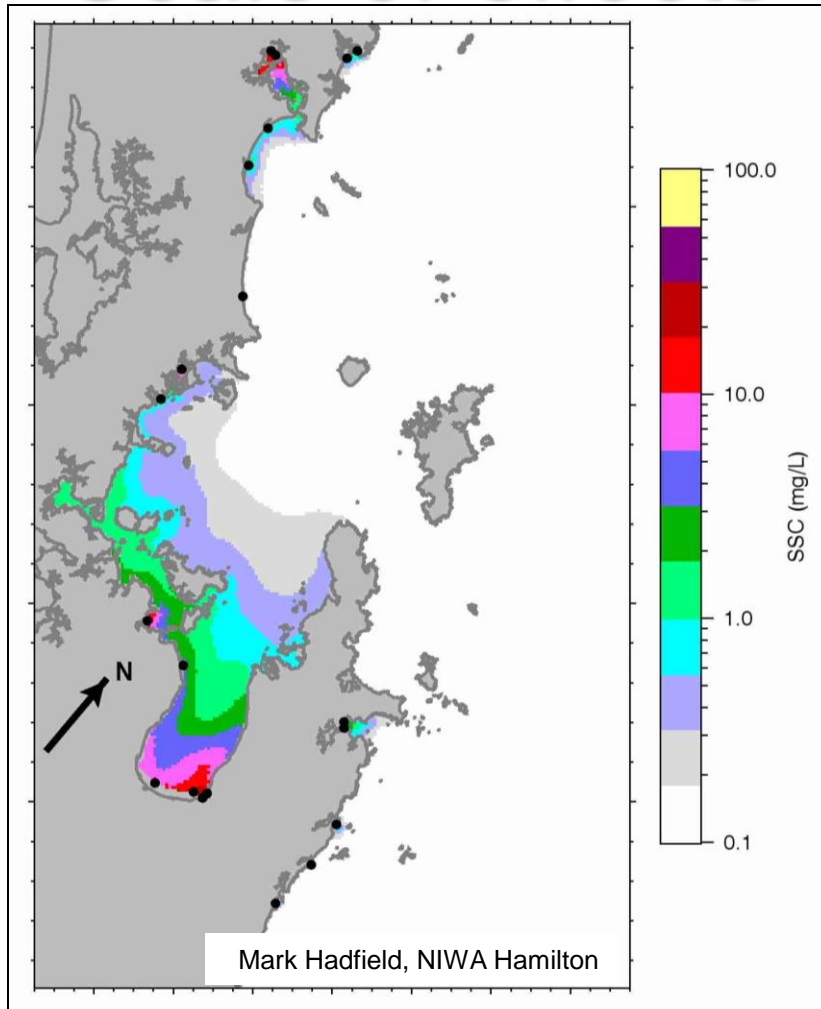
# Threatened species: Black petrel



Data from Abraham and Thompson (2011)



# Rural land management: Sediment Scale of effects

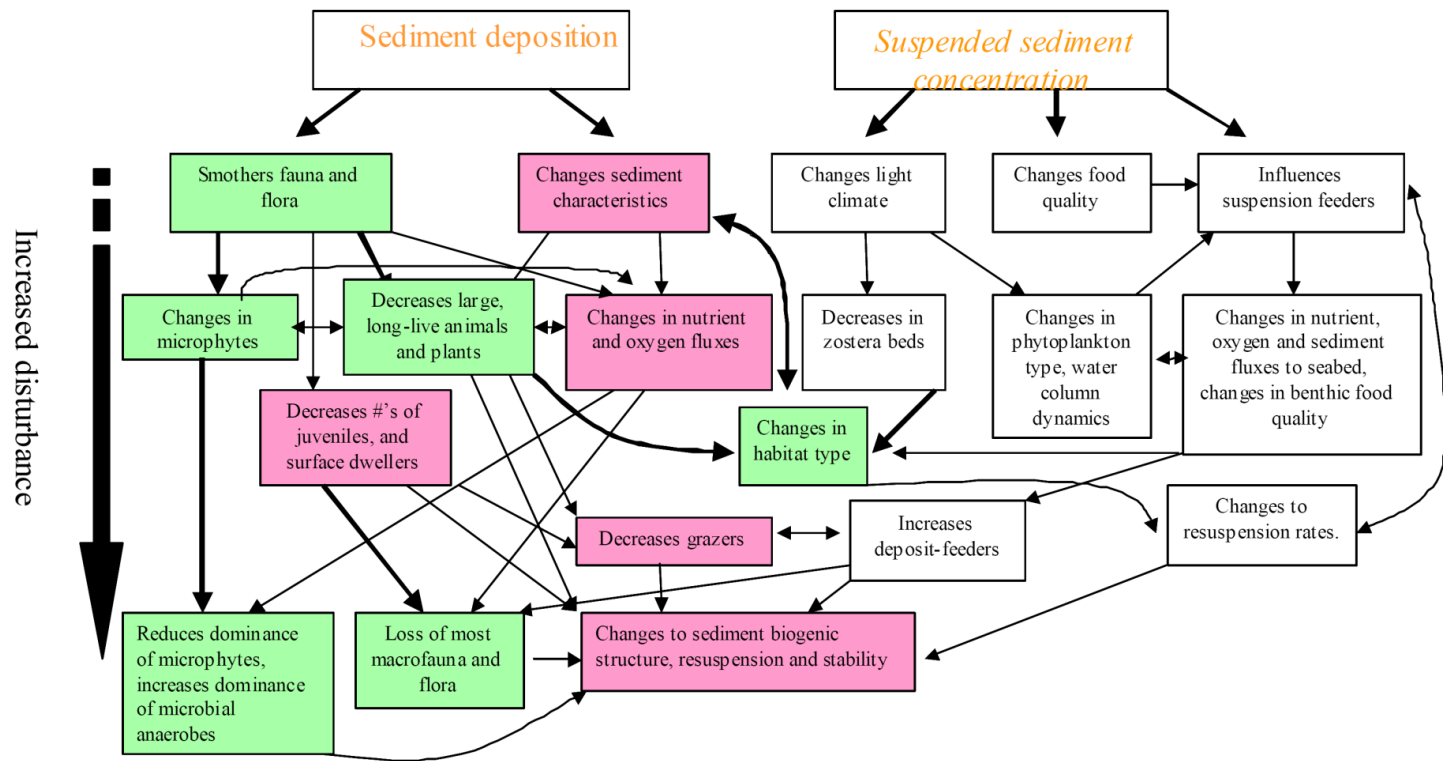




# Rural Land Management: Sediment Magnitude of effect

- Serious contaminant
- NZ Scientists rank sediment 3<sup>rd</sup> equal of 65 identified threats to marine habitats
- Modern sedimentation rates > natural sedimentation rates
- Increasing trends in the proportion of fine and/or muddy sediments
- We know this is likely to have altered ecological community composition and function in many areas
- Degraded baseline

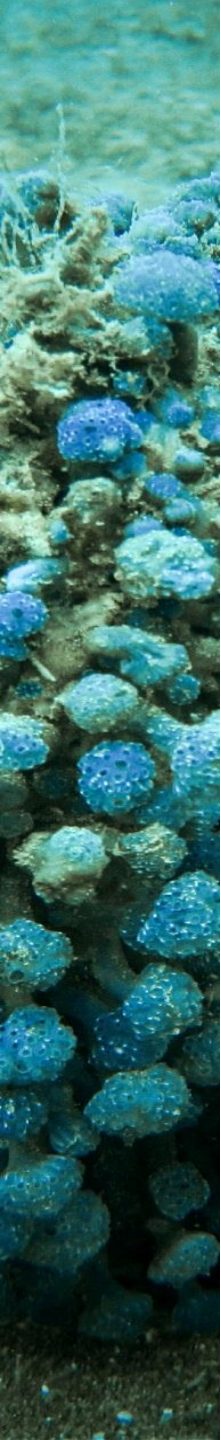
# Rural Land Management: Sediment Magnitude of effect



Gibbs M., Hewitt J. (2004) Effects of sedimentation on macrofaunal communities: a synthesis of research studies for ARC. ARC Technical Publication TP264, Auckland Regional Council, Auckland

Thrush S.F., Hewitt J.E., Cummings V., Ellis J.I., Hatton C., Lohrer A., Norkko A. (2004) Muddy waters: elevating sediment input to coastal and estuarine habitats. *Frontiers in Ecology and the Environment* 2:299-306

# Sediment: Types of effect



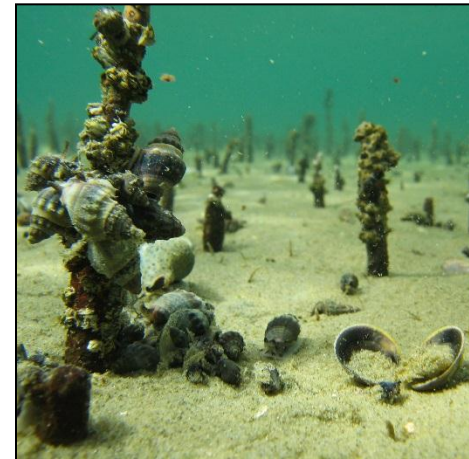
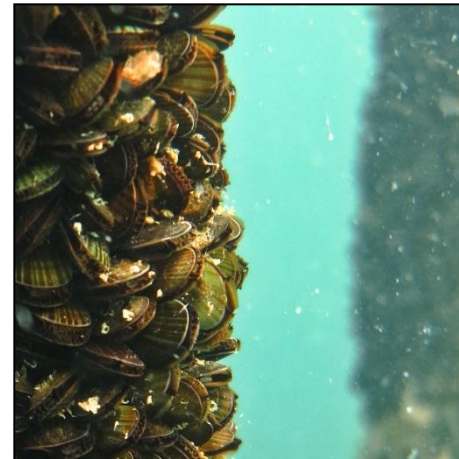
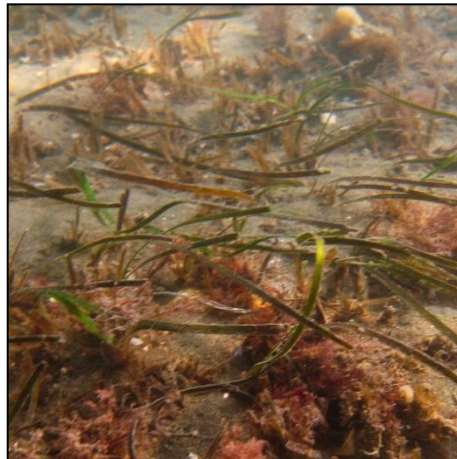
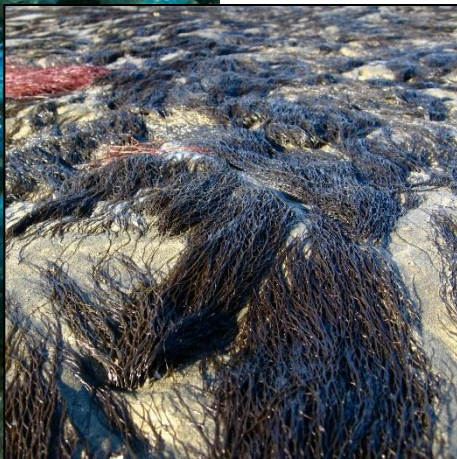
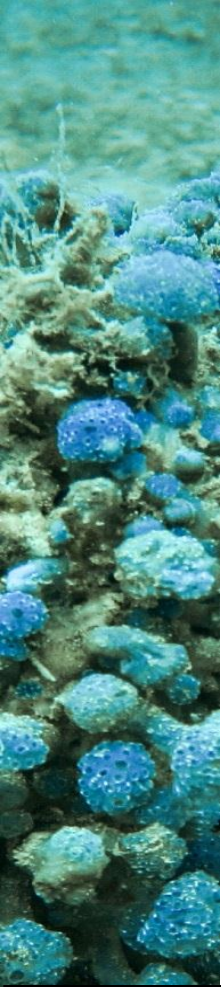


# Rural Land Management: Nutrients Scale of effect

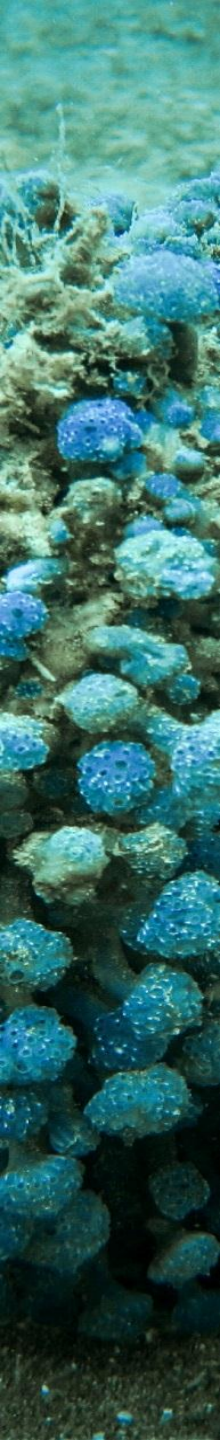
- Mainly a Firth of Thames issue
- Districts in the Hauraki plains have highest cow densities in NZ
- N loads from the Hauraki plains are among the highest in NZ and are predicted to keep increasing out to 2020
- Average N load to FoT is 3716 tonnes with 58% coming from Waihou river
  - Waihou concentrations increased by 0.8% to 1.7% per annum from 1993 to 2012
- Aquaculture reforms provide for an additional 1100 tonnes of nitrogen per year to the FoT

# Rural Land Management: Nutrients Magnitude of effect

- Land based nutrient inputs have altered productivity and biodiversity values in the Firth of Thames
- Growing concern about oxygen sags and acidification in FoT
- Nutrient and sediment effects interact



# Invasive species: Scale of effect



# Invasive species: Scale of effect

## Vectors

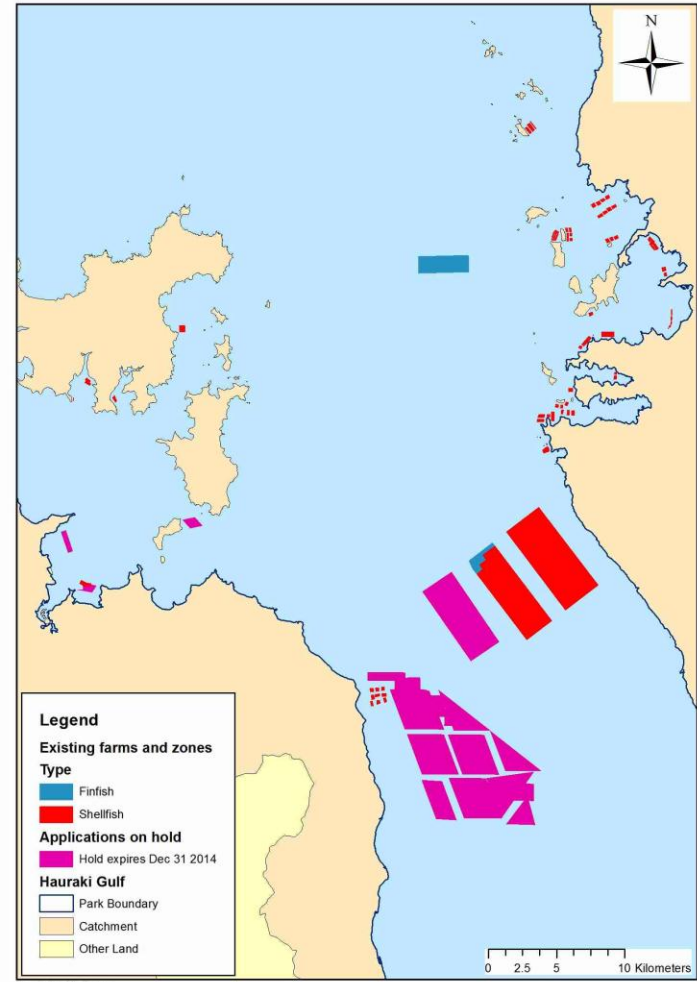
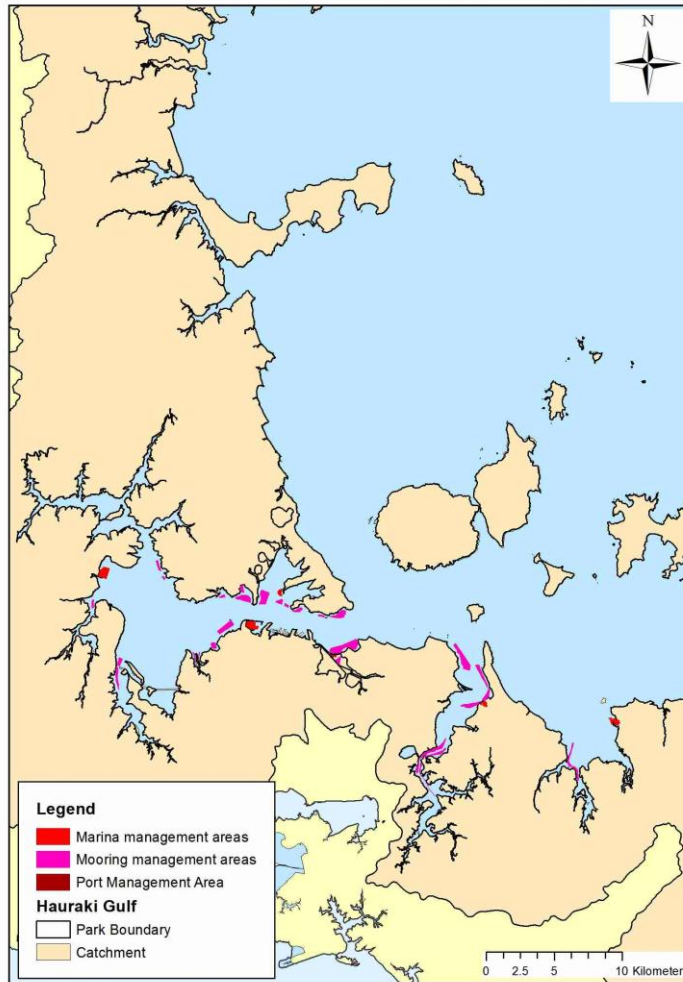
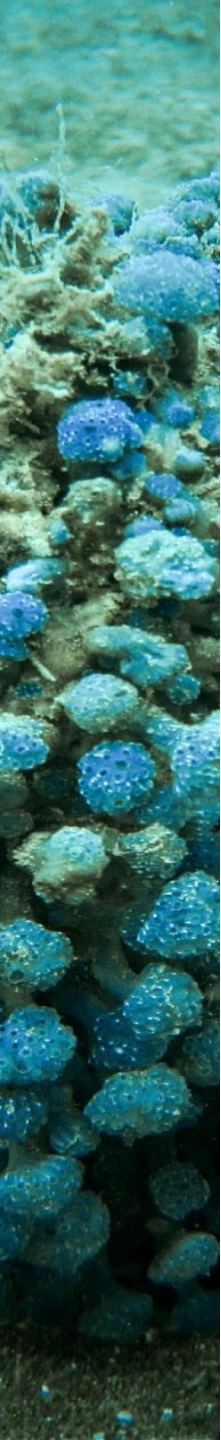
- 37% of NZ's seaport trade comes through PoA
- 11,000 yachts and launches in Auckland
- 2,500 to 2,800 personal water craft in Auckland
- 75,000 small craft in Auckland
- 15 marinas with 6,377 berths in Auckland
- 4 marinas in Waikato
- 5190 swing and pile moorings in Auckland and Waikato





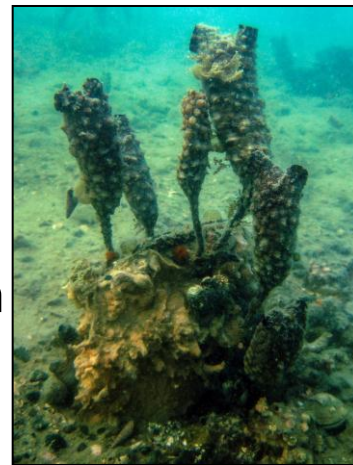
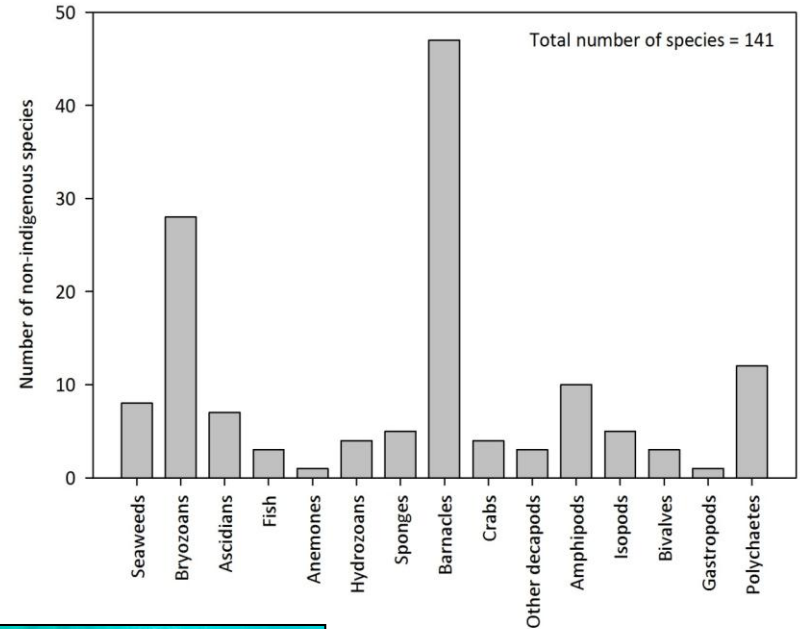
# Invasive species: Scale of effect

## Man-made substrates for growth

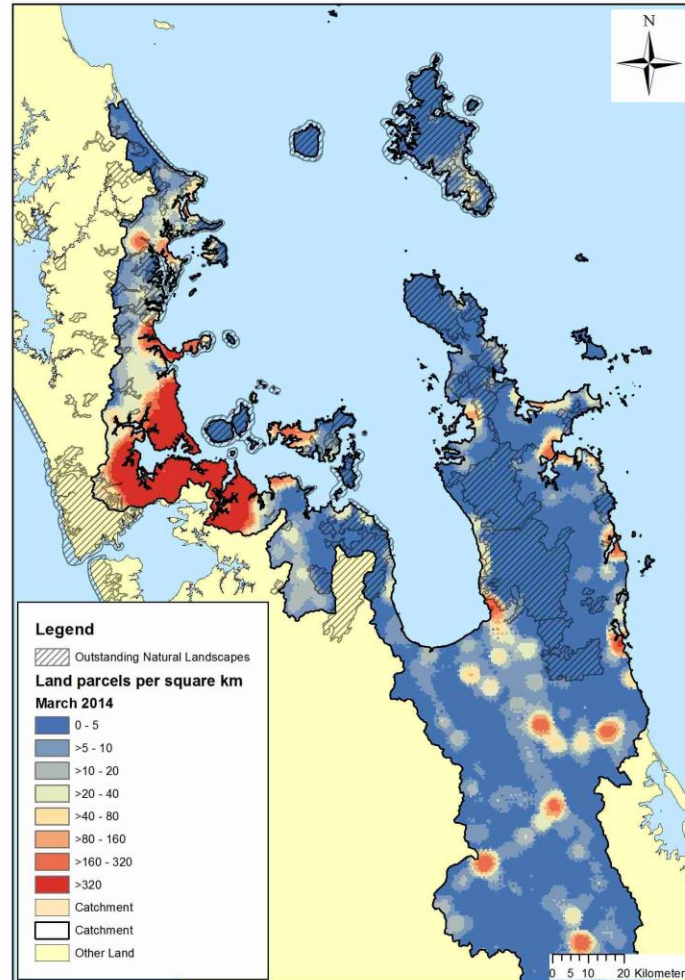


# Invasive species: magnitude

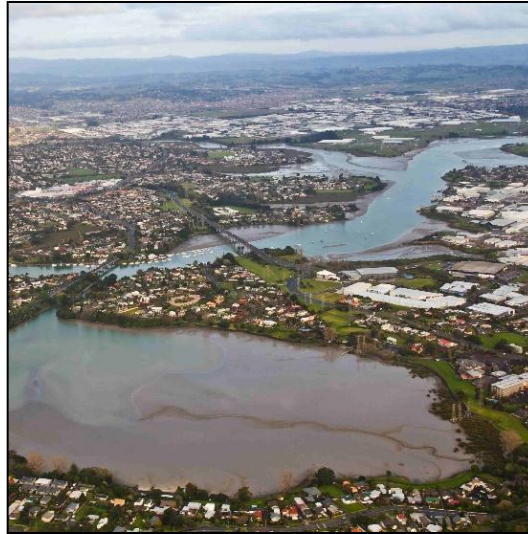
- 141 introduced species are known to occur in the Hauraki Gulf
- At least six of these have the potential to cause serious harm
- 5 of these have arrived since the late 1990s early 2000s.
- These species have tended to spread rapidly and some are now dominate species in areas they have colonised
- Four new species have been detected since the last SoE report in 2011



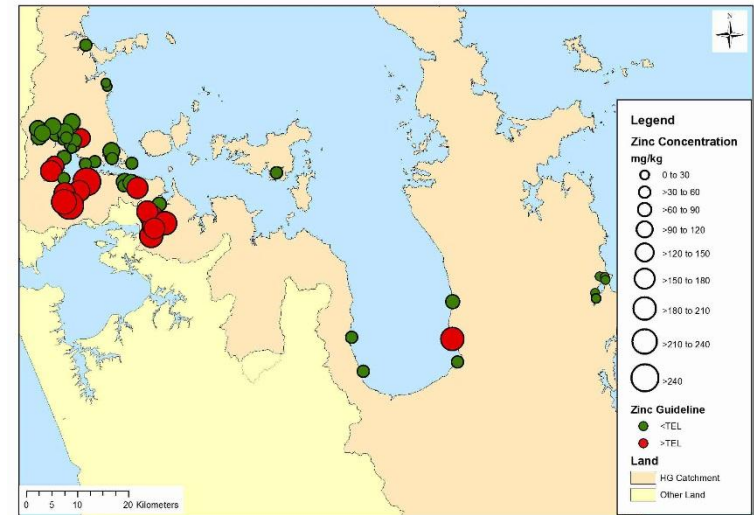
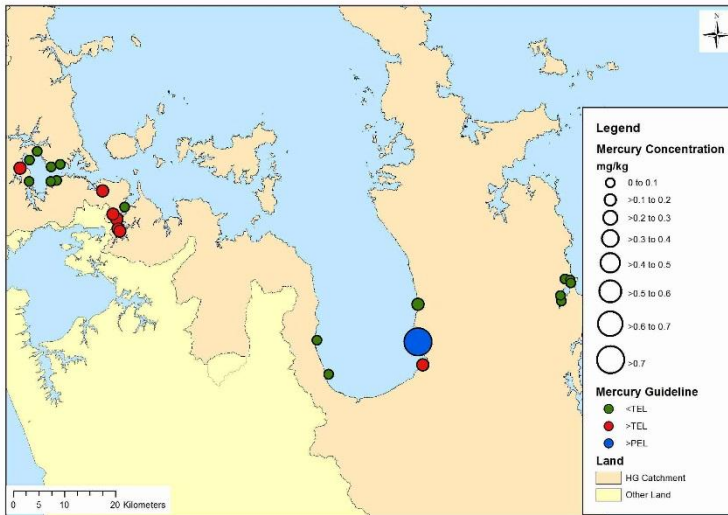
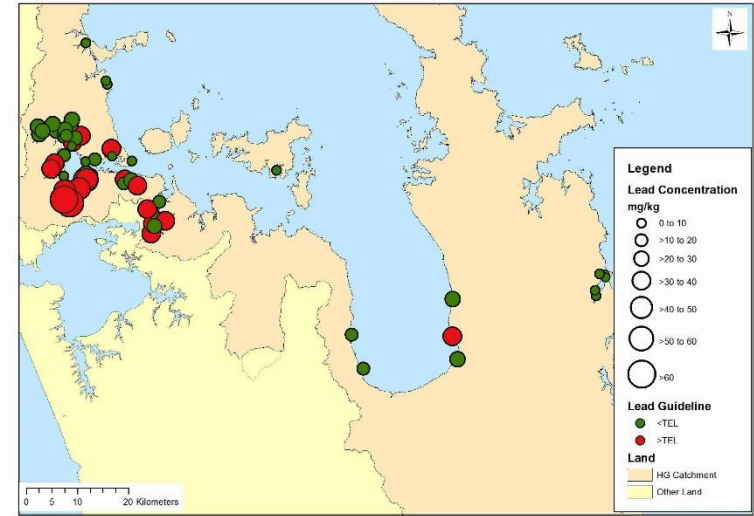
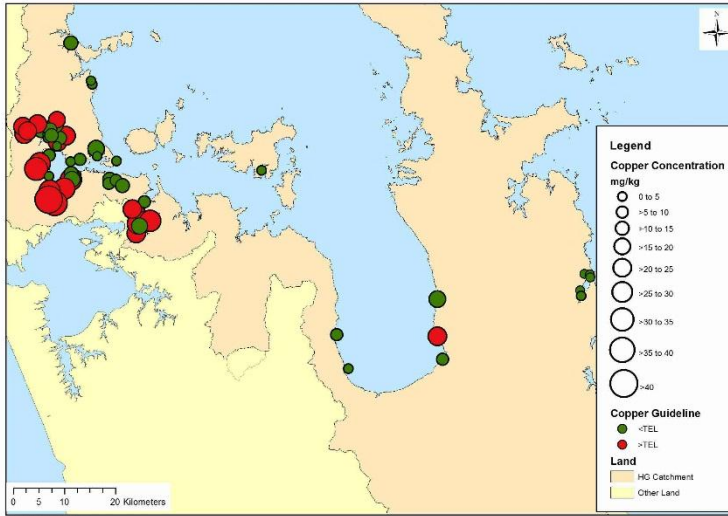
# Urbanisation and coastal development: Scale



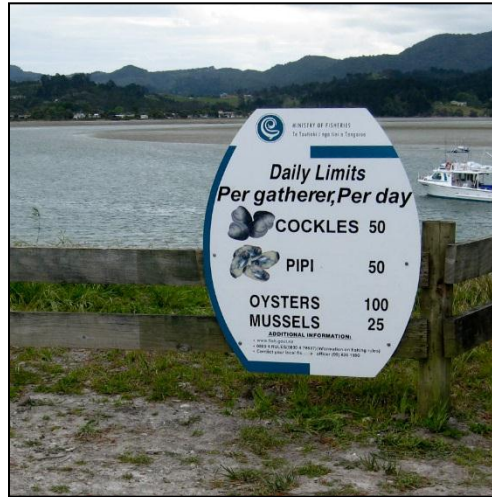
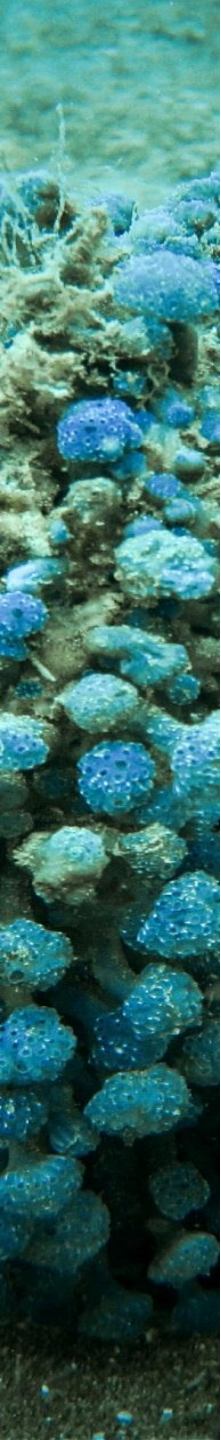
# Urbanisation magnitude: Auckland



# Urbanisation magnitude: toxic chemicals



# Urbanisation magnitude: Coastal towns and settlements



# Other biodiversity matters: Threatened species

- Fairy tern:
  - 45 mature individuals remain
- Bryde's whales:
  - less than 250 mature individuals,
  - around 46 of these residing in the Gulf
  - averaging 2 fatalities per year



# Conclusions

Activity group	Scale of effect	Magnitude of effect
Fishing	Entire Gulf	Highly significant
Activities that facilitate the introduction, growth and spread of invasive species	Entire Gulf	Poorly studied – high potential for serious impacts
Rural land activities	Inner gulf and estuaries, particularly FoT	Gradient progressing from highly significant to negligible
Urbanisation	Patchy, nearshore with greatest impact around Auckland	Variable impacts (moderate to highly significant)
Threatened species	Localised wrt species and/or location	Highly significant for individual species



