

Habitat Mapping in The Hauraki Gulf Marine Park

Dan Breen

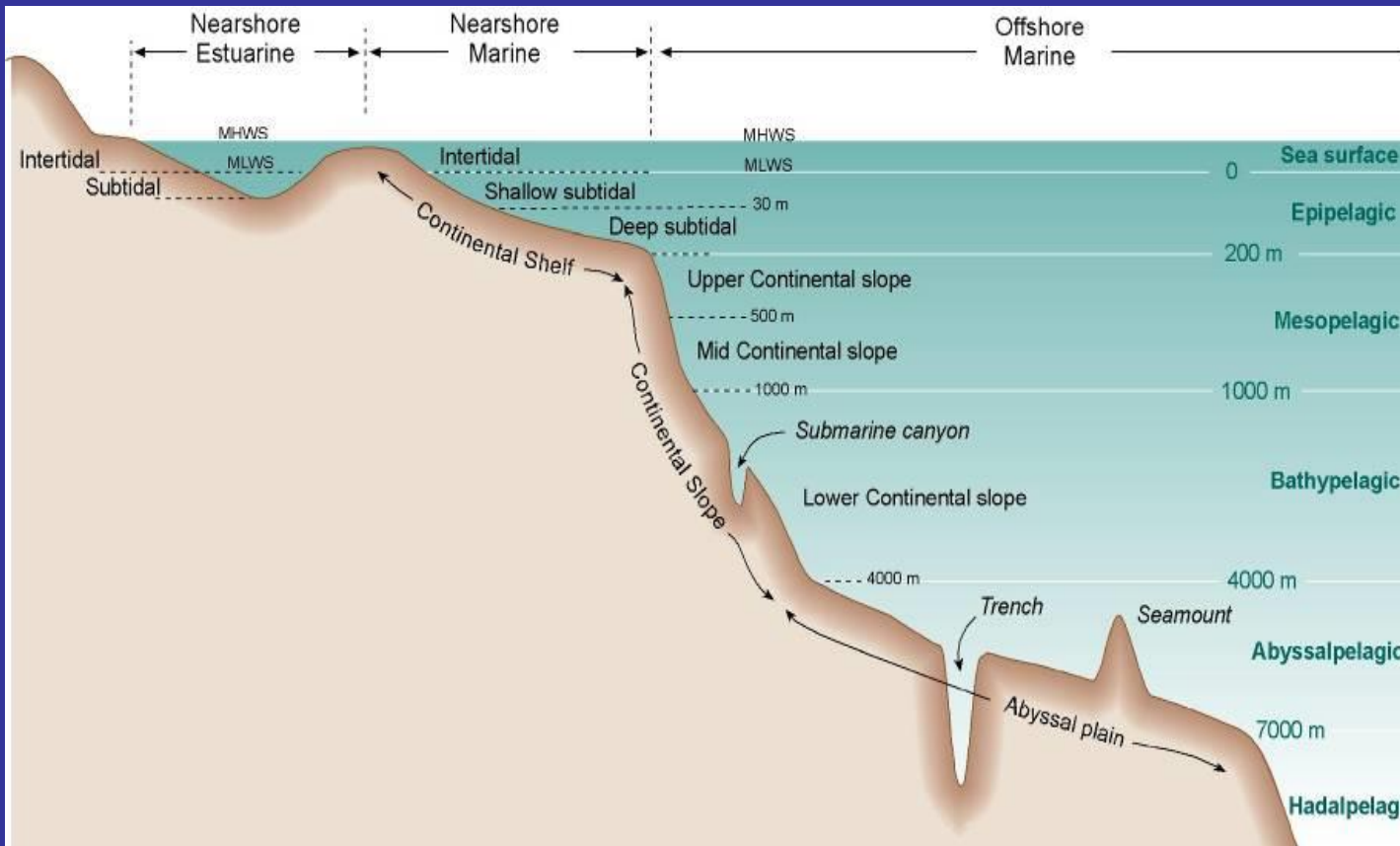
Outline

- 1. Intro – Habitat mapping**
- 2. “Coastal marine habitats and marine protected areas in the New Zealand Territorial Sea: a broad scale gap analysis”
(DOC and MFish)**
- 3. Maps for the Hauraki Gulf Marine Park**
- 4. Sidescan and multibeam surveys**
- 5. Surveys of species assemblages**
- 6. Descriptive, photo and video information**

How to map biodiversity?

- Map broad physical habitats assuming these relate to communities and species.
 - broad-scale habitat classification
- Field surveys of organism distribution
 - systematic surveys
- Models relating physical and biological data
- Review results through expert consensus
 - “Delphic” approach

- Several physical and biologically based classifications of HGMP
- Vary in spatial resolution from metres to hundreds of kilometres
- Vary in “taxonomic resolution” from broad scale physical habitats to community assemblages and individual species
- Quality of information depends on fitness for use
- Different data sets may have different role in different situations
- Data and techniques often complementary rather than mutually exclusive
- Review just few of many data sets collected or acquired for marine planning
- GIS based planning tools can help unite data from many sources and make them more accessible to wider audience



Coastal & Deepwater Classification

- Coastal =
- 13 Coastal Biogeographic Regions
- Major Environments – Estuarine & Coastal
- Depths – intertidal, subtidal to 30m, 30m to 200m
- Substrata – mud, sand, gravel, cobble, boulders, bedrock, biogenic
- Exposure – exposed, moderate, sheltered

Coastal marine habitats and marine protected areas in the New Zealand Territorial Sea: a broad scale gap analysis

Volume 1. Report and Appendices 1 to 6
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New Zealand

Volume 2. APPENDIX 7.
MAPS OF MANAGEMENT TOOLS

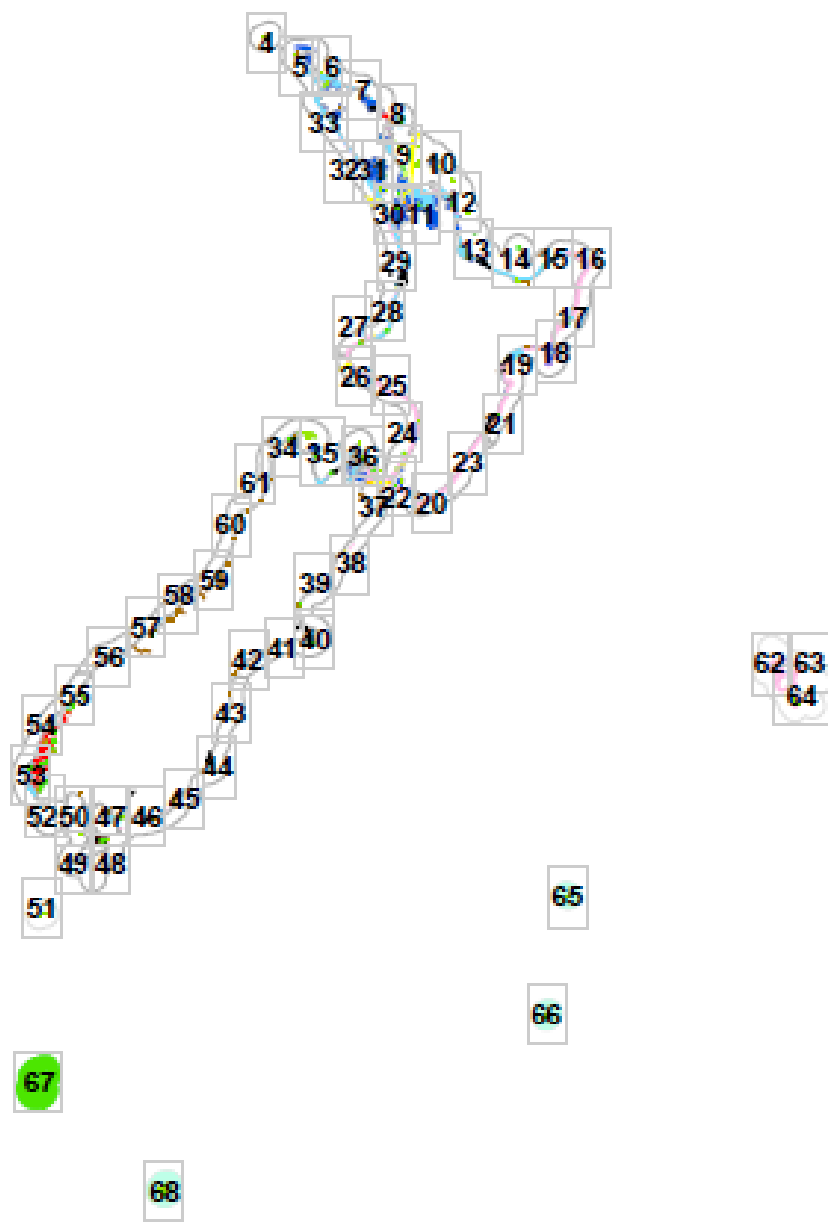
Volume 3. APPENDIX 8.
MAPS OF COASTAL MARINE HABITATS

<http://www.doc.govt.nz/publications/conservation/marine-and-coastal/marine-protected-areas/coastal-marine-habitats-and-marine-protected-areas-in-the-new-zealand-territorial-sea-a-broad-scale-gap-analysis/>

**APPENDIX 7.
MAPS (1:400,000 SCALE) OF COASTAL
MARINE HABITATS AND POTENTIAL
MARINE MANAGEMENT TOOLS TO
CONTRIBUTE TO A NATIONAL NETWORK
OF MARINE PROTECTED AREAS
IN THE NEW ZEALAND TERRITORIAL SEA.**



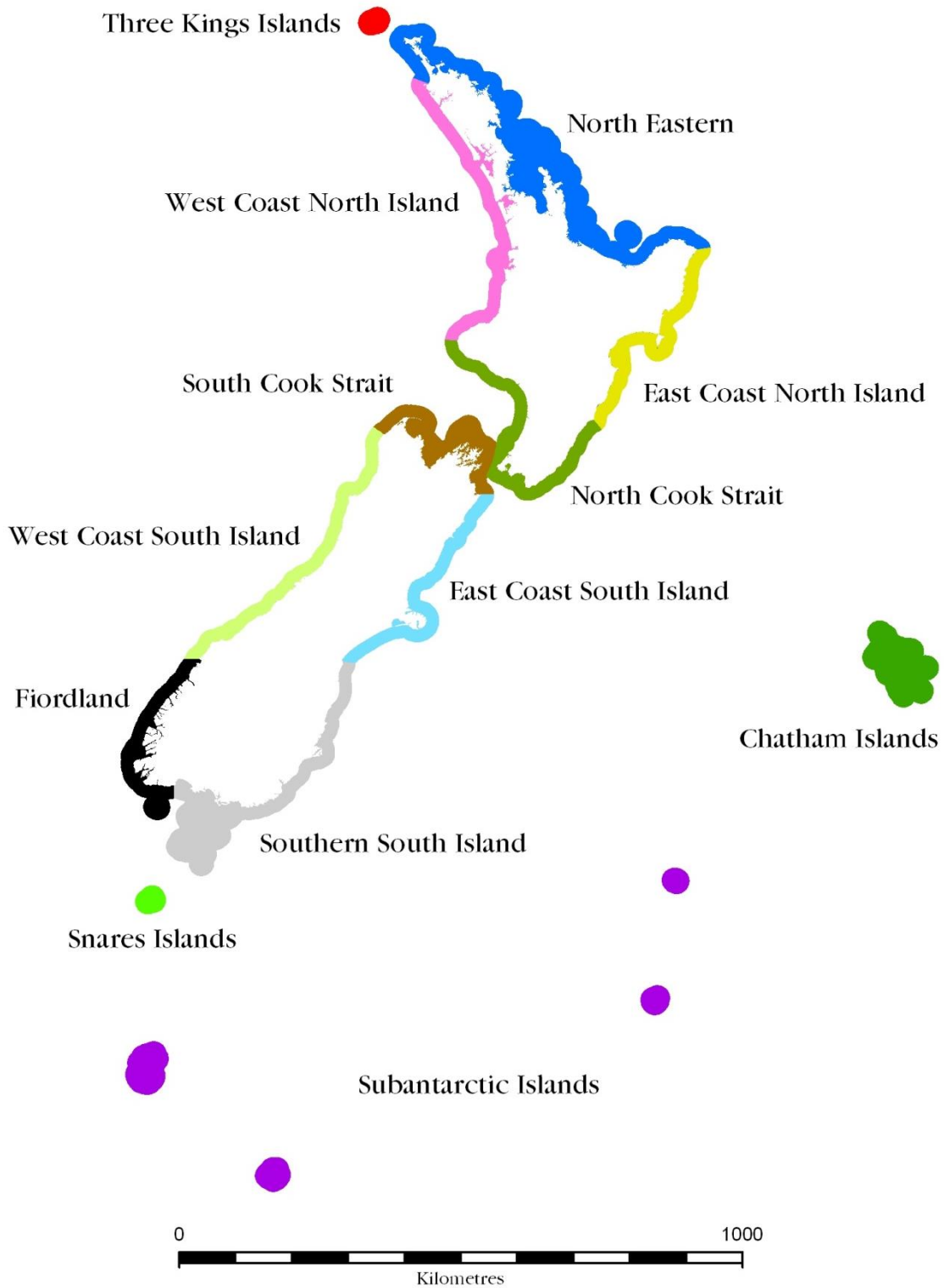
MAP SHEET INDEX





Bioregions

Policy, LINZ 12nm, estuary from Hume

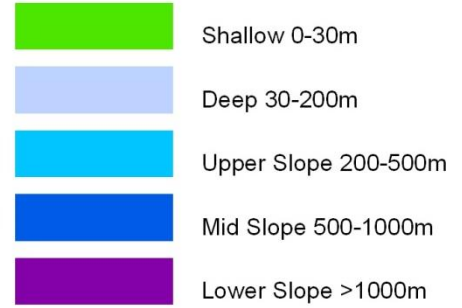




Depth



DEPTH



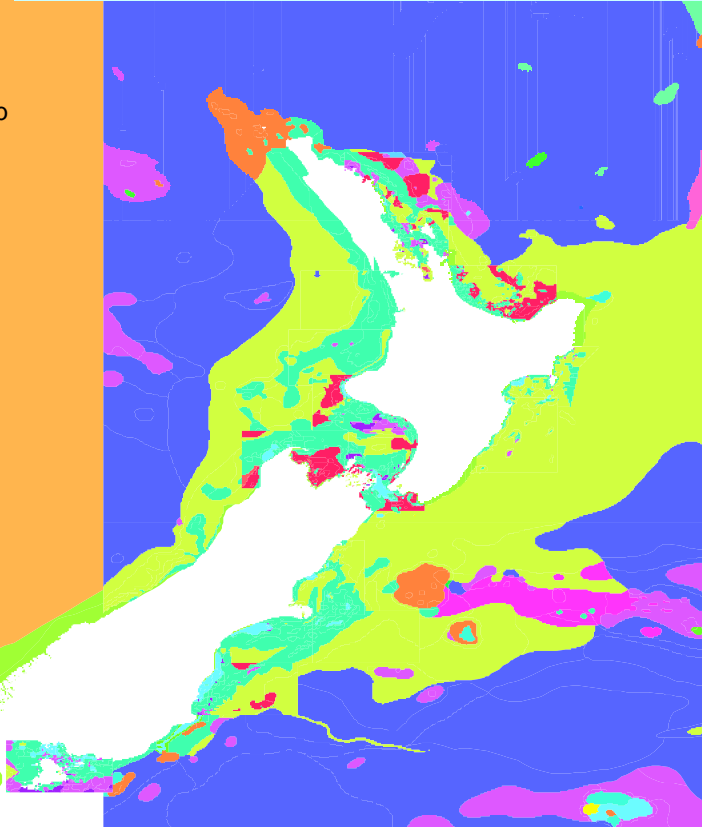
NIWA, charts, soundings



NZ Combined Ocean Sediments

1:200,000, 1:1000 000, 1:6 000 000
Bardsley *et al* 2008

- Seds_wgs84_region.shp
- Calc-Gravel
 - Calc-Gravel, b
 - Calc-Gravel/Sand, b
 - Calc-Mud
 - Calc-Ooze, b
 - Calc-Sand
 - Calc-Sand, b
 - Calc-Silt
 - Clay
 - Coarse Calc-Sand
 - Coarse Calc-Sand, b
 - Coarse Sand
 - Coarse Sand, a
 - Coarse Sand, v
 - Deep Ocean Clays
 - Gravel
 - Gravel, v
 - Gravel/Sand, t
 - Mud
 - Mud, rc
 - Mud, t
 - Sand
 - Sand, a
 - Sand, v
 - Siliceous-Ooze, b
 - Silt
 - Volcanic

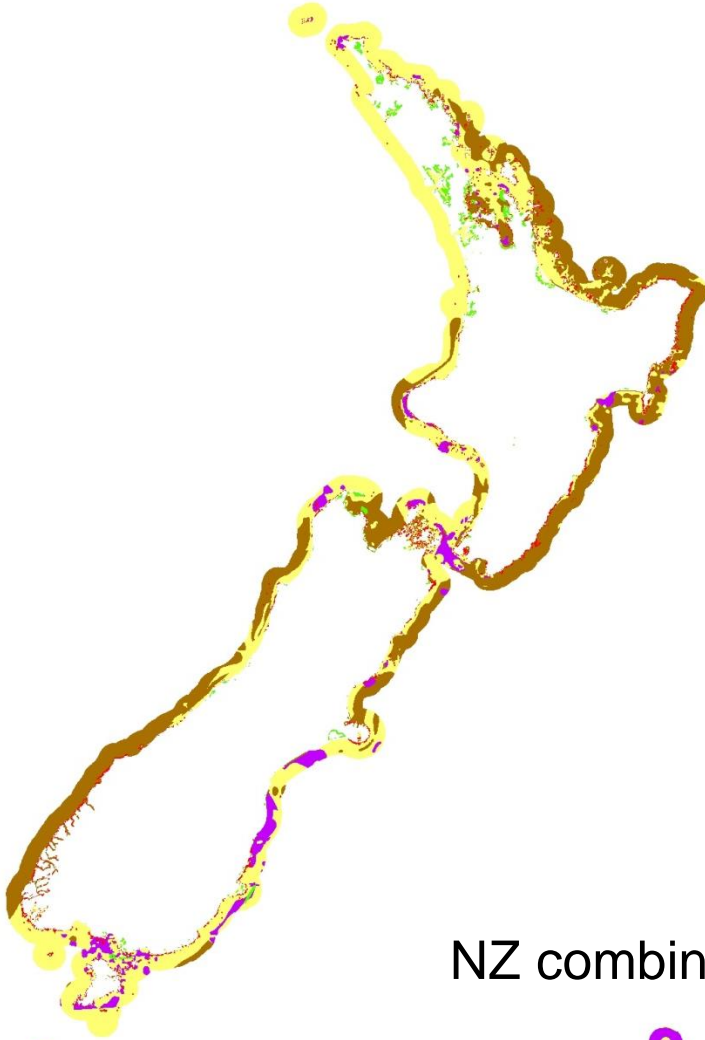




Substrata



SUBSTRATA



NZ combined sediments

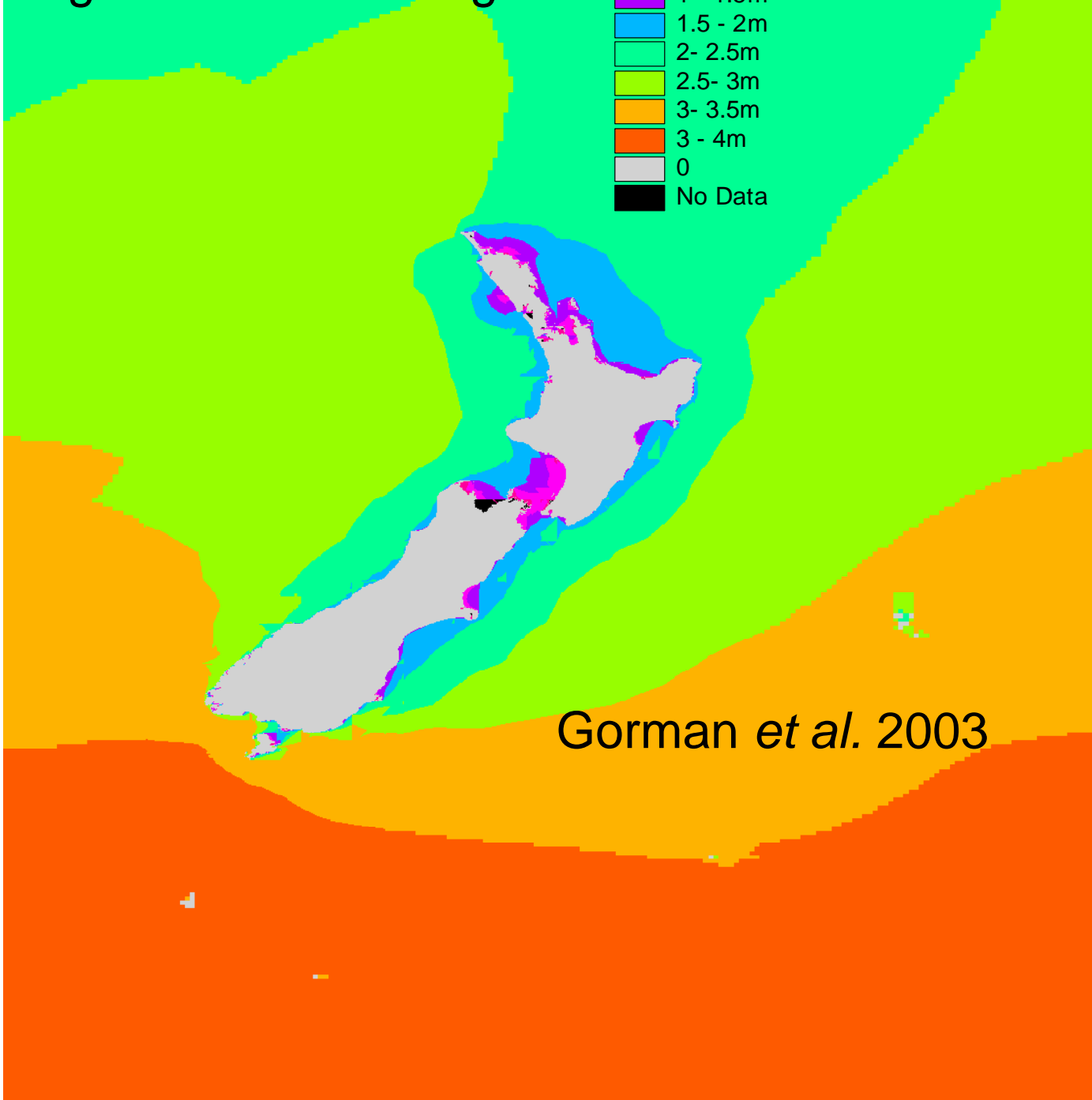
Reef from Wild & Duffy
from charts and field

Biogenic from literature
Scientist surveys (Sivaguru & Byers)
Topo and LandCover



Mean annual significant wave height

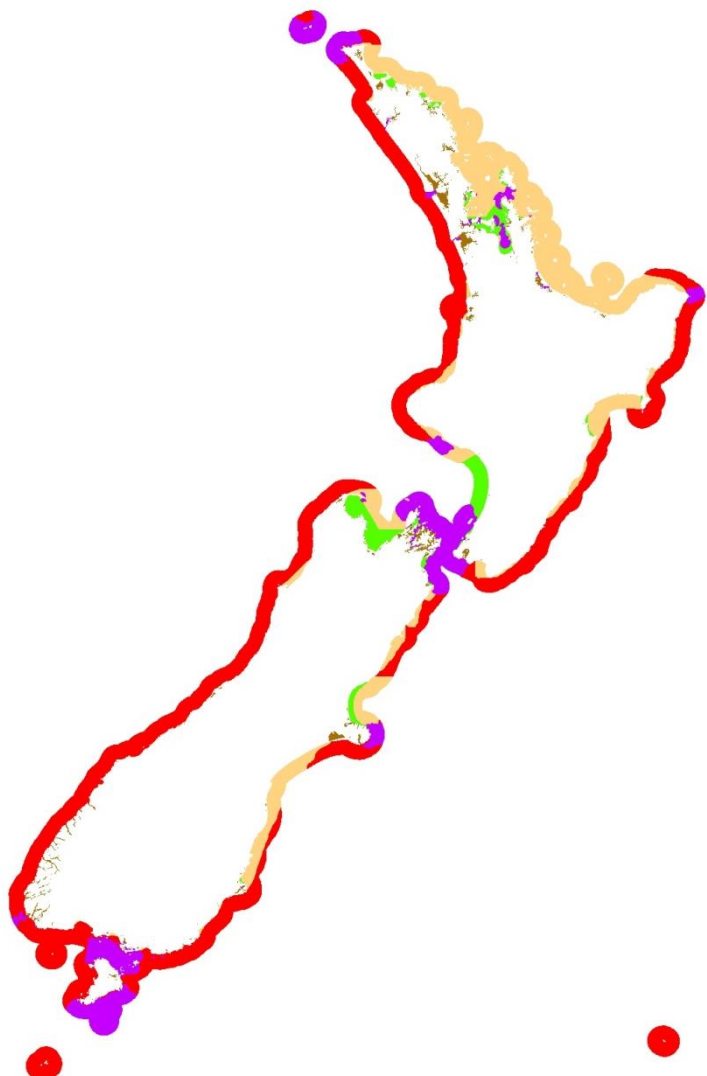
Hs Mean Annual Significant Wave Height



Gorman *et al.* 2003



Exposure



EXPOSURE

-  Exposed
-  High Current
-  Moderate
-  Sheltered
-  Estuarine

Estuary from Hume (NIWA)

 High current from Marine Environment Classification

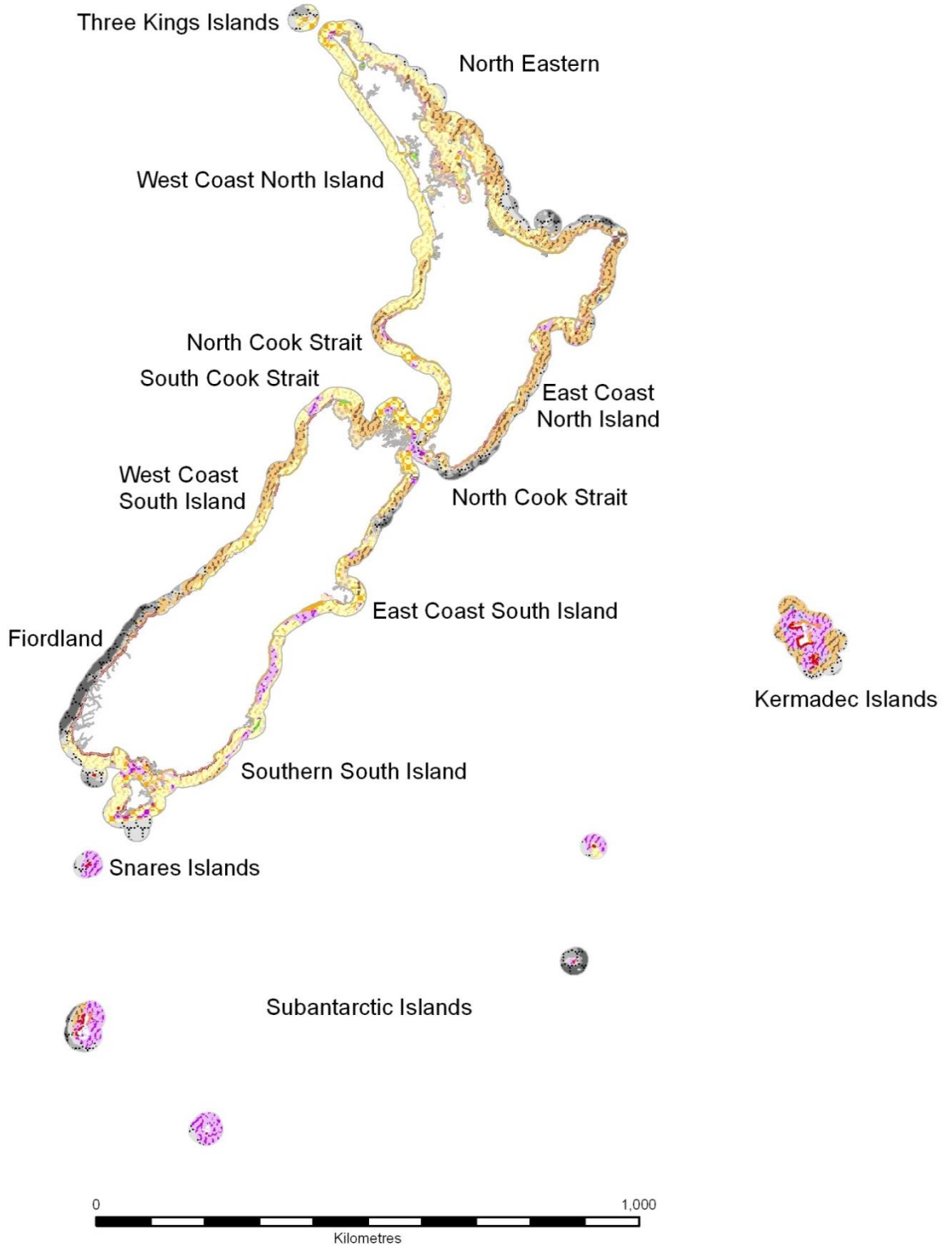




Kermadec Islands

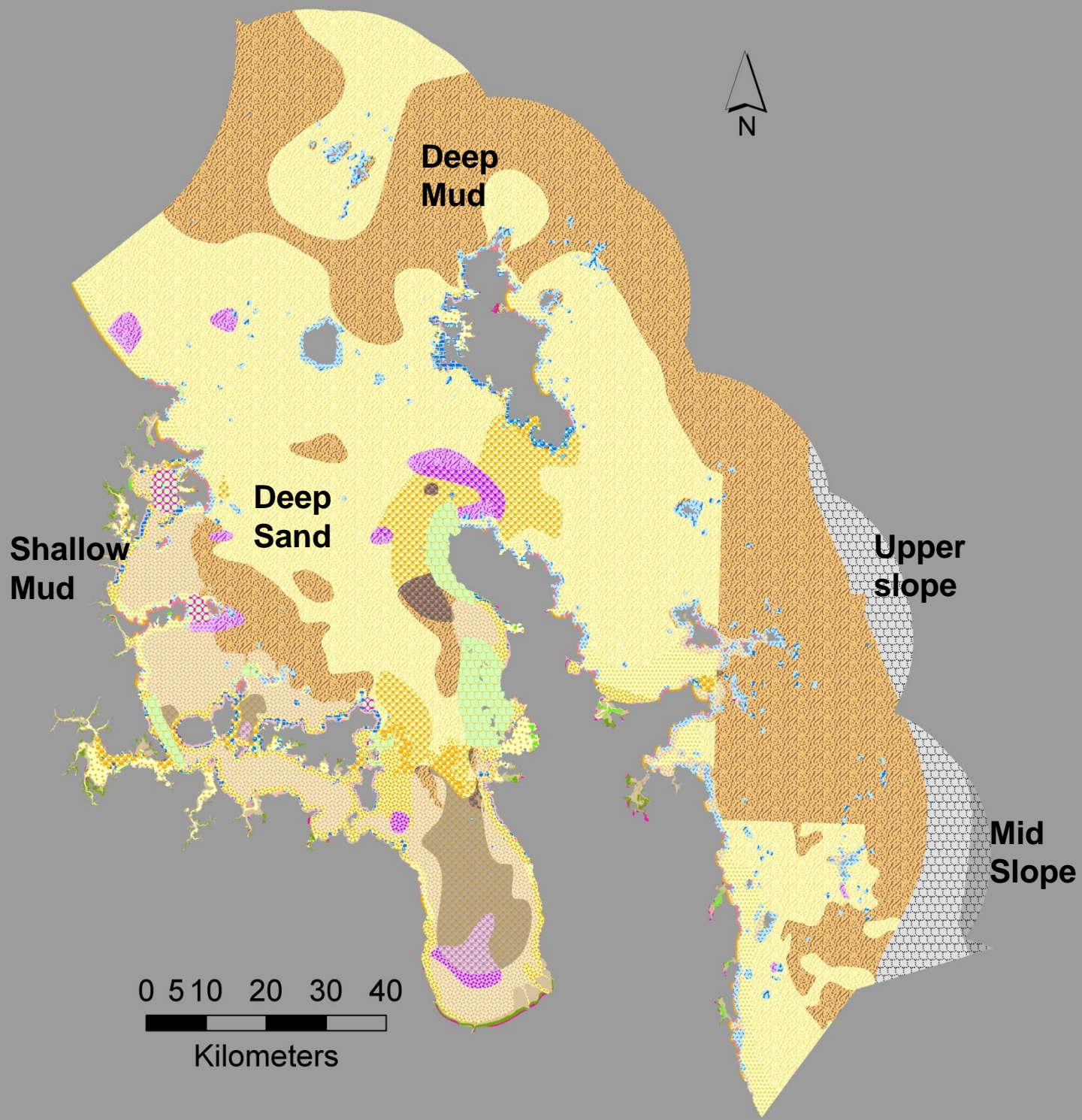


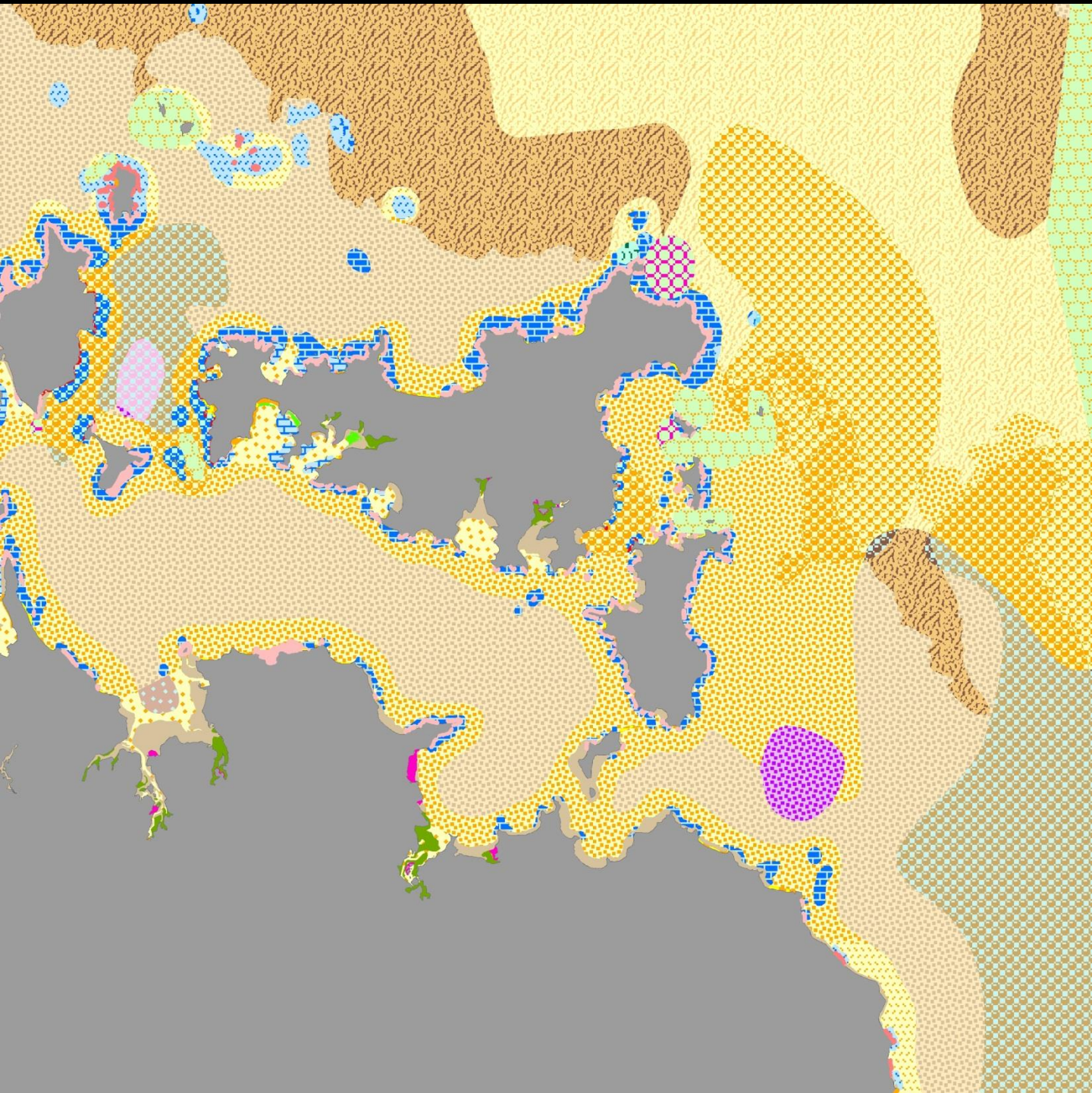
Bioregion x Depth x Substratum x Exposure



HABITATS

 Mudflat	 High Current Shallow Reef
 Estuarine Mud	 Deep Reef
 Shallow Mud	 High Current Deep Reef
 High Current Shallow Mud	 Estuarine Rocky Shore
 Deep Mud	 Sheltered Rocky Shore
 High Current Deep Mud	 Moderate Rocky Shore
 Estuarine Beach	 Exposed Rocky Shore
 Sheltered Beach	 High Current Rocky Shore
 Moderate Beach	 Biogenic Silt/Bryozoan Mounds
 Exposed Beach	 Biogenic Serpulist patch reefs <i>Galeolaria hystrix</i>
 High Current Beach	 Biogenic Seagrass Above MHW
 Estuarine Sand	 Biogenic Seagrass
 Sheltered Shallow Sand	 Biogenic Saltmarsh Above MHW
 Moderate Shallow Sand	 Biogenic Saltmarsh
 Exposed Shallow Sand	 Biogenic Rhodoliths
 High Current Shallow Sand	 Biogenic Mussel
 Deep Sand	 Biogenic Mangrove Above MHW
 High Current Deep Sand	 Biogenic Mangrove
 Estuarine Gravel	 Biogenic Low relief biogenic reef
 Sheltered Shallow Gravel	 Biogenic High relief biogenic reef
 Moderate Shallow Gravel	 Biogenic Dog cockles
 Exposed Shallow Gravel	 Biogenic Bryozoans
 High Current Shallow Gravel	 Exposed Shallow Volcanic
 Deep Gravel	 Moderate Shallow Volcanic
 High Current Deep Gravel	 Deep Volcanic
 Estuarine Reef	 Upper Slope
 Sheltered Shallow Reef	 Mid Slope
 Moderate Shallow Reef	 Lower Slope
 Exposed Shallow Reef	 Estuarine unclassified

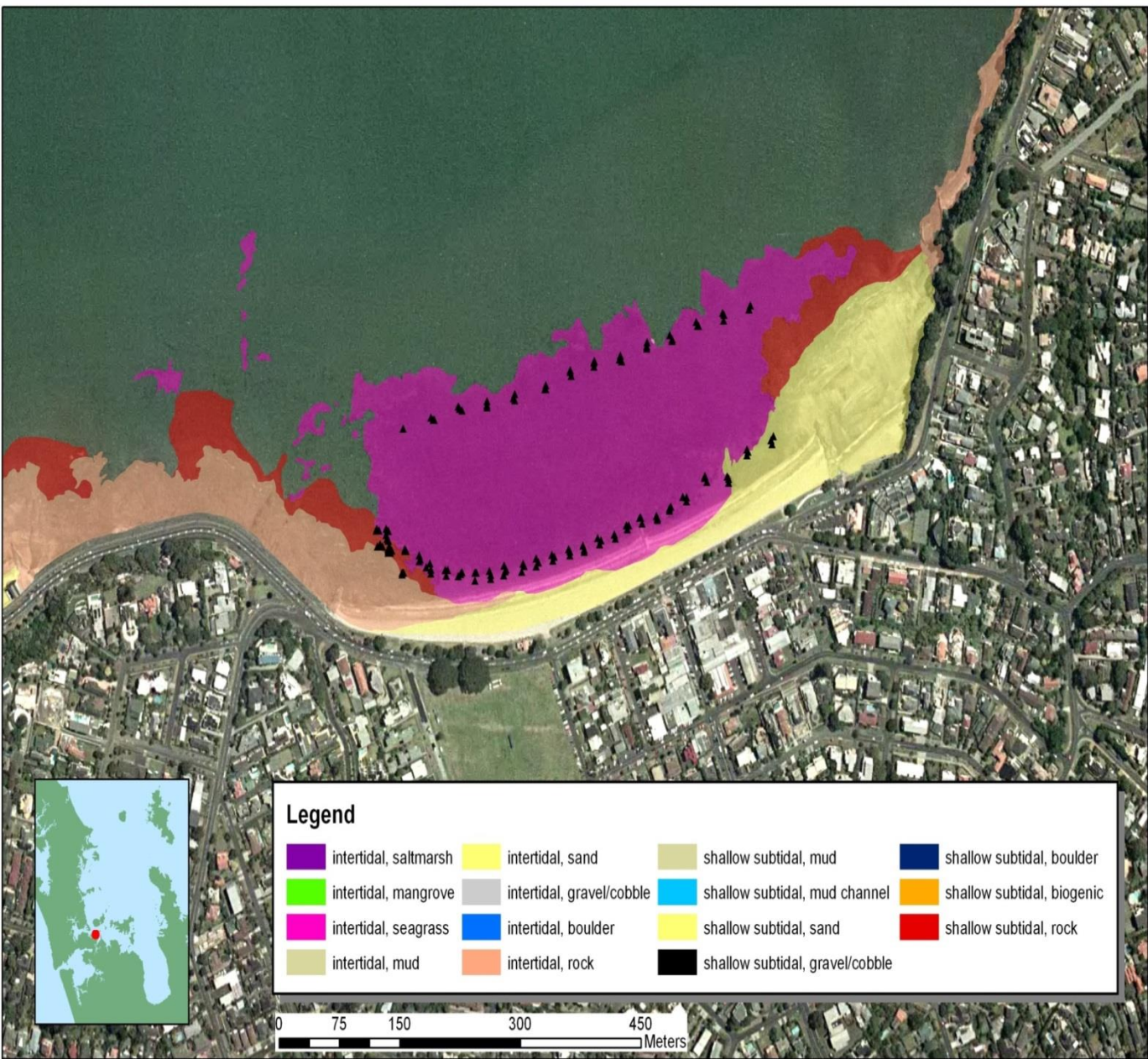




Broad scale habitats	% of Hauraki Gulf Marine Park (marine)
Deep Sand	35.9
Deep Mud	31.6
Shallow Mud	6.4
Upper Slope	4.1
Moderate Shallow Sand	3.1
High Current Deep Sand	3.0
Sheltered Shallow Sand	2.5
High Current Shallow Mud	2.2
Moderate Shallow Reef	1.5
Estuarine Sand	0.9
Deep Reef	0.8
Mudflat	0.8
High Current Shallow Sand	0.7
Deep Gravel	0.7
Mid Slope	0.6

	% of Hauraki Gulf Marine Park (marine)
Broad scale habitats	
Sheltered Shallow Reef	0.5
High Current Shallow Gravel	0.4
High Current Deep Mud	0.4
High Current Deep Gravel	0.3
Mangrove	0.3
Sheltered Shallow Gravel	0.2
High Current Shallow Reef	0.2
Estuarine Reef	0.1
Moderate Shallow Gravel	0.1
Sheltered Rocky Shore	0.1
Moderate Rocky Shore	0.1
Seagrass	0.1
Moderate Beach	0.1
Estuarine Mud	0.1

Beach, shallow Subtidal reef, Rocky shore, Seagrass, Mangrove and Saltmarsh mapped from Auckland Council aerial photo by Stacey Byers and Anna and Chris Wild

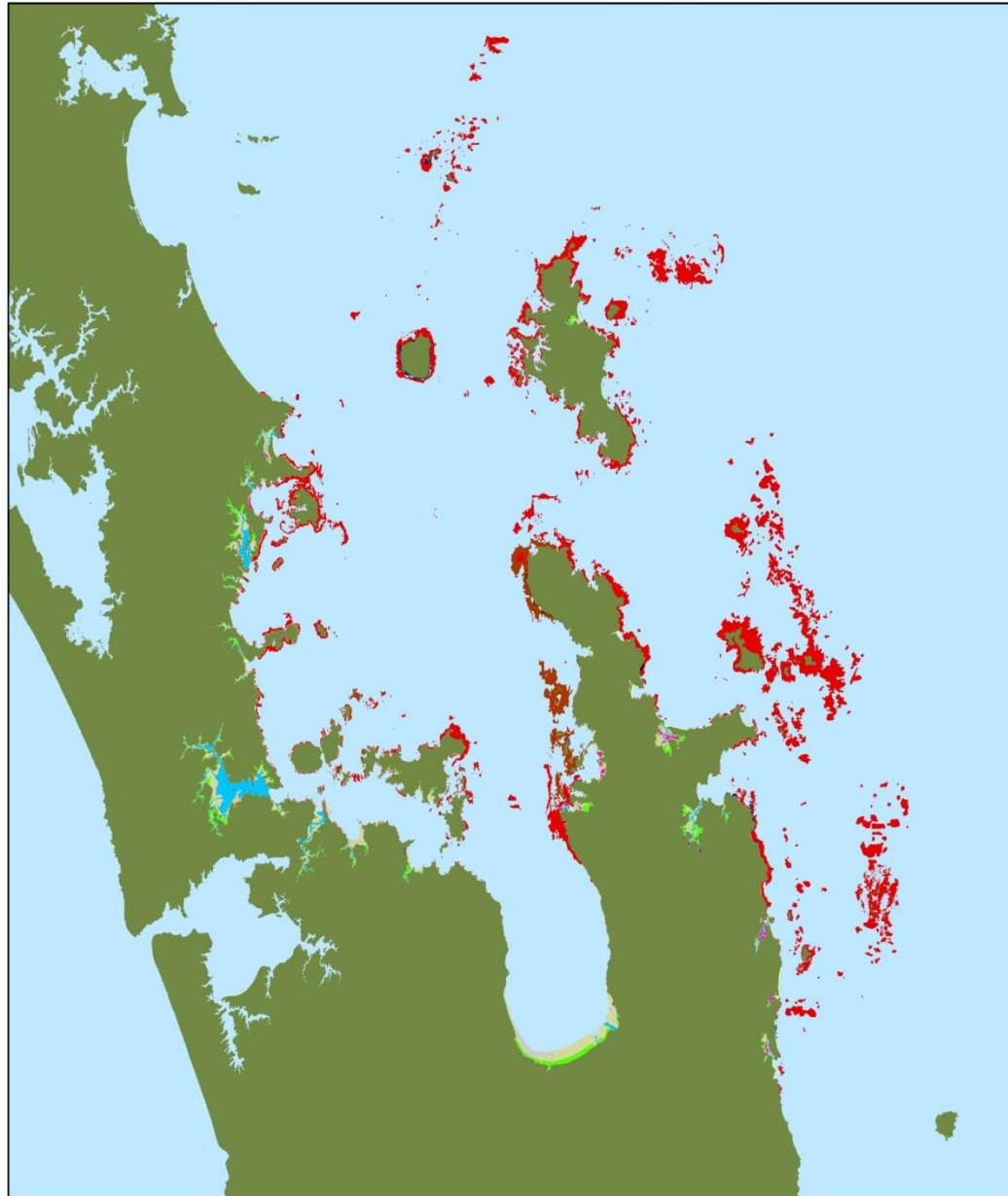


Legend

- intertidal, saltmarsh
- intertidal, mangrove
- intertidal, seagrass
- intertidal, mud
- intertidal, sand
- intertidal, gravel/cobble
- intertidal, boulder
- intertidal, rock
- shallow subtidal, mud
- shallow subtidal, mud channel
- shallow subtidal, sand
- shallow subtidal, gravel/cobble
- shallow subtidal, boulder
- shallow subtidal, biogenic
- subtidal rock



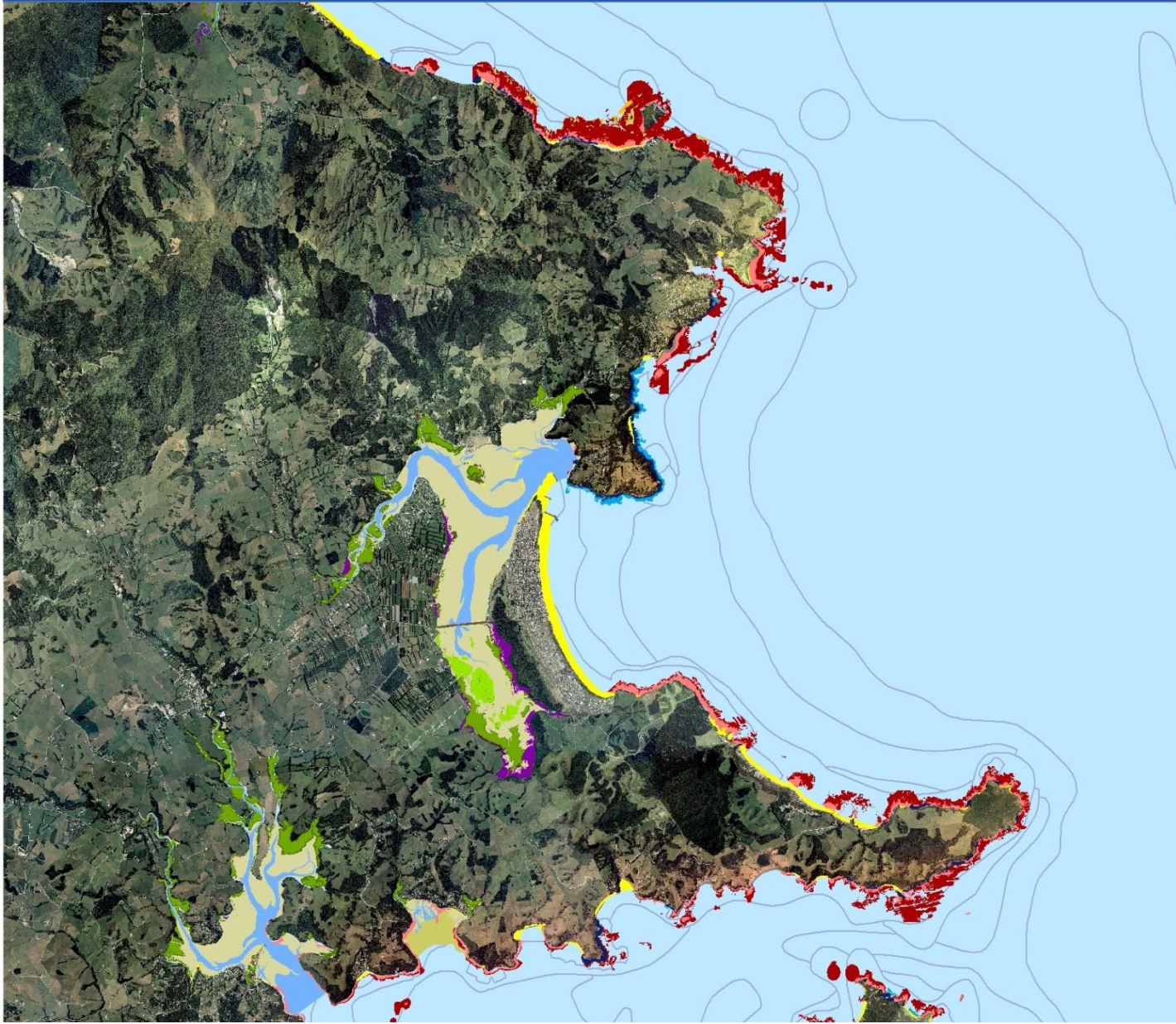
0 5 10 20 30 40
km



- Aerial photo
- Fare sheets

Mapping of habitats from aerial photo and fare sheets by Stacey Byers, Anna and Chris Wild (DOC Auckland) with edits by Vince Kerr and ASR and data from Environmental Waikato

Whangateau Harbour and surrounding area marine habitats



Map by
Stacy
Byers



1:400
0 5 10 20 Meters

Side scan sonar image

Sidescan sonar
Vince Kerr and
Roger Grace

Depth **22.2** m

 **32.9** m Cursor

Depth **75** m Distance **095** °t Bearing

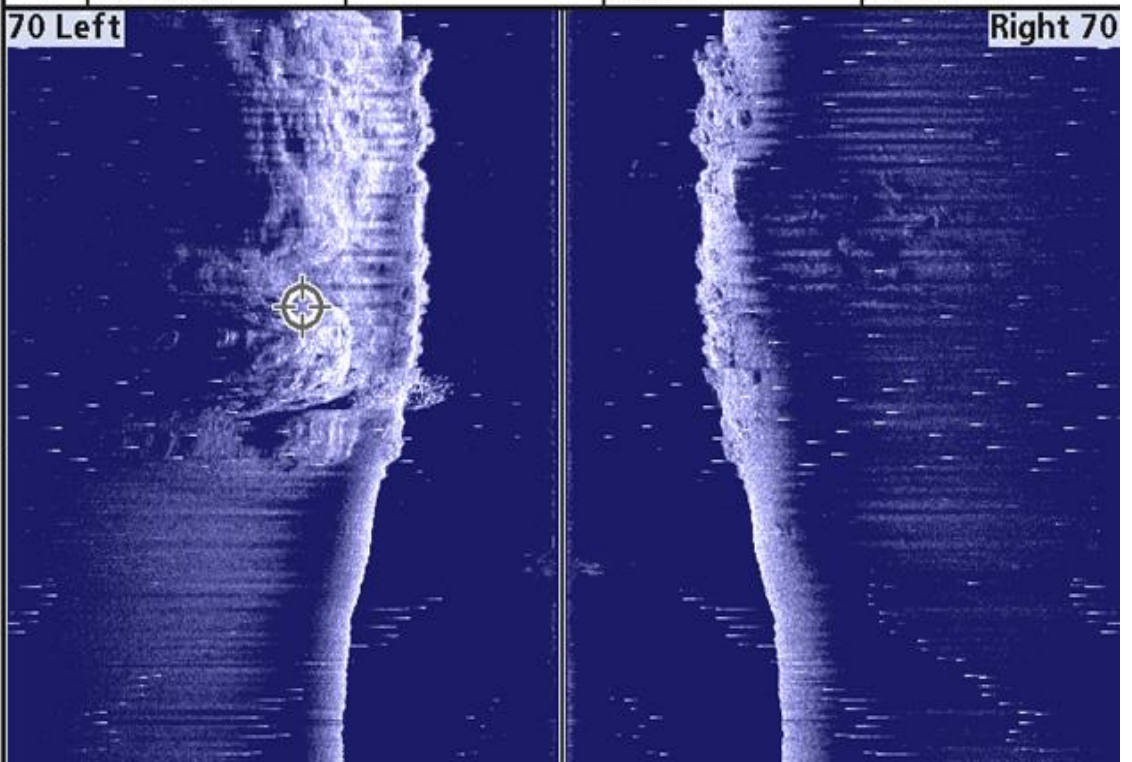
 **66:41**

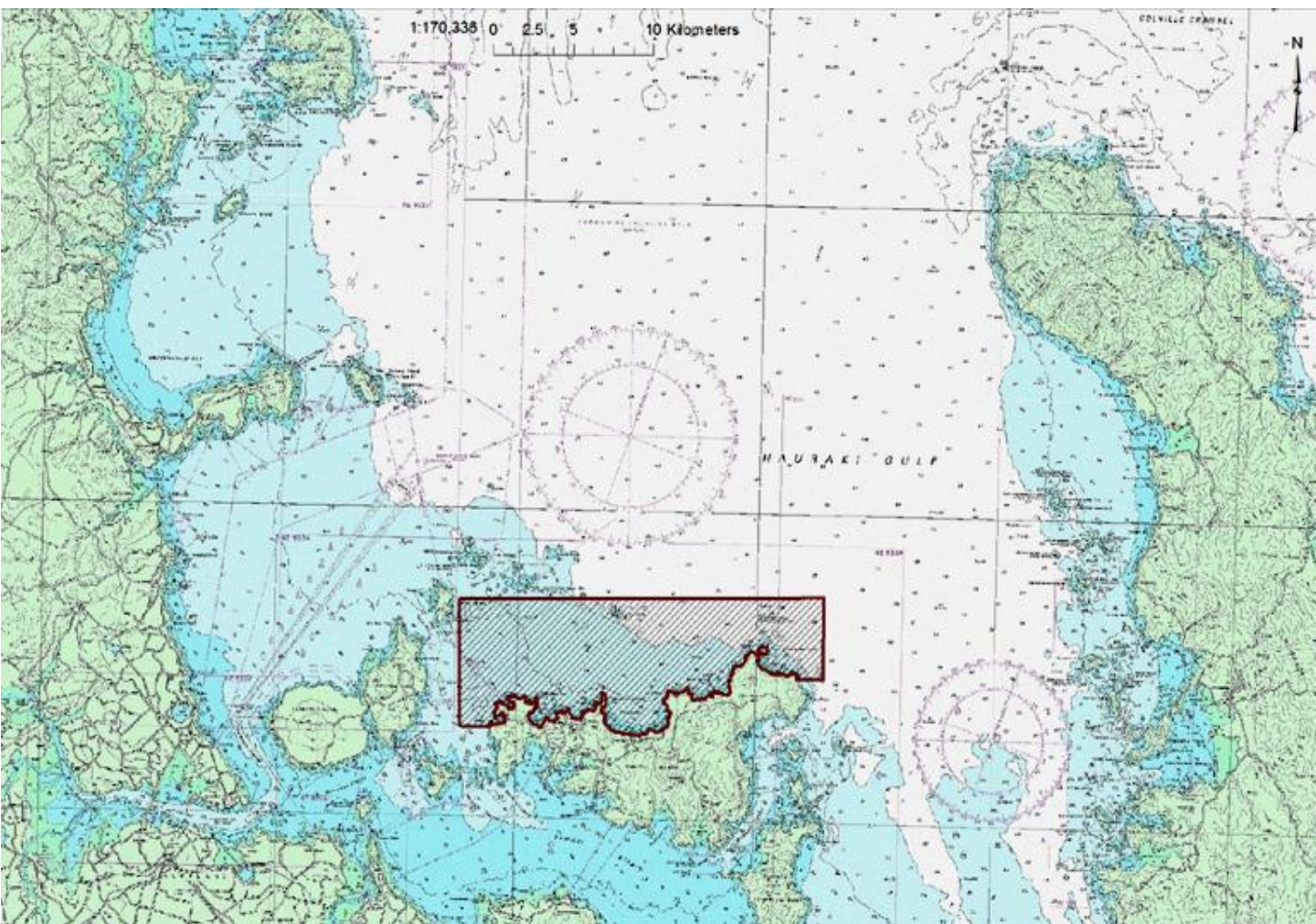
km kts
299 **2.4**

S **36°44.415'**
E **175°02.905'**

Temp **21.1** °C

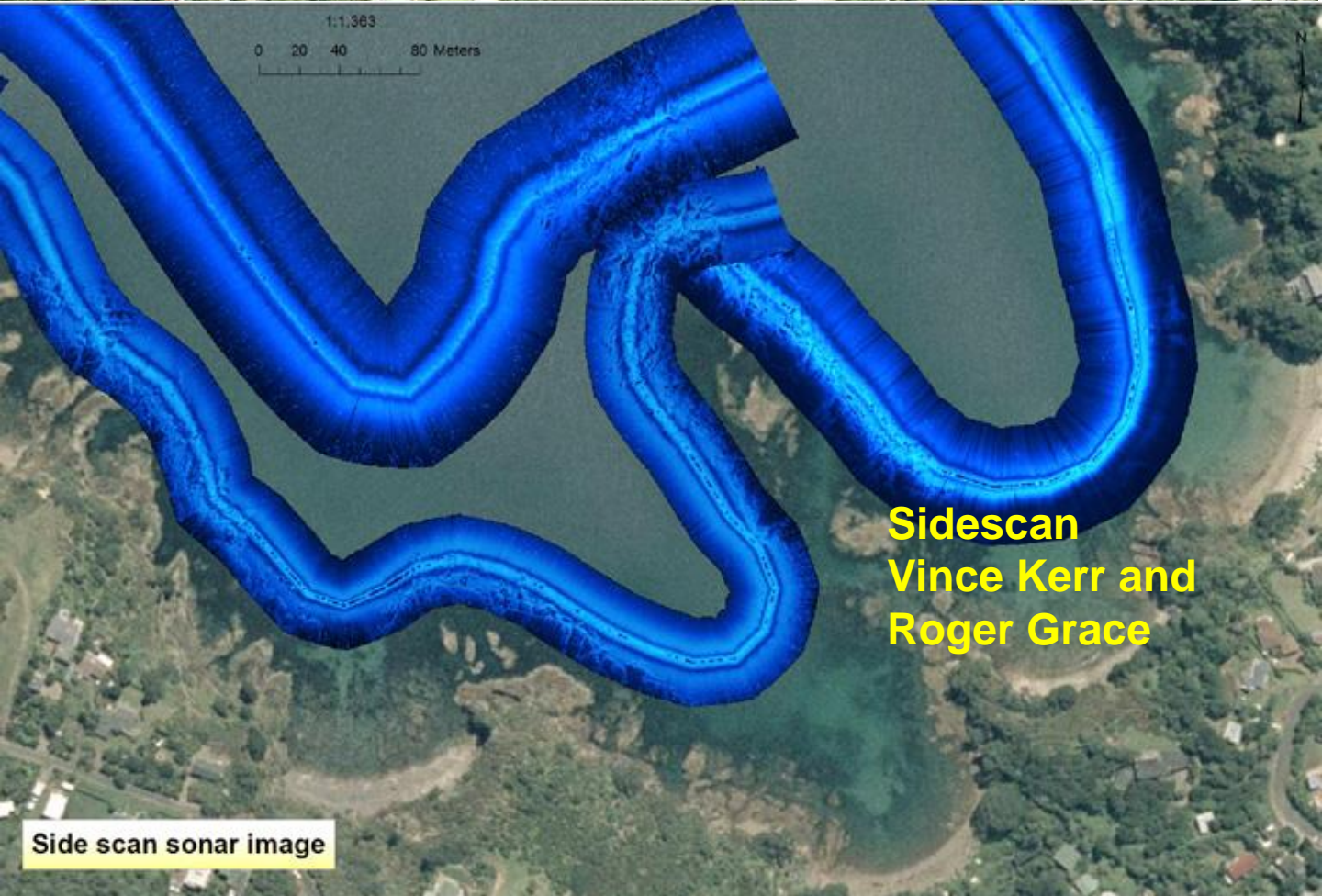
Speed **4.1** kts





Sidescan sonar of northern area of Waiheke Island by Vince Kerr and Roger Grace

**Aerial Photo:
Auckland Council**

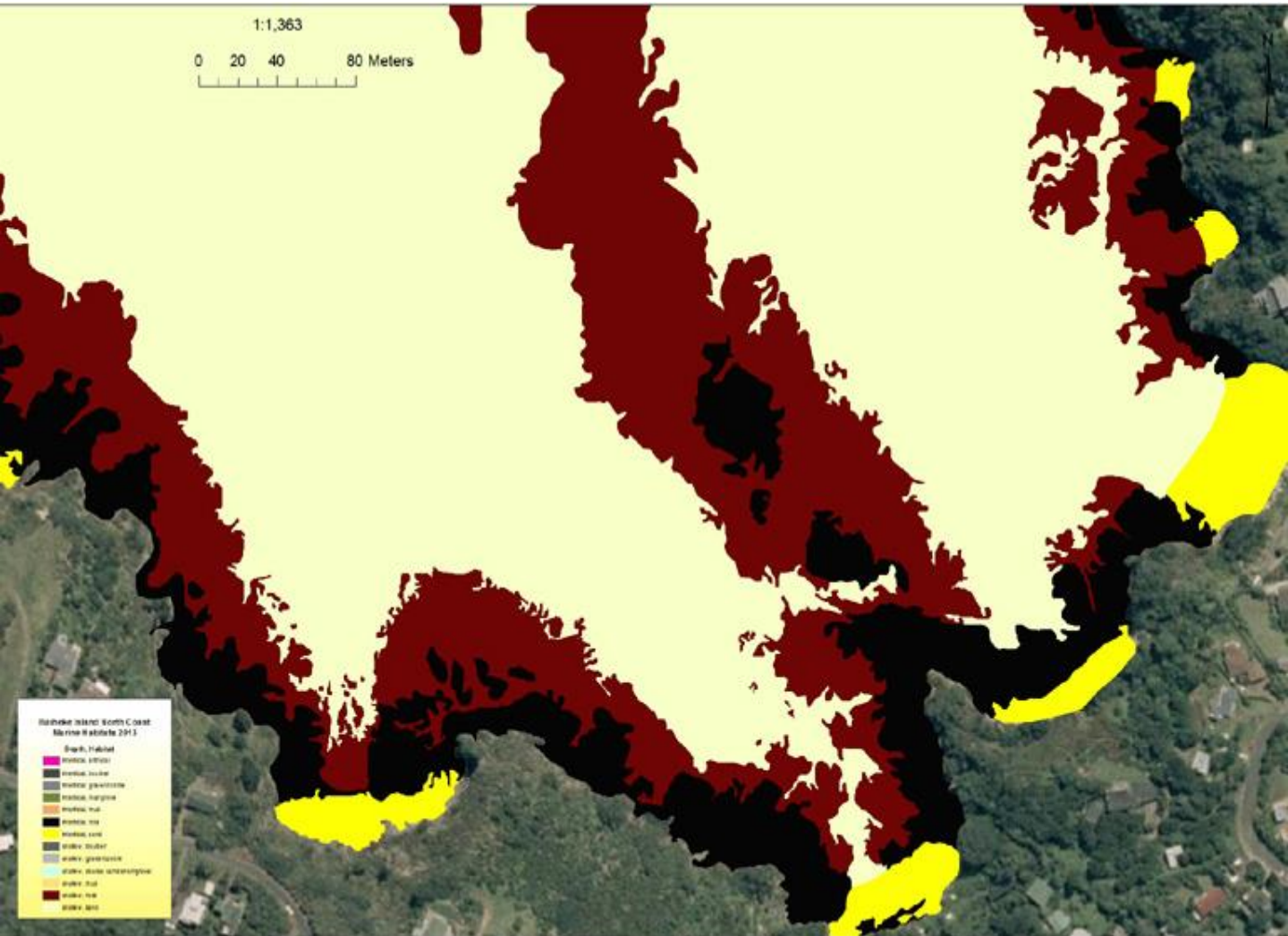


**Sidescan
Vince Kerr and
Roger Grace**

Side scan sonar image

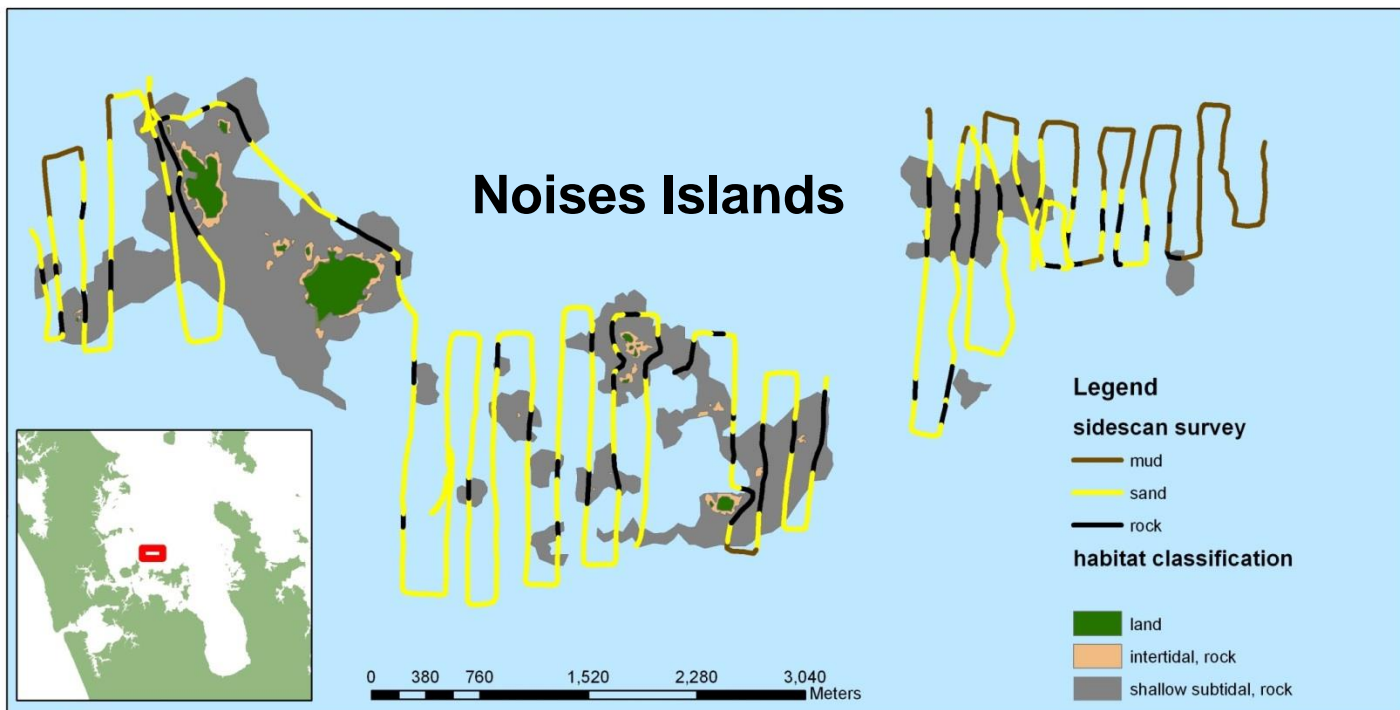
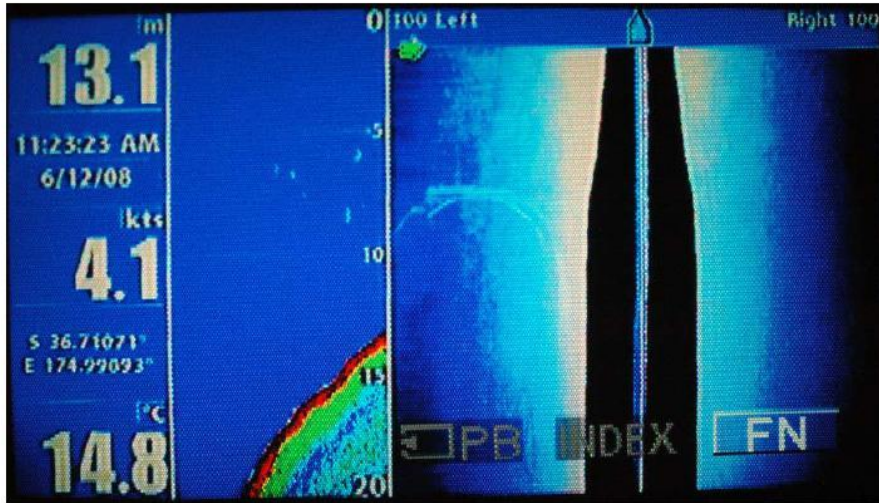
Mapping inshore habitats from sidescan sonar

Vince Kerr and
Roger Grace

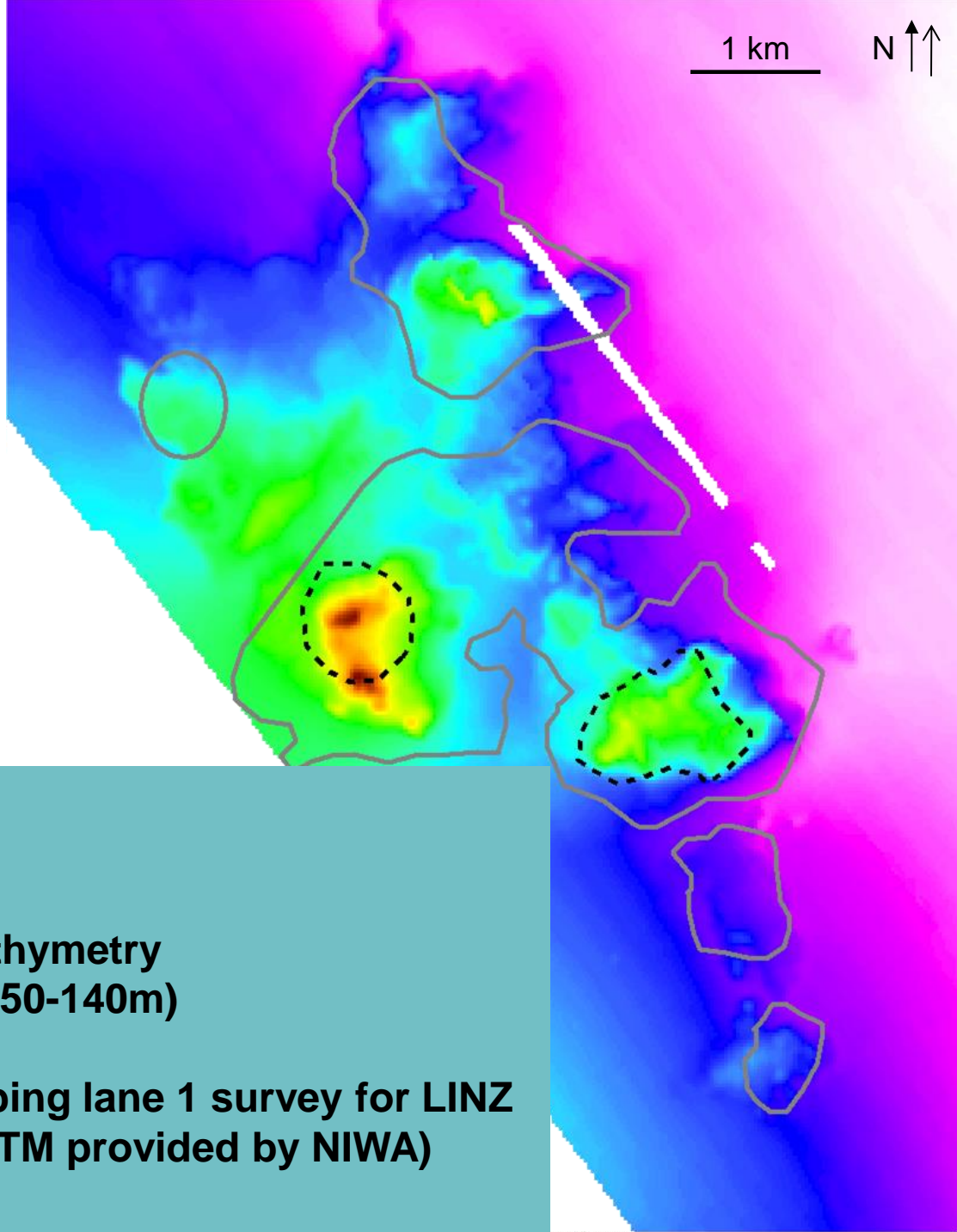


Ground truth: side scan sonar

Survey for DOC
by Roger Grace



And reefs north of Whangamata
(Roger Grace)



**Multibeam bathymetry
off Cuvier Is. (50-140m)**

**Colour - Shipping lane 1 survey for LINZ
from RNZN, DTM provided by NIWA)**



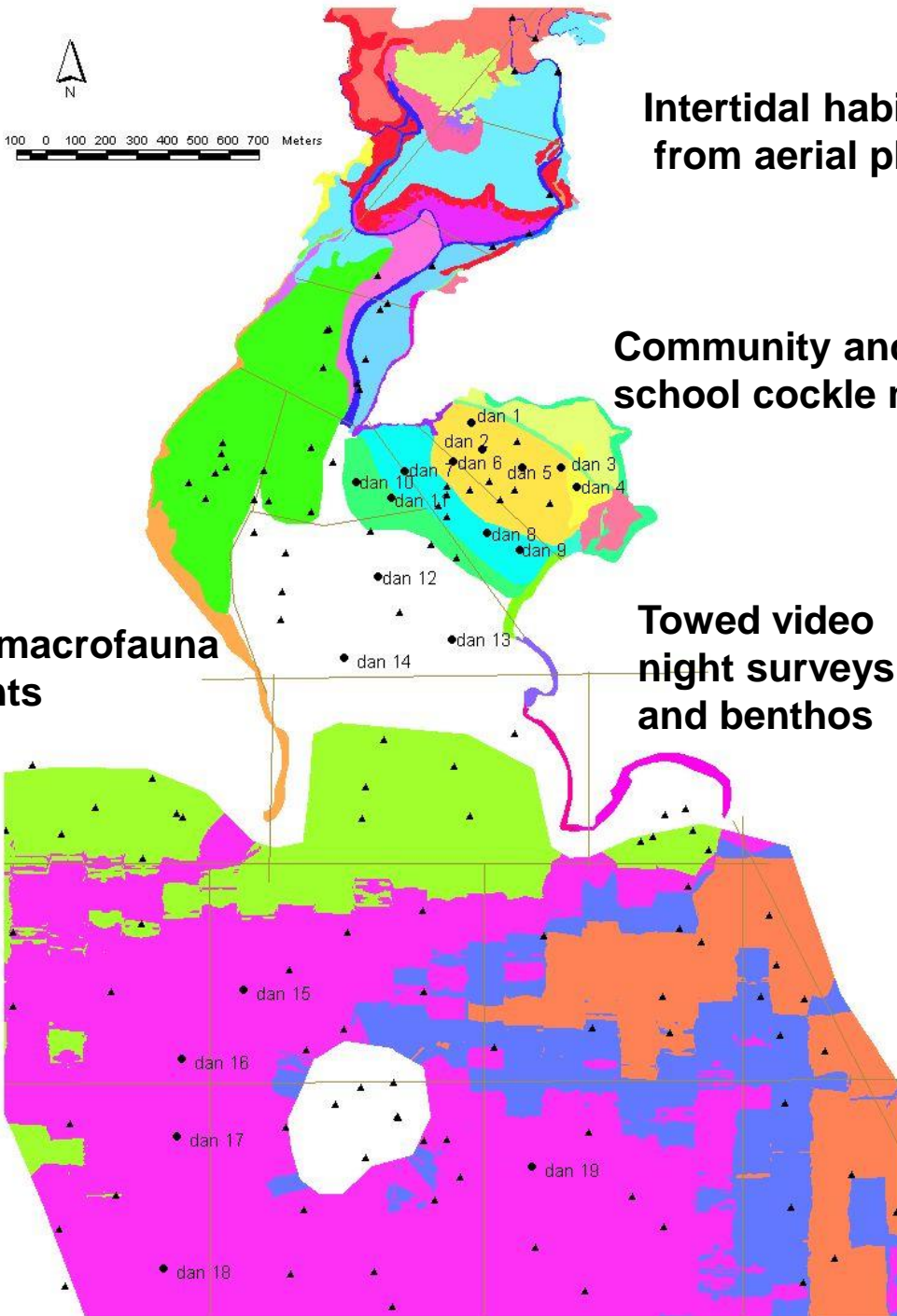
**High relief traced from hydrographic charts
(Chris Wild)**



**High relief from fare sheets
(Stacey Byers)**

Video drops to 110m Cuvier, Colville Channel

Te Matuku Marine Reserve



**Intertidal habitat map
from aerial photo**

**Community and
school cockle monitoring**

**Sediment & macrofauna
sample points**

**Towed video
night surveys of fishes
and benthos**

**Seabed types from NIWA
QTC single beam sonar
Waikato Uni sidescan and multibeam
NIWA and LINZ multibeam**