MAUKE

NEARSHORE MARINE ASSESSMENT

2020

Ministry *of* Marine Resources
TU'ANGA O TE PAE MOANA
COOK ISLANDS

Prepared for the Mauke Island Council and Community

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Ministry of Marine Resources

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Mauke Nearshore Invertebrate and Finfish Assessment 2020
Ministry of Marine Resources (MMR)

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Original Text: English

Design and Layout: Ministry of Marine Resources

Front Cover: Mauke Island aerial photo. MMR/K.Morejohn
Back Cover: Aerial view of Mauke Harbour. MMR/K.Morejohn

Avarua, Rarotonga, Cook Islands, 2020

ACKNOWLEDGEMENTS

This work was made possible with funding provided by the United Nations Development Programme (UNDP) Ridge to Reef Project (R2R) and MMR.

Many have contributed to the success of this expedition. We would like to thank MMR Director of Inshore Fisheries Koroa Raumea, Marine Scientist James Kora, Fisheries Officers Tua Matepi and Tai George, journalist Rachel Reeves, fish and SCUBA expert Graham McDonald, and Pacific Community (SPC) Coastal Fisheries Science, Management and Livelihoods Adviser, Ian Bertram.

Meitaki ranuinui ki te iti tangata o Akatokamanava e te au mema

I roto I te konitara enua no ta koutou tauturu.

The MMR marine survey team and Mauke Island Council. Photo by Graham McDonald

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INTRODUCTION

The purpose of this report is to provide an assessment of biodiversity and abundance of nearshore marine resources on the island of Mauke.

Mauke, also known as Akatokamanava is home to approximately 300 people and is situated at 20.1606º S, 157.3384º W. Together with Atiu to the west and Mitiaro to the north; these islands are commonly referred to as Ngaputoru. The Ngaputoru group are upraised coral islands surrounded by rugged cliffs (*uruatea*) and narrow reefs with limited access through the reef. Mauke lacks a lagoon and has limited coral reef area with a steep outer reef slope. Due to this limited reef habitat, the diversity and abundance of marine resources are relatively low. Mauke reef flats are shallow and exposed at normal low tides. This exposure can stress corals, invertebrates and reef fish, reducing their ability to persist in this environment. Invertebrates that can survive the pressure of prolonged exposure to air are further subjected to harvest.

There is only one *ra'ui* on Mauke located on the north-western side of the island which encompasses the site of Patito (known as the Patito Ra'ui). The management practices that surround *ra'ui* are traditionally controlled. There are no other forms of marine management on the island.

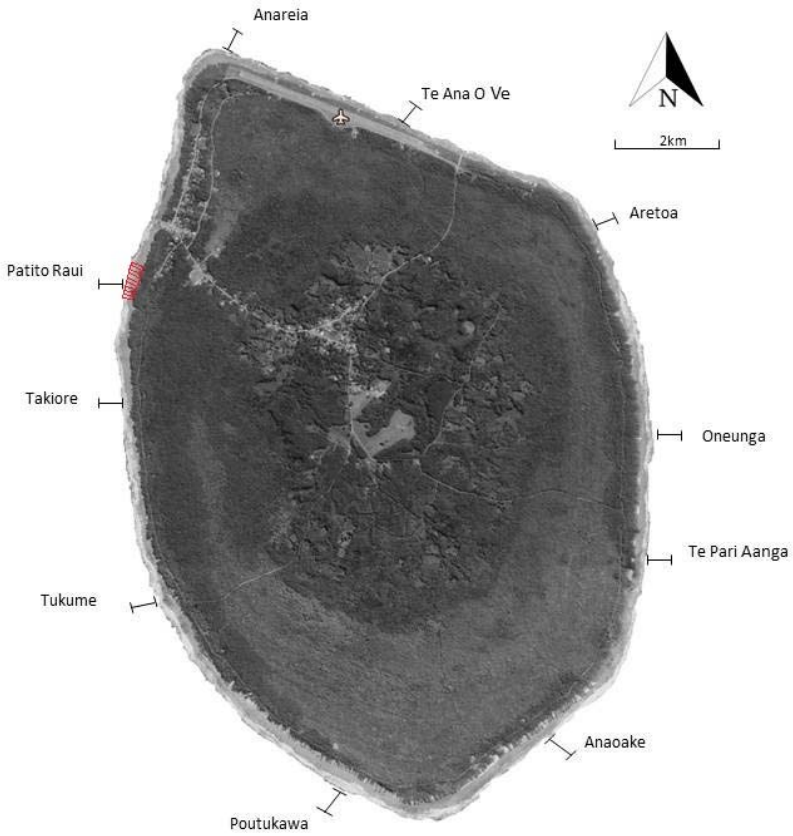

Figure 1. Mauke survey sites. Map source: Google DigitalGlobe.

METHODOLOGY

The Mauke survey took place from 16th to 23rd January 2020 with a total of ten sites surveyed around the island. Survey sites were selected to include any existing *ra'ui* and other control areas (unmanaged areas open to harvest). There is one designated *ra'ui* named Patito included in this survey (Patito Ra'ui). For historical comparisons, inner reef sites of Anaoake, Te Pari Aanga and Anaue which were previously surveyed by Ponia et al. 1998 and George & Kea 2014 were included in our survey.

Within each site, habitats were identified as inner reef benthos (RBT), reef front transect (RFT) and over reef transect (ORT). RBT and RFT transects were surveyed on the inner reef by walk sampling and if required, snorkelling, whilst ORT transects on the fore reef were surveyed using SCUBA. For the ORT habitat, SCUBA surveys were conducted in 10 m depth of water for finfish and invertebrates, and photoquadrats gathered for coral cover and substrate composition analyses. All species observed were identified to the lowest possible taxonomic classification. Invertebrate lengths were measured and finfish lengths visually estimated.

Figure 2. MMR staff survey Mauke fore reef. MMR/K.Morejohn

RESULTS

Invertebrates

A total of 4,412 individuals were observed across 90 transects, representing a total of 20 different taxa. The most frequently observed species was *ungakoa* (*Dendropoma* spp.) where a total of 1,536 individuals were recorded across all transects. *Rori toto* (*Holothuria atra*) and *pa'ua* (*Tridacna maxima*) were also frequently observed with a total of 524 and 477 individuals observed across all transects, respectively. The average invertebrate total abundance on the inner reef was greatest at Takiore (124 ± 24 ind./40 m^2, mean ± 1 SE) and least at Poutukava and Te Pari Aanga (14 ± 2 ind./40 m^2 and 14 ± 5 ind./40 m^2) shown in Figure 3. Invertebrate abundance over the reef was greatest at Patito Ra'ui (38 ± 24 ind./40 m^2) and lowest at Anaoake (1 ± 0 ind./40 m^2), Tukume (3 ± 1 ind./40 m^2) and Takiore (3 ± 1 ind./40 m^2). No invertebrates were recorded on the outer reef of Te Ana O Ve and Te Pari Aanga (Figure 3).

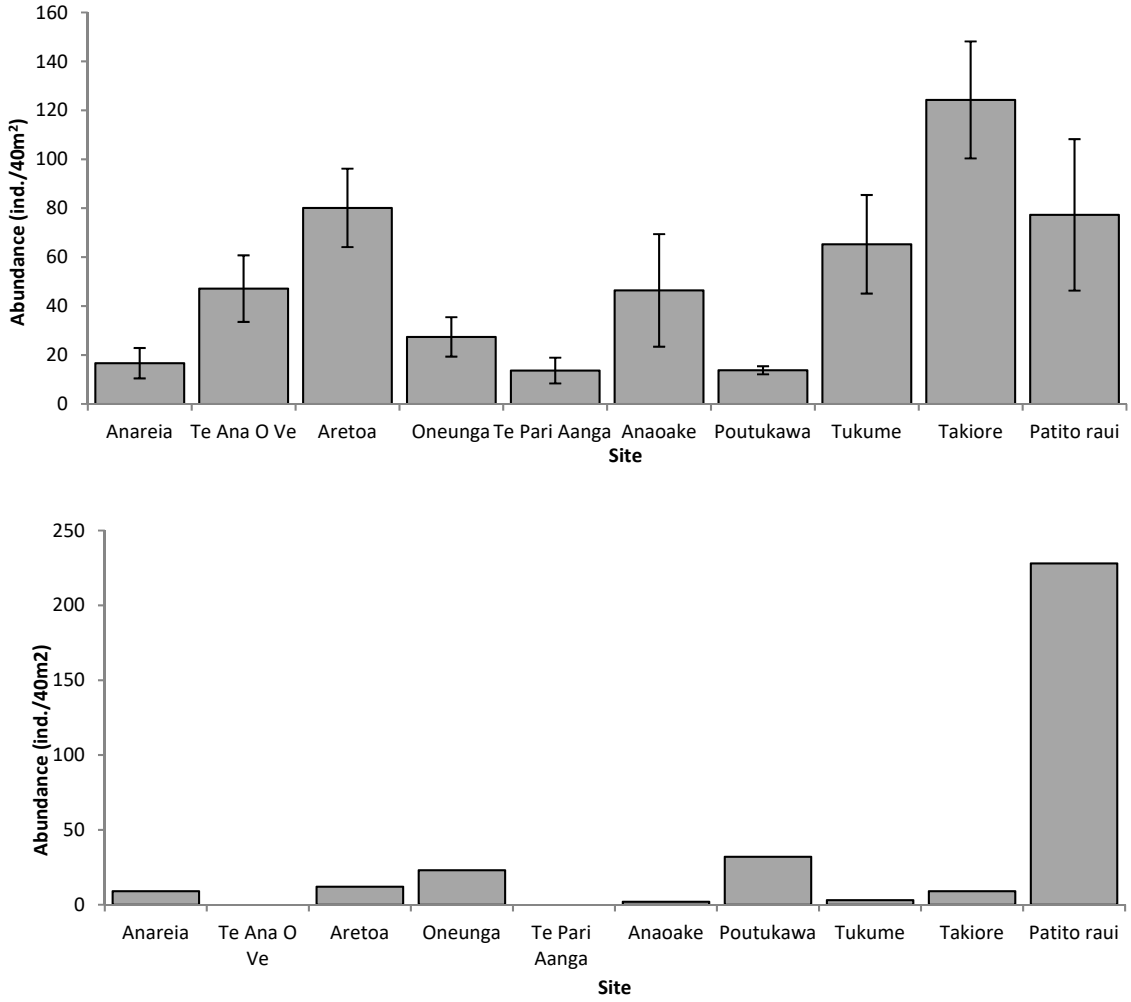

Figure 3. *Top:* Average invertebrate abundance on the inner reef. *Bottom:* Average invertebrate abundance on the fore reef slope.

Average *ungakoa* abundance on the inner reef was greatest at Patito Ra'ui (48 ± 20 ind./40 m^2) and least at Te Ana O Ve (2 ± 0 ind./40 m^2), Anareia (5 ± 2 ind./40 m^2) and Poutukava (5 ± 2 ind./40 m^2). The *ungakoa* abundance at Anaoake (41 ± 19 ind./40 m^2) was slightly greater than Aretoa and Tukume (37 ± 17 ind./40 m^2) and (39 ± 8 ind./40 m^2), shown in Figure 4.

Average *rori toto* abundance on the inner reef was greatest at Patito Ra'ui (28 ± 12 ind./40 m^2) and least abundant at Anaoake and Te Pari Aanga (1 ± 0 ind./40 m^2) shown in Figure 5.

Average *pa'ua* abundance on the inner reef was greatest at Takiore (58 ± 20 ind./40 m^2) and *pa'ua* were least abundant at the sites of Anareia, Te Ana O Ve, Oneunga and Anaoake (1 ± 0 ind./40 m^2; Figure 6). No *pa'ua* were recorded at Te Pari Aanga and Tukume. While the densities recorded at Takiore and Patito were greatest, these populations were predominately composed of very small, immature *pa'ua* (mean = 46.44 ± 1.87 mm).

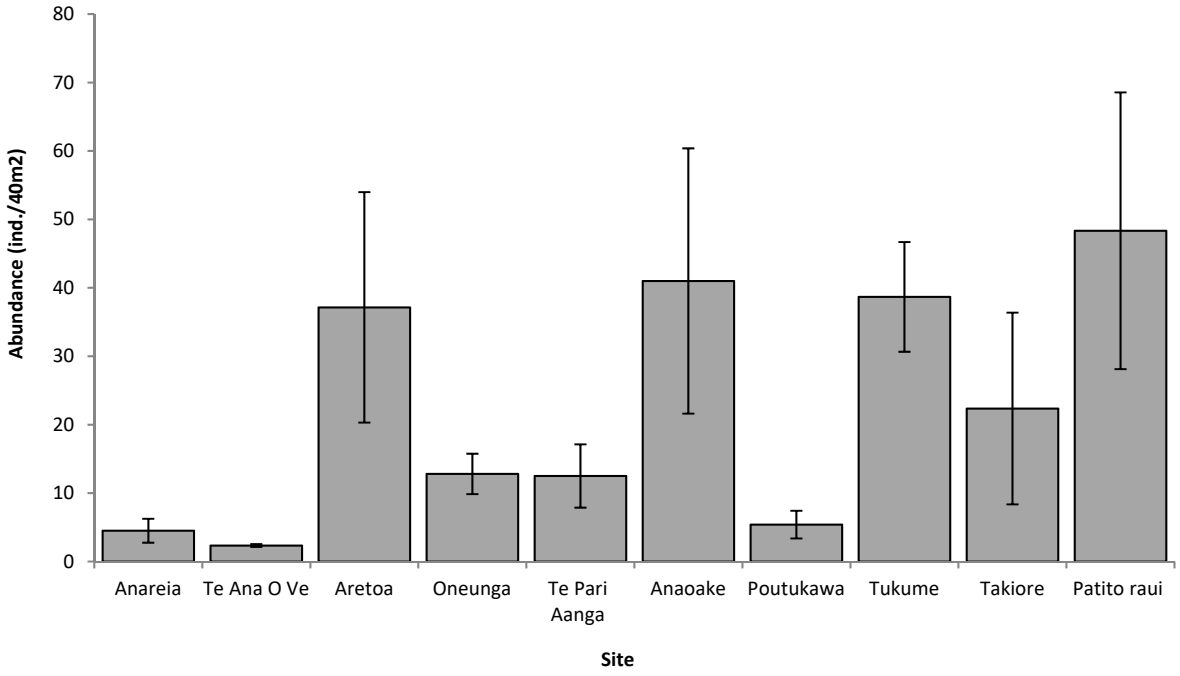

Figure 4. Average *ungakoa* abundance on inner reef sites.

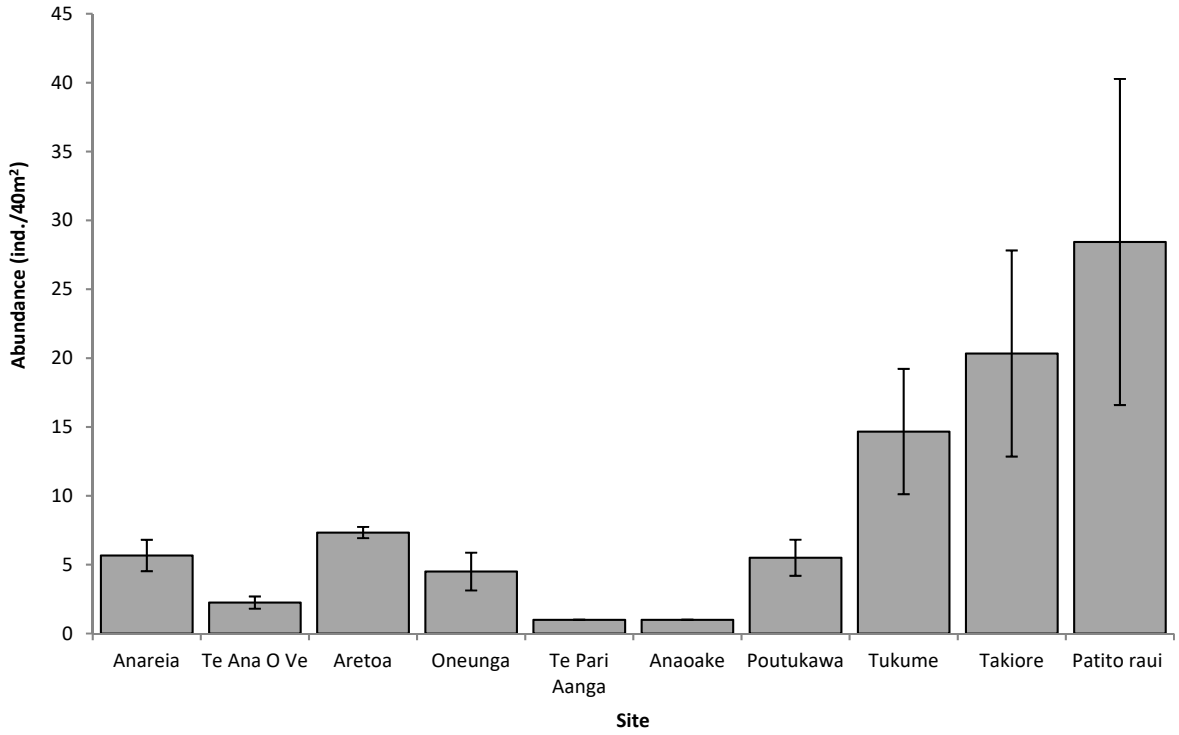

Figure 5. Average *rori toto* abundance on inner reef sites.

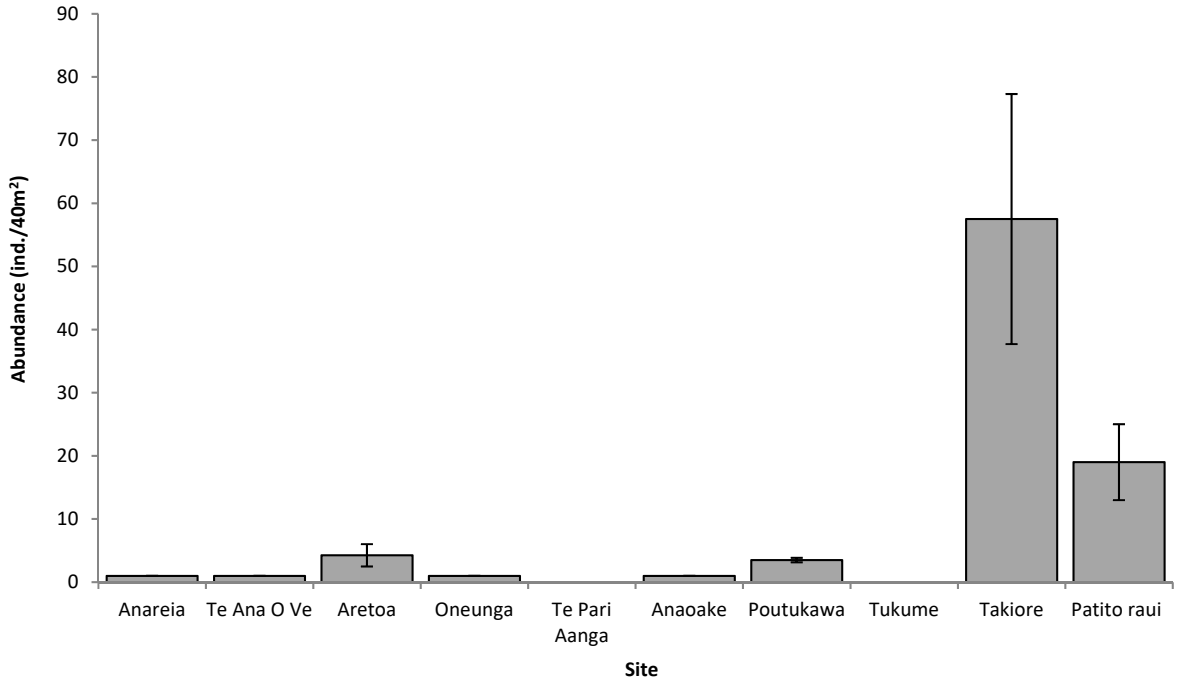

Figure 6. Average *pa'ua* abundance on inner reef sites.

Figure 7. *Pa'ua* (fluted giant clam, *Tridacna squamosa*) in 10 metres of water on the fore reef slope. MMR/K.Morejohn

Figure 8. Marine hermit crab (*Calcinus* sp.) within a *Mangeongeo* (*Drupa morum*) shell on the reef crest during low-tide. MMR/K.Morejohn

Finfish

A total of 4,500 individual fish were observed across 10 transects representing a total of 53 taxa. The most frequently observed species was *Chromis acares* where a total of 1,880 individuals were recorded across all transects. *Chromis vanderbilti* and *Chromis agilis* were also frequently observed with total individuals of 960 and 87 individuals, respectively.

Finfish density over the reef was greatest at Poutukava (653 ind./100 m^2) and least at Patito Ra'ui (67 ind./per 100 m^2; Figure 9).

An inter-island comparison of food fish (commonly eaten fish in the families: Acanthuridae, Carangidae, Serranidae, Lutjanidae, Lethrinidae, Scaridae, Mullidae and Siganidae) was performed for the Ngaputoru. Mauke densities averaged 39 ± 14 food fish/100 m^2 and were lower than Atiu (77 ± 17 food fish/100 m^2) and Mitiaro (52 ± 11 food fish/100 m^2).

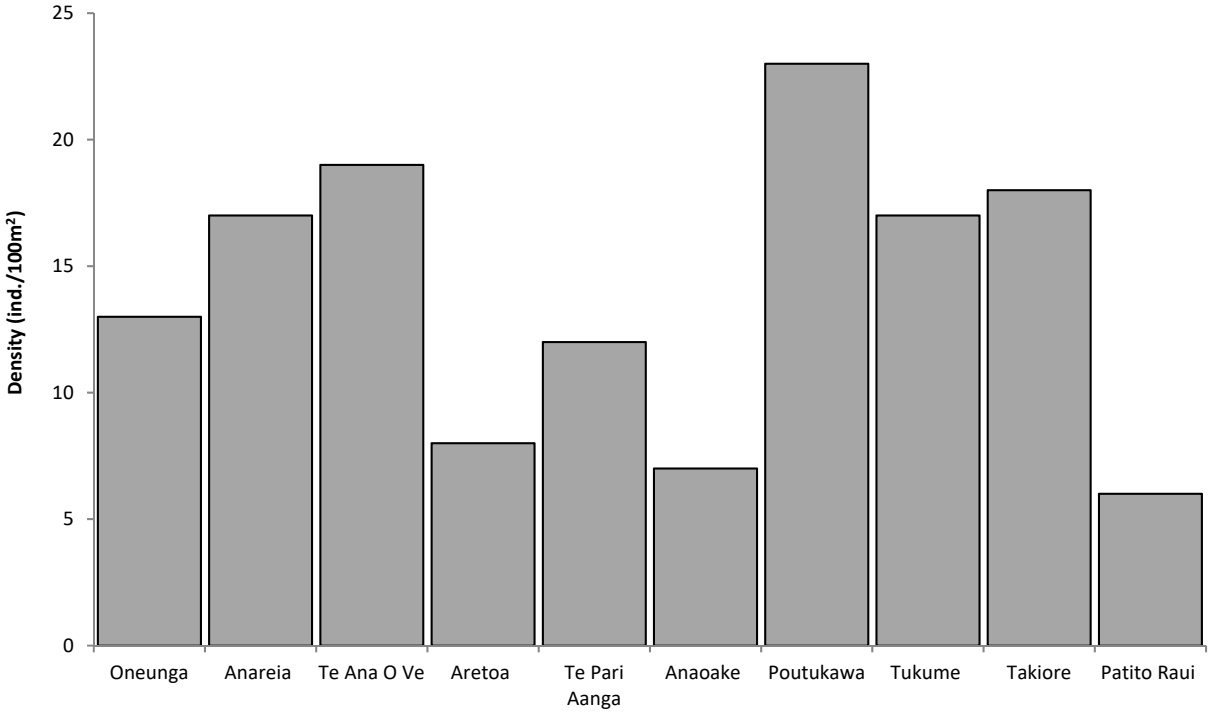

Figure 9. Finfish densities at fore reef sites.

Coral and Substrate

Average cover of hard coral was 28% across all sites and was greatest on the eastern side of the island at Oneunga and least at Te Pari Aanga. The average hard substrate cover (rock, rubble and pavement) was 34% and dominated the substrate cover on the outer reef of Mauke. Crustose coralline algae (CCA) was recorded across all sites with an average cover of 18%. Interestingly, CCA cover was greatest where dead coral cover was lowest. Dead coral cover averaged 5.8% at Patito Ra'ui, Takiore, Tukume, Anaoake, Te Pari Aanga, Oneunga, Aretoa and Anareia. There were no dead coral recorded at Poutukawa and Te Ana O Ve. Soft substrate accounted for the lowest percent cover across all ten sites. No sponges were recorded. Low average percent cover (1-2%) for bleached corals were recorded on the western side of the island.

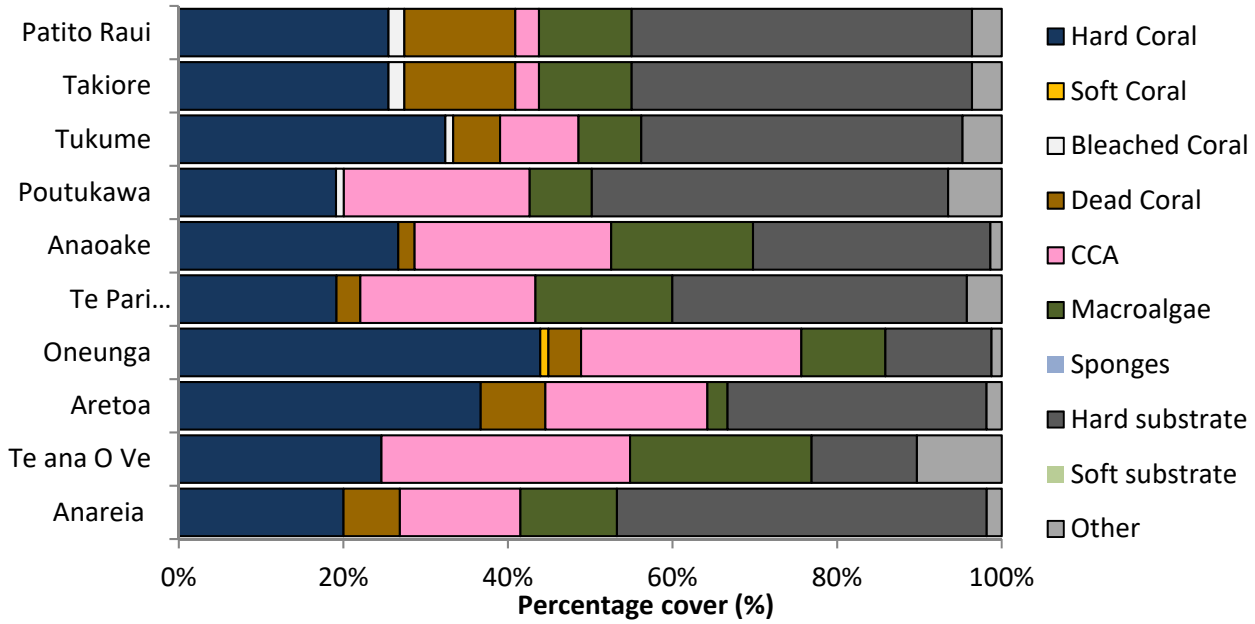

Figure 10. Substrate type and percentage cover from over the reef sites.

Figure 11. Typical fore reef slope, substrate and high densities of *Chromis acares* and *Chromis vanderbilti* (*katoti*) at 10 m depth. MMR/K.Morejohn

DISCUSSION AND RECOMMENDATIONS

This section provides considerations for the community and leaders in Mauke to improve the management of their marine resources.

Pa'ua habitat in Mauke is limited due to the narrow reef and harsh (rough and exposed) reef system, affecting recruitment and abundance. *Pa'ua* management should be considered, in particular the use of a minimum harvest size of 12 cm in total length.

Observations of healthy *pa'ua* densities of mature sizes were made on the fore reef, adjacent to the airport, between Anareia and Te Ana O Ve. Due to the previously mentioned habitat limitations on Mauke reef flats, healthy populations outside the reef are essential for maintaining healthy island-wide populations.

Among the Ngaputoru islands, Mauke had the lowest densities of food fish. At the time of our survey, the only active *ra'ui* was at Patito – this *ra'ui* did not extend beyond the reef. There were no areas (e.g. *ra'ui*) outside the reef where fishing was managed. This lack of protection may contribute to low food fish densities. For the purpose of increasing food fish densities and managing fish stocks beyond the reef, recommendations are provided below:

- Further surveys to capture size structure data of food fish and invertebrates to formulate management strategies such as size and catch limits, seasonal or time-area closures.
- Creating additional *ra'ui* around the island with a clear purpose for its establishment. Further discussions between MMR, the Island Council and community should be had to determine a suitable sized area and monitoring arrangements.
- Extending all *ra'ui* from the shore to the reef drop off to provide greater protection for food fish, however consideration of the practicalities of the troll fishery should be taken in to account.
- Creating a *ra'ui* along the airport extending from shore to the reef drop-off, specifically for *pa'ua* preservation.

Opposite Page: Aerial view of Patito Ra'ui and MMR survey team. MMR/K.Morejohn