Hauraki Gulf Monitoring Project Science Report 2021

A hairy trumpet snail, an uncommon find, found by students from Wentworth College at Manly Beach in Whangaparaoa

By Teresa Morrell, NZMSC educator.

Executive Summary

The Hauraki Gulf Monitoring Project (HGMP) is a coastal monitoring project that uses citizen science to gather information on biodiversity of the intertidal community of the Hauraki Gulf – Tikapa Moana. The HGMP uses the Marine Metre Squared (Mm2) methods (www.mm2.net.nz) to collect data on the diversity, abundance and distribution of invertebrates and seaweeds and small fish living between the tides. The project began in 2017 and this report summarizes the finding and outcomes of the collected data in 2021.

Some key highlights include:

- 7 school groups and 2 community groups participated
- 9 locations around the Hauraki Gulf were monitored
- 123 unique species were identified
- One invasive marine pest was recorded at two locations

This project would not be possible without the engagement and enthusiasm of the schools and community groups involved nor without the support of Foundation North, the New Zealand Association for Environmental Education (NZAEE), the New Zealand Marine Studies Centre, Sir Peter Blake Marine Education and Recreation Centre and the past co-coordinators of the project Dr Mels Barton, Shanthie Walker and Aless Smith

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Introduction

The Hauraki Gulf Marine Park or Tikapa Moana lies on the east coast of the Auckland and Waikato and covers an area of more than 1.2 million hectares (Department of Conservation, n.d.). Being located near the densest population of people in Aotearoa, Auckland having a population of 1.66 million in 2017 (Council, n.d.). Tikapa Moana is a hub of human activities with tourism operators offering activities like kayaking, boating snorkelling as well as ferries and trips to the many offshore islands (New Zealand Tourism, n.d.). Tikapa Moana is a place for recreation as well as a commercial and recreational fishing location, the biodiversity of the Hauraki Gulf are under threat (Hauraki Gulf Forum, 2020). This in turn threatens the value of this Marine Park as a source of kaimoana and recreation which support the physical and mental health of the people who are connected to this environment.

The 2020 "State of Our Gulf" report outlined the decline that kaimoana stocks such as crayfish and snapper are experiencing and the flow on effects for the biodiversity of the ecosystems within the gulf as kina/urchin barrens become more common (Hauraki Gulf Forum, 2020). It is due to the concern for this space and the species which call it home and a desire to engage the public in the health of this environment that the Hauraki Gulf Monitoring Project (HGMP) was started.

The Hauraki Gulf Monitoring Project (HGMP) was established in 2017 when Foundation North provided funding to the New Zealand Association for Environmental Education (NZAEE). Seeing a need to further engage with communities (particularly young people) in becoming kaitaiki/guardians of the Hauraki Gulf – Tikapa Moana/ Te Moananui-ā-Toi, the HGMP builds upon the annual event 'Seaweek'(also run by the NZAEE). The HGMP aims to encourage our connection with the coastal environment, develop an ethos of guardianship/kaitiakitanga and support environmental action projects to increase understanding how our activities affect the coastal environment.

To achieve these goals, the HGMP has utilised Marine Metre Squared (Mm2) as a tool for monitoring seashore ecology over time. Mm2 is a nationwide marine-focussed monitoring project that relies on the general public to gather information about what is living on their local seashore. Using a standard ecological surveying method, Mm2 is an effective way to encourage communities to look closer, get to know their local seashore and monitor change over time. This demonstration of citizen science – where the public participates in a scientific project (often through data collection) – can create partnerships between sectors, promote environmental awareness, involved local communities in science and kaitiakitanga/guardianship.

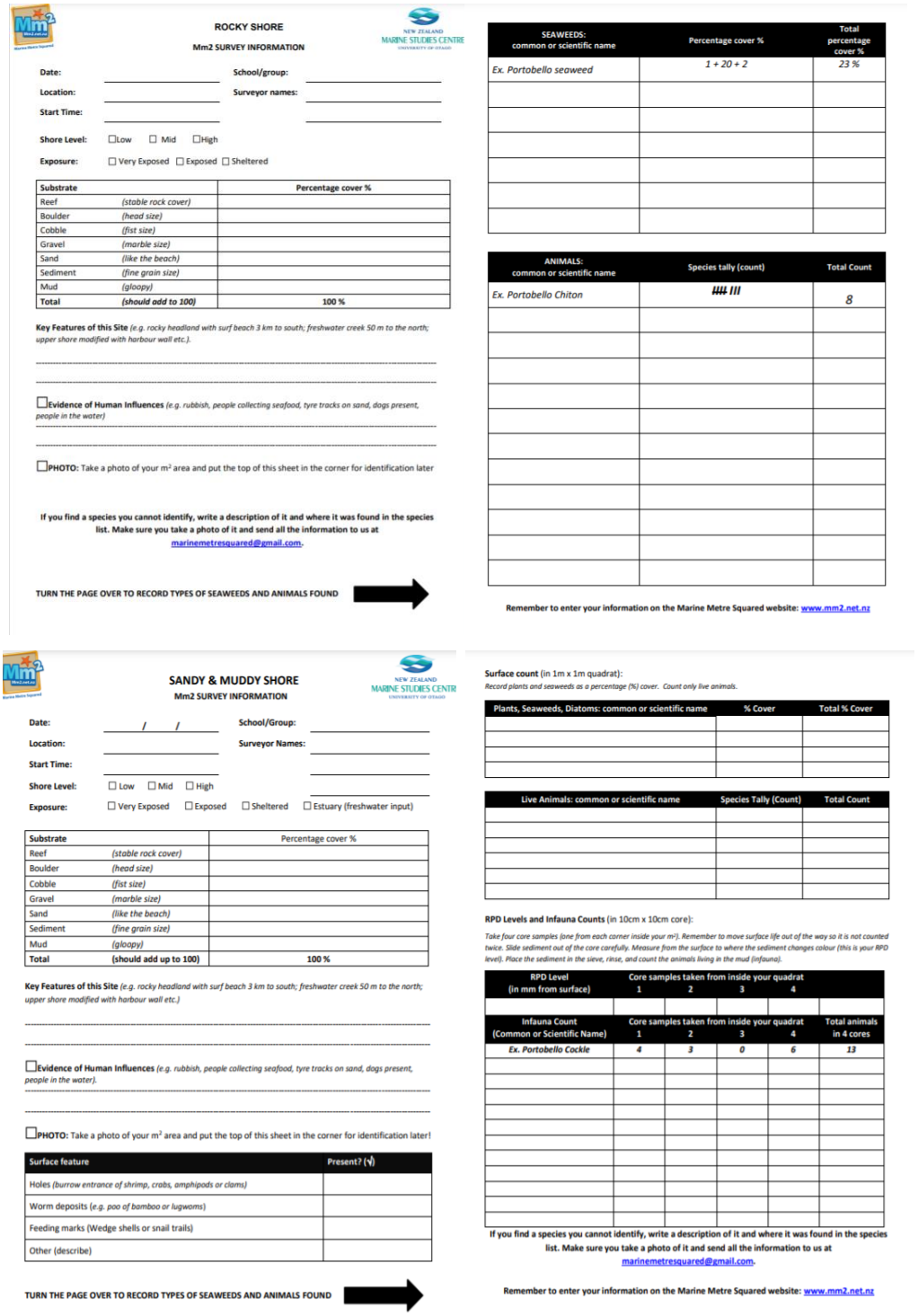
Through collecting data, participants not only have the opportunity to develop practical science skills but also gather data for useful measures of ecosystem health such as biodiversity, species abundance and distribution. Collection of baseline data is very valuable for long-term ecological monitoring and provides the opportunity to look at change in the biological community over time or other ecological parameters. It provides schools and community groups with a procedure to investigate questions that are of local concern and encourages them to regularly check the health of their local shore through monitoring.

The collection of data over time can help to serve as an early warning system for environmental change for managers. Data collected by citizen scientists can also be used to supplement data collected by other groups. As an issue of concern in the Hauraki Gulf is the impact of both terrestrial and waterborne human activities on the quality of Tikapa Moana as a habitat for biodiversity. To address this, the aim for this year was to link the Mm2 data collected by participating groups to observations of human influences around the chosen site and how these might be impacting the local marine life.

This report presents the data collected in the 2021 iteration of the HGMP.

Methods

Marine metre squared data is collected using a standardised methods as groups can follow a data collection protocol which is given in the data sheets which are customised for sampling on rocky and sand shores there are shown in figure 1 below.



ROCKY SHORE

Mm2 SURVEY INFORMATION

Date: School/group:

Location: Surveyor names:

Start Time:

Shore Level: ☐Low ☐ Mid ☐High

Exposure: ☐ Very Exposed ☐ Exposed ☐ Sheltered

Substrate		Percentage cover %
Reef	(stable rock cover)	
Boulder	(head size)	
Cobble	(fist size)	
Gravel	(marble size)	
Sand	(like the beach)	
Sediment	(fine grain size)	
Mud	(gloopy)	
Total	(should add to 100)	100 %

Key Features of this Site (e.g. rocky headland with surf beach 3 km to south; freshwater creek 50 m to the north; upper shore modified with harbour wall etc.).

☐Evidence of Human Influences (e.g. rubbish, people collecting seafood, tyre tracks on sand, dogs present, people in the water)

☐PHOTO: Take a photo of your m² area and put the top of this sheet in the corner for identification later

If you find a species you cannot identify, write a description of it and where it was found in the species list. Make sure you take a photo of it and send all the information to us at marinemetresquared@gmail.com.

TURN THE PAGE OVER TO RECORD TYPES OF SEAWEEDS AND ANIMALS FOUND

SEAWEEDS: common or scientific name	Percentage cover %	Total percentage cover %
Ex. Portobello seaweed	1 + 20 + 2	23 %

ANIMALS: common or scientific name	Species tally (count)	Total Count
Ex. Portobello Chiton	𝍸 III	8

Remember to enter your information on the Marine Metre Squared website: www.mm2.net.nz

SANDY & MUDDY SHORE

Mm2 SURVEY INFORMATION

Date: / / School/Group:

Location: Surveyor Names:

Start Time:

Shore Level: ☐ Low ☐ Mid ☐ High

Exposure: ☐ Very Exposed ☐ Exposed ☐ Sheltered ☐ Estuary (freshwater input)

Substrate		Percentage cover %
Reef	(stable rock cover)	
Boulder	(head size)	
Cobble	(fist size)	
Gravel	(marble size)	
Sand	(like the beach)	
Sediment	(fine grain size)	
Mud	(gloopy)	
Total	(should add up to 100)	100 %

Key Features of this Site (e.g. rocky headland with surf beach 3 km to south; freshwater creek 50 m to the north; upper shore modified with harbour wall etc.)

☐Evidence of Human Influences (e.g. rubbish, people collecting seafood, tyre tracks on sand, dogs present, people in the water).

☐PHOTO: Take a photo of your m² area and put the top of this sheet in the corner for identification later!

Surface feature	Present? (√)
Holes (burrow entrance of shrimp, crabs, amphipods or clams)	
Worm deposits (e.g. poo of bamboo or lugworms)	
Feeding marks (Wedge shells or snail trails)	
Other (describe)	

TURN THE PAGE OVER TO RECORD TYPES OF SEAWEEDS AND ANIMALS FOUND

Surface count (in 1m x 1m quadrat):

Record plants and seaweeds as a percentage (%) cover. Count only live animals.

Plants, Seaweeds, Diatoms: common or scientific name	% Cover	Total % Cover

Live Animals: common or scientific name	Species Tally (Count)	Total Count

RPD Levels and Infauna Counts (in 10cm x 10cm core):

Take four core samples (one from each corner inside your m²). Remember to move surface life out of the way so it is not counted twice. Slide sediment out of the core carefully. Measure from the surface to where the sediment changes colour (this is your RPD level). Place the sediment in the sieve, rinse, and count the animals living in the mud (infauna).

RPD Level (in mm from surface)	Core samples taken from inside your quadrat 1	2	3	4

Infauna Count (Common or Scientific Name)	Core samples taken from inside your quadrat 1	2	3	4	Total animals in 4 cores
Ex. Portobello Cockle	4	3	0	6	13

If you find a species you cannot identify, write a description of it and where it was found in the species list. Make sure you take a photo of it and send all the information to us at marinemetresquared@gmail.com.

Remember to enter your information on the Marine Metre Squared website: www.mm2.net.nz

Figure 1 Data collection sheets for both Rocky (top) and Sandy (bottom) shores.

In 2021 seven school groups and two community groups participated in the HGMP from Omaha to Maraetai (figure 2). Wentworth College surveyed Manly beach in Whangaparaoa, Westlake Girls College surveyed at Wenderholm Regional Park, Mahurangi College surveyed Omaha Beach, Te Atatu Intermediate surveyed Orangihina/Harbourview Park, Papatoetoe North School surveyed at Bucklands beach, Maraetai Beach School surveyed Maraetai Beach and Waiheke Primary surveyed Whakanewha Regional Park. The Blake Inspire group surveyed Campbell's Beach and the Whau River Catchment Trust surveyed at Orangihina/Harbourview Park and on the Te Atatu peninsula.

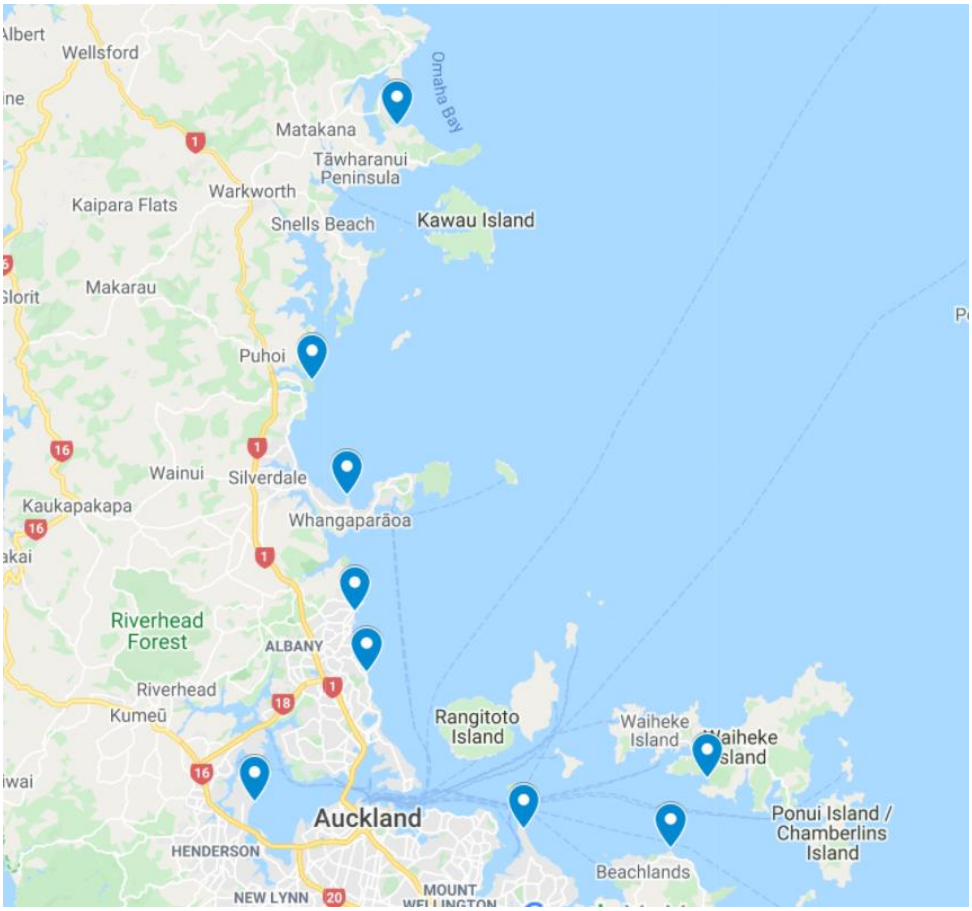


Figure 2 Sites surveyed in 2021

Results/Discussion

Species richness

The species richness in 2021 was like that of previous years. But plotting the data for each year the HGMP has been running shows a gradual declining trend. As species richness is an indicator of the number of unique species detected within a given space, for this report this is the Hauraki Gulf, this declining trend suggests that the number of unique species being detected is decreasing over time (figure 3). This could be due different groups being involved each year, so the accuracy of sampling is variable as the age of the participants changes. Or this could be indicative of what is happening in the Hauraki Gulf due to human activity in and around it. This data is however also influenced by the COVID-19 pandemic. In the years 2020 and 2021 groups were unable to have two sampling sessions as intended and this cause also be the cause of reduced species detection as perhaps the seasons dictate the presence or absence of some species.

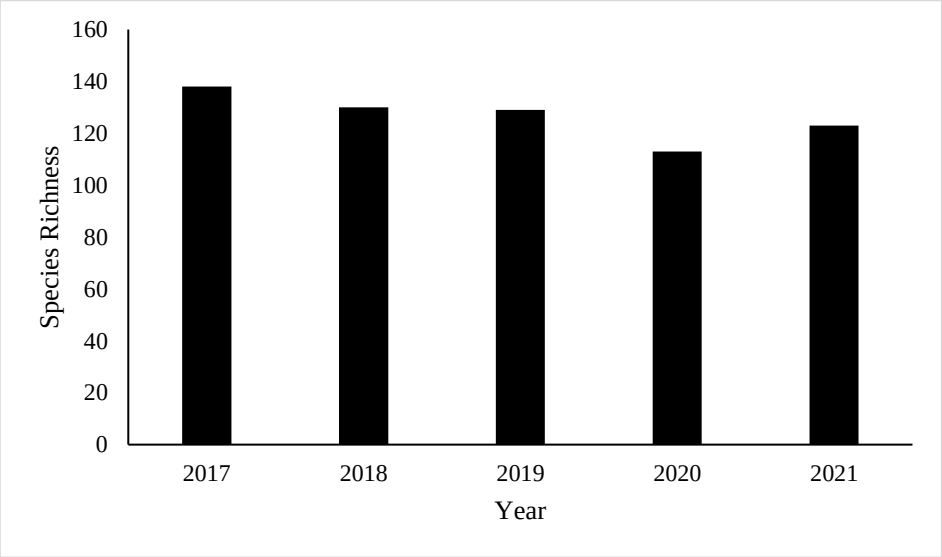


Figure 3 Species richness data for each year of the Hauraki Gulf.

Endemic, natives and introduced species.

Endemic species, species which are found only in New Zealand, were the most common group. Followed by natives, animals which occur naturally in a place but are found in others. And introduced species, species which were introduced either purposefully or accidentally by humans, were the least common (figure 4). A prevalence of introduced species can be an indicator of poor ecosystem health as it is indicative of an imbalance in the environment as often introduced or invasive species do not serve the roles of their native or endemic competitors. Introduced species are often generalist species so are extremely adaptable to environmental changes and reproduce more frequently than natives and endemics and can thereby outcompete them for resources such as food and space (Huxel, 1999). Additionally, due to their generalist nature, introduced/invasive

species are often more amenable to changing environmental conditions which gives them an advantage in today's changing world as the effects of climate change manifest (Rahel & Olden, 2008). Therefore, the presence of invasive species could further the detrimental effects of climate change for native and endemic species. Groups participating in the 2021 HGMP recorded introduced species at two sites, Manly Beach, Whangaparaoa and Buckland's beach (figure 4). The two introduced species detected in 2021 were the Pacific Oyster (*Crassostrea gigas*) and the Mediterranean Fan Worm (*Sabella spallanzanii*). The Pacific Oyster was accidentally introduced to New Zealand in the 1960's but it is now cultivated as a prominent aquaculture species (NIWA, 2020). Due to its role in the aquaculture industry of Aotearoa, the Pacific Oyster is widespread throughout New Zealand, however it's lack of detection in HGMP surveys are likely due to its similarity to the native rock oyster (*Saccostrea glomerata*) (figure 5). The Mediterranean Fan worm was first discovered in New Zealand in 2008 (Biosecurity New Zealand, n.d.). The ability of this species to form dense colonies of 1000s of individuals which exclude other species both animals and producers like seaweeds from growing (Biosecurity New Zealand, n.d.). This thereby impacting the balance of the ecosystems they appear in. However, the Mediterranean Fan worm is still not widespread and is currently only detected in a few harbours around the country. This means that detections of this species at any sites are extremely valuable for attempts to control the spread of this species.

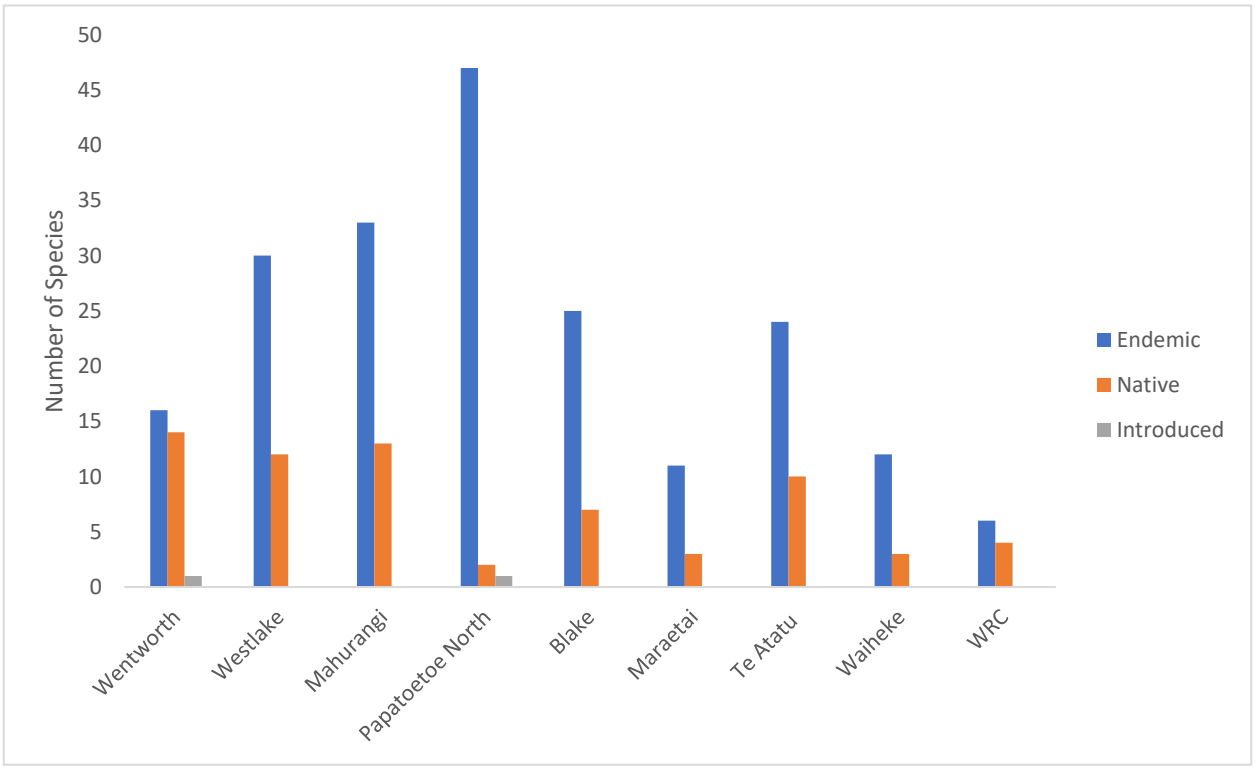


Figure 4 The number of endemics, natives and introduced species found at each site in 2021. WRC is the Whau River Catchment Group

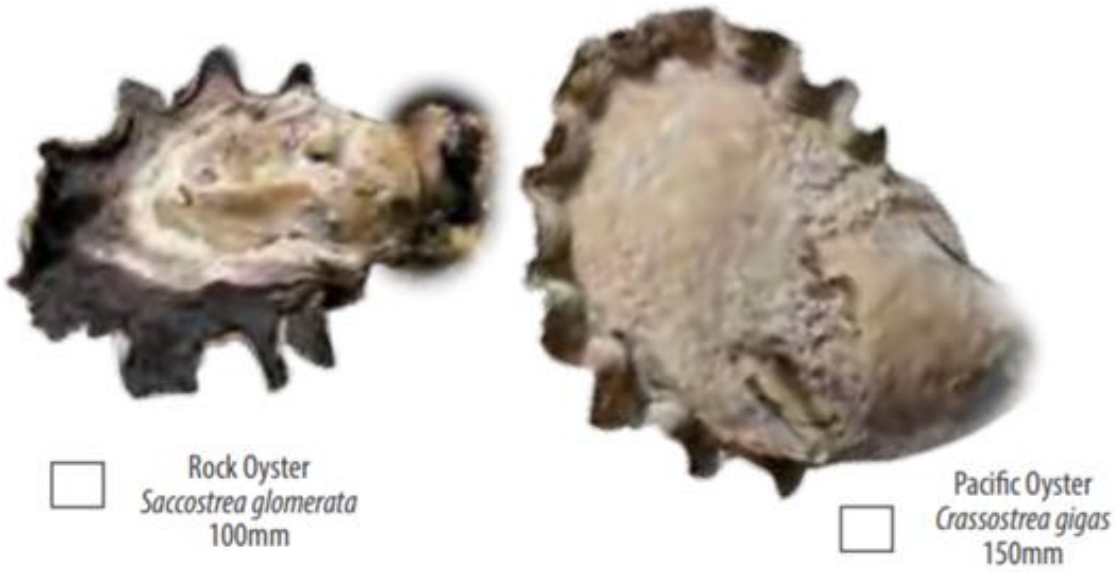


Figure 5 The native Rock Oyster (left) and introduced Pacific Oyster (Right) on the NZMSC shore guide.

Trophic Levels

The trophic level of an organism relates to its position in the food web. By plotting the number of species which belong to each trophic level gives an idea of the balance which exists within an ecosystem or environment which can in turn act as an indicator of ecosystem health (Roberta Costanza et al., n.d.). As the prominence of one group may indicate that another trophic level is being suppressed (Ripple et al., 2016). Conversely, if one is severely suppressed this could be a result of over predation. For example, the commercial fishing of snapper (*Pagrus auratus*) and crayfish (*Jasus edwardsii*) has led to a prevalence of kina (*Evechinus chloroticus*), a grazer, as their predators have been suppressed (Morrison, 2021). This in turn also leads to the removal of seaweeds (producers) as kina numbers explode and overgraze kelps. This causes the formation of urchin barrens in replacement of kelp forests. The number of species per trophic group across sites is shown in figure 6 whilst the number of species per trophic level at each site is shown in figure 7.

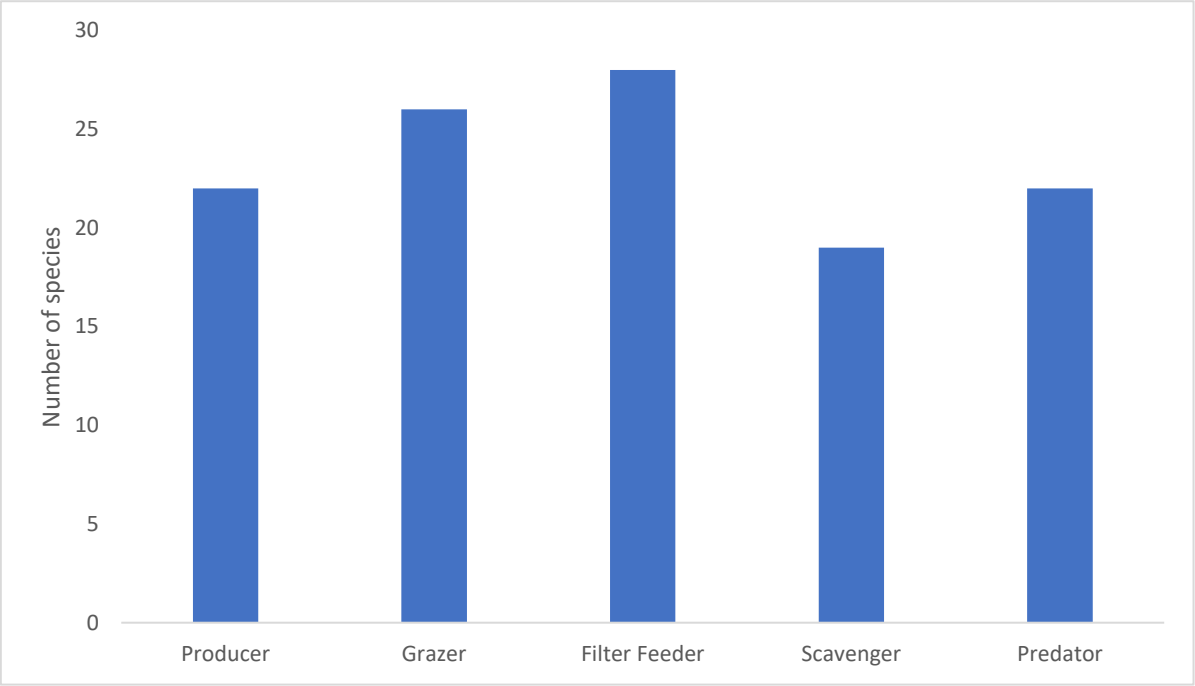


Figure 6 The number of species in each trophic group across all sites.

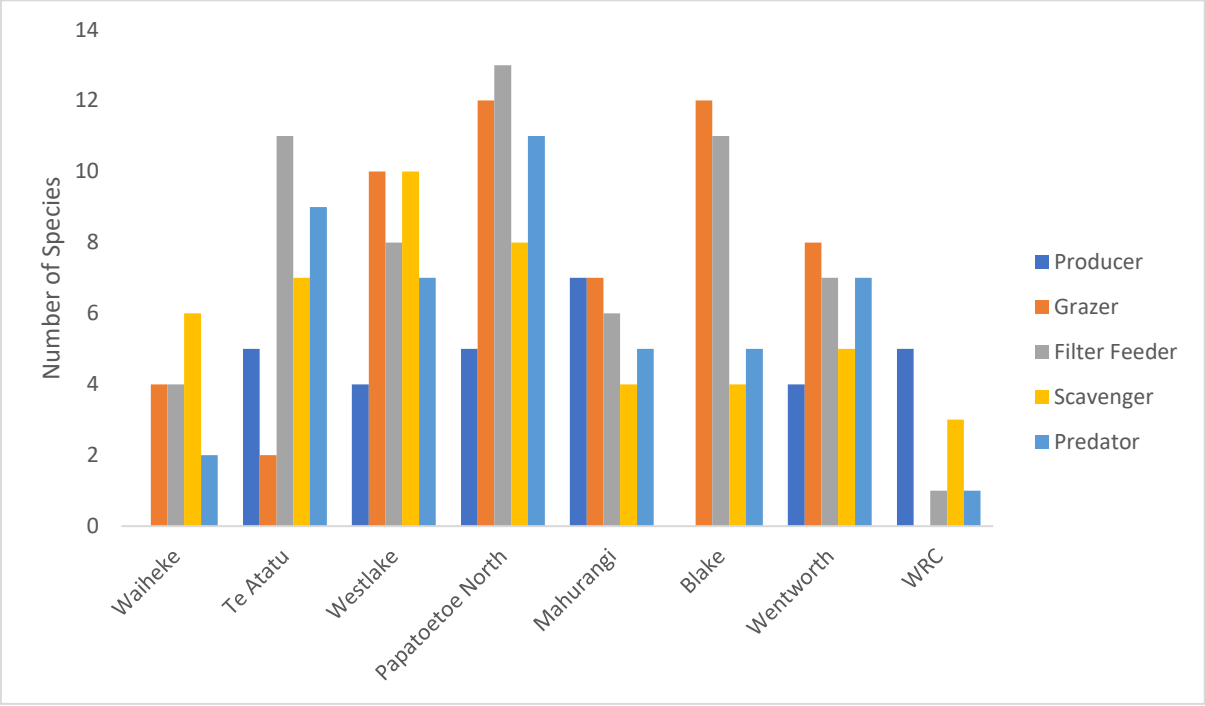


Figure 7 The number of species in each trophic level per site (shown by the group who collected the data).

Figure 6 shows that the number of species in the grazer and filter feeder trophic levels are the highest. This make senses as these groups have the most abundant food sources, the filter feeders having the most abundant food source. Figure 7 however, shows a range of peaks in different groups at each site. For instance, for the Waiheke group predator numbers were low whilst for Papatoetoe North, they were high. This graph is useful as it gives an idea of how balanced groups are. But it cannot give a complete picture as to the trophic levels in that environment as the subtidal species like fish are not included in these graphs. So though predators oberserved in the Waiheke Surveys were low, this may be as subtidal predators or seabirds may play a more important role here than the mud-dwelling predators but we cannot know this based off of this data alone. This highlights the importance of citizen science in supplementing the data collected by other groups and vice versa. And gives an indication that bird observations orior to the Mm2 surveys could give a better idea of the trophic dynamics at low tide.

Community structure over time

An extremely useful aspect of the HGMP is the recoding of data over time for the sites which have schools that take part every year. This is extremely useful in the understanding of the variability in an environment in terms of the species richness at the site. For example, Te Atatu Intermediate has been involved in the HGMP since it began in 2017. This means that their site Orangihina/Harbourview has had data recorded ever since. An example of plots using this long-term data is shown in figure 8 below.

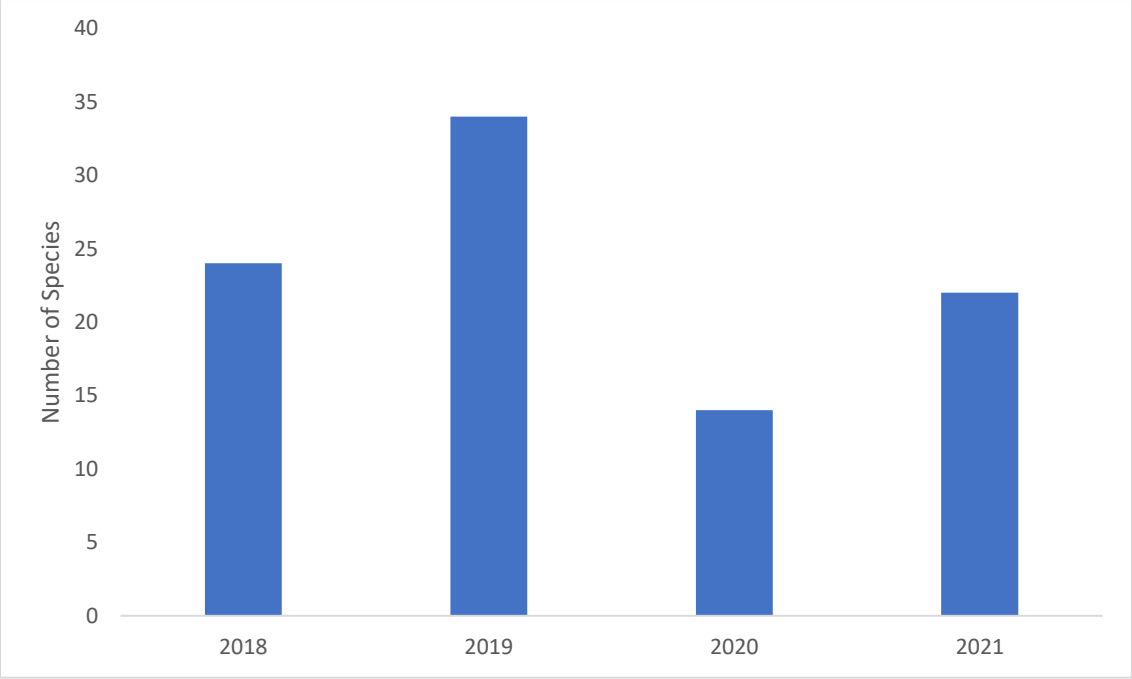


Figure 8 The number of species observed each year at Orangihina/Harbourview by Te Atatu Intermediate

Figure 8 shows that the number of species observed at Orangihina is variable, though the number detected in 2020 was influenced by the COVID-19 pandemic. This data is extremely useful as it could be combined with data such as environmental data to draw conclusions about what is influencing the number species observed.

Summary

The Hauraki Gulf Monitoring Project is valuable by facilitating a connection between school students and their local environment. The involvement of schools and community group in data collection and analysis helps to foster a sense of kaitiakitanga (guardianship) for these people as they become involved in monitoring the health of their local shore. Furthermore, this data is stored on a publicly available website (mm2.net.nz) so can be used by anyone to analyse data for a surveyed site. Additionally, this website makes it easy for citizen scientist to enter their data in a standardised way to allow the data entered across the country to be comparable.

This data provides a useful baseline as to the ongoing condition of a shore, for example the data shown in figure 8. The usefulness of this could be combined with other data to increase our understanding of the Hauraki Gulf shoreline. For future HGMP projects data collection as to bird counts as well as litter surveys could be used to gain an even clearer picture of what is happening in Tikapa Moana.

Table 1 A summary of the groups which have been involved in the HGMP since 2017

School/Community Group	Location	2021	2020	2019	2018	2017
Colvillle Harbour Care Group	Bree Rocks (rocky shore)		X	X		X
Colvillle Harbour Care Group	Bree Rocks (sandy/muddy shore)					X
Balmoral School	Coyle Park (rocky shore)		X			
Aless	Coyle Park (sandy shore)		X			
Sunnyhills Primary School	Farm Cove Estuary				X	X
Verran Primary School	Little Shoal Bay			X		
Long Bay Primary/Aless	Long Bay Regional Park (near MERC)		X			
Wentworth College	Manly Beach	X	X			
Bucklands Beach Primary	Musick Point					X
Mahurangi College	Omaha Beach	X		X		
Te Atatu Intermediate	Orangihina Reserve/Harbour View Reserve	X	X	X	X	
Beachlands Intermediate	Pine Harbour/Green Bay			X	X	
Whau River Catchment	Rosebank Domain Saltmarsh				X	
AGE	Takapuna Beach		X	X	X	
St Leos School	Torpedo Bay					X
Maraetai Primary	Tracey's Point/Walk, Maraetai	X			X	X
Long Bay Primary/Torbay Primary School	Waiake Beach			X	X	
Waitotara	Waiwera Beach			X		
Waiheke Primary School	Whakanewha Regional Park	X	X		X	
Papatoetoe North School	Bucklands beach	X				
Westlake Girls College	Wenderholm Regional Park	X				

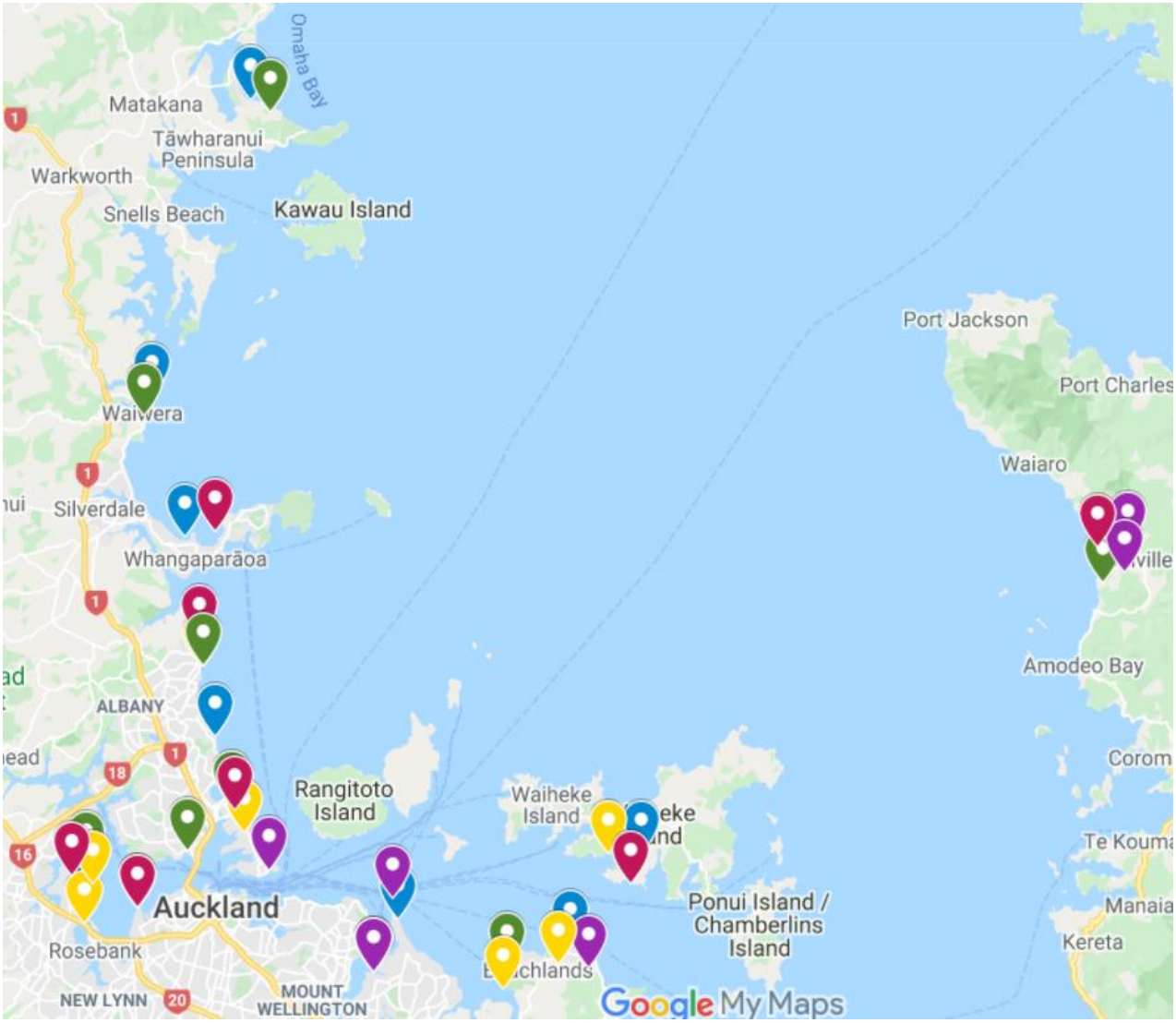


Figure 9 All the sites surveyed in the HGMP to date. Blue markers for 2021, Red for 2020, Green for 2019, Yellow for 2018 and Purple for 2017

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