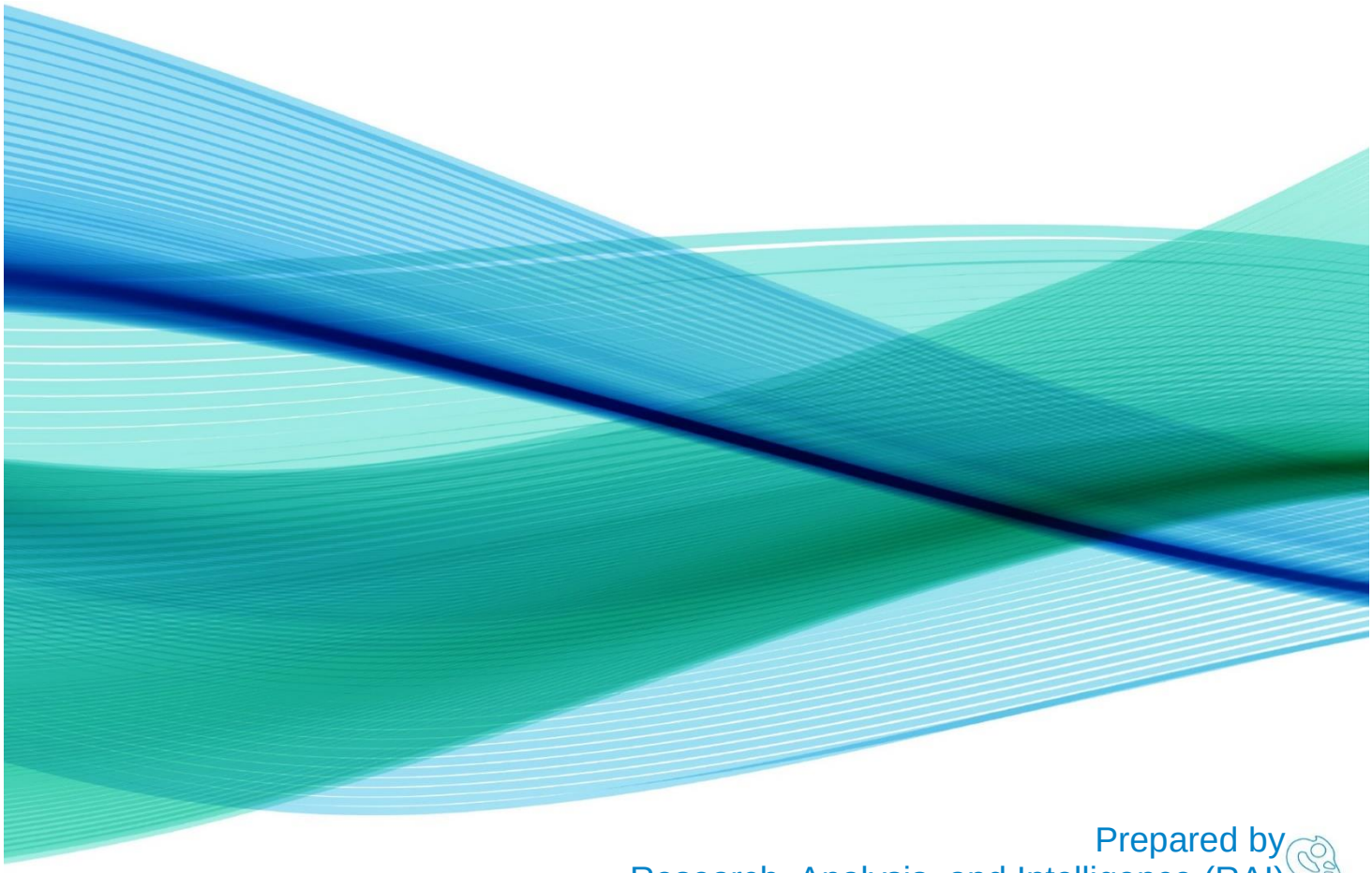
Nō te rere moana Aotearoa
MARITIME NEW ZEALAND

Recreational Boating Fatal Accidents: 2015-2020

2021



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Glossary

TERM	DEFINITION
Accident	A safety occurrence meeting the requirements detailed in the Maritime Transport Act 1994 s2(1), including an occurrence resulting in serious harm, which includes a death/fatality
Allision	A vessel striking an object such as a wharf or beacon
Bar	An area of sediment near the entrance to a river or harbour that can create hazardous sea states in certain tide and wind conditions
Canoe	An open paddle craft powered by single bladed paddles
Capsize	Vessel is rolled past 90 degrees, usually resulting in those on board entering the water
Collision	A vessel striking another vessel or person
Grounding	A vessel striking the sea floor, lake/river bed, ground, rocks, or shore
Dinghy	A small open vessel, whether powered by engine, oars, paddles, or sails
Incident	A safety occurrence, other than an accident, that is associated with the operation of a ship and affects or could affect the safety of operation
Inflatable	A vessel where primary floatation comes from inflated cells. Includes inflatable dinghies, rigid inflatable vessels (RIB/IRB) and rafts
Kayak	An enclosed or semi-enclosed paddle craft including sit-on-top and sea kayaks, powered by two bladed paddles.
MFED	Maritime Fatal Event Database
Missing Presumed Dead	A deceased person who's body is never recovered, including if they are subsequently declared dead
MNZ	Maritime New Zealand
MTA	Maritime Transport Act 1994
Overboard	A person falling from a vessel into the water either due to sea state or the person's own movement, with the vessel remaining afloat and upright
Power boat	A vessel primarily powered by an engine where design characteristics make it unsuitable to be classified as a dinghy, in particular being partially enclosed
RCCNZ	Rescue Coordination New Zealand
Recreational boat	A pleasure craft as described by MTA s2
Swamped	Vessel is filled with water due to a wave or other movement sufficient to compromise stability or buoyancy
Yacht	A vessel primarily powered by sail, excluding sailing dinghies

Executive summary

Each year a number of people die while participating in recreational boating, an activity pursued for enjoyment, or for the benefit of friends or family. Each accident is tragic and has its own unique set of circumstances, but the common factors across these accidents can help highlight ways that similar deaths may be prevented in the future.

This report is intended to give an overview of fatal recreational boating accidents between the beginning of 2015 and the end of 2020, and to provide additional insight into a number of key characteristics and identified patterns.

This six-year time period provided a total of **92** accidents resulting in **98** deaths or persons missing and presumed dead.

The analysis focuses primarily on characteristics that have sound supporting data. This means that data on some of the Safer Boating Forum's key safety messages[1] is not presented. Lifejacket and alcohol use however play a key role.

Analysis of this data shows that recreational boating deaths have fluctuated year-on-year, but show a relatively stable trend of 16 to 17 deaths per year over both a ten-year period and the six-year period of this report.

The highest number of accidents occurred on small power boats and small powered and unpowered dinghies or inflatables boats. Most accidents occurred on inland waters or coastal waters less than 1nm from shore. The victims of these accidents are overwhelmingly male, and primarily over the age of 45.

These accidents occurred across the country with rates generally in line with the participation (as determined via survey) in that region. Auckland and Waikato however had a lower accident rate than its participation would suggest, whereas Southland had a higher rate.

A majority of those who died in recreational boating accidents died from drowning after they ended up in the water from either falling overboard, or the vessel capsizing or being swamped. A smaller number of people were killed in traumatic accidents, either from high speed groundings or allisions, or from collisions between vessels and people in or on the water. Very few accidents were caused by a vessel striking another vessel.

Most of the accidents that resulted in people in the water happened suddenly, without time to use emergency equipment that was not already being worn on their person. A majority of those who died were not able to call for help, and a significant number were not wearing lifejackets. A challenging sea state or other moving water played a role in a majority of these accidents, which also contributed to their sudden nature, and likely played a role in reducing the likelihood of survival even for those who were wearing a lifejacket. Some of these accidents occurred in known hazardous areas such as bar crossings, but a significant number occurred along the coast less than 1nm from shore, or in the case of overboard accidents often in sheltered waters.

While some clear risk groups were identified, common themes were identified across a majority of the accidents, these were:

1. Accidents occurring suddenly and often without warning
2. Multiple people entering the water unexpectedly in challenging conditions
3. People falling overboard while alone on the vessel
4. No way to call for help
5. A lifejacket available but not worn, or a lifejacket that was improperly used

[1] Refer to report section 1.2

While these factors are largely in line with the messaging of the Safer Boating Forum, some of the details and patterns may be able to add focus, detail, and sophistication to that messaging, and identify areas for further research and exploration.

1 Recreational Boating in New Zealand

Each year a number of people die while participating in recreational boating, an activity pursued for enjoyment, or for the benefit of friends or family. Each accident is tragic and has its own unique set of circumstances, but the common factors across these accidents can help highlight ways that similar deaths may be prevented in the future.

This report is an analysis of fatal accidents involving recreational boating in New Zealand between the start of 2015 and the end of 2020. Maritime New Zealand (MNZ) collects detailed information on fatal accidents in order to support investigation and compliance actions, to support wider government functions, and to provide a sound dataset for analytical insight into the factors that influence the causes and outcomes of accidents. This report is intended to give an overview of fatal recreational boating accidents over this time period and to provide additional insight into a number of key characteristics and identified patterns.

1.1 Legislation and Rules

Recreational boating is the term used to describe boating in New Zealand that meets the definition of "pleasure craft" in Maritime Transport Act (MTA)[2], and is essentially boating that doesn't involve hire or reward. This excludes hired paddle craft, vessels provided as part of a business, or any other charter of a vessel.

Recreational skippers and vessels do not require any certification or registration, but are still governed by the general requirements of the MTA. In particular, section 19 describes the responsibility of the skipper to ensure the safe operation of their vessel. A number of maritime rule parts also apply to recreational boating, in particular navigation safety requirements of Part 91 and collision prevention requirements of Part 22. A number of these rule requirements are also reflected in local navigation bylaws, some of which include additional lifejacket requirements beyond Part 91's requirements to carrying lifejackets for everyone on board and to wear them at times of heightened risk.

Because recreational boating skippers and vessels do not have any direct certification relationship with MNZ, our knowledge and understanding of the sector relies on research or collection of data from 3rd parties.

The scope of this report is any recreational vessel inside New Zealand's 12nm territorial limit, or a recreational vessel outside that 12nm limit that meets the requirements of a "New Zealand ship" in the Ship Registration Act 1992[3]. This second criteria means this report includes two yachting accidents that occurred >12nm from shore.

1.2 Safer Boating Forum

In part because of the limited regulatory environment around recreational boating, cooperation between regulatory bodies, industry groups, and other water safety focused organisations is particularly important. The Safer Boating Forum exists to support this cooperation, sharing of information, and common approach to promoting safety in recreational boating.

The forum promotes five key messages:

1. Wear your lifejacket
2. Take two forms for waterproof communication
3. Check the marine weather forecast
4. Avoid alcohol
5. Be a responsible skipper

[2] Maritime Transport Act 1994, s 2(1)

[3] Ship Registration Act 1992, s 2(1)

1.3 Participation Numbers

Between 2017 and 2020 Maritime New Zealand commissioned a research company to conduct annual recreational boating participation surveys. This survey was to determine the number of adult New Zealanders that participated in the sector each year and the characteristics of that participation.

The 2020 participation survey indicated that **45%** of adult New Zealander's had participated in recreational boating at least once in the previous year. This can be extrapolated to **1,672,920** adult participants.[4]

This 45% participation was an increase from 42% the previous three years. In conjunction with an increasing adult population over this time these numbers show a steady increase in the number of recreational boating participants over time.

It is important to note that accident rate comparisons using participation numbers in relation to characteristics such as region, vessel type, and demographics only takes into account the number of people who participated, not the frequency with which they did so.

It is also important to note that a significant number of people indicated their primary participation was on a hired paddle craft or jet ski. This would mean that a fatal accident on this hired vessel would not be considered a recreational fatality. This may result in recreational paddle craft appearing to have a better fatal accident rate per-participant than they actually do.

This research also captured detailed information around demographics, participation characteristics, and safety behaviours. Where appropriate the characteristics of fatal accidents are compared to these research findings.

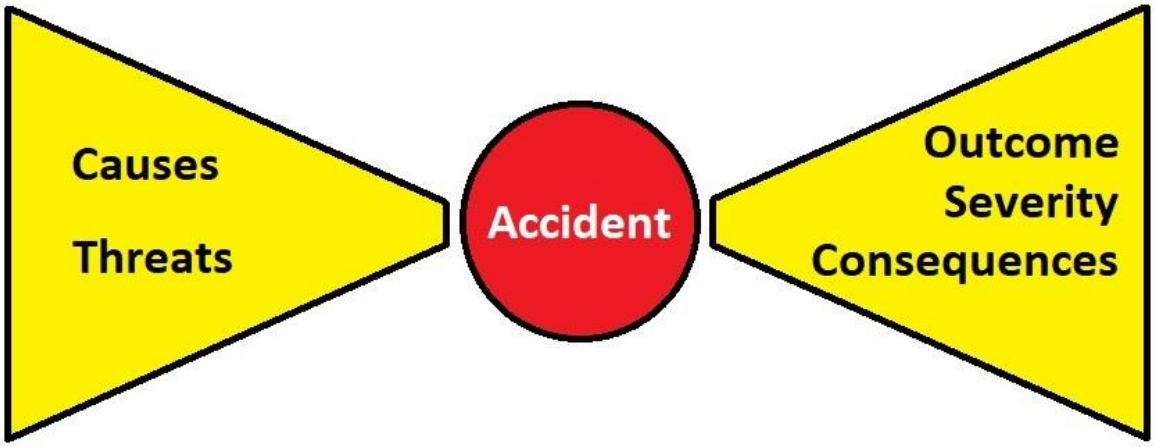
1.4 Fatal Accidents and MNZ

Maritime New Zealand can become aware of fatal accidents through a number of sources including notification from involved parties, from Police, Rescue Coordination Centre of New Zealand (RCCNZ), or media reports. Investigation of the accident scene is primarily lead by Police, with specialist input from MNZ investigators or maritime officers. This produces information on the nature of the accident, information to support coronial inquests, and to support compliance action if appropriate.

[4] https://www.maritimenz.govt.nz/recreational/safety-campaigns/recreational-research.asp#research_2020

1.5 Accident Coding and Standards

Details of all fatal accidents are recorded in the Maritime Fatal Event Database (MFED), which allows information specific to fatal accidents or that require additional detail to be captured. The data in MFED follows a basic form of the "Bowtie Method" of accident causality to be applied. This method describes threats and causal factors, the details of the accident, and the factors that then affect the severity of the accident. As in the diagram below:



This is an evolution of the James Reason Model of accident causality with additional focus on the outcome modifiers. This is particularly relevant to the recreational boating sector due to the emphasis on safety equipment, such as lifejackets and communication devices, that can help prevent an accident from resulting in a death. Some factors such as weather conditions, and drugs and alcohol can contribute to both the cause side and the outcome side.

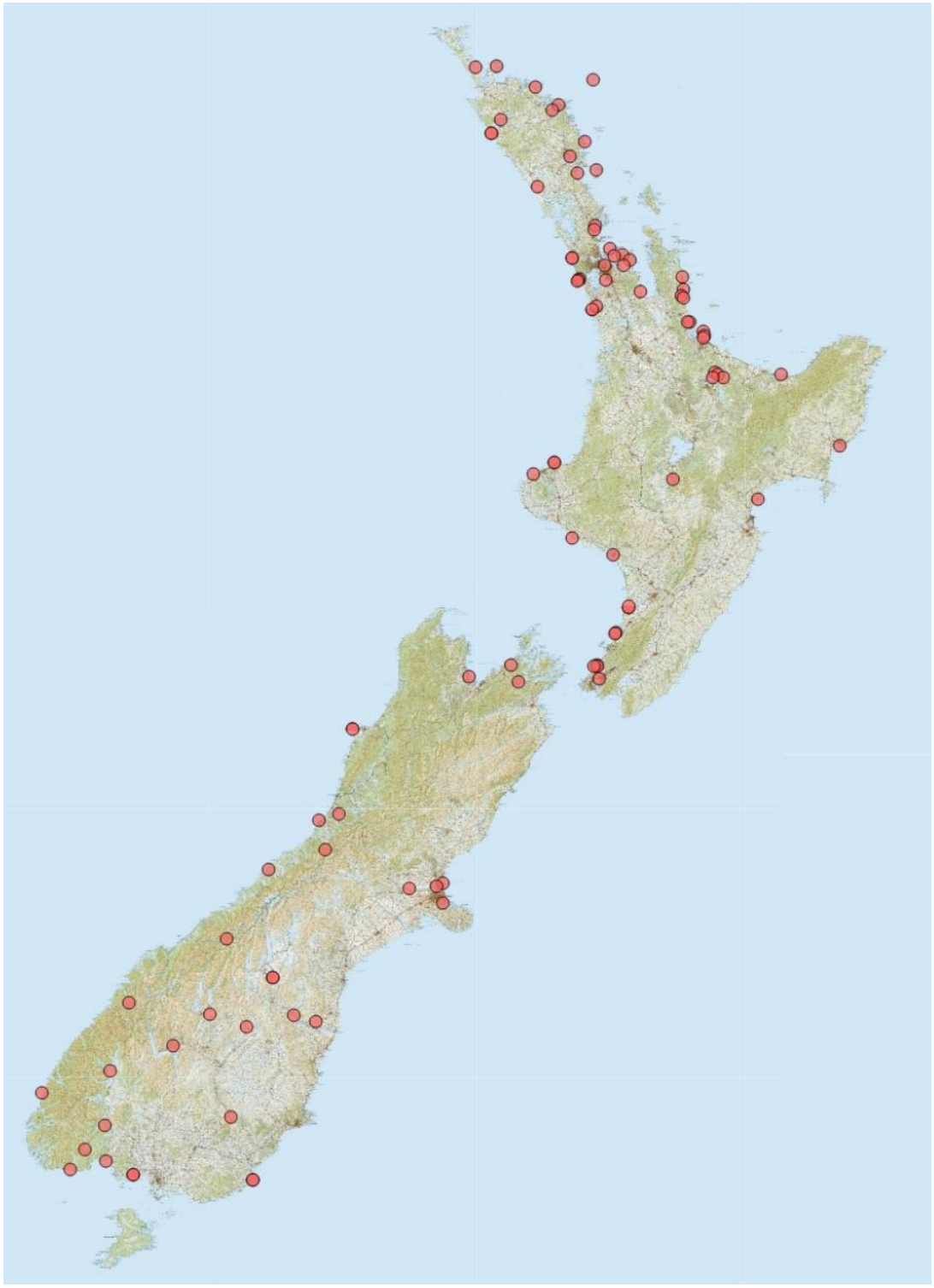
Medical Events

The MTA's definition of accident includes the words "as a result of being on a ship"[5], which is used as a general guide as to what to include or exclude from analysis. Accidents where the deceased suffered a medical event do not always fit into this definition. The standard being used in this report is that an accident is included if a person who suffered a medical event ended up in the water either before or after the medical event took place or were involved in an abnormal event such as a grounding. This means a small number of events were excluded where the person was found deceased from a medical event on board their vessel.

[5] Maritime Transport Act 1994, s 2(1)

2 Fatal Accident Overview

The map below shows all fatal recreational boating accidents between 2015 and 2020:



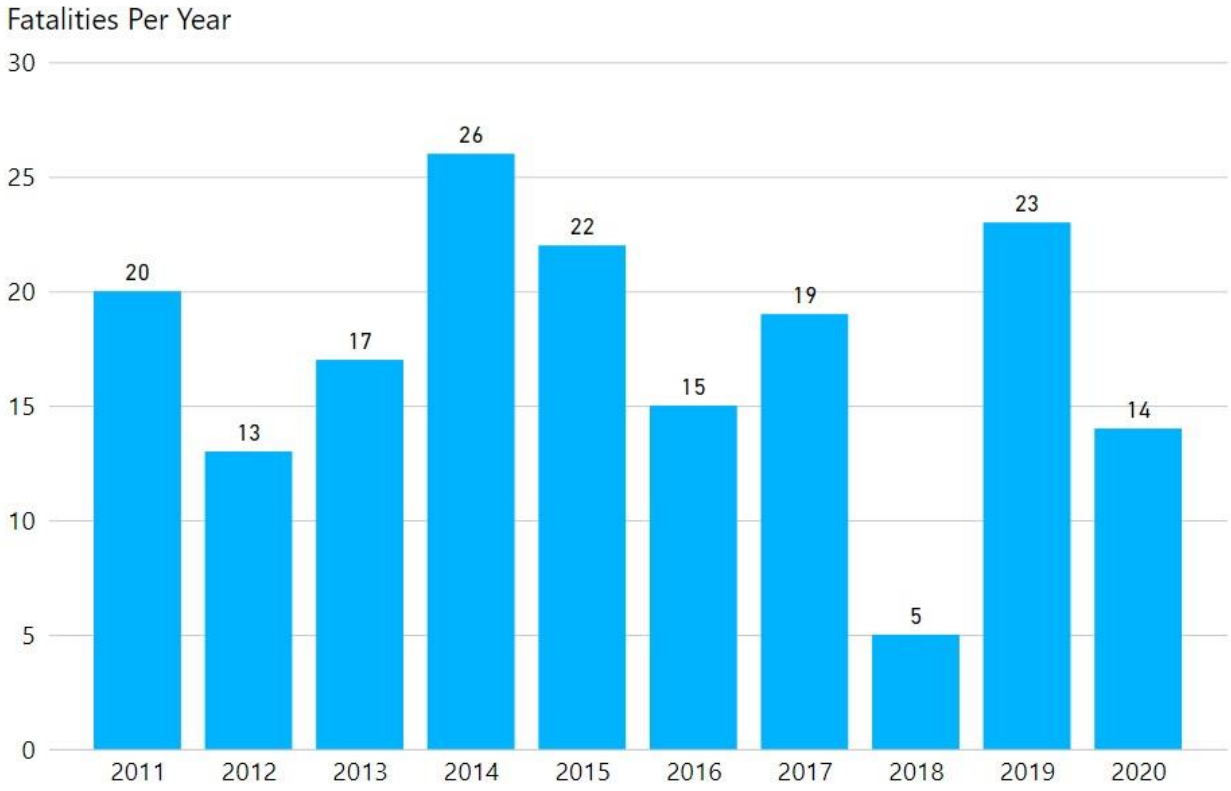
- Note this map excludes one yachting accident that occurred approximately 300nm north of New Zealand.

This shows that fatal accidents occur throughout the country.
Maps focusing on each region's accident are available in Appendix 2.

2.1 Fatal Accidents over Time and Season

Ten Year Trend

The graph below shows the number of fatalities per year over the last 10 years:



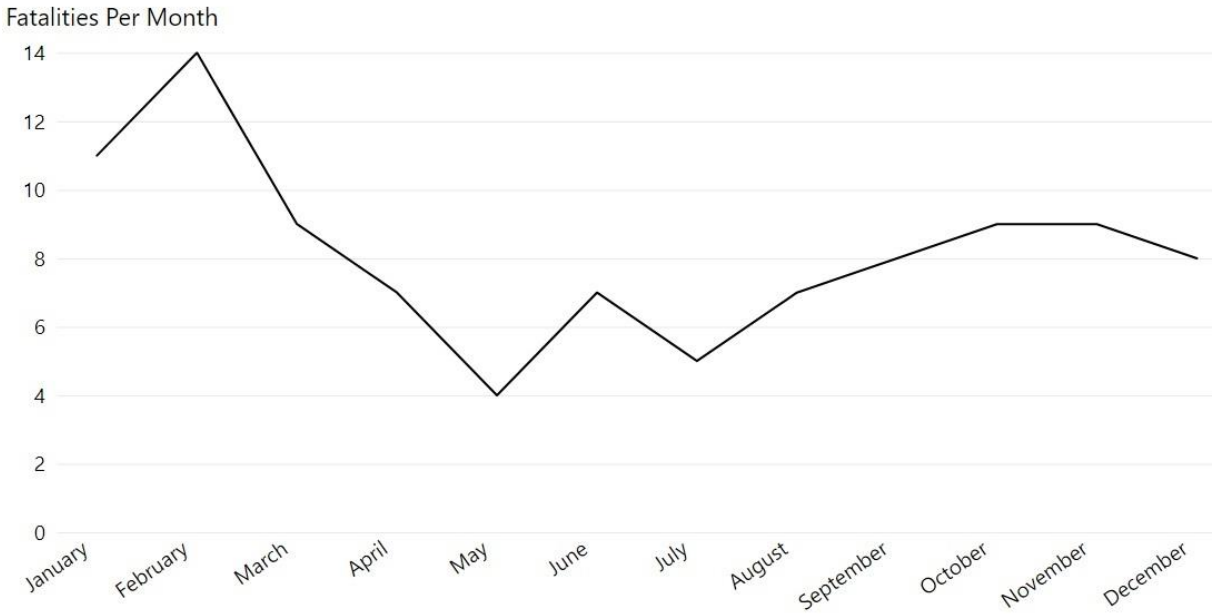
This results in an average of **17** deaths per year over 10 years, and **16** deaths per year over the six years covered by this report.

There is no significant trend in annual deaths over this period, although a slight reduction in the number of fatalities can be noted across both the 10 years data and the six years of this report. The increasing recreational boating participation described in report section 1.3 would also indicate that the recreational boating fatality rate is decreasing.

It can be noted however that both a high outlier like 2014 or a low outlier like 2018 do not predict future trends.

Seasonal Variation

The line graph below shows the seasonal variation of deaths throughout the year:



Below is a table showing the combined fatality numbers for each season:

Season	Number of Fatalities
Summer	33 (%)
Autumn	20 (%)
Winter	19 (%)
Spring	26 (%)

This shows that while there was a seasonal peak at the height of summer (January and February), there was still a significant number of fatalities during colder months.

Of vessel types, power boats followed this trend line the most closely, with a significant reduction in deaths from May through August. Other vessel types had a flatter trend throughout the year.

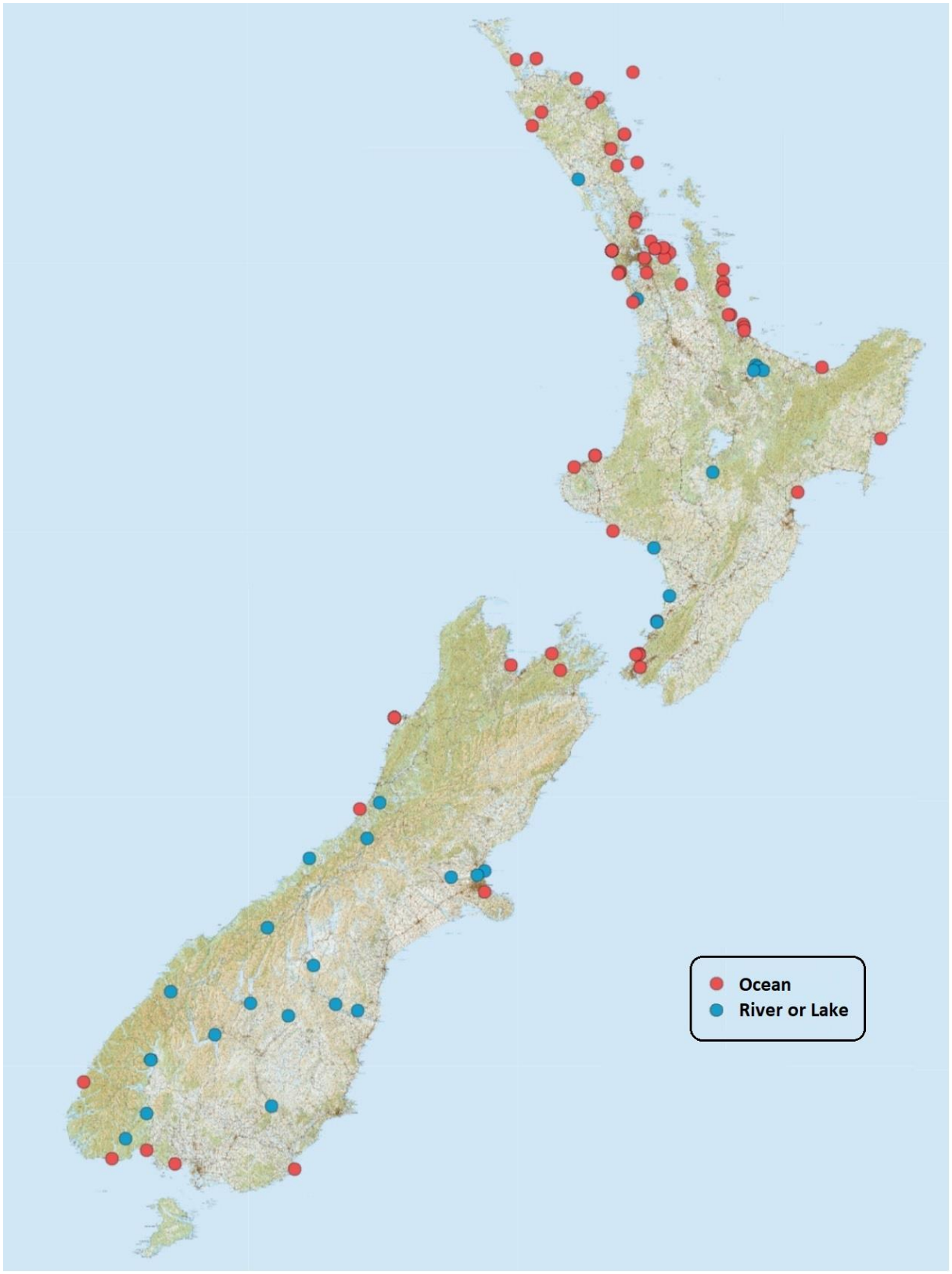
The North Island had a flatter trend, with a significant peak in January. The South Island had a more pronounced drop over the winter months, with two particular peaks in spring and late summer.

Time of Day

Time of day did not indicate a clear trend, although several spikes in the number of accidents appear late morning, early afternoon, and in the evening. All three of these are likely during times of high activity, particularly vessels returning after a morning or afternoon on the water. Several accidents were known to have occurred during hours of darkness, often contributing to difficulty in sighting collision or wave hazards.

2.2 Fatal Accidents by Location and Waters

Below is a map showing fatal accident locations and whether they occurred on a river or lake, or on the ocean, including inshore waters, harbours, and bars:



By Region

Below is a table that details the number of fatalities for each region in New Zealand, the percentage of total fatalities for the country this represents, the percentage of people who participation research suggests boat in each region, and the difference between these percentages:

Region	Number of Fatalities	Fatality Percentage	Participation Percentage	Difference
Northland	**15**	15%	16%	-1%
Auckland	**14**	14%	36%	-22%
Waikato	**9**	9%	19%	-10%
Bay of Plenty	**10**	10%	18%	-8%
Gisborne	**1**	1%	2%	-1%
Taranaki	**4**	4%	3%	+1%
Hawkes Bay	**1**	1%	3%	-2%
Manawatu	**2**	2%	4%	-2%
Wellington	**7**	7%	9%	-2%
Marlborough	**2**	2%	5%	-3%
Nelson	**0**	0%	5%	-5%
Tasman	**1**	1%	3%	-2%
West Coast	**6**	6%	12%	+1%
Canterbury	**7**	7%		
Otago	**6**	6%	7%	-1%
Southland	**10**	10%	3%	+7%
Outside New Zealand	**3**	3%		

-Orange highlight indicates an accident rate noticeably higher than participation would suggest.

-Green highlight indicates an accident rate noticeably lower than participation would suggest.

-Note due to low sample size West Coast participation data is included in Canterbury's results.

-Note that sum of participation >100% due to people who boat in multiple regions

-Note a vessel outside of New Zealand is counted if it was a "New Zealand ship"[6] at the time of the accident

This graphs shows that the number of accidents in most regions is roughly proportional to the amount of boating activity. Auckland and Waikato's accident rates were significantly lower than its participation rate would suggest, and Southland's significantly higher. While, due to a small sample size, the West Coast's participation numbers are combined with Canterbury's by the research provider, it is likely that

[6] Maritime Transport Act 1994, s 2(1)

it's accident rate is high considering it has a small proportion of the total participation between the two regions.

Because people can indicate they boat in multiple regions the sum of participation is great than 100%. This means that there is an inherent bias towards participation percentage being higher than fatality percentage. It should also be noted that as detailed in report section 1.3 participation numbers do not include frequency of use.

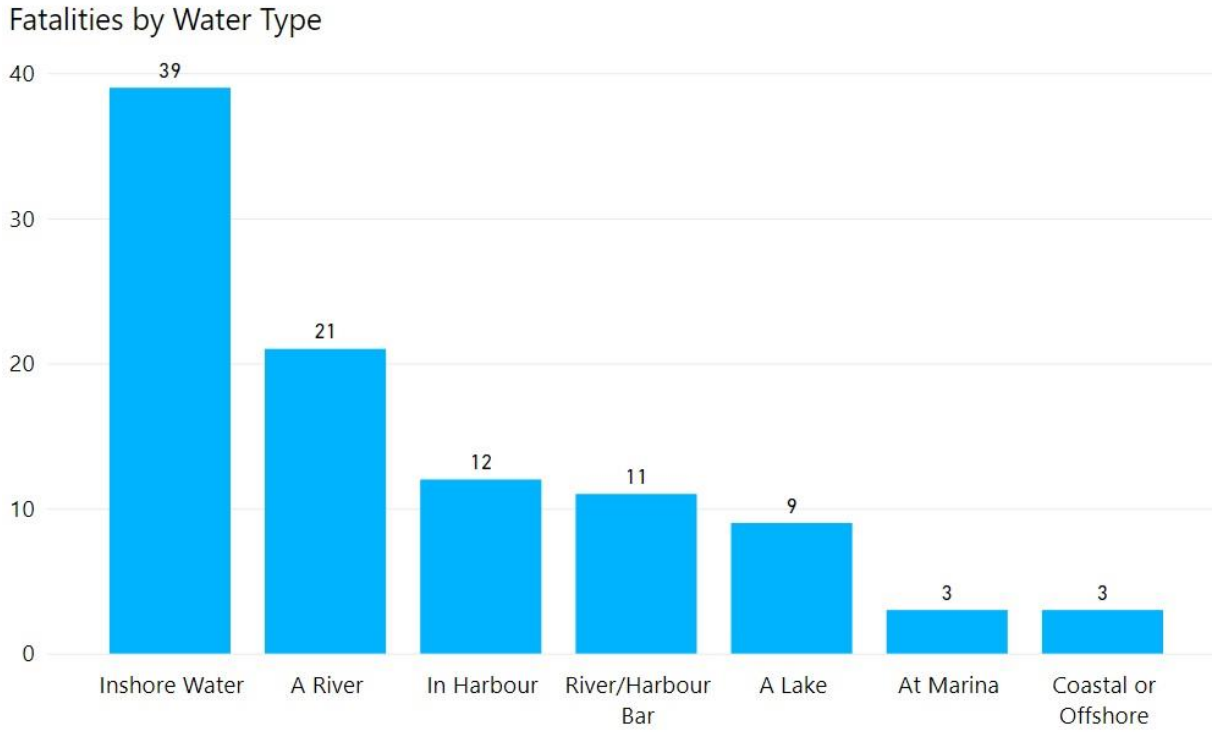
A total of 68 (69%) people died in the same region they were a resident in, with 24 (25%) in a different region to where they were a resident in, which includes yachting deaths outside of New Zealand waters. In a total of six deaths their region of residence was unknown.

Southland had the most fatalities involving visitors with four, and Auckland and Otago were the most common regions of residence for people who died in a different region with seven and four respectively.

Details of fatalities per region per year are available in Appendix 1.

By Type of Water

The graph below shows the number of fatalities for each type of waterway:



Note that "Inshore" captures a significant number of accidents as this is defined as up to 12nm from shore. Almost all inshore accidents occurred <1nm from shore.

3 Fatal Accidents by Vessel Characteristics

3.1 Basic Vessel Type

A number of characteristics of the vessels involved in fatal accident are recorded in MFED including details of their type, length, propulsion, build material, and any design or condition factors that may have played a role in the accident.

The table below lists the number of fatalities for each basic vessel type:

Basic Vessel Type	Number of Fatalities	Number of Vessels
Power Boat	37	33
Dinghy	18	18
Kayak/Canoe	16	16
Inflatable	12	11
Yacht	9	8
Jet Ski	3	3
Other	3	3

Details of fatalities per vessel type per year are available in Appendix 1.

Details of fatalities per vessel type per region are available in Appendix 1.

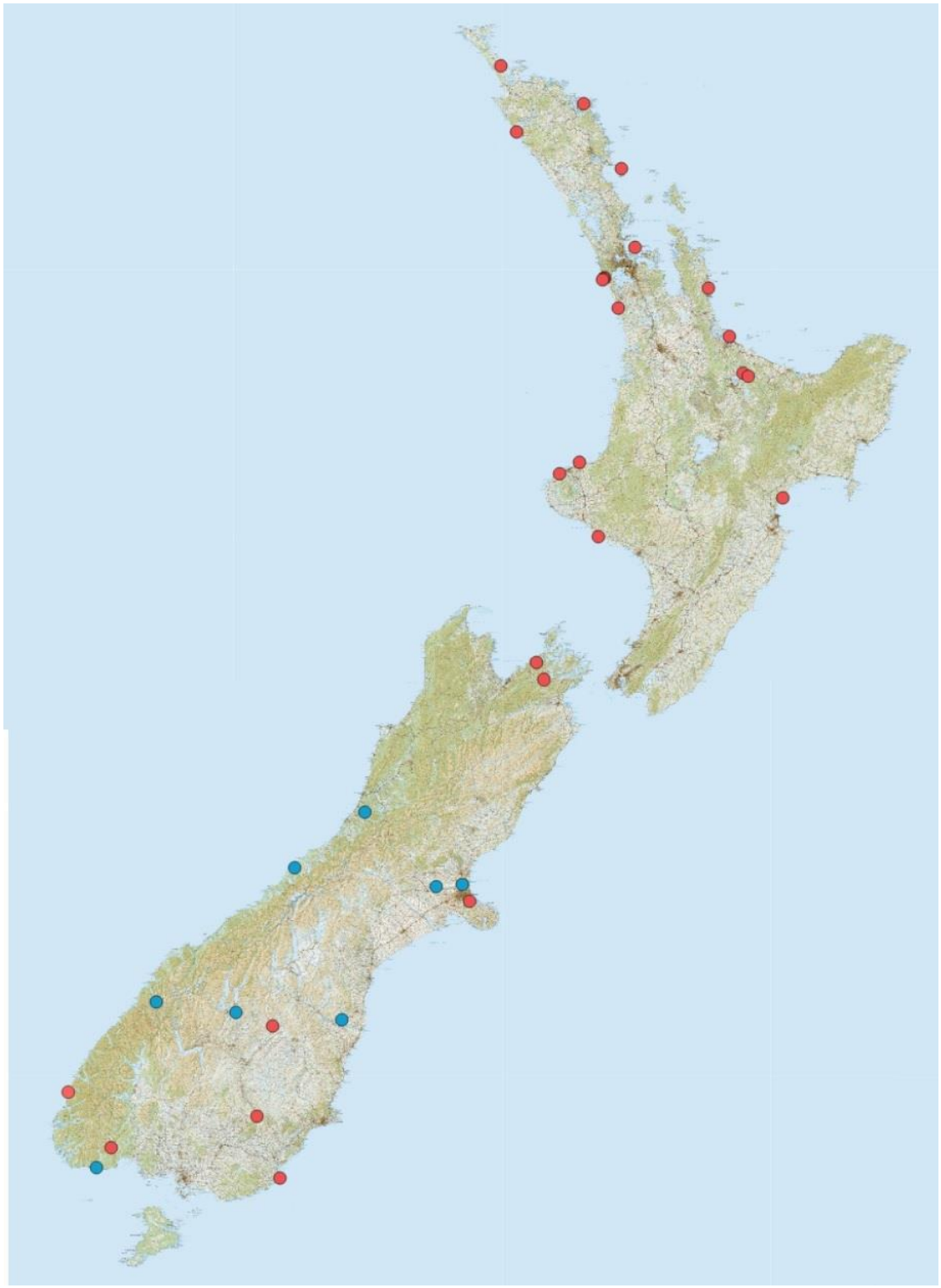
3.2 Detailed Vessel Type

The table below shows the detailed vessel types, as subsets of the basic vessel types shown in 2.3:

Basic Vessel Type	Detailed Vessel Type	Number of Fatalities	Number of Vessels
Power Boat	Power Boat	27	24
Power Boat	River jet boat	8	8
Power Boat	Other fishing	2	1
Dinghy	Dinghy (powered)	11	11
Dinghy	Dinghy (unpowered)	7	7
Kayak/Canoe	Sit-on-top kayak	8	8
Kayak/Canoe	Other kayak	7	7
Kayak/Canoe	Canoe	1	1

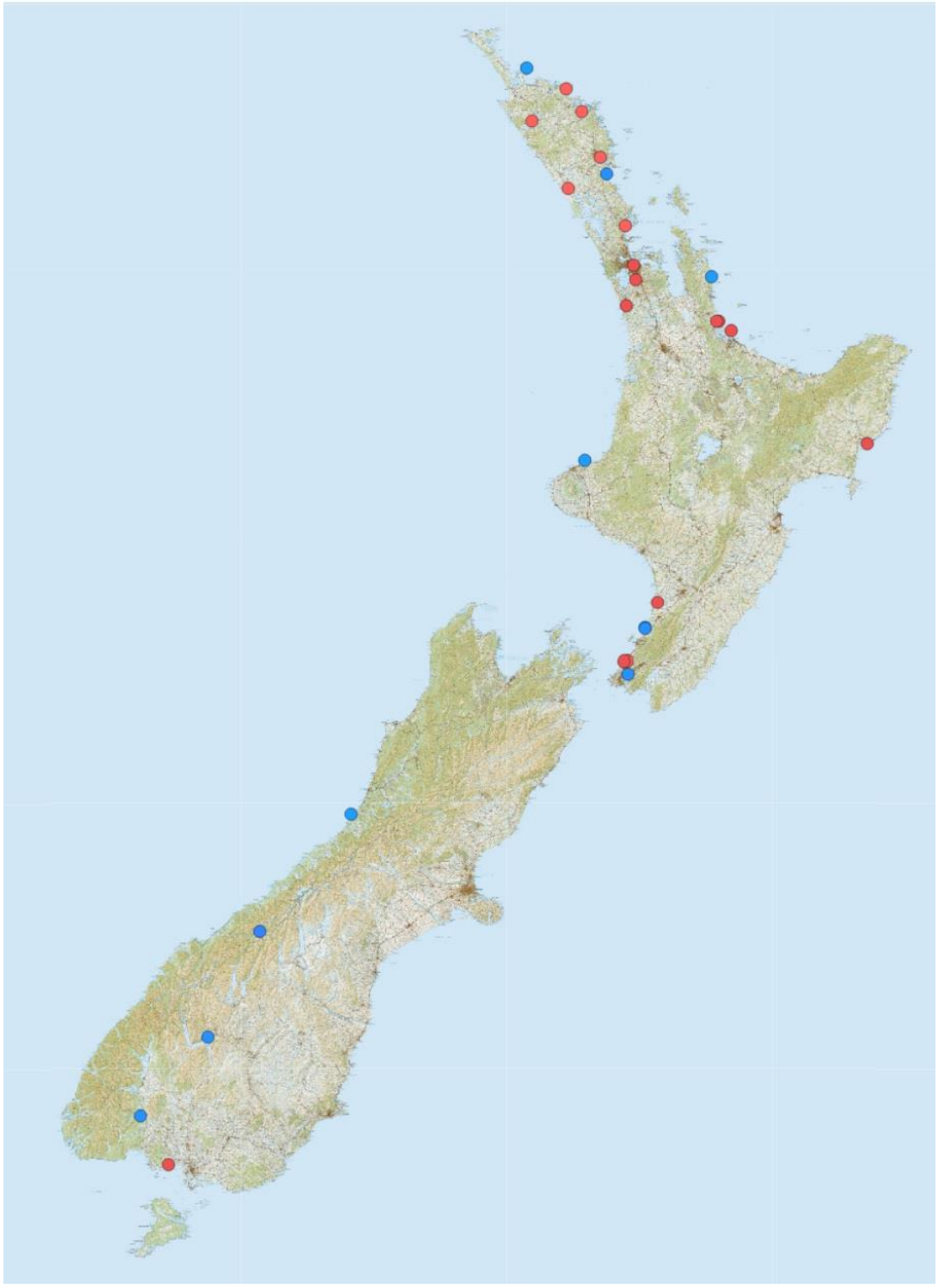
Basic Vessel Type	Detailed Vessel Type	Number of Fatalities	Number of Vessels
Inflatable	Inflatable (unpowered)	6	5
Inflatable	Inflatable (powered)	5	5
Inflatable	River raft	1	1
Yacht	Keel yacht	6	5
Yacht	Trailer yacht	3	3
Jet ski	Jet ski	3	3
Other	Stand up paddleboard	2	2
Other	Other recreational	1	1

Below is a map showing the location of all fatal accidents with a basic vessel type of “Power Boat”. In addition to this power boats with a sub category of “River Jet Boat” are coloured blue, meaning that all red marks are propeller driven power boats:



This map shows that propeller driven power boat accidents are spread throughout the coast of the country. All but one propeller drive power boat accident on inland waters were on a lake. All the other river accidents involved jet boats.

Below is a map that shows dinghy and inflatable fatal accidents. Non inflatable dinghies are in red, with inflatable boats in blue:



This map shows how accidents involving small open dinghies are particularly prevalent in the north half of the North Island.

Below is a map that shows the location of yacht fatal accidents. Keel yachts are coloured red and trailer yachts are coloured blue:

Two of the trailer yachts were racing at the time of the accident. One of the keel yachts was moored at the time of the accident and two were on passage to or from the Pacific Islands.

3.3 Vessel Length

In almost every accident the length of the vessel involved was either known or could be closely estimated. The length of paddle craft was often unknown, but all paddle craft involved in accidents in this report can reliably be considered to all be less than 6m in length, except for one surf ski known to be approximately 6.2m long. This is due to there being no other rowing boats, waka ama, or other craft clearly designed to carry more than two people.

The table below shows the split of vessels over and under 6m:

Basic Vessel Type	Number of Fatalities	Number of Vessels
6m or less	80	76
Greater than 6m	17	15
Unknown	1	1

Twenty-two (67%) power boats were between 4m and 6m, seven were greater than 6m, and three were less than 4m.

Only three dinghies or inflatables were over 4m, all at approximately 4.5m in length.

Three yachts were trailer yachts of approximately 7m, one was a keel yacht approximately 9m, the other four keel yachts were 12m in length or greater.

3.4 Vessel Build Material, Propulsion, and Condition

Vessel Build Material

Most vessels were built out of materials consistent with their type. Plastic kayaks and fibreglass yachts in particular.

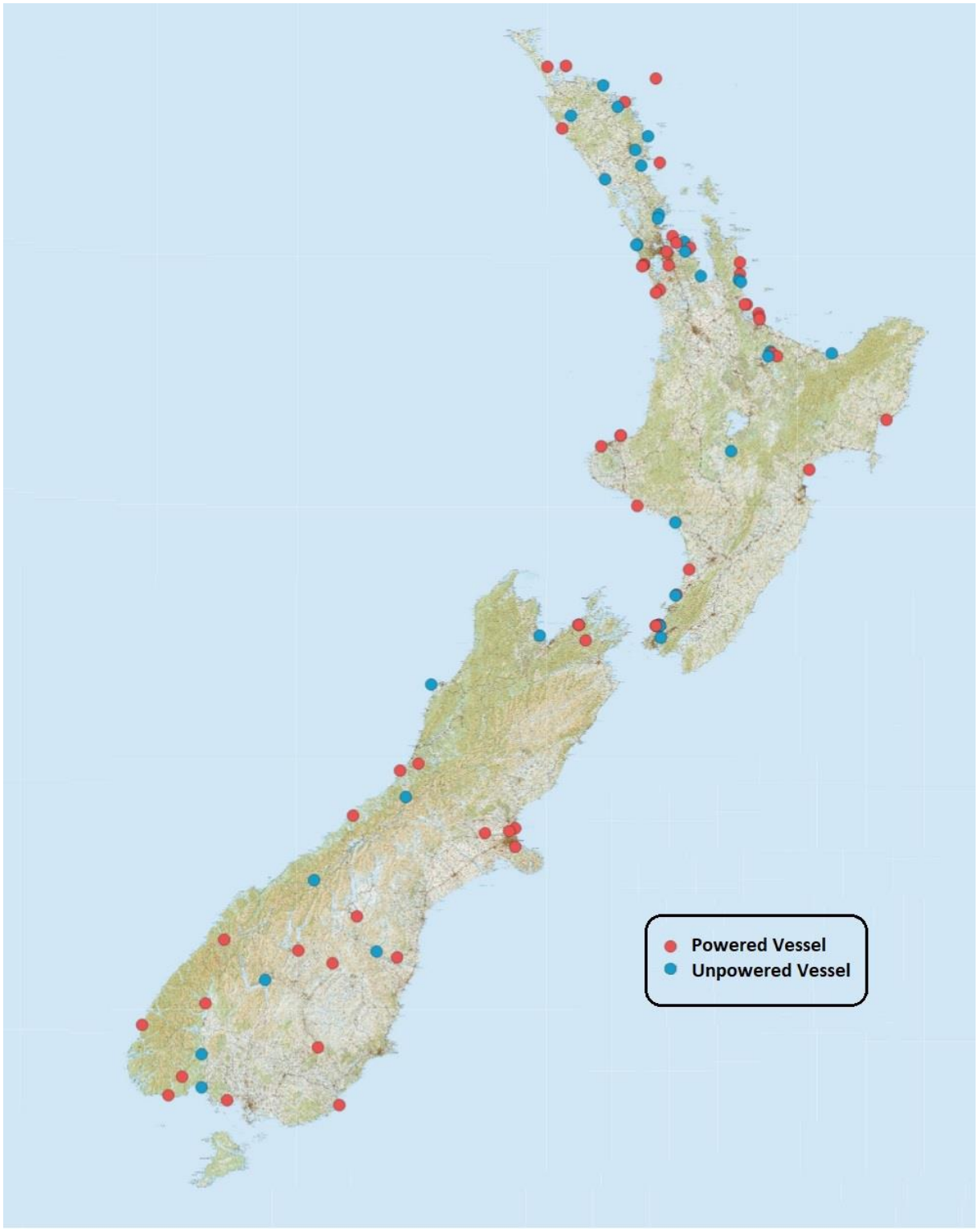
Dinghy's were largely aluminium, with a smaller number of fibreglass vessels.

Power boats were more evenly split between aluminium and fibreglass, with a small number of wooden vessels.

Vessel Propulsion

In every accident it is known whether the vessel was powered or unpowered. A vessel propelled exclusively by paddle(s) or sail(s) is considered unpowered.

The map below shows the distribution of accident around the country, with symbol colour indicating whether the vessel involved was powered or unpowered:



Powered vessels were involved in 60 accidents (65%) for a total of 65 deaths (66%), unpowered vessels were involved in 32 accidents (35%) of accidents for a total of 33 deaths (34%). Almost all

non-yacht powered vessels were powered with outboard motors. The size of these varied widely, although power boats tended to cluster around 50hp, 100hp, and 200hp.

Unpowered vessels had accidents across the country and across different types of waterway. However, with 20 deaths, a significant number were located in the top of North Island (Northland, Auckland, Waikato, and Bay of Plenty).

Vessel Condition

A small number of accident investigation reports included comments from investigators about the condition or suitability of the vessel involved. Some of these accidents involved vessels in poor physical condition that either increased the chance of the vessel taking on water while underway, or of suffering structural failure of the hull, transom, or outboard engine mounts.

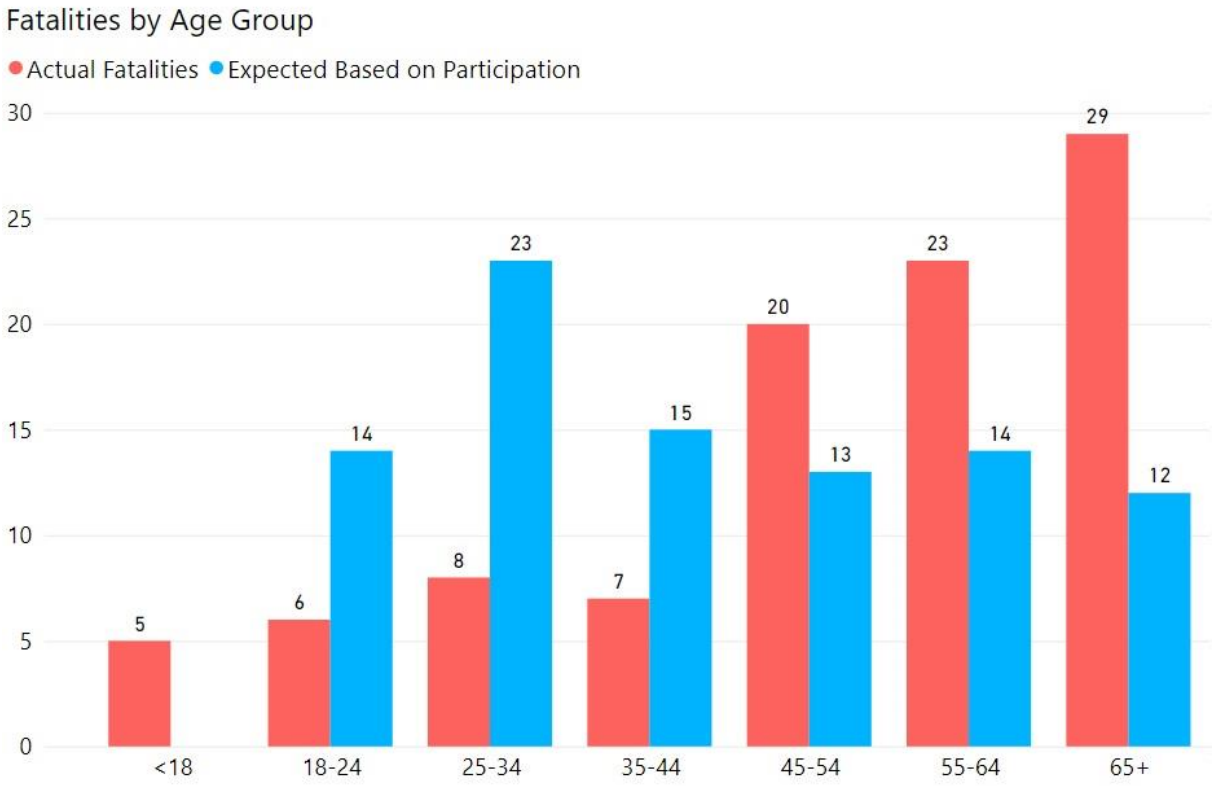
In a small number of accidents involving powered craft operating in challenging conditions either a failure or reduced power from an outboard engine was identified as contributing to the vessel being capsized or swamped by a wave.

"Former sailing dinghy in poor condition. The design of the sailing dinghy made it prone to tipping."

4 Demographic Details

4.1 Age

Below is a graph that shows the number of fatalities for each age group, and the number of adult fatalities that would be expected if this number directly followed participation numbers.



- Note that participation research only surveys adults

This shows a clear over representation amongst older participants, with fatality rate being between 50% and 125% higher for participants over 45. It also shows that younger participants are underrepresented in fatality numbers.

Fatalities by age group showed different patterns for different vessel types. Older participants (45 and over) were over represented in power boats, dinghies, and yachts. Young participants were over represented in kayaks and inflatables.

It should be noted that as detailed in report section 1.3 participation numbers do not include frequency of use.

4.2 Gender

The majority of those who died in recreational boating accidents were male.

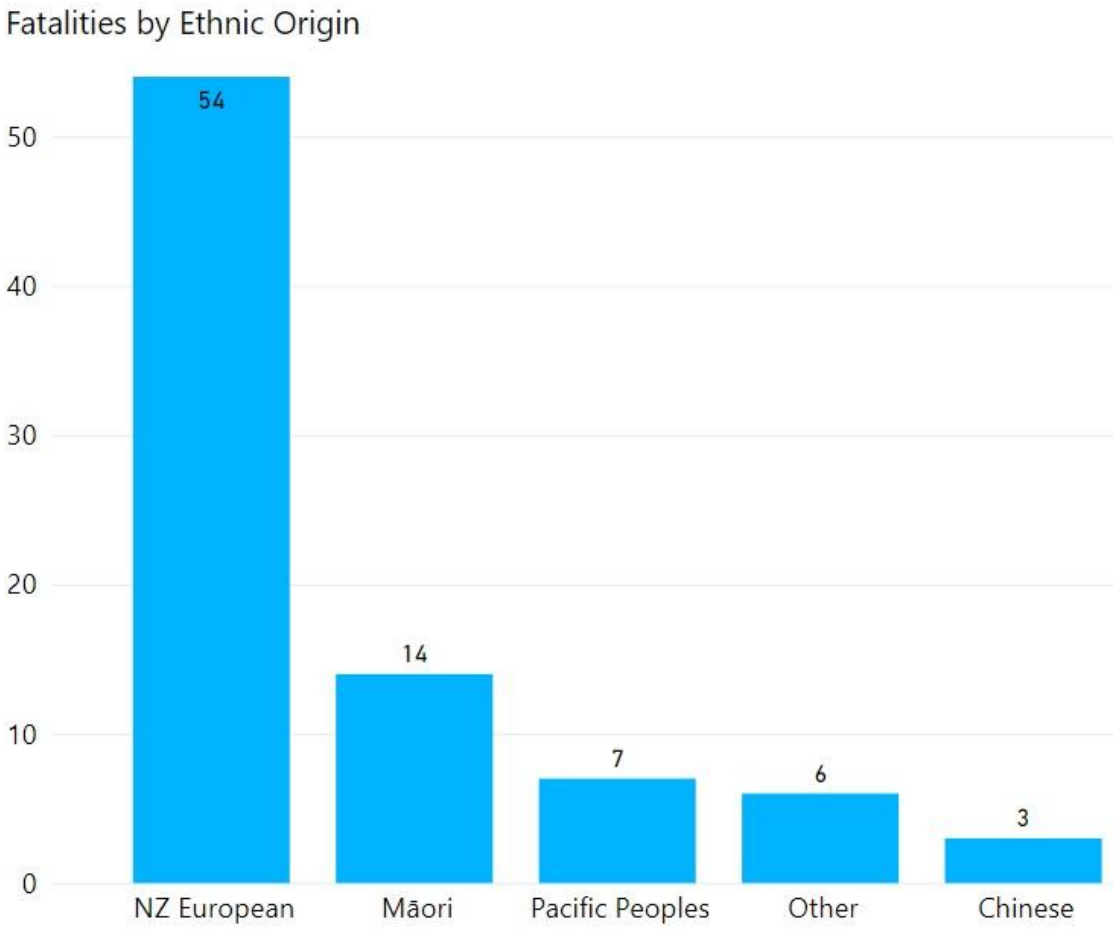
In total 88 (90%) were male, with 10 (10%) female. Research suggests that 53% of recreational participants are male and 47% female, meaning that males are significantly over represented in boating fatalities.

Of the 10 females that died, four were on paddle craft, and one was on an unpowered dinghy. The deceased was the skipper of the vessel in each of these accidents. Two of these accidents were on stand-up paddleboards, the only stand up paddleboard deaths in New Zealand over this time period.

In all five fatalities on powered craft the female who died was a passenger or crew member, not the skipper.

4.3 Ethnicity

Below is a graph showing the number of fatalities when ethnicity of victim was known (84% of fatalities):



- Source: Water Safety New Zealand, with additions from investigation reports where appropriate
- "Other" includes unrelated groups such as Other European and Indian

Only a single ethnicity can be applied to a boating fatality, as opposed to Stats NZ's census methodology[7] of multiple categories if appropriate. This combined with the inherent difficulty in assigning a person an ethnicity rather than allowing them to declare it, and limitations in the usefulness of the groupings, means that this attribute has significant limitations.

However, some insights can be made, in particular that a majority of those who die in boating accidents are New Zealand European.

Both Māori and Pacific Peoples are over represented compared to their participation numbers, with Māori victims making up 17% of fatalities vs 12% of participation, and Pacific Peoples making up 9% of fatalities vs 3% of participation.

Fatalities involving Māori were spread throughout the country, although primarily in the North Island (11 deaths), and across a number of vessel types, although all but one in boats under 6m.

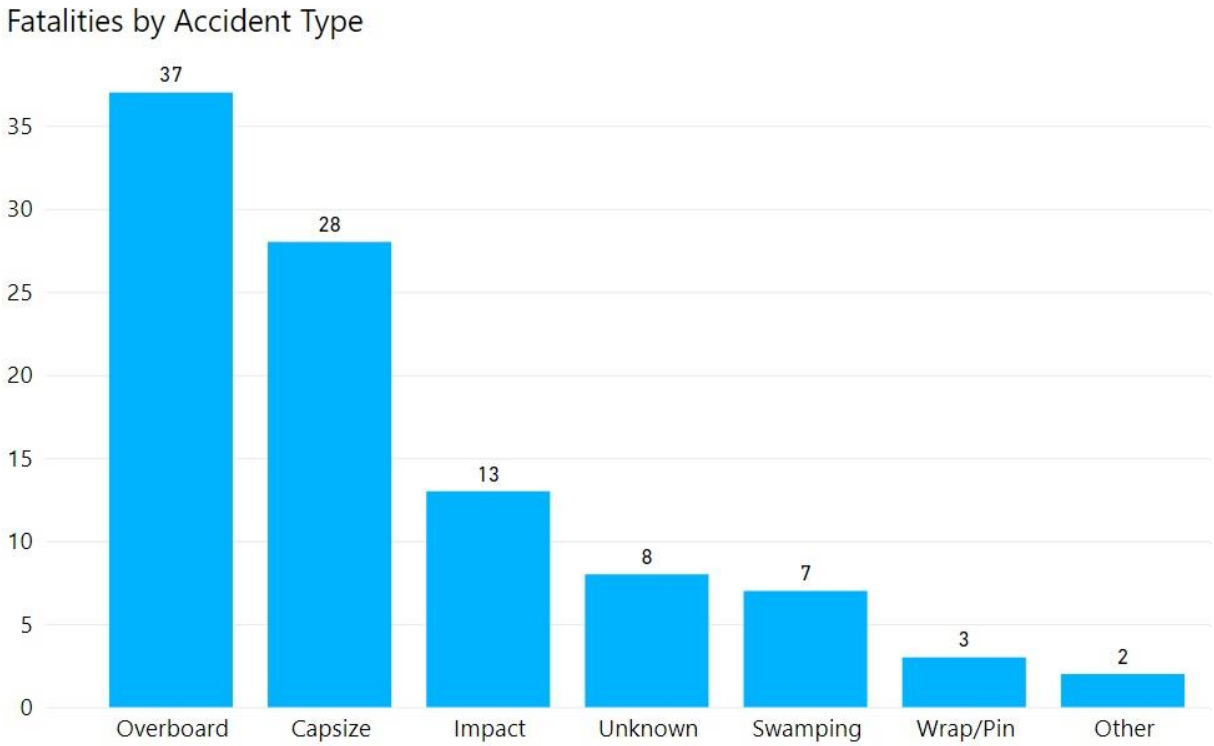
Fatalities involving Pacific Peoples were primarily in Auckland (5 deaths), and primarily in dinghies and power boats under 6m. Three of these deaths involved bar crossing accidents.

[7] http://datainfoplus.stats.govt.nz/Item/nz.govt.stats/7079024d-6231-4fc4-824f-dd8515d33141?_ga=2.26810109.1719806473.1627607482-1496645728.1624589407

5 Accident Types

5.1 Overview

Each fatal accident has at least one descriptor added to it that described the nature of the accident at the centre of the bowtie.



- "Other" involved one accident where a kite surfer was separated from their board in strong winds, and one accident where a water skier fell and was unable to be found when the towing boat returned to them.

Most (approximately 80%) boating deaths in New Zealand over the six-year time period were due to drowning, highlighted by the two most common accident types being accidents that resulted in at least one person on board entering the water unintentionally.

Accident recorded as "unknown" were all accidents with no survivors and no witnesses, where a sequence of events could not reasonably be assumed. All of these accidents resulted in wreckage and/or bodies being found some time after the accident – either still in the water or washed ashore.

Nearly half of all accidents involved vessels with only a single person on board. In accidents with more than one person on board the skipper was more likely to die than a passenger or crew member.

Details of fatalities per vessel type and accident type are available in Appendix 1.

"Two bodies and the wreckage of the fishing vessel were found near Breaksea Sound. The former commercial vessel was conducting a circumnavigation of the South Island, and was possibly attempting to shelter in the sound from strong gale force winds and rough seas."

5.2 Overboard

A total of 37 fatalities were due to the deceased falling overboard from a vessel that remained upright and floating.

No overboard accident resulted in multiple fatalities. However, 75% of all overboard accidents occurred on boats with only one person on board, meaning that there was no one to assist them back on board or to call for help from a communication device on board the vessel.

Very few overboard accidents had a record of the person in the water using a communication device to call for help.

Twenty-three people who died in overboard accidents were not wearing a lifejacket when they entered the water, compared to ten who were wearing one. Twenty of these 23 not wearing a lifejacket were alone of the vessel.

The most common vessel types involved in overboard accident were dinghies, kayaks, and inflatables under 6m in length, and yachts over 6m. Both of the jet ski fatalities in this reports time period were also overboard accidents.

Three overboard accidents involved a single person in a dinghy or inflatable either returning to or conducting maintenance on a larger vessel.

The cause of the overboard accident was unknown in a majority of these deaths, often due to a lack of witnesses. A small number could be contributed to the sea state in the harbour or inshore waters the vessel was operating on. The tendency for these small dinghies, kayaks, and inflatables to roll when those on board are standing or conducting other activities can be assumed to be a causal factor in a majority of the accidents where the sea state was not a factor.

“The fisherman was found by a member of the public who observed a floating lifejacket, and on recovering it found the deceased clinging to it. Their dinghy was recovered tied to a buoy 6km away, with it considered likely they were separated from it and were carried away by the tide.”

5.3 Capsize

A total of 28 fatalities were due to the vessel being rolled at least 90 degrees, resulting in at least one of those on board entering the water. Most accidents involved all those on board entering the water. 75% of capsize accidents involved vessels with more than one person on board, and three accidents resulted in two fatalities.

Fourteen people who died in overboard accidents were not wearing a lifejacket when they entered the water, compared to eleven who were wearing one.

The most common vessel type involved in a capsize accident were power boats under 6m in length, followed by inflatables and kayaks.

A total of 10 (36%) capsize fatalities occurred on river or harbour bars, and a total of 10 (36%) capsize fatalities occurred on inshore waters. A majority of these accidents involved breaking waves or a sea state with waves over 1m. A majority of these bar crossing and inshore accidents involved power boats under 6m or kayaks.

A total of eight (28%) capsize fatalities occurred on rivers, and involved inflatable dinghies, jet boats, one river raft, and one kayak.

"Vessel operated in the calmer river mouth before crossing the bar through the breakers. While returning the boat grounded while attempting to re-enter the river, and so turned back into the breakers before capsizing 40-50m offshore. The passenger on board was able to swim to shore with difficulty, but the skipper was unable to, despite wearing a lifejacket."

5.4 Swamping

A total of seven fatalities were due to the vessel being filled with water sufficient for it to either lose stability and capsize or to sink. Accidents where the vessel filling with water was not the primary reason it capsized were recorded as "capsize" accidents.

Most swamping accidents involved all those on board entering the water. All swamping accidents involved vessels with more than one person on board, although none resulted in multiple fatalities.

Only one swamping accident had a record of those on board being able to call for help, a PLB activated before the vessel sank, the only accident where those on board didn't enter the water suddenly.

Two people who died in swamping accidents were not wearing a lifejacket when they entered the water, compared to five who were.

The most common vessel types involved in swamping accidents were dinghies and power boats, with one accident involving a yacht.

"While returning down the coast towards the Wairaurahuru River the jet boat with three on board was swamped by a wave and sank. All three were wearing lifejackets and made it to shore, with one leaving the group to find help. One of the remaining men died from hypothermia a short time after making it to shore."

5.5 Impact

Accidents classified in 5.1 as involving an impact can be broken down into the following sub-categories:

Accident Type	Number of Fatalities
Collision/Allision	5
Grounding	4
Struck by Object	2
Struck by Vessel	2

- Note struck by “Struck by Vessel” only includes people who were in the water when they were struck, “Collison” applies to a vessel striking another vessel.

Most impact accidents involved the vessel striking a fixed object or running aground at speed. Fixed objects include channel markers, with groundings primarily being on river banks. Two of these accidents had alcohol as likely a causal factor.

Only two accidents involved a vessel striking another vessel. One involved a vessel striking a person being towed on a sea biscuit, one involved a vessel striking a moored vessel at night.

Both of those struck by a vessel while in the water had earlier been on board the vessel that struck them. One had entered the water for the purposes of recreational diving, the other was in the water after falling overboard due to a large wave. The second accident would likely have been prevented if a “kill cord” had been used to stop the engine once the person at the helm went overboard.

“Struck by Object” consisted of a single accident resulting in two fatalities. One person was struck and killed by a yacht’s rigging following a crash gybe, the other was knocked overboard shortly afterwards.

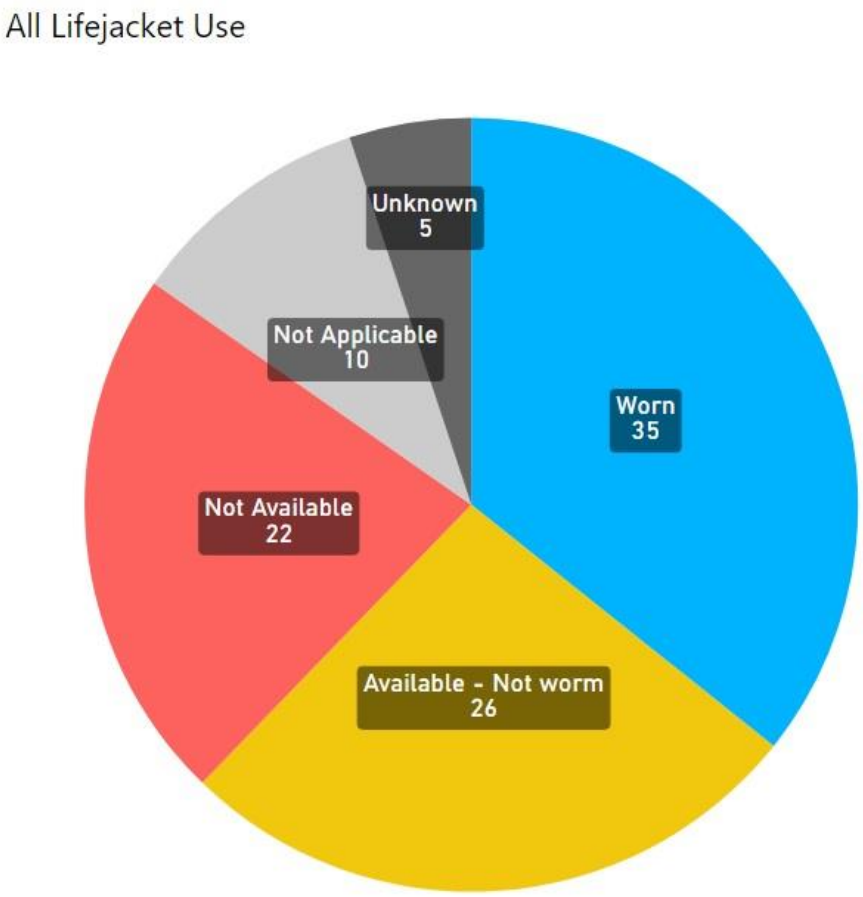
Most of those who died in impact accidents died as a result of traumatic injuries. One person likely died from drowning after being knocked overboard, and one person died from a medical event following a grounding.

“Boat towing a sea biscuit lost control when the biscuit hit a larger wave and pulled the stern of the boat side-on to a second wave. The three on board the boat and the biscuit were thrown into the water. The boat continuing motoring in a circle, striking the people in the water, causing fatal injuries to one.”

6 Safety Equipment Details

6.1 Lifejacket Overview

The chart below shows the lifejacket use recorded for each fatality. Accidents where the death was caused by traumatic injuries are coded as “Not Applicable”, as the lifejacket did not play a role in the outcome of the accident. These accidents are excluded from the analysis in 6.2 and 6.3, as are accidents where lifejacket use was unknown.



6.2 Lifejacket Carriage

In accidents where a lifejacket could have assisted the deceased (excluding traumatic accidents), 61 (73%) people who died had a lifejacket available to them on board the vessel. In 22 deaths (27%) the deceased did not have a lifejacket available to them on board.

The most common vessel to not have enough lifejackets on board were inflatable craft, with eight accidents where the deceased was known to not have a lifejacket available.

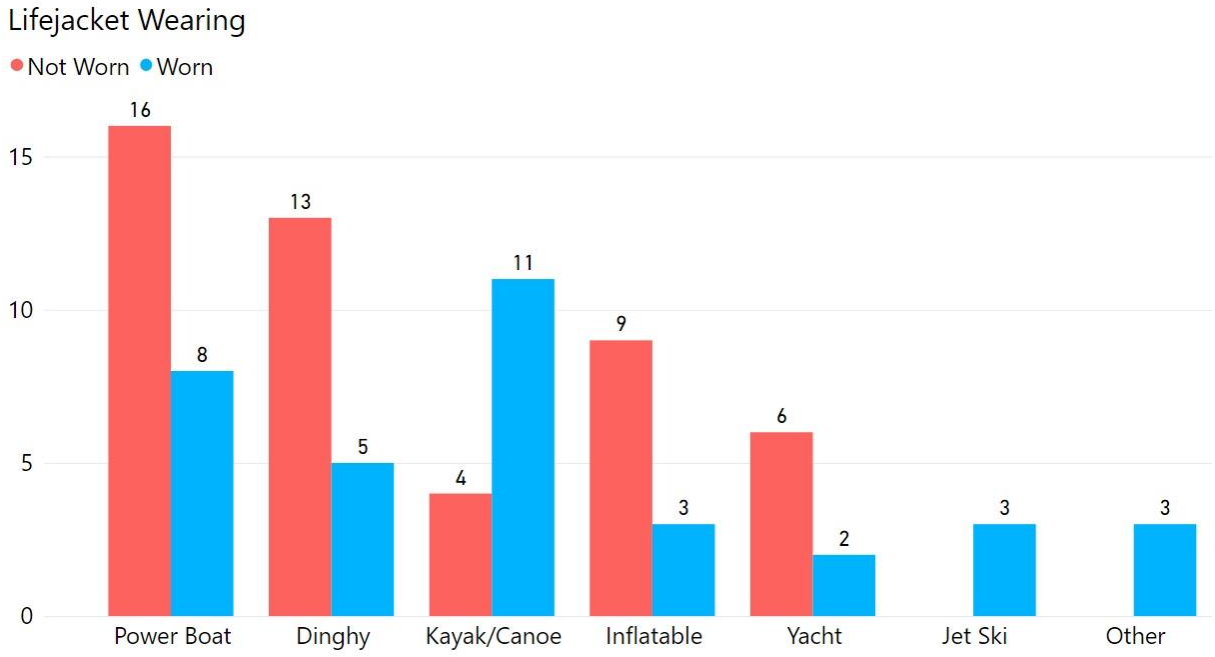
There was no significant difference in carriage/non-carriage accident proportion between male and female victims.

Victims over 55 were more likely to be carrying lifejackets on board than those under 55.

6.3 Lifejacket Wearing

In accidents where a lifejacket could have assisted the deceased (excluding traumatic accidents), 48 (58%) people who died were not wearing a lifejacket when they entered the water. In 35 deaths (42%) the deceased was wearing a lifejacket.

The graph below shows the number of fatalities by vessel type and whether the victim was wearing a lifejacket or not.



- Note that this does not include data for 11 deaths by traumatic injury and five deaths where lifejacket use was unknown.

This graph shows that for most vessel types two to three times as many people died without a lifejacket on than with one on. Paddle craft were the most significant departure from this trend, with a significantly larger number of people wearing a lifejacket, including both those who died on SUPs.

There was no difference in wearing/not-wearing ratios between male and female victims.

Victims under 55 were split approximately 50/50 between wearing and not wearing. Victims over 55 were twice as likely to not be wearing a lifejacket when they entered the water.

Note that despite not wearing lifejackets at a higher rate, victims over 55 were more likely to be carrying them on board.

Only one child died without a lifejacket on, however they were on board a vessel overnight at a marina, circumstances where a lifejacket would not usually be worn.

"Vessel crossing the harbour bar encountered steep waves. The vessel was turned away from a large wave, which struck side on, causing the vessel to roll over. All three on board found themselves in the water, two with lifejackets, however the skipper had earlier taken theirs off as it was too small. After twenty minutes the skipper began to struggle to stay afloat despite one of the survivors helping to keep them afloat, and eventually the men drifted apart."

6.4 Accidents with Lifejackets Worn

In accidents where a lifejacket could have assisted the deceased (excluding traumatic accidents), 34 people were known to have died despite having a lifejacket on when they entered the water.

By far the most common vessel type for someone wearing a lifejacket was kayaks with 11 fatalities.

Four of these accidents involved experienced kayakers travelling down a fast flowing river or through white water. They were then either pinned against an object or underwater despite the lifejacket, which is an inherent hazard in fast flowing conditions.

Several kayakers on inshore waters who were wearing lifejackets suffered medical events that may have contributed to them entering the water, or suffered a medical event while swimming to shore following a capsize or overboard. The role of the lifejacket can be difficult to determine in these circumstances.

Eight accidents across vessel types could be identified where the lifejacket was clearly found to have ridden up or otherwise failed to stay on the wearer. In several of these accidents the life jacket did not stay in place due to clips or zips not being secured properly, and several others had comment from investigation staff that a crotch-strap would have kept the lifejacket in place.

Several accidents involved victims who were wearing an inflatable lifejacket that either required manual inflation and weren't activated, or had a physical issue with the lifejacket. This included a pinhole leak in one, and a CO_2 activation canister that was not attached in another.

"A man and his daughter were fishing in the harbour when a large wave struck the dinghy and they were both thrown into the water. They were unable to re-enter the boat, and while they both had lifejackets on, after at least two hours the man became unconscious and slipped out of their lifejacket. While attempting to support him the daughter's lifejacket also came off. The abandoned and swamped dinghy was recovered by another vessel and a search was initiated. The daughter was found after nightfall treading water."

6.5 Communication Devices

Information on the communication devices carried on board the vessel involved in a fatal accident was not available reliably enough to conduct dataset-wide analysis. Research however suggests that only 57% of participants carry two forms waterproof communication all or most of the time they go out on the water.

Report sections 5.1 to 5.4 show that a majority of accidents involve either a solo skipper falling overboard or all on board ending up in the water. This would suggest that communication devices such as a fixed VHF radio, or a beacon or portable VHF radio not on the person would not have been able to be used to call for help.

A significant number of accidents involved a survivor swimming to shore to seek help, or of no one being aware of the accident until those involved were reported overdue or a body or wreckage was found. Only a small number of accidents involved a person successfully calling for help from a cell phone while in the water.

Very few fatal accidents described an EPIRB or PLB being activated, with beacon activations where a person still died largely occurring in poor weather conditions, far from shore, or in situations where immediate assistance would have been required, such as a kayaker pinned under water.

"A dinghy returning to Titahi Bay capsized after being swamped by a wave. Both those on board ended up in the water, one swam to shore to raise the alarm, but the second person clung to the upturned hull. They were later found face down in the water approximately 20m from shore."

7 Drugs and Alcohol

In a total of 21 accidents resulting in the death of 22 people either the skipper or the deceased could be confirmed as having a measurable blood alcohol level, to have likely consumed alcohol, a measurable quantity of illegal drugs in their system, or likely to have used illegal drugs.

In a total of 50 accidents resulting in 52 deaths alcohol use was not present or considered unlikely. In a total of 26 accident resulting in 28 deaths the role of alcohol could not reliably be determined.

Alcohol

In a total of 17 accidents resulting in the death of 18 people either the skipper or the deceased could be confirmed as having a measurable blood alcohol level, or to have likely consumed alcohol. In six of the eight instances where the exact level was available that level was above the New Zealand driving limit[8], and above the limit specified for a commercial seafarer conducting a designated safety duty by the Maritime Transport Act[9]. It can therefore be reasonably assumed that the alcohol consumption played a role in either the accident occurring or contributed to the accident resulting in a fatality in a majority of these cases.

A number of accidents did not have concrete alcohol consumption information available, either because a body was not found or could not be accurately tested, or because the information was not readily available to MNZ. This would suggest the actual number of alcohol related accidents is higher than indicated above.

Ten of the fatalities involved people falling overboard from a variety of different vessel types, four involved capsize accidents, two impact accidents, and two swamping accidents.

Four accidents involved either moored, anchored, or berthed vessel or people returning via tender to a moored, anchored, or berthed vessel.

The age of those who died was approximately in line with the age distribution detailed in report section 4.1.

Illegal Drugs

In a total of 9 accidents resulting in the death of 9 people either the skipper or the deceased could be confirmed as having a measurable quantity of illegal drugs in their system, or to likely have used illegal drugs.

Five of these fatalities also involved the use of alcohol.

The four fatalities that only involved illegal drugs involved three victims under 45, across a variety of vessel types.

All fatalities involved the use of cannabis, with one accident also possibly involving methamphetamine.

These factors would suggest that alcohol or illegal drugs are a factor in a small but meaningful number of fatal accidents across the recreational boating sector. Alcohol being a particular issue for people on or returning to moored craft.

"Boat made contact with a channel marker beside a large statue, likely at over 20kts. The passenger received fatal injuries in the collision, and the vessel then ran aground. The skipper was found incapacitated on the shore at the scene. Skipper found guilty of manslaughter."

[8] Land Transport Act 1998, s 11(a)

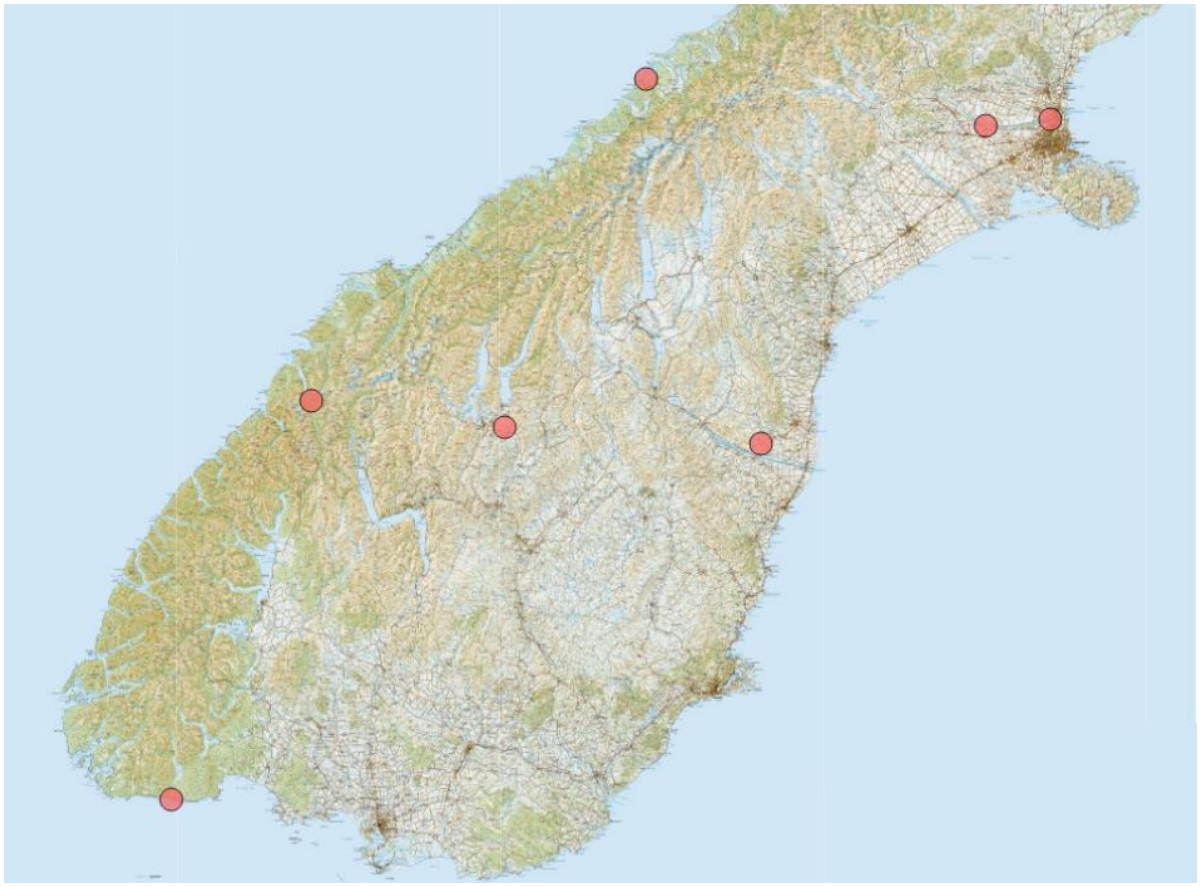
[9] Maritime Transport Act 1994, s 40B

8 Case Studies

Several areas were identified as being outliers in fatality numbers when compared to participation data, or where a common factor more specific that covered elsewhere in the report existed. Three of these are explored in more detail in this section. They are:

- River jet boats in the South Island – power boats with an inboard engine and jet propulsion unit designed to operate on shallow rivers.
- Southland Region – fatal accidents of all types in Southland, due to this region having an accident rate higher than other regions when compared to participation levels, as highlighted in report section 2.1 By Region.
- River and harbour bar crossings – fatal accidents occurring during bar crossings, a known high risk area.

8.1 River Jet Boats in the South Island



Seven fatalities involving jet boats designed for use on rivers occurred between 2015 and 2020.

These accidents were varied in nature, although four fatalities involved impact accidents. Two of these accidents were during organised races, one involving a vessel striking an overhanging tree branch and the other a vessel grounding at high speed following a steering gear failure. The two other impact accidents involved high speed groundings, a particular hazard when operating a vessel at speed on the confines of a river.

The other accidents involved the vessel capsizing or swamping. Two were likely due to the speed and rapid manoeuvring, one from the jet boat possibly hitting their own wake, the other from the jet boat heeling during a tight turn and capsizing.

Only one accident was clearly caused by existing water conditions, a jet boat operating on inshore waters returning towards a river mouth. Fast flowing water however likely contributed to several of the other accident resulting in a fatality.

These circumstances would suggest that the speed and operating environment of jet boats is a major factor in fatal accidents involving these vessels.

"Travelling upstream in low light conditions the driver failed to sight a gravel island. At the last moment they made a sharp left turn causing the boat to roll over the island, causing all four occupants to be ejected from the boat. One sustained fatal injuries, two suffered injuries requiring helicopter evacuation, and one suffered minor injuries"

8.2 Southland Region

As described in report section 2.2 the Southland Region had a higher accident rate than its participation rate would suggest.

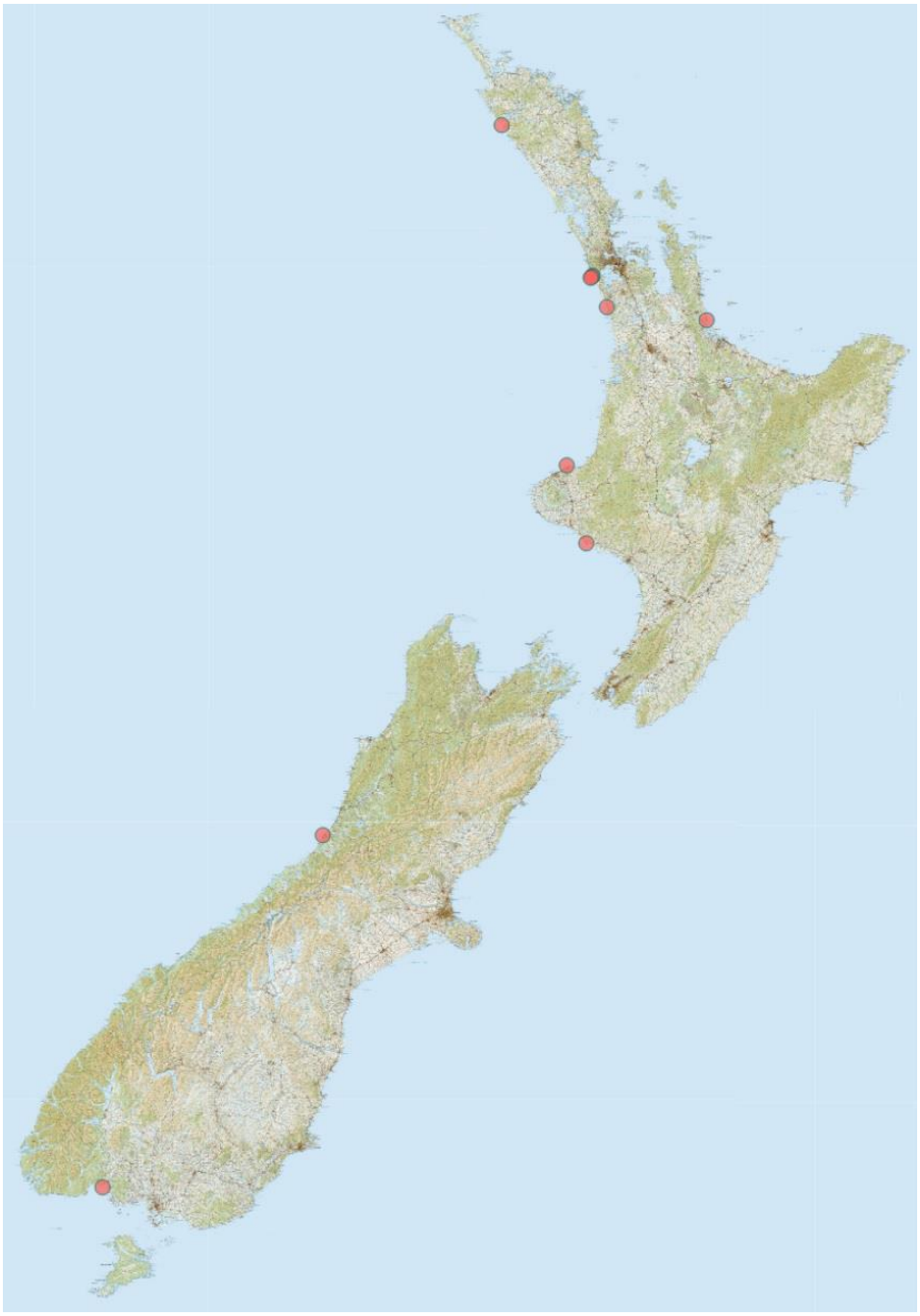
Vessel and accident types varied, however a number of common factors could be identified. Most involved males over 45 years of age on powered craft, with all but one accident having the victim wearing a lifejacket when they entered the water. Alcohol was a factor in three accidents, likely contributing to one accident occurring, and reducing the chances of survival in the other two.

While several accidents involved victims unable to call for help and contributing to extending their time in cold water, several accidents involved well equipped vessel where weather conditions or sea state created a particular hazard and meant that assistance was either unavailable or not timely enough to prevent a fatality. This would suggest that in this area remaining away from poor conditions and remaining on board the vessel is of particular importance.

"While returning down the coast towards the Wairaurahuru River the jet boat with three on board was swamped by a wave and sank. All three were wearing lifejackets and made it to shore, with one leaving the group to find help. One of the remaining men died from hypothermia a short time after making it to shore."

8.3 River and Harbour Bar Crossings

Below is a map of all fatal accidents that were identified as occurring on a river or harbour bar.



- Note that some river mouth accidents are not included if they were considered to not involve a hazardous bar

A total of ten accidents occurred on river or harbour bars, resulting in 11 fatalities. Six of these occurred on river bars and five on harbour bars.

All but one of the fatalities occurred on powered craft. These were primarily power boats with seven fatalities including one accident with two fatalities, two fatalities on powered inflatable vessels, and one fatality on a powered dinghy. One fatality occurred on a non-powered kayak. All but the kayak accident had more than one person on the vessel at the time.

All but one accident involved the vessel capsizing due to waves, with the sea state identified as including either breaking waves or waves over 1m in height. Waves of 2m or higher were also present in a number of accidents. The only other accident type was a swamping of a dinghy, also by a wave.

Five fatalities involved victims not wearing a lifejacket when they entered the water. Only one of these people did not have a lifejacket available to them on the vessel. Maritime Rules require all on board a vessel to wear a lifejacket when sea state or water conditions present a risk to safety[10].

All but two of the fatalities involving bar crossing occurred in the North Island.

All but one of those who died in a bar crossing accident were over the age of 45.

Three of those who died in a bar crossing accident were Pacific Peoples, all in separate accidents, contributing to nearly half of that groups overall fatalities.

The bars that had fatal accidents occur on them were as below:

Location	Bar Type	Number of Fatalities	Number of Accidents
Bowentown	Harbour	1	1
Hokianga	Harbour	1	1
Hokitika	River	1	1
Manukau	Harbour	3	3
Patea	River	1	1
Waikato	River	2	1
Waiau	River	1	1
Waitara	River	1	1

"The boat was struck by a wave on the port side, rolling the boat twice. The boat came to rest upside down, with all three on board trapped under the vessel. Two were able to escape to the surface but one remained trapped. The vessel had followed most of the bar crossing guide's recommendations except for having a lookout for approaching waves."

[10] Maritime Rule 91.4(6)

9 Conclusion and Future Research or Analysis

This report has highlighted a number of groups over represented in recreational boating fatal accidents, some of which have been well documented in the past, and some of which awareness of is growing. It has also provided greater detail of vessel characteristics, accident types, safety behaviour, and geographic distribution than was previously available.

Some of these key groups have been explored in report section 8 Case Studies. Some other groups, trends, and patterns identified in this report include:

1. Year-round accidents, with a significant increase of accidents in late summer.
2. Higher accident rate relative to participation in Southland, and a lower accident rate in Auckland, Waikato, and Bay of Plenty.
3. A majority of accidents occurring on inland waterways or inshore waters less than 1nm from shore.
4. A high number of accidents in paddle craft, dinghies, and inflatable craft less than 4m in length.
5. A high number of accidents in powerboats between 4m and 6m in length with outboard engines.
6. An over representation of deaths involving those 45 and over.
7. An over representation of deaths involving males.
8. An over representation of both Māori and Pacific Peoples**.**
9. Most accidents occurred suddenly, either capsizes, persons overboard, or impacts with objects or the shore.
10. These accidents can be used to group common characteristics
    a. People falling overboard from small (<4m) dinghies, inflatables, and paddle craft, often without a lifejackets on. These people are often alone, with no one aware the accident occurred.
    b. Powerboats between 4m and 6m capsizing in hostile waters, often with breaking waves close to shore or at a bar crossing. These vessels often had multiple people on board, often with a number of them wearing lifejackets. However the deceased would either not be wearing one, or if worn it would be used incorrectly or be inappropriate.
    c. Powerboats striking objects such as beacons, grounding a high speed, or striking people in or on the water. These impacts usually resulted in death from traumatic injuries.

These groupings can help lead future research into the characteristics of people who participate in activities identified as high risk, exploring the attitudes, and motivations of these groups.

Additional analysis onto casual factors is also important to better understand these accidents. This will require additional extraction of data from investigation and coroner reports, and improving causal factor coding frameworks at MNZ and with other Safer Boating Forum participants.

It is also anticipated that regular updates of this report will be made, possibly annually, with additional case studies produced outside of this cycle. Each new piece of work is ultimately to provide better tools and information to both those working in the recreational boating sector and participants, to help prevent deaths on the water.

Appendix A: Data Tables

Deaths Per Year Over Ten Years

Year	Number of Fatalities
2011	20
2012	13
2013	17
2014	26
2015	**22**
2016	**15**
2017	**19**
2018	**5**
2019	**23**
2020	**14**

Deaths Per Region Per Year

Region	2015	2016	2017	2018	2019	2020	Total
Northland	2	2	3	3	5	0	**15**
Auckland	4	0	6	0	3	5	**14**
Waikato	4	1	0	0	3	1	**9**
Bay of Plenty	2	0	6	0	2	0	**10**
Gisborne	0	1	0	0	0	0	**1**
Taranaki	1	2	1	0	0	0	**4**
Hawkes Bay	0	1	0	0	0	0	**1**
Manawatu	1	0	0	0	0	1	**2**
Wellington	3	0	2	0	0	2	**7**
Marlborough	0	0	0	0	1	1	**2**
Nelson	0	0	0	0	0	0	**0**
Tasman	0	0	0	0	0	1	**1**
West Coast	1	2	1	0	2	0	**6**
Canterbury	0	2	3	0	1	1	**7**
Otago	3	0	0	1	1	1	**6**
Southland	1	2	1	1	4	1	**10**
Outside New Zealand	0	2	0	0	1	0	**3**

Orange shading indicates where one year accounts for 40% or more of a regions total (min 5 total)

Deaths Per Basic Vessel Type Per Region

Region	Dinghy	Inflatable	Jet Ski	Kayak	Power Boat	Yacht	Other	Total
Northland	6	2	1	1	4	1	0	**15**
Auckland	3	0	1	3	3	1	2	**14**
Waikato	1	1	0	3	3	0	1	**9**
Bay of Plenty	3	0	0	3	3	1	0	**10**
Gisborne	1	0	0	0	0	0	0	**1**
Taranaki	0	1	0	0	3	0	0	**4**
Hawkes Bay	0	0	0	0	1	0	0	**1**
Manawatu	1	0	0	1	0	0	0	**2**
Wellington	2	4	0	0	0	1	0	**7**
Marlborough	0	0	0	0	2	0	0	**2**
Nelson	0	0	0	0	0	0	0	**0**
Tasman	0	0	0	1	0	0	0	**1**
West Coast	0	2	0	2	2	0	0	**6**
Canterbury	0	0	1	1	4	1	0	**7**
Otago	0	1	0	0	5	0	0	**6**
Southland	1	1	0	1	6	1	0	**10**
Outside New Zealand	0	0	0	0	0	3	0	**3**

Orange shading indicates where one vessel type accounts for 40% or more of a regions total (min 5 total)

Deaths Per Basic Vessel Type Per Year

Region	2015	2016	2017	2018	2019	2020	Total
Dinghy	4	2	3	2	4	3	**16**
Inflatable	3	1	3	2	1	2	**12**
Jet Ski	1	1	1	0	0	0	**2**
Kayak	6	3	1	1	2	3	**16**
Power Boat	6	6	6	0	14	5	**37**
Yacht	1	2	4	0	1	1	**8**
Other	1	0	1	0	1	0	**3**

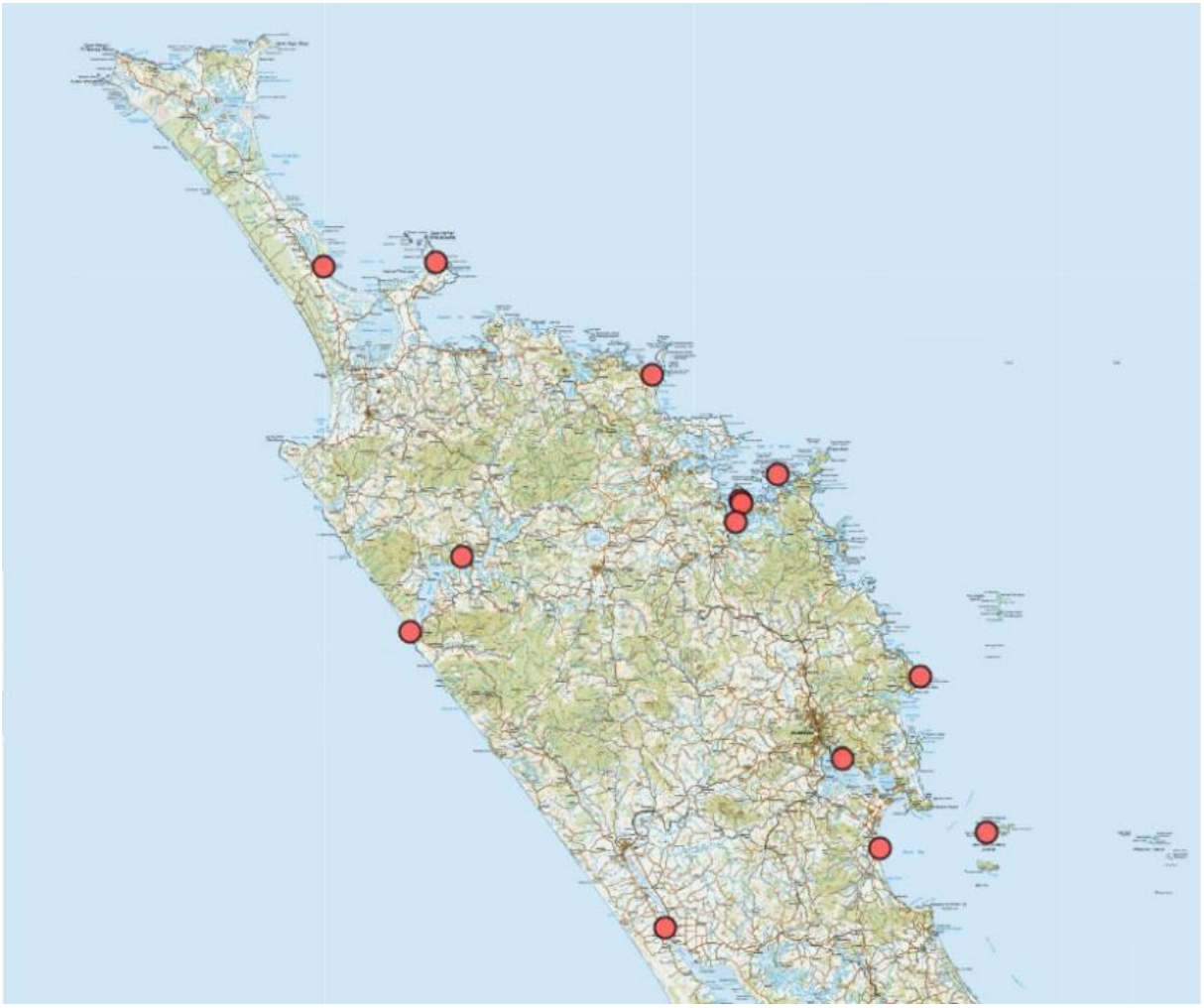
Orange shading indicates where one year accounts for 30% or more of a vessel's total (min 5 total)

Detailed Vessel Type	Accident Type	Total Fatalities
Canoe	Overboard	1
Dinghy (powered)	Capsize	1
Dinghy (powered)	Impact	2
Dinghy (powered)	Overboard	3
Dinghy (powered)	Swamping	3
Dinghy (powered)	Unknown	2
Dinghy (unpowered)	Overboard	7
Inflatable (powered)	Capsize	3
Inflatable (powered)	Impact	1
Inflatable (powered)	Overboard	1
Inflatable (unpowered)	Capsize	3
Inflatable (unpowered)	Overboard	3
Jet ski	Overboard	3
Keel yacht	Impact	2
Keel yacht	Overboard	3
Keel yacht	Swamping	1
Other fishing (former trawler)	Unknown	2
Other kayak	Capsize	3
Other kayak	Overboard	1
Other kayak	Wrap/pin	3
Other recreational	Other	1
Power boat	Capsize	12
Power boat	Impact	4
Power boat	Other	1
Power boat	Overboard	5
Power boat	Swamping	2
Power boat	Unknown	3

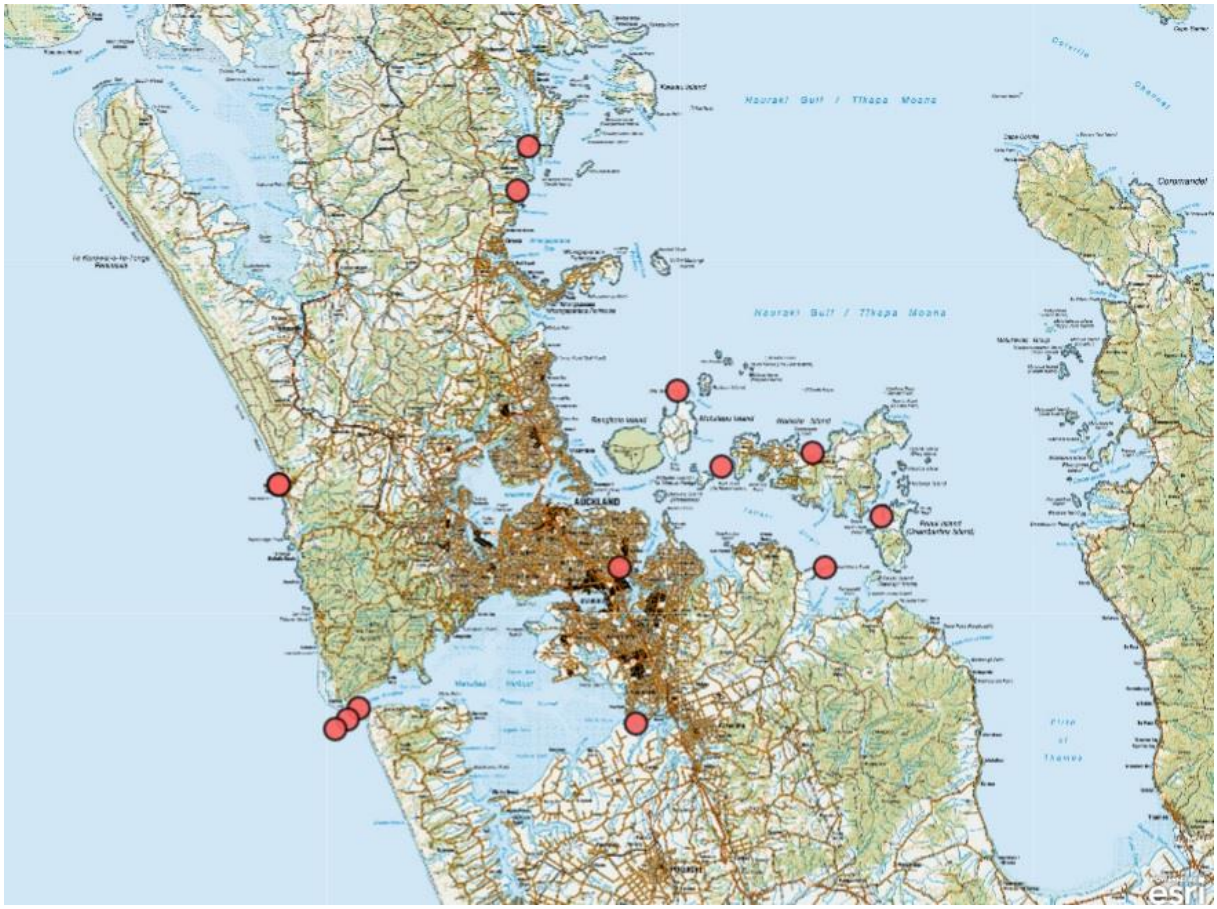
Detailed Vessel Type	Accident Type	Total Fatalities
River jet boat	Capsize	2
River jet boat	Impact	4
River jet boat	Swamping	1
River jet boat	Unknown	1
River raft	Capsize	1
Sit-on-top kayak	Capsize	3
Sit-on-top kayak	Capsize	5
Stand up paddleboard	Overboard	2
Trailer yacht	Overboard	3

Appendix B: Regional Maps

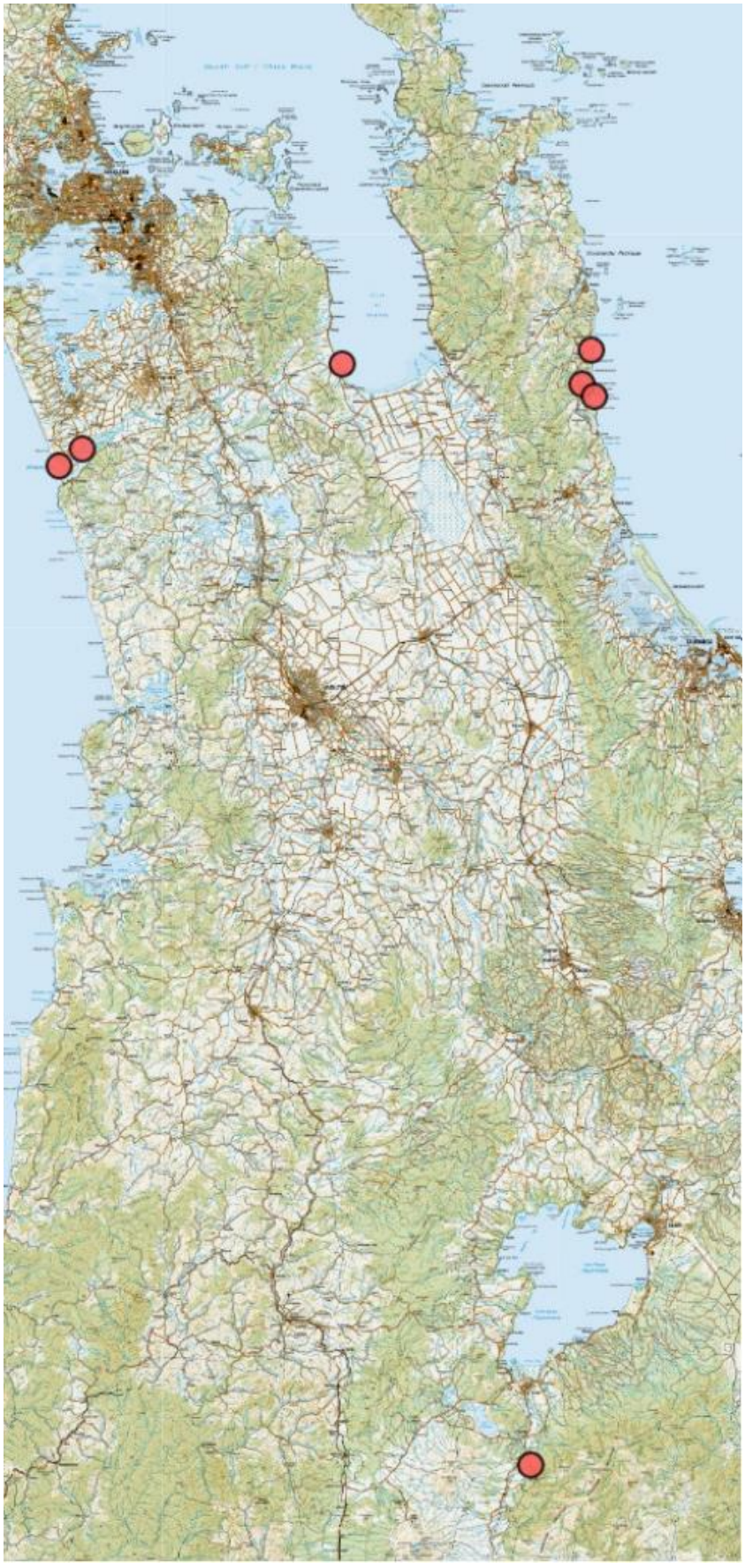
Northland Fatal Recreational Accidents 2015-2020



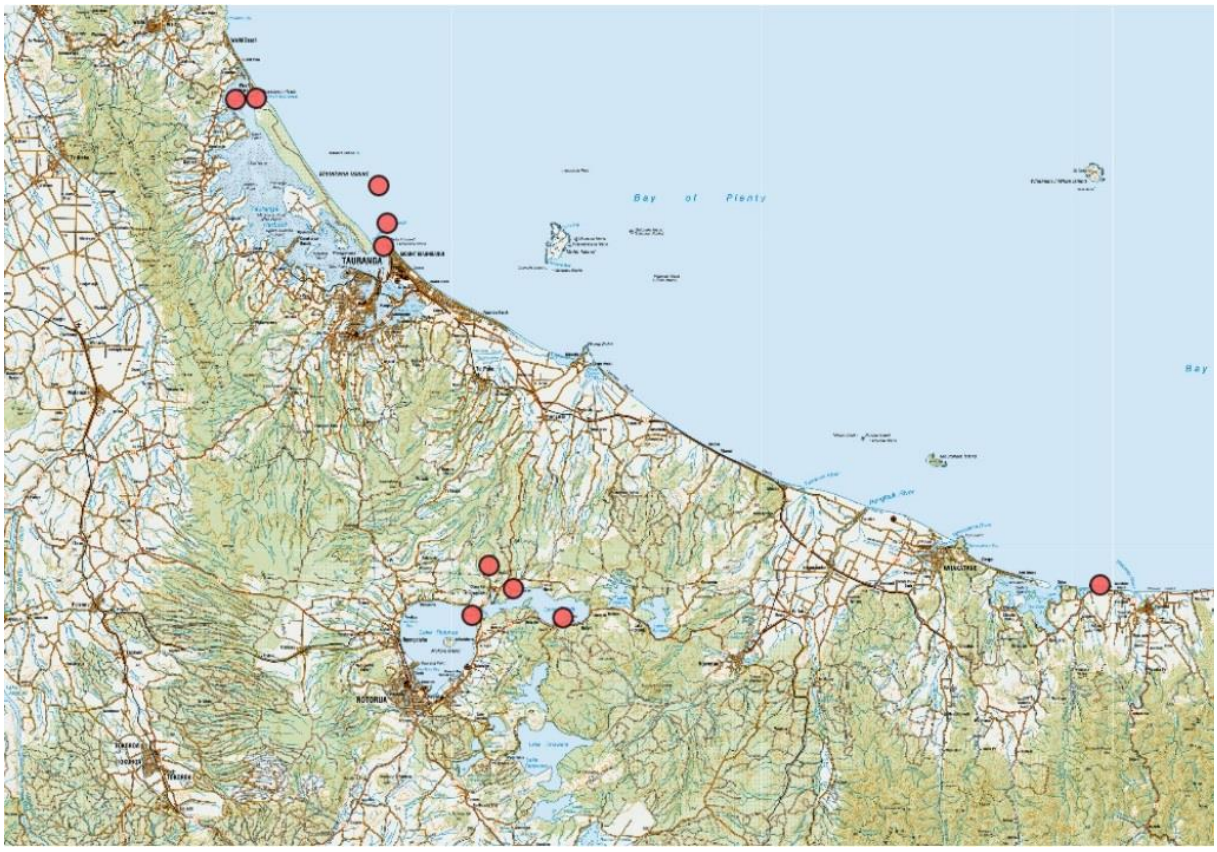
Auckland Fatal Recreational Accidents 2015-2020



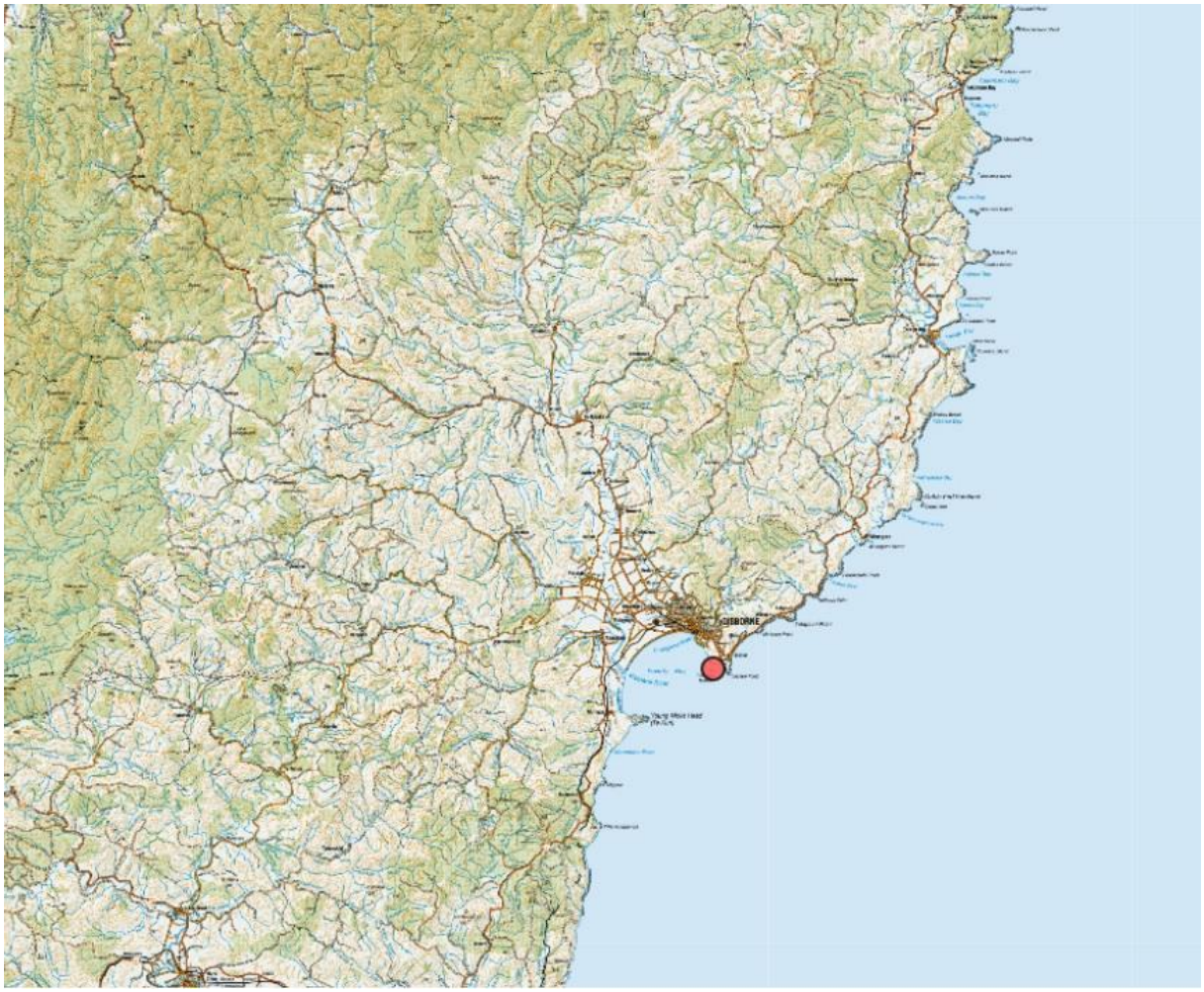
Waikato Fatal Recreational Accidents 2015-2020



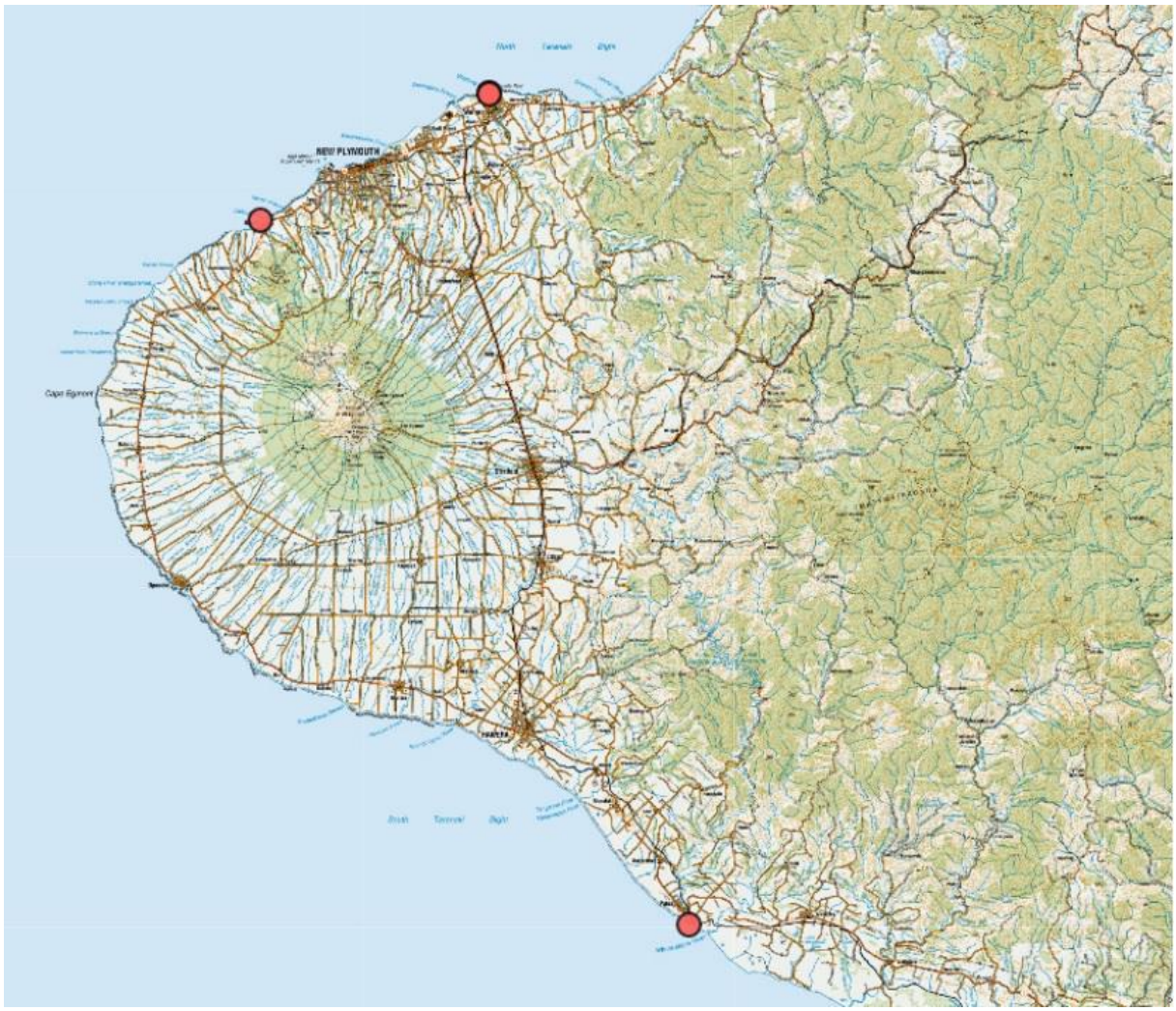
Bay of Plenty Fatal Recreational Accidents 2015-2020



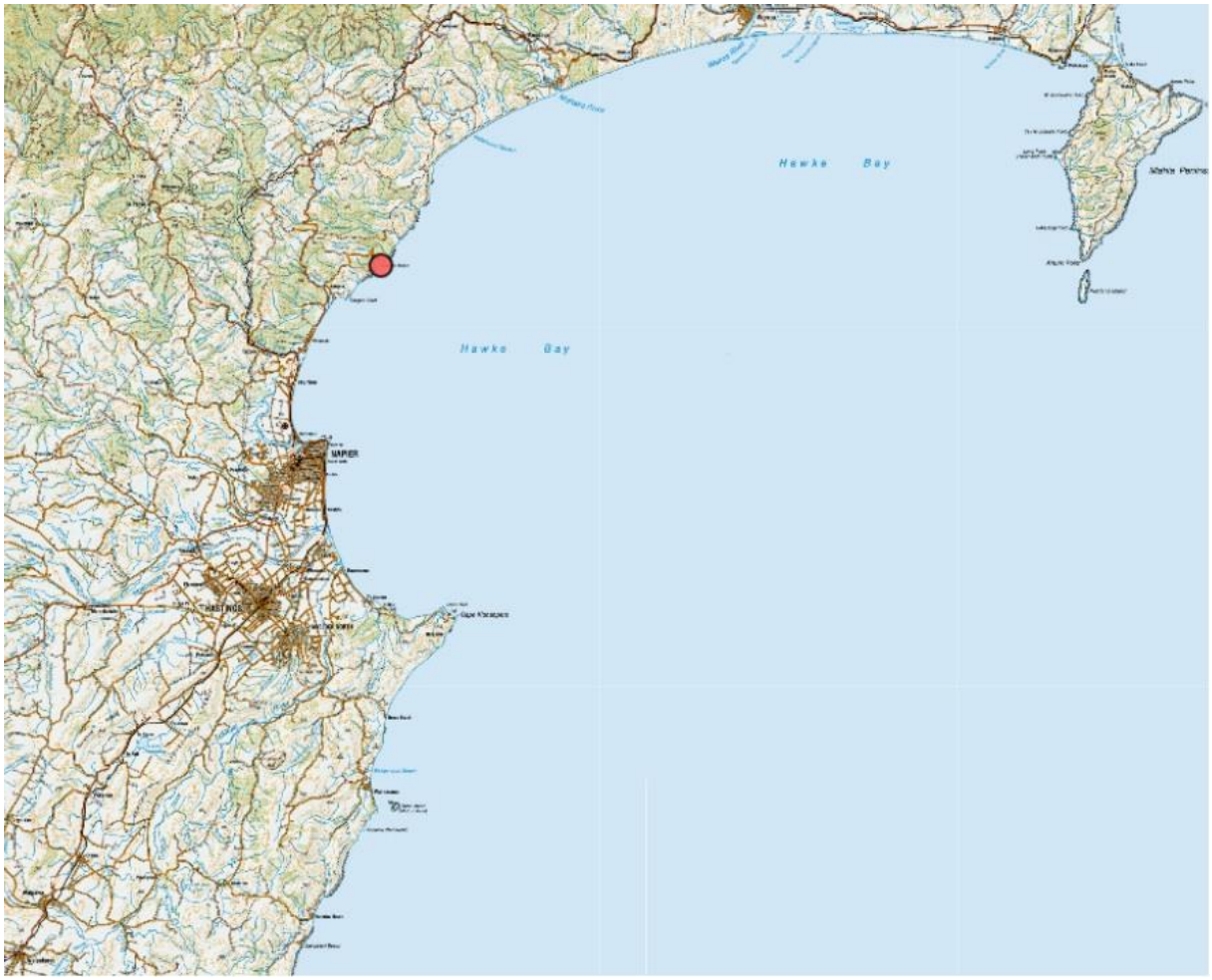
Gisborne Fatal Recreational Accidents 2015-2020



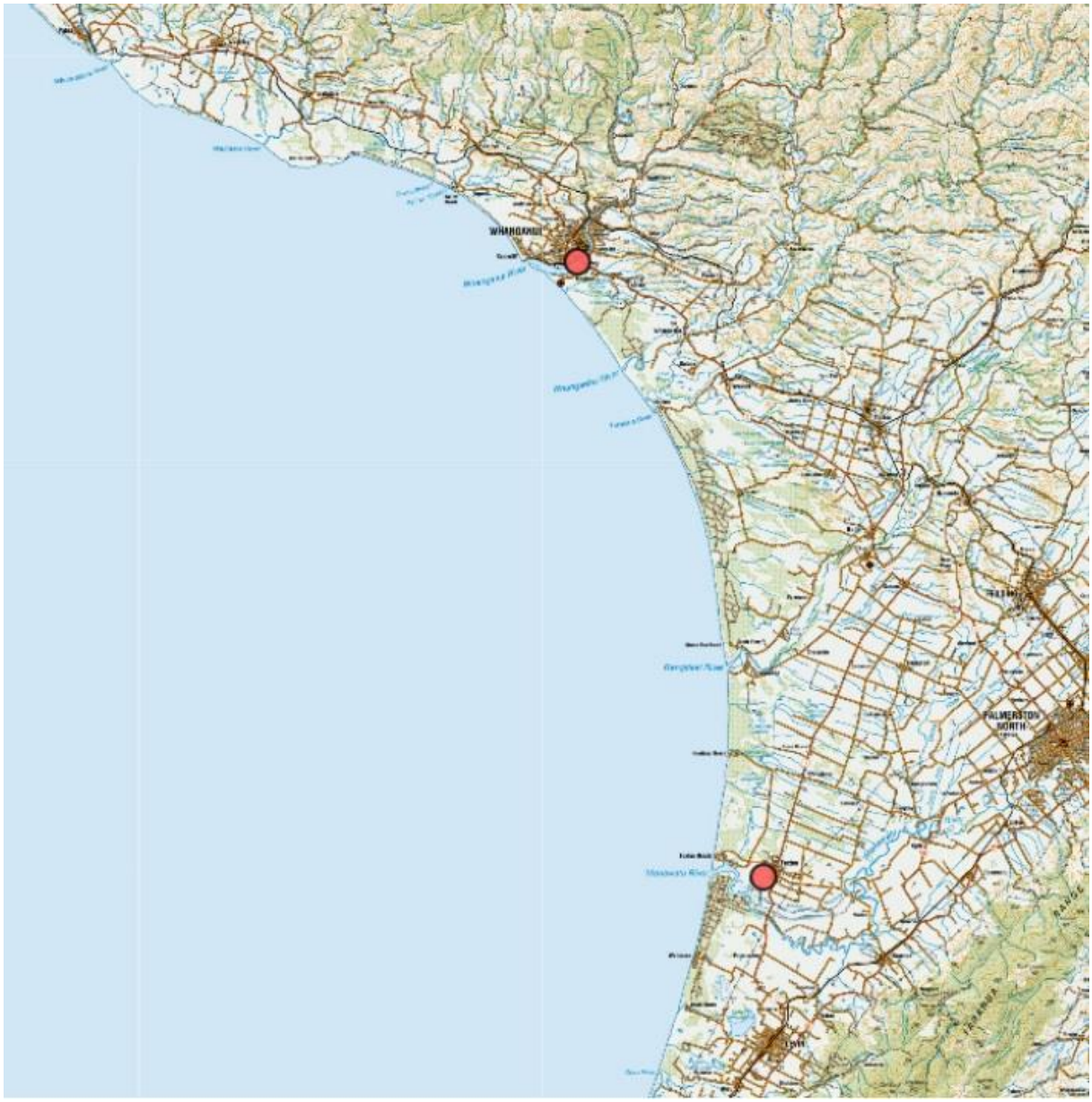
Taranaki Fatal Recreational Accidents 2015-2020



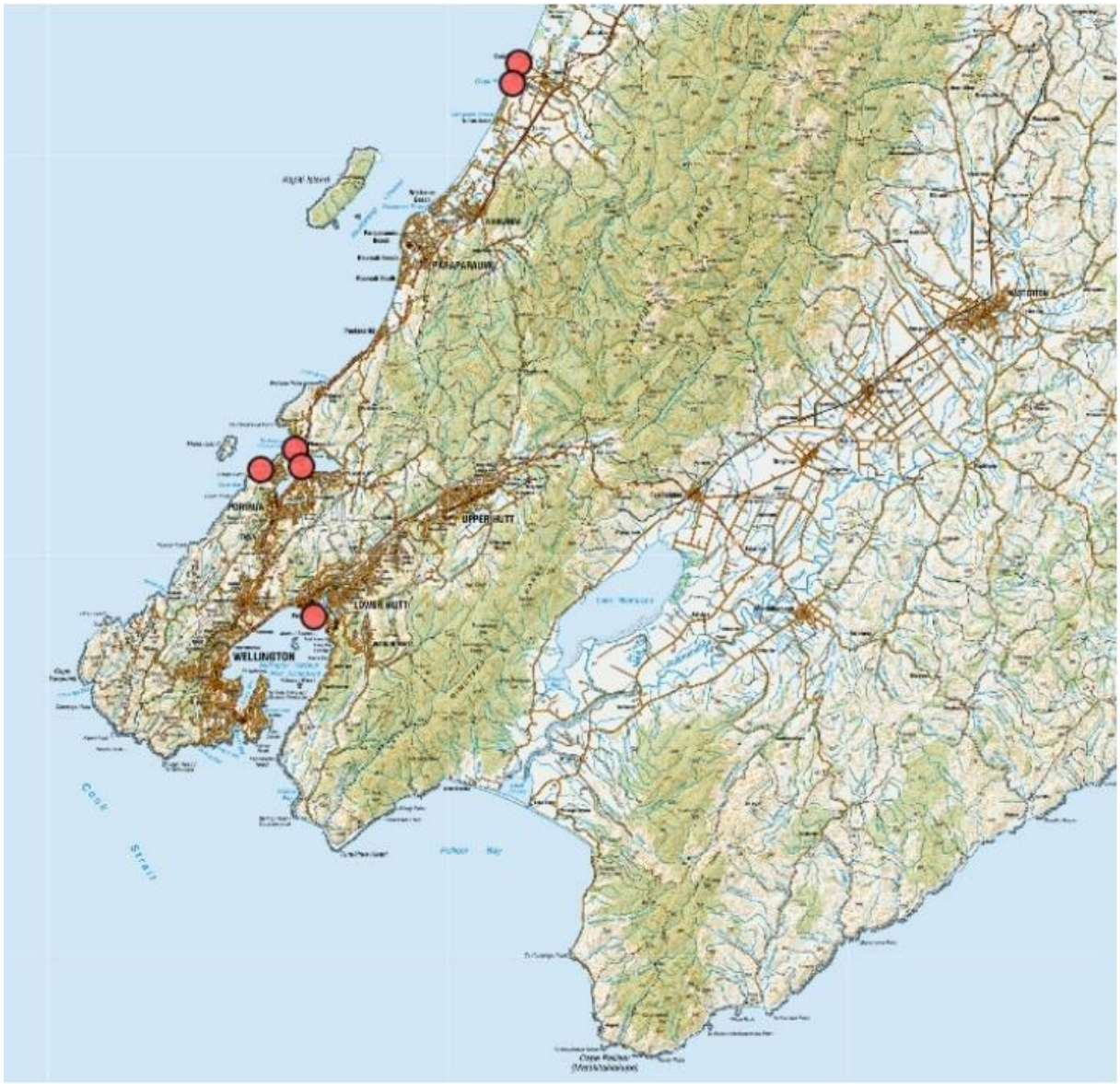
Hawkes Bay Fatal Recreational Accidents 2015-2020



Manawatu Fatal Recreational Accidents 2015-2020



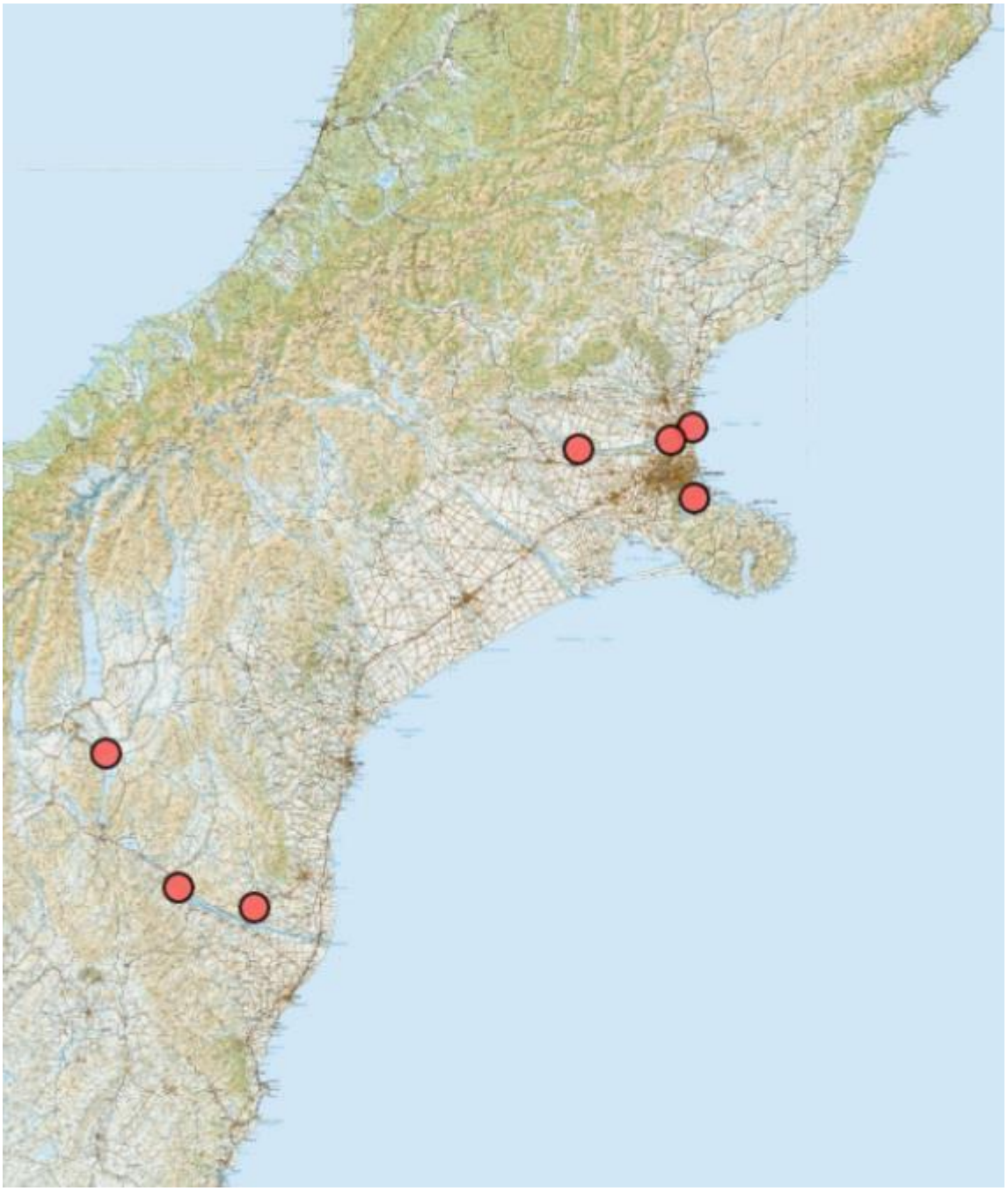
Wellington Fatal Recreational Accidents 2015-2020



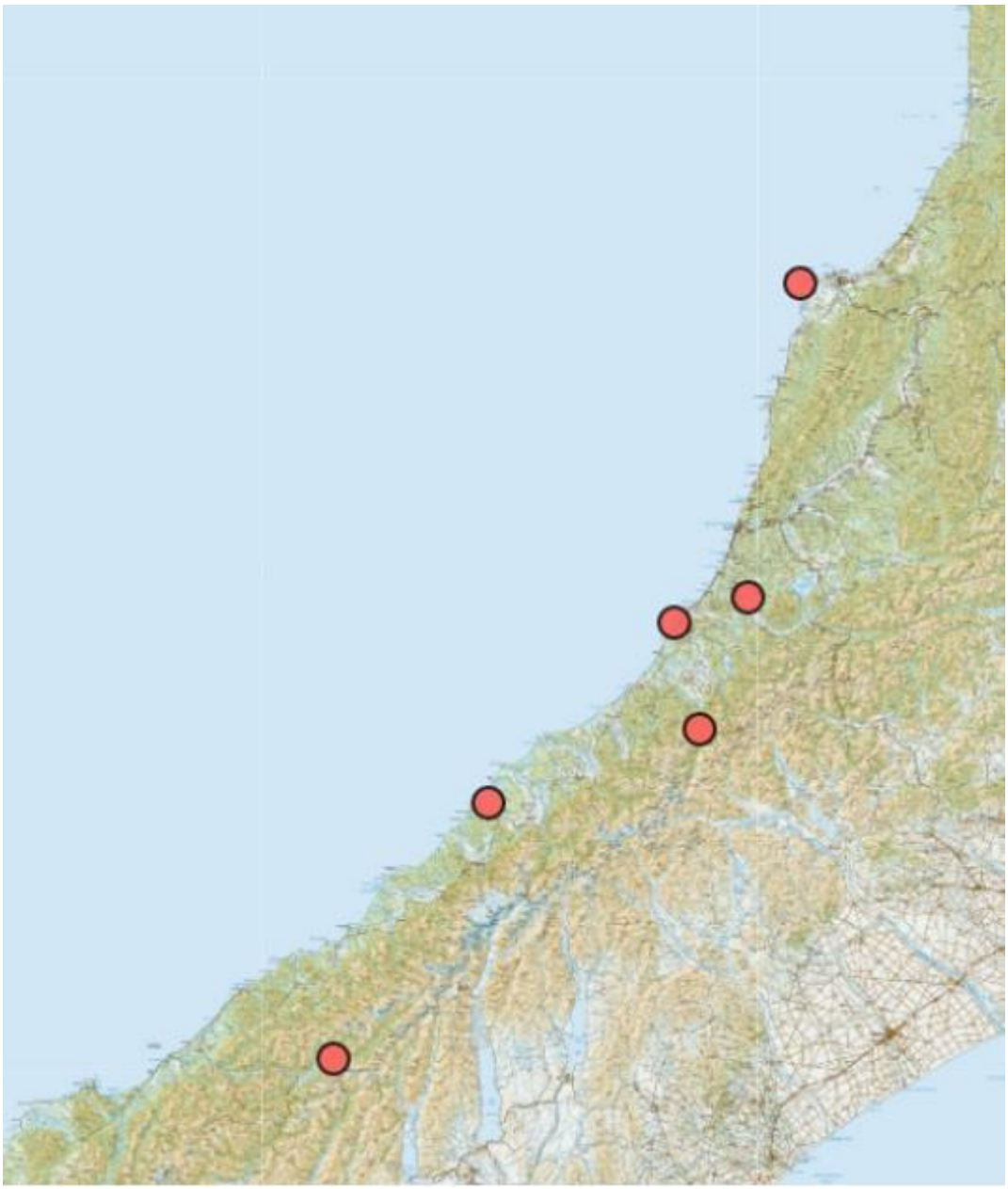
Marlborough Fatal Recreational Accidents 2015-2020

Tasman Fatal Recreational Accidents 2015-2020

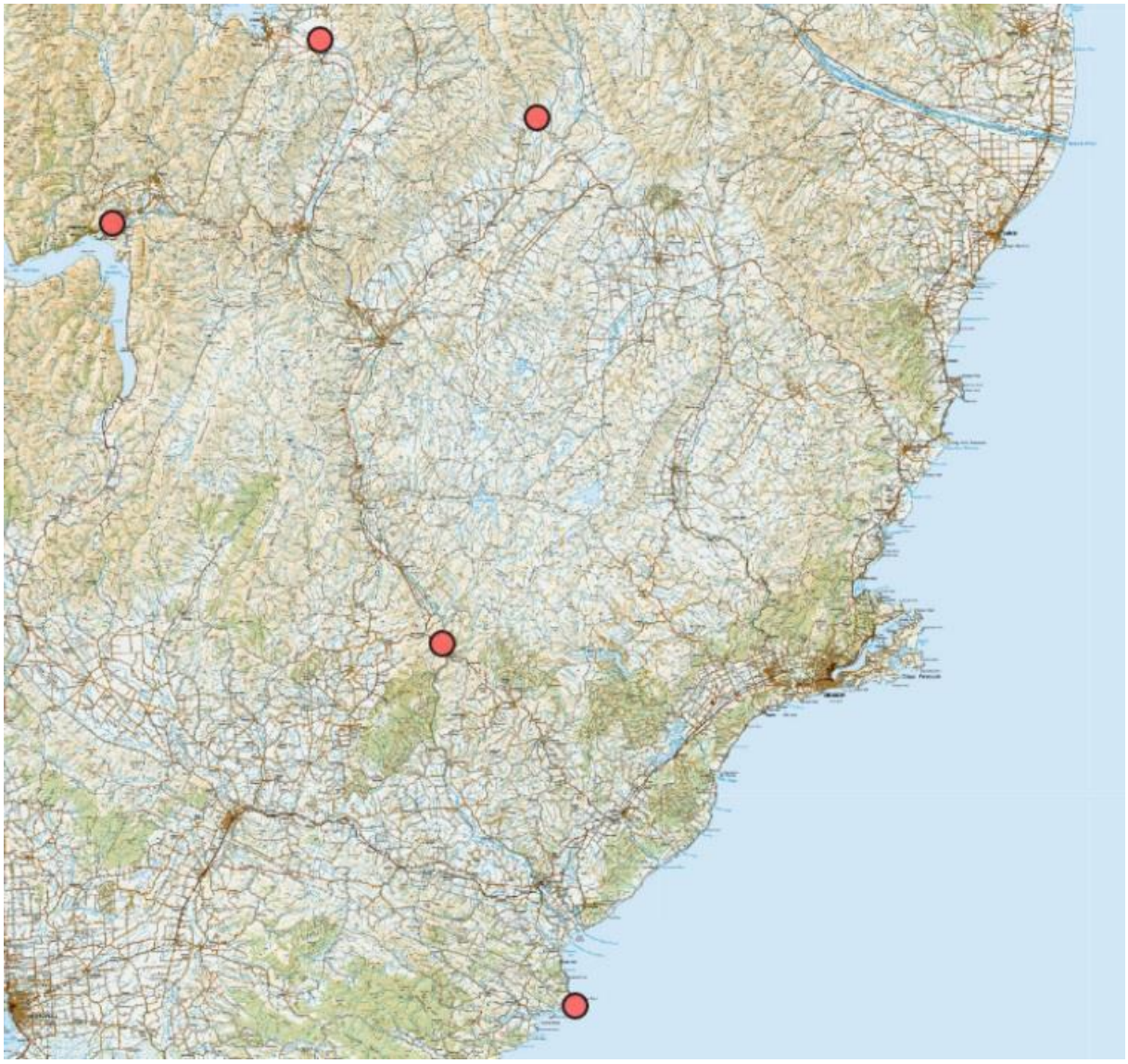
Canterbury Fatal Recreational Accidents 2015-2020



West Coast Fatal Recreational Accidents 2015-2020

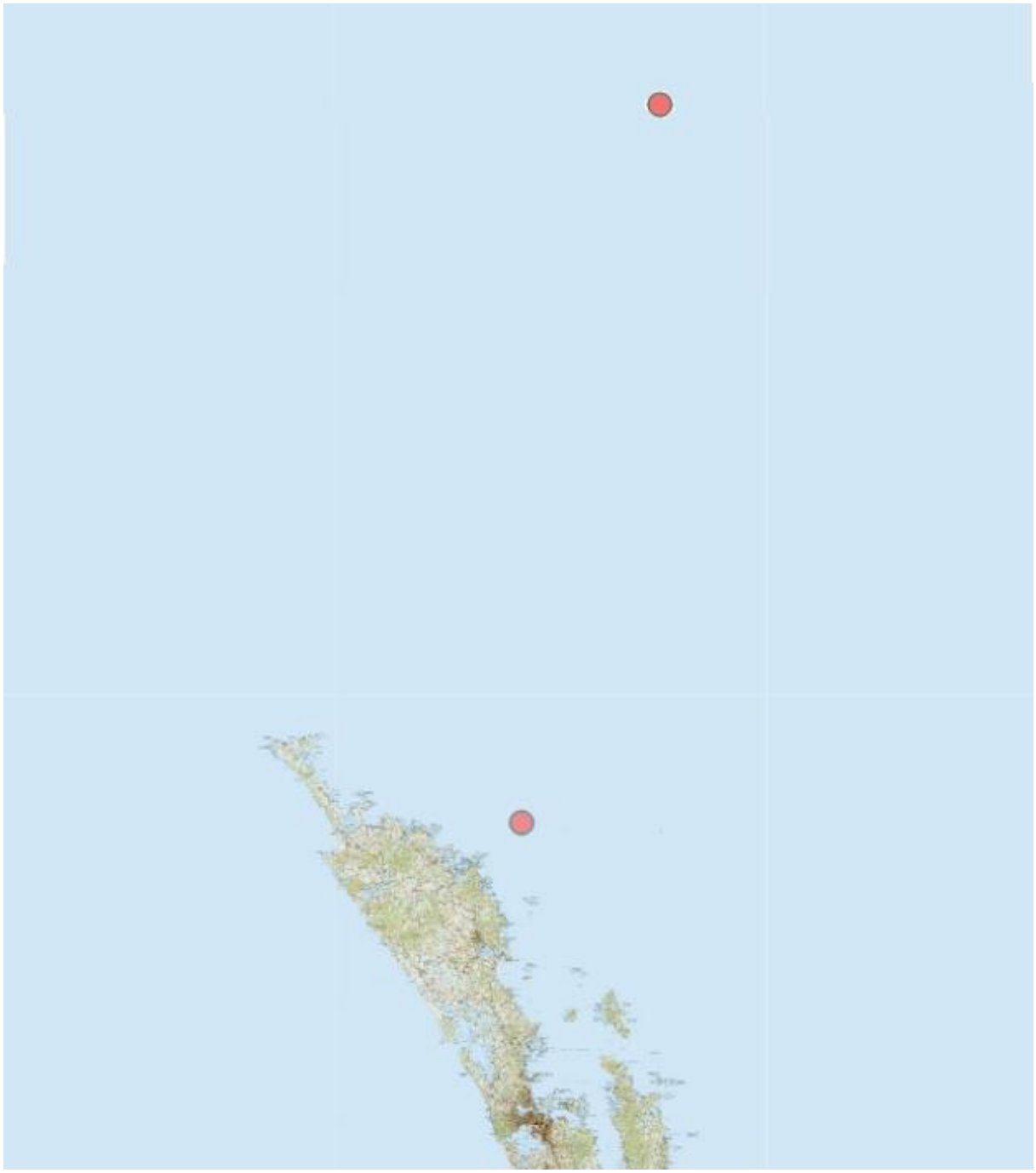


Otago Fatal Recreational Accidents 2015-2020



Southland Fatal Recreational Accidents 2015-2020

Fatal Recreational Accidents Outside New Zealand Territory 2015-2020



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