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Te Hunga Takutai o Aotearoa
NEW ZEALAND COASTAL SOCIETY

Coastal News

HMNZS Wellington, made safe and scuttled, 2005. But what else is out there? (Photo: Jdlewis, Wikimedia Commons).

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What lies beneath

By Lucy Brake, Contributing Writer

It has been nearly six years since the MV *Rena* grounded itself on one of the Bay of Plenty's most iconic fishing reefs and New Zealand found itself in the middle of its worst maritime environmental disaster. Now there are growing concerns that the 70-year old *Niagara* ship wreck near one of Northland's premier recreational dive spots could potentially collapse and release what has been estimated at four times the amount of oil that came from the *Rena*. It begs the question of just how many other wrecks are dotted around the country that might be quietly lying on the ocean floor waiting for time to erode away the outside and any oil to spill out?

Rena – what have we learnt?

Six years on and work connected to the *Rena* cleanup is still ongoing. There were 1700 tonnes of oil on board the *Rena*, which was very viscous and thick so ends up like a glutinous tar when it cools down, and this is why the salvors needed to heat it to get off the ship. Keith Manch, Maritime NZ Director, confirmed that within months of the incident most of the 360 tonnes of oil that leaked from the ship was cleared, "but the environmental, social, economic, and cultural impacts continued for years and affected Tauranga and its iwi".

Bay of Plenty Regional Council Chairman Doug Leeder, who is also Co-Chair of the Rena Recovery Governance Group, said that while the Rena Recovery Plan projects are now complete, a great deal of work will carry on: "Ongoing work like pest control and coastal environment monitoring will continue, in collaboration with iwi and as part of business as usual for the organisations involved." He notes that a "legacy of knowledge and understanding has been gathered through the Recovery Plan that will be incredibly useful should the Bay of Plenty or another region ever be faced with a similar incident in future."

In May 2014 the *Rena*'s owner lodged resource consent applications under the Resource Management Act to leave sections of the wreck and associated debris in place on Otaiti (Astrolabe) Reef, and to provide for any future discharges of contaminants that may arise from leaving the wreck in place. The Bay of Plenty Regional Council Hearing was held on 7 September 2015 and on 26 February 2016 the consent was approved for the wreck to remain and for any associated discharges to be managed. This decision was appealed to the Environment Court and in May 2017 the Court agreed with the Regional Council's decision to approve consent for the abandonment of the vessel.

The New Zealand Coastal Society produced a report titled '*Rena*: Lessons Learned' to help advance knowledge about this country's oil spill response and recovery process. The report commended the way the National Response Team worked closely with the local community and that this multidisciplinary approach is the 'cornerstone of effective coastal planning and management'. One of the findings of this report was that a concern for future incidents is the need for 'the maintenance of a healthy oil pollution fund, based on levies paid by visiting vessels, to cover the initial costs of pollution events, and adequate vessels and equipment to conduct clean-up operations'.

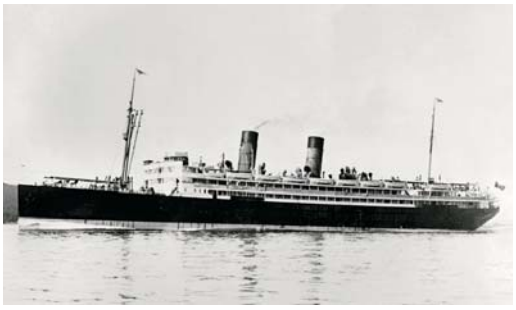
Fast forward six years and the *Rena* has become a diving destination with media articles likening the

wreck to a 'rare and beautiful site for divers'. The maintenance of a 'healthy oil pollution fund' is still being worked on.

A maritime disaster waiting to happen?

On 19 June 1940 the RMS *Niagara* hit mines off the Northland shoreline that had been laid by the German merchant ship *Orion*. It sunk to a depth of 121 metres and now lies on the floor of the Hauraki Gulf in the shipping channel between the Hen and Chicken Islands and Mokohinau Island, off Bream Head in Whangarei. The ship had just refueled in Auckland and could carry up to 4000 tonnes of heavy fuel oil. Reports note that when *Niagara* was first struck a large quantity of oil leaked from the ship and ended up around the Mangawhai, Waipu and Bream Tail coastline. Locals say that hardened black tar still remains on some of the less accessible coastal areas, a lasting reminder of the oil that came from the *Niagara*.

The wreck lies close to the boundary between Northland and Auckland Regions' Coastal Marine Waters. Both regional councils and Maritime NZ are aware of the *Niagara* wreck and the potential risk of an oil leak. Maritime NZ confirm that they and the Northland Regional Council have undertaken assessments of the risks posed by the wreck. Sarah Pettigrew, Advisor Ministerial Service at Maritime NZ, says that "when small leaks have occurred, the oil has naturally dispersed or broken up with no observed environmental impact". Sarah points out that as a result of the assessments it is believed "due to the depth of the wreck and the type of oil on board (a heavy marine fuel type with a high pour point), the oil is in a near solid form for much of the time. As the oil is likely distributed over a number of spaces and compartments of the wreck, a major leak is unlikely."



The RMS Niagara *sailing past Rangitoto in the 1920s (Sir George Grey Special Collections, Auckland Libraries, 35-R1152).*

However, there has been unease for a while amongst locals and marine biologists that the oil still on the ship is slowly leaking out. Recently this concern has grown because of the belief that the ship has deteriorated to a state where it will break up, releasing all of the oil left on board. Added to this problem is that no one really knows how much oil is actually still in the tanks.

Lyn Mayes, Chair of the Auckland Conservation Board, has a number of concerns about the potential risk the remaining oil places the surrounding environment under. "The *Niagara* shipwreck is a 'ticking time bomb' in our region with the potential to impact the Waitemata Harbour". They want to see funding allocated to remove the oil from the *Niagara* now rather than waiting until the wreck erodes further and fuel is spilled into the Gulf. This, Lyn stresses, is in line with recommendations from the Sea Change Marine Spatial Plan. "Oil slicks up to 15 kilometres long have already been seen from the wreck and a major spill would affect many of the 27 species of sea birds that live in the Hauraki Gulf including Cook's petrel, storm petrel, black petrel, Pycroft's petrel and fairy tern. Ecologists have expressed their concern about the risk to breeding colonies and habitat."

Willie Wright, Chair of the Northland Conservation Board, holds the same concerns as Lyn. "While the *Niagara* ship wreck falls with the jurisdiction of the Auckland Conservation Board's area, Northland Conservation Board supports their stance to have at the very least a complete survey as to the degradation of the vessel and to assess how much oil, if any, is still left on the ship." Willie says they have been told that there may be "up to 2000 tonnes left and divers have seen globules of oil escaping from the wreck. Should the ship implode and release that amount of oil then it will devastate the Northland coastline, marine habitats and species of fish and bird life in the Hauraki Gulf. Irrespective of jurisdictional boundaries we all would suffer the consequences of a possible massive pollution fallout."

Location of the Niagara *wreck site between the Hen and Chicken Islands and the Mokohinau Islands.*

Sarah from Maritime NZ points out that "contingency plans have been developed that could be put into action if a significant discharge occurred." These plans are the National Oil Spill Contingency Plan, the Northland, Auckland, and Waikato Region Marine Oil Spill Contingency Plans, and the Hauraki Gulf Marine Oil Spill Contingency Plan. "All of these plans apply in that they collectively cover the risks, threats, and response options for any oil spill from any source in the Hauraki Gulf, including the wreck of the *Niagara*," Sarah notes.

Willie urges that "risk management of this issue is imperative as it will be too late after the fact. It is easier and cheaper to consider the matter now instead of a potential disaster and then clean up our environment at a substantial economic cost and wildlife cost." The Northland and Auckland Conservation Boards are hopeful that the government will give this urgent attention to make sure the wreck is safe and remove the fuel oil from the *Niagara*. "This is a preventable environmental disaster. It is better to take action now to minimise the effects than to let the wreck totally fail in the next decade or so and have a catastrophic effect," says Lyn. Ultimately, before any decisions can be made, experts need to confirm just how much oil still remains on board.

Do we have a bigger problem?

There are several wrecks of ships around the coast that are likely suspects in terms of having some residual oil on board. The *Mikhail Lermontov* was a Russian cruise ship that sank in Gore Bay, Marlborough Sounds, in 1986. Shortly after sinking, 1600 tonnes of fuel oil and lubricants were removed from the wreck. Maritime NZ confirms that "the occasional small slick of oil has been observed in the vicinity of the wreck from time to time since but with no report of environmental impacts." The last report they received about oil observed around this wreck was in May 2012. There are also other small shipwrecks that Maritime NZ has noted, including: *Maranui*, a small general cargo ship that sank off Great Mercury Island in 1968; *Kaitawa,* a small coastal coal ship that sank off Cape Reinga in 1966; and *Holmglen*, a small general cargo ship that sank in 1959 off the coast to the south-east of Timaru.

The US and Europe are faced with hundreds of sunken ships with oil totalling in the millions of tonnes locked at the bottom of the sea, waiting until time erodes away the wrecks and the oil starts leaking. One classic example is the wreck of the *Jacob Luckenbach*, which sank in the Gulf of the Farallones in 1953. This was identified as the source of intermittent oil spills along California's central coast that had killed more than 50,000 birds. In 2002, US$20 million was spent extracting more than 3400 tonnes of remaining oil from the wreck, but nearly 1000 tonnes had to be left and sealed in as it was too hard to get to. The US National Oceanic and Atmospheric Administration (NOAA) prepared a report in 2013 that identified 87 wrecks that they believed held the greatest danger of

Diver assessing status of US shipwreck (US NOAA, public domain).

Oil from the Rena *being brought ashore on Papamoa Beach, 2012 (Photo: New Zealand Defence Force. Released under Creative Commons 2.0 licence).*

leaking oil; 36 of these were high risk because of how old they are. The race is on now to prepare contingency plans to evaluate and monitor these high-risk wrecks.

Maritime NZ says the spills from ship wrecks in this country are treated in the same manner as spills from any other source when it comes to a response. "However, when a fixed source of a potential spill is identified trajectory modelling may be undertaken in advance if it is considered useful for planning purposes," explains Sarah.

The question for New Zealand is do we feel this issue is important enough to take a more proactive and costly approach to identifying which wrecks are a problem and removing the oil before it spills out and damages our very special marine environment?

Oil leaks from wrecks: How big a problem is it internationally?

A 2010 *New Scientist* article looked specifically at the risk of oil leaks from WWII wrecks, which together account for around three-quarters of oil-containing wrecks worldwide. The article estimates that these wrecks contain between 2.5 to 20 million tonnes of oil, dwarfing the 40,000 tonnes released in the *Exxon Valdez* tanker spill in 1989. More worrying is that the steady disintegration of these wrecks could see many beginning to leak oil in the next decade or so – what the article dubs 'peak leak'.The article – 'Why wartime wrecks are slicking time bombs' – can be found at https://www.newscientist.com /article/mg20727761-600-why-wartime-wrecks-are-slicking-time-bombs/

A 2013 National Oceanic & Atmospheric Administration report (available to download from https://sanctuaries.noaa.gov/protect/ppw/) looks at the potential for oil leaks from 20,000 known shipwrecks in US waters. While the majority of these wrecks pose no risk, 87 were assessed at a high or medium risk of discharging significant quantities of oil in the near future (mostly on the US east coast). One of the biggest problems noted in the report is that the exact location of many of these wrecks is not known – thus neither is their current condition.

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Use of citizen science to assess the impact of forestry slash on beaches

By Murry Cave

On 13 April 2017, Cyclone Cook struck the eastern side of the North Island. While the impact on Tairāwhiti East Coast was not as significant as elsewhere, for example Edgecumbe, the region did not escape the impact. There was widespread flooding, with two sub-catchments of the Uawa bearing the brunt of the storm along with the upper Mata. At Wigan Bridge on Tauwhareparae Road, large volumes of debris in the Mangaheia sub-catchment put the bridge at risk of failure. Further north in the Mangatokerau sub-catchment, a debris flow generated a large volume of slash[1] that put a farmhouse at risk. Luckily the occupants self-evacuated.

Forestry is an important economic driver in Tairāwhiti, but that does not mean that the industry necessarily fully recognises the environmental impact of their operations. When the local paper put in reports of forestry slash in the river, inevitably there would be letters to the editor asserting that the material was all willow. With slash events becoming commonplace since forestry harvests started a decade ago, the community concern about the impacts has grown. After Cyclone Cook, the Gisborne District Council decided that an in-depth investigation into the impacts of Cyclone Cook should be undertaken. It was hoped that empirical data could be obtained so that the true extent of the problem could be obtained and the 'its all willow' argument put to bed.

One aspect of this investigation was an assessment of the coastal impacts of the slash event on Tolaga Beach (Figure 1). While council staff could have undertaken this study themselves, the opportunity to involve the local school in a citizen science project was obvious. The study duly took place on 22 August and involved 18 students and several teachers and helpers with five GDC science staff providing guidance and support.

Figure 1: Slash from Cyclone Cook on Tolaga Beach (Photo: Murry Cave).

The project design was for three 10 m^2 plots spaced equidistantly along the beach, but at some distance from the iconic Tolaga Bay Wharf because that area is regularly modified to maintain beach access for boat launch tractors (Figure 2). All woody debris over

1 Coarse and fine woody debris generated during forestry operations.

Figure 2: Aerial photograph of Tolaga beach showing plot locations.

6 cm diameter within the plot was counted according to type of material. Wood extending outside the plot had to be at least 75% inside the plot to be counted. The students were provided with identification charts so that they could differentiate between cut pine logs, long resident logs, fresh cut pine and wind throw pine as well as wind throw and non-wind throw willow and poplar. Each counted piece was then sprayed with dazzle to avoid recounting. As well as the wood counts, a team of students searched the beach for invertebrates, skinks and geckos (Figure 3) while another team did shore bird counts.

Figure 3: Tolaga Bay Area School students search for invertebrates, skinks and geckos (Photo: Murry Cave).

The project well met our expectations with the students generally able to differentiate and accurately count the different wood types present. The results were telling. When aggregated, all types of pine comprised 68% of the total while all types of willow and poplar comprised 32% (Figure 4). When looking at pine itself (Figure 5), it was found that 67% comprised long resident logs, 19% comprised cut pine logs, 12% was windthrow, and 2% were fresh cut (long resident logs with fresh cuts from locals collecting firewood).

Several conclusions could be drawn from the project. Firstly, from the council's point of view, it was our first successful foray into citizen science and one that

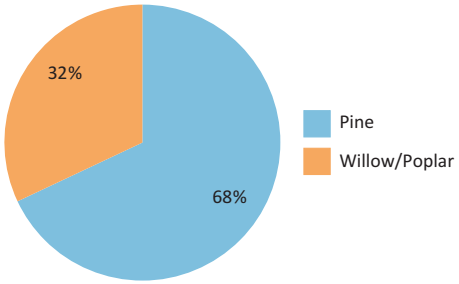

Figure 4: Pie chart showing the proportions of pine vs willows/poplar on Tolaga beach aggregated across all sites.

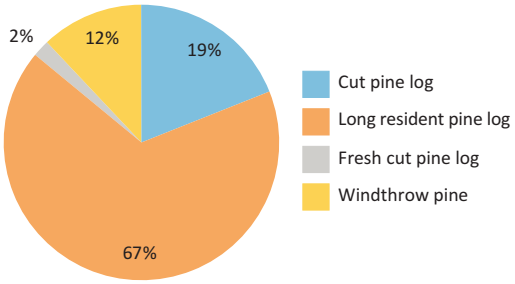

Figure 5: Pie chart showing the breakdown of types of pine material aggregated across all sites.

we'll continue. We will repeat the same study next year at the same plots to get a view of slash impacts on the beach over time, and we'll also identify other schools to take part and other projects that can be done in the future. Secondly, the study clearly established that forestry slash was a major contributor to the problem, but also that old or failed willow and poplars on riparian margins need to be addressed. An overall finding was that long resident logs, that is, logs that had been in the river system prior to Cyclone Cook, were a problem. These logs were mobilised in prior events but did not reach the sea. A parallel project at Wigan Bridge established that Cyclone Cook deposited a considerable amount of material to the flood plain – material that will be the source of the next forestry slash event.

Contributions sought for upcoming NZCS special publication

The November 2016 M7.8 Kaikoura earthquake sequence caused unprecedented changes to the natural and built environment, creating some 5000 landslides, damaging buildings in Wellington, cutting key rail and roading links, and radically altering the landscape.

In a complex sequence that lasted for about two minutes, the earthquake ruptured along a record 21 faultlines. Much of the northeastern coast of the South Island, from about 20 km south of Kaikoura, north to Cape Campbell, was uplifted during the quake by between 0.5 m and 2 m, and up to 5 m in some localised areas. Parts of the South Island have been shunted 5 m closer to the North, while on land, horizontal shifts of up to 12 m have been recorded.

The tsunami that followed the earthquake reached a peak height of about 7 m in Goose Bay. In some places, marine and freshwater flora and fauna were found 250 m inland from the high tide mark. The effects continued offshore, as huge mudslides wiped out all organisms living in the seabed in parts of the Kaikoura Canyon.

Coastal uplift at Waipapa Bay following the Kaikoura earthquake (Photo: Tom Shand, Tonkin + Taylor).

NZCS are planning a special publication to come out in early 2018 to cover the event, the impacts, and the responses since, which will be organised around three central themes:

- the earthquake event itself and the physical effects;
- the wider impacts on the ecological, social and built environment; and
- the longer-term response and rehabilitation.

Article topics that have already been confirmed include:

- Tectonic movement and coastal uplift
- Submarine landslides and seabed changes
- Tsunami impacts
- Civil defence response and implications
- Coastal communities impacts (built and social)
- Marine life impacts and ecology
- State Highway and railway rebuild
- Surf break changes
- Impacts on Wellington (port infrastructure and buildings).

We would welcome any additional content ideas, potential articles, and – especially – any photos you have (ideally, ones that haven't already been used in the media).

If you would like to contribute, please send any ideas, proposed topics (with a short abstract of about 100 words) and/or photos to Charles Hendtlass (cellwairmonk@gmail.com) or Renée Coutts (nzcoastalsociety@gmail.com).

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Engaging high school students in coastal issues using citizen science

By Emma Ryan (The University of Auckland), Julia Becker (GNS Science), and Kate Boersen (East Coast LAB (Life at the Boundary))

Background

Students at Napier Girls High School (NGHS) "were able to help gather data and solve real world problems" said Mr Lessard, teacher at NGHS, during a coastal hazards and management session in March 2017. Scientists, teachers and students collaborated to explore coastal hazard issues using citizen science. This article introduces and highlights the value of this collaborative citizen science work, which Mr Lessard describes as "the best decision to help my students succeed".

Introduction

Coastal hazards such as erosion and inundation are a serious issue for many New Zealand coastal communities and these hazards will be compounded by future sea-level rise and climate change. The successful management of coastal hazards requires the community to be aware of and understand the risks they face. It is hoped that by educating and engaging with the public to manage these hazards, communities will ultimately be more willing to be involved in decision making and be proactive in adapting. Coastal hazards have affected coastal communities in Hawke's Bay over the past few decades and coastal hazard management is a contentious local issue that has recently received more media attention. East Coast LAB (Life at the Boundary) and New Zealand scientists collaborated with a local Hawke's Bay school to engage the future generation in a project that built students' awareness and understanding of local coastal hazards and engaged students in citizen science. The project encouraged students to take part in science and learn more about coastal issues within their community. School students will likely experience such coastal hazard issues in some form in their lifetime so are important members of the local community to engage.

The project

This work was initiated by teachers at NGHS and East Coast LAB, who then formed a collaboration with scientists from the Living at the Edge programme of the Resilience to Nature's Challenges initiative (a National Science Challenge). The project involved Year 13 Geography and Earth/Astronomy students from NGHS and contributed to their NCEA assessments. A social and physical science workshop was held, followed by the collection of field data using quantitative and qualitative methods. The workshop was developed in consultation with all parties involved in the project and was delivered by researchers in March 2017 at the school in a classroom setting. Two researchers from the Living at the Edge programme gave informal presentations to the students about the use of social sciences to understand coastal issues,

Panel Q&A session at Napier Girls High School with scientists, local government and community group experts (Photo: Emma Ryan).

and coastal erosion processes and management options. The workshop included a lively question and answer panel session, attended by staff of local councils and coastal community groups, where students challenged existing coastal management paradigms. Students were then informed about citizen science and the students broke into two groups and became involved with one of two citizen science activities:

1) surveying beach profiles to collect data on beach change; or
2) conducting a face-to-face quantitative survey questionnaire to explore people's values and perspectives around coastal issues and climate change.

One researcher took the geography students through the basics of dumpy level surveying, including how to set up and use a dumpy level for collecting beach profile data and how to work through the data collected. The students could then apply this knowledge while doing their own fieldwork. Another researcher worked with students to help guide the

Students from Napier Girls High School conducting beach profile surveys at Westshore Beach (Photo: Kate Boersen).

development of their own face-to-face quantitative surveys about coastal and climate change issues. In developing their face-to face surveys, students were first asked to consider relevant survey tasks such as identifying the topic and outcome, considering the methodology, developing questions (with differing options, e.g. tick box, Likert-scale, free-response), data collection (paper, online, face-to-face), methods of analysis, and ethics. Students then broke off into small groups of three to four and developed questions for their surveys. Students were required to nominate one person to finish developing the survey, identify several people to undertake the survey, and someone to analyse the data.

The following week, field work was conducted using the knowledge gained in the classroom session. Students distributed copies of the surveys to their family members and friends to complete, and then analysed the data collected. Beach profile surveys were measured by the students at Westshore beach during low tide, with the assistance of teachers and scientists.

Concluding remarks

Through this project, high school students were able to further their understanding of coastal hazard management issues and gain insights into the social and physical science questions that are necessary to include in hazard management and adaptation planning. These activities have also helped develop an understanding of local coastal issues amongst the people they interacted with in collecting the data (e.g. family and friends who undertook the face-to-face survey). The project has contributed to enhancing scientific capability in the community, specifically on how to measure the physical and social impacts of coastal hazards and climate change. With baseline data, comparative datasets can be collected in future years to monitor change over time (as a school or community). Further, the students were able to contribute to and appreciate the value of two types of citizen science initiatives. Mr Lessard indicated that through this project, the girls were also "given the opportunity to see what studying geography may lead to as a career".

Students from Napier Girls High School conducting beach profile surveys at Westshore Beach (Photo: Kate Boersen).

If you would like to find out more about this project or how you could set up a similar collaboration with East Coast LAB, please contact Emma Ryan (e.ryan@auckland.ac.nz) or Kate Boersen (kate.boersen@eastcoastlab.org.nz).

NZCS Regional Representatives

Every region has a NZCS Regional Representative who is available to help you with any queries about NZCS activities or coastal issues in your local area. If you are interested in becoming involved as a regional representative, please get in touch with Paul Klinac (paul.klinac@aucklandcouncil.govt.nz).

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Ecosystem services based approach to coastal management in New Zealand

By Hannah Payne-Harker, Student Research Scholarship winner 2016

Context and research aims

The ecosystem services concept was developed into a widely accepted framework through the Millennium Ecosystem Assessment (2005). The MEA (2005) framework divides ecosystem services into four main categories – provisioning services, which are exploited for use; regulatory services, which regulate essential ecological functions; supporting services, which underpin other ecosystem services; and cultural services, which are non-material benefits derived from the environment.

There has also been a recent international shift towards sustainable development, which spurred the incorporation of sustainable management into the Resource Management Act 1991 in section 5 as the single purpose of the Act. The ecosystem services concept provides a possible way to balance the often 'competing and indeterminate' ecological and social interests contained in the sustainable management purpose of the Resource Management Act 1991 by considering the connections between humans and the environment (Palmer, 1995).

My Masters thesis explored the value of using an ecosystem services based approach for coastal management, the outcomes of the use of the approach, how the approach could be incorporated into the New Zealand resource management framework, and whether it can be used to enhance coastal management decision making. I sought to determine whether an ecosystem services based approach to management could enable the achievement of the sustainable management of coastal environments in New Zealand and internationally.

Investigating ecosystem services in relation to coastal environments is particularly relevant given that coastal environments can provide cumulative ecosystem service benefits, which are more significant and unique than other single service ecosystems because of their positioning as connecting points between the interface of coasts, lands and watersheds. Developing new methods of making effective coastal management decisions is also particularly pressing given continuing environmental change and human population growth, which are placing increasing demands on coastal environments.

Methods

I used a mixed-methods approach for the research because of the multi-disciplinary nature of the concept that I was investigating. The research involved a range of methods including interviews with coastal managers, document analysis of coastal management plans, and analysis of expert evidence statements and Environment Court material. Two case studies were selected to investigate the ecosystem services based approach to coastal management.

The first case study was the use of an approach that closely paralleled an ecosystem services based approach to coastal management by the East Otago Taiāpure Management Committee. The Committee manage the East Otago Taiāpure located in Karitane, Dunedin (Figure 1). The East Otago Taiāpure is a customary fisheries management tool that was put in place to address the concerns of Kaumātua (elders) of Kāti Huirapa ki Puketeraki over depleting pāua stocks within their rohe (area). The East Otago Taiāpure was formally gazetted in 1999 and the East Otago Taiāpure Management Committee was established in 2001 to oversee the carrying out of the principles and objectives. The first case study informed findings about the use of ecosystem services based approaches for coastal management.

The second case study was the approach used by the appellants in *East Otago Taiāpure Management Committee v Otago Regional Council* [2013]. The case was an appeal of the decision of the Otago Regional Council to grant Port Otago Ltd. Coastal Permit 2010.198, which permits the dumping of up to 7.2 million cubic metres of dredged material sourced from the Otago Harbour (Figure 2) for deepening and widening the Lower Harbour channel and the Port Chalmers swinging and berthing area. The key concern of the appellants was to avoid:

> [4] any discernible adverse effect on the inshore coastal area, in particular the kelp forest ecosystem (East Otago Taiāpure Management Committee, 2013, p.2).

The second case study informed findings about the use of ecosystem services based approaches for coastal planning decisions.

Figure 1: Map showing spatial boundaries of the East Otago Taiāpure (East Otago Taiāpure Management Committee, 2008).

Figure 2: Otago Harbour – approximate area where Port Otago Next Generation channel deepening project was proposed to take place (Google maps: Imagery ©2017 CNES/Airbus, DigitalGlobe, Landsat/Copernicus, Map data ©2017 Google).

Key findings

The key findings of the case studies in relation to each research objective and the aim of the research are summarised below.

Value of using an ecosystem services based approach for coastal management

The overall value of using an ecosystem services based approach was shown to be the ability to recognise and provide for connections between humans and the environment in coastal management.

For case study 1, this was demonstrated through the recognition of the educational ecosystem service of the coast, which allowed a positive feedback loop to develop between environmental awareness and coastal management actions at the East Otago Taiāpure and stimulated an on-going holistic management approach. For case study 2, this was demonstrated through the connections made between the habitat providing ecosystem service of *M. pyrifera* (bladder kelp) and the food providing ecosystem service of commercial marine species. Attention was drawn to these connections in the expert witness statements of appellants to demonstrate the importance of preserving underlying ecosystem functions that may have otherwise been unrecognised in the Environment Court.

Outcomes of using an ecosystem services based approach for coastal management

The overall outcome of using an ecosystem services based approach was shown to be an ability to manage on wide spatial and temporal scales. For case study 1, this was demonstrated through the implementation of management that recognised future generations through provision for the educational ecosystem service. For case study 2, this was demonstrated through the identification of cumulative impacts of inputs into coastal environments and the portrayal to decision makers of the need to recognise the combined impact of these on ecosystem function.

Incorporating ecosystem services based approaches into the New Zealand coastal management framework

Ecosystem services based approaches could be incorporated into the NZCPS (2010) to further emphasise the complex and dynamic nature of coastal environments that is identified in the document. Ecosystem services based approaches could be built into the RMA 1991 to further allow ecological concepts into the Act and to allowing a balancing between the ecological and management functions of the purpose of sustainable management contained in s5. Ecosystem services could be incorporated into coastal management plans through provisions that recognise the interactions between human actions and environmental impacts and into planning processes as a risk assessment and predictive tool.

Ecosystem services based approaches to coastal decision making

There is some evidence to suggest that the ecosystem services based approach can be used to enhance marine protection in coastal management decisions. For example, this was demonstrated by the addition of condition 4(a) to Coastal Permit 2010.198 in *East Otago Taiāpure Management Committee* (2013) that there was to be no discernible effect on the shoreline coastal environment, including the kelp forests, in order to "focus much of the rest of the consent in terms of the purposes of monitoring, consultative committees, and other outcomes" (Smith J.).

However, analysis of subsequent resource consent applications between the parties illustrated that the ecosystem services based approach may not have achieved wider sustainable management of the coastal environment, through failing to encourage the recognition of the kelp forest beyond the case.

The key limitation to achieving this may be the contrasting time frames between the short-term time frame for processing resource consents under the RMA 1991, and the long-term time frame required to gather adequate information to have a full understanding of a given coastal ecosystem and the services that it provides. Suggested mechanisms to overcome this include improving relationships between coastal management stakeholders, or providing for flexibility in planning processes to accommodate coastal ecology needs.

Acknowledgements

I was very grateful to be awarded the New Zealand Coastal Society Masters Scholarship, which has provided me with the motivation to carry out my study and the opportunity to share my findings with fellow coastal managers. I would like to thank the NZCS for this generous contribution.

I would also like to acknowledge my primary supervisor, Dr Wayne Stephenson from the Geography Department, University of Otago, and my secondary supervisor, Dr Chris Hepburn, from the Marine Sciences Department, University of Otago, and the Master of Planning staff and students who have provided constant support and encouragement along the way.

For more information on this research and the sources quoted, please contact Hannah c/o NZCS: nzcoastalsociety@gmail.com.

Coastal News

Te Hunga Takutai o Aotearoa
NEW ZEALAND COASTAL SOCIETY

Chair's message

by Hugh Leersnyder

A quarter of a century! Can you believe it? This year is the New Zealand Coastal Society's Silver Jubilee. It has been 25 years since that small group of founders with a common interest and passion for the coast decided to create a forum for like-minded people to get together to share their wisdom, experience and enthusiasm for the briny and its myriad of dimensions and interactions. The ink was still drying on the first iteration of the RMA; 'integrated management' was a buzz term of the era. The foresight of this founding group identified the need to bring together the disciplines of the natural and physical sciences, engineering, planning and community engagement to a single-outcome focus of the sustainable management of New Zealand's coastal and marine environment.

The articles and snippets in this edition of *Coastal News* reinforce the diversity of topics and work happening around the country. Lucy Brake provides a thought-provoking commentary on the potential effects from wrecks of bygone disasters coming back to haunt us with dire ecological and social consequences. The notion of rusting hulks belching trapped oil into the water column sounds like a situation best avoided! It seems to me investing in reducing the likelihood of significant environmental damage from these wrecks is worthy of thorough analysis and a sound risk-based decision... just don't leave it too long...

I am also delighted to read the articles of Murry Cave and Emma Ryan, et al. Apart from the interesting science discussed in these articles, the happy collision of science, education and communities is destined to produce better outcomes for the coast and is totally aligned to the NZCS mission and vision.

It is also fantastic to see the tangible outputs from the Coastal Society's support of research with Hannah Payne-Harker's dissertation on an 'Ecosystem services based approach to coastal management in New Zealand', linking science, policy and practice. Our 2017 award winners are also showcased, reflecting the diversity of research being undertaken, all with an opportunity for achieving relevant and practical outcomes.

The snippets of information from around the country in our News from the Regions section give a snap shot of what's hot. Our Regional Coordinators play a critical role in engaging with the Society's membership – but it's a two-way street. The broader membership needs to keep an eye out for topics of interest for articles or regional events and channel these through to the Regional Coordinators. In a plug for regional events, members, if you see an opportunity to assist your Regional Coordinators with an idea for an event, please let them know.

As we rush towards our annual conference in Tauranga, 15 to 17 November, the Society is in a very strong position. We have a committee dedicated and focused on meeting the Society's objectives. I hope we see as many of you as possible at the conference. It is shaping up to be an outstanding event.

A list of NZCS Regional Representatives, together with their contact details, is given on page 7. You can also contact any of the Management Committee members (details below) if you have a specific query. If you have a general query about the Society, contact the Administrator/Communications Coordinators, or Charles Hendtlass if you have a query about the Coastal News newsletter, including content suggestions or contributions (contact details below).

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NZCS 2017 award winners

Sam Thomas
Student Research PhD Scholarship

Does size matter in ecosystem functioning?

Sam's project aims to investigate the effects of increased nutrients and sedimentation on estuarine ecosystem functioning. It will focus on one of the dominant bivalves in New Zealand estuaries, *Austrovenus stutchburyi* (New Zealand cockle).The effect of these multiple stressors and how they impact ecosystem functioning will be looked at from an intraspecies perspective focusing on the functional trait of size.

The research will investigate how size affects ecosystem functioning and how this functioning changes under increased nutrient and sediment inputs. The study will then research how the bacterial community, which plays a vital role in ecosystem processes, is influenced by the presence of bivalves and how size and increased stressor levels change this interaction. The research will provide 'thresholds' for when ecosystem functioning starts to decrease under increasing nutrient and sediment stress.

Results from this study will provide information for local councils to set nutrient and sediment limits that prevent declines in ecosystem functioning. It will provide knowledge about how the potential loss of different size classes of key species can affect estuary functioning, which can be used by estuarine scientists and managers around the world. Understanding how different size classes are affected by multiple stressors will help influence management of resource harvesting.

Sam's supervisors are Candida Savage (Otago University) and Conrad Pilditch (Waikato University).

Craig MacDonell
Student Research MSc Scholarship

Characterisation of the state, evolution and interactions of small-scale vegetation and geomorphology distribution within the coastal restoration programme at the Okia Reserve using 4-Dimensional mapping with Remotely Piloted Aircraft System (RPAS).

Craig's research takes place at the Okia Reserve on the Otago Peninsula near Dunedin, an important breeding ground for Yellow-eyed penguins and marine mammals. Craig seeks to characterise and understand the current state of vegetation and geomorphology approximately 25 years after the area was reserved. It involves quantifying relationships and interactions between land-surface characteristics. Then, by leveraging the capacity to map the reserve in 3D repeatedly and at very high resolution with a RPAS, the changes in vegetation and geomorphology due to both natural and anthropogenic causes can be resolved, and their possible interplay analysed. The findings from this research will provide new knowledge and better understanding that will inform about the vulnerability of the site to specific hazards or threats such as inundation and erosion.

This will help reserve managers, namely the Yellow-eyed Penguin Trust and Dunedin City Council, better understand the site and plan for the future of this reserve. It will also contribute more generally to the understanding of the evolution of coastal reserves and the risks to these areas presently and into the future.

Craig's supervisors are Dr Pascal Sirguey (Surveying) and Assoc. Professor Mike Hilton (Geography), both at the University of Otago.

Berengere Dejeans
Conference Travel Award

Berengere received a Conference Travel Award for a presentation to the 2017 Coasts and Ports Conference in Cairns, Australia. A summary of her presentation is given below.

Assessment of the performance of a turbulence closure model along the tidally-influenced Kaipara River to the Estuary.

The ability to predict the transport of fine-sediment is crucial for many coastal management applications. Simulations of sediment transport at large spatial scales and over long timescales have been conducted using coupled hydrodynamic (HD) and sediment transport models (ST), but the incomplete understanding of some of the processes involved have limited the predictive capability of such models.

Turbulence plays a key role in the transport of fine-sediments, and therefore needs to be accurately resolved in any coupled (HD/ST) model. There are a number of commonly used turbulence models (referred to as closure schemes), each based on a different combination of assumptions.

The goal of this research is to examine the predictive capability of commonly used closure schemes. As a first step, the performance of the most widely used closure scheme was investigated. To do this a Delft3D HD model of the Kaipara River was established. By comparing model results and measurements collected in the field, the performance of the closure scheme can be ascertained. In general, the model reproduced the right order of magnitude of turbulence. However, turbulence characteristics are relatively poorly reproduced in some sections of the river, particularly in the vicinity of the bends. Future work will aim to use the model to improve our conceptual understanding of these fundamental processes, in particular the effects of turbulence on flocculation.

News from the regions

Coastal News

Te Hunga Takutai o Aotearoa NEW ZEALAND COASTAL SOCIETY

Northland

Laura Shaft and Michael Day, Regional Representatives

Regional Plan for Northland

Northland Regional Council formally notified the Proposed Regional Plan for Northland (Proposed Plan) on 6 September 2017. This single plan will eventually replace the three existing regional plans, including the Regional Coastal Plan. From a coastal management perspective, the Proposed Plan has a lot more mapping of zones/overlays within the coastal marine area than the existing Regional Coastal Plan. New GIS based mapping includes regionally significant surf breaks, marine pathways place limits, regionally significant anchorages, significant marine ecological areas, and historic heritage sites.

The Proposed Plan is available to view on the regional council's website: https://www.nrc.govt.nz/Your-Council/Council-Projects/New-Regional-Plan/

Updated tsunami evacuation maps

Northland now has an updated set of tsunami evacuation maps, covering the region's 3200 km of coastline. The maps are more user friendly than earlier versions and allow users to enter their address to go directly to the relevant location on the maps. They were created by GNS Science (who did the previous evacuation zones in 2011) and the updated zones make use of significant advances in the science of modelling tsunami, along with high-quality land surface data for Northland available through LiDAR. The evacuation maps are available to view here: www.nrc.govt.nz/evacuatenow

Notable consent applications

Refining NZ – Refining NZ have lodged a resource consent application with Northland Regional Council to deepen and re-align the Whangarei Harbour entrance and approaches (in order to enable larger tankers to be brought to the refinery at Marsden Point). Key aspects of the proposal are capital dredging of up to 3.7 million cubic metres of seabed, associated maintenance dredging, and the deposition of dredged material onto the seabed within two offshore disposal areas in Bream Bay.

Opua decision – An independent commissioner appointed by the Far North District Council and the Northland Regional Council has signed-off on an application to build a railway station near Opua, but declined an application for a coastal reclamation adjacent to the same site. Dr Rob Lieffering was appointed by the two councils to conduct a resource consent hearing into a joint application lodged by the Bay of Islands Vintage Railway Trust (BOIVRT) and BT Warren. The application was to build a station for the vintage railway, and an adjacent coastal reclamation that would be used to unload oysters from some of the Waikare Inlet farms as well as for marine services.

The commissioner found that overall, the potential adverse environmental effects of the BOIVRT plan would be moderate but, importantly, that the adverse effects on the at-risk bird species would be minor and that the proposed enhancement of the wetlands, together with predator controls, should result in a net ecological benefit. He found that the adverse effects of the coastal reclamation were moderate to significant in terms of natural character and visual effects, and significant in terms of recreation and cultural effects.

CoastCare Northland

CoastCare Northland dune planting is almost complete for the year with 12,600 dune plants planted at 18 sites around Northland. This includes several sites where mechanical reshaping has been undertaken to remove exotic vegetation and fill prior to planting with native sand-binding plants to enable the dunes to function more naturally.

Russell Landcare Trust planting spinifex and pingao at Long Beach (Photo: Northland Regional Council).

Planting at Waipū Cove with Waipu School (Photo: Northland Regional Council).

Members of Bream Bay Coastal Care Trust with a few of the many spinifex they have planted along Ruakākā beaches to fill in dune blow-outs, often caused by vehicles (Photo: Northland Regional Council).

Auckland

Sam Morgan, Natasha Carpenter and Lara Clarke, Regional Representatives

Auckland Unitary Plan (AUP) update

The coastal hazards provisions and the regional coastal plan components of the Auckland Unitary Plan (Operative in part) are not yet operative as they have been subject to appeals since the plan became 'operative in part' on 15 November 2016.

Three High Court appeals were filed in relation to the regional coastal plan components of the AUP. These were largely resolved by High Court decisions released in May and July 2017. As a result, the regional coastal plan was sent to the Minister of Conservation for approval on 14 July 2017. The majority of the coastal plan rules are located within 'Chapter F Coastal' of the AUP. To achieve an integrated approach to managing land and the coastal marine area, there are many other regional coastal plan provisions in the chapters for 'precincts', 'Auckland wide' and 'overlays'.

The coastal hazard provisions contained within the natural hazards chapter (chapter E36) of the AUP were subject to an appeal (point of law) by Man O'War Farm Limited (CIV-2016- 404-2331), which challenged the vires of the rules on the basis that the definition of 'land which may be subject to coastal hazards' as recommended by the Independent Hearings Panel was unclear and could not be easily identified by plan users. The definition used to define the area in which the provisions apply is not mapped in the plan.

Through discussion Auckland Council and Man O'War Farm agreed amendments to the definition in the AUP to provide greater clarity. The High Court granted the appeal (CIV-2016-404-2331 [2017]NZHC 1349) and made the agreed amendments to the plan text, substituting the amended version as council's decision version. Notice of this decision was served to the submitters to the coastal hazards section of the AUP, enabling these parties to appeal council's decision to the Environment Court. No appeals were received so the amended version of this component of the plan will soon be made operative.

East West Link

The EPA Board of Inquiry hearing for the NZTA East West Link project concluded on 15 September. The Link is one of the top central government priority transport projects for Auckland and aims to improve travel times between the Onehunga to Penrose industrial area and State Highways 1 and 20.

The Link is an integrated project aiming to achieve a variety of outcomes beyond transport including stormwater treatment, provision of recreational walking and cycling routes, and landscape outcomes. As a result, a complex project has been presented to the Board with a broad range of issues discussed including (but not limited to): noise effects; impacts of the project on historic heritage and Waikaraka Cemetery; stormwater and contaminated land outcomes; impacts on terrestrial and benthic ecology and avifauna; and, mitigation for loss of existing esplanade reserve.

Concept visual of foreshore with new wetlands and boardwalks with the adjacent new road (source: https://www.nzta.govt.nz/projects/east-west-link/maps-and-visuals/#landscape).

From a coastal perspective, the project includes for approximately 25 hectares of reclamation of the Mangere Inlet. This would be one of the largest reclamation projects undertaken in the Auckland region but is noted to be multi-functional, including additional land area for the road embankment, creation of landscape features and wetlands and provision of recreational features including boardwalks and bridges. The reclamation impinges on a number of Coastal Protection Areas and Significant Ecological Areas (both marine and terrestrial including Anns Creek). Another key coastal component of the project is the proposed subtidal dredging of a 15 ha area of the Mangere Inlet to provide material for the production of 'Mudcrete'. The material would be used for the construction of the outer bunds of the reclamation.

Key potential coastal issues that have been discussed through the Board of Inquiry process have included: the scale and shape of the proposed reclamation; the effects of the reclamation on hydrodynamics, sedimentation and ecology; the functional need for stormwater treatment ponds and landscape features; mana whenua values in relation to water treatment and reclamation; nature of seabed materials and potential effects of subtidal dredging versus alternative methods; and the coastal planning assessment for reclamation.

It now falls to the Board to consider all matters raised through the deliberation phase of this process. A draft decision open to submissions is due before the end of the year.

Bay of Plenty

Jonathan Clarke and Kieran Miller, Regional Representatives

Tauranga's Southern Pipeline Harbour Crossing

The Southern Pipeline is a large wastewater pipeline that is needed to future-proof Tauranga city and protect the environment. It will give the city's wastewater network some much-needed capacity that will reduce the risk of sewer overflows into the harbour. The steady growth of our city is putting increasing pressure on the wastewater treatment plant at Chapel Street. This is a risk for both the city and environment, as it increases the potential for

sewer overflows into the harbour. The Southern Pipeline will redirect some of the city's wastewater to the treatment plant at Te Maunga, which has extra capacity. The new pipeline will relieve the enormous burden that is on the Chapel Street treatment plant, allowing the plant to improve its performance. Construction began in 2009 and the pipeline is already operational from Maleme Street to Memorial Park. The section between Matapihi and Te Maunga is nearly finished, and the pipeline will be fully operational by December 2017.

Hills to the Ocean

BOP Regional Council have partnered with the Uretara Estuary Managers group, along with Ministry for the Environment and Western Bay of Plenty District Council, to deliver the Kaimai 'Hills to the Ocean' project that was launched under the MfE Freshwater Improvement Fund announcements recently. BOP Regional Council is contributing $200,000 toward the five year $500,000 project, which will support the Uretara Estaury Managers community group and local landowners to clean up waterways in five catchments that stretch from the Kaimai Range to the Tauranga Harbour. Key waterways that will benefit are the Tahawai, McKinney, Uretara, Te Rereatukahia and Te Mania Streams and their tributaries that all drain into Tauranga Harbour.

Kaituna River re-diversion update

Together with Papahikahawai landowners, BOP Regional Council removed two causeways from Papahikahawai Creek in June this year, allowing natural tidal flows into 13 hectares of Te Awa o Ngatoroirangi/ Maketū Estuary for the first time in 54 years, making it healthier for fish life. Papahikahawai Lagoon in the upper Maketū Estuary is looking healthier already with the area now recovering quickly with large amounts of algae already flushed away.

Waikato

Christin Atchinson and Jacqui Bell, Regional Representatives

Beachcare – WRC

Waikato Regional Council's Beachcare Programme is winding down for the summer after another successful planting season. A new record has been set – 67,225 plants have been planted this year and there's still two more planting bees to go. We owe a huge thanks to all the Beachcare community groups, iwi groups and volunteers who flocked to the planting bees carrying spades, smiles and buckets of enthusiasm. We also owe thanks to our programme partners, including several plant nurseries, schools, District Councils and the Department of Conservation.

Even though the planting is finished for the year, there's still plenty of work to do. We are now planning the 2018 planting season. We are also trialling a few new techniques over the next few months. We've had high sapling mortalities from rabbits and frost, so are trialling plant guards for vulnerable coastal shrubs. We are developing a community-based dune monitoring method, so community groups can measure changes in dune vegetation as a result of their planting and pest control efforts. We are helping Beachcare communities to develop restoration plans that can be used to declare their aims, set milestones and track progress. This will be a big step for Beachcare, as up until now it's operated on a yearly, on-demand basis. Restoration plans will allow future planning and will tie in nicely with our monitoring ambitions. See you at a planting bee next year!

Beachcare – TCDC

The Thames-Coromandel District Council has been supporting beach care groups and schools with planting across the district this September. The Pauanui beachfront, like much of our coastline, has been heavily modified from its natural state. Dune planting helps lessen the effects of erosion to protect Council's beachfront reserves and the houses and other developments that have been built behind. Planting the native species lessens storm damage to the dunes plus, unlike non-native plant species, they will regrow over the scarred side of the dunes, helping restore and retain them over the long term.

Dune restoration planting is also taking place in Whitianga at the Taputapuatea Reserve this month. Volunteers will plant thousands of native sand-binding plants and grass species along the dune systems at Buffalo Beach, adjacent to the Mercury Bay Boating Club. Thank-you to Waikato Regional Council for their generous donation of the plants. For more information on Coromandel coastal erosion and beach protection, visit www.tcdc.govt.nz/coastalmanagement.

Lou Mackwell (far left), one of TCDC's Community Field Representatives, who completed sand dune planting with the Pauanui Beach Care Group (Photo: TCDC).

Waikato University research

The Coastal Marine Group at the University of Waikato is a recognised leader in coastal research, focused on coastal sedimentation, geomorphology and morphodynamics, oceanographic processes, and coastal ecological impact monitoring. Here are some recent updates on their activities.

The first results from our Marsden experiments on mangrove dynamics and stability have been presented at international conferences by Julia Mullarney and Erik Horstman. Combined flume and field experiments, together with Karin Bryan, have shown how the density of mangrove roots modulates turbulence, reducing bed-shear stresses in high-density root canopies while enhancing the transport capacity above these denser canopies. It was also observed that flows in small

runnels incising the mangrove floor can be highly turbulent, forming a potential conduit for sediment transport at lower water levels in the mangroves. Our ongoing research focuses on how these hydrodynamics interact with the morphological development of the mangroves.

PhD student Victor Godoi has recently been working on storm wave clustering and its importance to coastal protection. Storm wave clustering has a substantial impact on coastal erosion because the beach has insufficient time to recover between storms. Moreover, clusters threaten, in addition, any coastal and offshore structures, such as sea-side roads and oil platforms. Victor investigated how storm wave clustering in New Zealand waters is influenced by near and remote atmospheric forcings. In order to do so, clustering was analysed and linked to fluctuations in wind conditions associated with well-known climate patterns, for instance the El Niño-Southern Oscillation and the Southern Annular Mode. This research has been conducted using the results of the 45-year (1957-2002) wave hindcast conducted by Richard Gorman (NIWA).

Mariana Cussioli (PhD student) has recently returned from Bremen, Germany, where she attended the 8th annual INTERCOAST Workshop. The international research training group INTERCOAST is a collaboration between the Universities of Bremen (Germany) and Waikato (New Zealand). She presented the results of a laboratory experiment carried out to test the response of suspension-feeding bivalves to the increases in suspended sediment concentrations. The study focuses on modelling those responses to estimate thresholds indicative of negative effects that could therefore reduce bivalve condition and biomass.

A Master's thesis ('Biosecurity: Managing the Mediterranean fanworm' (*Sabella spallanzanii*)) by Staci King (University of Waikato) examined the survivorship of *Sabella spallanzanii* after being exposed to typical mussel farming operations to determine the potential of secondary spread after harvesting, and explored a treatment option that would effectively kill *S. spallanzanii* while having minimal effect on the product.

Experimental procedures showed that *Sabella spallanzanii* is highly resilient to the typical re-seeding and harvest operations that occur in mussel aquaculture. Specimens survived upwards of 24 hours air exposure in desiccation treatments: a longer time frame than what would occur during re-seeding or the harvest process and subsequent landing of stock and transport to processing facilities. Long-term survival and regeneration of body parts within 28 days was evident following fragmentation: a simulation of the potential disturbance caused by the harvest process. Therefore, these processes are not effective in containing *S. spallanzanii* and may actually aid its re-infestation and help to expand its geographic range.

An additional experimental procedure found that *S. spallanzanii* can be quickly treated with acetic acid. Immersion in a 5% solution of acetic acid for one minute killed 75% of *S. spallanzanii* with no effect on mussel survivorship. This is a promising control method that could contain *S. spallanzanii* and have minimal impact on harvest production time. However, as a biocidal chemical there needs to be strict controls in place on its use in order to minimise any adverse environmental impact.

The results of these experiments will enable biosecurity and marine farm managers to make informed decisions about the treatment, management and containment of *Sabella spallanzanii* and prevent its secondary spread to new geographic areas. Key factors to a successful response to an incursion include early detection, good communication and collaboration between stakeholders, strong partnerships and rapid action.

Contributing to *Coastal News*

We welcome contributions for forthcoming issues of *Coastal News*. Please contact the Editor, Charles Hendtlass, at cellwairmonk@gmail.com if you'd like to submit an article, contribute some news items, have content suggestions, or would like a contributor's guide.

The submission deadline for the next issue is 31 January 2018.

Back issues and special publications

Back issues of *Coastal News* (from 1996 onwards) are available to download from the Society's website at www.coastalsociety.org.nz. From here you can also download pdf copies of the two NZCS special publications (the 2014 *Rena: Lessons learned* and the 2016 *Adapting to the consequences of climate change: Engaging with communities*), or obtain printed copies by emailing your request to nzcoastalsociety@gmail.com.

NZCS Mission Statement

The New Zealand Coastal Society was inaugurated in 1992 'to promote and advance sustainable management of the coastal environment'. The society provides a forum for those with a genuine interest in the coastal zone to communicate amongst themselves and with the public.

The society currently has over 400 members, including representatives from a wide range of coastal science, engineering and planning disciplines, employed in the engineering industry; local, regional and central government; research centres; and universities.

Membership applications should be sent to NZCS Administrator Renée Coutts (nzcoastalsociety@gmail.com).

Te Hunga Takutai o Aotearoa
NEW ZEALAND
COASTAL
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Background image – coastal uplift at Kaikoura, a result of the 2016 earthquake. NZCS is currently preparing a special publication about this event, its impacts, and the responses since, expected to be available in March 2018. For more information on this publication, including how you can contribute, see page 5. (Photo: Dave Allen, NIWA).