Te Hunga Takutai o Aotearoa
NEW ZEALAND COASTAL SOCIETY

Coastal News

Newsletter of the New Zealand Coastal Society: a Technical Group of Engineering New Zealand

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Small, scarce ...secure?

Two of the West Coast's endemic lizards are facing uncertain times. Read about the issues and plans to protect them in the article beginning on page 3.

Photo: R Gibson, Auckland Zoo

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Word from the Chair

Kia ora koutou

As another year draws to a close, I am reflecting on what has been a challenging year for the New Zealand Coastal Society, as we have all come to terms with the impacts and implications of Covid-19 and the sad passing of Eric Verstappen, a well-respected member of the NZCS and its Management Committee. However, many of the challenges presented have also provided opportunities for our society that will endure for years to come. An example of this was responding to the need to defer our annual conference, replaced with a webinar supported by Engineering New Zealand to launch our fourth special publication titled *Coastal Systems and Sea Level Rise* on the 26th November.

This event will be supported by the inaugural Eric Verstappen Young Professionals lunch in Auckland, Raglan and Christchurch, which aims to provide students and early-career professionals with an opportunity to network with invited mentors. This event is intended to be held every year at our annual conference as a fitting way to honour Eric's memory whilst we support the development of our next generation of coastal practitioners.

A particular highlight of this year has also included the executive committee voting unanimously to support the nomination for Rob Bell to be inducted as a life member of the NZCS in October. Rob is an extremely well deserving recipient of this position, which will be celebrated in an article published in the next *Coastal News*. A formal

presentation to Rob will also be made at the Coasts and Ports Conference held at Te Pae, Christchurch, in September, 2021.

The NZCS AGM, which is normally held at the annual conference, will also be run on-line this year as an interactive webinar on 2nd December between 12 and 12:30 pm. Details for joining this meeting will be published in the NZCS weekly digest closer to the time. It would be great to see as many of you as possible online as we close out business for 2020 and look forward to a prosperous 2021.

Finally, I would like to take this opportunity to thank the executive committee of the NZCS, our administrative and editorial support, and Engineering New Zealand for all of their hard work and support this year, and to wish all of our members a safe and enjoyable Christmas break with friends and family.

Nga mihi nui.

About the NZCS

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's mission is to take a leading role in facilitating robust discussion and nationally-coordinated interactions to better manage and learn about our coastal and marine environment.

The society currently has over 300 members based in New Zealand and overseas, including representatives from a wide range of coastal science, engineering and planning disciplines, employed in the consulting industry; local, regional and central government; research centres; and universities.

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

The impacts of coastal erosion and storms on the West Coast's critically endangered lizards

Lynn Adams, Department of Conservation Technical Advisor

The combined effects of habitat loss, predation and coastal erosion are seriously hampering conservation efforts for two of the West Coast's endemic lizards. This article describes the issues and the plans to protect these two unique species.

Kapitia skink

Population: (2018) <200 individuals

National status: Endemic

Conservation status: Nationally Critical

Kapitia skink (Photo: DOC).

The Kapitia skink (previously Chesterfield skink; *Oligosoma salmo*) was first discovered in 1993 in a small coastal area north of Hokitika. It was already in a critical state. Management was delayed by uncertainty over the species' taxonomic status, but by 2008 new genetic research resolved that it is a separate and distinctive new species.

Habitat loss is a significant threat. Aerial photos show a progressive loss of coastal native habitat post-war and while the skink currently survives in rough pasture, continued farm pasture improvements have further depleted their adopted habitat. They are now restricted to a narrow 5-10 m strip of coastal habitat between farm paddocks and sand dunes.

Compounding the loss of habitat, the Kapitia skink is also extremely vulnerable to the full suite of mammalian predators. We expect mice to be a significant predator, but rats, mustelids and cats will also be impacting on this species.

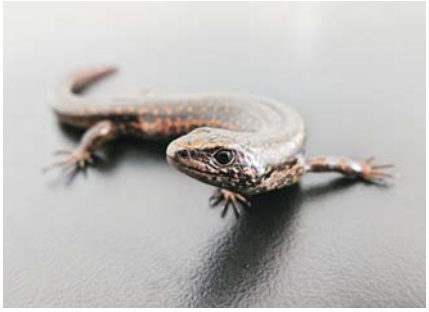
As if that wasn't enough, their tiny habitat is squeezed right up against the edge of the active dunes and is therefore also affected by storms, sea level rise and king tides.

Research to understand this species began in 2015. Prior to this, only 15 animals had ever been seen, with only a single skink seen in the previous decade. The Department of Conservation (DOC) is carrying out research to identify the causes of decline, understand the ecological needs of the species, and develop recovery methods. The research confirmed our initial fears, that this species is confined to a <1 ha narrow coastal strip squeezed between developed farmland and the beach and the estimated population numbered less than 200 individuals.

Did you know?
Kapitia skinks have strong prehensile tails to grip objects and help them climb. It's possible they once lived in trees.

In January 2018 ex-Cyclone Fehi coincided with king tides. There was widespread damaging flooding across the West Coast and the storm removed a third of the area buffering the Kapitia skink habitat, and over-washed the entire habitat. One month later ex-cyclone Gita threatened to do additional damage, although this was not realised because the storm tracked further north.

The outlook for the Kapitia skink was dire so DOC rescued 50 skinks to establish a captive population at Auckland Zoo. These skinks have subsequently adapted to zoo conditions and are breeding, creating an effective insurance population should things continue to deteriorate on the West Coast.



Kapitia skink – this is #120, she survived the damaging Cyclone Fehi storms and evaded collection for the Auckland Zoo insurance population, and gave birth to her first live young in summer 2018 (Photo: DOC).

This tiny narrow strip of rank pasture grass provides some of the best remaining habitat after the storms of Cyclone Fehi (Photo: DOC).

Two years on, the research has refocused on understanding the impacts of the storm and developing methods to protect the remaining population. Coastal erosion is still impacting this species. The northward drift of a nearby river mouth is removing more habitat and further threatening their habitat. Another storm, especially during a king tide, is likely to continue to erode this section of beach. The only viable method to protect this species is to relocate them to a new area altogether. To this end, a new reserve has been purchased and over the coming year a predator-proof fence will be built to secure this species. Until then, the population remains tiny and tenuous.

Cobble skink

Population: (2020) 56 individuals

National status: Endemic

Conservation status: Nationally Critical (extinct in the wild)

Cobble skink (Photo: R Gibson, Auckland Zoo).

Cobble skink (*Oligosoma* aff. *infrapunctatum* 'cobble') was first discovered in 2007, and is only known from a tiny cobble beach north of Westport. The species looks very similar to the closely related speckled skink, but, despite appearances, cobble skinks are very different from other species. They prefer the deep cobble habitat found immediately above the high tide mark. It's an area rich in food and heavily influenced by the marine environment. Cobble skinks have a reduced body size to help them wriggle through the spaces between cobbles, and they have large eyes.

When first discovered, cobble skinks were already restricted to a tiny area, but were apparently abundant there. It's likely the deep cobble structure of their habitat protected them from introduced predators, which were impacting on skink populations outside of this specialist habitat.

Eight years after discovery, the skink population had declined significantly due to loss of habitat from coastal erosion and coastal protection works to protect human infrastructure. Cobble skinks were assessed in late 2015 as Nationally Critical, because they occupied less than 1 ha of habitat and had undergone a severe decline.

Did you know?
This small skink is very agile and can quickly disappear into the small spaces between cobbles.

Very little is known about this species. It's expected that mice are a significant predator, but rats, mustelids and cats will also be preying upon skinks. Climate change, storm events and rising sea levels are likely to have significant impacts as this species lives on the fringe of the land. The cyclic loss of cobble habitat, likely natural, has also limited this species' ability to move and recolonise their preferred cobble habitat, and more frequent and intense storm events continue to erode the habitat that remains. Coastal development and coastal erosion protection work destroy habitat, as do vehicles and fire.

Imminent storms and ongoing erosion of their tiny habitat led DOC to carry out an emergency salvage operation in the winter of 2016. As many as possible of the remaining skinks were collected and flown to Auckland Zoo.

Thirty-six skinks were rescued only days ahead of a storm that removed the last of their remaining habitat. As far as we know, the entire remaining population of this species is now living at Auckland Zoo and the species is extinct in the wild. The species

Cobble skink in their preferred cobble habitat. (Photo: R Gibson, Auckland Zoo).

is proving more challenging to manage in captivity than its southern cousin the Kapitia skink, showing significant intraspecific aggression, but the population at the zoo is steadily increasing.

DOC and Auckland Zoo are working together to return these precious West Coast endemics to their natural home. We aim to find a suitable coastal habitat safe from predators and coastal erosion, but which contains an abundance of their preferred cobble habitat.

The future for this species is still very uncertain. But once numbers grow sufficiently within the captive facility, skinks will be released to wild cobble habitat to establish new populations along the beaches of the West Coast.

The lost kelp forest: A multi-disciplinary approach to understand change of *Macrocystis pyrifera* habitat in Otago, New Zealand

Madeline Glover, Chris Hepburn, Matthew Desmond, Emily Tidey and Anne-Marie Jackson[1]

Introduction

Macrocystis pyrifera (Bladder/Giant kelp; Rimurimu) typically grows on hard rocky reef substrates (Young et al., 2015). The large canopies created by *M. pyrifera* form kelp forests and they are considered to be ecosystem engineers (Miller et al., 2018). The canopies have the ability to reduce wave energy within the forest, which is important for larval settlement and habitat refugia (Miller et al., 2018).

The forests provide important nutrients to the surrounding waters as they break down as well as a direct food resource to grazers (Miller et al., 2018). Kelp forests also have the ability to reduce coastal erosion by reducing wave energy (Hurd et al., 1997), and they provide a buffer against ocean acidification through carbon dioxide uptake (Hepburn et al., 2011).

Globally, kelp forests provide many services to humans such as supporting fisheries, direct harvest, tourism, science, and potentially carbon uptake, and these services are estimated to be worth NZ$3.6 million per km per year (Filbee-Dexter and Wernberg, 2018).

In New Zealand, *M. pyrifera* is found ranging from Marlborough and Wellington in the north to the Sub-Antarctic Islands in the south (Desmond, 2016). Kelp forests support ecologically, culturally, and commercially important species such as *Haliotis iris* (pāua), *Jasus edwardsii* (southern rock lobster), *Parapercis colias* (blue cod), *Evechinus chloroticus* (kina), and *Odax pullus* (greenbone) (Desmond, 2016). In Otago, there has been an anecdotal decline in the density and distribution of these ecologically important kelp beds post-industrialisation.

Kelp forest decline

Nineteen semi-structured interviews were undertaken to determine changes in the distribution and density of *M. pyrifera* and to identify potential drivers of decline within the living memory of local experts. The pool of experts was made up of commercial and recreational fishermen, kaumātua, scientists, a skipper, a dive instructor, and a university technician. From the interviews, it is evident there has been a clear loss of kelp forests and a decline in density along the southern coastline from approximately the 1970s-1980s (see Figure 1). There has also likely been a decline in density and distribution along the northern coastline occurring around the 1980s-1990s (see Figure 1), however this is not as clear, likely due to shifting baselines amongst interviewees (Pauly, 1995).

Interviewees indicated that 'river runoff', primarily attributed to sediment increases in waterways, was the most likely driver of the loss of kelp forests along the Otago coast. Sedimentation is known to reduce kelp cover as a result of hard substrate occlusion preventing attachment, decreasing light availability for photosynthesis, and smothering smaller life stages (Young et al., 2015; Miller et al., 2018; Hurd et al., 1997).

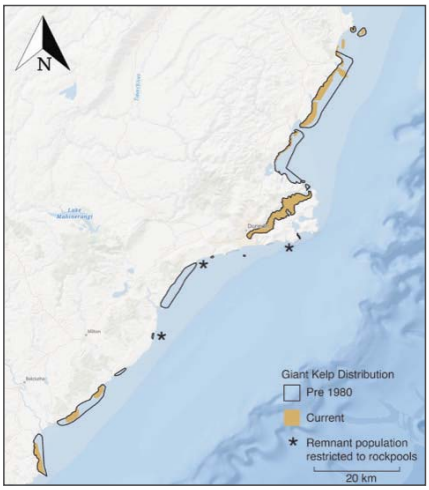


Figure 1: Macrocystis pyrifera distribution along coastal Otago from Katiki Point to Nugget Point showing the pre-1980 distribution and post-1980 decline (Image: Madeline Glover, Matthew Desmond and Chris Hepburn).

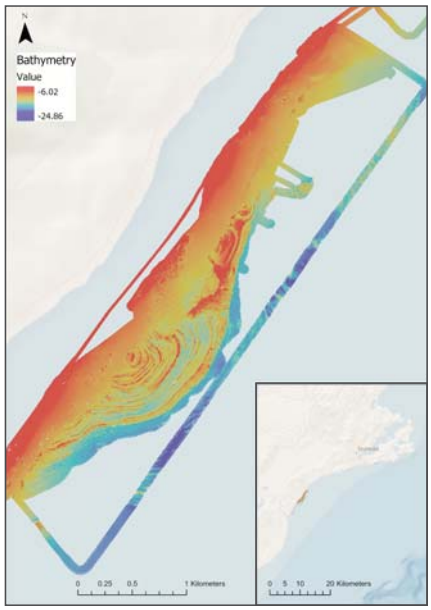


Figure 2: Reef structures found in the 2019 survey of the southern Otago coast between Taieri Island (46°03'27.2"S 170°13'02.5"E) and Bruce Rocks (45°58'37.7"S 170°18'12.3"E).

Remaining habitat

A significant loss of kelp was identified by interviewees along the Taieri-Brighton coast so this area was further investigated through multibeam and camera drop surveys. These surveys aimed to both validate the interviewees and determine what habitat remains in the area. A multibeam survey was undertaken using a R2 Sonic 2026 multibeam. The survey covered a 9.9 km stretch of coastline between Taieri Island and Brighton and identified two concentric reef structures (0.2 km^2 and 0.9 km^2) (see Figure 2). The reef structures are in the area described by interviewees and are in the correct depth band (Tait, 2019) with hard structures (Young et al., 2015) to support *M. pyrifera* growth, supporting the interviewees.

A drop camera survey of the reef structures was undertaken with 88 video camera drops being completed. The camera drop survey was compared to a previous survey of the East Otago Taiāpure, where it is known that *M. pyrifera* is still present. The camera drop

(1) University of Otago

survey of the Taieri reef structures supported the multibeam survey that there was sufficient hard structure to support *M. pyrifera*. The hard structure at the southern site was identified as predominantly consolidated reef as opposed to mainly boulders and cobbles in the East Otago Taiāpure. The algal compositions at the two sites were significantly different. In the East Otago Taiāpure there was a more heterogeneous mix of understory corallines and canopy brown seaweeds, whereas the Taieri Island site was a homogenous mix of coralline, rhodophytes, and *Caulerpa brownii* (see Figure 3).

Potential drivers

Globally, kelp forest distribution has been changing, with some increasing but the majority decreasing (Wernberg et al., 2019). There is seldom one driver of loss in an area, rather multiple stressors that cause a decline (Wahl et al., 2015). There are trends of increased coastal nutrients, increased sediment, warming ocean temperatures, global expansion of herbivorous organisms, harvesting, and invasive species that are creating unfavourable conditions for *M. pyrifera*, altering both distribution and density.

Interviewees indicated that increased sediment was the most likely cause for the decline observed in kelp forests along the Otago coast. Given the information available from this research it is likely that there were multiple stressors that caused the loss and lack of re-establishment of *M. pyrifera* at this site. The primary driver is likely increased fine sediment from the Taieri River post-industrialisation from land conversion. Increased sediment in waterways is an issue across much of New Zealand as a result of conversion of native plantations to urban, agricultural and forestry uses (Galbraith and Burns, 2007). There continues to be frequent large inundation of sediment from the Taieri River to the Otago coast (see Figure 4) that would likely continue to occlude reef structures and alter the light environment for macroalgal growth (Tait, 2019).

It is possible that alongside increases in sediment from the Taieri River, other factors have contributed to the loss and lack of re-establishment. During the late 1970s there was an alteration of ENSO cycling due to upwelling that caused a prolongment of the eastward shift of the El Niño phase of the cycle (Wang and An, 2002). The alteration of the cycle would have resulted in fewer storms and big seas along the Otago coast. Storms and big seas can cause the removal of sediment along the Otago coast and as a result there could have been a compounding accumulation of sediment as a result of increased sediment and lack of removal (Carter and Carter, 1986). Since the 1970s it is possible that there has been a recruitment limitation issue that has disallowed the re-establishment of *M. pyrifera* (Raimondi et al., 2004).

Future work

The thesis this article is based on achieved the initial stages of a 'bottom-up' or ecosystem-based understanding of a habitat. The identification of the structures, substrate composition, and algal community has allowed initial insights into changes that may have occurred at this site. To further understand this environment, and if it is ecologically viable as a site for future regeneration of *M. pyrifera*, it would be essential to further investigate the biotic and abiotic parameters. Other tolerance factors

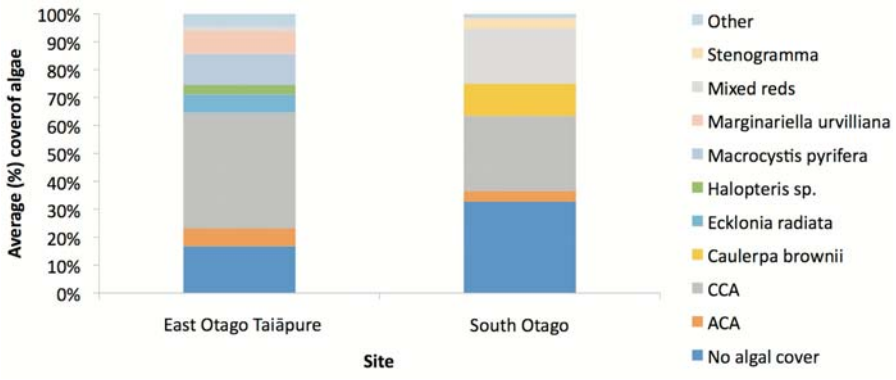


Figure 3: Average percentage cover of substrate types at East Otago Taiāpure (n=36) and South Otago (n=88) from drop camera surveys.

Figure 4: Screenshots from an aerial flyover of the Taieri River in flood in 2018 – (a) confluence of the Taieri River and the southern Otago coastline, and (b) Sediment plume along the Taieri-Brighton coastline (Images: Taieri River flyover, Blokenshed, 2019).

that would be important to further investigate would include, but not be limited to, the suspended sediment environment, wave action, light, and temperature. It is important to understand how the factors fluctuate and how this will then, in turn, alter the ability of *M. pyrifera* to carry out its biological functioning. In understanding how these environmental parameters are acting and interacting with the habitat it would also be essential to understand how, long term, these factors may change. If sustainable regeneration were to occur it needs to be put into a long-term goal, understanding the durability of the species under changing climatic conditions.

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Central government news

Amy Robinson, Central Government Representative

PCE report on estuaries

The Parliamentary Commissioner for the Environment, Simon Upton, has released a report entitled *Managing our estuaries*. The report recognises that estuaries are the receiving environment for land and freshwater based activities, and calls for integrated management of them under the National Policy Statement for Freshwater Management. The Commissioner also recommends instituting robust and standardised monitoring of the state of our estuaries incorporating mātauranga Māori.

To download the report go to: www.pce.parliament.nz/publications/managing-our-estuaries (FAQs and background reports are also available).

Resource management system review

The Independent Resource Management Review Panel, chaired by retired Court of Appeal Judge Hon Tony Randerson QC, has released its recommendations on reform of the resource management system. The panel proposes replacing the RMA with three new Acts.

The proposed Natural and Built Environments Act would focus on enhancing the quality of the environment and on achieving positive outcomes to support the wellbeing of present and future generations. The purpose of the proposed Strategic Planning Act would be to set long-term goals and facilitate the integration of legislative functions across the resource management system, utilising a spatial planning framework. Finally, the proposed Managed Retreat and Climate Change Act would provide some much needed guidance on managing the complexities of managed retreat.

The panel strongly recommended that all three of these proposed Acts give effect to the principles of Te Tiriti o Waitangi with greatly increased participation of Māori in the resource management system. It remains to be seen how and if these recommendations will be progressed following the general election in October.

For a summary of the report and the key recommendations, plus links to key documents, see: www.mfe.govt.nz/rmreview and to download the report go to: www.mfe.govt.nz/publications/rma/new-directions-resource-management-new-zealand

COVID-19 Recovery (Fast-track Consenting) Act 2020 coastal project update

This Act was assented on 8 July 2020 and provides an alternative consent pathway for 'shovel ready' infrastructure projects as part of the government's economic stimulus package.

The first of the four listed projects with a component in the coastal marine area has been lodged with the Environmental Protection Authority for consideration by the expert consenting panel (ECP), being NZTA's Te Ara Tupua-Ngauranga to Petone shared pathway project. This project will create a walking and cycling link between Lower Hutt and Wellington.

Two coastal projects have requested referral to the ECP. The first, Ariki Tahi Sugarloaf wharf expansion (located in Te Kouma Harbour, Coromandel), was declined by Ministers Parker and Sage, primarily on a natural justice basis whereby they considered that the project should follow the RMA consenting process to allow full public participation. The second project, Whakatane Boat Harbour, remains under consideration at the time of writing.

New National Environmental Standards for Marine Aquaculture (NES MA)

The NES MA aims to increase regulatory certainty and consistency across the country for the industry, whilst ensuring that environmental effects are appropriately managed. The NES MA was developed recognising that many resource consents for marine farms will expire between 2020 and 2025.

The key focus is to provide greater certainty for reconsenting these existing farms (previously authorised under the Marine Farming and Fisheries Acts that were 'grand-parented' into the RMA). It provides a straightforward consenting process for those older farms in areas deemed suitable for aquaculture by regional coastal plans by limiting public involvement in the consent process for these farms. However, for farms in areas that are not suitable for aquaculture, the requirements are more stringent and public consultation is required.

The NES MA doesn't provide rules and notification requirements for new marine farms – these will continue to be managed through rules in regional coastal plans. The NES MA will come into force on 1 December 2020.

Assessing the use of satellite derived bathymetry to simulate storm surge in New Zealand estuaries

Wagner Costa[1], Karin Bryan[1] and Giovanni Coco[2]

Coastal flooding events have become increasingly concerning worldwide in relation to climate change, due to the recent observation that they are growing in frequency and strength for many locations around the globe. In practice, predicting flooding events depends on understanding the contribution from the astronomical tide, wave run-up, fluvial discharge, vertical land motion, and changes in the sea level. In the specific case of estuaries, the bathymetric data are essential for predictions because the tidal propagation can be affected in terms of its amplitude and phase (timing) by the estuary's geometry (which can cause shoaling and choking) and bed-shear stress (which reduces energy due to its effect on friction).

There are many techniques to estimate topo-bathymetric data. One of them is in-situ surveys using echo-sounders, RTK or LiDAR devices. The advantages of these techniques are the high data quality and potential of good spatial coverage. However, they are usually expensive and more often than not area limited; for example, echo-sounding data collection is limited by the navigability of the estuary. To fill this gap, recent efforts have centred on estimating bathymetry from satellite images, a technique called Satellite Derived Bathymetry (SDB).

Existing SDB methods estimate the bathymetry using empirical formulas relating the relative reflectance of different spectral bands in each pixel to the water depth, where coefficients are evaluated using training data (Stumpf et al., 2003). These methods show a good approximation to measured data in open sea coastal areas; however, the method relies on light penetration to the seabed, and so there are limitations in its implementation for areas deeper than 25 m and in turbid waters such as enclosed seas, bays and estuaries.

Estimating bathymetry in intertidal zones can be more complicated using satellite methods because of the limitations of satellite coverage caused by the tidal dynamics. Recently, Google Earth Engine has shown innovation in the capacity to easily manage large geographical datasets, which has allowed global-scale studies in coastal science to evolve rapidly. Therefore, by combining recent SDB methods and the database of cloud cover, an extensive database for further developing bathymetry estimation using satellite images for estuaries on a large spatial scale can be accessed. Our current work is aimed at determining whether this database can be used to extract accurate intertidal bathymetric data from satellite imagery. The eventual goal is to use this SDB in numerical modeling of flooding events in estuaries.

Our method combines satellite images and local water level measurements and is composed of three steps, as shown in Figure 1. First, image pre-processing is done through the Google Earth Engine application (API) (Gorelick et al., 2017) in the Google Colab environment, querying images for a specific

(1) University of Waikato; (2) University of Auckland

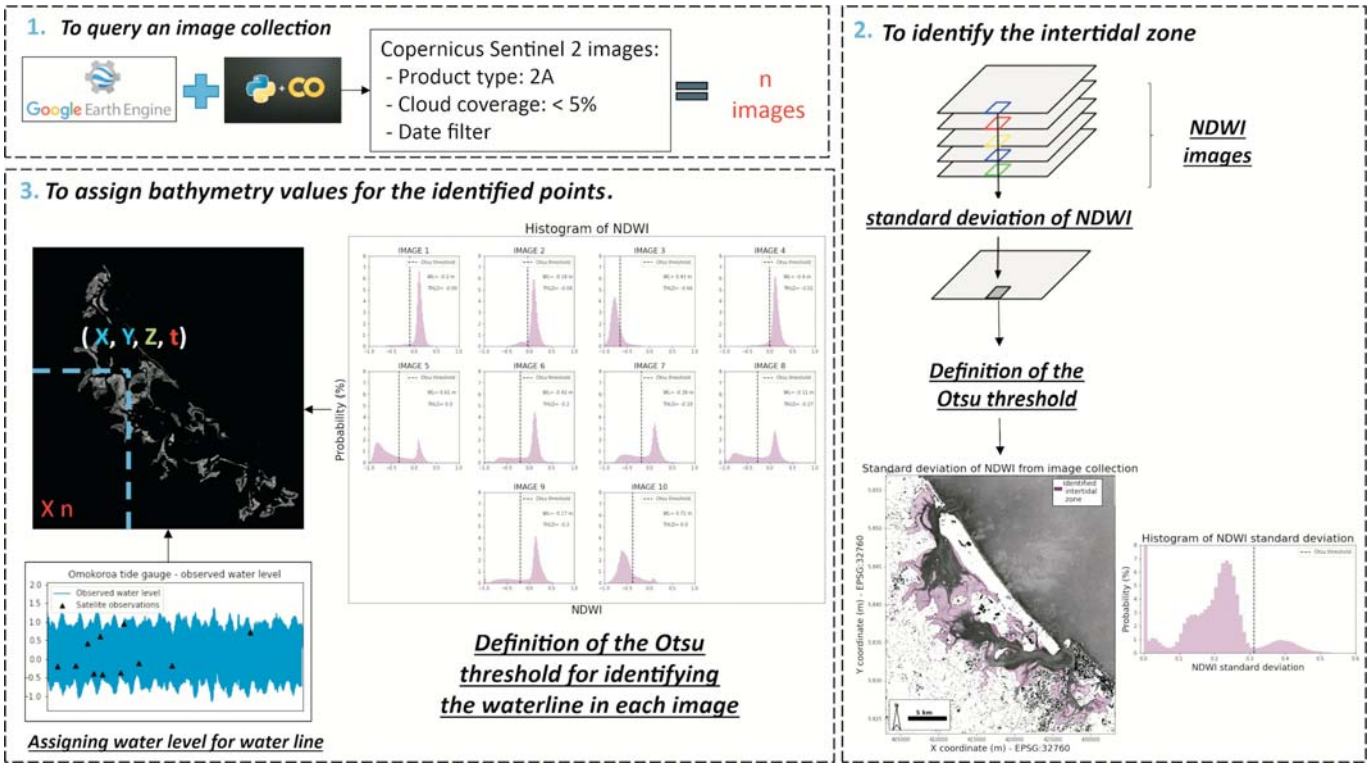

Figure 1: SDB method pipeline.

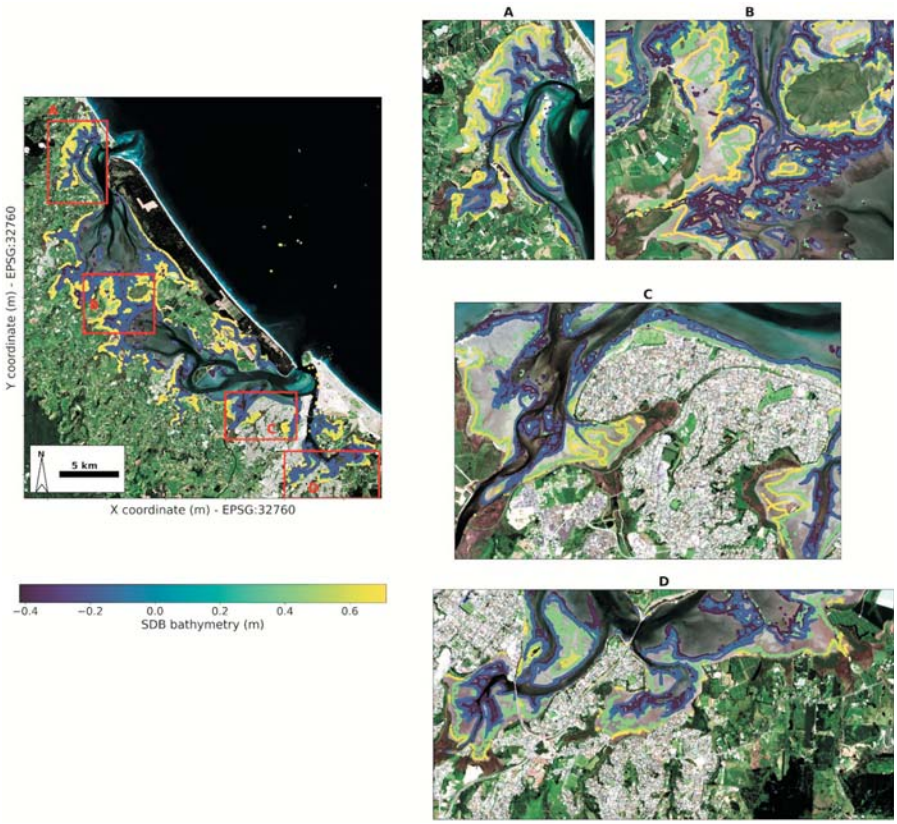

Figure 2: Samples of the SDB for intertidal zones created by analysing images collected at various tidal stages.

estuary in the Sentinel Copernicus database. Second, intertidal zone areas are identified using the Otsu threshold (Donchyts et al., 2016) on the standard deviation of the Normalized Difference Water Index (McFeeters, 1996) to locate the waterline:

$$NDWI = \rho_{green} - \rho_{swir} / \rho_{green} + \rho_{swir}$$

where ρ_{green} and ρ_{swir} are the green and shortwave infrared bands of Sentinel images respectively. The Otsu method works by defining the optimum threshold between two classes of data in the image distribution by finding the minimum value of the within-class variance. Third, we identify the boundary pixels between water and land (waterline) in each image of our collection inside the intertidal zone, and associate a waterlevel to the waterline using waterlevel observations from tide gauges.

The position of the waterline is defined using the algorithm Finding_Contours from the scikit.measure (Van Der Walt et al., 2014) python library. This function uses the Otsu threshold determined for every NDWI image distribution to extract the waterline contours. This contour extraction method uses the 'marching squares' algorithm (Lorensen and Cline, 1987) to identify precise contour boundaries in a two-dimensional array by linearly interpolating between adjacent pixel values. An example of the resultant bathymetry is shown in Figure 2. We validate the estimated bathymetry (gridded) for our test case (Tauranga Harbour), which has complete LiDAR coverage. The SDB is compared with LiDAR data available on the Land Information New Zealand (LINZ) website (https://data.linz.govt.nz).

The tidal wave in an estuary is not completely standing, and can experience deformations because of the estuary's geometry and bottom friction when propagating through enclosed areas, resulting in different tide amplitudes and timing (phases) over the estuarine domain. Moreover, the location of the detected waterline relative to the actual water line might vary with the tidal level (for example due to the change in the colour of the seabed associated with groundwater seepage at low tide). To ascertain whether it is necessary to take these factors into account, the derived bathymetry was assessed for any consistent biases identified by the statistical correlation between error and observed water level.

Once we have developed the best possible bathymetry estimation, using Tauranga Harbour as a test case, we can set up a hydrodynamic numerical model and compare the use of different bathymetry sources (e.g. high resolution survey data and SDB) in the simulation outputs, checking if there are significant differences between them in terms of the water level outputs. If these differences are not significant, this work will result in a dataset of estuary bathymetries for all New Zealand and allow the impact of present and future flooding to be assessed even in remote places of the country. Such a dataset could also help to evaluate biological, sedimentary and chemical processes in which tides and surges play an important role.

Preliminary results will be presented in the NZCS webinar series in January 2021 (see box below).

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See page 18 for more about the NZCS Webinar Series, or visit the NZCS 'Webinars and Presentation Slides' page at www.coastalsociety.org.nz/media/webinars to view previous Webinars and check for details of upcoming presentations.

NZCS 2020 award winners

Each year, the New Zealand Coastal Society presents awards to some of its members to recognise their efforts and to give financial support for their work. The awards are designed to recognise both professional and student achievement and merit in the study or advocacy of issues related to the betterment of New Zealand's coastal resources. These are the recipients of the 2020 awards.

Shaw Mead and Ed Atkin NZCS Professional Development Award

Contribution towards obtaining a Certificate of Competence (CoC) for Occupational SCUBA diving

The 2020 Professional Development Award (PDA) was awarded to Dr Shaw Mead and Ed Atkin, Directors of Whaingaroa-based (Raglan) consultancy eCoast Marine Consulting and Research. The PDA's aim of promoting and advancing practitioner knowledge and understanding of New Zealand's coastal zone was encapsulated in Shaw and Ed's application for funds to offset the cost of a specialist dive training course in scientific diving.

In September 2020, Shaw and Ed headed to Auckland to undertake the course with instructors from Waiheke Dive (www.waihekedive.com). The training, which provided PADI certified Dive Master accreditation, also incorporated additional training such as the use of full-face masks, nitrox air supply, and other skills necessary for the completion of the scientific diver Certificate of Competence (COC).

The first two days of the course were held at the Olympic pool in Newmarket, where they trained in 26°C water for a variety of underwater hazards and practiced technical skills before heading to the open water. The rest of the course was completed at Lake Pupuke on the North Shore, where the water was 9°C. Here they worked through hazards such as low visibility, dense weeds and closely monitored each member of the team for hypothermia.

While both Shaw and Ed spend a lot of time on or in the water, and have decades of scientific diving experience, they both relished the opportunity to upskill. Completing this training and obtaining COC certification improves the Safe Operational Procedures for eCoast and places them amongst the few consulting groups with the capability to undertake scientific dive work entirely in-house. This eliminates the need to engage commercial dive teams, which often lack the required technical skills and experience and will ultimately reduce costs for eCoast's clients.

Along with eCoast associate Dr Tim Haggitt, Shaw and Ed's certification means eCoast will have three COC certified Scientific Divers. As a dive team trio, they will not only be able to undertake work safely and efficiently, but also provide the next generation with scientific diving experience on a range of underwater services related to the sustainable management of Aotearoa's coastal and marine environment. These services include the deployment and retrieval of oceanographic instrumentation, ecological and physical surveys for subsea communications cables, the collection of seabed samples, monitoring of marine reserves, and resource consent application and compliance.

eCoast are long-time supporters of the New Zealand Coastal Society and are regular sponsors of the annual conference, including the upcoming regional event at their home in Whaingaroa. In 2017, eCoast introduced the annual conference based NZCS Sustainability Award, which recognises coastal projects that best embody the principles of sustainability. Additionally, the team at eCoast have been conference organisers, provided talks, mentors, field trip guides, and articles for the *Coastal News*.

The eCoast team genuinely believe in the vision of the NZCS, that the sustainable management of Aotearoa's coastal and marine environment should be underpinned by sound science, engineering and policy practice, comprehensive monitoring, involved communities and effective national networks. eCoast whole-heartedly thanks the New Zealand Coastal Society for the Professional Development Award.

Mojgan Razzahi Student Research PhD Scholarship

Morphological evolution and hydrodynamics of the Maketū Estuary after re-diversion of the Kaituna River

Globally, coastal ecosystems and the services they provide have been degraded and even lost in some places, largely as a result of human-induced disturbances such as land-use change, alteration of food webs, and climate-related stressors. Estuarine restoration by engineering interventions is occurring worldwide, with varying levels of success. Estuarine restoration generally aims to address water quality issues, such as salt/fresh water balance, estuarine flushing, and turbidity levels. However, little is known about how the magnitudes and spatial and temporal patterns in the various measures of estuarine water quality will change in response to freshwater and sediment management in the context of future sea level rise and climate change. It is also uncertain how sea level rise may affect the longevity of these restorations.

Mojgan's PhD research investigates how river re-diversion alters the physical health of estuaries, focusing on the morphodynamics and hydrodynamics of the Maketū estuary in the Bay of Plenty in response to the partial re-diversion of the Kaituna River. Mojgan will use a combination of field measurements and numerical modelling and her research will result in a better understanding of what determines if engineered restoration techniques ultimately result in a healthy estuary. Mojgan is based at the University of Waikato in Tauranga, supervised by Shari Gallop and Karin Bryan and supported by the Bay of Plenty Regional Council.

Akuhata Bailey-Winiata (Ngāti Whakaue, Tūhourangi, Ngāti Tutetawha) Māori/Pacific Island Student Research Scholarship

Potential impacts of sea level rise and storms on New Zealand coastal marae

Marae and urupā hold great historical and cultural significance within Māori society and the wider communities of New Zealand.

Marae are a place for hui, tangi and celebrations, and play many other important roles such as shelter during emergencies for affected communities. Many marae and urupā are situated on the low-lying coast, to allow traditional access to kaimoana and marine transport routes. However, the coast is under intense pressure from a growing population and climate change impacts such as sea level rise.

Akuhata is currently completing a Master of Science (Research) degree at the University of Waikato in Tauranga, under the supervision of Dr Shari Gallop, Prof Karin Bryan, Dr Scott Stephens (NIWA) and Josh Te Kani (Ngāi Te Rangi, Ngāti Ranginui, Ngāti Pūkenga, TCC).

His research aims to determine which marae are within the zone of sea level rise and storm surge impacts and conduct a geomorphological analysis of each marae. Akuhata is also undertaking a more detailed approach in the Bay of Plenty to explore potential responses to safeguard marae and urupā. Ultimately, Akuhata envisages that this research will contribute to the social and economic wellbeing of Māori communities.

Mojgan Razzahi

Akuhata Bailey-Winiata

Taylor Thomson

Taylor Thomson
Student Research MSc Scholarship

Estuarine ecosystem tipping points – the role of the deposit-feeding bivalve Macomona liliana *in regulating nutrient and sediment loading in estuarine environments*

Inspired by the first phase of the Sustainable Seas programme that finished in 2019, Taylor's project aims to determine the factors causing estuarine ecosystem's 'tipping points'. It will specifically focus on *Macomona liliana* (wedge shell) as a key species of shellfish in the estuarine intertidal ecosystem of Tauranga Harbour. Research into 'tipping points' is important, as our estuaries are under stress from fine sediments and nutrients entering through rivers and urban run-off. Identifying tipping points before they occur within the harbour is crucial, as a regime shift within this ecosystem would cause widespread loss of biodiversity, function, and recreational potential.

Taylor is aiming to create an interactive model to predict the tipping point of an estuary, based on the response of *M. liliana* to sediment and nutrient input. Following completion, this model can be altered and used by academics for predicting events in other estuaries around the world or using similar biota.

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 Sam Morgan (samm@4sight.co.nz) or Ana Serrano (ana.serrano@wsp.com).

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South Port capital dredging campaign 2020

Bryony Miller, NZCS Southland Regional Representative

Background

The Bluff Harbour entrance is renowned as one of the most challenging port entrance channels in New Zealand. Currently South Port New Zealand Ltd (South Port) is at the limit of its capacity for larger vessels to safely navigate in and out of the harbour. In order to future-proof the port, allow for ongoing shipping services from Bluff, and increase the safety of the shipping vessels, South Port is proposing to increase the depth of the existing Bluff Harbour entrance channel to between 9.45 m and 9.7 m target depths.

The capital dredging operation will involve removing outcrops of rock within the harbour entrance by drilling and blasting, dredging sediment from the berth pockets and swinging basin, and disposing of sediment and rock to sea. Total cut volumes of sediment and rock are estimated to be 120,000 m^3 and 40,000 m^3 respectively.

Sediment dredging methods

The soft sediment dredging will be undertaken using a Trailer Suction Hopper Dredger (TSHD). The TSHD is a self-propelled vessel equipped with one suction pipe, designed to trail along the side of the vessel when on the seabed. At the lower end of the suction pipe, a draghead is attached; suction is provided by an engine-driven dredge pump. The suction created by this pump is sufficient to dislodge and then transport a mixture of seabed materials and water through the draghead and suction pipe. The TSHD unloads by opening the doors that close the hopper. Once opened the contents will drop to the seabed as a result of gravity. During disposal the water is pumped onto the load by means of a sand pump.

It is estimated that the removal of 120,000 m^3 as part of the proposed capital dredging works will take four to six weeks of continuous dredging.

The dredge spoil will be deposited at a disposal site utilised by South Port that is located offshore to the south of Tiwai Peninsula and east of the harbour entrance. This site has been used for the disposal of dredging spoil since 1933 and has been the sole dredge spoil disposal location since 1979.

Figure 1: South Port NZ Ltd and Bluff Harbour entrance (Photo:South Port NZ Ltd).

Drilling and blasting methods

The rocky outcrops present in the Bluff Harbour shipping channel that are proposed to be blasted and removed primarily consist of dense basalt bedrock, overlain by fragmented sections from previous channel deepening and blasting campaigns in the 1980s. The subtidal section of underlying bedrock on the northern (Tiwai) side of the harbour entrance is approximately 350,000 m^2 in extent. This section of bedrock extends from Tiwai Rocks to the commencement of a sandy shore on the northern side of the inner harbour entrance. The rock dredging will be carried out by a specialist backhoe dredging barge fitted with spud piles. The backhoe dredge would first cover the areas to be dredged to remove any material that does not require blasting – doing this will confirm the areas that require drilling and blasting.

It is proposed that the drilling will be undertaken using a hydraulic drill rig mounted on the dredge's excavator arm. The drilling operation is currently proposed to be diverless and therefore would be independent of the tidal currents. Placing the charges and connecting them up to a detonating cord circuit will require diver intervention at slack water, however it is likely that a pneumatic system will be developed and attached to the excavator arm to enable the charges to be placed diverless. It is estimated that 7,000 holes will

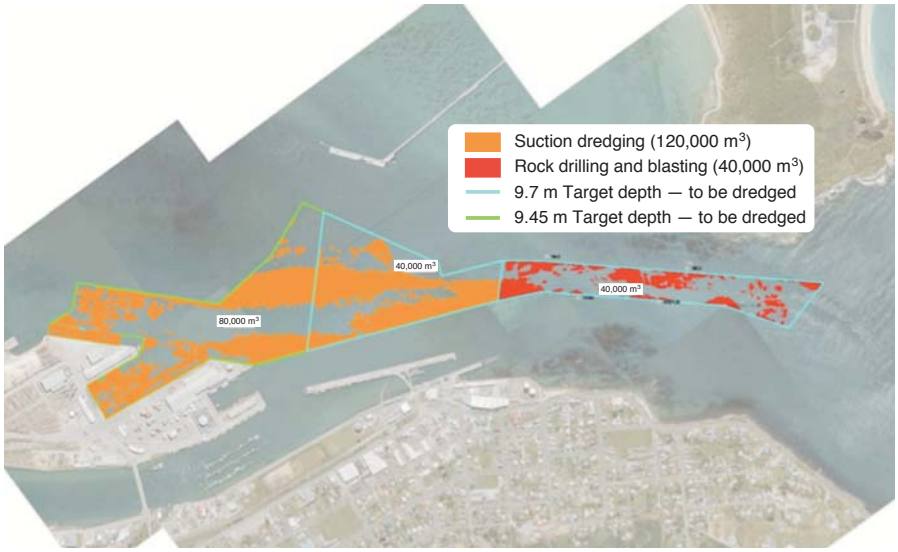


Figure 2: Proposed dredging and blasting locations, Bluff Harbour(South Port NZ Ltd).

be required and approximately 50 holes spaced 2 m apart and drilled to a 2.5 m depth. Diverless blast placement is important in this challenging channel due to swift currents and only a 15 to 20 minute slack tide.

Locating a site for the disposal of the marine rock fragments

Historically, blasted rock fragments from capital dredging operations have been disposed to land and helped build South Ports' Island Harbour rock wall armouring. However, with land storage space at a premium, South Port also wishes to investigate the option of rock disposal to sea. South Ports' current dredge spoil ground is primarily a sandy benthic habitat and is not considered an appropriate habitat to receive marine rock fragments from the blasting. Therefore, a new, more appropriate location was required.

e3Scientific Ltd carried out a marine assessment of effects report that aimed to identify an appropriate area for the rock disposal and to assess the effects of the Capital Dredging Programme on the ecology of the marine area. This was achieved by collating historic data, sediment distribution mapping, a comprehensive desktop assessment, video benthic drags, and epifauna and infauna dive assessments.

Video benthic drags and epifauna and infauna dive assessments – methods

Initial ground-truthing field work was carried out on 14 August 2020. A video sled methodology was utilised as a further precautionary measure, as opposed to a research trawl, to ensure that during ground-truthing the benthic habitat assessed was not adversely impacted.

An underwater video 'sled' with mounted GoPro was deployed and bottom-towed the length and breadth of the two potential sites including a control site located east of the sediment disposal site. A total of nine video tows, varying from 800 m to 100 m in length, were made through the two sites (n = 9). Sled video footage was briefly reviewed onboard and it was discovered that one site exhibited unfavourable characteristics for a rock deposition site while the other site showed favourable thick shell hash habitat. Sled video footage was thoroughly reviewed following the field work and adjustments to the most favourable proposed site were made based on the habitats found.

Following the underwater sled initial ground-truthing, SCUBA diving investigations were carried out on 21 August 2020 to further characterise areas of the favourable site identified via the sled video footage. Four dive transects of approximately 200 m across the width of the site were carried out and a total of four infaunal cores were taken along each dive transect, one core every 65 m interval (n = 16). Dive video footage was thoroughly reviewed, and a generalised habitat map was created based on both the sled and dive video footage and cored substrate.

Video benthic drags and epifauna and infauna dive assessments – results

An appropriate rock disposal site was identified through video benthic drags and video dive epifauna and infauna assessments and lies adjacent to the Tiwai Peninsula. This site has a depth of 13 to 15 metres, is predominantly thick (10 cm) shell hash with little infaunal abundance and diversity, and minimal epifauna. In contrast, a nearby Control Site further to the north, contained a coarse sand habitat containing brachiopod beds, bryozoans, sea tulips and sand dollars. All species identified were sessile ranging from sensitive (brachiopods) to resilient (sea tulips), indicating the habitat at this site is favourable for a wide range of species and provides for habitat complexity. Wave action calculations found the proposed rock fragment sizes would not be mobilised at this site and would provide a stable rocky reef habitat. Therefore, it was considered that the identified site is an appropriate location for the deposition of marine rock fragments to the seabed.

Sediment distribution mapping illustrated that the risk of sedimentation effects on nearby high value environments such as the Awarua Bay Ramsar site and the Motupōhue mātaitai is low, providing appropriate mitigation measures are implemented and turbidity monitoring is carried out.

The site to be blasted is a highly modified environment from previous blasting works, however it has since been recolonised to create a productive and diverse rocky reef habitat. Therefore, despite this habitat again being highly disturbed, it is likely that this site will recolonise to a similar extent over time and the subsequent deposition of the rock spoil to the seabed is expected to create a productive rocky reef habitat in a highly disturbed area with a low level of biodiversity.

A number of high value marine species such as white sharks, numerous seabirds, and marine mammals frequent this area therefore substantial avoidance and mitigation options are being adopted by South Port, who aim to carry out this capital dredging programme in order to future-proof the port operations and do so with minimal impacts on the surrounding natural marine environment.

Figure 3: Locations of the finalised proposed rock disposal site, nearby sediment disposal site at Tiwai Peninsula, Motupōhue mātaitai, and South Port NZ Ltd (e3Scientific Ltd).

News from the regions

Northland

Laura Shaft, Regional Representative

Northland Regional Council litter monitoring

Since February 2019, Northland Regional Council (NRC) has adopted Litter Intelligence (https://litterintelligence.org) to monitor litter. The NRC Litter Monitoring site (www.nrc.govt.nz/environment/coast/coastal-litter-monitoring-in-northland) is on the eastern shoreline of the Hātea River in the upper Whangarei Harbour.

Litter Intelligence is a long-term programme led by registered New Zealand charity Sustainable Coastlines. Funded by the Ministry for the Environment through the Waste Minimisation Fund, Litter Intelligence also works in close collaboration with the Department of Conservation and Statistics New Zealand. The Litter Intelligence data meets Tier-1 MfE Reporting Criteria. Results from Litter Intelligence featured in the 2019 *Our Marine Environment Report*.

NRC has also collaborated with Marine Debris Tracker (https://debristracker.org) and NorthTec (www.northtec.ac.nz) to create the Te Tai Tokerau Debris Monitoring Project TTTDMP App (https://tttdmp-northtec.hub.arcgis.com). The TTTDMP litter categories are paired with the Litter Intelligence and the International UNEP/IOC Guidelines. This enables the App user to peruse or add mapped litter items at their leisure whilst contributing valuable data.

Northland Regional Council microplastic in marine sediment and shellfish monitoring

NRC has contributed to Aotearoa Impacts and Mitigation of Microplastics AIM2 (www.esr.cri.nz/our-research/research-projects/aotearoa-impacts-and-mitigation-of-microplastics-aim) a national research programme to determine the impacts of microplastics in New Zealand. NRC and tangata whenua representatives collected marine sediment samples from 10 coastal sites and one lake site. These surveys were completed during summer 2019/20 and winter 2020. We have also provided shellfish samples from three east coast locations, two of which are Significant Ecological Areas.

Stormwater litter project

NRC are trying to estimate how much plastic and litter is reaching our rivers and estuaries each year, so we have initiated a project with NorthTec, Whitebait connection, WDC, FNDC and KDC. We are going to install litter traps at stormwater catch pits around the region and NorthTec will audit the contents of the traps every three months and estimate how much litter and plastic gets washed into the sea.

The project will also hopefully identify some high-risk land uses (playgrounds, car parks, supermarkets, fast food premises, industrial sites, etc.) so that we can target mitigation and education.

Auckland

Lara Clarke and Matthew McNeil, Regional Representatives

Orewa seawall proposal Environment Court decision

The Environment Court has issued a decision[1] to grant resource consent to the Auckland Council for the amended Orewa Beach seawall proposal, allowing an appeal against the Council's (as the consent authority) previous decision to decline the application. The proposal involves construction of a formed footpath along the esplanade reserve, beach access structures, naturalisation of a section of sand dune, and allowance for increasing the seawall height as sea level rises. Although located landward of MHWS the consent includes a limited tenure of 35 years and involves ongoing sand transfer, maintenance of plantings, and review conditions.

Following the decision in 2018, where the Environment Court allowed the appeal to proceed, in the circumstances where it was appearing as both the applicant and the respondent[2], a further decision has now been issued in relation to the resource consent application. The Court found that due to the passing of time, expert caucusing and amendments made to the location of the application, including the relocation of the seawall landward of the coastal marine area, significantly altered the policy framework and narrowed the issues before the court. The Courts note with relief that this jurisdictional matter of the consent now being sought under the district plan provisions, not the Regional Coastal Plan provisions of the Auckland Unitary Plan, did not affect expert consideration of effects in relation to coastal processes[3].

The Court acknowledges that the proposed seawall will have numerous benefits[4], including protecting the reserve against natural hazards, securing public access, enhancing recreational values and amenity values, and avoiding or mitigating adverse effects on coastal processes, landscape, and natural character values. It identified the irony in using hard engineering methods to avoid or mitigate effects on natural character in terms of the policies for its protection in the NZCPS. It also noted the complexity of the coastal environment and how consideration of these policies were central in the hearing commissioners' previous decision to decline the consent[5].

In considering the issues in contention the Court identifies elements of expert evidence and caucusing with reference to the MfE Coastal Hazards guidance[6], the need for comprehensive coastal management plans, the role of holistic adaptive management strategies, the consideration of erosional and inundation hazards, and the purpose of the esplanade reserve[7]. In discussion of the planning matters the consideration of managed retreat is identified for completeness and is acknowledged as difficult and complex[8]. Further the Court discuss the appropriateness of a soft option (in contrast to the seawall) for beach management and the evidence before them that such a solution would be suitable[9]. Through the evaluation of the case the Court

states endorsement for the advice and warnings from the expert witnesses that the Council, both as Applicant and as Respondent, must face and plan for the longer-term issues now.

Auckland Council has five years to give effect to this resource consent. If required, an application could be made to extend this timeframe to 10 years.

[1] Interim Decision No. [2020] NZEnvC 070 and the final decision (with conditions) Decision No. [2020] NZEnvC 122;
[2] Decision No. [2018] NZEnvC 22 and Decision No. [2018] NZEnvC 56;
[3] Paragraph 66; [4] Paragraph 141;
[5] Paragraph 142; [6] Paragraph 80;
[7] Paragraph 144; [8] Paragraph 126;
[9] Paragraph 143.

Cliff erosion in Auckland North Shore

Cliff erosion adjacent to residential houses in the Northshore suburbs of Auckland (Browns Bay/Rothesay Bay) has been the subject of several news stories, with news coverage identifying building material, soil and trees ending up on Browns Bay Beach below the sites. Signage is in place on the beach signalling the risk of falling material while council staff actively monitor the sites.

Council has initiated a review of the conditions of consent for one of the properties. This is being undertaken subject to condition 20 in the consent decision, which enables Council to utilise section 128 of the Resource Management Act 1991 if any part of the consented in-ground palisade wall (seaward of the dwelling) is exposed. The purpose of this review is stated, in the condition, to ensure the structural integrity of the wall is not compromised and this will not result in impacts on public health and safety or in adverse visual effects on coastal character, requiring that any adverse effects shall be mitigated and/or rectified. Both properties are also subject to provisions under the Building Act and works will be required to satisfy the provisions of this Act.

The resource consents for the two dwellings were considered under the proposed (in 2014) and operative in part (in 2017) Auckland Unitary Plan and elements of the Legacy Auckland Council District Plan: Northshore Section. The properties are located within an identified coastal setback area in both plans and as being on land which may be subject to coastal hazards under the operative in part Auckland Unitary Plan.

Waikato

Christin Atchinson and Jacqui Bell, Regional Representatives

Wharekawa Coast 2120

This project is led by Hauraki District in collaboration with the Waikato Regional Council, Waikato District Council, iwi and the larger community.

Sea level rise and changes in storm intensity as a result of climate change are real issues for the Kaiaua Coast area. The future is uncertain, but we can't wait for that future to arrive. We need to develop a community plan now that recognises that what we know now might change 10, 20 and 100 years down the track.

Wharekawa Coast 2120 is a major project that will look at a wide range of issues around the coast and how we can provide for a resilient and prosperous future over the next 100 years. While acknowledging that natural hazards are a concern, we also want to look at opportunities for the growth and development of our communities on the Kaiaua Coast, which includes Waharau, Whakatiwai, Kaiaua and Pūkorokoro-Miranda.

We want to ensure that the development of productive partnerships and dialogue with iwi is a priority. This project provides the opportunity to explore broadening the role of iwi as partners in future policy development and decision making, particularly in light of the upcoming settlement of the Hauraki Collective Settlement.

More information about the project can be found here: https://wharekawacoast2120.hauraki-dc.govt.nz/about/

Opoutere coastal forest buffer trial

By Moniqua Nelson-Tunley (WRC)

Wilding pines may be a pest, but they may hold some potential as a nursery crop for regenerating native forest. Tane's Tree Trust are currently investigating this possibility, with support from Waikato Regional Council, Ministry for the Environment, Northland Regional Council, Department of Conservation, iwi and community volunteers.

Many of our coastal pine plantations were developed to stabilise sand, but the cause of sand movement was loss of native vegetation from grazing and burning. Pine plantations are not an ideal solution; pines and exotic buffer trees like macrocarpa are badly affected by salt spray, coastal winds, saltwater inundation, and coastal erosion. On the other hand, native coastal forest is adapted to these costal hazards and also provides food and shelter for native wildlife.

The Tane's Tree Trust trials involve planting native coastal forest species in front of and in gaps within pine plantations. While the native plants are young, the pines act as a nursery crop, providing them with some shelter. As the native plants grow, they will provide food and shelter for native birds, lizards and invertebrates. Over time, the

Opoutere Beach (Photo: Moniqua Nelson-Tunley).

native forest is expected to become a permanent buffer for the pine plantation. The native plants will be more resilient to coastal hazards and unlike an exotic buffer they won't have to be felled periodically, so there will always be habitat available for native wildlife. Once the native trees have grown, they will protect the pine trees from coastal winds and salt spray.

One of the trial sites for this project is at Opoutere beach. Planting took place in July this year, with 3,455 plants of 14 different species. The Opoutere plantation forest has numerous gaps/meadows and a sparse canopy, so the trial included planting plots under canopy and within the gaps. The 2019 planting sites included open areas, which despite the summer drought, provided useful information on survival, vigour, and growth rate of each species. Planting was conducted by project partners and an army of community volunteers.

We hope to be reporting back on the results of this trial in coming years. If successful, these methods could be applied to establish native forest buffers on coastal pine plantations throughout New Zealand.

Water quality monitoring

In June this year Waikato Regional Council started state-of-the-environment monitoring for water quality in the Firth of Thames. Samples are collected each month by NIWA. Over ten sites we monitor water temperature, salinity, dissolved oxygen, turbidity, and sediments, agal growth (chlorophyll a), bacterial measures and the composition of phytoplankton. The programme is the first in the region to also routinely monitor carbon chemistry to track ocean acidification. The monthly data will be used together with high frequency data from two coastal monitoring buoys to inform water quality state and trends for ecological health and access policy effectiveness.

Water quality monitoring station (Photo: NIWA).

The Firth of Thames is the latest site in the council's coastal water quality monitoring programme. Monthly monitoring of water quality for ecological health also takes place in Whaingaroa (Raglan), Aotea, Kawhia and Tairua Harbours. During the summer season (November-April) we also monitor recreational water quality at popular swimming beaches in the region. If you would like to find more information about our programmes please go to https://www.waikatoregion.govt.nz/environment/natural-resources/coast/coastal-water-quality

Bay of Plenty

Jonathan Clarke, Kieran Miller and Josie Crawshaw, Regional Representatives

Return of ownership of Panepane Purakau

Western Bay of Plenty District Council has agreed to return ownership of the eastern end of Matakana Island to its ancestral owners. In a landmark decision at an extraordinary meeting of Council at Trustpower Baypark held in late October, Council voted unanimously in favour to return the 172 hectares of land, commonly known as Panepane Purakau, to the five local hapū. In front of more than 300 people, and livestreamed via Council's Facebook page, the decision was met with tears of joy, cheering and waiata from those in attendance. Council inherited the land at no cost from the Tauranga Harbour Board under the Local Government reorganisation in 1989.

Western Bay Mayor Garry Webber says this is an historic moment in Council's history and says returning the land to its ancestral ownership is the 'right thing to do'. The five hapū that connect to Matakana Island are part of Ngai te Rangi Iwi and include Ngai Tuwhiwhia, Ngati Tauaiti, Te Ngare, Te Whānau a Tauwhao and Ngai Tamawhariua. Ngai te Rangi Iwi kaumatua Hauata Palmer says it is an historic day for the hapū and comes after several years negotiating with Council for the return of ownership.

Under the transfer agreement a seven hectare public reserve will be created to ensure public access to the foreshore is protected in perpetuity and an esplanade strip will follow the coast to the ocean side. This means the public will still be able to fish off the wharf, walk along the beach, and use the recreational areas such as water-skiing lanes. Port of Tauranga navigation aids will remain in the same location and the land will be forested. Work will now begin on implementing the Council's decision, including completing the accretion claim, and providing the space for tikanga based kōrero between the five hapū and the descendant owners group. This will then be followed by an application to the Māori Land Court to determine the receiving entity.

Te Awa o Ngatoroirangi/Maketū Estuary

The health of Te Awa o Ngatoroirangi/Maketū Estuary is showing early signs of improvement according to Bay of Plenty Regional Council's latest report on findings from its environmental monitoring work in the estuary.

Bay of Plenty Regional Council Senior Coastal Scientist Stephen Park says they're seeing a reduction in mud and algae, and the return of sandy areas, shellfish, birds and other marine life as a result of work completed in 2017 to restore tidal inflows and wetlands around Papahikahawai. "It's too early yet to confirm positive results from the Kaituna River re-diversion and Te Paika wetland creation work that was opened in February this year, but salinity and oxygen levels in some parts of the estuary are starting to look better already," Mr Park says. Land drainage works carried out in the 1950s had cut off tidal and river inflows, and caused an ongoing decline in the health of Te Awa o Ngatoroirangi. Since 2014, Bay of Plenty Regional Council has been helping to reverse that decline by delivering work on the ground in partnership with tangata whenua and landowners including Papahikahawai Trust to restore wetlands, tidal flows and river inflows in the estuary.

Alert sirens decommissioned in Eastern Bay of Plenty

From 1 July, residents in coastal areas of the Eastern Bay will no longer hear alert sirens as a notice to check for official messages in case of a tsunami alert. Whakatāne and Ōpōtiki District Councils will no longer use the sirens and will rely on a range of other alerting tools including Emergency Mobile Alerts (EMA), radio, stinger sirens and

internet-based systems. The Eastern Bay's system relied on existing Fire and Emergency New Zealand (FENZ) station sirens with a long, sustained tone to distinguish it from the rise and fall call to volunteer fire fighters. This network is not message or voice capable and does not meet the requirements of the national director's Technical Standard. The Chief Executives from Ōpōtiki and Whakatāne District Councils represent their communities on the Coordinating Executive Group (CEG) to the Bay of Plenty Civil Defence Group. Whakatāne Chief Executive, Steph O'Sullivan, said that it was a carefully-considered decision of both Whakatāne and Ōpōtiki District Councils that weighed the very high cost of replacement sirens and the frequent issues and misunderstandings of the system. "Internationally, there is a movement away from reliance on sirens for tsunami alerts. We have many alerting tools in our toolbox and most of them are faster, more targeted, have better coverage and are more nuanced than a loud noise in specific coastal areas".

Taranaki

Thomas McElroy, Regional Representative

Te Ahua o Ngā Kūrei – Ngāti Mutunga Estuary Project

Due to concerns regarding the mauri and health of the Mimitangiatua (Mimi) and Urenui estuaries, Te Rūnanga o Ngāti Mutunga (Ngāti Mutunga) decided to investigate the estuaries through a Curious Minds citizen science project, funded by the Participatory Science Platform. Mimi, Urenui and Uruti Schools, and the Clifton Community Board became community partners in the project, and TRC was involved as a science and education partner.

The aim of the project was to investigate a range of issues that may have been affecting the health of the estuaries. These ranged from specific issues such as potential sewage contamination in Urenui's stormwater, to broad scale issues such as changing land use throughout the catchments.

Given the numerous avenues of investigation, the project included multiple survey components. These components ranged from shellfish surveys, sediment sampling and water testing to predator monitoring. Cultural Health Indicators were also assessed and a questionnaire on perceptions of the estuaries' state of health was distributed throughout the community.

The project was completed at the end of 2019, with results providing valuable information on a range of estuarine health indicators. For example, the location and density of shellfish populations, and different sediment properties throughout the estuaries were determined. Results from the sediment core samples provided evidence of each estuary having become muddier over time. Sediment plates that were installed in each estuary are now being monitored by Ngāti Mutunga to track sedimentation trends into the future.

Specific pollution issues were also identified with targeted water testing. Samples collected at the outlets of two stormwater lines running through the Urenui township contained strong evidence of human sewage contamination. Since receiving these results, the New Plymouth District Council and TRC have been working to identify potential sources, manage health risks and resolve the situation, in consultation with Ngāti Mutunga and the Taranaki District Health Board. This work is ongoing.

Upper South Island

Lisa Marquardt, Regional Representative

Marlborough multibeam habitat mapping

It has been just over two years since the Marlborough community received the findings of one of the most complex underwater coastal surveys of the seafloor undertaken in New Zealand. This multibeam survey covered more than 43,000 hectares of Queen Charlotte Sound/Tōtaranui and Tory Channel/Kura Te Au, and involved 280 days of vessels on the water that captured more than 5 billion data points.

At the time this was an unprecedented investment by a council in marine science as part of a collaborative partnership between Land Information New Zealand (LINZ), Discovery Marine Limited (DML), National Institute of Water and Atmospheric Research (NIWA) and Marlborough District Council (MDC). The survey unveiled the seafloor of the area in fine detail and provided a first glimpse of the complexities of the habitats that lay beneath the surface of the waves.

Since then, MDC have engaged NIWA on further contracts to identify biogenic habitats associated with different benthic habitats identified in the multibeam survey and model habitat suitability for key organisms across the survey area. This huge amount of high resolution data has enabled MDC to have a greater understanding of the biodiversity of its coastal marine area (CMA) by helping to refine the boundaries of existing, and identify new 'ecologically significant marine sites.' In fact, MDC have seen such value in having multibeam maps of the seafloor that a second collaboration to map parts of the Pelorus Sound/Te Hoiere has just been completed.

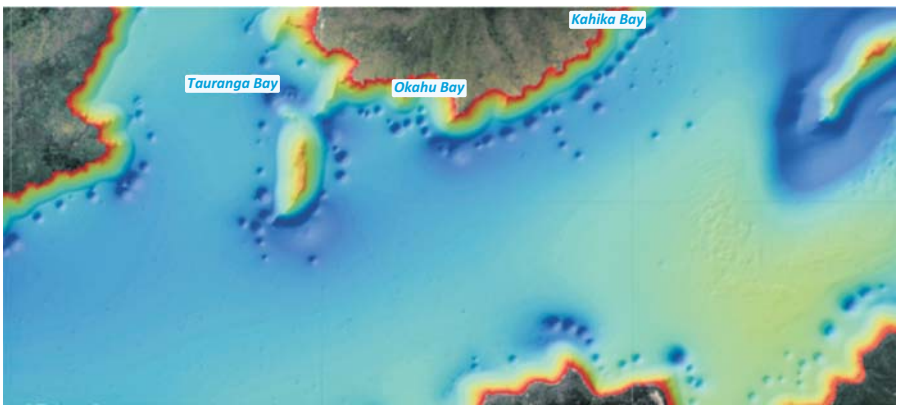
All the maps are available here: https://marlborough.maps.arcgis.com/apps/MapSeries/index.html?appid=155a89b0beb74035bd1c4c71f6f36646

Canterbury

Justin Cope and Deepani Seneviratna, Regional Representatives

Oceania Dairy wastewater outfall consent granted

In September Oceania Dairy was granted consent to construct and operate a 7.5 kilometre pipeline and coastal outfall which will discharge up to 10,000 cubic metres of treated wastewater per day into the coastal marine area from the Oceania milk-processing factory at Glenavy, about 50 km south of Timaru. Currently wastewater is



Interesting pock mark features that could be freshwater seeps in Queen Charlotte Sound.

discharged to land, but expansion plans and projected future growth will substantially increase the total processing capacity of the factory and increase wastewater production from the current 1,740 cubic metres per day. Limited access to land for land-based discharge of these larger volumes prompted the need for coastal discharge.

Coastal hazard assessments

It's been a busy 12 months for understanding future coastal hazards in Canterbury. Several Canterbury TAs have recently completed or are in the process of completing coastal hazard assessments.

Hurunui, Waimakariri, Selwyn and Timaru Districts have all completed coastal erosion and inundation assessments. Christchurch City Council are in the process of updating a 2017 assessment to include new technical information. Assessments for Waimakariri, Selwyn and Timaru have been completed primarily for informing District Plan reviews while Hurunui's and Christchurch City's provide the science for the beginning of community conversations around climate change and adaptation.

Hurunui District coastal conversations

In September, Hurunui District Council kicked off a Dynamic Adaptive Pathways Planning programme with six of their coastal communities.

A series of initial community meetings have been held to share the results of a coastal hazards and risk assessment carried out by Jacobs Consulting Ltd and to start a conversation about the process. Another round of meetings will be held in November for the communities to share their values and experiences and to discuss what matters to them and how that fits into possible future adaptation.

http://www.ncnews.co.nz/community/council-and-communities-join-forces-over-coastal-hazards

West Coast

Don Neale, Regional Representative

Provincial Growth Funding

Provincial Growth Funding has been sought and is being secured for a number of projects in the West Coast Region. Structural upgrades are planned to replace tiring wharf structures at the region's three ports at Westport, Greymouth and Jackson Bay.

The Regional Council is also proposing to secure Provincial Growth Funds to extend the coastal and river protection works surrounding Hokitika. The proposal includes a new rating district structure to help fund the works, an extension of the existing rock seawall up to the northern end of the town, and upgrades to the river floodwalls between Hokitika and the outlying Kaniere settlement. The landscaping and development of Sunset Point at the Hokitika River mouth is a separate project that is nearing completion.

NZCS monthly webinar series

We are switching things up a little this year! Like many, COVID-19 has impacted what we would have deemed our 'normal' way of doing things – especially with regards to our annual conference. It has provided us an opportunity and need to think outside of the box while embracing technology and virtual environments. Therefore we would like to introduce the '*NZCS Webinar Series – monthly technical presentations on contemporary New Zealand coastal issues*'.

We are putting out a call for interest to those members who would have been submitting an abstract to this year's conference, or may have an interesting piece of work or project, and would be interested in presenting in our new Webinar Series.

Please submit your topic proposal, and a short abstract (around 200 words) to nzcoastalsociety@gmail.com. Submissions can be made at any time, but close on the last Friday of each month.

Presentation details:

- The topic, abstract and a presenter bio will be pre-circulated
- Consists of a 15-20 minute live presentation, with an extra 5 to 10 minutes added for questions and discussion
- The presentation platform and any technical support will be provided by NZCS and Engineering New Zealand
- The abstract and presentations will be recorded and made available on the NZCS Media drive post presentation.

For more, see www.coastalsociety.org.nz/media/webinars

Advertising in *Coastal News*

Coastal News is published three times a year (in both print and electronic formats) and is distributed to the Society's 300 members and corporate members, as well as being publicly available on the NZCS website. Total readership per issue is estimated at 500+, comprising professionals in coastal science, engineering and planning, and employed in the engineering industry, local, regional and central government, research centres, and universities. If this is a group you would like to connect with, *Coastal News* has a range of advertising opportunities available, from small notices to a full page.

If you are interested in placing an advertisement, download the *NZCS Advertiser's Guide* from www.coastalsociety.org.nz/view/publications or email the NZCS Administrator at nzcoastalsociety@gmail.com for further details (please note that advertising space may not always be available in any specific issue, and that advertisements should be in keeping with NZCS aims and values).

University news

NZ Geographical Society Conference

While a number of conferences have been postponed this year, the NZ Geographical Society has pushed ahead with its conference in Wellington 25th-27th November and is running it synchronously – face-to-face and online. This enables international participants to present, and easy and relatively cheap online attendance. A special theme, organised by Hamish Rennie (Lincoln University) and Karen Fisher (Auckland University), is devoted to: 'Marine spatial planning: Ecosystem-based management, indigenous and local community empowerment?', which has attracted ten papers from around the world and is running in Wednesday and Thursday afternoon sessions.

Conference webpage here:
https://nzgsconference2020.gitlab.io/

Detailed programme here:
https://drive.google.com/file/d/1DlktXP16PnlYF-Zo3wKrMcs_HUoizDbu/view

Abstracts from the special session on Marine Spatial Planning: https://drive.google.com/file/d/1ODd0M2_pKuA0PE8Hlu-5YAQjZc1wRNMB/view

University of Auckland student research updates

Following are two project outlines from students studying for a Master of Engineering Studies (Environmental Engineering), at the University of Auckland, both supervised by Tom Shand.

Satellite based assessment of the effects of seawalls on adjacent beaches

Hans Ching

With unprecedented sea level rise over the last few decades and increasing threat to high-value coastal cities, seawalls are still being relied upon to manage this hazard. It is recognised that seawalls can potentially cause adverse impacts on the coastal environment. One of the most prominent impacts is increased erosion of the adjacent shoreline, commonly termed end erosion or end effect. End erosion has historically been assessed using either topographic survey or analysis of historic aerial photographs to determine the additional erosion occurring adjacent to the structure compared to further along the beach. However, these analysis methods are time-consuming and data is often limited. This investigation focusses on whether freely available satellite data can be used to detect and quantify end effect erosion.

The study uses freely available imagery from the LandSat and Sentinel satellites and utilises the CoastSat package to detect shoreline position. The shoreline defined using this method is the land-water boundary, which differs from more traditional analysis techniques that utilise a contour or edge of vegetation. However, it is useful in understanding whether the shoreline exhibits differing trends in front of, adjacent to, and away from the seawall. Both the shoreline trend based on regression analysis, and the fluctuation based on the standard deviation of the de-trended residual, have been analysed. Results show that fluctuations adjacent to the seawall, where end erosion is expected, tend to be higher than further away from the wall. This may be due to a more dynamic beach in this area or due to lower beach slopes allowing larger fluctuations. Results are compared with estimates of end erosion obtained by more conventional analysis with reasonable agreement. This indicates that these techniques could be used to rapidly assess end effect for many existing seawalls allowing development of more accurate predictive formulae.

The effect of coastal vegetation on wave overtopping flows for coastal structures

Theo Dombroski

Global warming is causing sea-level rise and the increased intensity of storm events, resulting in more risk of inundation at the coast. Conventional hard engineering coastal protection can be expensive, have negative ecological effects, and increase erosion in unintended areas. This research project looked at the key physical processes governing wave overtopping and the role that vegetation plays in energy dissipation. Tamaki Drive seawall in Auckland was chosen as the case study, due to input data availability from previous studies. Past experiments had looked at 'hard engineering' adaptations to Tamaki Drive for the prevention of overtopping. In contrast, this study looked at a softer alternative using native vegetation. The species Oioi (*Apodasmia similis*) was specifically chosen for its salt tolerance, dissipative characteristics, and the resilience required to withstand wave action at the coast.

The XBeach numerical model was used in non-hydrostatic (wave-resolving) mode to replicate the incident wave conditions from Cyclone Ita in 2014. Sensitivity testing was undertaken on vegetation density, height, width and placement position. Vegetation was found to be most effective in reducing mean overtopping volumes when placed on the front slope of a revetment, whereas vegetation placed on the crest may reduce peak velocities and discharge volumes. Vegetation widths of up to 3 m were capable, in some circumstances, of reducing overtopping flows by up to 90% when placed on the face of a slope and up to 40% when placed on a crest. However, further physical model or field testing is required to calibrate and validate the numerical model results.

This study highlights the effectiveness of vegetation for wave energy dissipation and shows great potential to integrate soft engineering methods into typical hard engineering solutions. If implemented correctly, the use of vegetation within coastal protection works could prove to be a cost-effective solution, while providing aesthetical green space and ecological benefits.

Newsletter archive & downloads

Back issues of *Coastal News* (from 1996 onwards) are available to download from the Society's website at www.coastalsociety.org.nz (under the 'Media > Publications' tab). Also available for download are author and article indexes for issues 1 to 71 (these will be updated each year), a Contributor's Guide to writing articles for *Coastal News*, and copies of the three NZCS Special publications – *Rena: Lessons learnt* (2014); *Adapting to the consequences of climate change* (2016); and *Shaky shores: Coastal impacts & responses to the 2016 Kaikōura earthquakes* (2018).

About the authors

Lynn Adams is a technical advisor for the Department of Conservation's Biodiversity Unit. She leads the lizard technical advisory group and, along with other TAG members, leads research programmes and develops management tools for New Zealand's most threatened lizards.

Madeline Glover is a Master's student at the University of Otago in the Marine Science and Surveying Departments. Her research applies both social and physical sciences to understand the changes in the *Macrocystis pyrifera* community along the Otago coastline within living memory as well as the potential for future regeneration of lost kelp forests.

Wagner Costa is a PhD candidate in Earth Sciences at Waikato University's Coastal Marine research group. His thesis is on the scope of the National Science Challenges New Zealand, and aims to identify the main drivers of estuarine flooding by exploring innovative modeling techniques to achieve an optimal prediction for the current and future flooding in New Zealand estuaries.

New NZCS publication completed

After months of planning, writing, collating, editing and design, NZCS's fourth special publication is now at the printers, with physical copies expected to be available to members from late November/early December. A pdf version will also be available on the NZCS website at: http://www.coastalsociety.org.nz/media/view/publications

The new publication will be launched as part of the 2020 NZCS 'virtual conference', supported by presentations from four of the book's authors. For details, see: http://www.coastalsociety.org.nz/conferences/nzcs-2020/

The New Zealand Coastal Society would like to acknowledge our corporate members for their support:

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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 a news item, have content suggestions or a photo to share, or to give some feedback on the newsletter.

The submission deadline for the next issue is 31 January 2021.

A Contributor's Guide is available for download from the Society's website at www.coastalsociety.org.nz (under the 'Publications' tab). This provides information on the style and format requirements when writing for NZCS publications. An index of articles previously published is also available for download.