Te Hunga Takutai o Aotearoa
NEW ZEALAND COASTAL SOCIETY

Coastal News

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Light to dark... one-way only?

'Coastal darkening' is becoming a worldwide problem in temperate coastal environments, the result of a number of stressors that together impact light availability. For more on this, see the article beginning on page 3.

Banks Peninsula, March 2021, showing sediment-laden waters from the Waimakariri and Rakaia Rivers entering the sea. Photo: NASA Earth Observatory.

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Word from the Chair

Kia ora koutou katoa, and welcome to the first *Coastal News* for 2024.

The management committee has had a fresh injection of members welcoming Alison Clarke, Andrew Allison and Holly Blakey to the team. Alison will be working with conference organisers and our regional reps, and Andrew will be looking at our membership base looking to see how best to serve you all. Holly has come on in the reinstated Emerging Career Rep position. All three have done some excellent work as regional representatives over the recent past, so we are confident that they are going to do a great job. In this issue, we include details of our new committee and regional representatives, as well as a bit more detail from Shari Gallop and Bryony Miller on the new Te Komiti Māori.

We're also farewelling Amy Robinson as one of our two co-Chairs in the society. Amy has done a fantastic job in leading the NZCS executive committee through the pandemic and all its challenges, growing the society's membership base, delivering value for our members through publications, webinars and other resources, and starting us on a journey to refresh our strategic direction. Thanks to Amy for everything you've contributed over the past three years. Sam Morgan is now stepping into the co-Chair role alongside Colin Whittaker, and we're looking forward to him bringing his energy and passion for the coast into the NZCS leadership. Sam shares some of his experiences on last year's NZCS Conference in this issue, and Andrew Swales provides some reflections on the Australasian Mangrove and Saltmarsh Network Conference in November 2023.

The year has started well with Prof Dave Kriebel sharing his knowledge and experiences as a visiting Fulbright Specialist. Whilst here he managed to give public talks in Auckland, Christchurch and Gisborne, where he was able to get out to see some of the damage caused by Cyclone Gabrielle

and the associated weather events. The phrase 'world class debris loads' was uttered on more than one occasion. In some of his presentations, Dave mentioned the common practice of raising buildings in flood zones as a climate adaptation measure. In this issue, researchers from NIWA explore this option in detail, while also providing a great explanation of the term '100-year flood'.

Colin was recently fortunate enough to visit Wellington as part of the Engineering New Zealand Forum. This gave a great opportunity to interact with other technical interest groups and regional branches within Engineering New Zealand, including some very interesting discussions with Richard Measures of the Rivers Group. While both societies are part of Engineering New Zealand, we both boast a diverse membership that goes far beyond the engineering discipline. We look forward to continuing some of these discussions in the coming weeks and months.

The theme of links between rivers and the coast is one that we explore in several articles in the current issue. Our first article considers the impacts of sediment runoff on the coastal zone, while a later article discusses the effects of tidal river proximity on groundwater hydrographs. We also have a follow-up article on plastic pathways in Northland, and plenty of interesting news from the regions and the universities. We also describe our next Special Publication on Coastal Transformation. We encourage you to submit an expression of interest to this publication.

We hope you enjoy the issue!

Colin Whittaker and Sam Morgan
NZ Coastal Society Co-Chairs

The NZCS was inaugurated in 1992 'to promote and advance sustainable management of the coastal environment'. It 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.

Coastal sediments and the darkness at noon

David R Schiel[1], Christopher N Battershill[2], Rahera Ohia[3]

First, we recognise and respect the territories of the iwi and hapū who are kaitiaki of the coasts of Aotearoa New Zealand. We further acknowledge the strong connections the diverse communities of Aotearoa New Zealand have with the lands, waters and people that surround them. The inter-dependence of lands, waters and people enables us to create a more complete picture of what is happening on our coasts and why. It also highlights where potential solutions might be found and who needs to be engaged to implement them successfully.

In asking advanced university students to provide a ranked list of threats to the marine environment, the top choices were overfishing, invasive species and climate change. Only one student in the class, who clearly paid attention to one of our lectures last year, mentioned run-off from the terrestrial environment. Their perceptions were no doubt influenced by the emphasis that years of teaching and the media have had on these issues. In Aotearoa New Zealand, the main marine spatial management tool is protected areas, which lessens overfishing, but does not deal with diffuse and sometimes catastrophic pouring of sediments and contaminants from land into the sea across catchments and regions. These often accumulate in the nearshore coastal zone only to be resuspended during increasingly frequent storm events. This affects the very infrastructure of rocky reef ecosystems, as water-column light, on which thriving kelp forests depend, is obstructed or diffused. We now see persistent states where kelp habitat, biodiversity, and productivity are lost. In fact, the rapidly accelerating degradation of kelp forest communities and their associated ecosystem services have been highlighted by iwi and agencies throughout New Zealand over at least the past 10 years (e.g. Donald & Battershill 2023, McCormack et al. 2024, Schiel 2013, Schiel & Howard-Williams 2015).

1 David Schiel, Distinguished Professor, Canterbury University.

2 Chris Battershill, Professor, Coastal Science, Waikato University.

3 Rahera Ohia, Ngāti Pūkenga, Ngāi Te Rangi, Waitaha.

However, detailed assessments of the rate of decline and the consequences of kelp forest demise have not until very recently been reflected in scientific publications or in specific New Zealand science policy designed to mitigate further deterioration. This lends urgency to the need for lessening the 'manageable' stressors that are accumulating to push kelp forest ecosystems beyond critical 'tipping points' as they increasingly interact with warming seas.

Coastal sedimentation from terrestrial run-off affects much, if not most, of the coastline of New Zealand. Increases in land use intensification and forestry have added to the coastal stressors around the country. This was seen in dramatic fashion last year when Cyclone Gabrielle devastated the coastal environment from East Cape southwards. Slash from harvested forestry blocks cascaded down the steep slopes along with torrents of water, mud and debris that inevitably made their way onto the coastal plain and into the marine environment.

Catastrophic as these types of events can be, there are more pernicious and less visible impacts on the marine environment from such activities. Nearshore kelp forests and their resident organisms are often smothered in the rain of sediments cascading to the sea floor. Resuspension during storms is a decadal (if not longer) legacy along our coasts because of occluding the transfer of light through the water column. Anyone who has flown over the country during periods after intense rain will have seen the vast sediment plumes coursing out of rivers and coastal waterways. Younger generations now sadly see this as normal, and the shifting baseline for triggering concern is an insidious barrier to realising fully the potentially catastrophic, non-reversible consequences of coastal sedimentary inundation. The water column beneath these sediment plumes is seriously compromised, not only with the amount of light reaching benthic habitats, but the frequency or wavelengths of light in the photosynthetic spectrum, on which kelp growth and reproduction rely, is also filtered out and reduced in murky waters. Therefore, there is shallowing or recession of kelp forests from the combined effect of mortality due to smothering, and poor recovery in the altered light environment.

'Coastal darkening' is becoming a worldwide problem in temperate coastal environments where the vast majority of kelp forests occur in waters less than 20 m in depth. In combination with other stressors such as more frequent and intense marine heat waves (Tait et al. 2021, Thoral et al. 2022, Montie et al. 2023, Xu et al. 2022) and generally warming seas, coastal sedimentation can affect the very infrastructure of unobstructed rocky reef and water-column light on which thriving

Figure 1: Coastal sediment plume after rain event in January 2024. This dumped a large load of sediment on coastal reefs along the coast near Raukokore.

Figure 2: The rain of coastal sediments smother kelp and subcanopy encrusting fauna and flora also diminishing light further affecting seaweed regeneration.

kelp forests depend, resulting in other persistent states where kelp habitat, biodiversity, and productivity are lost.

Our five-year, multi-institutional, MBIE-funded programme entitled *Toka Ākau Toitū Kaitiakitanga – building a sustainable future for coastal reef ecosystems*, aims to provide the necessary scientific and cultural underpinnings that will lead to more effective coastal management. This is a recognition that there is currently no cohesive understanding of these degradative drivers that allow informed and effective management strategies. Equally, there is inadequate understanding of scale-dependent biophysical interactions that result in observed patterns of effects. Historical baselines remain poorly parameterised despite being essential for gauging improvements – a problem exacerbated by limited surveillance tools for quantifying the status of these ecosystems and their associated values. This programme responds to piecemeal and often single-stressor research done in disparate locations. To date, there has been no co-designed programme of targeted biophysical coastal reef science, combined with traditional Māori knowledge, squarely aimed at the expressed needs of Māori, resource managers, and stakeholders, to achieve practical management outputs for reversing degradation. New management models and tools for sustaining healthy and resilient kelp forests are urgently needed. In recognition that no single entity can solve these pernicious problems, this programme was developed over a several years with key rangatira/mana wahine across the Mātauranga Māori-Science-Management-Stakeholder domain in response to that need, and to provide a clear pathway to knowledge uptake by whanau and communities.

Our approach is to use the most up-to-date technical advances in remote sensing, molecular and environmental chemistry, and participatory management models to gain a spatially-scaled understanding of stressor reduction and apply this new knowledge to achieve thriving kelp forest communities.

The research aims are:

1 **Understanding and establishing historical baselines:** Informed by Māori knowledge and experience, oral histories and previous data-sets, baselines of past ecological kelp forest structure, habitats and taonga species of particular significance are being identified and mapped. This helps resolve historical context, sources and gradients of stressors, and gauges ecosystem restorative targets.

2 **Measuring stressor effects:** Fit-for-purpose high-tech and environmental chemistry tools are being optimised and used for gauging kelp forest community composition and impact gradients. These include remote sensing tools for measuring within-habitat to wide-scale kelp forest structure. Environmental chemistry and e-DNA will help reveal sources and flows of contaminants and organic matter, trophic linkages, and hidden diversity of kelp forests.

3 **Developing new management models:** Engagement and Integration and scenario testing. The purpose here is to develop and transfer methodology that empowers iwi/hapū and provides regional managers with the means to monitor, gauge, report on, and react to changes in kelp forests. Environmental health indicators are being developed to provide meaningful metrics of kelp forest condition and gauge improvements over time. We are exploring co-management models that can be tested and put into practice to underpin adaptive/effective management.

This is an ambitious programme that involves researchers from many organisations, institutes and agencies, including key people from Ngāti Pūkenga, Ngāi Te Rangi, Ngāti Ranginui, and Te Whānau-ā-Apanui, the Universities of Canterbury, Waikato and Otago, NIWA, the Bay of Plenty Regional Council, and other regional and district councils. With the aid of this research programme it is hoped that some of the very hard issues of cross-ecosystem management can be increasingly resolved. Not all stressors are 'manageable', but it is clear that we as a country need to adopt a more holistic approach to cross-ecosystem management. The sea has always been the downstream accumulator of terrestrial-sourced contaminants. Without improvements and more effective management, the 'darkness at noon' will only get worse, to the further detriment of our iconic kelp forests.

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Raising buildings as an adaptation option – not straightforward?

Connon Andrews, Paula Holland, Paula Blackett, Christo Rautenbach, NIWA

The floods of 2023 once again highlighted the threats of flooding to New Zealand communities, a problem that is likely to worsen in the future with climate change.

In considering how to reduce flooding risk, elevating buildings such as homes is often perceived as an early adaptation intervention. After all, if a home is built sufficiently high from the ground, flood waters can flow under and around the house while residents and possessions are protected. So, raising buildings in flood prone areas makes sense, right?

In practice, the situation may be more complicated than it first appears – why?

Aiming high

Raising buildings to adapt to flood threats is generally considered an 'accommodation' adaptation option where the habitability in the hazard zone is maintained despite increasing levels of hazard occurrence. The accommodation approach to adaptation is often a package of complementary interventions such as land use planning (like zoning to stop people building in risky areas), establishing early warning systems and 'soft' adaptation options such as nature-based solutions (e.g., replanting wetlands to absorb river overflows).

Other commonly considered risk management approaches to flooding are hard engineering 'protect' adaptation options, such as building levees, flood walls and floodgates, or altering waterways, like diverting or widening rivers. These can all reduce the threat of flooding.

In the case of raising buildings, people who own their own buildings can contract builders to elevate them. Raising the building can involve a number of steps, including disconnecting services and utilities, installing jacks to lift the building, installing new piles, building sub floors, reconnecting building services and installing new access so users can enter the building at the new level.

The advantage of raising buildings in this way is that it can reduce flood risk, offering people a chance to stay longer in the area where they have connections. Connection to land is important in New Zealand. For residential properties, protecting the home in place means that homeowners and/or residents can avoid the expense of having to relocate, as well as avoid the disruption and trauma of leaving the area where ancestors, whanau and friends reside.

Firmly on the ground

So why don't more people raise their homes and buildings? At a very basic level, people may be unable to raise buildings because it can be expensive. In early 2023, NIWA commissioned a study as part of the Future Coasts Aotearoa[1] research programme to estimate the costs of raising buildings of different construction types[2]. The study found that the basic cost to elevate a typical residence (a single storey house with a ground floor area of 106 m^2) to be between NZD$200,000 and $400,000[3]. For non-residential buildings, this could be as high as NZD$0.9 to $1.7 million (assuming a single storey structure with a ground floor area of 500 m^2). For many, these costs will simply be out of reach, especially for houses where homeowners are still paying off mortgages or trying to recover from the last set of floods. And for smaller properties, costs of this scale may simply be impractical.

With expectations that New Zealand will face increasingly severe storm threats from climate change[4], there can be lower incentives for banks to finance buildings in areas where floods occur. Reports already exist of banks turning down applications for funding to elevate homes in flood prone areas because it can be too risky[5].

The baseline is changing

In New Zealand, the Building Regulations (1992) that includes the Building Code requires residential floor levels to be above the 50-year flood level. However, this height does not guarantee a building will not flood.

For example, during ex-Tropical Cyclone Gabrielle, rainfall within the Hawkes Bay Heretaunga Plains region generated flood flows with an estimated 400-500 year return period (specifically the Tūtaekuri and Ngaruroro Rivers). As a result, despite meeting the building code, houses were inundated and experienced significant damage[6].

Importantly, in many locations throughout the Heretaunga Plains region, prior to Cyclone Gabrielle the event would have been assessed with a return period of around 1,000 years or higher (Lane, 2024)[7]. This one event has changed return period flows and levels that are used to inform building construction.

Consequently, homeowners need to recognise that despite house floor levels being compliant with the Building Code at time of approval, they will not necessarily

What does 100-year flood event actually mean?

Flood events are often described as 1 in 100-year or 1 in 50-year events, but what does this actually mean? For a 1 in 100-year event this does not mean we will only have one event of this size in 100 years. Instead, a 100-year event refers to the chance of a flood event of that size occurring. This means that there is a 1/100 (or 1%) chance that an event of this scale might occur during an individual year. It is very possible, as early 2023 has shown us, to have two 100-year events within a short time frame.

A changing climate complicates the situation even further because the frequency and intensity of flood events will likely shift. For example, an event that has a 1% chance of occurring now may have a 5% chance of occurring in the future due to climate change. Similarly, an event that has a 1% chance of occurring in 20 years' time could be substantially larger and more damaging than a flood described as a 100-year flood in today's terms. It is not always an easy concept to grasp, but understanding the term is essential when developing adaptation options and plans.

be completely protected from extreme flood events. Moreover, as climate change progresses, what is currently described as a 50- or 100-year flood level may become more frequent in the future as rainfall intensity likely increases (see Box).

This raises a lot of questions: How high do we need to establish our homes and businesses to ensure protection into the future? What if the height we were told is safe today is no longer safe 20 years from now? Should property owners raise their homes and businesses higher than required to be prepared for future floods? It can be hard to know what to aim for. On the other hand, raising a home may at least buy homeowners a few years to work out what other options they have.

If owners can raise their homes and premises to safe levels, there remain challenges. First, residents in raised homes will remain in flood risk areas, so while homes may remain dry, their properties may flood and still need remediation. Communities can still face repeat costs after every flood. Second, roads and infrastructure around them may still get damaged. Communities could end up cut off physically or may end up without utilities. For people in low lying and coastal areas, this risk of being cut off may increase over time.

To ensure that communities do not become stranded during a flood event, those with raised houses are likely to need other infrastructure that serves them – like roads and utilities – to also be raised over time. Upgrading infrastructure is not straightforward and some infrastructure may need to be completely rebuilt, either by increasing elevation, changing location, or modifying to mitigate exacerbation of flood risks elsewhere. Ultimately, replacing infrastructure is expensive, potentially unaffordable, and the funds need to come from somewhere. This may mean an increase in rates, taxes or potentially deciding to reduce the level of service over time. Therefore, it is not straightforward.

So what?

So, raising buildings is often touted as a viable option to adapt to climate change impacts. While raising a house is physically possible, it is costly and may not offer a long-term solution because it doesn't consider supporting infrastructure and services.

At a community level, elevating buildings as a sole invention is not likely to be feasible when considering both the scale of required collective investment and the cost to maintain supporting infrastructure to service the community. Rather a suite of adaptation interventions is likely to be required to achieve an acceptable risk profile.

Adapting to floods and our changing extremes is complex. For those that can afford it, elevating buildings is a partial solution that can buy time until a wider adaptation plan is developed.

References and notes

1 https://niwa.co.nz/natural-hazards/research-projects/future-coasts-aotearoa

2 This work was commissioned to inform adaptation in programme case studies, including that for the Lower Waikato. The support of Swamp Frog Environmental & Tree Consultants Ltd – a Māori community-centred research company supporting whanau in Te Puuaha o Waikato – is acknowledged.

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Coastal Transformation Special Publication

After consultation with NZCS members attending the 2023 Conference, 'Coastal Transformation' has been chosen as the topic for the next NZCS Special Publication. The aim is to explore the dynamic changes occurring along Aotearoa New Zealand's coastlines and how the ways we interact with the coast are changing.

The publication will feature a range of diverse perspectives, research insights, and practical experiences related to both gradual shifts driven by the changing climate, and rapid transformations triggered by extreme events. Contributions will cover a wide array of voices and perspectives including communities, tangata whenua, practitioners, researchers and students across mātauranga Māori, planning, engineering, science, policy, management, law, economics, social science, resource management, and more.

At this stage of planning, the special publication will include four broad themes (although this might change as the project advances):

1 Transformations due to climate shifts
2 Transformations triggered by extreme events
3 Adaptive management and community-led approaches
4 Transforming relationships with the coast.

The resulting book will be published in 2025, and will be circulated to NZCS members; local, regional and central government agencies; research centers; consultancies; selected libraries; and universities. It will also be available on the NZCS website and the University of Auckland's figshare site for overseas readers to download.

Expressions of interest from potential authors are currently being sought. For more information, check out the current NZCS Digest, or email the Editor (Charles) at cellwairmonk@gmail.com. Submissions close May 10, but feel free to contact us if you have information or ideas to share.

Carparks to cockles – Plastic pathways in Te Taitokerau (Northland)

Nick Bamford[a], Manue Martinez[b], Olga Pantos[c]

Plastic pollution pervades globally, affecting oceans, air, and land. Despite its ubiquity, limited knowledge exists on local plastic pathways. The following displays collaborative efforts by Northland Regional Council, Crown Research Institutes, iwi, hapū, global researchers, and organisations studying plastic pollution impacts and pathways in Te Taitokerau (Northland). This also serves as a follow-up summary to the 'Coastal litter monitoring in Northland' article in *Coastal News,* Issue 77, pp. 6-7 (March 2022).

What we did

The following details stormwater and beach litter surveys, focusing on macro-plastics (larger than 5 mm). It also covers surveys on microplastics (smaller than 5 mm), conducted in areas near or chosen for their high recreational activity and geographical distribution across Te Taitokerau and the partners we worked with:

- Macroplastic stormwater surveys (LittaTrap™/Stormwater360)
- Macroplastic beach litter surveys (Litter Intelligence)
- Microplastic in beach sediments (Scion, ESR, and AIM[2])
- Microplastic in marine waters (Blue Cradle, AIM[2] and ESR)[d].
- Microplastic in shellfish (AIM[2] and ESR).

What we found

Stormwater litter loading rates varied significantly between land use categories. A total of six high risk land uses were identified: 'Fast food', 'Retail', 'Hospital', 'Playgrounds/skateparks', 'Carparks' and 'Transport, postal and warehousing'.

Plastic pollution and its pathways (Fig. 1) in Te Taitokerau are consistent with global studies. Plastic litter, accidentally or intentionally, enters stormwater networks then waterways where it continues to 'break up' into smaller particles. Plastic fibres originating from rope, clothing, or textiles were commonly found shapes in this microplastic research.

Plastic fragments were the next most common shape found in these microplastic studies. Hard plastic fragments were commonly found in our LittaTrap™ and beach litter surveys.

Plastic polymers polyethylene terephthalate (PET), polyethylene (PE), and polypropylene (PP) were commonly found in our microplastic studies. These are also the easiest to recycle numbers 1, 2, and 5 in Aotearoa New Zealand.

Research shows that microplastic colours in several Aotearoa[1] and South Pacific[2] marine fishes were predominately black or blue, while shellfish mainly ingested clear or blue. Hard microplastic fragments follow a similar trend. Colouring plastics imparts specific properties, aiding identification of contamination sources (Fig. 2). In Aotearoa New Zealand, fish and baleen whale scats commonly display black and blue, contrasting with clear in common dolphins[3], aligning with Te Taitokerau marine trawl samples.

Plastic pollution, despite widespread recognition, is still growing and will persist for centuries even if humans stopped producing and using plastics today. Plastic demand drives global transport and production, risking pollution. Sea transport poses major risks like nurdle spills and lost plastic items. Therefore, reducing

Figure 1: Key findings from all surveys and studies (Northland Regional Council).

a Environmental Monitoring Officer Coastal and Freshwater Field Operations, NRC.

b Chief Research Scientist M2M Consulting; Co-founder and Chief Scientist at Te Tai Tokerau Monitoring Debris Project.

c Senior Scientist, Water and Environment Group, ESR.

d Results from one of three trawls at seven locations. MBIE fund code C03X1802.

consumption crucially mitigates pollution. Acquiring only necessary items significantly decreases plastic's lifecycle pollution from extraction to disposal.

Ultimately, humans are responsible for plastic production and the associated pollution via the use of plastic-enabled products. This is a global issue anchored in systems of production and consumption in a linear economic model, where plastic items are convenient and waste management practices and infrastructures are often absent or inadequate.

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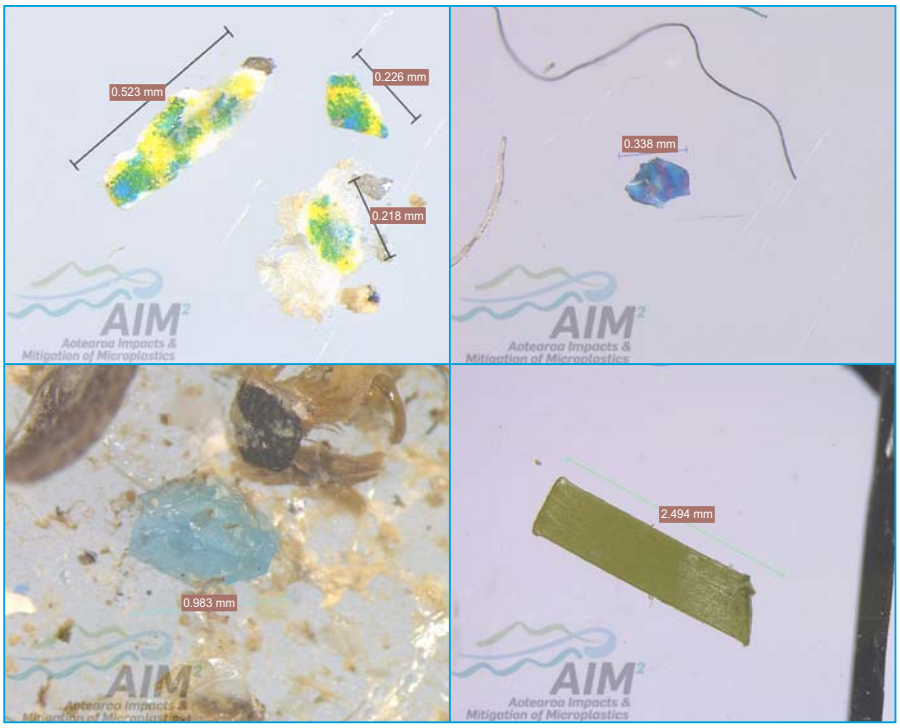

Figure 2: Examples of microplastics collected in Te Taitokerau marine trawls. PET [top left]; Acrylic [top right]; PE [bottom left]; and PP [bottom right] (Images: ESR/AIM^2).

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Australasian Mangrove and Saltmarsh Network Conference 2023

Andrew Swales, NIWA

Andrew Swales attended the Australasian Mangrove and Saltmarsh Network (AMSN) conference in November 2023 (University of Adelaide), with support from the NZ Coastal Society's Professional Development Award.

The AMSN brings together researchers, coastal managers, industry representatives and community groups who work across coastal wetland landscapes. Andrew presented the talk, 'Stormy weather: the response and resilience of a rapidly subsiding New Zealand mangrove-forest to an extreme storm-tide event'. The presentation reported the response to and recovery of one of our largest mangrove forests (southern Firth of Thames) from an extreme storm tide that occurred in January 2018, the largest such event since 1938. Sea level rise (SLR) is exacerbated here by rapid subsidence (i.e. ~8 mm/year) and sediment supply is a key factor driving the resilience of this coastal wetland. The presentation was co-authored by Steve Hunt (WRC), Kelly Carter (NIWA) and Catherine Lovelock (University of Queensland).

Understanding how Aotearoa New Zealand's (ANZ) coastal wetlands will respond to relative SLR over the coming decades, under a range of environmental conditions, to inform management and identify restoration opportunities is a key strand of NIWA's current Future Coasts Aotearoa (FCA) research programme[1,2]. A major objective of FCA is to inform how communities living in coastal lowlands can successfully transform in the face of SLR. This will require 'whole-of-system' adaptation across social and cultural well-beings, economic systems, and natural environments. The coastal wetland strand of FCA is being undertaken in collaboration with regional council partners, mana whenua, local and international research partners.

Attending AMSN 2023 provided a very timely opportunity to expand connections with Australia's coastal wetland community and explore developments that are occurring 'across the ditch' in blue carbon projects, coastal wetland management, adaptation and the restoration opportunities that are arising due to SLR. From my perspective, Australia is several years ahead of us in its thinking and actions in these facets of coastal wetland management. Australia has implemented a voluntary blue carbon market and has recently enacted the Nature Repair Market Act[3] (2023) that establishes a framework for a national, voluntary, biodiversity market. As a recent inductee to blue carbon science, the AMSN conference provided opportunities to learn about how Australian researchers, environmental managers and communities are working together in the coastal wetland restoration and blue carbon space. The insights gained and connections made will inform our FCA research and the information products that will ultimately benefit the sustainable management of ANZ's coastal wetlands. This includes informing SLR adaption strategies and coastal wetland restoration that is a growing need for central and local government agencies, mana whenua and communities at large.

Sincere thanks to the NZ Coastal Society for supporting my attendance at AMSN.

Links

1 https://niwa.co.nz/natural-hazards/research-projects/future-coasts-aotearoa

2 Radio NZ (Oct 2022): Sea-level rise effects on estuaries and wetlands to be tracked https://www.rnz.co.nz/news/national/476359/sea-level-rise-effects-on-estuaries-and wetlands-to-be-tracked

3 https://www.dcceew.gov.au/environment/environmental-markets/nature-repair-market

Visiting the Adelaide International Bird Sanctuary National Park – protecting the biodiversity of coastal wetlands and intertidal habitats along 60 km of coastline.

Blue carbon strategy and implementation is well advanced in Australia – we can learn from experience across the ditch.

Proximity to tidal rivers: A primary feature in groundwater hydrograph classification

Amandine Bosserelle[1]

Shallow groundwater interacts with the ocean level, tidal estuaries and rivers in many coastal low-lying cities and settlements. In Bosserelle et al. (2023), we studied the coastal urban shallow groundwater system near the Ōtākaro Avon and Ōpāwaho Heathcote Rivers in the coastal city of Ōtautahi Christchurch. We determined the characteristics of groundwater at shallow depth (<6 metres below ground level), including spatial and temporal trends in depths to groundwater and their relationship to natural and anthropogenic stressors. The primary feature in hydrograph classification was the proximity to tidal rivers and their correlation with tidal signals.

In this study, we applied cross-correlation analysis (CCA) to groundwater level and ocean level time series data measured across Christchurch and at the Sumner tide gauge. This method established the relationship between fluctuations in shallow groundwater levels and oceanic effects through the tidally influenced rivers as used in Setiawan et al. (2023). The correlation coefficient ranges from 0 to 1, and higher values indicate a stronger relationship between the two time-series. The discretisation of the tide signal in the time series used four increments of 0.25 of the cross-correlation coefficients (Groups). This analysis was done during the last seven days of 2019, between the 25th and the 31st of December, at the start of the driest consecutive six-month period between 2016 and 2020.

Tidal signals were most prominent in the groundwater levels of Group 1, with Group 1 being the most correlated and Group 4 being the least correlated to the oceanic tidal signal (Figure 1a). The larger the maximum cross-correlation coefficient between a group and the ocean levels, the stronger the tidal influence. The relationship between groups and features (here, the distance of the monitoring site per catchment to the nearest river or the coastline) was plotted using box plots in Figure 1b. The main results from CCA revealed that the closer the groundwater monitoring site is to the tidal rivers, the higher the correlation to the ocean levels. Groups 1 and 2, with the most substantial tidal influence, were located near a river or the coastline, as shown by the inset map in Figure 1b.

Interestingly, the distance from tidal rivers was the principal factor influencing the prominence of tidal signals in groundwater levels. More than the distance from the coastline, the distance from tidal rivers is the dominant vector of the influence of the ocean boundary on urban shallow groundwater via the estuary system. Shallow groundwater monitoring sites located on the New Brighton Spit (Figure 1b) belong to the least correlated to the tidal signal (Group 4) and some inland sites belong to the most correlated to the tidal signal (Group 1). It is surprising to observe the tidal signal propagating in groundwater along the Ōtākaro Avon and Ōpāwaho Heathcote Rivers and not to be a significant feature along the coastline and near the New Brighton beach. These findings have important implications for the impacts of sea-level rise on coastal groundwater dynamics.

References

Bosserelle, AL et al. (2023). Shallow groundwater characterisation and hydrograph classification in the coastal city of Ōtautahi/Christchurch, New Zealand. *Hydrogeology Journal*. doi.org/10.1007/s10040-023-02745-z

Setiawan, I (2023). Saltwater intrusion from an estuarine river: A field investigation. *Journal of Hydrology, 617,* 128955. doi.org/10.1016/j.jhydrol.2022.128955

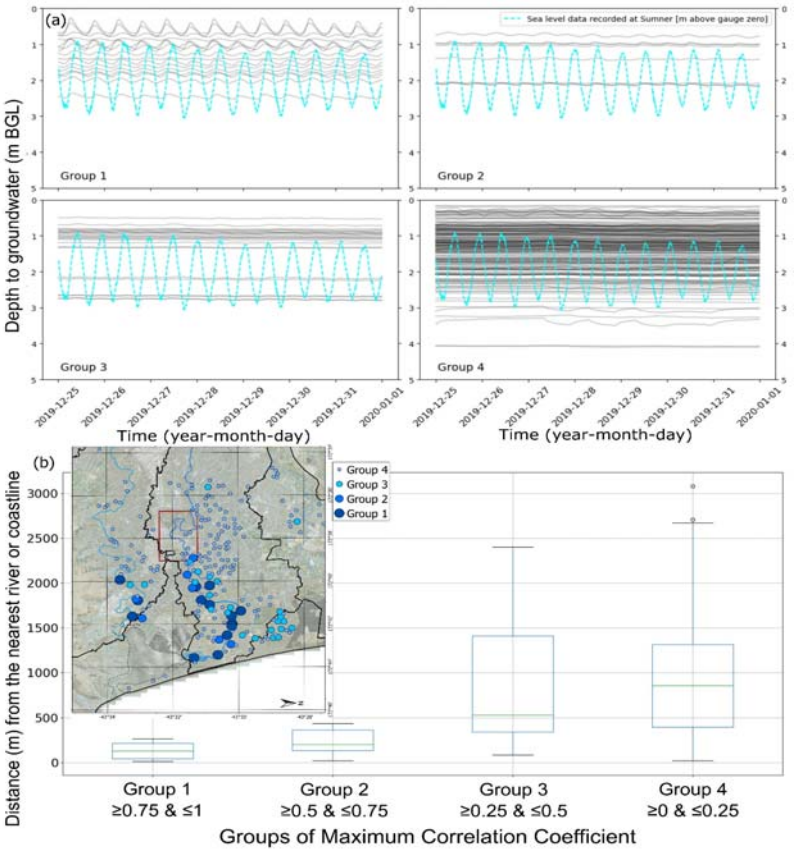

Figure 1: Result of the CCA: (a) groups of hydrographs from the most correlated to the tidal signal (Group 1) to the least correlated to the tidal signal (Group 4); (b) Box-whisker plots showing the correlation to features and the location map of the groups (Bosserelle et al. 2023).

1 Groundwater Research Scientist, PhD Candidate (University of Canterbury).

NZCS Wellington Conference wrap up – Who let the fog out?

Sam Morgan, Conference Organising Committee Chair

Who would have thought a rare day of relatively calm weather in Wellington would have had impacted conference proceedings so dramatically. For many delegates, including myself, it felt like a remake of the movie *Planes, Trains and Automobiles* as plans were made to get there. People made some extraordinary efforts to get to the conference, including some mammoth road trips traversing the North Island. Despite the challenges presented we had roughly 85% of those registered able to make it! I would like to give a big thanks to all of those who made the effort. The conference would not have been the same with out you.

As the travel chaos was ensuing the Local Organising Committee were busy shuffling timetables and other critical bits and pieces around to make sure we could put a show on. In particular I would like thank Mike, Verity, Holly, Greta and Amanda who were locked away glued to their screens and phones to get the mahi done. There was also some amazing support from the NZCS committee and admin team. Big thanks again!

I have been attending NZCS conferences for roughly 15 years now and I'm always impressed by the quality of subjects being discussed. The increased discussion in adaptation measures has been notable over this time as we seek to plan for future challenges. This conference was no exception with numerous presentations around the topic. These ranged from the technical aspects through to the work done with

Main photo – participants on the NIWA field trip pose before a blustery Wellington Harbour; the tour included the NIWA High-Performance Computing Facility (bottom left), the NIWA Invertebrate Collection (bottom centre), and the Deep-ocean Assessment and Reporting of Tsunamis project (bottom right) (all photos: NIWA). Inset photos – presentations at the conference venue (Photos: Jenni Fitzgerald).

communities to achieve sustainable outcomes both now and in the future.

The theme of community engagement in adaptation planning was strong through the proceedings with presentations from Belen Jimenez and Monique Eade being two that I managed to catch and enjoy. The importance of community engagement was really highlighted by Gemma Greenshield's keynote address. Gemma's lived experience of a managed retreat from her community following the Christchurch earthquakes highlighted the need start the processes now. The uncertainty brought about from such a disaster demonstrated the complicated nature of working with communities who are grappling with how their lives are changing. Gemma highlighted that with the future challenges of climate change and sea-level rise we have the opportunity to prepare our communities for what might happen. The more we are able to communicate with these communities the better the chance we have of getting the right outcomes. I would also like to thank Gemma for her persistence with Air NZ in getting on a flight to get to the venue in the afternoon of the opening day to present.

In his keynote address, Dan Hikuroa spoke to the knowledge of natural systems held within Mātauranga Māori. He was able to illustrate the ways in which knowledge is held in Mātauranga Māori and the value of using a knowledge base that extends far beyond the time that we have been able to collect data of our natural systems. To my mind this again highlights the need for engagement, as there are perspectives and knowledge within our various communities that will help us all moving forward.

Next years conference is to be held in Ōtautahi Christchurch, and the local organising committee are busy with the initial planning stages. I am looking forward to it and sure lightning (or fog) won't strike twice!

2023 NZCS Conference award winners

Best Presentation – Belen Jimenez (NIWA). *Coastal community engagement in the mission to map the seabed by the year 2030.*

Best Poster – Yelana Greig (University of Canterbury). *The impacts of introduced dune-building vegetation and variability in marine fluvial processes on estuary mouth dynamics.*

Best Student Presentation – Sophie Kolston (University of Auckland). *When do we leave? Modelling the impact of erosion on the North Auckland coastal cliff-top property market.*

Undergraduate Award Winners – Jonathan Chuhairy (University of Otago), Baily Rackham (University of Waikato), Edward Dickinson (University of Canterbury), Emma Hjorth (University of Auckland), Olivia Simmonds (University of Otago), and Mila Lawrence (Lincoln University).

NZCS 2023 Sustainability Award winner

The New Zealand Coastal Society Sustainability Award was first introduced by eCoast in 2017. This year, we are delighted to announce that the award was presented to Megan Oliver from Greater Wellington Regional Council for her fantastic presentation on developing guidance for marine offsetting and compensation in New Zealand.

The presentation showed an appreciation for cumulative losses due to coastal development and the complexities of managing them. It provided a practical and realistic approach for balancing human interests with the restoration of indigenous biodiversity and biological and physical processes, while keeping in line with values of sustainable coastal development.

We had hoped to present the award at the conference dinner, but due to the changes in conference schedule as a result of fog-induced chaos at the airport, it was presented at the end of the conference. Congratulations Megan on an excellent presentation.

The New Zealand Coastal Society Sustainability Award celebrates an organisation or individual making an outstanding contribution to promoting awareness, fostering aspiration, inspiring leadership, and showing a dedicated effort towards a sustainable future. Conference contributions are judged against three criteria that are central to our coastal life:

Dougal Greer (eCoast) presenting Megan Oliver with her award.

1. *Holistic Balance*:
   We assess the extent to which an organisation/individual integrates the four dimensions of wellbeing – environmental, social, cultural, and economic – to achieve a balanced sustainable outcome.
2. *Innovative Leadership*:
   The award recognises leadership and innovation in the application of sustainability strategies. This includes consideration of holistic systems thinking, minimised resource use, engagement in restoration efforts, and the integration of kaitiakitanga principles.
3. *Resilience and Adaptation*:
   The incorporation of adaptation and social resilience strategies are considered an integral aspect of implementation. Previous recipients have shown us that not only can environmental impacts be balanced against growth and development, but through diligent and responsible process the quality of our environment can be maintained and improved.

New NZCS Portfolio: Te Komiti Māori

In 2023 NZCS initiated a new committee portfolio – Te Komiti Māori, to uphold Māori values, ways of doing, being and knowing to be incorporated and supported in NZCS. We wanted to briefly introduce this komiti here, ourselves, and invite you to get in touch with us if you have ideas or questions on how we can move forward together. Our initial scope is to enhance te ao Māori being cherished in the NZCS and our activities and resources. We want to focus on Māori ways of being, doing and knowing being valued in our society in an inclusive and meaningful manner. Initially, the role of Te Komiti Māori is to:

- Support Māori coastal scientists, practitioners, students, etc.
- Be a point of contact for tangata whenua.
- Ensure all NZCS opportunities value te ao Māori and support other committees.
- At least one Te Komiti Māori member to contribute to award judging.
- Share NZCS opportunities such as awards to Māori channels.
- Share Māori-focused opportunities in NZCS communications.
- An overarching, long-term goal of developing and fostering relationships with tangata whenua.

The 2024 leads of Te Komiti Māori are Shari Gallop and Bryony Miller. Shari (Ngāti Maru ki Hauraki, Te Rarawa) lives in Tauranga and is the lead coastal scientist at Pattle Delamore Partners (PDP). Shari is passionate about practice and research focused on appropriately embedding Māori values in coastal climate change adaptation and restoration.

Bryony lives in Waihopai/Invercargill and is the Principal marine ecologist at e3Scientific. As an ecologist and diver, mātauranga Māori forms the essence of her role and her passion lies in marine restoration and the way in which our respect of the moana brings communities and iwi together.

There is a long huarahi (road) ahead, but we wanted to make Māori more visible in NZCS and just make a start. Kia ora!

Shari Gallop

Bryony Miller

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News from the regions

Northland

Kaeden Leonard, Marine Biosecurity Manager, Northland Regional Council

Caulerpa response

In July 2021, Biosecurity New Zealand (BNZ) was alerted to the presence of the invasive algae species, *Caulerpa brachypus* and *Caulerpa parvifolia*, at Aotea/Great Barrier Island. Subsequent discoveries were made at Ahuahu/Great Mercury Island in March 2022 and in Omākiwi Cove, Bay of Islands, in May 2023. This algae is an ecosystem engineer, meaning it creates large monoculture mats that outcompete native seaweeds and seagrasses, smother kai moana beds, and reduces the diversity of both flora and fauna. This has the potential to have cascading effects throughout the ecosystem, including changes to nutrient cycles, declines in fish populations, and shifts in food webs.

In Northland, a collaborative effort among hapū, the Ministry for Primary Industries (MPI), and the Northland Regional Council (NRC) led to comprehensive dive surveys to determine the extent of the infestation and to delimit the Caulerpa distribution. In response, an innovative approach involving both traditional and custom-designed dredging equipment was adopted to remove the algae while minimising environmental impact. Johnson Bros Limited, a local marine engineering and dredging contractor, has been engaged to create a dredge powerhead that functions similarly to a road sweeper, effectively removing Caulerpa from above ground as well as the below-ground stolon network.

Significant progress has been made in the project, with a pre-trial run of the dredge head completed, significant adjustments for improved performance made, and the establishment of a disposal site on private land, ensuring cost savings and reducing biosecurity risks. NRC and Johnson Bros Limited continue to run the trial of the new dredging tool, which is showing increasing promise.

Trial run of the new Johnson Bros dredging tool in Northland (Photo: NRC).

Waikato

Jamie Boyle, William Dobbin and Joshua Sargent, Regional Representatives

Waikato coastal restoration – super season

What a year for Coastcare Waikato! Following on from three years of La Nina and two of the biggest cyclones you can experience in Gabrielle and Hale, our Coastcare coordinaters and wonderful volunteers got to work this year.

Doing dune restoration at over 50 locations and 30 different beaches from Mokau all the way up to Whangapoua, we planted 82,716 native dune plants at 58 community events. In total, 1514 volunteers contributed 3330 hours of labour at the events. This last year would go down as one of the most productive for coastal restoration in the Waikato region.

Dune restoration volunteers at work in the Waikato (Photos: Coastcare Waikato).

Bay of Plenty

Jonathan Clarke, Scott Murray, Alison Clarke and Cole Burmester, Regional Representatives

Marine Parade coastal pathway completed

The new Marine Parade coastal pathway in Mount Maunganui was officially opened in December 2023, but has had the final finishing touches applied over the summer months. The pathway runs for three kilometres between Hopukiore (Mount Drury Reserve) and Oceanbeach Road and is a continuation of the Main Beach boardwalk (built in 1999). The new pathway was developed in partnership with local hapū Ngāi Tūkairangi and Ngāti Kuku and was designed by Boffa Miskell and built by Fulton Hogan, with construction beginning in April

View of the completed Marine Parade coastal pathway, Mount Maunganui (Photo: Copyright © Tauranga City Council 2011).

2023. The pathway is made with a mix of concrete and timber surfaces and is four metres wide, providing plenty of space to accommodate multiple users. As well as the structure itself, the project includes a variety of new amenities, including a playground aimed at younger children, seven new barbeques, 15 bike stands, 12 picnic tables, 11 seats, and multiple rubbish and recycling stations.

While the pathway itself is now complete, revegetation and dune restoration work along its length will continue over the next few years, with more native species to be reintroduced to the area.

For more on the project and its development, see https://letstalk.tauranga.govt.nz/projects/marine-parade-coastal-path

New wetland in development for the Waihi Estuary

Bethany Millar, Communications Advisor, Bay of Plenty Regional Council Toi Moana

Toi Moana Bay of Plenty Regional Council and iwi collective Te Wahapū o Waihi have partnered to buy 30 hectares of low-lying farmland for wetland creation at Cutwater Road, Pukehina, in an effort to improve the ecological health of Waihi Estuary.

The Waihi Estuary has been identified as one of the most degraded estuaries in the country, due to decades of wetland drainage, river channelisation, land use change and contaminated run-off throughout the 35,000-hectare catchment. Significant change is needed to return the estuary to a moderate state of ecological health.

The new wetland will be developed between the Pongakawa River and Pukehina Canal, on the margins of the Waihi Estuary. The concept involves creating 20 hectares of new coastal wetlands, with the remaining 10 hectares as a constructed treatment wetland. Once complete, the combined wetlands will improve water quality, biodiversity, cultural and recreational values, as well as contributing to climate change mitigation and adaptation outcomes.

Bay of Plenty Regional Council Coastal Catchments Manager Pim de Monchy says this project is enriched by the partnership with Te Wahapū o Waihi and the willingness of local farmers.

"We value the deep cultural connection tangata whenua have to the land, and the Mātauranga in relation to te Taiao. We also acknowledge the experience and willingness of the local farming community."

Co-design of the wetland is progressing with support from Charlotte Yates, SLR Consulting New Zealand Limited, who has come on board as Project Manager.

To achieve this unique project, 109 hectares was initially purchased on Cutwater Road, with 79 hectares on-sold to a neighbouring farmer whose interest in contributing to estuarine health was a key factor in allowing this project to go ahead. The remaining 30 hectares was funded 50% by Regional Council and 50% from Te Wahapū o Waihi through the Ministry for the Environment's Freshwater Improvement Fund.

Hawke's Bay

José Beyá, Regional Representative

Rangatira reef revetment

The Rangatira revetment, named after a nearby reef, is aimed at protecting the Whakarire Avenue Reserve, nearby properties, and two significant heritage sites, a Māori pre-burial site and an historic WWII pillbox.

More than 15,000 tonnes of rock were used in this major project, which took most of 2023 to complete. Construction had to take place around tides, and outside the kororā (little penguins) breeding season.

Left and below – New wetland creation at Cutwater Road, Pukehina, aimed at improving the ecological health of the Waihi Estuary (Photos: BOP Regional Council).

The completed Rangatira revetment (Photo: Napier City Council).

This picturesque spot is very popular with kororā, like much of the Ahuriri coast and Inner Harbour. A penguin-finding dog and handler were brought in to ensure the area was penguin-free before the major works began.

Onshore, there is still some work to be done, including further planting. The new-shared pathway will eventually link with another being constructed from the Meeanee Quay side of Whakarire Ave. Between the two, there is an improved car park at the eastern tip of the reserve. From the car park, anyone looking towards the sea will see the stumpy remains of the jetty once used by the North British and Hawke's Bay Freezing Company (1887-1930) to load its products onto ships.

For a backround to the project, see: https://www.stuff.co.nz/environment/131110527/coastal-property-owners-to-pay-25-of-napiers-4m-seawall

Haumoana 'H18' property sold in auction

One of the emblematic and controversial H18 properties in Haumoana has sold for $100k in a $1 reserve auction, despite the real estate listing stating that the seafront half of the land was now 'part of the sea'. The H21 (21 seafront properties along Clifton Rd in Haumoana, now H18 after three were removed) have been an icon to showcase coastal erosion issues in New Zealand.

For the full story, including a video report, see: https://www.newshub.co.nz/home/new-zealand/2024/02/beachfront-property-sells-for-just-100-000-in-hawke-s-bay-s-haumoana.html

Napier cruise ship visits

In February, Napier Port marked the 1000th cruise ship visit to Napier since visits began 30 years ago. The current summer season is on track to be busiest ever, with some 130,000 cruise visitors expected.

To help cope with the volume of arrivals, RightShip and Napier Port have joined forces to enhance maritime safety and sustainability. RightPort is a transformative digital solution that screens inbound vessels against risk-based criteria tailored to a port's requirements. It enables ports and terminals to streamline their pre-arrival processes, reduce administrative workload, and improve communication with vessels. RightPort also connects users to a global network of ports, allowing them to access feedback reports and vessel insights from other ports and terminals.

For more, see: www.napierport.co.nz/napier-port-marks-1000th-cruise-ship-visit-to-napier-as-current-summer-season-on-track-to-be-busiest-ever/

Coastal inundation drop-in session

A drop-in session was hosted by the Napier City Council on March 6 to discuss findings from the Clifton to Tangoio Coastal Inundation Report and the results of the recently updated coastal inundation hazards map. The session was aimed at coastal residents who may be impacted by future seawater flooding, giving them an opportunity to find out what this new information means for them and their properties.

For links to the report and to the inundation maps, see: https://www.napier.govt.nz/our-council/climate-change/coastal-inundation/

Jull Wharf – Ahuriri inner harbour works

Jull Wharf reached the end of its life this year and has been removed and replaced with a new rock revetment. It was a project that required very skilled digger expertise, not to mention penguin spotters to make sure any kororā in the area were kept safe!

For details see: https://www.napier.govt.nz/napier/projects/jull-wharf-removal/

Site after Jull Wharf removal (Photo: NCC).

Coastal monitoring

HBRC is renewing their contract for wave buoy data with the Port of Napier and has just deployed a new wave buoy off Cape Kidnappers and pressure sensors at Westshore and Te Awanga. The data collected by these instruments is essential for our understanding of the wave climate of Hawke's Bay and how it affects the different areas of our coast. It is also extremely valuable for improving our wave forecasts and swell warning systems.

Preparations underway for equipment deployment (Photo: HBRC).

Westshore renourishment

Recently the Hawke's Bay Regional Council started the annual renourishment and rebuild of the gravel bund that protects Westshore from coastal inundation and keeps the beach from eroding away. Some changes in the design were implemented to improve the protection of the surf club and slow down

the erosion of the bund on other critical areas.

Seaweek beach cleanup

At the beginning of March, the Seaweek Beach Cleanup (www.seaweek.org.nz) took place at Waitangi Regional Park, attracting many volunteers. Over 50 people attended the event and collected two trailers of rubbish in a morning's work.

Canterbury

Kate MacDonald and Tommaso Alestra, Regional Representatives

Coastal Pathway penguins

Christchurch City Council and Fulton Hogan have recently completed the final stage of the Te Ara Ihutai Christchurch Coastal Pathway between Moncks Bay and Rapanui Shag Rock. This part of the coastline supports a small colony of white-flippered penguin/kororā, a subspecies of the little blue penguin, one of the world's smallest penguins.

White-flippered penguins/kororā are classified as At Risk – Declining. They only breed around Banks Peninsula and on Motunau Island in Canterbury and there are thought to be about 10,000 left. Kororā are generally nocturnal on land and typically clamber ashore after dusk and leave before dawn. Between August and January, they nest in burrows, crevices, under boulders and sometimes under human made structures. One of these locations is at Moncks Bay, where a small colony of about 10 birds can be found in the rocky habitat beside the Coastal Pathway.

Some of the new nest boxes installed by the Coastal Pathway (Photo: Boffa Miskell).

Penguin experts from Boffa Miskell worked with Christchurch City Council and Fulton Hogan to minimise impacts on kororā during the construction of the Pathway. The works were carefully timed to occur when kororā were not ashore breeding or moulting. Before each stage of the works began, pre-construction surveys were undertaken to check if there were any kororā in burrows nearby. A penguin detector dog assisted with these surveys. If penguins were found, noise levels were monitored and setbacks were put in place to ensure that penguins were not impacted by construction noise and activities.

The new cantilevered Pathway provides kororā with greater protection from disturbance, particularly from dogs. As part of the project, twenty nest boxes were installed to provide more places for kororā to nest and moult, hopefully allowing the Moncks Bay colony to grow in size.

Penguin detector dog and handler on the look out for nesting kororā (Photo: Boffa Miskell).

Seal deaths in Kaikōura

Nearly 1000 seals have died along the Kaikōura coast since September of last year, most of them less than a year old. While some seal deaths are to be expected, the numbers since September have been higher than usual. Post mortem examinations ruled out disease as a cause, but the general body condition indicated starvation.

It's not immediately obvious why the seals are starving, but depleted fish stocks and marine heatwaves are likely factors.

For more, see: https://www.stuff.co.nz/environment/350164815/hundreds-seals-starve-death-kaikoura

Coastal News – proposed distribution changes

Like just about eveything else, the costs of printing *Coastal News* have continued to climb, to the extent that the Management Committee are considering changing how the newsletter is distributed to members.

Some of you might remember that NCZS trialled digital-only printing some years ago, but this was not universally popular with the membership and we reverted to paper copies. The intention this time is not to do away with printed copies altogether, but rather to give members the choice of receiving a paper or digital newsletter. There are two benefits to getting the digital version – you'll get the newsletter a week or more in advance of the paper version, and the web links that are now an integral part of the newsletter will be active (clickable) in the pdf. No more copying lengthy strings of characters!

Members will be asked later in the year which version of the newsletter they would like to receive. We're not intending to make this change until the November 2024 issue, so there's plenty of time to decide. If you have any comments about this change, please let the Editor Charles Hendtlass know (cellwairmonk@gmail.com).

Advertising in *Coastal News*

Coastal News is published three times a year (in both print and electronic formats) and the total readership per issue is estimated at 500+, comprising professionals in coastal science, engineering and planning, employed in the engineering industry, local, regional and central government, research centres, and universities.

There are a good variety 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 Renee, the NZCS Administrator, at nzcoastalsociety@gmail.com

University News

Sediment budgeting on the East Otago Coast: An understanding of sediment driven change to inform community based coastal management

Ruby Hudson, MSc student, School of Geography/School of Surveying, University of Otago

Within the sediment budgeting concept and framework, there is an opportunity to use coastal sediment budgeting tools to better understand shoreline change and evolution. My proposed thesis work aims to utilise this opportunity to understand the sediment regime and morphodynamics of the East Otago Coast, and to communicate this research to provide a tool to inform future community based coastal management. This project has been developed alongside and supported by Coastal People: Southern Skies – Centre of Research Excellence (CoRE), Kāti Huriapa ki Puketeraki, the East Otago Taiāpure Management Committee, and Coastal Otago Communities.

Guided primarily by sedimentation processes and community consultation, this research takes place north of the Otago Peninsula, between Taiaroa Head and Waikouaiti along the coast surrounding the East Otago Taiāpure. My research is guided by two key aims, each with a set of complimentary objectives, research questions, and experiments. The first aim examines the sediment regime and morphodynamic processes of the East Otago Coast through the delineation of hierarchical sediment compartments and production of a sediment budget model. Once established, the developed sediment budget will be used to investigate concerns of landscape responses to sea level rise as highlighted by local community and iwi. This investigation is driven by the second research aim which is to assess the impacts of sea level rise on localised shoreline response on the East Otago Coast. The sediment budget model will be used in conjunction with sensitivity assessments of the landscape to explore a range of different predicted sea level rise conditions.

I would like to acknowledge my Supervisors, Professor Wayne Stephenson and Emily Tidey; Coastal People: Southern Skies CoRE; Kāti Huriapa ki Puketeraki; the East Otago Taiāpure Management Committee; and Coastal Otago communities. Your interest, generosity and contributions to my research so far has been incredible, thank you.

If you have any questions or interests in my research, please contact me at: hudru002@student.otago.ac.nz

Newly-claimed seascapes: Options and potential applications

Lincoln University Master of Applied Science graduate, Faye White, recently published her thesis findings in the journal *Global Environmental Change Advances*.

Faye looked at the critical question of what can potentially be done with coastal areas that will be imminently- or are newly-inundated from sea-level rise (SLR). For example, they could be repurposed (i.e., changing the use and function of the seascape) in sheltered coastal waterways for aquaculture, fisheries, wetlands, and/or blue carbon, which may help enable ongoing sustainable and adaptive management.

Understandably, this has received little attention, as protection, accommodation, retreat and/or adaptation (the IPCC's 'PARA' framework) have been the predominant focus of communities facing difficult choices.

Faye undertook a systematic literature search and evaluated over 14,000 articles, from which 53 articles were identified that contained a range of potential options for repurposing 'newly-claimed seascapes'. She did not identify any studies that specifically centred on developing a range of options for repurposing inundated areas when responding to SLR. Therefore, she searched for options that could be reconceptualised for the preparation and management of newly-claimed seascapes. Faye's purpose was not to examine the feasibility of such options as these will be place- and context-specific; for example, abandoned and decontaminated structures could provide fish nursery habitat as artificial reefs.

In her research, Faye was mindful to state that repurposing not be viewed as a substitute for, or to divert attention away from, urgent investment in short- to medium-term management priorities to respond to SLR. Rather, her study offers a signal for policymakers and communities to consider whether imminently- or newly-inundated spaces could be reimagined and transitioned in some areas. This may be an important restorative frame.

Faye's work suggests that repurposing may extend the 'solution space' beyond the point of SLR impact, where the biophysical and socio-economic contexts are favourable. That framing may assist in reflexive management over long time scales, and that repurposing could extend the PARA management framework to PARAR.

Link to journal article: https://doi.org/10.1016/j.gecadv.2023.100002

Link to thesis: https://hdl.handle.net/10182/16903

Faye was supervised by Associate Professor Hamish Rennie and Dr Steve Urlich, and financial support was provided by a Sustainable Seas Scholarship and Lincoln University.

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