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

Issue 78 • July 2022

Nature-based solutions...

...are a family of environmental management approaches that address societal challenges in a holistic way. To find out how this relates to coastal climate change, turn to page 3.

Waiheke Island (Photo: Pixabay)

ISSN 1172-6938

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Word from the Chair

Kia ora koutou katoa. We hope you are surviving this wet winter and are as pleased as we are that we are now on the downhill slope back to warmer weather. Apologies for the slight delay in the release of this issue, but our friend Covid struck again! However, better late than never, and we have some great content to share with you all.

Firstly, we wish to acknowledge the sad loss of long-term NZCS member Andrew Laing. Andrew was a key contributor to the formation of NZCS and setting the foundations for where the Society is today. His contributions to the Society, and to meteorological and ocean climate science in New Zealand, has been an important one. The NZCS management committee shares its sincerest condolences with Andrew's family. Noho rangimāire Andrew.

Planning is well underway for the upcoming conference at Waiheke Island in November (see page 20). Keep a close eye on the weekly email digest which will have information on abstract submission soon. The organising committee are working hard in the background to ensure we make the most of holding our conference in such a great location and we are even more excited that this will be the first in-person conference since Invercargill in 2019. We are really looking forward to seeing you there!

NZCS had a productive committee meeting recently. The discussion was focussed on the Waiheke conference, preparation of Special Issue 5 (which is shaping up amazingly well and will be our longest publication to date), the NZCS strategic review, and how NZCS can provide support for the development of its members. We have lots of great ideas flying around – now we just need to find the time to get them up and running! As always, we would love to hear from our members on what we can do to benefit you.

If you have any ideas please send them through to us at: nzcoastalsociety@gmail.com.

Additionally, Jenni Fitzgerald has joined the management committee as Central Government Liaison. Jenni is the Environmental Planning Manager at NZTA Waka Kotahi and previously served on the committee. It's great to have you back on board Jenni!

Amy Robinson and Mark Ivamy
NZ Coastal Society Co-Chairs

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).

Defining nature-based solutions for coastal climate change in Aotearoa New Zealand

Shane Orchard[1]

Introduction

There is now substantial variation in how nature-based solutions (NbS) are defined and what they signify – but that hasn't deterred an explosion of interest in the underlying concepts and their applications. In broad terms, this family of environmental management approaches addresses societal challenges in a holistic way.

On the international front, there has been a steady accumulation of publications on the application of NbS to a wide range of contexts (e.g., urban restructuring, agriculture) and disciplines (e.g., benefits accounting) (Faivre et al. 2017; Brill et al. 2021).

Many of these publications identify principles, or propose evaluation models or performance indicators to guide the design and implementation of NbS. At the same time, moves are underway to sharpen the definition of NbS and strengthen the consistency and quality assurance aspects of projects that are undertaken under the auspices of NbS. This set of initiatives has a focus on supporting the potential of NbS as a transformative approach to sustainable development. They are also expected to influence the evidence base for what NbS entails and can accomplish, in turn influencing the levels of policy and funding support that are made available for NbS (Cohen-Shacham et al. 2019).

As we progress the NbS discourse here in Aotearoa New Zealand there is a need to consider these global developments to inform national NbS policy and guidance. In doing so we have the ability to influence and optimise the outcomes associated with the implementation of NbS concepts.

This article provides an overview of international trends and recent developments before discussing some of the key implications for environmental practitioners, researchers, policy developers and funders interested in NbS.

Different takes on NbS

NbS definitions

The terminology used to identify NbS lies at the heart of its call to action. Its communication is also essential for the mainstreaming and upscaling of NbS while preventing misuse of the term. For example, greenwashing may become commonplace if NbS are associated with relatively minor greening components in projects that otherwise contribute to the degradation of natural environments. Such projects may remain part of the problem rather than a 'solution' for the maintenance of natural environment values and resources faced with challenges such as climate change. At the same time, NbS can be applied across a range of contexts and scales so it is important that a degree of flexibility and adaptability is retained and recognised.

There are three main definitions of NbS in the contemporary literature (Table 1). The European Commission definition is arguably the least specific since any type of benefit to nature would appear to meet the objectives alongside the provision of social and economic benefits (European Commission 2020). The European Parliament definition has some similarities, but with the notable addition of a focus on addressing societal challenges in sustainable ways (European Parliament 2017). This serves to clarify the overall intent of NbS as a tool to support sustainability at various scales (Faivre et al. 2017). The IUCN definition provides more specific attention to the protection of nature in the design of NbS. This can be interpreted as an extension of the European Parliament focus on sustainable outcomes but goes further by reinforcing the need to maintain effectiveness over time. Projects that are inspired by nature, or mimic nature (i.e., biomimicry), are not regarded as NbS unless they clearly qualify on other grounds (Cohen-Shacham et al. 2016).

Implications of definitional differences

A lack of consensus in the meaning of key terms has a significant impact on the substance of NbS projects and their

NbS Definitions	References
European Commission Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes, and seascapes, through locally adapted, resource-efficient and systemic interventions.	Maes and Jacobs (2015)
European Parliament Actions inspired by, supported by or copied from nature that aim to help societies address a variety of environmental, social and economic challenges in sustainable ways. Most nature-based solutions do not have a single objective, but aim to bring multiple co-benefits.	European Parliament (2017)
International Union for Conservation of Nature (IUCN) Actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges, effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.	IUCN Resolution 069 IUCN (2016)

Table 1: Definitions of nature-based solutions (NbS) in the contemporary literature.

(1) Independent consultant at Waterlink and Research Associate at the University of Canterbury

outcomes. The major definitional differences boil down to variance in the extent of the benefits to nature. This includes attention to the distribution, intensity, additionality and permanence of the effects that are attributable to the NbS. The level of attention to these aspects also influences the degree to which they are required to be measured. In turn, this influences the evidence base for NbS as a framework for integrated solutions – and over time will ultimately define it.

One of the key arguments in the IUCN position involves maximising the potential of the NbS concept as a game-changer for sustainable development, in contrast to being just one of several terms broadly equated with greening initiatives, or the exploitation of nature for human needs (Cohen-Shacham et al. 2016). To address these aspects, IUCN has proposed eight principles that contribute to NbS in the sense of a definitional framework (Cohen-Shacham et al. 2019; Cohen-Shacham et al. 2016).

Another useful perspective was suggested by UNEP (2021) in relation to climate mitigation whereby agreed standards could play a safeguarding function against the potentially undesirable consequences of poorly-designed initiatives (Figure 1), and this same thinking can be applied to other NbS.

Potential role of standards

In a recent development, the IUCN has developed a Global Standard for NbS (hereafter the 'Standard') (IUCN 2020a). It is based on eight criteria and 28 indicators informed by the IUCN NbS principles (Figure 2). The Standard is currently framed as a tool to assess the extent to which an intervention would qualify as a NbS, and as a facilitative design tool to be used to strengthen the robustness of any proposed solution (IUCN 2020b). Another aspect of the rationale for a standard is the identification and promotion of good practices.

Such a focus requires that situational and value-laden dimensions of NbS are considered in the evolution of good practice concepts, and this is provided for in the IUCN Standard through the creation of a governance entity to support ongoing development and review (IUCN 2020a). With

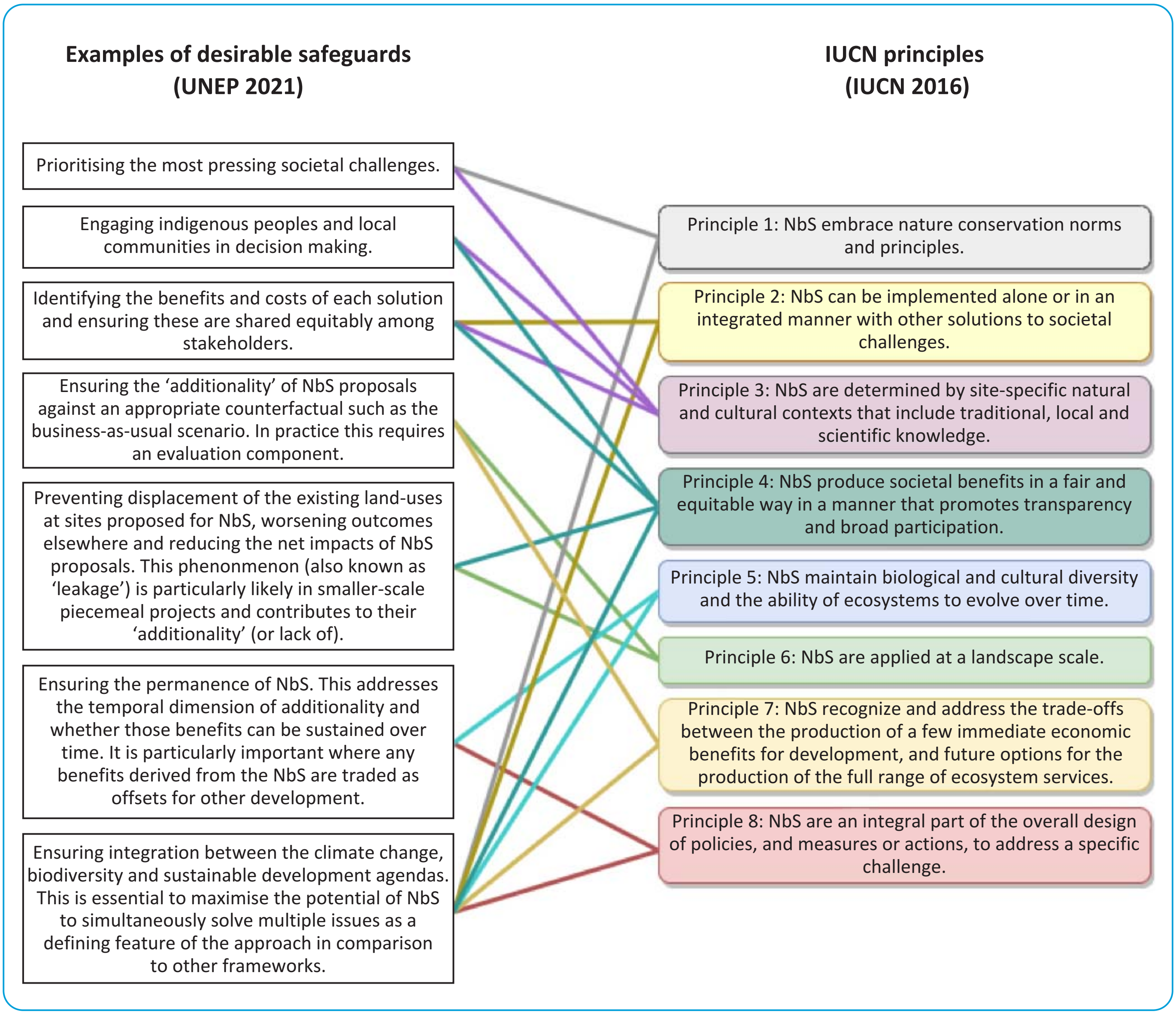

Figure 1: Undesirable consequences from poorly designed climate mitigation strategies (UNEP, 2021) mapped against the eight preliminary principles for nature-based solutions (NbS) proposed by the IUCN (Cohen-Shacham et al. 2016; IUCN 2016).

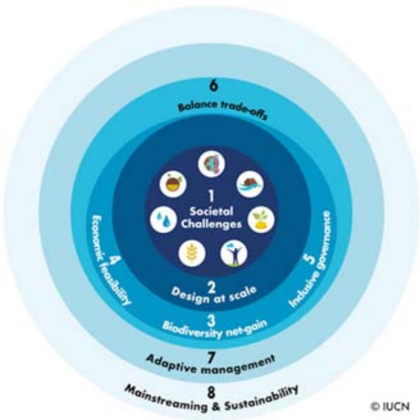

Figure 2: Relationships between the eight criteria that make up IUCN's Global Standard for Nature-based Solutions (IUCN 2020a).

this in mind the Standard may evolve further and could be adapted for a variety of contexts and purposes over time.

Application to coastal climate change

Coastal climate change is an example of a societal challenge that is perfectly suited to NbS. It also exemplifies the principle of natural environments being themselves impacted by climate change alongside their potential role in reducing risks to anthropogenic environments and values (Orchard 2014). Furthermore, they may assist both climate mitigation (e.g., carbon sequestration) and climate adaptation objectives (e.g., reduction of wave erosion risks), and some forms of NbS are able to deliver both (Kabisch et el. 2016).

Conversely, the failure to incorporate natural environments in climate change responses is form of maladaptation with major negative consequences for both biodiversity and society because of the need to maintain the natural capital that underpins ecosystem services (Costanza et al. 1998; Daily & Matson 2008). This is a key reason for the IUCN's strong stance on combating the climate change and biodiversity crises simultaneously to ensure that planetary life support systems do not continue to degrade.

Coastal environments near the land-water interface are particularly vulnerable to climate change because of their exposure to both hydrometeorological hazards and incremental drivers of change such as sea-level rise. The popularity of coastal areas for intensive land uses and settlement (Small & Nicholls 2003) also contributes to a 'perfect storm' for climate change adaptation by driving competition for space and presenting complex interactions between current land and water-use rights and the changing landscape. The implementation and upscaling of NbS is particularly challenging in these settings but important opportunities are likely to arise in the context of natural hazard management and recovery from natural disasters (Orchard & Schiel 2021). At the same time, many important species and resources are already protected under law. This not only provides an agreed policy standpoint for nature-based interventions, but also recognises the legacy effects of historical and often anthropogenic decline. NbS can provide a framework for solving these complex and often intertwined aspects of climate change at the necessary scales (Seddon et al. 2021).

Takeaways for Aotearoa New Zealand

At this early stage of NbS promotion and adoption it is important to take stock of the international dialogue and distil its significance. These aspects challenge the potential utility and value of NbS alongside other environmental management frameworks. In the near future, new developments may include clarity over the interventions that practitioners should associate with NbS and clearer direction for policy makers and funders looking to harness the concept in the development of specific strategies. The international literature remains fast-evolving and inconclusive at the current point in time, despite notable recent developments.

It is hoped that the brief overview provided here will support a discussion around the best ways to advance the NbS concept in our unique social-ecological contexts here in Aotearoa New Zealand.

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Pauanui Coastal Restoration – an example of community-driven environmental outcomes

Jamie Boyle, Thames-Coromandel District Council

Over the last two years, the southern shoreline in Pauanui has experienced successive storm events and has been assessed as unprecedented in the history of monitoring at Pauanui (Tonkin and Taylor, 2022). A cluster of storms occurred between April and September 2020, and again from May to October 2021. These storm clusters lasted the duration of winter months, with large and persistent swells recurring every two to three weeks and lasting anywhere between two and 10 days. Figure 1 shows a beach profile cross-section, where the September 2021 profile is the most landward since 1996. Also presented is the significant volume loss that has historically been interrupted by beach recovery.

Recent studies completed by Tonkin and Taylor (2022) compared University of Auckland hindcast data and the Bowentown wave buoy data with the beach profile records. They found that, whilst the wave events were not significant in size, it was the duration, cumulative nature, and lowering of the upper beach that allowed anomalous high runup hours, ensuing shoreline retreat. Figure 1 shows the unusually high number of extreme runup hours in winter 2020 and again in winter 2021. These align with the erosion anomalies when a significant volume of sediment was lost from the profile.

Unlike a more natural dune system, where successive dune plant zones can accommodate coastal erosion, the narrow Pauanui foredune system is constrained by a large, grassed reserve. Historically, dune restoration in Pauanui has been width-limited (maximum of 5 m) to maintain the highly valued reserve space. However, this has meant that following erosion events in the past, only a very narrow margin of the native sand trapping spinifex and pingao plants had remained. Unfortunately, the events of the last two years removed all native plants and only the grassed reserve remained. As a result, all dune self-repair potential was gone.

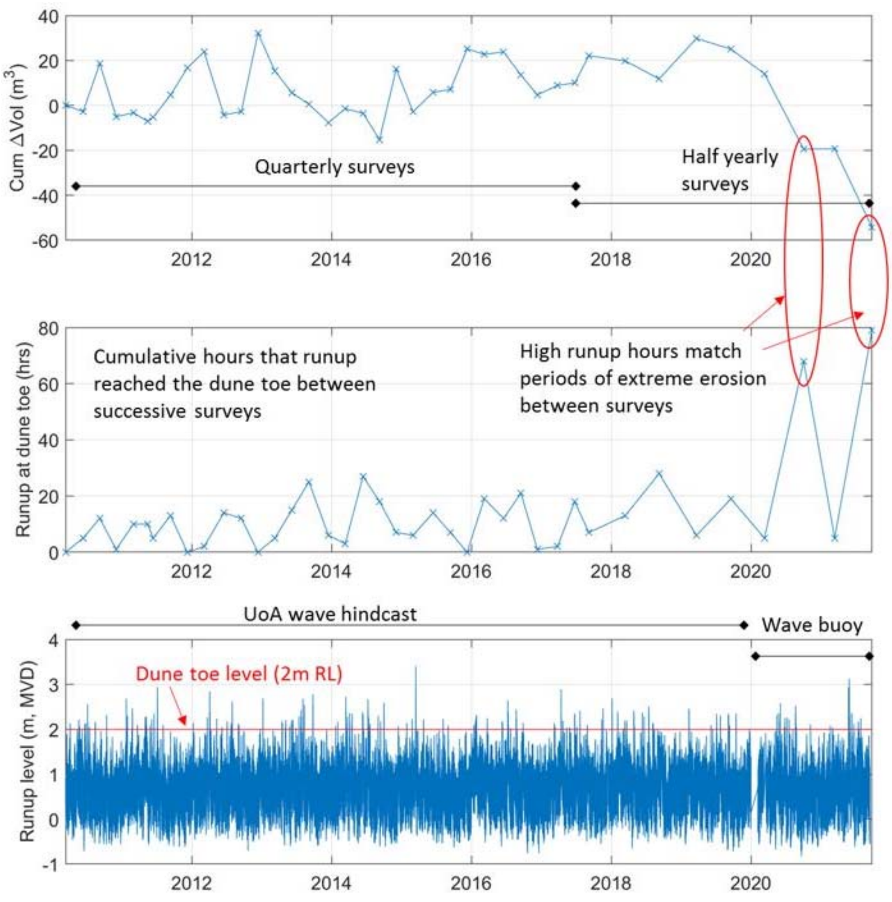

Figure 1: Comparison of wave runup and volumetric change at Waikato Regional Council beach profile CCS40-1 since 2010 (Source: Tonkin and Taylor, 2022).

Using a scientific approach, a much larger restored dune width was proposed to accommodate future erosion events and provide enough remaining plants to self-repair. This width was planned to take up approximately half of the grassed reserve and challenge the use of the reserve space. As such, significant community consultation was required. Thames-Coromandel District Council (TCDC) presented the proposal in a public meeting, and this was initially met with opposition. It was understandable that a one-off presentation is difficult to both contextualise and accept, and particularly when the work required needed a shift in the reserve use.

On the back of this meeting, a silver lining emerged with a small group getting together to discuss the merits of what TCDC had proposed. They sought external coastal scientific advice and, after much deliberation, the consensus was that the work proposed was indeed the most suitable for the current situation and this led to the formation of the 'Pauanui Dune Protection Society' (PDPS). Between May 2021 and early 2022, the PDPS put in a huge amount of work communicating with Pauanui ratepayers the need to undertake this work and helped disseminate some of the science and misinformation around coastal restoration work. Ultimately, the group and its members grew and gathered a large amount of community support for the project, as well as contributing to the restoration concept design and financing of native plant purchases.

This work culminated in May 2022, where one of New Zealand's largest ever (and Thames-Coromandel District Council's largest) single restoration events took place (see Figure 2). We had over 200 volunteers to help put over 13,000 native dune plants in the ground over a 265 m length of shoreline. The success of this event, and the hard graft leading up to it, shows the level of engagement that is both required and pertinent to large-scale restoration work. As a result, the PDPS and TCDC intend to broaden the scope of this work further north and south of the project area.

In the face of pending sea level rise and expected coastal erosion, we envisage that the magnitude of coastal restoration required to help combat future impacts needs to increase. The work presented at Pauanui highlights that there are challenges in how this is completed. However, with a clear and transparent process that is based on sound science, we believe that this level of coastal restoration is fully achievable and necessary if we want to transform suitable adaptation of the coastal zone.

We would like to put out a massive thank you to our volunteers and stakeholders who were involved in the preparation, undertaking and completion of this historic event (given in no particular order):

- Mercury Bay Environmental Trust
- Department of Conservation (Whitianga)
- New Zealand Coastal Society
- Waikato Regional Council
- Coastcare (Onemana, Waikato)
- Pauanui Dune Protection Society
- Recreational Services
- Hikuai School
- Valley Ed (Thames)
- Coastlands Nursery
- Storms Contracting
- Scotty's Bobcats
- East Coast Hire
- The wider Pauanui community and other volunteers.

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Figure 2: Before (top) showing the extent of shoreline erosion since May 2020, and after (bottom) showing the reshaping and planting work completed in May 2022 (Photos: Jamie Boyle).

Figure 3: Success achieved with a great group of volunteers (Photo: Jamie Boyle).

NZCS archive & downloads

The NZCS website houses an extensive archive of the Society's publications, including back issues of *Coastal News* (from issue 1, 1996 to date) and 'hot topic' reprints of significant articles from previous issues; newsletter author and article indexes (updated yearly); an author's guide to writing articles for NZCS publications; and copies of the four NZCS Special publications (published 2014-2020). All these can be accessed at www.coastalsociety.org.nz under the 'Media>Publications' tab on the main menu.

Fine sediments add to coastal squeeze for seagrass

Iñigo Zabarte-Maeztu and Fleur Matheson, NIWA Hamilton

Why seagrass matters

Seagrass meadows are a valued and important component of coastal marine ecosystems globally, but they are declining at an alarming rate (Waycott et al. 2009). In New Zealand, the natural range for our sole species of seagrass, *Zostera muelleri*, is from Cape Reinga to Stewart Island (Inglis 2003). It usually grows in shallow (<7m), sheltered, intertidal and shallow subtidal waters as continuous, or sometimes patchy, meadows.

The full historical extent of seagrass meadows in New Zealand coastal waters is unknown, but they are likely to have been much more extensive than they are today. Studies show that seagrass has been lost from various human-impacted estuaries and coastal embayments around our coastline. Consequently, *Z. muelleri* is classified as 'at-risk declining' by the Department of Conservation (de Lange et al. 2018).

Seagrass meadows are physically valued for biodiversity, as a marine habitat, refuge, and food source. In addition, they provide important functions for nutrient uptake and cycling, water and sediment oxygenation, foreshore stabilisation and wave dampening promoting particle settling, and for 'blue carbon' sequestration. In New Zealand, seagrass meadows have special value as nursery habitats for commercially important fish stocks, including snapper, especially in northern estuaries.

Fine sediments

The infilling of estuaries with fine sediments has been implicated in significant losses of seagrass meadows in several New Zealand estuaries (Tauranga Harbour, Porirua Harbour, New River Estuary). Coastal areas and estuaries are receiving environments for contemporary and legacy terrigenous fine sediments. Deforestation and soil erosion in the last 150 years has increased estuarine sedimentation rates ten-fold (Swales et al. 2020). Increasingly energetic rainstorms resulting from climate change are predicted in places to further increase sediment loads, particularly in areas with predominant soft-rock geology. Sea level rise is also set to increase inland migration pressure for coastal habitats, and warming ocean waters are likely to increase metabolic rates and therefore light requirements for aquatic plants (Matheson 2022). Consequently, seagrasses in the coastal zone are under significant cumulative stresses.

Fine sediments affect seagrasses in three ways (Zabarte-Maeztu et al., 2021) (Figure 1). Firstly, fine sediments *reduce light penetration* when suspended in the water column. As seagrasses need sufficient light to grow, they are especially vulnerable to this mode of action. Secondly, fine sediments may *settle on seagrasses* smothering leaf surfaces, inhibiting photosynthesis by shading, imposing a biological oxygen demand, and restricting metabolite exchange. In extreme cases, complete burial of whole plants may lead to loss of seagrasses. Thirdly, settled fine sediments and associated organic matter *intrude into substrate pore space* and degrade the physico-chemical environment of the seagrass rhizosphere by reducing porosity, and thus permeability. Low porosity, especially when accompanied by organic enrichment, reduces oxygen availability, shifts microbial metabolism to anaerobic pathways, and ultimately increases the prevalence of toxins associated with anoxia,

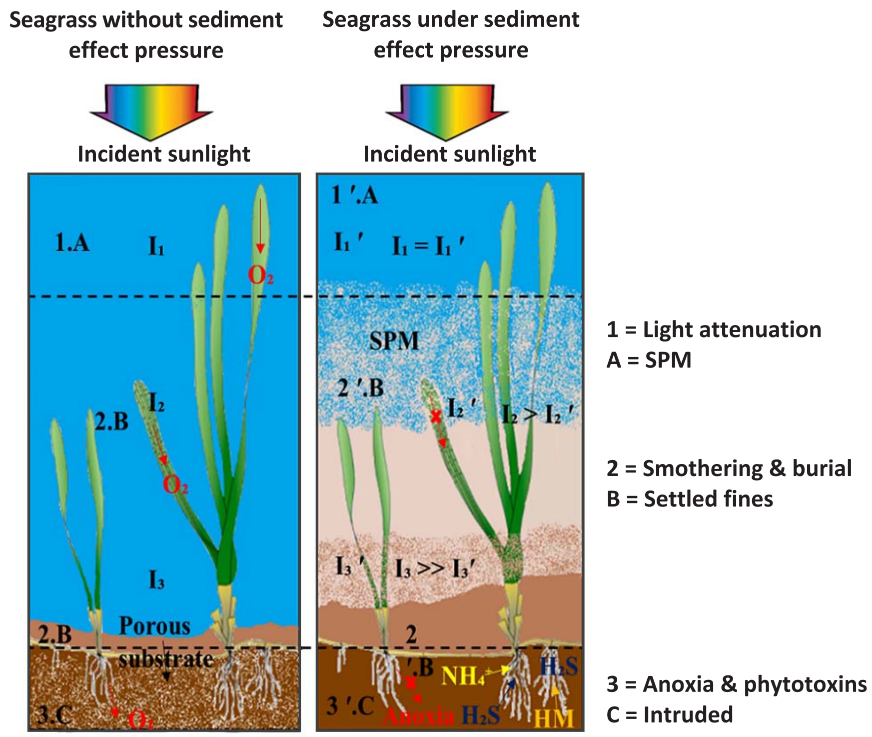

Figure 1: Conceptual diagram showing the three main modes of action for fine sediment effects on seagrasses. Numbers indicate the damage mechanisms: 1) Effect on light climate by suspended sediment, 2) Burial with light attenuation and smothering by settled sediment, and 3) alterations to substrate chemistry by intruded sediment. Letters indicate the locations where sediment modes of actions operate on the seagrass: A) Water column, B) Settled sediment on leaf surfaces or seafloor, and C) Sediment intruded into the substrate pores.The substrate is represented as browner under high sediment loading to illustrate higher sediment bulk density, organic oxygen demand, and lower pore space. These three effects of fine sediment interact to stress seagrass meadows. I is irradiance (or light), SPM is suspended particulate matter, NH4+ is ammoniacal nitrogen, and HM is heavy metals.

such as hydrogen sulphide (H_2S), ammoniacal nitrogen (NH_4^+), and heavy metals.

To effectively manage fine sediments in the coastal marine environment to protect seagrasses, and other vulnerable marine habitats, under contemporary and future climate settings, we need to be able to predict how these systems will respond under a range of scenarios. Robust models are needed that link catchment sediment loads to concentrations of suspended and deposited sediments in coastal marine environments to seagrass responses.

Carbon balance is key

NIWA research being conducted at Waiheke Island in the Hauraki Gulf will inform model development. Seagrass is presently found on Waiheke Island only at Anzac Bay (Figure 2) and at Te Huruhi Bay. It grows mostly in the intertidal zone. Accounts from early twentieth century trawl surveys of abundant 'grass' pulled up in nets in the Tamaki Strait (Morrison 2021) suggest that seagrass may have been much more prevalent along this sheltered coastline, and extended into deeper waters, in the past.

At Anzac Bay, where the largest remaining area of seagrass occurs, instruments have been deployed to measure the light that is available for plants to photosynthesise. Measurements are made just above the seabed, at the height of the seagrass canopy so they account for the presence of suspended sediments affecting light availability when plants are submerged (in the water).

Instruments have been deployed at the depth limit of the seagrass bed in the lower intertidal zone. Beyond this limit, we can reasonably assume that light becomes too low to sustain growth in the long term. For comparison, instruments have also been deployed to measure light availability in the upper intertidal zone where light should not be limiting.

Under laboratory conditions, photosynthetic parameters have been derived for intertidal *Zostera muelleri* growing under submerged and emerged (out of the water) conditions (Zabarte-Maeztu 2021). Crucial to seagrass survival is a parameter called the compensation irradiance (CI). This is the light level at which carbon production via photosynthesis is equal to carbon consumption by respiration (net photosynthesis = 0). Carbon production must exceed consumption for long term survival of plants.

Our laboratory measurements indicate a difference in the compensation irradiance for plants when growing submerged versus emerged (Figure 3). Our results indicate that a much lower light requirement is needed when plants are submerged. This presumably reflects that there is an energetic cost associated with desiccation stress (a type of injury caused when the amount of moisture lost by the leaves exceeds the amount of water taken in by roots) when plants are emerged.

We have applied the relationships shown in Figure 3 to field data from Anzac Bay. Results show that seagrass in the upper intertidal zone has a positive carbon balance, despite having greater light requirements (because they are emerged on average for longer). In contrast, at the maximum depth limit seagrass carbon balance is negative for extended periods of time (over 10 days) (Figure 4), despite having lower light requirements (because they are submerged on average for longer).

The implication of our findings to date is that if increased sediment loading to coastal waters along this Waiheke coastline reduces benthic light availability further in future, then seagrass extent across the tidal zone is likely to shrink further. Our future work in this area aims to further refine and apply these parameters in sediment-transport models to predict seagrass response to future changes in fine sediment loads.

Acknowledgements

We thank Professor Ian Hawes who helped with conceptualisation of the laboratory experiments. This research is supported by the MBIE Strategic Science Investment Fund (Contracts FWCE 2104, 2204) and a NIWA Science Capability Development Fund Scholarship to I. Zabarte-Maeztu.

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Figure 2: Intertidal seagrass at Anzac Bay, Waiheke Island (Photo: Fleur Matheson).

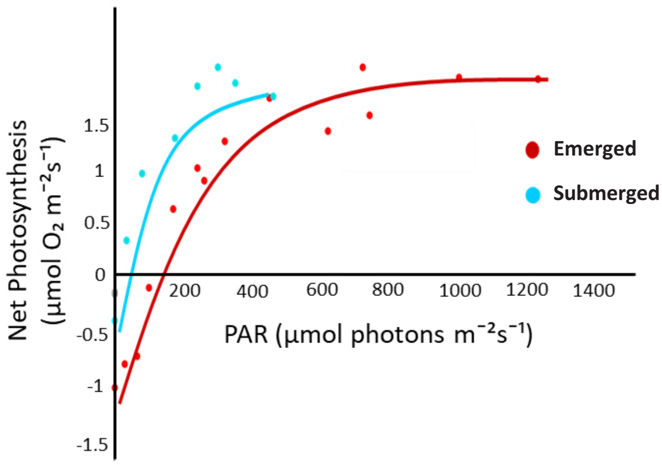

Figure 3: Photosynthesis Irradiance (PI) curves for specimens of Zostera muelleri *when emerged (in red) and when submerged (in blue) (from Zabarte-Maeztu, 2021).*

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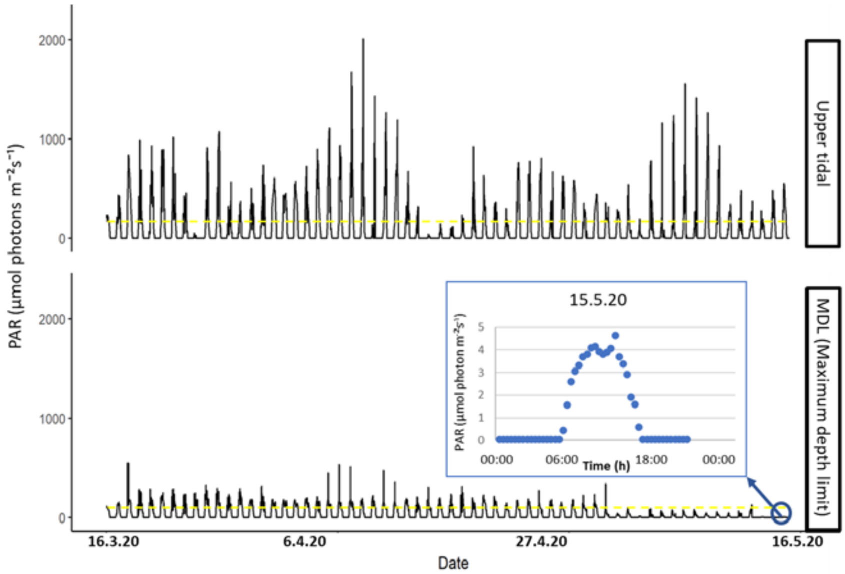

Figure 4: Photosynthetically active radiation (PAR) data at upper tidal area and at maximum depth limit for an example period of time. Yellow dash line shows the compensation irradiance (CI) at each location based on an average exposure time of the plants. An example of a day in which PAR falls below compensation irradiance at the maximum depth limit.

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Dr Andrew Laing – Obituary

15 September 1953-12 April 2022

Terry Hume, Life Member NZCS

It is with the greatest sadness that we learnt that Dr Andrew Laing, a well-respected and highly regarded member of the New Zealand Coastal Society and researcher in ocean climate science, passed peacefully with his family by his side after a brave battle with cancer. Andrew is survived by his wife Janice and children Katie, Emma and Hamish. Andrew was a devoted family man and loved overseas travel, he was a keen runner and hiker and talented musician.

Andrew started his career in ocean climate research by joining the NZ MetService in Wellington as a research meteorologist, after completion of his PhD in mathematics at the University of Canterbury in 1978. Six years later he was awarded a National Research Advisory Council Fellowship that enabled him to travel to the UK to work as a visiting scientist for two years at the Institute of Oceanographic Sciences. A product of this visit appeared in 1983, by way of Andrew being sole author of a paper on a spectral wave model for the SW Pacific centred on New Zealand and comprising a numerical grid of 15 by 20 nodes (how computing has changed!).

Andrew moved to NIWA with the restructuring of the government science system and creation of the Crown Research Institutes in 1992. As the only marine meteorological researcher at the MetService, Andrew eagerly joined the NIWA physical oceanographic group thereby enabling his ocean science interests to flourish. Within two years of arriving at NIWA's station at Greta Point he became a Project Director, effectively taking leadership of the ocean physics group, providing oversight of their research and applied science projects, along with the pastoral care of the staff.

His science expertise broadened into the satellite-based observations for studying ocean currents, waves and wind and professional consulting services in marine meteorology. He applied this knowledge to coastal erosion, wharf and port developments, cable route surveys, sea-level rise, aquaculture development, and wave energy generation. Andrew became the go-to person for providing wind and wave information and route simulations for yacht ocean racing, working alongside yacht designers and racers for Whitbread Round- the-World and America's Cup races, the Melbourne-to-Osaka Race, and Race 2000, a non-stop around the world race that was to be won by New Zealand sailors.

Andrew's science and expertise were recognised through publications in international scientific journals and membership and support of professional scientific societies. He was a founding member of the NZ Ocean Waves Society formed in 1987, where he held the role of President and also Vice-President through to 1992, established a newsletter and a management committee, and organised symposia. Following the formation of the NZCS in 1992, the membership was broadened and strengthened by a merger with the NZ Ocean Waves Society in 1994. Andrew also played an active role as a member of the NZ Marine Sciences Society and the Meteorological Society of NZ Inc. He was the New Zealand representative for both the Intergovernmental Oceanographic Commission of UNESCO and the World Meteorological Organisation's Commission for Marine Meteorology where he chaired its technical subgroup on wave modelling from 1989 to 1993.

Andrew was a leader and an exceptional manager, recognised through his appointment as NIWA's Regional Manager at Greta Point in 2000, and becoming NIWA's most senior Regional Manager when he retired in 2019. He also became the Manager for NIWA's atmospheric research station in Lauder, Central Otago, and was a member of NIWA's Operations Management Team.

Andrew was an active supporter of the NZCS for over 30 years, attending and presenting technical papers at many of the annual conferences. As a senior manager in NIWA he continued to support the society's activities through facilitating staff participation at events and organising conferences and sponsorship. NZCS members have reflected on Andrew's contribution as:

> *'…a very intelligent man with a great sense of humour... a joy to work with and excellent company at coastal conferences…';*
>
> *'…great support and collaborator to me in my early days at NIWA';*
>
> *'…he was always so passionate about bringing experts in different areas of coastal science and engineering together'; and*
>
> *'…we have lost a true coastal gentleman'.*

We all benefited from Andrew's collaborative approach, sharing of knowledge, his scientific inquisitiveness, wise counsel, and sense of humour. His passing will be sorely felt by his family, as well as within the NZCS and across the wider coastal community.

(my thanks to Dr Rob Murdoch of NIWA for providing insight into Andrew's career)

NZCS publication updates

Special publications go global

Now numbering four (with a fifth in preparation), NZCS special publications are produced every two years, and are intended to highlight new knowledge, expert perspectives, and practical experience on coastal issues in Aotearoa New Zealand. It is also an aim of the Society to distribute these publications freely and widely, both in print and as pdf downloads from its website.

At the beginning of June, the NZCS special publications were added to figshare.com via a dedicated page on the University of Auckland's figshare site (https://auckland.figshare.com/coastalsociety).

Figshare.com is a global repository where users can upload content that is then freely available to share and download. In addition, since figshare is a widely accessed global repository, content is more easily found than would be the case with, say, a search engine query. However, it is not intended to replace the current publication distribution methods (which will continue), but rather provide an additional channel with a global audience in mind.

To enable fair use of any downloaded NZCS material, the existing special publications have been reissued with Creative Commons Licences, and to ensure permanent availability have been assigned DOI (digital object identifier) addresses. Unlike a URL web address, a DOI reference never changes once it is created, meaning the content is always accessible even if a web address or other references to its location changes.

The figshare page has been in place since early June, and has certainly attracted interest. After six weeks, the special publications have collectively received 979 views and 59 downloads, with the bulk of both being from the USA. In terms of individual titles, both views and downloads are remarkably consistent, though *Shaky Shores – Coastal impacts & responses to the 2016 Kaikoura earthquakes* (2018) has the edge in views, and *Adapting to the consequences of climate change: Engaging with communities* (2016) leads in downloads. If you want a more detailed look at the views and downloads, click on the 'Stats' button in the page link shown above.

Special publication 5

Progress on the fifth NZCS special publication (*Coastal Adaptation – adapting to coastal change and hazard risk in Aotearoa New Zealand*) is continuing at pace – the content and structure is now firmly established, and most of the articles have been provided in their final peer-reviewed form. Next up is the book design and layout phase, which is expected to be completed by early September, followed by author reviews and final proofing.

Publication is on track for early November to coincide with the NZCS Annual Conference, and it will be available in both print format (which will be distributed to NZCS members, organisations, libraries and local government agencies) and an electronic version that will be freely available on the NZCS and figshare websites.

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News from the regions

Northland

Laura Shaft, Regional Representative

Coastal adaptation planning

The Te Taitokerau Climate Adaptation Strategy (TTCAS) has now been adopted by all four Northland Councils and sets an aligned framework for the delivery of adaptation actions (see www.catt.org.nz). Work is already underway on implementing many of the 46 'priority actions' listed in the Strategy, including the community adaptation project at Raupō/Ruawai. Our first coastal adaptation pilot project is underway in the kumara capital of New Zealand – Raupō/Ruawai. Community engagement is kicking off with an *Our Stories, Our Future* interactive showcase over four days. Detailed modelling of the Raupō Drainage Scheme is nearing completion and will be a key input into the planning process.

Dune fauna monitoring

Over the summer Northland Regional Council ran a dune health pilot programme with the Patuharakeke Te Iwi Trust Board. The purpose was to develop a fuller picture of dune health to complement the dune vegetation monitoring being undertaken. The study assessed the current state of dunes in places where work (such as pest, weed control and planting) is being undertaken, versus areas where no work is occurring. Four sites were chosen across Bream Bay to ensure a wide range of habitats and levels of management were included.

At each site a 5-minute bird count was conducted and four transects set up to survey vegetation, pests, skinks and invertebrates. At two of the sites artificial shelters for skinks were placed in January and checked in March under the supervision of approved handlers. The species recorded included katipō, native cockroach, copper, shore and plague skinks, rats, hedgehogs, 24 species of plant and 22 species of bird, including the nationally critical tara iti, New Zealand fairy tern. The programme is expected to continue in Bream Bay and be implemented in other significant dune systems around Northland.

Stormwater litter project

A year-long, multi-agency project has prevented over 20,000 pieces of rubbish from entering the region's waterways. The project is a collaborative effort between Northland Regional Council, NorthTec, Whitebait Connection, the Northland District Health Board, the region's three district councils, and local businesses, aimed at determining how much plastic and other litter reaches the rivers and estuaries of Te Taitokerau each year.

In 2021, 50 LittaTraps were installed in stormwater grates across the region to identify high risk land uses and estimate how much plastic gets washed into the sea. The devices trap plastic and other litter that would otherwise be carried straight into the sea and were installed at selected sites to capture a variety of land uses, including playgrounds, carparks, supermarkets, fast food premises, and industrial sites.

NorthTec audited the contents of the traps every three months, with the final audit completed in May 2022. The final audit found that 20,450 items were captured in the traps over the year-long study period. The next stage of the project is to analyse and understand the large differences in the quantity of litter and plastic captured at different sites. The data will also be used to estimate the total quantity of plastic entering the sea each year and analyse trends to help develop targeted mitigation and education resources.

Auckland

Lara Clarke, Matthew McNeil, Andrew Allison, and Eddie Beetham, Regional Representatives

Shoreline adaptation plans

Auckland Council's Shoreline Adaptation Plans (SAPs) are progressing well. The SAP programme addresses how council-owned land and assets on the coast can be adapted to the impacts of coastal hazards and climate change over the next 100 years. For Auckland, it is a key to implementing the MfE Coastal Hazards and Climate Change Guidance and Auckland's Climate Plan.

The first Shoreline Adaptation Plan was developed for Whangaparāoa Peninsula and was approved in March. It is available publicly to view through the Auckland Council website (www.aucklandcouncil.govt.nz, search for 'Shoreline adaptation plans'). Completion of our next SAP for the coast between Beachlands and the Auckland Regions south-eastern boundary is on track for September this year. The next two SAPs are due to launch next month for the Southern Manukau Harbour and Awhitu Peninsula and more information will be available shortly on the Auckland Council 'Have your Say' webpage (www.aucklandcouncil.govt.nz/have-your-say/topics-you-can-have-your-say-on).

Pakiri sand extraction resource consent application decision

The resource consent application by McCallum Brothers Limited (MBL) for coastal and discharge permits to extract sand from the coastal marine area offshore from Pakiri Beach has been refused by Auckland Council Commissioners. The application was to extract up to 2,000,000 m^3 of sand from between the 25 m and the 40 m isobaths, with no more than 15,000 m^3 in any 12 month period between the 25 m and 30 m isobaths.

A decision is yet to be made on two further resource consent applications by MBL to extract sand from 5-10 m water depths (near shore), and from 15-25 m water depths (mid shore).

MBL are able to continue to extract sand under existing resource consents. This includes the existing resource consent for offshore extraction beyond the 25 m isobath, which expires March 2023, and, pursuant to RMA S124, under the nearshore resource consent, which expired in September 2020, till the application to renew that consent has been determined.

Council response to NPS-UD and MDRS – how coastal areas are affected

In response to the National Policy Statement on Urban Development (NPSUD) and Medium Density Residential Standards (MDRS) Auckland Council responded in April through publishing preliminary draft maps to enable public discussion and feedback. Qualifying matters exemptions in the Auckland region (which can limit building heights or density requirements) will be decided prior to their notification of a Plan Change in August 2022. In relation to the coastal environment qualifying matters identified for the feedback process included:

- Coastal Erosion and Instability – 2130 (RCP8.5+)
- Coastal Inundation 1 per cent AEP Plus 1 m sea level rise
- Floodplains
- Significant Ecological Areas
- Outstanding and High Natural Character
- Outstanding Natural Features
- Outstanding Natural Landscapes
- Historic Heritage, and
- Sites and places of significance to mana whenua.

Bay of Plenty

Jonathan Clarke, Josie Crawshaw and Scott Murray, Regional Representatives

Motiti Protection Area monitoring

The Bay of Plenty Regional Council is working with tangata whenua, the University of Waikato, and central government agencies to implement monitoring and research programmes to assess changes in biodiversity due to the marine protection. Since the implementation of the Motiti Protection Areas in August 2020, a range of monitoring has been implemented including baited remote video surveys, drop camera transects, and diver surveys to quantify fish biodiversity and benthic habitat values.

Bay of Plenty climate change risk assessment

Bay of Plenty Regional Council have contracted Tonkin and Taylor to undertake a climate change risk assessment to identify and understand climate change risks within the region. The first phase of the project was completed earlier in the year, which focused on identifying key climate risks to the region with tangata whenua and community input. The second phase is about to begin, which is undertaking a detailed risk assessment with input from key subject matter experts. The final phase will bring the findings together in a summary document that will inform the next step of adaptation planning. (For more, see www.boprc.govt.nz/environment/climate-change/regional-risk-assessment).

Kaituna Mole upgrades

The Kaituna Mole at Maketū provides river management and recreational benefits for the lower Kaituna catchment area, including a popular fishing spot, a base for coastguard monitoring, and supporting the navigatable channel for local boaties. In July 2021 BOPRC started a major upgrade on the structure to make it structurally sound, fit for purpose, and safe for public use. Upgrades involved installing 50 m of new sheet piling around the existing structure, which is capped by a new concrete deck that ties the structure together and leads into the carpark area. The project was substantially completed in February 2022, with final landscaping improvements being planned in conjunction with Western Bay of Plenty District Council.

Whakatāne Boat Harbour (Te Rāhui Herenga o Waka)

An application has been submitted to the Covid-19 Recovery Fast-track Consenting for a project to develop a commercial boat harbour and associated facilities at Whakatāne, Bay of Plenty. An independent panel has reviewed the application and issued draft resource consent conditions, and the resource consent was granted on 22 June 2022, subject to conditions to Te Rāhui Herenga Waka Whakatāne Limited for the Whakatāne commercial boat harbour application. This project forms part of the wider Whakatāne Regeneration Programme - Kaupapa Whakahaumanu o Whakatāne.

Ōpōtiki Harbour development

The Ōpōtiki Harbour development will create a navigable harbour entrance at the Waioeka River mouth to service offshore aquaculture development, a mussel processing factory in Ōpōtiki, and associated marine infrastructure. The development will provide navigable access for commercial vessels to service the existing 3,800-hectare offshore mussel farm, enable additional aquaculture ventures and marine related development, increase overall social, economic and cultural wellbeing in the Eastern Bay of Plenty, and enhance recreational opportunities and public access to the coast. The development includes the construction of two training walls either side of a 120 m wide dredged channel, the closure of the existing river mouth, and the formation of new dune habitat. The construction of the 450 m long twin training walls, the closure of the existing river mouth, and opening of the new harbour entrance is expected to be complete in late 2023.

Hawke's Bay

José Beyá, Regional Representative

Clifton to Tangoio 2120 Coastal Hazards Strategy (update from issue 77)

The Memorandum of Transition has been signed and consultation with the community is underway until 31 July. It is being proposed that Hawke's Bay Regional Council takes charge of strategy development, transferring assets, and strategy implementation, this being the preferred option. All three partner councils have signed a Memorandum of Transition supporting the proposal in principle. The transfer of assets is still subject to detailed terms being agreed between the councils in a later Asset Transfer Agreement; this is also proposed to be confirmed in place prior to 1 July 2024. The consultation document can be found at: www.consultations.nz/assets/Consultations/GOV0522-CoastalHazardsCD-V11-FINAL.pdf

Opōtiki Harbour development (Photo: HEB Construction).

The coastal ecology workstream gap analysis has been completed and the next steps have been planned, while the signals, triggers and threshold workstream is still a work in progress.

Two reports from the design workstream (short-term concept design) have been made publicly available at www.hbcoast.co.nz, and the managed retreat workstream report has been completed and should be made publicly available soon.

Napier Port preparing to officially open new 6 Wharf in July

Napier Port achieved a significant construction milestone at the end of April by completing the key physical infrastructure on its new 350 m 6 Wharf. This milestone follows the recent completion of the 6 Wharf project's two-year dredging campaign, and is one step closer to seeing the wharf become operational. Napier Port is set to host an official 6 Wharf opening and karakia ceremony on Friday 22 July 2022, which will also unveil the wharf's new formal name.

For more information see www.napierport.co.nz/ahead-of-time-and-under-budget-napier-port-preparing-to-officially-open-new-6-wharf-in-july

Taranaki

Contributed by Maria Jesus Valdes, Ranger, Marine Reserves, New Plymouth

Classifying Aotearoa's fish species

The Department of Conservation's marine reserve monitoring programme has many different research objectives. One of them is to study the diversity, abundance, and demographic parameters (characteristics such as size) of key fish species. To fulfil this objective, a versatile non-invasive technique called 'baited underwater video (BUV)' is used. BUV consists of GoPro cameras mounted on a baited metal frame at different locations at marine reserve sites (protected) and non-protected sites (control) to record 30-minute videos at each site.

Once the data is collected, it normally takes many days to analyse the footage. However, breakthroughs in artificial intelligence (AI) and machine learning mean this no longer has to be the case.

DOC has partnered with worldwide machine learning experts to create the citizen science project 'Spyfish Aotearoa'. In the Spyfish Aotearoa website (www.zooniverse.org/projects/victorav/spyfish-aotearoa) anyone anywhere can help classify fish from videos from marine reserves throughout Aotearoa to train machine learning models. At first, these models will help filter out videos with no fish or other animals. Eventually, the models will be able to identify the fish quickly and efficiently, saving DOC both time and resources.

The New Plymouth DOC marine team is excited to announce that videos collected in Tapuae marine reserve over the summer of 2022 have just been added to the Spyfish Aotearoa platform. They welcome everyone to help classify the fish in the videos. The classifications will be used to determine the effectiveness of marine reserves, inform marine management, and protect our taonga (treasured) species.

Wellington

Ryan Abrey and Verity Taylor, Regional Representatives

CentrePort dredging works

From Monday 11 April, the *Albatros*, a Dutch dredging vessel, removed material in the berth pockets in front of Aotea Quay 1-5, a portion of Thorndon Container Wharf, Seaview Wharf, and Burnham Wharf.

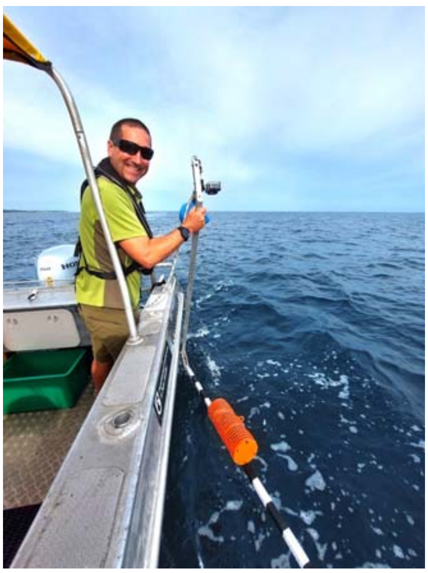
The work was undertaken to achieve the desired depths to allow for safe and efficient movement of shipping. Propeller wash and ship movements create build ups of sand on the sea floor, which needed to be removed.

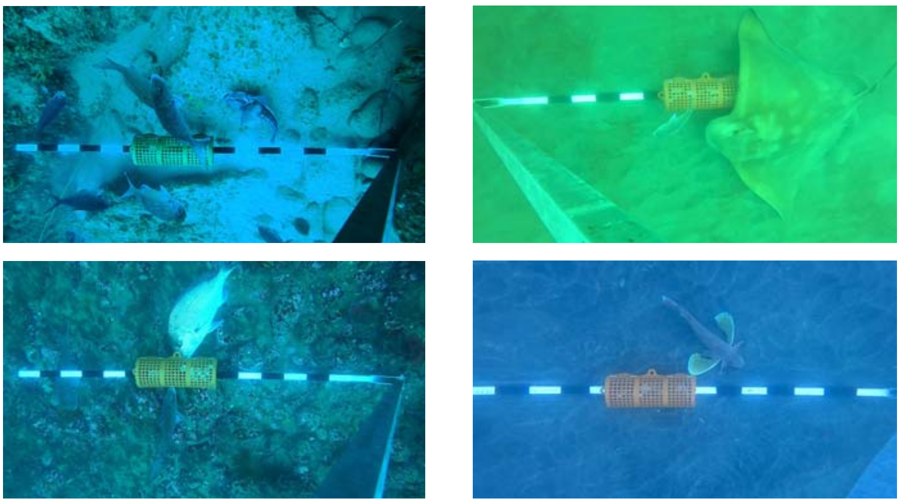
In addition, the *Albatros* did work on behalf of the Harbour Master/Greater Wellington Regional Council (GWRC), removing sand mounds at Falcon Shoals – an area of water between Seatoun and Eastbourne.

The removal of material at this site will enable greater separation of the inwards and outwards shipping channels, enhancing safety. This is acting on recommendations in a joint review by GWRC and CentrePort of navigation safety of the Wellington Harbour entrance conducted last year.

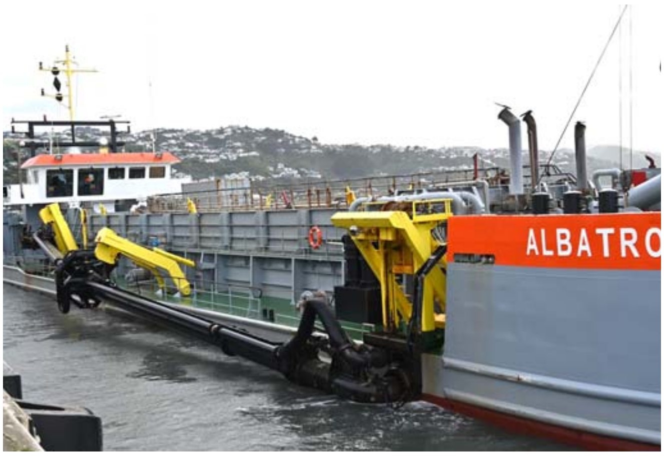
All the material removed by the *Albatros* was deposited at a site off Thorndon Container Wharf. The site has been used previously for deposits and is done safely and without disrupting the environment.

Greater Wellington Regional Council granted resource consent for the project covering areas such as care for the environment, maintenance of health and safety, and engagement with Te Whanganui a Tara iwi.





(Left) The baited underwater video system being deployed; (above) video screenshots of the system in action (Photos: Maria Jesus Valdes).



The Albatros in Wellington Harbour, April 2022 (Photos: CentrePort).

Otago

Sorrel O'Connell-Milne, Regional Representative

Tomahawk Lagoon ecosystem health

ECOTAGO is a charitable trust and citizen science team that has implemented an investigation into the environmental health of the Tomahawk Lagoon ecosystem. The group formed from an initial community meeting, which was held to discuss the occurrence of frequent and possibly harmful algal blooms in the lagoon. The residents were passionate about their 'back yard' and wanted some action from environmental managers to mitigate the situation.

At that time there was a significant paucity of reliable data in regard to water quality and biodiversity within Tomahawk Lagoon. ECOTAGO acquired some funding to implement a water quality programme to build a database that would allow a better understanding of the environmental status of the lagoon. The water parameters assessed include dissolved nutrients, turbidity, dissolved oxygen, water temperature, salinity, depth, E. coli and chlorophyll a.

ECOTAGO developed partnerships with the University of Otago, community groups (residents and school groups), BirdNZ, and environmental managers including the Otago Regional Council, Department of Conservation, and Fish and Game. Initially the group worked out of their car boots, but had the good fortune to rent the local hall to store gear and provide a place to carry out analysis of water samples. In 2016 ECOTAGO had four monitoring sites in the upper Tomahawk Lagoon and the main catchment stream. Currently eight sites in both the upper and lower lagoons and contributing streams are monitored. The group are conscious of the accuracy of data and take steps to ensure reliability of their analysis.

ECOTAGO have published an annual environmental report card that describes the water quality of the lagoon as between poor and satisfactory, and raises the question as to how the health of this water body may be improved. ECOTAGO have developed a closer working relationship with the Otago Regional Council and continue advocating for the lagoon. In the recent regional long term plan, the council have set aside funding to support the development of a catchment group, an ecological assessment of the catchment, and a permanent water quality site to further inform management of the Tomahawk Lagoon ecosystem.

During the last 12 months, ECOTAGO has designed and implemented a biodiversity investigation building a systematic picture of the fish, birds, invertebrates and planktonic

Upper Tomahawk Lagoon (Photo: Lakes380 – Our lakes' health past, present, future (www.Lakes380.com), licensed under CC BY-NC-SA 4.0, https://creativecommons.org/licenses/by-nc-sa/4.0/).

species. This data complements the water quality information to better describe the ecosystem health of Tomahawk Lagoon.

West Coast

Contributions from Don Neale (DOC & NZCS West Coast regional representative) and Paulette Birchfield (WCRC)

Coastal hazard event

A major storm event hit the West Coast on 11th June with large waves and thundery skies. Surprisingly, the sacrificial seawall at Mokihinui was impacted more during this event than with ex-cyclone Fehi in 2018, presumably because the westerly wave direction hit the seawall face-on. WCRC organised a quick repair with a couple of excavators. Other areas along the West Coast were also subject to wave inundation, but less erosion was noted. Several places usually hit badly (like Cobden and Punakaiki) held up really well, maybe having built a good buffer of beach sediment during the very mild summer months.

The photos below show deep drifts of sea foam that are a common occurrence after big storms, covering the local domain and cycle trail near Greymouth, plus what was left of the sacrificial seawall at Mokihinui.

Incident response training

Local organisations have taken advantage of CIMS (Coordinated Incident Management System) training being provided by Civil Defence. With the Alpine Fault rupture predicted to be increasingly likely as time goes on, emergency response is high on the priority list for the Coast. The standardised systems of CIMS will be useful for everything from major fault rupture to coastal storm events, floods and whale strandings.

Marine reserves monitoring

The monitoring of the remote Hautai Marine Reserve mentioned in the March Update brought a very surprising record of the critically endangered 'gravel maggot' sea slug (*Smeagol sp*.). This tiny subterranean beach creature was detected by environmental DNA (eDNA) sampling, which is proving to be an excellent method for detecting cryptic species in hard-to-survey locations. This chance discovery gained some excellent media attention that highlighted the work, collaborations and environments involved (see www.rnz.co.nz/news/national/467042/team-of-scientists-find-smeagol-sea-slug-on-remote-mainland-marine-reserve).

The Department of Conservation worked with Sustainable Coastlines in May to establish 'Litter Intelligence' beach rubbish monitoring sites at Punakaiki and Okarito. The aim is to have a New Zealand-wide network of Litter Intelligence monitoring locations using this robust method that has the tick of approval from Statistics NZ.

Marine heat wave

The South Island West Coast experienced a very significant marine heat wave in March, with sea temperatures reaching some five degrees higher than normal. The exact biological effects of these events can be hard to gauge, but some southward encroachments of warm-water species were noted over the summer, including an oarfish at Jackson Bay and a striped dolphin at Okarito.

Remains of the sacrificial seawall at Mokihinui (top); Sea foam drifts on wilderness trail (bottom left) and Karoro domain (bottom right) (Photos: WCRC).

News you might have missed

***Coastal News* Editor**

While the internet provides 24-7 access to thousands of news sites, the sheer volume and churn of stories on offer makes it is easy to overlook the 'one offs' – the intriguing, quirky or feel good items that don't make the headlines. This is equally applicable to the coastal world, so continuing our 'News you might have missed' segment, here are some stories that might have passed you by...

Coral news

Sea corals have featured in a number of stories recently, including two with health-related themes (though only one for humans). *The Daily Mail* asked – in a somewhat dramatic fashion – whether sea corals could be used to treat cancer, reporting that a 'holy grail' chemical with cytotoxic properties has been found in common soft corals off the Florida coast (for the full story, see www.dailymail.co.uk/sciencetech/article-10845905/Could-sea-corals-used-treat-CANCER-Scientists-discover-holy-grail-chemical-soft-corals.html). Meanwhile, the *Guardian* reports on a recent study suggesting that bottlenose dolphins may be selectively using corals to treat skin ailments, adding to the growing research on coral's previously unexplored medicinal properties (see: www.theguardian.com/environment/2022/may/19/pharmacy-in-the-sea-dolphins-use-coral-as-medicine-for-skin-ailments).

Another *Guardian* report looks at how one of the UK's rarest corals is coping with climate change, and it would seem self-migration is the key (see: www.theguardian.com/environment/2022/may/27/one-of-uks-rarest-corals-set-to-expand-its-range-as-climate-change-warms-seas).

And finally, a recent article puts the case for looking after ugly fish – it seems that the least conservation support is needed for aesthetically pleasing fish (however that might be decided), while those considered 'ugly' are the most endangered. For more on the unlikely topic of fish beauty, see www.theguardian.com/environment/2022/jun/07/the-reef-fish-people-find-ugly-more-likely-to-be-endangered-study-finds

Seagrass and seaweed news

Two contrasting stories on seagrass feature here, the first crowning a seagrass meadow in Shark Bay, Western Australia as the 'biggest plant on earth'. Covering around 200 square kilometers, and spawned from a single seed, it certainly beats any land based plant (for more, see: www.theguardian.com/environment/2022/jun/01/what-the-hell-australian-scientists-discover-biggest-plant-on-earth-off-wa-coast).

The second story leads with a rather sensational headline, reporting that 'seagrasses release 32 billion Coke cans-worth of sugar into the soil' – for how they came to this remarkable conclusion, see www.dailymail.co.uk/sciencetech/article-10774895/Seagrasses-release-32-billion-Coke-cans-worth-SUGAR-soil-study-reveals.html

And in news from Belize (and for something interesting to serve at your next party) how about a seaweed shake? It's become something of a symbol of the country's sustainable underwater farming initiatives. Read more at www.bbc.com/travel/article/20220606-belizes-sweet-sustainable-seaweed-shakes

Odd but interesting news

Do fish have maths skills? It's probably not a question you've ever asked yourself, but researchers at the University of Bonn claim that zebra mbuna and stingrays can add and subtract, albeit in a limited way. To find out more, and learn which species is top of the class, see: www.dailymail.co.uk/sciencetech/article-10672579/Fish-MATHS-Stingrays-zebra-mbuna-add-subtract-just-like-humans.html

Meanwhile, anchovies are in the news for their frenetic spawning habits. A study from the University of Southampton has found that the resulting water turbulence plays a key role in circulating nutrients and oxygen. While not considered important in the open ocean, such biological mixing is suggested to play a key role in keeping ecosystems running in coastal regions. For more on this study, see: www.dailymail.co.uk/sciencetech/article-10696039/Earths-oceans-fish-SEX-helping-circulate-nutrients.html

A pdf file of (clickable) links for this article and for the rest of the newsletter is provided on the NZCS website. For access details, see the box below.

Coastal News weblinks

One of the most noticeable trends in *Coastal News* over the years has been the rise in the use of web addresses – and their complexity. Obviously, these are an invaluable source of further information for readers, but in the printed version of the newsletter we can't include an active link as we do in the pdf version. We realise that long, complex and non-clickable web addresses can be frustrating (and counterproductive) for readers, so beginning with issue 74 we have been adding a pdf file of all the newsletter links to the NZCS website (www.coastalsociety.org.nz/publications) – so one click will work, rather than readers having to manually copy long strings of seemingly random characters.

To make things even easier, you can access the pdf file using the QR code to the right. The file contains every link published in each newsletter, organised by the pages where they appear, and all are active (clickable) links.

About the authors

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Jamie Boyle is a coastal scientist at the Thames-Coromandel District Council. He looks after coastal activity along the district, including overseeing the coastal restoration programme, resource and building consent coastal (hazard) applications, working with coastal communities on coastal hazard-specific issues, and is one part of a two-part council team leading their Shoreline Management Plan project.

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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 30 September 2022.

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.

Te Hunga Takutai o Aotearoa
NEW ZEALAND COASTAL SOCIETY

NZCS Annual Conference

22-25 November 2022

Waiheke Island

The New Zealand Coastal Society (NZCS) invites you to attend the NZCS Annual Conference being held on Waiheke Island from 22-25 November 2022. Through presentations and field trips, we plan to take full advantage of the coastal highlights, local culture and of course the hospitality, to make the conference both a learning opportunity and a memorable event.

This is your annual opportunity to share knowledge across a range of coastal management topics and meet with peers from around Aotearoa New Zealand.

We encourage students, iwi, community groups, and professionals to attend and share your latest projects and/or research. The NZCS 2022 Conference will provide a unique opportunity (especially post Covid-19) to meet and mingle with coastal professionals, local bodies, and policy makers in person.

For full conference details go to:

www.coastalsociety.org.nz/conferences/2022/

New Zealand Coastal Society

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Waiheke Island (Photo: Pixabay)