Te Hunga Takutai o Aotearoa
NEW ZEALAND COASTAL SOCIETY

Coastal News

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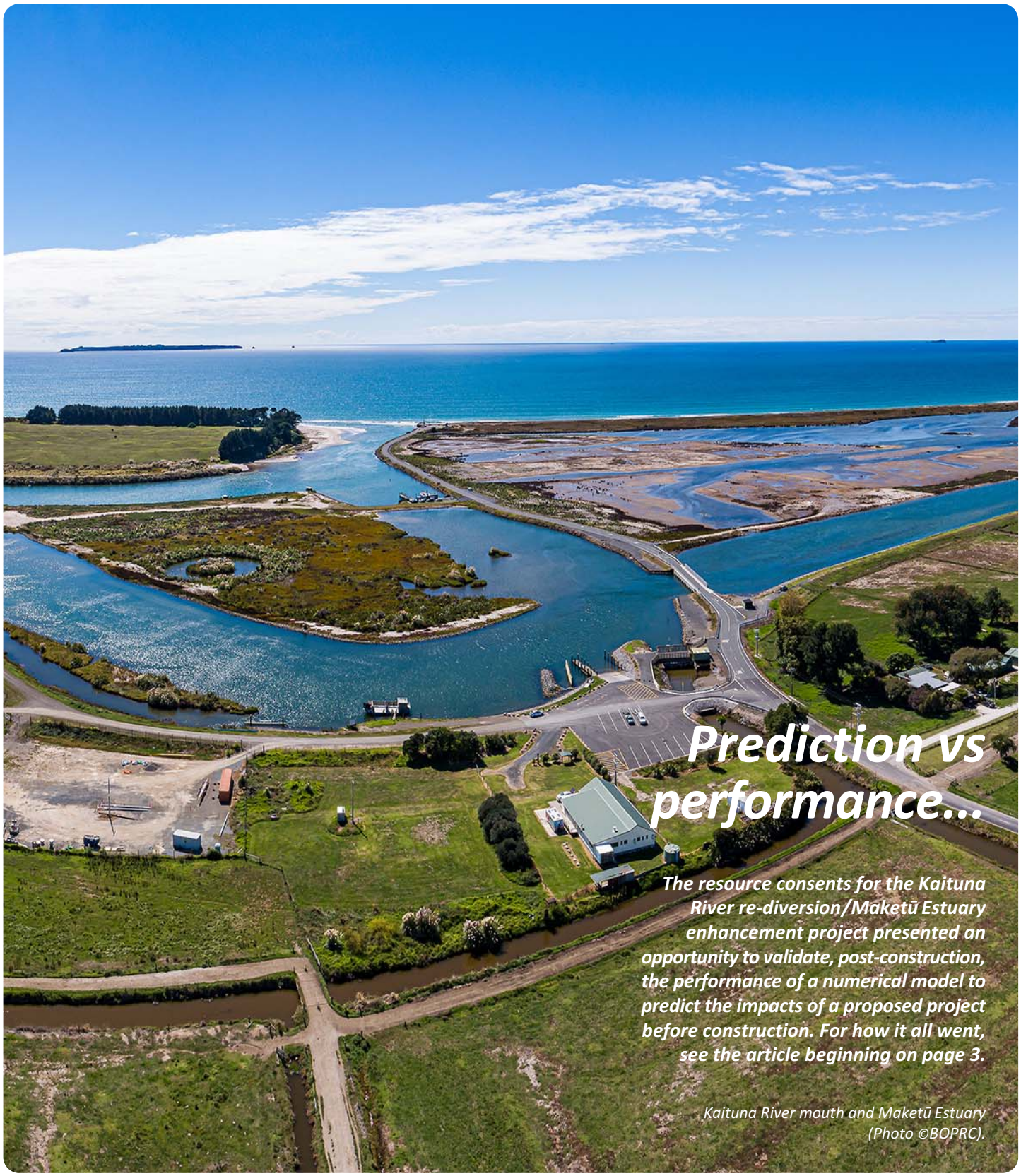

Prediction vs performance...

The resource consents for the Kaituna River re-diversion/Maketū Estuary enhancement project presented an opportunity to validate, post-construction, the performance of a numerical model to predict the impacts of a proposed project before construction. For how it all went, see the article beginning on page 3.

Kaituna River mouth and Maketū Estuary (Photo ©BOPRC).

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Word from the Chair

Kia ora all, and welcome to the first *Coastal News* issue of the year.

One of the highlights of last year's NZCS Conference was welcoming Deirdre Hart as our newest NZCS Life Member. We acknowledge her many contributions to coastal science and management, as well as to NZCS, in a short article within this issue. Speaking of the conference, Charles Hendtlass, our tireless and exceptional editor, decided to add to his usual *Coastal News* workload by contributing an article of his own, where he shares his own reflections from his first NZCS Conference.

We don't always have the opportunity to see how well our models perform against reality. However, the general point of prediction vs performance is very important to coastal practitioners. Ben Tuckey explores this in his article on the performance of hydrodynamic models for the Kaituna River re-diversion and the Maketū Estuary enhancement project, acknowledging the value of consenting conditions that required this validation. This issue of *Coastal News* also contains a couple of articles about giants. Terry Hume (NZCS Life Member) acknowledges some of the legends of coastal

science, on whose shoulders much of our understanding rests. Tom Shand discusses the birth of ocean giants (extreme swell events) and looks at the hazard posed by these events. Other articles explore citizen science to improve community resilience, and opportunities to leverage digital tools for coastal adaptation. We welcome Michael Paine and Sam Dixon as our new regional representatives, and share news from around the regions.

And finally, just a reminder that our annual conference is being held 18-21st November at the Napier War Memorial Centre. The local organising committee are busy working away on things to make it another great event. So keep an eye out for the call for abstracts landing in your inbox soon. The more talks we get the better.

Colin Whittaker and Sam Morgan
NZ Coastal Society Co-Chairs

About the NZCS

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

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

NZCS members represent a wide range of coastal science, engineering, management and planning disciplines. They are employed in the engineering and environmental consulting sectors, in local, regional, and central government, in research institutes, in the tertiary education sector, and in schools.

NZCS is a technical group of Engineering New Zealand. The multi-disciplinary nature of coastal management in New Zealand means many of our members are from areas other than engineering. There are no entry criteria for the society and we welcome membership enquiries from anyone with an interest in the coast.

Membership applications can be sent to the NZCS Administrator Renée Coutts at: nzcoastalsociety@gmail.com

Validation of the hydrodynamics of the Kaituna River re-diversion and Maketū Estuary enhancement project to meet consent conditions

Ben Tuckey , DHI

Introduction

The resource consent conditions for the Kaituna River re-diversion (see Figure 1) and Maketū Estuary enhancement project, have presented a unique opportunity to validate post-construction, the performance of a numerical model developed to predict the impacts of a proposed project before it had been constructed.

Figure 1: Fords Cut Re-diversion at control structures.

History and current state of lower Kaituna River and Maketū Estuary

The Kaituna River meets the sea at 'Te Tumu Cut'. The cut was created in 1956, diverting the river's flow away from its natural outlet via Maketū Estuary so that the surrounding areas could be drained and farmed. The new farmland came at a significant price since, with the loss of freshwater flows, the estuary's health steadily declined. The lower estuary was infilled with sand to create a significant flood tide delta, algal and fine sediment deposits accumulated in the upper estuary, 90% of the salt marsh wetlands were lost, and populations of both finfish and shellfish diminished.

A proposed re-diversion was developed by Bay of Plenty Regional Council (BOPRC), to halt the degradation of the Estuary and even reverse some of the damage.

The goal of the re-diversion was to significantly increase the volume of water (particularly fresh water) flowing from the Kaituna River into Maketū Estuary to maximise the ecological and cultural benefits while limiting cost and adverse environmental effects. The re-diversion was designed to maximise the flow into the estuary while keeping Te Tumu cut open for flood protection and boating access. New wetland areas and innovative chenier protection for remnant salt marsh were also created. Figure 2 presents an overview of the design.

Construction work began in June 2018, and the new re-diversion control gates opened in February 2020.

The re-diversion has already resulted in positive outcomes. There has been wetland re-creation on land which was previously farmed and a return of finfish and bird species. While only in the early stages of the estuary adjusting to the changes in hydrological regime, there is already evidence of algal and fine sediments being flushed out of the upper estuary, decreased salinity, decreased macro-algal cover and extent, increased overnight minimum dissolved oxygen levels, and anecdotal evidence of a recovery in the shellfish beds and finfish populations. Over time, positive outcomes are expected to increase and multiply.

The Project was funded by BOPRC and delivered in collaboration with tangata whenua and the wider community.

Resource consent conditions

DHI was commissioned to carry out numerical modelling to assess the impact of the proposed re-diversion (DHI, 2014). The assessment focused on changes in the hydrodynamics, morphology and water quality of the lower river and estuary.

The resource consent and conditions for the Kaituna River re-diversion and Maketū Estuary enhancement project were finalised in an Environment Court decision issued in May 2016.

A key concern was boating access through Te Tumu Cut. For mean tide and mean river flow, the modelling predicted that the volume of water which exits through the river mouth (ebb tide volume) would

Figure 2: Overview of Kaituna River re-diversion and Maketū Estuary enhancement project.

decrease by only 4%. It was concluded that an increase of up to 20% would have been acceptable without causing issues with boat access (Eco Nomos and DHI, 2015).

The consent conditions stated that the consent holder would validate the DHI model findings for outflow volumes in the lower Kaituna River. The outflow was to be measured over a tidal cycle in the lower river. Four measurements were to be collected. Two before construction work (Pre-Project) and two after commissioning the diversion (Post-Project).

The condition stated that the Post-Project measurements were to be made when river flow was the same flow as the Pre-Project flows and during the same tidal range with wave and bar conditions as similar as reasonably practical. The flow data was to be used to calculate the ebb tide (i.e. outflow) volume for the four measurements.

If any of the two Post-Project measured ebb tide volumes were found to be different than any of the two Pre-Project ebb tide volumes by 20% or more, mitigation measures were required to ensure the actual ebb tide volumes were within 20% for 'low flow' river conditions.

The Project consent provided for re-diversion of 600,000 m^3 per tidal cycle to Maketū Estuary, for a mean tide. Measurements were also required to confirm the Project is not exceeding this consented volume.

Data collection

BOPRC collected the measurements required as part of the consent conditions. It proved difficult to obtain flow measurements Pre- and Post-Project with as closer river flow and tide range as originally anticipated. However, a suitable data set was still obtained to meet the purposes of the consent, i.e. validating the findings of the numerical model.

Pre-Project, flow measurements for the lower Kaituna River, over close to a full tidal cycle were undertaken 14 June 2016 and 17 January 2017.

Post-project, corresponding flow measurements for the lower Kaituna River, over close to a full tidal cycle were undertaken 24 February 2021 and 2 December 2021.

Post-Project, flow measurements were also taken at the re-diversion control structure to measure flow from the Kaituna River to Maketū Estuary.

Te Tumu Cut was gauged using an Acoustic Doppler Current Profiler (ADCP) instrument mounted on the side of a boat, while Fords Cut was gauged upstream of the new control gates using an ADCP mounted in an Ocean Sciences trimaran (see Figure 3).

The river flow and predicted tidal conditions on the day of the surveys were outlined in Table 1. The flow was obtained from measurements at the Te Matai gauge. Neap, mean and spring tide corresponds to 0.99 m, 1.50 m and 2.04 m tidal ranges respectively.

Analysis of flow data for consent conditions

The percentage difference in ebb tide volume was compared for the most similar Pre-Project and Post-Project surveys, i.e. 16 June 2021 compared with 24 February 2021 and 17 January 2017 compared with 2 December 2021.

When comparing the 14 June 2016 Pre-Project Survey with the 24 February 2021 Post-Project ebb tide volumes, even though there was higher river flow on 14 June 2016, which is predicted to significantly increase the ebb tide volume, the volumes still agreed within the required 20% from the consent conditions.

When comparing the 17 January 2017 Pre-Project and the 2 December 2021 Post-Project, the ebb tide volumes agreed within 5.9%, well within the required 20% from the consent conditions.

The volume of water through the Fords Cut re-diversion channel, calculated from the 24 February 2021 flow measurements, close to a neap tide range, was 447,400 m^3. This can be compared with the volume of water

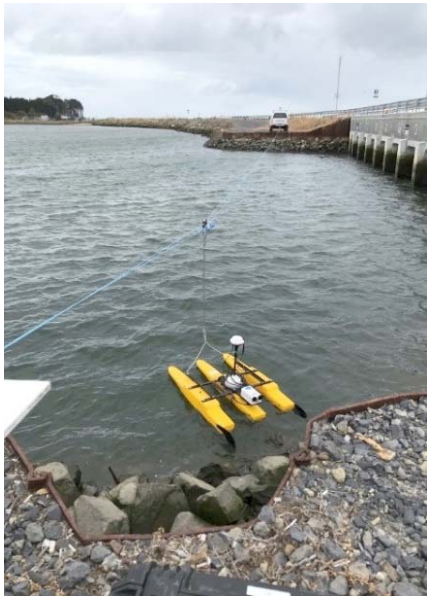

Figure 3: ADCP flow gauging at Fords Cut re-diversion at control structures.

predicted through Fords Cut by the model of 370,000 m^3 (adjusted for the impact of wave set-up and different final design of the re-diversion channel).

The volume of water calculated from the 2 December 2021 flow measured through Fords Cut, slightly higher than the mean tide range, was 639,800 m^3, while the volume of water predicted through Fords Cut from the model for slightly higher than mean tide and low river flow was 607,200 m^3 (adjusted for observed higher range on open coast and different final design of re-diversion channel). This indicates that the re-diversion is very close to the consented 600,000 m^3 when there is a mean river flow condition.

The validation work proved very useful as a recent study suggested that the re-diversion may not be performing as intended hydrodynamically. In particular, it suggested the flow through Fords Cut channel to the

	Pre-Project		Post-Project	
	June 2016	*January 2017*	*February 2021*	*December 2021*
Tidal Range Ebb Tide (m)	1.23	1.68	1.02	1.35
Tidal Range Flood Tide (m)	N/A	N/A	0.97	1.45
River Flow (m^3/s)	30.8 to 28.9	24.7	22.0	25.1

Table 1: River flow and tide range for data collection.

estuary may be significantly less than 600,000 m^3 per tidal cycle for mean tide.

Fortunately, the comprehensive data collection by BOPRC as part of the consent conditions, was collected on a date that overlaps with the data used by the other study. This indicated an issue with the method used by the study for calculating flow into the estuary, which significantly underestimated the peak discharge and total volume through the re-diversion.

The more comprehensive data collection proves the re-diversion is performing as intended hydrodynamically. This is a testament to the performance of the numerical model and the investment into a significant data collection campaign to build and calibrate the model.

Acknowledgement should also be given to the sensible consent conditions applied for the Project. The requirement of the verification of numerical models' post-construction, more often, would help to increase public confidence in modelling.

References

DHI (2014). *Kaituna River re-diversion and Ongatoro/Maketū Estuary enhancement project – numerical modelling*. Report for BOPRC.

Eco Nomos and DHI (2015). *Effect of proposed re-diversion on Te Tumu entrance and bar*. Memo for BOPRC.

NZCS Regional Representatives

Auckland	**Lara Clarke** lara.clarke@aucklandcouncil.govt.nz
	Matthew McNeil Matthew.McNeil@aucklandcouncil.govt.nz
	Eddie Beetham EBeetham@tonkintaylor.co.nz
	Sage Vernall sage.vernall@aucklandcouncil.govt.nz
Bay of Plenty	**Scott Murray** SMurray@tonkintaylor.co.nz
	Cole Burmester cole.burmester@beca.com
Canterbury	**Kate MacDonald** Kate.MacDonald@jacobs.com
	Tommaso Alestra Tommaso.Alestra@boffamiskell.co.nz
	Jessica Green Jessica.Green@beca.com
Gisborne	**Murry Cave** Murry.Cave@gdc.govt.nz
	Dylan Barnfield Dylan.Barnfield@wsp.com
Hawke's Bay	**José Beyá** jose@ihbeya.com
	João Albuquerque joao.albuquerque@hbrc.govt.nz
Northland	**Laura Shaft** lauras@nrc.govt.nz
Otago	**Sorrel O'Connell-Milne** sorrelomilne@gmail.com
	Amanda Riddle Amanda.Riddle@orc.govt.nz
Southland	**Ash Rabel** Ash.Rabel@es.govt.nz
Taranaki	**Sam Dixon** sam.dixon@wsp.com
Upper South	*Temporarily vacant*
Waikato	**Jamie Boyle** jamie.boyle@tcdc.govt.nz
	Joshua Sargent js535@students.waikato.ac.nz
	William Dobbin William.Dobbin@stantec.com
	Celeste Davies-Calway Celeste.Davies-Calway@waikatoregion.govt.nz
Wellington	**Greta Stuthridge** greta.stuthridge@stantec.com
	Michael Paine MPaine@aucklandcouncil.govt.nz
West Coast	**Don Neale** dneale@doc.govt.nz

Citizen science to boost community resilience amid increasing climate pressures

Kiri Shibahara[1,2] and Ana Serrano[1]

Continuing our long-standing commitment to community-led adaptation, Toi Moana Bay of Plenty Regional Council (BOPRC) piloted a citizen science initiative. Our primary objective was to empower local communities by placing data collection directly into their hands. Citizen science, defined as collaborative research led by the community, aligns perfectly with this goal. By involving community members in the data collection process, we ensure that the information gathered is relevant and actionable for their specific needs.

Additional benefits of adopting a citizen science approach for data gathering align naturally with BOPRC's overarching objectives for community-led adaptation initiatives:

- **Empowered communities**: By equipping local communities with the tools and knowledge to collect and analyse their own data, BOPRC's initiatives aim to foster a sense of community ownership.
- **Improved scientific literacy**: Citizen science can help enhance the community's understanding of scientific principles and local environmental hazards through hands-on data collection and analysis.
- **Enable informed decisions**: Providing communities with tools to gather observational data enables them to make more informed decisions about their adaptation strategies.
- **Tailored solutions**: Citizen science can take different forms, allowing each tool to be specifically developed and implemented to address the unique needs and challenges of each individual community.

Our approach: Bringing citizen science to our communities

Building on previous community-led initiatives, BOPRC engaged with a diverse range of community groups that had already worked on their climate adaptation management plans. This summer, we offered these groups the opportunity to implement citizen science in their communities, emphasising that with only 12 weeks, their active participation and ownership of the process were crucial for success.

We received enthusiastic responses from various community groups, including non-profit organisations and local hapū. After engaging with the community leaders, we began our process:

1 **Inception meetings**: We arranged a series of individual meetings and site visits with each community with the goal of understanding their needs, capabilities and suitability to citizen science.

2 **Research**: After developing an understanding of each community's needs and capabilities from the inception meetings, we researched existing citizen science tools that may suit their needs. The tools investigated included GIS tools, apps, physical installations, and online surveys.

3 **Tool evaluation**: The options were narrowed down by weighted multicriteria evaluation so that the most suitable options could be presented to the communities. The criteria and weightings were based on the unique needs and capabilities of each community, and included data relevance to needs, community engagement potential, user-friendliness, costs and labour, and data privacy.

4 **Community decision making**: The most suitable options were presented to the communities for them to choose what worked best. If none of the tools were appropriate, we went back to conduct further research.

5 **Designing and establishing**: We then began the process of designing and establishing the citizen science monitoring programme. This included detailed planning, creating 'how-to' documentation, customising tools, and establishing the necessary infrastructure to support the monitoring activities.

This structured approach (see Figure 1) allowed us to effectively implement citizen science initiatives tailored to our diverse communities and their needs.

Case studies in the Bay of Plenty

In this section, we will compare the outcomes this approach had for different communities, including the Waihi Beach Lifeguard Services and other communities within the Tauranga harbour.

Waihi Beach Lifeguard Services

Having previously collaborated with BOPRC to develop an adaptation plan, the Waihi Beach Lifeguard Services were enthusiastic about establishing a citizen science

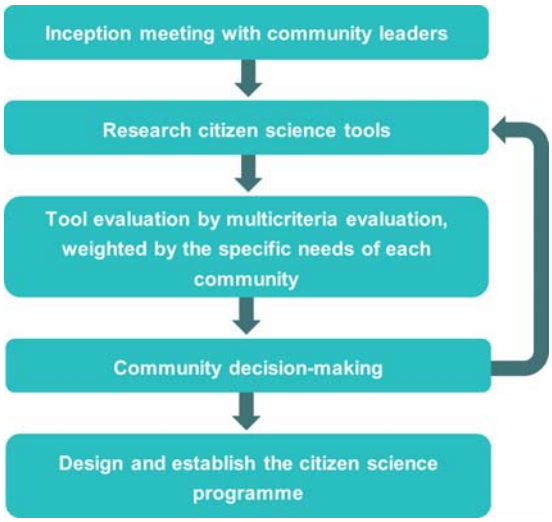

Figure 1: Flow chart showing the process used to bring citizen science to our communities.

1 Bay of Plenty Regional Council
2 University of Canterbury

programme to monitor environmental changes. We quickly realised that their highly engaged community, consistent year-round foot traffic, and dedicated community leaders made them well-suited for citizen science. Our research and evaluation were informed by these strengths, along with the view from their club building, the lifeguards' proficiency in using apps, and their connectedness through social media and regular newsletters.

The Waihi Beach Lifeguard Services decided that CoastSnap was the best tool for their community. CoastSnap is a citizen science tool for monitoring coastal change using repeat photos from fixed camera cradles. Community members use the cradle to take a photo and submit it by QR code, app, or email (see Figure 2). Among other uses, images will be processed to create a timelapse video showing changes to the beach profile over time. The results will help the community understand the impacts of climate change on their beach and inform adaptation decisions.

Tauranga Harbour communities

For the Tauranga Harbour communities, the integration of Mātauranga Māori, a knowledge system based on generations of observation and understanding of the natural world, was a key aspect of our approach. This connection to traditional knowledge systems helped ensure that the citizen science initiatives were culturally relevant and respected the unique perspectives of the Tauranga Harbour communities. Citizen science can complement Mātauranga Māori by providing additional data that supports traditional knowledge, to help communities make informed decisions about their environment.

The Tauranga Harbour communities are particularly concerned about the threat of erosion and rising sea levels on their urupā (burial sites). With no existing citizen science programmes specific to their needs, designing suitable citizen science programmes for these small, low foot-traffic communities was particularly challenging. We are developing information packages to help community members collect spatially referenced photographic evidence through the customisable ArcGIS Survey123 app. These online surveys could direct users to key areas of concern, identified through site visits to each island with guidance from local experts. This approach could enable community members to participate when observations are necessary, without requiring a large group of contributors.

Additionally, we explored the use of CoastSnap with another Tauranga Harbour community that had concerns about privacy and multiple locations of interest. This pilot highlighted the need to adapt tools to meet data privacy requirements, especially for sensitive areas such as urupā and other tapu (sacred) places. This was a useful learning experience for future citizen science initiatives.

Figure 2: The draft information panel that will accompany the CoastSnap station at the Waihi Beach Lifeguard Services' building.

Key insights

Designing and establishing citizen science programmes tailored towards each community came with its unique challenges. Through these, many lessons were learnt along the way, including:

- **Building trust is essential** for effective collaboration and progress. Continuous communication and transparency allowed us to develop good relationships and rapport with our communities.
- **Specificity is important**. Understanding the needs and capacity of a community is key to identify what citizen science tool works best for them. Large-scale, existing citizen science programmes do not work for all communities.
- **The community is expert**. Communities have a deeper understanding of their own homes and surroundings than any external person. Therefore, they should be actively involved in the research journey and lead the decision-making process.
- **Focus on enabling informed decisions** with every step.

Our approach of tailoring citizen science tools to meet the unique needs of each community helps foster resilience and empower communities to make informed decisions about their adaptation journey. This also helps communities to sustain adaptation efforts, ensuring ongoing engagement and support to maintain and enhance their adaptation strategies over time.

We hope this work serves as a model for other regions looking to harness the potential of citizen science in addressing environmental pressures.

About the author

The citizen science pilot was led by Kiri Shibahara, this summer's intern on the climate change and geospatial teams at BOPRC. Kiri is currently in her final year of a Bachelor of Environmental Science with Honours at the University of Canterbury. She thoroughly enjoyed the pragmatic aspects of her internship, particularly the hands-on implementation of citizen science initiatives. This experience allowed her to combine her passion for climate change, coastal science and environmental hazards with practical solutions to enhance community resilience.

Legends passed, but certainly not lost

Terry Hume, NZCS Life Member

The passing of Orrin Pilkey in December reminded me that the coastal community lost four legendary figures in the last couple of years. American Professors' Skip Davis, Paul Komar, Orrin Pilkey and New Zealand's Professor Bob Kirk. All made significant contributions to coastal science through their international science collaborations, publications and mentoring of post-graduate students. While visiting New Zealand they presented keynote addresses at conferences, including our NZ Coastal Society conference and other meetings. Having benefited from interactions with these coastal Kaumātua I felt it appropriate to reflect on their contributions to coastal science and links to New Zealand.

Skip Davis (Photo: Harte Research Institute)

Paul Komar (Photo: Oregon State University)

Bob Kirk (Photo: Dr Judy Kirk)

Orrin Pilkey (Photo: Wikimedia Commons CC BY-SA 3.0, https://creativecommons.org/licenses/by-sa/3.0/legalcode)

Richard A (Skip) Davis, Jr (1937-2023) was a Distinguished University Professor Emeritus from the University of South Florida (USF) where he worked for 33 years. After his retirement from the university he worked at the Hart Research Institute, Texas A&M-Corpus Christi as a Visiting Professor and Research Associate.

Skip specialised in beaches, barrier islands and tidal inlets. Much of his research was on the Gulf Coast of Florida often focusing on monitoring the performance of numerous beach nourishment projects, but with some projects on the Texas coast as well. He published numerous journal papers and authored/edited 26 books on Coastal Geology and Oceanography. Skip was a senior Fulbright Scholar in Australia and held visiting professorships at Duke University and the University of North Carolina, and in Denmark, Spain, Australia and New Zealand.

I first met Skip during his visiting professorship at the University of Waikato with Prof Terry Healy. Following this I was fortunate enough to spend six weeks at USF where he hosted myself and my family. I made the most of the opportunity to visit Florida's Gulf coast with Skip and pick his brains on beach and tidal inlet processes along that highly developed coast. Interestingly, while Skip's passion was for beaches and the coast, he once remarked to me that if he returned in another life, he would like to work on the South Island's braided rivers.

Paul Komar (1939-2023) was Professor Emeritus of Oceanography at Oregon State University, where he had been on the faculty since 1970. Following his M.S. degrees in Mathematics and Geology he completed a PhD at the Scripps Institution of Oceanography with Prof Doug Inman measuring longshore sand transport rates using fluorescent tracers. At Scripps Paul met up with Brigadier Ralph Alger Bagnold who was famous for his 1930s research on wind-blown sand transport and desert landforms (and as a Brigadier General who led a commando group against Rommel in North Africa during World War II). Interestingly, years later, after visiting Bagnold in England, Paul re-typed and edited Bagnold's autobiography *Sand, Wind & War*, that Bagnold had typed when he was in his 90s and nearly blind.

Paul's research interests went on to focus primarily on coastal processes, including investigations of wave-induced nearshore currents and the resulting transport of beach sediments. He worked on the climate controls on US West Coast processes and the resulting erosion problems, including those associated with occurrences of major El Ninos and a progressive increase in North Pacific wave heights. He authored over 100 scientific papers, but is probably best known for his highly influential textbook, *Beach Processes and Sedimentation*.

Paul's work took him to many countries including New Zealand. He undertook a visiting professorship at the University of Waikato and visited Canterbury University. Paul inspected much of our coast and, in 1996, was commissioned by Gisborne District Council to analyse the processes causing erosion at Wainui Beach and offer suggestions for possible remedial measures and management strategies.

In 2003 he was hired to be the Independent Facilitator for to work with the Hawke's Bay Regional Council, the Napier City Council, and the Port of Napier Ltd, advising them on issues dealing with investigations of the Hawke's Bay coast and its management. This led to a weighty technical report on environmental changes, shoreline erosion and management issues affecting the Hawke Bay shoreline, (summarised in a paper for JCR in 2010) and went on to underpin coastal adaptation work in the region.

Orrin Pilkey Jr. (1934-2024) was Professor Emeritus of Earth and Ocean Sciences, Nicholas School of the Environment, at Duke University, and founder and Director Emeritus of the Program for the Study of Developed Shorelines based at Western Carolina University.

After receiving degrees in geology from Washington State University, the University of Montana, and Florida State University, he began his career with the study of abyssal plains on the deep-sea floor. The destruction of his parents' house in Waveland, Mississippi, in Hurricane Camille (1969), saw him switch to the study of coasts. He became a lifelong advocate for safe and sensible coastal development and the protection of our beaches.

Orrin was bearded, barrel-chested, of stocky build and tough. He ran marathons in his 40s and as a smoke jumper was trained to parachute into fire zones. Often outspoken and polarising, his staunch advocacy for the protection of beaches saw his impassioned participation in hundreds of town hall meetings, legislative hearings, news stories and public debates. He argued that it was a mistake to put houses, condos, hotels and roads on mobile landscapes like the narrow banks of sand of the Outer Banks.

Orrin played a major role in North Carolina's decisions to largely ban seawalls. Orrin achieved notoriety when coastal erosion threatened the demise of the historic Cape Hatteras lighthouse In North Carolina. He was a proponent of letting it fall in place, until ultimately advocating for the moving of the lighthouse landward which occurred in 1999.

A prolific researcher and writer, he published more than 250 scientific papers, numerous opinion pieces and 49 books on topics such as barrier islands, coastal erosion and sea level rise. He co-edited and co-wrote *Living with the Shore*, a 22-volume series about the hazards of beachfront living. We arranged for Orrin to visit New Zealand as a keynote speaker at the International Coastal Symposium in 2000 at Rotorua. Following road trips to the Auckland, Coromandel and Bay of Plenty coasts we co-wrote an opinion piece for *Water and Atmosphere* magazine on the shoreline erosion problem and lessons from the past. Orrin observed that New Zealand was fortunate to have large stretches of undeveloped shoreline and warned that once protection (e.g., rock protection and beach nourishment) goes in, it is costly to maintain, and seawalls are rarely removed.

Bob Kirk (1944-2024) was Professor Emeritus at the University of Canterbury. He was a coastal geomorphologist who contributed significantly to our understanding of mixed sand and gravel beaches and lake beaches. Bob completed an MA (Hons) degree in geography under the supervision of Dr Roger McLean on beach morphology and sediments of the Canterbury Bight. He made a case study of a mixed sand-shingle beach using accepted principles of beach study drawn from the literature on both sand and shingle beaches. In the process he recognised the importance of grain size and swash zone processes and, significantly, that while the mixed sand-shingle beach has many of the morphological features of the shingle beach, it has few of the sand beach.

Following a stint running a weather station and observing a beach and penguins at Cape Royds, Antarctica, he began his PhD. Again, under McLean, this study focussed on wave dynamics, in particular swash zone processes through the examination of water motion and foreshore response on mixed sand-shingle beaches.

Bob was appointed a lecturer at the University of Canterbury (UC) in 1971. He spent his career at the University becoming a Professor and a Department Head for Geography. He contributed hugely to the teaching of physical geography, running legendary field trips, and supervising over 120 Masters and Doctoral theses. Bob become a leader in in coastal processes/ geomorphology, and with his post-grads focused on the dynamic interface between land and sea, including mixed sand and gravel beaches, intertidal shore platforms, river mouths and coastal lagoons and their lagoon mouth closure. The later work saw the Māori term hāpua applied to river-mouth lagoons on a mixed sand and gravel shorelines significantly affected by longshore drift.

Bob also made a significant contribution as a university administrator and in politics. He became Deputy Vice-Chancellor (Research) and oversaw Le Grew's restructuring of the university into four colleges with a stand-alone School of Law; the UC Digital Strategy and establishment of the virtual networks HITLab, the MacDiarmid Centre of Advanced Materials and Nanotechnology; the Allan Wilson Centre for Molecular Biology and Evolution; and the development of the UC Research Office. Following his deputy vice-chancellor role Bob became a regional councillor in Canterbury playing a key role in water resource planning and the development of water plans. He also served as the UC representative on the Canterbury Museum Trust.

In September 2013, Bob was awarded the Gold Medal, as a Distinguished New Zealand Geographer, from the New Zealand Geographical Society 'for exemplary and long-standing services to the New Zealand Geographical Society and the New Zealand geographical community'.

Bob was raised in a political family as the son of Norman Kirk, (New Zealand's 29th prime minister) and Dame Ruth. He was a very practical person and from a young age was fascinated with radio and gadgets of many kinds. He designed, built and published a paper on a portable field instrument system to sense and record the uprush and backwash of waves on beaches after recognising that on shingle beaches, changes in foreshore elevation and sediment distribution landward of the break point are produced largely by variations in those processes. In memory of Bob this piece of kit became (in 2024) the Professor RM (Bob) Kirk Memorial Award, which recognises the presentation at the NZCS annual conference that best represents the application of understanding of coastal or lakeshore processes in addressing a solution to a shore management conundrum.

Skip, Paul, Orrin and Bob were legendry figures that spent their careers researching the coast and beaches and advocating for its correct management. They were inspirational scientists and generous with their knowledge. Their international collaborations benefited numerous projects and careers. Today their legacy lives on through their knowledge of the coast, management issues and solutions to problems captured in scientific papers, popular articles and books. Their graduate students have gone on to lead programs managing, researching, and are now practicing their craft in the coastal space throughout the world.

Skip, Paul, Orrin and Bob may be legends passed, but certainly not lost.

The author acknowledges that in writing this article he has drawn extensively on material written by others in obituaries.

How ocean giants are born: tracking the long-distance impact and danger of extreme swells

Tom Shand[1]

Late last year, a massive ocean swell caused by a low pressure system in the North Pacific generated waves up to 20 metres high, and damaged coastlines and property thousands of kilometres from its source.

Two years earlier, another storm system southeast of New Zealand also whipped up massive waves, with the swell reaching as far as Canada, battering Pacific island coasts along the way.

These storms, and the swells they create, are facts of nature. But while we understand a lot about the extraordinary forces at work, we can still do more to predict their impact and coordinate global warning systems.

How big waves are born

Waves are made by wind blowing over a water surface. The longer and stronger the wind blows, the more energy is transferred into those waves.

As well as an increase in wave height, sustained high wind speeds generate waves with a longer period – that is, the distance or time between successive wave crests. Oceanographers refer to the mix of wave heights and periods (and to some extent directions) as a 'sea' state.

Once the wind stops blowing, or the sea moves away from the wind that is generating it, the waves become swell and start to separate. The longest-period waves move fastest and shorter-period waves more slowly.

Most waves resulting from a storm have periods of 12–16 seconds, with the individual waves travelling at speeds of 60–80km per hour.

But very large storms with high, sustained winds can generate waves with periods of more than 20 seconds. These waves travel much faster, over 100km per hour in the open ocean, and their energy (which travels more slowly than individual waves) can cover 1,500km in 24 hours.

Ocean waves, particularly long-period swells, lose very little energy as they travel. And unless they collide with an island and break, they are capable of travelling great distances.

By comparison, shorter period waves take much longer to travel and lose more energy. If they encounter a wind field moving in another direction, this also removes energy and reduces their height.

But sometimes, a particularly strong storm system can generate long-period waves with enough energy to travel across the Pacific, reaching shores thousands of kilometres away.

A unique characteristic of such long-range swells is that individual waves contain a lot more energy than shorter-period local waves. They grow to greater heights as they 'shoal' in shallow water, and can hit shorelines and structures with greater force, causing more damage and danger.

The 'Code Red 2' swell

The 'Code Red 2' swell was a good example of this in action. It was generated by a massive storm system southeast of New Zealand in July 2022. The 'significant wave height', or average of the largest third of the system's waves, reached 13 metres. Individual waves were up to twice this height.

The storm system was unusual due to very strong southerly winds blowing northweard from near Antarctica for over 2,000km. This resulted in long-period (20 second) swells moving north into the Pacific Ocean.

The swell first reached Tahiti, where waves closed most of the south-facing coast, prompting a Code Red warning. This was only the second such warning since 2011 (hence its name), and resulted in massive waves at the Teahupo'o surf break[1], location of the 2024 Olympic surfing event.

The swell also caused flooding along the south coast of Rarotonga and other Pacific Islands[1] before continuing north across the equator to reach the south coast of Hawaii – 7,000km from where it was generated.

Due to their direction and very long period, large waves reached places they don't usually affect, literally crashing weddings and breaking over houses[2]. The swell then carried on to hit the Californian coast some 10,000km away, and eventually reaching Canada more than a week after it was initially generated.

The 'Eddie' swell

More recently, the 2024 'Eddie' swell was generated from an extremely intense low pressure system in the North Pacific in December 2024. Waves near the centre of the storm reached heights of 20 metres, with a 22-second period.

The resulting swell hit Hawaii first, where waves were large enough to run the Eddie Aikau Big Wave Invitational[3] at Waimea Bay, a surfing event that requires such large waves it has only been run 11 times in its 40-year history (and which gave the swell its name).

This extreme swell then reached California 3,000km away, where it also generated giant surf[4], damaged boats in coastal marinas and caused part of the Santa Cruz wharf to collapse[5].

Due to its very long period, the swell was able to continue southward, still with a lot of energy. It reached the north coast of Ecuador and Peru[6], 8,500km from where it began, where it destroyed fishing boats. And it finally hit Chile, 11,000km from its source, where it closed ports and inundated coastal promenades[7].

These coasts typically receive large southwest swells. But this rare, long-period north swell was able to reach normally protected north-facing sections of coast, causing uncharacteristic damage.

1 Honorary Senior Lecturer, Department of Civil and Environmental Engineering, University of Auckland, Waipapa Taumata Rau

Predicting local impacts

It can be difficult to sound warnings for these types of long-period waves, as they are generated so far from the affected shorelines they are missed by local forecasters and emergency managers.

Global wave models such as those driven by the National Oceanic and Atmospheric Administration's[8] National Centers for Environmental Prediction are capable of predicting and tracking[9] these swells but require a more nuanced approach to predicting local impacts.

New early warning systems are being developed that take global wave forecasts and downscale them to take into account the shape of the local coastline. The wave information is then combined with predictions of tide and storm surge to give warnings of when coastal impacts may occur.

These systems will give emergency managers, ports and coastal infrastructure operators – and the public – better information and more time to prepare for these damaging wave events.

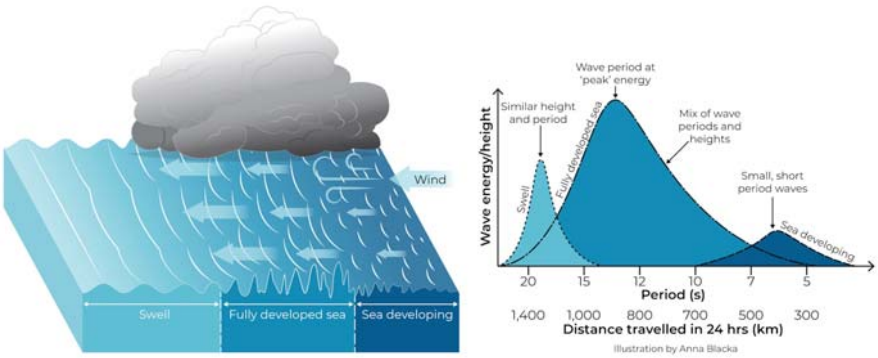

Figure 1: Waves are generated by wind blowing over water with the distribution of energy changing dependent on their stage of evolution (CC BY-NC-ND).*

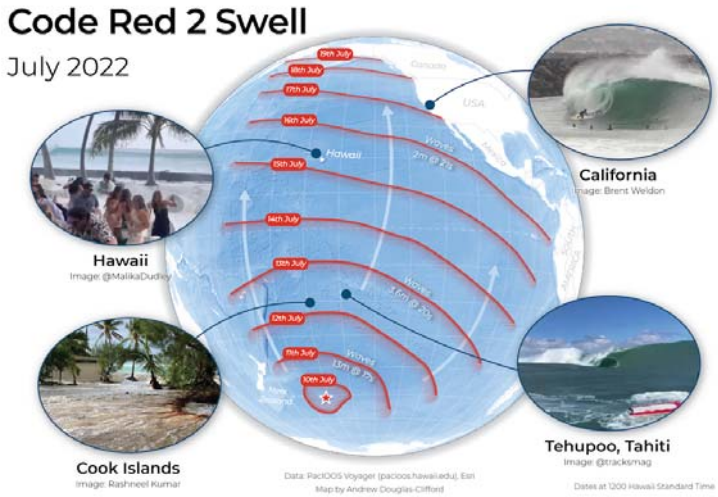

Figure 2: Tracking the July 2022 Code Red II swell across the Pacific (CC BY-NC-ND).*

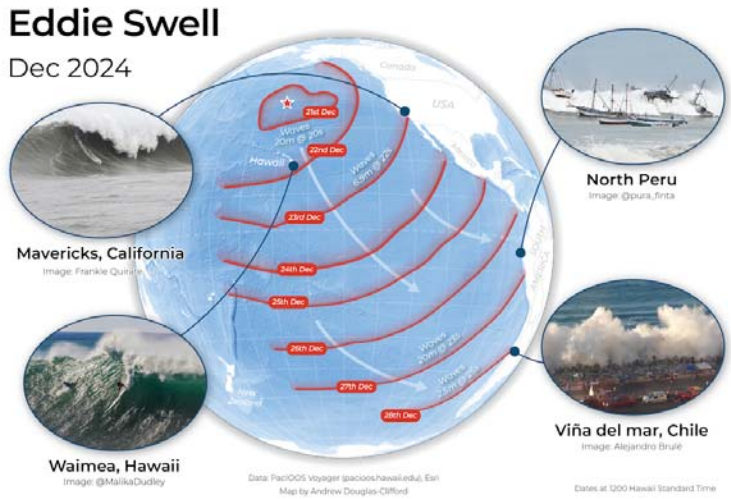

Figure 3: Tracking the December 2024 Eddie swell across the Pacific (CC BY-NC-ND).*

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From research to reality: Accelerating coastal adaptation through digital tools

Mitchell Anderson, Managing Director, Urban Intelligence

When we founded Urban Intelligence in 2021, we were driven by a recent article noting 'adaptation in large cities likely to be ineffective,' which in part spoke to the striking gap between risk and adaptation research and the tools available to decision makers, particularly for coastal communities facing increasing climate pressures.

Translating research into adaptation action

Early conversations with local council staff revealed that despite having access to hazard data, they struggled to translate this information into practical decisions about infrastructure, planning, and adaptation strategies – in other words, going from the 'what' to the 'so what' and subsequently, the 'now what'.

Another issue was that traditional risk assessments significantly underestimate the true impacts of climate change on coastal communities, often by orders of magnitude. Recent work with coastal councils has shown that focusing solely on direct asset damage misses significant community and economic disruption experienced during flood events.

For example, work published by the Climate Change Commission[1] in 2024 notes that while the number of properties in Aotearoa exposed to a present-day 1 in 100-year coastal inundation event is approximately 22,000, the number of those at risk of becoming isolated is over double, at 55,000.

Despite these advances, significant challenges remain. Communicating uncertainty effectively continues to be a struggle – how do we present complex probabilistic information in ways that enable decision making for a non-technical stakeholder? It's not as simple as providing more data; it's about transforming how that data is presented, understood, and integrated into existing decision-making processes.

Values in collision: The hidden challenge of risk assessment

Perhaps our most profound learning has been recognising that risk assessment isn't merely a technical exercise – it's a process where different values inevitably collide.

Early in our journey, we saw static risk assessment reports that accommodated every stakeholder perspective. The result? A compromise that fully satisfied no one and introduced new vulnerabilities through its inconsistencies.

This realisation led us to develop the Resilience Explorer® platform with a fundamentally different approach. Rather than forcing consensus on a single risk 'answer', we created a tool that allows users to explore risks through their own values and perspectives while maintaining analytical rigour.

Breaking down silos

An unexpected benefit has been how digital tools break down organisational silos. In Christchurch, teams responsible for different aspects of coastal management began using the same platform, leading to more consistent approaches and revealing interdependencies that might otherwise have been missed.

Looking forward: Enabling values-aware risk assessment

This values-aware approach to risk assessment has unlocked new possibilities for coastal adaptation. By acknowledging that different stakeholders prioritise different things – cultural heritage, economic development, ecological integrity – we can move past unproductive debates about whose values should prevail.

As we refine our approaches, we're exploring integration of real-time monitoring with long-term projections and developing more community-centered engagement tools. The journey from research to practice isn't just about better technology; it's about creating tools that fit into the existing human and organisational contexts where decisions are made.

Dr Mitchell Anderson is the Managing Director and co-founder of Urban Intelligence. For more information, visit urbanintelligence.co.nz

1 https://haveyoursay.climatecommission.govt.nz/comms-and-engagement/cc2f075f/user_uploads/2.a-urban-intelligence_national-infrastructure-exposure---property-isolation-report--2-.pdf

Accessing NZCS archives and downloads

The NZCS website has a comprehensive archive of publications and other material built up over the past 33 years on all things coastal, including:

- **back issues** of *Coastal News* (1996 to date) and 'hot topic' reprints of significant articles from previous issues;
- newsletter **author and article indexes** from issue 1 to date (updated yearly);
- an **author's guide** to writing articles for *Coastal News* and NZCS special publications;
- copies of the five completed **NZCS Special publications** (published 2014-2022);
- a selection of **webinars and presentation slides** from the last five years; and
- a selection of **videos** on topical coastal issues, interviews, talks and presentations from 2020 to date.

This material forms an important resource on coastal matters over the years, which we encourage you to browse, explore and download. To access, go to: https://www.coastalsociety.org.nz and click on the 'Content' tab.

The 2024 NZCS Conference: A newbie's review

Charles Hendtlass, Coastal News Editor

I have to start with a confession: despite a near 30-year association with the Coastal Society, I have never attended one of their conferences. I'm not sure why it has taken me so long to remedy this, but perhaps the lingering memories of once finding myself as a last-minute, fill-in presenter had something to do with it. Nevertheless, when offered the opportunity to attend Christchurch 2024, I thought it high time for me to experience the event rather than merely recording it in *Coastal News*. And quite an experience it turned out to be...

The first thing that struck me, something that I hadn't really anticipated, was the sheer number of people involved – delegates, presenters, student helpers and supporters – the venue was packed. In fact, the Christchurch conference saw the largest number of attendees ever at an NZCS conference. While the conference itself was just three days, organising such an event obviously takes months of meticulous planning; in this task, the local organising committee deserves the highest praise, as everything went off without a hitch (or at least none that were obvious!).

What also struck me as the conference progressed was the incredible variety of disciplines, interests and expertise that reside within the wider society, something that was evident from the sheer diversity and breadth of topics that were presented. Obviously, having assembled *Coastal News* for nearly three decades, I was aware of this, but somehow having it presented en masse really brought it into focus. So, even as an elderly newbie, I continue to learn things!

Keynote speakers are always regarded as a conference highlight, and those on offer certainly delivered. Debbie Tikao gave an overview of Te Kori a te Ko, an indigenous-led climate change adaptation programme focused on Akaroa Harbour, that looks to integrate traditional ecological knowledge with Western science, to engage the community, and build climate resilience. Dr Leanne Morgan addressed some commonly held misconceptions around the impact of sea-level rise on groundwater (causing salinisation and water table rise), from observations made while teaching groundwater hydrology. Dr Robert Young took a critical look at beach nourishment on the US east coast noting that, while a comprehensive database tracks nourishment projects, the approach lacks long-term vision, overlooks cumulative environmental impacts, and is transforming natural coastlines into artificial constructs as engineering replaces natural processes. Dr Fernando Mèndez delivered the endnote presentation, describing a stochastic coastal flood prediction system that uses metamodels and pre-run hydrodynamic simulations to quickly assess flood risk from both regular and extreme weather events, with the process able to generate inundation maps in seconds, enabling quicker preparedness through early warning systems.

The wide variety of other presentations on offer required some hard decisions on which to attend; being something of an outsider (at least in terms of my background and work experience), pretty much everything piqued my interest, so in the end I had to do some mental coin tosses. I did, however, make sure to attend those connected with the forthcoming Special Publication, since I knew they would become the focus of my life in the coming weeks! One thing I've noticed from years of adding conference reviews to the newsletter, is that every reviewer comments on the high quality of the presentations. Sometimes I did wonder if this was just people being polite – surely, not everything could be great – but the presentations I attended certainly reached the standards that previous reviewers have commented on.

The field trips provided a welcome opportunity to get out and about, with three of the field trips taking delegates north of the city, across to the east, and into the centre of Christchurch, with much of the attention focused on post-earthquake impacts to coastal zones, the extensive red-zoned areas, and the inner city respectively. The fourth option took to the somewhat choppy waters of Lyttelton Harbour with a visit to Quail Island. Fortunately for all, the early morning forecast ('rain, heavy at times, windy') didn't come to pass!

On a personal note, attending the conference provided me with an extra bonus, and that was to finally meet some of the dozens of NZCS people I have only ever corresponded with via email, some for a decade or more.

Keynote speakers in action at the 2024 Christchurch Conference.

Emails really only give a two-dimensional view – it's always much better to to get the full 3-D experience! So, for this opportunity, and for the overall experience of seeing the Coastal Society 'in action' (both formally and informally), I'd like the thank NZCS for first inviting me, and then encouraging me, to attend the 2024 Conference.

The 2025 conference will be held in Napier and, if attending a NZCS conference is something you've yet to experience, I can thoroughly recommend it. And if you are a regular, well, you'll know why I'm suggesting why it's such a good idea.

2024 NZCS Conference award winners

Most aligned with the conference theme – Shari Gallop and Jamie Boyle

Best presentation – Bronwen Gibberd (winner) and Mark Dickson (runner up)

Best poster – Amandine Bosserelle

Best student presentations – Bernadette Yafar & Myu Miyamoto (joint winners) and Jack Anderson & Sarra Ekladios (runner ups)

Sustainability award – Sea Nest Ltd

Professor RM (Bob) Kirk Memorial Award – Kate MacDonald. *This was the inaugural year for the award which recognises the presentation at the NZCS annual conference that best represents the application of understanding of coastal or lakeshore processes in addressing a solution to a shore management conundrum.*








Welcoming Deirdre Hart as the newest NZCS Life Member

Awards are a regular feature at NZCS Conferences, but the 2024 ceremony saw a particularly special award as Deirdre E Hart became the newest inductee to the ranks of Life Membership.

Deirdre has been an active member of the NZCS since 2005 and over the past 20 years she has made an outstanding contribution to both the Coastal Society and to New Zealand's coastal environment. Deirdre has contributed to the NZCS as both a Management Committee Member (2007-2013) and Chair (2011-2013), supported the organisation of the NZCS Annual and Australasian Coasts & Ports conferences, and has also contributed articles to *Coastal News* and to the NZCS Special Publications.

Beyond NZCS, Deirdre is a nationally recognised coastal scientist and her academic collaborations are evidenced in her many research publications, which encompass the physical, biological and human (including built environments) processes and multidisciplinary interactions in coastal environments.

Deirdre Hart pictured with the other NZCS Life Members (L-R) Terry Hume, John Lumsden, John Duder and Rob Bell at the Annual Conference Gala Dinner in Otautahi Chirstchurch.

In addition to her academic and research achievements, Deirdre has an impressive track record in dissemination of coastal science through education, informed management, and community engagement. For example, she encourages all coastal undergraduate and postgraduate students to become members of the NZCS, and facilitates their participation (through posters, oral presentations and other activities) at NZCS and other international coastal conferences.

NZCS Management Committee

Co-Chairs
Colin Whittaker & Sam Morgan
c.whittaker@auckland.ac.nz
sam.morgan@wsp.com

Deputy Chair
Ana Serrano
ana.serrano@boprc.govt.nz

Treasurer & Special Projects Coordinator
Mike Allis
mike@allisco.nz

Deputy Treasurer & National Regional Coordinator
Ryan Abrey
ryan.abrey@stantec.com

Te Komiti Māori
Shari Gallop & Bryony Miller
shari.gallop@pdp.co.nz
bryony.miller@e3scientific.co.nz

***Coastal News* & Special Publications Coordinators**
Ana Serrano & Connon Andrews
Ana.Serrano@boprc.govt.nz
Connon.Andrews@niwa.co.nz

Conference Coordinators
Alison Clarke & Shari Gallop
alison.clarke@slrconsulting.com
shari.gallop@pdp.co.nz

Awards and Scholarship Coordinator
Bryony Miller
bryony.miller@e3scientific.co.nz

University & Education Coordinator
Sophie Horton
sophie.horton@canterbury.ac.nz

Emerging Career Representative
Holly Blakley
HBlakely@tonkintaylor.co.nz

Regional Reps Coordinators
Andrew Allison & Alison Clarke
andrew.allison@urbanintelligence.co.nz
alison.clarke@slrconsulting.com

Membership Coordinators
Andrew Allison & Amy Robinson
andrew.allison@urbanintelligence.co.nz
Amy@arplanning.co.nz

Administration & Communications Coordinators
Renee Coutts & Belen Rada Mora
nzcoastalsociety@gmail.com

***Coastal News* Editor**
Charles Hendtlass
cellwairmonk@gmail.com

News from the regions

Recent updates to the regional representatives membership

There have been some recent changes to the regional representatives network, as Mojgan Razzaghi (Otago) and Corey Slimo (Taranaki) have both moved overseas to pursue new opportunities. We are, however, delighted to welcome two new representatives who will be covering the Taranaki and Wellington regions.

Michael Paine (Wellington)

Michael is a Coastal Engineer who grew up in Tauranga and lived his working life on the south coast of Wellington. He has worked for the last 11 years at Tonkin + Taylor since graduating from the University of Canterbury with a Bachelors Degree in Engineering.

He loves the New Zealand coastline, beaches, surf and kaimoana. While not anticipating where he would end up leaving university, he has merged his love of the coast with his professional life since starting his career and will never look back. He has been involved with a wide range of coastal projects in New Zealand and the Pacific from large scale coastal engineering to nature led design and adaptation. His two young daughters currently keep him very occupied outside of work.

Sam Dixon (Taranaki)

Sam grew up in the small coastal settlement of Ōakura where his family all had a passion for sailing, surfing and fishing which instilled a deep respect for the ocean and sustainable management. After studying resource management planning at Massey University Sam travelled and worked abroad including a stint working in China after which he returned to live in Lakura in 2003.

For the past 15 years Sam has worked for WSP where he leads a team of planners and environmental scientists based in Ngāmotu-New Plymouth. He works primarily in the infrastructure development, consenting and spatial planning space with a particular passion for coastal projects. Throughout his career Sam has led numerous coastal projects through design and consenting processes and he enjoys the multidisciplinary nature of resource management decision making. When he is not at work or DIY'ing at home he spends as much time as he can with his family and four children chasing waves and boating.

New regional representatives Michael Paine (left) and Sam Dixon (right).

Canterbury

Kate MacDonald, Tommaso Alestra and Jessica Green, Regional Representatives

Sabella control and removal

Mediterranean fanworm (*Sabella spallanzanii*) are an introduced marine invertebrate travelling on the hulls, niche areas and in ballast water of vessels. Fanworm release thousands of gametes into the water when reproducing, with larvae finding structures in shallow water to attach to. Sabella form a mucous case around their body and have a feeding mechanism that fans out trapping food from the water column. Sabella can form dense clumps and out-compete native species for food and habitat. Once established, they spread easily, posing a threat to native biodiversity, mahinga kai and commercial marine farming operations.

*Mediterranean fanworm (*Sabella spallanzanii*) (Photo: MPI).*

Sabella have been detected in the inner harbour of the Lyttelton Port since 2008, with populations being knocked back by targeted removal programmes over the years and improved biosecurity measures by commercial and recreational boaties. Biosecurity NZ's six monthly Marine High Risk Site Surveillance programme have indicated an increase in the population in Lyttelton Port's inner harbour since 2020. It has recently been found on yachts in Cass and Magazine bays and there are concerns the pest will increase its range outside the inner harbour and spread to new areas in New Zealand.

LPC, Environment Canterbury and Biosecurity New Zealand have been working on a coordinated control and removal programme to reduce the Sabella population. The programme is labour intensive with divers identifying the invasive species from the native species underwater and carefully removing the whole organism by hand from it's base. Visibility and shipping movements can be a challenge.

Along with the coordinated control programme in Lyttelton Harbour, boat owners must be vigilant that they are not carrying this pest with them from place to place. Environment Canterbury are reiterating the message to recreational boat owners to maintain a clean hull.

Akaroa Harbour developments

Following a 2018 assessment of the iconic Akaroa Wharf, in which the structure was deemed to be near the end of its useful life, plans have now been finalised for its replacement. The wharf, originally constructed in 1887, played a crucial role in the town's early development, and has been

a hub for recreation, commercial and tourism activities for generations. However, further repairs and maintenance were considered to be uneconomic, leading to the decision to replace the structure.

Designs for the new wharf are being finalised with input from Ōnuku Rūnanga, with the rebuild scheduled to begin in early 2026 with completion due by mid-2027.

In preparation for the new wharf's construction, Drummonds Jetty and Daly's Wharf have both been upgraded so that the community continues to have facilities available during the rebuild. Drummonds Jetty was re-opened on 18 December 2024 following a rebuild, with a floating pontoon added and opened on 24 February 2025. Daly's Wharf underwent strengthening work and other improvements, and was re-opened on 20 December 2024.

For the full background to the project, visit the Christchurch City Council's Akaroa Wharf update site (https://ccc.govt.nz/the-council/future-projects/major-facilities/akaroa-wharf).

Major plan approved for sea-level rise in Lyttelton Harbour

The Christchurch City Council has adopted a landmark 100-year Coastal Hazards Adaptation Plan to address the impacts of sea-level rise on public assets in Whakaraupō Lyttelton Harbour. This first-of-its-kind plan for the district prioritises six coastal communities: Rāpaki, Allandale, Teddington, Te Wharau Charteris Bay, Purau and Koukourarata Port Levy.

The plan was developed by the Whakaraupō to Koukourarata Coastal Panel, made up of local representatives including rūnanga, with support from the Council's Specialist Technical Advisory Group. The plan proposes adaptation strategies for vulnerable infrastructure – such as roads, wharves and walking tracks – to mitigate the effects of coastal flooding, erosion and rising groundwater. Informed by extensive community feedback, the plan uses signals, triggers and thresholds, rather than fixed timeframes, to establish flexible adaptation pathways. It also takes into account the wider transport network and connectivity to Christchurch. The estimated cost for asset adaptation over the next century is $217.8 million, based on current values and excluding ongoing maintenance.

Akaroa Wharf (Photo: Michal Klajban, Wikimedia Commons; CC BY-SA 4.0, https://creativecommons.org/licenses/by-sa/4.0/).

Drummonds Jetty following the recent rebuild and installation of a floating pontoon (Photo: Christchurch City Council).

Visit https://ccc.govt.nz/assets/Documents/Environment/Coast/CHA/CHAP-Whakaraupo-Lyttelton-Harbour-and-Koukourarata-Port-Levy-2025.pdf to download the full adaptation plan.

Otago

Sorrel O'Connell-Milne and Amanda Riddle, Regional Representatives

Otago Regional Council (ORC) coastal forecasting

Coastal forecasting is now in place for the Otago region from MetService through an online portal. Forecasts are given for 12 locations along the Otago coast (see Figure 1). Forecast parameters in the 7-day outlook include wave characteristics (height, period, direction), storm tide level (skew surge plus tidal level), and wind characteristics (speed, direction). Some example of coastal forecasts are shown in Figure 2.

Coastal forecasting allows for an early awareness of sea conditions that may cause impacts (such as inundation or erosion) on infrastructure (for example flood protection or roads) and properties along the Otago coast. Coastal forecasting is now part of the developing toolkit of coastal information that ORC Flood Response Team can use to assess conditions during a severe weather event. For example, coastal forecasts can be compared to real-time data from the Dunedin City Council (DCC) wave buoys to provide a manner of validation during an event.

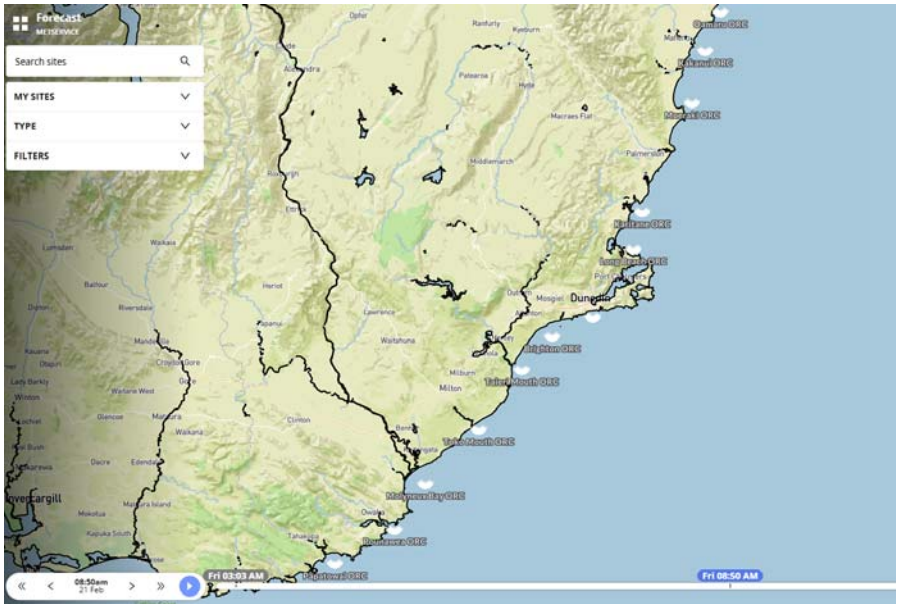

Figure 1: Location of the 12 sites for Otago coastal forecasting provided by MetService.

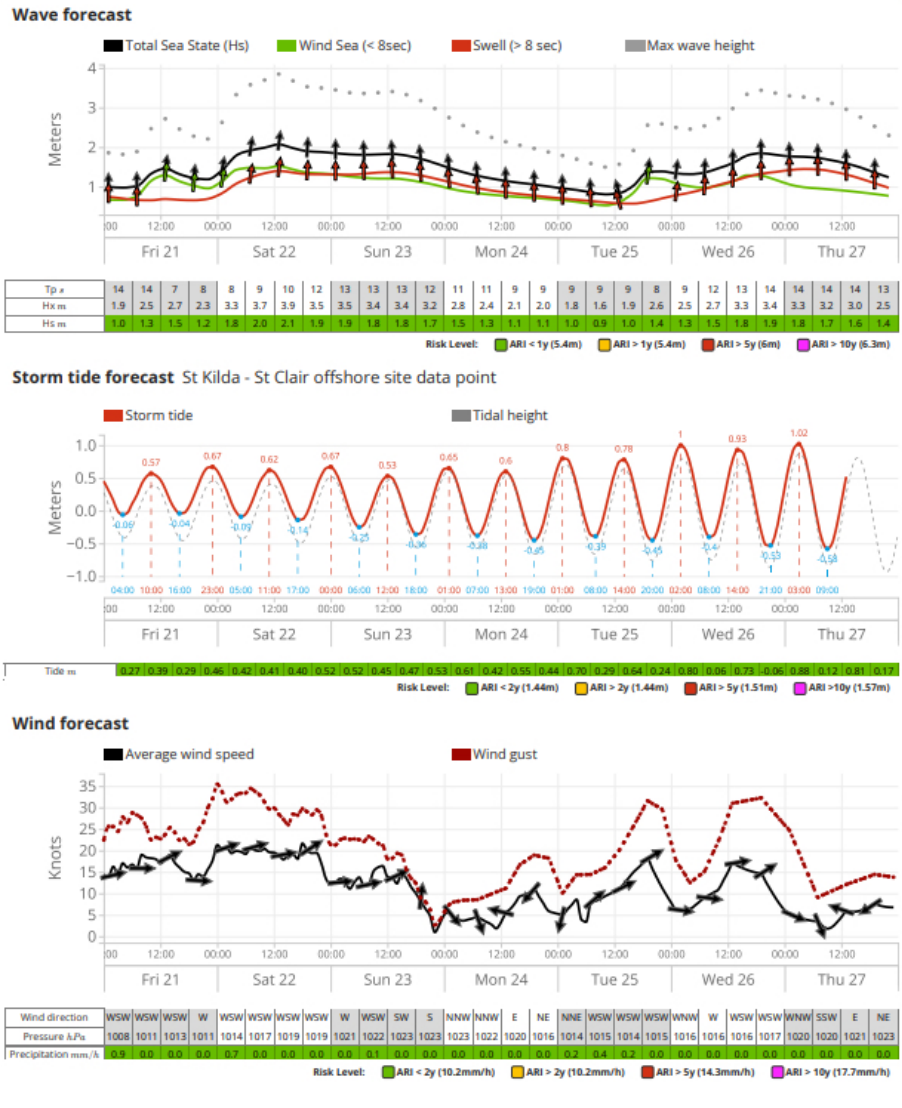

Figure 2: Example of coastal forecast for St Clair/St Kilda, 21/02/25-27/02/25.

Regional News from the web

New Wellington path and sea wall

Intended to be the 'final link' connecting Wellington city to Lower Hutt, a new pathway and sea wall, begun in 2022, is on track to be completed in the first half of 2026. The project will use over 6000 2.6 tonne interlocking concrete blocks in its construction, and it will link to the Petone to Melling cycle track and walkway that was completed in October 2023. The new construction will also act as a coastal wall to protect the road and rail lines that run along the coast from future sea level rise. The project prioritises marine ecology and the environment, including penguin protection measures and nesting places for birds along the pathway. For more, see https://www.rnz.co.nz/news/national/557558/new-path-and-sea-wall-will-be-final-link-between-wellington-and-lower-hutt

Invasive seaweed removal

Following Cyclone Tam, volunteers in the Bay of Islands worked to remove hundreds of tonnes of the highly invasive seaweed caulerpa from Omakiwi Cove. The local hapū, Ngāti Kuta and Patukeha, organised the cleanup to prevent the seaweed from spreading and harming local biodiversity and food sources. Volunteers used both manual labour and a digger to gather the seaweed and pile it above the high-tide mark, with help from other iwi and the Conquer Caulerpa Trust. In all, some 300 tonnes of seaweed were cleared. For more, see https://www.rnz.co.nz/news/national/558614/volunteers-remove-hundreds-of-tonnes-of-highly-invasive-seaweed-pest-after-cyclone-tam

Southland tsunami threat

A new study reveals that Southland faces a significant tsunami threat from the nearby Puysegur Subduction Zone, with the potential to cause 12m high waves. Communities like Invercargill, Bluff and Riverton, along with key transport hubs, are at risk. Experts stress the urgency of understanding this hazard, improving warning systems, and raising public awareness and preparedness, as the warning time for a local event is much shorter compared to distant earthquakes.

For more, see https://www.nzherald.co.nz/nz/nz-region-at-risk-of-12m-high-tsunamis-will-have-only-one-to-two-hours-notice/NCEHTBYUH5HQVHCT77EINITGFM/

News in brief

Research company Usearch estimates that around 2 million news articles are published every day on the web. Obviously not all are relevant to *Coastal News* readers, but even if 0.01% might be, that's still 200 stories each and every day. Below are a few that have caught the editor's eye that might have passed you by.

Local stories

Two New Zealand regions – Poverty Bay and Tāhuna-Glenorchy – have been selected to take part in a global climate initiative funded by the National Geographic Society, marking the first time that projects from New Zealand have been accepted. The initiative is designed to encourage local community and leadership involvement to seek climate action solutions for environmental protection and cultural preservation. To find out more, see https://www.1news.co.nz/2025/04/18/national-geographic-names-nz-regions-for-climate-change-initiative/

A recent presentation at the 187th meeting of the Acoustical Society of America has shed some light on a 1982 mystery off the coast of Fiji involving New Zealand researchers. A repeating series of four short bursts of sound resembling a quack were recorded which, while unidentifiable, were believed to be biological in origin (which led to the sounds being named the 'Bio-Duck'). While a conclusive identification still remains elusive, it is thought that the sounds could be an aquatic conversation. For more, see https://phys.org/news/2024-11-quack-underwater-coast-zealand-80s.html

Not so much elusive, but until recently undiscovered, researchers exploring deep water off the Fiordland coast have found marine communities never before filmed, including a protected species of red coral not previously seen in such large numbers. These were found some 4 km north of the entrance to Doubtful Sound, an area rarely explored due to prevailing weather conditions. For the story and accompanying video, see https://www.stuff.co.nz/nz-news/360563122/forests-protected-red-coral-filmed-first-time-fiordlands-coast

Turning to sharks, they're silent, right? After all, they don't possess sound-producing organs and so are believed to communicate and maintain social groupings through body language and possibly chemical signals. However, it seems at least one shark species – the rig shark – makes sounds by snapping its teeth; the clicking sound produced is loud, occurs over a range of frequencies (some detectable by humans), and is of short duration. The research was conducted by University of Auckland researchers and a paper has recently been published by the journal *Royal Society Open Science*. One question remains though – what are the sharks talking about? For more, see https://edition.cnn.com/2025/03/25/science/rig-shark-produces-sound-evidence/index.html

Finally, in an effort to boost the public's interest in local marine life, a 1.5 mm marine isopod found off New Zealand's south-east coast has been named after a Wellington brewery (*Pentaceration forkandbrewer*). While the connection between beer and marine life might seem tenuous, there is some rationale behind the naming choice – to find out what it is, see https://www.theguardian.com/world/2024/nov/14/nz-scientists-name-crustacean-after-brewery-pentaceration-fork-and-brewer

Tech-related news

The Southern Cross Next telecommunications cable between Australia and New Zealand now has a secondary use as a tsunami detector, with a UK-NZ scientific collaboration utilising a new laser-based technique to scan for earthquake and tsunami signals along the cable's 4,000 km length. A laser transmits ultra-stable light through the seafloor cable and amplifiers, located approximately 50-70 km apart, return this signal. Any variations in the returning data can then be analysed for potential earthquake and tsunami signatures. For more, see https://www.nzherald.co.nz/nz/submarine-cable-between-australia-and-nz-now-doubling-as-a-tsunami-sensor/UGXKB6R43NC25EUK3K4JQK24DA/

In a slightly less technical application, researchers in Florida are employing underwater 'doorbells' to identify and monitor fish species that are hindering coral reef restoration efforts. The doorbells have identified three species that together are responsible for eating more than 97% of coral laid as bait. For the full story, see https://www.theguardian.com/us-news/2025/mar/16/underwater-doorbell-scientists-coral-eating-fish-florida

A small-scale pilot project is now underway off the south coast of the UK to trial the removal of carbon directly from the sea. While not a new idea, this project is testing to find out if it could be more efficient and cost effective to remove carbon from the sea, given that it is present in greater concentrations than in the air. The project is one of 15 being funded in the UK to develop technologies to capture and store greenhouse gases. For more, see https://www.bbc.com/news/articles/cr788kljlklo

And in a somewhat less technical innovation, researchers in China have come up with a novel approach to tackle the scourge of micro plastics in water – a sponge. However, the sponge in question is not naturally occurring, but one made from squid bones and cotton. The biodegradable mixture has been found to remove 99.9% of micro plastics in initial testing. For more, see https://edition.cnn.com/2024/12/17/science/microplastics-sponge-wuhan-china-scn-intl-hnk/index.html

On the lighter side

If you think infrastructure projects take too long to complete, there might be a novel solution to speed things up. A stalled seven-year wetland restoration project in the Czech Republic was abandoned after local beavers completed it in two days, by creating long-lasting and natural dams that are now restoring the wetlands, and saving the Czech authorities around $2.2 million in the process (see https://www.yahoo.com/news/beavers-complete-government-seven-dam-125342176.html). Turning to narwhals, have you ever wondered what they might be using their tusks for? A new study in the Canadian High Arctic has come up with a surprising theory as to what they might be doing (see https://edition.cnn.com/2025/03/08/science/narwhal-tusks-play-behavior/index.html). And finally, for a brief time-out, why not watch a 'sharktopus' in action? (https://www.theguardian.com/us-news/2025/mar/21/octopus-shark-ride).

Accessing weblinks in the printed newsletter

Web links are an invaluable source of further information for readers, but in the printed version of *Coastal News* we can't include active links as we do in the pdf version.

We realise that manually copying long strings of seemingly random characters can be frustrating for readers, so for each issue we now produce a pdf file of live links – this can be found on the NZCS website at www.coastalsociety.org.nz/publications.

To make things even easier, you can access the pdf file by 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.

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nzcoastalsociety@gmail.com

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The submission deadline for the next issue is 15 June 2025.

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