Te Hunga Takutai o Aotearoa
NEW ZEALAND COASTAL SOCIETY

Coastal News

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

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Three and a half years later...

The November 2016 earthquake reshaped the Kaikōura landscape, including significant impacts on the coastline and marine ecosystems. Three and a half years later, we look at how these are recovering in the article beginning on page 3.

Drone assessing habitat changes and recovery along the Kaikōura coastline (Photo: Leigh Tait, NIWA).

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Word from the Chair

Kia ora koutou

As I write this piece working remotely from home, I am reflecting on what has been an unprecedented few months globally in the wake of Covid-19. I trust this issue of *Coastal News* finds you well and you have been able to navigate the numerous professional and personal challenges that may have been presented during this time.

For the NZCS committee one such challenge was the need to cancel this year's annual conference. We had preparations well advanced for the Waiheke conference, but with enduring uncertainties we simply could not promise to deliver a successful event.

While we hope to be able to revisit Waiheke in 2022 (following Coasts & Ports 2021 in Christchurch), the situation this year has provided an opportunity to test what is becoming part of our 'new normal' with respect to online interactive webinars to be hosted by our parent body Engineering New Zealand. The details for a series of events to be held on Thursday 26th November, in lieu of the annual conference, are outlined in detail on page 9 of this issue, and I'm hoping many of you will be able to join us either in person or online.

The NZCS AGM, which is normally held at the annual conference, will also be run online this year in November and the details for joining this interactive meeting will be published in the NZCS weekly digest closer to the time.

This issue of *Coastal News* includes an extremely interesting feature article on the recovery of the Kaikōura marine ecosystem three and a half years on from the devastating earthquake; an article on the diversity of Kaitiakitanga related to several New Zealand harbours; and research related to coastal cliff responses to individual wave impacts and new tools for assessing the health of New Zealand estuaries. News from the regions presents a diverse summary of coastal activity that has been undertaken throughout New Zealand over the last few months, and confirms that our members continue to lead the appropriate and sustainable management of New Zealand's coast.

Keep up the great work!

Nga mihi nui.

Paul Klinac
NZCS Chair

About the NZCS

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

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

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

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

Legacies of the Kaikōura earthquake on the coastal marine ecosystem

David Schiel[1], Tommaso Alestra[1], Shawn Gerrity[1], Shane Orchard[1], Robyn Dunmore[2], Dan Crossett[2], Mads Thomsen[1], John Pirker[1], and Leigh Tait[3]

Introduction

Natural ecosystems have many buffers that ameliorate the effects of disturbances. High species diversity, robust food web linkages, and redundancies of functions such as primary production and provision of seafood, are intimately linked. They are also bound to the physical elements of the environment to which they are adapted. When cataclysmic disturbances occur, such as the magnitude 7.8 Kaikōura earthquake, many of these linkages are broken, the usual buffers to change are greatly affected, and 'recovery' is unlikely to be a return to the pre-disturbance state.

The immediate impacts of the Kaikōura earthquake on the coastal marine ecosystem have been well-described (Alestra et al. 2019, 2020, Schiel et al. 2018, 2019, Thomsen et al. 2020). In summary, nearshore rocky habitats were lifted by up to 6.4 m above their former tidal heights along c 130 km of the coast, entire algal communities were lost because they were no longer immersed by tides, tens of thousands of mobile species such as banded wrasse, lobsters and pāua were stranded, and the pāua fishery was (and remains) closed to commercial and recreational fishers. Three and a half years later, the ecosystem is still in flux. Here we briefly describe the state of recovery along the coast.

Summary of what was done

After the November 2016 earthquake, thorough monitoring of rocky reef communities in the intertidal and shallow subtidal zones was done six-monthly for the first two years and then annually at 16 sites that encompassed the full range of uplift. All species and their abundances were recorded in random quadrats along set transect lines from the newly configured high intertidal zone to around 10 m depth subtidally.

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Sampling for the sizes and abundances of juvenile pāua (*Haliotis iris*) was done separately because much of their obligate small-boulder habitat in the lowest tidal zone was permanently lifted by the earthquake. Because of the patchiness of this habitat, the research team walked c 20 km of the heterogeneous coastline to locate and measure juvenile pāua. Experimental work on algal recovery was initiated, pāua population enhancement from hatchery-reared juveniles is being monitored in conjunction with the fishing industry and Kaikōura community, and innovative aerial drone techniques are being developed and used to judge the scale of habitat changes and recovery along the coastline. As well, temperature and light sensors are arrayed at critical habitats to gauge the altered and fluctuating physical environment.

Summary of recovery trajectory

Algal loss

Bull kelp (*Durvillaea* spp) was one of the hardest hit groups. The low intertidal species (*D. antarctica* and *D. poha*) died off almost completely at many sites, regardless of the degree of uplift, and have not recovered well, if at all, in most places. This undoubtedly reduced the primary productivity of these areas, as there has been no functional replacement of bull kelp by any other species. In fact, few of these large brown fucoid algae have functional replacements, so the loss of any of them greatly affects community composition and recovery after disturbances (Schiel 2006). Bull kelps considerably enhance species diversity within their habitats, and their loss has consequences lasting at least eight years (Schiel 2019). Large bull kelps also buffer the coast from wave action, and their loss may be contributing to the severe erosion of soft sedimentary rocky habitats (see cover photo). The slow recovery time of *Durvillaea* is related to their life history. They have a limited reproductive season of around three months during winter, are dioecious so male and female gametes must come from different individuals, and their propagules normally travel only a matter of tens of meters (Schiel et al. 2019). Recruitment of formerly occupied areas will therefore most likely come from detached drifting adults of distant populations.

Overall, the recovery of algae has been highly variable along the coast. There is virtually no recovery of the formerly dense mid-intertidal beds of the beaded fucoid alga Neptune's Necklace (*Hormosira banksii*). This species died off from the very large, high-diversity platforms around Kaikōura and has returned only in small patches on the lower tidal fringes. Across the coastline, there is little algal recovery in the mid and high intertidal zone. Where algal cover has returned, it is mostly tough calcareous coralline species and fleshy red algae in the low tidal zone. The recovery is related to the degree of coastal uplift (Figure 1). Sites with little uplift (< 0.2 m) have mostly returned to their former algal cover of 75%-80% in the low zone. At these sites the fucoid *Carpophyllum maschalocarpum* is now abundant rather than much larger bull kelp.

At sites lifted by around 2 m, algae cover around 30% of rocky surfaces, and beyond 4 m uplift there is only sparse algal cover. This compares to cover of at least 70% in the low zone of most sites before the earthquake. Subtidally the loss of algae has been less dramatic, but the high uplift sites are demonstrating poor recovery, most likely because of continued disturbance from shifting gravel and sediments, poor light quality, and a paucity of reproductive adult algae to seed new areas.

Changed infrastructure

The niche space of species is defined not only by interactions with the myriad other species present but also by the topography, tidal regime, temperature, wave forces and light environment of habitats. All of these were greatly altered by the earthquake. Unfortunately, as rocky habitats pushed upwards, there was little replacement by

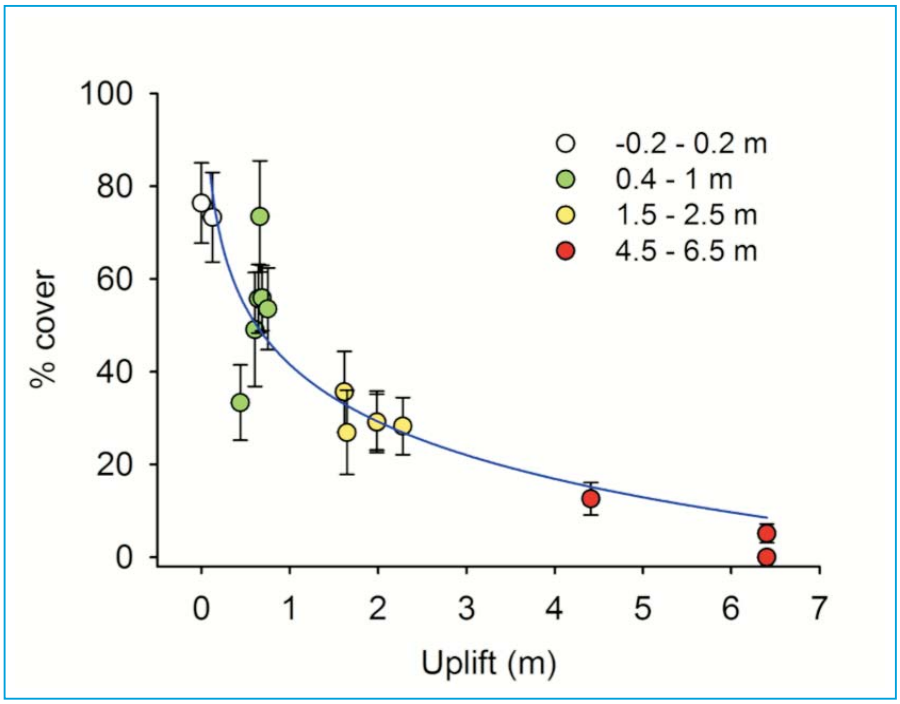

Figure 1: The percentage cover of large brown algae in the low intertidal zone at sites across degrees of uplift. The pre-earthquake cover of algae averaged around 75%-80% at these sites. This work is coordinated by post-doctoral researcher Tommaso Alestra.

rocks below them. The earthquake coast is mostly sand, gravel and boulders. The large reef platforms around Kaikōura, extending >100 m in width, once supported some of the greatest per-area diversity in New Zealand but now are almost barren. The tide still covers the reefs, but at a much shallower depth and for shorter periods. It is now common to see substratum temperatures >40 °C for several hours during low tides, which are lethal to most species. The increased erosion of reefs, after losing coralline algae that helped consolidate the friable surfaces, also slows the recovery (Schiel et al. 2019). The width of the intertidal zone is now usually only a few meters in most places and is near-vertical. This also is inhospitable to algal attachment because of direct pounding by waves.

Rain and storm events have continued to produce a large influx of sediments from coastal cliffs and catchments into the nearshore zone. This often smothers algae, invertebrates and their habitats, but also diminishes the light environment in coastal waters, with potential flow-on effects on algal productivity. For now, this is the new infrastructure within which recovery must occur. We have seen many instances where species have begun to come back, only to be lost because of inhospitable conditions or marine heat waves (Thomsen et al. 2019).

Pāua recovery

Pāua population recovery has been one of the more heartening stories of coastal improvement. Extensive patches of juvenile habitat were found along the coastline and there has been very strong recruitment of pāua in the years following the earthquake. Tagging studies of natural pāua and hatchery-raised juveniles placed into some sites show very good growth rates of 30-40 mm per year and good survival. This project has had great interest with the Kaikōura community and the pāua fishing industry (Figure 2).

Aerial drones

A major problem in assessing change in natural ecosystems is the large spatial scale that must be accommodated. To increase spatial coverage and provide a quantitative baseline against which to assess change, we have used multi-spectral drone imagery for rocky reef topography and algal cover. With machine learning, individual species can be identified and their spatial coverage determined accurately (Tait et al. 2019, Figure 3). This technology has also been useful for tracking dune formation, erosion and formation of gravel beaches, and for mapping habitats of coastal plants and birds. It is quite an exciting development of this research programme, which shows great promise for future uses in research and management.

Conclusion

Change to the earthquake-affected coast will continue because the algal communities and species that rely on them are still in flux (Figure 4). This is only a brief overview of 'recovery' so far. There continue to be natural impacts on the coastal infrastructure. These can be exacerbated by increased human usages and impacts from greatly increased access to the coastline around formerly isolated headlands. Time will tell how well we manage this collectively.

Figure 2: Ongoing work with pāua seeding of sites around Kaikōura, to augment natural recovery of pāua populations after the earthquake. Seed pāua from the hatchery are bright blue-green in shell colour. Top right: tagged hatchery pāua in experimental habitat, caged to keep out predators. Lower right: school pupils help find seed pāua, which shelter beneath rocks for around 3 years. Lower right: the blue-green shell cap is still visible on pāua that have grown for around 15 months in field sites. This work is part of PhD studies by Shawn Gerrity.

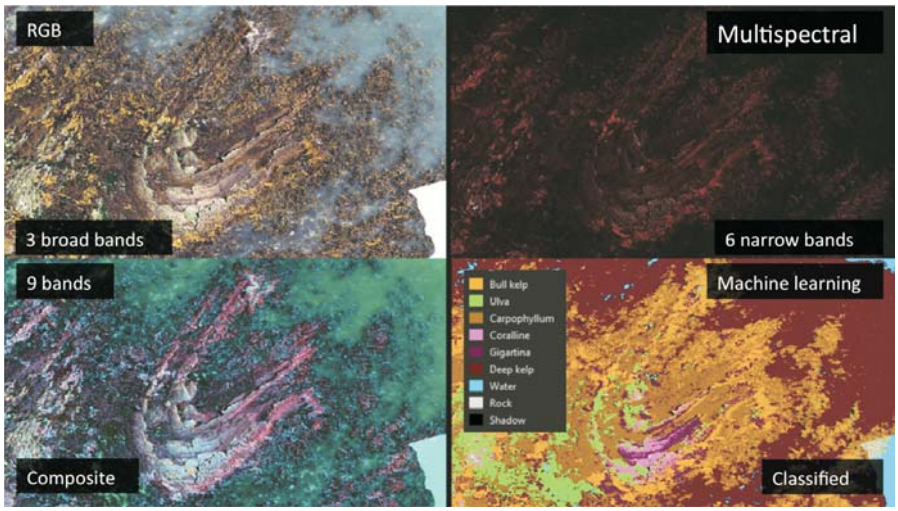

Figure 3: Different depictions of the same algal covered reef, in visible and non-visible light. Training machine learning programmes with greater spectral information ('bands') can greatly improve automated mapping over large areas, such as in lower right where the cover of different algae is shown (work from Leigh Tait, NIWA).

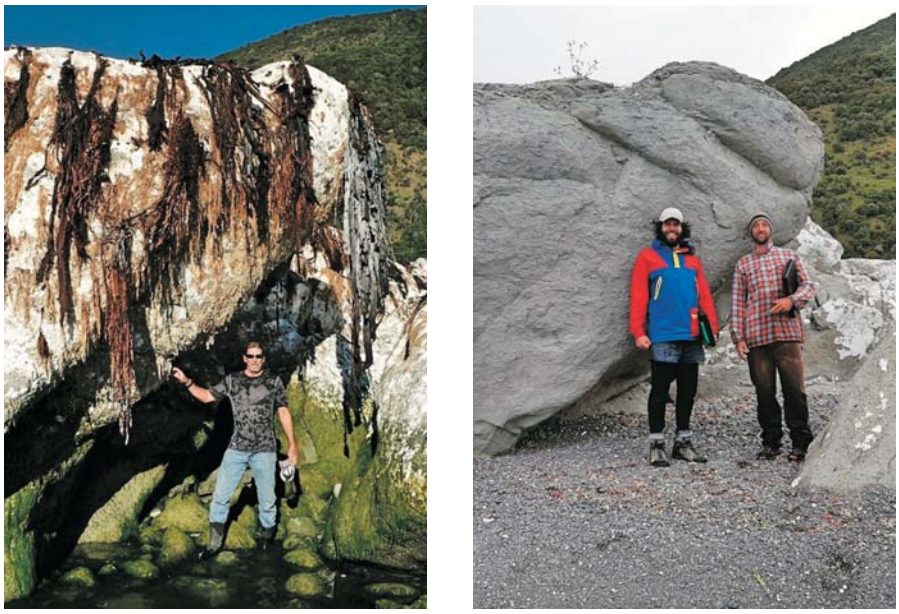

Figure 4: Left: Newly exposed subtidal reef two weeks after the earthquake, showing subtidal fucoid algae at Waipapa, where uplift was 6.4 m. Right: The same rock in 2019, showing infill of eroded sedimentary rock and movement of gravel (Photos: S Gerrity).

Acknowledgements

We thank MBIE, the National Science Challenge Sustainable Seas, and MPI, particularly Dr Rich Ford, for supporting this project. We thank Te Rūnanga o Kaikōura, Te Korowai, the East Coast Protection Group, the Marlborough District Council, and our Technical Advisory Group for guidance, support and interest.

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In 2018, NZCS published 'Shaky shores: Coastal impacts & responses to the 2016 Kaikōura earthquakes', which looked specifically at the coastal impacts and response to the November 2016 earthquakes. Included in this was an article summarising the impacts and changes in nearshore marine communities, which provides a 'then' context to the current article's 'now' perspective. A copy of 'Shaky Shores' can be downloaded from the NZCS website (under the Media/Publications tab at www.coastalsociety.org.nz).

Listening to the voices of our harbours: Kāwhia, Manukau and Whangarei

Marama Muru-Lanning, Keri Mills, Gerald Lanning, Shane Solomon

Mai Hawaikinui ki Whangaparāoa, huri ki Tāmaki, ki Whangarei, ka hoki anō ki Tāmaki. Whiti atu ki te Mānukanuka o Hoturoa. Ka haere ki Mōkau, ka taka te punga. Ka hoki ake ki Kāwhia kai, Kāwhia tangata, Kāwhia moana. Ka tū ko Hani rāua ko Puna. This kōrero hikoi, wordsmithed by Hukiterangi Muru for our recently awarded Marsden project, traces the harbour routes travelled by the Tainui waka, which is said to have been guided into the Kāwhia Harbour by Paneiraira, a taniwha water creature and kaitiaki. The English translation is 'From Hawaiki to Whangaparāoa, then to Tāmaki, then to Whangarei and returning to Tāmaki, crossing over to the Manukau Harbour. Continuing on to Mokau, Turning to Kāwhia, Kāwhia the waters, Kāwhia the sustenance, Kāwhia the people. The resting place of Hani and Puna, the prow and stern of the Tainui canoe'.

Our research focuses on 'kaitiakitanga' and on 'harbours', stemming from the intersection of these in the Manukau Harbour claim, led by the late Dame Nganeko Minhinnick, which was central to kaitiakitanga becoming a key concept in law and policy. We will investigate kaitiakitanga as an ethic and flaxroots politic, emphasising the work of community activists at multiple levels, from the shores and waters of their harbours to the steps of Parliament.

The word kaitiakitanga was mobilised by Māori rights activists in the 1980s, in strategic campaigns to defend their lands and waters from environmental desecration. The inclusion of kaitiakitanga in legislation and policy developed in the context of increasing neoliberal and Third Way politics, where the government sought to devolve many of its responsibilities to 'stakeholders'. Central and local government tend to use the term kaitiaki as a convenient Māori shorthand for stakeholder, recognising Māori 'interests' and requesting their labour without relinquishing power or offering reward. This project will provide a fuller description of kaitiakitanga, including its evolution since the 1980s, and the impact of law and policy on its practice today.

Our aim is to focus on the critically important and threatened environment of harbours. When the first voyagers arrived in Aotearoa they sought whaanga: sheltered bays in which to draw up their waka and come to land. Hundreds of years later, the first Europeans did the same. Aotearoa's harbours are and have always been coveted and contested sites for navigation, industry, fishing, recreation and settlement. Historically they are important places of meeting, negotiation and exchange. They are where land, sea and people come together. Yet there has never been a comprehensive study of harbours and their significance to New Zealanders or to Māori. Most written histories of individual harbours, if they mention Māori history at all, sail over it swiftly and shallowly before moving on to a narrative about Pākehā industry. What are the stories Māori tell about their harbours and their relationships with harbours? How do kaitiaki understand these places and how to best use and care for them?

This project arose from conversations with flaxroots Māori. Despite the prevalence of kaitiakitanga kōrero in the literature, the voices of those with daily responsibilities for it are seldom heard. Our case study approach, building from our established relationships with Māori communities in Waikato and Tai Tokerau, is necessary to explore the diverse local expressions of kaitiakitanga. Through our collaborations with tangata whenua from the harbours, we will investigate ways in which mātauranga Māori and kaitiakitanga (and related terms) interact with local and central government ways of knowing and treating the environment. We will explore kaitiakitanga as a political movement and a network of concepts and relationships, varying between places and communities, and changing over time.

We will listen to, and gather, stories of the Kāwhia, Manukau and Whangarei Harbours. These harbours cover a representative range of ecological states and threats, economic uses, and inter-iwi relationships. This project is not a comparative study, but an in-depth study of kaitiakitanga over harbours based on detailed case study analysis. The three sites will be put in national context by analysing documentary resources on kaitiakitanga across the motu. Our project builds on and broadens the important precedent set by Merata Kawharu in her 1998 PhD thesis on kaitiakitanga and subsequent publications, as well as work undertaken by Māori Marsden, Nganeko

Kāwhia Harbour (Photo: Gerald Lanning).

Minhinnick, Margaret Mutu, Angeline Greensill, Jacinta Ruru and others. Our focus on harbours allows us to look at dynamics of land and sea kaitiakitanga, as well as the multiple human relationships that are drawn together through harbours.

The narrow bureaucratic space in which central and local government allow for kaitiakitanga often hinders its full exercise, and fails to cater for the wider obligations, rights and spiritual dimensions that are fundamental to it. The first kaitiaki were atua, taniwha and other natural phenomena. Local meanings of kaitiakitanga come from its interplay with other Māori concepts such as mauri, rāhui, taniwha, mātauranga, rangatiratanga, mana, kotahitanga, whanaungatanga and whakapapa. Our study recognises that these terms are interpreted and practiced differently by different iwi, hapū, whānau and marae. We seek to learn how people have enacted kaitiakitanga in their daily lives, in continuation of tradition and in response to environmental degradation and appropriation. Kaitiakitanga today takes various forms, from upholding tikanga in interactions with the environment and passing knowledge on to future generations, to political work in conversation and contest with the state, such as letter writing, submission writing, legal action and protest.

Our study will go beyond the dominant voices of tribal spokespeople who are given preference by the Crown, government and iwi authorities. We are committed to including the full range of community voices, including the kōrero of kaumātua, rangatahi and particularly wāhine Māori. Women's leadership is especially important as it is underrepresented in existing literature.

Strong Māori women such as Nganeko Minhinnick, Tuaiwa Hautai (Eva) Rickard, Angeline Greensill, Carmen Kirkwood, Dayle Takitimu, Pania Newton and others less well-known have played a fundamental role in the activation of kaitiakitanga in relation to harbours. Furthermore, there is a rich history of tūpuna wāhine associated with harbours, including Whakaotirangi at Kāwhia; Puhihuia and Te Ata-i-Rehia at Manukau; and Kuiawai, Reitū and Reipae at Whangarei. The time for this research is now: harbours are under accelerating environmental pressure and Māori communities living on harbours are increasingly affected by climate change. Harbours around the country are the subject of multiple claims under the Marine and Coastal Area (Takutai Moana) Act 2011, and Waitangi Tribunal claims over harbours are yet to be settled and are at the forefront of the next wave of Treaty settlements.

Our research project will reveal, for the first time, the complex and diverse nature of relationships that Māori have with local harbours. Our research seeks to demonstrate that the wholeness of kaitiakitanga can only be fully understood when applied in context with other Māori concepts used by tangata whenua in specific places. This study reclaims the political nature of kaitiakitanga and the work of the women and men who have fought to protect the environment and to be recognised as kaitiaki. It explores how the codification of kaitiakitanga into law and policy has hindered or assisted Māori in their exercise of kaitiakitanga over harbours.

Our Research Aims are:

1) To develop a fuller description of kaitiakitanga. We ask: what does kaitiakitanga mean now and how do Māori communities living around harbours understand their role as kaitiaki? Our project will examine the practice of kaitiakitanga and the way the concept operates in interaction with other Māori concepts such as mauri, rāhui, taniwha, mātauranga, rangatiratanga, mana, kotahitanga, whanaungatanga and whakapapa. At present, kaitiakitanga is referred to in political discourse as if it is a generic 'Māori' practice. Our project seeks to show there is a diversity of kaitiakitanga practices and knowledges, specific to places and the communities that live alongside those places. Communities notice and experience changes intimately, in a way that scientists cannot replicate. We also seek to document the evolution of kaitiakitanga in the face of environmental change like rising sea levels, biodiversity loss and plastic pollution.

2) To investigate how kaitiakitanga interacts with law and policy. Since Aotearoa was colonised, kaitiaki have had to interact with the colonists' laws and policies in order to influence decisions over their environments. Today's kaitiaki are forced to become experts in the Resource Management Act, the workings of the Environment Court, the Takutai Moana claims process, letter and submission writing. Community leaders must attend numerous meetings with local government authorities and agencies. Whole lives are spent in this work. Our project seeks to honour these lives by laying out the complexity and challenges of being kaitiaki in modern legal and bureaucratic environments. We look to capture the fiercely political nature of kaitiakitanga. In bureaucratic discourse kaitiakitanga has been stripped of its teeth; it has become a catchphrase for Māori 'stewardship' and 'guardianship' of the environment, when kaitiakitanga has in fact been an urgent fight to stop the destruction and despoliation of sacred places and traditional food gathering sites. By documenting the obstructions Māori face in exercising kaitiakitanga our project will inform future legal and policy change in Aotearoa and potentially abroad.

3) To record the history and honour the visions, strategy and work of Māori activists in protecting Papatūānuku, her lands and waters. Māori activists have fought long and hard, and our project looks at their legacies. Central to this aim is the celebration and acknowledgment of wāhine Māori as kaitiaki.

4) To facilitate the recording of mātauranga for the benefit of participant communities. Importantly we will organise an international symposium, which will be a space for local and international experts to engage with local kaitiaki in order to share and disseminate knowledge. We will create a special environment breaking down barriers between scholars and community activists.

5) To advance Kaupapa and Tikanga methodologies and theories into new disciplinary areas and institutions. While these methods have flourished in education and public health they remain underdeveloped in anthropology, history and legal studies.

In achieving our research aims our project will contribute to the empowerment of Māori, advance human-environment, anthropological and oral history scholarship, and challenge narrow accounts of Māori history that neglect the full chorus of flaxroots voices.

Making an impact: Coastal cliff response to individual wave impacts

Catriona Thompson, University of Auckland

The driving force behind this doctoral research was in exploring the link between direct wave-cliff interaction. Previous studies had looked at wave impacts on cliffs at an hourly or tidal scale, whereas this research aimed to observe the cliff response to individual wave impacts in order to identify which wave conditions maximise erosive wave energy transfer to cliffs.

Underpinning the research were two key concepts. First, it has been argued that "... considering the millions of waves which break on storm wave coasts each year, it is probable that high shock pressures are occasionally produced in the field" (Trenhaile, 1987, p 17). Second, an extensive body of work on wave impacts on coastal structures has highlighted that individual waves that are breaking or near-breaking at the moment of impact, maximises impact pressure. The implication of these concepts are that low frequency, but high magnitude, wave impacts may be a significant driver of cliff erosion.

The main body of fieldwork was undertaken at Onaero Bay, Taranaki, New Zealand, as a 30-day deployment, with some supplementary data (45 min) from San Diego, California, USA. Analyses focused on wave impacts at the individual wave scale. Pivotal in facilitating this level of detail was the use of video recording to enable direct, real-time observations of the wave impact and resulting cliff response. By observing individual wave impacts with video and measuring concomitant seismic response from sensors buried at the cliff top, the research ascertained the influence of wave impact type on peak ground motion magnitude. Additional wave condition data was collected by wave pressure sensors located at the cliff toe and on the beach fronting the cliff.

A total of 7447 individual wave impacts were classified manually using 33 hours of video data. A wave impact classification scheme was developed that divided waves into eight types depending on the stage of wave transformation: two types of broken waves, four types of breaking or near-breaking waves, and two types of unbroken waves. This scheme provides an indication of the energy dissipated prior to impact as well as the kinematics of wave-cliff interaction. The shape of the wave at impact is crucial, because it controls whether there is a pocket of air entrapped and compressed by the overturning wave.

Analyses showed that breaking and near-breaking wave impacts produced the highest cliff ground shaking compared to broken and unbroken impacts. Breaking waves that entrapped a gas pocket at impact generated an average peak in ground displacement of between 38 µm and 36 µm, whereas completely broken and unbroken waves produced peak displacement of around 2 µm on average. For the largest 1% of peak ground displacement values (>75 µm), 97% were breaking or near-breaking, and only 3% were unbroken or broken impacts. Figure 1 shows the comparison between two hours of data: one when H_s = 1.5 m, and one during a storm when H_s = 3.7 m. The storm shaking velocities are much lower despite the higher H_s as all the waves had broken before reaching the cliff. Indeed, the largest values of cliff shaking from individual wave impacts did not coincide with storm conditions; instead, the video analysis indicated that they were due to breaking impacts under moderate wave conditions.

Spectral analysis was undertaken for each of the eight wave classes revealing distinctive spectral signatures for each class. In future work these signatures could possibly be used to identify the wave-breaking regime for other cliff locations where seismometers are available. In this research the power spectral density analyses confirmed that the energy delivery associated with breaking wave classes is orders of magnitude higher than

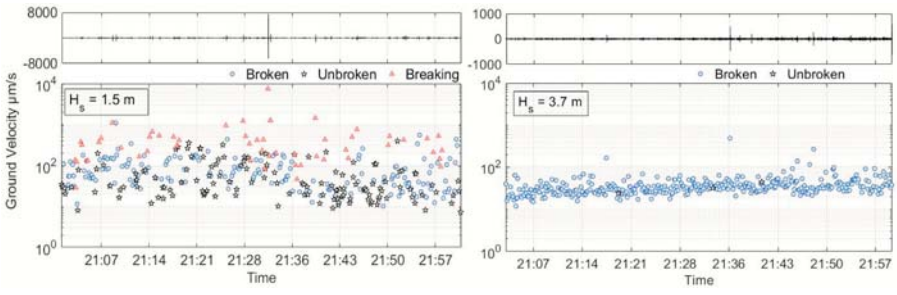


Figure 1. Time series of the seismic signal recorded over an hour by the seismometer (top), and individual wave impacts classified as broken, unbroken, and breaking impacts. Left: H_s = 1.5 m; right: H_s = 3.7 m.

broken and unbroken impacts. Breaking wave impacts with an entrapped gas pocket reached a peak of nearly 9 dB/Hz, compared to completely unbroken waves which reach a maximum of only 0.01 dB/Hz. The highest energy peak for one of the breaking wave categories with a trapped gas pocket was nearly four orders of magnitude greater than for unbroken waves. Breaking waves also had the highest total integrated sum of energy transferred over a wave impact event, demonstrating that the overall transfer of energy into cliffs was higher, not just the magnitude of the peak frequency.

Wave impact types were especially dependent on the ratio of water depth and wave height as it controls the location of the breakpoint relative to the cliff face. This relationship is fundamental for understanding energy dissipation and energy transfer to the cliff. Small variations in this ratio between successive waves (e.g. due to reflection and differences in incident wave height) resulted in large differences in impact class and cliff ground motion. However, observations show that there are periods during the tidal cycle when particular wave classes dominate, creative distinctive wave impact regimes.

Future changes in sea level or wave climate will change the cliff-toe water depth and wave height ratio, and therefore alter these impact regimes. Assuming that cliff ground motion represents a reliable proxy for cliff erosion, then results from this thesis suggest that accelerated erosion is likely in areas where changes in sea level or incident wave conditions lead to transitions in wave impact regimes towards greater breaking impacts.

Reference

Trenhaile, AS (1987). *The geomorphology of rock coasts*. Oxford University Press, USA.

NZCS 2020 Conference goes regional

The decision has been made to defer the NZCS 2020 conference that was to be held on Waiheke Island in November. The cancellation is disappointing given the work we have put in lining up venues, keynote speakers and sponsorship.

However, there is still uncertainty associated with COVID-19 issues, including the potential for reduced registrations, less sponsorship, travel restrictions by employers, restrictions on gathering numbers, a second wave of infection, and the lead time necessary to get deposits back from venue bookings. With this in mind, any conference we choose to run in November would most likely have to comply with a 'new normal' and we questioned whether we could run a successful conference with social distancing when social interaction is one of our conference's strengths.

An alternative event is being planned for 26 November that will take the form of:

1. The Eric Verstappen Young Professionals Breakfast (as a lunch time event this year) in agreed regional locations, hosted by selected mentors/NZCS members. This will be followed by;
2. An online launch of the NZCS Special Publication 2020 – 'Coastal Systems and Sea Level Rise: What to look for in the future' (see article on page 18), with selected authors presenting. This will include a suitable welcome from a nominated presenter. This will be followed by;
3. Regional catch-ups in nominated locations, hosted by NZCS regional representatives/committee members. These will be run from lunch time, and conclude with the regional/social events from late afternoon.

Further details and timelines will be advised on the NZCS website and in the weekly *Email Digest*. We plan to return to Waiheke Island for our 2022 NZCS annual event. This will be preceded by the 2021 Australasian Coast & Posts conference in September 2021 in Christchurch that replaces our NZCS annual event every 4th year.

The Eric Verstappen Young Professionals Breakfast

The NZCS Management Committee have decided to rename the Young Professionals Breakfast as T*he Eric Verstappen Young Professionals Breakfast*. This appropriately commemorates Eric who passed away this year. Eric was a coastal engineer with the Tasman District Council, a highly respected and long serving member of the NZ Coastal Society Management Committee and a staunch advocate of the breakfast in which he enjoyed contributing to each year. Eric's family approve of the idea and appreciate NZCS commemorating Eric in this way. Renaming the event adds value to an existing conference event that has been popular and successful for a decade. A tribute to Eric appeared in the March 2020 edition #71 of *Coastal News*.

The Young Professionals Breakfast was first run at the NZCS conference in Whitianga in 2010 and at the time called The Students Breakfast. It was an idea that evolved from a conversation between Rick Liefting (Tonkin & Taylor and NZCS committee member) and Peter Singleton (Environment Waikato) who saw a valuable way for the society to encourage and foster students into the coastal profession. Later it became known as the Young Professionals Breakfast and participation was expanded to include early-career (<5 years) coastal professionals. It now provides students and early-career professionals with an opportunity to network with and 'pick the brains' of invited mentors who have 'been there, done that' in the coastal scene. Most invited mentors are in positions that involve recruiting, so they are able to provide insights into what they are looking for in potential coastal employees and to offer a range of career examples and advice. The breakfast event is also an opportunity to network with people from across the country at the same early career stage. Registration is free for this event and open to all students and early-career professionals registered for the conference.

A decade on, the event is as successful as ever and the Society is committed to continue the event as the Eric Verstappen Young Professionals Breakfast in memory of Eric's contribution to the Society.

Dr Terry Hume

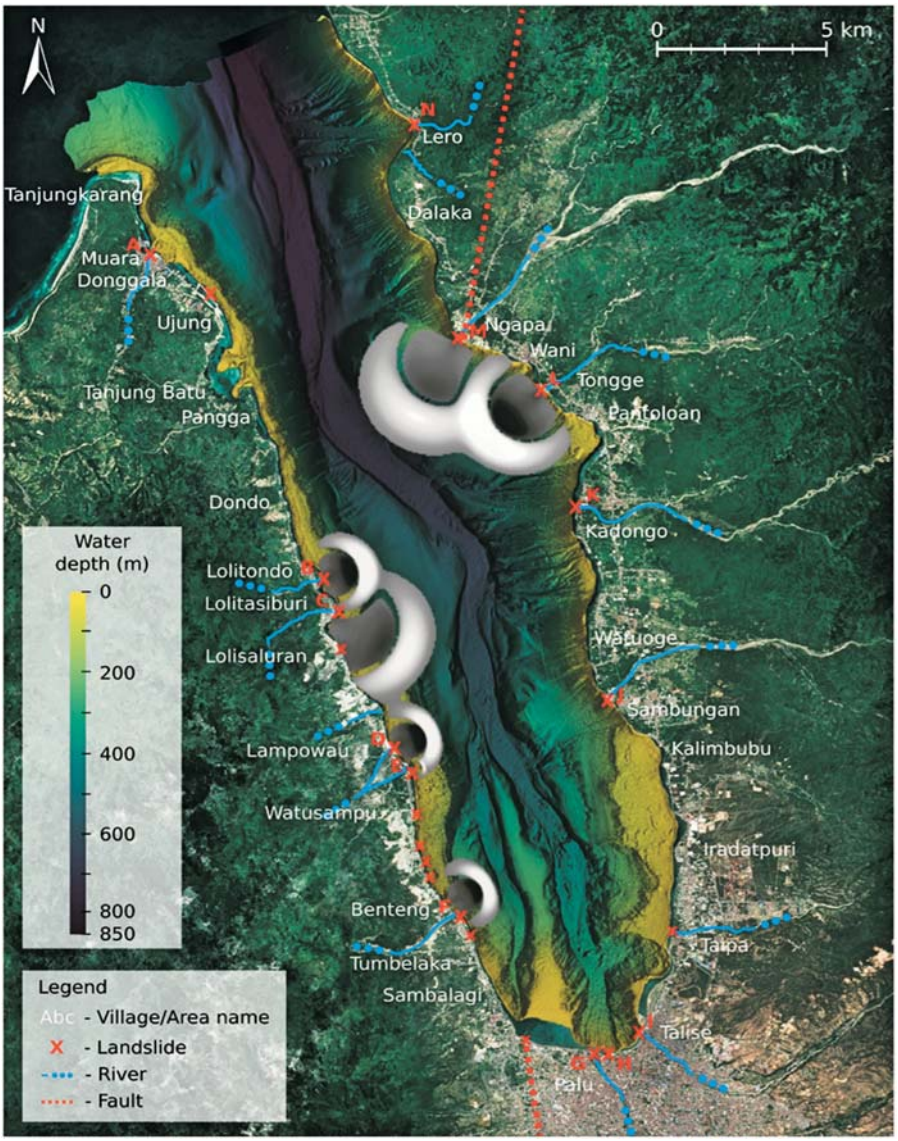
Coastal landslides in Palu Bay during the 2018 Sulawesi earthquake and tsunami

Pablo Higuera, University of Auckland

A joint team from the University of Auckland, the National University of Singapore, and several Indonesian institutions has recently published a paper in *Landslides,* in which we analyse the tsunamis observed in Palu Bay (Sulawesi, Indonesia) after the 2018 earthquake. The importance of this event, which still puzzles the scientific community, lies in the fact that it was not expected because Palu-Koro is a strike-slip fault. On top of that, the significant destruction in the area, also caused by liquefaction, and the numerous recordings uploaded to the social media in the following days made this event a very interesting research topic almost instantly. This article describes the efforts of researchers to understand this event and the process that it took for us to gather information and write the paper.

The initial efforts were focused in understanding the tsunamigenic mechanisms. Given the limited amount of data available at that moment, tectonic deformation, submarine landslides and the coastal landslides were pointed out as possible causes. Soon after, the results from a small number of field surveys started to be published, providing further insights on the effects of the tsunami along the coast. Two key conclusions were that runup measurements and splash heights, being 4-10 m locally, were consistent with large amplitude waves, and the lack of damage outside the bay indicated that the tsunami generation mechanisms needed to be within Palu Bay. At the same time the first efforts to model the tsunami waves from the estimated fault geometry (the fault remains unmapped underwater) and earthquake parameters were unsuccessful, since amplitudes were too small compared to existing tidal gauge measurements in the area, which pointed out around 4 m and 4 minute period waves arriving within 6 minutes after the mainshock. Therefore, the hypothesis of a large submarine landslide located between the tidal gauge (Pantoloan) and Palu city was embraced. At the same time coastal landslides were identified with the aid of field surveys and pre- and post-earthquake satellite images, becoming another plausible tsunamigenic factor, although there was no consensus on the relative contribution that each of the factors may have had.

In view of the importance that a high resolution post-earthquake bathymetry would have, both to improve our understanding and to run more detailed numerical simulations, our team performed two coordinated bathymetry surveys, one of them along with the Indonesian Navy. The result is a deep-water bathymetry with 10 m horizontal resolution and 5 m uncertainty at 850 m (maximum depth of the bay), and a coastal bathymetry with 0.8 m horizontal resolution and 0.8 m uncertainties at 200 m, the water depth where both are blended. Existing pre-earthquake bathymetry data had a scarcer resolution and significant uncertainties, nevertheless, when we compared it against our new data we did not



Map of Palu Bay with the bathymetry produced in this paper. The grayscale areas indicate the major tsunami waves generated by the landslides detected (denoted by red crosses). The light and dark areas indicate the peaks and troughs of the tsunami waves, respectively.

observe any significant submarine landslides. Consequently, the hypothesis of a massive submarine landslide causing the tsunamis can be ruled out.

In view of the growing uncertainties with water depth, we decided to base our study in identifying the pre- and post-earthquake coastal bathymetry changes. Our new data, along with high resolution satellite images, allowed us to characterize the extension and volume of 14 major coastal landslides, whose existence had been reported already in other works, and many smaller ones.

Generally, most coastal landslides are located at river deltas, where sediment is loose and accumulates over time. For example, in the largest coastal landslide detected, which is very close to the Pantoloan tidal gauge, a large portion of a river delta collapsed and 6.66 million m^3 of sediment were mobilised down the slopes of the bay towards the deep end. Moreover, we also applied existing semi-empirical formulations to identify the properties of the waves generated by those landslides. Coming back to the largest landslide, it potentially produced a wave around 11.1 m in height, 1382 m of wavelength and between 23.1 s and 52.2 s of period. It must be noted, nevertheless, that there are significant sources of uncertainty involved in all the steps, hence the estimations provided are order of magnitude only. Moreover, in some cases missing data prevented us from obtaining landslide-induced wave characteristics at certain locations.

The final step in our work involved propagating the tsunami waves with the nonlinear shallow water equation model COMCOT. The entire bay was simulated with a 20 m resolution grid, and each landslide-induced wave was introduced at its corresponding time. Time series of free surface elevation were recorded at three locations in which data had been reported in a recent paper based on existing videos. Although the data agreement is not perfect (no tuning was performed to the wave data), the simulation captures well the magnitude of the wave heights and interesting features observed in the existing videos, such as the undular bores arriving to Palu city.

Furthermore, despite the individual landslide waves being significantly shorter than typical tsunami waves, the model captures extremely well the wave periods measured in Palu (~2.5 minutes) and Pantoloan (~4 minutes). At Palu, the main reason behind this is the staggered distribution of the landslide sites, and the fact that wave crests combine with one another as they propagate towards Palu city. The reason behind the longer period in Pantoloan has been found to be resonance, as the landslide waves seem to be able to trigger the first E-W resonant mode of the bay.

In conclusion, in this work we produced a detailed bathymetry of Palu Bay, with a very high resolution in shallow waters that will be useful for other researchers to test their hypotheses. This is especially relevant to understand the relative contribution of the tectonic deformation, applying sophisticated physics-based models considering the super-shear rupture velocities reported, and the coastal landslides, since both appear to be now the main tsunamigenic drivers.

Finally, challenges still lie ahead. Future work will include reducing the uncertainties of the coastal landslides characteristics and the associated waves, as well as mapping the Palu-Koro fault underwater within the bay.

Coastal landslides in Palu Bay during 2018 Sulawesi earthquake and tsunami. Landslides. DOI: https://doi.org/10.1007/s10346-020-01417-3

NZCS Regional Representatives

Every region has a NZCS Regional Representative who is available to help you with any queries about NZCS activities or coastal issues in your local area. If you are interested in becoming involved as a regional representative, please get in touch with Sam Morgan (samm@4sight.co.nz) or Ana Serrano (ana.serrano@wsp.com).

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A new tool for assessing the health of New Zealand's estuaries

Dana Clark[1,2], Judi Hewitt[3], Joanne Ellis[2], and Conrad Pilditch[2]

Like many countries around the world, New Zealand does not have a standardised approach to estuary health assessment, making it difficult to compare estuaries and set national standards. Many of the biotic indices developed overseas are not readily transferable to New Zealand due to differences in species ecology and composition, stressor type or magnitude, and estuary geomorphology. So, researchers from Cawthron, the University of Waikato and NIWA have developed a new tool to assess the 'health' of New Zealand's estuaries, which can be applied to any estuary in New Zealand. Having a national-scale tool provides consistency, enables managers to evaluate the health of their estuary in a national context and reduces the substantial costs that would be required to develop separate estuary-scale or regional-scale models.

The National Benthic Health Models (BHMs) use information about the animals living in the seafloor sediments (e.g. shellfish and worms) to assign a score, which indicates the health of an estuary in response to two of New Zealand's key coastal stressors – sedimentation and heavy metal contamination (see Figure 1). This approach to assessing estuary health was originally developed by NIWA and the University of Auckland, and Auckland Council has been successfully using the method for their estuary monitoring since 2002. However, the original models could only be applied within the Auckland region whereas the new National BHMs, which were developed using data collected by councils across New Zealand, can be applied anywhere in the country.

(1) Cawthron Institute; (2) University of Waikato; (3) NIWA.

The National BHMs use a multivariate technique to describe how seafloor communities change in response to either sedimentation or heavy metal contamination. Most councils routinely collect information on the abundance of seafloor animals (macrofauna) as part of their estuary monitoring programmes. This macrofaunal data can be put into the model and information on the animals and their relative abundances is used to assign a health score from 1-5.

The five-category health score system allows managers to easily track the relative health of sites through time or identify thresholds for undesirable conditions, which may trigger management action. If macrofaunal data has been identified to an appropriate level of taxonomic resolution, health scores can also be calculated using historical data, meaning no information is lost when changing assessment approaches. As each of the models is linked to a specific stressor (sedimentation or heavy metal loading), mitigation measures to address degradation can be prioritised. This tool would be useful for councils, iwi, and groups who have a vested interest in improving estuary health.

For more information about the National BHMs see the paper published in *Marine Pollution Bulletin* (www.sciencedirect.com/science/article/pii/S0025326X19307507) or contact Dana Clark (dana.clark@cawthron.org.nz).

This research was funded through the *Oranga Taiao Oranga Tangata* research programme (MBIE contract MAUX1502), Cawthron's Internal Investment Fund, and the National Institute of Water and Atmospheric Research's Strategic Science Investment Fund. We also acknowledge the support of the New Zealand regional authorities that provided data and permission to use it.

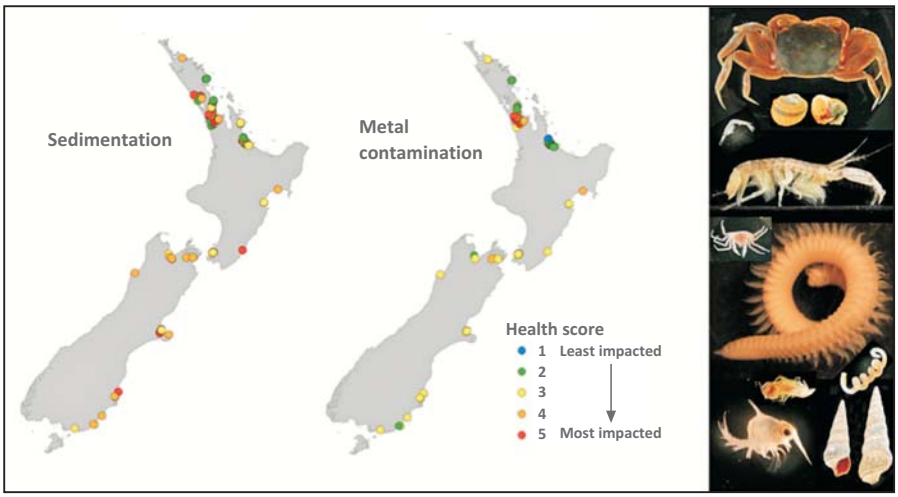


Figure 1: Estuary health scores assigned by the National Benthic Health Models to assess the status of estuarine sites across New Zealand in response to sedimentation or heavy metal contamination. The scores are derived from the diversity of benthic fauna living in the sediment (Photos: Cawthron Institute).

Newsletter archive & downloads

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

News from the regions

Northland

Laura Shaft, Regional Representative

Marine Biosecurity – Working towards clearer rules for NZ boaties

Ensuring boats are free of marine pests is critical to marine biosecurity and currently each region operates its own rules and requirements. To make this easier for boaties to follow, four of the upper North Island councils, with support from Biosecurity New Zealand, have been working on a New Zealand-first approach to pest management that will provide one clear, standard set of rules for the northernmost regions of the North Island, called the Inter-Regional Marine Pest Pathway Management Plan.

A discussion document was released for informal consultation in 2019, the feedback has been analysed, and an options analysis undertaken. We are now working towards understanding the best way forward and we'll know what that looks like around the middle of the year.

Seaweek 2020 – Kaupapa Moana

Seaweek is an annual event inspiring schools and communities in New Zealand to learn about and celebrate our relationship with the sea. This February and March communities around Northland got involved in a range of events and activities to learn about and help protect our coasts and oceans. These included CoastCare education days at Ngunguru – Pii Manu and Taipa, the Hokianga Festival of Change in Rawene, Experiencing Marine Reserves snorkel and kayak days, and Oceanfest, an evening of presentations by local and guest speakers.

Seaweek was also used as an opportunity to promote the Te Tai Tokerau Debris Monitoring Project (www.nrc.govt.nz/environment/coast/coastal-litter-monitoring-in-northland), which uses the Marine Debris Tracker app (http://marinedebris.engr.uga.edu/tracking) to give Northlanders an easy way of recording rubbish collected from our waterways. Over Seaweek, 37 surveys were done with a total of 11,221 litter items collected, 69% of which were plastic.

Kamo Primary students were introduced to the cultural importance of Te Manu-Ngunguru sandspit from local hapū and got up close to some marine pests before heading out to the beach to discover some birds and plants living there and learn more of the local history (Photo: Northland Regional Council).

Auckland

Lara Clark, Greg Munford and Matthew McNeil, Regional Representatives

Piha streams realignment works

The Marawhara and Wekatahi streams discharge onto north Piha Beach. These stream mouths periodically join, and align to the south along the beach, resulting in erosion of the sand dunes. A resource consent held by the Auckland Council authorises periodic stream realignment works and associated dune reinstatement and planting. The purpose of these works is to ensure there is a sufficient dune buffer to protect the adjacent road.

Stream realignment works, June 2020 (Photo: Matthew McNeil).

Significant beach accretion has occurred in recent years at Piha. As a result, the stream mouths joined and aligned to the south along the toe of the sand dunes. This resulted in significant dune toe erosion, reducing the buffer to the road. With reduced rainfall over the 2019/2020 summer, and a significantly wide dry high tide beach area, the northern Marawhara stream mouth blocked, causing inundation and creating a flooding risk upstream.

Stream realignment works were undertaken in early June 2020. This involved separating the stream mouths, and excavating two new approximately 200 m long stream channels across the beach face.

Excavated sand from the new stream channel was placed in the previous stream channel along the base of the dune, and pushed up at the dune scarp to help reinstate the dune toe. Spinifex and pingao were planted at the new dune toe, and temporary accessway fencing installed through this area. Stream mouth alignment, and the dune buffer, will continue to be monitored.

Cornwallis Wharf pile wrapping

Auckland Council is currently undertaking repair works to the Cornwallis Wharf. This structure is one of the region's oldest, large timber wharves, beginning life in 1928 when

Top, Cornwallis Wharf; Bottom, Denso pile wrapping (Photos: Christoph Soltau).

it serviced timber merchants and vessels bringing residents and visitors to Cornwallis Park on the northern shores of the Manukau Harbour. As road access to the area improved, the wharf fell into disrepair. Originally 191 m long, by 1989 only the landward third remained, which had in the meantime become one of Auckland's most intensively used recreational fishing spots.

An inspection in 1994 revealed that the remainder of the wharf was unsafe and it was closed to the public. Speculation that it would be removed led to widespread support for the wharf's retention and restoration. In 1999 the wharf was reconstructed, with considerable community input and financial sponsorship.

The new wharf retained the dimensions and style of the old wharf. However, the new wharf was bedevilled by the same problems that seem to have afflicted the old wharf: deterioration of the pine timber as a result of the 'shipworm', *Teredo navalis*, a boring mollusc that makes its home inside the timber. Above and below water inspection identified that deterioration was widespread in the timber braces, particularly at the connections to the piles. Borer incursion was also noted in some piles, which fortunately are large diameter and loss of some cross-sectional area in the interior of the piles could be tolerated.

It was decided to extend the life of the structure by preserving the piles by wrapping them and replacing the previous pine bracing with new hardwood timber. The pile wrap extends from the seabed to just below the wharf deck. It consists of the Denso 'Seashield' system, a layer of petrolatum impregnated tape that is tightly wrapped around the pile and then covered with a separate water-hardening fibreglass tape. The wrap seals the timber, smothering borers already inside the pile and preventing new borers settling on and boring into the timber.

The pile wrapping and replacement of the braces has been completed. The final stage of the wharf repair is the replacement of two access stairs and a low-tide platform at the wharf seaward end. Once the works are complete, the life of this historic structure will have been extended by several decades and it will remain available for all Aucklanders to enjoy.

Waikato

Christin Atchinson and Jacqui Bell, Regional Representatives

Call for dune-planting volunteers and coastal projects update

Our dune planting restoration programme is back in action after the lockdown period, with thousands of plants ready to be planted on beaches across our east coast.

"The good news is, Coastlands Plant Nursey held and nurtured the plants during the lockdown, so they have grown and are in pristine condition for planting," says our coastal restoration coordinator Tanya Patrick.

We have 30,000 plants ready to be planted across the Coromandel by Labour Weekend in October and we're looking for volunteers to help. If you want to get involved please contact tanya.patrick@tcdc.govt.nz

Our Council is proud to be part of the Coastcare partnership (www.coastalrestorationtrust.org.nz/coast-care-groups), alongside the Waikato Regional Council (WRC), Department of Conservation (DOC) and iwi, working in with beach care and ratepayer groups to protect and restore our coast.

"Our sand dunes have really bounced back after the small amounts of rain we've had, and with many people out walking and enjoying our beaches during the lockdown, they gained a new appreciation for our dunes," Ms Patrick says.

"The dunes protect land and properties from erosion and storms, and on many of our beaches, sand dunes are also natural habitats for native species of birds such as the dotterel," she says.

Please respect and help protect our dunes by staying off them and using marked accessways to get on to the beach, rather than trampling over the plantings.

People can also help by not driving on beach reserves or the dunes and not leaving rubbish on the beach.

Opito Bay, planted with sand-binding plants to help build up our dunes (Photo: TCDC).

Bay of Plenty

Jonathan Clarke, Kieran Miller and Josie Crawshaw, Regional Representatives

Motiti Protection Areas – a first for regional councils

On 24 April 2020 the Environment Court released its final decision directing the Bay of Plenty Regional Council to implement new rules within the Regional Coastal Environment Plan to protect three reef systems near Motiti Island and complete scientific monitoring to inform future integrated marine management solutions.

The Motiti Protection Areas are a group of three protection areas at reefs around Motiti Island where the taking of all plants and animals will be prohibited due to their significant marine biodiversity, landscape and cultural values. The areas comprise of Otaiti (Astrolabe Reef), where the wreck of the *Rena* lies (including reef systems Te Papa, Te Poroiti and O karapu Reef), Motuhaku Island (Schooner Rocks), and Motunau Island (Plate Island).

The implementation of the Motiti Protection Areas came through a long Court process, first beginning as a Coastal Plan appeal, moving through Environment Court, High Court and the Court of Appeal, due to jurisdictional issues between the RMA and Fisheries Act. The courts found the regional council can include rules within its plans to manage the effects of fishing if it is for the purpose of maintaining indigenous biodiversity or other resource management purposes where there is evidence of adverse effects on values from fishing. The c ourt has also directed Bay of Plenty Regional Council to collaborate with other government agencies and tangata whenua on future solutions for the area. The Motiti Protection Areas are due to be implemented in the coming months, following the addition of new rules into the Coastal Plan, sign off by the Minister of Conservation, and an ongoing education campaign to inform the public of the new rule.

If you have any specific questions about this case please contact Stacey Faire or Josie Crawshaw. Updates will also be provided on the Bay of Plenty Regional Council website www.boprc.govt.nz/motitipa

Updated findings for natural hazard risks in Tauranga

Natural hazard studies have been part of Tauranga City Council's focus since the late 1990s. The latest research updates the data TCC hold on erosion for coastal areas as well as liquefaction risks for Tauranga as a whole. Like last year's studies on inner harbour erosion and inundation, this latest coastal erosion research considers a range of potential sea level rise scenarios projected out to 2130. The new information improves TCC's understanding of the risks that sea level rise could create, and how the coastal zone may respond to those changes over the coming 100 years. Further research on natural hazards such as groundwater levels and volcanic ash fall is also in progress. Work on a cohesive resilience framework to quantify the impact of natural hazards on Tauranga City's infrastructure continues, evaluating the vulnerability of the city's assets to these hazards and determining how to mitigate these risks through urban form and infrastructure planning. Outcomes of the latest liquefaction study are now available on the council's website.

Funding announced for build of Ōpōtiki Harbour

Ōpōtiki Mayor, Lyn Riesterer, said she was thrilled with the announcement of funding for the build of Ōpōtiki's Harbour and that the community would be keen to celebrate this historic milestone. Regional Economic Development Minister, Shane Jones, said that the PGF would be investing $79.4 million in the project to help unlock the full aquaculture potential on Ōpōtiki's doorstep. "The harbour and its associated industry is a game changer for Ōpōtiki," Ms Riesterer said. "This is the start of a new era for our district – new jobs, new industry and a new way forward. And we are more than ready to grab this opportunity with both hands – get our rangatahi into real, long term and meaningful work. I can't wait to see the innovative future we build for ourselves with this kick start." This funding is in addition to $20 million pledged by the Bay of Plenty Regional Council in 2013 as part of its Regional Infrastructure Fund. This funding established the local and regional commitment to the project. In the years since, the Eastern Bay councils have continued to work closely and align the area's long-term vision and regional funding projects.

Hawke's Bay

José Beyá, Regional Representative

East Rd corner revetment proposal

A proposal for a 100 m long rock revetment wall in Haumoana, similar to that constructed in Clifton in 2019, is being developed for Hastings District Council by Tonkin + Taylor Ltd with the objective of preventing the erosion of Clifton Rd and the adjacent lifelines infrastructure at East Rd corner. The project is currently in the detailed design phase preparing for consent, while funding approval is progressing through the annual plan process.

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

Tonkin + Taylor has been progressing a study to assess the practicalities of Managed Retreat within the Hawke's Bay region and

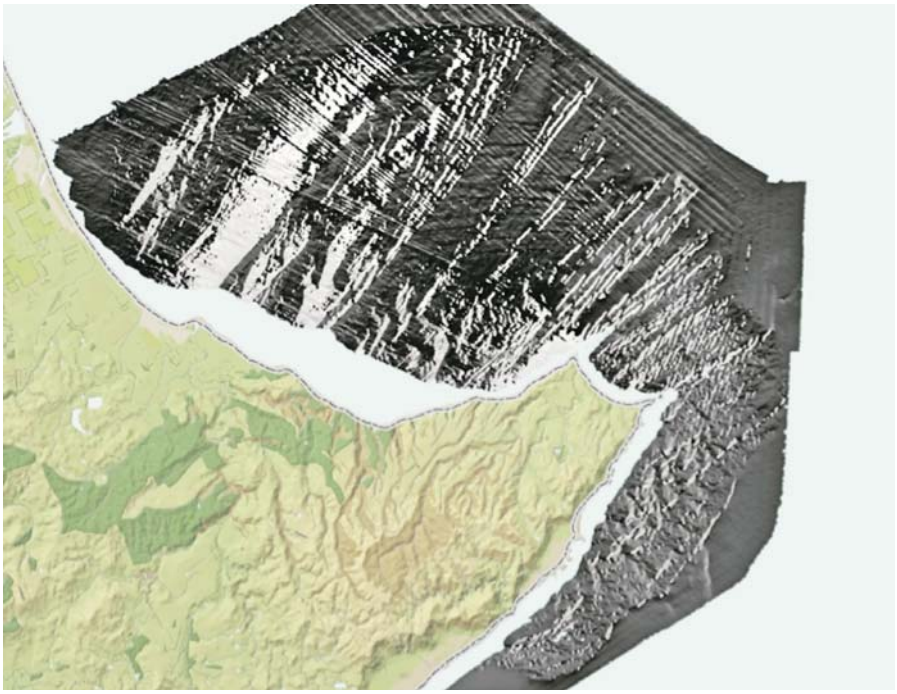
the likely costs under different implementation scenarios. Mitchel-Daysh has produced two draft reports on consentibility and regulatory issues for the strategy which are currently under review. The regional council is undertaking changes to the draft design report based on the peer review comments by Tonkin + Taylor. Workshops to communicate and discuss the progress to the community panel members are on the way.

The regional council participated in a report with the Ministry for the Environment looking at the challenges of implementing the Clifton to Tangoio Coastal Hazards Strategy 2120. The report identified three key challenges: (i) core responsibilities for adaptation are ambiguous; (ii) tools and mechanisms to manage current and future hazards are limited or inefficient; and (iii) lack of agreed approach and principles for sharing costs of works.

The report recommends that central government considers a range of avenues as part of a systems approach to addressing these challenges, such as: considering the issues and options raised in the report in the Resource Management Act review; providing new specific legislation on natural hazard risk management and climate change adaptation; and, developing a protocol for local authorities around funding. A copy of the report can be found at: www.hbcoast.co.nz/assets/Uploads/MFE-Case-study-challenges-with-implementing-the-Clifton-to-Tangoio-Coastal-Hazards-Strategy-2120.-Final-approved-version-30-Jan-2020.pdf

NIWA mapping Clive Hard (update from last issue)

The Clive Hard mapping by NIWA has been completed and the results are currently under review. The Clive Hard seabed was mapped through a joint project with NIWA and Hawke's Bay Regional Council to help identify important areas for biodiversity habitat. The bathymetric maps from this project provide detailed information on the structure, depth and composition of the seafloor (e.g. physical habitats). The backscatter information identifies structures in the water column (e.g. kelp beds). Analysis of the spatial extent of different habitat types will provide insight into whether this area has been affected by stressors like sedimentation.



Clive Hard – aspect view.

Transport and fate of suspended sediments in the marine environment

Ted Conroy has recently started as a PhD candidate at the University of Waikato. His work will provide insight on the sources, transport and fate of suspended sediment loads in the marine environment. The project involves remote sensing, fieldwork and numerical modelling, and is being developed in collaboration with the regional council.

6 Wharf project update – Dredging for new wharf started

Napier Port started dredging for the 6 Wharf in June, and aims to finish the wharf by the end of 2022, despite construction stopping during the Level 4 lockdown.

General manager of infrastructure services Michel de Vos says, "6 Wharf remains a vital piece of infrastructure to help support Hawke's Bay's economy. It will help to reduce congestion, improve operating efficiency and handle larger ships, which are getting bigger across all trades, as exports out of the region grow".

The *GPK* – a backhoe dredge operated by Heron Construction – arrived from Lyttleton in June and will be seen in the harbour for the next 18 months.

The port is monitoring water quality in real-time to ensure the dredging does not harm the marine environment, in particular fisheries and Pania Reef, which is a site of cultural and ecological significance. Alerts will be raised immediately by monitoring buoys at Pania Reef if the turbidity is above expected levels and will adapt our operations, or stop them, until conditions indicate it is safe to resume.

Most of the dredged material will be deposited at a consented site 5 km east of the port.

The dredging work is being guided by best-practice management plans to ensure water quality, cultural and recreational values, biosecurity, marine wildlife and birds, are all protected.

The Harbour Master has issued a notice to marine users to extend the marine exclusion zone around the port to keep vessels safe. All vessels not associated with the dredging operation are asked to stay 50 m away from the dredge.

Taranaki

Thomas McElroy, Regional Representative

Seachange Surveys

Seachange Surveys is a relatively new coastal monitoring project in the Taranaki Region, which aims to support communities in the monitoring of coastal species, primarily kaimoana (seafood) in their rohe moana (coastal area). The species of focus for their pilot project is the black foot pāua (*Haliotis iris*). Seachange Surveys is led by Wild for

Taranaki and funded by the Curious Minds initiative. The project has recently received another round of Curious Minds Funding to continue to grow the project in the Kaitake community this year.

Passionate residents from the Kaitake area and members of Ngā Mahanga a Tairi hapū have partnered with local marine scientists to develop a set of survey methods to learn about the pāua populations along the coastline, between Fort St George and Paritutu Rock. Last year two reefs were surveyed through the project, and this year an additional reef is being included in the project. One of the survey sites is located within Tapuae Marine Reserve, as the project hopes to contribute to the monitoring of this protected area and investigate the effectiveness of the no-take reserve.

For further information, see: facebook.com/seachangesurveys

Southland

Bryony Miller, Regional Representative

South Port dredging

The annual dredging at South Port is undertaken by South Port-owned plant, however, on occasion, more substantial dredging ('catch-up' dredging) is required to maintain the water depths at the berth pockets and swinging basin. This 'catch-up' dredging tends to occur every 12 to 15 years (the last was in 2005/06).

On this occasion South Port engaged the services of Dutch Dredging with the *Albatros* arriving at Bluff on Monday 13 April. The dredge remained at Bluff for 10 days removing approximately 40,000m^3 of spoil.

e3Scientific Ltd completed a diving benthic survey of the disposal site and dredging locations in February 2020 to assess the sediment composition, epibiota and infauna, to ensure that the ongoing use of this disposal site is not adversely affecting the ecology of the marine area.

The spoil disposal area is located offshore to the south of Tiwai Peninsula, and east of the harbour entrance (approximately 3.5 km east of Island Harbour). This site has been used for the disposal of dredging spoil since 1933, and since 1979 the site has been the sole dredge spoil disposal location.

As this is a maintenance campaign and not a capital campaign, no additional depth is achieved. It is merely getting water depths back to where they should be. The vessel draft at South Port remains at 9.7 m.

The Albatros *at Bluff, April 2020 (Photo: South Port NZ Ltd).*

News you might have missed...

The Covid-19 pandemic has dominated the news in recent months, and it looks likely this is not going to change any time soon. However, amongst the doom and gloom and uncertainties of this global event, there have been some positive stories emerging from the natural world that may have been overlooked.

With much of the human world in lockdown, natural environments and their wildlife inhabitants have, in some places, staged something of a comeback (albeit, likely to be brief). Many of these have involved coastal environments, including the following examples that you might have overlooked.

Istanbul's Bosphorus has gone from its usual dark-blue colour to a clear, bright turquoise, as lockdown has seen this usually busy waterway remain largely unused – for photos, see: www.dailymail.co.uk/news/article-8358787/Istanbuls-Bosphorus-transformed-dazzling-turquoise.html

Something similar has happened in Porstsmouth, England, where a lack of water traffic and human activity around the harbour has seen the usually murky waters clear – for the full story and a selection of before and after photos, see: www.dailymail.co.uk/news/article-8268831/Lockdown-turns-sea-tropical-pollution-activity.html

The re-emergence of sealife has also been widely reported in localities across the world. For example, in Venice, the lack of boats in the canals that normally churn up the muddy canal bottoms has not only allowed the water to clear, but has also seen a variety of aquatic life returning – for more, see: www.theguardian.com/environment/2020/mar/20/nature-is-taking-back-venice-wildlife-returns-to-tourist-free-city, and for the 'jellyfish' video, see: www.independent.co.uk/news/world/europe/venice-canals-jellyfish-nature-coronavirus-lockdown-video-a9477091.html

Meanwhile, exotic rays have been flocking to Dubai Marina along the Emirati coastline, along with increased numbers of dolphins and sharks – for more, see: https://edition.cnn.com/travel/article/marine-conservation-uae-spc-intl/index.html

The good news from Phuket, Thailand's most popular resort island, is that rare leatherback sea turtles have built their largest number of nests in 20 years, all thanks to a strict lockdown that has seen the usual congregations of sunbathing tourists disappear. For more, see: https://edition.cnn.com/travel/article/thailand-sea-turtles-coronavirus-scli-intl-scn/index.html

Finally, it seems even whales and other sea mammals have gained some respite from humans, thanks to a drop in underwater noise pollution from the low-frequency sound associated with shipping – see: www.theguardian.com/environment/2020/apr/27/silence-is-golden-for-whales-as-lockdown-reduces-ocean-noise-coronavirus

New NZCS special publication underway

Work is now underway on the latest NZCS Special Publication, intended for release this November. Planning started at the end of 2019, and now that topics, authors and chapters have been confirmed, the process of writing and collating has begun.

The working title for the new publication is 'Coastal Systems and Sea Level Rise: What to look for in the future', and the document will provide some high-level insight as to how our coastal systems have and can be expected to behave in response to past and future sea level rise. The idea behind the new publication is to provide coastal practitioners across the country with a sense of how different coastal systems operate and respond to changes in sea level rise. The aim of this is to convey that different coastal systems behave in different ways, and that these should be considered in the planning, management and engineering components of what practitioners dealing with coastal management issues are considering.

The provisional chapter topics for this publication are:

- Introduction/Foreword
- Māori perspectives
- National SLR project
- Modelling SLR responses
- Barrier beaches
- Sand beaches
- Gravel beaches
- Coastal hydrosystems
- Estuaries
- Conclusions.

There will be, however, one significant change from previous special publications, in that the launch will take place online (as part of the adjusted 2020 conference format of regional events outlined on page 9 of this *Coastal News*). Planning for the online conference alternative is underway, and details will be made available to members once they are finalised. This publication will be the fourth in the NZCS Special Publications series. The earlier publications can be downloaded from the NZCS website (www.coastalsociety.org.nz/media/view/publications):

- Rena: *Lessons learnt*
- *Adapting to the consequences of climate change*
- *Shaky shores: Coastal impacts & responses to the 2016 Kaikōura earthquakes.*

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Central government news

Amy Robinson, Central Government Representative

Officials at the Ministry for the Environment have been busy drafting the COVID-19 Recovery (Fast Track Consenting) Bill, which was enacted on July 8, 2020.

The Bill is intended to allow a streamlined consenting pathway for infrastructure projects as part of the government's post-COVID-19 economic stimulus package.

There are three approval tracks contained in the Bill. One track will allow for certain low-impact government projects to become permitted activities. Kiwirail, NZTA and the Department of Conservation have been working closely together on agreed set of permitted activity standards. At the time of writing activities in the coastal marine area (CMA) were not included as permitted.

Secondly, the Bill proposes a pathway for fast-tracking resource consent processes for other projects. To follow this pathway, the applicant would need to request that their application be fast-tracked through an Order in Council process. The Minister for the Environment would then decide whether the application will be fast-tracked or go through the usual resource consent process. If the project is partly or fully located in the CMA, the Minister of Conservation will have joint decision-making powers on whether the application is fast-tracked or not. Fast tracked applications will be decided by an expert consenting panel led by a present or retired Environment Court judge. Iwi and local councils will also be represented on the panel. The panel will decide which parties, if any, will be invited to comment on the application. A decision on a fast-tracked application must be released within 25 working days of the comments close date and there will not be any opportunity to appeal the decision.

The final pathway is a set of ten 'pre-approved' projects to be listed in the Bill that will be guaranteed to follow the fast-track process. Those with elements in the CMA are:

- Te Ara Tupua (NZTA) – cycleway and walkway between Petone and Ngauranga;
- Northern Pathway (NZTA) – cycleway and walkway connecting Auckland's CBD to the North Shore;
- Papakura to Drury (NZTA) – upgrade to State Highway 1 between Papakura and Drury (Auckland) to address existing bottlenecks; and
- Picton Ferry Terminal (aka IRex Picton) (Kiwirail) – upgrade of Picton Ferry Terminal for new ferries.

Note that the Bill is only relevant to RMA processes, not other legislative requirements that may impact on projects, such as consents required by the Public Works Act 1981 or permits under the Wildlife Act 1953. The Bill will be repealed two years following the date of enactment.

2019 NZCS PDA reports update

Each year, *Coastal News* publishes a short report by the recipients of the previous year's NZCS Professional Development Awards, documenting how they used the award.

In *Coastal News* 71 (March 2020), we published a PDA report by Josie Crawshaw, on her attendance at the 25th Biennial Coastal and Estuarine Research Federation (CERF) conference in Mobile, Alabama.

Her fellow 2019 recipient, Deirdre Hart, was scheduled to attend the International Coastal Symposium (ICS) in Seville, in April 2020, as part of her award, but the event has been postponed for a year due to the COVID-19 pandemic. Deirdre's PDA report will now appear in *Coastal News* 75 in July 2021. However, Deirdre's conference paper, 'Earthquakes, Coasts… and Climate Change? Multi-hazard Opportunities, Challenges and Approaches for Coastal Cities', has recently been published in the *Journal of Coastal Research* and is available on-line at https://doi.org/10.2112/SI95-159.1

About the authors

David Schiel heads the Marine Ecology Research Group at Canterbury University. He and his research team have been working on the recovery dynamics of the earthquake-affected coast of the South Island since November 2016. He is Distinguished Professor of Marine Science and is a Fellow of the Royal Society NZ.

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Pablo Higuera is a Lecturer in Coastal Engineering at the University of Auckland. His research field is Computational Fluid Dynamics (CFD) applied to solving coastal and offshore problems such as wave hydrodynamics, wave-structure interaction, hydraulics and environmental flows. He is currently developing the CFD model olaFlow within OpenFOAM.

NZCS monthly webinar series

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

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

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

Presentation details:

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

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 2020.

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.