



Coastal News



Black coral in Doubtful Sound.
Photo: Cawthron Institute.

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Cawthron scientists research drivers of black coral distributions in New Zealand fiords

By Shelly Farr Biswell, Editor

Cawthron scientists have found that black coral (*Antipathes fiordensis*) populations in New Zealand's Doubtful Sound are prone to climate changes and, as such, could become an important indicator species. Their study appears in the May issue of *Ecological Modelling*.

Using a pattern-oriented model developed specifically for this project, Cawthron scientists compared the effects of the Manapouri Hydro-electric Power Station diverting water from Doubtful Sound to the effects of wind and rain on black coral populations in the sound. Their findings confirm that the upper depth levels at which black coral are able to live is controlled largely by salinity.

While black coral populations are normally found in deep waters, the black coral species that live in New Zealand's fiords live closer to the water's surface. In fact, Fiordland is the only known place in the world where a species of black coral can be found in depths as shallow as 4 m.

Lead author Dr Weimin Jiangs says the occurrence of black coral at shallow depths in New Zealand's fiords has been attributed to the combination of low wave action and low light as a result of a buoyant low-salinity layer (LSL) which contains high levels of tannins that attenuate light.

"Recent research, however, has shown that low salinity exposure associated with periodic deepening of the LSL is a factor in limiting the upper depths that black coral can grow at," he says.

The presence of an LSL is a defining feature of all fiords; however, in Doubtful Sound a constant freshwater inflow from Lake Manapouri into Deep Cove through the Manapouri Hydro-electric Power Station tailrace acts to maintain a shallow LSL (~1-3 m in thickness) throughout much of the sound.

"Researchers had already found that a combination of up-fiord winds and episodic rainfall was the primary driver of LSL deepening events that occur in New Zealand fiords, but there is very little information available on the potential influence of the tailrace discharge during weather-driven events and the extent to which increases in discharge would further deepen the LSL," Weimin says.

To evaluate the potential effect of weather and the tailrace discharge on the LSL, and in turn the distribution of black coral, the researchers developed and validated a pattern-oriented model for predicting the upper depth limit of coral populations. This made use of existing salinity data and observations of existing black coral distribution. The approach is based on observed pattern (such as time series or spatial pattern) which accounts for site-history, characteristics and ecological processes over time and space.

The scientists used data outputs from numerical simulations of the LSL under different weather and tailrace discharge conditions to drive the model. These results were then used to forecast the potential effects of increasing the rate of tailrace discharge,

and to understand the influence of rain and wind on the upper depth limit of black coral populations.

Their findings suggest that while increases in lake diverted waters could reduce the available habitat of the species by about 30 cm, that 40 per cent increases in wind alone could reduce the available surface habitat by up to 1.5 m in the head of the fiord. Similarly, while changes in lake diverted water could reduce the surface habitat of the coral where it enters the fiord, a 40 per cent increase in rainfall would lead to fiord-wide changes in the vertical distribution of this species.

The modelling approach assumes that salinity is the primary driver of black coral survival in shallow waters, as opposed to other factors such as predation, or physical disturbance from wave action or sedimentation. Weimin notes that observations deviated from model results in the inner Doubtful Sound, suggesting further research is required to determine the influence of factors other than salinity.

Overall, Weimin says the modelling results show that anthropogenic activities, such as water diversion, have an impact on how close to the water surface black coral are able to live. However, wind and rain also play a significant role in levels of salinity in the fiords and consequently the distribution of black coral. These findings suggest that the collected data may have wider implications for monitoring climate effects in the region.



Scientist measures black coral in Doubtful Sound. Photo: Cawthron Institute.

He says, “Since black coral can’t move to avoid freshwater changes, this species can be used for tracking less obvious climate-related changes associated with wind and rain.”

While the modelling and analysis for this research focused on black coral, Weimin says the modelling approach could also be applied to other species whose distributions are driven by changes in environmental factors.

The research was internally funded by the Cawthron Institute and relied on data collected to monitor the effects of the power station on Doubtful Sound.

University of Auckland team excels in international submarine races

At the 13th annual International Submarine Races the University of Auckland’s human-powered submarine *Taniwha* finished first in its class (non-propeller single pilot) and just missed a new record for a sub of its kind.

The submarine was designed and built by students and staff from the university’s Auckland Bioengineering Institute and Department of Engineering Science. This is *Taniwha*’s second international outing, competing against student teams from Canada, Germany, Mexico, Netherlands, Oman, United Kingdom, and the United States. The team was the only one from the southern hemisphere team.

The human-powered 3-m long submarine is made of fibreglass and weighs 60 kg. It is driven by a pilot using scuba gear who remains submerged while using pedals to power fins to drive the sub through the water.

During competition, the submarine reached speeds of 3.65 knots over a 100-m long dragstrip.

“We received an honourable mention from the judges for innovation,” said Associate Professor Iain Anderson from the Auckland Bioengineering Institute who travelled with the team and who has been heavily involved in the design and engineering of the sub.

“We completed 10 of 11 races so the team did a fantastic job, giving the propeller teams a run for their money and proving fin propulsion underwater is reliable and fast – just as it is for fish.”

The team will compete again next year in Gosport in southern England at the European submarine races hoping to gain that extra knot in speed to beat their own fastest time and hopefully set a new record.

www.auckland.ac.nz



The *Taniwha* team from left to right are Koray Atalag (Diver), Gerrit Becker (Diver), Ben Pocock (Diver, Engineer), Sanjay Surendran (Diver), Chris Walker (Pilot), Iain Anderson (Diver). Photo: The University of Auckland.

Whale of a count this year

The annual four-week Department of Conservation (DOC) survey recorded 137 humpback whales this year. The highest number of humpbacks previously recorded in the survey was 106 in 2012 with the second highest, 92, last year.

The DOC research in partnership with OMV New Zealand aims to estimate size of the New Zealand humpback whale population and is assessing humpback whale recovery since commercial whaling ceased in 1964. The annual surveys are timed for humpback whales' northern migration from Antarctica to warmer South Pacific breeding grounds.

Survey leader Nadine Bott says the higher number of humpback whales seen indicates the New Zealand population is recovering, "but we are not yet seeing the extraordinary rates of increase they have in Australia of around 11 per cent a year. Perhaps that is something we will enjoy in our waters in the future."

The survey is carried out with the help of volunteers including six former whalers who lead the whale spotting from a high point on Arapawa Island overlooking Cook Strait. Whales seen are approached by boat to collect photos and skin samples using a biopsy dart tool that are used to identify individual whales.

"The ex-whalers are highly experienced and committed and have been invaluable to the project, especially our success in observing so many whales," says Nadine.

A surprise sighting during the survey was a rare white humpback whale spotted on 5 July. It was identified by its distinctive dorsal fin as being the famous Migaloo, a whale that usually migrates past Australia. Another special sighting was a newborn humpback calf on 7 July, only the second reported in New Zealand. Blue and sperm whales and a southern right whale were also seen by the survey team.

Unfortunately, humpback whales were seen in separate encounters this year with craypot line caught on them and line and buoys trailing behind. The two entangled whales were moving too fast for a

specially-trained DOC whale disentanglement team to get to them.

DOC notes that humpback whales' inquisitive nature, large flippers and tail, and their propensity to roll makes them particularly vulnerable to getting caught in craypot lines as they migrate along the New Zealand coast. People setting craypots can reduce the risk of whales getting entangled in them by minimising floating slack craypot line, allowing only enough for tidal action. Avoiding setting pots during June and July in offshore deeper water would also significantly reduce the risk.



Ex-whalers have assisted with the survey for the past six years. Photo: DOC Cook Strait Whale Survey.



Humpback calf and mother. Photo: DOC Cook Strait Whale Survey.



Humpback whale slapping its tail. Photo: DOC Cook Strait Whale Survey.

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Investigating ‘silent earthquakes’ off Gisborne coast

Beginning in 2018, scientists will investigate slow-slip earthquakes under the seafloor east of Gisborne through the International Ocean Discovery Program (IODP). NIWA marine geologist Philip Barnes and GNS Science marine geophysicist Stuart Henrys are two of the New Zealand-based leaders of the project.

The two-month expedition will be the first undersea drilling project anywhere in the world aimed specifically at understanding the mechanisms of slow-slip events or “silent earthquakes”. The planned expedition is the culmination of a five-year planning and proposal process involving scientists from New Zealand, the United States, Japan, Canada, and Europe. In all, about 50 scientists will be involved in the project.

Three drill sites up to 1.5 km deep are planned to better understand the Hikurangi Subduction zone: one on the subducting Pacific Plate, another where the plate boundary surfaces at the seafloor, and a third on the overriding plate directly above the area of slow-slip, about 40 km east of Gisborne. To monitor changes to the Earth’s crust over the next 10 years, instruments will be installed in two of the drill sites. The data will be downloaded every few years using an underwater remotely operated vehicle.

The Hikurangi Subduction zone is the main tectonic plate boundary in the North Island and is the most rapidly slipping fault in New Zealand. The Pacific Plate is moving westward at about 5 cm to 6 cm a year off the Poverty Bay coast.

Better understanding slow-slip events

Slow-slip events are similar to earthquakes in that they involve more rapid than normal movement between two pieces of the Earth’s crust along a fault line. But while the slip in a normal earthquake occurs in a matter of seconds, a slip in a slow-slip event can take weeks or even months to occur.

The discovery of slow-slip events has been one of the most important findings in seismology in the past 15

years. Scientists have proposed numerous theories to explain why silent earthquakes occur, but testing the theories is challenging as these events typically occur deep underground.

Slow-slip events off the coast of Gisborne have attracted significant attention from international scientists due to their close proximity to the Earth’s surface – typically about 5 km beneath the seafloor, which makes them accessible to scientific drilling.

An international commitment

The IODP is an international marine research collaboration that is funded by 26 nations dedicated to advancing scientific understanding of the Earth by sampling and monitoring sub-seafloor environments using specialised ocean drilling ships staffed by research scientists. New Zealand has been a member of IODP since 2008, as part of the Australia New Zealand IODP Consortium (ANZIC).

The decision to drill off the Gisborne coast represents the first New Zealand-led IODP project to go through the complete process from submission to scheduling, during the period that New Zealand has been an ANZIC consortium member (www.gns.cri.nz).



JOIDES Resolution at the dock in Colombo, Sri Lanka, during port call activities prior to Expedition 355 (Arabian Sea Monsoon) earlier this year. Photo: Dhananjai Pandey & IODP.

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Now and then...

These photos show the expansion of the viewing platform that looks out over the main seal colony at Cape Foulwind near Westport. The Cape Foulwind walkway has been upgraded over the intervening years to provide for the 100,000 or so visitors who come here to view the spectacular coastal landscapes. Photos: DOC.



DOC Cape Foulwind Viewing Platform 1980s.



DOC Cape Foulwind Viewing Platform 2015.

So what’s the best ‘Now and then’ of coastal photos that you’ve taken? Send them to Don Neale (dneale@doc.govt.nz) and we will put some of the best ones in *Coastal News* (with credit to you of course!).

International spotlight

Scientists look at how seagrass coverage affects fish diversity

Scientists monitoring *Zostera marina* seagrass meadows off the North Wales coast have found faunal community composition varied significantly based on the amount of seagrass coverage.

Researchers Rosemary McCloskey and Richard Unsworth from the Seagrass Ecosystem Research Group, College of Science, Swansea University, UK, found that species diversity was significantly higher in high-cover seagrass than in low-cover seagrass, noting that “faunal species composition of low-cover seagrass was more similar to sandy control plots than to higher-cover seagrass”.

The researchers studied areas with both high and low seagrass coverage over a 28-ha area near the village of Porthdinllaen in Gwynedd, Wales. They say the results of this study “underline how the impacts of small-scale disturbances from factors such as anchor damage, boat moorings and intertidal vehicle use on seagrass meadows that reduce shoot density and cover can impact upon associated fauna. These impacts have negative consequences for the delivery of ecosystem services such as the provision of nursery habitat.”

Their work was published in June 2015 in *PeerJ* journal (PeerJ 3:e1053 <https://dx.doi.org/10.7717/peerj.1053>).

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Student scholarship winners announced

Each year NZCS awards two scholarships to students conducting research that has the potential to contribute towards the aims of the society. The judges were “chuffed” by the high calibre of the applications received this year. As one judge noted, “What was particularly exciting to see was the breadth of research being undertaken. We also noted that much of the research will have practical applications for addressing issues ranging from coastal monitoring to erosion hazards.”

NZCS congratulates this year’s winners: Hannah Berger who is working towards her Masters of Science in Geography at University of Canterbury and Ben Robertson who is working towards his PhD in the Department of Marine Science at the University of Otago. Hannah will receive a NZ\$2500 scholarship and Ben will receive a NZ\$5000 scholarship.

Hannah Berger

Characterising landscape and sea-level dynamics to predict shoreline responses over the next 100+ years in a high-energy coastal setting.



Hannah’s research will focus on understanding and predicting coastal shoreline responses over the next 100+ years for the settlement of Kaikoura. Her work will include an assessment of how the shoreline will change based on current physical and anthropogenic processes, along with predicted sea-level rise and other climate change effects in tectonically active regions.

Her research findings will provide the local council with possible coastal management options, as well as contribute towards national and international research on managing high-energy coastlines subject to sea-level change.

Hannah’s supervisors are Deirdre Hart, Justin Cope, and Matthew Hughes.

Ben Robertson

Development of a cost-effective trophic state assessment protocol for shallow, temperate tidal lagoon estuaries.



Ben’s research is aimed at developing a cost-effective trophic state assessment protocol for shallow New Zealand estuaries, with particular focus on sedimentation and nutrient enrichment related issues in these systems. Ultimately, his work will provide new information fundamental to informing the setting of ecologically meaningful nutrient and sediment input limits for our estuaries.

Specifically, he will investigate the physical susceptibility, nutrient and sediment-load susceptibility, and estuary-wide and site-specific abiotic/biotic response relationships (and associated thresholds) with the aim of informing a management tool for:

- the appropriate design of monitoring programmes for shallow tidal lagoon estuaries, including identification of key trophic state indicators; and
- the assessment of the overall level of estuarine eutrophication and sedimentation stress based on the combined indicator response relations and associated thresholds.

Ben’s research will fill a current international knowledge gap and is expected to provide robust information that is appropriately intuitive for applied purposes and applicable to estuaries throughout New Zealand.

Ben’s supervisors are Candida Savage, Steve Wing, Federico Baltar, and Jonathan Gardner.

Adapting shorelines – a reflection of managed realignment at Muriwai

By Natasha Carpenter and Paul Klinac, Coastal Management Services, Auckland Council

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Auckland's 3100 km of coastline has historically been characterised by reactive management. Increasing anthropogenic, environmental and climatic pressures, however, emphasise the need to move towards a more proactive and sustainable approach. A recent report from the Parliamentary Commissioner for the Environment highlights the issue of sea-level rise on our shorelines, including the increased risk from coastal inundation and erosion.

Such risks, coupled with consideration of a finite pool of ratepayer monies, further necessitate the need for comprehensive, longer-term planning. This, however, also poses challenging questions for our future coastal infrastructure, including: What are the maintenance and renewal costs associated with existing or new infrastructure? Where should alternative management responses be considered? What are the long-term impacts of climate change on such options?

One area where the challenge of posing and responding to such questions can be demonstrated is Muriwai Beach, a section of which has been subject to a progressive managed realignment response since 2006.

Muriwai is situated on the west coast of Auckland, approximately 45 km from the city. The beach is in a high-energy environment, subject to both long period ocean swell as well as shorter period waves generated from the Tasman Sea. The surrounding area has experienced continued development and has a population of around 2500, but attracts approximately one million visitors per year.

Historically, the beach was relatively stable but since the 1960s it has experienced an erosional trend resulting in an average loss of up to 65 m of land at the southern end. While the erosion is expected to be cyclic, it may take years or decades to readjust. The observed erosion threatened regional park infrastructure, including a visitor car park, pedestrian and vehicle access ways, a stormwater outfall and the main surf club access lane. The erosion resulted in cliffing at the front end of the car park, restricted beach access and poor visual amenity of the area.

In response to the above issues, a Coastal Hazards Management Strategy (CHMS) was commissioned in 2002 to provide guiding principles for the future management of this area. National and regional statutory documents direct us to consider the viability of managed realignment and its role in climate change adaptation and to apply where appropriate. As a result, the strategy recommended monitoring and the establishment of trigger points to initiate a managed realignment of the southern car park (excluding Motutara Road). This was particularly pertinent considering the high-energy coastal environment and the constraints related to the provision of a coastal defence structure in the area.



Figure 1: Historical photo of Muriwai beach, 2 April 1957 depicting what was a natural valley feature prior to infilling and reclamation.

However, because the managed realignment approach is still relatively in its infancy in New Zealand it would only be through further practical application that this approach could be better understood and accepted as a mainstream management response in the future.

In 2006, the managed realignment trigger levels were reached following a period of sustained storm events with accelerated erosion in 2005 to 2007 resulting in approximately 8 m of erosion. To consult and agree upon the delivery of the CHMS, the Muriwai Erosion Group was formed comprising membership of identified stakeholders: district and regional councils, surf club, resident and ratepayers association, and iwi. Despite the pursuit of the recommended strategy of managed realignment, however, there were significant challenges related to its implementation.

The group experienced continued pressure from a diverse user group to retain a balance of infrastructure and access at the site. To address this conflict, a series of workshops were held with the local community to explore the various management options, their



Figure 2: Coastal erosion at the southern car park, 2006.

opportunities and limitations. These were supported by independent facilitators and experts to enable an unbiased and open discussion. Overall, the community engagement was successful in developing a majority-supported option of staged managed realignment with unified outcomes.

The first stage of the works was completed in 2009, with the car park realigned approximately 40 m landward from its previous position. The fronting dune was graded back to a new car park configuration. The underlying area reshaped and set back was found to be a mix of clean sands and fill from past reclamations highlighting the issues of inappropriate legacy land use that dictate many of the management challenges coastal practitioners face today. In total, 4000 m³ of clean sand was able to be redistributed to the intertidal area. The regraded dune was replanted through a dune management programme to stabilise the face and encourage natural sand accumulation.



Figure 3: Completion of stage 1 with realignment of car park and dune regrading.

The initial stage of the project has restored and improved amenity and beach access. It has also provided an area of dry high-tide beach for recreational use. Another key advantage of the project is its financial benefits; the stage 1 realignment cost ~\$85k as opposed to \$150k for a structural response over a limited three-year period. In addition to the above, an appreciation of erosion at the site and successes of stage 1 works also prompted the independent relocation of the surf club from immediately behind the eroding dune face some 300 m inland, where an improved facility was rebuilt.

The Muriwai realignment project is ongoing and is currently moving to stage 2, focusing on the dune section to the north of the car park (Figure 4). At this location, the dunes are poorly vegetated with weeds, such as the South African ice plant (*Carpobrotus edulis*), colonising the area. This is causing over-steepening of the dunes, making them less resilient to storm events, resulting in significant cliffing of the dune top and continued sand loss during onshore conditions.



Figure 4: View of proposed stage 2 works outlining the over-steepened dunes.

This process is also exposing debris material in the face of the dune, a further indicator of historical modification. While the material is not believed to be contaminated, its removal is a high priority to restore this section of the regional park to its natural state. As a result, the next stage of the project will involve the removing of such material and the re-grading of the dunes to a lower, more stable profile with clean material redistributed on the back dune.

At present, initial options for stage 2 are being drafted, assisted by consideration of dune profile data for the site and adjacent sections. Public consultation in respect of draft options is planned to commence from October 2015 with anticipated lodgement of any resource consents required in February 2016.

The Muriwai project has provided a successful example of managed realignment to date. Stage 1 of the works has removed a section of hard engineering structures at the subject site and subsequently much of the associated enduring maintenance costs; a crucial consideration given the future pressures of shoreline response in respect of erosion and climate change along our coasts. In addition, the realignment has restored safe coastal access, created a dry beach at high tide for recreational use, and enhanced the visual amenity and natural character of the area. However, stage 1 of the Muriwai project was not without its challenges, and highlights three key considerations for similar future projects:

- 1) public perception education and acceptance;
- 2) political and community support for the application of regulatory framework and guidance, which requires the consideration of non-structural responses; and
- 3) the challenge of providing long-term certainty when specifying managed realignment for highly dynamic coastlines.

With respect to points one and two, community engagement is a critical element towards the acceptance and successful implementation of managed realignment schemes. It must be clear that a range of options have been objectively explored.

This project confirmed engagement is best delivered through an independent facilitator to enable an impartial conversation with the community. Furthermore, the decision-making process behind the preferred option must be clearly articulated, making all drivers in the decision-making process explicit, including the regulatory framework direction and requirements, the cost-benefit analysis, the desire to provide future resilience and adaptability, and enduring community support for present and future generations.

Relating to point three, given the dynamic nature of the coastal environment, future predictions of coastline evolution are always subject to a degree of uncertainty. This is further exacerbated by the effects of climate change and sea-level rise. Therefore, an enhanced understanding of future coastal evolution is required to assist in more robust decision-making and to build trust with the community that the implications of this management option are well understood.

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One of the keynote speakers at the upcoming Coasts & Ports 2015 conference will be Dr Todd Bridges. Todd leads the US Army Corp of Engineers' Engineering With Nature programme and is the US Army's Senior Research Scientist for Environmental Science where he serves as the Director of the Centre for Contaminated Sediments. He took time out of his busy schedule to talk to editor Shelly Biswell about some of his recent work and the Engineering With Nature programme.

You were involved in the US Army Corp of Engineer's North Atlantic Coast Comprehensive Study (NACCS) that was published earlier this year. Can you discuss the study and some of the lessons learned from Hurricane Sandy?

Hurricane Sandy was the deadliest and most destructive hurricane of the 2012 Atlantic hurricane season. It was also one of the most costly hurricanes in US history. It caused water levels to rise along the entire east coast of the US with the highest storm surges and greatest inundation on land occurring in New Jersey, New York and Connecticut.

The NACCS report is based on the results of a two-year study to address coastal storm and flood risk to vulnerable populations, property, ecosystems, and infrastructure affected by Hurricane Sandy.

The report has been compiled to help local communities better understand and address changing flood risks associated with climate change. It builds on many of the lessons learned from Hurricane Sandy and includes a Coastal Storm Risk Management Framework. Aside from structural and non-structural features to address flood risks, the report also included natural and nature-based features that could be used to provide services such as erosion control, wave attenuation and surge reduction.

One of the lessons with Hurricane Sandy has been the need to put in place sustainable and resilient infrastructure based on projected sea-level changes and changes in the frequency and severity of weather events. The NACCS report, including our supporting technical report on natural and nature-based features, can be accessed at www.nad.usace.army.mil/CompStudy



Todd Bridges on San Francisco Bay during the PIANC World Congress in June 2014.

As an aside, the last Coasts & Ports conference I spoke at was following Hurricane Katrina. In the aftermath of that devastating hurricane, our focus was very much on how we assess and manage risk. It's crucial that we continue to share lessons learned and test our knowledge and practices with others in our profession. It's great that Coasts & Ports provides a forum to do just that.

Can you discuss the Coastal Storm Risk Management Framework?

The Coastal Storm Risk Management Framework can be customised to look at flood risk in coastal areas. The nine-step framework helps users identify existing and future risks and vulnerabilities, compare risk management measures, and consider solutions. We have also developed a set of technical products to guide users through each step of the process.

What is the aim of Engineering With Nature?

Engineering With Nature is a programme that aims to offer sustainable solutions that deliver economic, social, and environmental benefits associated with water resources infrastructure. In the context of coastal risk management, our goal is to highlight and employ practices that make use of natural and nature-based features, such as islands, beaches, dunes and reefs, in an integrated way to reduce flood risks and increase coastal resilience.

There are four key elements to the Engineering With Nature approach:

- producing operational efficiencies;
- using natural processes to maximum benefit;
- broadening and extending the benefits provided by projects; and
- using science-based collaborative processes with stakeholders and partners.

Can you discuss some of Engineering With Nature's recent work?

An important aspect of our work has been determining assessment processes that assist engineers, planners and communities in fully understanding the benefits and risks. Because natural systems are dynamic, we also work with stakeholders to understand implementation and operational issues associated with nature-based solutions.

A big part of what we do is share good examples of engineering with nature with the aim of making exceptional examples more common. Each year we feature demonstration projects. Recent projects include:

- Landscape Evolution of the Oil Spill Mitigation Sand Berm in the Chandeleur Islands, Louisiana (see boxout);
- Guidelines for Planning, Design, Placement and Maintenance of Large Wood in Rivers: Restoring Process and Function (in collaboration with the Bureau of Reclamation);

- Sediment Retention Engineering to Facilitate Wetland Development in San Francisco Bay, California;
- Atchafalaya River Island and Wetlands Creation Through Strategic Sediment Placement in Morgan City, Louisiana; and
- Engineering Tern Habitat into the Ashtabula Breakwater in Ashtabula, Ohio.

We have also developed a number of tools and resources to assist engineers and planners with



integrating nature and nature-based features in coastal management, including a sediment beneficial use calculator to conduct rapid calculations of wetland areas that can be constructed from a given volume or dredged material, or to determine the volume of dredged material needed to construct a desired area of wetlands.

You can find information on the tools, examples of engineering with nature, and some of our recent research on our Engineering With Nature website (<http://el.erdc.usace.army.mil/ewn/index.html>).



The two aerial photographs above show a portion of the New Jersey coastal town of Mantoloking, just north of where Hurricane Sandy made landfall. The right photograph was taken by the Remote Sensing Division of the National Oceanic and Atmospheric Administration (NOAA) on 31 October 2012; the left image was acquired by the same group on 18 March 2007. The images were acquired from an altitude of roughly 7500 feet (2286 m), using a Trimble Digital Sensor System. Aerial photography courtesy of the NOAA Remote Sensing Division. Caption by Mike Carlowicz.

Studying the E-4 sand berm in the Chandeleur Islands

The Chandeleur Islands sit within the Breton National Wildlife Refuge (off the coast of Louisiana, USA) and are important habitat for a number of threatened wildlife species, as well as providing recreational benefits and storm protection for local communities in coastal Louisiana.

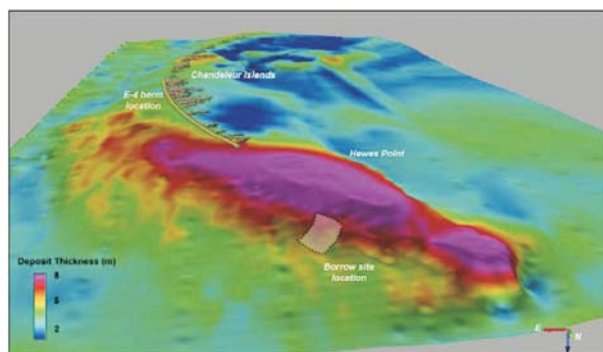


Figure 1: Location of the Chandeleur Islands sand berm and the Hewes Point borrow site along the terminal spit (figure courtesy of Flocks et al. 2012).

On 20 April 2010, approximately 130 km southeast of the Chandeleur Islands, the drilling rig Deepwater Horizon exploded and oil began discharging from the Macondo MC252 well beneath it. Within two weeks, oil was observed at the islands and elsewhere along the Louisiana coastline.

By May 2010, in an attempt to protect mainland wetlands, Louisiana requested emergency authorisation to construct sand berms along the coast to block the movement of oil.

Following a consultation process, a berm (known as E-4) was constructed at Breton National Wildlife Refuge. The E-4 berm extends along the submerged axis of the northernmost Chandeleur Island chain

for approximately 8 km and then joins the island shoreface for an additional 4 km.

About 4 million m³ of sandy sediment was used in the construction.

Engineered as a temporary structure, the berm is now offering scientists an

opportunity to observe how sudden changes in morphology (for example, due to storms or renourishment projects) and geologic processes will affect barrier-island evolution.

Understanding the physical interactions that drive coastal evolution provides a framework of knowledge for effective management of coastal planning, protection, and restoration.

The research project is a joint effort between the US Army Corps of Engineers, the US Fish and Wildlife Service, and the US Geological Survey. A final report of the project is currently being prepared.

Learn more at:

<http://soundwaves.usgs.gov/2012/08/SW201208.pdf>

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Word from the Chair

We're in it together

by Rick Liefing

You can tell coastal professionals – we are out on the coast year-round (along with a few hearty fishers, surfers and dog walkers). Winter brings new information and new challenges for all of us.

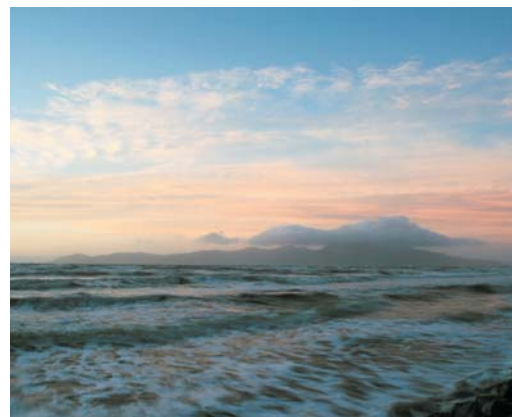
As sea levels rise and extreme weather events become more common there will be an increasing need for coastal communities to adapt and for coastal planners, scientists, policy analysts and decision-makers to find solutions. In many ways, I think the society's vision and mission have never been more important than they are today. As coastal properties, infrastructure, livelihoods and lifestyles come under increasing pressure, it is crucial that we are "professional, communicative, apolitical and responsible" about supporting the sustainable management of New Zealand's coastal and marine environment.

Part of our role as a society is to offer coastal professionals the opportunity to come together and discuss new research, approaches and techniques in a way that leads to greater understanding and continues to refine best practice. The upcoming Coasts & Ports conference is a chance for our members and our colleagues from around the Pacific to join in on some of these important discussions.

Another part of our role is building the profile of the society and our work. We do this in many ways,

including through our annual contestable scholarship programme. This year we had a number of strong applicants, but after careful consideration our judges determined two stand-out winners: Hannah Berger who is working on her Masters degree at the University of Canterbury and Ben Robertson who is working on his PhD at the University of Otago. You can read more about both of them on page 5. I would like to thank all the students who applied this year and congratulate both Hannah and Ben.

Enjoy the rest of winter and hope to see you at the conference!



Kapiti Island. Photo: Iain Dawe, Regional Coordinator.

NZCS strategic plan – charting our future

The NZCS management committee has drafted a strategic plan to cover the period 2015 to 2018. The strategic plan will guide the key outcomes and deliverables to be achieved over the next three years. As part of the planning process, the committee has also reviewed and confirmed our mission, vision and values.

The four areas covered in the strategic plan include:

- Profile – identifying ways to maintain and enhance the society's profile as an organisation recognised for its contribution to coastal issues throughout New Zealand;
- Communication – maintaining and broadening the ways we communicate to and between NZCS members;
- Financial – ensuring we continue to operate in a financially sustainable manner; and
- Member services – ensuring members are satisfied with services provided and identifying new ways to support our members' professional development.

We have made the strategic plan available in the membership section of our website. If you are

unable to access the plan through the website, please email nzcoastalsociety@gmail.com and request that a copy be emailed to you.

An opportunity to get involved

If you want to get involved in specific workstreams or have some great ideas of your own, please let us know! Email your suggestions to nzcoastalsociety@gmail.com or contact your regional coordinator or a management committee member to discuss.

- *Our mission:* To take a leading role in facilitating robust discussion and nationally coordinated interactions to learn about and better manage our coastal and marine environment.
- *Our vision:* Sustainable management of New Zealand's coastal and marine environment underpinned by sound science, engineering and policy practice, comprehensive monitoring, involved communities and effective national networks.
- *Our values:* The NZCS will promote this vision by being professional, communicative, apolitical and responsible. The NZCS will work positively with others with common interests.

News in brief

New rules for antifouling paints

From 1 July 2015, anyone who uses antifouling paints needs to make sure they work in a controlled work area. They must also put up signs to warn people about the work they are doing, and the measures they need to take to stay safe. The new rules require anyone who removes antifouling paint from a boat to make sure that all the scrapings and other waste are collected and disposed of properly.

Antifouling paints help boats operate more efficiently and limit the spread of marine pests around New Zealand's coasts; however, they can also pose risks. In 2013 the Environmental Protection Agency (EPA) conducted a reassessment of antifouling paints. The new rules were created following the reassessment.

The EPA has created a brochure to help people understand the rules and follow them. The brochure was sent to marinas all around the country and is available on the EPA website (www.epa.govt.nz).

Poor condition of scallop populations analysed

Earlier this year callers to the Ministry for Primary Industries (MPI) 24-hour Exotic Pest and Disease Hotline reported deformed and smaller than normal scallops in three locations: around Great Barrier and Mercury islands, and in Pelorus Sound.

MPI Animal Health Laboratory analysed scallops collected from the three locations using molecular (polymerase chain reaction) testing. A low prevalence of the pathogen *Perkinsus olseni* was observed at all three sites. *P. olseni* is established in New Zealand having been found in other shellfish species around the North Island and the top of the South Island.

The lab's examination showed inflammation and some degeneration of the digestive tubules in some of the scallops in samples from all three sites. Little scientific research has been done to determine how this damage is caused, but there is a suggestion that a virus-like particle may be a contributing factor.

All the Mercury Island scallops had cysts present, and half had a marked immune response. Samples from Pelorus Sound showed a high bacterial load of *Vibrio splendidus*, a common opportunistic bacterium in New Zealand waters.

Results of the investigation suggest there was not one causal factor or disease. Instead the mortality and poor condition of the scallop populations are likely the result of a combination of many natural causes.

www.mpi.govt.nz

EPA grants marine consent to Shell Todd Oil Services for its Maui offshore facilities

The EPA has granted a marine consent to Shell Todd Oil Services (STOS) for 35 years to undertake activities relating to extracting, producing and transporting natural gas and condensate in and from the Maui natural gas field. The marine consent covers work at

STOS' existing structures, known as Maui Platform Alpha and Maui Platform Bravo, and all associated structures and submarine pipelines. The consent is subject to conditions that will be monitored and enforced by the EPA.

The application was considered by a decision-making committee (DMC) appointed by the EPA Board. After considering information provided, the DMC decided that granting the marine consent would accord with the sustainable management purpose of the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012. This is the second publicly notified application for a marine consent to be granted by the EPA. The first was granted to OMV for operations at their Maari field.

www.epa.govt.nz/EEZ/stos/decision/Pages/default.aspx

Three new MPAs announced for the West Coast

In June, the Government announced three new marine protected areas (MPAs) that will add 9557 ha to New Zealand's protected area network. The three MPAs complement the five marine reserves established on the West Coast last year.

As part of protecting the areas, the (Challenger Area Commercial Fishing) Regulations 1986 will be amended to prohibit the use of mobile, bottom-impacting commercial fishing methods in the areas which border the existing Hautai and Punakaiki marine reserves.

The regulations will protect benthic habitats in these areas, while still allowing some fishing methods to continue in the new MPAs. All fishing activity is prohibited within the adjacent marine reserves (www.doc.govt.nz).

New report shows wider value of aquaculture industry

A report commissioned by MPI on the social effects of the Southland aquaculture industry shows that the introduction of aquaculture to the region has been positive with many of the individuals interviewed benefiting from a rise in personal income, skills and overall job satisfaction.

The research included interviews with 66 local businesses, community organisations and 130 industry staff. Results included:

- 31 per cent of staff reported an increase in self-respect;
- 81 per cent of staff had learned new skills; and
- 70 per cent reported an increase in annual income compared to their previous employment.

Southland was chosen as a case study for the research because its existing aquaculture is well understood commercially and in the community. The report covers 25 years of aquaculture on Stewart Island and Bluff.

The Social and Community Effects of Aquaculture case study is available at www.mpi.govt.nz.

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News from the regions

Coastal News



Auckland

*Sam Morgan and Paul Klinac,
Regional Coordinators*

Proposed Auckland Unitary Plan

The hearing for the Proposed Auckland Unitary Plan (PAUP) coastal zones was held over five days between 25 March and 1 April. Over 2000 submission points were addressed with over 70 documents of evidence prepared by the Auckland Council and submitters. This followed 24 mediation sessions that were held between 24 November 2014 and 16 January 2015. Key topics included mangrove removal, discharge of sewage from boats, marinas, moorings, aquaculture, stock access to the coastal marine area, the future of the Port of Onehunga, controls on bio-fouling, providing for infrastructure and protection of whales and seabirds.

The coastal hearing was quickly followed by the city centre hearing which included the downtown waterfront area from the Port of Auckland to Westhaven Marina. The big topics there included the proposed reclamation to extend Bledisloe Wharf and the proposed inclusion of a viewshaft from Queens Wharf.

Topics still to go to a hearing include the mapping of the coastal zones and significant ecological areas, and the provisions for coastal precincts for particular marinas and rowing courses. The recommendations of the Independent Hearing Panel are expected to be released mid-2016.

Bay of Plenty

*Mark Ivamy and Sharon De Luca,
Regional Coordinators*

Oil spill

Heavy fuel oil leaked into Tauranga Harbour from a Mobil-owned pipe during a fuel transfer operation on 27 April 2015. Bay of Plenty Regional Council (BOPRC) staff responded and deployed booms to contain the spill as soon as they received notification. Clean-up operations and shoreline checks are ongoing. Approximately 1500 litres of oil has been removed from the coastal marine area by the BOPRC.

Coastal hazard assessments

Western Bay of Plenty District Council has recently completed coastal hazard assessments for Waihi Beach and Pukehina. The assessments map identifies land susceptible to both coastal erosion and inundation over a 50- and 100-year timeframe. The council held community engagement workshops in May and is preparing plan changes to incorporate the updated mapping and associated rules.

Tauranga tsunami evacuation

Tauranga City Council has completed tsunami evacuation modelling for Mount Maunganui and Papamoa. The tsunami hazard was modelled on a seismic event of magnitude Mw 9.0 along the variation

to the Southern Kermadec Trench. The council has identified suitable evacuation zones and points required to safely evacuate the communities vulnerable to tsunami hazard.

Community open day workshops are planned for the upcoming months and construction work has begun on the required access improvements to the evacuation route network.

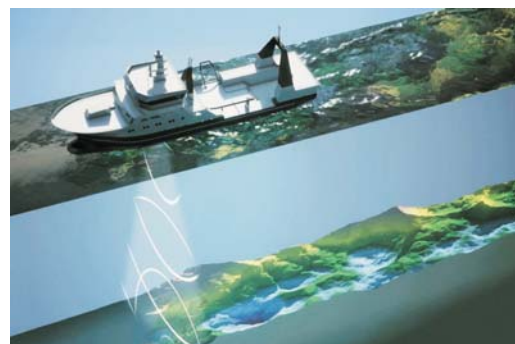
Wellington

Iain Dawe, Regional Coordinator

Mapping marine environment around Kapiti Island

Scientists are mapping the submarine landscape of Kapiti Island. The project is in partnership with the National Institute of Water and Atmospheric Research (NIWA), Victoria University of Wellington, the Department of Conservation (DOC), and Land Information New Zealand (LINZ).

The mapping was done over June and July using multibeam echo-sounding technology deployed from NIWA's inshore research vessel *Ikatere*. The resulting data will enable the production of highly accurate bathymetry, habitat and biotope maps of the seafloor to a depth of 50 m over an area of 50 km². Information will also be used by LINZ for the next update of the region's navigational charts.



NIWA's multibeam echo-sounder maps the seafloor using a fan of acoustic beams providing 100 per cent coverage of the seabed. Photo: NIWA.



Ikatere on Wellington Harbour. Photo: NIWA.

Data recorded throughout the full water column can be used to characterise water masses, identify gas seeps and sediment plumes, and detect schools of fish. The information will contribute towards assessing the ecological integrity of Kapiti's marine environment.

Kapiti is one of the country's most important small islands, lying 6 km off the coast of the North Island about 40 km north of Wellington. It is the first time the seafloor around the island has been mapped using 21st century technology.

West Coast

Don Neale, Regional Coordinator

West Coast Penguin Trust wins two Leading Light Awards

By Kim McPherson, Deputy-Chairperson, West Coast Penguin Trust

"And the winner of the Not-for-Profit Award kindly sponsored by Westland Milk Products goes to ... West Coast Penguin Trust!" announced TV One's Peter Williams at the Leading Light Awards. A short time later he went on to announce "the winner of the Environment Award sponsored by the Department of Conservation goes to West Coast Penguin Trust".

The astonished Kerry-Jayne Wilson, trust chairperson, said in her acceptance speech, "This is a prize of far greater value to us than this beautiful trophy. It is the exposure this recognition gives us to fellow coasters who we may not otherwise connect with, and the kudos it gives when seeking financial or in-kind support so vital for any non-profit organisation."



Accepting awards at the Leading Lights Award Ceremony (from left to right) Reuben Lane, Ranger, Department of Conservation; Kerry-Jayne Wilson, Trust Chairperson; and Inger Perkins, Trust Manager.

The West Coast Penguin Trust was set up in 2006 by local residents concerned by the decline in local blue penguins. Based on monitoring work, members of the trust knew that one of the major factors contributing to penguin decline in the Punakaiki/Charleston area can be attributed to road kill. With that in mind, one of the trust's big efforts has been to build a fence along the state highway in that area. In 2014 the fence was opened (well, for blue penguins closed). Since the fence went up there have been no reported penguin deaths in the fenced area. This successful venture was possible thanks to local support, loads of volunteer hours and sponsorship from numerous parties.



One of the West Coast Penguin Trust's main projects has been putting up a fence along the state highway. Photo: West Coast Penguin Trust.



The fence was made possible thanks to the hard work of volunteers and the generosity of the local community. Photo: West Coast Penguin Trust.

While the fence was under construction yet another project was nearing completion – an education resource that was launched in late 2014. This booklet is available to any school or youth group and can be downloaded from the trust's website. The resource allows children to learn more about the coastal environment, penguins and other seabirds.

This trust isn't just about blue penguins; it now encompasses all seabirds along the West Coast and last year it began research on tawaki (Fiordland crested penguin). With little known about tawaki, the trust sees exciting times ahead as it stretches its wings into new areas.

This small, vibrant trust will continue to implement practical conservation projects that benefit both coastal wildlife and the West Coast community.

www.bluepenguin.org.nz

Canterbury

Justin Cope and Gareth Taylor, Regional Coordinators

Earthquake faults report released

In June, Environment Canterbury released a report on earthquake faults in the Kaikoura district, the sixth in a series of earthquake fault reports on different districts of the Canterbury region. The report, by GNS Science, provides information on the locations and character of known active geological faults and folds throughout the Kaikoura district.

The GNS report is intended to highlight areas where there is a risk of faults cutting or buckling the land

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where they reach the ground surface and damaging buildings and infrastructure. Environment Canterbury and Kaikoura District Council will use the report for land information requests (LIRs), land information memoranda (LIMs), public education, and planning and policy.

Lyttelton Port Recovery Plan preliminary draft



In April, Environment Canterbury released the Lyttelton Port Recovery Plan preliminary draft for public consultation. A total of 277 written submissions were received. The aspects of the plan that drew particular attention in the submissions included the proposed reclamation at Te Awaparahi Bay and its effects on

the harbour and surrounding communities, the cruise berth location, the ferry terminal location, the provision of a new marina, and current and future port traffic on Norwich Quay.

A public hearing about the preliminary draft Lyttelton Port Recovery Plan was held in June. The hearing panel was made up of the Hon Sir Graham Panckhurst as chair, Peter Atkinson and Tim Vial. About 50 people, including those representing organisations, spoke to their submissions during the hearing. The hearing panel will make recommendations to Environment Canterbury, which will then make a decision on the draft Lyttelton Port Recovery Plan before presenting it to the Minister for Canterbury Earthquake Recovery by mid-August. The minister intends to notify the draft plan and invite written comments from the public before making a decision on whether to accept it.

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NZCS Regional Coordinators

Every region has a NZCS Regional Coordinator who is available to help you with any queries about NZCS activities or coastal issues in your local area.

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Vanishing nature

Book review by Chandra Littlewood

Vanishing Nature is a publication from the Environmental Defence Society (EDS) with assistance from the New Zealand Law Foundation. Written by Marie A Brown, R T Theo Stephens, Raewyn Peart, and Bevis Fedder, *Vanishing Nature* provides a comprehensive look at New Zealand's very real biodiversity crisis. The book presents New Zealand's ecological story and describes the current state of New Zealand's biodiversity, how this occurred and what major changes need to take place to stop the rapid decline in our native flora and fauna.

The authors analyse the issues facing New Zealand's biodiversity and address how both government and non-government groups are responding to these challenges. The book is divided into manageable sections and this, along with the selection of stunning images throughout the book, makes it an interesting and thought-provoking read.

The first part of the book is separated into sections (managing public conservation land, protecting biodiversity on private land, safeguarding freshwater biodiversity, protecting marine biodiversity, and

supporting community conservation) enabling the reader to select specific topics or read from cover to cover. One key message is that biodiversity decline is an issue connecting all sectors of society and will require widespread collaboration for positive change to occur.

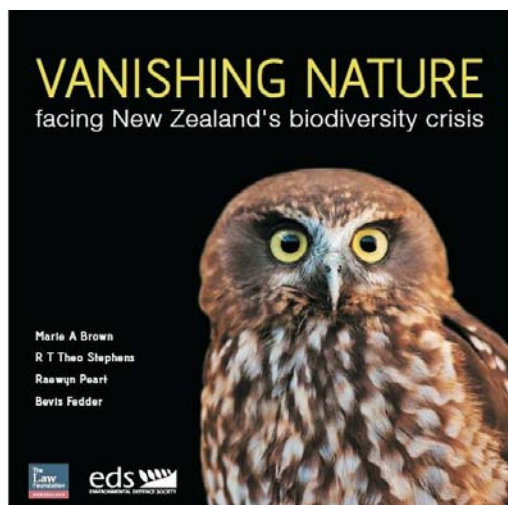
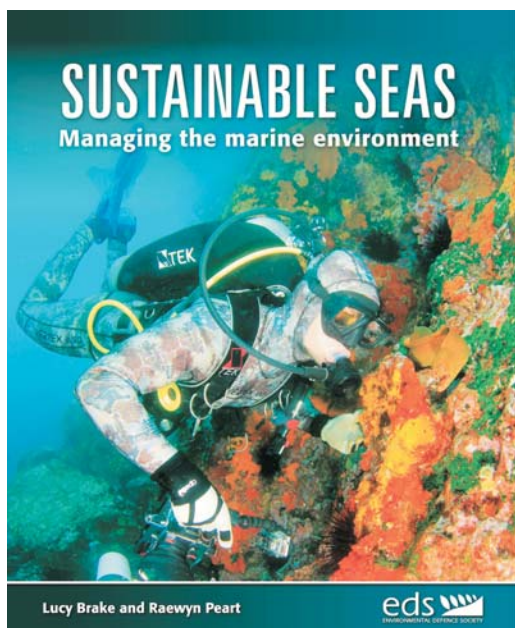
The authors don't just analyse the problems, they also offer real solutions for the future. These solutions are broken up into three comprehensive approaches: strategic, tactical and practical. Each section is thorough and well explained.

Vanishing Nature concludes that to build ecological resilience, strategic change is required. Regulatory and technical solutions will help get part of the way, but long-lasting change needs bigger shifts on bigger scales.

Sustainable seas

EDS has recently published *Sustainable Seas: Managing the marine environment* by Lucy Brake and Raewyn Peart. As part of its commitment to the coastal environment, the New Zealand Coastal Society financially contributed to this publication.

Learn more about both publications at www.eds.org.nz.



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Contributing to Coastal News

We always welcome contributions for forthcoming issues of *Coastal News*. Please contact the Editor, Shelly Farr Biswell, at shelly@biswell.net if you'd like to submit a news in brief, article, or have content suggestions. The submission deadline for the next issue is 1 October 2015.



NZCS *Rena* Publication

In 2014 the New Zealand Coastal Society published *Rena: Lessons Learnt* to complement the growing knowledge base on oil responses in New Zealand.

Please contact the NZCS Administrator at nzcoastalsociety@gmail.com for information on obtaining a copy.

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



NZCS Mission Statement

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 currently has over 400 members, including representatives from a wide range of coastal science, engineering and planning disciplines, employed in the engineering industry; local, regional and central government; research centres; and universities.

Applications for membership should be sent to NZCS Administrator
Renee Coutts (email: nzcoastalsociety@gmail.com).

Disclaimer

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