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Photo courtesy Beca.

## Tauranga's Harbour Link Project Bridging the Gap

The Western Bay of Plenty is one of New Zealand's fastest growing areas, with Tauranga city now the country's sixth largest population centre. Tauranga is also home to New Zealand's largest port by cargo volume – Port of Tauranga. Given the growth in the area and the importance of the port, efficient transport corridors in the western Bay of Plenty sub region are crucial to minimise congestion and provide for further growth.

After many years of planning, NZ Transport Agency's (NZTA) Harbour Link project has been completed three months ahead of schedule and under budget. Harbour Link has doubled the capacity of the critical harbour crossing between Tauranga and Mount Maunganui, providing improved traffic flows, reduced journey times, and more efficient access to and from Port of Tauranga. It has also reduced congestion at several busy city intersections, and it provides a safer and more scenic route for cyclists and pedestrians.

### Two Stages

Harbour Link was constructed in two stages. Stage 1 included the expansion of Hewletts Road to four lanes on the Mount Maunganui side of the harbour and was completed in September 2007.

Stage 2 involved making four lanes on the bridge causeway, the construction of a duplicate harbour bridge, and a four-lane flyover from Takitimu Drive to the existing harbour bridge. Harbour Link was officially opened on 18 December 2009.

### Community and the Environment

The Harbour Link project has had strong public backing since the project was initiated by Tauranga City Council in 1997. Considerable consultation was undertaken on the approvals under the Resource Management Act for designation and resource consents. A Key Stakeholders Group was established to enable information to be provided and responses gained from the key interested parties as well as the public consultation programme that featured communications with affected landowners. In addition, a Community Liaison Group was set up to allow interested parties to respond on the urban design aspects of the project. Tangata whenua were consulted throughout the project.

An important part of the Harbour Link project was the provision of better pedestrian and cycle facilities, including a designated pedestrian/cycle route protected from traffic by a barrier across the new harbour bridge.



Caring for the environment was also a vital part of the Harbour Link project. Planning was undertaken to protect and enhance the natural, social and physical environment, particularly around the harbour. The whole project involved extensive landscaping, including a walkway and reserve area under the western abutment to the harbour bridges. Urban design was a consideration as well and landscaping incorporated artworks and interpretation panels at key points around the development. Comprehensive noise mitigation has been incorporated in a sensitive manner that recognises the cultural relationship of the Whareroa Marae to the Otamataha Pa.

Given the sensitive coastal environment in which the project was undertaken, Tauranga City and then NZTA worked to lessen the effects on the natural environment and historic places. The project therefore provides improvements for the area. For example, the stormwater runoff from all the structures (including the original bridge) is now captured and treated before discharge.

### Big Thinking

Harbour Link has scored some impressive statistics in its three-year journey across the harbour. During construction of Stage 2, approximately 36,000 cubic metres of concrete were poured – equalling about 6000 full concrete trucks, or 1.8 million 20 litre containers. About 3500 tonnes of steel was also used.

The new harbour bridge used 750,000 metres of 'stressing strand' – a metal cable incorporated to provide additional strength to the concrete beams. Working like a large rubber band, the stressing strand is stretched and threaded through the beams. It would take seven and a half hours to drive from one end of the stressing strand to the other at 100 km an hour!

The first column for the project was poured on February 28, 2008 and the first viaduct bridge beam was poured in April 2008. The 184 beams that form the structure of the Chapel Street Viaduct are some of the largest of their type cast in New Zealand. Each beam is up to 37 metres long and weighs up to 80 tonnes.

There were 105 piles drilled for the project, 19 of them constructed in the water. Piling for the new harbour bridge began in May 2008 and the deepest pile extends 65 m below the seabed.

An innovative solution for constructing Stage 2 was the use of bentonite during piling. Three bentonite factories were established to manufacture the naturally occurring mud-slurry used to support the pile bore during drilling. The bentonite piling method significantly reduces issues with bore stability that in the past were overcome by expensive full-length permanent steel casings, which in turn create the noise and vibration that is usually associated with piling. This method of piling is common overseas, but

piling using bentonite on this scale was a New Zealand first.

The new harbour bridge itself began moving across the Tauranga Harbour on October 3, 2008, and took seven months to cross the harbour before touching down on the Mount causeway at the end of April 2009.

*Article prepared by Cushla Loomb, Beca Planning  
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*Tauranga Harbour Bridge – then...*



*...and now (both photos courtesy Beca).*

# Wellington Coast at Centre of Earthquake Study

New Zealand and Japanese scientists are involved in a two-year project designed to produce information on the structure and processes between the Pacific and Australian tectonic plates that are locked under Wellington.

Based on the behaviour of similar locked plates in other parts of the world, scientists expect this plate boundary will eventually rupture and produce a large, damaging earthquake.

Project coordinator Stuart Henrys, of GNS Science, says it's important to understand the physical processes that lead to large subduction zone earthquakes, sometimes called megathrust earthquakes.

"Together with our Japanese collaborators, we anticipate this research will lead to a better understanding of what controls seismic behaviour on the plate interface beneath the lower North Island."

As the first phase of the project, 50 portable seismometers on loan from the US were placed around the Wellington region in November 2009. The seismometers supplement permanent seismographs that are already in place as part of the GeoNet Project. Scientists will use information gathered from the network of instruments (known as a seismic array) to get an accurate picture of earthquake activity under the lower North Island. The instruments will record hundreds of small earthquakes, as well as thousands of sound

sources made by a seismic survey ship off the North Island coast.

In March 2010, the 50 portable seismometers will be moved to form a straight line between the Kapiti and Wairarapa coasts. The line of instruments will be extended off both coasts with 20 'ocean-bottom seismometers' from Japan being placed on the seafloor.

The onshore and offshore instruments will remain in place for one month recording sound sources from a seismic survey ship undertaking an oil and gas prospectivity study of the nearby Pegasus and

Subduction earthquakes occur at convergent plate boundaries such as the one under the lower North Island. This is where one tectonic plate (the Pacific) is forced under the other (the Australian). Large sections of these plate boundaries can get stuck. When they rupture, they produce very large earthquakes in excess of magnitude 9.

They are sometimes called megathrust earthquakes, and there have been about four of these events worldwide in the past century. The most recent was the 2004 Sumatra-Andaman Earthquake in which the Indian plate subducted under the Burma plate, producing a 1600 km-long rupture of the seafloor and triggering the Boxing Day Tsunami.

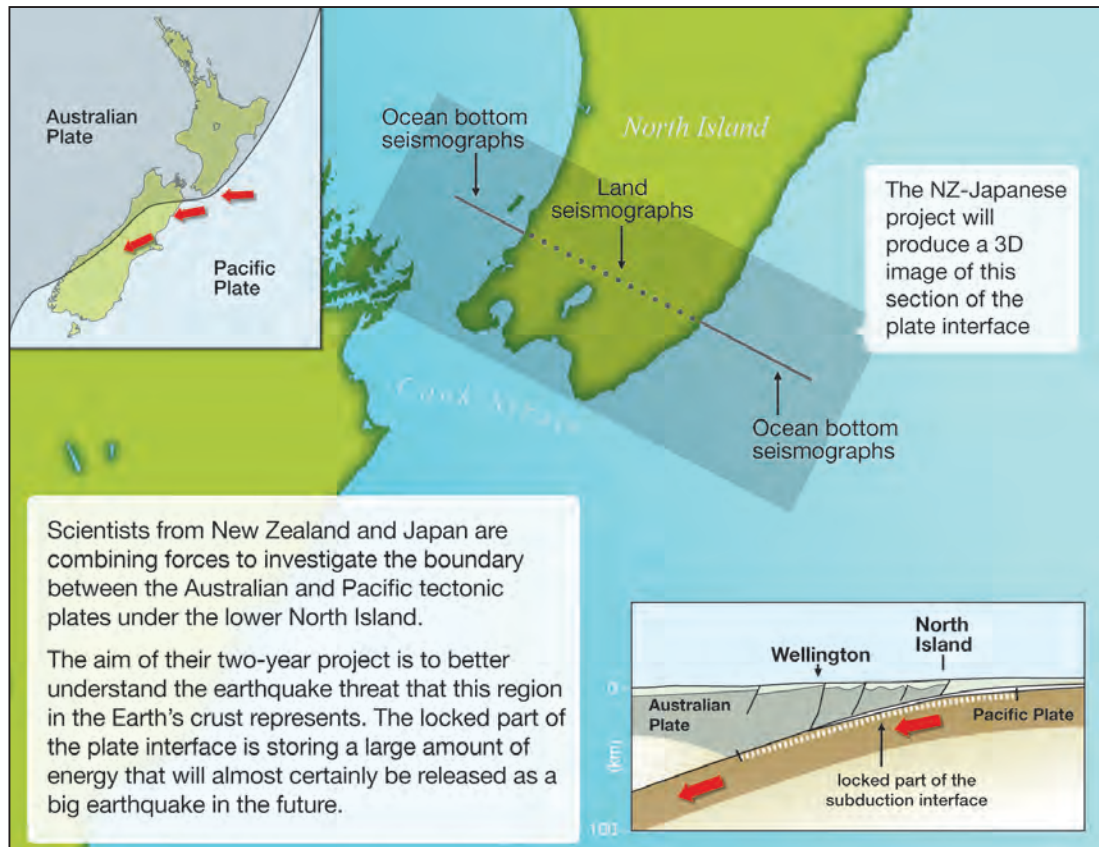


Image courtesy GNS Science.

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Wanganui basins for the Ministry of Economic Development.

In the final fieldwork phase of the project in early 2011, 900 portable seismometers from Japan and the US will be placed in a straight line across the lower North Island from coast to coast, again between Kapiti and Wairarapa. They will record seismic waves from borehole blasts set off by scientists.

The project will be one of the biggest seismic deployments in New Zealand's history. It will also be the first time the plate subduction zone under the Wellington region has been studied in such detail.

Scientists will combine all the seismic recordings

like a CAT scan to build a three-dimensional image of the subduction zone under the lower North Island.

They will then be able to compare this image with a similar 3D image of the subduction zone beneath Tokyo, which has a similar geological setting to Wellington.

The project is being coordinated by GNS Science and Victoria University, in conjunction with the Ministry of Economic Development's Crown Minerals group, and with support from scientists of the Earthquake Research Institute at Tokyo University.

For more information visit [www.gns.cri.nz/news/release/20100222.html](http://www.gns.cri.nz/news/release/20100222.html).



View of Wellington Harbour.

## Profile: Karin Bryan



NZCS management committee member Karin Bryan is a senior lecturer in coastal science at the University of Waikato. She works within the Coastal Marine Group which is part of the University's Department of Earth

and Ocean Sciences. She has a particular interest in beach processes, estuarine nutrient dynamics, and video techniques for coastal monitoring.

Karin completed a PhD in surf-zone processes at Dalhousie University and has a BSc (Hons) degree in physical geography and physics from the University of Toronto. Her doctorate examined the effect of complex beach topography on low frequency waves. Although continuing her theoretical work on surf-zone physics, she has expanded her research interest into three main areas:

- Use of video technology to measure morphological change and wave properties

on beaches. In particular working on the NIWA Cam-Era programme and the Muriwai ARGUS station.

- Modelling and measuring near-bed and swash zone sedimentation processes. In particular how they are affected by mineralogy (i.e. black minerals) and ground water seepage.
- Modelling nutrient dynamics in estuarine systems, including understanding the role of terrestrial and marine contributions to the nutrient balance.

Karin previously worked as a scientist in the coastal processes group at NIWA, working mainly on better understanding the processes controlling coastal erosion and inundation, largely by developing techniques for Cam-Era video images of beaches.

She joined the NZ Coastal Society executive in 2009 and serves as an academic liaison.

Karin can be contacted at: [k.bryan@waikato.ac.nz](mailto:k.bryan@waikato.ac.nz).

# Wind Farm Noise Standard Published

New Zealand Standard NZS 6808:2010 Wind Farm Noise was released on 1 March 2010. The standard provides wind farm developers, local authority decision makers, and communities with methods for predicting, measuring, and assessing sound from wind farms. It also recommends limits on sound from wind farms to prevent communities from experiencing unreasonable noise.

Jointly funded by the New Zealand Wind Energy Association and the Energy Efficiency and Conservation Authority, the standard replaces the 1998 version.

Over the last decade there has been considerable growth in the number and scale of wind farms, and the knowledge gained from measuring and assessing the effects of sound from wind farms has also advanced over that period.

The 2010 version retains the recommended noise limits in the 1998 version. The recommended limits in the standard are intended to provide protection against sleep disturbance and maintain a reasonable amenity at locations surrounding a wind farm. It introduces a new provision for a lower more stringent limit where a local authority

According to the New Zealand Wind Energy Association, New Zealand currently has 11 operating wind farms. These wind farms currently supply about 3% of New Zealand's annual electricity generation. Several operating wind farms are located near New Zealand's coasts, including Meridian Energy's Project West Wind, near Wellington, where all 62 wind turbines are operating.

There are also 18 proposed wind farms that are in various stages of the consent process or have been consented, but are not yet under construction. Several of these are proposed near New Zealand's coasts, including in the Waikato, Wellington, and Marlborough regions.

has identified in its district plan the need to provide a higher degree of protection of acoustic amenity in a particular area. This new provision is referred to as the high amenity limit. The standard sets out in detail the circumstances under which limits should apply.

The standards committee also worked to ensure better protection for communities by addressing issues such as:

- Cumulative effects from multiple wind farms or wind farms developed in stages.
- Forewarning prospective residents of an area already affected or permitted to be affected by wind farm sound (reverse sensitivity).
- Wind farm-specific audible characteristics (amplitude modulation).

The new version of the standard includes model consent conditions. When included in a consent or designation these conditions may provide territorial authorities with practical compliance, monitoring, and enforcement measures.

The process of developing the standard took the committee approximately 18 months, including a two-month period during which the public had an opportunity to comment on the draft. Standards New Zealand received over 600 comments on the draft standard. The committee reviewed each comment as part of the process of preparing the final version of the standard.

For more information about the Wind Farm Noise Standard visit [www.standards.co.nz](http://www.standards.co.nz). To learn more about wind farms in New Zealand visit [www.windenergy.org.nz](http://www.windenergy.org.nz).

## Missed an article in *Coastal News*?

Back issues (from Issue 6, April 1996) are available as pdf downloads from [www.coastalsociety.org.nz](http://www.coastalsociety.org.nz) - follow the Publications link on the front page.

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On 1 March 2010 the New Zealand Standard NZS 6808:2010 Wind Farm Noise was released. Meridian Energy's White Hill Wind Farm, Southland. Photo courtesy NZWEA.

# Beach Scraping and Dune Repair at Whangapoua Beach

*After storms in the winter of 2008 resulted in severe dune erosion and placed several houses at risk at Whangapoua Beach the community knew something had to be done. Amy Robinson, Environment Waikato, and Jim Dahm, Eco Nomos Ltd, report on the community's environmentally friendly and cost-efficient solution – beach scraping.*

## Coastal News



Whangapoua is located on the eastern Coromandel Peninsula, approximately 30 minutes drive north of Whitianga. The beach has a north-easterly aspect and is characterised by fine- to medium-sized sand, with a mean significant wave height of approximately one metre. EW has been monitoring Whangapoua Beach for ~29 years with beach profiles at three locations along the beach. It is a compartmentalised pocket beach, which means it does not experience net littoral drift or significant sediment exchange with adjacent beaches.

The beach profile data and other evidence indicate that most shoreline change is associated with both onshore-offshore and alongshore sediment exchange within the beach system. Beach rotation can be significant, where the sand volume oscillates between opposite ends of the beach due to seasonal variations in wave approach angle. The beach profile data enables reasonable estimation of maximum likely erosion for return periods of 50 to 100 years and has recently been used to update the development setbacks recommended at the beach.

### Coastal Erosion Event

A series of northerly storm events during July and August 2008 resulted in severe dune erosion at the southern 750 metres of Whangapoua Beach which placed several houses at risk should further erosion occur. The closest house was 5.5 m away from the erosion scarp with at least four more houses within 7 m. The erosion was the most severe at this end of the beach. The scarp was over-steepened and would eventually naturally collapse to a more stable slope.

The initial reaction of some affected beach-front property owners was that a rock revetment seawall needed to be constructed to protect their dwellings. Others, however, were opposed to this approach and convinced owners to fully explore all options. To do this, the Whangapoua Beach Ratepayers Association (WBRA) engaged local coastal scientist Jim Dahm (Eco Nomos Ltd) to assess the risk and investigate a range of approaches; with a short report prepared considering no action, assisted dune recovery, constructing an erosion protection structure, and landward relocation of the dwellings. Following the report and discussions, the affected landowners chose to undertake assisted dune

recovery using beach scraping – aiming to restore the dune to pre-storm dimensions and so reinstate the natural protective buffer against erosion. In the longer term, existing setbacks will see the threatened dwellings relocated landward as they are replaced – with several houses having already gone through this process over the last 10 to 15 years.

The reasons the owners chose working with nature over a seawall are many but love of their beach, involvement in the local Beachcare programme for 10 years (during which time they have seen other parts of the beach erode and recover), support of key members in the community, and active dialogue and cooperation were all factors.

On deciding that beach scraping was the appropriate way forward, the community had to then make a conscious effort to wait and go through the consent process knowing that some dwellings close to the sea remained at serious risk. Waiting was also required to enable sufficient beach recovery so that beach scraping could be effective.

### Beach Scraping

Beach scraping involves moving material from the lower beach face onto the frontal dune to reconstruct the foredune – redistribution rather than addition of sand. In essence, machines are used to reconstruct the dune rather than waiting for natural dune repair to occur with trapping of sand by vegetation (a process that can take some years). It is a commonly used technique overseas but to date use on this scale has been limited in New Zealand. In most circumstances, it is unnecessary and preferable to live with natural dune recovery. It can, however, be a very useful option to manage serious risk and avoid seawalls at appropriate sites.

### The Consent Process

The consent followed a non-notified process and demonstrates a positive example of the relevant statutory bodies working together with the community and iwi for beneficial environmental outcomes. Whangapoua Beach was assessed as retaining a high level of natural character despite the human development that exists there. The beach scraping proposal did not adversely affect natural character values primarily because there was no seawall construction and consequently enhanced public enjoyment of the area. In terms of ecological effect, the works were designed to avoid New Zealand dotterel and tuatua habitat.

Consent was granted authorising up to 22,500 m<sup>3</sup> of sediment per beach scraping event, being 15 m<sup>3</sup> over the 1500 m length of beach, for a 10-year period, to enable the applicant to repair any

possible future severe coastal erosion events in a timely manner. The actual works undertaken were at the affected southern region of the beach, to a maximum volume of 10,500 m<sup>3</sup>.

On gaining the resource consent, WBRA engaged a contractor to carry out the works during December 2008. The works were undertaken using a long-reach digger that transferred the sand landward onto the upper beachface and dune

from the lower beach profile between mean sea level and the level of maximum wave run up. The sediment was then graded up the dune with a bulldozer. On completion of the works, a 3 to 5 m width of high tide beach was maintained and the following autumn the reshaped dunes were planted with native dune binding species, pingao and spinifex. The total cost to date has been about 3 to 4 per cent of that of a seawall.



Figure 1: Whangapoua Beach, 19 April 2008 Note the healthy foredune and spinifex growing to the dune toe. Photo courtesy of Ron Ovenden.



Figure 2: Dune erosion following the storms of winter 2008.





### Looking Forward

Following the success of the Whangapoua Beach scraping project, Thames Coromandel District Council intends to lodge a comprehensive resource consent application in early 2010 to undertake beach scraping at beaches in its district that are prone to coastal erosion. This will allow the council to quickly repair erosion scarps that threaten property, with the intention of deterring property owners from taking the typical reactive approach of wanting to construct rock seawalls

which amongst other things, degrade natural character and visual amenity, limit public access along the beach, and result in exacerbated coastal erosion including beach lowering, loss of high tide beach and end-effect erosion. The use of 'soft solutions' such as this are favoured by the New Zealand Coastal Policy Statement and EW's policy and planning documents.

Contact Amy Robinson ([amy.robinson@ew.govt.nz](mailto:amy.robinson@ew.govt.nz)) and Jim Dahm ([jdahm@xtra.co.nz](mailto:jdahm@xtra.co.nz)) for more information.



Figure 3: Following the beach scraping, 11 December 2008.



Figure 4: Recovery one year later on 11 December 2009; planted with native dune-binding vegetation.



# News in Brief

## Blue Energy: New Zealand's Place in the World

The Aotearoa Wave and Tidal Energy Association (AWATEA) will be hosting a two-day conference and EXPO on 19–20 April in Wellington. The conference will feature presentations by New Zealand device and project developers, industry participants, regulators, and policy analysts. Tuesday 20 April will be an international day with up to 18 countries represented and presentations by member countries from the executive committee of the Ocean Energy Systems Implementing Agreement of the International Energy Agency, of which New Zealand is a current member and chair.

As in past years, AWATEA is hoping that the announcement of the annual award of the Marine Energy Deployment Fund will be made at the conference. For more details go to AWATEA's conference webpage at [www.awatea.org.nz/2010conference.html](http://www.awatea.org.nz/2010conference.html).

## Aquaculture Reforms: Update

A summary of the submissions on the government-established Technical Advisory Group's report *Re-Starting Aquaculture* is now available on the Ministry of Fisheries website at [www.fish.govt.nz/en-nz/Consultations/Restarting+Aquaculture/default.htm](http://www.fish.govt.nz/en-nz/Consultations/Restarting+Aquaculture/default.htm). A total of 223 written submissions were received.

The submissions are being considered as part of policy development. Cabinet approval of the proposed policy for aquaculture reform will be sought in March.



Submissions were recently received regarding the report *Re-Starting Aquaculture*.

## Waikanae Estuary Care Group Wins Award

In December 2009, Greater Wellington Regional Council awarded the Waikanae Estuary Care Group the Rata Community Partnership Award for the group's work in restoring the Waikanae Estuary Scientific Reserve.

The group's vision is a native bird corridor from

Kapiti Island to the Tararuas. Since 2004 the group has planted over 25,000 native trees and progressively eliminated weeds to return the area closer to its pre-European vegetation. The group has its own shade house and also supervises the planting of suitable native plants by local schools. Detailed planning and a commitment to monitoring and following through are strong features of the group's work.

Visit [www.gw.govt.nz/our-environmental-champions-200/](http://www.gw.govt.nz/our-environmental-champions-200/) for more information about Greater Wellington's environmental awards.



Since 2004 the Waikanae Estuary Care Group has planted over 25,000 native trees.

## Recently Published

*Ahumoana Ahutangata, Aquaculture Development in New Zealand: Scientific and Technical Information to Inform Maori*  
Available at [www.tpk.govt.nz](http://www.tpk.govt.nz)

*Water Research Strategy* jointly published by the Foundation for Research Science and Technology and Ministry for the Environment.

Published in December 2009, the strategy is intended to guide the science sector to deliver the information and tools required to enable world-class management of water resources in New Zealand. There is a particular focus on guiding investment in water research over the next ten years. Available at [www.mfe.govt.nz/publications/water/water-research-strategy/index.html](http://www.mfe.govt.nz/publications/water/water-research-strategy/index.html).

## RMAA 2009 Publications

The Ministry for the Environment has developed a series of fact sheets that summarises the Resource Management Act (Simplifying and Streamlining) Amendment Act 2009. They have also updated many of their RMA publications to reflect changes and processes arising from RMAA 2009. These publications are listed at [www.mfe.govt.nz/publications/rma/](http://www.mfe.govt.nz/publications/rma/).

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# Garbage Survey Nets Interesting Results

In 2009, Maritime New Zealand undertook an extensive survey of fishing vessel operators to better understand the challenges they face in dealing with garbage on board their vessels and the realities of garbage management at sea. The vast majority of data on marine debris is based on the results of beach cleanups or underwater surveys, but this data does little to differentiate between land-sourced and vessel-sourced garbage or help with identifying ways to minimise vessel-sourced debris.

The survey focused on the types and volumes of garbage produced on vessels, how garbage is managed during the voyage, the perceived barriers to bringing garbage ashore and the operators' levels of understanding of the rules and regulations. Additional questions collected data on the vessel size, fishing type, crewing and voyage patterns and also on observations of garbage at sea.

Unsurprisingly, plastic topped the list of garbage produced on boats, with plastic bags and wrapping making up the bulk of this. Other types of plastics included bottles, strapping, bait packaging and fishing-related items like nylon lines, netting and rope. There was a big difference in the amount of garbage produced per person per day, suggesting that it is possible to take measures, such as careful purchasing and removing packaging before sailing, which will significantly reduce the volume of garbage that has to be dealt with on board.

Nearly three-quarters of respondents said they stored their garbage in plastic bags and well over half store their garbage on the deck of the boat. So, even if people are careful to collect all of their garbage with the intention of bringing it ashore there is a real risk of bags breaking or being washed overboard.

One alarming result from the survey was that



*A 2009 MNZ survey of fishing operators revealed that plastic is the leading type of marine debris produced on board. More than 70% of respondents also reported finding plastic debris while they were out at sea.*

more than 70% of respondents reported finding plastic debris while they were out at sea. This material presents not only a significant and long-term environmental hazard, but is also a safety risk when boat engines and fishing equipment are damaged.

Of the barriers to returning waste to shore the most commonly cited was inadequacy of shore-side reception facilities. Other reasons included space on the boat and time. Encouragingly, however, many operators stated that there weren't actually significant barriers to bringing waste ashore. Still, despite most operators stating that they believed they knew the garbage laws the answers received in this survey indicate substantial misunderstandings and lack of knowledge about the rules.

Maritime New Zealand is continuing this project through close collaboration with industry to improve education and provide practical guidance on ways to manage garbage on board and so minimise vessel contributions to marine debris. Other barriers to good practice, such as the need

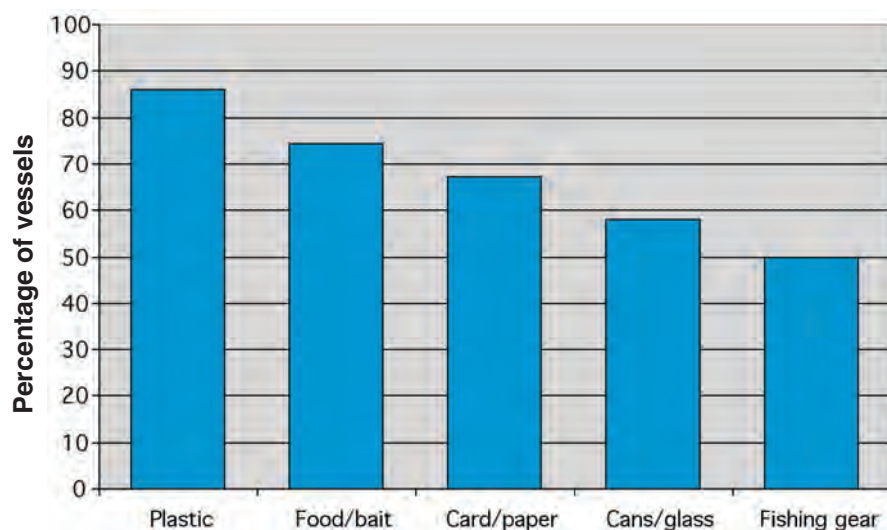


Figure 1: Garbage produced on fishing vessels.



for adequate shore-side reception facilities, will be discussed with regional councils and port authorities.

The results from this project are also being used to contribute to a review of the International Convention for the Prevention of Pollution from Ships by Garbage (MARPOL Annex V) and will soon be extended in New Zealand to the recreational boating sector.

If you have any questions about garbage management on vessels please call Alison Lane, Maritime New Zealand, on 04 473 0111.

*Alison Lane, Maritime New Zealand*



## NZCS Management Committee

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For any enquiries regarding Coastal News articles, please contact  
**NZCS Editor** Shelly Biswell (shelly@biswell.net).

## NZCS Regional Coordinators

Every region in the country 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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# Summer Red: Project Crimson Helps Restore Coastal Pohutukawa at Kawhia

## Coastal News



Near the small town of Kawhia on the highest point between the Kawhia and Aotea Harbours, Project Crimson Trustee Gordon Hosking and science advisor David Bergin are conducting research on a stand of pohutukawa that is thought to be one of the last remnants of pohutukawa forest that once covered the area.

The inland sand dune, which lies about 1000 metres from sea, was stabilised nine years ago with marram grass as part of a forest establishment operation, but the area remained unplanted. The site was identified by Project Crimson as culturally and ecologically significant four years ago and was grazed by cattle until 2007 when it was fenced and stock excluded from the area.

The stand of pohutukawa is known as the Pukeatua stand and is made up of approximately 25 trees.

“The stand, one of three remaining, is the largest and only protected remnant of pohutukawa forest in the area and we’re excited about the opportunity to protect existing trees and re-establish the species in the area,” says Gordon.

“Although the site is very exposed and there has been some tree death, the remaining trees are still mostly healthy and their foliage is undamaged by possums or insects.”

Gordon began his association with the area in 2003 working with DOC and the local community to identify how Project Crimson might support projects around the Kawhia Harbour and return the area to its former natural glory. The Pukeatua

stand was subsequently identified as having considerable cultural and ecological significance, with a 1935 publication referring to an extensive stand of pohutukawa clothing these dunes in the past. The project team will reassess the stand every year for the next five years to record their health and associated pohutukawa regeneration.

In November 2009, Gordon, David and David’s son Michael documented the current stand and associated site, including measuring all stems, establishing a Permanent Sample Plot (PSP) within the stand and establishing and assessing vegetation monitoring transects.

“Not only do we want to secure and restore the health of the residual stand and monitor natural regeneration, but we want to understand and hopefully enhance the process,” says Gordon.

Trials are proposed to evaluate the use of companion species, those naturally found associated with coastal pohutukawa forest, in the establishment of pohutukawa on such an exposed and difficult site.

Project Crimson will provide up to 1000 pohutukawa seedlings each year for the next five years from seed collected from all three residual stands to be planted around the Pukeatua stand. Companion plants will be supplied by the Te Hinengaro O Kawhia Trust Nursery, which will have first call on funding received from Environment Waikato’s Environmental Initiatives Fund.

“Since the 2007 fencing and exclusion of stock,



*David and Michael Bergin assessing vegetation plots – pohutukawa stand in background (Photo courtesy Project Crimson).*

the regeneration of pohutukawa, and herbaceous plants generally has been remarkable," says Hosking.

"We are especially grateful to the landowners, David and Nan Morrison, for their enthusiastic support of the initiative."

"Project Crimson is proud to be involved with the Kawhia community, assisting with the re-establishment of pohutukawa through projects designed to bring back summer red to the area."

Kawhia has become a key area for Project Crimson

support, largely due to the enthusiastic collaboration of the local community, Department of Conservation, Environment Waikato, local landowners and the Te Hinengaro O Kawhia Trust Nursery.

The wider Kawhia initiative involves several landowners in the area, including Les and Evelyn Shaw who have fenced the harbour edge and other areas of their property and planted hundreds of pohutukawa provided by Project Crimson, bringing back the iconic red flowers to the area.

*Hannah White, Project Crimson*



*Pohutukawa seedlings at Te Hinengaro O Kawhia Trust Nursery.*



*Les and Evelyn Shaw have fenced the harbour edge and other areas of their property and planted hundreds of pohutukawa (photos courtesy Project Crimson).*

# News from the Regions

## Waikato Regional News

Amy Robinson, Waikato Regional Coordinator

### Tsunami Threat

Low lying areas of Coromandel Peninsula coast were evacuated following the earthquake in Samoa that occurred on 30 September 2009. The resultant tsunami was measured at Whitianga with a peak wave height of 0.27 metres and a peak period of 21 minutes, which corresponds to one of the resonant periods for Buffalo Bay. The Whitianga signal was picked up approximately 5.5 hours following the earthquake.

Many of the eastern Coromandel communities evacuated, highlighting concerns regarding inaccurate reporting whereby communities are listening and reacting to early media reports rather than waiting for accurate information to come through Civil Defence with respect to the level of threat. This raises further concern that people may become complacent over time with future tsunami events. There were no reports of damage.

### 'Governing the Gulf' Presentation

NZCS, in conjunction with the Hauraki Gulf Forum, Resource Management Law Association, and New Zealand Planning Institute, hosted a talk by Raewyn Peart in Thames in October 2009 on the recently published *Governing the Gulf* guide. The guide outlines how to give effect to the Hauraki Gulf Marine Park Act (HGMPA) through RMA policies and plans. The guide was prepared to help inform the preparation of a second generation of regional and district policy statements and plans required under the Resource Management Act. Raewyn authored the guide, which covers such topics as:

- current impacts on the Gulf;
- the legislative framework of the HGMPA;
- how the HGMPA has been applied by the Court;
- how the HGMPA differs from the RMA;
- how the tangata whenua provisions of the Act can be given effect; and
- how the HGMPA can be implemented in RMA policy statements and plans.

*Governing the Gulf – Giving Effect to the Hauraki Gulf Marine Park Act through Policies and Plans* can be viewed at [www.arc.govt.nz/environment/coastal-and-marine/hauraki-gulf-forum/hauraki-gulf-marine-park-act-2000.cfm](http://www.arc.govt.nz/environment/coastal-and-marine/hauraki-gulf-forum/hauraki-gulf-marine-park-act-2000.cfm).

## Bay of Plenty Regional News

Reuben Fraser, Bay of Plenty Regional Coordinator

### Mechanical Mangrove Removal a First in Tauranga Harbour

Several years of anticipation and hard work came to fruition in mid-January with the first mechanical

mangrove clearance in Tauranga Harbour.

Matua Estuary was the first site for the landmark clearance and 1.4 ha of mature mangroves were cleared in the space of three tide cycles.

The work is being carried out by Waitohi Contractors using a 12-tonne excavator on a modified track frame, with a ground pressure of 2.4 psi and a boom-mounted mulching head. The machine produces fine mulch material and removes stumps and aerial roots alike.

Environment Bay of Plenty monitoring indicates that the mechanical mangrove removal and the mulch itself are not having any negative impact on aquatic life in the harbour.

Photo point and bird monitoring immediately after the clearance shows a high level of bird activity, both wading birds and rail, in the mulched areas and a rapid re-colonisation by whelks, titiko and crabs.

The mulch material has remained in the same place even after two weeks as it becomes mixed with sediment from when the machine passes over the estuary surface. There has been a small amount of movement in which the larger, woody portion of mulch has been pushed landward towards the remaining mangroves from wave action. Although the strong south-easterly winds during Auckland Anniversary weekend did not cause much movement of mulch in the Omokoroa site which has a south-easterly aspect.

The estuary care groups, who have till now cleared the mangroves by hand, are over the moon at the progress and reckon it's "a year's work done in a day".



Omokoroa mangrove removal. Photo courtesy Environment Bay of Plenty.

### Other Bay of Plenty News

- Environment Bay of Plenty is undergoing an update of the maps associated with the Regional Coastal Environment Plan (planning process), due to be notified towards the middle of the year. The maps will identify areas that are significant in terms of ecology, landscape and heritage. This is the first time that heritage areas will be specifically identified.

## Coastal News



- The hearing for the Port of Tauranga dredging (14 million cubic metres) consent application is scheduled for the second week of March.
- The adverse impact on dunes at Matata from the Rotorua surf-casting fishing tournament has been decreasing each year as participants act more responsibly.
- Coastcare works in 2009 saw nearly 80,000 dune plants planted.
- Western Bay of Plenty District Council and Whakatane District Council are applying for funding for a cycleway along the Bay of Plenty coast.
- Recent monitoring has shown that decomposing sea lettuce produces higher than expected levels of hydrogen sulphide, with potential health impacts.
- Eastern Sea Farms (marine farm off the Opotiki coast) are due to put in trial lines and are also considering applying for consent for a range of other species.
- Consultation is being carried out by the operations section of Environment Bay of Plenty regarding potential diversion of the Kaituna River back into the Maketu Estuary.

## Hawke's Bay Regional News

Neil Daykin, Hawke's Bay Regional Coordinator

### Swell Events

This spring and summer has been relatively quiet with only two significant swell events, one in October and one in January. Maximum wave heights were 6.15 m and 4.37 m respectively.

Total wave energy takes into account the three main wave components (wave height, period and wavelength) – the higher the wave energy, the greater the potential is for higher run-up, erosion, inundation and/or property damage. Because of this, comparisons of swell event wave energy values are extremely useful for evaluating and possibly identifying trigger (public warning) levels for erosion, inundation and/or property/coastal damage.

Initial analysis of the wave energy graphs and values in conjunction with the wave data, damage reports and other data, indicate trigger levels of 1500 kJ for the significant wave energy and 400 kJ for maximum wave energy, over which there is a likelihood of coastal damage. These trigger

levels correspond approximately with three metre significant wave heights and five metre max wave heights. Comparison of the significant and max wave energies highlights the variability of each event in respect of wave heights, periods and wavelengths. For example, the November 2005 event has the highest maximum wave energy of all the events whereas it has the third highest significant wave energy. Max wave energy is shown to be approximately 2.5 times that of significant wave energy. With any use of trigger warning levels, other timing factors such as tide state, tide cycle (spring vs. neap) or storm surge need to be considered as part of an informed decision.

Caution must be exercised when evaluating and comparing wave energy against reported swell event damage as it is difficult to assess the impact of antecedent conditions (previous wave conditions) on any structure or beach etc. In addition, not all damage is reported or recorded during or after an event. The coastal processes involved are very complex and trigger levels are just guides.

### Clifton Motor Camp

Following on from the last issue of the *Coastal News*, November 2009 saw the removal of the ad hoc sea defences from the shoreline at Clifton. Since then, Hawke's Bay Regional Council have established five cross sections for monthly surveying to monitor coastal response.

Table 1 summarises and simplifies the survey data results from the last three months. The time remaining column is based on a simple and rough extrapolation of beach profile, how much loss has occurred in the last two to three months and related wave conditions over that period. Timings should be used with caution and not as definitive timelines as they will depend on unknown future wave conditions and beach response. The current speed of the beach retreat and flattening of the profile should slow as the beach nears its natural beach slope/profile. Beach movement will likely continue on the current trend of erosion, but at a much slower pace than we are seeing now (long-term erosion rate of 0.75 m/yr for Clifton, Tonkin & Taylor 2004).

### Wairoa District

Wairoa District Council is just starting a feasibility

XS	Approx. horizontal loss of beach after 2.5 months (m)	Approx. distance remaining between new access road and beach crest (m)	Projected time remaining before beach crest reaches new access road (months)
1	2.5	16	18 (end May 2011)
2	3.5	15	10 (end Nov 2010)
3	5.0	11	5 (end June 2010)
4	5.5	8.5	3 (end April 2010)
5	4.5	7.5	4 (end May 2010)

Table 1: Summary of Clifton Cross Section Surveys.





study looking into how to deal with coastal erosion that is impacting and threatening the Nuhaka-Opoutama Road near Mahia. Options include re-routing the road inland as well as structural coastal protection measures.

In 2007, Wairoa District Council submitted a resource consent application to construct a seawall on the Mahia East Coast Road to repair a road drop out. The design of the seawall was assessed to potentially cause more than minor effects so the consent was put on hold whilst further investigations were carried out. The drop out has continued to grow, such that before Christmas (December 2009), it was deemed that the public's safety was at risk so the proposed seawall was constructed under the emergency provisions of the RMA. Construction finished recently and Wairoa District Council now has to apply for retrospective resource consent.

The Hawke's Bay Regional Council and Wairoa District Council's joint hearing of resource consent applications have announced their decision for a subdivision and development at the northern end of Mahanga Beach near Mahia, with consents being granted subject to certain conditions. The consents included a coastal protection structure, dwellings, stream realignment, wastewater systems, and associated earthworks, all of which are in close proximity to the sea.

### Taranaki Regional News

*Kate Giles, Taranaki Regional Coordinator*

#### Coastal Plan

Work is continuing on the ten-year review of the Taranaki Regional Coastal Plan. Stakeholders have all been visited as part of consultation, and council staff are now going through the plan, rule by rule to discuss what works and what needs to be changed and added (some of this will be dependent on the as yet unreleased NZCPS).

#### Coastal Erosion

It's been pretty quiet around Taranaki with regard to coastal erosion, with no major storms over the past four months. An area in front of the New Plymouth Boardriders clubrooms (between two rock seawalls) has been slowly falling into the sea and the New Plymouth District Council (NPDC) have been attempting to keep the dunes in place by mounding up the area in front with logs and additional sand, and constructing fencing to keep children from jumping down the bank.

#### Dune Restoration Workshop

NPDC recently hosted a free one-day dune restoration workshop. The workshop was attended by approximately 30 people, who listened to various speakers followed by a field trip to view examples of dune restoration undertaken by NPDC.

#### Coastal Bathing Water Quality

The coastal bathing water surveys are in full swing with results available on the Taranaki Regional

Council website ([www.trc.govt.nz](http://www.trc.govt.nz)). Click on the Coastal Water Quality tab on the map.

### Penguin Deaths

During January, over 100 little blue penguins were found dead on beaches around Taranaki. There were various theories about why the deaths may have occurred, with the main two possibilities being a toxic algal bloom (red algal blooms had been noted around the coast at the same time) and starvation. DOC undertook water sampling to see if the algal blooms may have been the cause, while dead penguins were sent away for examination. Results so far suggest starvation was the likely cause.



*Northern little blue penguin swimming, Aorangi, Poor Knights Islands, March 1985. Photo by Rod Morris, Photographer Crown Copyright, Department of Conservation, 2010.*

### Wellington Regional News

*Iain Dawe, Wellington Regional Coordinator*

#### Tsunami Evacuation Maps

Work on developing multi-zone tsunami evacuation maps for the region is nearly completed. Recent events have hastened the need for local Civil Defence Emergency Management (CDEM) offices to develop tsunami evacuation plans.

The project began with some first order modelling conducted by a team at GNS Science, Lower Hutt. The modelling was performed in ArcGIS with an empirically derived attenuation function. LiDAR data was used where available, which improved the accuracy of the results enormously.

The attenuation function reduced run-up by 1.0 m every 200 m inland. Different rules were created around river mouths, where the water aids run-up, and the rule was doubled to 1.0 m loss for every 400 m.

The maps have three zones, red, orange, and yellow, that indicate different levels of threat. The red zone is a shore exclusion area, to be evacuated if there is an event like the Samoan tsunami. This area can be evacuated through a combination of public warnings and longer-term education (i.e. self evacuation). The orange zone represents a 500-year event and will be the official CDEM evacuation zone for large distant source events when there is enough lead-in time for evacuation. The yellow zone represents the worst-case



scenario event and will be a self-evacuation zone. Generally this will be a local source tsunami with very little or no warning time, caused for example by a large local earthquake. Residents will need to take responsibility to move to higher ground, because CDEM will not be able to effect an evacuation in time.

### **Maranui Surf Club**

After much consultation, the heritage listed Maranui surf club building and café on the Lyall Bay foreshore is to be rebuilt. A fire gutted the iconic Wellington building in August last year throwing its future into doubt as the cost of repairs were estimated at \$750,000. Some people questioned whether it was wise to rebuild on the beach, in light of sea level rise. However, there was considerable pressure from the local community to allow the building to be restored and for it to remain on the beach. Under the deal, the ownership of the building will be transferred from the council to the surf club and the council will also contribute \$350,000 toward its restoration. Now it remains to be seen whether the sea will let it stay there.

### **South Wairarapa District Council**

South Wairarapa District Council has applied for a large global consent to conduct seawall construction along the South Wairarapa coastline. The area is exposed to large southerly swells and experiences erosion from time to time. Some areas are in net long-term retreat and in places the road is perilously close to the beach. Naturally, these places are under the greatest threat, and the council wants to be able to act in these situations quickly without having to apply for a consent every time to get work done. Greater Wellington looked closely at the proposal and required the consent to be more targeted as there are a number of high-value ecological sites along this stretch of coast. The work is ongoing and currently the proposal is being modified.

### **Kapiti Coast District Council**

Kapiti Coast District Council is embarking on a major upgrade of its coastal defences. Work is nearly finished on the section at Raumati South that has seen a re-building and extension of the revetment and improved public access. Planning is now beginning for the long 1.5 km stretch of seawalls along the Paekakariki shoreline. The work will be phased over seven years.

Greater Wellington has been developing a series of dune restoration plans for a number of beaches around the region, including on the Kapiti Coast, Porirua and Wellington City. Reports have been produced by Coastline Consultants in conjunction with input from Greater Wellington staff. Many parts of the coast have been degraded by human activities over the past 50 years and Greater Wellington has been targeting areas with the potential for restoration. Some of the areas have high ecological values whilst others are heavily modified urban beaches, such as Lyall Bay, that

can act as a showcase for soft engineering.

A beach that will benefit from these plans is Titahi Bay. Porirua City Council have recently released Titahi Bay Beach Natural Systems Action Plan. It aims to address many issues that urban beaches typically face, such as how to manage stormwater outfalls, cars on the foreshore, dune degradation and erosion. Previous recommendations were to extend a seawall to manage erosion, but the restoration plan provides direction on replanting and growing the sand dunes as a low impact alternative. The local community broadly supports this approach as Titahi Bay is an extremely popular recreational beach with high amenity value.

### **Canterbury Regional News**

*Justin Cope, Canterbury Regional Coordinator*

#### **Sediment Mapping and Bathymetry of Upper Akaroa Harbour Project**

A study which mapped the soft sediment seabed of the upper Akaroa Harbour on Banks Peninsula has been completed for Environment Canterbury by the Integrated Coastal Research Centre of the University of Canterbury and DTec Consulting.

The study was commissioned in order to establish a baseline against which future changes in sediment and bathymetric patterns could be assessed in future years. The bathymetry part of the study extended into the intertidal areas of the upper harbour not covered by a recent (2008) LINZ hydrographic survey while the second objective was to characterise the spatial distribution of soft-sediment textures within the upper Akaroa Harbour.

The report has produced detailed bathymetric maps of the bays in the upper harbour as well as sediment distribution and textural maps of the entire upper Akaroa Harbour. The report is available from Environment Canterbury.

#### **GIS Mapping of the Avon-Heathcote Estuary Ihutai**

A centralised suppository of all scientific and general interest information with a spatial component relating to Christchurch's Avon Heathcote Estuary Ihutai is now able to be accessed through the Avon Heathcote Estuary Trust website ([www.estuary.org.nz](http://www.estuary.org.nz)). This excellent resource provides maps and data on all aspects of wildlife and ecosystems through to sediments, water quality data, and locations of structures within the estuary margins.

### **Contributing to Coastal News**

*Coastal News* welcomes contributions for each issue. Please contact Shelly Biswell at [shelly@biswell.net](mailto:shelly@biswell.net) if you'd like to submit a news brief or article.

The submission deadline for the next issue of *Coastal News* is 1 May 2010.

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# On Campus

## Developing Bioindicators for New Zealand Estuaries

In October 2009, the *New Zealand Journal of Marine and Freshwater Research* (NZJMFR) published 'Nitrogen yields from New Zealand coastal catchments to receiving estuaries' by Keira Heggie and Candida Savage of the University of Otago. The paper is just one of several to come out of a three-year project Candida and her two students – Keira Heggie and Matthew Hammond – undertook on the development of bioindicators for the assimilation of terrestrial nutrient inputs in coastal ecosystems as a tool for watershed management. The project was funded through the Ministry of Fisheries Biodiversity Research Programme.

The project investigated the development of bioindicators to assist land managers in detecting and quantifying changes in anthropogenic nitrogen inputs into coastal and estuarine ecosystems.

"Many fish depend on estuaries and other coastal ecosystems for part of their life cycle," says Ministry of Fisheries principal scientist Mary Livingston. "Activities like farming, forestry and land development can significantly impact these environments by increasing the delivery of nutrients to nuisance levels resulting in eutrophication or changes to biodiversity. Bioindicators have an important role to play in identifying nutrient sources."

The researchers compared six study sites with different levels of development in the catchments ranging from pristine through to urban. Overall, the results showed a strong relationship between the per cent agricultural land in surrounding

catchments and total nitrogen loading to nearshore environments.

Candida says the project had three objectives: "We wanted to look at the effects which different types of land use had on estuaries in terms of nutrient loading. We then worked to develop a series of bioindicators or biomarkers to detect and quantify changes in anthropogenic nitrogen inputs to coastal ecosystems. Finally, we validated the use of bioindicators using controlled laboratory and field experiments."

For this project, Candida and her students looked at a variety of different land uses, from farming to urbanised to pristine. Most of the past research in this area has focused on urbanised environments, which tend to have distinct point sources of nutrients (for example, sewage) entering an estuary. What the researchers found is that, unlike urbanised areas, nutrient sources from farmlands are much harder to isolate and require sampling across estuarine gradients.

Candida says working to identify bioindicators in estuaries had its own set of challenges, "We needed to identify species that represent different trophic levels, as well as occur throughout the estuarine gradient – from brackish to fully marine areas. Estuaries are also highly dynamic ecosystems, and therefore require sampling over multiple scales."

The researchers found that the fast-growing sea lettuce (*Ulva spp.*) was a good bioindicator of dissolved nutrient sources in an estuary during the spring and summer, but for a number of reasons was not as reliable an indicator in the autumn and winter. For primary consumers they identified two bivalves: New Zealand littleneck

## Coastal News



Marine science students from the University of Otago taking water column samples for nutrients in Tokomairiro Estuary, an ecosystem with an agricultural and forest-influenced catchment. Courtesy Candida Savage.

clams (*Austrovenus stutchburyi*) and Mediterranean mussels (*Mytilus galloprovincialis*) as suitable indicators of particulate nitrogen sources. The researchers also looked at two fish species: spotty (*Notolabrus celidotus*) and estuarine triplefin (*Grahamina nigripenne*).

As Candida explains, for part of the year, the sea lettuce provided a very good indicator of nutrient levels measured in the water column and modelled using the nitrogen model presented in the October 2009 issue of *NZJMFR*. The bivalves provided valuable complementary information about the origin of the particulate nitrogen sources in the water over longer time intervals than the sea lettuce. The fish provided critical information on the ecological effects of nutrient enrichment on higher trophic levels.

Typical to research findings around the world, Candida and her students found that fish in nutrient-rich estuaries sometimes grow faster than their counterparts in more pristine estuaries. However, Candida and Matt showed that fish in nutrient-enriched systems also tended to have less diverse diets, which indicates a lower diversity of prey items in estuaries with excess nutrient inputs.

The researchers' findings suggest that to accurately assess nutrient loading and its impacts, complementary bioindicators need to be used and managers need to take into account a number of factors, including the season and lag responses before chemical markers reflect the different nutrient sources.

Candida says that while the findings from the project were similar to what she and her students had hypothesised, she had expected to see much clearer distinctions between sources of nitrogen. Nutrient concentrations could also vary dramatically over short timescales. In terms of management this means that complementary

bioindicators need to be used and compared across systems and over a number of seasons to ensure accurate interpretation of the trends.

She adds, that "used as part of a suite of measurements, bioindicators can serve as an early detection tool and could be used to manage nutrient loading before it becomes a problem in an estuary".

The Ministry of Fisheries is using the information gained from this and other research projects to determine the links between land use and degradation of fish habitat in estuaries and the coastal environment. To learn more about the land-sea interface and other research projects funded by the Ministry of Fisheries, email Mary at [mary.livingston@fish.govt.nz](mailto:mary.livingston@fish.govt.nz).

To learn more about this research project, email Candida at [candida.savage@otago.ac.nz](mailto:candida.savage@otago.ac.nz).



Keira Heggie, Masters student, collecting water quality data in Tokomairiro Estuary. Courtesy Candida Savage.



Candida Savage processing samples in Paterson Inlet, Stewart Island. Stewart Island was used as a pristine system against which other estuaries were compared in terms of their food web relationships and chemical markers in organisms' tissues.



Mussels (*Mytilus galloprovincialis*) in a flume experiment at Portobello Marine Laboratory to test mussel clearance rates under different salinity and flow rate regimes. A series of experiments were used to ground-truth data collected in estuaries. Courtesy Keira Heggie.



# New Zealand Coastal Society Corporate Members

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Corporate membership enables organisations and companies to become part of the New Zealand Coastal Society and support the society's mission of taking a leading role in facilitating a vibrant, healthy and sustainable coastal and ocean environment. Organisations and companies can show their support for the aims and activities of the society and achieve public recognition of that support.

Corporate membership benefits include:

- High profile listing as a corporate member sponsor on the NZCS website ([www.coastalsociety.org.nz/Corporate.htm](http://www.coastalsociety.org.nz/Corporate.htm)).
- Website listing of services provided by corporate organisation, contact details, and links to recent projects or corporate member website.

- One free individual membership for the person nominated as the corporate contact or any subsequent replacement alternate.
- Five complimentary copies of *Coastal News* published three times per year – March, June and November.
- Discounted registration at member rates for the corporate contact to all NZCS conferences.
- Short feature on a corporate member in *Coastal News*.

For more information on corporate memberships please contact:

Kath Coombes  
Membership Coordinator  
Coastal Society Committee  
[kath.coombes@arc.govt.nz](mailto:kath.coombes@arc.govt.nz)

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



Port and marine projects are located in a sensitive environment that can change overnight as a result of a storm. Coupled with the challenge of these natural processes, economic drivers, environmental impacts, and consenting and permitting processes are typically key project elements.

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Some examples of projects that the Ports and Coastal team have been involved in include:

- Hobsonville Landing redevelopment
- Coastal strategies for New Plymouth, Whangarei, Hastings
- Auckland Sea+City project
- Coastal structures assessment and consenting.

Contact: [portsandcoastal@beca.com](mailto:portsandcoastal@beca.com)

