NIWA
Taihoro Nukurangi

Aquatic Biodiversity & Biosecurity

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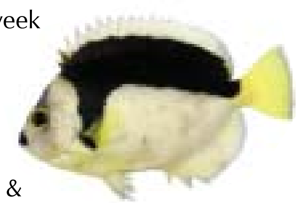
National Centre for Aquatic Biodiversity & Biosecurity

NORFANZ marine biodiversity survey uncovers mysteries of the deep

Blue skates



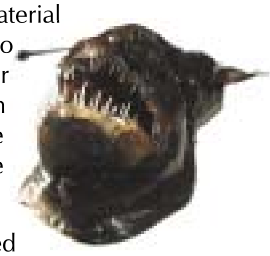
Ballina-angel fish

Scientists are excited by the huge number and variety of fish and invertebrate species sampled on a recent 4-week survey of the Norfolk Ridge and Lord Howe Rise.

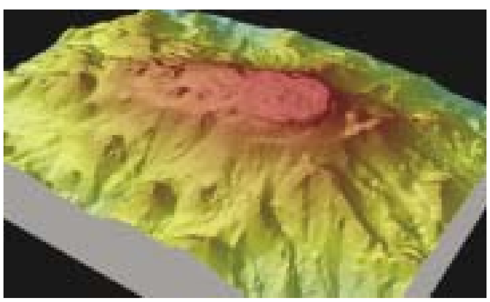
The survey, termed NORFANZ, was a collaborative effort between New Zealand and Australia, largely funded by New Zealand's Ministry of Fisheries and Australia's National Oceans Office. NIWA and Commonwealth Scientific & Industrial Research Organisation (CSIRO) supported the survey and, together with Te Papa and several Australian museums, provided extensive scientific input. NIWA's research vessel *Tangaroa* was chartered for the survey, carrying 27 scientists from Australia, New Zealand, France, New Caledonia, and the USA.

Batfish

The survey was designed to investigate the biodiversity of the mid Tasman Sea region, which is poorly known within and beyond the Exclusive Economic Zones (EEZ) of Australia, New Zealand, and New Caledonia. The region had not been scientifically surveyed before, so this voyage was researching new areas. Other 'firsts' included the range of different gear types that were used to catch a large variety of animals of all shapes and sizes; the use of *Tangaroa*'s acoustic multibeam system to map the seamount sites and find areas where it was safe to sample; the bringing together of so many international taxonomic experts to identify material on-board; and the development and use of real-time photographic databases to confirm species identification. The capabilities of *Tangaroa* and her crew, together with a high level of enthusiasm and cooperation within the scientific team, ensured the survey was a great success.



Hump-back angler fish



This 3-D image of Seamount 7 from *Tangaroa*'s multibeam system shows the rugged nature of the seafloor at some of the survey sites.

During the voyage we surveyed 168 stations at 14 seamount and slope sites at depths of between 100 and 2000 m. More than 500 species of fish, and well in excess of 1000 species of invertebrates were catalogued on-board, and these numbers will undoubtedly increase as material is examined in more detail back on land. The results from the survey will play an important part in meeting the objectives of the New Zealand Biodiversity Strategy, conservation assessment, and regional marine planning under Australia's Oceans Policy in the Australian EEZ, and will contribute to the management of the parts of the survey area within New Zealand's EEZ. It will take many months (if not years) to examine, identify, and write-up the findings of the survey, but we will keep you posted in future articles in *Aquatic Biodiversity & Biosecurity*.

Malcolm Clark
Clive Roberts

Explore lost worlds of the deep
NORFANZ VOYAGE
10 MAY TO 8 JUNE 2003

Photos taken on NORFANZ voyage.
For more information, see
www.oceans.gov.au/norfanz

Mapping seafloor ecology and biodiversity

NIWA's National Centre for Aquatic Biodiversity & Biosecurity is investigating how we can speed up mapping the distribution of life on the seafloor to better meet the needs of those managing our marine environment.

The distribution of habitats across the seafloor plays an important role in the functioning and diversity of marine assemblages. Resource managers, conservation biologists, and biodiversity scientists are all concerned about how fragmented or connected habitats are. For example, assessments of habitat structure can help to determine any large-scale effects on biodiversity.

Traditional quantitative sampling, which uses grabs, cores, and even video, is not cost-effective over large subtidal areas of the seafloor. However, there are now devices capable of quickly sampling such areas. These devices, which often use sound, were initially used to map sedimentary features, but they are now increasingly being used to map biological habitats on the seafloor.

Acoustic devices send out a signal and measure its energy when it is reflected back, but the slope, roughness, and absorption characteristics of the seafloor all affect this value. Seaweeds and bottom-dwelling animals will also have an effect, but how much? And how do we interpret any differences in these measurements?

There are two possible ways to map seafloor assemblages by using remote acoustic devices.

- Habitats are mapped from the acoustic data and verified by biological sampling. Although this may work for some large animals and seaweeds, the acoustical habitats may not reflect the finer-scale distributions of bottom-dwelling animals.
- Another approach is to find out what parts of the acoustic data can help to predict seafloor communities, and create a map by combining those data with values from the restricted grab, core, or video samples.

A patch of sponges in Kawau Bay.

To investigate these different approaches we used a towed video camera, a single-beam sonar with the QTC VIEW™ data-acquisition system, and side-scan sonar to collect data at five sites in Kawau Bay, a large embayment on the northeast coast of the North Island. The embayment consists mainly of diverse soft-sediment habitats between 10 and 20 m deep. There are dense but patchy areas of horse mussels, sponges, tubeworms, coralline algae, and sea snails, as well as some hydroids, sea-stars, bryozoans, ascidians, and crabs.

Our video data included counts of the plants and animals on the seafloor and an assessment of sediment characteristics. We found five distinct communities based on analysis of these counts.

Sediment microtopography caused by polychaete worms.

Forty-five percent of the samples were classified into the correct single-beam defined habitats by using mud and coarse sand content. However, we were still 70% wrong in our classification of samples from one of the habitats, despite including sediment and biological information from the video. We used horse mussel, mud, and coralline algae content to classify 63% of the samples into the correct side-scan habitats.

Not all of the habitats defined by side-scan or single-beam methods had distinct assemblages, and those in each habitat were not very consistent. Descriptions of the assemblages were based on a few faunal types and did not vary much between habitats. Even densities of large species (e.g., horse mussels) did not vary greatly between acoustically defined habitats. So, although the side-scan and single-beam habitats were related to features seen on the video, they did not do a good job of describing the ecological communities.

What more needs to be done before these mapping techniques can be used on a routine basis?

- We need to study what aspects of acoustic and environmental data are useful to predict levels of biodiversity in different locations.
- Extend the work to infaunal (burrowing) assemblages.
- Determine the best way to produce broad-scale maps from highly detailed data.
- Use different techniques to develop guidelines for the amount of area that needs to be sampled.
- Update designs as new techniques become available.

This work was funded by the Foundation for Research, Science & Technology.

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Filming yacht hulls from around the world – the Biosecurity HullCam

The past 50 years have seen major advances in the development of toxic antifouling paints to prevent the growth of marine species on ship and boat hulls. Despite these efforts, hull fouling continues to be one of the main ways in which exotic marine species are introduced into New Zealand and other countries.

Between 400 and 500 ocean-going yachts visit New Zealand each year – and even more during the America's Cup. These yachts can pose a biosecurity risk if they carry problem species on their hulls, especially because they travel more slowly than merchant vessels, and spend more time in destination ports. However, in contrast to merchant vessels, these yachts have not received much attention.

Working with the HullCam in an Auckland marina.

NIWA, through the National Centre for Aquatic Biodiversity & Biosecurity, is currently researching the development of better predictive tools to identify and manage the marine biosecurity risks posed by ocean-going yachts visiting New Zealand.

NIWA and the Ministry of Agriculture and Forestry have been working together to collect information on the recent travel and maintenance history of yachts entering New Zealand from overseas, and the amount and diversity of fouling organisms found on them. We can estimate the fouling on boat hulls by using 'HullCam', a specially designed piece of sampling equipment with a remote underwater video lens attached to a frame. The frame has wheels mounted to it that allow it to roll along or across a yacht hull while being steered from the surface by a telescopic arm. The remote lens, aided by twin underwater lights, transmits a moving image to a digital video camera at the surface. Still images can then be captured off the footage to determine the composition and abundance of fouling assemblages.

So far we have used the HullCam to sample fouling assemblages on nearly 100 yachts. Scuba divers and the HullCam were used to sample some of the boats, and both methods recorded similar estimates of fouling cover and composition. However, the HullCam is more efficient; two people, or even one, can use the HullCam to sample hulls (at least three staff are required for diving), and it takes half the time of divers to sample a single yacht. Divers can also make only a limited number of repetitive ascents in a single day.

Robust and predictive models require many samples for calibration. With the HullCam we can easily get information on the degree of fouling on international yacht hulls. We intend to sample another 100 international yachts during the coming boating season, and develop a predictive model from the data.

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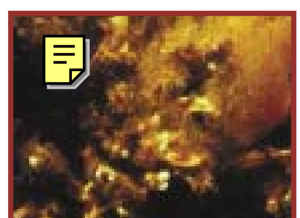
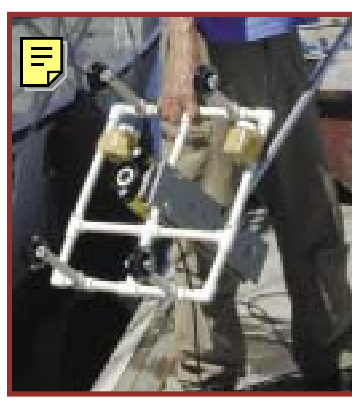


Above: a look at a boat hull through the HullCam's 'eye'.



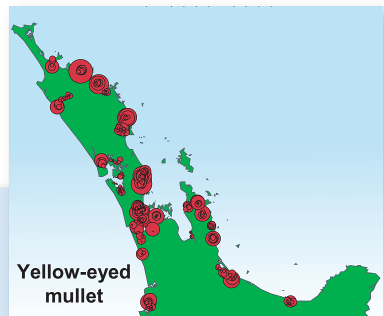
Left: the HullCam is easy to operate in the field, and has been used to sample yachts ranging from 10 to 25 m in length.

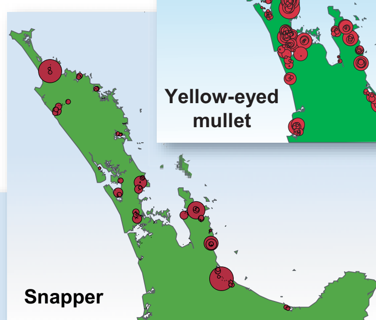
Floundering in the mud – can we predict estuarine fish diversity and numbers?

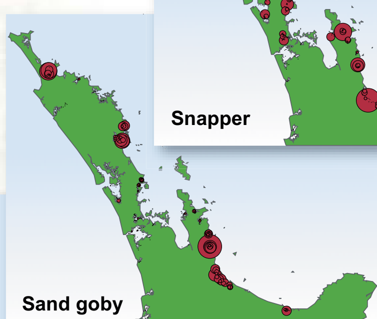
It would be great if we could preserve or enhance the diversity and numbers of fish in New Zealand's estuaries and harbours, but to do this we need to know which habitats within estuaries and harbours are important for which fish species. If we know this, then we can better judge the likely effect of human activities, such as erosion, pollution, dredging, fishing, and marina development, on fish communities.

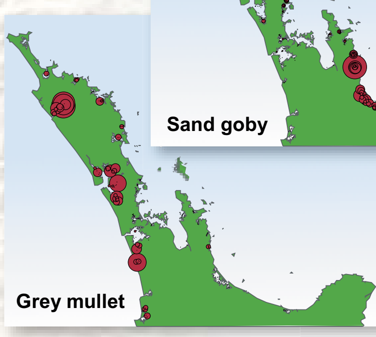
Estuaries and shallow harbours are on the back doorstep of all our large coastal cities. Despite this, we have much to learn about the marine life in them. We are unable to answer many basic questions, including: What species live there? How many are there? What ecological processes influence them? What effect do human activities have on them?

NIWA, through the National Centre for Aquatic Biodiversity & Biosecurity, set out to answer some of these questions in relation to fish as part of a Foundation for Research, Science & Technology funded research project. In February 2001 we carried out a large-scale beach-seine survey of 25 estuaries around the northern North Island to identify large- and medium-scale spatial patterns in the distribution and habitat use of fish. We used fine-mesh beach seines at low tide to sample the fish because this is when they are concentrated in the channels bordering intertidal flats. More than 71 000 small fish and 39 species were caught at 305 sites between Kawhia and Ohiwa Harbour.









Most of the fish we caught were less than 100 mm long, and were either small species or juveniles of larger species. Yellow-eyed mullet, exquisite goby, anchovy, and smelt dominated our catch. The most abundant commercial species were sand flounder, yellow-belly flounder, grey mullet, and snapper.

Yellow-eyed mullet, yellow-belly flounder, and sand flounder were common throughout the region. The two flounders were mostly found in the muddy upper reaches of estuaries, whereas yellow-eyed mullet were common everywhere. Although yellow-eyed mullet has little recreational or commercial importance, its abundance in all estuaries indicates that it is extremely important ecologically. It is undoubtedly a major food source for predatory fish and birds (e.g., shags). Anchovies and smelt were patchily distributed, the latter associated with high freshwater inflows. Some species (sand goby, parore, spotty, and snapper) were much more abundant on the east coast of the North Island than the west coast, and all were associated with seagrass beds. Grey mullet and exquisite goby were caught mainly on the west coast, the latter particularly in Kaipara Harbour.

Our next step was to determine whether the number of any of the fish species was related to the physical or chemical features of the environment. If there was a relationship, then we might be able to use those features to predict the number of fish in places not sampled. We tested a wide range of variables, including estuary or harbour type, distance from the open sea, water temperature, salinity, turbidity, habitat type, harbour characteristics (e.g., area, depth) and catchment characteristics (e.g., rainfall, freshwater runoff).

We found that the number of some fish species is closely correlated with certain variables. For example, sand goby numbers are highest in areas with clear water and seagrass beds, whereas exquisite gobies are found mainly in muddy areas in the upper reaches of the estuary. The two species are rarely found together. Yellow-belly flounders prefer the muddy, turbid, low-salinity upper reaches of estuaries, and avoid seagrass.

These results bode well for our ability to predict estuarine fish numbers. However, we can nearly always improve our predictions if we know which harbour or estuary the fish live in. This indicates that one or more other factors influencing the numbers of fish have not been included in our analyses; this might be because we do not currently have sufficient data or because we do not know enough about the biological requirements of each species to know what variables to use.

Another problem is that some fish species showed little relationship with any of the variables (e.g., yellow-eyed mullet, sand flounder, snapper), so we are unable to predict their numbers accurately. Unfortunately, these species are all important either ecologically or for fisheries. Yellow-eyed mullet are common just about everywhere in estuaries, so it is probably not necessary to be able to precisely predict their numbers, but sand flounder and snapper are much more localised. Snapper were usually found in association with seagrass beds in east coast estuaries, although some seagrass beds had no snapper.

We recently extended our fish sampling in estuaries to depths greater than 10 m by towing a beam-trawl net behind a sampling barge. This showed that juvenile snapper are common in the deep channels and central regions of many estuaries – areas that cannot be sampled by beach seines. Beach seines sample only the fringes of snapper habitat in

Beach-seine catch of snapper, kahawai, globefish, trevally, garfish, and yellow-eyed mullet.

estuaries, which may explain our inability to predict the number of snapper in our beach-seine samples. Further work is now underway to determine the importance of the shallow and deep parts of estuaries for snapper (and other species).

In early 2003 we carried out another beach-seine survey of six new estuaries in the northern North Island. When these results have been analysed we will compare them with the earlier predictions we made for those same harbours.

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Seeps – a new frontier in freshwater biodiversity?

Recent research by NIWA's National Centre for Aquatic Biodiversity & Biosecurity has highlighted the surprisingly important role that small streamside and rock-face seepages can play in harbouring aquatic biodiversity. These habitats often consist of thin films of water that barely flow over rock surfaces, sometimes with a covering of leaves and moss. Such seepages originate from concentrated groundwater outflows, and often remain wet all year round. Sampling these habitats can be a challenge because of their inaccessibility.

We sampled 21 sites over a 3-week period last summer in western Waikato. This region has a high degree of geological diversity, providing a wide range of seepage sites with different habitat structure and water chemistry. We painstakingly picked invertebrates from seeps, and scrubbed wet bits of rock to remove any algae. During this limited survey we found more than 87 species of invertebrates and 95 species of algae, mostly diatoms.

Our findings included invertebrate species not normally encountered during conventional sampling of other freshwater habitats, such as small hydrobiid snails which are currently under taxonomic review by NIWA scientist Martin Haase (*Aquatic Biodiversity & Biosecurity* 2: 3); the mayfly *Zephlebia nebulosa* which seems to be a seepage and spring specialist (photo a); a previously unrecorded group of cased chironomids (photo b); and the first North Island record of the stonefly *Spaniocerca bicornata*. The seepages also provided pupation sites for some infrequently encountered caddisfly groups (*Tiphobiosis* and *Edpercivalia*) (previous difficulty finding pupae from these groups hampered taxonomic work).

More than half the algal samples collected contained the diatom *Diatomella*, sometimes in abundance (photo c). This cosmopolitan genus is uncommon worldwide and is mainly found in partly exposed habitats such as moss clumps. Very sparse populations of *Diatomella* have been previously recorded in New Zealand, although they are reportedly common in some of the subantarctic islands. One sample we collected also contained a large population of an as-yet-unidentified centric diatom (photo d). We are currently investigating the taxonomy of these and other unusual diatoms from our samples.

Our findings show that seep habitats can harbour an unusual collection of aquatic plants and animals not normally found in other freshwater habitats. Many of the invertebrates appear to have special adaptations for surviving in thin water films on rock surfaces, including short legs, flattened bodies, and wedge-shaped pupae. Seeps are fed by localised groundwater recharge because they may be susceptible to changes in hydrology. Seeps may also be sensitive to the removal of riparian vegetation, which could increase temperatures and reduce leaf and moss cover that seems to provide habitat for many of the invertebrates (and some diatoms) found.

This study is co-funded by the Department of Conservation in association with the Foundation for Research, Science & Technology.

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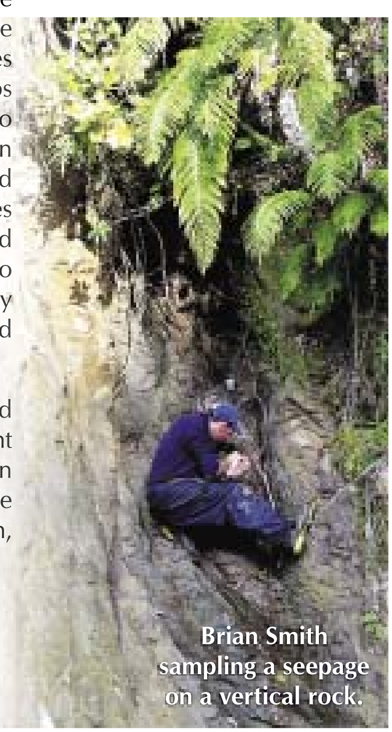


Brian Smith sampling a seepage on a vertical rock.

Stopping the freshwater wild rice invader

Manchurian wild rice or Manchurian rice grass (*Zizania latifolia*) is a giant semi-aquatic grass that has smothered riverbanks, invaded pastures, and run rampant through drainage channels in parts of the North Island from Northland to the Kapiti Coast. NIWA's National Centre for Aquatic Biodiversity & Biosecurity has been researching methods to control this species.

Manchurian wild rice was first introduced to New Zealand from Asia around the turn of the last century. It arrived in the ballast water carried by timber ships, and was discarded on the banks of the northern Wairoa River near Dargaville. Although introduced accidentally, it was later deliberately planted in the Hauraki Plains area to supposedly stabilise stopbanks. However, rather than stabilise banks, Manchurian wild rice can, in the long term, cause them to slump, encouraging erosion.

This grass causes other problems too. It invades drainage channels, which prevents access, impedes water flow, and increases the likelihood of flooding. Unless intensive grazing is maintained in pastures adjacent to drains filled with Manchurian wild rice, it will invade these areas too. This plant dramatically reduces the diversity of native vegetation by displacing small species and enveloping taller vegetation. The result: long-term monocultures of Manchurian wild rice.

There are no reports of such nuisance growths in the plant's native Asia (i.e., Taiwan, eastern China, and Southeast Asia), which could be due to the intensive landuse practices associated with its cultivation as a source of food. This giant grass is grown for its edible seed, rhizomes, young shoots, and stem bases. Galls induced by a smut fungus on the rice are also cultivated and used as a summer and autumn vegetable.

In New Zealand, Manchurian wild rice is typically found on the berm of waterways where it can tolerate both fresh and brackish water, and along the tidal reaches of rivers. It forms dense stands about 3 to 4 m high, and has a strong, deep root system and bulky rhizomes that spread several metres down into soft sediment. It is dispersed when water transports seeds and pieces of rhizome to new locations. Contaminated drainage machinery is also a major factor in its spread between catchments.

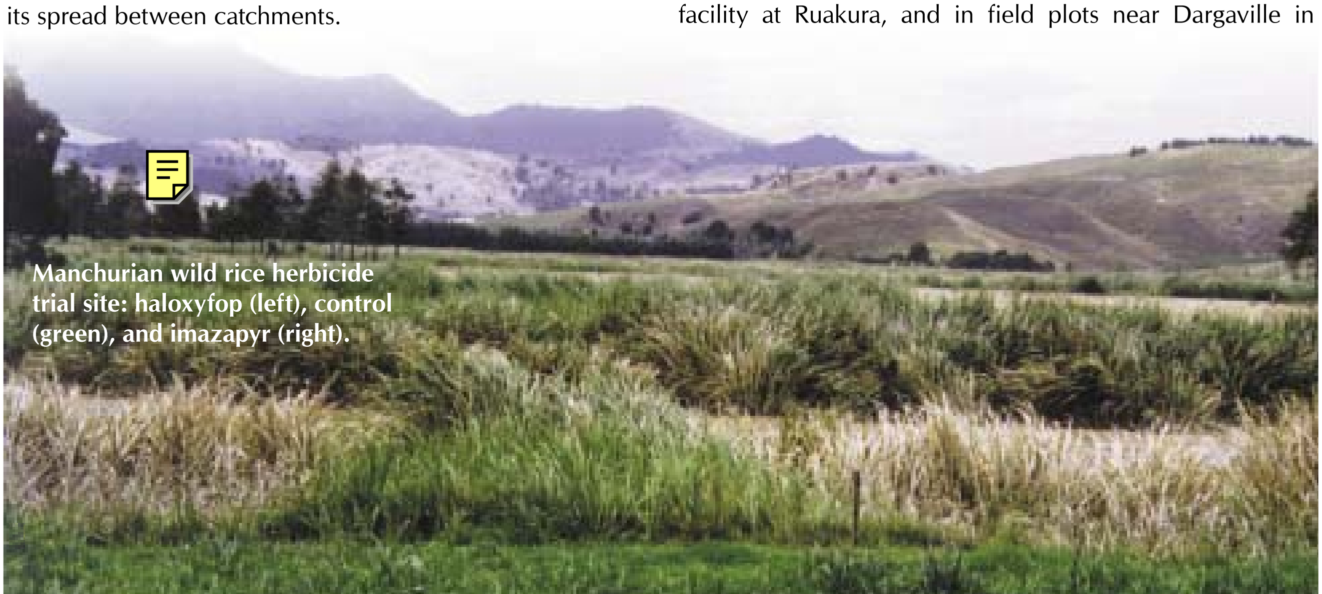
The biggest infestation of Manchurian wild rice is in the Kaipara District of Northland, especially around the site of its introduction – the northern Wairoa River and associated waterways. Smaller infestations occur in the Whangarei and Far North Districts, as well as in Rodney and Waitakere Districts (Auckland), Hauraki Plains (Waikato), and Kapiti Coast (Wellington). Manchurian wild rice could potentially infest any lowland wetland, especially the margins of still or flowing water bodies.

NIWA has been investigating a combination of physical and chemical control options to stem the plant's progress. Mechanical diggers have commonly been used to remove the plant, but there is the risk of transferring rhizome fragments to new sites. The Northland Regional Council (NRC) has identified this as the main method of dispersal, and actively promotes cleaning drainage machinery before it is used in areas not infested. Mowing, grazing, burning, and a combination of these methods have been used to control the plant where it has spread to pastures. However, because stock will graze only on new shoots, the pastures must be constantly maintained to prevent plants from becoming large and unpalatable.

Herbicide trials in New Zealand have evaluated sodium chlorate, sodium TCA, paraquat, glyphosate, and dalapon (2,2-dichloropropionic acid) in combination with amitrole. Although none of these products will eradicate this grass, some do reduce its height or cover (or both), preventing it from flowering and dispersing seed. The recent use of grass-specific herbicides also shows promise.

NIWA has used its Aquatic Weed Risk Assessment Model to assess the weediness of Manchurian wild rice, and is evaluating new tools to control and manage it for concerned managers of water bodies. We trialled three herbicides previously used with some success in New Zealand for the control of nuisance rhizomatous marginal grasses, including Manchurian wild rice, phragmites, and spartina. Haloxyfop (Gallant®) and quizalofop (Targa®) were used because they are grass-selective, and imazapyr (Arsenal®), a broad-spectrum herbicide, was trialled because of its success controlling phragmites.

We conducted the trials in containers at NIWA's experimental facility at Ruakura, and in field plots near Dargaville in



Manchurian wild rice herbicide trial site: haloxyfop (left), control (green), and imazapyr (right).

Flowering Manchurian wild rice.

collaboration with NRC. The trials were monitored for more than a year and each product was evaluated at several different rates. Haloxyfop and imazapyr significantly reduced the leaf biomass of the grass in containers. The best results for the grass in field plots were also achieved with haloxyfop – rates as low as 0.5 kg/ha were gained by using very high water rates (1600 L/ha), reducing cover to less than 10% for more than a year. This rate is equivalent to a 40% reduction in the amount of haloxyfop previously recommended by NRC to control Manchurian wild rice.

From the information resulting from these trials, and ecotoxicological studies carried out at NIWA, NRC have obtained a consent to control all Manchurian wild rice within their region. They have also set up a programme to progressively control the grass, beginning with isolated areas outside the main infestation zone.

We acknowledge the Foundation for Research, Science & Technology, Northland Regional Council (who co-funded the programme), and Peter Joynt who kindly assisted with organisation of the field trial.

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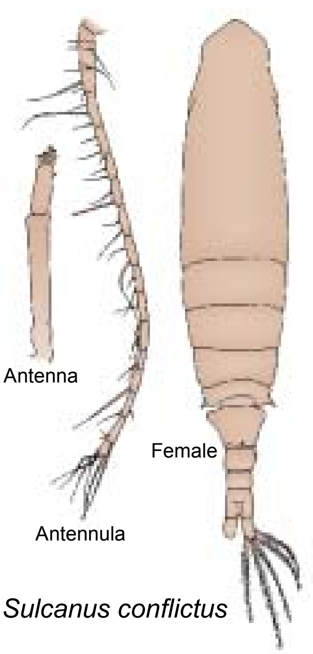
Rare bug in Auckland region raises many questions

A rare oar-footed planktonic bug, thought to be a possible alien species, seems to have settled in Auckland's Orakei Basin and the Mahurangi Harbour. The small (1.5 mm), very rare crustacean *Sulcanus conflictus* belongs to the subclass Copepoda, and was put in its own family (Sulcanidae) by Australian A.G.Nicholls in 1945. This species is very unusual because it is the only calanoid copepod that does not have an outer branch on its antenna. The only other place where this species is found is Australia (New South Wales, western Australia, and Tasmania). Therefore, it is highly likely that this family evolved more than 120 million years ago when Australia and New Zealand were part of the same landmass.

Sulcanus conflictus, which was first discovered in New Zealand by J. Vaughan, a student at the University of Auckland, was sent to NIWA for identification in the 1970s. University workers briefly mentioned it in a paper in 1986 but, because Vaughan's thesis was never published, the significance of this find was not addressed until the publication of *NIWA Biodiversity Memoir 111* in 1999.



Sulcanus conflictus

Vaughan observed that *S. conflictus* appeared in the Orakei Basin only when salinities were low. This confirms a recent discovery by an Australian worker that these copepods lay resting eggs that sink to the floor of an estuary and wait, in a dormant state, for suitable conditions for hatching.

Sulcanus conflictus has since been found in Mahurangi Harbour, raising the possibility that it may not be an alien species after all, and has perhaps been here all along. Its discovery also raises several questions about the conservation of New Zealand's biodiversity. Is *S. conflictus* found only in the Auckland region? What is the relationship between its geographic distribution and the salinity, temperature, and stability of estuarine environments? What role does it play in the functioning of estuarine ecosystems? Can we discount the possibility that it was introduced from elsewhere? And is it endangered by the infilling of estuaries?

Also, if this estuarine species is of alien origin, how did it reach two locations in New Zealand? On the other hand, if it is truly native, has it diverged genetically from its ancient Australian cousins? We encourage others researching New Zealand's northern estuaries to look out for this fascinating copepod and answer these questions.

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On the lookout for introduced marine isopods

How much do we really know about what lives on our shores? Well, not as much as we might like to think. Recently a common grey isopod crustacean was found while turning over rocks at low tide during a routine search at Island Bay in Wellington. A check through the literature suggested it might be *Cirolana australiense*, a common Australian species – but it was not. This discovery highlights two important points: how little we know about what species exist on even our most readily accessible shores, and the difficulty in identifying these and separating them from introduced alien species.

One might think there are few opportunities for an alien isopod species to find a vacant niche to exploit and become established, but at least 25 species of isopod are recognised as being introduced at various locations throughout the world. These include two of the most abundant marine isopod families – the Cirolanidae and the Sphaeromatidae.

Only one marine isopod species, *Cymodoce tuberculata*, has been identified as being introduced into New Zealand, but this has since been discounted as a misidentification. New Zealand has 'exported' the cirolanid *Eurylana arcuata* to Australia and the Pacific coast of the USA. Another New Zealand species, *Pseudosphaeroma campbellensis*, has recently been found in harbours and marinas in California and may also have been introduced to southern Australia. The North Pacific cirolanid *Cirolana harfordi* is established in most southern Australian ports, but it has not been reported in New Zealand even though conditions seem to be suitable.

The new species of *Cirolana* found at Island Bay (photo: Peter Shearer).

There are numerous criteria that can be used to identify an invader, including belonging to groups of animals not known from New Zealand but characteristic of another geographic region; having habits suitable for translocation (e.g., the ability to live on the fouled hulls of ships); and being found only in harbours or marinas. However, all these criteria rely on first being able to identify the species.

Recognising an introduced species is no simple task. It requires high-resolution taxonomy and a working knowledge of the likely evolutionary relationships of the animal. As scientific techniques and knowledge advance, so does our ability to identify species that are nearly identical in outward appearance. In recent decades, revisions of isopod species long believed to have a global distribution have resulted in 'species swarms' of between 20 and 30 species or more. One such swarm is the so-called '*Cirolana parva* group' of species, once considered to be a single, globally distributed species. This group now has 25 named species and a similar number of undescribed species, all of which are nearly identical in general appearance. The nominate species is now restricted to the Caribbean and Pacific Panama, while all the other species are restricted to island groups or extended coastal regions.

The only record of this group of species in New Zealand was of *Cirolana australiense* (Hale, 1925), which was reported from the Chatham Islands in the early 1960s. There was no suggestion at the time that this species might have been introduced, but this did seem likely. To most identifiers this animal would appear to be identical to Australian specimens. The alternative was that this distribution was natural, albeit inconsistent with the distributional patterns shown by other species in the family.

Bearing this in mind, collections were made at Island Bay and other nearby locations for a detailed taxonomic study. Examination of collections held at the Auckland Institute and Museum in Auckland and at Te Papa in Wellington revealed a second subtidal species, also very similar to *C. australiense*. Neither of these two species, both which are found in the Auckland region to at least Kaikoura in the south and east to the Chatham Islands, are *C. australiense*. The critical differences lay in the details of the spines and 'hairs' (setae) on their anterior legs, and the shape of some of their body segments. The descriptions of these two common species, which are new to science and endemic to New Zealand, have been submitted for publication.

A conservative estimate suggests that the potential number of marine isopods around New Zealand may exceed 1000. Clearly 'new' isopods can be readily discovered, but how do we know which of these may be introduced? The important message here is that without solid background knowledge of both New Zealand and world fauna based on accurate taxonomy, it is often not possible to identify indigenous 'new' species from those that may have been introduced.

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