Coastal ecosystem monitoring—the big picture

Pa Point

New Zealand waters host a rich diversity of marine life with an estimated 17,000 species living in communities from rock pools to the deep ocean. Taking a holistic approach, DOC's marine scientists are developing new methods to monitor the health (or ecological integrity) of the country's array of coastal ecosystems.

Beginning with trials in marine reserves, monitoring methods (including video recordings) are designed to identify different types of habitat and highlight any factors that may degrade the status of a location. The results combine to create a 'snapshot' of an ecosystem against which to track future changes and evaluate how well conservation measures, such as marine reserves, are working.

Tonga Island Marine Reserve, Abel Tasman National Park.

Department of Conservation
Te Papa Atawhai

Overview

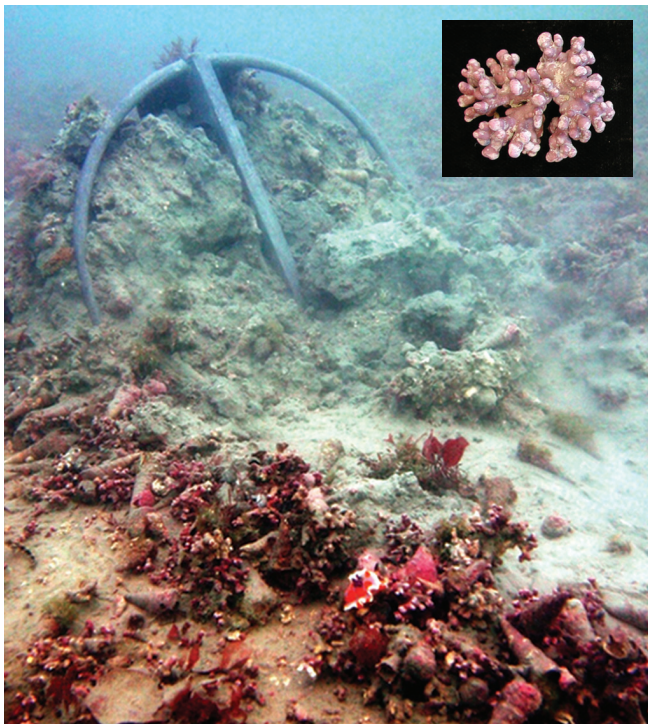
This project is developing a monitoring and reporting system for marine reserves that examines sites in a holistic, standardised way, based on a concept called ecological integrity. It investigates how native, pristine, diverse and resilient the ecosystem is and if all of its components are present and functioning.

Recording what's around our coast

New Zealand's marine ecosystems are very diverse, ranging from the subtropical Kermadec Islands to subantarctic Campbell Island/Motu Ihupuku. Half of New Zealand's marine species are found nowhere else and a quarter of the world's seabird species breed in this region.

Mainland New Zealand has a coastline 14,000 km long, but relatively little is known about the plants and animals that live along it, compared with the country's land-based ecosystems. Also, the information that is available is not standardised, having been collected by many people for a wide variety of research programmes. This makes it difficult to compare ecosystems with each other and over time, or identify the types of ecosystems that should be protected in marine reserves.

Increased coastal development, climate change and other factors are altering New Zealand's marine ecosystems—sometimes rapidly. New standardised monitoring methods will help track these changes in the future.



Damage to a rhodolith bed caused by a boat anchor in Tonga Island Marine Reserve. *Photo: R. Davidson.* Inset: Rhodolith close-up. *Photo: NIWA*

Indicators

An indicator is a simple measure that summarises a large amount of complex information about the health of an ecosystem. Indicators can be very useful for tracking trends in response to stress or management actions, and for communicating the significance of the trends to conservation managers and the public.

Commonly used indicators include the levels of heavy metals in shellfish and sediment, the diversity of species present and the number of introduced species found.

A good indicator:

- is easy to measure and record in a cost-efficient way
- responds predictably to stress
- is clearly understood by non-experts.

The presence of sensitive species is an indicator of good ecological health. Rhodoliths are rare coral-like seaweeds that only grow in clean, clear water, so their occurrence indicates low levels of sedimentation (usually silt carried to the sea by streams and rivers). The 3-dimensional structure that rhodoliths add to a sandy seabed is significant as it creates places for fish, shellfish and other seaweeds to live.

Biscuit star, jewel anemones, sponges, sea squirts, algae and bryozoans make up a diverse ecosystem in Port Pegasus/Pikihatiti, Stewart Island/Rakiura.

The diversity of species in an ecosystem can also be used as an indicator of its health. Different species are found in ecosystems with more disturbance from human activity, so recording the array of species in an area can provide an assessment of ecosystem health.

Video monitoring—a valuable new tool

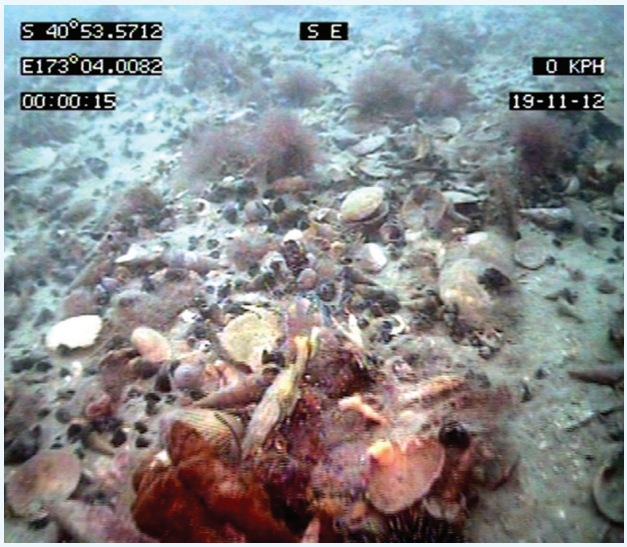
Video monitoring:

- is cost-effective
- is safe to use in deep water
- provides a permanent record of the species viewed.

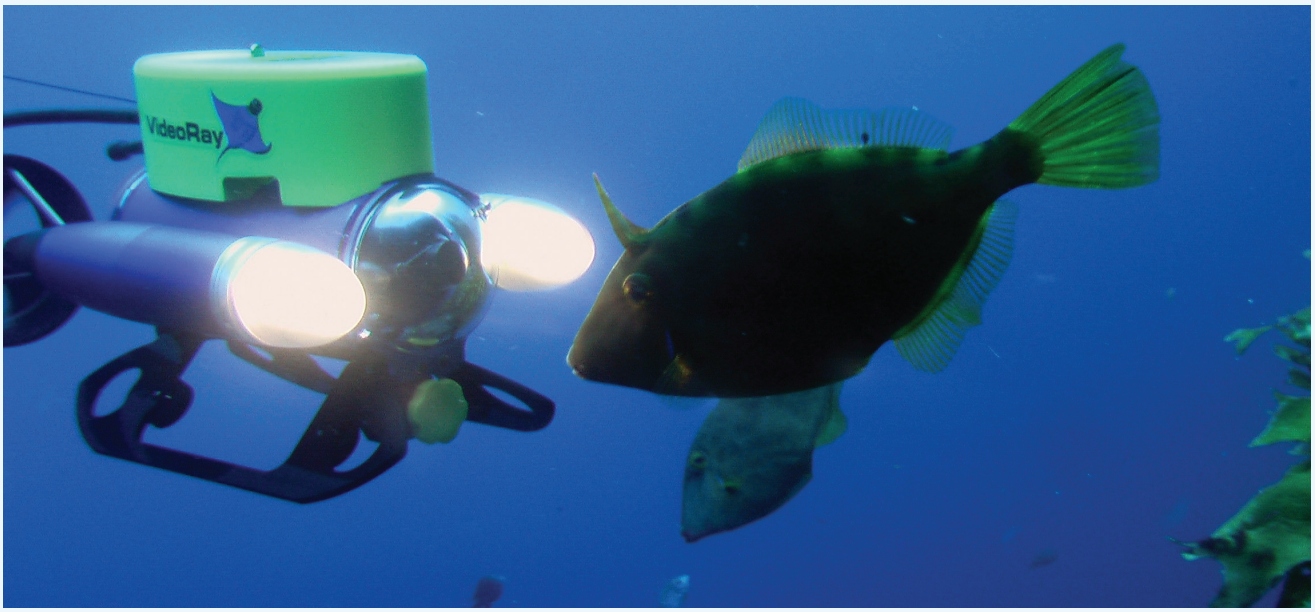
Video recording is one of our most useful marine monitoring tools. We collect footage via a remote sled-mounted camera towed behind a boat or from a camera suspended underwater. Diver video from key locations is used to supplement and verify the remote video information.

GPS, depth and scale data are recorded with each video, which is viewed in real time on the boat above. The video information can be transferred later to create a map of the location.

To investigate deeper waters, we use a remote operated vehicle (ROV), which descends to 300 metres. ROVs can be equipped with a video camera, lights and a grab arm. An operator is able to film a species of interest (e.g. seaweed) and if necessary, take a sample with the grab arm and bring it to the surface.



Video footage of the sea bed recorded on a sled-mounted video camera, showing time, date and GPS stamp.



DOC's remote operated vehicle being investigated by a leatherjacket in a kelp forest. *Photo: V. Kerr*

Taking the bait

A video recording of the fish attracted to a baited container is a useful way to measure the size and diversity of fish living in an area.

The species, number and size of each fish is counted from a screenshot taken every 30 or 60 seconds and compared across sites. This screenshot shows snapper attracted to a baited tripod in the Poor Knights Islands Marine Reserve.

Putting it all together—a trial in Tonga Island Marine Reserve

Tonga Island Marine Reserve, which extends 1.9 km from the Abel Tasman National Park coastline, was selected to trial some of our ecological integrity sampling and reporting methods.

The trial combined previously reported research with the survey information we collected via remote video cameras and divers. The presence of various species was recorded in the following categories:

- seaweed and estuarine plants
- fish (e.g. spotty, tarakihi, blue cod)
- other marine animals (e.g. shellfish, lobster, pāua, kina, scallop)
- seabirds
- threatened species.

We also identified the type of substrate (e.g. sand, mud, shell), measured the depth of sediment covering the seabed and took samples of sediment and shellfish to analyse for contaminants such as heavy metals.

The methods and indicators used in the trial enabled the health of the marine reserve and the coastal area of Abel Tasman National Park to be assessed. Issues that degrade the status of the site (such as sedimentation from land and damage to the sea floor from recreational anchoring and dredging) were also identified.

What's next

These trial results are being reviewed to refine the monitoring and reporting methods and further develop the indicators of ecosystem health.

Setting up a mechanism for local communities to contribute to marine reserve monitoring is another important next step.

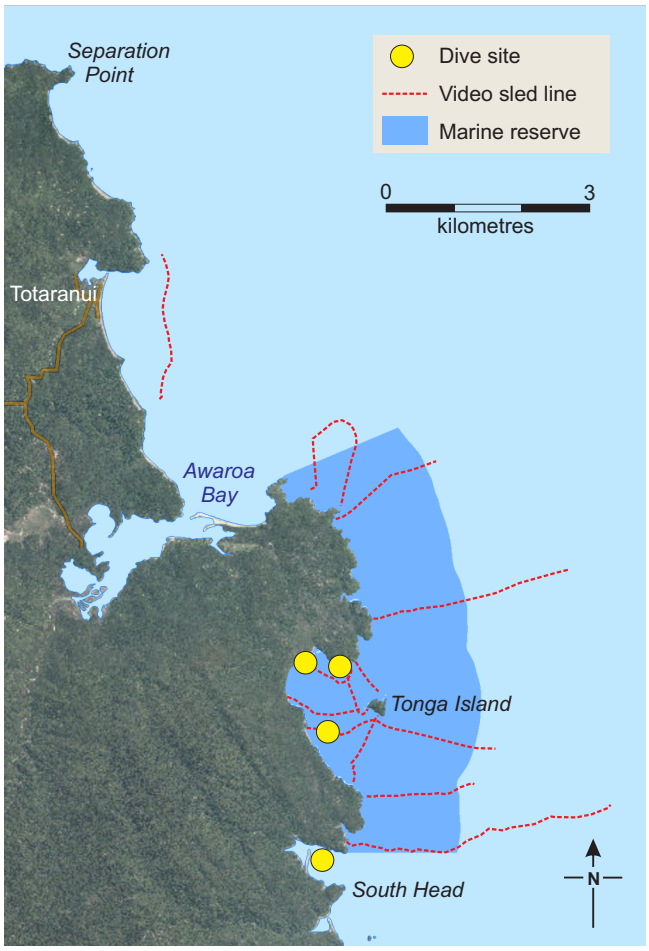
Find out more

Read the full report:

A strategy to assess trends in the ecological integrity of New Zealand's marine ecosystems
www.doc.govt.nz/marine-ecological-integrity

Functional traits as indicators of ecological integrity
www.doc.govt.nz/functional-traits-ecological-integrity

Trial indicators for an ecological integrity assessment (EIA), Abel Tasman coast
www.doc.govt.nz/indicators-ecological-integrity



Map of Abel Tasman National Park showing the video sled lines, dive sites and marine reserve boundary.

Tonga Island. The island is significant to Māori, who have occupied it in the past. The word 'tonga' means southerly wind.

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