State of the Bays
Tasman Bay and Golden Bay Marine Environments

Image data credit: NASA / USGS.

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Values Statement
Tasman District Council and Nelson City Council

The coastal marine area of Tasman and Golden Bays is an integral part of life in the region. It stretches from Onetahua (Farewell Spit) in the west to Raetihi (Cape Soucis) in the east and out to the 12 nautical mile limit of the territorial sea.

The area is dynamic and diverse, and is shaped by a complex web of physical and ecological processes. It includes a diverse range of coastal environments and habitats including deep oceanic waters, shallow coastal seas, sheltered estuarine systems, boulder banks, spits, sand dunes, salt marshes, sea cliffs, some high energy beaches and coastal wetlands. The coast is bordered by a range of land types including national and regional parks, a wide range of rural land uses, and some urban and industrial development. The area has a rich history of human settlement and use.

The Bays are economically important to the region; they are worked and lived in, and are used for marine commerce, commercial fishing and transport. People also use the Bays for recreation and the sustenance of human health, wellbeing and spirit. The intrinsic values of the Bays provide a sense of belonging for many New Zealanders and for them it is an essential touchstone with nature and the marine environment.

The Bays and their catchments have complex interrelationships that need to be understood and managed, to ensure that their values are maintained, protected or enhanced over time. The Bays cross territorial and departmental jurisdictions and land and water boundaries. It is important that the objectives and approaches to management of the Bays are integrated in such a way that it provides for their conservation, enhancement, sustainable use and development

Marine Environmental Information

Measuring the state of health of the marine environment is challenging. Often very little historic information is available, and surveys can be difficult and expensive to undertake. Our coastal seas are large areas, and the majority of the sub-tidal environment cannot be seen without specialised equipment. This means that most of this environment is less visible than land, or even freshwater and estuarine environments, and the public's ability to assess the state of the marine environment for themselves is limited.

Information on the marine environment is collected for different purposes, including for consent-associated monitoring, research, and for fisheries management. Recently, the available information on the coastal marine areas of Tasman Bay (Te Tai-O-Aorere) and Golden Bay (Mohua) was compiled[1]. Here, we summarise the key points from that information for a general readership. For more detailed information and data sources, readers are referred to the main report.

The marine environment is affected by human activity on land. The effects of land-based activity can flow through to the marine environment via rivers and estuaries, so we briefly consider land, freshwater, and estuarine information before concentrating on the coastal marine area of Tasman and Golden Bays.

We explain some common methods used to collect environmental data, and then consider six key themes that relate to the state of the marine environment. Finally, we summarise the state, trends, and data quality in Tasman and Golden Bays.

Māori approaches to assessment of environmental health are not considered explicitly in this report[2]. There is broad recognition among Māori, scientists and council of a need to build better relationships between Western scientific approaches to ecosystem management and Māori communities, values, and knowledge. Engagement with tāngata whenua is also required by many policies under the New Zealand Coastal Policy Statement. The policy prescribes how local authorities take into account the principles of the Treaty of Waitangi and kaitiakitanga[3] in relation to the coastal environment. Development and integration of cultural monitoring is one way to recognise and provide for Māori values and interests in environmental management. Assessments using cultural health indicators are undertaken as part of some freshwater and estuarine projects in the region, and Māori cultural intertidal monitoring approaches have been tested locally. However, to our knowledge no cultural monitoring currently occurs in coastal waters.

[1] Newcombe E, Clark D, Gillespie P, Morrisey D, MacKenzie L 2015. Assessing the State of the Marine Environment in Tasman Bay and Golden Bay. Prepared for Nelson City Council and Tasman District Council. Cawthron Report No. 2716. 70 p. plus appendix. (TDC and NCC joint project, funded by MBIE Envirolink advice grant 1567-NLCC86)

[2] Some issues regarding the status of Māori in marine management were considered in a past report: Newcombe E, Cornelisen C 2014. Towards an integrated monitoring programme for Nelson Bays coastal marine area. Prepared for Tasman District Council and Nelson City Council. Cawthron Report No. 2544. 44 p. plus appendices.

[3] Guardianship, stewardship, trustee.

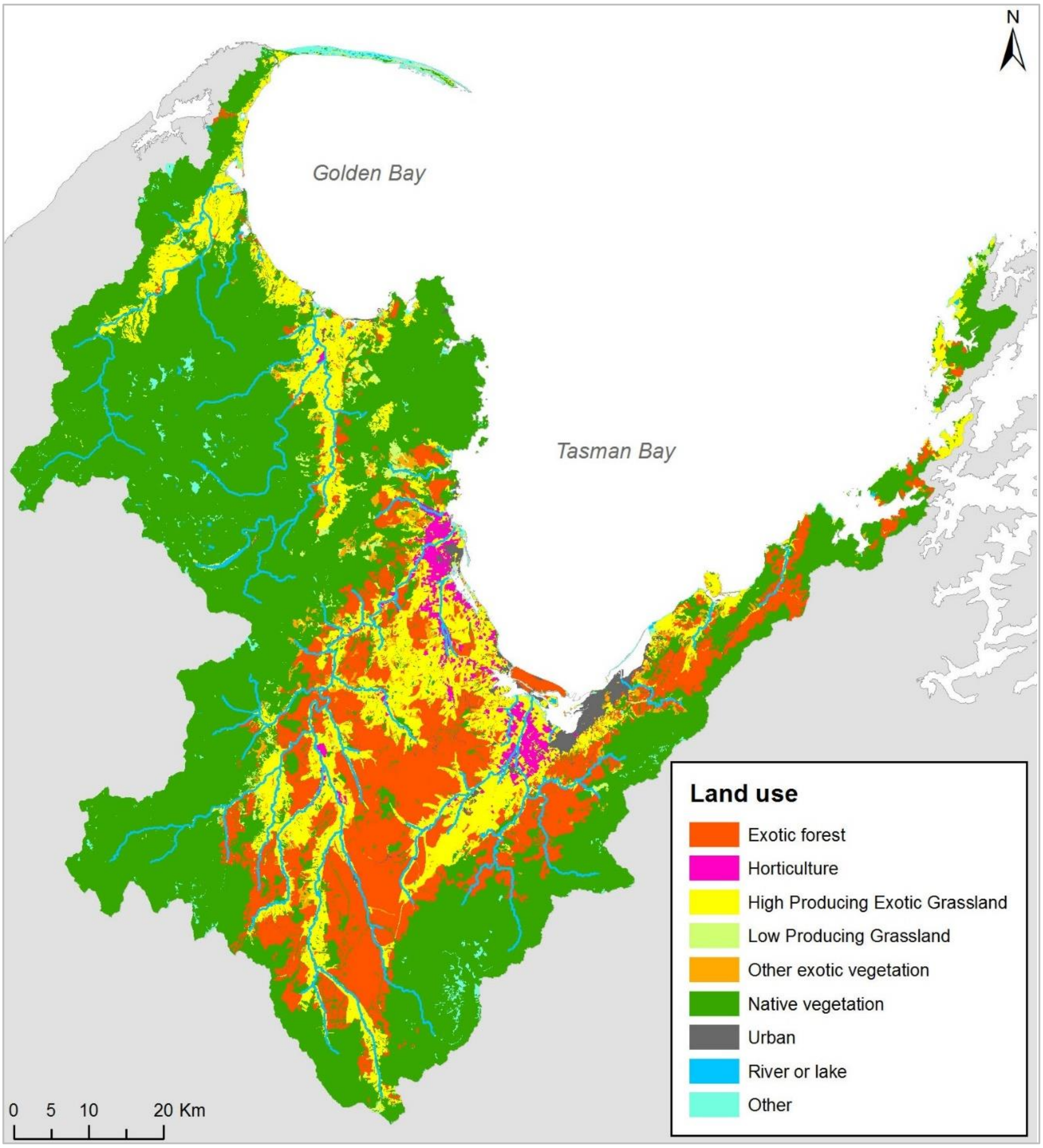
Coastal Catchments and Estuaries

Our focus is the coastal marine environment, that is, the sea on the open coast. However, all environments are connected, and many of the most important pressures on the marine environment are caused by activity on land. The sea is the receiving environment for run-off from land, which often reaches the coast via rivers or streams, and estuaries. This run-off often includes sediments and other contaminants from human activity. Here, we present some very general information about the effects of these activities on land and freshwater quality in Tasman Bay and Golden Bay. We then summarise the state of information about estuaries in the Bays.

Land

Changes in land use, such as conversion of native forest to other purposes, often lead to increases in sediment loading to rivers and the marine receiving environment. Nutrients (e.g. fertilisers and effluent discharge) and chemicals (e.g. pesticides and herbicides) can be introduced to the marine environment via runoff from land. Similarly, faecal bacteria from humans and land animals can contaminate freshwater and marine environments.

Land cover in the catchments of Tasman Bay and Golden Bay is dominated by native vegetation in the upper catchments, with substantial pasture (high and low-producing grassland) near the coast and bordering the rivers in the mid-catchment areas (see map below). Exotic forestry is widespread in the catchments of Tasman Bay, but rare in those of Golden Bay. Horticulture is concentrated in the low lands of the Waimea Plains and the land surrounding Motueka.



Land cover in the catchments of Tasman and Golden Bays

Freshwater

Freshwater environmental monitoring has historically been more thorough than in coastal waters. Environmental measurements from rivers and streams across New Zealand have been used to classify water quality into four groups as seen in the table below. The colours indicate the worst to best with red (worst quarter), orange, yellow, and green (best quarter). White indicates that no data are available (sourced from Land Air Water Aotearoa: www.lawa.org.nz).

Stream water quality data, collected from monitoring points nearest the coast, show that there is variable water quality in streams that flow into Tasman Bay and Golden Bay.

More freshwater data is available from monitoring and research – we present only selected LAWA data.

	River/stream/creek	Faecal indicator (*E. coli*)	Turbidity	Nitrogen or ammonia
Golden Bay	Aorere	green	green	green
	Onekaka	orange	green	green
	Takaka	green	green	green
	Motupipi	yellow	green	red
	Winter	yellow	orange	white
Tasman Bay	Riwaka	green	green	white
	Motueka	green	green	yellow
	Tasman Valley	red	orange	red
	Seaton Valley	yellow	red	red
	Waimea	green	yellow	yellow
	Reservoir	orange	orange	red
	Saxton	red	orange	red
	Orphanage	yellow	yellow	yellow
	Poorman	yellow	yellow	green
	Jenkins	orange	orange	orange
	Maitai	yellow	green	green
	Todds Valley	orange	yellow	yellow
	Wakapuaka	yellow	green	green
	Whangamoa	green	green	green

Water quality information from streams in Tasman Bay and Golden Bay (from Land Air Water Aotearoa)
The colours indicate groupings (quartiles) of water quality across New Zealand with red (worst quarter), orange, yellow, and green (best quarter). White indicates that no data are available

Estuaries

Estuaries are quite well studied, and monitoring is often specifically designed to assess the state of the environment. In the last 15 years the local Councils have initiated a number of mapping projects and surveys in Whangamoa Estuary, Nelson Haven, Delaware Estuary, Waimea Inlet, Moutere Estuary, Motueka Estuary, Motupipi Estuary, and Ruataniwha Estuary. This work is supplemented by consent-associated monitoring at some sites. Tasman Bay and Golden Bay estuaries have been modified to varying extents by human activities.

Tasman Bay and Golden Bay estuaries are typically broad and shallow. They have extensive intertidal sand and mud flats, vegetated wetlands (for example eelgrass, peripheral salt marsh) and limited coarse-grained habitats. This habitat structure and the associated plant and animal communities mean that estuaries are areas of generally high local productivity and biodiversity. They also have important links to the ecosystems and marine resources further out to sea.

Input of fine-grained sediment is a significant issue for Tasman Bay and Golden Bay estuaries. Increases in sediment deposition resulting from human activity on land (i.e., land use changes and disturbance) can drastically increase the amount of muddy habitat. Mud may reduce or replace more productive coarser-grained sediments such as those supporting eelgrass communities and / or shellfish beds. The expansion of mud-flat habitat can therefore reduce estuarine biodiversity with follow-on effects to the coastal food-web.

An increased supply of nutrients can result in problems associated with over-enrichment. Such problems are largely mitigated in most Tasman Bay and Golden Bay estuaries due to the rapid tidal flushing rates. However, localised eutrophication effects sometimes occur near to nutrient-enriched freshwater inflows from rivers, streams or drains. The associated problems generally stem from an overgrowth of seaweed such as sea lettuce, or blooms of bacteria or microalgae (including phytoplankton). In port areas of the Nelson Haven, there are levels of contamination that are consistent with current and historical use of such a facility.

Estuaries also function as buffers between land and sea, but in some cases this buffer has been affected by human modification. Important aspects of estuarine function are the retention and / or processing of sediments, nutrients and contaminants that would otherwise be directly discharged into the Bays. These functions have been compromised in many estuaries by the removal of large areas of freshwater and estuarine wetlands through flood control, infilling, and various urban, agricultural and industrial developments. The natural land to sea succession of plant communities, including the terrestrial fringe of scrubland grading into forest cover, has been further interrupted by 'hardening'. This is often related to coastal developments that have affected all estuaries in the region to varying extents (for example harbour infrastructure, roads, and flood control). Such physical barriers to tidal inundation will reduce the ability of wetland habitats to naturally migrate landward as sea level rises.

Coastal Marine Area

Environmental information and health status can be considered in a range of ways, here we have identified six key themes that are important aspects of determining the environmental health in Tasman and Golden Bays.

- Primary productivity
- Sedimentation
- Habitat integrity
- Contamination
- Fisheries
- Invasive species

For each theme we consider:

- why it’s important
- where information comes from
- what the information tells us
- what changes could be considered

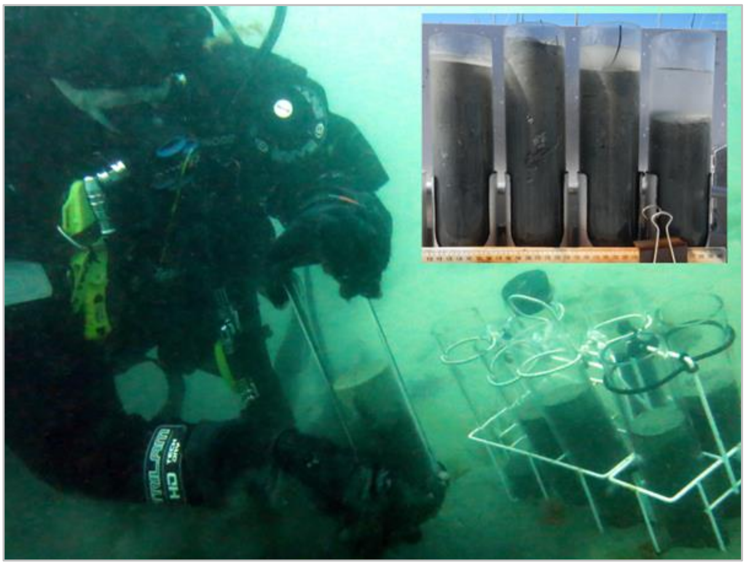
First, we show some of the commonly used methods for collecting environmental information in the marine environment.

Common data collection methods

Photos, video, and diver observations are simple but important ways of collecting information.

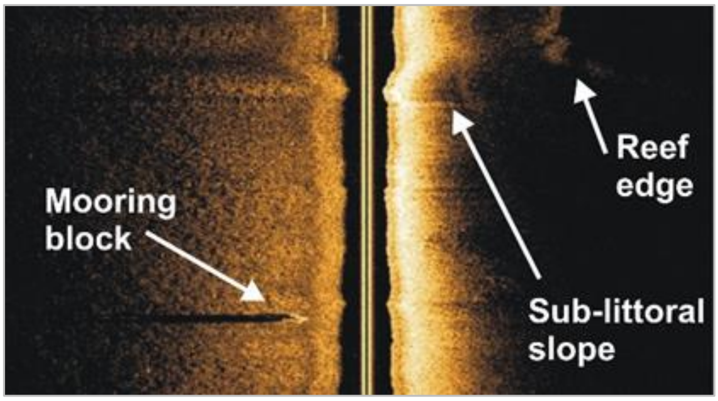
Moored instruments such as the data loggers on the TASCAM buoy, can record and transmit information about water quality.

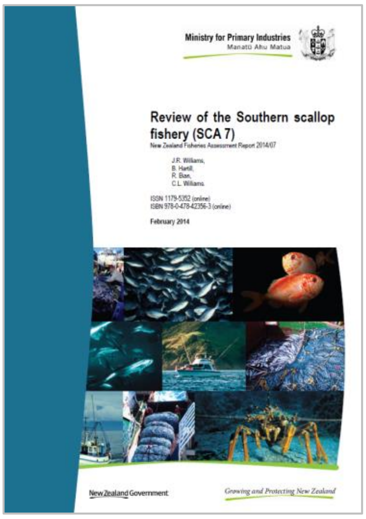
Sediment cores can be collected with a grab-sampler, or by divers, and are used for a range of environmental measurements, including grain size, nutrient and contaminant concentrations, or organic content.



Common data collection methods

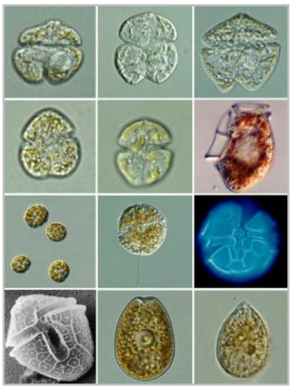
Seabed imaging such as side-scan sonar (see image) or multi-beam echosounders are used to map large areas of habitat.





Fisheries data are collected by the Ministry for Primary Industries.

Taxonomy The types and abundances of organisms in a community can indicate environmental health.Right: microscopic algae from the water column. Far right: small animals from sediments.

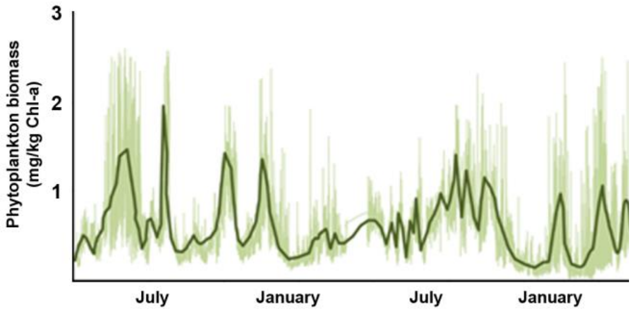


Shellfish are tested for contaminant concentrations to protect human health.

Water samples Are tested for nutrient concentrations in areas where enrichment may occur.

Primary productivity

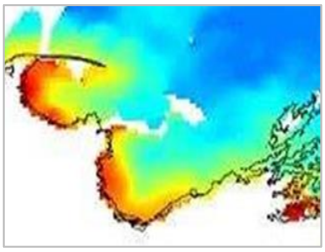
Primary producers can convert light into organic matter, and provide food at the base of the food chain. The most important primary producers in the coastal marine environment are seaweeds and microalgae (microscopic plants, termed 'phytoplankton' when they live in the water column). Human activity can greatly increase nutrient run-off from land by addition of sewage, effluent, industrial waste, fertilizers, and land disturbance. If human activity results in too many nutrients being released into the sea, problem growths of seaweeds or microalgae can occur. Furthermore, some microalgae produce toxins that can be harmful to marine organisms or humans.



Phytoplankton biomass is highly variable over time

Phytoplankton abundance (estimated by measuring the concentration of the plant pigment chlorophyll-*a* in the water) is highly variable over time. An example of chlorophyll-*a* data from the TASCAM monitoring buoy (www.cawthron.org.nz/tascam) is shown in pale green, with average levels indicated in darker green.

Satellite images can now be used to estimate the primary productivity of surface ocean waters. Waters near the coast are generally more productive (warmer colours in the image to the right), as nutrient run-off from land increases phytoplankton growth. Analysis of historic satellite images means that scientists can now look back over 20 years for trends in coastal water properties.



Productivity information from satellite images

Estimated inputs of nitrogen to Tasman Bay and nearby waters.

Source	Nitrogen (tonnes per year)
Oceanic Inputs (estimated)	10,000
Bells Island municipal discharge[1]	97
Nelson fisheries processing	70
Nelson City municipal discharge	102
Waimea River	226
Small Waimea streams	24
Motueka River	613
Other tributaries	50

Nitrogen is the nutrient most likely to cause algal blooms in the Bays. Most of the nitrogen input into the Bays comes from natural oceanic upwelling, and only about 10 percent comes from the land (including inputs associated with human activity). Overall, the region seems at low risk of large scale nutrient-related impacts. However, nearshore and local-scale effects of nutrient inputs may occur, such as blooms of sea lettuce in intertidal areas where nutrient inputs are high. Estuaries are more susceptible to these blooms than outer coast environments.

Farmed mussels can filter out phytoplankton from the water. However, no evidence of undesirable levels of phytoplankton removal has been found in routine monitoring in the region.

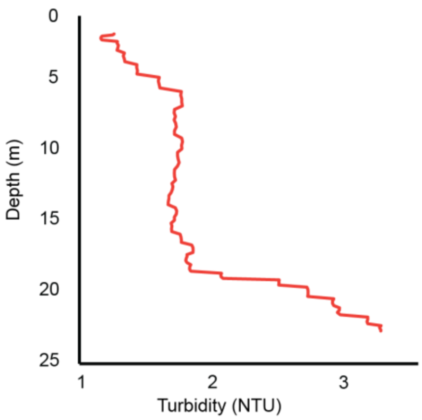
Maintaining controls on nutrient inputs will ensure problems associated with nutrient input do not occur in Tasman and Golden Bays. Ensuring mussel farming develops at sustainable levels (with use of up-to-date modelling and sampling technologies) will avoid depletion of phytoplankton communities. Understanding of seaweed distribution and productivity in the region is not well developed, but may be more of an issue from a habitat integrity perspective, than a productivity issue.

Sedimentation

Fine sediments are washed into the sea from land, and often human activity increases the amount of sediment input. Sediment can cause stress in the environment by reducing light levels, clogging the gills of shellfish such as scallops, preventing plants and animals from settling, and burying organisms and habitat.

To date, no detailed ongoing measurements of sediment inputs to the Bays have been made, although NIWA has used a computer model to calculate sediment inputs nationally. Photographs (right) and sediment cores from resource consent based monitoring show us that very fine surface sediments are common in Tasman and Golden Bays.

The Motueka river plume, carrying suspended sediments, is apparent after rainfall

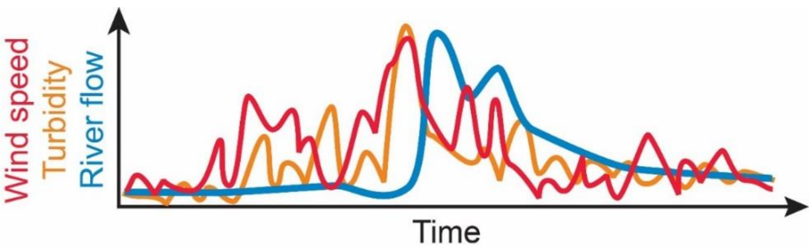


A water column profile shows a marked increase in turbidity near the seabed.

In the last two decades land-based sediment inputs have not been especially high, although it is clear that land-derived sediments are still washed into the Bays during storm events (right, a sediment plume from the Motueka River after heavy rainfall).

An important aspect of sedimentation in Tasman and Golden Bays is that a near-seabed layer of highly turbid (sediment laden) water is present for much of the year (see graph left). This is thought to reduce settlement and survival of animals and plants that live on the seabed in the Bays.

Sediments are strongly affected by disturbance, and settled sediments are often re-suspended in the water column by waves and currents. The graph below shows this phenomenon. In storm conditions, murkiness (turbidity – orange line) of the waters in Tasman Bay increases just after high winds (red line), and before river-flows have increased. This shows that run-off from land is not the only cause of suspended sediments (turbidity), but that re-suspension of settled sediment is an important contributing factor to water clarity in the Bays.



In a storm, seawater turbidity (orange) increases soon after strong winds (red) create rough seas and before river flow (blue) can deposit sediments into Tasman Bay

Changes to sediment levels in the water column can be made by both limiting sediment input from land, and by reducing disturbance of the seabed (see Habitat integrity below).

Habitats (habitat integrity)

Habitat integrity is the extent to which natural habitats still exist, so that the communities associated with them can survive.

Some habitats are made from non-living material (for example, bedrock or stony areas), but many habitats are made from or changed by living plants and animals (seaweed forests, shellfish reefs, sponge gardens, bryozoan reefs). Changes to the features of a habitat, such as change in the amount or type of sediment or the loss of key plants or animals that create structure, will affect biodiversity and habitat-integrity.

Changes in habitat can be detected from observations over time, or estimated from differences between areas with and without certain activities. Maps can be made from data collected from physical samples (such as sediments), or from images such as side-scan sonar that capture the texture of the seabed. Often habitats have changed long before we were able to map, or even observe them, so gleaning habitat information from historical sources can be very important (right).

Marine reserves and the Separation Point protected zone are relatively small, and as such are not protected from all human impacts. Nonetheless, they are valuable areas for studying habitat change in Tasman and Golden Bays. Mapping can assist in understanding habitat distribution within and outside of protected areas.

I HEREBY GIVE NOTICE that I have applied to the Commissioner of Crown Lands for an Exclusive Right to WORK an OYSTER BED situated in Tasman's Corner, GOLDEN BAY, about 2¾ miles North-easterly direction from the mouth of Puponga Inlet.

E. DAVIDSON.

April 3, 1873. 840

THE BARQUE LUTTERWORTH ASHORE.

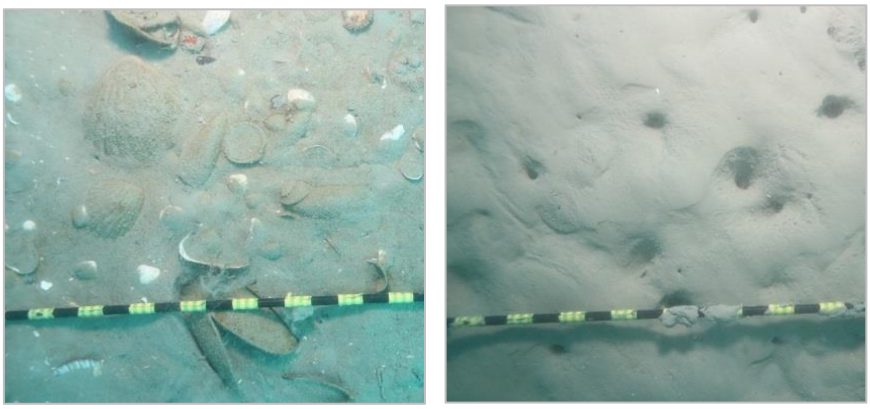
AT THE ARROW ROCK.

Some excitement was occasioned in town this forenoon when it was learnt that the barque Lutterworth had taken the ground at the Arrow Rock while going out under sail. The Lutterworth ... was reached, when the wind lulled, and the vessel veered with her head to the mussel reef. She struck gently and went about 15 or 20 feet on to the bank.

Old newspaper reports provide interesting clues about the historical extent of shellfish beds

Disturbance by fishing has substantially modified soft-sediment habitats within the Bays by homogenising sediments and reducing habitat integrity over much of the seafloor. Many of the remaining seabed communities are characteristic of a highly disturbed environment, but the extent and status of remaining healthy biogenic (animal or plant derived) habitat is not well understood. Less is known about rocky reef habitats in the Bays, but it is likely that there have been food-web effects (for example increases in kina abundance and a reduction in seaweed abundance) relating to the removal of large fish in many areas (see Fishing section).

Sediments characteristic of high disturbance are common in Tasman and Golden Bays. On the right, sediments protected by disturbance (by mussel-farming structures) show signs of stability and structure. A range of shell types are present, and sediments are coarser. The image on the far right shows only fine sediments, with burrows made by mobile animals that can survive disturbance.



The seabed in Tasman Bay in areas of low disturbance (left) and higher disturbance (right)

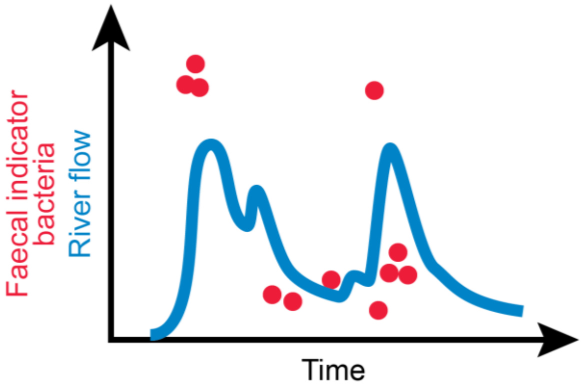
We can protect habitat integrity by limiting disturbance (such as by limiting contact fishing methods or other activities that can disturb the seabed). Establishment of marine reserves often results in an increase in biogenic habitat. It may be possible to assist some habitats to re-establish (by creating settlement surfaces that assist shellfish reefs to re-establish, or by managing fishing so that large fish are able to fill their natural role in ecosystems – see Fishing section below). Monitoring of marine reserves would ideally consider habitat-forming species such as large seaweeds, horse mussels, bryozoans and sponges.

Contamination

Bacterial contamination

Contamination of seawater by faecal material can cause problems for human health, either by contact with the water, or by consuming animals that are contaminated (primarily filter-feeding shellfish). Specific bacteria are used to indicate the presence of faecal material, and while they are not pathogenic themselves, they indicate that pathogens may be present. Information about bacterial contamination comes from council surveys of swimming beaches, consent-associated monitoring (such as that associated with sewage disposal) and research projects. Bacteria that indicate contamination by faecal material can be measured either in the water itself, or in animals that may accumulate material, such mussels.

Overall, bacterial contamination appears to be low in coastal waters of the Bays, but occasional peaks do occur, often following periods of rainfall. Land-based activity that does not require a resource consent can be a greater cause of bacterial contamination than consented activity. Research has shown that faecal indicator bacteria in Tasman Bay increase when high river flows enter the Bay (see graph, right), and that this contamination can be detected at least 6 km off shore. Microbial source tracking (MST), which uses genetic techniques to identify the type of animal that faecal material is from, identified the main source of faecal indicator bacteria was farm animals (cows or sheep).



Faecal indicator bacteria in Tasman Bay peak when river flows increase rapidly

To reduce bacterial contamination, we first need to identify the source. Microbial source tracking, combined with more intensive sampling of the concentration of faecal indicator bacteria in coastal, estuarine, and freshwater environments would build up a clearer picture of the key sources of bacterial contamination.

Chemical contamination

Toxic chemicals can cause problems for marine communities by either killing some species, or by reducing their ability to grow and reproduce. Human health can be affected if contaminants accumulate in the bodies of animals that we consume. Information about chemical contamination comes primarily from resource consent monitoring concerning activities that are potential sources of contamination (such as dredge spoil disposal and hull cleaning). Contaminant concentrations can be measured in sediments, or in the bodies of animals.

Detectable levels of contaminants occur at Port Nelson (within Nelson Haven), some from historical use of products that are now banned. Other detectable levels of chemical contamination occur in association with consented activity outside of the port areas, but contamination only occurs at low levels. For example, shellfish do not exceed contaminant levels considered acceptable for human consumption, and levels high enough to potentially have ecological impacts do not occur on the outer coast.

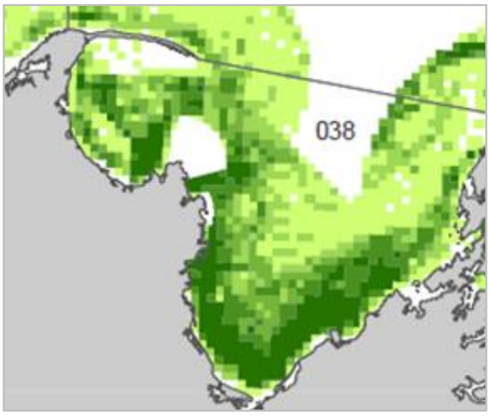
A historical concern in Tasman Bay has been the Mapua Fruit Growers Chemical Company site, where high levels of contamination occurred at a chemical storage site. Remedial work has been undertaken, and while small areas of contamination are still detectable within the estuary, this is localised and does not extend into the outer coastal environment.

Many sources of chemical contamination are reducing over time. For example, the use of anti-fouling compounds and pesticides that have been shown to be very persistent in the environment are now banned nationally and internationally (Tributyltin (TBT) is one). Researchers are now working to understand the effects on the environment of emerging contaminants, including compounds found in personal care products.

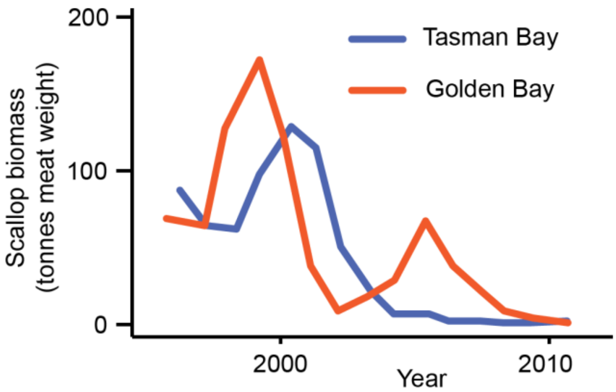
Fisheries

Marine species that are consumed by humans have important commercial and recreational value, but also play a role in the natural marine food web.

Fisheries data are collected by the Ministry for Primary Industries, but often only summary data are available publicly. Recreational catch data are estimated by surveying fishers. The state of fish stocks is estimated from catch data, or from targeted field surveys. MPI data (right) show the intensity of midwater and bottom-trawling effort over 6 years. Almost all unprotected areas within 12 nautical miles of shore have been trawled at least once. Most areas have been trawled many times, the darkest green areas have been trawled between 5 and 120 times.



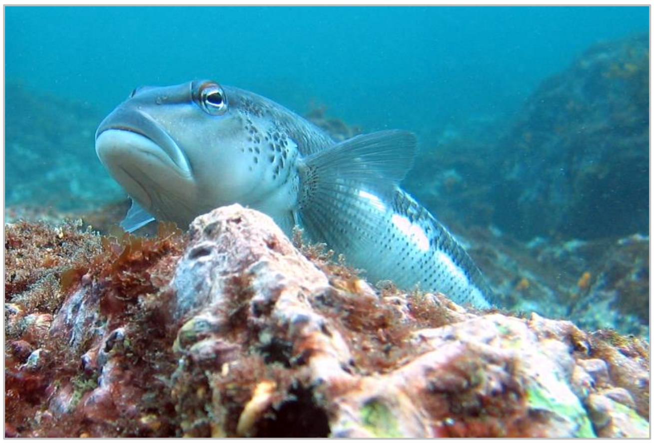
Fishing intensity in Tasman and Golden Bays



Scallop biomass in Tasman Bay and Golden Bays

Important fish stocks are depleted compared to historical levels within the Bays, which suggests that substantial changes to the food-web have also occurred. Historical biomass of snapper has been estimated based on catch data. These estimates show that the biomass has been reduced to less than 10 percent of that in 1930. Since 2009, one or two years of high recruitment have seen some recent increase in snapper populations, although they are still below target management levels. Scallop populations are known to be highly variable, but biomass estimates also show a decline to very low levels in the Bays in the last 15 years (see graph, left).

Protected areas show an increase in the numbers of some exploited species. There is some evidence to suggest that fishing is having food-web effects on rocky reefs. Marine reserves at Tonga Island and Horoirangi have shown that numbers of some fish (including blue cod) increase when fishing is not allowed, even in quite small areas. At Tonga Island, an increase in kina has been seen outside the reserve, but not inside. This could be because fish such as large blue cod in the reserve are preying on kina. In other marine reserves in New Zealand, it has been shown that when large fish eat herbivores such as kina, populations of seaweeds become more abundant, which provides habitat for other species.



Blue cod often become more abundant in areas protected from fishing such as Tonga Island and Horoirangi marine reserves

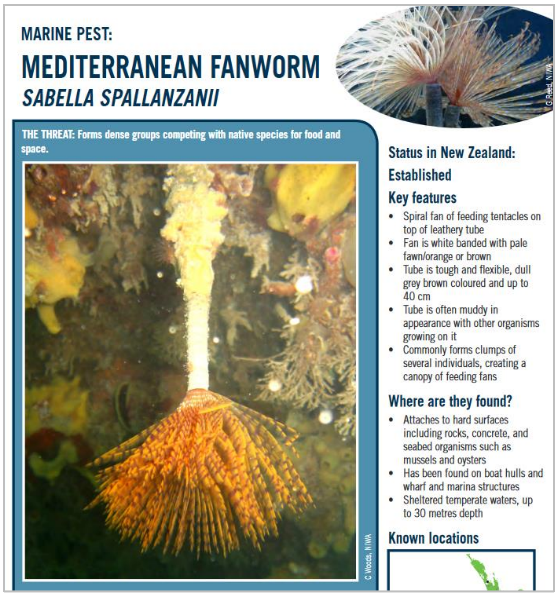
Councils do not have the ability to limit fisheries activity for fisheries management purposes, although legal advice has stated that they are able to control fisheries for protection of biodiversity. In several regions of New Zealand collaborative community-driven initiatives are being undertaken to manage the marine environment for a range of purposes, for example, the Fiordland Marine Guardians (www.fmg.org.nz) and Te Korowai o Te Tai o Marokura Kaikoura Coastal Guardians (www.teamkorowai.org.nz). These collaborative processes can result in agreement on changes to the way marine space and fisheries are managed.

Biosecurity / Invasive species

Invasive species can cause a range of problems in the marine environment. They may compete with native species, and foul boats and equipment. This can have negative effects for ecological, recreational, commercial, and cultural reasons.

Ports are important hubs for the spread of pest species and regular biosecurity surveys are undertaken at ports across New Zealand. Biosecurity surveys at ports within the Bays have found a number of established invasive species, but substantial negative impacts have not been documented. Recent incursions of pest species include the sea squirt *Styela clava*, and the fanworm *Sabella spallanzanii*.

As potentially problematic species spread throughout the world, the chance of them being introduced to New Zealand and then spread within New Zealand increases. However, a local initiative, the Top of the South Biosecurity Partnership is working to reduce the risks and impacts of marine invasions in Marlborough, Nelson, and Tasman.



More information on marine pests can be found at www.biosecurity.govt.nz

Assessing the state of the marine environment in Tasman Bay and Golden Bay: themes, state, trends, and data quality

Theme	State	Trend	Data quality*
Toxic chemical contamination	Minor detectability of some contaminants	Unknown	Medium
Faecal contamination	Widespread contamination from diffuse sources	Unknown	Medium
Sedimentation	Unknown	Unknown	Low
Primary productivity - water column	Not greatly increased by nutrient input, possibly reduced by water column sediment shading	Unknown	Medium (TASCAM), potential for emerging technologies
Primary productivity - seabed	Probably reduced by water column sediment shading and loss of seaweed forests	Unknown	Low
Habitats (Habitat integrity) soft sediments	High disturbance causing homogenisation and fine seabed surface	Unknown	Low
Habitats (Habitat integrity) rocky reefs	Probably seriously degraded, seaweed forests likely very reduced	Unknown	Low
Fisheries	Depleted, likely due to overfishing and habitat removal	Unknown	Medium
Biosecurity/invasive species	Non-native species repeatedly being transported to the region	Pressure increasing, but improving biosecurity networks	Medium

*__Data quality classifications: Non-existent__ = indirect information sources (e.g. anecdotal, estimated) only **Low** = some direct measurement, not ongoing **Medium** = measured on more than one occasion but inconsistent methods **High** = repeated consistent measurements available