Expert panel review of selected significant marine sites surveyed during the summer of 2018-2019

Research, survey and monitoring report number 1008

A report prepared for:
Marlborough District Council and Department of Conservation
C/o Seymour Square
Blenheim

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Significant Marine Site Expert Panel

Rob Davidson has been involved in marine biology for over 30 years. Rob holds a Master of Science with First Class Honours from the University of Canterbury, 1987 and has presented 18 conference papers and published 12 papers in international peer-reviewed scientific journals. He has previously worked for MAF and the Department of Conservation. Presently Rob is the director of an independent science consultancy. During his time at DOC, he coordinated or was involved in many large-scale ecological surveys of coastal areas throughout Nelson and Marlborough. Rob compiled this information into the Department's Coastal Resources Inventory which was later reproduced as reports for the Councils' coastal plans. He has implemented monitoring programmes spanning up to 26 years, relating to Cook Strait ferry impacts, marine farm recovery and marine reserve monitoring. As a consultant, Rob has provided scientific information for over 900 resource consent applications and impact assessments. His company has also coordinated a marine ecological database for the Marlborough District Council. Over his working career, he has conducted over 4000 dives throughout the Marlborough area and has extensive knowledge of the underwater features and values of Marlborough.

Clinton Duffy is a marine scientist employed as a Technical Advisor (Marine) with the Department of Conservation's Marine Ecosystems Team. He holds an M.Sc. (Hons) in Zoology from the University of Canterbury, 1990, and worked as a marine and freshwater technical support officer for the Department's Nelson/Marlborough, East Coast Hawke's Bay and Wanganui Conservancies from 1990-1999, and as a Scientific Officer (marine ecology) in the Science & Research and Marine Conservation Units from 1999-2012. He has authored over 80 scientific publications and reports. His areas of expertise include marine survey and monitoring; biogeography of New Zealand reef fishes, algae and invertebrates; and the conservation biology, taxonomy and behaviour of sharks and rays. He has dived, either in a professional or private capacity, around much of New Zealand's coastline, and co-ordinated of a dive survey of shallow subtidal habitats of the Marlborough Sounds in 1989-90.

Andrew Baxter has over 38 years' experience in coastal and marine management, specialising in marine ecology including marine mammals. He graduated from the University of Canterbury in 1981 with a BSc with First Class Honours in Zoology. Following two years working for the Taranaki Catchment Commission as a marine biologist, Andrew worked as a fisheries management scientist for MAF Fisheries based in Wellington from 1984 to 1987. He has been employed as a marine ecologist for the Department of Conservation in Nelson since October 1987. Andrew is currently a Technical Advisor in DOC's Marine Ecosystems Team.

Sean Handley is a Marine Ecologist based at NIWA in Nelson. Sean was awarded his PhD in 1997 by the University of Auckland with support from the Cawthron Institute, where he was studying the ecology of shellfish and their pests (spionid polychaetes). He has a broad range of research and consultancy experience and expertise interacting with a range of marine sectors including: aquaculture, fisheries, conservation, iwi, NGO'S and regional councils. Sean has a very wide range of skills, working on research projects relating to: aquaculture of shellfish and sponges, ballast water testing, biosecurity surveys, ecological surveys and biological collections throughout NZ, Fiordland ecological surveys including deep reef communities, and benthic ecology. More recently he has undertaken reviews of historical changes to seabed and fish communities and has an interest in palaeoecology to establish baselines to inform future management and restoration of coastal resources.

Peter Gaze worked for many years with Ecology Division of DSIR, involved with research into the distribution, conservation and economic value of birdlife in New Zealand. This included a study of forest bird ecology, in particular, rifleman, kereru and mohua. Peter is a co-author of the first atlas of bird distribution in New Zealand. Various research projects took him to the sub-Antarctic, the Kermadecs, Cook Islands and Tahiti. He then moved to the Department of Conservation where his role was primarily to provide technical advice on fauna conservation work in Nelson and Marlborough. This role enabled him to bring a national perspective to local matters. Related fields of interest include the impact and control of mammalian predators as well as reptile conservation including leading the department's recovery of tuatara for the last ten years. Both roles have included projects working on the islands and wildlife of the Marlborough Sounds. A plan written for the management of these islands continues to guide the work of the Department. He has a long association with bird research and conservation throughout the country and was for some time the secretary for the Ornithological Society of NZ. Peter has now works for charitable trusts committed to conservation in Abel Tasman National Park and the outer Marlborough Sounds.

Sam du Fresne has over 20 years of experience studying marine mammals, beginning with his master’s thesis in 1998. He has conducted several dolphin surveys in New Zealand focussed mainly on Hector’s dolphins and has worked in places as diverse as Far East Russia, Hawaii and Western Australia. After graduating with a PhD from the University of Otago in 2005, Sam worked as an independent consultant, specialising in marine mammals. As a consultant, Sam worked closely with DoC, MFish, NIWA, Cawthron, various regional councils and several industry clients, providing expert advice and research services on a range of species and issues. Sam also spent time at SMRU Ltd in St Andrews (Scotland) where he worked as a senior research scientist, focussing mainly on marine mammals and renewable energy projects. Recently, after working for more than three years in Western Australia on mega-projects such as the Gorgon and Wheatstone LNG developments, Sam returned to New Zealand to join the EEZ Compliance team at the Environmental Protection Authority in Wellington.

Shannel Courtney is a Nelson-based plant ecologist with the Department of Conservation, working as a Technical Advisor in the Terrestrial Ecosystems Unit. In 1983 he attained a Master of Science in plant ecology at Canterbury University and before DOC has worked for the NZ Wildlife Service, NZ Department of Lands and Survey and NZ Forest Service on management issues. For much of the earlier part of his career, he has been involved in the assessment of natural areas for ecological significance and has led various ecological surveys of the East Cape, Taranaki, Marlborough and Nelson regions. Relevant publications and co-authorships include Protected Natural Area reports for North Taranaki, Motu and Pukeamaru Ecological Districts and for Molesworth Station, habitat restoration guides for Nelson City and Tasman District, and several publications on the development of a natural character framework for the Marlborough Sounds. For the last 20 years, he has specialised in threatened plant conservation and co-ordinates the recovery of nationally threatened and at-risk species in the Nelson region and Marlborough Sounds. He is currently on the National Threatened Plant Panel and on the committee of the NZ Plant Conservation Network. In 2008 he was awarded the Loder Cup in recognition of his services to plant conservation.

1.0 Summary

In 2011, a total of 129 significant marine sites were identified for the first time in Marlborough (Davidson *et al.,* 2011). In 2015, the Marlborough District Council (MDC) and Department of Conservation (DOC) embarked on an ongoing survey and monitoring programme aimed at updating and improving the database of significant sites. The programme also collects data for monitoring change at selected significant sites. This programme was guided by a detailed range of survey protocols including techniques suited for rapid reconnaissance (i.e. qualitative descriptions) and techniques suitable for monitoring (i.e. quantitative and certain qualitative data) (Davidson *et al.,* 2014). Significant sites selected each year for investigation were chosen by the Expert Panel that prioritized sites on the basis they:

- Had limited or old biological information.
- Were areas where additional information was needed for management purposes.
- Were under threat or vulnerable to impacts.
- Were suitable for monitoring.
- May contain significant undocumented values.

Summer surveys have been undertaken on four previous occasions (Davidson and Richards, 2015; 2016; Davidson *et al*., 2017a, 2018a). Reports and raw data from surveys were lodged separately with the MDC. The authors also provided comment on site boundary alterations and made recommendations. At the end of each survey period, the MDC Significant Marine Site Expert Panel reviewed data, assessed sites using accepted criteria and made recommendations.

The present report outlines the Significant Marine Site Expert Panel review of sites surveyed during the fifth survey programme conducted in Pelorus Sound, Tory Channel and Catherine Cove (Davidson *et al*., 2019). The Expert Panel assessed sites using the seven criteria originally developed by Davidson *et al.* (2011) and modified by the Expert Panel in 2015 and 2016 (see Davidson *et. al.,* 2015; 2016). The updated criteria were presented in Appendix 1 of the 2017 report. No changes to the criteria were made during the present assessment (see Appendix 1).

Overall, the Expert Panel accepted recommendations proposed in the summer fieldwork report produced by Davidson *et al*. (2019). Three new sites were accepted by the Panel (Rat Point (reef), Gold Reef Bay west (biogenic community) and Nikau Bay outer coast (current swept biogenic community)). Three sites that were surveyed were rejected as they did not support features that were considered significant. New quantitative data collected for two

existing sites were accepted (Penzance Bay (elephantfish spawning), Ouokaha Island (tubeworm mounds)). Adjustments to the boundaries of two existing sites were approved (Tennyson Inlet (stable protected catchment), Deep Bay (subtidal cockle bed)). One site located at the head of Hitaua Bay (subtidal cockle bed), previously removed as a significant site was reinstated.

The Panel also assessed site sensitivity/impacts from a range of anthropogenic threats including physical disturbance. One site was recommended for urgent management action (Ouokaha Island), and other sites were recommended for future management action (e.g. at the time of forest harvest). Other recommended management actions included the selection of mooring types in Penzance Bay and widespread actions to minimise sediment originating from the Pelorus catchment.

2.0 Background

In 2011, a report outlining Marlborough's ecologically significant marine sites was produced for MDC and DOC (Davidson *et al*. 2011). The assembled group of expert authors ("Expert Panel") developed a set of criteria to assess the relative biological importance of candidate sites. Sites that received a medium or high score were termed "significant". A total of 129 significant sites were recognized and described during that process.

The authors stated that their assessment of significance was based on existing data or information; however, they noted many sites had limited or old information. Some marine sites had not been surveyed or the information available was incomplete, patchy or potentially not reflective of the current state of the sites. The authors stated more investigation was required to better assess the status of many significant sites.

The authors also stated that many of the sites not assessed as "significant" had the potential to be ranked higher in the future as more information became available. Further, they recognized the quality of some existing significant sites may decline over time due to natural or human-related events or activities. The authors, therefore, acknowledged their assessments would require updating on a regular basis.

Davidson *et al*. (2013) produced a protocol for receiving information for new candidate sites and for reassessing existing ecologically significant marine sites. The goal of that protocol was to establish consistency and to ensure a rigorous and consistent process for site identification, data collection and assessment. The aims of that report were to establish:

- The level of information required for new candidate sites.
- The process for assessing new sites and reassessing existing sites.
- A protocol for record-keeping, selection of experts and publication of new reports.

Davidson *et al.* (2014) provided guidance on the collection, storage and publication of biophysical data from potential new significant sites as well as existing sites. The biological investigation process was separated into three main elements:

- Investigation and survey of new sites.
- Collection of additional information from existing significant sites or sites that previously were not ranked as being ecologically significant.
- Status monitoring of existing significant sites (i.e. site health checks).

Davidson *et al.* (2014) also detailed a range of candidate sites for survey and monitoring. The authors also provided comment on survey protocols including techniques suited for rapid reconnaissance (i.e. qualitative descriptions) and techniques suitable for monitoring (i.e. combinations of both qualitative and quantitative data collection).

Follow-up surveys were undertaken in the summers of:

Year 1: 2014-2015, 21 sites and sub-sites in eastern Marlborough Sounds.
Year 2: 2015-2016, 15 sites, subsites in Croisilles Harbour and D'Urville Island.
Year 3: 2016-2017, 15 sites, subsites Croisilles to Waitui Bay, outer Sounds.
Year 4: 2017-2018, 14 sites in central Pelorus Sound.
Year 5: 2018-2019, 11 sites in Pelorus (8), Tory Channel (2)and Catherine Cove (1).

Davidson and Richards (2015, 2016) and Davidson *et al*. (2017a, 2018a, 2019) summarised the new biological data, while raw data and compiled spreadsheets summarising data were provided to MDC for storage. The authors also commented on site boundary alterations and recommended changes to the assessments of significance. After all summer surveys, the Expert Panel was reconvened to reassess the new information and make recommendations.

The present report presents the review by the Expert Panel for 2018-2019 (year 5) survey season reported in Davidson *et al*. (2019). The Panel also commented on anthropogenic threats and vulnerability of significant sites.

3.0 The assessment process

3.1 Data collation

All data collected by Davidson *et al*. (2019) were compiled and made available to the expert panel during the present review. Davidson *et al*. (2019) described six potential new significant sites and provided new data for five existing or previous significant sites (Table 1).

Information collected during fieldwork included: high definition and low-resolution drop camera photographs, handheld still photography, handheld video, remote video, sonar images, and observations (note: all raw data are held by MDC). Information relating to each original site surveyed by Davidson *et al.* (2011) was also compiled and made available including: site description, site boundaries, ecological assessment, and any data previously compiled or known for the site or sub-site.

3.2 Expert Panel

For the present review, most of the Expert Panel involved in the Davidson *et al*., (2011) report and 2015, 2016, 2017 and 2018 reviews were reconvened, apart from Sam du Fresne (marine mammals), Peter Gaze (birds) and Shannel Courtney (plants). Sean Handley (NIWA) replaced existing member Bruno Brosnan in 2017. Information was also reviewed by the other panel members to ensure consistency. Sam du Fresne, Peter Gaze and Shannel Courtney were not involved in the present reassessment meeting as no new or resurveyed marine mammal, bird or plant sites were under scrutiny.

4.0 Wording of the assessment criteria

During previous Expert Panel reviews (Davidson *et al.* 2015; 2016), panel members recognized a need to clarify some of the original assessment criteria used by Davidson *et al.* (2011) to avoid any possible misinterpretation. Some further minor revisions to the criteria were also proposed and adopted during the 2017 review.

The present assessment made no alterations to the 2017 criteria (see Appendix 1 for the revised current criteria). During this process, the Expert Panel took care not to create an inconsistency between the sites assessed in Davidson *et al*. (2011) and subsequent reassessments. It is recognised, however, that some 2011 significant sites will require reassessment using the 2017 criteria to ensure consistency. Existing sites may also need to be reassessed considering information from new or other existing sites (e.g. where criteria are relative scores such as “the best of their kind”). A review of criteria is also being considered.

5.0 Review of survey sites (2017-2018)

The Expert Panel assessed all sites based on the information and proposed changes presented in Davidson *et al*. (2019) and recommended to:

- <u>Accept</u> three of the six new sites and <u>reject</u> the other three that were investigated (Table 1).
- <u>Accept</u> boundary adjustments at two existing significant sites.
- <u>Accept</u> new quantitative data collected from two sites.

Significant site boundary refinements and new sites resulted in an overall increase of 760.6 ha (Table 1). Most of this increased area was located in Tennyson Inlet (740.22 ha).

Table 1. Summary of significant sites and assessment by the expert review panel.

Sites (Davidson *et al.* , 2019)	Biological features	Review panel recommendations	Original data	New area (ha)	Change (ha)	Reason/s for change
Site 3.9 Tennyson Inlet (stable protected catchment)	Stable catchments	Adjust boundary to encompass values	1211.68	1951.9	740.22	Data for new seabed
Site 3.28 Penzance Bay (elephantfish egg-laying)	Elephantfish spawning habitat	Accept new data	6.68	6.68	0.00	Additional quantitative data
Site 3.26 Ouokaha Island (tubeworm mounds)	Tubeworm mounds	Accept new data	6.5	6.5	0.00	Additional quantitative data
Site 5.5 Hitaua Bay Head (estuary and cockle bed)	Estuary and subtidal cockle bed	Reinstate site	1.86	1.96	0.10	Site recovery
Site 5.7 Deep Bay (subtidal cockles)	Subtidal cockle bed	Adjust boundary to encompass values	1.8	1.97	0.17	Improved detail of survey
Rat Point (reef)	Large reef	Accept new site		2.03	2.03	Data for new site
Nikau Bay outer coast (biogenic community)	Current swept community	Accept new site		16.5	16.50	Data for new site
Gold Reef Bay (west) (biogenic community)	Ascidian and horse mussel biogenic community	Accept new site		1.57	1.57	Data for new site
Pukatea Bay (east)		Reject as a site				Values not medium or high
Pigyard Bay (west)		Reject as a site				Values not medium or high
Catherine Cove (north)		Reject as a site				Values not medium or high
Totals			1228.52	1989.11	760.6	
Increase to significant sites (ha)					760.6	
Decrease to significant sites (ha)					0.0	

6.0 Site summaries including expert panel review for each site (see green shading).

Site 3.9 Tennyson Inlet (stable catchment)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number	3.9	3.9
Site name	Tennyson Inlet	Tennyson Inlet
Site description	Tennyson Inlet is located at the western end of Tawhitinui Reach, 22 km north of Havelock. It has a main reach with many small bays including Tawa, Tuna, Deep and Matai Bays (Godsiff Bay). The Inlet is well separated from the rest of the Sound due to its geographic location, as a result water residency times are likely to be some of the longest in the Sounds. There is a relatively low variety of subtidal habitats and species compared to other areas in the Marlborough Sounds (Davidson *et al*., 2011).	
Ecological description of attributes	Tennyson Inlet is recognised as the largest bay complex in the Marlborough Sounds surrounded by stable and protected native forest catchments (Davidson *et al*., 2011).	
Biogeographic area	Pelorus Sound	
Level of original information	2. Qualitative internal report	
Date of original assessment	01/09/2011	
Report	Davidson R. J.; Duffy C.A.J.; Gaze P.; Baxter, A.; DuFresne S.; Courtney S.; Hamill P. 2011. Ecologically significant marine sites in Marlborough, New Zealand. Co-ordinated by Davidson environmental limited for Marlborough District Council and Department of Conservation.	
Field work (present)		
Date	17-18 March 2018; 16th April 2019	
Lead organisation	Davidson Environmental	
Personnel	Rob Davidson, Courtney Rayes, Tom Scott-Simmonds	
Site Characteristics		
Original area of significant site (ha)	1211.68	
Suggested revision of significant site (ha)	1884.9	
Marine zone	Sublittoral (low tide to continental shelf)	
Depth range (m)	3-25 m	
Wave Climate	Sheltered coast (enclosed or semi-enclosed water body)	
Methods		
Method of assessment	Drop camera (cable remote) HD photographs (remote underwater) HD video (remote underwater) Sonar Scan	
Substratum (revised site)		
Substrata (widespread and dominant >50% cover)	Silt	
Substrata (widespread and dominant >50% cover)		
Substrata (widespread and dominant >50% cover)		
Substrata (common 30-50% cover)	Fine sand	
Substrata (common 30-50% cover)		
Substrata (common 30-50% cover)		
Substrata (minor <30%)	Dead whole shell	
Substrata (minor <30%)	Dead broken shell	
Substrata (localised patch or patches)	Bedrock	
Substrata (localised patch or patches)	Boulder	
Substrata (localised patch or patches)	Cobble	
Important species (revised site)		
Are important species present?	Yes	
Important species 1	Elephantfish egg cases present	
Species status	Conservation/scientific importance	
Human Impacts		
Damage and or impacts noted	Exotic species. *Asperococcus bullosus* was observed in Ngawhakawhiti Bay. Introduced tubeworms (*Chaetopterus*) common an some locations around coastal edges.	
Proportion of significant site effected	< 10%	
Level of impact	Patchy	
Type of damage or activity observed	Introduced or exotic species	
Type of damage or activity observed	Sedimentation	

SIGNIFICANT SITE SUMMARY	Existing and present survey information	Expert panel assessment
Original area of significant site (ha)	1211.68	1211.68
Recommended area of significant site (ha)	1884.9	1951.9
Change to original site	Increase	Increase
Change (ha)	673.22	740.22
Percentage change from original area (%)	55.6%	61.1%
Anthropogenic disturbance	Low	Low
Species/habitat sensitivity	Sensitive	Sensitive
Anthropogenic vulnerability	Low-moderate	Low-moderate
Assessment criteria scores	**Assessment criteria scores (original)**	**Assessment criteria scores (present review)**
1. Representativeness	H (high)	H (high)
2. Rarity	L (low)	L (low)
3. Diversity	L (low)	L (low)
4. Distinctiveness	L (low)	L (low)
5. Size	H (high)	H (high)
6. Connectivity	H (high)	H (high)
7. Catchment	H (high)	H (high)
Comments	New elephantfish spawning area documented in Penzance Bay (see site 3.29). New site in Matai Bay (see site 3.28). Exotic algae *Asperococcus bullosus* (Nelson and Knight, 1995) was present in Ngawhakawhiti Bay. When abundant, this species smothers the benthos and may deter elephantfish from spawning as this species of shark selects a particular range of substrates to lay egg cases. Exotic tubeworm (Chaetopteridea) abundant at some locations around coastal edges. In New Zealand there have been many recent reports of the parchment-like tubes of *Chaetopterus* littering beaches, especially after storms (Wikipedia, 2018). Since about 1995, large areas of shallow sea have been invaded by the worm, believed to be C. variopedatus. Since about 1995, divers reported seeing whole areas of the sea bed covered in parchment-like tubes (http://www.seafriends.org.nz/indepth/invasion.htm). Washed up by storms, these tubes break into millions of parchment shreds that litter our beaches, decaying very slowly. Large beds of *Chaetopterus* were observed in Grove Arm, inner Queen Charlotte Sound in 1989-90, and were colonised by a number of native seaweeds (particularly *Lenormandia chauvini*) and invertebrates (e.g. *Corbula, Pecten, Chirodota*) (C. Duffy pers. obs.). *C. variopedatus* builds and lives permanently in a tough, flexible, papery U-shaped tube buried in soft substrate with both ends protruding like little chimneys. The worm is segmented, pale coloured and up to twenty-five centimetres long. The anterior end is short and has bristle-bearing segments and a shovel-like mouth. The middle section bears parapodia. On the 12th segment these are modified into long wing-like structures which secrete mucus and form a bag. The parapodia on segments 13, 14 and 15 are fused into three paddle-shaped, piston-like structures, the purpose of which is to pump water through the tube. The water is drawn in through the anterior end and expelled through the posterior end, passing through the fine mesh of the mucus bag where food particles get trapped. The mucus bag is later rolled up and passed by a conveyor belt of whipping hairs in the ciliated dorsal groove to the mouth where it is swallowed whole. The posterior half of the worm is segmented and tapers towards the rear, bearing appendages on each segment.	Tennyson Inlet habitats and communities may be biologically different to bays with modified catchments. This can only be determined by thorough quantitative sampling. Until this is done the site is ranked as low rarity and distinctiveness. Assessment of estuarine areas will be conducted separately and were not included in this assessment. The panel believed the northern addition to the significant site is justified as it encompasses areas with adjacent protected forest. An area around the Elaine Bay was excluded due to the privately owned land parcel planted in pines. The boundary was established approximately 300 m from shore as sedimentation impacts can extend considerable distance from shore (Fransen *et al*., 1998; Urlich, 2015).
Recommendations	Adopt new site boundaries.	Adjust boundaries to include northern new area.

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	Davidson, R.J.; Richards, L.A.; Rayes, C.; Scott-Simmonds, T. 2018. Significant marine site survey and monitoring programme (survey 4): Summary report 2017-2018. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report number 878.	

Site 3.26 Ouokaha Island (tubeworm mounds)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number	3.26	3.26
Site name	Ouokaha Island	Ouokaha Island (tubeworm mounds)
Site description	Ouokaha Island is an approximately 4.02 ha island located at the southern tip of Hopai Peninsula, Crail Bay. The significant site is located along the western side and the channel	
Ecological description of attributes	Hay (1990) stated " From the low water mark to about 3 metres depth there is a fairly thick band of seaweed comprising *Cystophora torulosa* , *C. retroflexa* , *Carpophyllum flexuosum* and *Sargassum sinclairii* . Occasionally there are small clumps of *Hormosira* - an unusual feature since the plant is usually confined to the intertidal zone. Sponges were recorded, especially the sulphur sponge *Aplysilla sulfurea* . At about 22 m depth, most of the bedrock is covered with shelly debris and muddy sand. This marks the upper limit of a zone of horse mussels, *Atrina zelandica* , which extends to 27 m depth. Below this depth there is a thick, gooey mud with a few burrows and dead shells. The horse mussels support a rich epibiota of sponges, chitons, window oysters, fan shells and brachiopods. The ribbed, red brachiopod, *Terebratella sanguinea* , is very abundant below 17 m depth, and is free living on shell fragments or pieces of polychaete worm tube and dead brachiopod valves. Near the southwestern end of the peninsula, especially, there are large, brittle mounds of colonies of the tubeworm *Galeolaria hystrix* . Scallops were found sporadically below about 15 m depth. The large starfish, *Coscinasterias,* is also common at this depth and was observed feeding on juvenile *Atrina* as well as a variety of bivalves. Fish seen included the spotty, triplefin, blue cod, kahawhai, stargazer and eagle rays.	
Biogeographic area	Pelorus Sound	
Level of original information	2. Qualitative internal report	
Date of original assessment	01/09/2011	
Report	Hay, C.H. 1990. The hydrography and benthic marine biota of Crail Bay, Pelorus Sound: A general account. Unpublished report prepared for NZ Resort & Condominium Development Ltd. Held by Marlborough District Council technical library number: L001241	
Field work (present)		
Date	6 March 2019	
Lead organisation	Davidson Environmental	
Personnel	Rob Davidson, Courtney Rayes, Tom Scott-Simmonds	
Site Characteristics		
Original area of significant site (ha)	6.5	
Suggested revision of significant site (ha)	6.5	
Marine zone	Sublittoral (low tide to continental shelf)	
Depth range (m)	0-30 m	
Wave Climate	Sheltered coast (enclosed or semi-enclosed water body)	
Methods		
Method of assessment	Diver quantitative data Photographs (handheld surface)	
Substratum (revised site)		
Substrata (widespread and dominant >50% cover)	Cobble	
Substrata (widespread and dominant >50% cover)		
Substrata (widespread and dominant >50% cover)		
Substrata (common 30-50% cover)	Boulder	
Substrata (common 30-50% cover)	Silt	
Substrata (common 30-50% cover)	Fine sand	
Substrata (minor <30%)	Dead whole shell	
Substrata (minor <30%)	Dead broken shell	
Substrata (localised patch or patches)	Bedrock	
Substrata (localised patch or patches)		
Substrata (localised patch or patches)		
Important species (revised site)		
Are important species present?	Yes	
Important species 1	*Galeolaria hystrix* mounds	
Species status	Biogenic habitat forming	
Biogenic type (if applicable)	Tubeworm mounds (e.g. G. hystrix)	
Human Impacts		
Damage and or impacts noted	Yes, damaged tubeworm mounds (11 % of mounds impacted)	
Proportion of significant site effected	< 10%	
Level of impact	Davidson et al. (2018) documented recreational fishing vessels around the island during their brief survey in January 2018. Their divers also observed several damaged mounds. The	
Type of damage or activity observed	Anchor damage or marks on benthos	

SIGNIFICANT SITE SUMMARY	Existing and present survey information	Expert panel assessment
Original area of significant site (ha)	6.5	6.5
Recommended area of significant site (ha)	6.5	
Change to original site	No change	
Change (ha)	0	
Percentage change from original area (%)	NA	
Anthropogenic disturbance	Moderate	
Species/habitat sensitivity	Extremely sensitive	
Anthropogenic vulnerability	High	
Assessment criteria scores	**Assessment criteria scores (original)**	**Assessment criteria scores (present review)**
1. Representativeness	H (high)	H (high)
2. Rarity	M (medium)	M (medium)
3. Diversity	M (medium)	M (medium)
4. Distinctiveness	M (medium)	M (medium)
5. Size	H (high)	H (high)
6. Connectivity	L (low)	L (low)
7. Catchment	L (low)	L (low)
Comments	Presence of large *Galeolaria* mounds. Mounds are large and although not abundant are common along the inshore areas of this coast (1 every 35 square meters). Large mounds are not common or widespread in Pelorus Sound, therefore this site is one of the better examples of a site that supports mounds.	The panel noted that Hay (1990) reported horse mussels from c. 17-27 m depth but considered that despite the loss of horse mussels from the site the presence of large tube worm mounds and other significant epifauna such as sponges and brachiopods means it retains significant values. The reason for the loss of horse mussels from the site is unknown.
Recommendations	Restrict anchoring within the site. Kill wilding pines. Monitor tubeworm mound abundance and damage.	No change to existing significant site. Update database to include new data.

Site 3.28 Penzance Bay (elephantfish spawning)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number	3.28	3.28
Site name	Penzance Bay (elephantfish spawning)	Penzance Bay (elephantfish spawning)
Site description	Penzance Bay is located along the northern shores of Tennyson Inlet. The Bay supports a small settlement of mostly holiday homes, a jetty and launching ramp. The site overlaps with the larger Tennyson Inlet significant site (Davidson et al., 2011; Davidson et al., 2018).	
Ecological description of attributes	Site used by elephantfish to lay eggs. At present the site has the highest abundance of egg cases for any site known in the Sounds.	
Biogeographic area	Pelorus Sound	
Level of original information	2. Qualitative internal report	
Date of original assessment	01/09/2011	
Report	Davidson R. J.; Duffy C.A.J.; Gaze P.; Baxter, A.; DuFresne S.; Courtney S.; Hamill P. 2011. Ecologically significant marine sites in Marlborough, New Zealand. Co-ordinated by Davidson environmental limited for Marlborough District Council and Department of Conservation.	
Field work (present)		
Date	6th March 2019	
Lead organisation	Davidson Environmental	
Personnel	Rob Davidson, Courtney Rayes, Tom Scott-Simmonds	
Site Characteristics		
Original area of significant site (ha)	6.68	
Suggested revision of significant site (ha)	6.68	
Marine zone	Sublittoral (low tide to continental shelf)	
Depth range (m)	7-13 m	
Wave Climate	Sheltered coast (enclosed or semi-enclosed water body)	
Methods		
Method of assessment	Diver quantitative data Photographs (handheld surface)	
Substratum (revised site)		
Substrata (widespread and dominant >50% cover)		
Substrata (widespread and dominant >50% cover)		
Substrata (widespread and dominant >50% cover)		
Substrata (common 30-50% cover)	Fine sand	
Substrata (common 30-50% cover)	Silt	
Substrata (common 30-50% cover)		
Substrata (minor <30%)	Dead whole shell	
Substrata (minor <30%)	Dead broken shell	
Substrata (localised patch or patches)		
Substrata (localised patch or patches)		
Substrata (localised patch or patches)		
Important species (revised site)		
Are important species present?	Yes	
Important species 1	Elephantfish spawning	
Species status	Conservation/scientific importance	
Biogenic type (if applicable)		
Human Impacts		
Damage and or impacts noted	Fine sediment present, moorings may disturb egg cases, moorings restrict recreational dredging. Rubbish from boat maitenance observed.	
Proportion of significant site effected	75-100%	
Level of impact	Unknown	
Type of damage or activity observed	Sedimentation	
Type of damage or activity observed	Moorings	
Type of damage or activity observed	Rubbish	
Type of damage or activity observed		

SIGNIFICANT SITE SUMMARY	Existing and present survey information	Expert panel assessment
Original area of significant site (ha)	6.68	6.68
Recommended area of significant site (ha)	6.68	6.68
Change to original site	No change	
Change (ha)	0	
Percentage change from original area (%)	NA	
Anthropogenic disturbance	Moderate	Moderate
Species/habitat sensitivity	Unknown	Unknown
Anthropogenic vulnerability	Low-moderate	Low-moderate
Assessment criteria scores	**Assessment criteria scores (original)**	**Assessment criteria scores (present review)**
1. Representativeness	M (medium)	H (high)
2. Rarity	M (medium)	M (medium)
3. Diversity	L (low)	L (low)
4. Distinctiveness	M (medium)	M (medium)
5. Size	L (low)	L (low)
6. Connectivity	M (medium)	H (high)
7. Catchment	M (medium)	M (medium)
Comments	Highest density of egg cases known from Marlborough.	Representiveness based on one data point in time. Garne Bay was the location with the previous highest abundance, but recent data suggests numbers have declined. High connectivity due to site being surrounded by stable terrestrial. Connectivity: Tennyson Inlet significant site as well as Fitzroy Bay edges.
Recommendations	Monitor elephantfish egg case densities. Replace traditional moorings with low impact moorings where they overlap with spawning habitat. Undertake benthic clean-up to remove rubbish under boats. Educate mooring owners to ensure no further rubbish is dumped from boats.	No change to significant site.

REFERENCES		
	Nelson, W.A.; Knight, G.A. 1995. *Asperococcus bullosus* - A new record for northern New Zealand of an adventive marine brown alga. Tane, Vol. 35, PP 121-125.	Hurst, R.J.; Stevenson, M.L.; Bagley, N.W.; Griggs, L.H.; Morrison, M.A.; Francis, M.P. 2000. Areas of importance for spawning, pupping or egg-laying, and juveniles of New Zealand coastal fish. NIWA Technical Report. Final Research Report for Ministry of Fisheries Research Project ENV1999/03 Objective 1.
	Francis, M.P. 1997. Spatial and temporal variation in the growth rate of elephantfish (*Callorhinchus milii*). New Zealand Journal of Marine and Freshwater Research, Vol. 31: 9—23.	Duffy, C.; Francis, M.; Dunn, M.; Finucci, B.; Ford, R.; Hitchmough, R.; Rolfe, J. 2016. Conservation status of New Zealand chondrichthyans (chimaeras, sharks and rays), 2016. New Zealand Threat Classification Series. Department of Conservation.
	Didier, D. A. 1995: Phylogenetic systematics of extant chimaeroid fishes (Holocephali, Chimaeroidei). American Museum novitates 3119. 86 p.	
	Didier, D.A. 1993. The chimaeroid fishes: a taxonomic review with notes on their general biology. Chrondros 4(5).	

Site 3.29 Gold Reef Bay (west)(biogenic community)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number	New site	3.29
Site name	Gold Reef Bay (west)	Gold Reef Bay (west)
Site description	The Gold Bay (west) site is a stretch of coast is located within and between two small bays along the northern coast of Kenepuru Sound south-east of St Omer Bay and west of Gold Reef Bay. The benthos is relatively shallow and dominated by fine sediments. In the shallows silt with a small component of natural shell dominates, with deeper areas dominated by silt and clays (mud).	
Ecological description of attributes	Part of this area supports dense beds of the solitary ascidian (Cnemidocarpa bicornuta) and moderate number of horse mussels (Atrina zelandica) at some locations. The ascidian is often common in ports, harbours, and coastal environments (Page and Kelly, 2016). The authors state it may be locally abundant on shallow reefs and wharf piles and generally co-occurs with Cnemidocarpa nisiotis. This species of ascidian is widespread throughout New Zealand. Davidson et al., (2011) documented another high density bed of these ascidians in inner Queen Charlotte Sound (site 4.2). This is the only high density bed documented from Pelorus Sound.	
Biogeographic area	Pelorus Sound	
Level of original information	1. Brief visit	
Date of original assessment		
Report		
Field work (present)		
Date	5 April 2019	
Lead organisation	Davidson Environmental	
Personnel	Rob Davidson, Courtney Rayes, Tim Edwards	
Site Characteristics		
Original area of significant site (ha)		
Suggested revision of significant site (ha)		
Marine zone	Sublittoral (low tide to continental shelf)	
Depth range (m)	1-6 m	
Wave Climate	Sheltered coast (enclosed or semi-enclosed water body)	
Methods		
Method of assessment	Drop camera (cable remote) Sonar Scan	
Substratum (revised site)		
Substrata (widespread and dominant >50% cover)	Silt	
Substrata (widespread and dominant >50% cover)		
Substrata (widespread and dominant >50% cover)		
Substrata (common 30-50% cover)		
Substrata (common 30-50% cover)		
Substrata (common 30-50% cover)		
Substrata (minor <30%)	Dead whole shell	
Substrata (minor <30%)	Dead broken shell	
Substrata (localised patch or patches)	Cobble	
Substrata (localised patch or patches)		
Substrata (localised patch or patches)		
Important species (revised site)		
Are important species present?	No	
Important species 1		
Species status		
Biogenic type (if applicable)		
Human Impacts		
Damage and or impacts noted	None observed	
Proportion of significant site effected		
Level of impact		
Type of damage or activity observed		

SIGNIFICANT SITE SUMMARY	Existing and present survey information	Expert panel assessment
Original area of significant site (ha)		
Recommended area of significant site (ha)	1.57	1.57
Change to original site	Increase	Increase
Change (ha)	1.57	1.57
Percentage change from original area (%)	100.0%	100.0%
Anthropogenic disturbance	Low	Low
Species/habitat sensitivity	Sensitive	Sensitive
Anthropogenic vulnerability	Low	Low
Assessment criteria scores	Assessment criteria scores (original)	Assessment criteria scores (present review)
1. Representativeness	M (medium)	H (high)
2. Rarity	L (low)	L (low)
3. Diversity	L (low)	L (low)
4. Distinctiveness	L (low)	M (medium)
5. Size	M (medium)	H (high)
6. Connectivity	H (high)	L (low)
7. Catchment	H (high)	H (high)
Comments	This is the only high density bed documented from Pelorus Sound. Catchment is Ferndale Scenic Reserve with a small area of private land in the western bay.	Although adjacent land is stable and protected, the Pelorus catchment is a major source of sediment to this area. Adjacent reserve is <100 ha in size. Best known ascidian site in Pelorus.
Recommendations	Create a new significant site.	Create new site.

REFERENCES		
	Davidson, R.J.; Richards, L.A.; Rayes, C.; Scott-Simmonds, T. 2019. Significant marine site survey and monitoring programme (survey 5): Summary report 2018-2019. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report	
	Page, M,; Kelly, M. 2016. Awesome ascidians. Produced by NIWA. https://www.niwa.co.nz/coasts-and-oceans/marine-identification-guides-and-fact-sheets/seasquirt-id-guide	

Site 3.30 Nikau Bay outer coast (current swept biogenic community)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number		3.30
Site name	Nikau Bay (outer coast)	Nikau Bay (outer coast)
Site description	This coast is located approximately 15 km north of Havelock. Survey areas were the coastline between Four Fathom Bay and Nikau Bay, between Nikau and Little Nikau Bays, and a small promontory south of Little Nikau Bay.	
Ecological description of attributes	This coast was dominated by rocky substrata in the shallows, with coarser soft substrata between approximately 6-25 m depth. Below approximately 25 m depth substrata was dominated by silts and some shell. The coarse soft substrata was characterised by combinations of silt, fine sand and dead whole and broken shell. In places shell was dominant and formed with hash (broken shell) or beds of whole and broken shell. This coarse soft substrata was likely swept clear of fine substrata due to the moderate to strong currents that occur along this coast. Coarse substrata often supported a variety of current loving species dominated by colonial ascidians (*Aplidium phortax; Didemnium vexillum*) and a hydroid (*Symplectoscyphus subarticulatu* s)	
Biogeographic area	Pelorus Sound	
Level of original information	2. Qualitative internal report	
Date of original assessment	11/07/1905	
Report	Davidson, R.J.; Richards, L.A.; Rayes, C.; Scott-Simmonds, T. 2019. Significant marine site survey and monitoring programme (survey 5): Summary report 2018-2019. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report number 943.	
Field work (present)		
Date	5 April 2019	
Lead organisation	Davidson Environmental	
Personnel	Rob Davidson, Laura Richards, Courtney Rayes, Tom Scott-Simmonds	
Site Characteristics		
Original area of significant site (ha)		
Suggested revision of significant site (ha)	16.5	
Marine zone	Sublittoral (low tide to continental shelf)	
Depth range (m)	0-24 m	
Wave Climate	Sheltered coast (enclosed or semi-enclosed water body)	
Methods		
Method of assessment	Sonar Scan Drop camera (cable remote)	
Substratum (revised site)		
Substrata (widespread and dominant >50% cover)	Mud (silt and clay)	
Substrata (widespread and dominant >50% cover)		
Substrata (widespread and dominant >50% cover)		
Substrata (common 30-50% cover)		
Substrata (common 30-50% cover)		
Substrata (common 30-50% cover)		
Substrata (minor <30%)	Dead whole shell	
Substrata (minor <30%)	Dead broken shell	
Substrata (localised patch or patches)	Cobble	
Substrata (localised patch or patches)	Bedrock	
Substrata (localised patch or patches)		
Important species (revised site)		
Are important species present?	Yes	
Important species 1	Colonial ascidians, hydroids	
Species status	Biogenic habitat forming	
Biogenic type (if applicable)	Low Relief biogenic (variety of species)	
Human Impacts		
Damage and or impacts noted	Area is subjected to high sedimentation	
Proportion of significant site effected	75-100%	
Level of impact	Smothering by sediment is evident, especially as depth increases.	
Type of damage or activity observed	Sedimentation	

SIGNIFICANT SITE SUMMARY	Existing and present survey information	Expert panel assessment
Original area of significant site (ha)		
Recommended area of significant site (ha)	16.5	16.5
Change to original site	Increase	Increase
Change (ha)	16.5	16.5
Percentage change from original area (%)	100.0%	100.0%
Anthropogenic disturbance	Moderate-high	Moderate-high
Species/habitat sensitivity	Sensitive	Sensitive
Anthropogenic vulnerability	Moderate-high	Moderate-high
Assessment criteria scores	Assessment criteria scores (original)	Assessment criteria scores (present review)
1. Representativeness	H (high)	M (medium)
2. Rarity	M (medium)	L (low)
3. Diversity	M (medium)	M (medium)
4. Distinctiveness	H (high)	L (low)
5. Size	H (high)	M (medium)
6. Connectivity	H (high)	H (high)
7. Catchment	L (low)	L (low)
Comments	Presence of current swept species. Community type different than current swept habitats located further from Havelock.	We expect there may be other comparable habitats and communities along the edges of Hikapu Reach. Relative size may change when more areas are surveyed.
Recommendations	New significant site (two sub-sites).	Accept new sites

Site 3.31 Rat Point (reef)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number		3.31
Site name	Rat Point reef	Rat Point (reef)
Site description	Rat Point is located on the northern shoreline of Waitata Bay, near Waitata Reach, Pelorus Sound. A reef extends from the small promontory for some 270 m distance from the tip of Rat Point.	
Ecological description of attributes	This is one of the largest reef structures known from inside Pelorus Sound. Based on drop camera images the reef supports numerous Ancorina sponges and patches of tubeworm mounds (*G. hystrix*).	
Biogeographic area	Pelorus Sound	
Level of original information		
Date of original assessment		
Report		
Field work (present)		
Date	9 April 2019	
Lead organisation	Davidson Environmental	
Personnel	Rob Davidson, Courtney Rayes, Tom Scott-Simmonds	
Site Characteristics		
Original area of significant site (ha)		
Suggested revision of significant site (ha)	2.03	
Marine zone	Sublittoral (low tide to continental shelf)	
Depth range (m)	0-30 m	
Wave Climate	Sheltered coast (enclosed or semi-enclosed water body)	
Methods		
Method of assessment	Sonar Scan Drop camera (cable remote)	
Substratum (revised site)		
Substrata (widespread and dominant >50% cover)	Bedrock	
Substrata (widespread and dominant >50% cover)		
Substrata (widespread and dominant >50% cover)		
Substrata (common 30-50% cover)		
Substrata (common 30-50% cover)		
Substrata (common 30-50% cover)		
Substrata (minor <30%)	Dead whole shell	
Substrata (minor <30%)	Dead broken shell	
Substrata (localised patch or patches)	Cobble	
Substrata (localised patch or patches)		
Substrata (localised patch or patches)		
Important species (revised site)		
Are important species present?	Yes	
Important species 1	*Galeolaria hystrix* mounds	
Species status	Biogenic habitat forming	
Biogenic type (if applicable)	Tubeworm mounds (e.g. G. hystrix)	
Human Impacts		
Damage and or impacts noted	None observed	
Proportion of significant site effected		
Level of impact	No impacts observed. Adjacent marine farms are not located over reef habitat (Note: one part of an adjacent farm has a MPI exclusion zone for growing structures to avoid cobbles).	
Type of damage or activity observed		

SIGNIFICANT SITE SUMMARY	Existing and present survey information	Expert panel assessment
Original area of significant site (ha)		
Recommended area of significant site (ha)	2.03	
Change to original site	Increase	
Change (ha)	2.03	
Percentage change from original area (%)	100.0%	
Anthropogenic disturbance	Unknown	
Species/habitat sensitivity	Sensitive	
Anthropogenic vulnerability	Low	
Assessment criteria scores	**Assessment criteria scores (original)**	**Assessment criteria scores (present review)**
1. Representativeness	H (high)	M (medium)
2. Rarity	M (medium)	L (low)
3. Diversity	M (medium)	M (medium)
4. Distinctiveness	H (high)	M (medium)
5. Size	H (high)	H (high)
6. Connectivity		M (medium)
7. Catchment	L (low)	L (low)
Comments	One of longest reef structures inside Pelorus Sound. Presence of large sponges, encrusting organisms and *Galeolaria* mounds.	May be longest reef inside Pelorus Sound. Biogenic patches on reef are of interest.
Recommendations	New significant site.	Create new significant site.

Site 5.5 Hitaua Bay (estuary and subtidal cockle bed)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number	5.5	5.5
Site name	Hitaua Bay	Hitaua Bay (estuary and subtidal cockle bed)
Site description	Hitaua Bay is located on the southern shoreline of Tory Channel, towards the western entrance to Queen Charlotte Sound. It has 5km of coastline, a sea area of 84.6 ha, and is approximately 920m across the bay mouth. Hitaua Bay is 18 km by water from Picton and 15 km from Cook	
Ecological description of attributes	Hitaua Bay Estuary was ranked as the best example of an estuarine habitat in the Tory Channel biogeographic area (Davidson et al., 2011). Davidson and Richards (2015) resurveyed the area and stated "although it still supports estuarine habitats, it appears to have recently been influenced by the deposition of fine sediment from the logged catchment. Observations show a build-up of fine sediment over and around intertidal cobbles and a disappearance of some intertidal species compared to a baseline survey conducted in 2003". The authors also stated, "cockles do remain in comparable densities to 2003, however their mean size appears to have declined." Davidson and Richards (2015) concluded "the site is no longer the best example of an estuarine habitat in Tory Channel and it is recommended that it be removed from the list of significant sites." The review panel agreed, and the site was removed as a significant site (Davidson et al., 2015).	
Biogeographic area	Pelorus Sound	
Level of original information	3. Quantitative internal report	
Date of original assessment	01/09/2011	
Report	Davidson R.J.; Duffy C.A.J.; Gaze P.; Baxter A.; Du Fresne S.; Courtney S. 2011. Ecologically significant marine sites in Marlborough, New Zealand. Co-ordinated by Davidson Environmental Limited for Marlborough District Council and Department of Conservation.	
Field work (present)		
Date	5 March 2019	
Lead organisation	Davidson Environmental	
Personnel	Rob Davidson, Courtney Rayes, Tom Scott-Simmonds	
Site Characteristics		
Original area of significant site (ha)	1.86	
Suggested revision of significant site (ha)	1.97	
Marine zone	Intertidal (littoral)	
Depth range (m)	0-2 m	
Wave Climate	Sheltered coast (enclosed or semi-enclosed water body)	
Methods		
Method of assessment	Diver quantitative data Photographs (handheld surface) HD video (handheld underwater)	
Substratum (revised site)		
Substrata (widespread and dominant >50% cover)	Cobble	
Substrata (widespread and dominant >50% cover)		
Substrata (widespread and dominant >50% cover)		
Substrata (common 30-50% cover)		
Substrata (common 30-50% cover)		
Substrata (common 30-50% cover)		
Substrata (minor <30%)	Silt	
Substrata (minor <30%)	Granule	
Substrata (localised patch or patches)		
Substrata (localised patch or patches)		
Substrata (localised patch or patches)		
Important species (revised site)		
Are important species present?	Yes	
Important species 1	Cockle bed	
Species status	Iconic	
Biogenic type (if applicable)		
Human Impacts		
Damage and or impacts noted	Yes, some sedimentation	
Proportion of significant site effected	75-100%	
Level of impact	Fine sediment is present and widespread over the intertidal, however, it has declined since the	
Type of damage or activity observed	Sedimentation	

SIGNIFICANT SITE SUMMARY	Existing and present survey information	Expert panel assessment
Original area of significant site (ha)	1.86	
Recommended area of significant site (ha)	1.97	
Change to original site	Increase	
Change (ha)	0.11	
Percentage change from original area (%)	5.9%	
Anthropogenic disturbance	Moderate	
Species/habitat sensitivity	Sensitive	
Anthropogenic vulnerability	High	
Assessment criteria scores	**Assessment criteria scores (original)**	**Assessment criteria scores (present review)**
1. Representativeness	M (medium)	M (medium)
2. Rarity	L (low)	L (low)
3. Diversity	M (medium)	M (medium)
4. Distinctiveness	M (medium)	M (medium)
5. Size	L (low)	M (medium)
6. Connectivity	L (low)	M (medium)
7. Catchment	L (low)	L (low)
Comments	Habitats have recovered over time. Cockle bed again supports larger individuals.	Size: Estuary size relative to other estuaries in Tory Channel is moderate to large, but may change if and when other estuarine areas in Tory Channel are surveyed. Subtidal cockle bed is of scientific interest and is not a common feature in Sounds.
Recommendations	Restrict anchoring within the site. Kill wilding pines near wetland. Monitor tubeworm mound	Accept as a significant site.

REFERENCES		
	Davidson, R. J.; Baxter, A. S.; Duffy, C. A. J.; Gaze, P.; du Fresne, S.; Courtney, S.; Brosnan, B. 2015. Reassessment of selected significant marine sites (2014-2015) and evaluation of protection requirements for significant sites with benthic values. Prepared by Davidson	
	Davidson, R.J. and Richards, L.A. 2015. Significant marine site survey and monitoring programme: Summary 2014-2015. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report number 819.	
	Davidson, R. J.; Richards L. 2003: Biological report on three sites in Tory Channel in relation to recent or proposed forestry activities. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and Monitoring Report No. 444.	

Site 5.7 Deep Bay (subtidal cockle bed)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number	5.7	5.5
Site name	Deep Bay	Deep Bay (subtidal cockle bed)
Site description	Deep Bay (40 ha) is located along the northern coastline of Tory Channel (Figure 1). The bay is approximately 1.2 km in length and up to 350 m wide. The bay is relatively shallow	
Ecological description of attributes	Davidson et al. (2011) ranked the deap of Deep Bay as a significant site. The authors stated "there is a cockle bed at the head of Deep Bay (Davidson and Richards, 2003a). It is low density compared to other areas in Tory Channel, but individual cockles are extremely large and therefore of scientific interest. In March 2019, the area was resurveyed, and the presence of large subtidal cockles was confirmed (Davidson et al., 2019). The authors reported cockle density ranged from 0 to 4 individuals per core sample or 0 to 226 individuals per m^2 (Table 8). In the previous 2003 survey, cockle density ranged from 0 to 5 individuals per core sample or 0 to 283 individuals per m^2. Mean cockle size from another bay in Tory Channel and several bays in Pelorus Sound, showed Deep Bay supported the largest cockles in Marlborough and perhaps the South Island.	
Biogeographic area	Pelorus Sound	
Level of original information	3. Quantitative internal report	
Date of original assessment	01/09/2011	
Report	Davidson R.J.; Duffy C.A.J.; Gaze P.; Baxter A.; Du Fresne S.; Courtney S. 2011. Ecologically significant marine sites in Marlborough, New Zealand. Co-ordinated by Davidson Environmental Limited for Marlborough District Council and Department of Conservation.	
Field work (present)		
Date	5 March 2019	
Lead organisation	Davidson Environmental	
Personnel	Rob Davidson, Courtney Rayes, Tom Scott-Simmonds	
Site Characteristics		
Original area of significant site (ha)	1.8	
Suggested revision of significant site (ha)	1.8	
Marine zone	Sublittoral (low tide to continental shelf)	
Depth range (m)	0-6 m	
Wave Climate	Sheltered coast (enclosed or semi-enclosed water body)	
Methods		
Method of assessment	Diver quantitative data Photographs (handheld surface)	
Substratum (revised site)		
Substrata (widespread and dominant >50% cover)	Mud (silt and clay)	
Substrata (widespread and dominant >50% cover)		
Substrata (widespread and dominant >50% cover)		
Substrata (common 30-50% cover)		
Substrata (common 30-50% cover)		
Substrata (common 30-50% cover)		
Substrata (minor <30%)	Fine sand	
Substrata (minor <30%)		
Substrata (localised patch or patches)		
Substrata (localised patch or patches)		
Substrata (localised patch or patches)		
Important species (revised site)		
Are important species present?	Yes	
Important species 1	Cockle bed	
Species status	Iconic	
Biogenic type (if applicable)		
Human Impacts		
Damage and or impacts noted	Yes, some surface sedimentation	
Proportion of significant site effected	75-100%	
Level of impact	Fine sediment is present on surface of substidal sediments. No change to cockle bed.	
Type of damage or activity observed	Sedimentation	

SIGNIFICANT SITE SUMMARY	Existing and present survey information	Expert panel assessment
Original area of significant site (ha)	1.8	
Recommended area of significant site (ha)	1.97	
Change to original site	Increase	
Change (ha)	0.17	
Percentage change from original area (%)	9.4%	
Anthropogenic disturbance	Low-moderate	
Species/habitat sensitivity	Sensitive	
Anthropogenic vulnerability	Low-moderate	
Assessment criteria scores	**Assessment criteria scores (original)**	**Assessment criteria scores (present review)**
1. Representativeness	M (medium)	H (high)
2. Rarity	L (low)	M (medium)
3. Diversity	L (low)	L (low)
4. Distinctiveness	M (medium)	M (medium)
5. Size	L (low)	H (high)
6. Connectivity	L (low)	M (medium)
7. Catchment	L (low)	L (low)
Comments	No change to cockle bed after logging events. Cockle bed supports large individuals in low density.	Large cockles in a subtidal location of scientific interest. Cockles of this size rare and best example in Sounds. Largest known subtidal bed in Tory Channel.
Recommendations	Ensure future logging is conducted to minimize impacts from a large rainfall event.	Adjust boundary.

REFERENCES		
	survey and monitoring programme (survey 5): Summary report 2018-2019. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring	
	Davidson, R. J.; Richards L. 2003: Biological report on three sites in Tory Channel in relation to recent or proposed forestry activities. Prepared by Davidson Environmental	

6.0 Significant site sensitivity and anthropogenic disturbance

6.1 Anthropogenic impacts

Ranking of significant sites in Davidson *et al*. (2011) revealed the biological assemblages they supported were often uncommon with many representing one of few or the last of their kind in each biogeographic area. The existence of significant sites or their persistence was often attributed to environmental factors such as topography or substratum providing some level of natural protection from anthropogenic impacts.

Many of Marlborough's significant marine sites are thought to be remnants of habitats and communities historically more widespread (Davidson *et al*., 2011; Davidson and Richards 2015; 2016; Handley 2015, 2016; Davidson *et al*., 2017; 2018). This situation reflects a global trend of declining biogenic habitat area and quality with consequential effects on wider ecological values (Thrush *et al.,* 2006a, 2006b; Gray *et al.,* 2006; Lotz *et al*., 2006; Airoldi *et al.,* 2008; McCauley *et al.,* 2015; Anderson *et al*., 2019). Aside from climate change effects, key threats to biogenic habitats include bottom trawling, shellfish dredging, sedimentation, invasive species, coastal infrastructure, water quality and port-related dredging (MacDiarmind et al., 2012). Anderson *et al*. (2019) stated: "biogenic habitats growing along the New Zealand coast (e.g. eelgrass meadows, mangrove forests and kelp forests) especially those close to urban areas, face a range of threats and stresses associated with increased sedimentation, benthic disturbance through coastal development (infrastructure) and coastal maintenance (e.g. channel dredging), along with declines in water quality (e.g. increased suspended sediments, nutrification and pollution) associated with these activities". The authors also stated: "although some biogenic habitats occur within Marine Reserves, and they are afforded protection against direct physical disturbance (e.g. benthic fishing activities), they do not safeguard them against key threats from land-based issues such as sediment and nutrient run-off."

A decline in biogenic habitats in New Zealand has been linked to declining juvenile fish habitat and identified as a contributor to declines in fish abundance and biomass (see Morrison *et al*. 2014 for review). Hurst *et al*. (2000) stated: "The Environmental Principles of the 1996 Fisheries Act require that habitat of particular significance for fisheries management should be protected". Because the Fisheries Act 1996 has not prevented the continued fragmentation and loss of habitats (e.g. Davidson & Richards 2015; Urlich 2017), Urlich *et al*. (2018) contend that the definition of "maintained" (see: CBD, NZBS, Fisheries Act 1996) has not prevented the frequency and extent of fishing disturbance from outstripping the recovery potential of resident organisms, highlighting the need for management of cumulative impacts on the seafloor. Urlich *et al*. (2018) proposed that anthropogenic disturbance should be managed to "safeguard" ecological functioning of biogenic habitats as fundamental coastal processes underpinning biodiversity and its contingent ecological complexes.

Importantly, significant sites that support biogenic habitats have often been described as important to juvenile fish (Diaz, *et al*., 2003; Dahlgren *et al*., 2006; McCain *et al*., 2016). Wilson *et al*. (2010) for example reported habitat degradation compounded effects of fishing on coral reefs as increased fishing reduces large-bodied target species, while habitat loss resulted in fewer small-bodied juveniles and prey that replenish stocks and provide dietary resources for predators. Loss and degradation of marine biological values around New Zealand and internationally has usually been linked to anthropogenic activities (Lauder 1987, Stead 1991, Cranfield *et al.* 1999, Cranfield *et al.* 2003, Morrison *et al.,* 2009; Davidson *et al.,* 2011; Paul 2012; Morrison *et al.,* 2014, 2014a; Handley 2015, 2016). Direct physical disturbance by trawling and dredging for example, has been assessed as one of the main causes of damage to marine benthic biological values (MacDiarmid *et al.*, 2012; MfE, 2016). It is likely that without protection or strong management, Marlborough's less resilient significant marine sites will continue to be lost or degraded with consequential impacts on fish abundance.

Davidson and Richards (2015) highlighted the decline of biological attributes at several significant sites originally identified by Davidson *et al.* (2011), including sites becoming smaller and some being functionally lost. In contrast, Davidson and Richards (2016) did not document loss that could be directly attributed to human activities; rather site boundaries were adjusted based on improved information and data. Davidson *et al*. (2017a) reported that some sites were adversely affected by anthropogenic activities. In the most recent study, Davidson *et al*. (2018; 2019) reported many sites were altered in size due to improvements in survey detail, while others had their attributes degraded by physical disturbance, exotic species and/or increased sedimentation.

Some biogenic habitats once damaged and lost may not recover, but rather may shift to an alternate ecosystem state (Airoldi and Beck, 2007). Large scale historical losses of biogenic habitats have been documented in New Zealand's history (e,g, the loss of ~500 km^2 of green-lipped mussel beds within the Firth of Thames has coincided with large declines in water quality, increased sedimentation and resuspension of sediments (described in Morrison *et al*., 2014a). Large-scale losses of green-lipped mussels within Kenepuru Sounds and horse mussel beds from across the outer Marlborough Sounds are also described by long-time fishers and residents (Handley, 2015; Davidson and Richards 2015).

6.2 Threat assessment process

The Expert Panel assessed anthropogenic threats for each significant site surveyed in 2019 (Table 3) based on:

- The perceived level of anthropogenic disturbance (e.g. dredging recorded or observed).
- Species, community or habitat vulnerability to anthropogenic impact (e.g. fragile species).
- Significant site vulnerability to anthropogenic impact (e.g. site located on an offshore soft

bottom or site located next to rocky reef).

This assessment was based on the panel's collective knowledge of the biophysical characteristics of each significant site (e.g. personal knowledge) and/or from the literature (including bathymetry charts) , as well as information on the distribution and intensity of marine pressures such as bottom trawling and dredging.

Similar approaches have been adopted by Halpern *et al.* (2007) and further adapted for the assessment of New Zealand's marine environment by MacDiarmid *et al.* (2012). Robertson and Stevens (2012) described an ecological vulnerability assessment (originally developed by UNESCO (2000)) for use at estuarine sites in Tasman and Golden Bays. The UNESCO methodology was designed to be used by experts to represent how coastline ecosystems were likely to respond to potential "stressors".

Definitions for the threat categories used in the present assessment of significant sites were:

Anthropogenic disturbance: Known or expected (based on experts' experience) level of impact associated with human-related activities. Disturbance levels range from little or no disturbance (low score) to sites regularly subjected to disturbance (high score). Impacts range from direct physical disturbance to indirect effects, including those from the adjacent catchments.

Sensitivity: Assessment of the sensitivity of habitats, species and/or communities present at a site. Scores ranged from extremely sensitive biological features such as lace corals and brittle tubeworm mounds (high vulnerability score) to relatively robust species or habitats such as coarse substrate/mobile shores and high energy kelp forests (low vulnerability score).

Anthropogenic vulnerability is an assessment of the vulnerability of habitat, species and/or community to human-derived damage because of its location or the level of physical or legal protection. For example, a very shallow community is regarded as having a low vulnerability to damage from dredging and trawling, while a marine reserve has a high level of legal protection from marine-based anthropogenic impacts.

Table 3. Selected environmental categories used to assess threat.

Categories	Descriptions, definitions and examples
Anthropogenic disturbance	
Low	Little or no known human associated physical disturbance. Catchment effects low (vegetated).
Moderate	Light equipment and/or anchoring disturbance. Well managed catchment.
High	Subjected to regular or heavy equipment seabed disturbance, and/or catchments modified and poorly managed.
Sensitivity (species, habitat)	
Resilient (low or unlikely)	Algae forest, coarse mobile substrata, reef, boulder bank, high energy shore, short-lived species.
Sensitive (moderate)	Horse mussels, soft tubeworms, shellfish beds, red algae bed.
Very sensitive (high)	Massive bryozoans, sponges, hydroids, burrowing anemone.
Extremely sensitive (very high)	Lace or fragile bryozoan colonies, tubeworm mounds, rhodoliths.
Anthropogenic vulnerability	
Low	Legally or physically protected e.g. in a reserve, on rocky substrata, on a steep slope.
Moderate	Limited or difficult access e.g. close to rocks, shallow, close to shore. Limited or no legal protection.
High	Location easily accessed, no legal protection e.g. offshore soft bottom substratum.

6.3 Threat assessment summary

Of the three categories, anthropogenic disturbance is likely to be the most important consideration for the continued viability of a significant site. Any score above "low" indicates human activities are likely to be having an impact and management action is likely appropriate to ensure the continuation of natural values at the site. Six of the eight sites were scored "moderate" or higher (Table 4). One site was scored "high" due to historic high levels of sediment smothering, while another site was scored "moderate-high" due to recreational fisher anchor damage.

Species sensitivity was ranked as unknown or low at two sites. The remainder of the sites supported sensitive or extremely sensitive species or communities.

Anthropogenic vulnerability was ranked "low" at only one site. The remainder of sites ranged from "low-moderate" to "high" due to factors such as the sites exposure or proximity to threats, adjacent land status and human activities in the area or catchments.

Site 3.9 Tennyson Inlet (stable and protected catchment)

Tennyson Inlet is the largest bay complex in the Marlborough Sounds, mostly surrounded by stable and protected native forest catchments. Benthic habitats are, therefore representative of relatively low sediment inputs compared to most other areas in Pelorus Sound. The benthic habitats were ranked as sensitive to change from this state, with a "low-moderate" vulnerability to increased sediment loading. Present human impacts and use were assessed as relatively low in Tennyson Inlet compared to much of Pelorus Sound. Small settlements exist at Duncan, Penzance and Elaine Bays, but most of the catchments have little or low habitation. Forestry blocks exist on private land in the Tennyson Inlet catchment and Elaine Bay. Replanting of existing and planting of new forestry blocks requires careful consideration and, if permitted, need to be carefully managed to ensure the low sedimentation properties of this site are maintained.

Site 3.26 Ouokaha Island (tubeworm mounds)

The western side of Ouokaha Island supports the best known example of *Galeolaria* tubeworm mounds in Pelorus Sound. *Galeolaria* tubeworm beds are known from only 18.2 ha or 0.003% of the Marlborough Sounds' marine area. The Ouokaha Island site is 6.5 ha in size and supports low-density tubeworm mounds. Davidson *et al*. (2018; 2019) documented damage from anchors and their associated chains deployed by recreational fishers (11% of mounds were damaged). This site will likely continue to be reduced in quality unless anchoring is excluded. Tubeworm mounds are ranked as extremely sensitive and vulnerable to physical disturbance.

Site 3.28 Penzance Bay elephantfish spawning

High numbers of elephantfish egg cases were documented from this significant site in Penzance Bay. There is a moderate level of disturbance due to the presence of numerous moorings in the bay. These do, however, act to exclude recreational dredging. Traditional block and chain moorings likely disturb egg cases as chains are dragged over the seabed. It is, therefore, recommended that moorings be converted to low impact systems. Some rubbish associated with moored vessels were observed by divers. Dumping of rubbish from vessels is an illegal activity (Marine Pollution Regulations, 1998). Maintaining low sediment inputs from the adjacent privately owner settlement is also considered important for the maintenance of suitable spawning habitat in the bay.

Site 3.29 Gold Reef Bay (west) (biogenic community)

This site is significant due to the presence of an ascidian dominated biogenic community located in the small bays west of Gold Reef Bay. The biogenic community has been coated in silt but the impact on this species is not known (moderate-high disturbance but species may be resilient to sedimentation). The site is ranked as a moderate to high vulnerability to sediment due to its proximity to the Pelorus and Kaituna River catchments.

Site 3.30 Nikau Bay outer coast (current swept community)

This current swept benthic community located along the adges of Hikapu Reach is significant due to its biogenic community (e.g. hydroids, ascidians, sponges). The community has been impacted by sedimentation with many species coated in silt (moderate-high disturbance). These species are regarded as sensitive as they can become completely smothered and die. The site is regarded as being moderate to high vulnerability to sediment due to its proximity to the Pelorus and Kaituna River catchments.

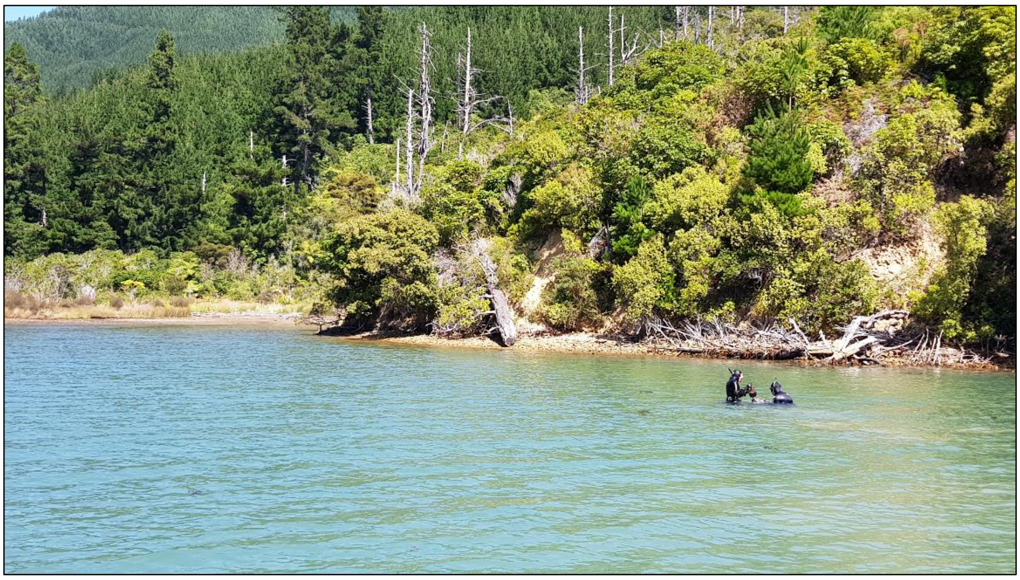
Site 3.31 Rat Point (reef)

Rat Point is significant due to the large reef structure and associated biogenic species. The reef showed no signed of any anthropogenic impacts. Tubeworm mounds were observed on the reef and these are ranked as extremely sensitive to physical disturbance. The site was ranked as having a low level of vulnerability to physical disturbance.

Site 5.5 Hitaua Bay (estuary and subtidal cockle bed)

This site is significant due to the large estuary (i.e. relative to other Tory Channel estuaries) and the presence of a subtidal cockle bed. The area was removed as a significant site in 2015 due to the smothering of estuarine and shallow subtidal habitats following logging and large rainfall events. The disturbance score, therefore, remains “high”. The intertidal flats, eelgrass and subtidal cockle beds are ranked as sensitive to impacts and the site is regarded as having a moderate to high vulnerability to future events as the catchment remains in pine plantation. Actions that minimise sediment runoff after logging events are recommended.

Cockle sampling in Hitaua Bay, 2019.



Site 5.7 Deep Bay (subtidal cockle bed)

This site is significant due to a subtidal cockle bed supporting very large individuals. The catchment was recently logged, but there is no indication the cockle bed has been adversely affected. Some terrestrially-derived sediments were observed on the seafloor. The disturbance score was, therefore, ranked as "moderate". The subtidal cockle bed was ranked as "sensitive" to impacts and the site is regarded as having a "moderate" vulnerability to future forest harvesting events. Actions that minimise sediment runoff after logging events are recommended.

Table 4. Summary of anthropogenic disturbance and vulnerability assessment for 2019 significant sites.

Sites	Anthropogenic disturbance	Sensitivity (species, habitat)	Anthropogenic vulnerability	Major issues	Comments
Site 3.9 Tennyson Inlet (stable protected catchment)	Low	Sensitive	Low-moderate	Increased sedimentation	Low levels of human impact, stable catchments, habitats vulnerable to increased sedimentation, no commercial dredging & trawling.
Site 3.26 Ouokaha Island (tubeworm mounds)	Moderate to high	Extremely sensitive	High	Recreational anchoring	Recreational fishers regularly anchor and damage tubeworm mounds (11% damaged).
Site 3.28 Penzance Bay (elephantfish egg-laying)	Moderate	Unknown	Low-moderate	Sedimentation, moorings	Areas of habitat impacted by moorings, egg case sensitivity not known, no commercial dredging & trawling. Low impact moorings would minimize impacts. Some rubbish present from mooring owners.
Site 3.29 Gold Reef Bay (west) (biogenic community)	Moderate	Resilient	Moderate to high	Sedimentation	Sediment from Pelorus catchment is deposited in Kenepuru Sound. This community is relatively resilient to the effects of sedimentation.
Site 3.30 Nikau Bay outer coast (current swept biogenic community)	Moderate	Sensitive	Moderate to high	Sedimentation	Sediment from Pelorus catchment is deposited in this area and has likely impacted the community composition.
Site 3.31 Rat Point (reef)	Low	Extremely sensitive	Low		Reef habitat, small risk of anchor damage, tubeworm mounds present and are fragile.
Site 5.5 Hitaua Bay (estuary and cockle bed)	High	Sensitive	Moderate to high	Sedimentation	Some damage to biogenic habitats from anchoring by recreational fishers likely. Dredging and trawling unlikely. Mounds are fragile.
Site 5.7 Deep Bay (subtidal cockles)	Moderate	Sensitive	Moderate	Sedimentation	Reef habitat, small risk of anchor damage, tubeworm mounds may be present

7.0 Erratum

The following are errors in Davidson *et al*. (2011).

Page 62 Map 7
Site names and numbers located in wrong positions on Map 7.
Fix: Swap Site 2.29 Witt Rock with Site 2.28 MacManaway Rocks on Map 7

Page 91 Map 15
Site names and numbers located in wrong positions on Map 15.
Fix: Swap labels 4.22 Puriri Bay with 4.23 Matiere Point on Map 15

Page 19 Table 2
Fix: Willawa Point (spelling error)

Page 73 Line 3
Fix: Replace reference numbers 337, 338, 339 with 251, 373, 374, 375

Page 73 Para 2 Line 4
Fix: Replace reference numbers 94 with 102

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Appendix 1. Assessment criteria (2017)

The following section presents the updated assessment criteria used to evaluate the ecological significance in the present review report. The ranking for each criterion are: H = High (which can be thought of as outstanding), M = Medium (which is still highly significant) and L = Low (which is more representative or typical of ecosystems that pre-dated human disturbance). Criteria scores collectively contribute to the overall site ranking and indicate the reason/s for the significance of a site. A site that does not achieve “H” or “M” is not ranked as reaching the planning threshold of being an ecologically significant site in the present report, however, such sites may possess a variety of biological attributes considered important for other reasons or have insufficient data to enable ranking.

1. Representativeness

The site is significant if it contains biological features (habitat, species, community) that represent a good example within the biogeographic area.

High: The site contains the best example of its type known from the biogeographic area.
Medium: The site contains one of the better examples, but not the best, of its type known from the biogeographic area.
Low: The site contains an example, but not one of the better or best, of its type known from the biogeographic area.

2 Rarity

The site is significant if it contains flora and fauna listed as nationally threatened nationally endangered, nationally vulnerable, or in serious decline. The site is also considered significant if it supports flora and fauna that are sparse, locally endemic, or at an extreme in their national distribution. The site is also significant if it supports a habitat or habitats or community assemblages that are rare nationally, regionally or within the biogeographic area.

High: The site contains a nationally important species, habitat or community; or the site contains several species, habitats, communities that are threatened within the biogeographic area.
Medium: The site contains one or a few species, habitats or communities that are threatened but not nationally, or contains rare or uncommon species, habitats or communities within the biogeographic area.
Low: The site is not known to contain flora, fauna or communities that are threatened, rare or uncommon in the biogeographic area, region or nationally.

3 Diversity

The site is significant if it contains a range of species and habitat types notable for their complexity (i.e. diversity of species, habitat, community).

High: The site contains a high diversity of species, habitats or communities.
Medium: The site contains a moderate diversity of species, habitats or communities.
Low: The site contains a low diversity of species, habitats or communities.

4 Distinctiveness

The site is significant if it contains ecological features (e.g. species, habitats, communities) that are outstanding or unique nationally, in the region, or in the biogeographic area.

High: The site contains any ecological feature that is unique nationally, in the region, or in the biogeographic area, or it contains several features that are outstanding regionally or in the biogeographic area.
Medium: The site contains any ecological feature that is notable or unusual but not outstanding or unique nationally, in the region or in the biogeographic area.
Low: The site contains no known ecological features that are outstanding or unique nationally, in the region or in the biogeographic area (i.e. ecological features are typical rather than distinctive).

5 Size

The site is significant if it is moderate to large relative or other habitats or communities of its type in the biogeographic area.

High: The site is large relative to other habitats or communities of its type in the biogeographic area.
Medium: The site is moderate size relative to other habitats or communities of its type in the biogeographic area.
Low: The site is small relative to other habitats or communities of its type in the biogeographic area.

6 Connectivity

The site is significant if it is adjacent to, or close to other significant marine, freshwater or terrestrial areas or the site is sufficiently close to other sites of its kind to enable biological interchange (e.g. larval transport, settlement of juveniles).

High: The site is near or well connected to a large significant site or several other significant sites.
Medium: The site is near other significant sites, but only partially connected to them or at an appreciable distance.
Low: The site is isolated from other significant sites.

7 Adjacent catchment modifications

Catchments that drain large tracts of land can lead to high sediment loading into adjacent marine areas. A site is significant if the adjacent catchment is >400 ha and clad in relatively mature native vegetative cover resulting in a long term stable environment with markedly reduced sediment and contaminant run-off compared to developed or modified catchments.

High: The site is dominated by a stable and relatively mature native vegetated catchment (>400 ha) that is legally protected.
Medium: The site is dominated by a stable and relatively mature native vegetated catchment (>400 ha) with partial or no legal protection.
Low: The site is surrounded by a catchment (>400 ha) that is farmed, highly modified or has limited, relatively mature, vegetative cover.
Not applicable: The site is little influenced by catchment effects (e.g. offshore site, current swept site).