Davidson Environmental Limited

Expert panel review of selected significant marine sites surveyed in 2016-2017

Research, survey and monitoring report number 867

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

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October 2017

Bibliographic reference:

Davidson, R. J;[1] Baxter, A. S;[2] Duffy, C. A. J;[2] Brosnan, B;[5] Gaze, P;[4]; du Fresne, S;[3] Courtney, S.[2] 2017. Expert panel review of selected significant marine sites surveyed in 2016-2017. Prepared by Davidson Environmental Limited for Marlborough District Council and Department of Conservation. Survey and monitoring report no. 867.

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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 internationally peer reviewed scientific journals. He has worked for MAF and the Department of Conservation and since 1994 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 25 years, relating to Cook Strait ferry impacts, marine farm recovery and marine reserve monitoring. As a consultant, Rob has provided scientific information for over 850 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 an 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 a 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 is a member of the New Zealand Marine Sciences Society, Oceania Chondrichthyan Society and the IUCN Shark Specialist Group – Australia and Oceania. Clinton 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 from the Kermadec Islands to Stewart Island, including co-ordination of a dive survey of shallow subtidal habitats of the Marlborough Sounds in 1989-90.

Andrew Baxter has over 35 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 Species and Threats Team.

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 the 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 19 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.

Bruno Brosnan presently works for Te Atiawa o Te Waka-a-Maui as Rohe Manager and was formerly a Coastal Planner at the Marlborough District Council. His qualifications include a Bachelor's of Science in Zoology and Psychology from Massey University, a postgraduate diploma in Marine Science from Otago University, a Master of Science in Marine Science from Otago University investigating recovery and succession of benthic environments after large scale disturbance, a post graduate diploma in Environmental Management from the University of Waikato, a Master of Management Studies from the University of Waikato, and a Master of Planning from Massey University. Bruno is also a qualified diver instructor.

1.0 Summary

Davidson *et al.* (2011) described a total of 129 significant marine sites in Marlborough. 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 significant site database. The programme also aimed to collect new data for repeat monitoring of 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). Site selection was guided by:

- Sites identified as having limited or old biological information (Davidson *et al.,* 2011).
- Sites where additional information was needed (Davidson *et al.,* 2014).
- Recommended sites suitable for monitoring (Davidson *et al.,* 2014).
- New potential sites based on new information received since 2011.

Two follow-up summer surveys have been undertaken to date. The first was conducted in summer 2014/2015 and targeted 21 sites and sub-sites in the eastern Marlborough Sounds (Davidson and Richards, 2015). The second survey was conducted in the summer of 2015-2016 and targeted 15 sites and sub-sites in the Croisilles Harbour and D'Urville Island areas (Davidson and Richards, 2016). Reports and raw data from these summer surveys were lodged with the MDC. The authors also provided comment on site boundary alterations and recommendations based on new data.

The present report outlines the Significant Marine Site Expert Panel review of sites surveyed during the third survey programme conducted in Croisilles Harbour, D'Urville Island, and outer Sounds areas in the summer of 2017 (Davidson *et al*., 2017a). The Panel also reviewed sites suggested from a survey of Tory Channel funded by New Zealand King Salmon Ltd. The Expert Panel assessed sites using the seven criteria originally developed by Davidson *et al.* (2011) and modified by the Expert Panel in 2015, 2016 (see Davidson *et. al.,* 2015; 2016) and during the present review. The updated criteria are presented in Appendix 1 of the present report.

The present report also assesses site sensitivity to a range of anthropogenic threats including physical disturbance.

Overall, the Expert Panel accepted the boundary modifications proposed by Davidson *et al*. (2017a) and Tory Channel sites suggested by Davidson *et al*. (2017b). Two other new sites and one new sub-site were also accepted by the review group. The Expert Panel recommended that one site proposed by Davidson *et al*., (2017a) be reassessed in the future once more information was available.

2.0 Background

In 2011, a report outlining Marlborough's known 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 each site. 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 that 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 that 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 that the quality of some existing significant sites may decline over time due to natural or human related events or activities. The authors therefore acknowledged that 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 updated 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:

- Survey of new sites;
- Collection of additional information from existing significant sites or sites that previously were not ranked as being ecologically significant; and
- 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 2014-2015 (21 sites and sub-sites in eastern Marlborough Sounds), 2015-2016, (15 sites and sub-sites in the Croisilles Harbour and D'Urville Island areas), and 2016-2017 (15 sites and sub-sites predominately from the Croisilles Harbour around to Waitui Bay, outer Marlborough Sounds). Davidson and Richards (2015, 2016) and Davidson et al. (2017a) summarised the new biological data; raw data were provided to MDC for storage. The authors also commented on site boundary alterations and recommended any necessary changes to the assessments of significance. On the previous two and the present occasion, the Expert Panel was reconvened to reassess the new information and make recommendations.

The present report presents the Expert Panel review of the 2016-2017 survey season reported in Davidson *et al*. (2017a) and a survey of Tory Channel funded by New Zealand King Salmon Ltd. The Panel also comments on anthropogenic threats and vulnerability of significant sites.

3.0 The assessment process

3.1 Data collation

All data collected by Davidson *et al*. (2017a) were compiled and made available to the expert panel during the present review.

Davidson *et al*. (2017a) suggested one site (Titi Island) be split into 3 sub-sites, while one site (Rangitoto Islands) be split into four sub-sites. These authors defined sub-sites as having comparable habitats and communities, but each sub-site was physically separate. One new sub-site was added to an existing set of three sub-sites at Hunia (Port Gore). In total, Davidson *et al*. (2017a) described 15 sites and sub-sites in their study.

Davidson *et al*. (2017b) identified three major habitat types each split into sub-sites (Table 1).

(1) Sixteen sub-sites supported combinations of bryozoans, sponges, ascidians, hydroids and variety of other invertebrate species (78.2 ha). Sites west of Te Rua Bay were comparable to the north and south-western sites described by Davidson and Richards (2015) (i.e. Sites 5.1 to 5.4). Sites east of Te Rua were comparable to Site 5.8 (Davidson and Richards, 2015).
(2) The authors also suggested 14 sub-sites (12.2 ha) supporting subtidal eelgrass beds.
(3) Two sub-sites supporting subtidal beds of drift macroalgae on soft substratum were also recommended as significant sites (41.9 ha).

Information collected during field work included: high definition and low-resolution drop camera photographs, hand held still photography, hand held 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 subsequent review in 2015 and 2016 were reconvened, apart from Sam du Fresne (marine mammals) and Shannel Courtney (plants). Peter Gaze reviewed new data for a new king shag site located in Tawhitinui Reach prior to the group assessment; this assessment was also reviewed by the other panel members to ensure consistency. Sam du Fresne and Shannel Courtney were not involved in the present reassessment meeting as no new or resurveyed marine mammal or plant sites were under scrutiny; however, all experts reviewed and commented on the present report and are therefore included as authors.

4.0 Wording of the assessment criteria

During the previous Expert Panel reviews (Davidson *et al.* 2015; 2016), the panel members recognized a need to clarify some of the original assessment criteria used by Davidson *et al.* (2011) to avoid any possible misinterpretation. The Expert Panel applied the revised criteria during the reassessment of surveyed sites in 2014-2015 and 2015-2016 survey years.

During the present review, some further minor revisions to the criteria were proposed and adopted (see Appendix 1 for revised criteria). During this process, the Expert Panel took great care not to create inconsistency between the sites assessed in Davidson *et al*. (2011) and the subsequent reassessments. It is recognised, however, that some 2011 significant sites will require future reassessment using the revised criteria to ensure a consistent approach is adopted. A more comprehensive review of the criteria to incorporate recent advancements in assessment criteria in New Zealand is also being considered.

5.0 Review of survey sites (2016-2017)

The Expert Panel assessed all sites and sub-sites based on the information and proposed changes presented in Davidson *et al*. (2017a) (Table 1) and recommended the following.

- <u>Accept</u> the new significant site at Tawhitinui Bay (king shag colony).
- <u>Accept</u> the new significant site at Bonne Point, eastern D'Urville Island (rhodolith bed).

- Accept the new sub-site at Hunia coast, Port Gore (tubeworms).
- Reject the proposed new site at Titi Island offshore rock. The review panel considered there was insufficient evidence to support the new site and recommended further field work.
- Accept boundary adjustments for the remaining significant sites.
- Accept new biogenic sub-sites in Tory Channel.
- Accept new subtidal eelgrass beds in Tory Channel
- Accept subtidal macroalgae beds, however, more survey work is required to confirm these features are permanent.

The agreed boundary refinements lead to both increases (588.1 ha) and decreases (-458.9 ha) to the size of individual significant sites with an overall increase of 129.2 ha between 2011 and 2017 (Table 2).

Table 1: Summary of suggested significant sub-sites from the Davidson *et al.* (2017b) survey.

Site	Community type	Area (ha)	Benthos type
5.4e Katoa Point	Bryozoan, sponge, ascidian, hydroid	3.31	Granules, shell, sand, silt boulder, cobble, bedrock
5.4f Te Weka Bay	Bryozoan, sponge, ascidian, hydroid	4.5	Granules, shell, sand, silt boulder, cobble, bedrock
5.4g Moioio Island	Bryozoan, sponge, ascidian, hydroid	4.19	Granules, shell, sand, silt boulder, cobble, bedrock
5.4h Kaihinui Point	Bryozoan, sponge, ascidian, hydroid	2.95	Granules, shell, sand, silt boulder, cobble, bedrock
5.4i Papatea Point	Bryozoan, sponge, ascidian, hydroid	7.57	Granules, shell, sand, silt boulder, cobble, bedrock
5.4j Tio Point	Bryozoan, sponge, ascidian, hydroid	6.28	Granules, shell, sand, silt boulder, cobble, bedrock
5.4k Motukina Point	Bryozoan, sponge, ascidian, hydroid	7.97	Granules, shell, sand, silt boulder, cobble, bedrock
5.4l Te Rua (west)	Bryozoan, sponge, ascidian, hydroid	2.13	Granules, shell, sand, silt boulder, cobble, bedrock
5.4m Tapapaweke Point	Bryozoan, sponge, ascidian, hydroid	2.16	Granules, shell, sand, silt boulder, cobble, bedrock
5.4n Puhe Point	Bryozoan, sponge, ascidian, hydroid	4.66	Granules, shell, sand, silt boulder, cobble, bedrock
5.4m Te Rua (east)	Bryozoan, sponge, ascidian, hydroid	19.75	Granules, shell, sand, silt boulder, cobble, bedrock
5.8g Tipi Bay (west)	Bryozoan, sponge, ascidian, hydroid	2.36	Granules, shell, sand, silt boulder, cobble, bedrock
5.8h Tipi Bay (east 1)	Bryozoan, sponge, ascidian, hydroid	1.47	Granules, shell, sand, silt boulder, cobble, bedrock
5.8i Tipi Bay (east 2)	Bryozoan, sponge, ascidian, hydroid	3.61	Granules, shell, sand, silt boulder, cobble, bedrock
5.8kThoms Bay (west)	Bryozoan, sponge, ascidian, hydroid	3.16	Granules, shell, sand, silt boulder, cobble, bedrock
5.8l Thoms Bay (east)	Bryozoan, sponge, ascidian, hydroid	2.11	Granules, shell, sand, silt boulder, cobble, bedrock
5.10a Motukina (east)	Subtidal eelgrass	0.61	Sand, silt
5.10b Te Rua (east 1)	Subtidal eelgrass	0.09	Sand, silt
5.10c Te Rua (east 2)	Subtidal eelgrass	0.19	Sand, silt
5.10d Te Rua (east 3)	Subtidal eelgrass	0.27	Sand, silt
5.10e Te Rua (east 4)	Subtidal eelgrass	0.36	Sand, silt
5.10f Te Rua (east 5)	Subtidal eelgrass	0.79	Sand, silt
5.10g Te Rua (east 6)	Subtidal eelgrass	0.82	Sand, silt
5.10h Tipi Bay (west)	Subtidal eelgrass	0.14	Sand, silt
5.10i Tipi Bay (east 1)	Subtidal eelgrass	0.1	Sand, silt
5.10j Tipi Bay (east 2)	Subtidal eelgrass	0.13	Sand, silt
5.10k Tipi Bay (east 3)	Subtidal eelgrass	0.08	Sand, silt
5.10l Thoms Bay (west)	Subtidal eelgrass	3.78	Sand, silt
5.10m Thoms Bay (east 1)	Subtidal eelgrass	4.23	Sand, silt
5.10n Thoms Bay (east 2)	Subtidal eelgrass	0.63	Sand, silt
5.11a Ngaruru Bay (east)	Subtidal drift macroalgae	39.61	Silt
5.11b Ngaruru Bay (west)	Subtidal drift macroalgae	2.32	Silt
Totals		**132.33**	

Table 2. Summary of significant site assessment by expert review panel.

Site	Biological features	Review panel recommendations	Original data	New area (ha)	Change (ha)	Reason/s for change
Site 1.2 Croisilles Harbour Entrance (habitat & lancelet)	Physical structure, lancelets	Accept new data	368.5	492	123.50	Additional quantitative data
Site 2.6 Rangitoto Islands (A, B, C, D) (biogenic community)	Biogenic structures	Adjust boundary to encompass values	429.8	168.5	-261.30	Improved detail of survey
Site 2.10 Trio Islands (west) (biogenic community)	Biogenic structures	Adjust boundary to encompass values	558.5	1017.3	458.80	Improved detail of survey
Site 2.27 Titi Island (A, B, C)(biogenic community)	Biogenic structures	Adjust boundary to encompass values	52.5	38.1	-14.40	Improved detail of survey/physical damage
Site 2.30 Waitui Bay (biogenic community)	Biogenic structures	Adjust boundary to encompass values	294.9	112.8	-182.10	Improved detail of survey/physical damage
Site 2.33 Hunia Coast (tubeworms)	Tubeworms	Accept new sub-site	17.5	18.5	1.00	Data for new sub-site
Site 3.1 Harris Bay (algae)	Red algae	Adjust boundary	20.5	19.4	-1.10	Improved detail of survey
Titi Island Rock (biogenic community)	Biogenic community	Reject, collect more data	0	0	0.00	Insufficient data
Bonne Point (rhodolith bed)	Rhodoliths	Accept new site	0	4.68	4.68	Data for new site
Tawhitinui Bay (king shag)	King shag colony	Accept new site	0	0.16	0.16	Data for new site
Totals			1742.2	1871.44	129.2	
Increase to significant sites (ha)					588.1	
Decrease to significant sites (ha)					-458.9	

Sites (Davidson *et al.* , 2017b)	Biological features	Review panel recommendations	Original data	New area (ha)	Change (ha)	Reason/s for change
Site 5.4 e-m Tory Channel western biogenic habitats	Biogenic structures	Add new sub-sites		65.47	65.47	New surveyed sites
Site 5.8 g-l Tory Channel eastern biogenic habitats	Biogenic structures	Add new sub-sites		12.71	12.71	New surveyed sites
Site 5.10 a-n Tory Channel subtidal eelgrass	Subtidal eelgrass	Add new sub-sites		12.22	12.22	New surveyed sites
Site 5.11 a-b Ngaruru Bay subtidal macraoalgae beds	Macroalgae beds	Add new sub-sites		41.93	41.93	New surveyed sites
Totals			0	132.33	132.3	
Increase to significant sites (ha)					132.3	
Decrease to significant sites (ha)					0.0	

Site summaries

The following tables summarise the Expert Panel review for each site (green shading).

Site 1.2 Croisilles Harbour Entrance (shallow habitats and lancelet)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment 2016
Site number	1.2	1.2
Site name	Croisilles Harbour Entrance (subtidal)	Croisilles Harbour entrance (subtidal)
Site description	About 368 ha of subtidal sand flats are on the northern side of the entrance to Croisilles Harbour between the Croisilles islands and the northern headland to the harbour. Ranging in depth from 5 to 15m, the flats have been commercially dredged in the past but are now dredged only by recreational fishers during the scallop season. The sand flats are bisected by occasional channels that provide deeper habitats for some species (Davidson and Duffy 1992).	The area comprises approximately 492 ha of subtidal sand flats on the northern side of Croisilles Harbour entrance. These sandy sediments range from 5 to 16m depth. They were commercially dredged till 1989, and are now dredged only by recreational fishers during the scallop season. The sand flats are bisected by occasional channels that provide deeper habitats for some species (Davidson and Duffy 1992). The coasrse sandy substratum is home to the largest lancelet bed in Marlborough.
Ecological importance	This area is one of the largest and best examples of shallow, tidally swept sand flats in Marlborough. The flats provide habitats for a variety of species often found in large numbers. For example, beds of scallops are widespread and regularly recorded throughout this area. These flats are the only known site in Marlborough where the new Zealand lancelet has been recorded (Davidson and Duffy 1992).	Significant site boundaries were based on the location of coarse soft substrata that has been confirmed to be habitat for lancelet. Struthers (2015) states based on collection records, lancelet distribution is northeast North Island to from North Cape to Mahia Peninsula, outer Marlborough Sounds and Tasman Bay; habitat "coarse, clean sediment at depths of 0-55 m." Largest and best known lanacelet site in Marlborough.
Human Impacts		
Damage and or impacts noted	No impact on benthos noted but dredging is a common activity	MAF maps of commercially fished scallop beds suggest the area was commercially dredged up until at least 1989.
Proportion of significant site effected	75-100%	
Level of damage	Low	
Type of damage or activity observed	Dredging (recreational)	
Type of damage or activity observed		
Type of damage or activity observed		
Type of damage or activity observed		
SIGNIFICANT SITE SUMMARY	**Existing and present survey information**	**Expert panel assessment**
Original area of significant site (ha)	368	492
Recommended area of significant site (ha)	492	492
Change to original site	Increase	No change
Change (ha)	124	0.0
Percentage change from original area (%)	33.7	0.0
Anthropogenic disturbance	High intensity during season (recreational dredging frequent event during scallop season)	Moderate disturbance during scallop season (light equipment).
Vulnerability assessment	Low (due to historic dredging it is probable the benthos has adjusted to the impacts over time)	Resilient to light gear, but impact from heavy gear unknown. If opened to commercial gear a "before" survey of the lancelet population and substratum is strongly recommended.
Assessment criteria scores	**Assessment criteria scores (original)**	**Assessment criteria scores (revised)**
1. Representativeness	H (high)	H (high)
2. Rarity	M (medium)	M (medium)
3. Diversity and pattern	M (medium)	M (medium)
4. Distinctiveness	H (high)	M (medium)
5. Size	H (high)	H (high)
6. Connectivity	L (low)	L (low)
7. Catchment	M (medium)	L (low)
Comments	The area supports three main soft substratum types (A) rippled mobile sand and shell, (B) sand, fine sand and shell and (C) silt. There are indications this shallow area may have a base of cobble material. Mobile rippled sand and shell supports lancelets. It is unknown how much of the significant sites supports this species and only one site has been quantitatively surveyed. The numbers of lancelet reported place this site as the highest density known from the Marlborough Sounds.	One of a low number of sites known to support lancelets in Tasman/Marlborough (3 sites in Marlborough, 5 sites in Tasman Bay). Lancelet site potentially more widespread. Classified as sparse (naturally uncommon). Therefore likely to be reassessed in the future as an at risk taxa. Diversity unknown and ranked as low until data becomes available to properly assess this aspect of the site (we expect it will be medium). Distinctive habitat supporting lancelet in Sounds area. Widespread presence of lancelet supports high status for representativeness. This is the largest and best known lancelet site in Marlborough.
Recommendations	A widespread quantitative survey of lancelet abundance and distribution over this significant site is suggested.	Supply new lancelet data to Te Papa.
REFERENCES	Davidson, R. J.; Duffy, C. A. J. 1992. Preliminary intertidal and subtidal investigation of Croisilles Harbour, Nelson. Nelson/Marlborough Conservancy occasional Publication no. 5, 33 p.	Davidson, R.J. and Richards, L.A. 2016. Significant marine site survey and monitoring programme: Summary 2015-2016. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report number 836.
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	Paulin C.D. 1977. *Epigonichthys hectori* (Benham), the New Zealand lancelet (Leptocardii: Epigonichthyidae). National Museum of New Zealand Records 1(9): 143-7.	Davidson, R.J.; Richards, L.A.; Rayes, C. 2017. Significant marine site survey and monitoring programme (survey 3): Summary report 2016-2017. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report number 859.

Site 2.5 Bonne Point (rhodoliths)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number		2.5
Site name	Bonne Point (rhodoliths)	Bonne Point (rhodoliths)
Site description	A new rhodolith bed was discovered during the present study adjacent to Bonne Point, eastern D'Urville Island (Figures 10 and 11, Plate 21). The present survey located this bed, mapped its extent and outlined the percentage cover of rhodoliths for future monitoring purposes. Bonne Point is located on the northern outer side of Catherine Cove Peninsula some 9.8 km north-east of French Pass. This associated rhodolith bed is the second known from the Two Bay Point to Jackson Bay biogeographic area. The other sites being Site 2.13 (a, b and c) located in Catherine Cove. Despite the Bonne Point bed being small is size, the percentage cover values were high (mean = 86% cover, SD = +/- 13.4).	A small rhodolith bed is located adjacent to Bonne Point, eastern D'Urville Island. Bonne Point is located on the northern outer side of Catherine Cove Peninsula some 9.8 km north-east of French Pass. The rhodolith bed is the second known from the Two Bay Point to Jackson Bay biogeographic area. The other sites being Site 2.13 (a, b and c) located in Catherine Cove. Despite the Bonne Point bed being small is size, the percentage cover values were high (mean = 86% cover, SD = +/- 13.4).
Ecological description of attributes	This associated rhodolith bed is the second known from the Two Bay Point to Jackson Bay biogeographic area. The other sites being Site 2.13 (a, b and c) located in Catherine Cove. Despite the Bonne Point bed being small is size, the percentage cover values were high (mean = 86% cover, SD = +/- 13.4).	This site increases known rhodolith sites by 6% taking it to 32 ha total for Marlborough.
SIGNIFICANT SITE SUMMARY	**Existing and present survey information**	**Expert panel assessment**
Original area of significant site (ha)		
Recommended area of significant site (ha)	2.1	2.1
Change to original site	Increase	Increase
Change (ha)	2.1	2.1
Percentage change from original area (%)	100.0	100.0
Anthropogenic disturbance	Low (recreational anchoring occurrs in the area).	Low (recreational anchoring occurs in the area).
Vulnerability assessment	Sensitive (biogenic)	Sensitive (biogenic habitat)
Assessment criteria scores (original)		**Assessment criteria scores (revised)**
1. Representativeness		M (medium)
2. Rarity		M (medium)
3. Diversity		M (medium)
4. Distinctiveness		M (medium)
5. Size		L (low)
6. Connectivity		NA
7. Catchment		M (medium)
Comments		
Recommendations	Add new site to list of Significant Sites. Protect habitats from all physical disturbance.	Add new site to list of Significant Sites. Protect habitats from all physical disturbance.
REFERENCES	Davidson, R.J.; Richards, L.A.; Rayes, C. 2017. Significant marine site survey and monitoring programme: Summary report 2016-2017. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report number 859.	
	Davidson, R.J. and Richards, L.A. 2016. Significant marine site survey and monitoring programme: Summary report 2015-2016. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report number 836.	

Site 2.6 Rangitoto Islands (biogenic communities)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number	2.6 a, b, c, d	2.6 a, b, c, d
Site name	Rangitoto Islands	Rangitoto Islands (biogenic habitats)
Site description	The site is located around the current swept Rangitoto Islands on the north-eastern coast of D'Urville Island. Biogenic mounds have been previously reported and when present can form a high percentage covers over soft and rocky substrata.	The site is located around the current swept Rangitoto Islands, north-eastern D'Urville Island. Biogenic mounds have been previously reported (Davidson and Brown, 1994; Davidson *et al*., 2011; Davidson and Richards, 2016) and when present can form a high percentage cover over soft and rocky substrata.
Ecological description of attributes	Sites contain biogenic mounds composed of variable combinations of bryozoans, sponges, ascidians and hydroids. The functions provided by biogenic habitats are diverse, and can include the elevation of biodiversity, benthos-pelagic coupling, sediment baffling, protection from erosion, nutrient recycling, the provision of shelter and food for a wide range of other organisms, and even the creation of geological features over longer time scales (Bradstock and Gordon 1983; Turner et al., 1999; Carbines and Cole, 2009; Wood et al., 2012; Morrison et al., 2014). Morrison et al. (2014) stated, a range of biogenic habitats also directly underpin fisheries production for a range of species, through: 1) the provision of shelter from predation, 2) the provision of associated prey species, and in some cases, 3) the provision of surfaces for reproductive purposes e.g. the laying of elasmobranch egg cases; as well as, 4) indirectly in the case of primary producers through trophic pathways.	All sub-sites contain biogenic mounds dominated by variable combinations of bryozoans, sponges, ascidians and hydroids. The biogenic mounds found on soft substratum in sub-site 2.6b are considered to be the best examples of their kind in Marlborough.

SIGNIFICANT SITE SUMMARY	Existing and present survey information	Expert panel assessment
Original area of significant site (ha)	559.5	559.5
Recommended area of significant site (ha)	168.5	168.5
Change to original site	Decrease	Decrease
Change (ha)	391	391
Percentage change from original area (%)	69.9	69.9
Anthropogenic disturbance	Moderate (trawling and dredging occurs periodically)	Moderate (trawling and possibly dredging occurs periodically)
Vulnerability assessment	Sensitive (biogenic mounds sensitive)	The biogenic habitats on mud/shell are extremely vulnerable to physical disturbance. Recovery after any disturbance on this type of biogenic habitat is likely to be extremely slow.
Assessment criteria scores	**Assessment criteria scores (original)**	**Assessment criteria scores (revised)**
1. Representativeness	H (high)	H (high)
2. Rarity	L (low)	H (high)
3. Diversity and pattern	M (medium)	H (high)
4. Distinctiveness	H (high)	H (high)
5. Size	M (medium)	H (high)
6. Connectivity	L (low)	M (medium)
7. Catchment	L (low)	NA
Comments	Previously the area was either investigated Davidson and Richards (2016) and Davidson and Brown (1994). The present survey intensifies the level of data collected. Sonar and depth soundings of much of the deep areas of the original significant area showed a low likelihood of biogenic habitats. The survey concentrated in areas where sonar and previous studies have detected biogenic habitats. The reduction in the area between 2011 and the present study is likely due to more accurate survey methods. Data from Davidson and Brown (1994) suggested biogenic habitats were located on the eastern side of Wakaterepapanui Island. The present survey focussed on this area.	Sub-site 2.6b supports a rare biogenic habitat and is therefore ranked as "high" in representativeness. This area in 2.6b is regarded as best bryozoan dominated habitat on mud/shell substratum in Marlborough. Recovery times for bryozoans growing on mud are likely to be extremely long.
Recommendations	Adjust boundaries to fit the biogenic habitats. Significant Sites 2.5a-c be deleted and included in sites 2.5 a-d. Protect habitats from all physical disturbance.	Provide high level of protection for all sites.

REFERENCES		
	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.	Davidson, R.J.; Richards, L.A.; Rayes, C. 2017. Significant marine site survey and monitoring programme (survey 3): Summary report 2016-2017. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report number 859.
	Bradstock, M., and Gordon, D.P. 1983. Coral like bryozoan growths in Tasman Bay, and their protection to conserve commercial fish stocks. N.Z. Journal Marine Freshwater Research Vol. 8., pp 1516.	
	Davidson, R.J. and Richards, L.A. 2016. Significant marine site survey and monitoring programme: Summary 2015-2016. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report number 836.	
	Davidson, R.J.; Brown, D.A. 1994. Ecological report on four marine reserve options: eastern D'Urville Island area. Department of Conservation. Nelson/Marlborough Conservancy, Occasional Publication no. 22., 41 p	

Site 2.10 Trio Islands (west) (biogenic communities)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number	2.1	2.10
Site name	Trio Islands (west)	Trio Islands (west)
Site description	This site was originally one part of a two part site located in offshore areas either side (east and west) of the Trios Islands (Davidson *et al*., 2011).	This 1017 ha area is located on the western side of the Trios Islands, outer Marlborough Sounds. The original sites recognised in this area has been surveyed and the original boundaries adjusted to encompasss biogenic habitats living on a soft sediment benthos.
Ecological description of attributes	The site supports biogenic structures dominated by variable proportions of bryozoans, sponges, ascidians and a variety of other biogenic habitat forming species. Functions provided by biogenic habitats are diverse, and can include the elevation of biodiversity, bentho-pelagic coupling, sediment baffling, protection from erosion, nutrient recycling, the provision of shelter and food for a wide range of other organisms, and even the creation of geological features over longer time scales (Bradstock and Gordon 1983; Turner et al., 1999; Carbines and Cole, 2009; Wood et al., 2012; Morrison et al., 2014). Morrison et al. (2014) stated, a range of biogenic habitats also directly underpin fisheries production for a range of species, through: 1) the provision of shelter from predation, 2) the provision of associated prey species, and in some cases, 3) the provision of surfaces for reproductive purposes e.g. the laying of elasmobranch egg cases; as well as, 4) indirectly in the case of primary producers through trophic pathways.	The site supports biogenic structures dominated by variable proportions of bryozoans, sponges, ascidians and a variety of other biogenic habitat forming species. These communities appear to be degraded probably due to intermittent trawling activities that occur in this area. If left free of physical damage, it is likely the biogenic communities will recover over time. Functions provided by biogenic habitats are diverse, and can include the elevation of biodiversity, bentho-pelagic coupling, sediment baffling, protection from erosion, nutrient recycling, the provision of shelter and food for a wide range of other organisms, and even the creation of geological features over longer time scales (Bradstock and Gordon 1983; Turner *et al*., 1999; Carbines and Cole, 2009; Wood *et a* l., 2012; Morrison et al., 2014). Morrison *et al*. (2014) stated, a range of biogenic habitats also directly underpin fisheries production for a range of species, through: 1) the provision of shelter from predation, 2) the provision of associated prey species, and in some cases, 3) the provision of surfaces for reproductive purposes e.g. the laying of elasmobranch egg cases; as well as, 4) indirectly in the case of primary producers through trophic pathways.

SIGNIFICANT SITE SUMMARY	Existing and present survey information	Expert panel assessment
Original area of significant site (ha)	559.5	559.5
Recommended area of significant site (ha)	1017.3	1017.3
Change to original site	Increase	Increase
Change (ha)	457.8	457.8
Percentage change from original area (%)	81.8	81.8
Anthropogenic disturbance	Moderate (trawling occurs periodically)	Moderate (trawling occurs periodically)
Vulnerability assessment	Sensitive (biogenic mounds sensitive)	Sensitive habitats present, but they appear impacted and degraded.
Assessment criteria scores	**Assessment criteria scores (original)**	**Assessment criteria scores (revised)**
1. Representativeness	L (low)	M (medium)
2. Rarity	L (low)	H (high)
3. Diversity and pattern	M (medium)	M (medium)
4. Distinctiveness	L (low)	M (medium)
5. Size	H (high)	H (high)
6. Connectivity	L (low)	H (high)
7. Catchment	L (low)	NA
Comments	Davidson *et a* l. (2011) conducted a brief survey of the area. The present study intensifies the survey detail.	Habitat degraded, but is regarded as a rare habitat type in the Sounds (i.e. biogenic community on flat, soft substratum). Environmental variables (currents, shell abundance) mean there is a high likelyhood the site will improve over time if left undisturbed.
Recommendations	Adjust boundaries to fit the biogenic habitats. Protect habitats from all physical disturbance.	Adjust boundaries to fit the biogenic habitats. Protect habitats from physical disturbance.
REFERENCES	Davidson, R.J. and Richards, L.A. 2016. Significant marine site survey and monitoring programme: Summary 2015-2016. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report number 836.	Davidson, R.J.; Richards, L.A.; Rayes, C. 2017. Significant marine site survey and monitoring programme (survey 3): Summary report 2016-2017. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report number 859.
	Bradstock, M., and Gordon, D.P. 1983. Coral like bryozoan growths in Tasman Bay, and their protection to conserve commercial fish stocks. N.Z. Journal Marine Freshwater Research Vol. 8., pp 1516.	

Site 2.27 Titi Island (biogenic communities)

Site Registration Detail (original)	**Existing and present survey information**	**Expert panel assessment**
Site number	2.27	2.27 (a-c)
Site name	Titi Island (subtidal)	Titi Island (subtidal)
Site description	Titi island is located approximately 4.6 km west of Forsyth island. Titi island covers 24ha and has a circumference of approximately 3.3 km, and is approximately 1.2 km long and 300m wide (Davidson *et al*., 2011). Davidson et al. (2011) stated "The soft sediment seafloor along the northern shoreline of Titi island supports a variety of biogenic habitat-forming species including horse mussels, hydroids, sponges and bryozoans. Horse mussels, hydroids and sponges are relatively common at the north-western end of the island in water 20-30m deep. Large colonies of the Separation Point coral live below 30m along the northern side of the island."	Titi island is located approximately 4.6 km west of Forsyth island. Titi island is 24 ha and has a circumference of approximately 3.3 km. The island is approximately 1.2 km long and 300m wide (Davidson *et al*., 2011). The sea around the island comprises a variety of substrata and habitats that are often wave or current influenced.
Ecological description of attributes	The site supports biogenic structures dominated by variable proportions of bryozoans, sponges, ascidians and a variety of other biogenic habitat forming species. Functions provided by biogenic habitats are diverse, and can include the elevation of biodiversity, bentho-pelagic coupling, sediment baffling, protection from erosion, nutrient recycling, the provision of shelter and food for a wide range of other organisms, and even the creation of geological features over longer time scales (Bradstock and Gordon 1983; Turner *et al*., 1999; Carbines and Cole, 2009; Wood *et al*., 2012; Morrison *et al*., 2014). Morrison et al. (2014) stated, a range of biogenic habitats also directly underpin fisheries production for a range of species, through: 1) the provision of shelter from predation, 2) the provision of associated prey species, and in some cases, 3) the provision of surfaces for reproductive purposes e.g. the laying of elasmobranch egg cases; as well as, 4) indirectly in the case of primary producers through trophic pathways.	The site supports biogenic structures dominated by bryozoans, sponges, ascidians and a variety of other biogenic habitat forming species. Sub-sites a, b and c are distinct, each chracterised by a range of habitats, communities and environmental regimes giving this site, as a whole, a high diversity score.
SIGNIFICANT SITE SUMMARY	**Existing and present survey information**	**Expert panel assessment**
Original area of significant site (ha)	52.5	52.5
Recommended area of significant site (ha)	38.1	38.1
Change to original site	Decrease	Decrease
Change (ha)	14.4	14.4
Percentage change from original area (%)	-27.4	-27.4
Anthropogenic disturbance	Moderate (trawling occurs periodically in the area)	Moderate (trawling occurs periodically close ot Titi Island)
Vulnerability assessment	Sensitive (biogenic mounds sensitive)	Sensitive (biogenic mounds sensitive). Some more resilient habitats also exist and are usually associated with rocky substrata.
Assessment criteria scores (original)		**Assessment criteria scores (revised)**
1. Representativeness	M (medium)	M (medium)
2. Rarity	L (low)	M (medium)
3. Diversity	M (medium)	H (high)
4. Distinctiveness	M (medium)	M (medium)
5. Size	L (low)	M (medium)
6. Connectivity	L (low)	M (medium)
7. Catchment	NA	NA
Comments	Davidson *et a*l. (2011) conducted a brief survey of the area. The present study intensifies the survey detail.	Northern area may support more biogenic habitats (i.e.deeper). Suggest future survey east of sub-site "a" (i.e. deeper and shallower). Biogenic habitats are located on shore slope. High diversity of habitats observed from the three sub-sites.
Recommendations	Adjust boundaries to fit the biogenic habitats. Protect habitats from all physical disturbance.	Adjust boundaries to fit the biogenic habitats. Protect habitats from all physical disturbance.
REFERENCES	Davidson, R.J.; Richards, L.A.; Rayes, C. 2017. Significant marine site survey and monitoring programme: Summary report 2016-2017. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report number 859.	
	Bradstock, M., and Gordon, D.P. 1983. Coral like bryozoan growths in Tasman Bay, and their protection to conserve commercial fish stocks. N.Z. Journal Marine Freshwater Research Vol. 8., pp 1516.	

Site 2.30 Waitui Bay (biogenic communities)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number	2.30	2.3
Site name	Waitui Bay	Waitui Bay
Site description	Waitui Bay is remote and large north-facing bay located west of Cape Lambert and opens directly into Cook Strait. Waitui Bay has a coastline of approximately 13.28 km, a sea area of 1310 ha and the mouth of Waitui Bay is approximately 6.2 km wide (Davidson *et al*., 2011). Davidson et al. (2011) reported that based on a study by Cameron Hay (DSIR), a large area of central Waitui Bay supported horse mussels and associated encrusting species. The author stated this bed was one of the two largest horse mussel beds in the biogeographic area.	Waitui Bay is remote and large north-facing bay located west of Cape Lambert and opens directly into Cook Strait. Waitui Bay has a coastline of approximately 13.28 km, a sea area of 1310 ha and the mouth of Waitui Bay is approximately 6.2 km wide (Davidson et al., 2011). The original site described in Davidson *et al*. (2011) was based on work done on a horse mussel bed located in the central bay by Cameron Hay (DSIR).
Ecological description of attributes	The site supports biogenic structures dominated by variable proportions of bryozoans, sponges, ascidians and a variety of other biogenic habitat forming species. Functions provided by biogenic habitats are diverse, and can include the elevation of biodiversity, bentho-pelagic coupling, sediment baffling, protection from erosion, nutrient recycling, the provision of shelter and food for a wide range of other organisms, and even the creation of geological features over longer time scales (Bradstock and Gordon 1983; Turner *et al*., 1999; Carbines and Cole, 2009; Wood *et al*., 2012; Morrison *et al*., 2014). Morrison et al. (2014) stated, a range of biogenic habitats also directly underpin fisheries production for a range of species, through: 1) the provision of shelter from predation, 2) the provision of associated prey species, and in some cases, 3) the provision of surfaces for reproductive purposes e.g. the laying of elasmobranch egg cases; as well as, 4) indirectly in the case of primary producers through trophic pathways.	The new significant site supports biogenic structures dominated by variable proportions of bryozoans, sponges, ascidians and a variety of other biogenic habitat forming species including low numbers of horse mussels. The site appears to be impacted by historic physical damage.

SIGNIFICANT SITE SUMMARY	Existing and present survey information	Expert panel assessment
Original area of significant site (ha)	294.9	294.9
Recommended area of significant site (ha)	112.8	112.8
Change to original site	Decrease	Decrease
Change (ha)	182.1	182.1
Percentage change from original area (%)	-62%	-62%
Anthropogenic disturbance	Moderate (trawling and dredging occurs periodically in the area)	Moderate (trawling and dredging occurs periodically in the area)
Vulnerability assessment	Sensitive (biogenic mounds sensitive)	Sensitive (biogenic mounds and horse mussels present)
Assessment criteria scores (original)		**Assessment criteria scores (revised)**
1. Representativeness	M (medium)	L (low)
2. Rarity	L (low)	M (medium)
3. Diversity	M (medium)	M (medium)
4. Distinctiveness	M (medium)	L (low)
5. Size	H (high)	H (high)
6. Connectivity	L (low)	M (medium)
7. Catchment	L (low)	NA
Comments	Davidson *et a*l. (2011) conducted a brief survey of the area. The present study intensifies the survey detail.	Area with remnant horse mussels and associated species are degraded, likely due to physical damage. Representativeness and distinctiveness downgraded due to damage. Biogenic habitats are located on a soft substratum benthos and as such are an uncommon biogenic community type.
Recommendations	Adjust boundaries to fit the biogenic habitats. Protect remnant habitats from all physical disturbance.	Adjust boundaries to fit the biogenic habitats. Protect remnant habitats from all physical disturbance.

REFERENCES		
	Davidson, R.J.; Richards, L.A.; Rayes, C. 2017. Significant marine site survey and monitoring programme: Summary report 2016-2017. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report number 859.	
	Bradstock, M., and Gordon, D.P. 1983. Coral like bryozoan growths in Tasman Bay, and their protection to conserve commercial fish stocks. N.Z. Journal Marine Freshwater Research Vol. 8., pp 1516.	
	Hay, C.H. 1990. The ecological importance of the horse mussel (*Atrina zelandica*) with special reference to the Marlborough Sounds. Prepared for Nelson Marlborough Regional Office, DOC.	

Site 3.1 Harris Bay (algae)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number	3.10	3.1
Site name	Harris Bay (red algae)	Harris Bay (red algae)
Site description	Harris Bay is on the western side of the entrance to Pelorus Sound, immediately south of Paparoa and 54 km by sea from Havelock. Harris Bay has 1.7 km of coastline and a sea area of 37.5 ha. Davidson *et al*. (2011) reported the northern side was relatively shallow and supported a 20 ha bed of red algae located in 8-22m depth. The authors collected 10 drop camera images.	Harris Bay is on the western side of the entrance to Pelorus Sound, immediately south of Paparoa and 54 km by sea from Havelock. Harris Bay has 1.7 km of coastline and a sea area of 37.5 ha. Davidson *et al*. (2011) reported the northern side was relatively shallow and supported a 20 ha bed of red algae located in 8-22m depth. The authors collected 10 drop camera images.
Ecological description of attributes	Red algae beds can be productive. Everett (1994) stated that the increased abundance of small deposit-feeding fauna was likely a result of an increase in food resources due to in situ burial and decomposition of macroalgae. The authors also stated experiments indicated that, like other submerged aquatic vegetation, macroalgae can play an important functional role in structuring benthic faunal assemblages.	Red algae abundance (percentage cover) is variable seasonally and between years. This is the only red algae bed recognised from Pelorus Sound, however, percentage cover values are low compared to Queen Charlotte Sounds and Pot Underwood. The extent and abundance of red algae varied between Davidson *et a* l. (2011) and the present study.
SIGNIFICANT SITE SUMMARY	**Existing and present survey information**	**Expert panel assessment**
Original area of significant site (ha)	20.5	20.5
Recommended area of significant site (ha)	19.4	24.3
Change to original site	Decrease	Increase
Change (ha)	-1.1	3.8
Percentage change from original area (%)	5.4%	18.5%
Anthropogenic disturbance	Low (occasional recreational boat anchoring)	Low (occasional recreational boat anchoring).
Vulnerability assessment	Moderate to low sensitivity (red algae is quick growing and relatively resilient to low level physical damage)	Moderate to low sensitivity (red algae is quick growing and relatively resilient to low level physical damage)
Assessment criteria scores (original)		**Assessment criteria scores (revised)**
1. Representativeness	H (high)	H (high)
2. Rarity	L (low)	M (medium)
3. Diversity	M (medium)	M (medium)
4. Distinctiveness	M (medium)	M (medium)
5. Size	M (medium)	H (high)
6. Connectivity	L (low)	L (low)
7. Catchment	L (low)	L (low)
Comments	Davidson et al. (2011) collected 10 drop camera photos. The present survey improves the level of detail and better describes to sites boundaries. Overall red algae percentage cover declined between the two sample events.	Adjust boundary to include areas previously known area that supported red algae. Reason: algae beds vary yearly and throughout the year and the significant site should encompass the full extent of the bed to include variation between years and with seasons. Largest red algae bed known from Pelorus Sound.
Recommendations	Create new polygon to encompass red algae bed. Protect habitat from heavy physical disturbance.	Create new polygon to encompass new and old red algae bed. Protect habitat from heavy physical disturbance.
REFERENCES	Davidson, R.J.; Richards, L.A.; Rayes, C. 2017. Significant marine site survey and monitoring programme: Summary report 2016-2017. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report number 859.	
	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.	
	Everett, R.A. 1994. Macroalgae in marine soft-sediment communities: effects on benthic faunal assemblages. Volume 175, Issue 2, Pages 253-274. https://doi.org/10.1016/0022-0981(94)90030-2	

Site 3.22 Tawhitinui Bay (king shag)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number		3.22
Site name	Tawhitinui Bay (king shag)	Tawhitinui Bay (king shag)
Site description	Tawhitinui Bay is a small bay at the eastern end of Tawhitinui Reach, Pelorus Sound. Tawhitinui Bay is approximately 36.5 km by sea from Havelock. Tawhitinui Bay has a coastline length of approximately 2970 m and covers an area of sea of approximately 79.5 ha. The mouth of Tawhitinui Bay is approximately 1900 m wide. This site was briefly visited on two occasions during the present study and photos were collected. A previous aerial survey counted 43 birds and 16 active nests (Schuckard et al., 2015).	Tawhitinui Bay is a small bay at the eastern end of Tawhitinui Reach, Pelorus Sound. Tawhitinui Bay is approximately 36.5 km by sea from Havelock and 20 km from the entrance to Pelorus Sound. Tawhitinui Bay has a coastline length of approximately 2.97 km and covers an area of sea of approximately 79.5 ha.
Ecological description of attributes	The New Zealand king shag is endemic to New Zealand, only occurring in the Marlborough Sounds. Subfossil bone deposits indicate two regional haplogroups, from the Cook Strait region and northern North Island. However, king shags have been confined to the outer Marlborough Sounds for at least 240 years (NZ birds online). King shags are restricted to the outer Marlborough Sounds, from the west coast of D'Urville Island east to where Queen Charlotte Sound and Cook Strait meet. About 85% of all existing birds are located at five colonies: Rahuinui Island, Duffers Reef, Trio Islands, Sentinel Rock and White Rocks. The shags feed up to 25 km in a predominantly southwest direction from the main colonies, mainly in waters up to 50 m deep (but diving in deeper waters has been recorded). The foraging area of king shag is estimated to be 1300 km2. Away from the Marlborough Sounds, there are records of single king shags from Wellington Harbour (July 2002), and Kaikoura (October 2011). In 2015 and 2016 seven individual king shags, mostly 1st and 2nd year birds, were recorded from Abel Tasman National Park. The International Union for Conservation of Nature threat classification is "Vulnerable to extinction" and under the New Zealand Threat Classification System the species has the status "Nationally Endangered". This means the species is considered threatened with extinction due to its low population numbers, the limited area of occupancy (usually considered to be the nesting habitat of seabirds) and limited extent of occurrence (foraging range at sea). The total population of King Shags is likely to be less than 1000 birds and more than 800. The most recent full population census in February 2015 identified 839 birds (Schuckard et al., 2015).	One of only two mainland breeding colonies in Marlborough.

SIGNIFICANT SITE SUMMARY	Existing and present survey information	Expert panel assessment
Original area of significant site (ha)		
Recommended area of significant site (ha)	0.16	0.16
Change to original site	Increase	Increase
Change (ha)	0.16	0.2
Percentage change from original area (%)	100.0%	100
Anthropogenic disturbance	Moderate (regular recreational fishing occurs along this coast)	Moderate (regular recreational drift fishing occurs along this coast and may cause disturbance to nesting birds).
Vulnerability assessment	High sensitivity (birds are readily disturbed if approached).	High sensitivity (birds are readily disturbed if approached). Pigs are likely the biggest threat to this mainland colony.
Assessment criteria scores (original)		**Assessment criteria scores (revised)**
1. Representativeness	M (medium)	M (medium)
2. Rarity	H (high)	H (high)
3. Diversity and pattern	L (low)	L (low)
4. Distinctiveness	M (medium)	M (medium)
5. Size	L (low)	L (low)
6. Connectivity	M (medium)	M (medium)
7. Catchment	NA	H (high)
Comments		
Recommendations	Create a new polygon to encompass the roosting and breeding site. Protect from disturbance.	Create new significant site to encompass the roosting and breeding site. Protect from disturbance. Investigate options to establish pig-proof fence and advocate for a minimum recommended approach distance to colonies.

REFERENCES		
	Davidson, R.J.; Richards, L.A.; Rayes, C. 2017. Significant marine site survey and monitoring programme: Summary report 2016-2017. Prepared by Davidson Environmental Limited for Marlborough District Council. Survey and monitoring report number 859.	
	Schuckard, R.; Melville, D.S.; Taylor, G. 2015. Population and breeding census of New Zealand king shag (*Leucocarbo carunculatus*) in 2015. Notornis 62 (4): 209-218.	
	Schuckard, R. 2006. Population status of the New Zealand king shag (*Leucocarbo carunculatus*). Notornis 53: 297-307.	

Site 5.4 Tory channel west (biogenic structures)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number	5.4e-n	5.4 e-n
Site name	Tory channel bryozoan, sponge, ascidian and hydroid community	Tory Channel west (bryozoan, sponge, ascidian and hydroid community)
Site description	There are seven existing current swept significant sites located along the north-west and south-west edges of Tory Channel (Davidson and Richards, 2015). The new sites described here are comparable to sites 5.1, 5.2, 5.3, and 5.4a, 5.4b, 5.4c and 5.4d (Davidson and Richards, 2015). Communities are often, but not always associated with rocky structures.	
Ecological importance	Bryozoans, sponges and hydroids create biogenic habitats that provide three dimensional structures on the benthos. These habitats are utilised by a wide variety of species including juvenile fish.	

Human Impacts

Damage and or impacts noted	No impact on benthos noted during survey, but trawling occurs along the main reach and was observed on one day during the present study. Historic dredging targeting kina has historically occurred in Tory Channel.	Some dredging for kina may occur in Tory Channel. No trawling is permitted in Tory Channel.
Proportion of significant site effected		
Level of damage	Unknown	
Type of damage or activity observed		
Type of damage or activity observed		
Type of damage or activity observed		
Type of damage or activity observed		

SIGNIFICANT SITE SUMMARY	Existing and present survey information	Expert panel assessment
Original area of significant site (ha)	3.63 Te Pangu Bay (subtidal)	Katoa Point (3.3 ha). Te Weka Bay (4.4 ha), Tapapaweka Point (2.16 ha), Moioio Island (4.2 ha), Kaihinu Point (2.95 ha), Papatea Point (7.6 ha), Tio Point (6.3 ha), Motukina point (7.97 ha), Te Rua (west)(2.1 ha), Te Rua (east)(19.8 ha), Tipi (west)(2.36 ha), Tipi Bay (east1)(1.5 ha), Tipi Bay (east2)(3.6 ha), Thoms Bay (west)(3.2 ha), Thoms Bay (east)(2.1 ha), Puhe Point (4.7 ha). Total = 78 ha.
Recommended area of significant site (ha)	45.72	
Change to original site	Increase	
Change (ha)	42.09	
Percentage change from original area (%)	92.0	
Anthropogenic disturbance	Kina dredging may occur. Three salmon farms are located along the edges of the main reach. Several mussel farms are located in adjacent bays to the main reach. Pine plantations are widespread in most catchments of the bays along Tory Channel. The intertidal and shallow subtidal received wakes from ferry passage.	
Vulnerability assessment	Medium to high (bryozoans, sponges and hydroids are vulnerable to physical disturbance). Many remnant habitats are associated with outcropping rock that appears to provide refuge from physical damage.	
Assessment criteria scores (original)		Assessment criteria scores (revised)
1. Representativeness	H (high)	H (high)
2. Rarity	M (medium)	M (medium)
3. Diversity and pattern	M (medium)	H (high)
4. Distinctiveness	M (medium)	H (high)
5. Size	H (high)	H (high)
6. Connectivity	L (low)	H (high)
7. Catchment	L (low)	L (low)
Comments	The new sites described in this site record form are comparable to sites 5.1, 5.2, 5.3, and 5.4a-d (Davidson and Richards, 2015).	
Recommendations	Assess these sites for significant site status. Group any sites with the existing Significant Site 5.4. New sites should be listed as sub-sites.	Add new sub-sites to Site 5.4

REFERENCES		
	Davidson R.J.; 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.; 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 Environmental Limited for Marlborough District Council and Department of Conservation. Survey and monitoring report no. 824.	

Site 5.8 Tory Channel east (biogenic structures)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number	5.8g-l	5.8 g-l
Site name	Tory channel hydroid, bryozoan, sponge and ascidian community	Tory Channel east (hydroid, bryozoan, sponge and ascidian community)
Site description	There are six existing significant sub-sites along the current swept north-eastern edges of Tory Channel (Davidson and Richards, 2015). The new sites described here are comparable to sites 5.8a-f (Davidson and Richards, 2015). Communities are often, but not always associated with rocky structures.	
Ecological importance	Bryozoans, sponges and hydroids create biogenic habitats that provide three dimensional structures on the benthos. These habitats are utilised by a wide variety of species including juvenile fish.	

Human Impacts

Damage and or impacts noted	No impact on benthos noted during survey, but trawling occurs along the main reach. Historic dredging targeting kina has historically occurred in Tory Channel.	Some dredging for kina may occur in Tory Channel. No trawling is permitted in Tory Channel.
Proportion of significant site effected		
Level of damage	Unknown	
Type of damage or activity observed		
Type of damage or activity observed		
Type of damage or activity observed		
Type of damage or activity observed		

SIGNIFICANT SITE SUMMARY	Existing and present survey information	Expert panel assessment
Original area of significant site (ha)	0	
Sites		Te Rua (east)(19.8 ha), Tipi (west)(2.36 ha), Tipi Bay (east1)(1.5 ha), Tipi Bay (east2)(3.6 ha), Thoms Bay (west)(3.2 ha), Thoms Bay (east)(2.1 ha), Puhe Point (4.7 ha).
Recommended area of significant site (ha)	32.46	
Change to original site	Increase	
Change (ha)	32.46	
Percentage change from original area (%)	100.0	
Anthropogenic disturbance	Kina dredging may occur. Three salmon farms are located along the edges of the main reach. Several mussel farms are located in adjacent bays to the main reach. Pine plantations are widespread in most catchments of the bays along Tory Channel. The intertidal and shallow subtidal received wakes from ferry passage.	
Vulnerability assessment	Medium to high (bryozoans, sponges and hydroids are vulnerable to physical disturbance). Many remnant habitats are associated with outcropping rock that appears to provide refuge from physical damage (dredging and trawling). Also vulnerable to sedimenttion, but mititigated by strong currents.	
Assessment criteria scores (original)		**Assessment criteria scores (revised)**
1. Representativeness	H (high)	H (high)
2. Rarity	M (medium)	M (medium)
3. Diversity	M (medium)	H (high)
4. Distinctiveness	H (high)	H (high)
5. Size	H (high)	M (medium)
6. Connectivity	H (high)	H (high)
7. Catchment	L (low)	L (low)
Comments	The new sites described in this site record form are comparable to existing Significant Sites 5.8	
Recommendations	Assess these sites for significant site status. Group any sites with the existing Significant Site 5.8. New sites should be listed as sub-sites.	Add new sub-sites to Site 5.8

REFERENCES		
	Davidson R.J.; 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.; 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 Environmental Limited for Marlborough District Council and Department of Conservation. Survey and monitoring report no. 824.	

Site 5.10 Tory Channel east (subtidal eelgrass beds)

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number		5.10 a-n
Site name	Outer Tory Channel (subtidal eelgrass)	Tory Channel east (subtidal eelgrass)
Site description	14 new sub-sites supporting subtidal eelgrass.	
Ecological importance	Permanently submerged beds of seagrass (Zosteraceae) in coastal waters are rare in New Zealand, where most seagrass beds are confined to the intertidal zone of estuaries (Schwarz *et al*., 2006). Subtidal beds are knowns from offshore islands including Slipper Is (Bay of Islands), Cavallis and Great Mercury Island. Seagrasses including eelgrass are among the most productive plants of earth (McRoy and McMillan, 1977; Knox, 1986; Duarte and Chiscano, 1999) a and influence community structure and function through a combination of physical, chemical, and biological mechanisms (Phillips 1984, Thayer et al., 1984). Declining seagrass populations worldwide have been largely due to increases in anthropogenic disturbance (Short and Burdick, 1996) including lowered water quality or clarity, nutrient and sediment loading from runoff and sewage disposal, dredging and filling for navigation, pollution, upland development, and commercial fishing (Fonseca et al., 1984; Short and Burdick, 1996; Short and Wyllie-Echeverria, 1996). At present, no	
Human Impacts		
Damage and or impacts noted	No impacts noted during survey. Eelgrass is vulnerable to smothering by sediment.	Eelgrass is vulnerable to smothering by sediment.
Proportion of significant site effected		
Level of damage	None	
Type of damage or activity observed		
Type of damage or activity observed		
Type of damage or activity observed		
Type of damage or activity observed		
SIGNIFICANT SITE SUMMARY	**Existing and present survey information**	**Expert panel assessment**
Original area of significant site (ha)		
Sites and sub-sites	Tory Channel subtidal eelgrass beds	
Recommended area of significant site (ha)	12.2	
Change to original site		
Change (ha)	0	
Percentage change from original area (%)	0.0	
Anthropogenic disturbance	None observed	Anchoring damage, new moorings, increased sediment
Vulnerability assessment	Declining seagrass populations worldwide have been largely due to increases in anthropogenic disturbance (Short and Burdick, 1996) including lowered water quality or clarity, nutrient and sediment loading from runoff and sewage disposal, dredging and filling for navigation, pollution, upland development, and commercial fishing (Fonseca et al., 1984; Short and Burdick, 1996; Short and Wyllie-Echeverria, 1996).	Declining seagrass populations worldwide have been largely due to increases in anthropogenic disturbance (Short and Burdick, 1996) including sedimentation (Fonseca et al., 1984; Short and Burdick, 1996; Short and Wyllie-Echeverria, 1996).
Assessment criteria scores (original)		**Assessment criteria scores (revised)**
1. Representativeness		H (high)
2. Rarity		H (high)
3. Diversity		H (high)
4. Distinctiveness		H (high)
5. Size		H (high)
6. Connectivity		L (low)
7. Catchment		L (low)
Comments	Intertidal eelgrass beds have been recorded from a variety of sites in the Marlborough Sounds and Tasman/Golden Bays, but subtidal eelgrass beds appear to be restricted to the southern shores of Tory Channel.	High diversity (from literature).
Recommendations	Assess these sites for significant site status. List as a group of sub-sites.	
REFERENCES	Short, F.T.; Burdick, D.M. 1996. Quantifying seagrass habitat loss in relation to housing development and nitrogen loading in Waquoit Bay, Massachusetts. Estuaries 19:730–739.	
	Short, F.T.; Wyllie-Echeverria, S. 1996. Natural and human-induced disturbance of seagrasses. Environ Conserv 23: 17–27.	
	Fonseca, M.S.; Thayer, G.W.; Chester, A.J. 1984. Impact of scallop harvesting on eelgrass (Zostera marina) meadows: implications for management. N Am J Fish Manag 4:286–293.	
	Matheson, F.; Dos Santos, V.; Inglis, G.; Pilditch, C.; Reed, J.; Morrison, M.; Lundquist, C.; Van Houte-Howes, K.; Hailes, S.; Hewitt, J. 2009. New Zealand seagrass - General Information Guide NIWA Information Series No. 72	
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Site 5.11 Ngaruru Bay subtidal drift algae

Site Registration Detail (original)	Existing and present survey information	Expert panel assessment
Site number		5.11
Site name	Ngaruru Bay (subtidal drift macroalgae)	Ngaruru Bay (subtidal drift macroalgae)
Site description	Two new sub-sites supporting subtidal drift macroalgae.	
Ecological importance	Drift macroalgae is known to be very productive and may provide habitat for a variety of species (Knox, 1986; Norkko *et al*., 2000). Norkko et al. (2000) stated drifting algae at a site in Finland at times supported very high abundances of invertebrates (up to 1116 individuals/g algal dry weight), surpassing invertebrate densities recorded in seagrass communities. Britton-Simmons *et a*l. (2012) stated the export of large amounts of detritus derived from nearshore macrophyte production into deep-water habitats likely fuels extensive secondary production in their study area located in offshore aphotic zones. Drift material is an excellent food resource (Wilson et al., 1990) since it tends to have elevated levels of nitrogen (Mann, 1988) and diminished levels of defensive chemicals (Duggins and Eckman, 1997). Drift macroalgae may also provide shelter and enhance dispersal mechanisms for other species (Holmquist, 1994). This resource could therefore be important for driving marine secondary productivity.	
Human Impacts		
Damage and or impacts noted	No impacts noted during survey.	Dredging and trawling in this area is unlikely.
Proportion of significant site effected		
Level of damage		
Type of damage or activity observed		
Type of damage or activity observed		
Type of damage or activity observed		
Type of damage or activity observed		
SIGNIFICANT SITE SUMMARY	**Existing and present survey information**	**Expert panel assessment**
Original area of significant site (ha)		
Sites and sub-sites	Tory Channel subtidal drift macroalgae	
Recommended area of significant site (ha)	41.9	
Change to original site		
Change (ha)	0	
Percentage change from original area (%)	0.0	
Anthropogenic disturbance	None observed	
Vulnerability assessment	Little is known about anthropogenic threats to drift macroalgal beds on soft substratum. It is probable that threats may be indirect and associated with the source of drift macroalgae. There are numerous studies documenting a decline of living macroalgal beds on rocky substrata due factors such as climate change, ecosystem changes (e.g. predation) and environmental variable (e.g. reduced light penetration) (Smale *et al*., 2013). MacDiarmid *et al*. (2012) concluded that kelp forests on sheltered coasts were affected by 39 threats.	
Assessment criteria scores (original)		**Assessment criteria scores (revised)**
1. Representativeness		H (high)
2. Rarity		M (medium)
3. Diversity		Unknown
4. Distinctiveness		H (high)
5. Size		H (high)
6. Connectivity		L (low)
7. Catchment		NA
Comments	Two subtidal sites supporting dense beds of drift macroalgae were investigated in Ngaruru Bay. Macroalgae was dominated by large brown, red foliose species and sea lettuce. Drift macroalgae was found in shallow water (3 to 8 m depth) and was observed at up to 100% cover over the underlying silt substratum.	It is unknown if this is a regular occurrence or an intermittent phenomenon. Suggest collection of more data over a longer time frame. Diversity unknown at present. Collection of samples also suggested to determine diversity of algal species and fauna living in association with drift algae.
Recommendations	Assess these sites for significant site status. List as a group of sub-sites.	
REFERENCES	Smale, D.; Burrows, M.; Moore, P.; O'Connor, N.; Hawkins, S. 2013. Threats and knowledge gaps for ecosystem services provided by kelp forests: a northeast Atlantic perspective. Ecology and Evolution Vol: 3 (11) pp: 4016-4038. DOI 10.1002/ece3.774	
	MacDiarmid, A.B.; McKenzie, A.; Sturman, J.; Beaumont, J.; Mikaloff-Fletcher, S.; Dunne, J. 2012. Assessment of anthropogenic threats to New Zealand marine habitats. New Zealand Aquatic Environment and Biodiversity Report 93: 255 p	
	Norkko, J.; Bonsdorff, E.; Norkko, A. 2000. Drifting algal mats as an alternative habitat for benthic invertebrates: Species specific responses to a transient resource. Journal of Experimental Marine Biology and Ecology, Volume 248, Issue 1.	
	Britton-Simmons, K. H.; Rhoades, A.L.; Pacunski,R.E.; Galloway, A.W.E.; Lowe, A.T.; Sosik, E.A.; Dethier, M.N.; Duggins, D.O. Habitat and bathymetry influence the landscape-scale distribution and abundance of drift macrophytes and associated invertebrates. Limnol. Oceanogr., 57(1), 2012, 176–184. doi:10.4319/lo.2012.57.1.0176	
	Wilson, K.A.; Able, K.W.; Heck, K.L. 1990. Predation rates on Juvenile blue crabs in estuarine nursery habitats - evidence for the importance of macroalgae (Ulva-lactuca). Mar Ecol Prog Ser 58(3):243–251.	

6.0 Significant site sensitivity and anthropogenic disturbance

6.1 Anthropogenic impacts

Many of Marlborough's significant marine sites contain biological features considered uncommon and remnants of habitats and communities that were likely once more widespread (Davidson *et al*. 2011; Davidson and Richards 2015; 2016; Handley 2015, 2016). This situation reflects a global trend of declining biogenic habitats (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). For example, in New Zealand, a decline in biogenic habitats has been linked to declining juvenile fish habitats and, therefore, a decline in fish abundance and biomass (see Morrison *et al*. 2014 for review).

The site assessment criteria used by Davidson *et al*. (2011) relied heavily on identifying the best or better sites remaining in each biogeographic area. In certain cases, the biological values represented the last, or best remaining of their kind, based on existing knowledge. Their survival was often due to environmental factors such as topography or substratum that provided some level of natural protection from anthropogenic impacts.

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, for example from trawling and dredging, 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.

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. Both scenarios were reported by Davidson *et al*. (2017).

6.2 Threat assessment process

For each significant site, the Expert Panel assessed anthropogenic threats (Table 3). These were based on:

(4) The perceived level of anthropogenic disturbance (e.g. dredging recorded).

(5) Each species, community or habitats vulnerability to anthropogenic impact (e.g. fragile species).

(6) Significant site vulnerability to anthropogenic impact (e.g. site located on an offshore soft bottom, 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).

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 react to the effects of potential "stressors".

Definitions for the threat categories used in the assessment of threats 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 a habitat, species and/or community's vulnerability to human derived damage by nature of 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 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 Assessment summary

Sites 3.1 (Harris Bay) was ranked as both resilient for species and location as well as being subject to a low level of human impact (Table 3). This site is shallow, in a bay considered unsuitable for dredging and trawling. Sites 2.33 (Hunia tubeworms) and 2.5 (Bonne Point rhodoliths) were also ranked as having low levels of disturbance and physical vulnerability due to their location. For example, Bonne Point rhodoliths were protected from dredging and trawling due to the presence of a reef; however, the site is considered vulnerable to anchoring impacts.

Site 1.2 (Croisilles Entrance) was assessed as has having a high level of physical disturbance, but was dominated by a resilient habitat and infauna. In contrast, sites 2.6, 2.10 and 2.30 supported fragile biogenic communities and were assessed as vulnerable to physical damage. Only biogenic communities growing on rock were assessed as having a low level of physical vulnerability (e.g. 2.27 Titi Island).

Site 2.6 (Rangitoto Passage) was subjected to human impacts, but these were considered patchy. Some habitats present at the Rangitoto site remained free of disturbance because of their location on or near rocky reefs, but were regarded having a high species/community sensitivity due to their fragile nature.

Subtidal eelgrass beds in Tory Channel are fragile and vulnerable to physical disturbance from activities such as anchoring or from catchments effects such as sedimentation. Pine forest clearance in adjacent areas for example, would likely lead to smothering.

The Expert Panel recommends that all sites that are regarded as sensitive or vulnerable to anthropogenic disturbance (Table 4) be given a level of protection that ensures their biological values are not further degraded.

7.0 Erratum

The following are errors to the Davidson et al., (2011) report.

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 with 4.23 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

Acknowledgements

The project was funded and supported by the Marlborough District Council and the Department of Conservation. Constructive and detailed comments on this report were gratefully received from Steve Urlich (MDC). Lancelet records from Te Papa were provided by Carl Struthers.

Table 4. Summary of anthropogenic disturbance and vulnerability assessment.

Sites	Anthropogenic disturbance	Sensitivity (species, habitat)	Anthropogenic vulnerability	Comments
Site 1.2 Croisilles Harbour Entrance (habitat & lancelet)	High	Resilient	Low	Resilient habitat and species to recreational dredging
Site 2.6 Rangitoto Islands (A, B, C, D) (biogenic community)	Moderate	Extremely sensitive	High	Rare and fragile biogenic community on soft substrata
Site 2.10 Trio Islands (west) (biogenic community)	Moderate to high	Extremely sensitive	High	Fragile biogenic community on soft substrata
Site 2.27 Titi Island (A, B, C)(biogenic community)	Moderate	Extremely sensitive	Low	Fragile biogenic restricted to or near rock
Site 2.30 Waitui Bay (biogenic community)	Moderate to high	Extremely sensitive	High	Biogenic community on soft substrata
Site 2.33 Hunia Coast (tubeworms)	Low	Sensitive	Low	Community in very shallow water
Site 3.1 Harris Bay (algae)	Low	Resilient	Low	Community in shallow water
Site 2.5 Bonne Point (rhodolith bed)	Low	Extremely sensitive	Low	Protected by reef, vulnerable to anchoring
Site 3.23 Tawhitinui Bay (king shag)	Moderate	Extremely sensitive	High	Area used by recreational fishers
Site 5.4 e-m Tory Channel western biogenic habitats	Moderate	Extremely sensitive	Moderate	Fragile biogenic restricted to or near rock, fringes vulnerable
Site 5.8 g-l Tory Channel eastern biogenic habitats	Moderate	Extremely sensitive	Moderate	Fragile biogenic restricted to or near rock, fringes vulnerable
Site 5.10 a-n Tory Channel subtidal eelgrass	Low	Extremely sensitive	High	Very vulnerable physical disturbance, moorings and anchoring
Site 5.11 a-b Ngaruru Bay subtidal macraoalgae beds	Low	Resilient	Low	Likely resilient to physical disturbance

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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 a sites significance. Site that do not achieve "H" or "M" are 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).