MCORI Project: 21-12 **March 2022**

ShoreZone Habitat Mapping Summary Report

Gulf Islands Survey Area

Chrome Island Lighthouse

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Gulf Islands Survey Area Summary

989 km of shoreline mapped

4,953 shoreline units created

Average unit length is **200 m**

46% of the intertidal is classified as **Rock and Sediment-dominated** and **28%** is classed as **Rock**

71% of the shoreline has a high Oil Residence Index value (residence of months to years)

5% of the shoreline has a **Shoreline Modification** of some type

14 biobands were classified in the **intertidal** with **Green Algae, Barnacle** and **Rockweed** being the most common (**over 83%** of units each)

6 biobands were classified in the **supratidal** with **Black Lichen** (**52%** of units) being the most common

8 biobands were classified in the **subtidal** with **Eelgrass** being the most common (**26%** of units)

Village Bay, Mayne Island

Seal Islets

Saturna Island

Tribune Bay, Hornby Island

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1 INTRODUCTION

ShoreZone is an imaging and habitat classification system for the coastal nearshore margin including the shallow subtidal, intertidal shoreline and supratidal fringe. One objective of ShoreZone is to produce a georeferenced, searchable inventory of the physical and biological attributes of coastal habitats. ShoreZone imagery and habitat mapping attributes can provide a useful baseline from which to study change over time, while the attributes mapped (such as shoreline sediments, predicted oil residence and biotic communities) provide an important resource for scientists, managers and responders. The ShoreZone mapping system provides a decision support tool with many potential uses including community planning, facilities citing, conservation planning, research and fisheries management, emergency planning and response, search and rescue, education and habitat modeling.

The ShoreZone system was developed in the 1980s and 1990s to map coastal habitats in British Columbia and Washington State (Howes 2001; Berry *et al.* 2004). In 2001 ShoreZone was implemented in Alaska, beginning with Cook Inlet, Outer Kenai, Katmai, and portions of the Kodiak Archipelago (Harper and Morris 2004). ShoreZone has since expanded to a spatially continuous database of over 122,000 km of coastal Alaska, British Columbia, Washington State and Oregon (see Figure 1). Figure 2 shows the extent of the shoreline mapped around the Gulf Islands and is the section of shoreline covered by this summary report.

The ShoreZone imaging surveys conducted around the Gulf Islands in August 2021 acquired aerial video and digital still images of the coast during minus tides (zero-meter tide levels and lower). The imagery and associated audio commentary were used to map the physical and biological attributes of the shoreline. The entire shoreline was mapped according the most recent ShoreZone coastal habitat mapping protocol (Cook *et al*. 2017). The purpose of this report is to provide a summary of the physical (Section 2) and biological (Section 3) data imaged and classified in the Gulf Islands survey area. Please see the Acknowledgments section included in this report for the imaging and mapping funding partners in British Columbia.

The length of shoreline mapped is **989 kilometers** in **4,953 along-shore segments** (units), averaging 200 m in length. The digital shoreline used for the ShoreZone habitat mapping was the CHS_Highwaterline_BCalbers.shp.

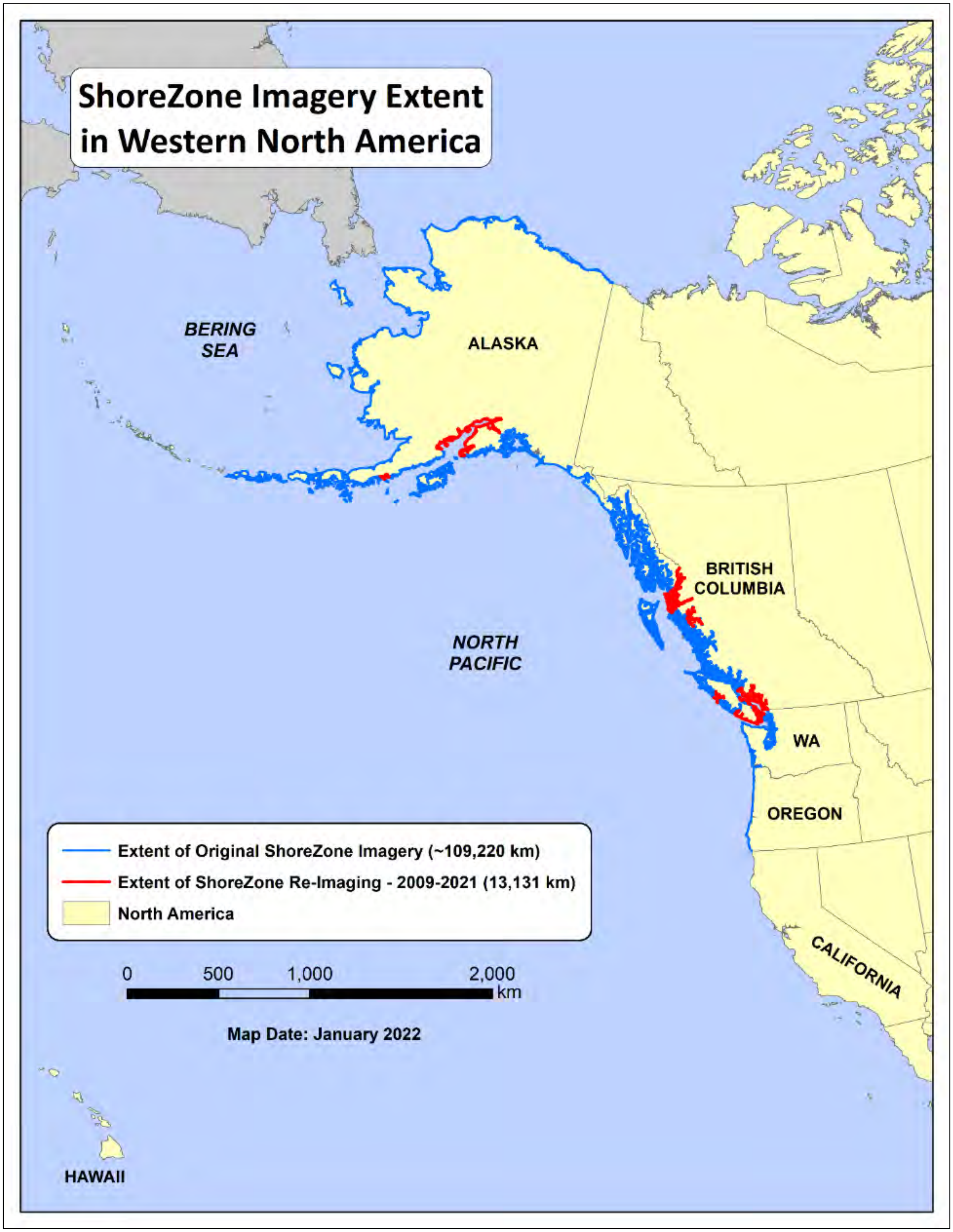

Figure 1. Extent of ShoreZone imagery in Alaska, British Columbia, Washington State and Oregon as of March 2022.

Figure 2. Extent of ShoreZone mapping for the Gulf Islands covered in this report.

2 PHYSICAL ATTRIBUTE DATA SUMMARY

2.1 Coastal Class

Figure 3. Map of the Coastal Class categories grouped by type (also known as Shore Type).

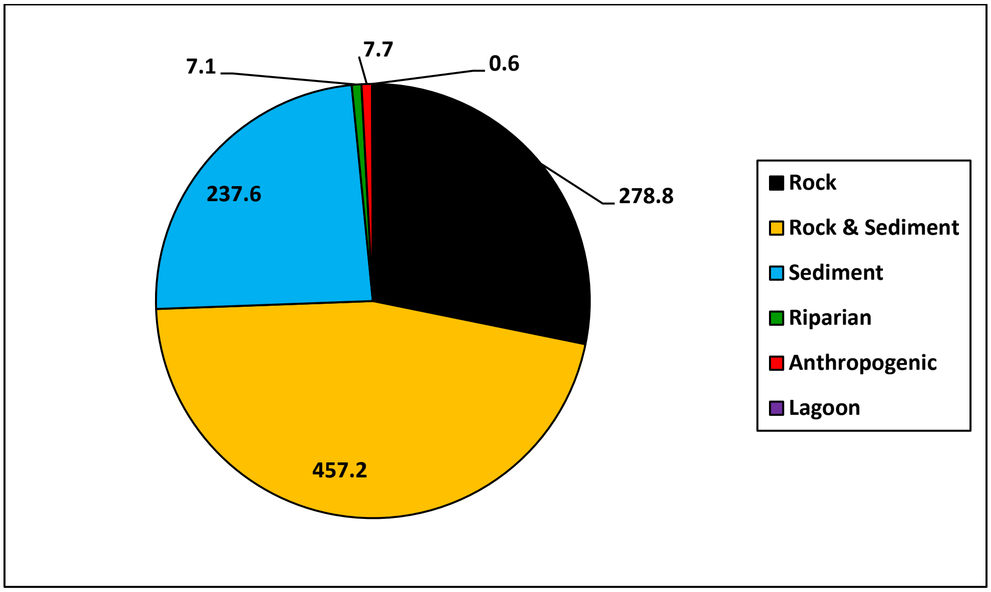

Figure 4. Grouped Coastal Class categories by shoreline length (km).

The Coastal Class is used to define along-shore coastal units based on the dominant process, geomorphic features and other attributes such as substrate size, across-shore width, and slope (Cook *et al*., 2017 after Howes *et al*., 1994). The principal characteristics of each along-shore unit are used to assign one of 39 overall unit classifications. Rock and sediment shorelines (46.2%) were prominent along with Rock shorelines (28.2%) and Sediment shorelines (24.0%) in the Gulf Islands survey area. Riparian, Anthropogenic, and Lagoon shorelines all comprised the rest of the coast (see Figures 3 and 4 for distribution and summary statistics). The description for each Coastal Class category in the survey area is given in Table 1. Photographic examples of the major Coastal Classes mapped in the Gulf Islands survey area are found in Appendix A, Table A-1.

Table 1. Summary of Coastal Classes for the Gulf Islands survey area.

Substrate Type	Shore Type No.	Shore Type Description	Sum of Unit Length (km)	# of Units	% Occurrence (by length)	Cumulative Occurrence (%, km)
Rock	1	Rock Ramp, wide	14	59	1	28% 279 km
	2	Rock Platform, wide	11	80	1	
	3	Rock Cliff	153	742	15	
	4	Rock Ramp, narrow	99	501	10	
	5	Rock Platform, narrow	2	8	<1	
Rock & Sediment	6	Ramp w gravel beach, narrow	8	39	1	46% 457 km
	7	Platform w gravel beach, wide	10	30	1	
	8	Cliff with gravel beach	129	542	13	
	9	Ramp with gravel beach	78	476	8	
	10	Platform with gravel beach	1	3	<1	
	11	Ramp w gravel & sand beach, wide	29	171	3	
	12	Platform with G&S beach, wide	67	312	7	
	13	Cliff with gravel/sand beach	14	117	1	
	14	Ramp with gravel/sand beach	112	700	11	
	15	Platform with gravel/sand beach	2	15	<1	
	16	Ramp w sand beach, wide	<1	1	<1	
	17	Platform w sand beach, wide	6	26	1	
	18	Cliff with sand beach	1	5	<1	
	19	Ramp with sand beach, narrow	1	7	<1	
Sediment	21	Gravel flat, wide	1	5	<1	24% 238 km
	22	Gravel beach, narrow	10	38	1	
	24	Sand & gravel flat or fan	102	316	10	
	25	Sand & gravel beach, narrow	92	615	9	
	26	Sand & gravel flat or fan	1	5	<1	
	27	Sand beach	1	3	<1	
	28	Sand flat	23	46	2	
	29	Mudflat	6	14	1	
	30	Sand beach	2	9	<1	
Organics	31	Organics/Estuarine	7	8	1	1% 7 km
Man-made	32	Man-made, permeable	7	55	1	1% 8 km
	33	Man-made, impermeable	<1	3	<1	
Lagoon	36	Lagoon	1	2	<1	<1% 1 km
Totals:			***989***	***4,953***	***100***	***100%***

Note: This table only includes Coastal Classes observed in the survey area.

2.2 Environmental Sensitivity Index (ESI)

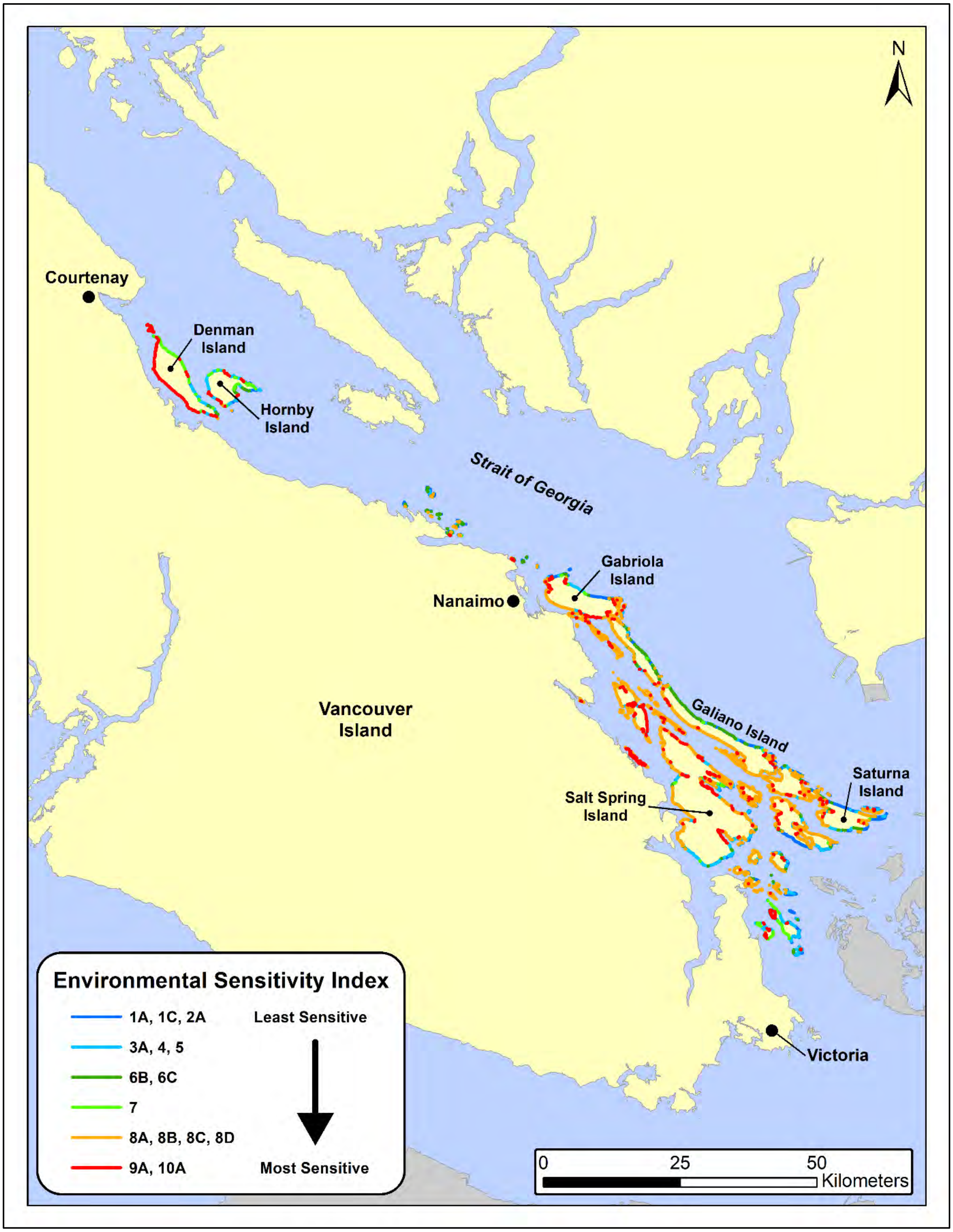

Figure 5. Distribution of the grouped ESI categories from least to most sensitive to oiling.

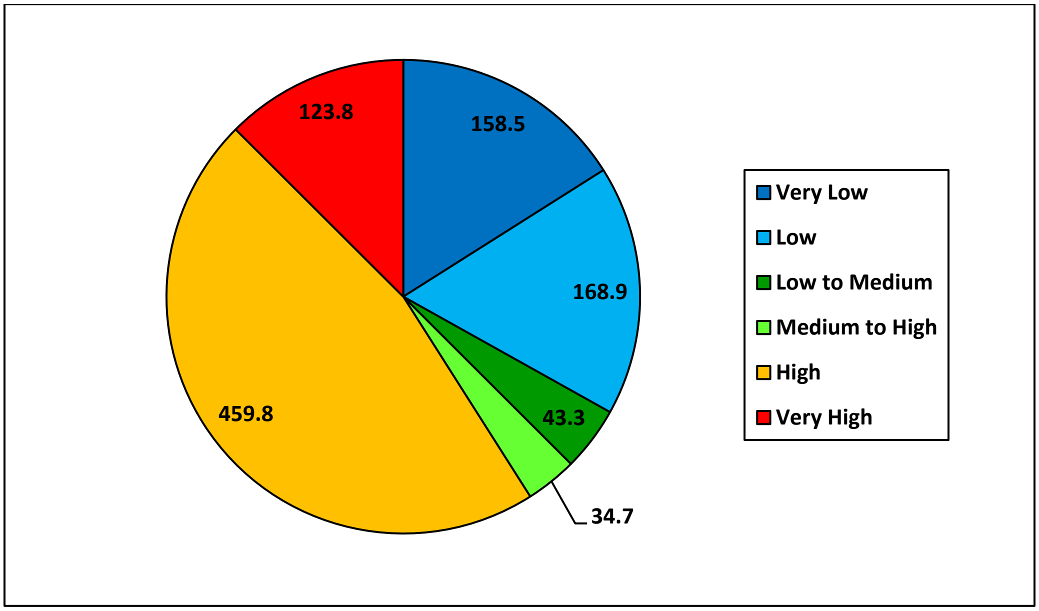

Figure 6. Grouped most sensitive ESI categories by shoreline length (km).

The NOAA Environmental Sensitivity Index (ESI) is a shoreline classification system developed to characterize coastal regions based on sensitivity to potential oil spills (Petersen *et al*., 2002). The ESI system uses wave exposure and principal substrate type to assign a rank of 1 to 10 (with 10 being the most sensitive to oil) to alongshore units. Up to three ESI numbers can be assigned to each ShoreZone unit (high, mid and low intertidal) if applicable. The highest ESI number for each unit, which is the most sensitive, is used in this analysis.

The majority of the Gulf Islands' coastline is represented by the grouped High and Very High categories (59.0% of shoreline length). These sections of the shoreline have a potentially high sensitivity to oil. At the other end of the spectrum, only 33.1% of the shoreline was mapped with a potentially low sensitivity to oil (Figures 5 and 6). The summary of Coastal Class by ESI class can be seen in Table 2.

Table 2. Summary of Coastal Classes by ESI Class for the Gulf Islands survey area.

Environmental Sensitivity Index (ESI)		Sum of Unit Length (km)	# of Units	% of Total Shoreline Length
No.	Description			
1A	Exposed rocky shores; Exposed rocky banks	54	245	5
1C	Exposed rocky cliffs with boulder talus base	19	86	2
2A	Exposed wave-cut platforms in bedrock, mud, or clay	86	411	9
3A	Fine- to medium-grained sand beaches	3	14	<1
4	Coarse-grained sand beaches	1	7	<1
5	Mixed sand and gravel beaches	165	967	17
6B	Gravel beaches (cobbles and boulders)	42	210	4
6C	Rip rap	1	10	<1
7	Exposed tidal flats	35	90	4
8A	Sheltered scarps in bedrock, mud, or clay; sheltered rocky shores (impermeable)	237	1,367	24
8B	Sheltered, solid, man-made structures; sheltered rocky shores (permeable)	3	8	<1
8C	Sheltered Rip Rap	7	53	1
8D	Sheltered rocky rubble shores	213	1,093	22
9A	Sheltered tidal flats	86	313	9
10A	Salt- and brackish-water marshes	36	79	4
	Totals:	***989***	***4,953***	***100***

Note: ESI Classes not observed in this survey area were not included in the table.

2.3 Oil Residence Index (ORI)

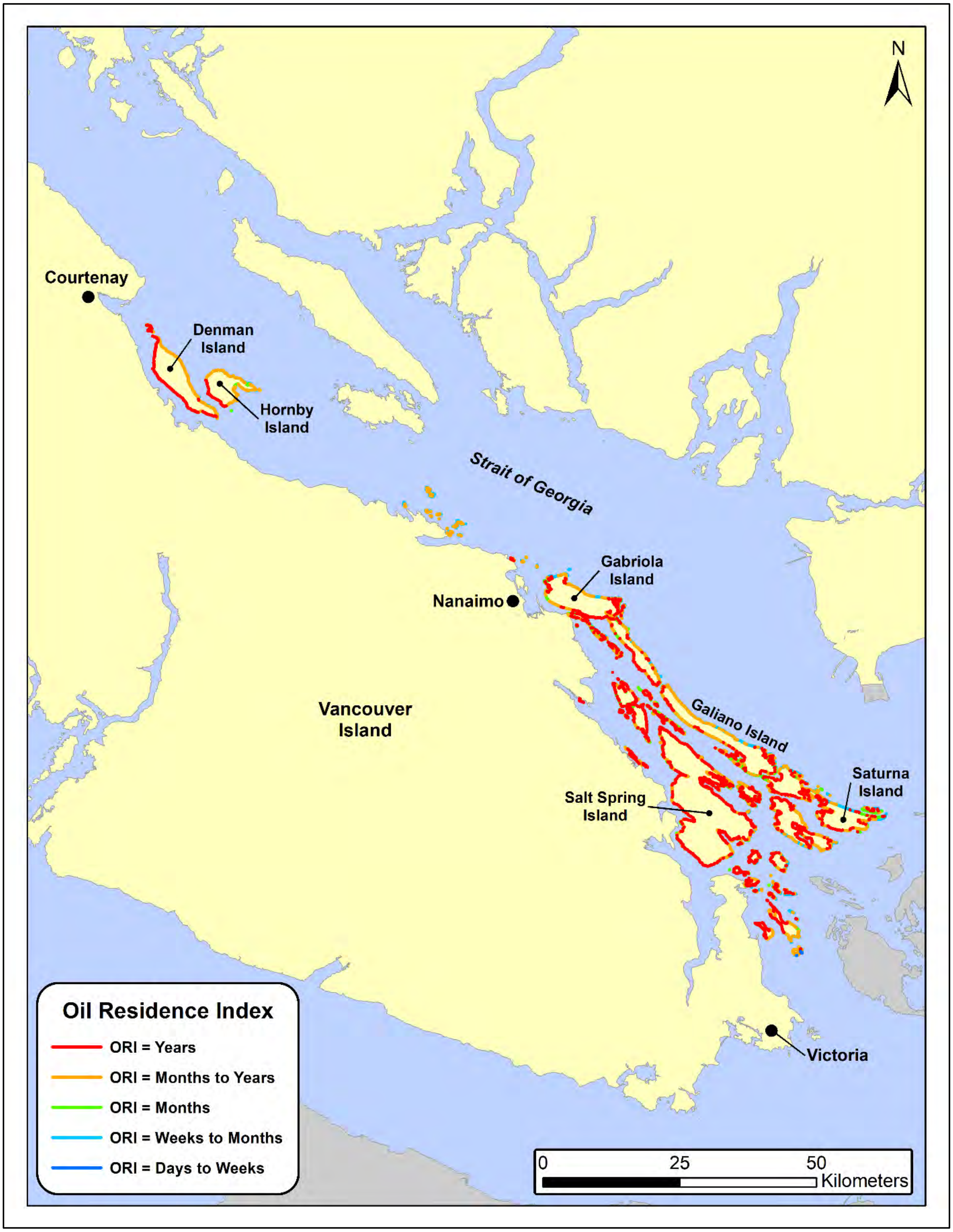

Figure 7. Distribution of the Oil Residence Index (ORI) categories.

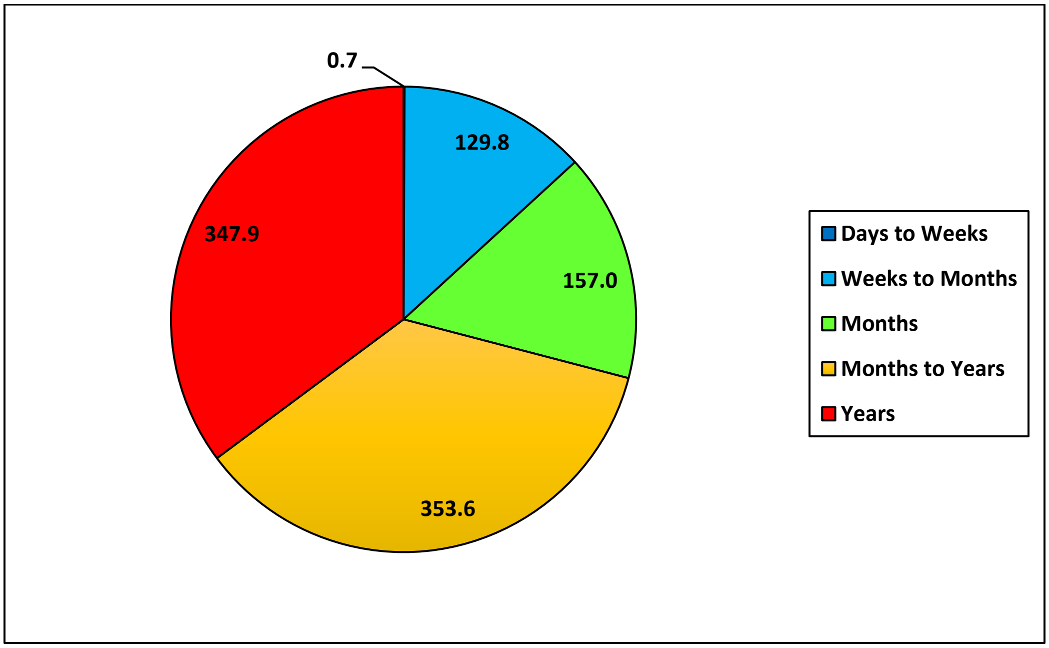

Figure 8. Oil Residence Index (ORI) categories by shoreline length (km).

The Oil Residence Index (ORI) is a rating between 1 and 5 with a value of 1 indicating a relatively short oil residence (days to weeks) while a value of 5 reflects potentially very long oil residence times (years). An ORI value is applied to each alongshore unit and to each across-shore component based on sediment texture and wave exposure (Cook *et al*., 2017). The ShoreZone ORI was developed by Dr. John Harper based on his many years of experience with cleaning up oiled shorelines, starting with the Exxon Valdez spill in Prince William Sound in Alaska. Lower wave exposures and mobile sediments lead to higher ORI values for 71% of the shore segments in the Gulf Islands survey area, indicating oil residence times are on the order of months to years (see Figures 7 and 8 for distribution and summary statistics).

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2.4 ShoreZone Coastal Vulnerability

2.4.1 Flood Zone Width

Figure 9. Distribution of the Coastal Vulnerability Flooding Class.

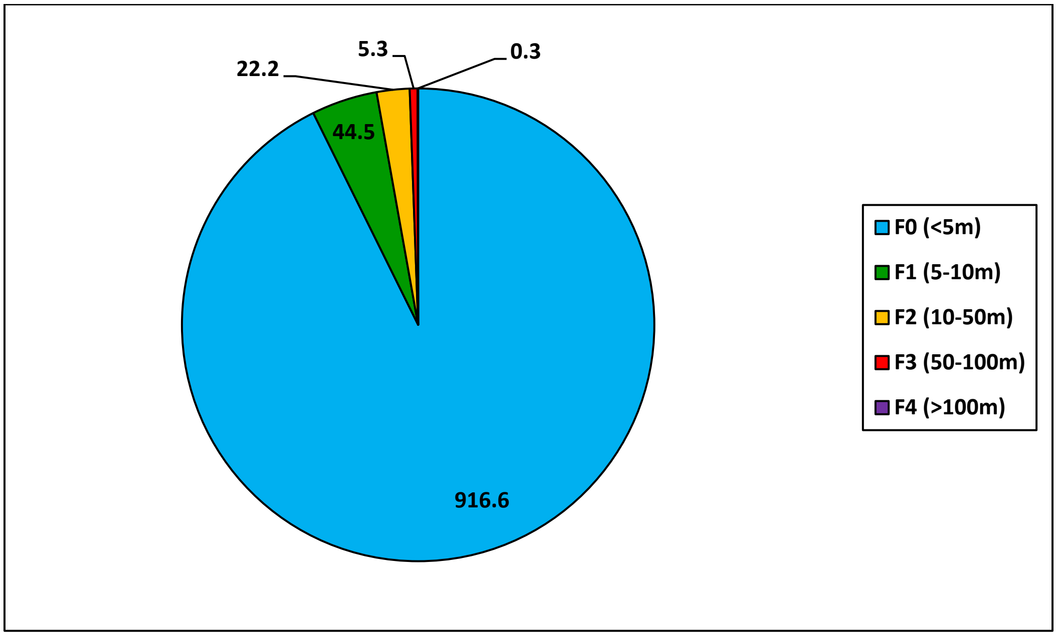

Figure 10. Flooding Class categories by shoreline length (km).

The Coastal Vulnerability Module (CVM) includes a classification of flooding sensitivity based on the across shore profile and photographic evidence of historical flooding such as an unambiguous marine debris line. The Flooding Class is an estimate of vulnerability to inundation of the terrestrial area beyond the supratidal. The distance to the debris line is measured and used to classify the flooding potential. Flat shorelines with very low gradients that show evidence of historical flooding have a higher risk of being inundated by storm surges. Potential for damage due to flooding is generally low in the Gulf Islands study area, with 92.7% of the shoreline at a low risk of flooding <5m from the Mean High Waterline (MHW) (see Figures 9 and 10 for distribution and summary statistics). The flooding class is a parameter of the Coastal Vulnerability Index (see Page 16).

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2.4.2 Coastal Vulnerability Observations

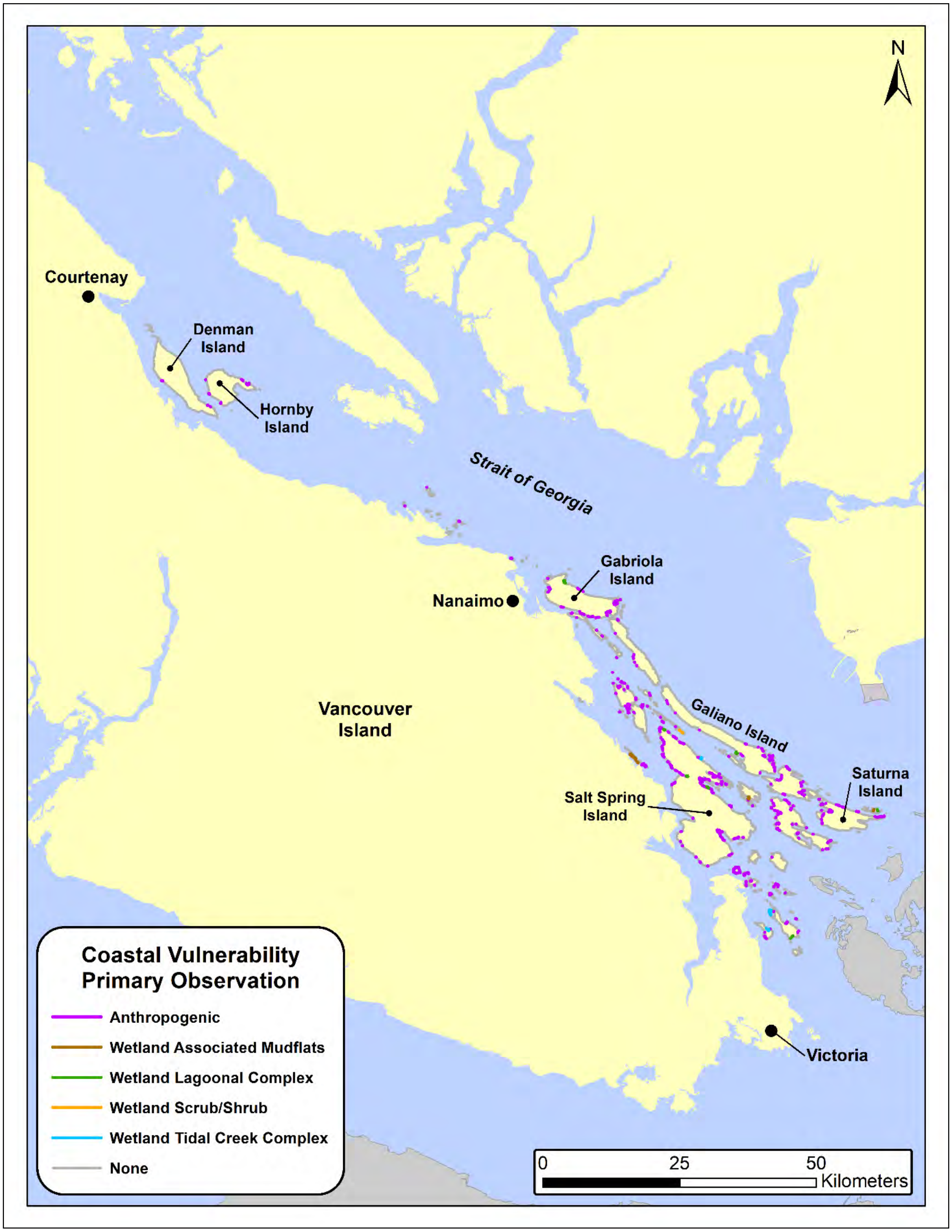

Figure 11. Distribution of the Coastal Vulnerability Observations categories.

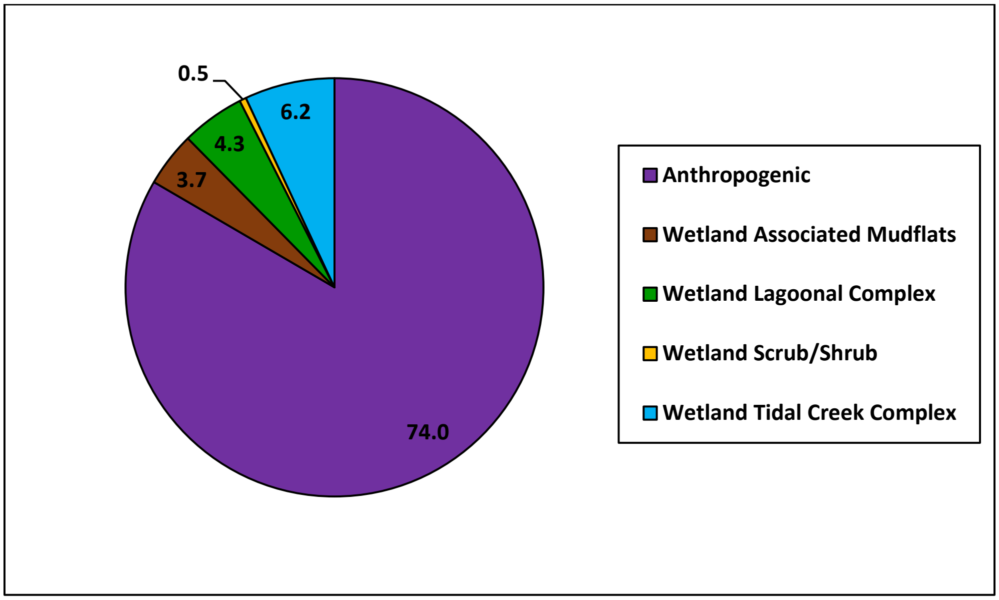

Figure 12. Coastal Vulnerability Observations categories by shoreline length (km). Category 'None' not shown.

The Coastal Vulnerability Observations are features important for estimating the frequency and extent of coastal inundation. In the Gulf Islands survey area, apart from the 'None' category, the majority of observations were from the Anthropogenic category with 74 km. The subsequent category was the Wetland Tidal Creek complex category with 7 km (see Figures 11 and 12 for distribution and summary statistics). With regards to the Anthropogenic category, it is important to point out that these areas are not necessarily areas of vulnerability, but areas potentially impacted.

2.4.3 Coastal Vulnerability Index

In the 2017 ShoreZone protocol (Cook *et al*., 2017), the methods of Thieler and Hammer-Klose (2000) (http://woodshole.er.usgs.gov/project-pages/cvi/) were adapted to calculate a Coastal Vulnerability Index (CVI) using five ShoreZone attributes: Coastal Class, Max Tide Range, Shoreline Erosion index, Flood Zone Width, and Significant Wave Height. When we first attempted to calculate the CVI for the portion of the shoreline funded in the Eastern Aleutians by the Oil Spill Response Institute, it did not match the observations of the mappers as it appeared to rank too much of the rocky, steep shoreline as High or Very High in terms of vulnerability to sea level rise. After analysis of the data, we determined this was due to the use of a relative ranking system where the values from the study area were only compared to each other to determine the CVI rank. To resolve this issue, we calculated an absolute value for each CVI rank which is described in the latest version of the protocol (Cook *et al*., 2017). The distribution of ranks in the Gulf Islands survey area is shown in Figure 13. Due to the protected nature of the coastline, few units in the survey area were ranked Moderate in terms of vulnerability to sea level rise, while the rest were ranked as Low. The Coastal Class and Wave Exposure were likely the driving factors behind the rankings in this survey area.

Figure 13. Distribution of Coastal Vulnerability index ranks in the Gulf Islands survey area.

2.5 Anthropogenic Shore Modifications

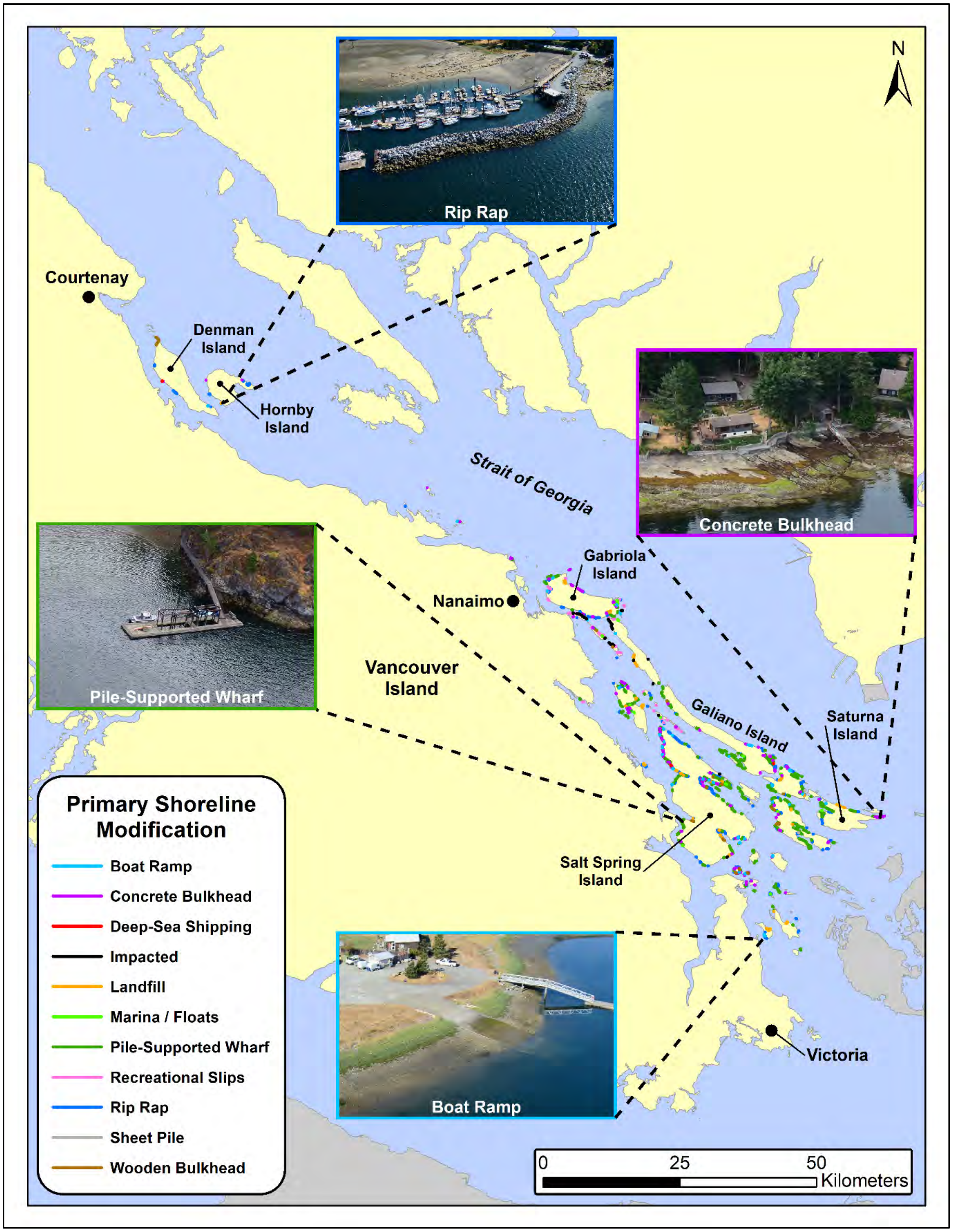

Figure 14. Distribution of types of the primary Shore Modifications. There may be other shore modifications in any given unit. That data would be found in the Shore Modifications table in the geodatabase.

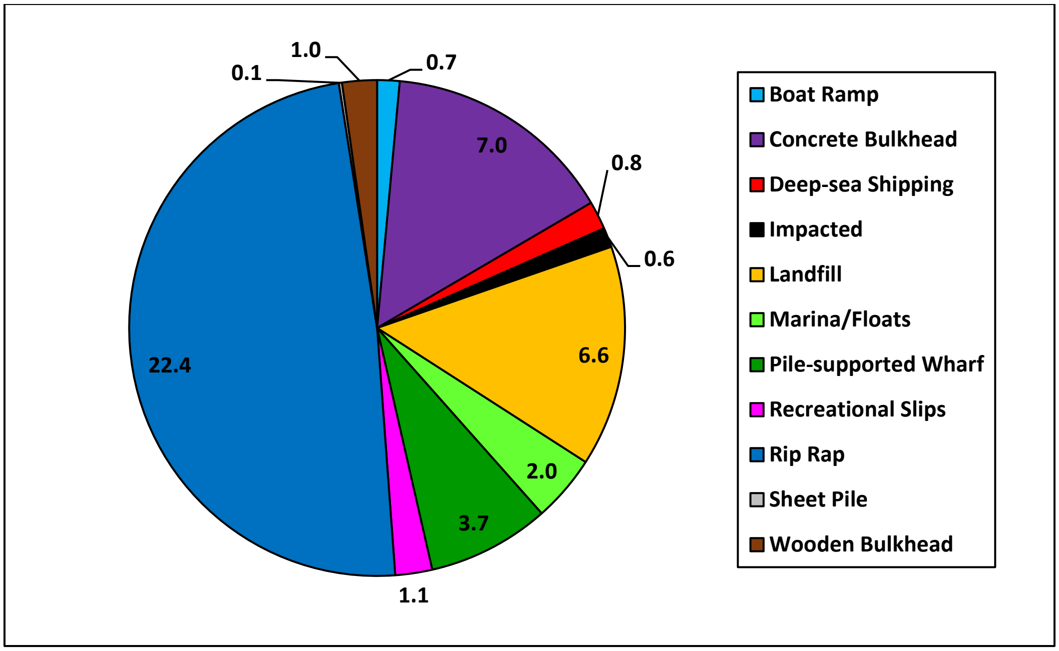

Figure 15. Shore Modifications by estimated shoreline length (km) of each modification type.

The Shoreline Modification attribute provides a thorough catalogue of the specific types of anthropogenic modification in each unit (Cook *et al*., 2017). This includes many modifications within a given unit. For example, if both riprap and a pile-supported wharf occur, both are catalogued in the appropriate zone of that unit with an estimate of the alongshore length of the unit that modification covers. A total of 4.7% of the shoreline (taking the estimated length of that modification within the unit into account) exhibits shore modifications in the Gulf Islands study area (Figure 15). Rip Rap was the most commonly recorded observation (48.7%) with Concrete Bulkhead (15.1%) and Landfill (14.4%) rounding out the top three shoreline modifications along the coast. The associated map (Figure 14) shows the distribution of primary shore modifications, though it should be noted that any given modification is possible along the entire length of the indicated shore unit. The Geodatabase delivered with this report displays each shore modification with a specific length category (meters) along the shoreline pertaining to each unit as well as the specific zone (supratidal or intertidal) the modification occurs in.

3 BIOLOGICAL ATTRIBUTE DATA SUMMARY

3.1 Biobands

Biobands represent assemblages of coastal biota found on the shoreline at characteristic wave exposures, substrate conditions and typical across-shore elevations. Biobands are spatially distinct, with alongshore and across-shore patterns of color and texture that are visible in aerial imagery (see Appendix A, Table A-2 for photographic examples of the common biobands from the Nootka Sound survey area). Full descriptions of all biobands, including indicator and associated species, can be found in the ShoreZone protocol (Cook *et al*., 2017).

There are several metrics used for the biobands within each unit. All biobands are classified as Patchy (in <50% of the length of the unit) or Continuous (in >50% of the length of the unit). The zone in which a bioband was observed determines how the bioband is further described. For example, biobands found in the supratidal (A Zone) and subtidal (C Zone) are described by percent of alongshore length of unit and a width category. The intertidal (B zone) biobands are described by percent of alongshore length of the unit and percent cover of the zone. All metrics are described in the 2017 ShoreZone protocol (Cook *et al*. 2017). The data presented in this report uses Patchy and Continuous as metrics as that is consistent across all biobands.

Biobands mapped in the Gulf Islands survey area are summarized in Tables 3 and 4. The most commonly occurring intertidal bioband in the survey area was Green Algae in 92% of units. Rockweed and Barnacle were also common and were found in 74% and 83% of units, respectively. The most common supratidal bioband was Black Lichen, occurring in 52% of the units, while the supratidal/high intertidal Salt Marsh bioband was found in only 16% of units. The most common low intertidal/subtidal biobands were Bull Kelp (24%), Eelgrass (26%) and Brown Bladed Kelps (15%), although it should be noted that some of the Brown Bladed Kelps may include Sargassum if the Sargassum was not distinguishable from the other kelps. Distribution maps, statistics and observations about some specific biobands are found in the following pages.

Table 3. Bioband abundances for non-splash zone biobands mapped in the Gulf Islands.

Bioband		Patchy		Continuous		Total (km)	% of Total Mapped
Name	Code	(km)	%	(km)	%		
Dune Grass	DUGR	80	8	15	2	95	10
Salt Marsh	SAMB	119	12	37	4	156	16
Barnacle	BARN	98	10	723	73	822	83
Rockweed	ROCK	343	35	389	39	732	74
Green Algae	GRAL	253	26	656	66	909	92
Oysters	OYST	129	13	99	10	228	23
Blue Mussel	BLMU	65	7	53	5	118	12
Echinoderms	ECHI	22	2	0	0	22	2
Sand Dollars	SAND	6	1	0	0	6	1
Bleached Red Algae	BRAL	1	0	1	0	2	0
Filamentous and Foliose Red Algae	FFRA	49	5	53	5	101	10
Coralline Red Algae	CORA	0	0	0	0	1	0
Brown Bladed Kelps	BRBA	57	6	88	9	145	15
Sargassum	SARG	35	4	28	3	63	6
Eelgrass	EELG	78	8	181	18	259	26
Bull Kelp	BUKE	98	10	138	14	236	24
Soft Brown Kelp	SOBK	7	1	2	0	9	1

Table 4. Bioband abundances for splash zone biobands mapped in the Gulf Islands.

Bioband		Narrow (<1m)		Medium (1-5m)		Wide (>5m)		Total (km)	% of Total Mapped
Name	Code	(km)	%	(km)	%	(km)	%		
Black Lichen	BLLI	356	36	150	15	4	0	510	52
Splash Zone	SPZO	320	32	24	2	0	0	344	35
White Lichen	WHLI	21	2	3	0	1	0	26	3
Yellow Lichen	YELI	46	5	12	1	1	0	59	6

The Oyster bioband tends to be more common on the South Coast than other parts of BC and is generally only seen where concentrations of the introduced Pacific Oyster (*Magallana gigas*) are high enough to be visible from the aerial imagery. This was generally noted to occur in areas where there is or has been oyster aquaculture, which is the case throughout the Gulf Islands survey area. The Blue Mussel bioband was more common in the survey area in the Semi-Protected, rocky portions of the coast. It should be noted that the Blue Mussels appeared unusual in some places, being lighter in color and appearing to be detached from the substrate. This survey took place shortly after an extreme heat event in BC and that event caused some unusual die-offs of intertidal biota. This likely affected the Rockweed in the survey area as well, as it appeared shriveled and black in many areas. Figures 16 and 17 show graphs of the proportion of the shoreline with the Oyster and Blue Mussel biobands, respectively. A map of the distribution of the Oyster and Blue Mussel bioband is in Figure 18.

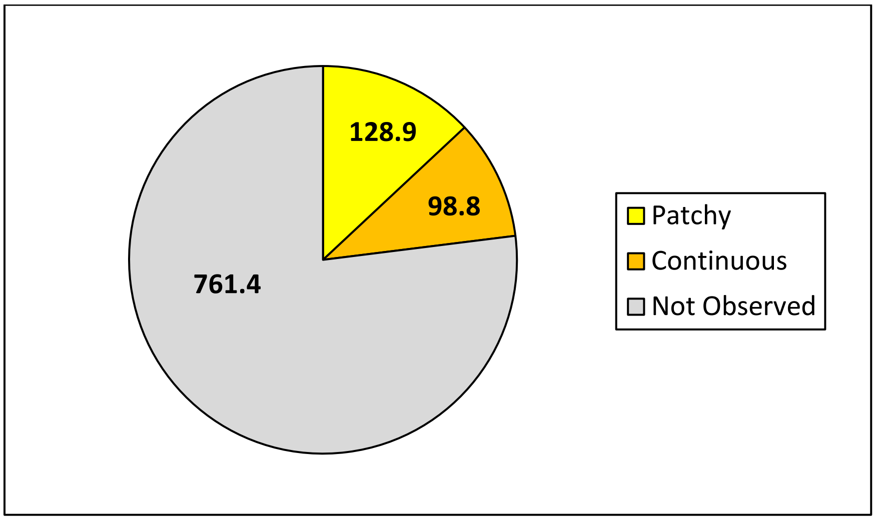

Figure 16. Proportion of shoreline length (km) of the intertidal Oyster (OYST) bioband by category.

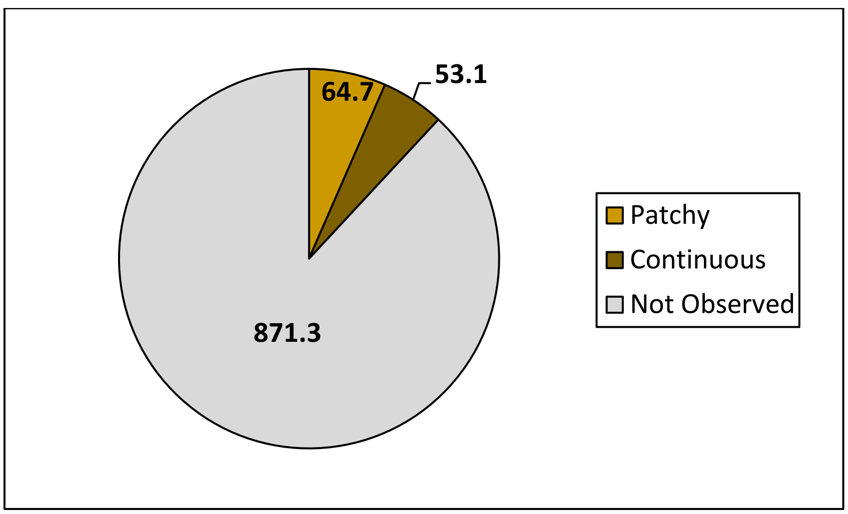

Figure 17. Proportion of shoreline length (km) of the intertidal Blue Mussel (BLMU) bioband by category.

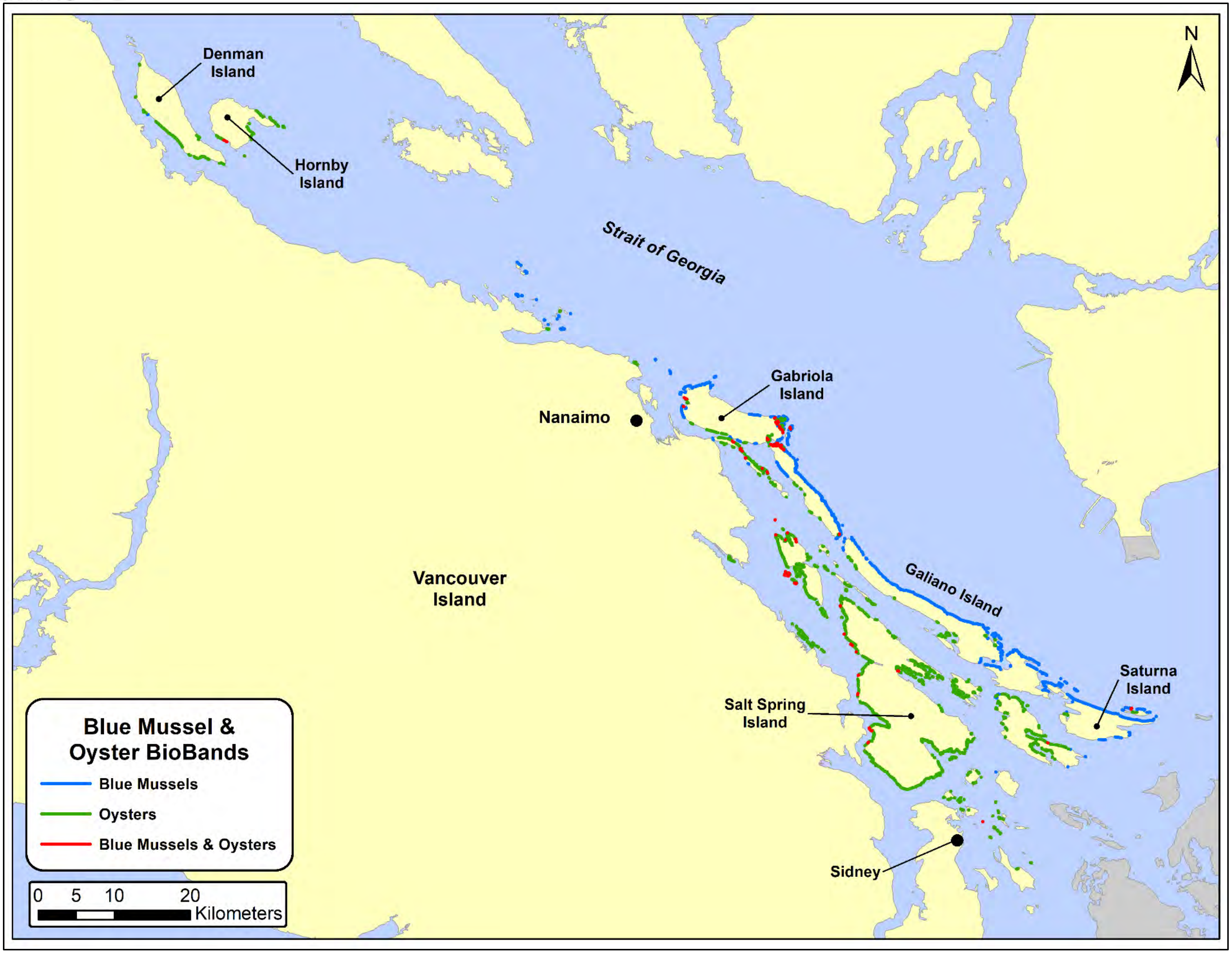

Figure 18. Distribution of the Oyster (OYST) and Blue Mussel (BLMU) biobands in the Gulf Islands survey area.

Seagrasses are an important component of coastal ecosystems with Eelgrass beds forming in sandy substrate at Semi-Protected and lower exposures while Surfgrass generally attaches to hard substrate on Semi-Protected or Semi-Exposed beaches. In the Gulf Islands only Eelgrass was observed, as the habitat requirements necessary for Surfgrass were not met along most of the coastline. Eelgrass beds are nursery habitats for juvenile fish and also sequester and store atmospheric carbon (called 'Blue Carbon') in addition to other valuable ecosystem services.

The Sargassum bioband was observed in the Gulf Islands survey area. The Sargassum bioband is defined by the presence of Japanese Wireweed (*Sargassum muticum*), which is an introduced species. The Sargassum band was observed in only 6% of units although it is possible much of the Brown Bladed Kelp that was recorded was actually a mix of kelps with Sargassum as there were areas where browns could be observed in the subtidal but not enough detail could be seen to determine if Sargassum was present. It can therefore be assumed it was more widely distributed than indicated by the ShoreZone mapping. There is significant literature available on the impacts of introduced Japanese Wireweed with somewhat conflicting conclusions, as some studies find negative impacts on native species (DeWreede and Vandermeulen, 1988; Britton-Simmons, 2004) and some find little to no impacts (Sanchez and Fernandez, 2005; Olabarria *et al*., 2009). White (2003) studied the effects of *S. muticum* on macroalgal communities and grazing invertebrates in BC and found that the effects of introduction were both density and time dependent and were mediated through competition for light and also that the effects went in both positive and negative directions depending on the species being studied.

See Figures 19 and 20 for a graph showing the proportion of the shoreline with the Eelgrass and Sargassum biobands, respectively, and a distribution map for both in Figure 21.

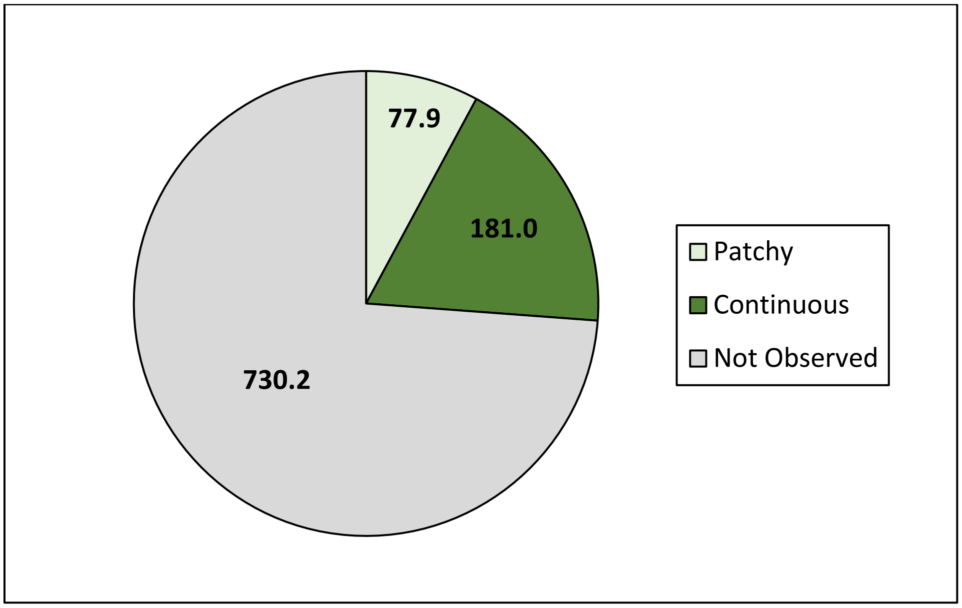

Figure 19. Distribution of the intertidal/subtidal Eelgrass bioband by shoreline length (km).

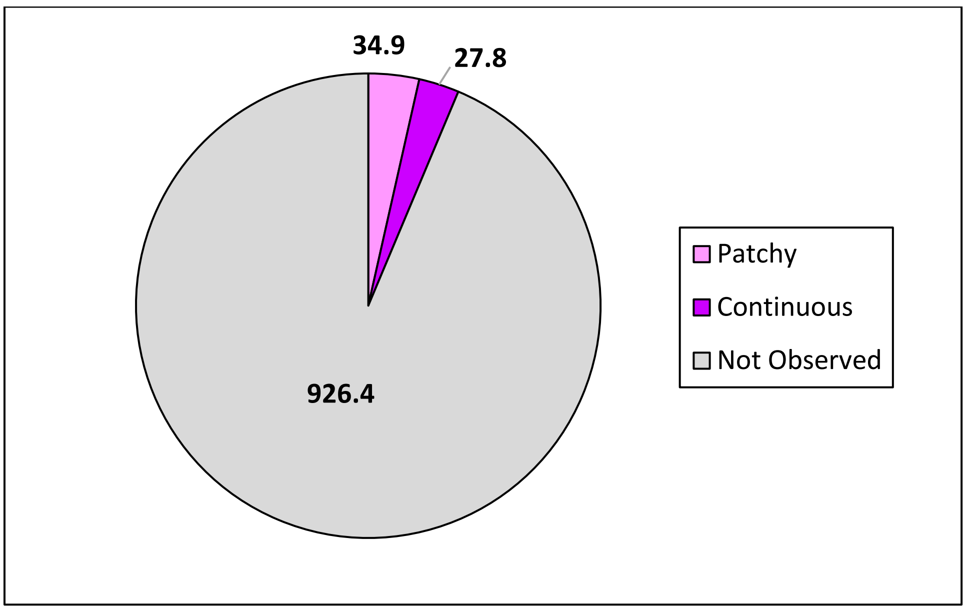

Figure 20. Distribution of the intertidal/subtidal Sargassum bioband by shoreline length (km).

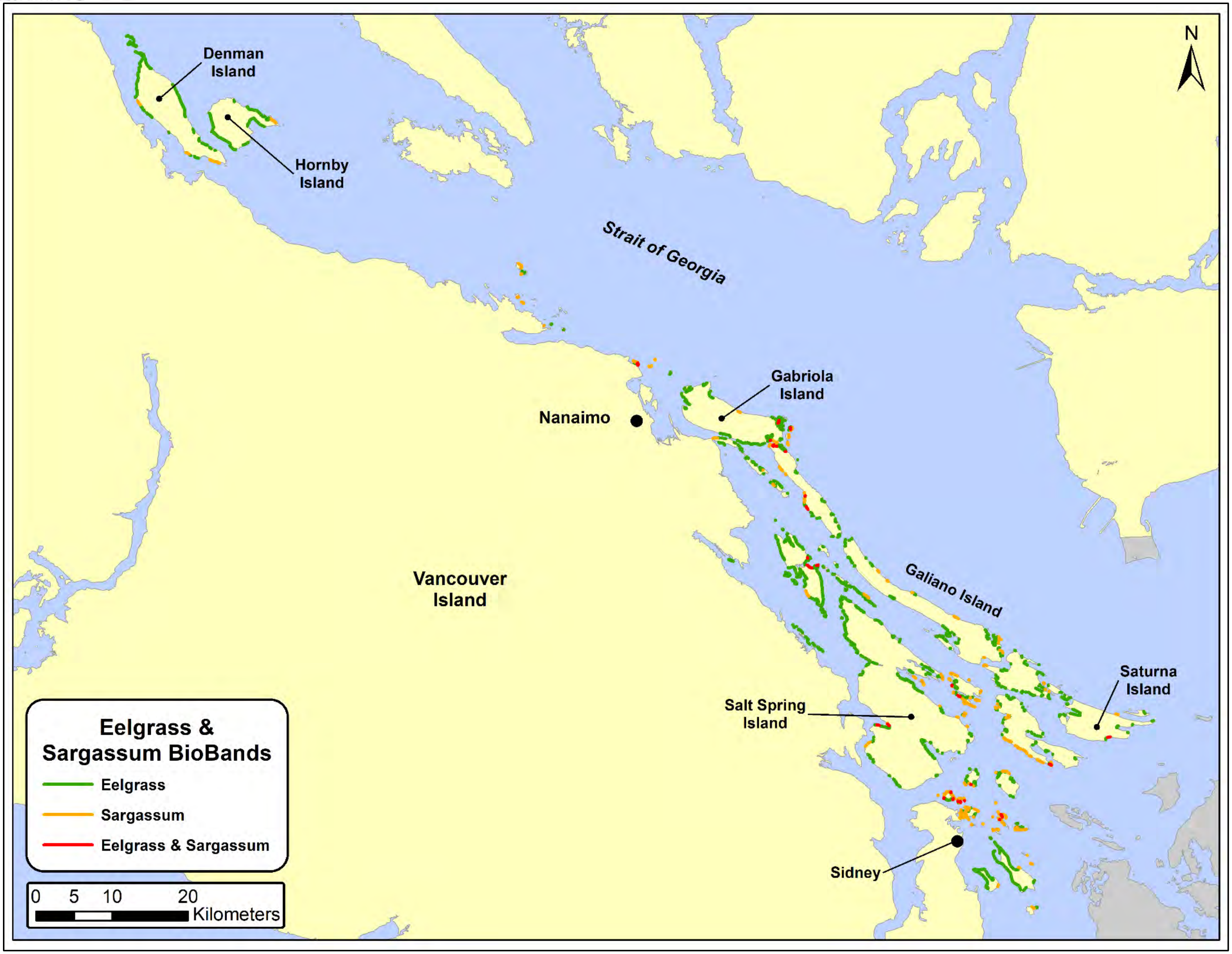

Figure 21. Distribution of the Sargassum (SARG) and Eelgrass (EELG) biobands in the Gulf Islands.

Canopy kelps form valuable habitat for fish, invertebrates and other algae and are an important part of a healthy coastline and healthy fisheries. Bull Kelp (*Nereocystis leutkeana*) was the only canopy kelp noted in the survey area, although it was not particularly widespread and was generally absent from the more protected coastline except where tidal currents are more pronounced. See Figure 22 for a graph showing the proportion of Bull Kelp along the survey area shoreline, Figure 23 for an example image of Bull Kelp in the survey area and a map of the distribution of Bull Kelp in Figure 24.

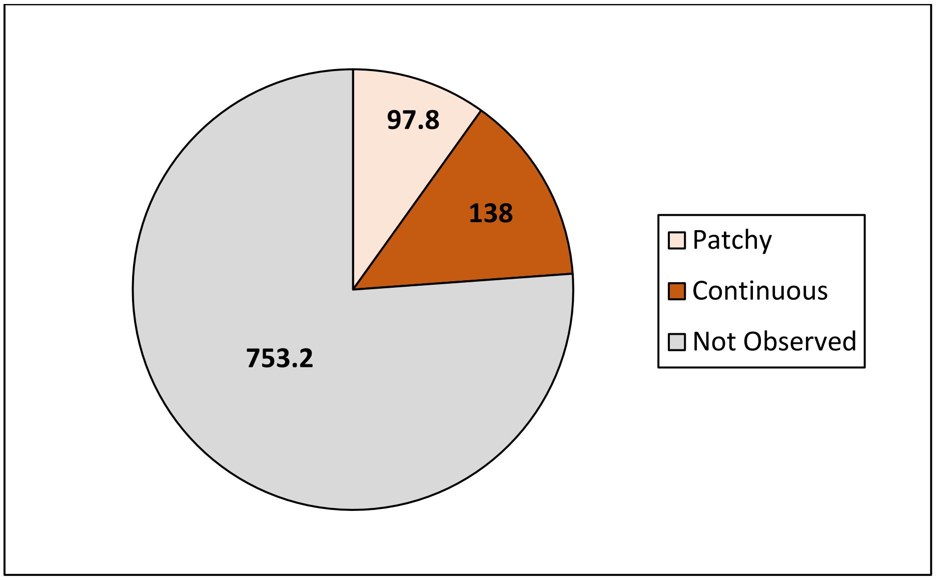

Figure 22. Distribution of the Bull Kelp (BUKE) bioband by shoreline length (km).

Figure 23. Image of a dense Bull Kelp bed at D’arcy Island (bc21_gi_10682).

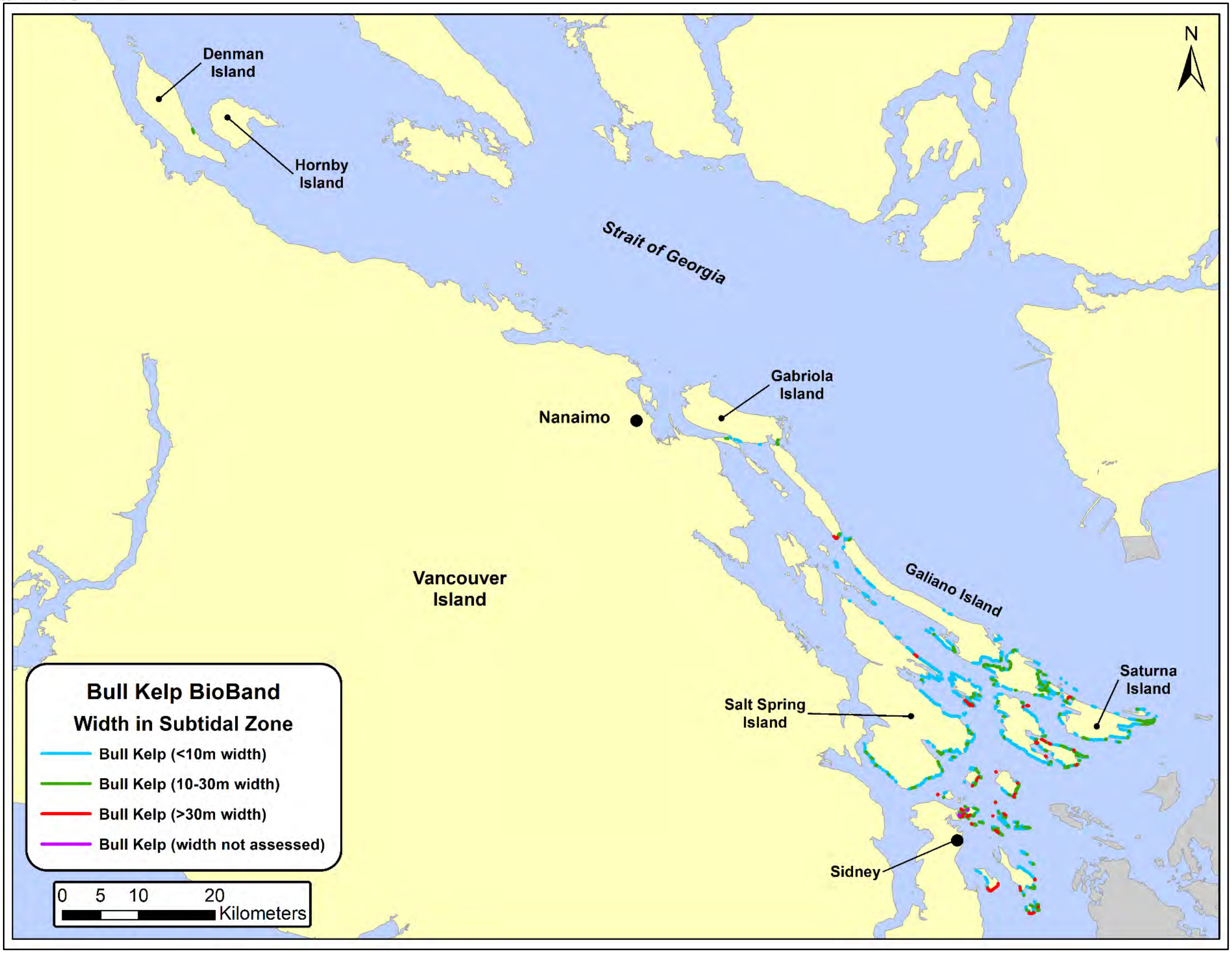

Figure 24. Distribution of the Bull Kelp (BUKE) bioband in the Gulf Islands.

Salt Marsh was the most commonly occurring supratidal, non-splash zone bioband but was found in only 16% of units (see Figures 25 for a graph of proportion of the shoreline with that bioband and Figure 27 for a distribution map). Salt Marsh can occur either in the lower supratidal or upper intertidal, while this map shows the width of the band at the top of the beach. The Salt Marsh in this area was mostly a narrow band near the tree line (see Figure 26 for photo). This is an important habitat for many shoreline species and can provide important ecological services, such as filtering land-based nutrients which can help maintain the balance of other habitats such as eelgrass meadows (Valiela *et al*., 2000).

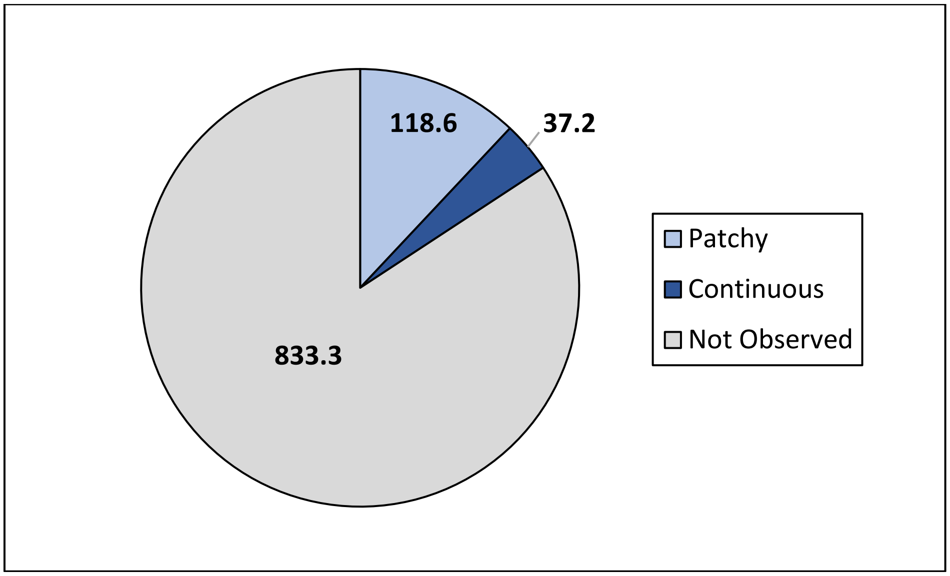

Figure 25. Distribution of the Salt Marsh (SAMB) bioband by shoreline length (km).

Figure 26. Image of a narrow Salt Marsh bioband in Long Harbour on Saltspring Island (bc21_gi_06167).

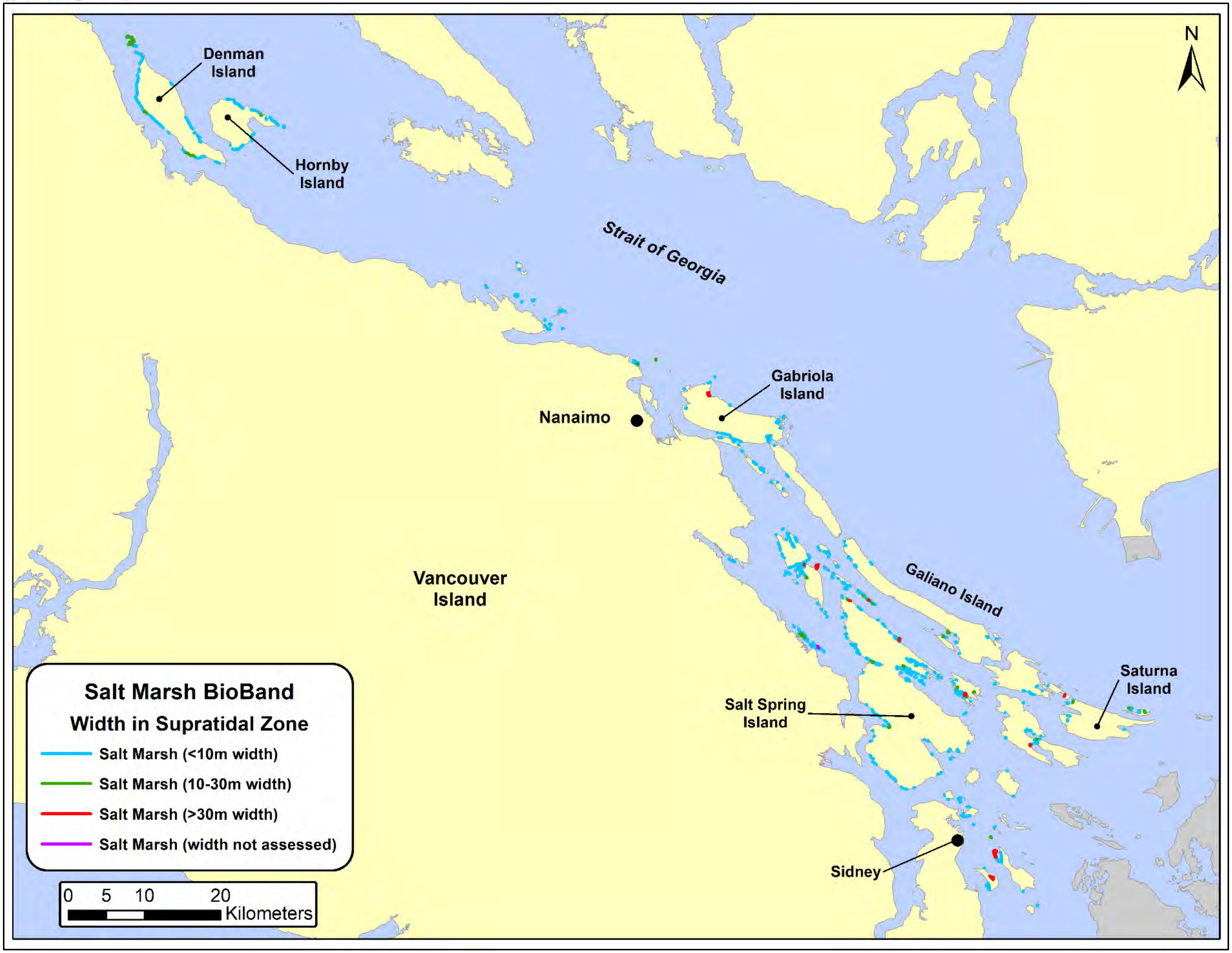

Figure 27. Distribution of the Salt Marsh (SAMB) bioband in the Gulf Islands.

3.2 Biological Wave Exposure

Biological wave exposure categories range from Very Protected (VP) to Very Exposed (VE) and are usually defined in ShoreZone on the basis of a typical set of biobands. When present, the relative abundance of biota in each alongshore unit is used as a proxy to determine the wave exposure at that site. For definitions of the Biological Wave Exposures and the exposure ranges of the biobands see the most recent ShoreZone protocol (Cook *et al*., 2017).

The distribution of the wave exposure categories mapped in the Gulf Islands are summarized in Figure 28 and a distribution map of the categories is shown in Figure 29. Almost the entire coastline (99.9%) was in the lower to moderate wave exposures (Very Protected to Semi-Protected), with most of that Protected (69.5%). None of the coastline of the Gulf Islands fell into the Exposed or Very Exposed categories.

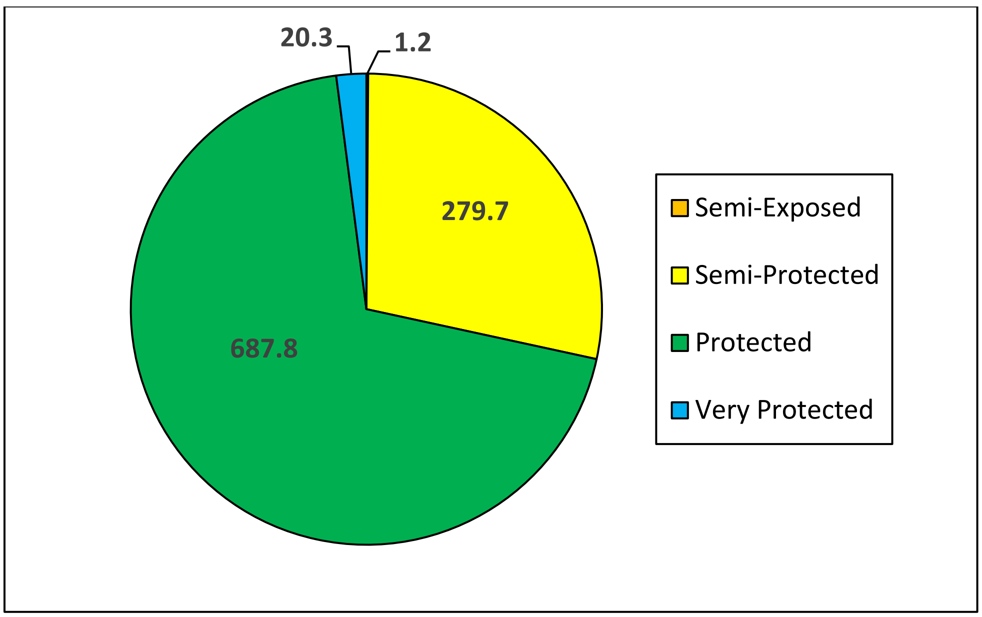

Figure 28. Distribution of Biological Wave Exposures mapped in the Gulf Islands by shoreline length (km).

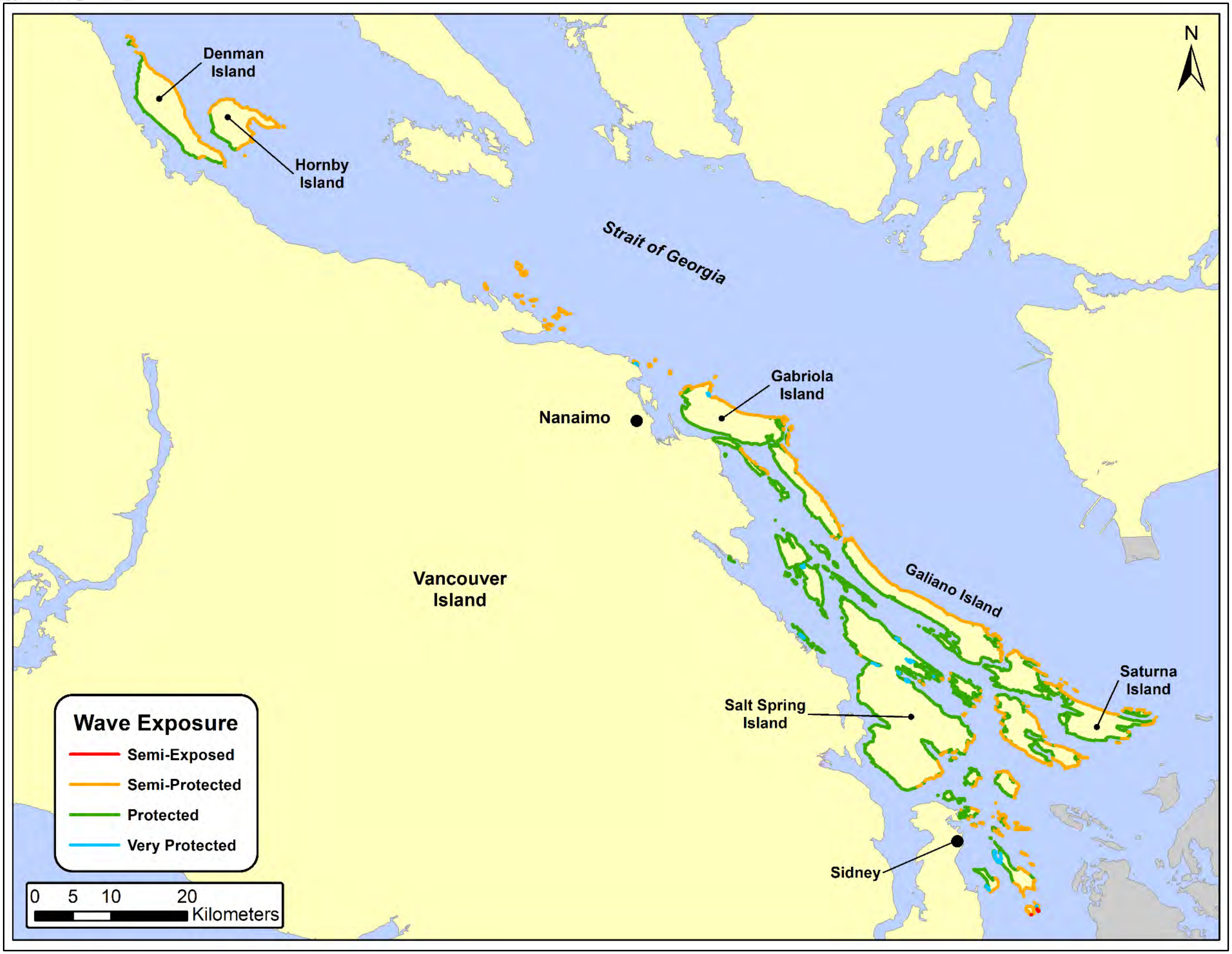

Figure 29. Distribution of the Biological Wave Exposure in the Gulf Islands.

3.3 Habitat Class

Habitat Class is a classification based on wave exposure and geomorphic characteristics observed in an alongshore unit. The habitat class is intended to provide a single attribute to characterize the biophysical features of each unit. The habitat class is assigned by the biological mapper and weighted according to the dominant structuring process. Wave action is the most common structuring process with less commonly observed habitats being those structured by current, estuarine/fluvial processes, and anthropogenic structures. For habitat classes structured by wave action substrate mobility determines the presence of epibenthic biota. Where the substrate is highly mobile, biota is sparse or absent, and where the substrate is stable, biota can be abundant. For further definitions and explanations of Habitat Class codes please see the most recent ShoreZone protocol (Cook *et al*., 2017).

The distribution of the Habitat Class categories mapped in the Gulf Islands are summarized in Figure 30 and a distribution map of the categories is shown in Figure 31. Partially mobile substrate is the dominant shoreline type (60.3%), with Immobile accounting for the bulk of the rest (27.4%).

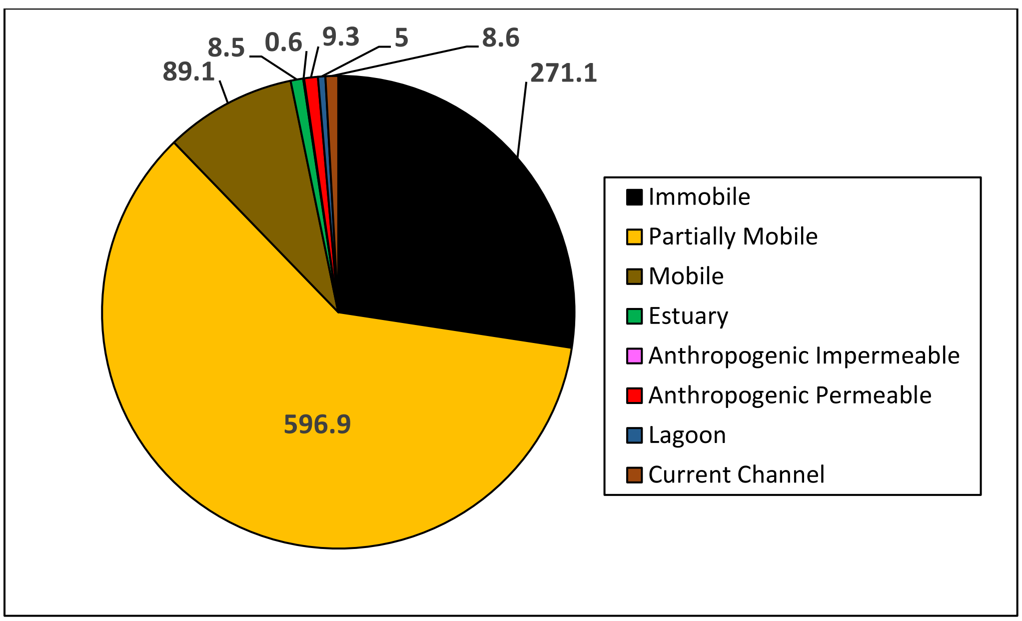

Figure 30. Distribution of Habitat Class categories in the Gulf Islands by shoreline length (km).

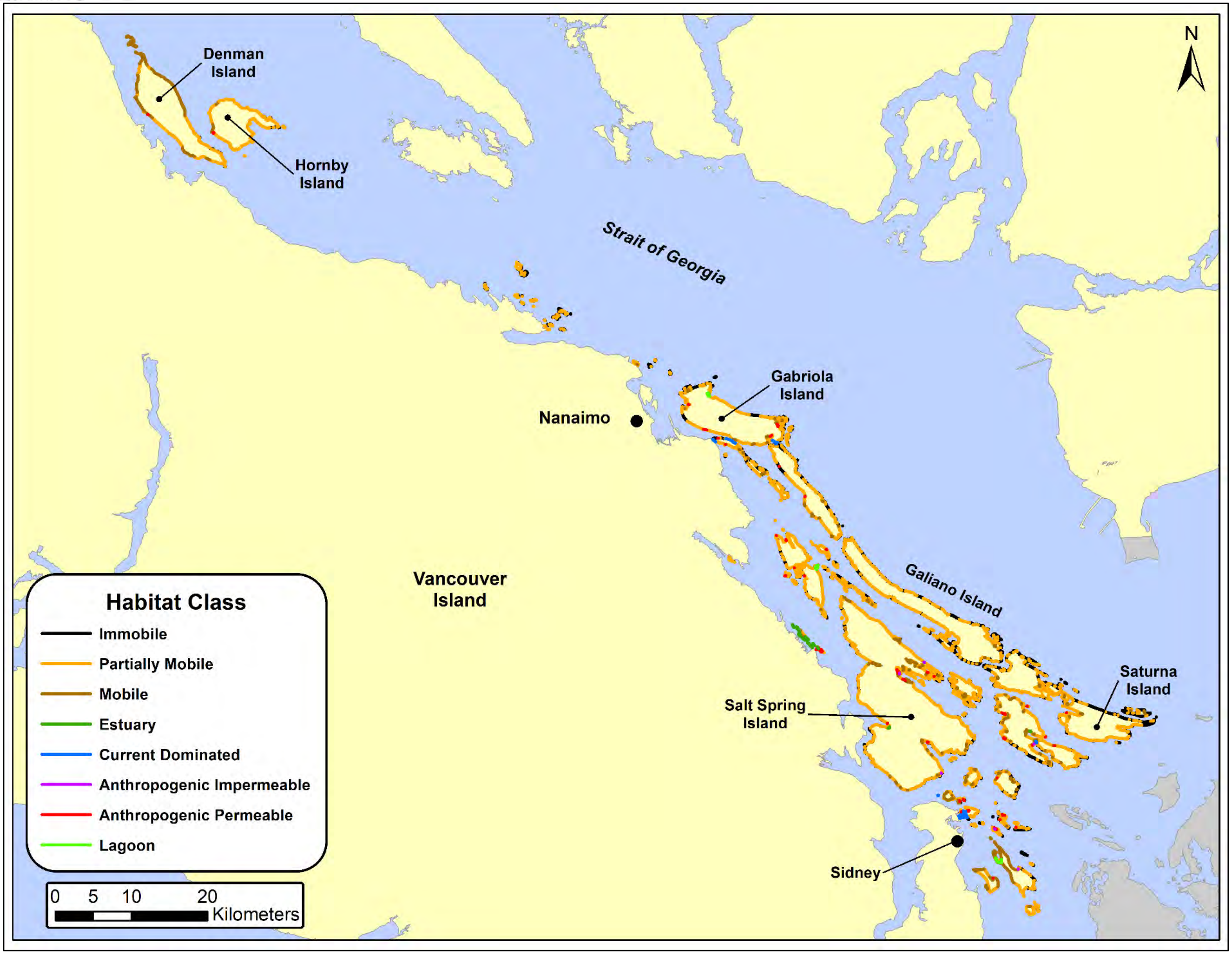

Figure 31. Distribution of Habitat Class categories in the Gulf Islands.

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5 ACKNOWLEDGMENTS

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Protocols for data access and distribution are established by the program partner agencies. Please see www.ShoreZone.org for a list of partner agencies and related web sites. Video imagery can be viewed and digital stills for the US dataset can be downloaded online at www.ShoreZone.org or the NOAA ShoreZone Page and the BC imagery dataset can be accessed through the Coastal and Ocean Resources' ArcGIS site. The mapping geodatabases and summary reports (as well as ground survey data and reports) can be downloaded through the Coastal and Ocean Resources download center. Further ShoreZone resources, including a newly updated Illustrated Data Dictionary, can be accessed through the NOAA ShoreZone Page.

Any hardcopies or published data sets utilizing ShoreZone products should clearly indicate their source. For questions regarding the protocols or information in this report, please contact Sarah Cook, General Manager of Coastal and Ocean Resources, at Sarah@coastalandoceans.com (250-658-4050). For data requests or analytical support contact Kalen Morrow at Kalen@coastalandoceans.com.

APPENDIX A

Photographic Examples of Coastal Classes and Biobands

Table A-1. Examples of the Coastal Classes in the Gulf Islands survey area (Page 38).
Table A-2. Examples of the Biobands in the Gulf Islands survey area (Page 46).

Table A-1. Examples of the Coastal Classes in the Gulf Islands survey area.

Photo bc21_gi_01306: Example of Coastal Class 2; Rock Platform, wide.
Tumbo Island.

Photo bc21_gi_08610: Example of Coastal Class 3; Rock Cliff.
Helliwell Provincial Park, Hornby Island.

Photo bc21_gi_09976: Example of Coastal Class 4; Rock Ramp.
Denman Island.

Photo bc21_gi_06802: Example of Coastal Class 8; Cliff gravel beach.
Valdes Island.

Photo bc21_gi_00714: Example of Coastal Class 9; Ramp with gravel beach.
Kadonaga Bay, Mayne Island.

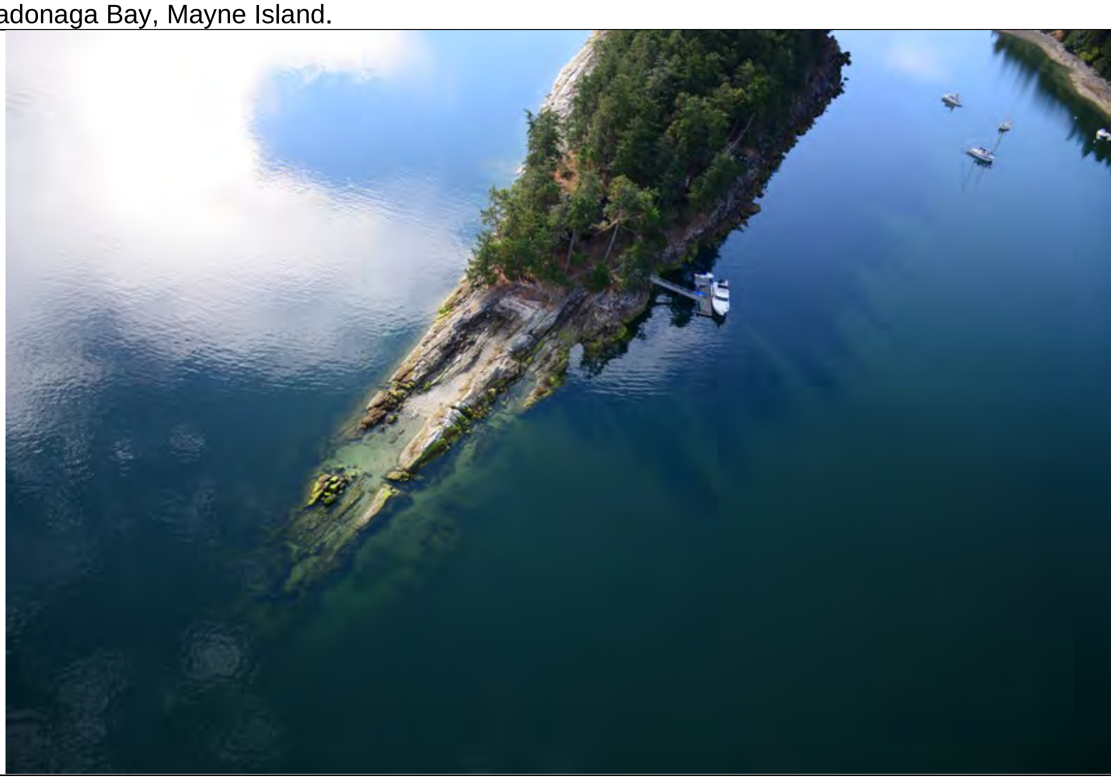

Photo bc21_gi_00368: Example of Coastal Class 11; Ramp with gravel & sand beach.
Parker Island.

Photo bc21_gi_09196: Example of Coastal Class 12; Platform with gravel & sand beach, wide.
Denman Point, Denman Island.

Photo bc21_gi_02954: Example of Coastal Class 13; Cliff with gravel & sand beach.
Cufra Inlet.

Photo bc21_gi_04857: Example of Coastal Class 14; Ramp with gravel & sand beach.
Bedwell Harbour.

Photo bc21_gi_08347: Example of Coastal Class 17; Platform with sand beach, wide.
Link Island.

Photo bc21_gi_05370: Example of Coastal Class 24; Sand & gravel flat or fan. Davidson Bay.

Photo bc21_gi_09365: Example of Coastal Class 25; Sand & gravel beach, narrow. Denman Island.

Photo bc21_gi_02794: Example of Coastal Class 27; Sand beach.
Porlier Pass, Galiano Island.

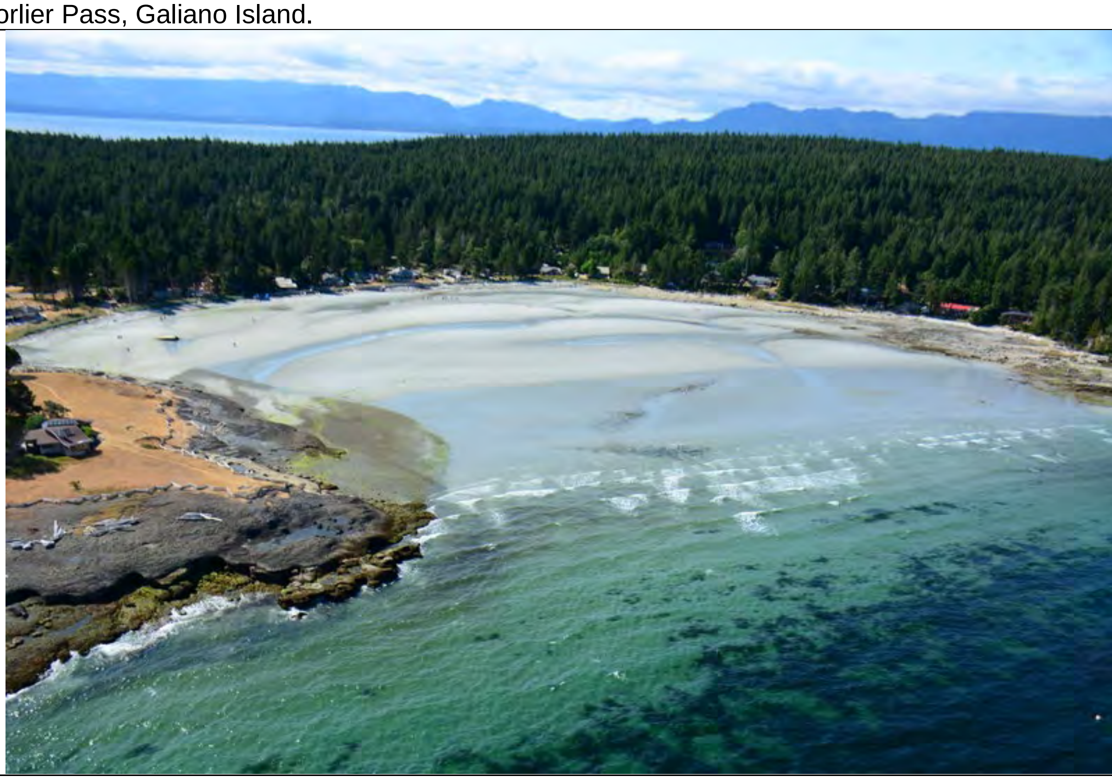

Photo bc21_gi_08669: Example of Coastal Class 28; Sand flat.
Whaling Station Bay, Hornby Island.

Photo bc21_gi_03277: Example of Coastal Class 31; Organics/Fines.
Telegraph Harbour.

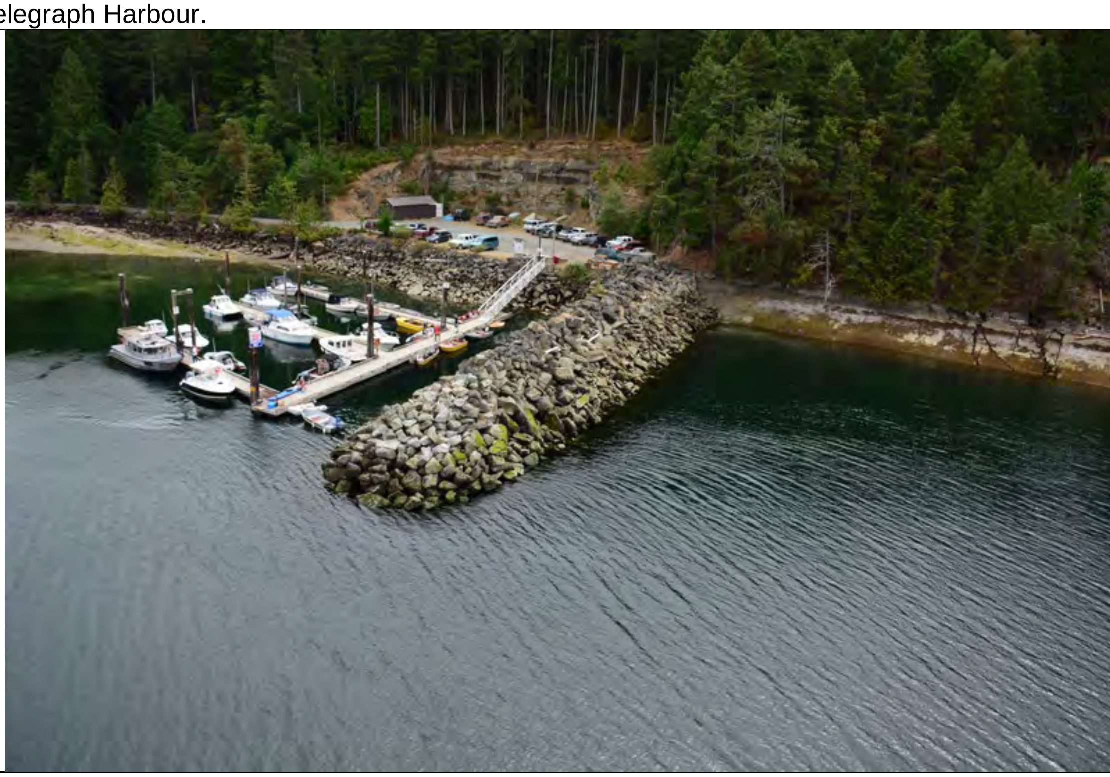

Photo bc21_gi_08433: Example of Coastal Class 32; Permeable man-made structures.
Mudge Island.

Table A-2. Examples of the Biobands in the Gulf Islands survey area.

Photo bc21_gi_07612: Good example of the Splash Zone (SPZO) bioband which is an erosional or active A Zone without attached vegetation. Southeast Vance Island.

Photo bc21_gi_04102: Good example of White Lichen (WHLI) bioband in the supratidal zone, above the Black Lichen band. East side of Saltspring Island, south of Burgoyne Bay.

Photo bc21_gi_11231: Good example of the Yellow Lichen (YELI) bioband which is a yellow-orange band in the supratidal zone. Northwest of Sheep Island.

Photo bc21_gi_08862: Good example of the Black Lichen (BLLI) bioband which is a black band in the supratidal zone, usually caused by the lichen *Verrucaria* sp. Lambert Channel, Denman Island.

Photo bc21_gi_11384: Good example of blue-green Dune Grass (DUGR) bioband in the supratidal zone. Little Group Ker Island.

Photo bc21_gi_06362: Good example of Salt Marsh (SAMB) bioband in the supratidal/intertidal zone. Walker Hook, Saltspring Island.

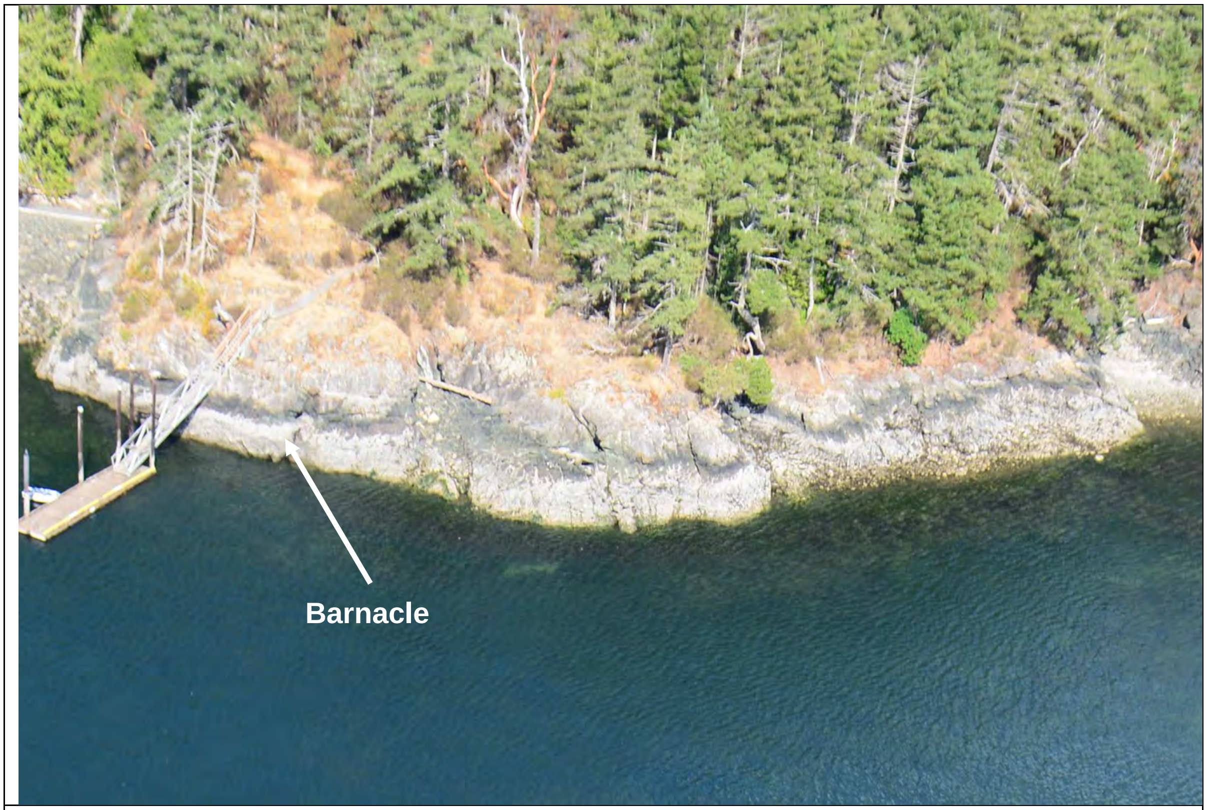

Photo bc21_gi_11786: Good example of the Barnacle (BARN) bioband in the intertidal zone. Princess Bay, Portland Island.

Photo bc21_gi_07777: Good example of the golden-brown Rockweed (ROCK) bioband. Gabriola Island.

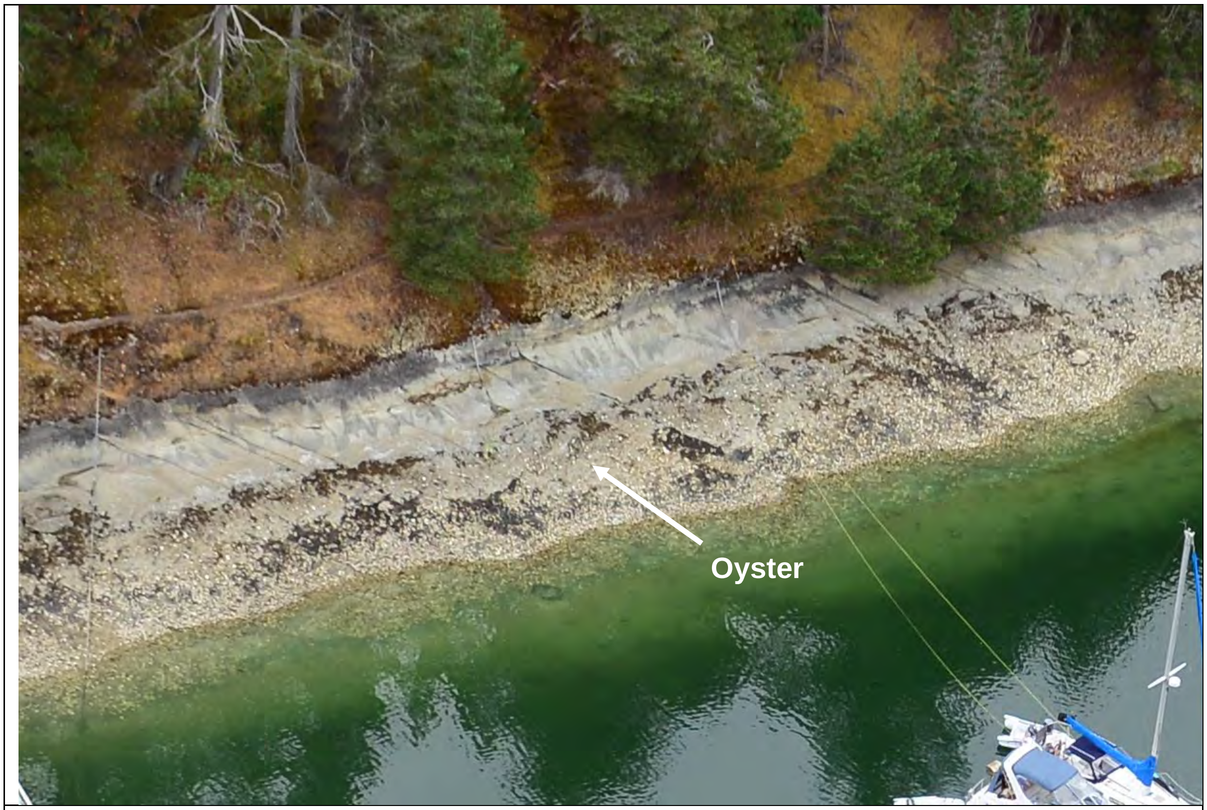

Photo bc21_gi_08245: Good example of the white spots of the Oyster (OYST) bioband. Pirate's Cove Marine Provincial Park, De Courcy Island.

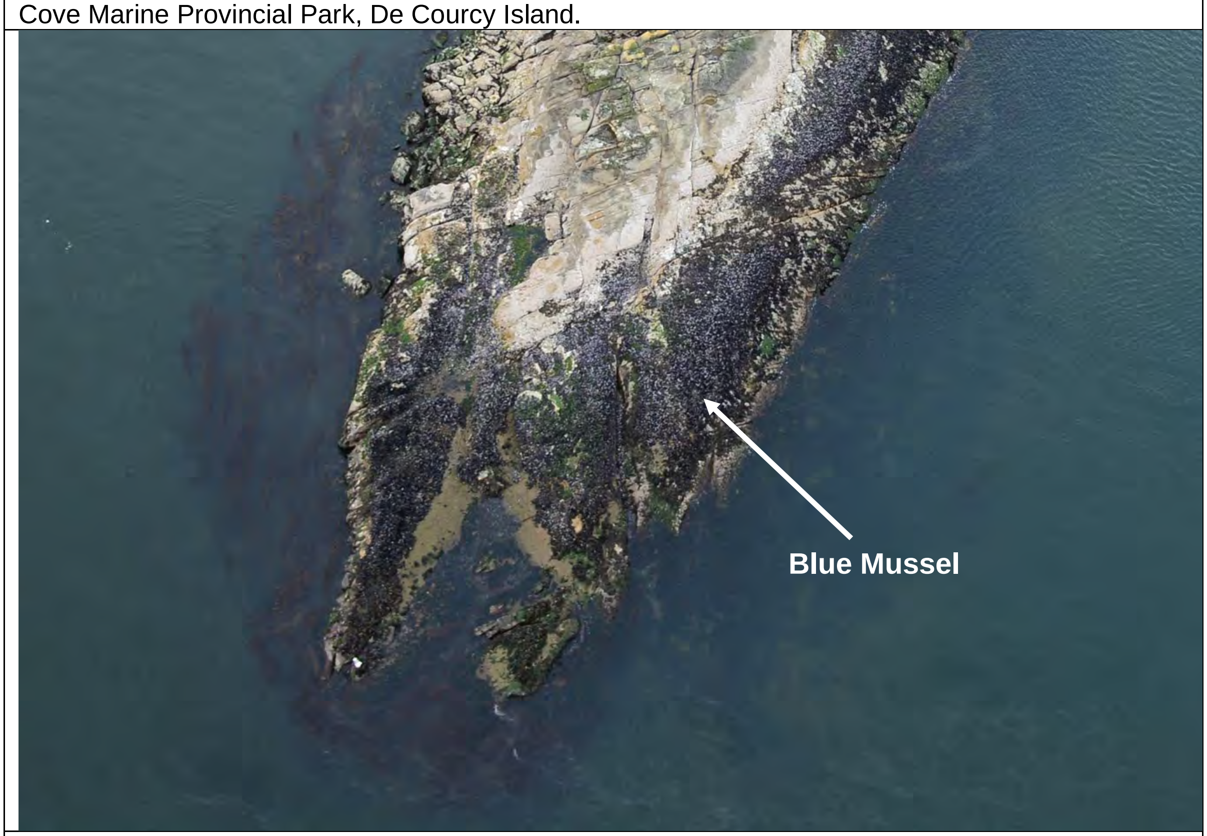

Photo bc21_gi_07032: Good example of the black Blue Mussel (BLMU) bioband in the mid-intertidal. South end of Valdes Island.

Photo bc21_gi_07619: Good example of the Green Algae (GRAL) bioband in the lower intertidal. Gaviola Island.

Photo bc21_gi_07162: Good example of the Echinoderm (ECHI) bioband which was all *Pisaster* sp. in this study area. Eastern side of Valdes Island.

Photo bc21_gi_07787: Good example of the golden Bleached Red Algae (BRAL) bioband in the lower intertidal. Gabriola Island.

Photo bc21_gi_07779: Good example of the Filamentous and Foliose Red Algae (FFRA) bioband in the lower intertidal. Gabriola Island.

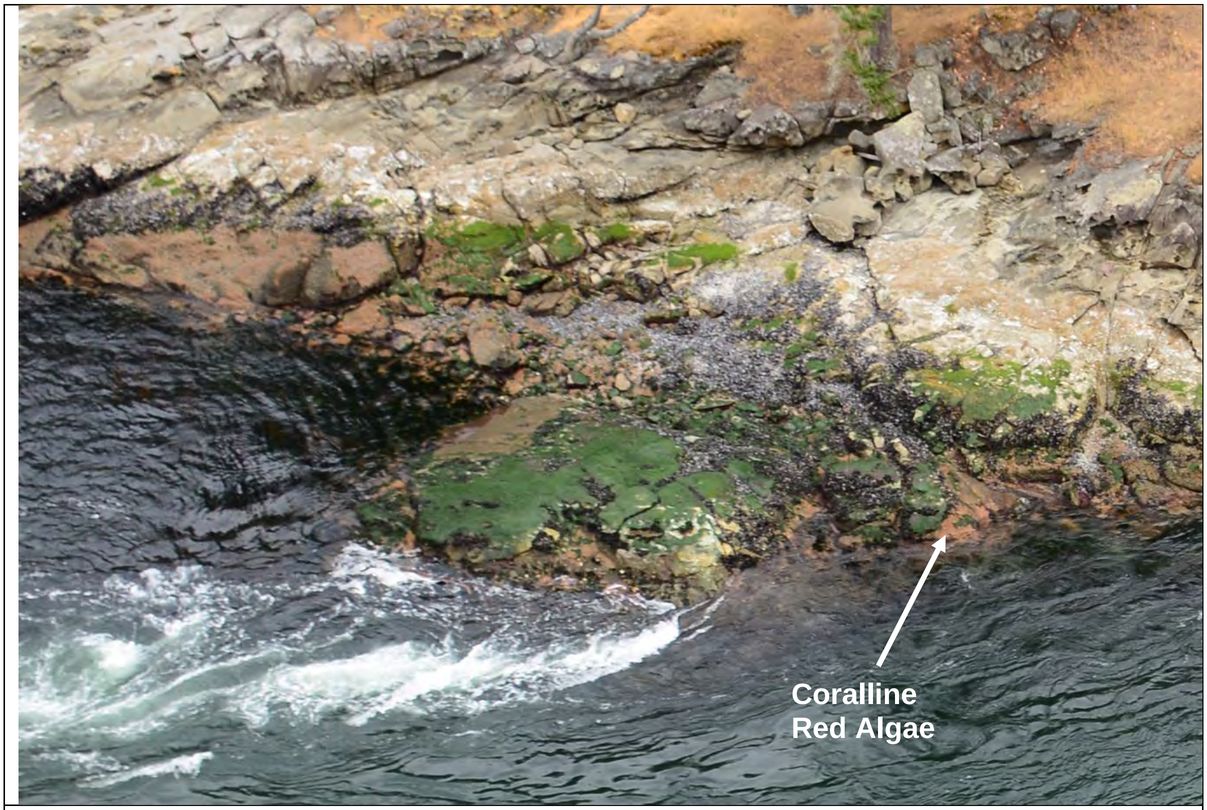

Photo bc21_gi_08058: Good example of the Coralline Red Algae (CORA) in the lower intertidal. Dodd Narrows, Mudge Island.

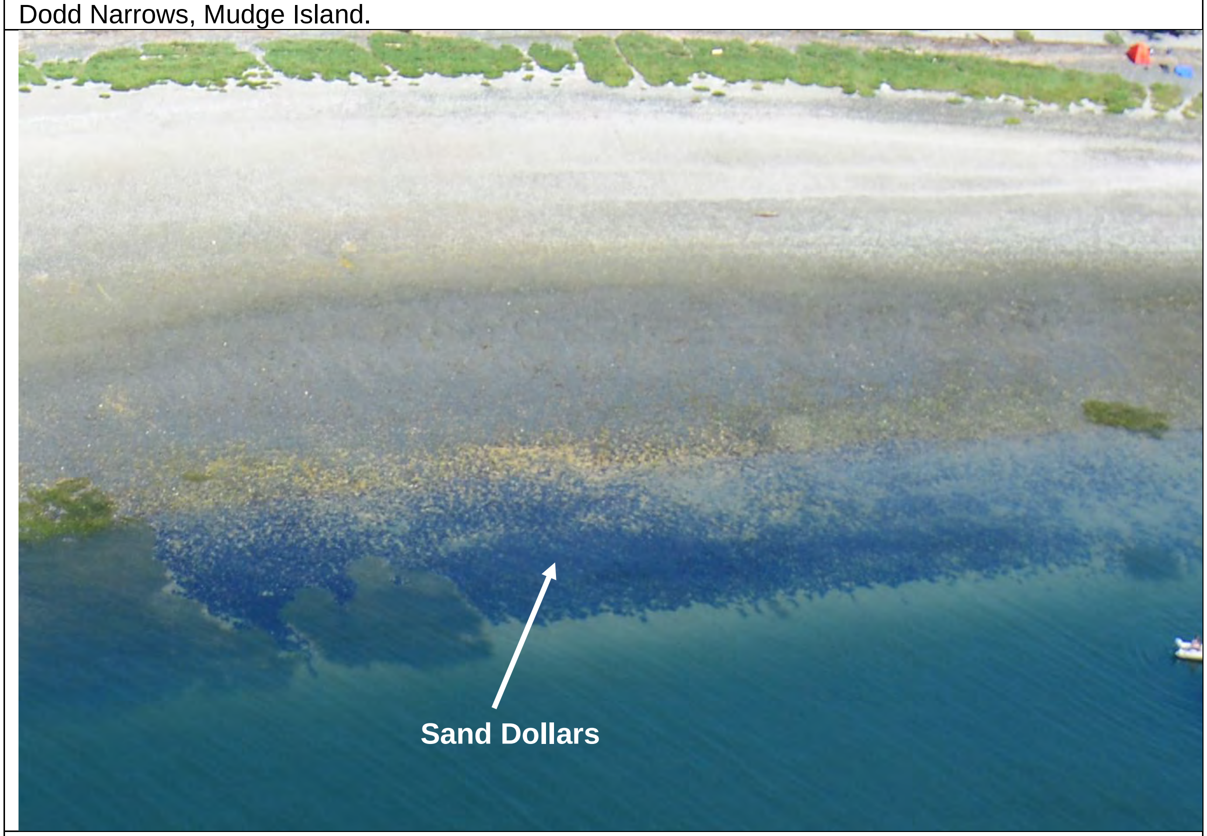

Photo bc21_gi_09118: Good example of the Sand dollar (SAND) bioband in the subtidal. Sandy Island Marine Provincial Park, Denman Island.

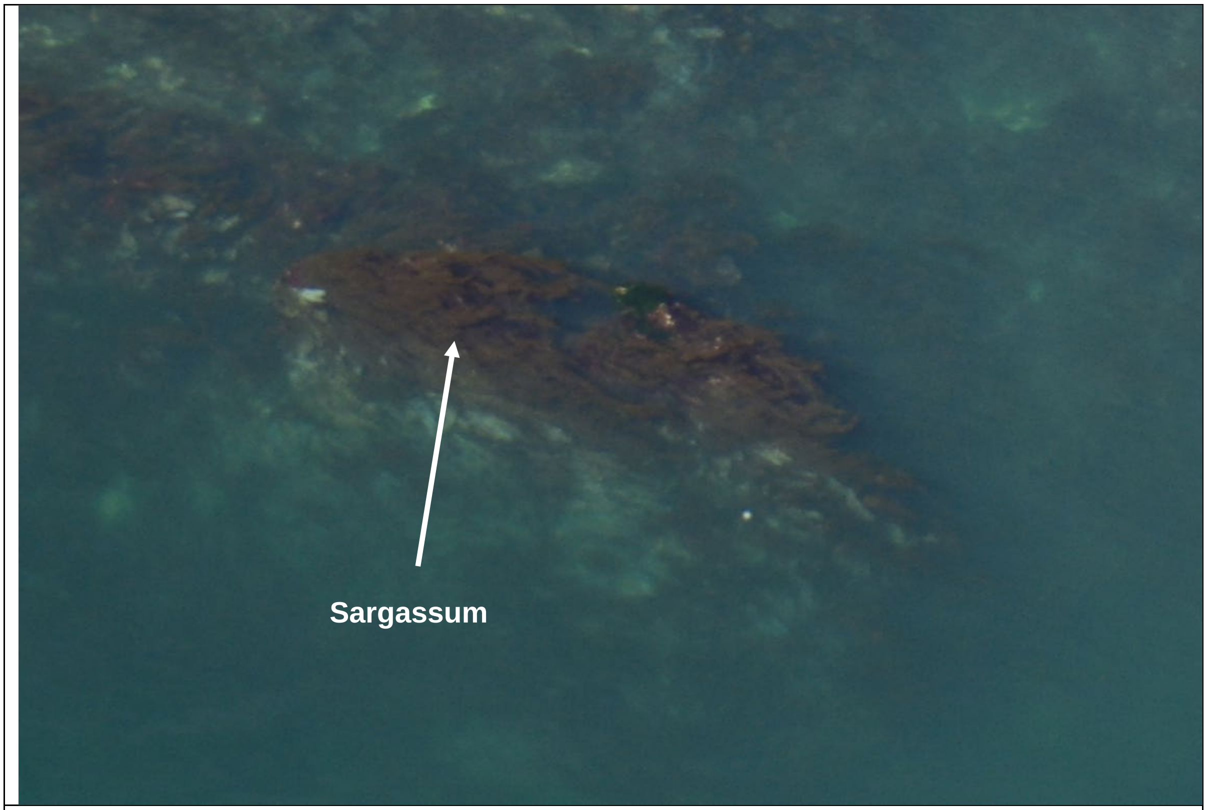

Photo bc21_gi_11162: Good example of the fluffy, floating Sargassum (SARG) bioband. Brethour Island.

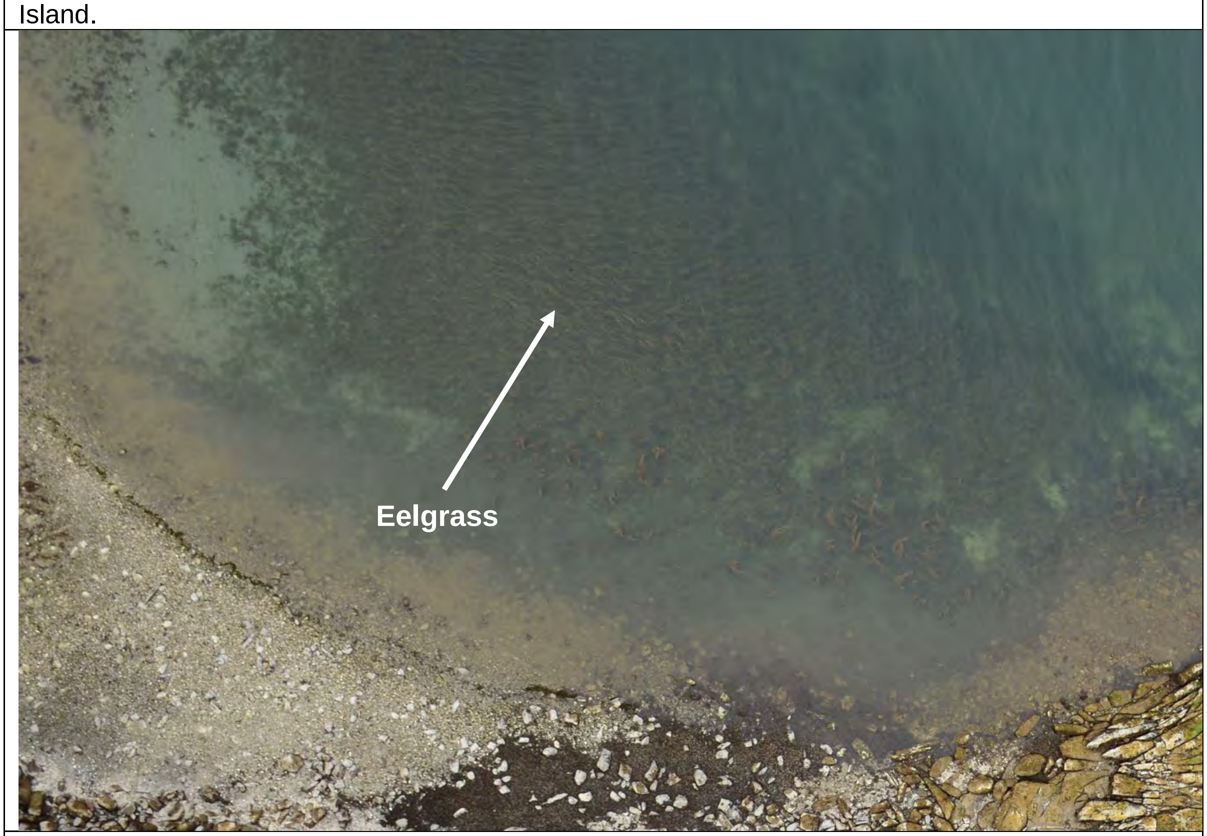

Photo bc21_gi_07308: Good example of the Eelgrass (EELG) bioband in the subtidal. Northeast Valdes Island.

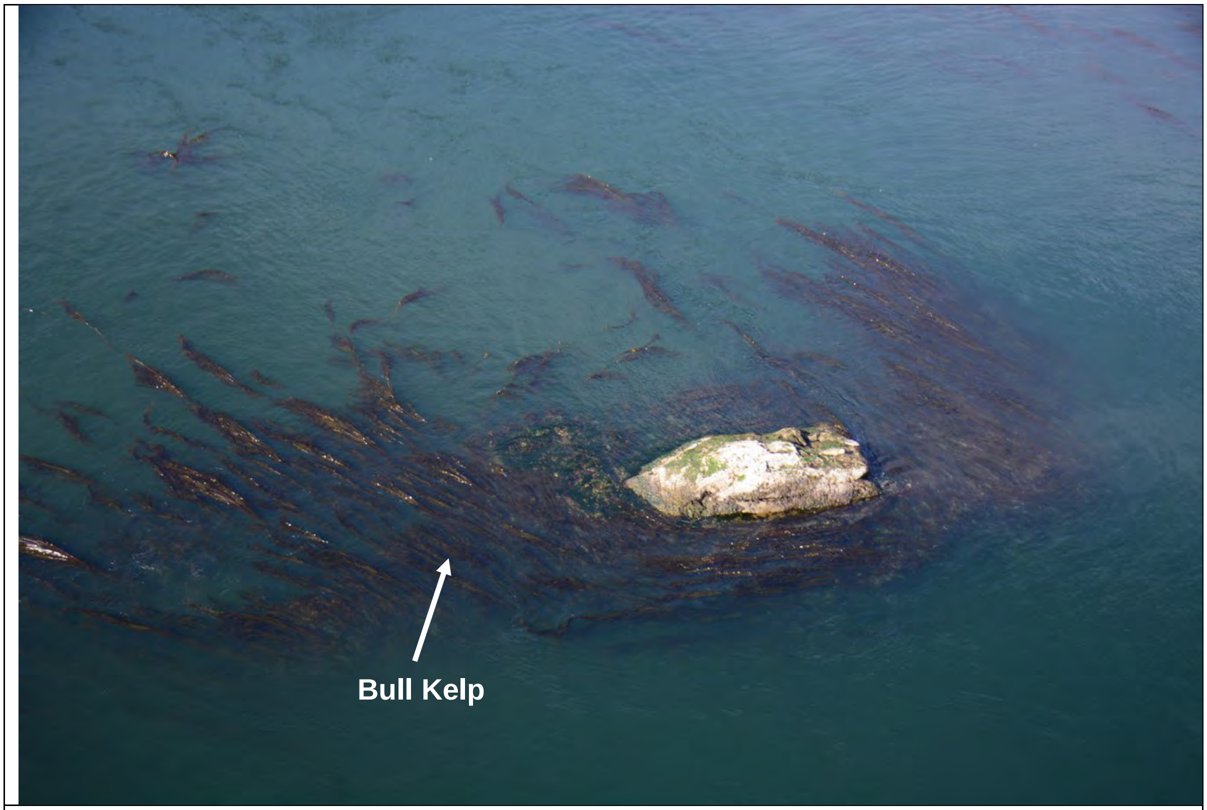

Photo bc21_gi_11299: Good example of the Bull Kelp (BUKE) bioband in the nearshore. Forrest Island.