



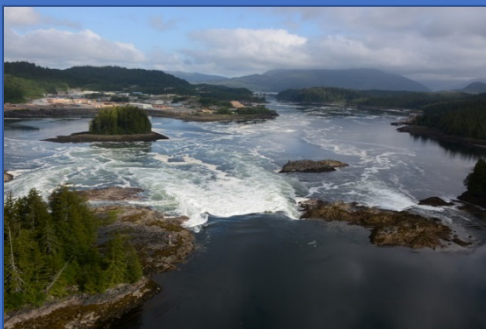
Coastal and Ocean Resources
a MER company

ShoreZone Summary Report

Prince Rupert

March 2019

Prepared for:
Department of Fisheries
and Oceans



On the cover:

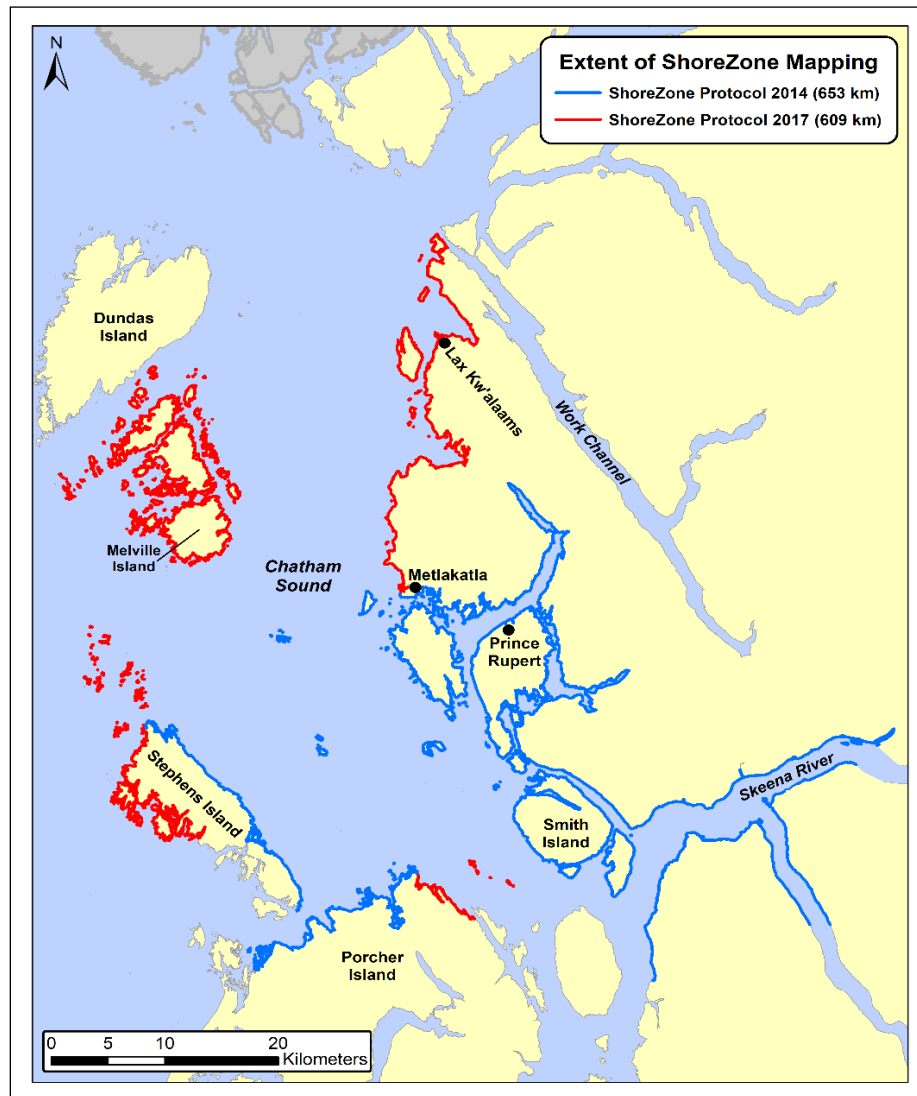
Gribbell Islet, Metlakatla Passage

Butze Rapids

Prince Rupert

ShoreZone Habitat Mapping Summary Report

Prince Rupert Survey Area



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Prince Rupert Area Summary

1,263 km of shoreline mapped

5,279 shoreline units created

Average unit length is **239 m**

49% of the intertidal is classified as **Rock and Sediment-dominated** and **26%** is classed as **Sediment-dominated**

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

7% of the shoreline has a **Shoreline Modification** of some type

14 intertidal biobands were classified, with **Rockweed** and **Green Algae** being the most common (**over 70%** of units each)

7 supratidal biobands were classified, with **Black Lichen** and **Salt Marsh** being the most common (over **65%** of units each)

9 subtidal biobands were classified, with **Bladed Brown Algae** being the most common (over **50%** of units)



Prince Rupert



Lucy Islands



Metlakatla



Porcher Island



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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 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 and managers. 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 75,000 km of coastal Alaska and 45,000 km of British Columbia, Washington and Oregon (see Figure 1). Figure 2 shows the extent of the shoreline mapped around Prince Rupert and is the section of shoreline covered by this summary report.

The ShoreZone imaging surveys conducted around Prince Rupert in June 2014 and June 2015 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. Approximately half of the shoreline was mapped according the most recent ShoreZone coastal habitat mapping protocol (Cook *et al.* 2017) and the other half was mapped according the to 2014 ShoreZone protocol (Harper *et al.* 2014). The purpose of this report is to provide a summary of the physical (Section 2) and biological (Section 3) data imaged and classified around the Prince Rupert survey area.

The length of shoreline mapped is 1,263 kilometers in 5,279 along-shore segments (units), averaging 239 m in length. The digital shoreline used for the ShoreZone habitat mapping was the CHS_Highwaterline_BCalbers.shp.

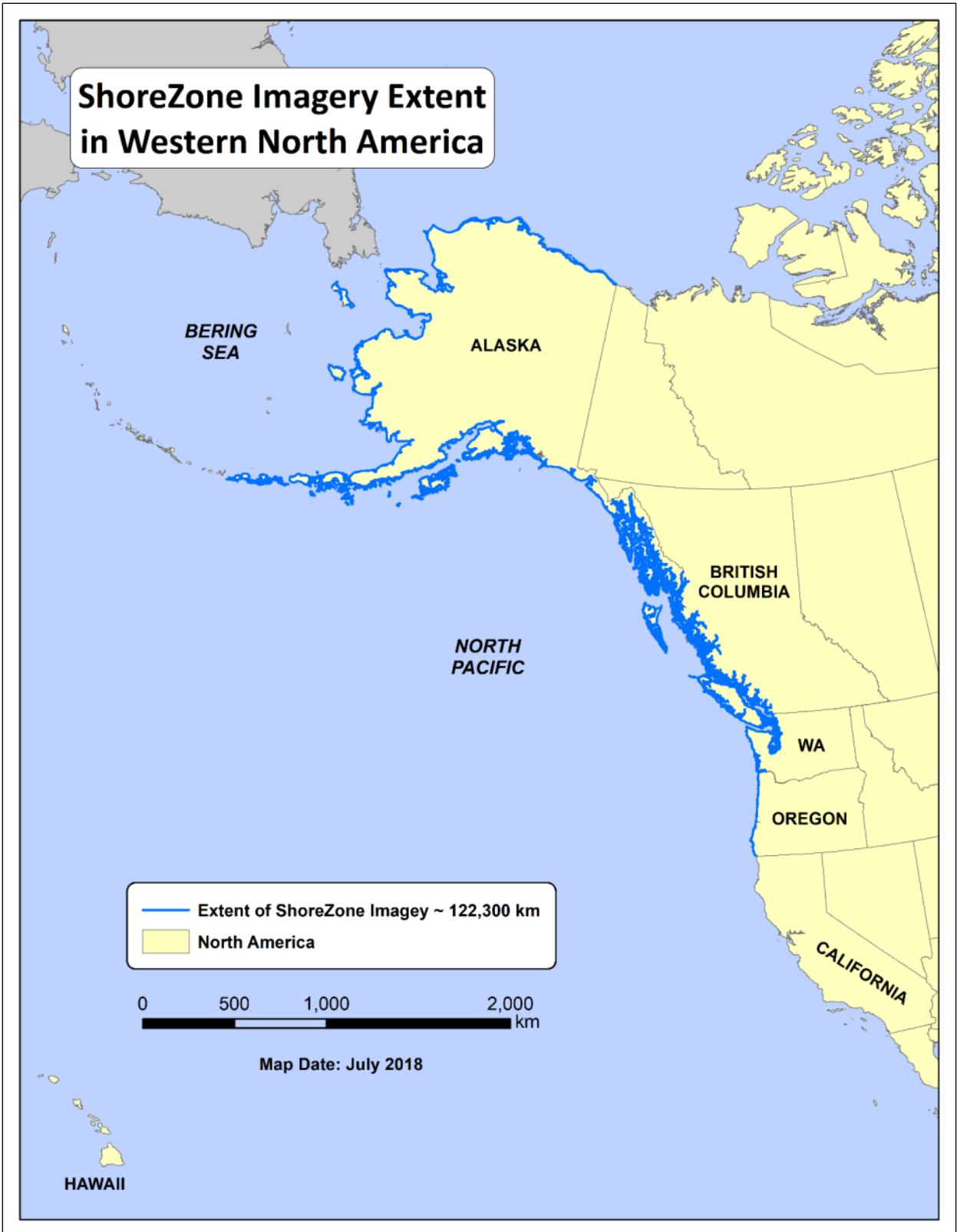


Figure 1. Extent of ShoreZone imagery in Alaska, British Columbia, Washington State and Oregon as of March 2019.

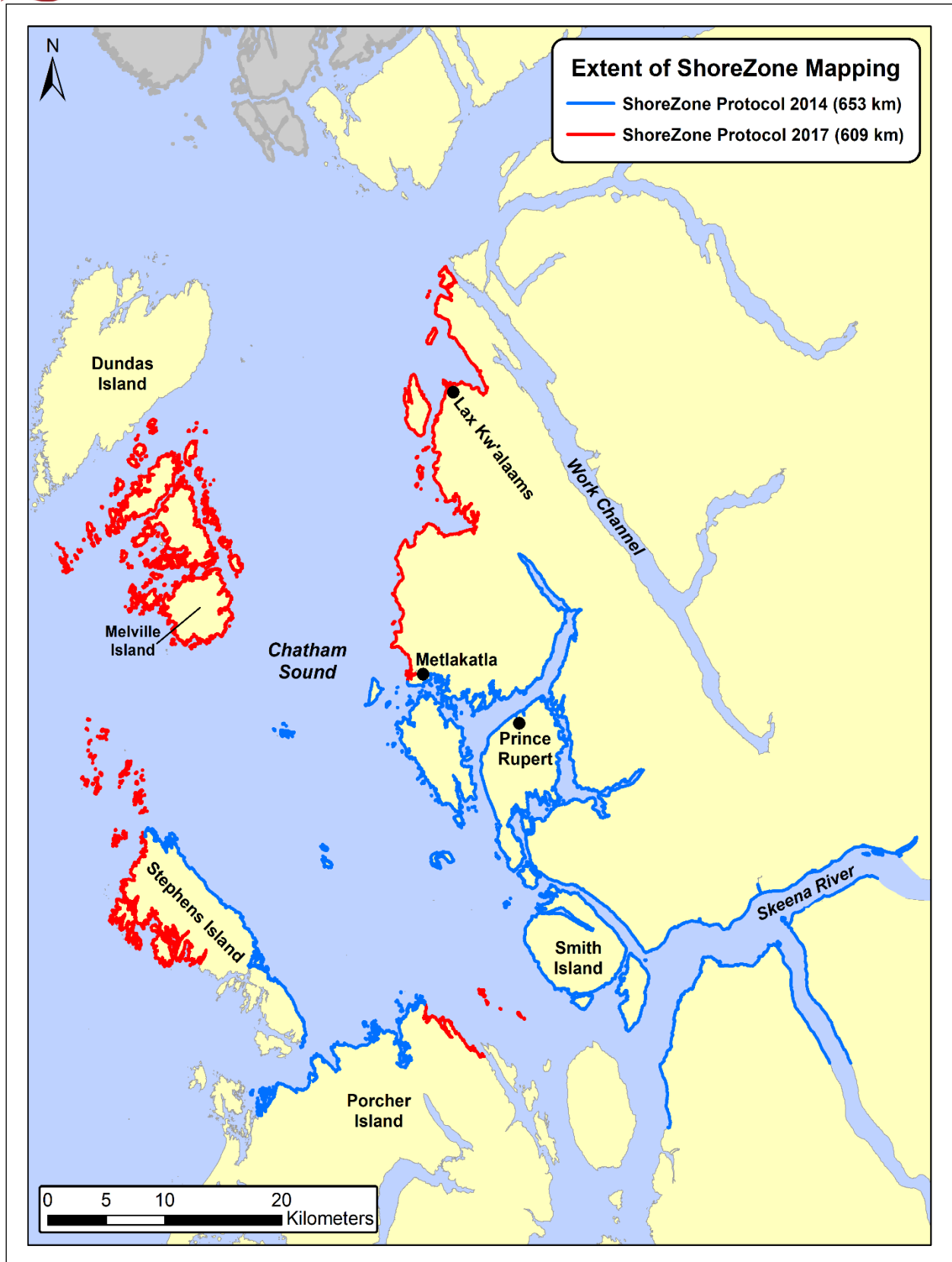


Figure 2. Extent of mapping for the Prince Rupert survey area.



2 PHYSICAL ATTRIBUTE DATA SUMMARY

2.1 Coastal Class

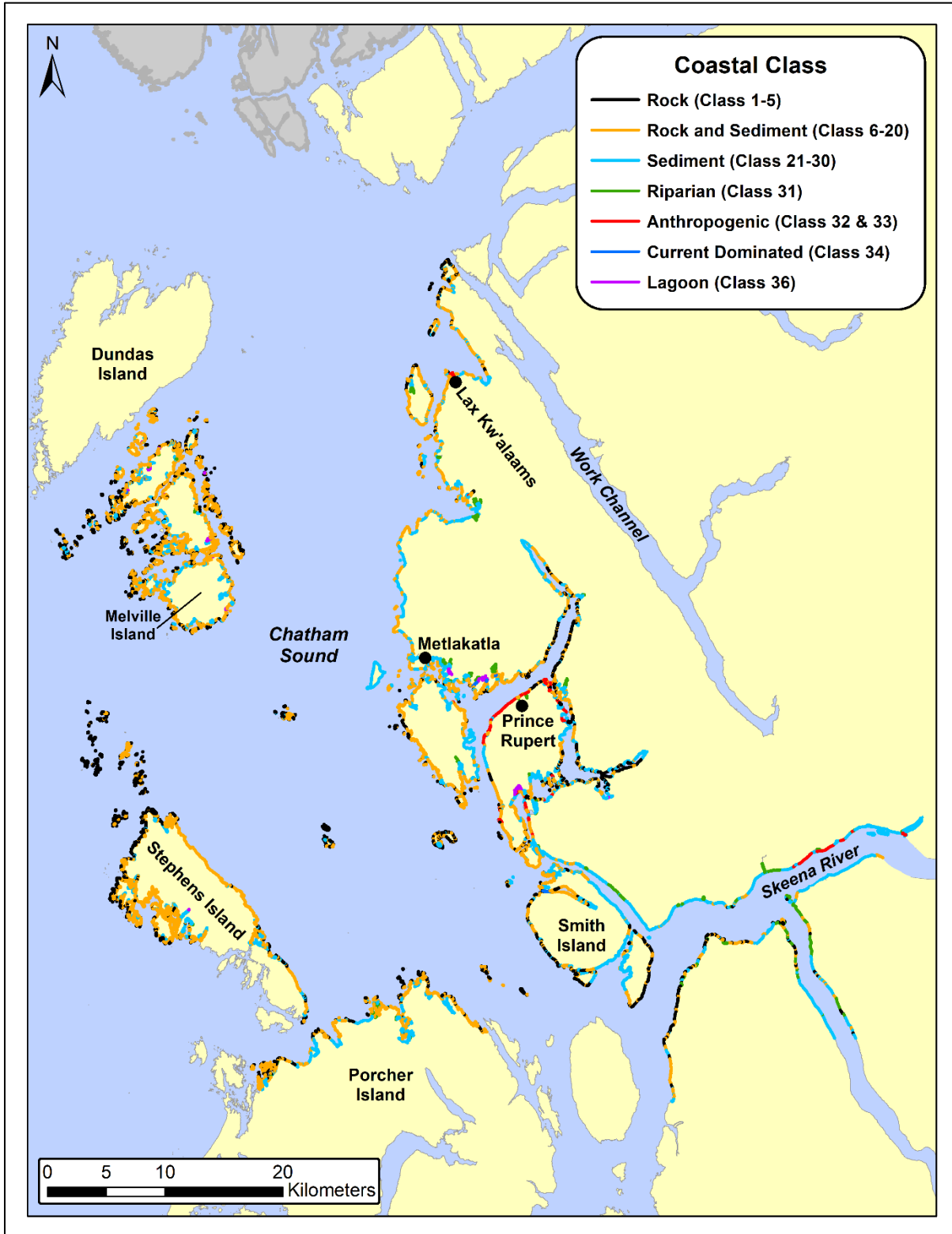


Figure 3. Map of the Coastal Class categories grouped by type (also known as Shore Type).

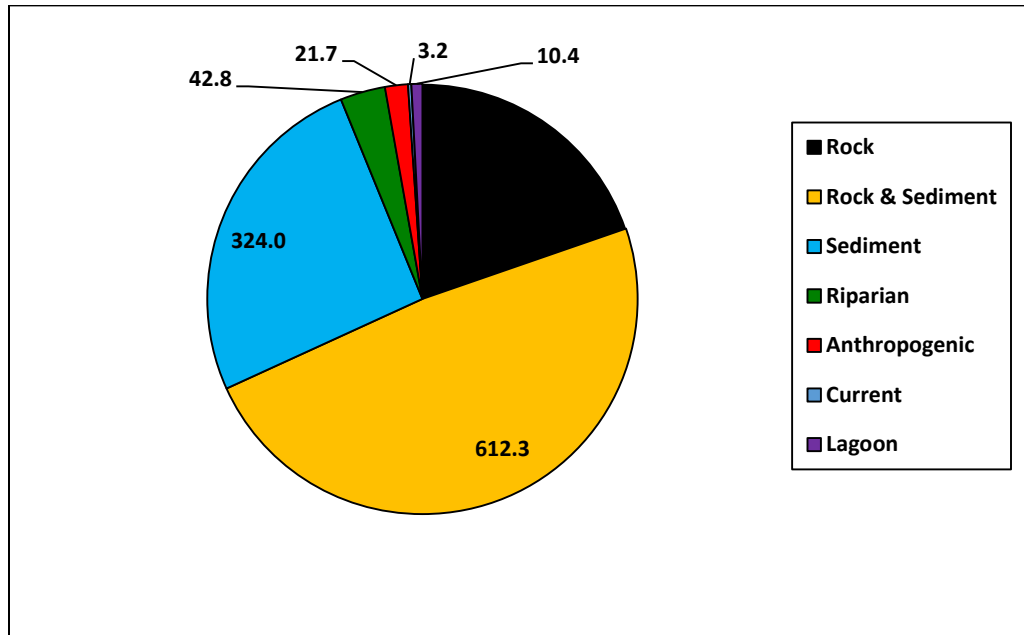


Figure 4. Grouped Coastal Class categories by shoreline length (km).

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 (48.5%) with Sediment shorelines (25.6%) dominated the Prince Rupert survey area. Rock shorelines followed with 19.7% while Riparian, Anthropogenic, Lagoon, and Current 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 Prince Rupert survey area are found in Appendix A, Table A-1.

Table 1. Summary of Coastal Classes for the Prince Rupert survey area.

Substrate Type	Shore Type		Sum of Unit Length (km)	# of Units	% Occurrence (by length)	Cumulative Occurrence (% , km)
	No.	Description				
Rock	1	Rock Ramp, wide	12	60	1	20% 249 km
	2	Rock Platform, wide	12	67	1	
	3	Rock Cliff	162	843	13	
	4	Rock Ramp, narrow	63	392	5	
	5	Rock Platform, narrow	1	2	<1	
Rock & Sediment	6	Ramp w gravel beach, narrow	25	109	2	49% 612 km
	7	Platform w gravel beach, wide	13	46	1	
	8	Cliff with gravel beach	43	239	3	
	9	Ramp with gravel beach	61	380	5	
	10	Platform with gravel beach	<1	3	<1	
	11	Ramp w gravel & sand beach, ...	192	787	15	
	12	Platform with G&S beach, wide	127	340	10	
	13	Cliff with gravel/sand beach	24	132	2	
	14	Ramp with gravel/sand beach	88	534	7	
	15	Platform with gravel/sand beach	1	3	<1	
	16	Ramp w sand beach, wide	16	61	1	
	17	Platform w sand beach, wide	10	30	1	
	18	Cliff with sand beach	7	28	1	
	19	Ramp w sand beach, narrow	5	24	<1	
Sediment	21	Gravel flat, wide	6	21	<1	26% 324 km
	22	Gravel beach, narrow	5	38	<1	
	24	Sand & gravel flat or fan	165	515	13	
	25	Sand & gravel beach, narrow	26	143	2	
	26	Sand & gravel flat or fan	3	17	<1	
	27	Sand beach	<1	3	<1	
	28	Sand flat	70	153	6	
	29	Mudflat	39	74	3	
	30	Sand beach	9	21	1	
	Organics	31	Organics/Estuarine	43	86	
Man-made	32	Man-made, permeable	21	88	2	2% 22 km
	33	Man-made, impermeable	1	6	<1	
Current	34	Channel	3	14	<1	<1 3 km
Lagoon	36	Lagoon	10	20	1	1% 10 km
Totals:			1,263	5,279	100	100%

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



2.2 Environmental Sensitivity Index (ESI)

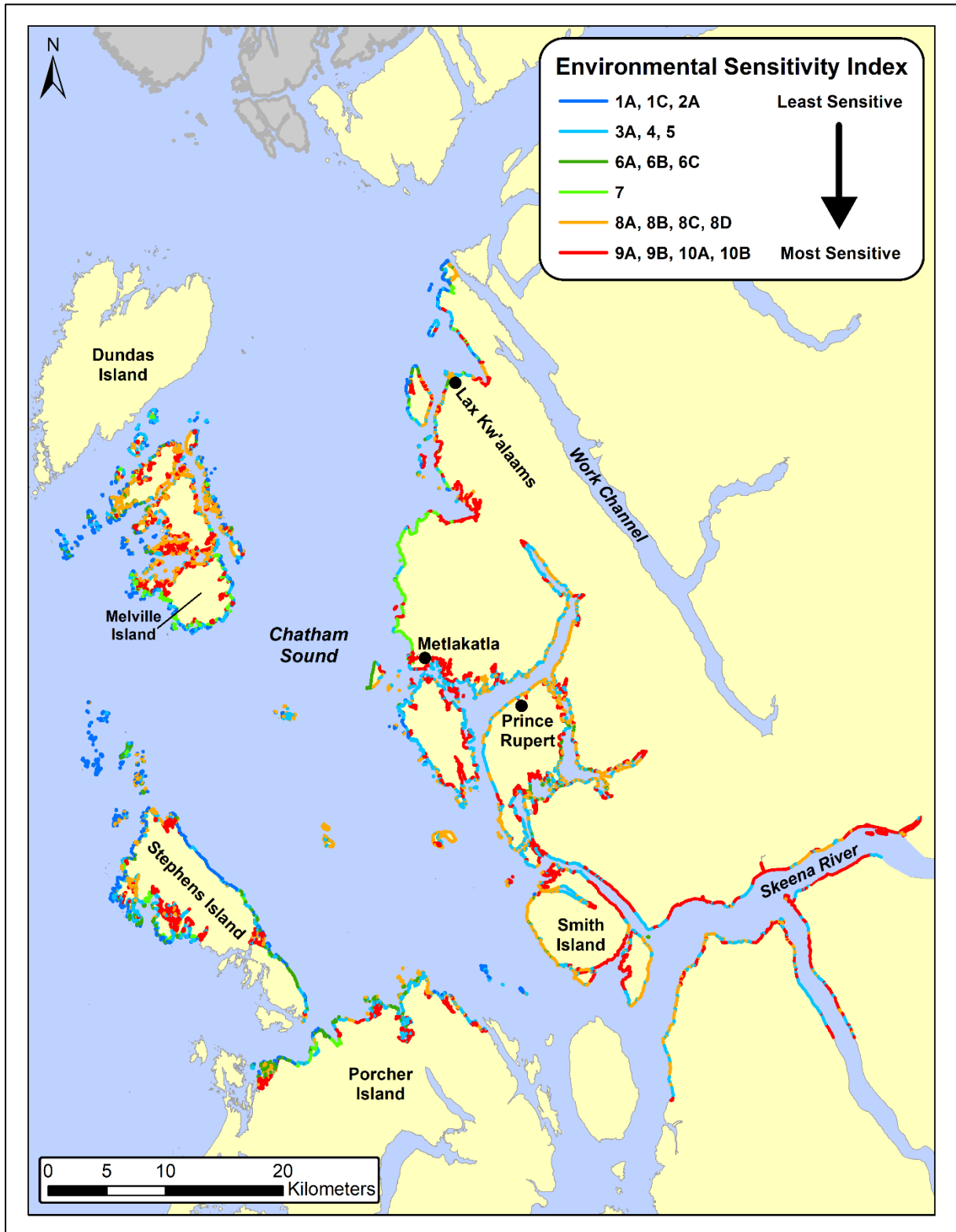


Figure 5. Distribution of the grouped ESI categories from least to most sensitive to oiling.

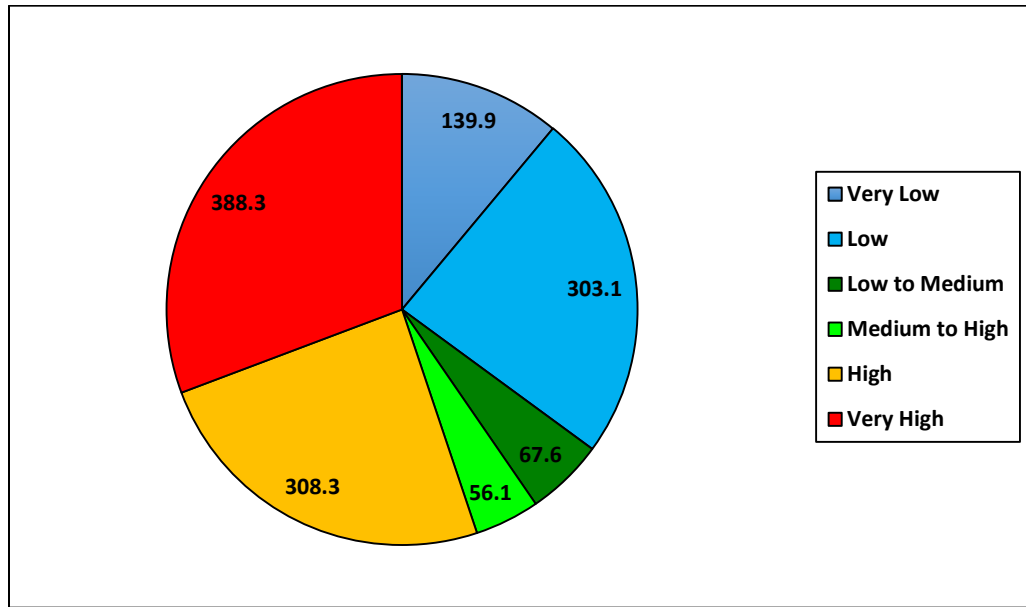


Figure 6. Grouped most sensitive ESI categories by shoreline length (km).

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 coastline around Prince Rupert is represented by the grouped High and Very High categories (55.1% of shoreline length). These sections of the shoreline have a potentially high sensitivity to oil. At the other end of the spectrum, only 35% 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 Prince Rupert 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	68	364	5
1C	Exposed rocky cliffs with boulder talus base	5	24	<1
2A	Exposed wave-cut platforms in bedrock, mud, or clay	68	382	5
3A	Fine- to medium-grained sand beaches	29	121	2
4	Coarse-grained sand beaches	4	21	<1
5	Mixed sand and gravel beaches	270	1,258	21
6A	Gravel beaches (granules and pebbles)	2	8	<1
6B	Gravel beaches (cobbles and boulders)	66	350	5
6C	Rip rap	<1	2	<1
7	Exposed tidal flats	56	150	4
8A	Sheltered scarps in bedrock, mud, or clay; sheltered rocky shores (impermeable)	166	928	13
8B	Sheltered, solid, man-made structures; sheltered rocky shores (permeable)	41	170	3
8C	Sheltered Rip Rap	18	78	1
8D	Sheltered rocky rubble shores	84	532	7
9A	Sheltered tidal flats	284	648	22
9B	Vegetated low banks	5	9	<1
10A	Salt- and brackish-water marshes	99	232	8
10B	Freshwater marshes	<1	2	<1
Totals:		1,263	5,279	100

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



2.3 Oil Residence Index (ORI)

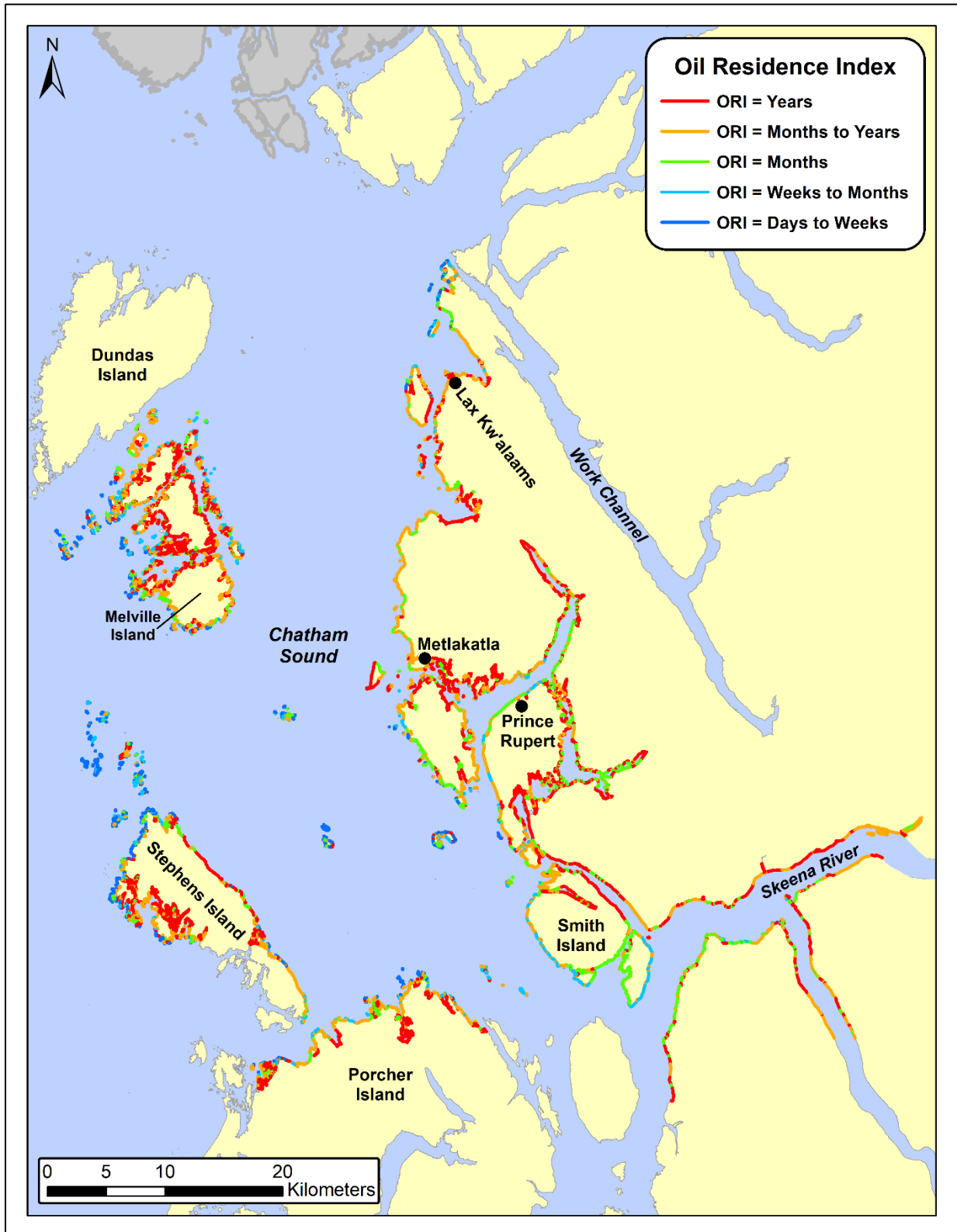


Figure 7. Distribution of the Oil Residence Index (ORI) categories.

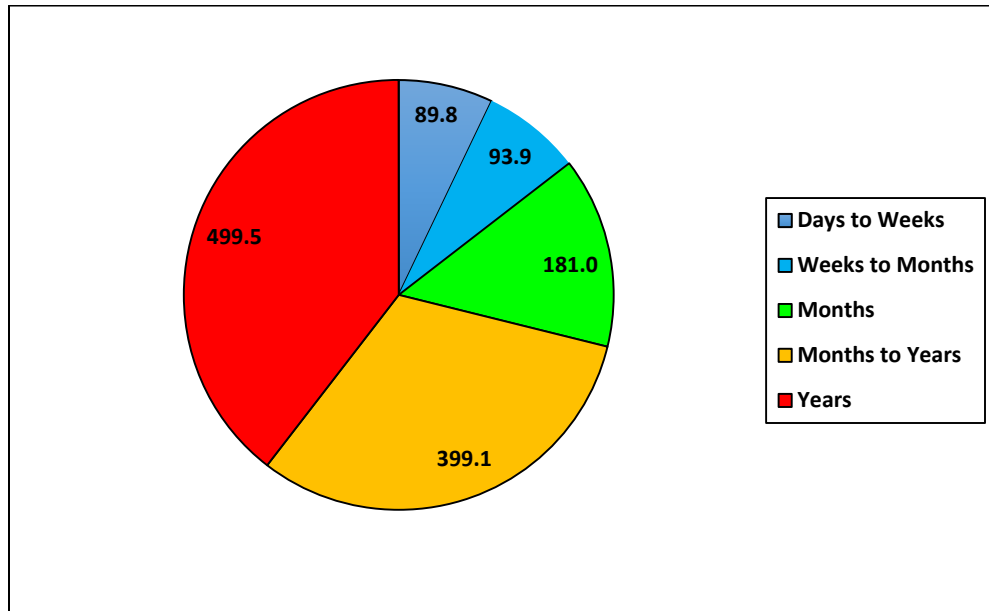


Figure 8. Oil Residence Index (ORI) categories by shoreline length (km).

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 71.1% of the shore segments in the Prince Rupert survey area, indicating oil residence times are on the order of months to years (see Figures 7 and 8 for distribution and summary statistics).



2.4 ShoreZone Coastal Vulnerability

2.4.1 Flood Zone Width

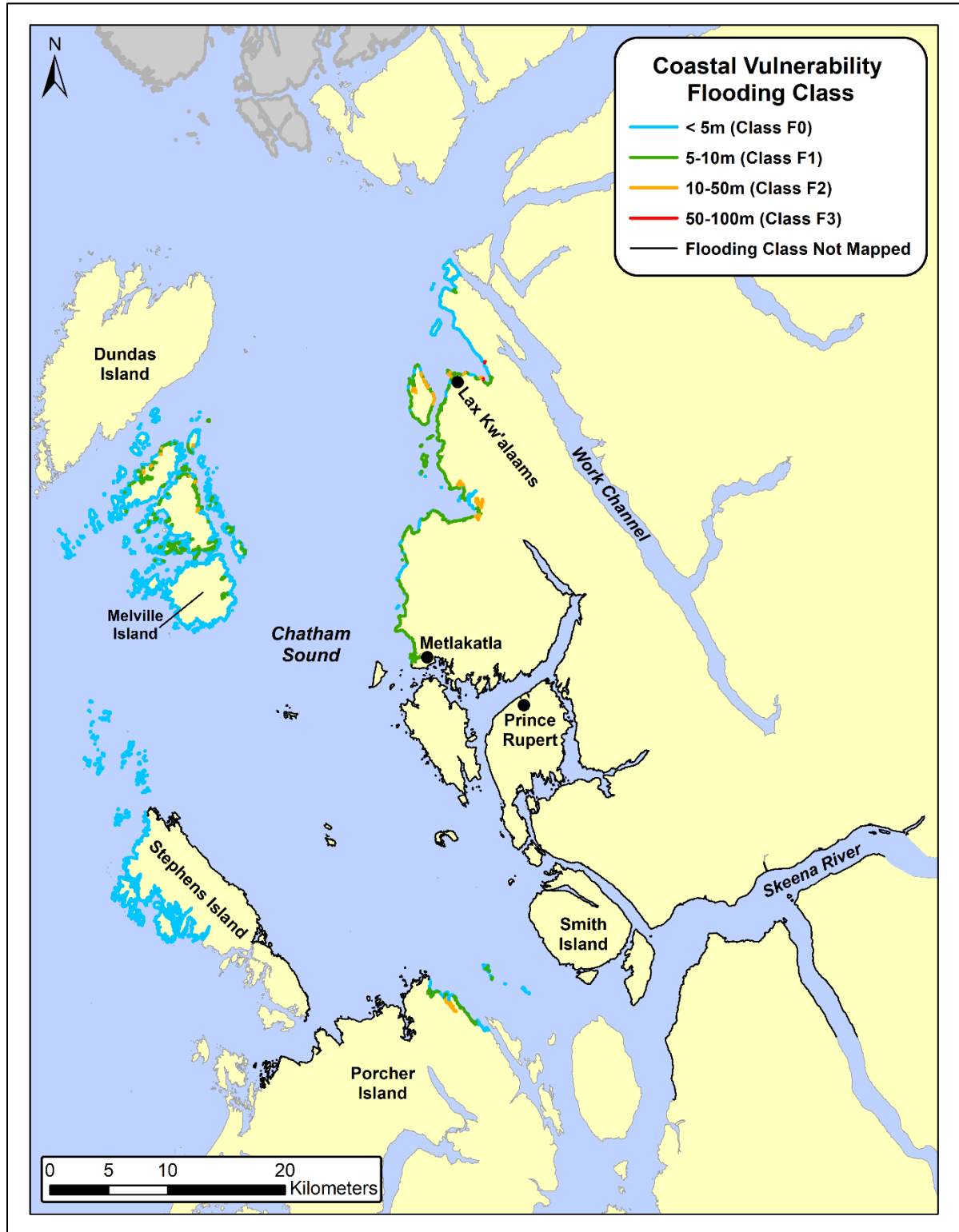


Figure 9. Distribution of the Coastal Vulnerability Flooding Class.

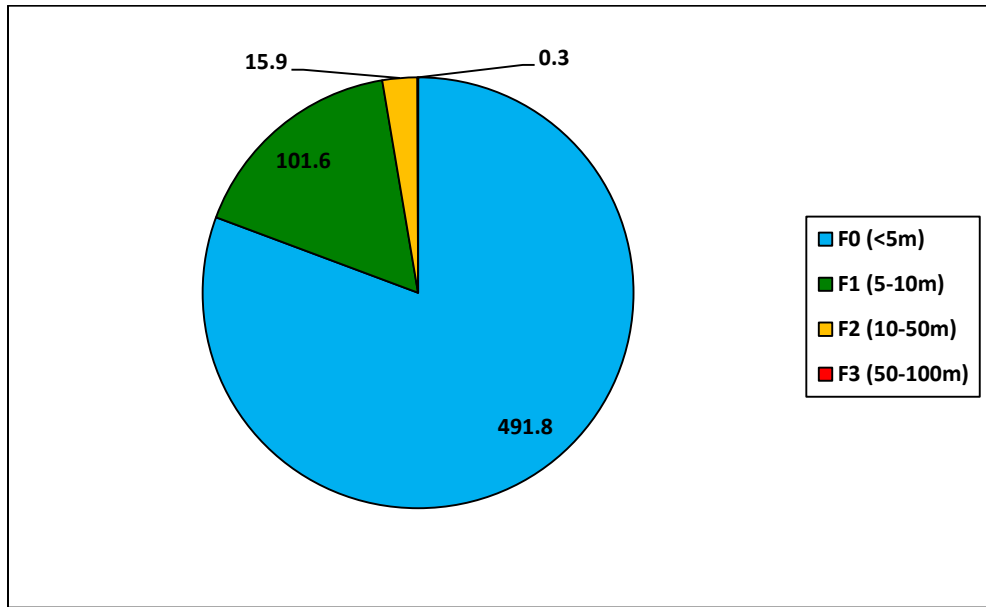


Figure 10. Flooding Class categories by shoreline length (km).

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 study area, with 80.7% of the shoreline at a low risk of flooding <5m from 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). Note that the first section of Prince Rupert mapping in this report was completed under a different ShoreZone protocol which did not include the Coastal Vulnerability Module.

2.4.2 Coastal Vulnerability Observations

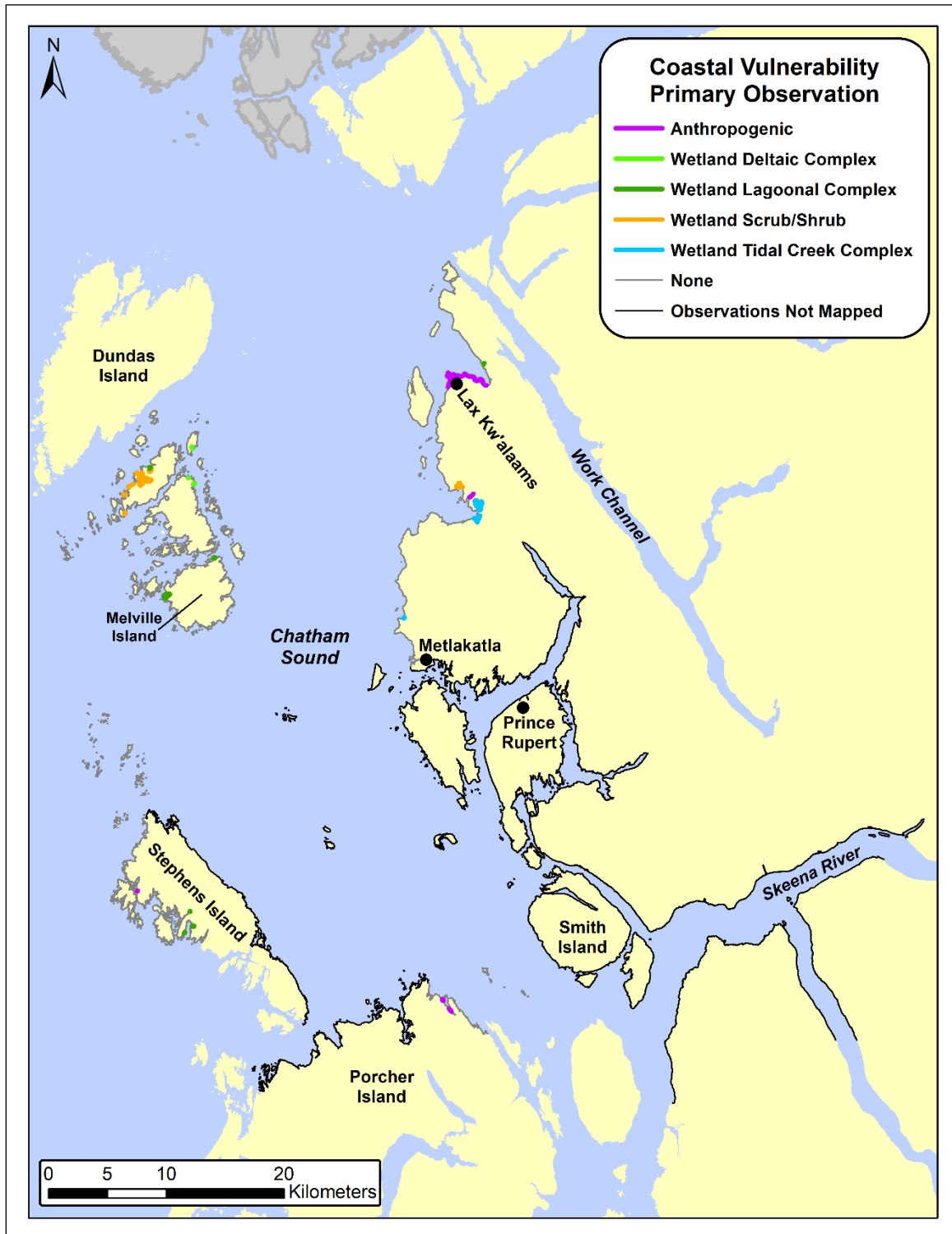


Figure 11. Distribution of the Coastal Vulnerability Observations categories.

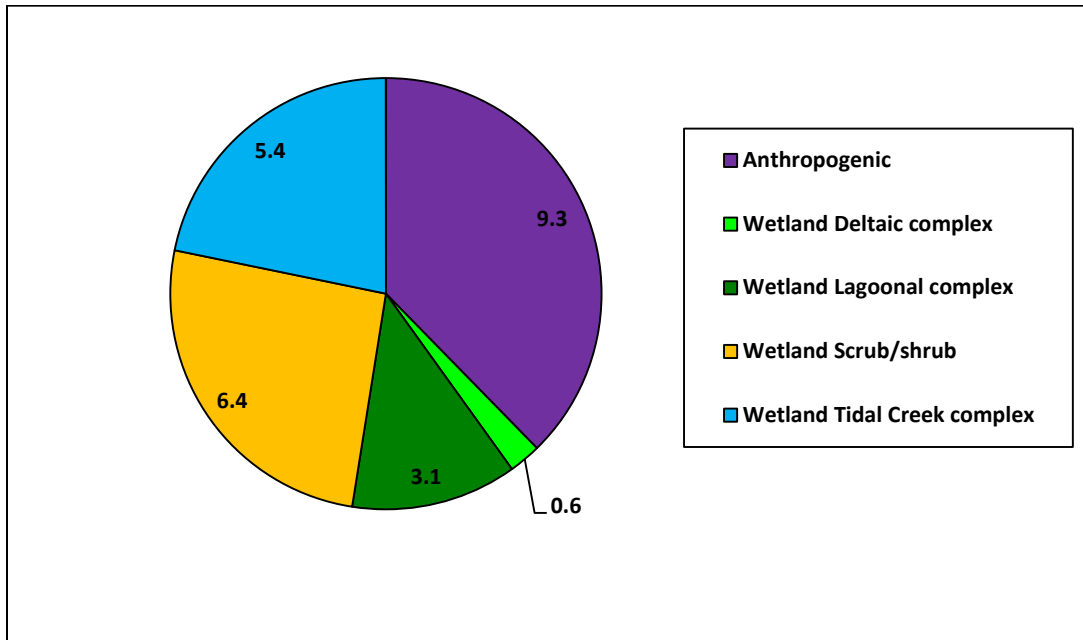


Figure 12. Coastal Vulnerability Observations categories by shoreline length (km). Category 'None' not shown.

The CVM Observations are features important for estimating the frequency and extent of coastal inundation. In the Prince Rupert area, apart from the 'None' category, the majority of observations were from Anthropogenic category with 9.3 km and the Wetland Scrub/shrub category with 6.4 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. Note that the first section of Prince Rupert mapping in this report was completed under a different ShoreZone protocol which did not include the Coastal Vulnerability Module.

2.4.3 Coastal Vulnerability Index

The methods of Thieler and Hammer-Klose (2000) (<http://woodshole.er.usgs.gov/project-pages/cvi/>) were adapted to calculate the Coastal Vulnerability Index (CVI) using five ShoreZone attributes: Shore Type, Max Tide Range, Shoreline Erosion index, Flood Zone Width, and Wave Height. See the most recent ShoreZone protocol for more details (Cook *et al.*, 2017). When we first attempted to calculate the CVI for the portion of the shoreline funded in the Eastern Aleutians by OSRI, 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 using 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 survey area is shown in Figure 13. Note that the CVI could only be calculated for the mapping completed under the 2017 protocol as the appropriate attributes were not mapped as part of the 2014 ShoreZone protocol which was used for the mapping completed in 2015. Under the new absolute ranking system, all the shoreline mapped for this project is ranked as Low vulnerability to sea level rise. This is consistent with mapper observations during review of the imagery and with the rocky nature of the shoreline.

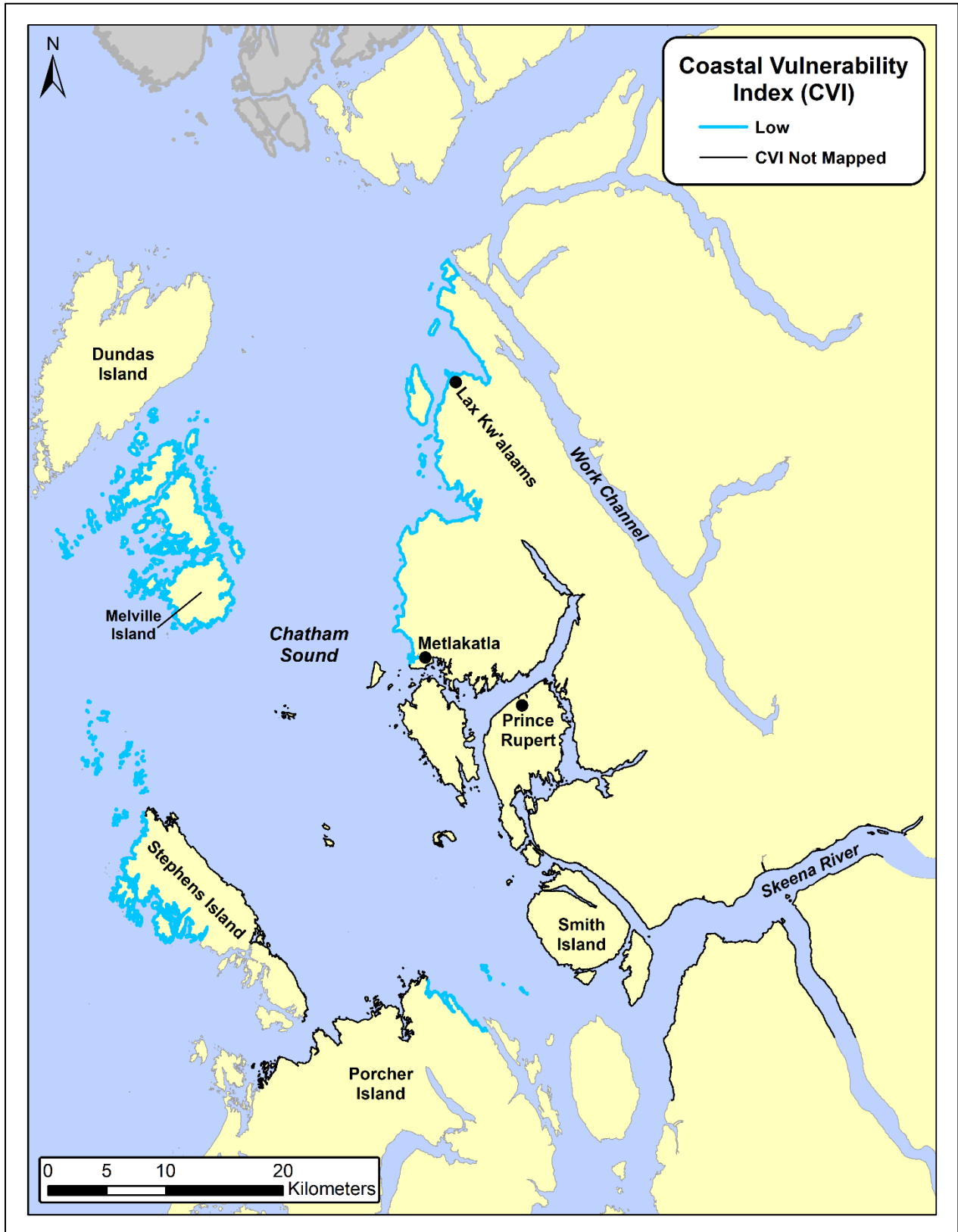


Figure 13. Distribution of Coastal Vulnerability index ranks.

2.5 Anthropogenic Shore Modifications

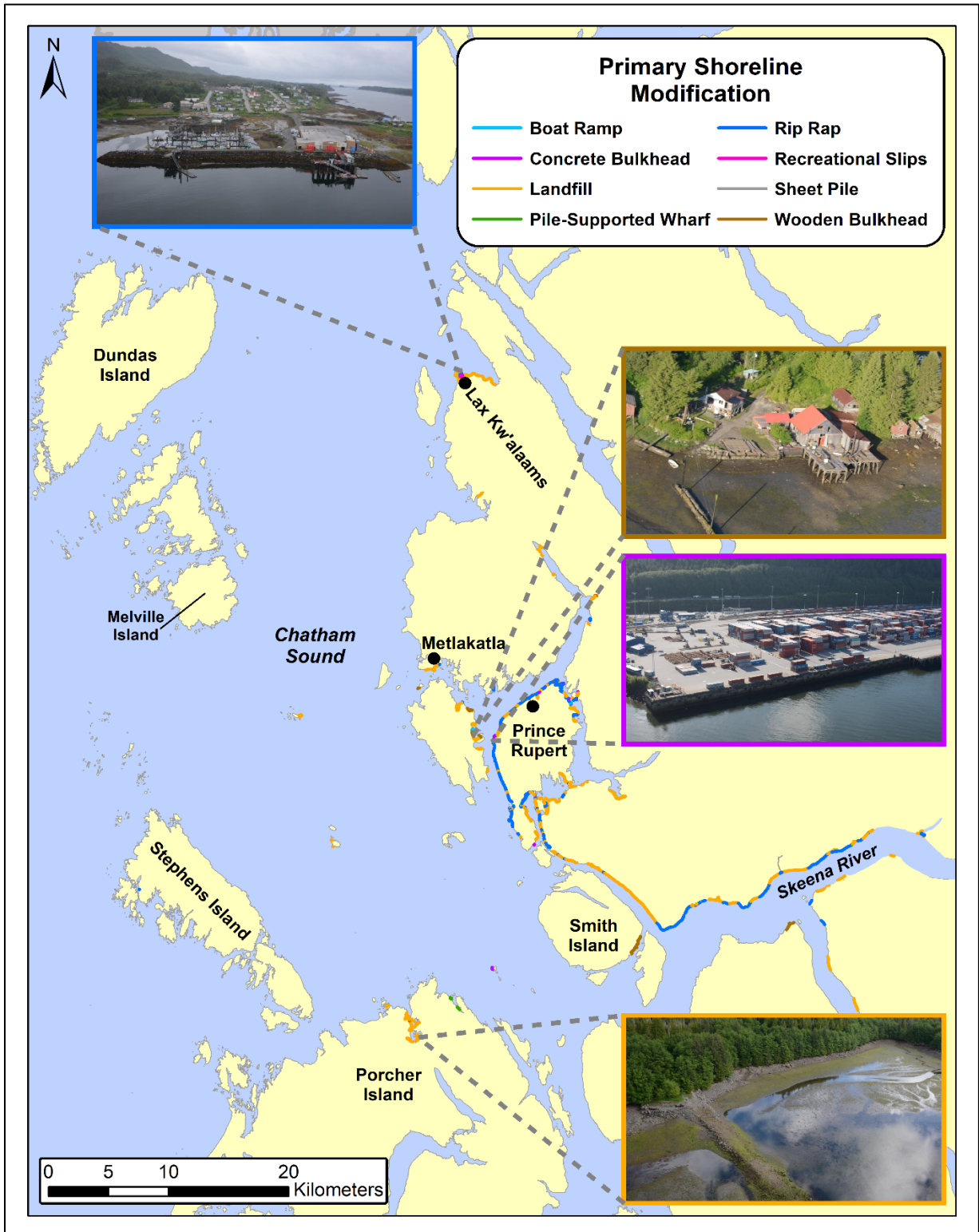


Figure 14. Distribution of types of the primary Shore Modifications. There may be other shore modifications in any given unit. That data would be found in the Shore Modifications table in the geodatabase.

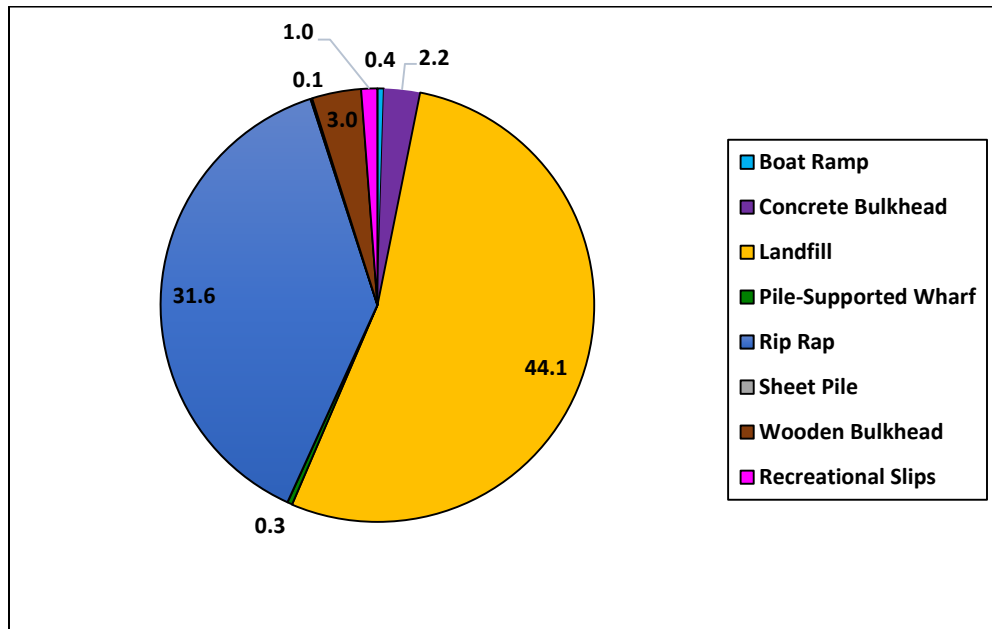


Figure 15. Shore Modifications by estimated shoreline length (km) of each modification type.

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 6.5% of the shoreline (taking the estimated length of that modification within the unit into account) exhibits shore modifications in the Prince Rupert study area (Figure 14). Landfill was the most commonly recorded observation (53.3%) with Rip Rap (31.6%) and Wooden Bulkheads (3.7%) 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 necessarily 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. Note that the first section of Prince Rupert mapping in this report was completed under a different ShoreZone protocol which mapped Recreational Slips and Wharfs in a different manner - one in which they cannot be represented proportionally by shoreline length. That particular data is in the Geodatabase for reference.

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 Prince Rupert survey area). Full descriptions of all biobands, including indicator and associated species can be found in the ShoreZone protocol (Cook *et al.* 2017). It is important to note that a nested bioband classification was developed and applied to all ShoreZone mapping completed after 2015, which includes the mapping completed for DFO that is incorporated into this report; however, the mapping completed for the Port of Prince Rupert and Metlakatla First Nation was completed prior to that change so does not include the new bioband names or metrics (see Figure 2 for exact areas mapped under each protocol). Changes to the bioband definitions include the application of a consistent naming convention and new four-digit codes for each bioband. A number of new biobands were added, and some were split to better describe the banding that has been observed as ShoreZone continues to move into new and unique areas.

In the 2014 ShoreZone protocol, only two descriptors were used for the distribution of biobands within each unit: Patchy (in <50% of the length of the unit) or Continuous (in >50% of the length of the unit). In the 2017 protocol, the specific elevation or zone of the intertidal determined how the bioband attributes were 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 used Patchy and Continuous as metrics as that was consistent across the two datasets.

Biobands mapped in the Prince Rupert area to date are summarized in Table 3. The most commonly occurring intertidal biobands in the survey areas were Rockweed which was found in 95% of units while Green Algae and Barnacles found in 73% and 66% of units, respectively. The most common Splash Zone bioband was Black Lichen, occurring in 70% of the units while the Salt Marsh bioband was found in 62% of units. The most common subtidal biobands were Brown Bladed Kelps (47%), Soft Brown Kelps (44%) and Eelgrass (39%). All the most common biobands were typically associated with semi-protected to protected partially mobile shorelines, which is a good description of the majority of this area. Distribution maps, statistics and observations about some specific biobands are found following Table 3.

Table 3. Bioband abundances mapped around Prince Rupert to date.

Bioband			Patchy		Continuous		Total (km)	% of Total Mapped
Name	Old Code	New Code	(km)	%	(km)	%		
Dune Grass	GRA	DUGR	13	1	78	6	91	7
Sedges	SED	SEDG	22	1	141	6	163	7
Salt Marsh	PUC	SAMB	993	22	1379	40	2372	62
Barnacle	BAR	BARN	262	21	571	45	832	66
Rockweed	FUC	ROCK	251	20	954	75	1205	95
Green Algae	ULV	GRAL	332	26	595	47	928	73
Blue Mussel	BMU	BLMU	5	<1	26	2	31	2
Echinoderms		ECHI	0.9	<1	1	<1	2	<1
Bleached Red Algae	HAL	BRAL	7	1	12	1	19	2
Filamentous and Foliose Red Algae	RED*	FFRA	214	17	322	26	536	42
Coralline Red Algae	RED*	CORA	7	1	17	1	24	2
Alaria	ALA	ALAR	3	<1	23	2	27	2
Soft Brown Kelp	SBR	SOBK	211	17	344	27	555	44
Dark Brown Kelp	CHB	DABK	25	2	136	11	161	13
Brown Bladed Kelps	SBR/CHB/ ALA	BRBA	163	13	434	34	597	47
Invertebrates		INVE	0	0	0.3	<1	0.3	<1
Surfgrass	SUR	SURF	38	3	63	5	100	8
Eelgrass	ZOS	EELG	188	15	310	25	498	39
Urchin Barrens	URC	URBA	52	4	113	9	164	13
Giant Kelp	MAC	GIKE	113	9	151	12	263	21
Bull Kelp	NER	BUKE	116	9	115	9	231	18
Canopy Kelp	MAC/NER	BRCA	5	<1	4	<1	9	<1

*The RED bioband included Filamentous and Foliose Red Algae as well as Coralline Red Algae. Those have now been split into two biobands.

Salt Marsh (PUC/SAMB) was the most commonly occurring supratidal, non-splash zone bioband and was found in 62% of units (see Figures 16 and 18 for graph of proportion and distribution map). Salt Marsh can occur either in the supratidal or lower intertidal, both occurrence are incorporated here. Salt Marsh was fairly ubiquitous along the shoreline, mostly as a narrow strip of vegetation between the trees and intertidal zone (see Figure 17 for photo). This is an important habitat for many shoreline inhabitants and can provide important ecological functions, such as filtering land-based nutrients which can help maintain the balance of other habitats such as eelgrass meadows (Valiela *et al.*, 2000).

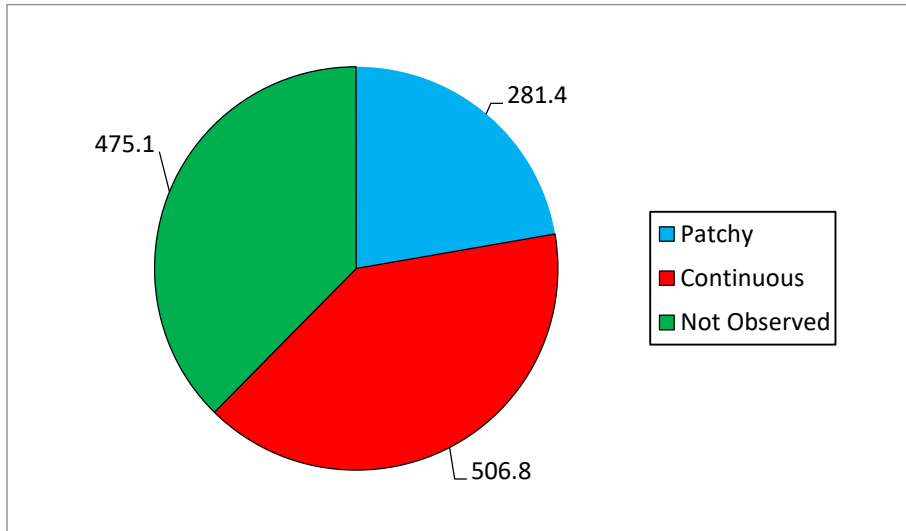


Figure 16. Proportion of shoreline length (km) of the supratidal/intertidal Salt Marsh (SAMB) bioband by shoreline length category.



Figure 17. Photo of a narrow strip of Salt Marsh bioband on Dunira Island in the Melville Island group.



Figure 18. Distribution of the Salt Marsh (SAMB) bioband around Prince Rupert from mapping completed to date.

Urchin Barrens (URBA) are subtidal patches where the lack of predators such as Sea Otters over the long term and sea stars in the shorter term (Schultz *et al.*, 2016), has allowed sea urchins to proliferate. This bioband occurs in 13% of the mapped units to date (see Figures 19 and 21 for graph of proportion and distribution map). These urchins graze down the kelp and expose the underlying substrate which is often covered by coralline red algae as it is the only algae urchins will not graze. Urchin Barrens include Coralline Red Algae as a component with Bladed Kelp and Canopy Kelp biobands generally co-occurring as a narrow strip in the upper subtidal. This narrow strip is the zone where wave action prevents the urchins from grazing (see photo in Figure 20). Urchin Barrens were observed along the outer portions of the coast, in more exposed areas (Semi-Protected and higher).

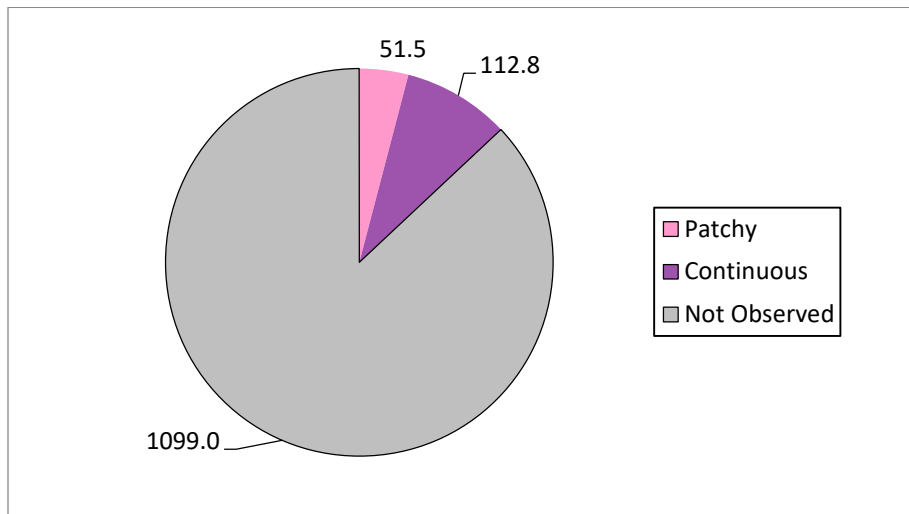


Figure 19. Distribution of the subtidal Urchin Barrens bioband by shoreline length (km).



Figure 20. Example of the Urchin Barren bioband, below the narrow strip of kelps.

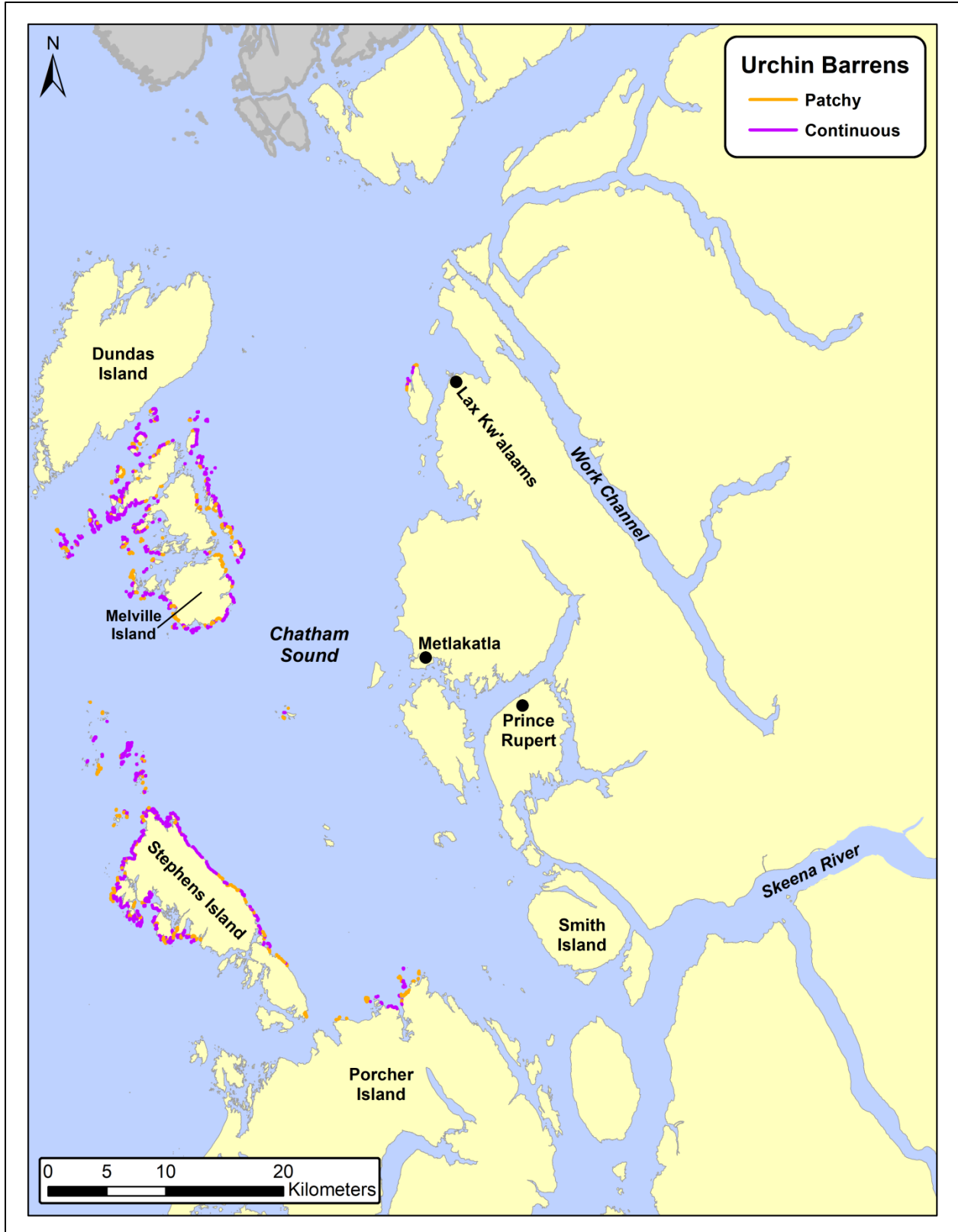


Figure 21. Distribution of the Urchin Barrens (URC/URBA) bioband. Please note that Bladed Kelps (SBR/SOBK, CHB/DABK, BRBA) and Canopy Kelps (MAC/GIKE, NER/BUKE) generally co-occur with Urchin Barrens as a narrow strip in the upper subtidal zone.

There were two canopy kelps observed in the Prince Rupert mapping completed to date, Bull Kelp (NER/BUKE) and Giant Kelp (MAC/GIKE). Canopy kelps form valuable habitat for other algae, fish and invertebrates and are an important part of a healthy coastline. Bull Kelp can handle more exposed parts of the coast while Giant Kelp tended to be in areas that were Semi-Protected down to Protected. Where the two canopy kelps co-occur, the Giant Kelp is generally found inshore of the Bull Kelp bed. Giant Kelp is also less tolerant of lower salinity so was not found in the area around the mouth of the Skeena River, to the south of Prince Rupert. See Figures 22 and 23 for statistics on the distribution of the individual canopy kelp biobands and a distribution map for both in Figure 24.

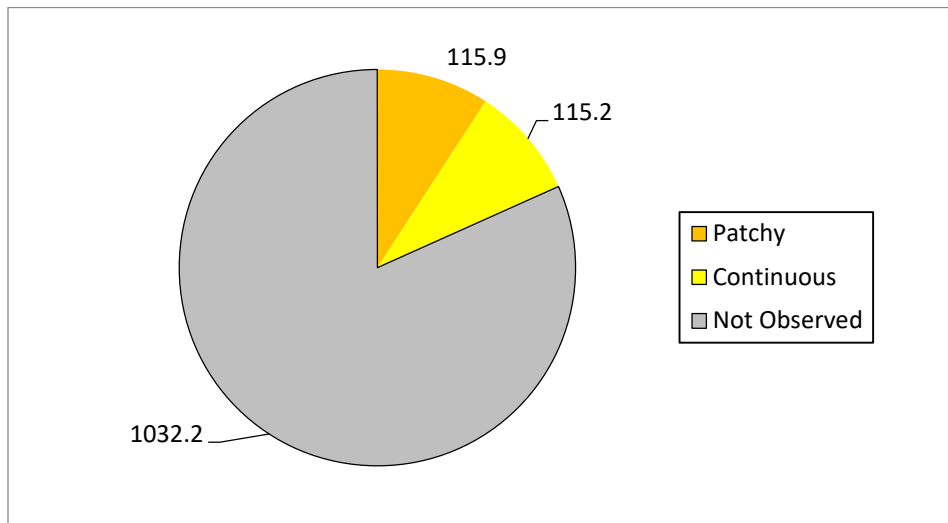


Figure 22. Distribution of the subtidal Bull Kelp (NER/BUKE) bioband by shoreline length (km).

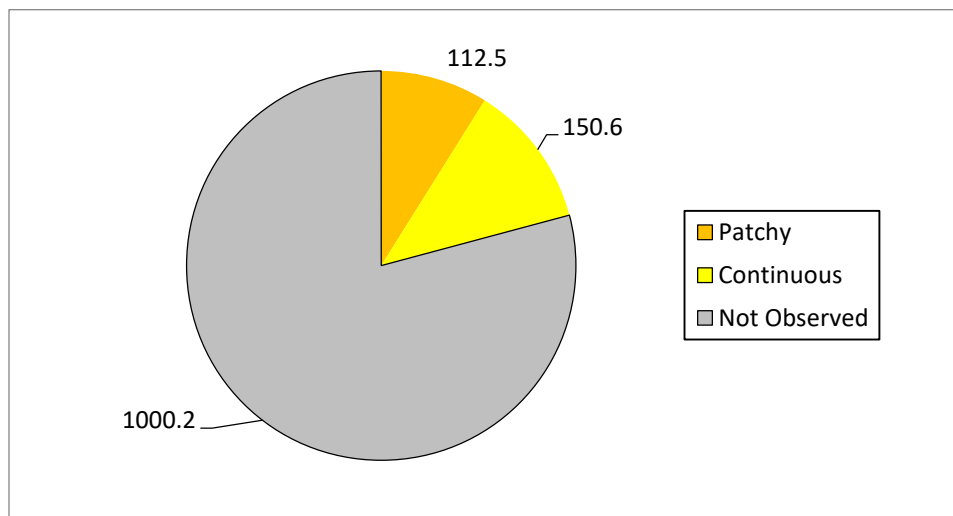


Figure 23. Distribution of the subtidal Giant Kelp (MAC/GIKE) bioband by shoreline length (km).

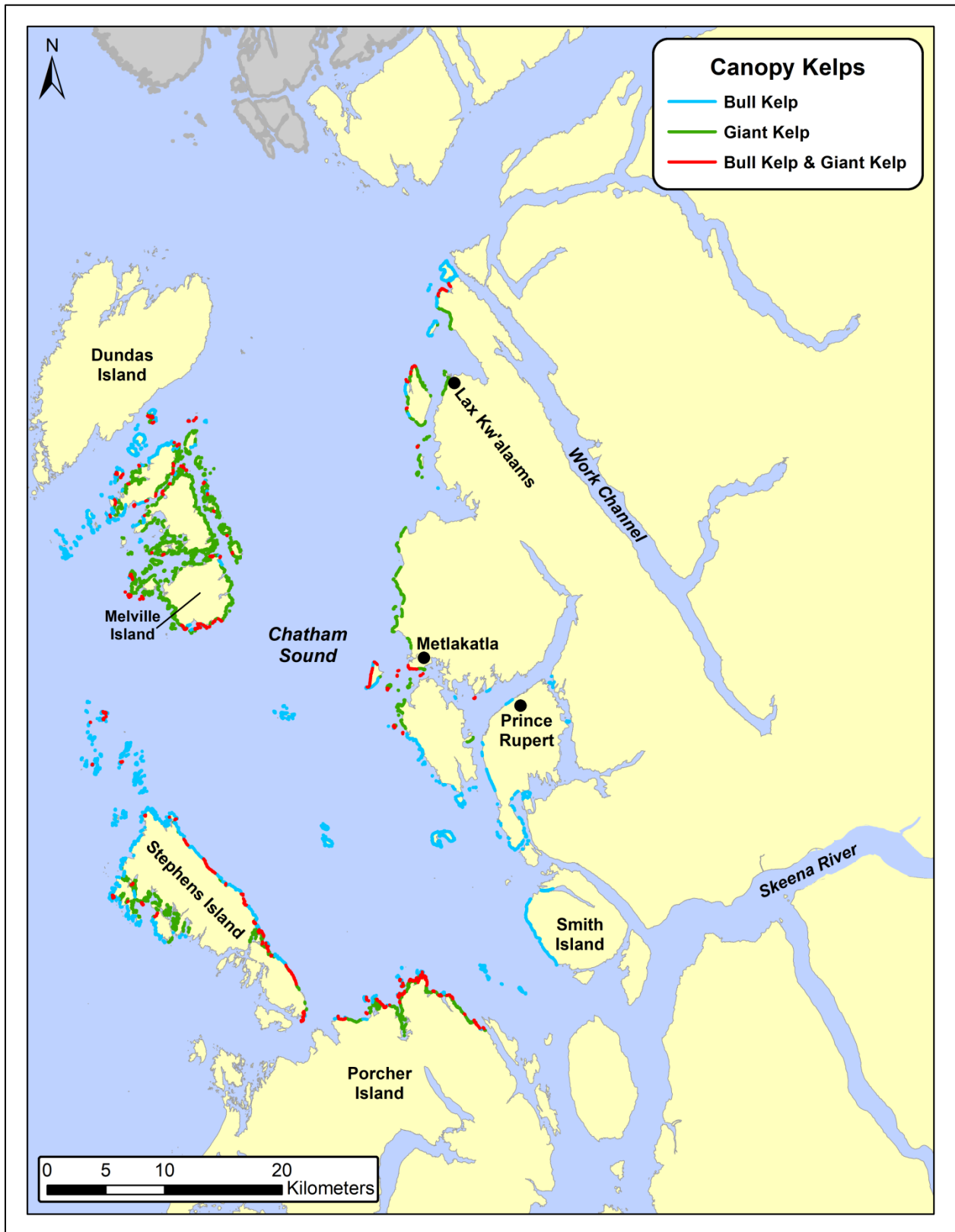


Figure 24. Distribution of the canopy kelp biobands, Bull Kelp (NER/BUKE) and Giant Kelp (MAC/GIKE) in the survey area.

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 observation and relative abundance of biota in each alongshore unit is used to determine the classification for the biological wave exposure. The assemblages of biota observed are then used as a proxy for 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 Prince Rupert area mapped to date are summarized in Figure 25 and a distribution map of the categories is shown in Figure 26. Most of the coastline (86.9%) was in the lower to moderate wave exposures (Very Protected to Semi-Protected), with most of that Protected (53.6%).

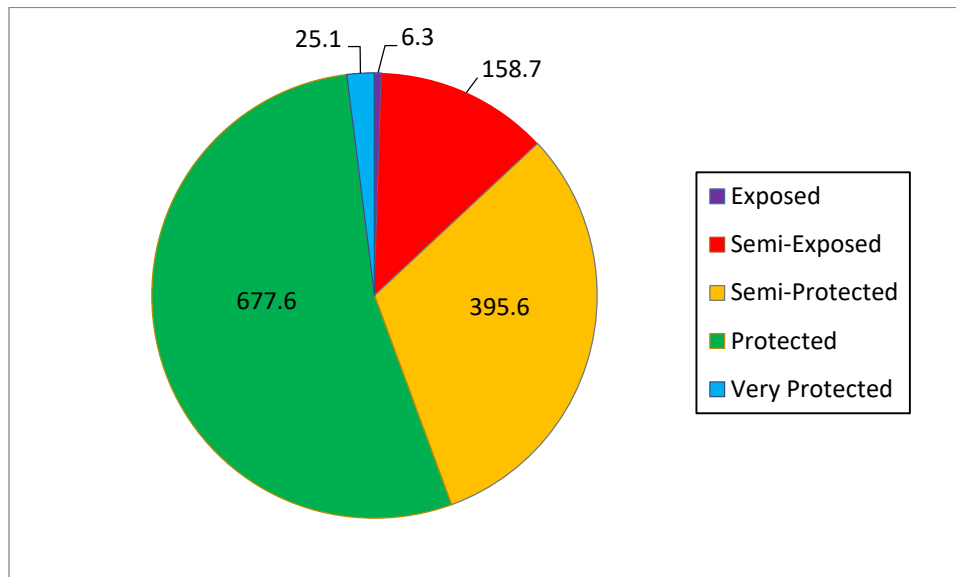


Figure 25. Distribution of Biological Wave Exposures mapped in the Prince Rupert area to date by shoreline length (km).

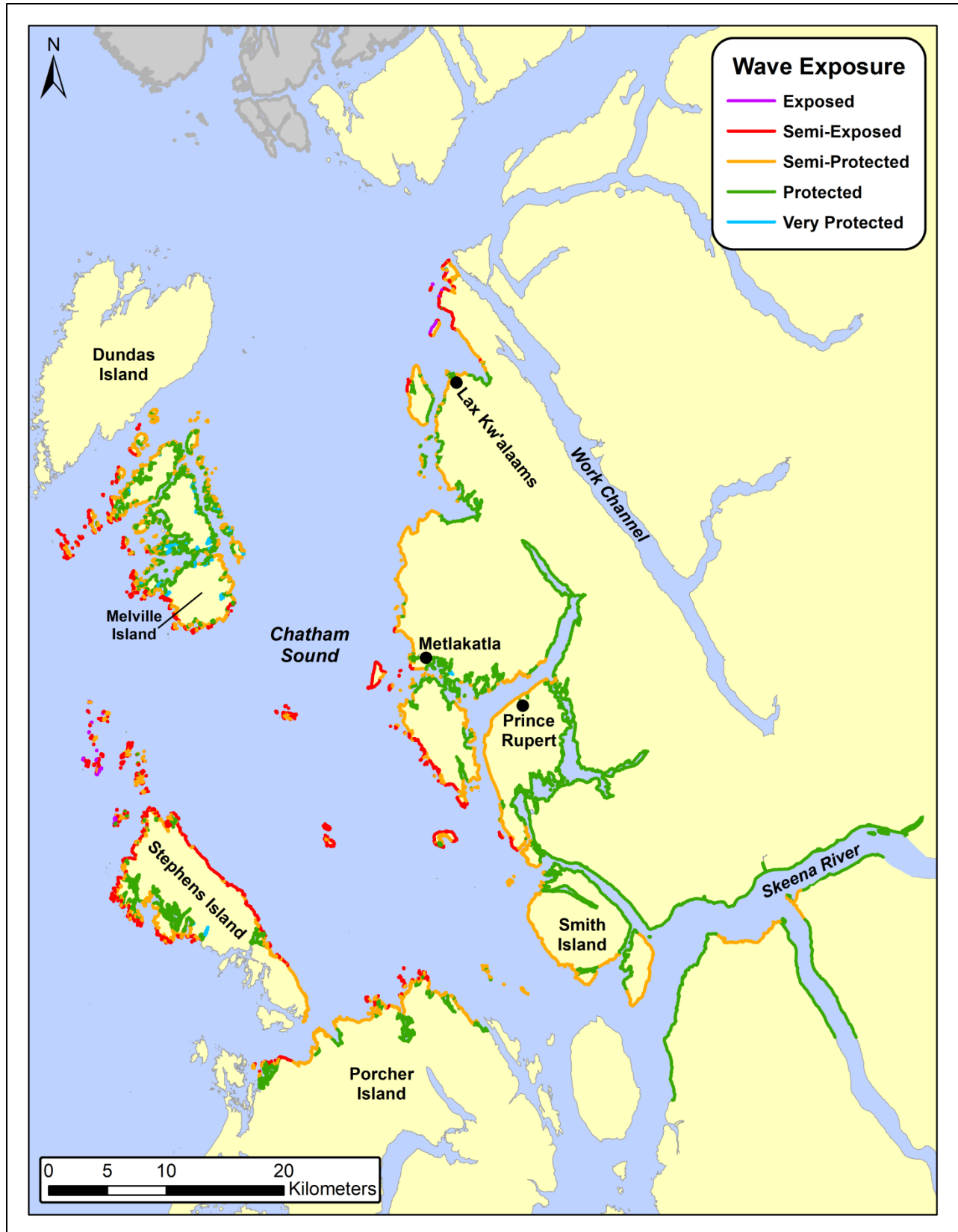


Figure 26. Distribution of the Biological Wave Exposure in the Prince Rupert area mapped to date.

3.3 Habitat Class

Habitat Class is a classification based on wave exposure and geomorphic characteristics observed on 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 exposure is the most common structuring process, and less commonly observed habitats are those structured by current, estuarine/fluvial processes, and anthropogenic structures. For habitat classes structured by wave exposure, 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 habitat class categories mapped for the Prince Rupert area to date are summarized in Figures 27 and 28. Partially mobile substrate is the dominant shoreline type (61.4%). Estuaries are not very common in this area with only 3.4% of the shoreline in that classification. The estuary habitat class is associated with spawning and nursery habitats for fish as well as breeding and foraging grounds for birds and other wildlife. However, although individual units may not have been classed as estuaries, the Skeena River is a significant influence to the area and much of the southern portion of the area surveyed could be considered estuarine in nature. The Anthropogenic habitat occurred in 1.9% of units as there the only large developed area was the Port of Prince Rupert and Port Edward.

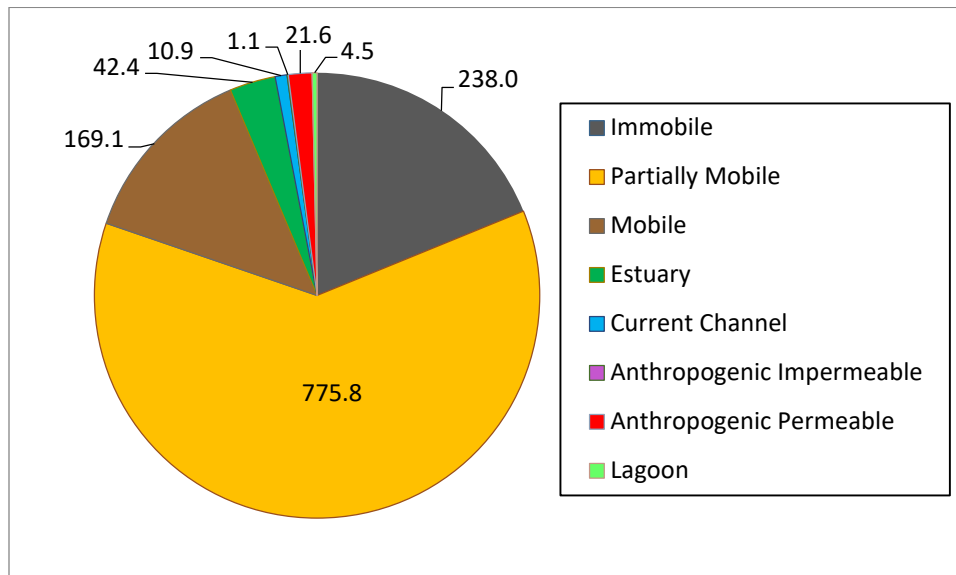


Figure 27. Distribution of Habitat Class categories in the Prince Rupert area Mapped to date by shoreline length (km).

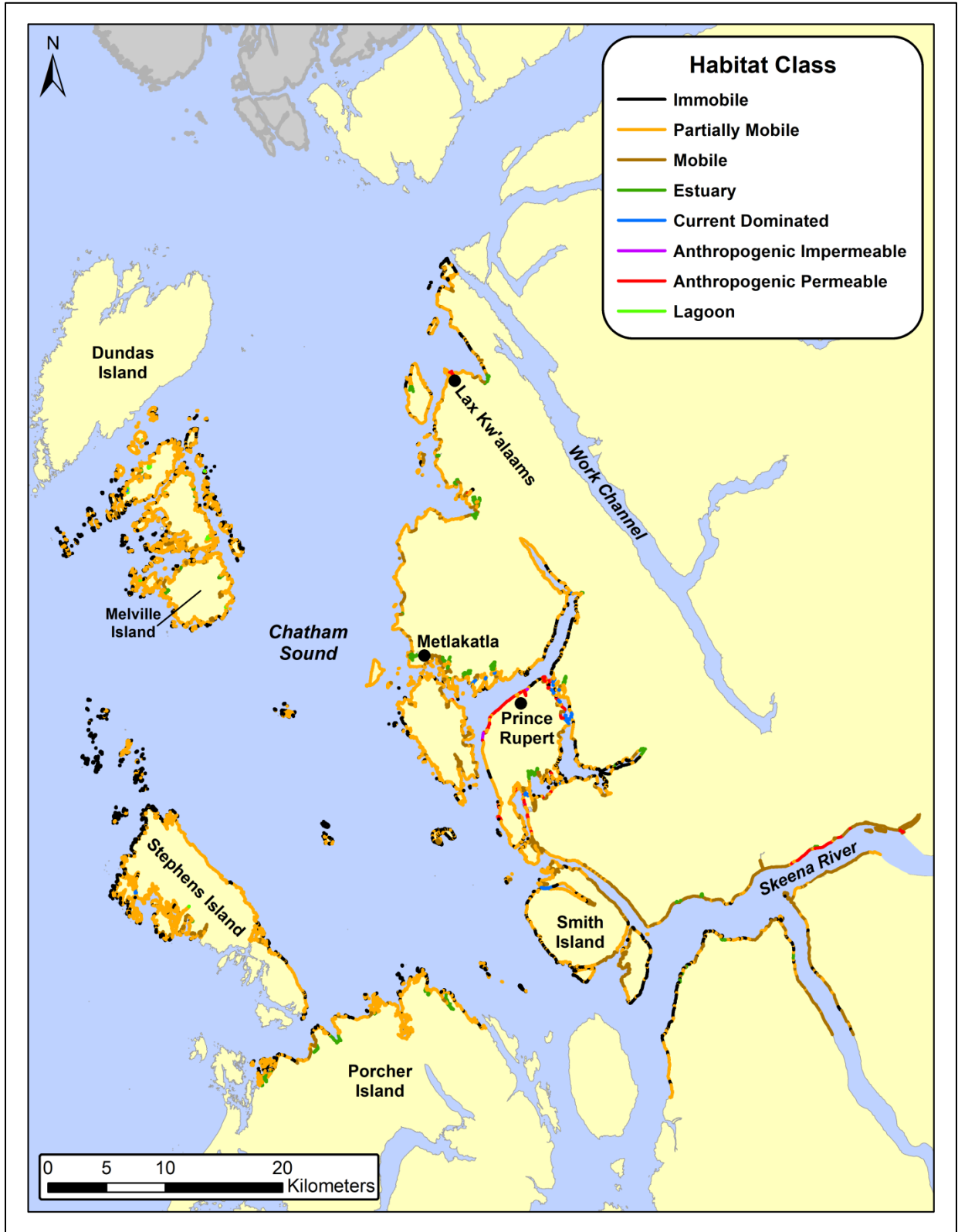


Figure 28. Distribution of Habitat Class categories in the Prince Rupert area mapped to date.

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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 downloaded online at www.ShoreZone.org and [Coastal and Ocean Resources' ArcGIS site](#). Any hardcopies or published data sets utilizing ShoreZone products shall 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 around Prince Rupert (Page 35).
Table A-2. Examples of the most common Biobands around Prince Rupert (Page 41).



Table A-1. Examples of the Coastal Classes in the Prince Rupert Survey Area.



Photo bc14_pr_00503: Example of Coastal Class 3; Rock Cliff.
East Kinahan Island.



Photo bc14_07662: Example of Coastal Class 4; Rock Ramp.
Lucy Islands.



Photo bc14_pr_00261: Example of Coastal Class 9; Ramp with gravel beach. Cridge Island.



Photo bc14_pr_06853: Example of Coastal Class 11; Ramp with gravel and sand beach, wide. Lax Kw'alaams, Chatham Sound.



Photo bc14_pr_01565: Example of Coastal Class 13; Cliff with gravel/sand beach, narrow. Robertson Point.



Photo bc14_pr_02047: Example of Coastal Class 14; Ramp with gravel/sand beach, narrow. Tuck Inlet.



Photo bc14_pr_02138: Example of Coastal Class 25; Sand and gravel beach, narrow. Tuck Inlet.



Photo bc14_pr_07465: Example of Coastal Class 24; Sand and gravel flat or fan. Hodgson Reefs, Chatham Sound.



Photo bc14_pr_07386: Example of Coastal Class 28; Sand flat. Reeks Point, Chatham Sound.



Photo bc14_pr_02434: Example of Coastal Class 31; Organics/Fines. Shawatlan Estuary.



Photo bc14_pr_02754: Example of Coastal Class 32; Permeable man-made structures. Prince Rupert.



Photo bc14_pr_01509: Example of Coastal Class 36; Lagoons. Metlakatla.



Table A-2. Examples of the most common Biobands in the Prince Rupert survey area.



Photo bc15_sh_09246: Good example of the Black Lichen (VER/BLLI) bioband which is a black band in the supratidal zone, usually caused by the lichen *Verrucaria* sp. Tree Nob Island Group.



Photo bc14_pr_06834: Good example of the Dune Grass (GRA/DUGR) bioband. Lax Kw'alaams.



Photo bc15_sh_09244: Good example of White Lichen (WHLI) bioband in the supratidal zone, above the Black Lichen band. Tree Nob Island group.



Photo bc14_pr_01900: Good example of Salt Marsh (PUC/SAMB) bioband in the supratidal/intertidal zone. Prince Rupert Harbour.



Photo bc14_pr_07880: Good example of the Barnacle (BAR/BARN) bioband in the high intertidal zone. Digby Island.



Photo bc14_pr_00277: Good example of the Rockweed (FUC/ROCK) bioband. Prince Rupert.



Photo bc15_sh_13705: Good example of the Green Algae (ULV/GRAL) bioband in the lower intertidal. Melville Island group.



Photo bc14_pr_01185: Good example of kelps at the waterline (BRBA or SBR/SOBK biobands). Tugwell Island.



Photo bc14_pr_01538: Example of the Eelgrass (EELG) bioband in the lower intertidal/subtidal. Metlakatla pass.



Photo bc15_pr_14515: Good example of a kelps (BRBA or CHB/DABK biobands) and Surfgrass (SUR/SURF) bioband in the lower intertidal and subtidal. Stephens Island.



Photo bc14_pr_14327: Good example of the Bull Kelp (NER/BUKE) bioband (outer row), Giant Kelp (MAC/GIKE) bioband (inner row) and Urchin Barrens (URC/URBA) bioband in the nearshore. Stephens Island.