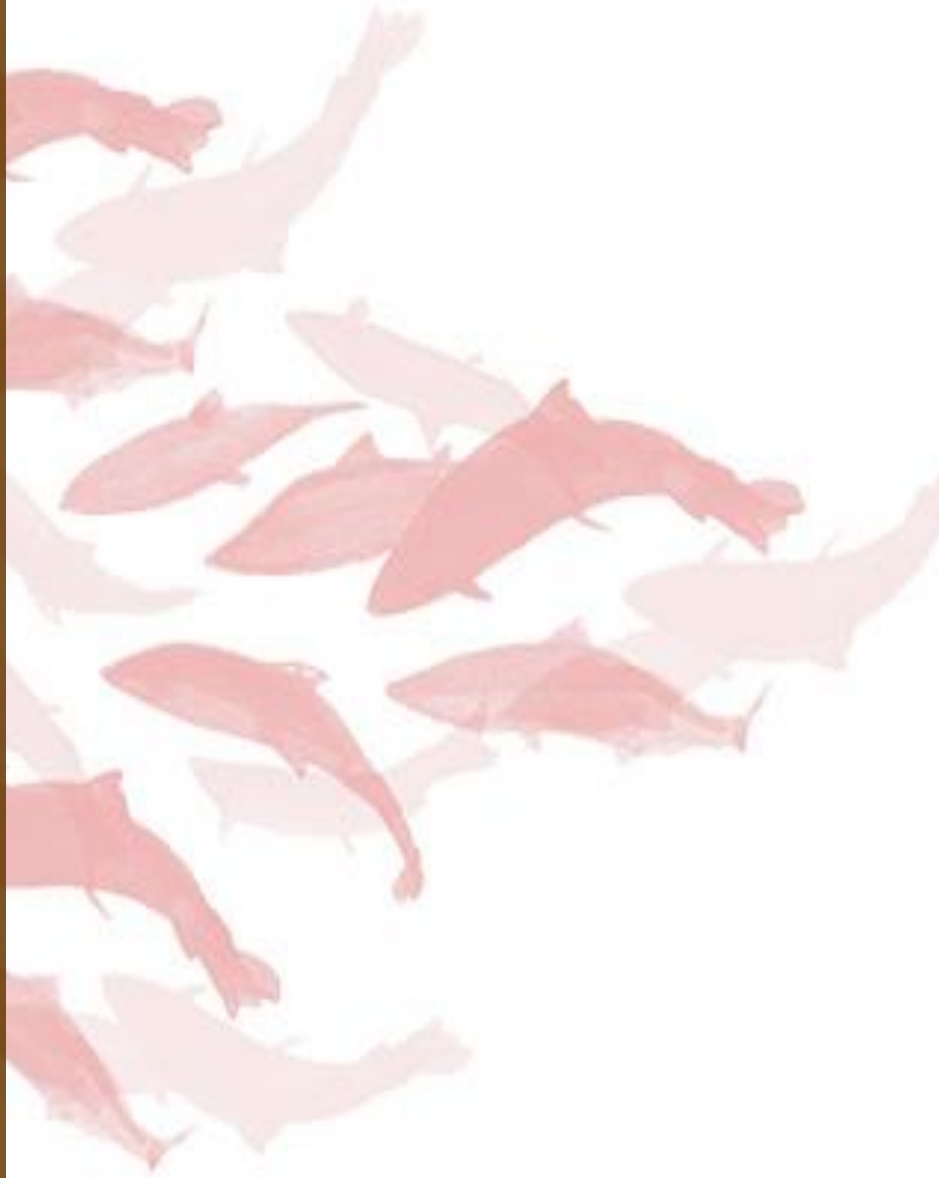


Skeena River Estuary Assessment Supplemental

Data Quality Assessment



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More information about this project can be found in these publications:

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1. DATA QUALITY ASSESSMENT METHODS

A data quality assessment (DQA) was undertaken to systematically and objectively review the quality of the data used for the Pacific Salmon Foundation's Skeena Estuary Assessment (see Pacific Salmon Foundation 2015, Pickard et al. 2015). A novel set of criteria was developed, specifically designed for this project. The criteria were applied to each of the datasets chosen for the assessment to generate overall DQA scores, which reflected the relevance and scientific quality of each individual dataset.

The DQA criteria were organized as a series of questions within the DQA table (Section 2) and a DQA table was completed for each dataset evaluated. Within the DQA table, answers to initial questions dictated subsequent questions. Questions marked with an asterisk in the DQA table were answered first and in the order specified by the DQA flow chart (Section 3). Then, the DQA flow chart also indicated whether one should answer the remaining questions in the DQA table.

Each of the criteria fit into one of two groups, which each received a score at the end of the DQA:

Relevance: relevance of the data for this Skeena estuary assessment.

Scientific Quality: the scientific rigor of the data collection.

The scientific quality score reflects the level of scientific rigor of the study given the study objectives, and not the objectives of this assessment. In many cases, data gathered for other purposes may have been collected using high standards of scientific rigour but may not be appropriate for this assessment and therefore receive a lower score for the relevance criteria. Whether a criterion belongs to the relevance or scientific quality group is displayed in the first column of the DQA table (Section 2).

Data quality can be evaluated based upon whether data was collected at the right spatial and temporal scale, following an appropriate methodological approach, and in a clearly documented manner. Criteria for this assessment were organized into five categories:

1. Type of Data
2. Documentation and Metadata
3. Quality Assurance and Quality Control (QAQC)
4. Coverage
5. Methodology

Scoring levels for each criterion were either binary (i.e. yes/no) or trinary (i.e. low/medium/high, which occasionally included a fourth "not within

information provided” option). More than two levels were needed for some criterion due to dataset complexities whereby “high” was not appropriate for one reason and “low” was not appropriate for other reason. No more than three levels were used for any of the criterion because of the need to clearly choose appropriate levels for all datasets, and because adding additional levels makes it more difficult it is to rationalize a choice between one level and another. The following sections discuss the details and rationale for the criteria in each category and provide further information about scoring levels.

Type of Data

The two criteria in this category were used to determine whether all the data in the dataset were collected in the same way. If data within the same dataset were collected differently and data were not combined in a standardized way, then the data that were collected differently were analyzed separately for the subsequent questions. It was necessary to make this distinction prior to answering subsequent questions because it was a requirement for answering other questions that data were collected the same way or using a standardized amalgamation technique. These two questions were not used in the overall scoring, but instead just used for arranging the data for subsequent questions.

Documentation / Metadata

The two criteria in this category were used to determine if standardized metadata were available with the data and if there was the information necessary to answer the subsequent questions. The standardized metadata question was in the scientific quality group because metadata are important for any use of the data, not just for this particular assessment. Having sufficient documentation to answer subsequent questions was in the relevance group because it is only pertinent for this assessment. There are three scoring levels for the sufficient documentation question because it was not only important to determine whether there is enough information to answer subsequent questions, but also to delineate between having a comprehensive package of documentation versus pieces of information. If there was no information to answer subsequent questions (i.e. low score), then the DQA was discontinued because of insufficient information and it was determined that the data could not be used for this assessment.

Quality Assurance / Quality Control (QAQC)

Data may or may not be part of a study or publication that has gone through a peer review process. This criterion was included in the DQA because when a review process is used, reviewers may validate approaches, ensure a

certain standard of quality is maintained, and/or provide feedback for improving the approach or analysis. Three scoring levels were used for this question in order to distinguish whether a review process was used as well as if a review incorporated scientific rigour.

Coverage

These criteria were related to either spatial coverage or temporal coverage. They were included in the DQA because it was necessary that the spatial and temporal coverage of the data were pertinent for this assessment. Thus, all the criteria in this category were in the relevance group. The first question was whether the data are spatial. If the data were not spatial then the DQA was discontinued because the data were not relevant for this assessment. This question was not used in the overall scoring, just used to determine whether the assessment continued.

The two questions from this category used in overall scoring related to the proportion of area of interest that the data covers (spatial) and how long ago the data were collected (temporal). For the spatial question, the area of interest was specific to each dataset. For example, for shoreline development, total area of interest was the shoreline areas within the estuary. If the data were a set of points within an area of interest, a polygon was created around the points in order to provide an estimate of the spatial coverage. Three scoring levels were used for both the spatial and temporal questions. Additionally, a "not within information provided" option was available for the temporal question. The scoring levels for the spatial question were delineated based on high and low being the upper and lower quartiles and medium being 25-75%. The scoring levels for the temporal question were defined based on notable events in the Skeena estuary around which there was data collection, namely closure of a mill and the more recent initiation of studies related to potential industrial development (Barb Faggetter, pers. comm.).

The criteria question regarding timespan of data collection (i.e. number of years) was included for documentation purposes, but was not used in the overall scoring.

Methodology

The first question in this category was a scientific quality question and related to whether the approach taken to collect the data followed best practices or a logical rationale. The subsequent scientific quality questions were related to how that approach was carried out. These criteria were included in the DQA because if an inappropriate approach was chosen or an

appropriate approach was not carried out properly then the resulting data may not correctly represent the intended mechanism or system.

The first question had three scoring levels because there could have been specific information about how a best practice or logical approach was followed (high), no indication of why an approach was taken (low), or some indication of why an approach was taken but it was incomplete or not clear (medium).

Three scoring levels were also used for the questions related to consistency, sample size, site selection, time of collection, and goals. These questions were designed to assess how the approach had been carried out. Thus, three scoring levels were used because for these questions, the approach could have been followed and done well (high), not followed or not done well (low), or somewhat followed but not completely (medium). For example, in assessing sample size, there could have been a census (high), an insufficient sample size (low), or a potentially sufficient sample size but no rationale provided (medium).

For the question related to precision, there were two scoring levels and an additional "not applicable" option. This was because quantitative estimates of variability were either included or not. Then for some datasets, including quantitative estimates would not have been possible given the intent of the data collection (e.g. exploratory one-offs), so this question was not applicable for those datasets.

The question related to the resolution of the data was the only relevance criterion in this category, and was included in the DQA because data could have been collected in a robust way for a different purpose and not be of a resolution necessary for this assessment. There were three scoring levels for this question because the resolution could have been ideal for this assessment (high), not ideal but usable (medium), or not usable for this assessment (low).

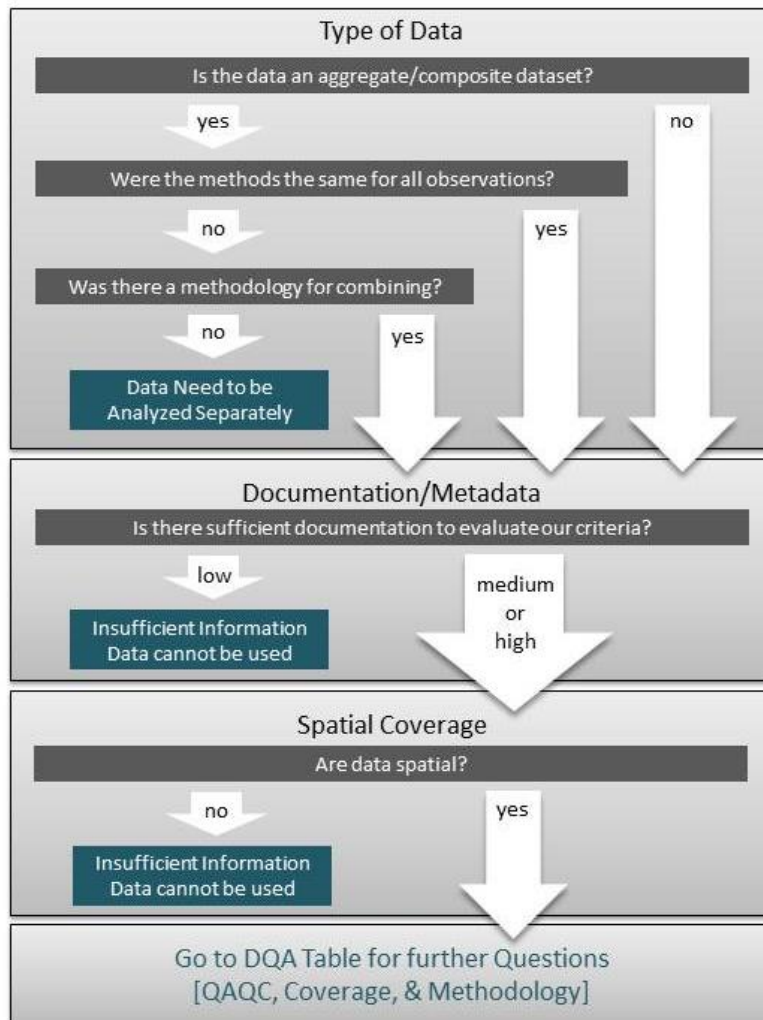
2. DATA QUALITY ASSESSMENT TEMPLATE

Data Quality Assessment (DQA) table template. Questions with an asterisk (*) are answered first, as indicated by the DQA flow chart (Section 3).

Relevance or Scientific quality	Criteria & Question	Scoring Levels	Score	Rationale
Criteria Category: Type of Data				
R	*Type: Is the data an aggregate/composite dataset?	Yes/No		
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No		
Criteria Category: Documentation/Metadata				
S	Metadata: Do metadata exist/available?	Yes/No		
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	Low – no information Medium – some information but not complete or clear High – metadata, reports or papers		
Criteria Category: QAQC				
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	Low – no review Medium – no scientific review High – scientific review (eg. published, grey literature, review process)		
Criteria Category: Coverage				
R	*Spatial: Are the data spatial?	Yes/No		
R	Spatial: What proportion of area of interest within the estuary does the data cover?	Low – <10% Medium – 10-50% High – >50%		
R	Temporal: How recent are data?	Low – before 2001 Medium – 2001-2010 High – after 2010 or not pertinent NI – not within information provided		

R	Temporal: How many years of data were collected?	Input number of years		
Criteria Category: Methodology				
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low – did not follow best practices and no rationale Medium – did not follow best practices but seems to have a rationale High – followed best practices or logical rationale		
S	Consistency: Were the methods the same for all observations within the project?	Low – methods were not the same Medium – minor differences in methods High – methods were the same		
S	Precision: Did project have quantitative estimates of variability?	Yes/No – for projects with replicates NA – for exploratory (one-offs)		
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low – sample size not sufficient to meet objective or was not discussed Medium – sample size discussed but not fully rationalized High – census or sample size requirements discussed and rationalized		
S	Site Selection: How were sites chosen?	Low – targeted, judgement or opportunistic Medium – tried to place randomly but didn't have true random design High – census or probabilistic		
S	Time of Collection: Was data collected at the appropriate time?	Low – not appropriate time Medium – close to appropriate time High – appropriate time		
S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low – no Medium – met some of the intended goals High – yes NI – not enough information provided		
R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low – no Medium – resolution not ideal but usable High – yes		
Other Comments:				

3. DATA QUALITY ASSESSMENT FLOW CHART



This flow chart displays the order of questions to be asked in completing a data quality assessment (DQA). The initial questions for each section (type of data, documentation/metadata, spatial coverage) should be asked first, and are identified by an asterisk in the DQA table (Section 2).

4. SUMMARY OF DATA QUALITY ASSESSMENT (DQA) SCORES

Relevance or Scientific	Criteria & Question	Wastewater Discharges	Disposal at Sea Sites	Log Storage & Handling	PRH Water Quality Sampling	Shoreline Development	Marine Vessel Traffic	Intertidal Wetlands	BCMCA - Chlorophyll a	BC Shorezone Bioband	Borstad CASI - Eelgrass	Chatham Sound Study - Eelgrass	BCMCA - Eelgrass	WWF - Eelgrass	PRH Foreshore Habitat Classification	GeoBC - Kelp	Zooplankton	Riparian Vegetation	Harbour Seal Haulouts
Type of Data																			
R	Type	N	Y	N	N	N	N	Y	N	N	N	N	N	N	N	Y	N	Y	
R	Consistency	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Documentation/Metadata																			
S	Metadata	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
R	Documentation	H	H	H	H	H	H	H	H	H	H	H	H	H	H	M	H	H	H
QAQC																			
S	Review	H	H	H	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H
Coverage																			
R	Spatial: Y/N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
R	Spatial: proportion	H	H	H	L	L	H	L	M	H	L	M	H	L	L	H	L	L	M
R	Temporal: how recent?	H	H	H	H	H	M	M	M	L	L	H	M	M	M	M	L	H	L
R	Temporal: # years collected	84	70	NA	1	NA	1	2	4	1	1	1	1	5	2	NI	2	1	33
Methodology																			
S	Best Practices	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
S	Consistency	H	H	H	M	H	H	H	H	H	H	H	H	H	H	H	H	H	H
S	Precision	NA	NA	NA	NA	NA	NA	NA	N	NA	NA	NA	NA	NA	NA	NA	N	NA	Y
S	Sample Size	H	H	H	M	H	H	H	H	H	H	H	H	H	H	H	H	H	H
S	Site Selection	H	H	H	L	H	H	H	H	H	H	M	H	M	H	H	L	H	H
S	Time of Collection	H	H	H	H	H	H	H	H	H	H	H	M	H	H	NI	H	H	H
S	Goals	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
R	Resolution	H	H	H	H	H	M	H	H	M	H	H	H	H	H	H	H	H	H
Dataset Score																			
	Relevance:	***	***	***	**	**	**	**	**	**	*	***	***	**	**	**	*	**	**
	Scientific Quality:	***	***	***	**	***	***	***	***	***	***	***	***	***	***	***	**	***	***

*For criteria scores, N=no; Y=yes, H=high, M=medium, L=low, NI=no information. Dataset scores are determined using the criteria scores following the methods outlined in Section 1.

5. DATA QUALITY ASSESSMENT (DQA) TABLES FOR DATASETS USED IN THE SKEENA ESTUARY ASSESSMENT

BC MoE - Wastewater Discharges				
<i>Relevance or Scientific Quality</i>	<i>Criteria & Questions</i>	<i>Scoring Criteria</i>	<i>Score</i>	<i>Rationale (include any references)</i>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	N	
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	The dataset is location of permits so methodology is just compiling permits.
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	There are metadata providing details about permits.
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Metadata provide details about permits.
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	All government permits are technically reviewed, which incorporates scientific information.
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	Data are points of discharge locations.
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	H	Encompasses all waste water permits in the estuary.

R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information provided	H	Data is current as of Jan 2015
R	Temporal: How many years of data were collected?	Input number of years	84	
Criteria Category:		Methodology		
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low - did not follow best practices and no rationale Medium - did not follow best practices but seems to have a rationale High - followed best practices or logical rationale	H	Yes, database contains all permits.
S	Consistency: Were the methods the same for all observations within the project?	Low - methods were not the same Medium - minor differences in methods High - methods were the same	H	Yes, consistent methods used to compile permits
S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	NA	Dataset is list of permits so having estimates of variability is not applicable for this dataset.
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	Census of all permits.
S	Site Selection: How were sites chosen?	Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic	H	Census of all permits.

S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time High - appropriate time	H	Data can be collected at any time.
S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low - no Medium - met some of the intended goals High - yes NI - not enough information provided	H	Met goal of providing location and information about all waste water discharge permits.
R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	H	Dataset includes all permits in the estuary.

Other
Comments:

This is a dataset of points about wastewater discharge permit locations and the allowable discharges and not a database of actual measurements of discharges.

Environment Canada - Disposal at Sea Sites				
<i>Relevance or Scientific Quality</i>	<i>Criteria & Questions</i>	<i>Scoring Criteria</i>	<i>Score</i>	<i>Rationale (include any references)</i>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	Y	Environment Canada inactive and active disposal at sea site datasets were merged to create this dataset.
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	Both datasets were created by compiling permit information.
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	Information about the locations and types of disposals are detailed by 2013 Environment Canada maps and in Ward and Sullivan (1980).
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Information about the locations and types of disposals are detailed by 2013 Environment Canada maps and in Ward and Sullivan (1980).
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	All government permits are technically reviewed, which incorporates scientific information.
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	Dataset provides inactive and active disposal at sea locations.
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <10% medium - 10-50% high - >50%	H	100% of permits in the estuary.

R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information provided	H	Data was compiled in February 2013 (from BCMCA Atlas page)
R	Temporal: How many years of data were collected?	Input number of years	70	Historical permit information goes back to 1945
Criteria Category: Methodology				
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low - did not follow best practices and no rationale Medium - did not follow best practices but seems to have a rationale High - followed best practices or logical rationale	H	Database contains all of the permits in the estuary area. (from metadata)
S	Consistency: Were the methods the same for all observations within the project?	Low - methods were not the same Medium - minor differences in methods High - methods were the same	H	Yes, consistent methods used to compile permits
S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	NA	Dataset is list of permits so having estimates of variability is not applicable for this dataset.
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	Census of all permits.

S	Site Selection: How were sites chosen?	Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic	H	Census of all permits.
S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time High - appropriate time	H	Data can be collected at any time.
S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low - no Medium - met some of the intended goals High - yes NI - not enough information provided	H	The purpose of this dataset was to display point locations of active and inactive marine disposal sites.
R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	H	Dataset includes all permits in the estuary.

Other
Comments:

This is a dataset of points about disposal at sea permit locations and not a database of actual measurements of disposals.

Tantalus Crown Tenures - Log Storage and Handling

<i>Relevance or Scientific Quality</i>	<i>Criteria & Questions</i>	<i>Scoring Criteria</i>	<i>Score</i>	<i>Rationale (include any references)</i>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	N	
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	Standardized metadata available.
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Standardized metadata available.
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	All government tenures are technically reviewed, which incorporates scientific information.
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	Dataset provides locations of tenures.
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	H	100% coverage
R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information provided	H	Updated daily.

R	Temporal: How many years of data were collected?	Input number of years	NA	Database of active tenures so does not include historical data.
Criteria Category:	Methodology			
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low - did not follow best practices and no rationale Medium - did not follow best practices but seems to have a rationale High - followed best practices or logical rationale	H	Yes, database contains all tenures.
S	Consistency: Were the methods the same for all observations within the project?	Low - methods were not the same Medium - minor differences in methods High - methods were the same	H	Yes, consistent methods used to compile tenures.
S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	NA	List of tenures so estimates of variability are not applicable.
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	Census of all tenures.
S	Site Selection: How were sites chosen?	Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic	H	Census of all tenures.
S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time High - appropriate time	H	Data can be collected at any time.

S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low - no Medium - met some of the intended goals High - yes NI - not enough information provided	H	Met goal of providing location and information about all tenures.
R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	H	Resolution is at an appropriate scale.
Other Comments:				
This is a database of polygons identifying all tenure locations and not a database of measurements.				

Prince Rupert Harbour Water Quality Sampling				
<i>Relevance or Scientific Quality</i>	<i>Criteria & Questions</i>	<i>Scoring Criteria</i>	<i>Score</i>	<i>Rationale (include any references)</i>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	N	
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	Documentation provided about why and how data was gathered (Baird 2013a, Baird 2013b & Jossul and Robinson 2013).
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Report provided for data collected in each annual quarter (Baird 2013a, Baird 2013b & Jossul and Robinson 2013).
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	L	Documentation did not indicate that any review was conducted.
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	Samples taken at multiple points throughout harbour.
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	L	Using a polygon surrounding the sample points, 22% of estuary is covered.

R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information provided	H	Data collected in 2013.
R	Temporal: How many years of data were collected?	Input number of years	1	Data collected in multiple seasons within 2013.
Criteria Category: Methodology				
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low - did not follow best practices and no rationale Medium - did not follow best practices but seems to have a rationale High - followed best practices or logical rationale	H	The reports stated that they used best practices as per Clark (2003). Clark (2003) only has protocols for freshwater. They could have looked elsewhere for marine protocols but those are not as widely used in BC as Clark (2003).
S	Consistency: Were the methods the same for all observations within the project?	Low - methods were not the same Medium - minor differences in methods High - methods were the same	M	Sample sites differed in the different quarters. Temperature data suggests measurement error as there seems to be variations in how the YSI instrument was handled. The only time that temperature changes >0.1 degrees C, data suggests temperature is increasing with depth, which is counter to expectation. This makes us speculate as to whether instrument was allowed to come to equilibrium after first entry into water.

S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	NA	<p>Laboratory quality assurance was conducted using 2 samples. Multiple field samples to calculate estimates of variability were not collected.</p> <p>Note: There was an accuracy issue as no field filtration was conducted. Clark (2003, p.253) states:</p> <p>"When the sampling objective is to determine concentrations of dissolved metals, low level nutrients (e.g., phosphorus), or chlorophyll a in a water system, the sample must be filtered through a non-metallic 0.45 µm membrane immediately after collection."</p> <p>Report states that samples were delivered to lab within 24hrs and filtered upon arrival at the lab, which does not follow protocol that calls for field filtering. Some samples had holding times of >30 hrs, which also exceeds protocol.</p>
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	<p>Low - sample size not sufficient to meet objective or was not discussed</p> <p>Medium - sample size discussed but not fully rationalized</p> <p>High - census or sample size requirements discussed and rationalized</p>	M	<p>First quarter report states: "It is recommended that the current station locations be re-configured to clusters of three or four stations. This will allow for a more robust statistical comparison of results for future sampling programs as well as prioritizing specific areas where PRPA would like to focus their efforts on, such as anticipated areas of future development."</p> <p>Report discusses sample size selection but it is not fully</p>

rationalized and samples collected were not from all sites intended due to "time constraints".

S	Site Selection: How were sites chosen?	<p>Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic</p>	L	<p>Report stated that sites were selected for exposure but didn't discuss how exposure was determined. First quarter document stated: "It is recommended that the current station locations be re-configured to clusters of three or four stations. This will allow for a more robust statistical comparison of results for future sampling programs as well as prioritizing specific areas where PRPA would like to focus their efforts on, such as anticipated areas of future development. The new station locations will more closely follow an "exposure" vs "reference" approach."</p>
S	Time of Collection: Was data collected at the appropriate time?	<p>Low - not appropriate time Medium - close to appropriate time High - appropriate time</p>	H	<p>They collected at different times of year to gather seasonal variation. This is appropriate for this type of data.</p>
S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	<p>Low - no Medium - met some of the intended goals High - yes NI - not enough information provided</p>	H	<p>The first quarter report states: "The water quality monitoring program has 3 objectives: 1) characterize natural marine environmental variability; 2) compare values of selected</p>

parameters against acceptable water quality thresholds; and 3) generate sufficient baseline water quality data to characterize changes over time (e.g., seasons) and between areas/stations through quantitative assessment." There is some concern that accuracy of data may have affected results. Yet, as far as can tell, their data has met their objectives.

R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	H Resolution of water quality data is at a scale appropriate for this assessment.
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Other Comments:
We only have 3 of the 5 reports (and datasets).

Ocean Ecology - Shoreline Development				
<i>Relevance or Scientific Quality</i>	<i>Criteria & Questions</i>	<i>Scoring Criteria</i>	<i>Score</i>	<i>Rationale (include any references)</i>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	N	
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	Information provided in Ocean Ecology (2014)
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Information provided in Ocean Ecology (2014)
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process) or scientific review not applicable.	H	This data is just a map of development, so scientific review not applicable.
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	Data is % modification of shoreline in and nearby Prince Rupert Harbour.
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	L	Data covers ~12% of estuary shoreline.

R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information provided	H	Not pertinent because shoreline development changes were greatest prior to most recent maps. Most recent maps used for comparison with historical data ranged from 1996-2000.
R	Temporal: How many years of data were collected?	Input number of years	NA	Comparison of information between years. Thus, number of years NA.
Criteria Category:		Methodology		
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low - did not follow best practices and no rationale Medium - did not follow best practices but seems to have a rationale High - followed best practices or logical rationale	H	Mapping conducted using best practices for the times at which the data was collected. Comparison methodology examined percent change which follows a logical rationale.
S	Consistency: Were the methods the same for all observations within the project?	Low - methods were not the same Medium - minor differences in methods High - methods were the same	H	The same method was used to compare each of the different shore segments.
S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	NA	The amount of development was surveyed at different times and then compared. Thus, quantitative estimates of variability are not applicable.
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	Census - conducted all of the area of interest for that study.

S	Site Selection: How were sites chosen?	Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic	H	Census - conducted all of the area of interest for that study.
S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time High - appropriate time	H	No inappropriate time to collect data.
S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low - no Medium - met some of the intended goals High - yes NI - not enough information provided	H	Goal was to examine percent change and that was done.
R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	H	Resolution appropriate for use in this assessment.
Other Comments:				

British Columbia Marine Conservation Analysis (BCMCA) - Marine Vessel Traffic

<i>Relevance or Scientific Quality</i>	<i>Criteria & Questions</i>	<i>Scoring Criteria</i>	<i>Score</i>	<i>Rationale (include any references)</i>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	N	All of the data has been collected by MARIN.
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	All of the data has been collected by MARIN.
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	BCMCA standardized metadata, including atlas pages.
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Standardized metadata exists.
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	BCMCA data reviewed prior to being published in atlas.
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	Data is 5 x 5km grid with vessel traffic hours provided for each grid cell.
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	H	100% coverage
R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information	M	Data was gathered in 2010.

provided

R	Temporal: How many years of data were collected?	Input number of years	1	
Criteria Category: Methodology				
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	<p>Low - did not follow best practices and no rationale</p> <p>Medium - did not follow best practices but seems to have a rationale</p> <p>High - followed best practices or logical rationale</p>	H	<p>"This dataset illustrates the density of marine vessel traffic (by hours) within 5 km by 5 km grid cells for Canada's Pacific waters for 2010. Traffic is broken down into categories: Fishing, Government, Merchant, Passenger & Cruise, Pleasure & Yachts, Research, Tanker, and Tug & Service For the BCMCA" (from metadata)</p> <p>The data custodian is Dr. Patrick O'Hara at the Canadian Wildlife Service. Data was gathered from the Canadian Coast Guard AIS system. Thus, small vessels that do not have an AIS system are not captured in this dataset.</p>
S	Consistency: Were the methods the same for all observations within the project?	<p>Low - methods were not the same</p> <p>Medium - minor differences in methods</p> <p>High - methods were the same</p>	H	Yes, data was gathered from the Canadian Coast Guard AIS system.
S	Precision: Did project have quantitative estimates of variability?	<p>Yes/No - for projects with replicates</p> <p>NA - for exploratory (one-offs)</p>	NA	Data is of vessel traffic. Quantitative estimates of variability are not applicable.

S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	Census
S	Site Selection: How were sites chosen?	Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic	H	Census
S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time High - appropriate time	H	Data collected in all seasons, which is what is required to capture vessel traffic from all seasons.
S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low - no Medium - met some of the intended goals High - yes NI - not enough information provided	H	Yes, met intended goals. "the dataset's purpose is to illustrate the distribution and density of vessel traffic in 2010" (from metadata)
R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	M	Resolution of data is 5 km by 5 km grid cells.

Other Comments:

Ocean Ecology - Intertidal Wetlands

<u>Relevance or Scientific Quality</u>	<u>Criteria & Questions</u>	<u>Scoring Criteria</u>	<u>Score</u>	<u>Rationale (include any references)</u>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	Y	Ocean Ecology (2014) states that data were taken from the Prince Rupert Harbour Foreshore Habitat Classification (Archipelago Marine Research Ltd. 1999), the North Coast 2000 Aerial Video Imaging Survey (CORI 2000), and the Freshwater Atlas Stream Network (DataBC Geo 2008).
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	The derived dataset for vegetation is based on foreshore and shorezone datasets. Stream location was taken from freshwater atlas. There was a consistent method for combining the underlying data into the derived dataset.
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	The derived data is described in Ocean Ecology (2014). Original data is described by Prince Rupert Harbour Foreshore Habitat Classification (Archipelago Marine Research Ltd. 1999), the North Coast 2000 Aerial Video Imaging Survey (CORI 2000), and the Freshwater Atlas Stream Network (DataBC Geo 2008).
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	The derived data is described in Ocean Ecology (2014). Original data is described by Prince Rupert Harbour Foreshore Habitat Classification (Archipelago Marine Research Ltd. 1999), the North Coast 2000 Aerial Video Imaging Survey (CORI 2000), and the Freshwater Atlas Stream Network (DataBC Geo 2008).

Criteria Category:		QAQC		
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	The derived data was reviewed by a scientific committee before publication. Original freshwater atlas stream network data was reviewed by the the provincial government. The shorezone data is a well known dataset used for a number of years. The data itself is not published but the methodology is published. The data has been vetted by provincial department. Original foreshore habitat classification data (1997) was reviewed by panel of scientists. Updates (2010) have been reviewed and accepted by DFO.
Criteria Category:		Coverage		
R	*Spatial: Are the data spatial?	Yes/No	Y	
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	L	Derived data covers ~12% of estuary shoreline.
R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information provided	M	All data sets are from 2010 or earlier.
R	Temporal: How many years of data were collected?	Input number of years	2	foreshore 1yr; shorezone 2yrs; freshwater stream 2yrs
Criteria Category:		Methodology		

S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	<p>Low - did not follow best practices and no rationale</p> <p>Medium - did not follow best practices but seems to have a rationale</p> <p>High - followed best practices or logical rationale</p>	H	<p>The derived data was produced for a scientific study involving the generation of layers for use in a GIS model. Original data was digitized in a format which was suitable for use as input to the GIS model.</p> <p>Original data collection followed best practices as described in shorezone and foreshore DQA tables. The freshwater stream dataset was created using a standardized provincially accepted methodology.</p>
S	Consistency: Were the methods the same for all observations within the project?	<p>Low - methods were not the same</p> <p>Medium - minor differences in methods</p> <p>High - methods were the same</p>	H	In the derived data, all GIS layers for the model were indexed based on a consistent standardized methodology (Ocean Ecology 2014).
S	Precision: Did project have quantitative estimates of variability?	<p>Yes/No - for projects with replicates</p> <p>NA - for exploratory (one-offs)</p>	NA	Derived data was based on survey data, so there were not estimates of variability and they were also not required for modeling exercise.
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	<p>Low - sample size not sufficient to meet objective or was not discussed</p> <p>Medium - sample size discussed but not fully rationalized</p> <p>High - census or sample size requirements discussed and rationalized</p>	H	The underlying data was survey data, so essentially a census.
S	Site Selection: How were sites chosen?	<p>Low - targeted, judgement or opportunistic</p> <p>Medium - tried to place randomly but didn't have true random design</p> <p>High - census or</p>	H	Each geographical segment was analyzed based on the underlying data for each segment, which was survey data.

probabilistic

S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time High - appropriate time	H Each of the three underlying datasets include data that were collected at the appropriate time.
S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low - no Medium - met some of the intended goals High - yes NI - not enough information provided	H The derived dataset was used in a model "to analyze the habitat in and around the Skeena River estuary in terms of suitability as valuable or critical habitat to juvenile salmonids". The model successfully accomplished this goal.
R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	H Resolution based on geology of the estuary.

Other Comments:
 Upon using the data, one should read Ocean Ecology 2014 to get the definitions for the categories in the data.

British Columbia Marine Conservation Analysis (BCMCA) - Chlorophyll a

<i>Relevance or Scientific Quality</i>	<i>Criteria & Questions</i>	<i>Scoring Criteria</i>	<i>Score</i>	<i>Rationale (include any references)</i>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	N	
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	BCMCA standardized metadata, including atlas pages.
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Standardized metadata exists. Note: missing some information about how averaging was conducted (i.e. didn't define spring).
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	BCMCA data reviewed prior to being published in atlas.
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	Dataset is 500 x 500m grid with chlorophyll concentration provided for each grid cell.
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	M	Data covers 54% of the estuary. Data doesn't cover close to coasts in some areas due to resolution of the satellite data. Also does not cover area in Skeena River.

R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information provided	M	Data gathered 2003-2006. Dataset is average of data during that time period.
R	Temporal: How many years of data were collected?	Input number of years	4	
Criteria Category: Methodology				
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low - did not follow best practices and no rationale Medium - did not follow best practices but seems to have a rationale High - followed best practices or logical rationale	H	This dataset is the standard publically available dataset for this type of data. "Original data acquired from OceanColor WEB as binary hdf files. HDF files were imported to Idrisi software using hdf import function. The Idrisi rasters were exported as float files and imported into ArcGIS via float to raster conversion. The Arc rasters were then projected to the Albers projection and clipped to the extents of the study area, resampled to match the 500m grid cell size, and snapped to the bathymetry layer. The original MODIS data are scaled from 0-255. The values were converted to chlorophyll concentration values using the appropriate pixel value to concentration equation obtained from the Aqua-MODIS website. The values were scaled up by 1000 for the calculation so that sufficient precision was maintained (the ArcGIS operator rounded the results of the calculation)."
S	Consistency: Were the methods the same for all observations within the project?	Low - methods were not the same Medium - minor differences in methods	H	Methods were the same for all observations.

High - methods were the same

S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	N	There were temporal replicates. No estimates of variability provided.
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	Census
S	Site Selection: How were sites chosen?	Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic	H	Census
S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time High - appropriate time	H	Metadata states that the data were collected in spring. It seems as though they are averaging every day for 3 months (Mar-May), but it is unclear about how that is being done. Spring is appropriate time of year to examine phytoplankton productivity.

S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	<p>Low - no Medium - met some of the intended goals High - yes NI - not enough information provided</p>	H	<p>Yes, met intended goals. "The British Columbia Marine Conservation Analysis (BCMCA) is a collaborative project assembling and analyzing spatial information about Canada's Pacific Ocean. The overall goal of the BCMCA is to identify marine areas of high conservation value and marine areas important to human use. Results of the project are intended to inform and help advance marine planning initiatives in BC by providing collaborative, peer-reviewed scientific analyses based on the best ecological and human use spatial data at scales relevant to a BC coast-wide analysis. The purpose of this dataset is to identify areas of high chlorophyll concentration (less than 30 mg/m³) on the BC coast as a surrogate for areas of high primary productivity and a proxy for potentially important foraging areas for some seabirds and marine mammals." (from metadata)</p>
R	Resolution: Is the resolution at a scale appropriate for this assessment?	<p>Low - no Medium - resolution not ideal but usable High - yes</p>	H	<p>Resolution of original data is 4km. Data was resampled to get 500m resolution. "Original data had a raster resolution of 4km. Imported data were converted to a 500m grid using the nearest neighbour technique to preserve true data values. While the precision of the data remains 4km, the data rectifies well with other data sets in the study area. The 500x500m</p>

model therefore likely provides good horizontal accuracy." (from metadata)

Other Comments:

BC Shorezone Bioband Mapping				
<i>Relevance or Scientific Quality</i>	<i>Criteria & Questions</i>	<i>Scoring Criteria</i>	<i>Score</i>	<i>Rationale (include any references)</i>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	N	
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	BCMCA standardized metadata, including atlas pages.
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Standardized shorezone metadata exists.
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	BCMCA data reviewed prior to being published in atlas. This dataset is well known and has been highly used for a number of years. The data itself is not published but the methodology is published. The data has been vetted by the Province.
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	H	Covers ~90% of estuary. Does not cover PR harbour area.

R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information provided	L	Survey was done over number of years and data collected for north coast was collected June 2 - July 5, 2000.
R	Temporal: How many years of data were collected?	Input number of years	1	
Criteria Category:		Methodology		
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low - did not follow best practices and no rationale Medium - did not follow best practices but seems to have a rationale High - followed best practices or logical rationale	H	Province considers this methodology the best practice. Designed to gather intertidal data related both seaweeds and eelgrass. Subtidal eelgrass missed because conducted using aerial flights with video.
S	Consistency: Were the methods the same for all observations within the project?	Low - methods were not the same Medium - minor differences in methods High - methods were the same	H	Methods did not change during project. Shorezone data collection system consistent for entire North Pacific coast. (only variation: used helicopter on most occasions and a beaver on a few occasions - but data collected the same way from both platforms)
S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	NA	There are no estimates of variability because this was a one-off survey.
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	Essentially a census - tried to survey entire BC coastline (but did not capture harbour area).
S	Site Selection: How were sites chosen?	Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random	H	Essentially a census - tried to survey entire BC coastline.

design
 High - census or probabilistic

S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time High - appropriate time	H	Timing was selected to be best for both seaweed and eelgrass. In accounting for both seaweeds and eelgrass, timing was appropriate. However, it should be noted that June is a bit early for eelgrass (July is better) and June is more optimal for seaweeds. (Note: data was collected at low tide, which is good - but wasn't absolute low and some eelgrass was missed (such as around Lucy Island).)
S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low - no Medium - met some of the intended goals High - yes NI - not enough information provided	H	The goal was to survey and map seaweed and eelgrass extent. A large area was well covered and areas were repeated until good data was collected. Thus, the goals/objectives were met.
R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	M	Resolution is variable because segments are being defined by geological characteristics. Shoreline segments range from approx <1km to probably about 5km. Other datasets break shore segments down into finer scales and so those datasets would be of a higher quality.

Other
 Comments:

Borstad CASI Survey - Eelgrass				
<i>Relevance or Scientific Quality</i>	<i>Criteria & Questions</i>	<i>Scoring Criteria</i>	<i>Score</i>	<i>Rationale (include any references)</i>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	N	
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	Information is provided in Borstad (1996) and Archipelago (1999), which discusses Forsyth et al. (1998)
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Information is provided in Borstad (1996) and Archipelago (1999), which discusses Forsyth et al. (1998)
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	Reviewed by scientists at DFO, Archipelago and individuals at the Port of Prince Rupert.
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	Data are displayed as georeferenced polygons.
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	L	Covers limited sites in and nearby Prince Rupert Harbour (~5% of estuary covered).

R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information provided	L	Data collected 1997.
R	Temporal: How many years of data were collected?	Input number of years	1	
Criteria Category:		Methodology		
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low - did not follow best practices and no rationale Medium - did not follow best practices but seems to have a rationale High - followed best practices or logical rationale	H	Methodology (detailed in quote below) has been used in multiple places in North America for intertidal vegetation mapping. "The Compact Airborne Spectrographic Imager (casi, manufactured by Itres Instruments Ltd. of Calgary) is a pushbroom sensor that simultaneously acquires data in up to 288 visible and near IR channels over a 512 element wide array. In the configuration used to map Prince Rupert Harbour the 288 spectral channels were grouped into 11 non-continuous bands designed to discriminate intertidal vegetation (Ritter and Lanzer, 1997; Aitken et al., 1995)." (Borstad 1996)
S	Consistency: Were the methods the same for all observations within the project?	Low - methods were not the same Medium - minor differences in methods High - methods were the same	H	All observations followed same methods.
S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	NA	It was a survey method so there were no replicates.

S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	Census
S	Site Selection: How were sites chosen?	Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic	H	Census
S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time High - appropriate time	H	"The study was timed to correspond with maximum vegetation development at the end of the summer, extreme low tides and high sun angle to allow for optimum observation conditions. Habitats to be mapped included kelp and eelgrass beds, and flats and intertidal vegetation. Bad weather prevented acquisition of useful data in 1996, and the area was reflowed in August, 1997 during the next extreme daytime low tide (Forsyth et al., 1998)." (Borstad 1996)
S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low - no Medium - met some of the intended goals High - yes NI - not enough information provided	H	Purpose of study was "to identify and chart ecologically sensitive areas within the harbour" (Borstad 1996) Thus, the data met the intended goals.

R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	H	"Imagery was acquired from an altitude of 10 000 feet, resulting in 4 m pixel resolution and a 2 km wide image swath." (Borstad 1996) Resolution appropriate for this assessment.
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Other Comments:

This dataset combined with other eelgrass datasets will provide a more comprehensive picture of the amount of eelgrass in the region. This dataset is one of the best eelgrass surveys of the Flora Banks area. Borstad methodology captures intertidal as well as some subtidal eelgrass.

Ocean Ecology - Eelgrass				
<i>Relevance or Scientific Quality</i>	<i>Criteria & Questions</i>	<i>Scoring Criteria</i>	<i>Score</i>	<i>Rationale (include any references)</i>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	N	
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	Information provided in Ocean Ecology (2013).
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Information provided in Ocean Ecology (2013).
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	Reviewed by scientists at WWF.
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	Sampling points are georeferenced with associated eelgrass data.
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	M	Dataset covers sites throughout Skeena estuary. A polygon around the sites indicates that 70% of the estuary is covered.
R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information	H	Data collected 2012.

provided

R	Temporal: How many years of data were collected?	Input number of years	1	
Criteria Category:	Methodology			
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low - did not follow best practices and no rationale Medium - did not follow best practices but seems to have a rationale High - followed best practices or logical rationale	H	There are no best practices for this type of sampling. Methodology followed a logical rationale using underwater camera surveys.
S	Consistency: Were the methods the same for all observations within the project?	Low - methods were not the same Medium - minor differences in methods High - methods were the same	H	All observations followed same methods.
S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	NA	This was a survey so there were no replicates.
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	Sample size was chosen to provide sites in multiple places throughout the estuary as well as providing information about the relative extent of subtidal eelgrass as compared to intertidal eelgrass.

S	Site Selection: How were sites chosen?	<p>Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic</p>	M	<p>"The Chatham Sound Eelgrass Study consisted of 36 sites selected throughout the region based on: Location within a proposed Conservancy area. Location within a priority habitat area. Location relative to industrial activities. Degree of riverine influence. Presence of intertidal eelgrass from previous studies. Presence of site morphology which indicated a high likelihood of eelgrass presence." (Ocean Ecology 2013) Sites were stratified but there was no attempt to do random design (due to purpose of study, which was to compare sites with and without intertidal eelgrass). Information did not discuss how site selection would support quantitative comparison of sites with and without intertidal eelgrass.</p>
S	Time of Collection: Was data collected at the appropriate time?	<p>Low - not appropriate time Medium - close to appropriate time High - appropriate time</p>	H	<p>Data collected July 22 - Sept 5, which is the appropriate time.</p>
S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	<p>Low - no Medium - met some of the intended goals High - yes NI - not enough information provided</p>	H	<p>The purpose of study was to understand status and extent of subtidal eelgrass beds, and compare subtidal eelgrass extent to nearby intertidal eelgrass extent. Thus, the data met the intended goals.</p>

R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	H	Resolution appropriate for this assessment.
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Other Comments:

This dataset combined with other eelgrass datasets will provide a more comprehensive picture of the amount of eelgrass in the region. This dataset is designed to capture subtidal eelgrass, not intertidal eelgrass.

BCMCA - Eelgrass				
<u>Relevance or Scientific Quality</u>	<u>Criteria & Questions</u>	<u>Scoring Criteria</u>	<u>Score</u>	<u>Rationale (include any references)</u>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	N	
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	Bennett (2003) is available on the community mapping network (CMN) website.
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Bennett (2003) is available on the community mapping network (CMN) website.
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	Data was collected for DFO, so it underwent DFO science review.
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	H	100%
R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information provided	M	Data collected 1980.

R	Temporal: How many years of data were collected?	Input number of years	1	
Criteria Category:	Methodology			
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low - did not follow best practices and no rationale Medium - did not follow best practices but seems to have a rationale High - followed best practices or logical rationale	H	Used aerial surveys, which was confirmed as an acceptable methodology by DFO. There are no best practices for eelgrass aerial surveys.
S	Consistency: Were the methods the same for all observations within the project?	Low - methods were not the same Medium - minor differences in methods High - methods were the same	H	All observations followed Haegele (1975), which is discussed in Bennett (2003).
S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	NA	This was a survey so there were no replicates.
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	Census
S	Site Selection: How were sites chosen?	Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic	H	Census
S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time High - appropriate time	M	Aerial photographs taken June, 1980 (Bennet 2003). July is best.

S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low - no Medium - met some of the intended goals High - yes NI - not enough information provided	H "The original data set was compiled with the purpose of gathering "knowledge on the extent and type of shoreline vegetation on which Pacific herring annually deposit adhesive eggs" (Haegele, 1975)." (Bennet 2003) Study did collect information about vegetation extent, so did meeting intended goals.
R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	H Resolution appropriate for this assessment.
Other Comments:			
This dataset combined with other eelgrass datasets will provide a more comprehensive picture of the amount of eelgrass in the region. "This survey method captures both intertidal and subtidal eelgrass. There was no ground truthing by divers in these areas (Bennett, 2003)." (Ocean Ecology 2013).			

WWF - Eelgrass				
<i>Relevance or Scientific Quality</i>	<i>Criteria & Questions</i>	<i>Scoring Criteria</i>	<i>Score</i>	<i>Rationale (include any references)</i>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	N	
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	Environment Canada (2002) available on community mapping network (CMN) website.
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Environment Canada (2002) available on community mapping network (CMN) website.
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	After data is collected, it was reviewed by scientific committee (QAQC process) prior to going onto the public website.
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	Mapped eelgrass extent.
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	L	The focus area for this study was Prince Rupert harbour, and lack of presence does not necessarily mean absence for this data. ~5% of estuary covered by this dataset.

R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information provided	M	Data collected 2002-2003 and 2007-2009.
R	Temporal: How many years of data were collected?	Input number of years	5	
Criteria Category:		Methodology		
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low - did not follow best practices and no rationale Medium - did not follow best practices but seems to have a rationale High - followed best practices or logical rationale	H	Followed SHIM methodology for eelgrass surveying as per Environment Canada (2002), which is the best practice for eelgrass surveys.
S	Consistency: Were the methods the same for all observations within the project?	Low - methods were not the same Medium - minor differences in methods High - methods were the same	H	All observations followed Environment Canada (2002).
S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	NA	This was a survey so there were no replicates.
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	This was a survey to ID location of eelgrass habitat.
S	Site Selection: How were sites chosen?	Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic	H	Attempted to conduct a census. Note: there were capacity limitation but they did try to map as many as possible using volunteer effort.
S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time	M	Some observations were conducted during summer, which is the best time of year,

High - appropriate time

but some observations were conducted at other times.

S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low - no Medium - met some of the intended goals High - yes NI - not enough information provided	H	The survey was conducted to ID location of eelgrass habitat around the harbour. They met the intended goals of their study.
R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	H	Resolution appropriate for this assessment.

Other Comments:

This dataset combined with other eelgrass datasets will provide a more comprehensive picture of the amount of eelgrass in the region. This survey largely captured intertidal eelgrass. There may have been a few sites in which mapping captured some subtidal eelgrass.

Prince Rupert Harbour Foreshore Habitat Classification

<i>Relevance or Scientific Quality</i>	<i>Criteria & Questions</i>	<i>Scoring Criteria</i>	<i>Score</i>	<i>Rationale (include any references)</i>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	N	
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	Combination of CASI- and shorezone-based methodology and site ground-truthing.
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	Information provided in Forsyth et al. (1998) and Ambach & Casey (2011)
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Information provided in Forsyth et al. (1998) and Ambach & Casey (2011)
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	Original work (1997) reviewed by panel of scientists. Updates (2010) have been reviewed and accepted by DFO.
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	Provides shoreline data in and around Prince Rupert Harbour.
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	L	Covers in and just around Prince Rupert Harbour. So <25% of the estuary
R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information	M	Data collected in 1997, 1999 and 2010

provided

R	Temporal: How many years of data were collected?	Input number of years	2
Criteria Category: Methodology			
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	<p>Low - did not follow best practices and no rationale</p> <p>Medium - did not follow best practices but seems to have a rationale</p> <p>High - followed best practices or logical rationale</p>	H
S	Consistency: Were the methods the same for all observations within the project?	<p>Low - methods were not the same</p> <p>Medium - minor differences in methods</p> <p>High - methods were the same</p>	H

The data collection methodology has been used in multiple places in North America for intertidal vegetation mapping. "The Compact Airborne Spectrographic Imager (casi, manufactured by Itres Instruments Ltd. of Calgary) is a pushbroom sensor that simultaneously acquires data in up to 288 visible and near IR channels over a 512 element wide array. In the configuration used to map Prince Rupert Harbour the 288 spectral channels were grouped into 11 non-continuous bands designed to discriminate intertidal vegetation (Ritter and Lanzer, 1997; Aitken et al., 1995)." (Borstad 1996)
Shorezone data collection system consistent for entire North Pacific coast.

2010 updates followed the same methodologies, wherever possible, as original 1997 data. 2010 updates consisted of further ground-truthing surveys, but no aerial flights,

either CASI or shorezone.

S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	NA	This was a survey so there were no replicates.
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	This was a survey, so they basically attempted to conduct a census.
S	Site Selection: How were sites chosen?	Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic	H	Attempted to conduct a census. Original 1997 flights covered entire harbour region. Ground-truthing surveys were originally carried out more or less randomly in 1996. In 2010, 104 of the original 126 shoreline units were physically ground-truthed by WWF staff.
S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time High - appropriate time	H	Observations conducted during summer and early fall, which is appropriate.
S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low - no Medium - met some of the intended goals High - yes NI - not enough information provided	H	Survey conducted to provide a "useful dataset to have available for broad range of users is a general classification of foreshore conditions." (Ambach & Casey 2011). So the data met the intended goal.
R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable	H	Resolution appropriate for this assessment.

High - yes

Other
Comments:

This dataset combined with the shorezone dataset will provide a more comprehensive picture of the amount of kelp and eelgrass in the region.

GeoBC - Kelp				
<u>Relevance or Scientific Quality</u>	<u>Criteria & Questions</u>	<u>Scoring Criteria</u>	<u>Score</u>	<u>Rationale (include any references)</u>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	N	
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	Standardized GeoBC metadata.
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	M	Standardized GeoBC metadata is available but it does not allow for evaluating all criteria.
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	"Resource information is collected using peer-reviewed provincial Resource Information Standards Committee which include standards for data management and analysis." (from metadata)
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	Provides information about the distribution of kelp beds (in polygons). "Attribute information includes relative abundance, species, biomass and density of the beds." (from metadata)

R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	H	100%
R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information provided	M	Date of data: 2004-02-13 (from metadata)
R	Temporal: How many years of data were collected?	Input number of years	NI	No information provided about number of years of data collected.
Criteria Category: Methodology				
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low - did not follow best practices and no rationale Medium - did not follow best practices but seems to have a rationale High - followed best practices or logical rationale	H	"Resource information is collected using peer-reviewed provincial Resource Information Standards Committee which include standards for data management and analysis." (from metadata)
S	Consistency: Were the methods the same for all observations within the project?	Low - methods were not the same Medium - minor differences in methods High - methods were the same	H	All data were collected using provincial Resource Information Standards.
S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	NA	This was a survey so there were no replicates.
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	This was a survey, so they basically attempted to conduct a census.
S	Site Selection: How were sites chosen?	Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic	H	Survey, so basically attempted to conduct a census.

S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time High - appropriate time	NI	No information provided about what time of year or whether it low or high tide when the data was collected.
S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low - no Medium - met some of the intended goals High - yes NI - not enough information provided	H	The purpose of the dataset is "to provide data and analyses for coastal resource management, conservation, protection and planning applications. Data was originally collected to identify important use areas in the event of an oil spill." (from BC data catalogue)
R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	H	Resolution appropriate for this assessment.

Other
Comments:

Ocean Ecology - Zooplankton				
<i>Relevance or Scientific Quality</i>	<i>Criteria & Questions</i>	<i>Scoring Criteria</i>	<i>Score</i>	<i>Rationale (include any references)</i>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	Y	It is aggregate. Data was compiled from 2 different sources.
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	Methodology for collecting data was the same. There was a slight variation in the units the data was reported in so unit conversion was used.
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	Information related to the derived data is detailed in Ocean Ecology (2014). Reports related to underlying data are NEAT 1975 and Higgins & Schouwenburg 1973 (as stated in Ocean Ecology 2014)
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Information related to the derived data is detailed in Ocean Ecology (2014). Reports related to underlying data are NEAT 1975 and Higgins & Schouwenburg 1973 (as stated in Ocean Ecology 2014)
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	Underlying data is detailed in government documents that have been critiqued, used and referenced many times by scientists.
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	Locations of sample points are

				provided.
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	L	Derived data covers ~12% of estuary shoreline.
R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information provided	L	Data collected 1972 & 1974. (NEAT 1975; data collected during Oct. - Nov., 1974 and Higgins & Schouwenburg 1973; data collected during Apr. - Aug., 1972)
R	Temporal: How many years of data were collected?	Input number of years	2	
Criteria Category:	Methodology			
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low - did not follow best practices and no rationale Medium - did not follow best practices but seems to have a rationale High - followed best practices or logical rationale	H	Followed standardized protocol of DFO at the time. The best practices that exist now did not exist then.
S	Consistency: Were the methods the same for all observations within the project?	Low - methods were not the same Medium - minor differences in methods High - methods were the same	H	Methods were the same at all sites and for both years.
S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	N	No estimate of variability because wasn't required for the particular study.
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	Original data was triplicate by depth (i.e. 2-4 different depths at each site depending on how deep each site was). Sample size for original data was discussed and rationalized. Derived data created by using a depth by volume calculation to get pseudoreplicates. Derived data has approximately 2-4 pseudoreplicates per site. The

				derived data was constrained by original data.
S	Site Selection: How were sites chosen?	Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic	L	Sites were chosen to be representative of the area. So not random.
S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time High - appropriate time	H	NEAT 1975; data collected during Oct. - Nov., 1974 and Higgins & Schouwenburg 1973; data collected during Apr. - Aug., 1972. Zooplankton active approx Apr to Nov so these were appropriate times.
S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low - no Medium - met some of the intended goals High - yes NI - not enough information provided	H	Derived data met goal of informing habitat suitability for overarching study. The purpose of overarching study was "to analyze the habitat in and around the Skeena River estuary in terms of suitability as valuable or critical habitat to juvenile salmonids."
R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	H	Resolution is at scale appropriate for this assessment.
Other Comments:				

Ocean Ecology - Riparian Vegetation				
<i>Relevance or Scientific Quality</i>	<i>Criteria & Questions</i>	<i>Scoring Criteria</i>	<i>Score</i>	<i>Rationale (include any references)</i>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	N	"Presence/absence of riparian vegetation along the shoreline and channels was determined by examining satellite images from Bing maps (images taken in 2012 by DigitalGlobe's WorldView-2 satellite with a multispectral imagery resolution of 1.8 meters)." (Ocean Ecology 2014)
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	Y	One data source: Bing satellite data.
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	Derived data is described in report by Ocean Ecology (2014). For original data, Bing website has information about how data is collected.
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Derived data is described in report by Ocean Ecology (2014). For original data, Bing website has information about how data is collected.
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	Derived data reviewed by scientific committee.

Criteria Category:		Coverage		
R	*Spatial: Are the data spatial?	Yes/No	Y	Provides shoreline data in and around Prince Rupert Harbour.
R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	L	Derived data covers ~12% of estuary shoreline.
R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information provided	H	Bing data from 2012.
R	Temporal: How many years of data were collected?	Input number of years	1	
Criteria Category:		Methodology		
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low - did not follow best practices and no rationale Medium - did not follow best practices but seems to have a rationale High - followed best practices or logical rationale	H	The derived data was produced from Bing satellite data for a scientific study involving the generation of layers for use in a GIS model.
S	Consistency: Were the methods the same for all observations within the project?	Low - methods were not the same Medium - minor differences in methods High - methods were the same	H	In derived data, all GIS layers for the model were indexed based on a consistent standardized methodology (see Ocean Ecology 2014).
S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	NA	Satellite data, so no estimates of variability.
S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	Census

S	Site Selection: How were sites chosen?	Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic	H	Each geographical shoreline segment is analyzed based on the underlying satellite data.
S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time High - appropriate time	H	Satellite data was summer image, which is appropriate season.
S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low - no Medium - met some of the intended goals High - yes NI - not enough information provided	H	Dataset was used in a model "to analyze the habitat in and around the Skeena River estuary in terms of suitability as valuable or critical habitat to juvenile salmonids". The data successfully supported this goal.
R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	H	Resolution based on geology of the estuary.

Other
Comments:

British Columbia Marine Conservation Analysis (BCMCA) - Harbour Seal Haulouts

<u>Relevance or Scientific Quality</u>	<u>Criteria & Questions</u>	<u>Scoring Criteria</u>	<u>Score</u>	<u>Rationale (include any references)</u>
Criteria Category:	Type of data			
R	*Type: Is the data an aggregate/composite dataset?	Yes/No	Y	"Data Sources: 1) Fisheries and Oceans Canada - aerial surveys between 1966-1998 as reported in Olesiuk, P. 1999. An Assessment of the Status of Harbour Seals in British Columbia. 2) Province of British Columbia - harbour seal haulouts, 1996" (from metadata)
R	*Consistency: Were the methods the same for all observations? If no, was there methodology for combining?	Yes/No	N	Although 2 datasets were used, the second dataset was only for 1 year, while the first dataset was 33 years and covered the 1 year that the 2nd dataset covered.
Criteria Category:	Documentation/Metadata			
S	Standardized metadata: do metadata exist? Are they available?	Yes/No	Y	BCMCA standardized metadata, including atlas pages.
R	*Documentation: Is there sufficient documentation to evaluate our criteria?	low - no information medium - some information but not complete or clear high - metadata, reports or papers	H	Standardized metadata exists.
Criteria Category:	QAQC			
S	Review: Was the data reviewed? (eg. published paper, grey lit, QAQC process, advisory committee, 3rd party review, formal review process, informal review)	low - no review medium - no scientific review high - scientific review (eg. published, grey lit, review process)	H	BCMCA data reviewed prior to being published in atlas. First dataset was from Olesiuk (1999), which was an update of a previous peer-reviewed publication.
Criteria Category:	Coverage			
R	*Spatial: Are the data spatial?	Yes/No	Y	Dataset provides haulout locations.

R	Spatial: What proportion of area of interest within the estuary does the data cover?	low - <25% medium - 25-75% high - >75%	M	>25% (may be >75%% but no indication of areas covered in which haulout sites were not identified).
R	Temporal: How recent are data?	low - before 2001 medium - 2001-2010 high - after 2010 or not pertinent NI - not within information provided	L	"Data Sources: 1) Fisheries and Oceans Canada - aerial surveys between 1966-1998 as reported in Olesiuk, P. 1999. An Assessment of the Status of Harbour Seals in British Columbia. 2) Province of British Columbia - harbour seal haulouts, 1996" (from metadata)
R	Temporal: How many years of data were collected?	Input number of years	33	
Criteria Category: Methodology				
S	Best Practices: Were best practices used or was there a logical rationale for methods used (if no best practices)?	Low - did not follow best practices and no rationale Medium - did not follow best practices but seems to have a rationale High - followed best practices or logical rationale	H	"Data Sources: 1) Fisheries and Oceans Canada - aerial surveys between 1966-1998 as reported in Olesiuk, P. 1999. An Assessment of the Status of Harbour Seals in British Columbia. 2) Province of British Columbia - harbour seal haulouts, 1996" (from metadata) Olesiuk (1999) was an update of a previous peer-reviewed publication.
S	Consistency: Were the methods the same for all observations within the project?	Low - methods were not the same Medium - minor differences in methods High - methods were the same	H	First dataset was conducted using consistent methods. Not clear how second dataset was collected. However, that dataset was just 1 year and that year was also covered by first dataset).
S	Precision: Did project have quantitative estimates of variability?	Yes/No - for projects with replicates NA - for exploratory (one-offs)	Y	95% confidence intervals provided.

S	Sample Size: Did samples per strata meet protocol requirements? (eg., power analyses, best practices)	Low - sample size not sufficient to meet objective or was not discussed Medium - sample size discussed but not fully rationalized High - census or sample size requirements discussed and rationalized	H	Census
S	Site Selection: How were sites chosen?	Low - targeted, judgement or opportunistic Medium - tried to place randomly but didn't have true random design High - census or probabilistic	H	Census
S	Time of Collection: Was data collected at the appropriate time?	Low - not appropriate time Medium - close to appropriate time High - appropriate time	H	Olesiuk (1999, p.8) provide a rationale for why observations were made for season, time of week, and time of tide. "censuses were times to coincide with low tides" "censuses in high traffic areas were conducted on weekdays so as to minimize disturbance by recreational boaters" "censuses were generally conducted toward the end of pupping season"
S	Goals: Did the data meet the intended goals and criteria of the study in which it was collected?	Low - no Medium - met some of the intended goals High - yes NI - not enough information provided	H	Yes, met intended goals. "The purpose of this dataset is to identify the spatial distribution of harbour seal haulout sites identified as a feature at the BCMCA Marine Mammal Experts Workshop."
R	Resolution: Is the resolution at a scale appropriate for this assessment?	Low - no Medium - resolution not ideal but usable High - yes	H	Resolution in points because it is based on the location of haul out sites.

Other Comments:

In the course of looking for the 1996 Provincial data, found additional data (GeoBC) for 1997-2004.

6. REFERENCES

- Aitken, J., G. Borstad, and L. Deysher. 1995. Nearshore project: multispectral data collection and image processing consultation. Unpublished report prepared by Borstad Associates Ltd. for Washington State Department of Natural Resources, Aquatic Resources Division, Olympia, WAUSA.117 pp
- Ambach, M., and J. Casey. Final Report: Identification and mapping of fish habitat within and around Prince Rupert Harbour. WWF-Canada, Prince Rupert, BC. Available at: http://awsassets.wwf.ca/downloads/identification_and_mapping_of_fish_habitat_within_and_around_prince_rupert_harbour.pdf
- Archipelago Marine Research Ltd. 1999. Prince Rupert Harbour Foreshore Habitat Classification and Proposed Development Study.
- B.C. Ministry of Environment (MOE). 2006. British Columbia Approved Water Quality Guidelines: 2006 Edition. Available at: http://www.env.gov.bc.ca/wat/wq/BCguidelines/approv_wq_guide/approved.html
- B.C. Ministry of Environment (MOE). 2001. Water quality criteria for microbiological indicators. Available at: <http://www.env.gov.bc.ca/wat/wq/BCguidelines/microbiology/microbiology.html>
- Baird, J.B. 2013a. Baseline Marine Water Quality Sampling Program Summary – Q1. Memorandum prepared by SNC Lavalin for the Prince Rupert Port Authority.
- Baird, J.B. 2013b. Baseline Marine Water Quality Sampling Program Summary – Q2. Memorandum prepared by SNC Lavalin for the Prince Rupert Port Authority.
- Bennett, K. 2003. Haegele Eelgrass Metadata and Digital Data Specifications. Produced by Geostreams Consulting for Department of Fisheries and Oceans, Canadian Wildlife Service, and Ducks Unlimited.
- Borstad Associates Ltd. 1996. Mapping Intertidal Habitat in Prince Rupert Harbour. Consultant report prepared by Borstad Associates Ltd. Available at: <http://remote-sensing.aslenv.com/documents/Mapping%20Intertidal%20Habitat%20in%20Prince%20Rupert%20Harbour.pdf>
- Clark, M.J.R. (editor). 2003. British Columbia Field Sampling Manual. Water, Air and Climate Change Branch, Ministry of Water, Land and Air Protection, Victoria, BC, Canada. 312 pp.
- Coastal & Ocean Resources Inc. (CORI). 2000. North Coast 2000 Aerial Video Imaging Survey.
- DataBC Geo. 2008. Freshwater Atlas Stream Network. <https://apps.gov.bc.ca/pub/geometadata/metadataDetail.do?recordUID=50648&recordSet=ISO19115>.
- Environment Canada. 2002. Methods for mapping and monitoring eelgrass habitat in British Columbia. Report prepared by Precision Identification Biological Consultants for Environment Canada and Canadian Wildlife Service.

Forsyth, F., G. Borstad, W. Horniak, and L. Brown. 1998. Prince Rupert intertidal habitat inventory project. Report prepared by Borstad Associates Ltd. for The Prince Rupert Port Corporation, The Department of Fisheries and Oceans, and The City of Prince Rupert.

Haegle, C.W. 1975. Vegetation mapping of herring spawning grounds in British Columbia. Ocean 75 Record. IEEE Publications 75 CHO 995-1 OEC. New York, N.Y. p. 840-844.

Higgins, R.J., and W.J. Schouwenburg. 1973. A biological assessment of fish utilization of the Skeena River estuary, with special reference to port development in Prince Rupert. Dept. of Envir., Fish. & Mar. Ser. Tech. Rep. 1973-1.

Jossul, S., and C. Robinson. 2013. Baseline Marine Water Quality Sampling Program Summary – Q4. Memorandum prepared by SNC Lavalin for the Prince Rupert Port Authority. Ocean Ecology. 2013. Chatham Sound eelgrass study final report. Report prepared by Ocean Ecology for World Wildlife Fund – Prince Rupert.

Northcoast Environmental Analysis Team (NEAT). 1975. Federal-Provincial Joint Committee on Tsimpsean Peninsula Port Development. Northcoast Environmental Analysis Team, B.R. Hinton & Associates. Volumes 1 through 6.

Ocean Ecology. 2014. Skeena River estuary juvenile salmon habitat. Report prepared by Ocean Ecology for Skeena Wild Conservation Trust and Skeena Watershed Conservation Coalition.

Olesiuk, P.F. 1999. An assessment of the status of harbour seals (*Phoca vitulina*) in British Columbia. Department of Fisheries and Oceans, Canadian Stock Assessment Secretariat Research Document 99/33.

Pacific Salmon Foundation. 2015. The Skeena River Estuary – A Snapshot of Current Status and Condition. Vancouver, BC.

Pickard, D., M. Porter, E. Olson, B. Connors, K. Kellock, E. Jones, and K. Connors. 2015. Skeena River Estuary Assessment: Technical Report. Pacific Salmon Foundation, Vancouver, BC.

Ritter, R. and E. L. Lanzer. 1997. Remote sensing of nearshore vegetation in Washington State's Puget Sound. Proceedings of 1997 Geospatial Conference, Seattle, WA, volume 3, pp. 527 - 536

Ward, A.B., and D.L. Sullivan. 1980. A review of existing and historical ocean dumpsites in the Pacific region: Regional program report: 80-5. Environmental Protection Service, Environment Canada, Pacific Region.