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Malaspina Complex Eelgrass

FINAL REPORT

The Distribution of Eelgrass in Okeover and Malaspina Inlets

by

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SUMMARY

One of the issues facing coastal planners for the Malaspina – Okeover Inlets area of British Columbia is the occurrence of resources that may be sensitive to human disturbances. One such resource is eelgrass, which is (a) known to be sensitive to disturbances and (b) known to have high ecological value, particularly as nearshore fish habitat. Eelgrass is known to occur in Malaspina – Okeover Inlet and as part of the development of a coastal use plan, a survey was conducted to document the occurrence of eelgrass in the plan area (excluding designated marine park areas, as these areas are already targeted as conservation sites).

The project used four types of information to inventory the existence of the eelgrass beds:

1. provincial mapping data from a 1995 aerial videographic survey of the inlet (provided by the Ministry of Sustainable Resource Management [MSRM]),
2. interpretation of provincial colour aerial photos collected in 1994 and 2001,
3. boat reconnaissance data provided by John Dafoe,
4. seabed videography collected during a 4 day field program (3 to 6 May 2003).

Items 1-3 were available prior to the field survey and assembled on a "preliminary planning map" to provide some priority investigation sites. There is a total of 67 km of shoreline within the plan area (53 km of shoreline within the Park were not included) so it was important to prioritize efforts for the limited field survey. All of the 18 sites that were identified on the "preliminary planning map" were investigated with towed underwater video. Additional sites were checked in the field based on suitable intertidal characteristics such as soft-sediment shoreline with beaches; navigation data shows the locations of all shoreline that was checked. Areas inside oyster leases were generally not checked, unless there was previous data indicating eelgrass presence.

Eelgrass beds were identified along 6,400m of the shoreline (referenced to the high water line, HWL) at 21 sites. The total area of eelgrass is estimated at 63,000 m^2. Eelgrass was found at a number of sites that were not identified on the "preliminary planning map" and generally occurred in protected bays with associated beaches, with some exceptions; eelgrass was present in a narrow fringing band below rock shorelines but these occurrences were few. At most sites, the density of eelgrass plants was in the lowest two cover classes, 1 to 10% and 11 to 25%. Although eelgrass is not widely distributed within the Inlets, there is abundant vegetation on the seabed, with most shallow-water areas (<5m below chart datum) having >50% vegetation cover. Bladed kelp (*Laminarian* sp.), sea lettuce (*Ulva* sp.) and *Sargassum muticum* are common on rocky or boulder/cobble bottoms in the nearshore and form the bulk of the vegetation cover. Pacific herring commonly use *Sargassum* for spawning

The use of a hierarchy of inventory techniques worked well – the aerial photo interpretations and boat reconnaissance surveys identified 16 of 21 eelgrass sites including areas that we might not have suspected to find eelgrass. Low-tide boat reconnaissance helped identify other areas and the towed video verified known beds and identified additional areas with eelgrass. An important part of the inventory is to document not only where eelgrass occurs, but also where it is absent.

LIST OF TABLES

LIST OF FIGURES

The Powell River Protection and Wilderness Society (PRPAWS) and Ecocare Conservancy previously funded a boat reconnaissance survey of eelgrass in the Malaspina Inlet Complex that was conducted by John Dafoe. John Dafoe and Jane Cameron of PRPAWS graciously provided the boat reconnaissance observation data.

The Ministry of Sustainable Resource Management (MSRM) provided the unpublished aerial videographic data.

1.1 State of the Problem

Eelgrass and associated invertebrate and fish communities provide important nearshore habitat with high ecological value. Eelgrass habitat provides forage, rearing, and protection opportunities for nearshore fish including juvenile salmon. Eelgrass generally requires optimum conditions in order to flourish including a soft-sediment bottom, water depths between one and five metres, and a semi-protected shoreline. There is concern that the eelgrass beds within the Malaspina, Okeover, Lancelot, and Theodosia Inlets may be negatively impacted by both existing and future human-use activities in the area such as aquaculture sites. These activities occur in the nearshore zone often overlapping existing or potential eelgrass habitat. In order to develop a strategic planning process for this region, areas sensitive to human-use disturbances must be identified.

1.2 Project Objectives

The primary goal of this project was to document the occurrence of eelgrass in Malaspina, Okeover, Lancelot, and Theodosia Inlets and identify locations in the study area that may be sensitive to human-use disturbance. The study area covers approximately 120 km of shoreline, 53km of which are marine park and excluded from the project as this shoreline is already targeted as conservation area. The survey identified the location and characterized the habitat of all eelgrass sites making it a Level 2 Monitoring survey according to the Methods for Mapping and Monitoring Eelgrass Habitat in British Columbia (2002). In addition, the survey included three parameters from a Level 3 survey, maximum depth, minimum depth and the distribution of eelgrass.

Four methods of data collection were used in the project; aerial videography information from 1995, low-tide boat reconnaissance surveys from 2002, air photo interpretation from 1994 and 2002, and seabed video imagery from May 2003 field surveys. The final product of this synthesis of information is a map delineating the location of eelgrass sites within the study area.

2.1 Review of Existing Information

2.1.1 Aerial Videographic Data

Aerial video imagery was taken of the study area in 1995 as part of the Land Use Coordination Office (LUCO; now part of MSRM) ShoreZone overflights and mapping which resulted in the MSRM ShoreZone Mapping database. Eelgrass sites identified from this database are tied to specific shore units that were electronically transferred to our planning base map.

2.1.2 Boat Reconnaissance Data

John Dafoe, a tour guide in the region, identified eelgrass beds using low-tide boat reconnaissance surveys in the summer of 2002. Water visibility was good so no snorkeling was necessary. The Dafoe eelgrass locations were marked on a CHS chart which was provided by MSRM. These locations were visually transferred to our planning base map using the area measurements and locations denoted on the chart.

2.2 Interpretation of Aerial Photos

2.2.1 2002 Colour Air Photos

Electronic colour air photos were provided by Baron Carswell at the Ministry of Agriculture, Food, and Fisheries (MAFF). These MAFF air photos were collected near low-tide on 18 April, 2002 between 13:25 and 15:10 (+1.8 to +3.0 m tidal height; 1:5000 scale). The flight path covered lease areas in Malaspina, Okeover, and Lancelot Inlets. The photos were registered to an Albers projection base map and interpreted for possible eelgrass locations, which appear as dark areas in the nearshore. During the original registration of the air photos and the conversion to UTM datum, some registration errors developed. Because of this, the locations of the eelgrass site interpreted from these maps was generally offset between 5 and 30m with one bed along the western edge of Okeover Inlet placed 180m offshore from the actual GPS location. Once the interpretation was complete, a comparison was made between the known eelgrass beds from the ShoreZone videography and the Dafoe data to calibrate our air photo observations. These interpreted eelgrass positions were then plotted on our planning basemap.

2.2.2 1994 Colour Air Photos

Areas not covered by the MAFF air photos were purchased from the MSRM air photo library. These near low-tide (2.5-2.3m CD) air photos were taken on 20 September, 1994 between 11:25 and 12:15 (1:10,000 scale). The images were scanned onto a computer and registered to fit the base map. As with the 2002 air photos, errors were incurred during the registration process. In order to fit the eelgrass locations to the shoreline, the size and shape of the site was digitized from the air photo and the location was estimated based on comparing the shoreline of the air photo to the LUCO shoreline. This method generally resulted in a less than 10m discrepancy

between the interpreted eelgrass location and the actual GPS location. These air photos were interpreted using the same method as that outlined under 2002 Air Photos and additional eelgrass locations were transferred to the planning base map.

2.3 Field Survey

2.3.1 Reconnaissance Observations from Vessel

At a lower tides (< 2m CD) it was possible to observe the shoreward edge of eelgrass from the boat. In order to inventory the area of coastline within the land-use plan boundaries, this method was used to explore sites not identified on the preliminary maps. All areas considered potential eelgrass sites were checked; these sites mostly included sheltered coves with soft-sediment bottoms.

2.3.2 Seabed Videography

All areas identified as eelgrass sites on the preliminary map were inventoried using seabed video imagery. A towed underwater camera was lowered to the seabed and imagery was digitally recorded. Areas with eelgrass were surveyed in a grid or zig-zag pattern in order to delineate the margins of eelgrass habitat and determine eelgrass distribution (Fig. 1). During surveying, the presence of eelgrass was monitored on the video screen, with start--stop times noted. The maximum and minimum depths for eelgrass at each site were also noted; measured depths were later corrected to chart datum using predicted tidal software for Okeover Inlet.

Towed camera positioning was provided by Differential Global Positioning Satellites (DGPS; Garmin Model 53), and recorded continuously during the survey. Quoted accuracy is ± 3m. All data were recorded in UTM format, Zone 10, WGS84. In comparison with DGPS locations, the Canadian Hydrographic Service (CHS) charts had a registration shift of about 20m to the east.

In two areas with shellfish leases, observations of the seafloor were difficult due to multiple anchoring lines (See picture Cap0013 in Appendix D). In these areas “spot checks” (the video camera was lowered to the seabed, eelgrass was noted, and the camera was raised without being towed) were used to locate eelgrass and the eelgrass margins were later extrapolated from these spot checks.

Following data collection, the eelgrass locations were plotted and both the plots and the tracklines were transferred to the base map. As a result, both the eelgrass sites and areas without eelgrass are known. The boundaries for each eelgrass bed area were interpolated from presence along the tracklines, and polygons were produced to show the area and location at each site. The inset in Figure 1 illustrates the process of digitizing eelgrass polygons. The orange dotted line is the trackline of the video camera and the dark purple dotted line represents the area where eelgrass was observed. From these two lines, the light purple polygon was created to depict the shape and location of the eelgrass bed

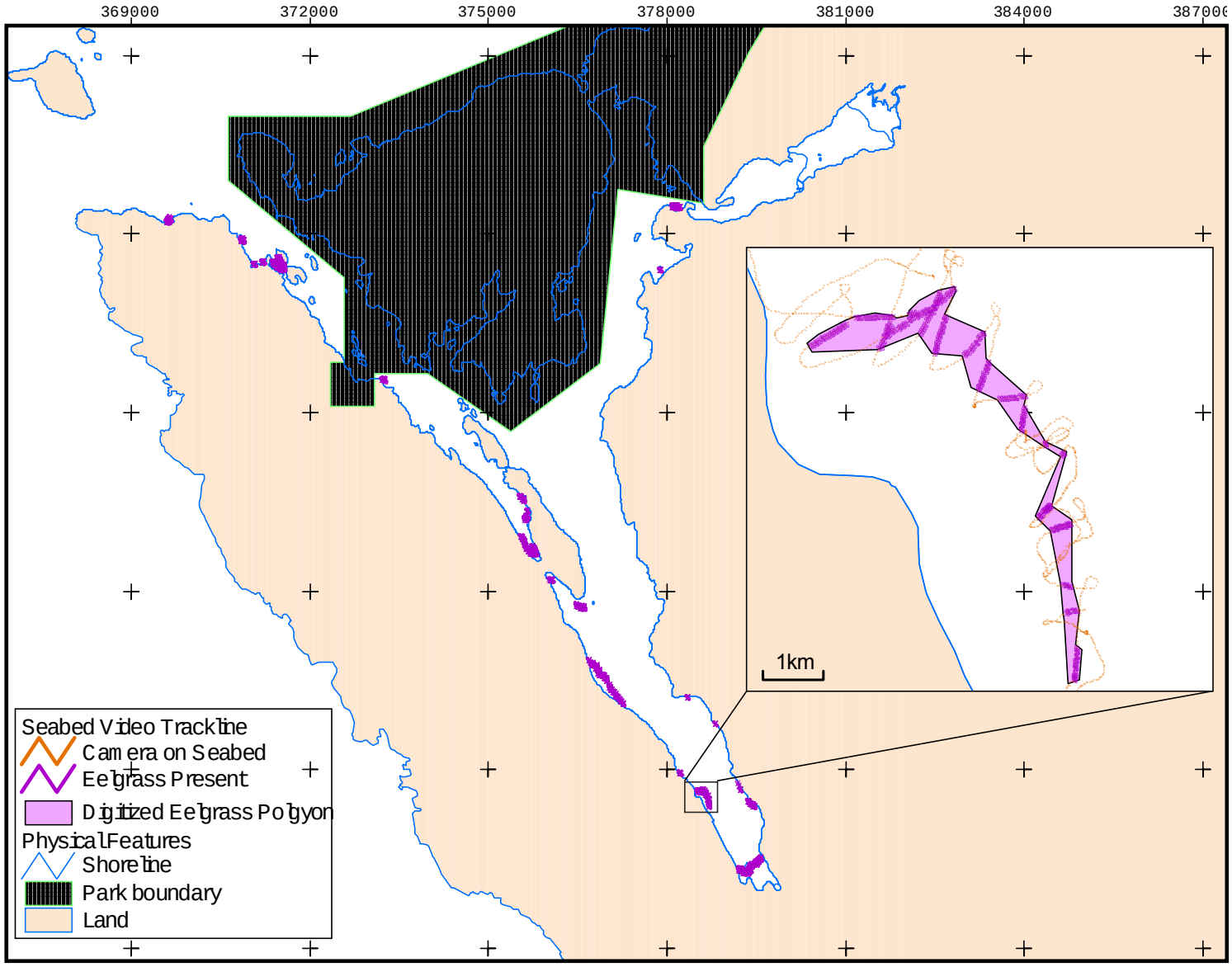

Figure 1 Process of creating Eelgrass Polygons based on Seabed Videography.

In presenting our results, the preliminary planning map data is briefly compared to the seabed videographic data. There are strengths and weaknesses for each methodology, however georeferenced seabed videography is considered the most accurate of the techniques. This accuracy is due to (a) observations being positioned using differential GPS navigation, (b) imagery with a seabed resolution of only a few centimetres resulting in the unlikeliness of eelgrass being missed, and (c) a georeferenced videotape that provides a permanent, verifiable record of observations.

3.1 Aerial Videographic Survey

Eight eelgrass sites were identified using the aerial video imagery from the MSRM ShoreZone Mapping database. Seven of these were taken directly from the database. The eighth site was added after reviewing the overflight tapes and a possible presence of eelgrass was identified. The seabed videography survey confirmed that six of the seven mapped sites contained eelgrass. The aerial videographic narration was reviewed for the site without eelgrass and it was determined that this shore unit contains "beach grasses" not eelgrass. The eelgrass areas mapped from the aerial videography are depicted on the map as segments of the shoreline and do not show the exact location or area of the eelgrass sites. Also, the ShoreZone videographic interpretation missed 15of the 21 mapped eelgrass locations.

3.2 Boat Reconnaissance Survey Data

The comparison of data collected during John Dafoe's low-tide boat reconnaissance surveys and the seabed videography was good. Eelgrass was present at all of the 10 sites identified in the Dafoe boat reconnaissance survey, as verified through seabed videography. The exact size and location of these sites was not always accurate, however, 11 of 21 of the eelgrass sites in the study area were missed in the Dafoe boat survey.

3.3 Aerial Photo Interpretation Data

Eighteen eelgrass sites were identified using both the 2002 and the 1994 colour air photo interpretations. Eight of these sites were not identified by either the MSRM ShoreZone Mapping database or the boat reconnaissance surveys. Each of these sites was checked during the seabed video survey. Three identified sites around Coode Island did not contain eelgrass, one of which was also located using the MSRM ShoreZone Mapping database. In addition to this, one site between Coode Island and Coode Peninsula was inaccessible due to long lines from an oyster farm. In general, the size and shape of the eelgrass sites identified by air photo interpretation was close to the actual size and shape seen with the seabed video survey and the location along the shoreline was correct. Due to registration problems, the distance of the eelgrass from shoreline was often incorrect. The 2002 air photos were off between 5 and 30m with one bed along the western edge of Okeover Inlet placed 180m offshore from the actual GPS location.

The 1994 air photos were more accurate with many of the locations having a less than 10m discrepancy. Air photo interpretation identified 16 of the 21 sites, although some of the smaller beds within sites were missed.

3.4 Field Survey Observations

3.4.1 Reconnaissance Observations

Visual reconnaissance from the vessel identified two eelgrass sites not on the preliminary maps. These sites were both in sheltered bays with soft-sediment bottoms. Each site was then surveyed with the seabed videography to determine the eelgrass boundaries. Reconnaissance and seabed videographic observations covered approximately 40,000m of shoreline.

3.4.2 Seabed Videographic Observations

Seabed videography was used to survey all sites delineated on the preliminary maps. Appendix B shows the dates and times for all recorded tapes. This survey determined accurate locations and areas for each of the eelgrass sites. In addition to this, many locations with suitable eelgrass habitat not on the maps were inventoried using the seabed imagery when the tides were too high for visual reconnaissance. The method identified three new sites and expanded the eelgrass coverage in two known locations. In total 21 eelgrass sites were surveyed with the seabed videography. These are labeled "Eelgrass (Seabed Videography'03)" in Figures 2-5. Many of these had multiple eelgrass locations at one site for a total of 32 individual eelgrass "beds" totaling 6,400m of coastline and covering an area of 63,000m^2. The shoreline length, area, and maximum and minimum depth of eelgrass occurrence at each site are documented in Table 1. Site numbers are illustrated in Figures 2-5.

Several areas within Theodosia Inlet were surveyed and although it appeared to have areas of potential eelgrass habitat, most soft bottom bays in the inlet were primarily devoid of vegetation. Areas with a steeper intertidal/shallow subtidal region and a boulder/cobble seabed had both bladed kelps (*Laminaria* sp.) and *Sargassum* in narrow fringing bands. Some of the soft-sediment areas had wood debris from old log dumps, which may explain part of their lack of vegetation. Also, Theodosia Inlet appears to have less marine influence and salinities may be too low to support eelgrass.

Most of the eelgrass inventoried was classified as patchy with only 31% of the individual beds considered continuous (Table 2). Also, 16 of the 32 "beds" had coverage of less than 25% (See photos Cap0002.JPG, Cap0004.JPG, Cap0008.JPG, and Cap0019.JPG in Appendix D). Of the remaining locations, 11 had partial coverage (either the primary or secondary form) of less than 25% and 5 (19%) had a total coverage of 26-75% (only one of these five had a tertiary coverage of greater than 75%; Table 2; see also photos Cap0001.JPG, Cap0003.JPG, and Cap0009.JPG in Appendix D).

Table 1 Quantitative Description of Eelgrass Sites based on Seabed Videography

Site #	Shoreline Length at LWL (m)	Shoreline Length at HWL (m)	Eelgrass Area (m^2)	Maximum Depth (m)*	Minimum Depth (m)*
1	80	200	1,800	3.6	+0.1
2	55	75	1,392	3.1	+0.3
3A	17	130	109	3.2	+0.1
3B	30	90	305	3.3	+0.6
4A	66	85	1,380	2.0	+1.1
4B	40	55	520	1.6	+1.3
4C	150	255	2,696	1.9	+1.2
4D	122	160	2,848	3.0	+1.6
5	40	55	618	1.8	+0.4
6	245	245	1,867	1.9	+1.0
7	300	590	4,676	1.8	+1.3
8A	83	125	1,795	0.9	+1.6
8B	30	30	388	0.3	+0.1
9A	95	175	645	1.1	+1.2
9B	10	15	30	1.2	+0.1
10	20	20	200	0.1	+0.2
11	160	160	3,784	2.0	+0.4
12A	33	180	587	1.3	+0.2
12B	6	20	30	1.7	+1.4
13	960	1,015	21,279	1.4	+1.2
14	25	25	124	Unknown	Unknown
15	340	380	6,692	Unknown	Unknown
16A	230	500	5,882	Unknown	Unknown
16B	230	1,410	3,767	Unknown	Unknown
17A	150	150	915	Unknown	Unknown
17B	15	15	91	Unknown	Unknown
17C	7	7	23	Unknown	Unknown
17D	7	7	23	Unknown	Unknown
18	10	10	22	Unknown	Unknown
19	15	15	79	Unknown	Unknown
20	13	13	26	0.6	0.0
21	135	177	2,822	2.02	+1.2
Total	3,939	6,389	67,415		
Average	239	387	4,086	1.8	+0.8

*relative to chart datum

Table 2 Qualitative Description of Eelgrass Sites based on Seabed Videography

Site #	Location	Form	Distribution	% Cover (Primary/Secondary /Tertiary)	Substrate Type
1	Feather Bay	Flat	Patchy	26-50/51-75/1-10	Sand/Mud
2	S. of Myrmidon Pt	Flat	Patchy	26-50/51-75/1-10	Sand/Mud
3A	Cove W. of Beulah Is	Flat	Patchy	11-25	Sand/Mud
3B	Cove W. of Beulah Is	Flat	Continuous	26-50	Sand/Mud
4A	W .of Beulah Is	Flat	Continuous	1-10/11-25	Sand/Mud
4B	W. of Beulah Is	Flat	Continuous	26-50/11-25	Sand/Mud w cobble
4C	W. of Beulah Is	Flat	Continuous	26-50/1-10	Sand/Mud
4D	W. of Beulah Is	Flat	Continuous	26-50/1-10/51-75	Sand/Mud w few boulders
5	S. of Park Boundary	Flat	Continuous	51-75/1-10	Sand
6	W. Trevenen Bay	Fringing	Continuous	1-10/11-25/50-75	Sand
7	Head Trevenen	Flat	Continuous	26-50/1-10	Sand/Mud
8A	E. Trevenen Bay	Flat	Patchy	1-10/11-25	Sand
8B	E. Trevenen Bay	Flat	Patchy	1-10	Sand w some pebble
9A	E. Trevenen Bay	Flat	Patchy	11-25/1-10	Sand w few boulders
9B	E. Trevenen Bay	Flat	Patchy	51-75	Sand
10	Coode Is	Flat	Patchy	1-10	Sand
11	Tip of Coode Pen	Flat	Continuous	51-75	Sand
12A	Head of Penrose Bay	Flat	Patchy	51-75	Sand w pebble/cobble
12B	Head of Penrose Bay	Flat	Patchy	11-25	Sand/Mud
13	N. of Public Dock	Fringing	Patchy	1-10/26-50/51-75	Sand w cobble
14	N. of Lucy Rk	Flat	Patchy	11-25	Sand w boulder/cobble
15	N. of Lucy Rk	Flat	Patchy	50-75/1-10	Sand w pebble/cobble
16A	Head of Okeover Inlet	Flat	Patchy	11-25	Sand/Mud
16B	Head of Okeover Inlet	Flat	Patchy	1-10	Sand/Mud
17A	E. Okeover	Fringing	Patchy	11-25/26-50/>75	Sand
17B	E. Okeover	Fringing	Patchy	1-10	Sand w cobble/boulder
17C	E. Okeover	Fringing	Patchy	1-10	Sand w pebble
17D	E. Okeover	Fringing	Patchy	1-10	Sand
18	E. Okeover	Fringing	Patchy	1-10	Sand
19	E. Okeover	Flat	Patchy	1-10	Sand w pebble
20	Thors Cove	Flat	Patchy	1-10	Sand
21	Mouth of Theodosia	Flat	Continuous	26-50/51-75	Sand

terminology follows: Environment Canada, 2002. Methods for mapping eelgrass in British Columbia (Version 4). Contract Report by Precision Identification of Vancouver, BC for the Canadian Wildlife Service, Environment Canada, Delta, BC, 41p.

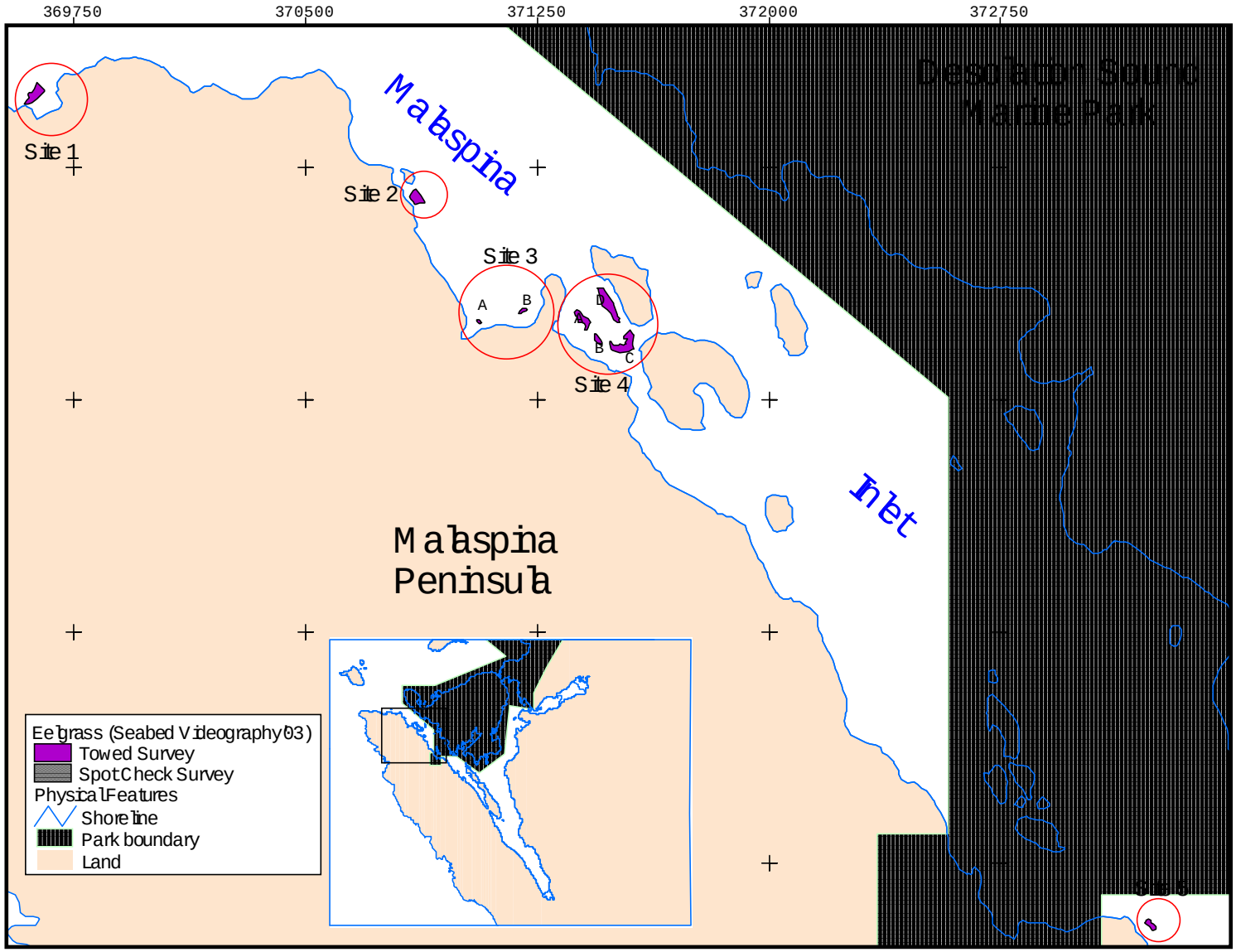

Figure 2 Eelgrass sites in Malaspina Inlet based on Seabed Videography.

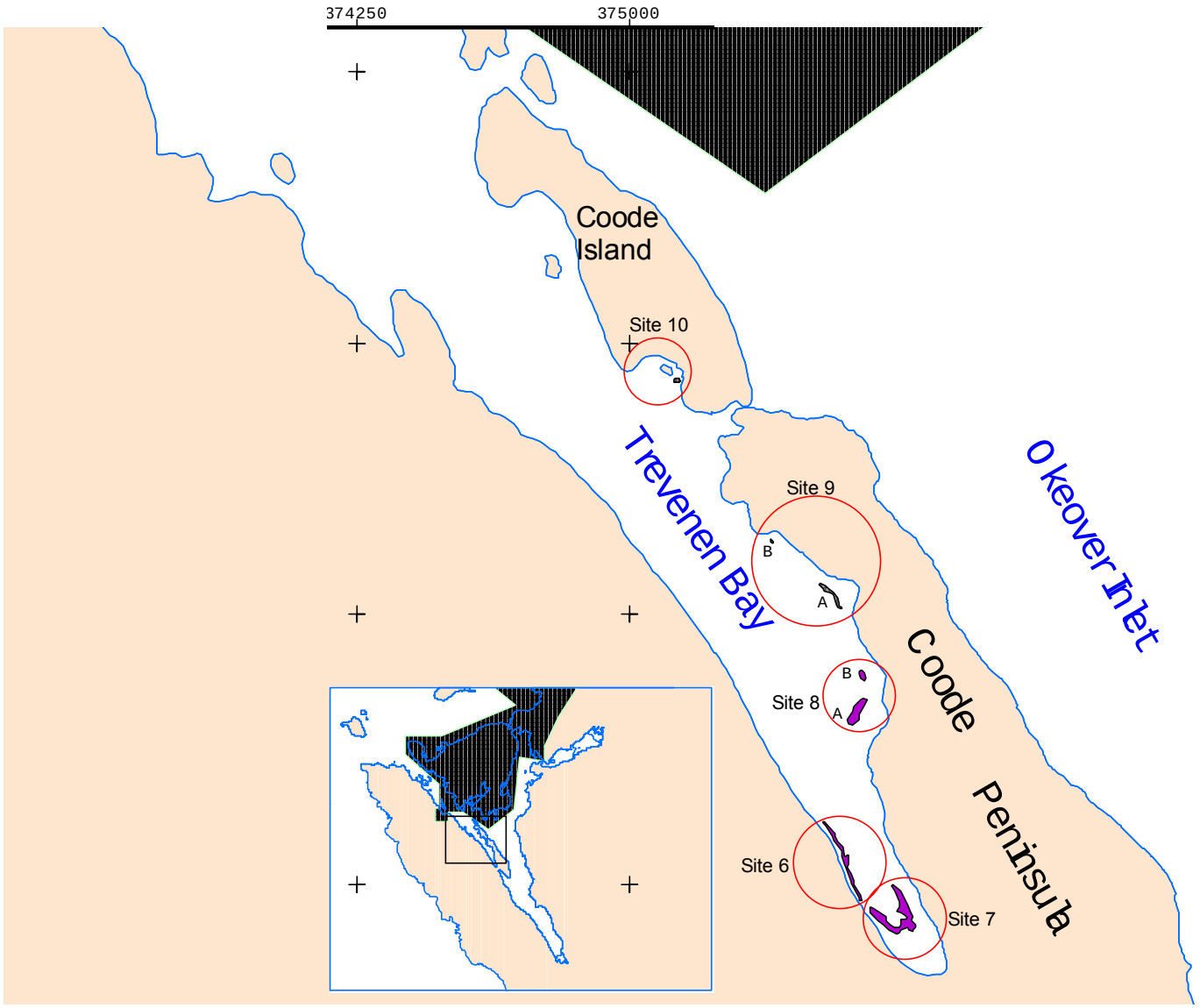

Figure 3 Eelgrass sites in Trevenen Bay based on Seabed Videography.

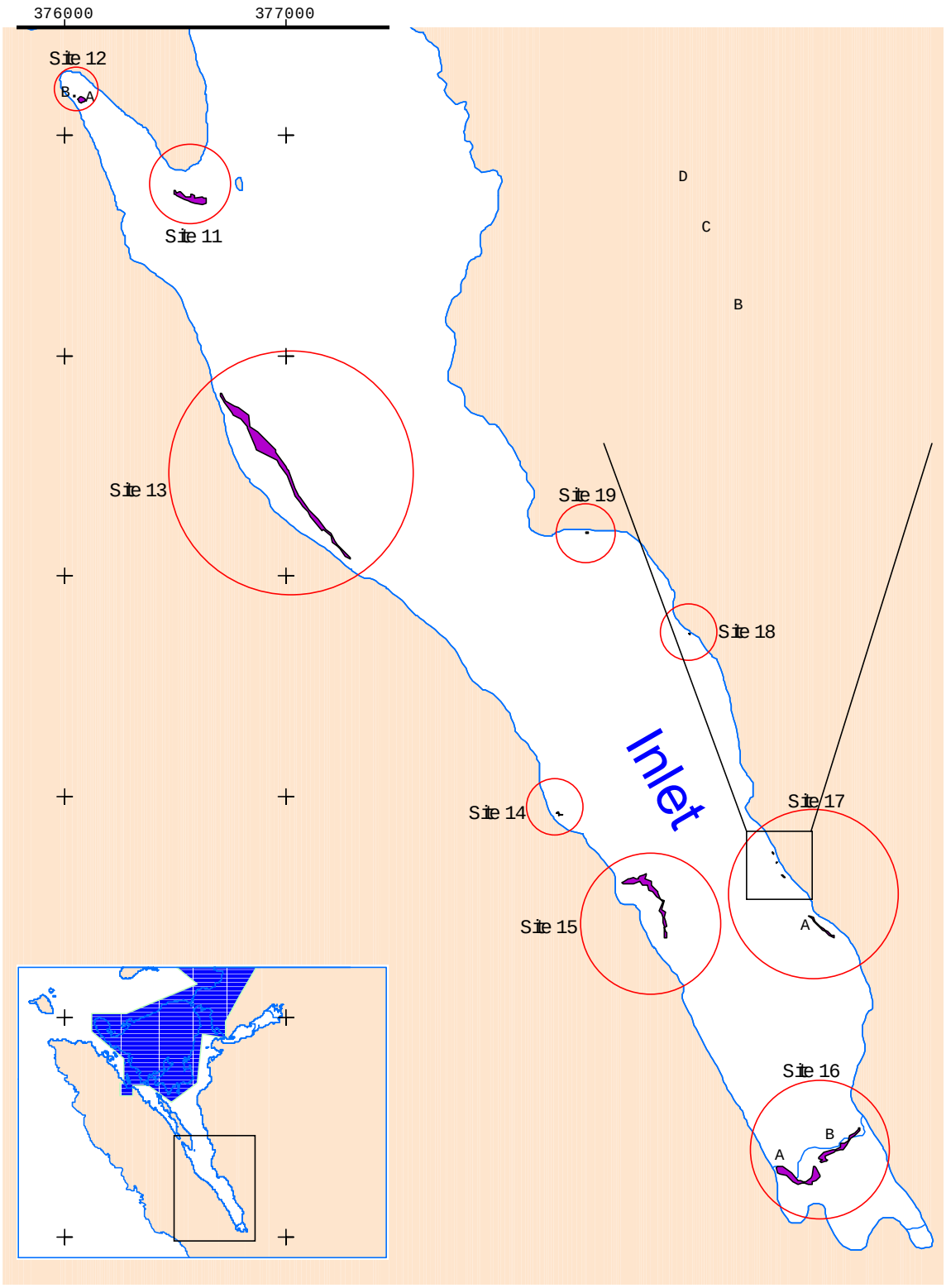

Figure 4 Eelgrass in Okeover Inlet based on Seabed Videography.

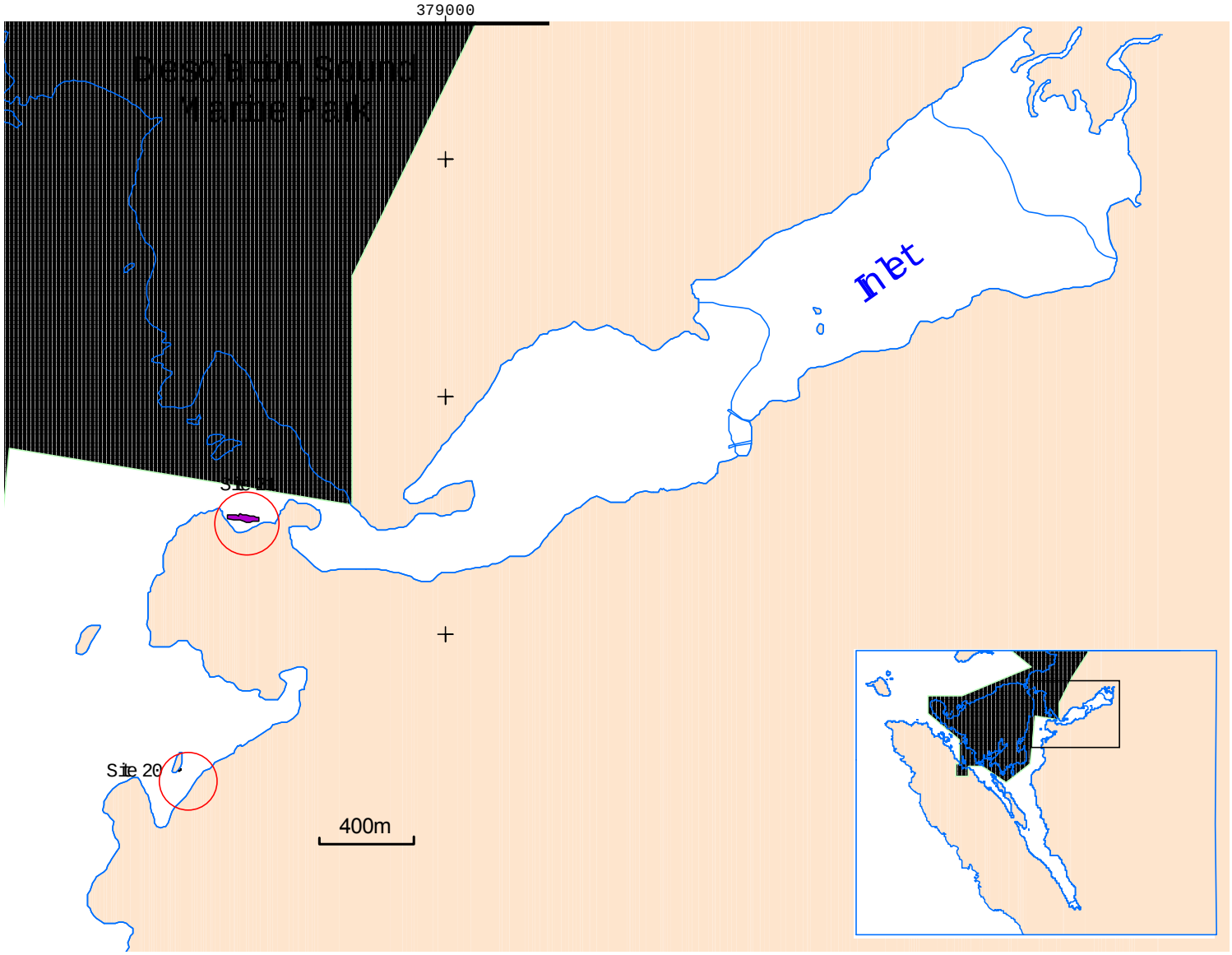

Figure 5 Eelgrass in Theodosia Inlet based on Seabed Videography.

4.0 CONCLUSIONS

1. Reconnaissance and seabed videographic observations covered approximately 40,000m (60%) of shoreline. The remainder of the shoreline was evaluated from the boat as being unsuitable habitat for eelgrass, i.e bedrock cliffs or steep boulder, cobble beaches. Using four survey methods, 6,400m of the 67,000m of HWL shoreline (6%) were found to have associated eelgrass sites in the Malaspina, Okeover, Lancelot, Theodosia Inlet area. These sites were mostly soft-sediment, semi-protected shoreline with only a few fringing sites located along a rockier coast. Most sites were concentrated in three locations; in the area west of Beulah Is, in southern Trevenen Bay, and in Okeover Inlet south of Penrose Bay.

2. Twenty-one sites were identified in total with some sites containing separate "beds" for a total of 32 individual beds. Of these 32 beds, 50% had eelgrass densities in the lowest two cover classes (<25%). An additional 35% had at least partial coverage in these cover classes. Only 19% of the eelgrass surveyed had a density of greater than 25%.

3. The maximum observed depth of eelgrass during the survey was 3.6m (chart datum, CD) with an average maximum of 1.8m (CD) for all the sites. The minimum observed eelgrass depth was +1.6m (CD) with an average minimum of +0.8m (CD) for all the sites.

4. The use of a multiple inventory techniques worked well in identifying eelgrass sites. Some sites were identified through aerial videographic data and boat reconnaissance data that may have been overlooked based solely on the "prime eelgrass location" of soft-sediment beaches. Air photos picked up eelgrass sites that these existing data sources missed and the underwater video survey located even more sites and was used to determine boundaries and exact eelgrass locations.

5. There is a plan to re-establish flow in the Theodosia River; flow is presently diverted to Lake Powell through a diversion dam. The re-establishment of flow is likely to (a) reduce salinity in Theodisa Inlet, (b) increase stratification and (c) increase turbidity associated with the river input. These are all factors that are likely to reduce the potential for eelgrass establishment in the Inlet.

APPENDIX A – LIST OF AERIAL PHOTOS USED AND TIDAL HEIGHTS

Source	Date	Air Photo	Time	Tide (m)
MAFF	18-Apr-02	Earliest	13:21	300
		Latest	15:10	181
MSRM	20-Sep-94	BCC94162 No.032	11:26	246
		BCC94162 No.034	11:27	247
		BCC94162 No.035	11:27	247
		BCC94162 No.040	11:28	247
		BCC94162 No.062	11:35	248
		BCC94162 No.087	11:43	241
		BC94142 No.138	12:14	224

APPENDIX B – TAPE LOG OF VIDEOGRAPHY COLLECTED DURING SURVEY

Tape Number	Date	Start	Stop	Comments
Okeover_01	3-May-03	9:17:51	10:15:44	
Okeover_02	3-May-03	10:17:05	11:17:00	
Okeover_03	3-May-03	11:19:00	13:34:45	Break 11:23:00-12:41:58
Okeover_04	3-May-03	13:35:20	14:51:41	Break 13:58:17-14:02:49, 14:08:32-14:12:30, 14:36:52-14:43:45
Okeover_05	3-May-03	14:53:21	15:59:24	Break 14:58:00-15:02:00, 15:34:00-15:38:09
Okeover_06	3-May-03	16:04:16	17:36:00	Break 16:46:48-17:29:11
Okeover_07	3-May-03	17:37:52	18:39:25	
Okeover_08	4-May-03	8:54:50	9:54:17	
Okeover_09	4-May-03	9:55:25	10:55:02	
Okeover_10	4-May-03	11:10:23	12:41:46	Break 11:44:33-12:15:18
Okeover_11	4-May-03	12:43:41	13:49:54	
Okeover_12	4-May-03	13:51:10	14:53:16	Break 14:18:42-14:20:42, 14:36:54-14:38:56, 14:53:16-14:53:16
Okeover_13	5-May-03	9:10:46	10:11:55	
Okeover_14	5-May-03	11:01:40	12:01:48	
Okeover_15	5-May-03	12:08:18	13:49:05	Break 12:13:16-12:54:02
Okeover_16	5-May-03	13:53:50	14:46:30	
Okeover_17	5-May-03	15:09:44	16:10:51	
Okeover_18	5-May-03	16:14:02		Break 16:45:02-17:02:17, 17:13:28-17:16:42
Okeover_19	6-May-03	11:40:24	12:39:17	
Okeover_20	6-May-03	12:43:20	14:26:30	Break 12:43:37-12:50:41, 13:00:23-13:33:30, 13:50:15-13:54:05
Okeover_21	6-May-03	14:46:00	16:59:37	Break 15:16:10-16:37:43

Column #	Heading	Description
1	INDEX	Record Number for whole database
2	INDEX_DAY	Record Number by Tape
3	LAT	Decimal degrees (negative is south)
4	LON	Decimal degrees (negative is west)
5	UTM_E	WGS84 datum
6	UTM_N	WGS84 datum
7	UTM_ZONE	10
8	DATE	yyyymmdd
9	PDT	hhmmss
10	UTC	hhmmss
11	SPEED_M/S	km / hour
12	HEADING	Decimal degrees
13	TRUE_MAG	True/Magnetic indicator
14	DIST_M	Distance between fix pts (meters)
15	TAPE	Tape Number
16	EELGRASS	Yes=Present, No=Absent, FOB=Fish off Bottom

Navigation Data

The navigation data is supplied on a CD-ROM and entails two types of data. The entire database can be found in 03-16 Okeover Eelgrass.mdb. This file includes the presence of eelgrass and its location.

The raw data is found in nine text (.txt) files. These files can be opened in MS Excel using the following directions:

1) In Excel, chose File – Open and change the "Files of Type" box to Text Files. Select the file you wish to use and click "Open".
2) Chose "Delimited" as the file type for the data and click "Next".
3) Chose "Comma" as the delimiters and click "Next".
4) Click "Finish" and the file opens. The rows with the number signs indicate the field headings for each column.

The text files are as follows:

File Name	**Date**
Okeover_1.txt	3-May-03
Okeover_2.txt	4-May-03
Okeover_3.txt	5-May-03
Okeover_4.txt	5-May-03
Okeover_5.txt	5-May-03
Okeover_6.txt	5-May-03
Okeover_7.txt	5-May-03
Okeover_8.txt	6-May-03
Okeover_9.txt	6-May-03
Okeover_10.txt	6-May-03

Selected image captures taken from the seabed videography.

File Name	Site #	Description
Cap0001.JPG	4C	Patchy eelgrass cover of 26-50%
Cap0002.JPG	4C	Patchy eelgrass cover of 1-10% and *Sargassum*
Cap0003.JPG	4C	Patchy eelgrass cover of 26-50% with hooded nudibranch (*Melibe leonina)*
Cap0004.JPG	4D	Patchy eelgrass cover of 1-10% with sea lettuce (*Ulva* sp.)
Cap0005.JPG	6	Fringing, patchy eelgrass with ochre star (*Pisaster orchraceus)*
Cap0006.JPG	6	Fringing, continuous eelgrass at 11-25% cover with hooded nudibranch
Cap0007.JPG	7	Patchy, flat eelgrass
Cap0008.JPG	9A	Spot check site with 1-10% cover on boulder substrate
Cap0009.JPG	9A	Spot check site with 26-50% cover with *Melibe leonina*
Cap0010.JPG	16A	Flat, patchy eelgrass with 1-10% cover
Cap0011.JPG	17A	Fringing area with 11-25% cover
Cap0012.JPG	5	Eelgrass with bull kelp (*Nereocystis leutkeana*)
Cap0013.JPG	5	Cable on bottom through eelgrass site
Cap0014.JPG	5	Eelgrass with hooded nudibranch (*Melibe leonina*)
Cap0015.JPG	--	Wood debris on sandy bottom in cove at mouth of Theodosia Inlet