Remotely Operated Vehicle Surveys of Rockfish Conservation Areas in British Columbia, February 2009 – July 2011

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2017

Canadian Technical Report of Fisheries and Aquatic Sciences 3189

Fisheries and Oceans Canada | Pêches et Océans Canada

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Canadian Technical Report of Fisheries and Aquatic Sciences

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Fisheries and Aquatic Sciences 3189

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REMOTELY OPERATED VEHICLE SURVEYS OF ROCKFISH CONSERVATION AREAS IN BRITISH COLUMBIA, FEBRUARY 2009 - JULY 2011

by

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Cat. No. Fs 97-6-3189E-PDF ISBN 978-0-660-0747-6 ISSN 1488-5379

Correct citation for this publication:

Haggarty, D.R., Flemming, R., Cooke, K., Deleys, N., and Yamanaka, K.L. 2017. Remotely operated vehicle surveys of rockfish conservation areas in British Columbia, February 2009 - July 2011. Can. Tech. Rep. Fish. Aquat. Sci. 3189: vi + 141 p.

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As part of an overall Rockfish Conservation Strategy in British Columbia (BC), Canada, new spatial management measures were designated, the later referred to as Rockfish Conservation Areas (RCAs), which prohibited most recreational and commercial fishing within their boundaries. Between 2002 and 2007, 164 RCAs were implemented throughout the BC coast. Non-intrusive visual surveys were then developed to study fish communities and assess stock status and habitat of inshore rockfish. Between 2009 and 2011, seven visual surveys were conducted at 47 RCAs and adjacent fished areas in southern BC using a Deep Ocean Engineering Phantom HD2+2 remotely operated vehicle (ROV). In total, 424 transects were completed in a paired sampling design over similar rockfish habitat both inside and adjacent to the RCAs. This technical report provides a summary of the visual surveys used to initially assess RCAs in BC and details the methods used to plan the visual survey transects, collect visual data, analyze recorded video, process the transect track lines, and manage the database.

Résumé

Haggarty, D.R., R. Flemming, K. Cooke, N. Deleys and K.L. Yamanaka. 2017. Remotely operated vehicle surveys of rockfish conservation areas in British Columbia, February 2009 - July 2011. Can. Tech. Rep. Fish. Aquat. Sci. 3189: vi + 141 p

Dans le cadre d’une stratégie globale de conservation des sébastes en Colombie-Britannique (CB), Canada, de nouvelles mesures de gestion spatiales, les Aires de Conservation des Sébastes (ACSs), interdisant la plupart des pêches récréatives et commerciales au sein de leurs frontières ont été élaborées. Entre 2002 et 2007, 164 ACS ont été créées le long de la côte de la Colombie-Britannique. Des relevés visuels non-intrusifs ont ensuite été mis au point pour étudier les communautés piscicoles et évaluer l’état des stocks et les habitats des sébastes côtiers. Entre 2009 et 2011, sept inventaires visuels ont été effectués dans 47 ACSs et dans des zones adjacentes où la pêche était autorisée dans le sud de la Colombie-Britannique en utilisant un véhicule télécommandé (ROV) Deep Ocean Engineering Phantom HD2+2. Au total, 424 transects ont été effectués selon un échantillonnage par pair dans des habitats favorables aux sébastes et similaires à l'intérieur et à proximité immédiate des ACSs. Ce rapport technique résume les relevés visuels effectués pour évaluer les ACSs en CB et présente les méthodes utilisées pour la préparation des transects visuels, le recueil des données visuelles, l’analyse des vidéos recueillies, les procédés pour définir les transects, et la gestion des bases de données.

Introduction

In response to conservation concerns associated with a sharp decline in inshore rockfish abundance throughout the 1990's a system of 164 Rockfish Conservation Areas (RCAs) were implemented in British Columbia (BC), Canada as part of a Rockfish Conservation Strategy. Initiated in 2001, the Rockfish Conservation Strategy also included actions to substantially decrease fishing mortality, implement catch monitoring across all groundfish fisheries, and improve stock monitoring and assessment. RCAs were established between 2002 and 2007 and prohibit hook and line and bottom trawl fisheries. RCAs protect almost 30% of rockfish habitat between Vancouver Island and the mainland (inside waters) and approximately 15% of habitat on the rest of the coast (outside waters) (Yamanaka and Logan 2010). Inshore rockfish include five species of the genus *Sebastes* (Copper Rockfish *S. caurinus,* Quillback Rockfish *S. maliger,* China Rockfish *S. nebulosus,* Tiger Rockfish *S. nigrocinctus,* and Yelloweye Rockfish *S. ruberrimus*) that are found on shallow (<200 m) rocky reefs. Numerous other fish species including two greenling species (family Hexagrammidae), Lingcod *Ophiodon elongatus*, the Kelp Greenling *Hexagrammos decagrammus,* and the Greenstriped Rockfish *S. elongatus* are also protected in RCAs.

Areas closed to fishing are considered a necessary tool to conserve Pacific Rockfishes (genus *Sebastes*) which are characterized as long-lived (some > 100 years), have small home ranges and episodic recruitment (Parker et al. 2000, Yoklavich 1998). Their effectiveness for conserving rockfish species has been demonstrated at two marine reserves in California (Hamilton et al. 2010, Keller et al. 2014). These closed areas had significantly larger rockfish and greater biomass (and therefore reproductive output) than non-reserve sites. The length of time lapsed since the establishment of harvest reserves (closed areas) also influences their effectiveness. A one-year old reserve showed no difference from open areas (Paddack and Estes 2000), whereas a five-year old Channel Islands marine reserve network showed the biomass of targeted fish species, including five rockfish species, at a level approximately two times higher inside reserves than outside (Hamilton et al. 2010). Hamilton et al (2010) also show that the biomass trajectories of targeted species inside and outside of reserves diverged through time, with targeted species increasing inside reserves relative to outside. Despite overall declining trends in groundfish catch rates in a fishery independent trawl survey, higher catch rates for numerous rockfish species were found in closed areas that were continuously closed to trawling as well as a higher proportion of larger fish (Keller et al. 2014).

The need for non-destructive monitoring tools to sample depleted populations in protected areas (Field et al. 2006) has led to an increase in visual surveys. Cost effective remotely operated vehicles (ROVs) have become a popular tool for visual surveys to assess marine resources (Stoner et al. 2008). In addition to fish abundance and size data, visual surveys also allow the collection of information on habitat use, behaviour, and species associations (Laidig et al. 2009, Love et al. 2009, O'Farrell et al. 2009, Yoklavich et al. 2002). Stoner *et al.* (2008) contend that there is no better way to monitor fishes in structurally complex habitats. This technical report provides summary information on the visual ROV surveys completed between 2009 and 2011 to assess the fish communities within and adjacent to the RCAs shortly after their implementation. Since Inshore Rockfish are long-lived, slow to mature, and have sporadic recruitment success (Love et al. 2002), a time-lag of as long as 20 years can be expected

before significant changes in the demographics of the fish community can be detected (Starr et al. 2015). It is therefore important that the methods and locations sampled in our initial surveys of RCAs in BC be documented so that data collected on future surveys can be compared to assess changes.

This report gives an overview of the visual ROV surveys conducted shortly after the establishment of RCAs in BC together with details on survey planning, transect location information, ROV configuration and operating procedures, video capture and review protocols, transect processing methods, and database organization in Appendices 1 through 7.

Methods

Survey planning

The Inshore Rockfish Program completed 7 visual surveys of RCAs between 2009 and 2011 (Figure 1). A total of 47 RCAs were surveyed in 4 regions of British Columbia: Strait of Georgia, Johnstone Strait, Queen Charlotte Strait, and the West Coast of Vancouver Island (Figure 1). There are no comparable visual data within the RCAs before they were established, therefore a larger RCA study (Haggarty et al. 2016) employs a Control-Impact study design whereby data from inside the RCAs are compared to nearby sites that are open to fishing in order to infer reserve effects (Claudet and Guidetti 2010, Glasby 1997, Pelletier et al. 2008, Underwood 1992). Paired transects 300 m to 900 m in length were planned and plotted in a geographic information system (GIS) software package ArcView (version 3.0) ESRI in similar rock reef habitat inside and outside of RCAs. Rock reef habitat was identified from the best bathymetry data available in the area, which ranged from sub-metre multibeam bathymetry to nautical charts. Most transect lines were planned perpendicular to the bottom slope and were conducted from the deep up to the shallow depths, although transects in areas with very steep terrain in the Johnstone Strait Region were run parallel to the slope.

Transect information including location, date, time, latitude, longitude, and duration of each transect are presented in Appendix Tables A and B in Appendix 1: Detailed survey planning.

Data collection

ROV surveys were conducted from the Canadian Coast Guard vessels *Vector* and *Neocaligus*. A Deep Ocean Engineering Phantom HD2+2 ROV was deployed from these ships using a 300 m umbilical taped to a wire suspending a 225 kg clump weight. The clump weight allowed the ROV to remain below the ship while manoeuvring over terrain along the transects at speeds of up to one knot. The ROV was equipped with a scanning sonar set to view at 60 m and assisted navigation through rocky terrain.

Video was captured with a Sony EVI 300 Zoom video camera and data recorded digitally onto RAID hard drives and onto backup Mini DV tapes. Two 120 watt ROS Q-LED lights were mounted below the camera and one 150 watt Super SeaArc HID light was mounted above the camera for a total of 18,000 lumens of light. Lights were used during all transects. Two parallel green lasers spaced ten cm apart were mounted on the ROV and used to measure fish lengths as well as the width of the field of view (FOV) which is taken to be the transect's width.

The position of the ROV was determined using "TrackPoint 3" ultra-short baseline (USBL) acoustic tracking system (Ore International). ROV and ship's position data were recorded and mapped using Hypack software 2009. The typical speed of the ROV was about 0.4 - 0.8kt, or 1/4 to 1/2 meter per second.

A Dual-frequency IDentification SONar (DIDSON) was mounted on the ROV in order to determine if fish were evading the ROV since the sonar detects fish before they come into view on the video. The sonar images were displayed on software that accompanied the DIDSON and recorded to hard drives. Preliminary data analysis shows that rockfish sensed by both the DIDSON and video showed no or mild avoidance (they changed position within the frame) and no rockfish showed strong avoidance (Yamanaka pers. comm.).

Detailed information about ROV operations are provided in Appendix 2: The Phantom Remote Operated Vehicle and Science-Lab Operations and Checklists.

Video analysis

Following the surveys, videos were reviewed and all fish, habitat, and field of view observations were recorded using the custom software program AVLog. Video files were opened from within the AVLog software and played within a window in the program (Figure 2). At least two passes of the video were reviewed for each transect; the first pass was reviewed for fish and the second pass reviewed for habitat. Whenever the bottom could not be seen in the video (i.e. the ROV was not near the bottom and not collecting usable data), the viewer would indicate unusable data by selecting an "off bottom" code and once the bottom came into view again, selecting an "on bottom" code. This allows for sections of the transect without usable data to be clipped from each transect. Observation data were collected for use with two density estimation methods; line and strip transects.

During the first review, viewers count all fish observed and identify them to the lowest taxonomic group possible. Viewers record when the fish first appears on the screen by pausing the video or selecting the appropriate species button within the recording software. Next, using a ruler, the reviewer would measure (in cm) the distance between the fish and a line splitting the screen in half, vertically (M). The separation of the lasers on the screen was then measured in centimeters (ML) and using the known laser distance (AL, 10 cm) a conversion into an actual fish distance (A) is made. For example, a fish is 5.5 cm measured distance (M) from the centerline, and the lasers are measured to be 1.5 cm apart (ML). The real distance of the lasers is 10 cm (AL). The ratio of A:M is the same as ML:AL so the actual fish distance (A=36.7) is found with the equation:

$$A = M \times \frac{AL}{ML}$$

Equation 1

This is recorded as the range on the species entry form. The position of the fish was also recorded as port or starboard of the centerline. A fish on the center line was recorded as "Center" and would have an associated range of 0. The size of the fish observed was also recorded. The viewer would play the video until the fish was as close to the same plane as the lasers. The video would then be paused to measure the fish length (M) and laser distance (ML) to find the actual

fish size (A), also using Equation 1. The length was recorded under "size" on the species entry form. Comments were also recorded. The distance and length measurements were documented when possible (i.e. when the whole fish could be seen). The reviewers focused on these measurements for commercially important groundfish species.

During a second review, habitat was recorded as a continuous variable. Habitat was defined as a combination of substrate classification, biocover categories, substrate complexity, substrate relief, and biocover thickness. Each time the habitat changed, a new habitat was recorded. Primary substrate (greater than 50%) was categorized in 9 classes following methods in (Pacunski and Palsson 2001) and (Martin et al. 2006, Martin and Yamanaka 2004). For later studies, these classes were subsequently lumped into three classes: Bedrock, Mixed Coarse and Mixed Fine (Table 2) (Haggarty et al. 2016). Similarly, 19 classes of biocover exist in the original dataset were grouped into 3 classes for a later study: Bare, Encrusting Organisms and Emergent Organisms. Habitat complexity and relief were also recorded in 4 classes which were re-classified into High and Low (Table 2) (Haggarty et al. 2016). Habitat classes not assigned a new combined type do not appear in the data base.

During a final review, reviewers measured the field of view every 30 seconds, unless the ROV was off the bottom to determine an area swept or belt transect area for the video transect. Video was paused and the width of the viewing screen (M) and the laser distance (ML) measured. Using Equation 1, the actual field of view could be calculated, excluding portions of the transect where the ROV was "off the bottom". The AVLog software records 10 different attributes of the transect processing (Table 3).

Detailed information about video analysis are presented in Appendices 3 and 4: Video Viewing Checklist and AVLog Video Review Software, respectively.

Transect processing

The ROV transect track points from the acoustic tracking system were exported from Hypack and mapped using ArcGIS (version 9.3) ESRI from track points from the acoustic tracking system to give a geospatial representation of the vessel track during the course of transects. The tracking is subject to various errors caused by:

- multipaths, which are caused by the acoustics bouncing off the surface of the water and back again. Multipaths cause the hydrophone to detect the transponder deeper than it actually is due to the increased time of the return.

- bottom characteristics that scatter or reflect acoustic energy, such as steep rock walls.

- acoustic noise from the ship or other nearby vessels which can result in signal loss.

Points that were obvious tracking errors had to be eliminated or edited using data from the ROV compass heading, typical speed and time. Smoothed lines were then created from the edited points and calibrated with the date-time with the Calibrate Routes Tool. The actual distance the

ROV traveled over the ocean floor was then calculated using the z-field (depth) in the ArcGIS 3D Analyst extension to determine the surface length.

The date-time field was then calculated for all the fish and the habitat observations, and field of view measurement from the video analysis. The date-time associated with each track point links the fish, habitat and field of view observations and allows them to be mapped onto their transect lines using the Make Route Event Layer tool. Habitat variables were then assigned to FOV measurements. However, only the sections of each transect where the transect indicator corresponds to "Substrate Codes - Habitat observation" and "ROV on bottom" were considered (Table 3). Sections of the transect when the ROV was recorded as "Off the bottom" were not assigned habitat variables to each FOV measurement. Area swept polygons were then created for the habitats using the Buffer tool with ½ of the field of view measurement as the radius and calculating the area of the polygon with flat ends (i.e. without round end caps).

Detailed information about transect mapping methods is presented in Appendix 5: ROV Transect Processing. Python Scripts used are presented in Appendix 6: Python Scripts.

Database

All ROV data reside in a master MS SQL database (PacGFVideo) maintained at the Pacific Biological Station (Lynne Yamanaka, custodian). Data are also managed in ArcGIS geodatabases.

Detailed information about the database fields and structure are presented in Appendix 7: PacGFVideo.mdb database organization.

Results

This report details data collected on 7 research cruises that took place from 2009-2011 (Figure 1). We completed 424 transects (205 transects were inside the RCAs, and 219 were adjacent to the RCAs). Most of these transects were completed successfully and deemed usable, but few transects were not. Reasons for aborted transects include too strong a current, high winds, and equipment failures. The usability of these aborted transects has not been investigated nor rationalized.

Seven RCAs were sampled twice, two RCAs were sampled three times, and one RCA was sampled five times (Table 4). Two trips were also completed in the RCA 'Departure Bay' however Trip 111 was for training.

Although we did one ROV trip in the Broken Island Group RCA, it did not have very much rocky habitat. Most of the rocky habitat in the Broken Group Islands is too shallow to sample with an ROV from the Vector.

Twenty three RCAs sampled are in the Strait of Georgia, nine are in Johnstone Strait, six are in Queen Charlotte Strait, and nine are on the WCVI.

RCAs had been closed between 3 to 7 years at time of sampling (Table 4).

The locations of transects with respect to the RCAs are shown on Figure 3 to Figure 8. The latitude and longitude of the start point of each transect are found in Appendix 1 – Appendix Table A. The start date, length (in minutes) and comments about each transect are in Appendix 1 – Appendix Table B.

We collected fish data on 44 RCAs (Table 5). Unidentified rockfish (*Sebastes spp.*) were the most abundant taxa of fish observed on all of the transects. These were mostly juvenile rockfish which could not be identified to species. Of the fishes that were identifiable, Quillback Rockfish (*S. maliger*) were the most commonly observed fish species (3,069) (Table 5). The ROV data set also contains information on 27,124 invertebrates. Unidentified starfish, Giant Red Sea Cucumber (P*arastichopus californicus*) and Plumose Anemone (*Metridium sp*.) were the most often counted invertebrates on the transects (Table 5). Invertebrates were not the focus of the survey so data on invertebrates is not comprehensive in terms of the species presence or abundance.

Discussion

We collected valuable data on Inshore Rockfish abundance and habitat use with an ROV. ROV surveys are an effective way to monitor inshore rockfish in RCAs. Unlike longline or other fishing surveys, ROVs concurrently collect habitat and fish data and are non-extractive, which are both important factors when monitoring conservation areas (Field et al. 2006, Stoner et al. 2008). ROV surveys do, however, require great technical expertise during field work as well to processes tracking data and reviewing videos after the surveys.

The RCAs had been closed to fishing for between 3 to 7 years when we sampled them. Because inshore rockfish are very long lived, are slow to mature, and have sporadic recruitment success (Love et al. 2002), it is expected that RCAs may take upwards of 20 years before significant changes in response variables are evident (Starr et al. 2015). It is important to monitor RCAs to gain an understanding of which areas may be over-and under-performing so that they can be adaptively managed (Hamilton et al. 2010, White et al. 2011). Assessing the performance of spatial management is also important for gaining and maintaining stakeholder support. In a survey about attitudes towards the RCAs, it was found that commercial, recreational and First Nations fishers all felt strongly that the RCAs should be monitored (Haggarty 2014). We have provided details of our data collection process so that these ROV data can be used as initial conditions and compared to on future surveys. Detailed analyses of these data are presented in (Haggarty 2015 and Haggarty et al. 2016).

Acknowledgements

We would like to thank the conscientious work of the captains and crews of the Vector and Neocaligus, our ROV pilots: Jonathan Martin, Andy Clark, and Josh Chernov; and the ROV field crews and operations set-up: Karina Cooke, James Pegg, Wolfgang Carolsfeld, George Cronkite, Jen Paton, Jen Tyler, and Janine Beckett. Other ROV video analysis was done at Archipelago Marine Research by J. Paton, J. Tyler, S. Buchanan, J. Reynolds, and M. Elfert. Transect cleaning and mapping work was done by John Ziemanski at Coastal Resources Mapping and Don Neumann at Integrated Information Systems. We also thank reviewers Sarah Davies and Chris Grandin for their thoughtful comments which improved the manuscript.

Table 1. Dates, vessels, and description of the ROV trips. See Appendix Tables A and B for full information about the ROV trips.

TRIP ID	START DATE	END DATE	VESSEL	DESCRIPTION
109	27-Feb-2009	10-Mar-2009	Vector	RCA Site ROV Research Feb
110	05-Nov-2009	28-Nov-2009	Vector	RCA in/out ROV Research Nov (Vector065)
111	05-Jan-2010	15-Jan-2010	Neocaligus	Experimental ROV and Longline (Neo04) (T19-31)
112	04-Mar-2010	12-Mar-2010	Neocaligus	Experimental ROV and Longline (Neo11) (T1-12,14-16)
113	09-Aug-2010	17-Aug-2010	Vector	RCA in/out ROV Research Aug (Vector058) J. Strait
114	03-Mar-2011	15-Mar-2011	Vector	RCA in/out ROV Research Mar (Vector013) WCVIS
115	22-Jun-2011	12-Jul-2011	Vector	RCA in/out ROV Research Jun (Vector033) WCVIN

Table 2. Habitat along ROV transects are classified into the following categories, Combined habitat with blank entries were not used in the analysis.

Substrate (PS)	Substrate Type	Substrate Description	Combined Habitat
1	Artificial	Pilings, tires, ships, etc.	
2	Hardpan	Sandstone	Rock
3	Bedrock	Bedrock	Rock
4	Boulder	Rocks > 25cm diameter	Rock
5	Cobble	Rocks 6 - 25cm	Mixed Coarse
6	Mixed coarse	Cobble/gravel/shell	Mixed Coarse
7	Gravel	Small rocks and pebbles 0.75 - 6cm	Mixed Coarse
8	Sand	Includes sand/shell	Mixed Fine
9	Mud	Includes mud/shell	Mixed Fine
Biocover (PB)	**Biocover Type**	**Biocover Description**	
1	Bare	<10% cover	Bare
2	Kelp	Kelp	Emergent
3	Ulva	Ulva	
4	Other algae	Other algae	
5	Algal mat	Algal mat	
6	Scallops	Scallops	Encrusting
7	Barnacles	Barnacles	Encrusting
8	Anemones	Mainly Metridium	Emergent
9	Encrusting organisms	Psolus sp., barnacles, hydroids, bryozoans, anemones	Encrusting
10	Eelgrass	Eelgrass	
11	Ophiuroids	Ophiuroids	
12	Tube worms, empty tubes	Tube worms, empty tubes	Encrusting
13	Debris, detritus	Debris, detritus	
14	Sea pens/sea whips/sea lilies	Sea pens/whips/lilies	Emergent
15	Sponges	Sponges	Emergent
16	Sea pens	Sea pens	Emergent
17	Sea whips	Sea whips	Emergent
18	Sea lilies	Sea lilies	Emergent
99	Unknown	Unknown	
Relief (RL)	**Relief Type**	**Relief Description**	
1	None	Flat or rolling	Low
2	Low	Vertical relief 0.5 - 2m	Low
3	High	Vertical relief > 2m	High
4	Steep	Slope or wall	High
Complexity (CX)	**Complexity Name**	**Complexity Description**	
1	Simple	Flat, rolling with no crevices	Low
2	Low	Very few crevices	Low
3	Medium	More than a few but not lots of crevices	High
4	High	Multiple crevices	High

Biocover Thickness (BT)	Description-Cover	Biocover Thickness (BT)	Description-Cover
1	0 - 25 %	3	51 - 75 %
2	26 - 50 %	4	76 - 100 %

Table 3. Transect indicator codes used in the AVLog Software.

Code	Indicator
1	Time code set
2	Transect start
3	Transect end
4	Substrate codes set (habitat observation)
5	Species event (observation)
6	ROV On bottom
7	ROV Off bottom
8	Shutdown (video review software)
9	Video stream missing
10	Field of view recorded

Table 4. RCAs sampled by region (Strait of Georgia (SG), Johnstone Strait (JS), Queen Charlotte Strait (QCST), and West Coast of Vancouver Island (WCVI)), including years and months sampled, age of RCA at time of sampling, the number of transects completed inside and outside the RCAs, and the number of transects with a fish count. In bold are RCAs with a fish count inside and/or outside the RCAs. Transects completed outside of RCAs marked with an asterisk (*) indicates they were paired with a longline set.

RCA name	Region	Trip ID	Sampled in		RCA age	# Transect completed		# Transect with fish count	
			Year	Months		In	Out	In	Out
Ballenas Island	SG	111	2010	January	6	3	2*	3	2
Bate - Shadwell Passage	QCST	115	2011	June	5	3	3	3	3
Bedwell Sound	WCVI	114	2011	March	7	5	5	5	5
Bolivar Passage	QCST	115	2011	June	5	6	4	6	4
Brethour,Domville,Forrest,Gooch Islands	SG	109	2009	February-March	3	6	3	6	3
Brethour,Domville,Forrest,Gooch Islands	SG	110	2009	November	3	6	4	6	4
Brethour,Domville,Forrest,Gooch Islands	SG	114	2011	March	5	2	2	2	2
Broken Islands Group	WCVI	114	2011	March	7	1	13	1	13
Brooks Bay	WCVI	115	2011	June	7	6	7	6	7
Browning Passage - Hunt Rock	QCST	115	2011	June	5	5	5	5	5
Chancellor Inlet West	JS	113	2010	August	4	2	2*	2	2
Checleset Bay	WCVI	115	2011	June	6	10	11	10	11
Coal Island	SG	109	2009	February-March	3	0	1	0	1
D'Arcy Island to Beaumont Shoal	SG	110	2009	November	3	3	3	3	3
Davie Bay	SG	111	2010	January	4	0	2*	0	0
Departure Bay	SG	111	201	January	4	0	1*	0	0
Departure Bay	SG	112	2010	March	4	0	4*	0	4
Desolation Sound	SG	110	2009	November	3	13	11	13	11
Desolation Sound	SG	111	2010	January	4	0	5*	0	0
Dickson - Polkinghorne Islands	JS	113	2010	August	4	2	2*	2	2
Dinner Rock	SG	110	2009	November	3	4	3	4	3
Domett Point	SG	109	2009	February-March	3	3	2	3	2
Eden-Bonwick-Midsummer-Swanson Islands	JS	113	2010	August	4	0	1*	0	1
Estevan Point	WCVI	114	2011	March	6	0	3	0	3
Folger Passage	WCVI	114	2011	March	7	6	5	6	5
Goletas Channel	QCST	115	2011	June	7	2	2	2	2
Halibut Bank	SG	109	2009	February-March	3	4	4	4	4
Halibut Bank	SG	110	2009	November	3	6	5	6	5
Hardy Bay - Five Fathom Rock	QCST	115	2011	June	5	0	2	0	2
Hardy Island	SG	110	2009	November	3	3	2	2	2
Lower Clio Channel	JS	113	2010	August	4	2	2*	2	2
McCall Bank	SG	109	2009	February-March	3	4	0	4	0
Nanoose - Schooner Cove	SG	111	2010	January	4	1	0	1	0
Nanoose - Schooner Cove	SG	112	2010	March	4	1	15*	1	0
Northumberland Channel	SG	109	2009	February-March	3	3	3	3	3

RCA name	Region	Trip ID	Sampled in		RCA age	# Transect completed		# Transect with fish count	
			Year	Months		In	Out	In	Out
Northumberland Channel	SG	110	2009	November	3	3	3	3	3
Northumberland Channel	SG	111	2010	January	4	3	3	3	3
Northumberland Channel	SG	112	2010	March	4	7	5	7	5
Northumberland Channel	SG	113	2010	August	4	0	1	0	1
Octopus Islands to Hoskyn Channel	JS	113	2010	August	4	1	2*	1	2
Pam Rock	SG	109	2009	February-March	5	6	2	6	2
Prevost Island North	SG	110	2009	November	3	7	5	7	5
Read - Cortes Islands	JS	113	2010	August	4	2	2*	2	2
Sabine Channel-Jervis-Jedediah Islands	SG	110	2009	November	3	3	3	3	3
Sabine Channel-Jervis-Jedediah Islands	SG	111	2010	January	4	1	0	0	0
Saltspring Island North	SG	109	2009	February-March	5	4	0	4	0
Saltspring Island North	SG	110	2009	November	5	4	0	4	0
Saranac Island	WCVI	114	2011	March	7	4	6	4	6
Scott Islands	WCVI	115	2011	June	7	10	12	10	12
Shelter Bay	QCST	115	2011	June	5	2	2	2	2
Skookumchuck Narrows	SG	110	2009	November	3	0	1	0	1
Teakerne Arm	SG	111	2010	January	6	1	2*	0	0
Thurston Bay	JS	113	2010	August	6	3	2	3	2
Topknot	WCVI	115	2011	June	7	5	7	5	7
Trincomali Channel	SG	109	2009	February-March	3	10	4	10	3
Trincomali Channel	SG	110	2009	November	3	11	5	11	5
Valdes Island East	SG	110	2009	November	3	3	3	3	3
Valdes Island East	SG	111	2010	January	4	2	4	2	2
Viscount Island	JS	113	2010	August	4	1	3*	1	3
Walken Island to Hemming Bay	JS	113	2010	August	4	0	1*	0	1

Table 5. Number of species recorded on ROV transects by scientific name, common name, DFO species code, and number of individuals counted. Note that not all invertebrate species were recorded and that the number of invertebrates counted is not comprehensive.

Scientific name	Common name	Species code	Count
Fish			**44,468**
Agonidae	Poachers	546	429
Agonopsis vulsa	Northern Spearnose Poacher	549	4
Ammodytidae	Sand Lances	360	2
Anarrhichthys ocellatus	Wolf Eel	351	7
Bathymasteridae	Ronquils	317	50
Brosmophycis marginata	Red Brotula	230	1
Chirolophis decoratus	Decorated Warbonnet	332	15
Chirolophis nugator	Mosshead Warbonnet	333	1
Citharichthys stigmaeus	Speckled Sanddab	598	1
Clupea pallasii	Pacific Herring	096	89
Cottidae	Sculpins	472	294
Cyclopteridae	Lumpfishes And Snailfishes	568	1
Cymatogaster aggregata	Shiner Perch	304	1,830
Dasycottus setiger	Spinyhead Sculpin	497	2
Embiotocidae	Surfperches	298	36
Enophrys bison	Buffalo Sculpin	499	9
Eopsetta jordani	Petrale Sole	607	1
Gadidae	Codfishes	221	2,198
Gadus macrocephalus	Pacific Cod	222	135
Glyptocephalus zachirus	Rex Sole	610	29
Gobiidae	Gobies	362	5
Hemilepidotus hemilepidotus	Red Irish Lord	502	13
Hemilepidotus spinosus	Brown Irish Lord	504	3
Hexagrammidae	Greenlings	459	22
Hexagrammos decagrammus	Kelp Greenling	461	1,158
Hexagrammos stelleri	Whitespotted Greenling	466	3
Hippoglossus stenolepis	Pacific Halibut	614	21
Hydrolagus colliei	Spotted ratfish	066	2,855
Hyperprosopon argenteum	Walleye Surfperch	307	3
Icelinus borealis	Northern Sculpin	507	1
Icelinus filamentosus	Threadfin Sculpin	510	1
Isopsetta isolepis	Butter Sole	619	1
Jordania zonope	Longfin Sculpin	516	1
Lepidopsetta bilineata	Southern Rock Sole	621	153
Leptocottus armatus	Pacific Staghorn Sculpin	518	1
Limanda aspera	Yellowfin Sole	623	1
Liparidae	Snailfishes	578	4
Liparis callyodon	Spotted Snailfish	579	1
Lipariscus nanus	Pygmy Snailfish	589	313
Lumpenus sagitta	Snake Prickleback	337	122
Lycodes pacificus	Blackbelly Eelpout	245	5

Scientific name	Common name	Species code	Count
Lyopsetta exilis	Slender Sole	625	12
Malacocottus kincaidi	Blackfin Sculpin	519	4
Merluccius productus	Pacific Hake	225	125
Microgadus proximus	Pacific Tomcod	226	11
Microstomus pacificus	Dover Sole	626	162
Myoxocephalus polyacanthocephalus	Great Sculpin	521	46
Myxinidae	Hagfishes	016	1
Nautichthys oculofasciatus	Sailfin Sculpin	522	7
Odontopyxis trispinosa	Pygmy Poacher	564	1
Ophiodon elongatus	Lingcod	467	879
Osmeridae	Smelts	136	11
Parophrys vetulus	English Sole	628	41
Percidae	Perches	782	6
Petromyzontidae	Lampreys	019	1
Platichthys stellatus	Starry Flounder	631	2
Pleuronectiformes	Flatfishes	597	1,706
Podothecus accipenserinus	Sturgeon Poacher	550	9
Porichthys notatus	Plainfin Midshipman	207	10
Raja binoculata	Big Skate	056	4
Raja rhina	Longnose Skate	059	11
Rajidae	Skates	051	9
Reinhardtius stomias	Arrowtooth Flounder	602	2
Rhacochilus vacca	Pile Perch	312	186
Rhinogobiops nicholsii	Blackeye Goby	365	2
Ronquilus jordani	Northern Ronquil	319	26
Ruscarius meanyi	Puget Sound Sculpin	483	3
Salmonidae	Salmonids	106	4
Scorpaenichthys marmoratus	Cabezon	540	11
Sebastes brevispinis	Silvergray Rockfish	405	96
Sebastes caurinus	Copper Rockfish	407	352
Sebastes crameri	Darkblotched Rockfish	410	15
Sebastes diploproa	Splitnose Rockfish	412	20
Sebastes elongatus	Greenstriped Rockfish	414	779
Sebastes emphaeus	Puget Sound Rockfish	415	2,405
Sebastes entomelas	Widow Rockfish	417	201
Sebastes flavidus	Yellowtail Rockfish	418	1,051
Sebastes helvomaculatus	Rosethorn Rockfish	421	452
Sebastes maliger	Quillback Rockfish	424	3,069
Sebastes melanops	Black Rockfish	426	89
Sebastes miniatus	Vermilion Rockfish	428	151
Sebastes mystinus	Blue Rockfish	429	89
Sebastes nebulosus	China Rockfish	431	530
Sebastes nigrocinctus	Tiger Rockfish	433	177
Sebastes paucispinis	Bocaccio	435	4
Sebastes pinniger	Canary Rockfish	437	928

Scientific name	Common name	Species code	Count
Sebastes proriger	Redstripe Rockfish	439	69
Sebastes ruberrimus	Yelloweye Rockfish	442	810
Sebastes variegatus	Harlequin Rockfish	446	3
Sebastes wilsoni	Pygmy Rockfish	448	36
Sebastes zacentrus	Sharpchin Rockfish	450	262
Sebastes	Rockfishes	389	14,989
Sebastolobus alascanus	Shortspine Thornyhead	451	1
Squalus suckleyi	North Pacific Spiny Dogfish	044	17
Stichaeidae	Pricklebacks	324	83
Syngnathidae	Pipefishes	277	1
Theragra chalcogramma	Walleye Pollock	228	1,288
Unknown fish	Unknown Fish	015	1,969
Zoarcidae	Eelpouts	231	1,419
Invertebrates			**27,124**
Actiniaria	Anemone	3L0	117
Aeolidiidae	Aeolid Nudibranchs	56B	8
Anthopleura	Aggregating Sea Anemones	3L2	350
Aoridae	Benthic Amphipoda	OFA	1
Ascidiacea	Ascidians And Tunicates	8AB	2
Asteroidea	Starfish	4GA	6,876
Balanophyllia	Cup Coral	3J3	2
Balanophyllia elegans	Orange Cup Coral	3J4	1
Balticina septentrionalis	Sea Whip	3U2	327
Bivalvia	Bivalve Molluscs	60A	13
Brachiopoda	Lampshells	2QA	10
Brachyura	True Crabs	WAA	11
Calcarea	Calcareous Sponges	2A1	44
Cancer productus	Red Rock Crab	XLA	12
Cancridae	Cancer Crabs	XKA	10
Cephalopoda	Cephalopods	91A	3
Ceramaster patagonicus	Cookie Star	4JG	29
Chionoecetes	Tanner Crabs	ZAD	48
Chlamys hastata	Spiny Scallop	67C	182
Cirripedia	Barnacles	HCA	36
Crinoidea	Sea Lilies And Feather Stars	4AB	1,217
Crossaster papposus	Rose Starfish	4TG	1
Ctenodiscus crispatus	Mud Star	4HC	6
Decapoda	Decapods	SAA	1
Demospongiae	Bath Sponges	2Q0	42
Dendrobranchiata	Shrimp	SAB	141
Dermasterias imbricata	Leather Star	4OC	3
Doridiidae	Sea Lemon	51F	1
Echinacea	Sea Urchins	6AB	31
Enteroctopus dofleini	Giant Pacific Octopus	98E	29
Epizoanthus scotinus	Orange Zoanthid	3P3	5

Scientific name	Common name	Species code	Count
Euphausiacea	Euphausiids	RAB	5
Euryalina	Basket Stars	5QA	317
Euspira lewisii	Lewis Moonsnail	27F	1
Evasterias troschelii	Mottled Star	4YE	7
Fusitriton oregonensis	Oregontriton	28I	2
Gorgonacea	Gorgonian Corals	3S0	1,133
Henricia leviuscula annectens	Blood Star	4QE	15
Henricia sanguinolenta	Northern Henricia	4QH	1
Hexactinellida	Glass Sponges	2I0	1,364
Hydrozoa	Hydroid	3A2	37
Lithodes	King Crab	VMB	1
Lithodidae	Deep Sea Crabs	VIA	4
Lithodinae	Deep Sea Crabs	VLA	2
Lopholithodes	Box Crabs	VMH	22
Luidia foliolata	Sand Star	4GD	21
Mediaster aequalis	Vermillion Starfish	4JD	169
Metacarcinus magister	Dungeness Crab	XKG	29
Metridium	Plumose Anemone	3M8	2,441
Munida quadrispina	Squat Lobster	VSA	1,381
Nudibranchia	Seaslugs	51A	112
Octopoda	Octopus	97A	47
Ophiuroidea	Brittle Star	5AA	1
Oregonia gracilis	Graceful Decorator Crab	ZCA	1
Orthasterias koehleri	Long-Armed Sea Star	4YB	4
Oxyrhyncha	Spider Crabs	ZAA	1
Pachycerianthus fimbriatus	Tubedwelling Anemone	3O7	367
Paguridae	Right-Handed Hermits	VAC	21
Palaeotaxodonta	Sub-class of Bivalves	60B	29
Pandalidae	Pandalid Shrimp	SBA	2
Pandalus platyceros	Prawn	SDF	532
Paragorgia pacifica	Bubblegum Coral	3S7	9
Parastichopus californicus	Giant Red Sea Cucumber	6OB	6,624
Parastichopus leukothele	Whitespotted Sea Cucumber	6OC	1
Pectinidae	Scallop	67B	41
Pennatulacea	Sea Pens	3U0	617
Phrynophiurida	Basket Stars	5AB	17
Pisaster brevispinus	Pink Short-Spined Star	4ZC	89
Porifera	Sponges	2A0	20
Psolus chitinoides	Armoured Sea Cucumber	6QC	6
Pteraster tesselatus	Cushion Star	4UH	5
Pterasteridae	Sea Stars - order Velatida	4UE	1
Ptilosarcus gurneyi	Sea Pen	3U5	51
Pycnopodia helianthoides	Sunflower Starfish	4XE	541
Rossia pacifica	Pacific Bobtail Squid	91G	7
Scleractinia	Stony Corals	3J2	999

Scientific name	Common name	Species code	Count
Sedentaria	Tube Worms	0FA	41
Solaster dawsoni	Morning Sun Starfish	4TB	3
Solaster stimpsoni	Striped Sun Starfish	4TC	9
Solasteridae	Sun Stars	4TA	3
Stichopodidae	Sea Cucumbers	6OA	25
Strongylocentrotus droebachiensis	Green Sea Urchin	6BB	37
Strongylocentrotus franciscanus	Red Sea Urchin	6BC	30
Strongylocentrotus purpuratus	Purple Sea Urchin	6BD	276
Teuthida	Squids	92A	4
Tresus	Horse Clam	76D	2
Virgularia	Octocorals	3V0	36
Zoanthidea	Order of Cnidarians	3P0	2

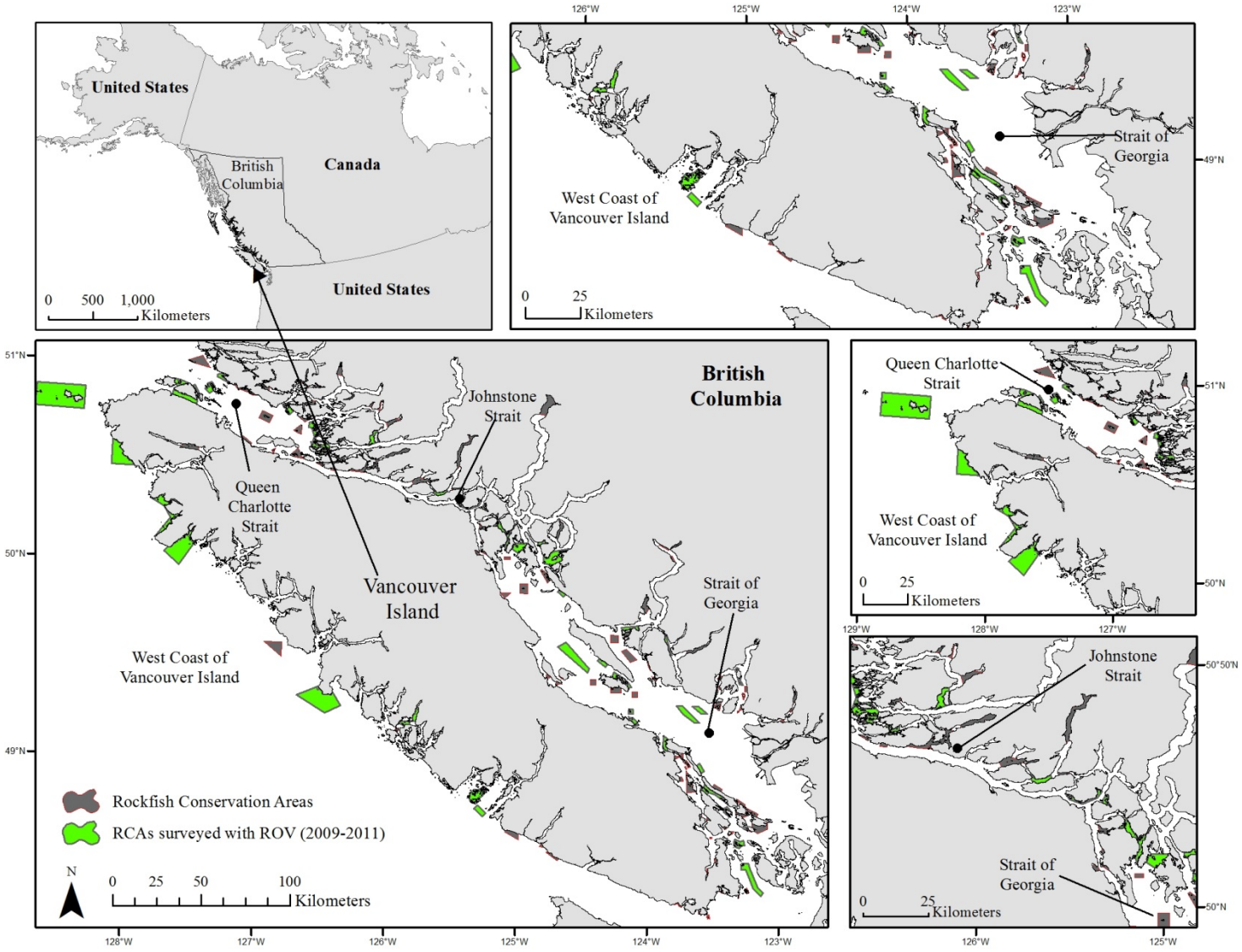

Figure 1. RCAs in Southern British Columbia that were sampled using an ROV between 2009 and 2011.

Figure 2. Example of video being reviewed in AVLog.

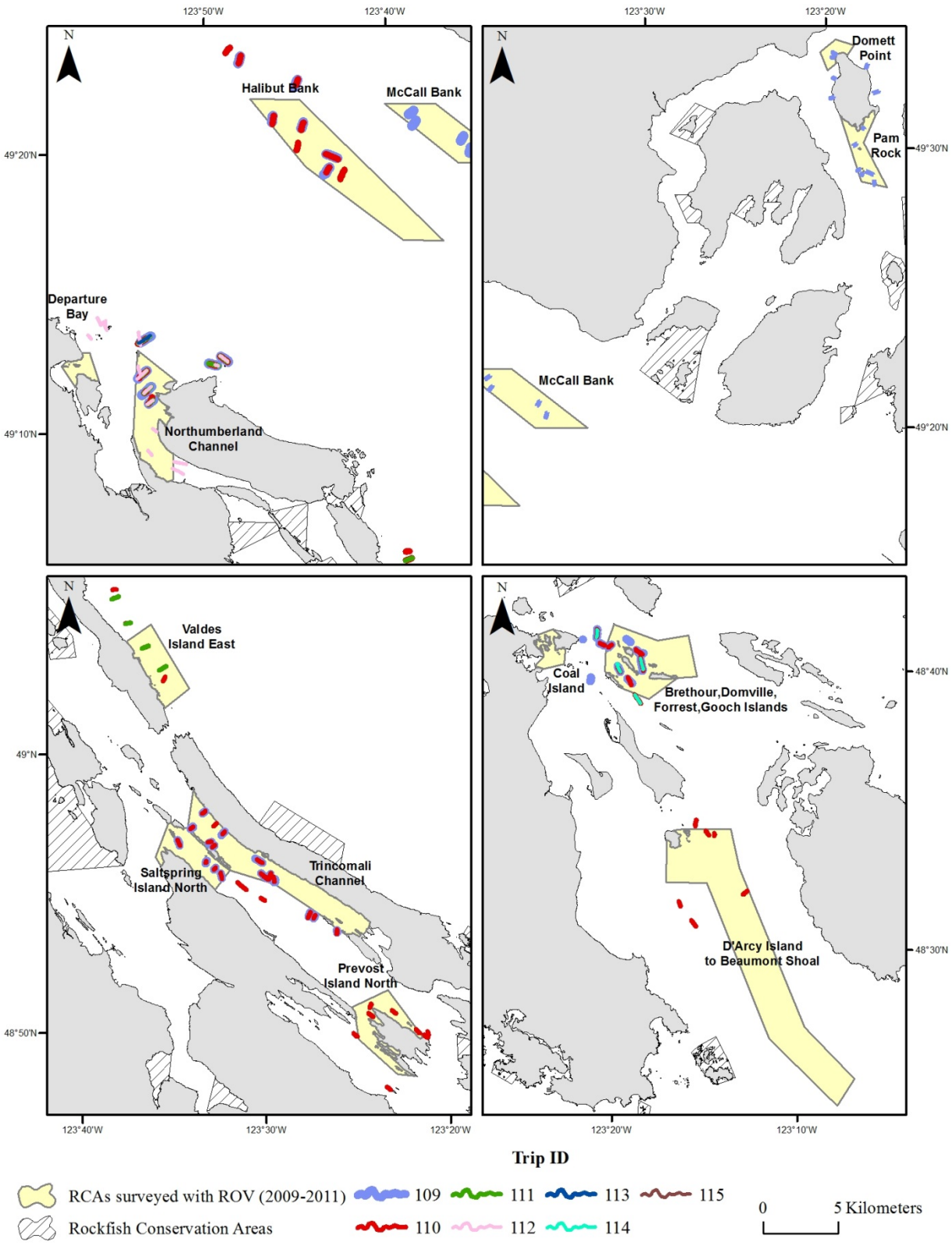

Figure 3. Locations of ROV transects in the Southern Strait of Georgia.

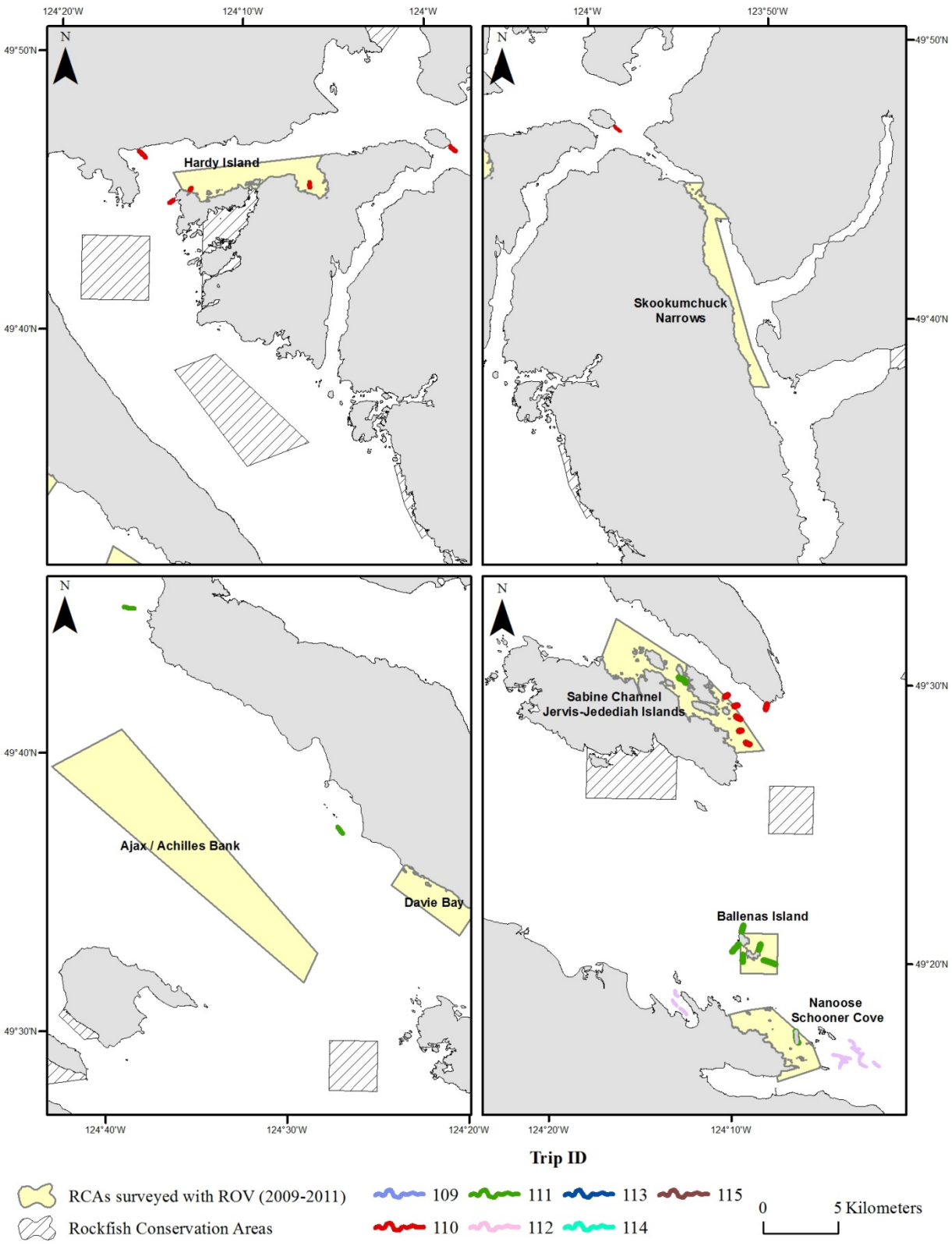

Figure 4. Locations of ROV transects in the Northern Strait of Georgia.

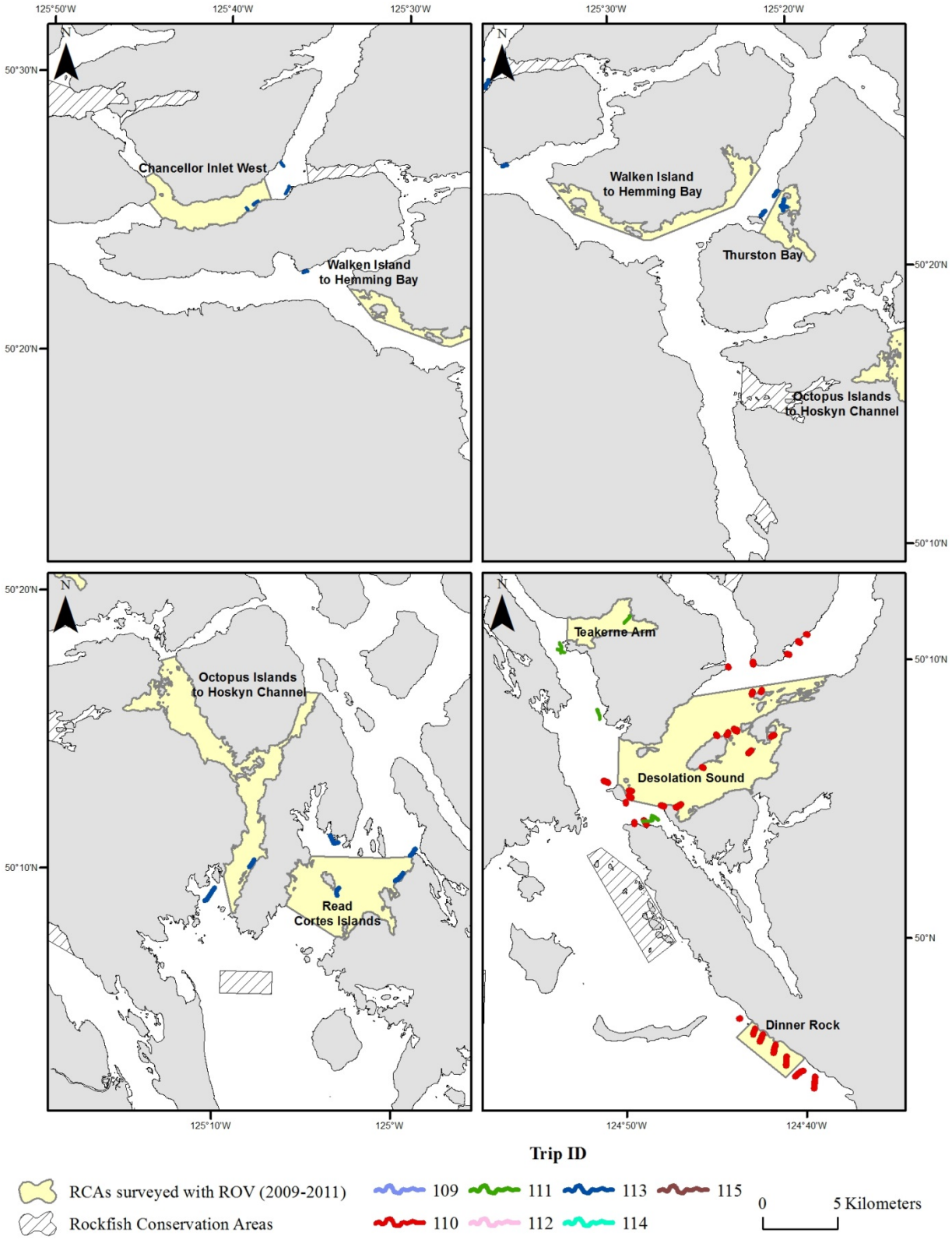

Figure 5. Locations of ROV transects in the Northern Strait of Georgia and Johnstone Strait.

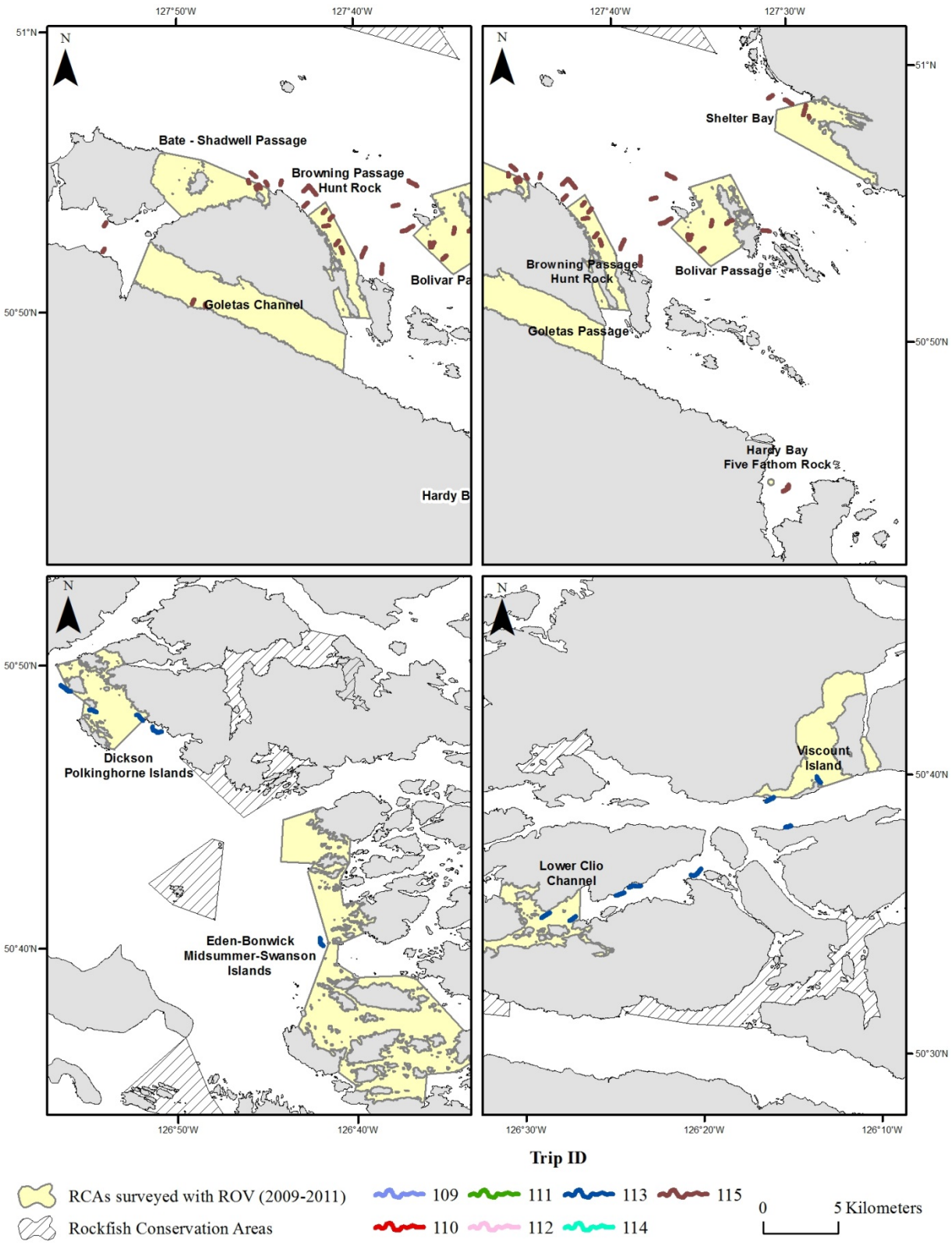

Figure 6. Locations of ROV transects in Johnstone Strait and Queen Charlotte Strait.

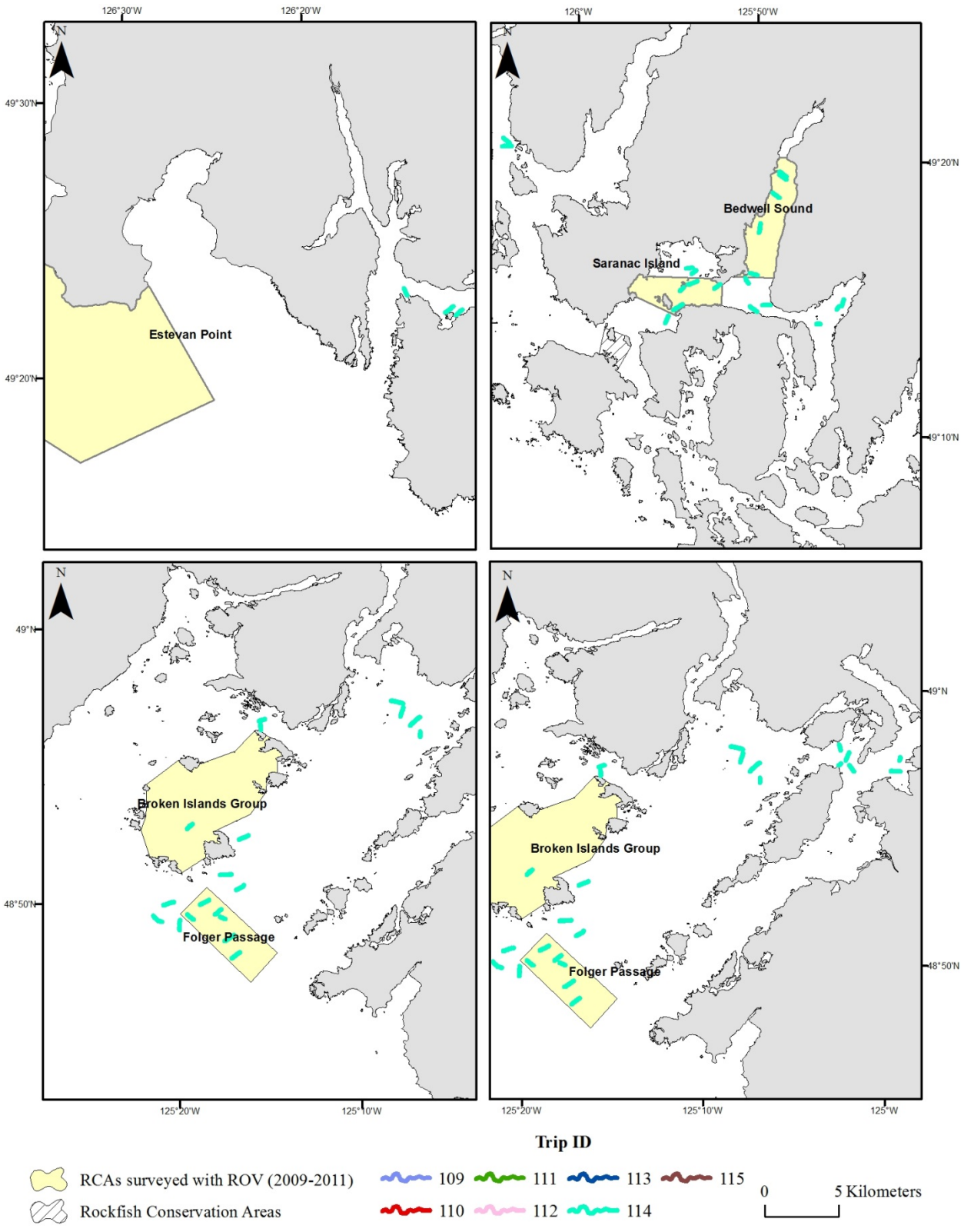

Figure 7. Locations of ROV transects on the West Coast of Vancouver Island.

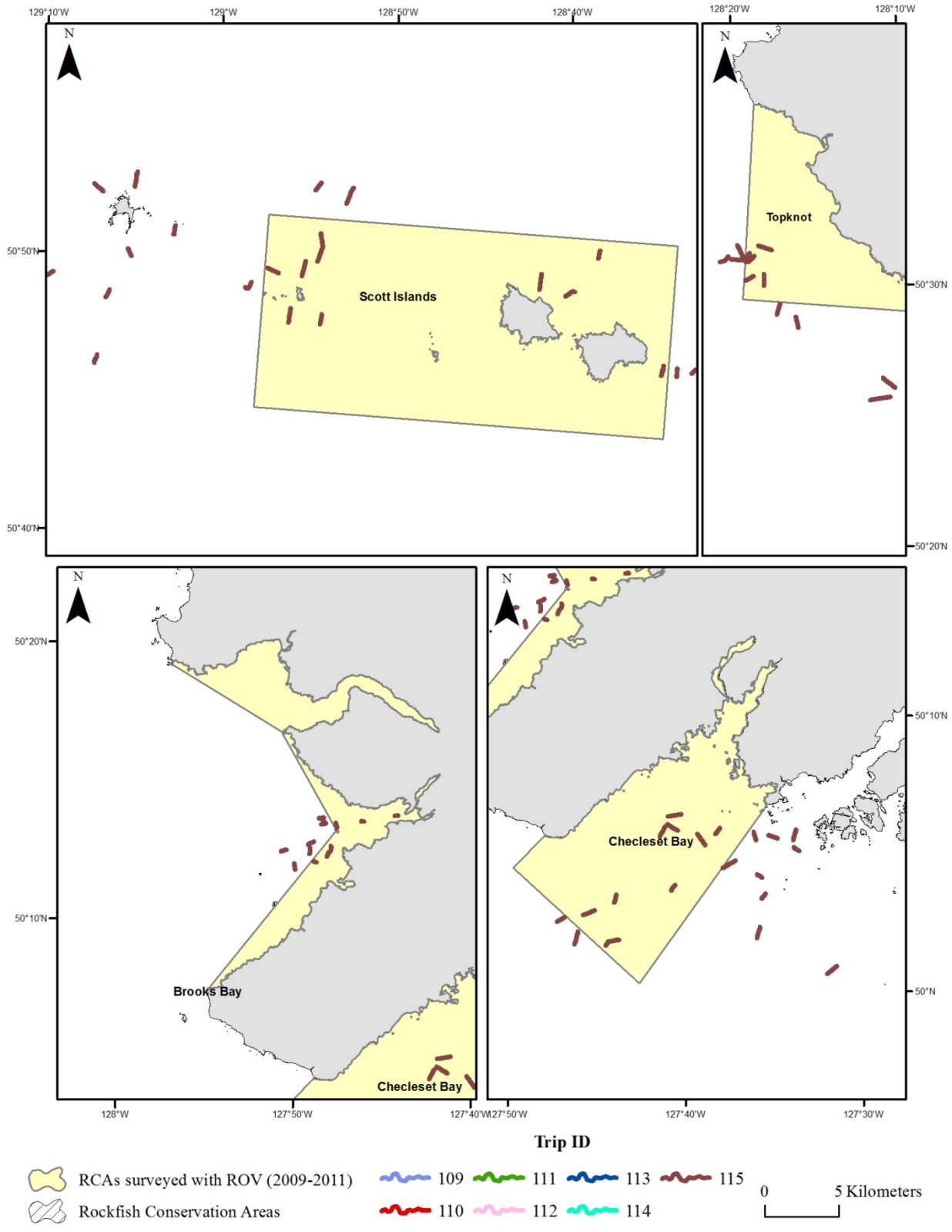

Figure 8. Locations of ROV transects on the West Coast of Vancouver Island.

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Appendix 1. Detailed survey planning

Appendix Table A. Latitude and longitude of the start and end of each ROV transect. Latitude and longitude were calculated from the trackline data using ArcGIS.

Trip ID	Event ID	Transect	RCA	Distance To RCA	RCA Name	Start Latitude	Start Longitude	End Latitude	End Longitude
109	336	1	Out	796.3	Brethour,Domville,Forrest,Gooch Islands	48.691320	-123.348378	48.686400	-123.348838
109	337	2	Out	163.3	Brethour,Domville,Forrest,Gooch Islands	48.683102	-123.346758	48.681621	-123.342240
109	338	3	In	0.0	Brethour,Domville,Forrest,Gooch Islands	48.680393	-123.338199	48.682122	-123.335282
109	339	4	Out	1321.3	Coal Island	48.685363	-123.361583	48.685097	-123.360867
109	340	5	In	0.0	Brethour,Domville,Forrest,Gooch Islands	48.662050	-123.320819	48.658846	-123.316308
109	341	6	In	0.0	Brethour,Domville,Forrest,Gooch Islands	48.674047	-123.309079	48.666439	-123.307420
109	342	7	In	0.0	Brethour,Domville,Forrest,Gooch Islands	48.679095	-123.312757	48.677125	-123.306303
109	343	8	In	0.0	Brethour,Domville,Forrest,Gooch Islands	48.685726	-123.322465	48.683617	-123.318416
109	344	9	Out	1002.0	Brethour,Domville,Forrest,Gooch Islands	48.660719	-123.353903	48.662737	-123.353775
109	345	10	In	0.0	Brethour,Domville,Forrest,Gooch Islands	48.669628	-123.330122	48.665703	-123.327007
109	346	11	Out	81.9	Trincomali Channel	48.896227	-123.437318	48.894560	-123.437308
109	347	12	Out	228.1	Trincomali Channel	48.906671	-123.461778	48.904175	-123.463572
109	348	13	Out	192.2	Trincomali Channel	48.905051	-123.457087	48.903047	-123.458793
109	349	14	In	0.0	Trincomali Channel	48.929865	-123.506620	48.927081	-123.501791
109	350	15	In	0.0	Trincomali Channel	48.929842	-123.497974	48.926566	-123.499449
109	351	16	In	0.0	Trincomali Channel	48.947318	-123.553659	48.948508	-123.551847
109	352	17	In	0.0	Trincomali Channel	48.945529	-123.550706	48.946415	-123.549053
109	353	18	In	0.0	Trincomali Channel	48.957633	-123.569255	48.956220	-123.571341
109	354	19	In	0.0	Trincomali Channel	48.956151	-123.570907	48.957354	-123.568382
109	355	20	In	0.0	Trincomali Channel	48.965457	-123.560389	48.966905	-123.557793
109	356	21	In	0.0	Trincomali Channel	48.954834	-123.539812	48.952598	-123.542980
109	357	22	In	0.0	Trincomali Channel	48.938861	-123.512362	48.936166	-123.505311
109	358	23	In	0.0	Saltspring Island North	48.949481	-123.582791	48.946212	-123.580797
109	359	24	In	0.0	Saltspring Island North	48.937344	-123.556088	48.935659	-123.557147
109	360	25	In	0.0	Saltspring Island North	48.931931	-123.549593	48.933065	-123.547798
109	361	26	In	0.0	Saltspring Island North	48.929956	-123.543519	48.926646	-123.542161
109	362	27	In	0.0	Trincomali Channel	48.926728	-123.494830	48.924617	-123.494658
109	363	28	Out	1198.9	Trincomali Channel	Not documented			
109	364	29	Out	3370.8	Northumberland Channel	49.214392	-123.814186	49.211114	-123.807310
109	365	30	Out	2434.1	Northumberland Channel	49.210151	-123.825318	49.208803	-123.817130

Trip ID	Event ID	Transect	RCA	Distance To RCA	RCA Name	Start Latitude	Start Longitude	End Latitude	End Longitude
109	366	31	In	0.0	Northumberland Channel	49.185625	-123.879924	49.187772	-123.875362
109	367	32	In	0.0	Northumberland Channel	49.190746	-123.885810	49.195808	-123.877429
109	368	33	In	0.0	Northumberland Channel	49.200413	-123.890003	49.205407	-123.881693
109	369	34	In	0.0	Halibut Bank	49.328247	-123.716548	49.323736	-123.721624
109	370	35	In	0.0	Halibut Bank	49.358580	-123.768997	49.354555	-123.769939
109	371	36	In	0.0	Halibut Bank	49.355002	-123.740859	49.351249	-123.742856
109	372	37	Out	2517.2	Halibut Bank	49.394011	-123.799386	49.389751	-123.801245
109	373	38	Out	5460.5	Halibut Bank	49.417428	-123.792413	49.419186	-123.787906
109	374	39	In	0.0	Pam Rock	49.481248	-123.288714	49.477943	-123.287551
109	375	40	In	0.0	Pam Rock	49.486379	-123.296146	49.484248	-123.288852
109	376	41	In	0.0	Pam Rock	49.501238	-123.308035	49.502891	-123.304657
109	377	42	In	0.0	Pam Rock	49.512154	-123.298609	49.511276	-123.297536
109	378	43	Out	1158.4	Pam Rock	49.532964	-123.289804	49.534151	-123.284686
109	379	44	Out	1450.2	Domett Point	49.550371	-123.294874	49.548234	-123.296108
109	380	45	Out	1305.6	Pam Rock	49.529871	-123.329068	49.530666	-123.325884
109	381	46	Out	583.2	Domett Point	49.542398	-123.326982	49.541155	-123.324412
109	382	47	In	0.0	Domett Point	49.557377	-123.326800	49.556413	-123.324263
109	383	48	In	0.0	Domett Point	49.554372	-123.327636	49.554176	-123.324741
109	384	49	In	0.0	Domett Point	49.555843	-123.326069	49.555371	-123.324284
109	385	50	Out	28.4	Pam Rock	49.486799	-123.304050	49.486830	-123.303805
109	385	50	In	0.0	Pam Rock	49.486831	-123.303805	49.487464	-123.300915
109	386	51	In	0.0	Pam Rock	49.485393	-123.299289	49.483312	-123.300264
109	387	52	Out	5444.9	Halibut Bank	49.419693	-123.807757	49.415777	-123.808614
109	388	53	Out	809.7	Halibut Bank	49.380531	-123.746607	49.375617	-123.749657
109	389	54	In	0.0	Halibut Bank	49.336121	-123.719681	49.333715	-123.709275
109	390	55	In	0.0	McCall Bank	49.360137	-123.644610	49.362626	-123.639770
109	391	56	In	0.0	McCall Bank	49.356748	-123.637621	49.353395	-123.641288
109	392	57	In	0.0	McCall Bank	49.347687	-123.594111	49.344697	-123.596483
109	393	58	In	0.0	McCall Bank	49.340958	-123.587251	49.337393	-123.588738
109	394	59	Out	1202.4	Northumberland Channel	49.225600	-123.879744	49.226085	-123.878540
109	394	59	Out	549.7	Northumberland Channel	49.222051	-123.888439	49.225600	-123.879744
110	395	1	In	0.0	Trincomali Channel	48.956165	-123.571084	48.957406	-123.568390
110	396	2	In	0.0	Trincomali Channel	48.948153	-123.555228	48.948721	-123.551643
110	397	3	In	0.0	Trincomali Channel	48.945291	-123.551166	48.946498	-123.548854
110	398	4	In	0.0	Trincomali Channel	48.954747	-123.539902	48.953271	-123.541944
110	399	5	In	0.0	Trincomali Channel	48.957763	-123.550420	48.959536	-123.547444
110	400	6	In	0.0	Trincomali Channel	48.965272	-123.560978	48.967049	-123.557751
110	401	7	In	0.0	Trincomali Channel	48.927881	-123.495481	48.924749	-123.494550

Trip ID	Event ID	Transect	RCA	Distance To RCA	RCA Name	Start Latitude	Start Longitude	End Latitude	End Longitude
110	402	8	In	0.0	Trincomali Channel	48.930021	-123.497643	48.926330	-123.499392
110	403	9	In	0.0	Trincomali Channel	48.929924	-123.506756	48.926333	-123.500628
110	404	10	In	0.0	Trincomali Channel	48.938156	-123.510550	48.936088	-123.505252
110	405	11	Out	213.0	Trincomali Channel	48.906783	-123.461545	48.903330	-123.463968
110	406	12	Out	176.6	Trincomali Channel	48.905209	-123.457062	48.902984	-123.458835
110	407	13	Out	56.5	Trincomali Channel	48.896501	-123.437312	48.894009	-123.437794
110	408	14	Out	624.3	Trincomali Channel	48.924322	-123.527898	48.919980	-123.520009
110	409	15	In	0.0	Saltspring Island North	48.930062	-123.543510	48.926484	-123.542289
110	410	16	In	0.0	Saltspring Island North	48.933054	-123.548167	48.931879	-123.549607
110	411	17	In	0.0	Saltspring Island North	48.937050	-123.556651	48.935792	-123.557170
110	412	18	In	0.0	Saltspring Island North	48.949502	-123.582894	48.946073	-123.580570
110	413	19	Out	1145.5	Trincomali Channel	48.915234	-123.506862	48.913662	-123.502994
110	414	20	In	0.0	Trincomali Channel	48.929950	-123.506683	48.926321	-123.500670
110	415	21	Out	63.3	Prevost Island North	48.834646	-123.422023	48.832485	-123.418405
110	416	22	In	0.0	Prevost Island North	48.846479	-123.408614	48.845070	-123.405353
110	417	23	In	0.0	Prevost Island North	48.846490	-123.407642	48.844495	-123.404180
110	418	24	In	0.0	Prevost Island North	48.852285	-123.405782	48.849743	-123.407530
110	419	25	In	0.0	Prevost Island North	48.848601	-123.387358	48.846609	-123.383571
110	420	26	In	0.0	Prevost Island North	48.837179	-123.365214	48.834733	-123.361584
110	421	27	Out	154.7	Prevost Island North	48.834042	-123.358048	48.832174	-123.354526
110	422	28	Out	417.9	Prevost Island North	48.836063	-123.354708	48.833437	-123.353559
110	423	29	In	0.0	Brethour,Domville,Forrest,Gooch Islands	48.668935	-123.329742	48.665830	-123.327118
110	424	30	In	0.0	Brethour,Domville,Forrest,Gooch Islands	48.662842	-123.320537	48.658136	-123.317128
110	425	31	Out	84.9	Brethour,Domville,Forrest,Gooch Islands	48.652411	-123.314385	48.650464	-123.312409
110	426	32	Out	205.5	Brethour,Domville,Forrest,Gooch Islands	48.650733	-123.312455	48.647001	-123.308615
110	427	33	In	0.0	Brethour,Domville,Forrest,Gooch Islands	48.666763	-123.306587	48.666628	-123.306580
110	428	34	In	0.0	Brethour,Domville,Forrest,Gooch Islands	48.674627	-123.309355	48.666975	-123.306626
110	429	35	In	0.0	Brethour,Domville,Forrest,Gooch Islands	48.679723	-123.313308	48.676393	-123.306997
110	430	36	Out	121.9	Brethour,Domville,Forrest,Gooch Islands	48.683172	-123.346215	48.681764	-123.341563
110	431	37	In	0.0	Brethour,Domville,Forrest,Gooch Islands	48.680388	-123.338096	48.682097	-123.335207
110	432	38	Out	797.3	Brethour,Domville,Forrest,Gooch Islands	48.691532	-123.348399	48.686725	-123.348629
110	433	39	Out	1762.3	D'Arcy Island to Beaumont Shoal	48.517470	-123.262124	48.513885	-123.258191
110	434	40	Out	1256.1	D'Arcy Island to Beaumont Shoal	48.528701	-123.273575	48.525834	-123.272290
110	435	41	In	0.0	D'Arcy Island to Beaumont Shoal	48.532947	-123.215731	48.535244	-123.211609
110	436	42	In	0.0	D'Arcy Island to Beaumont Shoal	48.569567	-123.242015	48.568148	-123.241799
110	437	43	In	0.0	D'Arcy Island to Beaumont Shoal	48.570978	-123.249604	48.568344	-123.246638
110	438	44	Out	187.1	D'Arcy Island to Beaumont Shoal	48.577501	-123.258395	48.573770	-123.259111
110	439	45	Out	1098.0	Prevost Island North	48.802712	-123.391274	48.800753	-123.387579

Trip ID	Event ID	Transect	RCA	Distance To RCA	RCA Name	Start Latitude	Start Longitude	End Latitude	End Longitude
110	440	46	In	0.0	Prevost Island North	48.846712	-123.408524	48.844953	-123.404965
110	441	47	In	0.0	Prevost Island North	48.852348	-123.405818	48.849812	-123.407417
110	442	48	Out	57.6	Prevost Island North	48.834714	-123.421906	48.832674	-123.418373
110	443	49	In	0.0	Northumberland Channel	49.189486	-123.876703	49.185362	-123.880069
110	444	50	In	0.0	Northumberland Channel	49.191990	-123.883747	49.193130	-123.881224
110	445	51	In	0.0	Northumberland Channel	49.200845	-123.888895	49.205405	-123.881393
110	446	52	Out	451.7	Northumberland Channel	49.221378	-123.890117	49.224447	-123.882722
110	447	53	Out	2462.5	Northumberland Channel	49.209970	-123.824710	49.208852	-123.817705
110	448	54	Out	3342.0	Northumberland Channel	49.214528	-123.814744	49.211164	-123.807744
110	449	55	Out	649.0	Desolation Sound	50.090034	-124.862732	50.088790	-124.858733
110	450	56	In	0.0	Desolation Sound	50.081693	-124.838624	50.080213	-124.836179
110	451	57	In	0.0	Desolation Sound	50.084506	-124.839127	50.084410	-124.835907
110	452	58	Out	1121.0	Desolation Sound	50.067021	-124.824453	50.064486	-124.822013
110	453	59	Out	1369.9	Desolation Sound	50.065795	-124.833200	50.064486	-124.833233
110	454	60	In	0.0	Desolation Sound	50.076141	-124.808896	50.075694	-124.806022
110	455	61	In	0.0	Desolation Sound	50.075113	-124.794433	50.077143	-124.790111
110	456	62	In	0.0	Desolation Sound	50.099819	-124.771823	50.098885	-124.769996
110	457	63	In	0.0	Desolation Sound	50.108573	-124.728656	50.110388	-124.725769
110	458	64	In	0.0	Desolation Sound	50.118663	-124.707880	50.120030	-124.704397
110	459	65	In	0.0	Desolation Sound	50.122971	-124.742390	50.121463	-124.740044
110	460	66	Out	1546.4	Desolation Sound	50.160328	-124.749089	50.159698	-124.748957
110	461	67	Out	1496.4	Desolation Sound	50.163340	-124.726102	50.161847	-124.726077
110	462	68	Out	1771.5	Desolation Sound	50.168520	-124.694853	50.168224	-124.692696
110	463	69	Out	2452.3	Desolation Sound	50.176322	-124.684769	50.175538	-124.683249
110	464	70	Out	2890.9	Desolation Sound	50.180751	-124.677083	50.180414	-124.675734
110	465	71	Out	1344.4	Dinner Rock	49.915906	-124.659554	49.908710	-124.660673
110	466	72	Out	380.8	Dinner Rock	49.915799	-124.678193	49.919210	-124.670653
110	467	73	In	0.0	Dinner Rock	49.927707	-124.686371	49.921995	-124.686848
110	468	74	In	0.0	Dinner Rock	49.934750	-124.697136	49.929332	-124.698659
110	469	75	In	0.0	Dinner Rock	49.940702	-124.708692	49.936112	-124.711693
110	470	76	In	0.0	Dinner Rock	49.943845	-124.716457	49.940277	-124.718080
110	471	77	Out	710.3	Dinner Rock	49.949408	-124.731601	49.949749	-124.730286
110	472	78	Out	187.1	Desolation Sound	50.077695	-124.841546	50.076521	-124.841275
110	473	79	Out	673.1	Desolation Sound	50.090201	-124.862753	50.088934	-124.859066
110	474	80	In	0.0	Desolation Sound	50.119290	-124.759178	50.118454	-124.757874
110	475	81	In	0.0	Desolation Sound	50.120807	-124.747732	50.119188	-124.749132
110	476	82	In	0.0	Desolation Sound	50.145744	-124.725960	50.143870	-124.726613
110	477	83	In	0.0	Desolation Sound	50.146674	-124.717222	50.145311	-124.718182

Trip ID	Event ID	Transect	RCA	Distance To RCA	RCA Name	Start Latitude	Start Longitude	End Latitude	End Longitude
110	478	84	Out	2422.0	Desolation Sound	50.176290	-124.684711	50.175329	-124.682665
110	479	85	In	0.0	Desolation Sound	50.075260	-124.794952	50.077196	-124.789781
110	480	86	Out	2102.8	Hardy Island	49.774086	-124.261214	49.770236	-124.255194
110	481	87	Out	923.3	Hardy Island	49.743555	-124.232625	49.745141	-124.228853
110	482	88	In	0.0	Hardy Island	49.752654	-124.212040	49.751391	-124.213629
110	483	89	In	0.0	Hardy Island	Not documented			
110	484	90	In	0.0	Hardy Island	49.757030	-124.103134	49.753968	-124.102895
110	485	91	Out	5534.3	Skookumchuck Narrows	49.779848	-123.973786	49.776878	-123.968655
110	486	92	Out	1628.8	Sabine Channel-Jervis-Jedediah Islands	49.487969	-124.139644	49.484757	-124.140621
110	487	93	Out	3.5	Sabine Channel-Jervis-Jedediah Islands	49.492045	-124.178125	49.492998	-124.175550
110	488	94	Out	17.4	Sabine Channel-Jervis-Jedediah Islands	49.486347	-124.169342	49.486739	-124.166569
110	489	95	In	0.0	Sabine Channel-Jervis-Jedediah Islands	49.480190	-124.167662	49.478604	-124.163810
110	490	96	In	0.0	Sabine Channel-Jervis-Jedediah Islands	49.471661	-124.164707	49.471988	-124.162142
110	491	97	In	0.0	Sabine Channel-Jervis-Jedediah Islands	49.464744	-124.158444	49.463619	-124.154797
110	492	98	In	0.0	Halibut Bank	49.358471	-123.768024	49.353560	-123.769584
110	493	99	In	0.0	Halibut Bank	49.354838	-123.740844	49.350128	-123.742842
110	494	100	In	0.0	Halibut Bank	49.335970	-123.720078	49.333003	-123.708676
110	495	101	In	0.0	Halibut Bank	49.328265	-123.716410	49.325022	-123.719545
110	496	102	In	0.0	Halibut Bank	49.326896	-123.702659	49.320947	-123.706604
110	497	103	In	0.0	Halibut Bank	49.342558	-123.745549	49.338302	-123.746863
110	498	104	Out	5366.3	Halibut Bank	49.419281	-123.807665	49.415030	-123.808710
110	499	105	Out	5378.8	Halibut Bank	49.416682	-123.792697	49.419079	-123.787684
110	500	106	Out	3474.5	Halibut Bank	49.399262	-123.808847	49.395839	-123.813224
110	501	107	Out	2510.1	Halibut Bank	49.394325	-123.798843	49.389805	-123.800690
110	502	108	Out	971.4	Halibut Bank	49.380610	-123.746373	49.377071	-123.748332
110	503	109	In	0.0	Valdes Island East	49.047269	-123.594997	49.044461	-123.596983
110	504	110	In	0.0	Valdes Island East	49.052625	-123.596243	49.053367	-123.594485
110	505	111	In	0.0	Valdes Island East	49.064134	-123.615080	49.065378	-123.610757
110	506	112	Out	861.3	Valdes Island East	49.078660	-123.631883	49.079125	-123.627087
110	507	113	Out	2748.0	Valdes Island East	49.093445	-123.643687	49.094842	-123.637990
110	508	114	Out	3200.9	Valdes Island East	49.098708	-123.643591	49.098898	-123.639998
110	509	0-Practice	Out	161.60	Departure Bay	Not documented			
110	510	1	In	0.0	Valdes Island East	Not documented			
110	511	2	In	0.0	Valdes Island East	Not documented			
111	512	3	In	0.0	Valdes Island East	49.050775	-123.601011	49.053344	-123.594235
111	513	4	In	0.0	Valdes Island East	49.063787	-123.616781	49.065391	-123.610476
111	514	5	Out	847.1	Valdes Island East	49.078553	-123.632180	49.079092	-123.626821
111	515	6	Out	2736.2	Valdes Island East	49.093180	-123.644502	49.094841	-123.637714

Trip ID	Event ID	Transect	RCA	Distance To RCA	RCA Name	Start Latitude	Start Longitude	End Latitude	End Longitude
111	516	7	Out	3348.1	Northumberland Channel	49.214742	-123.814779	49.211074	-123.807818
111	517	8	Out	2411.9	Northumberland Channel	49.210069	-123.825599	49.208680	-123.815979
111	518	9	Out	452.0	Northumberland Channel	49.221242	-123.889942	49.226042	-123.878730
111	519	10	In	0.0	Northumberland Channel	49.201946	-123.887318	49.205488	-123.881516
111	520	11	In	0.0	Northumberland Channel	49.191889	-123.884280	49.195940	-123.877276
111	521	12	In	0.0	Northumberland Channel	49.185081	-123.880937	49.187728	-123.875578
111	522	13	In	0.0	Ballenas Island	49.334805	-124.139216	49.332438	-124.128017
111	523	14	In	0.0	Ballenas Island	49.344330	-124.142115	49.340763	-124.143541
111	524	15	Out	156.8	Ballenas Island	49.355301	-124.158167	49.351740	-124.159589
111	525	16	Out	170.9	Ballenas Island	49.344033	-124.162184	49.339341	-124.168000
111	526	17	In	0.0	Ballenas Island	49.338037	-124.158042	49.333593	-124.158084
111	527	18	In	0.0	Nanoose - Schooner Cove	49.292597	-124.108560	49.285737	-124.106179
111	528	19	In	0.0	Teakerne Arm	50.185992	-124.845481	50.188732	-124.842302
111	529	20	Out	548.5	Teakerne Arm	50.171757	-124.907161	50.169720	-124.905406
111	530	21	Out	805.8	Teakerne Arm	50.167916	-124.909173	50.166138	-124.902400
111	531	22	Out	1780.8	Desolation Sound	50.132503	-124.870533	50.128303	-124.868030
111	532	23	Out	838.1	Desolation Sound	50.068386	-124.817451	50.068319	-124.817685
111	533	24	Out	705.8	Desolation Sound	50.069600	-124.816559	50.067284	-124.811028
111	534	25	Out	1029.7	Desolation Sound	50.066291	-124.824435	50.066880	-124.816334
111	535	26	Out	1036.4	Desolation Sound	50.066255	-124.825565	50.066829	-124.816428
111	536	27	Out	8060.4	Ajax / Achilles Bank	49.754791	-124.660207	49.753923	-124.650846
111	537	28	Out	8059.1	Ajax / Achilles Bank	49.754793	-124.660260	49.754014	-124.650727
111	538	29	Out	4598.6	Davie Bay	49.625876	-124.458980	49.622102	-124.454222
111	539	30	Out	4598.2	Davie Bay	49.625903	-124.458933	49.622107	-124.454212
111	540	31	In	0.0	Sabine Channel-Jervis-Jedediah Islands	49.502037	-124.218918	49.500073	-124.214840
112	541	1	Out	1427.7	Nanoose - Schooner Cove	49.276940	-124.067395	49.275227	-124.062699
112	542	2	Out	1299.4	Nanoose - Schooner Cove	49.273453	-124.067429	49.274299	-124.061607
112	543	3	Out	1214.7	Nanoose - Schooner Cove	49.275872	-124.065617	49.271043	-124.068319
112	544	4	Out	1574.8	Nanoose - Schooner Cove	49.277134	-124.065111	49.276543	-124.058906
112	545	5	Out	2510.7	Nanoose - Schooner Cove	49.282079	-124.054459	49.279073	-124.048326
112	546	6	Out	2544.2	Nanoose - Schooner Cove	49.278511	-124.048213	49.275562	-124.050384
112	547	7	Out	3506.9	Nanoose - Schooner Cove	49.274464	-124.037069	49.272077	-124.032212
112	548	8	Out	2564.9	Nanoose - Schooner Cove	49.273986	-124.049977	49.271842	-124.043706
112	549	9	Out	2371.1	Nanoose - Schooner Cove	49.287222	-124.058849	49.284360	-124.054795
112	550	10	Out	1012.5	Nanoose - Schooner Cove	49.278743	-124.074592	49.277821	-124.066371
112	551	11	Out	1674.7	Nanoose - Schooner Cove	Not documented			
112	552	12	Out	2367.1	Nanoose - Schooner Cove	49.283063	-124.057168	49.282231	-124.049880
112	553	13	In	0.0	Nanoose - Schooner Cove	49.292561	-124.108562	49.285744	-124.107788

Trip ID	Event ID	Transect	RCA	Distance To RCA	RCA Name	Start Latitude	Start Longitude	End Latitude	End Longitude
112	554	14	Out	3576.4	Nanoose - Schooner Cove	49.315630	-124.219800	49.312350	-124.217010
112	555	15	Out	3521.4	Nanoose - Schooner Cove	49.308948	-124.221211	49.306343	-124.218126
112	556	16	Out	2813.9	Nanoose - Schooner Cove	49.304993	-124.214648	49.301468	-124.209004
112	557	17	In	0.0	Northumberland Channel	49.185078	-123.880995	49.187695	-123.875543
112	558	18	Out	3348.3	Northumberland Channel	49.214719	-123.814858	49.211152	-123.807828
112	559	19	Out	2759.0	Northumberland Channel	49.209215	-123.819578	49.208660	-123.816072
112	560	20	Out	469.5	Northumberland Channel	49.221398	-123.889857	49.226023	-123.878669
112	561	21	In	0.0	Northumberland Channel	49.200082	-123.890436	49.205452	-123.881452
112	562	22	In	0.0	Northumberland Channel	49.191756	-123.884045	49.195838	-123.877363
112	563	23	In	0.0	Northumberland Channel	49.157889	-123.879936	49.154593	-123.876024
112	564	24	In	0.0	Northumberland Channel	49.147059	-123.857687	49.143508	-123.846969
112	565	25	Out	1880.3	Departure Bay	49.234168	-123.921789	49.229214	-123.918787
112	566	26	Out	1938.1	Departure Bay	49.234862	-123.919777	49.230148	-123.919472
112	567	27	Out	1973.9	Departure Bay	49.236575	-123.927460	49.232031	-123.924027
112	568	28	Out	929.3	Departure Bay	49.226158	-123.936028	49.225946	-123.935408
112	569	29	Out	411.6	Northumberland Channel	49.228405	-123.889682	49.220424	-123.887392
112	570	30	In	0.0	Northumberland Channel	49.207991	-123.889696	49.202583	-123.886837
112	571	31	Out	30.3	Northumberland Channel	49.150922	-123.856252	49.149554	-123.844551
112	572	32	In	0.0	Northumberland Channel	49.170738	-123.875917	49.168773	-123.871906
113	573	1	Out	497.9	Northumberland Channel	49.221638	-123.889638	49.226185	-123.879031
113	574	2	Out	893.4	Read - Cortes Islands	50.190974	-125.062630	50.186968	-125.054748
113	575	3	In	0.0	Read - Cortes Islands	50.169862	-124.993441	50.164886	-125.000993
113	576	4	Out	63.5	Read - Cortes Islands	50.184452	-124.982329	50.180185	-124.987786
113	577	5	Out	734.4	Octopus Islands to Hoskyn Channel	50.157947	-125.168787	50.150162	-125.176901
113	578	6	Out	1211.3	Octopus Islands to Hoskyn Channel	50.153222	-125.173792	50.149614	-125.178176
113	579	7	In	0.0	Octopus Islands to Hoskyn Channel	50.175261	-125.132760	50.170868	-125.137211
113	580	8	In	0.0	Read - Cortes Islands	50.160084	-125.053156	50.154975	-125.054217
113	581	9	Out	196.5	Thurston Bay	50.375172	-125.334418	50.372188	-125.337681
113	582	10	In	0.0	Thurston Bay	50.367086	-125.329762	50.363785	-125.328964
113	583	11	In	0.0	Thurston Bay	50.370320	-125.328427	50.367963	-125.329097
113	584	12	In	0.0	Thurston Bay	50.366427	-125.331087	50.365874	-125.325461
113	585	13	Out	343.2	Thurston Bay	50.363044	-125.345641	50.360257	-125.349473
113	586	14	Out	3042.6	Walken Island to Hemming Bay	50.384280	-125.593365	50.385253	-125.588805
113	587	15	Out	1003.6	Chancellor Inlet West	50.435898	-125.608941	50.431113	-125.612015
113	588	16	In	0.0	Chancellor Inlet West	50.423630	-125.641380	50.426358	-125.637166
113	589	17	In	0.0	Chancellor Inlet West	50.422187	-125.648435	50.420730	-125.646756
113	590	18	Out	1507.2	Chancellor Inlet West	50.449894	-125.617657	50.447682	-125.615035
113	591	19	Out	1855.4	Viscount Island	50.632215	-126.269729	50.633135	-126.264132

Trip ID	Event ID	Transect	RCA	Distance To RCA	RCA Name	Start Latitude	Start Longitude	End Latitude	End Longitude
113	592	20	Out	17.1	Viscount Island	50.647165	-126.288521	50.649851	-126.281407
113	593	21	In	0.0	Viscount Island	50.663299	-126.242117	50.659617	-126.237897
113	594	22	Out	5962.9	Viscount Island	50.601188	-126.356214	50.605196	-126.346881
113	595	23	Out	3212.2	Lower Clio Channel	50.591914	-126.413872	50.593400	-126.402548
113	596	24	In	0.0	Lower Clio Channel	50.571449	-126.494674	50.574886	-126.486534
113	597	25	In	0.0	Lower Clio Channel	50.570479	-126.467923	50.573386	-126.462379
113	598	26	Out	2366.3	Lower Clio Channel	50.586688	-126.425570	50.588796	-126.417998
113	599	27	Out	267.3	Eden-Bonwick-Midsummer-Swanson Islands	50.681446	-126.710127	50.676649	-126.706456
113	600	28	Out	695.5	Dickson - Polkinghorne Islands	50.801021	-126.875638	50.798054	-126.866900
113	601	29	In	0.0	Dickson - Polkinghorne Islands	50.807167	-126.891904	50.804194	-126.884918
113	602	30	In	0.0	Dickson - Polkinghorne Islands	50.808734	-126.935680	50.807708	-126.928620
113	603	31	Out	13.2	Dickson - Polkinghorne Islands	50.822406	-126.963784	50.818960	-126.953499
114	604	1	In	0.0	Brethour,Domville,Forrest,Gooch Islands	48.670688	-123.330126	48.665849	-123.327346
114	605	2	Out	101.0	Brethour,Domville,Forrest,Gooch Islands	48.652205	-123.314170	48.647006	-123.308966
114	606	3	In	0.0	Brethour,Domville,Forrest,Gooch Islands	48.674153	-123.309365	48.667370	-123.306688
114	607	4	Out	806.9	Brethour,Domville,Forrest,Gooch Islands	48.691139	-123.348485	48.686253	-123.348997
114	608	5	Out	15322.9	Broken Islands Group	48.961609	-125.040950	48.956616	-125.043977
114	609	6	Out	8197.9	Broken Islands Group	48.963094	-125.150369	48.961638	-125.138797
114	610	7	Out	8377.5	Broken Islands Group	48.959625	-125.138770	48.953625	-125.141157
114	611	8	Out	8847.2	Broken Islands Group	48.948457	-125.131931	48.953691	-125.123161
114	612	9	Out	1205.9	Folger Passage	48.845493	-125.287931	48.848811	-125.280830
114	613	10	Out	1214.3	Folger Passage	48.854506	-125.303140	48.855085	-125.292528
114	614	11	Out	1208.3	Broken Islands Group	48.876258	-125.286689	48.878893	-125.278080
114	615	12	In	0.0	Folger Passage	48.836090	-125.320805	48.839248	-125.312242
114	616	13	In	0.0	Folger Passage	48.830301	-125.306746	48.833636	-125.300499
114	617	14	In	0.0	Folger Passage	48.829234	-125.302177	48.827741	-125.296655
114	618	15	In	0.0	Folger Passage	48.814537	-125.297093	48.818484	-125.288441
114	619	16	In	0.0	Folger Passage	48.803941	-125.290100	48.807913	-125.282636
114	620	17	In	0.0	Folger Passage	48.829931	-125.332412	48.826969	-125.326132
114	621	18	Out	317.0	Folger Passage	48.826433	-125.338802	48.820256	-125.338770
114	622	19	Out	1348.7	Folger Passage	48.828694	-125.363382	48.824884	-125.354995
114	623	20	Out	883.6	Folger Passage	48.835205	-125.354492	48.837309	-125.344493
114	624	21	In	0.0	Bedwell Sound	49.323077	-125.808355	49.320032	-125.801496
114	625	22	In	0.0	Bedwell Sound	49.324798	-125.808372	49.321778	-125.801287
114	626	23	In	0.0	Bedwell Sound	49.311956	-125.814177	49.308913	-125.807252
114	627	24	In	0.0	Bedwell Sound	49.292887	-125.824013	49.287329	-125.825128
114	628	25	In	0.0	Bedwell Sound	49.262521	-125.832498	49.261310	-125.824845

Trip ID	Event ID	Transect	RCA	Distance To RCA	RCA Name	Start Latitude	Start Longitude	End Latitude	End Longitude
114	629	26	Out	1824.9	Bedwell Sound	49.243420	-125.819467	49.243565	-125.811986
114	630	27	Out	1940.7	Saranac Island	49.242373	-125.830623	49.239204	-125.823975
114	631	28	Out	4242.0	Bedwell Sound	49.233053	-125.768711	49.233234	-125.765214
114	632	29	In	0.0	Saranac Island	49.252363	-125.864735	49.255067	-125.859378
114	633	30	In	0.0	Saranac Island	49.250156	-125.896312	49.252499	-125.892831
114	634	31	In	0.0	Saranac Island	49.254463	-125.889384	49.256506	-125.880515
114	635	32	Out	267.8	Saranac Island	49.260742	-125.886065	49.262967	-125.882150
114	636	33	Out	617.4	Saranac Island	49.264027	-125.891797	49.264423	-125.885306
114	637	34	In	0.0	Saranac Island	49.238299	-125.902013	49.242246	-125.893425
114	638	35	Out	235.2	Saranac Island	49.234818	-125.906373	49.230125	-125.908981
114	639	36	Out	60.9	Bedwell Sound	49.259452	-125.836221	49.256033	-125.832849
114	640	37	Out	4744.4	Bedwell Sound	49.244566	-125.747795	49.242420	-125.750571
114	641	38	Out	4931.2	Bedwell Sound	49.248612	-125.744187	49.244473	-125.745805
114	642	39	Out	12436.9	Saranac Island	49.338534	-126.065884	49.335438	-126.060056
114	643	40	Out	16662.2	Estevan Point	49.384204	-126.187730	49.388179	-126.180494
114	644	41	Out	17264.7	Estevan Point	49.382840	-126.177886	49.386305	-126.171895
114	645	42	Out	14787.7	Estevan Point	49.397648	-126.227177	49.393256	-126.223582
114	646	43	Out	12209.2	Saranac Island	49.333540	-126.067014	49.333872	-126.058011
114	647	44	Out	736.9	Broken Islands Group	48.948372	-125.271794	48.949733	-125.266119
114	648	45	Out	9356.7	Broken Islands Group	48.944915	-125.122686	48.941764	-125.122443
114	649	46	Out	15504.5	Broken Islands Group	48.953653	-125.040541	48.950153	-125.036104
114	650	47	Out	14764.5	Broken Islands Group	48.953480	-125.050772	48.954841	-125.048082
114	651	48	Out	15113.6	Broken Islands Group	48.966254	-125.050391	48.962712	-125.048876
114	652	49	Out	327.0	Broken Islands Group	48.946683	-125.269966	48.943144	-125.269174
114	653	50	In	0.0	Broken Islands Group	48.881672	-125.334804	48.884944	-125.329520
114	654	51	Out	18231.3	Broken Islands Group	48.950804	-125.002096	48.950794	-124.993084
114	655	52	Out	18902.5	Broken Islands Group	48.959206	-124.993484	48.957422	-124.994309
115	656	1	Out	928.9	Hardy Bay - Five Fathom Rock	50.742952	-127.469823	50.740957	-127.469849
115	657	2	Out	818.8	Hardy Bay - Five Fathom Rock	50.738861	-127.474776	50.740262	-127.471257
115	658	3	Out	445.4	Bolivar Passage	50.895519	-127.607611	50.899058	-127.597233
115	659	4	Out	2139.6	Bolivar Passage	50.909925	-127.617867	50.911211	-127.612593
115	660	5	Out	1110.9	Bolivar Passage	50.925978	-127.604459	50.923010	-127.595853
115	661	6	In	0.0	Bolivar Passage	50.887670	-127.577777	50.886918	-127.578239
115	662	7	In	0.0	Bolivar Passage	50.882585	-127.564022	50.880215	-127.567716
115	663	8	In	0.0	Bolivar Passage	50.889854	-127.576608	50.887944	-127.577726
115	664	9	Out	1494.0	Browning Passage - Hunt Rock	50.875214	-127.624284	50.869270	-127.623937
115	665	10	Out	415.5	Browning Passage - Hunt Rock	50.884492	-127.640856	50.878670	-127.644157
115	666	11	Out	711.7	Bolivar Passage	50.895195	-127.509716	50.894946	-127.502842

Trip ID	Event ID	Transect	RCA	Distance To RCA	RCA Name	Start Latitude	Start Longitude	End Latitude	End Longitude
115	667	12	In	0.0	Bolivar Passage	50.897912	-127.544522	50.900075	-127.539064
115	668	13	In	0.0	Bolivar Passage	50.899604	-127.558255	50.895981	-127.559059
115	669	14	In	0.0	Browning Passage - Hunt Rock	50.887458	-127.666503	50.884882	-127.669572
115	670	15	In	0.0	Browning Passage - Hunt Rock	50.905621	-127.680794	50.903226	-127.683321
115	671	16	In	0.0	Browning Passage - Hunt Rock	50.902181	-127.673783	50.899543	-127.676757
115	672	17	In	0.0	Browning Passage - Hunt Rock	50.895402	-127.681924	50.896040	-127.676597
115	673	18	Out	655.3	Browning Passage - Hunt Rock	50.908918	-127.698372	50.906199	-127.702259
115	674	19	Out	750.1	Browning Passage - Hunt Rock	50.918790	-127.697584	50.913893	-127.690294
115	675	20	Out	1458.5	Browning Passage - Hunt Rock	50.919040	-127.698184	50.915583	-127.703289
115	676	21	In	0.0	Browning Passage - Hunt Rock	50.883677	-127.664361	50.880034	-127.661991
115	677	22	In	0.0	Bolivar Passage	50.890032	-127.580664	50.886884	-127.579587
115	678	23	Out	9211.9	Scott Islands	50.886230	-129.070292	50.876860	-129.071609
115	679	24	Out	11282.5	Scott Islands	50.876675	-129.110539	50.872595	-129.101732
115	680	25	Out	14161.2	Scott Islands	50.819073	-129.148645	50.822076	-129.142713
115	681	26	Out	10760.6	Scott Islands	50.773970	-129.094277	50.768916	-129.096609
115	682	27	Out	10284.1	Scott Islands	50.813874	-129.087647	50.808863	-129.090914
115	683	28	Out	9013.4	Scott Islands	50.839213	-129.073727	50.834942	-129.070127
115	684	29	Out	6221.3	Scott Islands	50.855428	-129.030059	50.849941	-129.030418
115	685	30	Out	811.3	Scott Islands	50.821694	-128.958954	50.825310	-128.953211
115	686	31	Out	1555.0	Scott Islands	50.793212	-128.524229	50.790648	-128.527943
115	687	32	Out	554.5	Scott Islands	50.793136	-128.541755	50.788003	-128.541911
115	688	33	In	0.0	Scott Islands	50.794353	-128.554881	50.787861	-128.556881
115	689	34	In	0.0	Scott Islands	50.831410	-128.653444	50.834536	-128.644865
115	690	35	In	0.0	Scott Islands	50.843762	-128.677689	50.834327	-128.678755
115	691	36	In	0.0	Scott Islands	50.860622	-128.623809	50.855763	-128.624942
115	692	37	In	0.0	Shelter Bay	50.972369	-127.475705	50.966057	-127.477523
115	693	38	Out	113.7	Shelter Bay	50.975037	-127.495863	50.972432	-127.488615
115	694	39	In	0.0	Shelter Bay	50.966205	-127.472117	50.964708	-127.471540
115	695	40	Out	931.3	Shelter Bay	50.977219	-127.507907	50.974827	-127.511775
115	696	41	Out	125.4	Topknot	50.508589	-128.315113	50.508612	-128.302447
115	697	42	Out	119.5	Topknot	50.517726	-128.309659	50.509956	-128.302401
115	698	43	In	0.0	Topknot	50.513371	-128.296997	50.507379	-128.300392
115	699	44	In	0.0	Topknot	50.511616	-128.292260	50.507719	-128.298107
115	700	45	In	0.0	Topknot	50.518395	-128.288869	50.516236	-128.274761
115	701	46	Out	4831.1	Topknot	50.439887	-128.154666	50.434040	-128.141618
115	702	47	Out	6164.7	Topknot	50.424968	-128.165574	50.427910	-128.145725
115	703	48	Out	117.6	Checleset Bay	50.029134	-127.798064	50.032155	-127.790747
115	704	49	In	0.0	Checleset Bay	50.034061	-127.774136	50.037553	-127.762993

Trip ID	Event ID	Transect	RCA	Distance To RCA	RCA Name	Start Latitude	Start Longitude	End Latitude	End Longitude
115	705	50	Out	209.5	Checleset Bay	50.024216	-127.777504	50.015939	-127.780257
115	706	51	In	0.0	Checleset Bay	50.019078	-127.749264	50.020731	-127.738590
115	707	52	In	0.0	Checleset Bay	50.018734	-127.748791	50.016621	-127.750778
115	708	53	In	0.0	Checleset Bay	50.047642	-127.743724	50.042761	-127.745627
115	709	54	Out	331.7	Brooks Bay	50.237450	-127.825689	50.237868	-127.820984
115	710	55	In	0.0	Brooks Bay	50.241697	-127.754752	50.242082	-127.751240
115	711	56	In	0.0	Brooks Bay	50.237335	-127.785868	50.237280	-127.783502
115	712	57	In	0.0	Brooks Bay	50.237119	-127.785798	50.237130	-127.784831
115	713	58	In	0.0	Brooks Bay	50.235322	-127.809499	50.232547	-127.808298
115	714	59	Out	414.9	Brooks Bay	50.236762	-127.822687	50.234462	-127.818940
115	715	60	Out	435.5	Brooks Bay	50.233914	-127.823390	50.234553	-127.819358
115	716	61	Out	727.9	Brooks Bay	50.221077	-127.834575	50.223137	-127.829237
115	717	62	Out	419.9	Brooks Bay	50.219796	-127.832541	50.215632	-127.832488
115	718	63	In	0.0	Brooks Bay	50.211411	-127.828516	50.210718	-127.825160
115	719	64	In	0.0	Brooks Bay	50.221048	-127.812818	50.214429	-127.816013
115	720	65	Out	521.1	Brooks Bay	50.209241	-127.846298	50.205571	-127.845126
115	721	66	Out	1804.6	Brooks Bay	50.215893	-127.859291	50.217105	-127.854424
115	722	67	In	0.0	Checleset Bay	50.090436	-127.702434	50.084276	-127.706626
115	723	68	In	0.0	Checleset Bay	50.096888	-127.700308	50.098694	-127.687612
115	724	69	In	0.0	Checleset Bay	50.087350	-127.671411	50.080974	-127.663385
115	725	70	Out	3111.6	Checleset Bay	50.083065	-127.580188	50.081023	-127.574774
115	726	71	Out	4380.7	Checleset Bay	50.033779	-127.607045	50.026821	-127.609526
115	727	72	Out	3341.6	Checleset Bay	50.053941	-127.603839	50.050913	-127.606923
115	728	73	Out	2158.5	Checleset Bay	50.065360	-127.613074	50.063504	-127.608528
115	729	74	In	0.0	Checleset Bay	50.055674	-127.689415	50.052212	-127.692688
115	730	75	In	0.0	Checleset Bay	50.092156	-127.700467	50.088555	-127.689744
115	731	76	In	0.0	Checleset Bay	50.091920	-127.650466	50.087942	-127.654706
115	732	77	Out	29.3	Checleset Bay	50.067718	-127.645799	50.072705	-127.634168
115	733	78	Out	305.7	Checleset Bay	50.090940	-127.618783	50.085920	-127.615904
115	734	79	Out	1276.1	Checleset Bay	50.089279	-127.604404	50.087791	-127.595984
115	735	80	Out	2537.3	Checleset Bay	50.093862	-127.579174	50.087264	-127.581142
115	736	81	Out	9906.9	Checleset Bay	50.007827	-127.541324	50.012853	-127.533047
115	737	82	Out	1217.6	Topknot	50.506095	-128.326140	50.510213	-128.317900
115	738	83	In	0.0	Topknot	50.495536	-128.298967	50.498655	-128.291442
115	739	84	In	0.0	Topknot	50.500845	-128.281117	50.493148	-128.280318
115	740	85	Out	958.0	Topknot	50.474740	-128.246391	50.468067	-128.242872
115	741	86	Out	108.9	Topknot	50.482338	-128.262835	50.475409	-128.265335
115	742	87	In	0.0	Scott Islands	50.840391	-128.903330	50.831244	-128.906008

Trip ID	Event ID	Transect	RCA	Distance To RCA	RCA Name	Start Latitude	Start Longitude	End Latitude	End Longitude
115	743	88	In	0.0	Scott Islands	50.834418	-128.939183	50.831793	-128.927963
115	744	89	In	0.0	Scott Islands	50.811283	-128.914380	50.802320	-128.915240
115	745	90	In	0.0	Scott Islands	50.809361	-128.884107	50.803081	-128.885009
115	746	91	In	0.0	Scott Islands	50.849604	-128.888411	50.840630	-128.892270
115	747	92	In	0.0	Scott Islands	50.857871	-128.891153	50.849821	-128.888378
115	748	93	Out	1117.0	Scott Islands	50.886804	-128.863332	50.876814	-128.868822
115	749	94	Out	1875.7	Scott Islands	50.888173	-128.894380	50.883600	-128.899406
115	750	95	Out	2614.4	Goletas Channel	50.873582	-127.886794	50.871632	-127.888800
115	751	96	In	0.0	Goletas Channel	50.846961	-127.799282	50.844194	-127.800912
115	752	97	In	0.0	Goletas Channel	50.844855	-127.788363	50.843007	-127.787878
115	753	98	In	0.0	Bate - Shadwell Passage	50.916787	-127.748438	50.914818	-127.747003
115	754	99	In	0.0	Bate - Shadwell Passage	50.917931	-127.745874	50.915681	-127.743422
115	755	100	Out	149.5	Bate - Shadwell Passage	50.919781	-127.739064	50.917632	-127.736865
115	756	101	Out	790.6	Bate - Shadwell Passage	50.921088	-127.724126	50.918361	-127.725312
115	757	102	Out	385.0	Bate - Shadwell Passage	50.924675	-127.753911	50.922403	-127.748322
115	758	103	In	0.0	Bate - Shadwell Passage	50.920254	-127.755435	50.918345	-127.754590
115	759	104	Out	3159.1	Goletas Channel	50.889476	-127.886642	50.887054	-127.888699

Appendix Table B. Event ID and information by ROV transect. Event comments were recorded at the completion of each transect.

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
109	336	1	27/02/2009 12:56	NW of Greig Island	40	Date on overlay incorrect-shows Feb27,Didson recorded in regular time-coppers, kelp greenlings, quillbacks, cabazon
109	337	2	27/02/2009 14:33	N of Greig Island	27	Finished early, shallow waters-coppers, kelp greenlings, quillbacks, cabazon
109	338	3	27/02/2009 15:35	E of Greig Island	16	Good habitat, not many fish-quillback, kelp greelings
109	339	4	27/02/2009 16:43	E of Coal Island	4	Cable wire broke-difficult recovery - quillback
109	340	5	28/02/2009 9:09	S of Domville Island	25	No Didson until plug repaired -mainly lingcod and greenlings
109	341	6	28/02/2009 14:42	E of Domville Island	56	Good habitat RCA - approx. 11 quillback,1 copper, puget sound king crab
109	342	7	28/02/2009 16:06	E of Domville Island	22	Scallops, urchins, cucumbers
109	343	8	28/02/2009 16:55	N of Brethour Island	12	Kelp greenling country
109	344	9	01/03/2009 8:08	W of Forrest Island	11	Cut dive short due to current - Crab trap, groundline observed, quillback and kelp greenlings
109	345	10	01/03/2009 9:34	N of Forrest Island	28	Good habitat, pulled off bottom many times- 4 copper and yelloweye?
109	346	11	01/03/2009 12:52	W of Sphinx Island	16	Siting of black rockfish
109	347	12	01/03/2009 13:55	NW of Wise Island	23	Good habitat, many quillback
109	348	13	01/03/2009 14:47	Ballingall	15	Partial rocky habitat
109	349	14	01/03/2009 15:48	E of Panther Point	30	Quillback, copper, greenstripes and perch.
109	350	15	01/03/2009 16:55	Walker Rock	21	Eel pouts, sand dabs, lingcod, quillbacks.
109	351	16	02/03/2009 10:14	N of Wallace Island 1	18	Large rock walls, 4 coppers
109	352	17	02/03/2009 10:53	N of Wallace Island 2	12	Typical Trincomali habitat
109	353	18	02/03/2009 12:33	Chivers Point	13	Typical Trincomali habitat
109	354	19	02/03/2009 13:07	Chivers Point2	13	Rocky habitat at beginning, back to mud, shell
109	355	20	02/03/2009 14:02	Spotlight Cove	15	
109	356	21	02/03/2009 15:08	Bodega1	21	lots of rockfish at the end of the dive
109	357	22	02/03/2009 16:08	Retreat Island	34	
109	358	23	03/03/2009 8:11	S of Jackscrew Island	25	
109	359	24	03/03/2009 9:10	S of Wallace Island1	17	
109	360	25	03/03/2009 10:13	S of Wallace Island2	9	
109	361	26	03/03/2009 10:50	Canover Cove	26	
109	362	27	03/03/2009 12:27	S of Retreat Is	11	lots of current, little rock to be found.
109	363	28	03/03/2009 13:21	Victoria Shoal	35	SITE NAME - Victoria Shoal; RCA:Trincomali/Out;

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
						Latitude 48.9167 - Longitude -123.5167. Followed a ridge. Kelp greenlings, copper, quillback. No logging data. LatLon approximate.
109	364	29	04/03/2009 13:35	Entrance Island 1	36	Lots of lingcod, quillback, greenstripe, 1 juv yelloweye, 1 tiger
109	365	30	04/03/2009 15:09	Entrance Island 2	28	Ratfish habitat! Greenstripe, quillback and some yelloweye
109	366	31	04/03/2009 16:35	Malaspina Point 1	29	Steep wall at end. Quillback, copper, and yelloweye
109	367	32	05/03/2009 8:50	Malaspina Point 2	51	Mud and rock walls. Ratfish, quillback, pollock. Weather picking up.
109	368	33	05/03/2009 16:56	Malaspina Point 3	42	Dover dover dover! Some quillback.
109	369	34	06/03/2009 9:17	Halibut 1	48	Sponges and mud. Close up of sponges taken at transect end only on digital video
109	370	35	06/03/2009 10:58	Halibut 2	26	Sponges and mud. Pollock and some greenstriped rockfish at the beginning
109	371	36	06/03/2009 13:05	Halibut 3	24	Mud, pollock, sponges.
109	372	37	06/03/2009 14:56	Halibut North 1	29	Sponges and cobble
109	373	38	06/03/2009 16:08	Halibut North 2	33	Sponges, a few rocks
109	374	39	07/03/2009 9:15	Pam Rock 1	22	Mud and sponges
109	375	40	07/03/2009 10:27	Pam Rock 2	33	deep mud on slope
109	376	41	07/03/2009 12:45	Christie Islet 1	22	Flatfish, mud and rock wall
109	377	42	07/03/2009 14:00	SE Anvil Island	12	Mud and rock wall.
109	378	43	07/03/2009 15:11	E Anvil Island	32	Mud, sponges, splitnose and 1 quillback
109	379	44	07/03/2009 16:25	NE Anvil Island	22	Mud and a wall. Sponges, few rockfish. Didson was not recording immediately. See point in hyPack for start
109	380	45	08/03/2009 9:39	W Anvil Island 1	27	Time change this morning. Deep site with lots of rocks, and a couple quillbacks, one juv yelloweye.
109	381	46	08/03/2009 10:56	W Anvil Island 2	33	Lots of logs in mud and then a sheer rock wall.
109	382	47	08/03/2009 12:56	N Anvil Island 1	24	Poor visibility. Mud with rocks near end. 1 Quillback, greenstripes.
109	383	48	08/03/2009 14:44	N Anvil Island 2	23	mud and then the wall.
109	384	49	08/03/2009 15:31	N Anvil Island 3	17	Ran up the wall again. 2 Quillback, one lingcod
109	385	50	08/03/2009 16:55	Pam Rock 3	31	Sponges! Some redstripes? Copper after the end of the transect.
109	386	51	08/03/2009 18:37	Pam Rock 4	32	Sponges and rock. Wrong overlay on the video, says Tran 50, should be 51
109	387	52	09/03/2009 10:02	Halibut North 3	27	Pollock

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
109	388	53	09/03/2009 11:29	Halibut North 4	41	gradual slope, one quillback
109	389	54	09/03/2009 13:05	Halibut 4	43	Digital video stopped after 10 min (Arch GIS was open). Made full digital recording from tape and called it "Transect54full" Flat slope and pollock (lots of pollock), greenstripes, flatfish, and poachers.
109	390	55	09/03/2009 14:50	McCall 1	25	Pollock everywhere. Fairly flat mud with a little rock, but no rockfish.
109	391	56	09/03/2009 15:57	McCall 2	29	One rock with 4 quillbacks and 2 juv yelloweye.
109	392	57	09/03/2009 17:58	McCall 3	33	Some cobble, a few rockfish. Stubby squid footage.
109	393	58	10/03/2009 8:10	McCall 4	21	Shrimp and prawns, some pollock and one dogfish. Mud and cobble.
109	394	59	10/03/2009 10:29	Snake Island	78	A little up and down, good habitat and lots of rockfish. 2 tapes. Hypak logging was stopped and restarted near beginning.
110	395	1	06/11/2009 17:21	Chivers Pt. NE Wallace Island	18	Follow Nov Transect 19 (40m south of 18), video of ROV surfacing at the end of the tape
110	396	2	06/11/2009 18:28	Wallace Is(1 fromFeb09)	19	Follow Feb Transect 1(Wallace Island), no rockfish
110	397	3	06/11/2009 19:15	Wallace Island(FebTransect 17)	16	Follow Feb Transect 17(Wallace Island), no rockfish?
110	398	4	06/11/2009 21:05	Gabriola Island (Feb Transect 21)	14	Follow Feb Transect 21, copper rockfish
110	399	5	06/11/2009 21:59	Gabriola Island (Feb 'Bodega')	18	Follow Feb Planned Transect (not previously surveyed), copper rockfish
110	400	6	06/11/2009 22:59	Gabriola Island (Feb Transect 20)	22	Follow Feb Transect 20, copper rockfish
110	401	7	07/11/2009 16:58	Walker Rock (Feb Transect 27)	26	couple of quillback rockfish,
110	402	8	07/11/2009 18:07	Walker Rock (Feb Transect 15)	29	quillback rockfish in amongst the metridium at the top of the rock ridge,
110	403	9	07/11/2009 19:07	Walker Rock (Feb Transect 14)	40	quillbacks amid the metridium at the top of the ridges, depth reading on the overlay is drifting - zeroed at the surface but out by 10 m by the end of the dive.
110	404	10	07/11/2009 20:52	Retreat Cove (Feb Transect 22)	23	21:07 see rockfish in Didson then see it in the video, couple of rockfish and greenlings, depth ok this dive
110	405	11	07/11/2009 22:08	East side of Wise Island (Feb Transect 12)	28	outside RCA, 3 juvenile yelloweye, quillbacks,
110	406	12	07/11/2009 23:07	East side of Wise Island	17	roughback sculpin, dancing prawn,

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
				(Feb Transect 13)		
110	407	13	08/11/2009 0:01	East side of Wise Island (Feb Transect 11)	17	moved the strain relief 6 inches towards the clump
110	408	14	08/11/2009 15:52	Victoria Shoal (Feb Transect 28)	57	very poor visibility, rockfish all on the lee side of the ridge, zeroed depth
110	409	15	08/11/2009 17:24	SE Wallace Island (Feb transect 26)	21	lower currents and better visibility, rockfish, zeroed depth
110	410	16	08/11/2009 18:11	SE Wallace Island (Feb transect 25)	12	no rockfish, no current better visibility,
110	411	17	08/11/2009 18:51	SE Wallace Island (Feb Transect 24)	11	no rockfish, lingcod in the shallows, zeroed depth
110	412	18	08/11/2009 20:18	Jackscrew Island (Feb Transect 23)	22	no rockfish, red rock crabs - mating tanner crabs here in Feb, zeroed depth off by 3 m; Rob reckons and Andy supports, that if the boat positioned the transducer over the transect line, the tracking would be better.
110	413	19	08/11/2009 21:26	Victoria Rock (Feb Victoria)	20	zeroed depth out by 6m
110	414	20	08/11/2009 22:16	Walker Rock (Feb Transect 14/Nov Transect 9)	44	no current and OK visibility, quillbacks, lingcod, yelloweye, zeroed depth out by 2 m
110	415	21	09/11/2009 22:48	Prevost 1 (new transect, Horda Shoal)	24	
110	416	22	09/11/2009 23:46	Prevost 2 (new transect, James Bay)	16	Only RAW file avail. From HyPack (export failed(?)), current at start of transect
110	417	23	09/11/2009 0:19	Prevost 2b (parallel 2)	22	driver crabbed expertly along rock face,
110	418	24	10/11/2009 16:27	Prevost 1 (new Peile Point)	21	very strong current at start of transect, school of herring after transect end,
110	419	25	10/11/2009 17:25	Prevost 5 (east of island)	24	
110	420	26	10/11/2009 18:20	Prevost 6 (southeast of island)	21	wall at beginning of transect, end out of RCA, ROV stayed in water for next transect,
110	421	27	10/11/2009 18:57	Prevost 7 (southeast of island)	24	CURRENT AT BEGINNING, ,
110	422	28	10/11/2009 20:23	Prevost 8 (southeast of island)	25	current pushing ROV,
110	423	29	12/11/2009 16:10	Forrest (Feb. transect 10)	25	
110	424	30	12/11/2009 17:19	Forrest (Feb. transect 5 (adjusted to follow feb.	38	Cloud sponges, Clump beacon off by 100m for later part of transect

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
110	425	31	12/11/2009 18:55	Forrest TransectS1 (new North to South)	23	outside RCA, current too strong, transect aborted early,
110	426	32	12/11/2009 20:30	Forrest TransectS1 (new-other end)	35	outside RCA, same transect as 31, but approached from opposite end, Snagged on line (crab) at end of transect, wrap around umbilical, clump torn from umbilical, ROV extracted by careful rotation, rear camera essential
110	427	33	12/11/2009 22:15	Forrest (Feb Transect 6)	7	dive aborted due to strong current,
110	428	34	13/11/2009 16:13	Forrest (Feb Transect 6)	70	wind pushing ship, result slow dive speed, clump tracking off (on HyPack) for about 5 min around 16:45
110	429	35	13/11/2009 17:57	Forrest (Feb Transect 7)	37	Bad habitat first half of transect, OSD depth showing 4m at surface, end of dive
110	430	36	13/11/2009 19:51	Forrest (Feb transect 2)	33	
110	431	37	13/11/2009 21:20	Forrest (Feb Transect 3)	13	
110	432	38	13/11/2009 22:07	Forrest (Feb Transect 1)	28	
110	433	39	14/11/2009 15:41	Darcy1 (Beaumont Shoal)	36	Habitat flat shell bottom behind a ridge, not great RF,
110	434	40	14/11/2009 16:54	Darcy2	18	Habitat shell reef, not rock, not great RF,
110	435	41	14/11/2009 17:58	Darcy3	27	good habitat, deep transect, many juv RF more visible on the didson than on ROV, depth at surface out 2-3 m-re-zero before next dive
110	436	42	14/11/2009 20:35	Darcy6	46	deep transect with too much wire angle to make decent forward progress. Observed a dogfish before the start of the transect,
110	437	43	14/11/2009 21:59	Darcy9	24	WMM software crash - digital recording started 8:15 into the transect (tape started at beginning),
110	438	44	14/11/2009 23:03	Darcy7	23	Decent habitat at start of transect but became shell reef,
110	439	45	15/11/2009 15:51	Prevost9	35	poor visibility for most of transect,
110	440	46	15/11/2009 17:17	Prevost2 (repeat)	18	
110	441	47	15/11/2009 18:19	Prevost1 (repeat)	24	good habitat, may have seen a brown rf, saw YE juv,
110	442	48	15/11/2009 20:14	Prevost3 (repeat)	26	DECENT HABITAT, unknown rockfish at start which might be able to id from video,
110	443	49	17/11/2009 16:35	Gabriola Malaspina point (Feb transect 31)	33	
110	444	50	17/11/2009 18:03	Gabriola Malaspina point (Feb transect 32)	18	Ended transect early since we thought clump weight came detached from tether,
110	445	51	17/11/2009 18:57	Gabriola Malaspina point (Feb transect 33)	30	ridges with flats in between. 3? YE,

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
110	446	52	17/11/2009 20:53	Gabriola, Snake I, outside rca (Feb transect 59)	38	boot sponge reef at start of transect, started transect well past start to decrease depth, very fishy! Many QB, several YE, Tiger, Copper, one shaft seal backed off a bit. Jonathon tightened it.
110	447	53	17/11/2009 22:00	Gabriola, Entrance I. Outside RCA (Feb transect 30	26	22:22 coral 68 m,
110	448	54	17/11/2009 23:12	Gabriola, Entrance I. Outside RCA, (Feb transect 2	28	
110	449	55	18/11/2009 16:32	Desolation 1, Kinghorn I. outside	23	Boot sponges in deep water, few fish, some yoy qcb.
110	450	56	18/11/2009 17:46	Desolation 2, Kinghorn I. Inside	18	no .avi file for this dive since movie maker crashed, use dv tape, made video file from tape,
110	451	57	18/11/2009 18:37	Desolation 3, Kinghorn I. Inside	27	Boot sponge- live and rubble, YE juv (3), juv QB, erratic track line as ROV pulled off wall with ship movement in wind, wind coming up ,
110	452	58	18/11/2009 21:18	Desolation 5, Sarah Point, outside	22	lingcod caught shiner, YE, steep wall at end, compass behaved normally, shut-down appeared to work
110	453	59	19/11/2009 16:49	Desolation 4, Sarah Point, outside	13	short transect, steep wall and ship called it for being too close to shore. Went through a large school of herring on the way down. , Jon shut down ROV to check vertical thruster for a herring. Looked ok.
110	454	60	19/11/2009 17:46	Desolation 6, Zephine Head, Inside	17	Steep wall, lots of boot sponge and MANY juv QB,
110	455	61	19/11/2009 18:59	Desolation 7, Zephine Head, Inside	27	Went over a pinnacle and up a wall, great habitat with many juv and yoy QB and some YE, saw one QB enter a boot sponge, re-deployed ROV after Jon checked umbilical strain relief
110	456	62	19/11/2009 20:26	Desolation 8, Mink I, Inside	12	flat crappy habitat then wall which we couldn't travel very far since too close to shore, not a great transect,
110	457	63	19/11/2009 21:20	Desolation12, tenedos bay, inside	18	
110	458	64	19/11/2009 22:20	Desolation13, tenedos bay, inside	16	Started tape and file early to tape jellyfish for Jon, redtree coral,
110	459	65	19/11/2009 23:17	Desolation11, Otter Rock, inside	27	OVERLAY TRANSECT NUMBER NOT CHANGED, READS 64,

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
110	460	66	20/11/2009 19:16	Desolation16, Marylebone Pt., Outside	10	steep wall, aborted dive early, discard data, Caught umbilical on a ground line, clump hit bottom, aborted dive, Didson also stopped working
110	461	67	20/11/2009 20:29	Desolation17, Horace Head, Outside	13	steep wall, few fish,
110	462	68	20/11/2009 21:27	Desolation18, Homfray Channel, Outside	12	Stopped after first minute of the avi tape (68, restarted with 68A). No fish seen though,
110	463	69	20/11/2009 22:17	Desolation19, Homfray Channel, Outside	14	Steep transect, started deep, canary just before start, some YE and small QB, large live cloud and boot sponges on wall and sponge rubble below,
110	464	70	20/11/2009 23:11	Desolation20, Homfray Channel, Outside	10	Steep transect, started deep, large live cloud and boot sponges on wall and sponge rubble below, several small YE, transect steep and close to shore, tracking had ROV on land at end of dive,
110	465	71	21/11/2009 16:22	Dinner Rock1, Outside	40	Flat bottom with sand waves and boot sponge bioherms, many sea whips and a surprising number of rockfish, ROV tracking seems off, need to charge
110	466	72	21/11/2009 17:42	Dinner Rock2, Outside	37	Flat bottom with sand waves and boot sponge bioherms, many sea whips and some rockfish, bottom not as steep as I thought it would be from contours,
110	467	73	21/11/2009 18:54	Dinner Rock3, Inside	41	Flat bottom with sand waves and boot sponge bioherms, many sea whips and some rockfish, bottom not as steep as I thought it would be from contours, rock with QB right after end of transect ,
110	468	74	21/11/2009 20:37	Dinner Rock4, Inside	32	Same as previous but with more rock at end of dive,
110	469	75	21/11/2009 21:43	Dinner Rock5, Inside	25	Nearly continuous sponge reef until around 40 m, mostly boot sponges, great juv habitat
110	470	76	21/11/2009 22:44	Dinner Rock6, Inside	21	Lots of boot and cloud sponges on rock reef at start, sea whips at end, many shiner perch at end,
110	471	77	21/11/2009 23:42	Dinner Rock7, outside	8	Nice reef with lots of sponges and some coral, many fish, aborted early due to strong current, fishing net of bottom,
110	472	78	22/11/2009 16:32	Desolation21, Kinghorn I., Outside	11	Nice sponges, some juv rockfish, no time stamp for 1st minute or so of transect,
110	473	79	22/11/2009 17:21	Desolation1, Kinghorn I., Outside (repeat)	15	repeated transect, good hab, some juv habitat,
110	474	80	22/11/2009 18:25	Desolation9, Mink I., Inside	12	qb before transect start, herring on way down, nice rock wall, several fish, YE, Tiger,

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
110	475	81	22/11/2009 19:09	Desolation10, Mink I., Inside	19	Nice habitat, rock wall, ,
110	476	82	22/11/2009 20:34	Desolation14, Melville I., Inside	14	Stepped wall, QB licked a rock,
110	477	83	22/11/2009 20:21	Desolation15, Melville I., Inside	79	V. deep transect and steep transect (172-45m) deeper than bridge sounding, steep wall, YE and QB,
110	478	84	22/11/2009 22:21	Desolation19, Homfray Channel, Outside (Repeat)	14	Deep, steep transect,
110	479	85	22/11/2009 23:41	Desolation7, Zephine Head, Inside (Repeat)	22	3 YE right at start of transect, good fishy transect, many YE including 1 very gravid ,
110	480	86	23/11/2009 16:17	Jervis2, Thunder Bay, Out	37	v. Flat muddy bottom for most of dive with lots of flatfish and hake, one area with rocks and many RF and LC, several YE,
110	481	87	23/11/2009 17:56	Jervis1, Ball Pt, Out	20	V. nice transect, deep and steep rock, bubble gum coral at depth, cloud sponges everywhere, many RF,
110	482	88	23/11/2009 18:54	Jervis4, Ball Pt, In	13	many sponges,
110	483	89	23/11/2009 20:19	Jervis6, In	15	SITE NAME - Jervis6; RCA:Hardy Island/In; Latitude 49.758 - Longitude -124.18. Bottom dropped off after start of dive, hyPack crashed, dive aborted due to downslope and other confounding factors, no useable data,
110	484	90	23/11/2009 21:42	Jervis7, In	34	crappy transect-slow due to wind pushing boat and ROV off bottom and not making way often, old booming ground with logs and bark, off of oyster farm, but rockfish in pockets around rocks whenever there were rocks., Jon does not like Jervis inlet
110	485	91	23/11/2009 23:34	Jervis9, Out	31	Steep wall, numerous cloud sponges, some coral at start of transect, off bottom in middle of transect for quite a while, trackline broken in two due to midnight GMT, ,
110	486	92	24/11/2009 17:43	Lasqueti1, Texada I., Out	25	Bubble gum coral at start of transect, Very deep transect, saw some splitnose, wall at end with cloud sponges,
110	487	93	24/11/2009 18:38	Lasqueti2, Jedidiah I, Out on the line	18	Wall with nice sponges (cloud and Heterochnoe) and excellent habitat, NO rockfish! ,
110	488	94	24/11/2009 19:52	Lasqueti3, Jedidiah I, Out on the line	10	Another wall with nice sponges, few Rockfish,
110	489	95	24/11/2009 21:06	Lasqueti4, Jedidiah I, In	27	coral and sponge, long time off bottom crossing a gully,

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
						then possibly saw a bocacio,
110	490	96	24/11/2009 22:06	Lasqueti5, Jedidiah I, In	19	sponges on rock, nice habitat, wind came up and had to abort transect-ship having trouble ,
110	491	97	24/11/2009 23:08	Lasqueti6, Jedidiah I, In	24	deep dive with sponges, less steep than previous, some RF, aborted early due to wind, movie maker file stopped at 23:12, use mini-dv, made video file from tape,
110	492	98	26/11/2009 15:54	Halibut_T35, in, Feb transect35,	39	boring!! Flat, sandy bottom, boot sponge bioherm at end. ,
110	493	99	26/11/2009 17:11	Halibut_T36, in, Feb transect36,	31	also boring, flat but with more boot sponge bioherm. 1 QB,
110	494	100	26/11/2009 18:14	Halibut_T54, in, Feb transect54,	55	very flat and boring for most of transect, sponge bioherm and rocks at very end, Jen drove last 1/2 of transect
110	495	101	26/11/2009 20:05	Halibut_T34, in, Feb transect34,	23	Started transect at the shallow end by accident, but relatively flat so still did it. 2 YE and more sponges. ,
110	496	102	26/11/2009 21:07	Halibut_4, in, Feb transect	37	very flat and boring for most of transect, fighting hermit crabs, fishy at the end-qb, ye, and lingcod,
110	497	103	26/11/2009 22:22	Halibut_2, in, Feb transect	28	ANOTHER BORING FLAT ONE, NOT VERY FISHY,
110	498	104	27/11/2009 18:28	Halibut_T52, out, Feb transect	32	Nice sponge habitat, few rockfish but 2 YE juv, Sonar behaving as if it were tilted. Jon will assess
110	499	105	27/11/2009 20:04	Halibut_T38, out, Feb transect	27	Flat and boring until sponges at end of transect. QB in sponges, several (5?) small octopus, sonar still behaving oddly
110	500	106	27/11/2009 21:12	Halibut_T1, out, Feb transect Halibut_Nor	35	Ship did donuts for a while at start of transect, many unusable minutes, few fish, sonar still behaving oddly
110	501	107	27/11/2009 22:33	Halibut_T37, out, Feb transect37	32	Nice sponge habitat at end of transect,
110	502	108	27/11/2009 23:47	Halibut_T53, out, Feb transect53	26	ANOTHER DULL ONE,
110	503	109	28/11/2009 18:53	Valdes1, In	23	Nice reef with lots of fish and crinoids,
110	504	110	28/11/2009 20:12	Valdes2, In	12	Dive aborted due to large swell and strong current keeping us of bottom and out of control. ,
110	505	111	28/11/2009 20:58	Valdes3, In	21	Swelly, crinoids, boulders and QB and lingcod ,
110	506	112	28/11/2009 21:45	Valdes4, out	21	crinoids and wall, big flat bottom between 2 ridges,
110	507	113	28/11/2009 22:55	Valdes5, out	23	crinoids, qb and lingcod, Jon and Karina changed a thruster seal
110	508	114	28/11/2009 23:42	Valdes6, out	14	Short, shallow transect, nice habitat, lots of crinoids,

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
						tested tracking at 24oo gmt after ended transect logging
111	509	0	05/01/2010 22:38	Departure Bay	11	SITE NAME - Departure Bay; RCA:Departure Bay/Out; Latitude 49.205 - Longitude -123.96. Vessel GPS track recorded, heading approximately North
111	510	1	06/01/2010 18:40	Valdes1	13	SITE NAME - Valdes1; RCA:Valdes Island East/In (same location as Event_ID 503); Latitude 49.046 - Longitude -123.596. ABORTED current over 1kt, difficulty getting established on transect, compass may be reversed
111	511	2	06/01/2010 20:27	Valdes1 (second attempt)	16	SITE NAME - Valdes1 (2nd attempt); RCA:Valdes Island East/In (same lat/long as Event_ID 510, same location as Event_ID 503); Latitude 49.046 - Longitude -123.596. NOT LOGGED IN HYPACK Transect planned from [49.047397, -123.594921] to [49.044016, -123.597205] Otherwise, good dive, plenty of fish.
111	512	3	06/01/2010 21:10	Valdes2	26	Copper at start (just before transect officially begins) extra 12 minutes of recorded video pre-pended though - Tiger at 21:34
111	513	4	06/01/2010 22:02	Valdes3	21	
111	514	5	06/01/2010 22:46	Valdes4	15	22:52 boat shown 90 degrees off actual heading, also ROV off course, GYRO window shows constant "Ignored" messages (ok)
111	515	6	06/01/2010 23:24	Valdes5	19	
111	516	7	07/01/2010 16:22	Transect 29 (from Feb2009)	23	fish!
111	517	8	07/01/2010 17:13	Transect 30 (from Feb2009)	25	17:19 yelloweye strikes prawn(?)
111	518	9	07/01/2010 18:17	Transect 59 (from Feb2009)	40	
111	519	10	07/01/2010 19:30	Transect 33 (from Feb2009)	37	two start targets recorded? ; survey acquisition has encountered an error and needs to close - twice , 2nd at 19:42:40 *LOGGING WILL BE BROKEN!
111	520	11	07/01/2010 21:02	Transect 32 (from Feb2009)	36	recorded launch at start and recovery at end -tracking anomalies, ships position and heading - clump jumped off to 250m after 3540, suspect dead battery? , returned at 3804
111	521	12	07/01/2010 22:07	Transect 31 (from	28	

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
				Feb2009)		
111	522	13	08/01/2010 16:51	Ballenas6	32	Survey Acquisition error at beginning of dive, so shut down Left/Right indicator
111	523	14	08/01/2010 17:54	Ballenas7	17	muddy transect, few fish
111	524	15	08/01/2010 18:39	Ballenas10	18	compass for vessel out 180 degrees at start
111	525	16	08/01/2010 20:04	Ballenas9	30	HyPack survey crashed again during lunch!
111	526	17	08/01/2010 21:09	Ballenas8	50	some difficulty proceeding - deep dive, wind on surface. Clump may have encountered bottom sometime after 21:18, resolved by 21:39
111	527	18	08/01/2010 23:01	Ballenas4	34	23:18:50 - cable strung 1m off bottom, on chart
111	528	19	10/01/2010 16:57	Longline1 Teakerne Arm	93	Longline paired - 1st attempt to follow longline set, missed line once, found on second pass. Recording not started until marker 6, 17:04; 18:18:00 gyro lost boat heading or about 20 seconds
111	529	20	10/01/2010 20:41	Longline2 Joyce Point	114	Longline paired - recording started as line intersected, transect started at start of gear; clump jump, 5 or 6 times, offscreen for about 20 seconds each. 2 passes in either direction; there is a 10 m offset in positions when heading in the opposite direction
111	530	21	11/01/2010 16:36	Longline3 Joyce Point 2	105	Longline paired -
111	531	22	11/01/2010 12:45	Longline4 Refuge Cove	94	Longline paired - longline fell on ROV umbilical as it was set, we were able to fly out from under it
111	532	23	12/01/2010 16:40	Longline5 Stacey Rock	100	Longline paired - Started logging at 17:00; Survey Window Data Acquisition Error (aka CRASH) at 17:58 Tracking DATA LOST from before that (see Shared Memory Output?)
111	533	24	12/01/2010 19:43	Longline6 Stacey Rock 2	99	Longline paired - intersected transect at 3, headed back to start
111	534	25	12/01/2010 22:27	Longline7 Stacey Rock 3	31	Longline paired - nice shot of clump, pole, and boat at start; intersect transect at pos. 2, start logging, head back to start
111	535	26	12/01/2010 23:40	Longline7 Stacey Rock 3	23	Longline paired - stopped logging over GMT midnight
111	536	27	13/01/2010 16:43	Longline8 Texada North	24	Longline paired - started tape as soon as ROV on bottom; Survey Acquisition CRASH as we intersected line 1 hook before marker 1; Logging and transect started at flagging tape (turn around)
111	537	28	13/01/2010 18:00	Longline8 Texada North	26	Longline paired -

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
111	538	29	13/01/2010 21:33	Longline9 Mouat Island	40	Longline paired - Under boat shot at start (first 30sec)
111	539	30	13/01/2010 22:40	Longline9 Mouat Island	41	Longline paired -
111	540	31	14/01/2010 17:13	Longline10 Jedediah Island	98	Longline paired - Strong winds (>20 gusts) therefore start transect at shallow/sheltered end and proceed north as far as possible
112	541	1	04/03/2010 16:06	Edgell Banks	97	Longline paired - Intersected at Marker 9 approx 7:45 local time, proceeded East to 10, turned around to return to start…
112	542	2	04/03/2010 19:13	Edgell Banks	102	Longline paired - very confused line, lots of fish on hooks, between markers 1,3
112	543	3	04/03/2010 22:46	Edgell Banks	105	Longline paired - Crossed GMT midnight, did not stop logging. Will stop logging at end of pass, before #3. 1 File didn't make it into log, another file did not export, but all points were recorded - ?
112	544	4	05/03/2010 15:40	Edgell Banks	104	Longline paired -
112	545	5	05/03/2010 18:48	Edgell Banks	115	Longline paired - 2nd half pass #2 not recorded on DV tape (ran out)
112	546	6	05/03/2010 22:36	Edgell Banks	113	Longline paired -
112	547	7	06/03/2010 15:55	Edgell Banks	101	Longline paired - 1st two passes not recorded on Didson
112	548	8	06/03/2010 19:17	Edgell Banks	107	Longline paired - Didson not recorded for start of pass 3. Time frozen on OSD before 3 - recorded marks at 2, 4, 9, 15 time on audio and typed on OSD
112	549	9	06/03/2010 22:42	Edgell Banks	99	Longline paired - Made some attempts to fix the OSD, result delayed start by 10 min - recorded odd marks on audio and manually on OSD
112	550	10	07/03/2010 19:18	Edgell Banks	111	Longline paired - fine sediment at end of line, murky vis. At 20:20 shortened Didson field of view - start 1.67, length 2.5, Logged 1 extra hour of trackpoints!
112	551	11		Edgell Banks		SITE NAME - Edgell Banks; RCA:Nanoose-Schonner/Out; Latitude 49.271 - Longitude -124.062. Power on Neo failure (brief) lost lab lights and video signal, also tracking erratic - returned in about 2 minutes; however Arclight did not come back on, switched off to wait for 20 min, noticed pulsing of other lights - squall came through, Neo blown ar
112	552	12	08/03/2010 21:42	Edgell Banks	112	Longline paired -
112	553	13	08/03/2010 0:20	Ballenas4	33	flew straight down the line - tracking errors to west of line

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
						as we flew ahead of the circle of trust (hydrophone cone) THIS Transect goes through a cable area on the chart! Several seen. Very little habitat.
112	554	14	09/03/2010 15:32	Northwest Bay E	106	Longline paired - DV tape ran out, missed 18 minutes of pass 2, restarted a few hooks into pass 3 (15:32-16:14-16:44-end)
112	555	15	09/03/2010 18:30	Northwest Bay W	107	Longline paired - HyPack crash approx 19:28
112	556	16	09/03/2010 21:34	Northwest Bay SE	111	Longline paired - 3 cabezons, 2 starry flounder, 2 quillback - sand and loose kelp
112	557	17	10/03/2010 16:12	Transect31 (Malaspina Pt S)	30	ACEDvio converter card not responding this morning, replaced with Canopus; large overhanging rock at 436150 5448660 approx. Power failure
112	558	18	10/03/2010 21:11	Transect29 (Entrance Is N)	32	uncanny visibility, very pretty, fishy transect
112	559	19	10/03/2010 22:13	Transect30 (Entrance Is S)	29	NOT LOGGING UNTIL 22:32 ON TRACKING, but Karina bang on the line
112	560	20	10/03/2010 23:22	Transect59 (Snake Is N)	40	Few tracking errors apparent until last 1/4 of transect (pilot responsible for meandering track :-)
112	561	21	10/03/2010 0:38	Transect33 (Snake Is S)	36	
112	562	22	11/03/2010 16:17	Transect32 (Malaspina Pt N)	27	clump encountered rock wall (seen on video), then tracking errors
112	563	23	11/03/2010 17:28	Northumberland1	31	transect planned along ridge top, flown to east or low side; no Didson recorded; some industrial debris; note that this ridge is not shown on the chart
112	564	24	11/03/2010 18:25	Northumberland2	52	another ridge top, low to the west; started just inside RCA, left at 18:30; some industrial debris; note that this ridge is not shown on the chart
112	565	25	11/03/2010 20:15	FiveFingers1	24	No Didson recorded
112	566	26	11/03/2010 20:57	FiveFingers2	21	OSD not updated! Shows T# 25.
112	567	27	11/03/2010 21:47	FiveFingers3	18	discovered ling, greenling and others chase the green lasers.
112	568	28	11/03/2010 22:24	FiveFingers4 and 5	20	travel south on 4, turn around on bottom and return north on 5, straddle ridgetop
112	569	29	11/03/2010 23:22	Snake1	34	very nice
112	570	30	11/03/2010 0:24	Snake2	18	
112	571	31	12/03/2010 15:55	Northumberland4	41	(Northumberland3 skipped)
112	572	32	12/03/2010 17:10	Northumberland5	22	

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
113	573	1	09/08/2010 23:18	Gabriola, Snake I, outside rca (Feb transect 59)	57	1st transect. Had to stop/restart track logging at midnight GMT. Two tracks logged.
113	574	2	10/08/2010 16:37	1025-1, Read Island	58	transect went well! Stayed very close to planned line and was mostly within depth stratum. Good vis.
113	575	3	10/08/2010 20:36	1027.1 In Read-Cortez RCA	45	off bottom for a good part of transect. Nice sponges. Extremely variable and confusing bottom.
113	576	4	10/08/2010 23:28	1027-1 Outside Read Island Block 1027	33	again, off bottom for parts of transect. Had to run shallower than the planned transect line due to discrepancy in depths. Will have to redraw a line to be fished. Didson clock 12 hours offset for transects 2-4. Transect just crossed GMT midnight by 1 min
113	577	5	11/08/2010 15:55	1374-1 Outside Hoskyn RCA, block 1374	62	terrible visibility! First part of transect on mud. Then went over a nice rocky pinnacle. Off bottom on descent of rise. Missed last 2 minutes of transect on video tape.
113	578	6	11/08/2010 17:58	1374-4 Outside Hoskyn RCA, block 1374	37	drew new line at other end of line 1374 to re-do part of transect that we couldn't see anything on descent of slope.
113	579	7	11/08/2010 20:14	1374.1 Inside Hoskyn Channel RCA	38	low visibility and poor habitat. 1 short section of good habitat.
113	580	8	11/08/2010 22:26	1025.3 Inside Read-Cortes RCA	44	visibility better. Had to run transect line parallel to planned line since I messed up and chose a line in the wrong depth class! Lots of sponge. Transect worked out great despite botching thanks to skilled pilot and captain! Nice habitat and many rockfis
113	581	9	12/08/2010 17:26	SonoraOut1 Sonora1 Outside RCA	29	transect deep to shallow 150 m to 40 m. mud below rock wall. Some good habitat. Yelloweye, QB and greenstripe (which were washed out at first so look v pale.)
113	582	10	12/08/2010 19:38	sonoraIn1 Sonora1 RCA	26	transect from 160 to 90 m. some rock habitat, but mostly flat mud. Steep shore required ending transect.
113	583	11	12/08/2010 21:21	sonoraIn3 inside Sonora RCA	22	small patches of rock surrounded by mud. Some rockfish. Ended in about
113	584	12	12/08/2010 22:52	sonoraIn2 Inside Sonora RCA	26	very nice rocky habitat at end of dive. Many small qb amongst feather stars
113	585	13	13/08/2010 0:49	sonoarout2 outside RCA	41	time/date stamp is on the 13th. Beginning of transect on mud with a side slope that made navigation difficult so lots of time off bottom. End of transect nice habitat with QB, lingcod and 1 copper.

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
113	586	14	13/08/2010 14:50	925 Needham Pt.	29	depths: started in 90 to shallower to 75, then into stratum. Nice habitat. Off bottom for a bit between ridges. QB, lingcod, 1 YE, Kelp Greenling, ratfish. Ended transect early since umbilical ripped off wire. Umbilical twisted around wire on recovery.
113	587	15	13/08/2010 17:52	Block 891, Chancellor Channel, 891-2	38	transect went over a number of ridges that ran perpendicular to shore. Off bottom between ridges so quite a bit of off bottom time. Large YE, QB, Lingcod, greenstripe. Had to crab some of transect. Ended transect early to avoid eddy line and current off o
113	588	16	13/08/2010 20:50	Inside Chancellor Channel, 891.1	55	slow transect mostly crabbing along the wall. Few times off bottom. QB and YE
113	589	17	13/08/2010 22:51	Inside Chancellor Channel C3, perpendicular to tra	12	crappy transect with no habitat. Sloping sandy bottom with ratfish feeding then a shear wall that we couldn't get to.
113	590	18	14/08/2010 1:03	Outside Chancellor RCA, perpendicular	26	I fell asleep. Sloping mushy habitat with very low vis. Rock right at the end of the transect.
113	591	19	14/08/2010 14:55	block 685-1, knight inlet	67	steep slope of rock and shell bits. Start in 75m, up to 55, down to 115. 2 DV tapes. No data on second tape-all off bottom so I discarded it. End useful transect should be at the cut corner. No data afterwards.
113	592	20	14/08/2010 21:10	block 669-1, Doctor islets	85	tape changed at 20:09, great habitat. Transect between 42 and 70 m. Many smallish QB. Ended transect about 3/4 of length due to current and length of time.
113	593	21	15/08/2010 0:45	Inside Tribune Channel RCA line 685.1, Shewll Isla	53	Very nice habitat with many quillback. Good transect.
113	594	22	15/08/2010 15:57	Block 706-1, Dorman Island	52	Flat, soft habitat with occasional boulders. Quillback near any rock. Many shrimp and prawns.
113	595	23	15/08/2010 17:51	Block 704-1, Turnour Island.	51	transect in about 60-70 m in cobble, boulder habitat. Steep rock wall at end of transect. Some Quillback, 2 yelloweye, 1 yellowtail.
113	596	24	15/08/2010 20:02	line 715.1, inside Clio Channel RCA	52	bad vis. Bad habitat for most of transect. One section of nice boulders with QB and Lingcod and 1 yellowtail.
113	597	25	15/08/2010 21:49	line 715.2, inside Clio Channel RCA	34	started logging twice since I had to restart video capture software. Vis better than t 24, but still low. Better habitat: cobble-boulder then turned to flat mud with prawns and

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
						shrimp.
113	598	26	15/08/2010 23:22	Block 715-1, outside clio channel	33	better vis, some boulder habitat with soft bottom/cobble areas between. Captain called end of transect due to approaching dinner hour.
113	599	27	16/08/2010 16:17	Block 471-2, outside Broughton RCA	73	bad vis. Bottom cobble-shell. Occasional boulders with rockfish around them. Some QB, maybe Puget Sound RF. Many green urchins and hermit crabs. Depth gauge on ROV was 10 m out! Check depths against mini-log.
113	600	28	16/08/2010 19:54	Block 221-1, Outside Polkinghorne I.	58	Good, steep habitat. Transect between 55-80m. Did transect slightly below planned line. Schools of Yellowtail off of steep rocks out of ROV view. We were able to see them on recovery. QB, YT, YE, LC.
113	601	29	16/08/2010 21:47	line 221.1, inside Polkinghorne RCA	41	Great habitat, many QB and some unknown little rockfish, possibly Puget sound? Some lingcod.
113	602	30	16/08/2010 23:03	line 210.1 inside Polkinghorne RCA	28	low vis, poor habitat except for a small section of boulders and a big rock. Transect into a current and wind. Ended transect early due to current.
113	603	31	17/08/2010 16:16	Block 210-1, outside Polkinghorne	69	Very good transect with many fish. QB, yellowtail, LRR, kelp greenling, YE. Two mini-DV tapes
114	604	1	04/03/2011 18:57	Forrest I sidney, Transect10Nov09, EventID424, Ins	23	nice habitat
114	605	2	04/03/2011 21:23	Forrest I sidney, Transect10Nov09, EventID425, out	42	good transect, some very good habitat
114	606	3	04/03/2011 22:58	Domville Island, Sidney, inside RCA, Event ID427	45	difficult transect, some current, high relief, and clump tracking was erratic. Decent habitat however few Rockfish.
114	607	4	05/03/2011 0:25	Greig Island, Sidney, Outside RCA, EventID 432	32	March 6 GMT
114	608	5	05/03/2011 17:57	Rainy Bay,BS, Transect 157, Out	39	no didson data, only a small amount of good habitat at end of transect. Some Greenstripe, Puget sound or red stripe and a few QB. Halibut?
114	609	6	05/03/2011 20:55	Baeria Rocks, Transect 149, Out	45	flat and muddy for first half or 2/3 then nice hab at end.
114	610	7	05/03/2011 22:24	Baeria Rocks, Transect	36	nice habitat particularly at end of transect. After transect,

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
				142, Out		we saw a YE and Boccacio,
114	611	8	05/03/2011 23:54	Baeria Rocks, Transect 140, Out	50	second half good habitat, YE, QB, PS, Canary, LC. Two tracks-had to stop track over midnight GMT but it was on flat, muddy habitat.
114	612	9	06/03/2011 17:13	F69, Imperial Eagle near Folger, Out	35	Nice habitat, good transect, QB, YE, China, YT, Black, several LC and KG
114	613	10	06/03/2011 18:38	F71, Imperial Eagle Pinnacle Reef, Out	44	Last third of transect good habitat, before that very flat and muddy. Qb, YE, Canary, LC. No didson data again. Drive must be full?
114	614	11	06/03/2011 20:29	TransectI3, Effingham, Out	35	Went over a nice reef in middle of transect.
114	615	12	06/03/2011 22:00	Transect F30, Miller Reef IN	54	Nice habitat, rocky with sand waves in between. Canary, QB, China, Tiger, Yt, LC, KG
114	616	13	06/03/2011 23:43	Transect F18, Miller Reef IN	27	Good habitat, many canaries, QB, YT, LC. Left ROV in water to swim to next transect to avoid recovery/deployment in swell.
114	617	14	07/03/2011 0:47	Transect F23, Miller Reef IN	26	beautiful habitat! QB, YT, China, LC
114	618	15	07/03/2011 16:29	Transect F10, Miller Reef In	44	Flat at start of transect but then some nice habitat. YE, QB, Canary, Tiger, LC, KG
114	619	16	07/03/2011 18:00	Transect F9, Miller Reef In	31	Good habitat but long stretch of cobble. ROV got wrapped around float line and required recovery. Umbilical broke away from clump as it should have and strain relief appeared to take strain. Everything appears to be OK.
114	620	17	07/03/2011 20:42	Transect F34, Miller Reef In	25	Some very nice habitat in middle of transect with long cobble sections on either side. YE, QB, LC, KG
114	621	18	07/03/2011 21:53	Transect F35, Miller Reef Out	31	Nice habitat. QB, YE,YT, Canary, China and Tiger, LC, KG
114	622	19	07/03/2011 23:13	Transect F43, Miller Reef Out	29	Very good habitat but the current had us so the speed was quite fast. Nice large YE, Tiger, QB, China, YT, Vermillion. Also strayed off of transect line significantly.
114	623	20	08/03/2011 0:23	Transect F41, Miller Reef Out	41	Flat for first half, then very nice hab. Qb, YE, YT, Canary, Vermillion and many China. LC, KG.
114	624	21	08/03/2011 16:39	TransectC32, Bedwell Sound, In RCA	30	Some pockets of rocks with rockfish. YE, YT, Copper, LC, KG. low vis.
114	625	22	08/03/2011 17:50	TransectC33, Bedwell	28	Very limited rocky habitat, but rockfish were on it. YE,

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
				Sound, In RCA		Copper, QB, Vermillion. Low vis.
114	626	23	08/03/2011 18:56	TransectC31, Bedwell Sound, In RCA	28	Very little habitat, only a few rockfish. Qb, Canary. Arc light was off. Low vis.
114	627	24	08/03/2011 20:45	TransectC29, Bedwell Sound, In RCA	32	very low vis. A small patch of habitat at very end of transect. Copper, Vermillion.
114	628	25	08/03/2011 22:03	TransectC25, Bedwell Sound, In RCA	31	Flat, muddy habitat for most of transect. Last 4 minutes in rock-copper, vermillion and YT.
114	629	26	08/03/2011 23:18	TransectC21, Matleset Narrows, Out RCA	29	A couple small rocks (one early, the others at end) with rockfish, Vermillion and Copper. Rest of transect sand-mud-shell. Lots of prawns.
114	630	27	09/03/2011 0:20	TransectC20, Matleset Narrows, Out RCA	38	Sand-shell-mud for much of the transect. End of transect nice, rocky habitat, current swept. Many Copper, Vermillion, and Juv YT. LC,KG.
114	631	28	09/03/2011 23:38	TransectW2, Matleset Narrows, Out RCA	22	Rock-cobble, current swept hab. Some Copper and QB. End of transect at GMT midnight. Hooked a groundline around the umbilical near the ROV. Had to recover and pull line up. When clump broke away, ROV pulled in by hand. Recovered ROV and ground line. ROV l
114	632	29	10/03/2011 16:52	Transect C17, In Sarnac RCA	20	digital video didn't start correctly. Missed the first 2.5 min of tape, but no fish were seen. Flat, sandy habitat. Sea whips and pens. Only a few juvenile rockfish at end of transect. Rock limited to shoreline.
114	633	30	10/03/2011 18:00	Transect C12, In Sarnac RCA	29	sandy bottom with many sea whips and pens. No rocky habitat. Many! Great sculpin and several juvenile rockfish-Yt-Black and CQB.
114	634	31	10/03/2011 19:15	Transect C9, In Sarnac RCA	31	sandy, soft bottom for most of transect. Some rock at end. YT. Saw a LC nd Copper after transect ended.
114	635	32	10/03/2011 21:27	Transect C3, Out Sarnac RCA	31	some good habitat early in transect. Small vermillion, copper, juv YT and CQB. Then habitat flat, sand-shell, horse clams. Ended transect early due to a ground line that we were concerned about.
114	636	33	10/03/2011 22:33	Transect C6, Out Sarnac RCA	28	Start of transect flat sandy bottom with lots of sea whips. Then a nice reef with rockfish-Copper, 1 China, Black, KG.
114	637	34	10/03/2011 23:44	Transect C2, In Sarnac RCA	55	Fields of sea whips! A section of nice reef habitat with QB, juv QB, Black, YT, many YT juveniles on flat habitat and around sea whips mixed in with shiner perch.

Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
						Also many sculpins
114	638	35	11/03/2011 16:45	Transect C1, Ritchie Bay, Out RCS	30	No rockfish seen or rockfish habitat. Sandy substrate with many clams showing. Sculpins, no juvenile rockfish observed. Beginning of transect fast as we got in position to deal with the current.
114	639	36	11/03/2011 18:13	Transect C26, Outside RCA	22	very low vis. Current hit us at the end of this transect and blew us off of the reef. So no good data collected.
114	640	37	11/03/2011 20:03	Transect W5, Warn Bay, Out RCA	16	Vis OK. Nice reef with several Vermillion, and YT juveniles. Kept ROV in water for transit between transects.
114	641	38	11/03/2011 20:38	Transect W6, Warn bay, Out RCA	37	Flat sand with small sections of rock. Some vermillion but overall dull transect. Got to a reef right at end of transect but had to end it due to depth.
114	642	39	12/03/2011 0:31	Transect O12, Millar Channel, Out	39	Pretty low vis. lots of herring! Start of transect flat and silty, then came up a nice wall. YE, QB, YT, Copper, China, LC. Depths may have been off by 4-5 m deep.
114	643	40	12/03/2011 15:56	Transect O8, George Islands, Out	41	Beginning of transect flat, mud, then a nice wall with QB, Copper, YT, Juv Canary. Loew vis.
114	644	41	12/03/2011 17:17	Transect O7, George Islands, Out	40	Nice rocky habitat. QB, Copper, Canary, Yt, Vermillion, Puget Sound, GS, maybe a redstripe.
114	645	42	12/03/2011 18:43	Transect O6, Sterling Pt, Out	32	Flat, muddy hab at start, then a wall and nice reef. QB, Canary, Copper, YT, PS, KG. low vis.
114	646	43	12/03/2011 21:01	Transect O9, Millar Pasage, Out	43	Flat, muddy hab at start, then a wall and nice reef. QB, YE, Canary, Copper, YT,LC, KG.
114	647	44	14/03/2011 18:00	Transect S2, Sechart Channel, Out	37	nice, rocky habitat covered in crinoids. Some QB, YT, PS, LC, KG, but relatively few fish for the amount of habitat.
114	648	45	14/03/2011 19:55	Transect I53, Chain Islands, Imperial Eagle, Out	25	Terrible vis! Got to rock at 20:17 (made mark in tracking) but vis was still too bad to collect any useful data and ROV was in danger of colliding with rocks since there was also some swell even at 70 m!
114	649	46	14/03/2011 21:19	Transect R3, Rainy Bay, Out	47	Nice transect. Decent vis, some very nice, craggy habitat and several fish. Redstripe, Canary, QB, Copper, LC, KG.
114	650	47	14/03/2011 22:42	Transect R2, Rainy Bay, Out	18	Steep wall, very smooth rock. LC, QB, Copper, Redstripe, YT.
114	651	48	14/03/2011 23:28	Transect R1, Rainy Bay, Out	30	Stepped wall. Good habitat. Many small red rockfish juveniles, redstripe or Puget sound, or other? YE (gravid), Copper (gravid) QB, Greenstripe, YT, Canary, severl LC.

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114	652	49	15/03/2011 1:39	Transect S3, Sechart Channel, Prideaux, Out	35	Cobble, boulder, mud habitat. Quite a few greenstipes and small red guys (splitnose juvs?).
114	653	50	15/03/2011 17:17	Transect T3, Coaster Channel, Broken Group In	39	Cobble, boulders with sediment on top. Many crinoids. Some larger boulders at end with QB. Canary, several LC, 1 halibut. Wind came up and boat blew off transect and ROV had to chase boat.
114	654	51	15/03/2011 20:05	Transect T4, San Mateo Bay, Out	54	Beginning of transect flat, mud, then rock walls with lots of juv red rockfish, canary, YT, QB, YE, 2 bocacio or silvergrey.
114	655	52	15/03/2011 21:46	Transect T6, Chris Rock, San Mateo Bay, Out	16	deep transect, mud at start, then strait up an overhung wall. YE, boccacio or silvergrey, little red r.
115	656	1	24/06/2011 15:38	Port Hardy Bay	46	Beautiful morning, calm, test launch - winch problems - hydraulic fluid low. Abort Dive. Retrieve clump and test winch. Yellowtail rockfish swim around the clump weight.
115	657	2	24/06/2011 17:22	Port Hardy Bay again	12	Clean transect, no problems. Quillback at the end of the transect! Spaghetti sponge all over the bottom? Tape ends at 17:44
115	658	3	24/06/2011 21:41	Redfern Island B04	40	Shell hash, rock, yelloweye deep, lots of red rockfish, quillbacks, lingcod and kelp greenlings.
115	659	4	24/06/2011 23:13	Alleviation Rock B05	25	Mud bottom to start then into the cobbles and rocks - big rock outcrops at the end. Yelloweye at 145 m, sharpchin, little red jobs, yellowtail
115	660	5	25/06/2011 1:11	Hedley Island B06	37	Mainly mud bottom, rocks toward the end but had to end due to kelp beds.
115	661	6	25/06/2011 14:56	Barge Rock B01	12	Rocks, nice habitat with sponges, yelloweye, little red rockfish. Winch failure abort transect. Recover clump with capstan.
115	662	7	25/06/2011 19:46	Nye Rock B08	28	Started on rock, sponges and rockfishes. Getting pulled by the ship, can't slow down. Move operations to forward chains.
115	663	8	25/06/2011 20:49	Barge Rock take 2 B01	24	Start on shell hash, pebble pavement, then into rocks - rockfish. Clump part from wire - recover ROV by pulling on the umbilical. Did not start trackpoint logging for this transect - need to recover from the backup file.
115	664	9	25/06/2011 22:39	Scarlett Point BP09	35	Start over soft shell and mud bottom, some sea whips. Into some rocks with lots of cup corals. Variety of

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						rockfishes! Yellowtail, dark blotched? Pygmy? Sharpchin? Black?
115	665	10	26/06/2011 1:36	Croker Rock BP10	37	Mostly over flat bottom until the end. Lots of little red rockfish. Gravid ones pygmy rockfish?
115	666	11	26/06/2011 14:33	Shelter Pass B07	28	Mostly shell, cobble and hash. Rocks at the end of the dive with many pygmy rf.
115	667	12	26/06/2011 15:58	Bolivar Passage1 B02	50	Lots of current at the start of this line. One large halibut. Some quillback, pygmys and yellowtail.
115	668	13	26/06/2011 17:41	Bolivar Passage2 B03	25	Lots of brittle stars and sea urchins at start, school of yellowtail, gravel bottom mid way, end of transect…a tiger, quillback and china rockfish.
115	669	14	26/06/2011 19:22	Hougestal Pt BP06	24	School of yellowtail, some kelp greenlings and possibly pygmys.
115	670	15	27/06/2011 14:38	Hunt Rock BP03	19	Pebble, sand, shell habitat with rock ridges
115	671	16	27/06/2011 15:39	Hunt Rock South BP07	31	Beautiful dive - metridia forests, lots of quillback, china, octopus, etc. Capture HD video.
115	672	17	27/06/2011 17:01	Hougestal Pt North BP04	30	Pebble, sand with cobbles at start, couple rock ridges with lots of Pygmy Rockfish - close-up on HD video. Silvergray? QB and YE.
115	673	18	27/06/2011 18:12	Nigei Island Northeast BP01	26	
115	674	19	27/06/2011 19:50	Hunt Rock North BP02	62	more 'Beautifuller' transect, many many fish (QB, rosethorn, YE, lingcod, canary, YT, black and tigers); most of the transect was alongside a steep rock wall.
115	675	20	27/06/2011 21:45	Hunt Rock NorthWest BP11	28	Pebble, shell, sand, and lots of swimming scallops. Fishy - halibut, ye, tiger, qb, kg and many little red rf. Ending on a ridge with white and red corals.
115	676	21	27/06/2011 23:19	Browning Passage BP5	27	Boulders at start, then shell, sand, pebbles and then to a steep wall. Very fishy: tiger, silvergrey, ye, rosethorn ,qb, kg and lots of little red rf
115	677	22	28/06/2011 1:02	Barge Rock Take 3 B01	29	Very, very steep walls. Large sponges, yellowtail, qb, and many little red rf, slender sole? And another sole? Pcod.
115	678	23	28/06/2011 14:34	Triangle Island North S56	41	Sand waves even at 50 meters! Colorful rock due to encrusting algae and sponges. Fishy; lcods, kg, canaries, coppers qb, china. Hard bottom for most of transect.
115	679	24	28/06/2011 16:13	Triangle Island NW S57	43	Hard bottom, very rocky with encrusting organisms. Lots of wave action - not much 'tall growth' on rocks - very

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						few anemones, mostly solitary. Saw many China at the start of transect along with YE and canaries.
115	680	25	28/06/2011 17:54	Triangle Island SW S53	26	Transected from shallow to deep because of current. Sand at the start, boulders, hard bottom. Saw a few canary, many rosethorn, ye and a couple of schools of juvenile rf.
115	681	26	28/06/2011 19:25	Triangle Island South1 S43	39	Transect started in cobble and then into rock outcrops with lots of crevice sPace. Tonnes of small red rockfish. Some of these are darkblotched??? Yelloweye at the end.
115	682	27	28/06/2011 20:58	Triangle Island South2 S46	22	Pebble pavement with not much relief change. HD video of the squat lobsters.
115	683	28	28/06/2011 22:06	Triangle Island South3 S52	32	Clam shells - piles and piles of clam shells, cobbles then rocks at the end. Lingcod, tiger, yelloweye canaries, chinas maybe vermillions?
115	684	29	28/06/2011 23:16	Triangle Island South4 S45	27	Sand bottom to start into rock and cobbles. Halibut on HD! Canaries and vermillion? Greenlings, lingcod, v. small rf, china
115	685	30		Sartine Island West1		aborted - too much current
115	686	31	29/06/2011 14:17	Cox Island East1 S1	19	In Scott Channel at slack water, shell gravel to boulders and rock - rockfish - vermillion, canary, QB, greenlings, coppers, china.
115	687	32	29/06/2011 15:36	Cox Island East2 S4	20	Pebble shell bottom - octopus - some QB and lots of kelp greenlings. First transect with new cable-umbilical ties. All OK up to 2 kts through the water.
115	688	33	29/06/2011 16:49	Cox Island East3 S2	39	Cobble pebble bottom with shells, orange sponge everywhere - on HD. QBs, china and kelp greenlings chasing the lasers.
115	689	34	29/06/2011 20:32	Lanz Island NorthEast4 S29	30	Transected parallel to line due to tide and current. Cobble, pebbles and sand - not much to see, coppers, greenlings and quillback..
115	690	35	29/06/2011 21:36	Lanz Island North1 S19	34	Not much to see on this transect. Some qb and greenlings. Too long in the 'deep'. Will adjust the next transect.
115	691	36	29/06/2011 23:10	Cox Island North S58	40	Shell and sand from start to finish. Ratfish only!
115	692	37	01/07/2011 16:11	Shelter Bay 1 SB1	43	Muddy bottom until the end of transect. Lots of ratfish and flatfish. Saw 1 quillback and 3 juvenile rf throughout. One Pcod. NO avi found on disc, recovered from DV tape back at PBS.
115	693	38	01/07/2011 22:45	Shelter Bay 2 SB3	27	Start in the mud, ratfish. Into the rocks - tonnes of

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						scallops, darkblotched rf?? On HD, yellowtails or blacks in a group
115	694	39	02/07/2011 15:07	Wallace Islands SB9	16	low visibility, start on sand - scallops into rocks quillback in metridia forest, yellowtails, silvergray, small red rf - pygmy school
115	695	40	02/07/2011 16:41	Annie Rocks SB5	35	start on the sand and shell bottom, into the rocks, yelloweye, yellowtail, tiger, and quillbacks.
115	696	41	03/07/2011 14:32	Top Knot T12 OUT	45	In rock immediately. Excellent habitat. Many lingcod. QB, YE, tiger, rosethorn, yoy rockfish of some kind, PS. Spotty fishing the line near transect. Didson was not working due to lack of ethernet connection.
115	697	42	03/07/2011 15:54	Top Knot T11 OUT	72	cobble bottom with sand waves for first 2/3 of transect. Nice rocky habitat for last 1/3. YE, QB, China, Tiger, many Lingcod. 2 dv tapes. Took a long (6 min) HD clip in good, fishy habitat. DIDSON stopped working.
115	698	43	03/07/2011 17:47	Top Knot T9 IN	40	cobble at start then rocky, nice hab. Many YE, some QB, tiger, china, PS, Lingcod. School of canary at start.
115	699	44	03/07/2011 19:49	Top Knot T3 IN	53	Compass erratic during dive; powered off ROV to fix. Wolf Eel 20:05
115	700	45	03/07/2011 21:27	Top Knot T11 IN	37	2nd transect named T11 in planning file, named '2' in HyPack. Timecode (in Cyberlink) started at 10:00ish? (Still no DIDSON, not recording) Big swing on retrieval, ROV frame contacted rail in a denty sort of way.
115	701	46	04/07/2011 23:20	Top Knot T14 OUT	48	No Logging before midnight, T14.RAW is after midnight - Get beginning from Shared Memory Output. Sand waves and mud at beginning, much better habitat 2nd half (synched clock on HD computer before this transect)
115	702	47	04/07/2011 1:12	Top Knot T13 OUT	58	Compass erratic again during dive; powered off ROV to fix. Lots of sand again, very rugose last 1/4.
115	703	48	04/07/2011 15:03	Checleset Bay CB14 OUT	32	(Still no solution to DIDSON failure - works for 15 minutes and then quits)(Trackpoint line file will have datetime name)(Video saved as .mpg) Fantastic steep, large boulder habitat, many fish
115	704	49	04/07/2011 16:16	Checleset Bay CB9 IN	31	Slow start but good habitat at end, many juveniles, mixed species, gravid Puget Sound?
115	705	50	04/07/2011 17:38	Checleset Bay CB13 OUT	34	Good habitat. Followed by several yelloweye for a few minutes, chasing lasers.

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115	706	51	04/07/2011 19:27	Checleset Bay CB12 IN	27	Mud most of the dive with a little good habitat at the end.
115	707	52	04/07/2011 20:41	Checleset Bay CB11 IN	12	Good habitat, rosethorns, YE, Lings
115	708	53	04/07/2011 21:39	Checleset Bay CB10 IN	28	Good habitat, carried on after transect line but started down the peak. QB's YE's Canary school
115	709	54	05/07/2011 1:16	Brooks Bay BB21 OUT	15	Poor vis at start and muddy rocks later on. Got better with some QB, canary, and a few YE and Ling
115	710	55	05/07/2011 14:53	Brooks Bay BB3 IN	15	Good habitat. Copper, QB's, Vermillion, canary. Short transect so we used the same tape for TR 55, 56, and 57.
115	711	56	05/07/2011 15:44	Brooks Bay BB4 IN	12	Missed the start with some good habitat, boat reversed to try it again for TR 57. Same tape for TR 55,56, and 57
115	712	57	05/07/2011 16:02	Brooks Bay BB4 IN	5	Went back to try to hit the rocky habitat. Very small, low relief rock. Some juvenile fish (canary) on it, but no real adult habitat on this transect. Probably omit TBB4 from analysis.
115	713	58	05/07/2011 16:57	Brooks Bay BB2 IN	26	Good rocks, Lots of fish coming out to play with the lasers. Canary QB, Copper, some YE, kelp greenlings. TR 58 and 59 on the same tape.
115	714	59	05/07/2011 18:04	Brooks Bay BB5 OUT	18	Good habitat, QB's, copper, YE, canary, kelp greenlings. TR 58 and 59 on the same tape.
115	715	60	05/07/2011 19:23	Brooks Bay BB6 OUT	18	Good hab. QB, Canary, Copper, China, Lingcod and KG.
115	716	61	05/07/2011 20:17	Brooks Bay BB10 OUT	20	Good habitat. QB, juv canary, copper, china, lingcod, PS, yoy PS!
115	717	62	05/07/2011 21:07	Brooks Bay BB19 OUT	28	Good habitat. Off bottom a lot since had trouble with tension on tether for some reason
115	718	63	05/07/2011 22:16	Brooks Bay BB26 IN	9	Good habitat but short transect. YE, QB, Copper, Vermillion, PS, LC, KG. School of YT.
115	719	64	05/07/2011 22:57	Brooks Bay BB18 and 28 IN	31	combined two transects lines so a bit of off bottom in middle. Good habitat on either end. QB, Copper, Canary, YE, Vermillion
115	720	65	06/07/2011 0:53	Brooks Bay BB14 Out	20	Start sandy and cobbles, then rocky wall. Got quite shallow.
115	721	66	06/07/2011 1:42	Brooks Bay BB15 Out	19	boulder cobble habitat then wall and ridge. Good hab.
115	722	67	06/07/2011 14:37	Checleset Bay CB2 IN	35	excellent habitat. Very fishy. YE! QB, vermillion, lingcod, KG, Blue, Canary, YT, PS, YOY CQB
115	723	68	06/07/2011 15:44	Checleset Bay CB7 IN	44	most in flat sand or cobble habitat. Reef at end.
115	724	69	06/07/2011 17:14	Checleset Bay CB8 IN	38	extended transect past top and went over top. Mostly low relief reef.

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115	725	70	06/07/2011 19:24	Checleset Bay CB25 OUT	23	Mud beginning, small reef w fish. Rock at end. Extended transect. Moderately fishy.
115	726	71	06/07/2011 20:42	Checleset Bay CB19 OUT	37	DIDSON works again! (although we did not observe it other than at the start and end of transect) Long way over sand waves to rock, several canary at first cobbly rise, then again moderate reefy habitat and fish.
115	727	72	06/07/2011 22:09	Checleset Bay CB20 OUT	19	bit of rock at beginning very fishy, sandy plateau, ridge, plateau, then very large boulder jumble, china, canary, vermillion DIDSON failed on this transect
115	728	73	06/07/2011 23:01	Checleset Bay CB5 OUT	16	No rock on planned line, headed south based on sonar and vessels comfort with shallow water. Very steep rock section with fish. Large school of Yellowtail(?) as ROV pulled off transect.
115	729	74	07/07/2011 1:43	Checleset Bay CB4 IN	26	CHS Hydrographer on board multibeamed rock and provided geotiff for planning. :-) Fish chasing ROV lights very aggressively, all species. Earlier today the Vector approached a 22' sport boat fishing at this location, indicated that they should desist, and
115	730	75	07/07/2011 14:33	Checleset Bay CB1 IN	37	(Stil no DIDSON). Shows on OSD. Fish attracted to ROV lights and lasers, Greenling, China, Lingcod, QB, some Canary & Vermillion.
115	731	76	07/07/2011 15:45	Checleset Bay CBN1 IN	25	Good transect, boulders and many China, thankyou multibeam.
115	732	77	07/07/2011 17:10	Checleset Bay CBN2 OUT	46	started digital video well before transect start, tape after, ran out at 36 min (original transect end).winds 15 to 20. skirted 3 small mountains, then up a rising rock shoulder, flat bedrock with lower complexity and few fish after transect end.
115	733	78	07/07/2011 19:14	Checleset Bay CBN4 OUT	33	Nice habitat, mapped on multibeam. Over several humps, quite fishy. Cabezon
115	734	79	07/07/2011 20:21	Checleset Bay CB23 OUT	23	good habitat. Ship was being blown so it was a bit fast, especially since ROV had to go up several steep walls. Quite fishy.
115	735	80	07/07/2011 21:17	Checleset Bay CB24 OUT	31	start mud and low relief reef, then a nice reef. Lingcod chasing PS, Many PS or other YOY, Silvergrey, YE, QB, Canary, YT
115	736	81	07/07/2011 23:01	Checleset Bay CB3	42	boring! This is a PFMA block. No rockfish habitat.

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				PFMA block		Pebbles then sand. Saw 1 lingcod near end, some ratfish and 3 YOY rockfish.
115	737	82	08/07/2011 14:52	TopKnot T26 Out	37	Deeper transect 120-90m. Very complex rocky habitat. Went up and over several ridges, so some downhill, off-bottom sections. Many LC, silvergrey, canary, YE, QB, and some Boccacio.
115	738	83	08/07/2011 16:17	TopKnot T6 IN	30	Great Habitat but not as fishy as some around here. Many rosethorn, YE, LC, some QB, Tiger.
115	739	84	08/07/2011 17:30	TopKnot T5 IN	46	Great Habitat again. YE, school of Widows, many yoy, lingcod, China, Tiger. Bkup tape ran out after 30 min so HD recorded for end of Transect
115	740	85	08/07/2011 23:02	TopKnot T23 OUT	62	Good habitat in terms of complex bedrock and boulders, but general muckiness ie mud or growth on rock, not many fish, except consistent juveniles. this site may be less exposed to current than others at Topknot
115	741	86	09/07/2011 1:01	TopKnot T24 OUT	38	Terrain excessively complex in places, impossible to follow with ROV. Cleaner than last transect, but still relatively few fish.
115	742	87	09/07/2011 14:24	Sartine S30 IN	31	Tape starts at 27:42. Interesting at start, many canaries. Current.
115	743	88	09/07/2011 15:39	Sartine S35 IN	36	Tape starts at 11:00. All sand or gravel bottom, without end according to sonar, ended transect early.
115	744	89	09/07/2011 17:01	Sartine S32 IN	38	Tape starts at 13:57. Fantastic visibility, good habitat, but not a lot of fish.
115	745	90	09/07/2011 18:15	Sartine SN1 IN	36	Tape starts at 20:39. Good habitat many Rosethorn and juveniles at start. Less fish than expected based on complex rock and boulder habitat, some China and Greenling. White sponge and other growth encrusting rock at shallower depths, only occasional Gr
115	746	91	09/07/2011 19:53	Sartine S59 IN	45	good habitat. YE, LC, QB, Canary, China, Vermillion. More abundance than previous
115	747	92	09/07/2011 21:04	Sartine S62 IN	52	Pretty good habitat. Came up the other side of the reef on T91. QB, YE, China, Halibut, Canary. Lots of scallops.
115	748	93	09/07/2011 22:42	Sartine S61 OUT	38	Good habitat. 2 octopus, YE, QB, China, Lingcod, KG, wolfeel. Also did first part of transect S61.
115	749	94	10/07/2011 0:47	Sartine S51 OUT	29	Excellent, complex habitat. Many YE, LC, school of YT, QB, China, Tiger, Vermillion, PS, Rosethorn, Octopus.

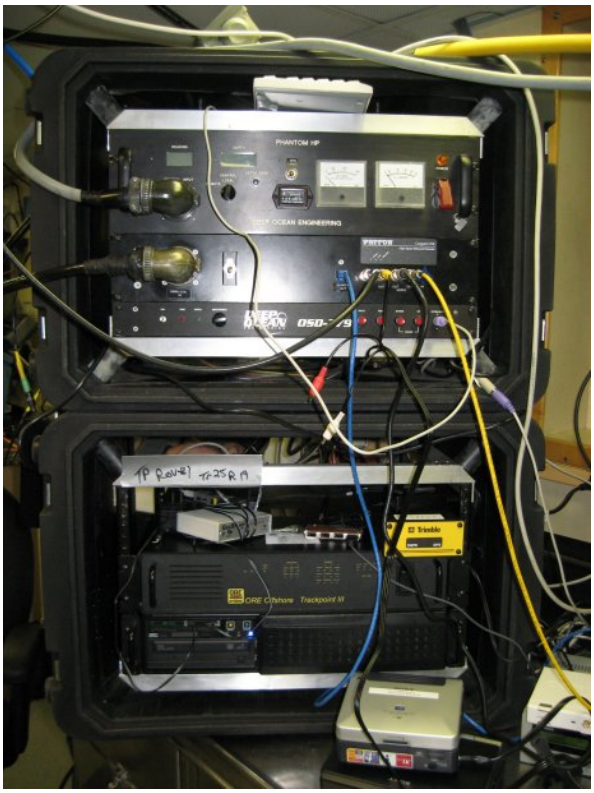
Trip ID	Event ID	Transect Number	Transect start time (GMT)	Site Name	Transect duration (min)	Event Comments
115	750	95	10/07/2011 14:36	Goletas G14 OUT	19	Deep and Steep, but in good, ledge habitat. YE, QB, Tiger, LC, KG. Current strong in places.
115	751	96	10/07/2011 16:05	Goletas G12 IN	32	Deep and Steep, but in good, ledge habitat. Some nice cloud sponge and many metridium. YE, QB, Tiger, YT, PS, KG. Current strong at end.
115	752	97	10/07/2011 17:19	Goletas G11 IN	14	Short transect but some good, steep habitat. QB, YT, Juv Canary, PS, Sharpchin, Cloud Sponges. Not much current.
115	753	98	10/07/2011 19:10	BateShadwell SP10 IN	24	Good transect, rock wall and Quillback, tracking probably confused by many vertical rock surfaces, off bottom for a while
115	754	99	10/07/2011 20:04	BateShadwell SP9 IN	18	Another good one. Unusual white 'miniature metridium' growth carpeting rock at 25m.
115	755	100	10/07/2011 20:47	BateShadwell SP11 OUT	18	Similar to last 2 in this area. Less current, rock, and fish.
115	756	101	10/07/2011 21:52	BateShadwell SP12 OUT	15	Good transect. Series of few meter high ridges. Tigers in with Gorgonian coral.
115	757	102	10/07/2011 22:31	BateShadwell SP14 OUT	37	Thick with QB! A few juv YE, two very small, one near cloud sponge, other at end. Not similar to SP11 or 12, but may be a good comparison to Hunt Rock.
115	758	103	10/07/2011 23:41	BateShadwell SP13 IN	11	Good short transect, QB and Tiger, few YE
115	759	104	11/07/2011 1:02	Goletas G13 OUT	16	steep mud bank. Strong current. Many Ratfish. Better habitat toward end, big school of Blue Rockfish. Marked target for transect end, but then ROV wandered around and found a Yelloweye, several more Blue, some QB and a Lingcod.

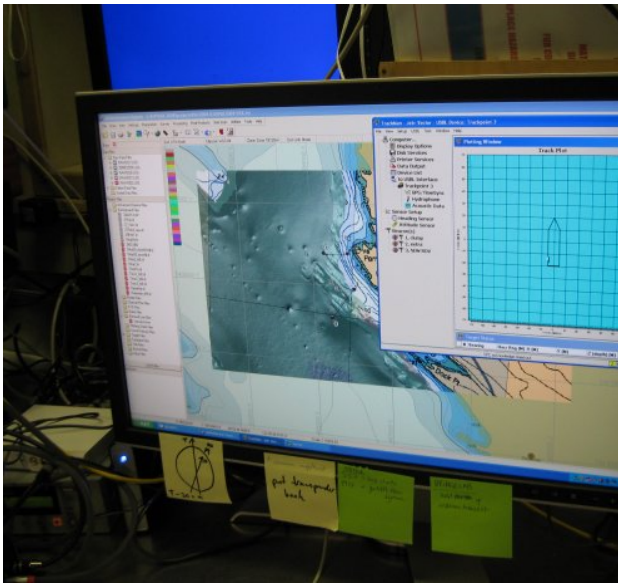
Appendix 2. The Phantom Remote Operated Vehicle and Science-Lab Operations and Checklists

The Phantom ROV aboard the CCGS Vector - set up, wire routing, calibrations, and how-to(s)

Rack mounted box

The rack mounted box houses the slab console, junction box, on-screen display, the TrackPoint III deck unit and the navigational (NAV) computer. The slab console is plugged into the power transformer. The junction box, TrackPoint III deck unit and NAV computer are plugged into 120V outlets and the on-screen display is powered by a 12V adaptor to the junction box. A large viewing monitor (the NAV monitor) and keyboard are connected to the NAV computer.





Power transformer

The power transformer converts 120V (vessel) to 240V (ROV). It is connected to the back of the slab control on the rack mounted box - connection is labeled ‘240 VAC’. The plug-in wire is routed along the ceiling of the lab and plugged into a 120V, 30 amp outlet.

Hydrophone

The hydrophone is Packed in a wooden box. A specifically built arm extension is used with the vessels equipment to mount the hydrophone. It is mounted on a hydrographic mount and hung off the side of the vessel so that it is positioned underneath the vessel’s hull.

Aboard the vessel, a dopler arm is secured to the deck. A hydrophone mount is inserted and secured. At the end of it, the arm extension is attached. The hydrophone’s wire is plugged into the back of the TrackPoint III deck unit, routed along the ceiling, and exits the lab through one of the port-holes. It is then fed through the hydrophone mount and arm extension and connected to the hydrophone.

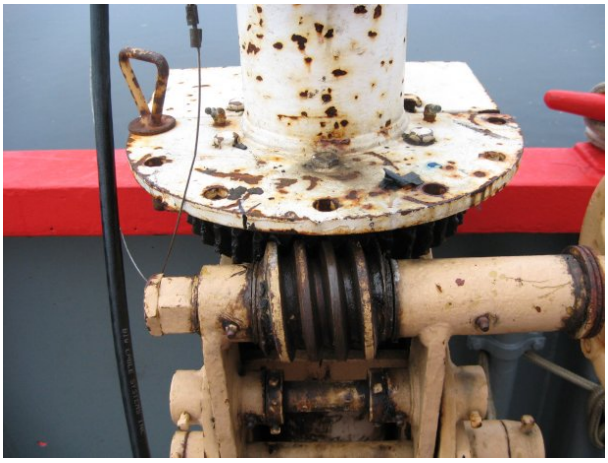
IMPORTANT: When connecting the hydrophone to the plug-in, ensure that the heading marker (a small grove on the front of the hydrophone located in front of one of the 4 screws) is lined up with the V-groove of the stainless steel plate on the arm extension. This marker points to the bow.




Care of the hydrophone: there are 2 o-rings that should be examined before connecting to the cable. One is located just inside the hydrophone and the other on the outside. The o-ring lubrication for this unit is ‘unique’. Use Parker O Lube by Parker Seals or Barium grease. Ensure that no lubrication gets on to the sensor (the black end of the hydrophone).

Calibrating the hydrophone

Once connected, the hydrophone is lowered into the water and then must be calibrated. A transponder is attached to a rope with an anchor weight at the end of it. It is hung off the side of the vessel, in line with the hydrophone, but as far away from it as possible. In theory, both the hydrophone and the transponder should be in line with the bow of the vessel. If the hydrophone 'sees' the transponder hanging at the bow, then calibration is complete. If not, the hydrophone is turned right or left until it sees the transponder in the correct location. Arrow markings are placed on the dopler arm to ensure that the hydrophone is set in its correction position for each ROV dive.

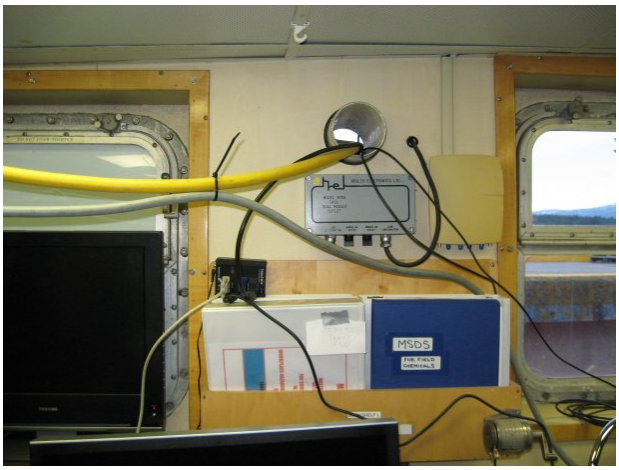


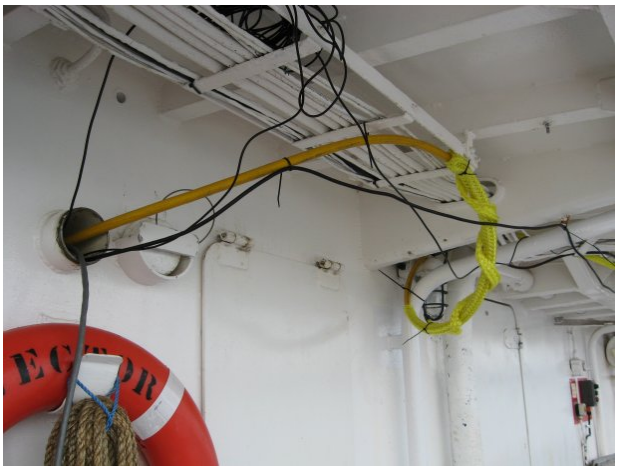
Between ROV dives, or at the end of the day, a protective PVC sleeve is placed over the hydrophone and secured with a hose clamp.

Umbilical

The ROVs umbilical is housed in a large fish tote. Both the power end and the ROV end of the umbilical are easily accessible.

The power end of the ROV umbilical is fed into the lab via a small port-hole in the wall; along the way, it is secured to the deckhead. In the lab, the power end is connected to the front of the junction box in the rack mounted box – connection is labeled ‘UMBILICAL IN’.





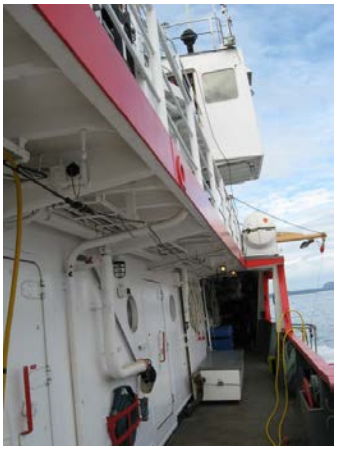
The ROV end of the umbilical has a junction (or splice) on it. This is where wires from the umbilical are soldered to the two main connecting whips which plug into the ROV. The junction is secured to the ROV’s frame using just a few zap straps and wrapped with electrical tape. Only use zap straps to secure hard things to the frame and use electrical tape for securing wiring.

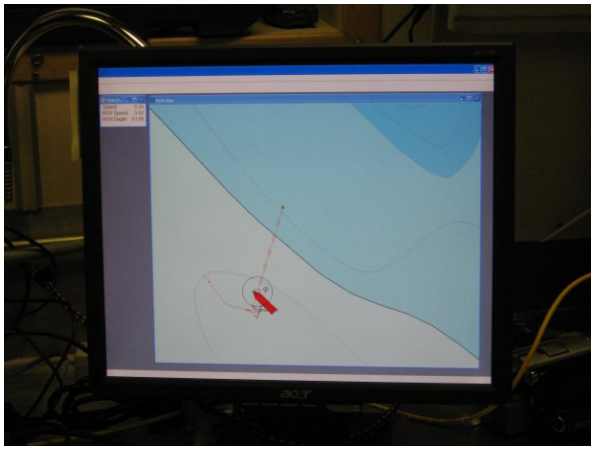
GPS

Two GPS antennae are mounted on an upper deck railing of the vessel. The primary system used with the ROV is the Trimble GPS; the Furuno GPS is used as the backup. Wires are run along the deckhead, into the lab via wall port-holes, and along the lab's ceiling to the rack-mounted box. The Trimble is connected to the GPS processor unit which is positioned on the TrackPoint III deck unit. The processor unit is connected to one of the serial ports on the NAV computer. The Furuno processor unit is located on top of the rack-mounted box and its serial port connector lies 'ready to go'.

Bridge NAV monitor

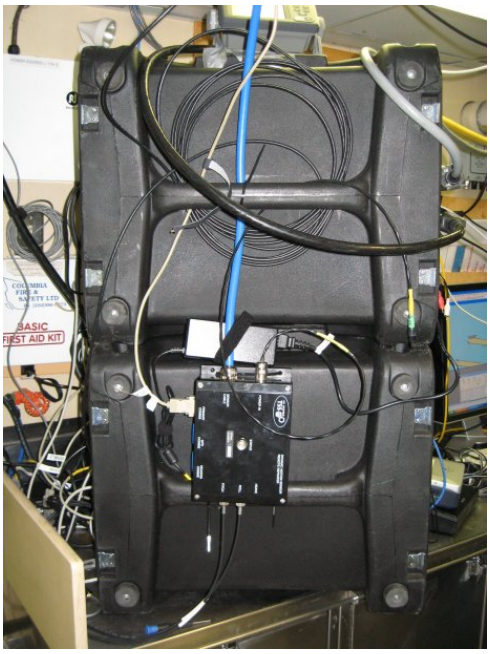
A second NAV monitor is connected to a splitter/amplifier to allow viewing on the bridge. The monitor is set-up on the bridge and its wires are routed along ceilings, walls, deck heads and through wall port-holes. The wire is connected to a VideoView box (the splitter amplifier) located beside the rack-mounted box. The VideoView box is connected to the NAV computer.

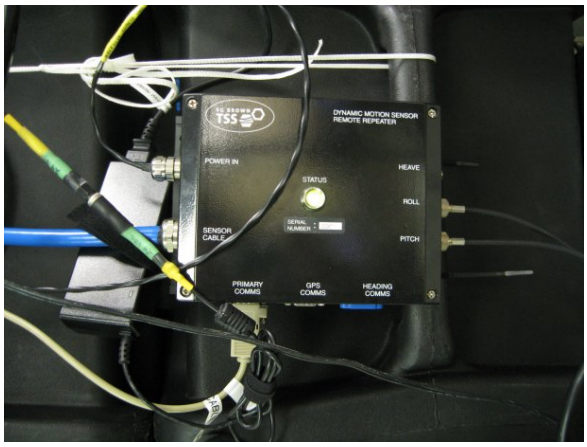




Motion sensor

A motion sensor is used to increase the accuracy of the ROV position relative to the ship. It is secured as closely as possible to the roll center of the vessel. Its wire is routed along the lab's ceiling and connects to a remote repeater box secured to the outside of the rack-mounted box. The remote repeater box is connected to the TrackPoint III deck unit (the connection is labeled 'Analog Sensor Input'). The power supply is attached to the remote repeater box and plugged into an electrical outlet.



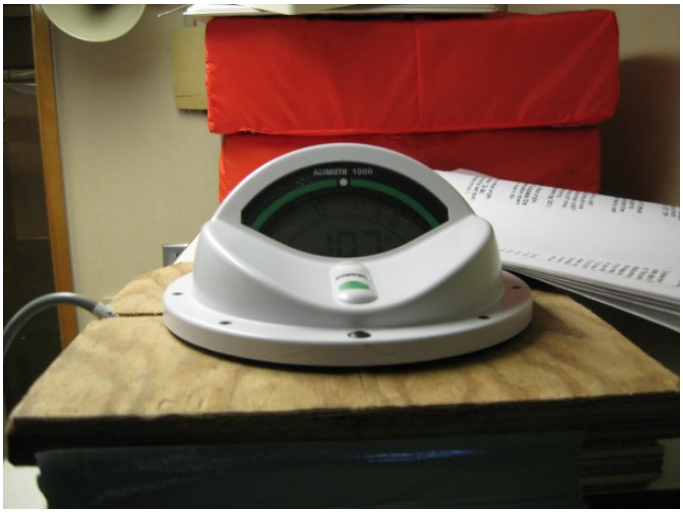


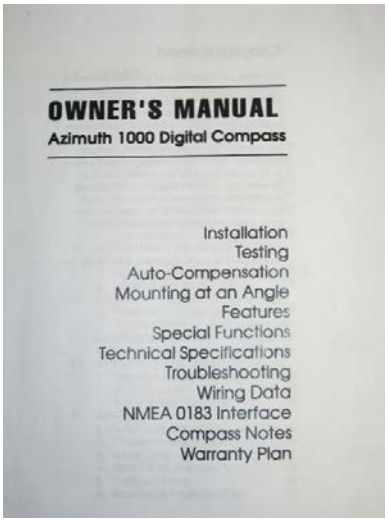
Digital Compass

A digital compass is placed on a shelf in the lab as far away from the electronics as possible. Its wires are routed along the ceiling and connected to one of the serial ports on the NAV computer and an electrical outlet.

Calibrating the digital compass

Turn the compass on. Have the boat steer in a slow, steady speed (idle speed) through a full circle that takes at least 2 minutes to complete. After completing one full circle, continue circling another time. The compass should now be calibrated. For further details, refer to the Azimuth 1000 Digital Compass Owner's Manual.





Deck camera

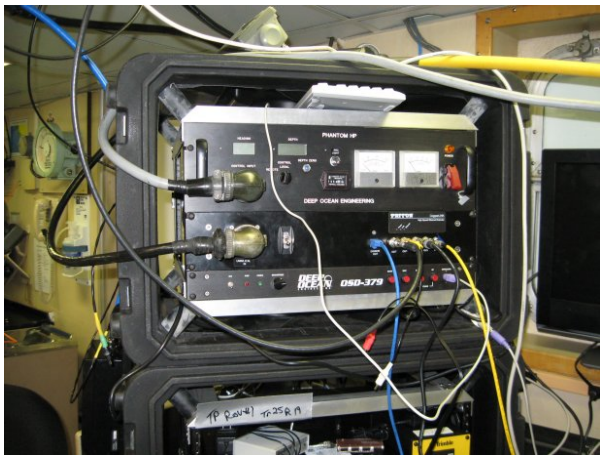
A camera is mounted on the deck at the hydrographic station to view clump weight and wire angle activity. Its wire is secured to the deckhead, fed through the lab's port-hole and connected to a small television screen in the lab.

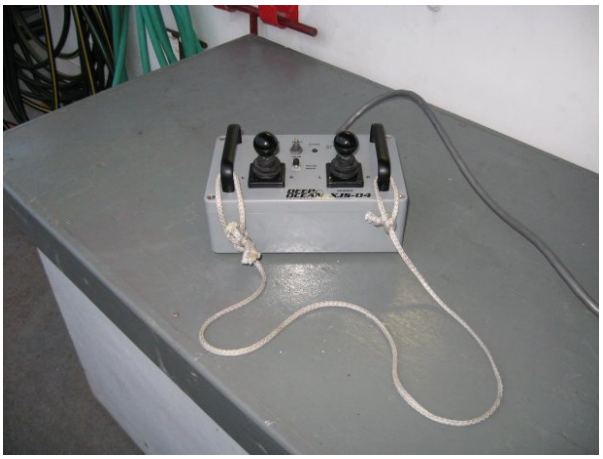
Pilot Control Box

The wire from the pilot control box is connected to the front of the slab control – connection labeled 'CONTROL UNIT'.

Remote Pilot Control Box

A remote pilot control box is used when deploying and recovering the ROV from the water. A switch on the slab console, labeled CONTROL, is switched from LOCAL to REMOTE when the pilot goes outside on deck to use it. The wire from the remote control box enters the lab through the port-hole and is connected to the back of the slab console - connection is labeled 'REMOTE'.

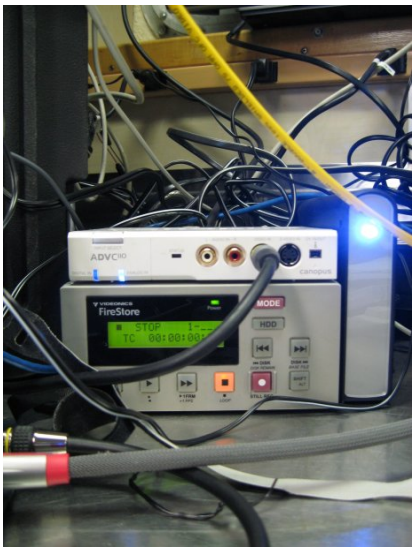




Video Recording Equipment

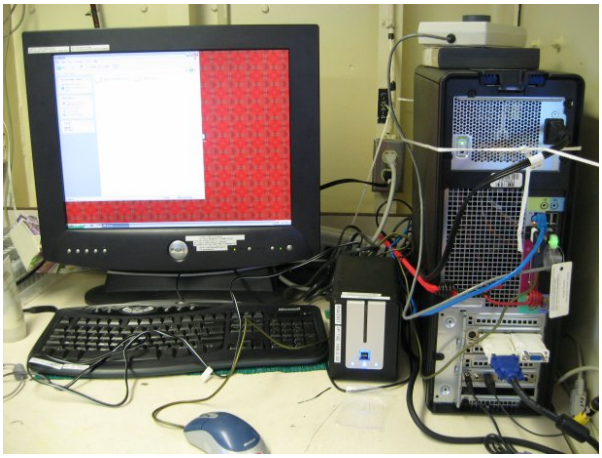
Video from the ROV comes in at the back of the junction box (video splitter in) and then comes out into a 4-way splitter on the front of the junction box.

1. Video out is captured onto a hard drive.



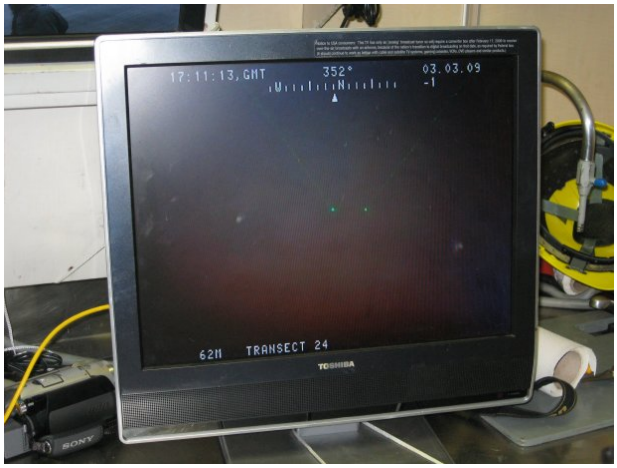
Method #1 - a 3-unit stack consisting of an analog to digital converter, a FireStore hard-drive recorder, and hard-drive. Each unit has its own power supply.

Method #2 - a DV capture card to RAID drives and Windows Movie Maker software.



2. Video is recorded to a digital MiniDV video cassette.

3. Video is sent to the monitor at the pilot station.



Hand-held Radio Antenna

To avoid interference with the lab's electronics, a 3-way radio antenna is mounted outside on the deckhead. Its wire is routed into the lab via the wall port-hole and connected to a 3-way radio replacing its whip antennae.

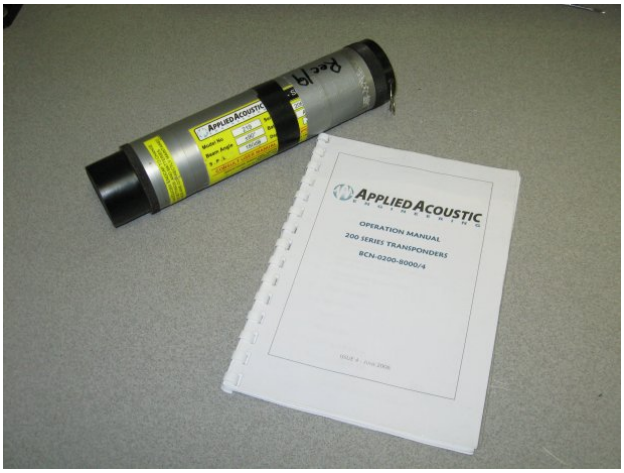
Transponder

The transponder ‘talks’ to the hydrophone for ROV tracking. There is always a transponder (or two) secured onto the ROV frame and most times, one is also secured on the wire just above the clump weight.

Daily maintenance of the transponder includes:

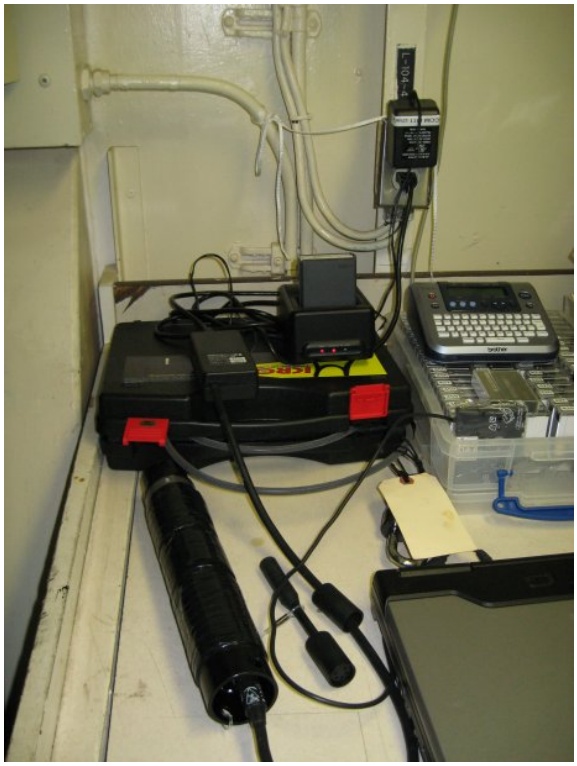
If battery operated:

- Unscrew the endcap from the body
- Replace two 9V batteries daily – 9V batteries start off with a voltage of about 9.4 – 9.5V. The batteries need to be changed once the voltage reaches 9.0 because they lose voltage very quickly at that point
- Check the O-rings, and wipe with a Kimwipe
- Ensure that there is no lint on the O-rings
- Re-lube the O-rings and the inside of the holding cylinder ensuring that no lubrication gets onto the endcap
- Each transponder is set with a different receive and transmit frequency - for example, one transponder sends (tracks) at 25kHz and receives at 19 kHz – refer to the operational manual - Applied Acoustic Engineering for switch settings
- Screw the endcap back onto the body



If chargeable:

- Connect the transponder in its charger overnight.

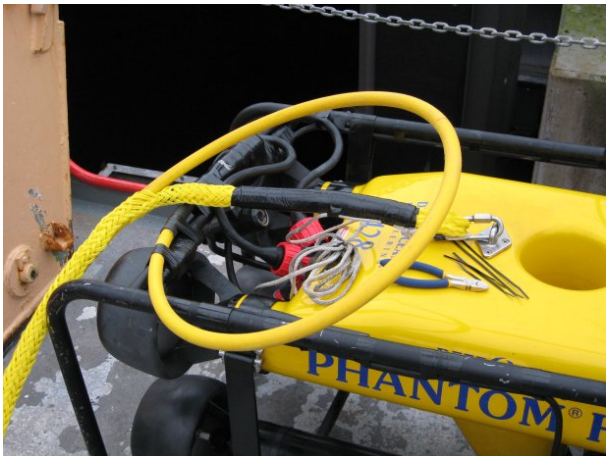


Umbilical Attachment to the ROV and Lift Line

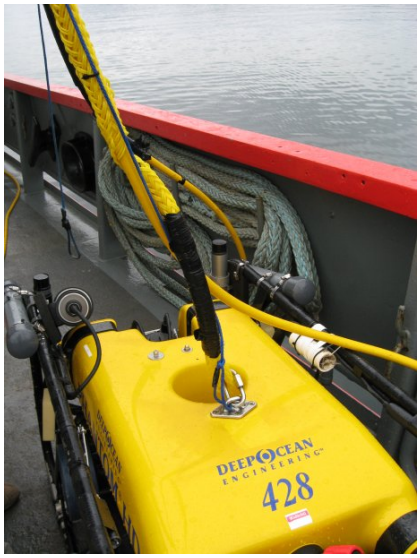
A lift line is used to lift the ROV in and out of the water. It runs along the umbilical and is loosely attached with zap straps and electrical tape. To reduce stress on this portion of the umbilical, a 1.5 to 2 meter length of hose is sliced horizontally and wrapped around the cable. A second piece of hose can also be used on top of the first hose for additional strength. Electrical tape is used to attach the hose to the umbilical. This is covered with a woven strain relief (yellow mesh) that is secured at the end furthest away from the ROV by gently shrink- wrapping it around the cable. The other end is looped. Here, a quick link will attach it to the ROV The lift line is attached to the ROV at one end and is run along and attached to the umbilical using tape on the hose/umbilical portion of the line and zap straps on the strain relief portion.

As can be seen in the photo, the woven strain relief is in place and will cover a portion of the hose/umbilical.

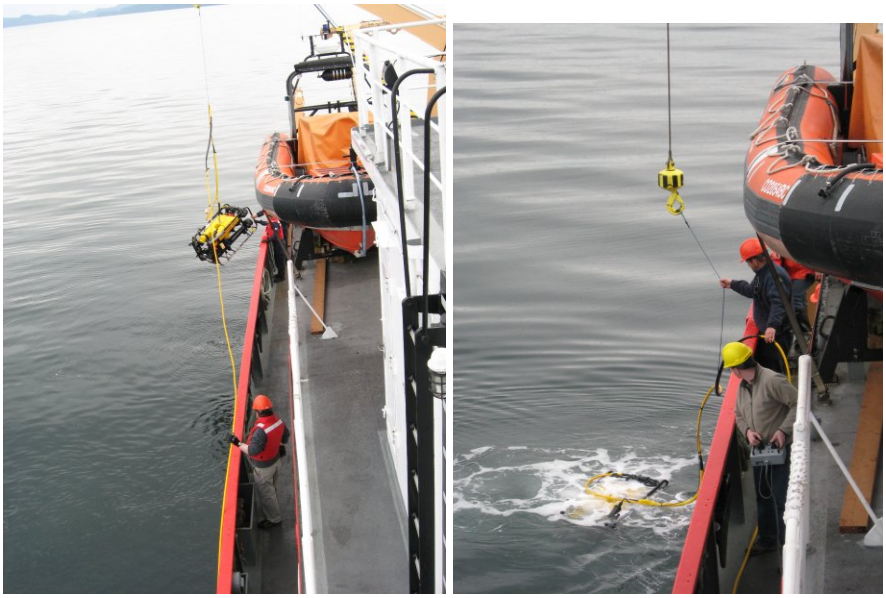
Wrapping electrical tape around the hose and umbilical.



The woven strain relief is looped at one end and a quick link attaches it to the ROV.



The photo above shows the woven strain relief (here the lift line is attached using loosely fitted zap straps), the lift line (blue rope), and a quick link.



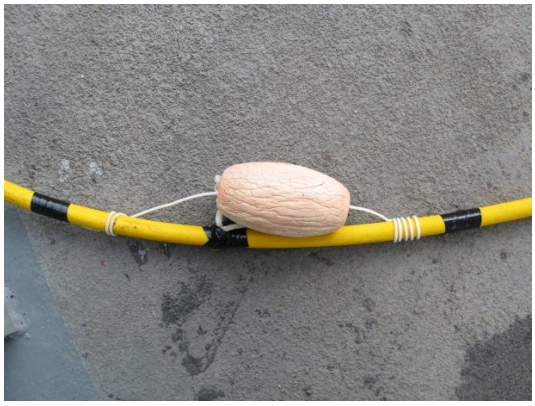
Above…launching the ROV.

Strain Relief Test

A quick test can be done to ensure that the weight of the ROV is taken up by the woven strain relief rather than the umbilical. Lift the umbilical at about a 45 degree angle to the ROV. The loop made by the free umbilical, closest to the ROV (as seen in the photo), should be no less that 20 inches in diameter.

Floating the ROV end of the Umbilical

Three floats are secured to the umbilical, just beyond the lift line/hose portion of the line, thus allowing the umbilical to float when the ROV is at the surface and preventing it from getting caught on things. They are placed approximately 6 meters apart. The blue float below is preferred as they do not compress at depth.



Clump Weight

A clump weight is attached to the umbilical approximately 25 meters from the ROV end. Hose and woven strain relief are used in a similar same way as it was at the ROV end. This strengthens the line for the weight of the clump. The distance between the clump and the ROV is adjusted every few days so as not to cause stress on the line. Each ‘last’ placement is marked with a section of tape so as not to re-secure the strain relief to that point.

Umbilical Management

Attention should be given to the umbilical at all times. A figure eight is used when uncoiling and recoiling the umbilical back into its tote. The brown rope in the photo is a runaway tie off line – if one lost control of the umbilical (i.e. broken clump wire), this line can be tied off to prevent console damage.

On-Deck Working Procedures for the Phantom ROV

These working procedures should be considered to be a guide only, a starting point for the three main team players of ROV ops to open their working dialogue. There could be very good reasons for any one of bridge, deck and lab teams to vary the procedure from what is described here, but critical is timely communication with the other work stations and agreement and confirmation of receipt of these communications. Having a designated team leader per shift on each team – bridge, lab and deck is useful for clear communications.

A meeting between all personnel to outline the ROV survey procedures at the start of the cruise, for each shift, will be helpful to teams understanding their role in the operations.

The Chief Scientist (CS) plans the ROV transect lines usually from deep to shallow and discusses these with the Commanding Officer (CO). A transect is selected and is displayed on the Helm Map (HyPack software) on a bridge monitor.

Radio communication is established between Bridge, Science Lab, Science Deck Boss and Bosun/Deck Crew. All are ready and standing by for ROV operations.

Pre-Launch

The goal of the Vessel, the ROV, and the ROV's clump weight is to reach the transect start at approximately the same time.

- Once the vessel is near the start point of the transect line, the CO gives permission for the Bosun and Deck Crew to deploy the hydrophone pole. The Science Deck Boss ensures that it is locked in the same orientation as at calibration (by lining up arrow markings).
  The deployment and recovery of the hydrophone pole is a 3-person job (the Bosun and 2 crew members). Tasks include operation of the HIAB, the hand-crank winch, handling the hook and keeping an eye on the wire, and removing /replacing the protective covering from the hydrophone.

  The Science Deck Boss informs the Science Lab before and after deployment and recovery of hydrophone pole.

  The Science Lab initiates tracking once the pole is in position.

- The CO determines the direction and strength of the vessel drift. If the vessel drift is greater than 1 knot, this is to be discussed with the CS.
- The Science Deck Boss checks with the Science Lab, Bosun and Deck Crew and informs the Bridge that all are ready to start operations.

- The CO positions the vessel upstream of the start point, so that the ROV will drift away from the Vessel and both the ROV and Vessel will drift towards the transect start point
- ROV Pilot is positioned on Deck with the remote pilot box, standing by for launch.

Launch

Launch and recovery procedures are designed to minimize the possibility of damage to the ROV, umbilical, ship, and injuries to personnel. It is especially important to maintain clear communications during this period. At the surface and in close proximity to the ship, the tracking system operates very poorly.

On Deck, the deployment of the ROV requires the Bosun at the HIAB, 2 crew members at the ROV, 1 science person handling the umbilical and the Science Deck Boss acting as coordinator between Bridge, Science Lab and Deck.

- The Bridge gives permission for the Bosun and Deck Crew to deploy the ROV and confirms that the **ship's clutch is disengaged** for the period that the ROV is at the surface. At this time the ship should be fairly neutral in the water and when it drifts due to wind, should be oriented by use of bow thrusters to drift away from the ROV in the water.
- The ROV is lowered into the water.
- The Science Deck Boss requests confirmation from the Pilot that he/she has a visual and control of the ROV.
- The ROV is released from the HIAB hook (a piece of electrical tape is used to secure the loose end of the lift line to the umbilical – once wrapped, the tape end is folded onto itself for quick removal upon retrieval)
- The Science Deck Boss informs Bridge and Science Lab that the "**ROV is in the water"**
- The ROV is piloted visually from the deck remote control, away off the starboard side of the ship, perpendicular to the hydro-winch station and holds position. The umbilical is fed over the side and the Science Deck Boss and Deck Crew move to the hydro-winch station.

At this point, three people plus the Science Deck Boss are required. One crew member at the hydro-winch, one science member handling the umbilical out of its storage box, one crew member taping the umbilical to the wire and the Science Deck Boss acting as coordinator between Bridge, Science Lab and Deck.

- The Science Deck Boss informs the CO when the Deck Crew and Science Lab are ready to deploy the clump weight.

- CO gives permission for the Deck Crew to deploy the clump weight and relays a vessel sounding of the depth. The ROV begins to dive and piloting of the ROV is turned over to the Science Lab.
- **Bridge engages clutch** and maintains position over the ROV. This may require some slow lateral movement. Usually there would be no wire angle unless there are different current directions occurring in water layers.
- Deck crew begins taping the umbilical to the hydro-winch wire, every 2 to 3 meters (depending on currents), as it is deployed.
- ROV dives as quickly as possible to keep up with the descent of the clump – **the ROV should always remain below the clump weight**
- On steep slopes:
  - ROV maintains position upslope of clump in order to arrive at bottom before clump
  - ROV maintains view up slope in order to prevent hitting slope from behind
- Science Lab informs the Science Deck Boss and Bridge when the ROV is on the bottom and relays the ROV's depth.
- Science Deck Boss requests the Deck Crew to position the clump weight 10 metres above the ROV. (This is a general rule of thumb rather than an absolute number. The goal is for the clump weight so stay close enough to the ROV so the ROV has enough free tether to operate, but not so close that there is a large risk of the Clump weight getting caught on the bottom or hitting the ROV. The length of wire out is not always the best measurement of the clump depth, especially if there is current resulting in a wire angle in which case the clump weight can be considerably shallower than the length of wire that is out. Sources of information for determining the length of wire out for the clump weight include the sounder depth from the vessel bridge, the ROV depth, the clump depth as calculated by the tracking system, the bottom type and topography, and feedback from the ROV pilot. At the beginning of a dive and especially at the beginning of a trip, there will often need to be a lot of communication to determine the clump depth, but eventually the deck boss can determine the proper clump movements by monitoring the ROV depth in the video and with occasional input from the ROV pilot and bridge).

<u>On Transect</u>

- Science Lab informs Bridge that they are ready to **"start transect**".
- CO positions the vessel so that the clump weight follows the ROV along the transect line. (The tracking system will track both the ROV and the clump weight. The clump weight will have a range circle around it that is the approximate maximum distance it can easily operate from the clump weight. The goal of the bridge crew is to position the ship so that the clump weight circle stays around the ROV. Ideally the clump weight should be

behind the ROV so that it is in deeper water and if the umbilical pulls on the ROV it pulls from behind.)

- Science Deck Boss watches the ROV's depth and communicates with the Science Lab when the clump weight is being moved to maintain a position 10 m above the ROV (see earlier discussion on clump weight positioning).
- Science Lab communicates with the Bridge and Science Deck Boss on the progression of the ROV along the transect line.
  - ROV tries to maintain speed and distance off bottom
  - If ROV is stopped for closer observations, the lab should inform the bridge so they can decide whether the Vessel should also stop to maintain the proper position of the clump weight relative to the ROV.
  - If ROV resumes transect after a stoppage the lab should inform the bridge.
  - If ROV is on a steep slope:
    - Then the Vessel must reduce speed as ROV has less horizontal travel
    - If ROV is climbing up, the clump weight wire and umbilical must be retrieved
    - If ROV is diving, the clump weight wire and umbilical need to be paid out
- Science Lab will inform Bridge and Science Deck Boss at "end transect" and when ROV can be retrieved.

Recovery

On deck, the recovery of the ROV requires the Bosun at the HIAB, 2 crew members at the ROV, 1 science person handling the umbilical and the Science Deck Boss acting as the coordinator between Bridge, Science Lab and Deck.

- CO positions the vessel so that when the ROV nears the surface and the vessel is declutched, the vessel will drift away from the ROV when it surfaces on the starboard side.
- CO will inform the Deck Crew when the clump weight can be retrieved.
- As the clump weight begins its ascent to the surface, the Science Deck Boss communicates its depth, at 10 meter intervals, to the Bridge and Science Lab.
- ROV positions itself perpendicular and to the starboard side of the Vessel during its ascent ensuring that the ROV and umbilical is out from under the ship.
- Clump is brought to the surface but ROV remains just below the surface – clump weight should always reach the surface before the ROV
- Science Deck Boss communicates to the Bridge and Science Lab when the clump is being retrieved and gives the position and direction of the umbilical relative to the Vessel.
- When safe to do so, Bridge will give clearance to the ROV to surface, and should confirm that Bridge has de-clutched the vessel. At this time the ship should be fairly neutral in the water and when it drifts due to wind, should be oriented by use of bow thrusters to drift

away from the ROV in the water. The most likely orientation would be obliquely into the wind, but the CO's experience and current conditions would determine the strategy used.

- CO communicates vessel drift to Pilot (Science Lab). ROV may have to compensate as it surfaces (for example, if the ship is drifting too fast (0.5 KN) in any direction it will be difficult for ROV to progress or the ship and ROV could collide).
- ROV pilot transitions from Science Lab to Deck and drives ROV along- side the Vessel and at the same time the remaining umbilical is lifted up onto the Vessel and is laid along the length of the deck.
- Science Deck Boss ensures that the ROV's lights are off and that the lasers are pointing downward
- The ROV is lifted out of the water ensuring that its front-end is positioned away from the hull of the Vessel (this protects the 'expensive parts' from damage)
- Slack is maintained between the clump weight and the umbilical connection to the ROV
- Science Deck Boss informs Bridge and Science Lab when the "**ROV is on the Deck"**
- **CO engages vessel clutch** and regains control of the ship.
- CO informs Bosun and Deck Crew whether or not the hydrophone pole should be lifted out of the water depending on next station and consideration of 3 knot limit to vessel speed with pole deployed.

A Daily and Between-Dive Checklist for the Phantom ROV

Start of Day

- Remove protective coverings from sensitive parts (i.e. camera lenses, lights and Didson)
- Remove the **chargeable transponder** from its charger (in the Science Lab) and secure it onto the ROV frame using hose clamps provided
- Unscrew the endcap from the body of the **battery operated transponder** on the clump weight and change the 2- 9V batteries, check the O-rings for nicks and/or lint and re-lube, then re-screw the endcap onto the transponder body
- Check cameras – ON/tilt
- Check thrusters – up/down, left/right/, forward/reverse
- Check thruster seals
- Check sPacing on propeller shafts – white sleeves need to be loose, sPacing between oil chamber and head of shaft needs to remain constant between dives
- Check wire connections
- Connect the Didson (Didson is disconnected only if it has power supply issues)
- Check lasers ON/OFF
- Secure initialized Vemco Mini-Logger (from the Science Lab) to ROV frame using zap ties and electrical tape

Between Dives

- Check ROV thruster seals.
- Check sPacing on propeller shafts – white sleeves need to be loose, sPacing between oil chamber and head of shaft needs to remain constant between dives
- Unplug the Didson and place a protective cover on the transponder (to indicate that the Didson is not connected)

End of Day

- Hose the ROV down with fresh water.
- Wash out the holes on top of Didson unit with fresh water
- Replace protective coverings on sensitive parts
- Remove the Vemco Mini-logger from ROV frame and give to Science Lab to download data.
- Remove chargeable transponder form ROV frame and place in charger in Science Lab.

Remember **Umbilical Management** – Attention should be given to the umbilical at all times. A figure eight, an over and under motion, is used when uncoiling and recoiling the umbilical out of

and into its storage tote. Double check any umbilical that is left on the Deck to ensure that there are no tight coils. Coils in the umbilical should be no less than 20 inches in diameter. Try to keep the remaining umbilical out of traffic area, off to the side, to avoid being stepped on.

Clump weight distance from ROV is approximately 25 meters. This distance is adjusted every few days so as not to cause stress on the line. Each ‘last’ placement is marked with a section of tape so as not to re-secure the woven strain relief at that point.

Science Lab Operations and Daily Checklist

Start of day

1. Initiate Minilog TD.

- Open Minilog software, place minilog TD unit in receptacle.
- File…Data directory set to L:\ROV_018\MINILOG.
- Choose Minilog...New Study to initialize.
- Enter the proper date in the Study ID text box.
- Click Initialize, when complete, click OK.
- Hand over to Science Deck Boss to attach to ROV

2. Open Daily Log and Cyberlink PowerDirector 8.

3. Open Didson Software (should do this before turning on the Didson).

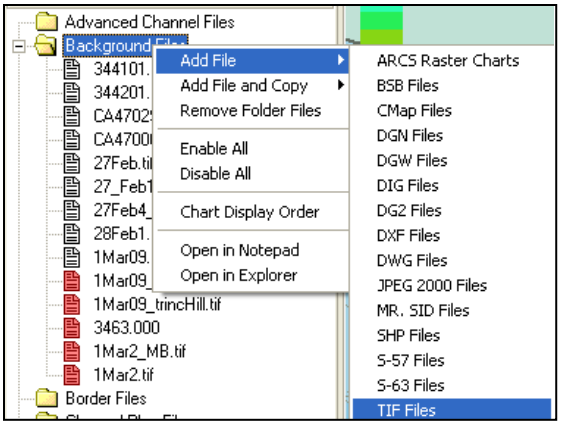
4. Open HyPack 2009 and Trackman, or alternatively, don't shut these down once started.

5. Ensure audio and video cords from DOE rack mount are plugged into the Mini DV tape deck and digital converter box (ADVC).

6. Test audio on the tape deck for signal. Ensure video feed to computer and from computer to DROBO.

7. Load ARCMap geotiff files and charts into HYPACK 2008.

- Copy and paste geotiffs into C:\Charts\GEOTIFFS folder.
- In HyPack administrator window, right click on Background Files
- Choose Add File - TIF files. Navigate to the new geotiff files in C:\Charts\GEOTIFFS
- To load charts. Right click on Background Files
- Choose Add File - S-57 Files. Navigate to the C:\Charts\S57charts folder and add the appropriate chart.
- In Background Files again, right click, choose Chart Display Order to ensure the layers are ordered correctly.
- Files not in use should be disabled. To do this, right click on the individual files to uncheck the Enabled feature



8. Create a redundant (backup) file for track lines.

In Survey Window, choose Options ->Shared Memory Output
Choose Start then minimize window; do not close window.
This file should run in the background all day. Create a new track file for each day.

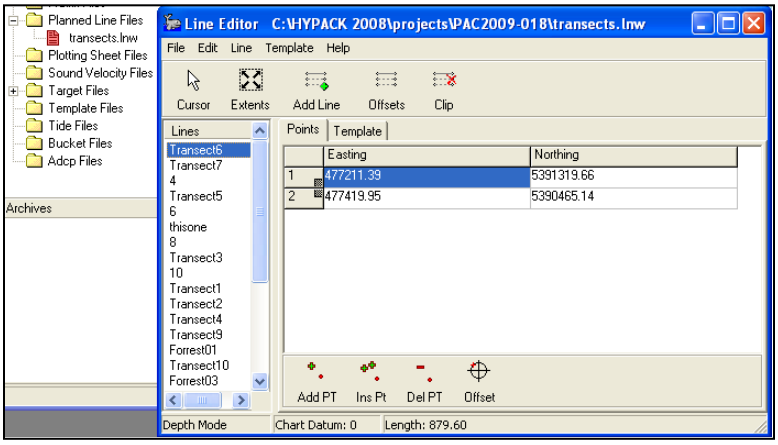
9. Power up the ROV: Phantom HP DOE rack mount, there are 3 switches, one for each unit on the rack.

10. Turn on radios and call the bridge and deck for a radio check.

<u>Pre-dive checklist</u>

11. Create tracklines in HyPack or Select existing tracklines (.RAW named after trackline or date)

Double click on the transect.lnw file under Planned Line Files to open the Line Editor window.



Create new transect lines. For each new line click on Add Line, then Cursor.
In the Administrator window, click on the start and end points on the geotiff image. A line should appear.

Rename the line in the Line Editor window with the appropriate transect #. Right click on the current name and choose ‘rename’. Minimize Line Editor under Background Files in panel on left.

Open Survey Window by choosing Survey or click on the icon:  If error: “…could not load GPS library” try restarting (don’t save) the Administrator.

In the Survey window, refresh the lines. Choose Line - Select File - transects.lnw - Open.

To highlight a line in the Survey window, right click on the end of the line and check ‘select’. To change the direction of the line, right click on the end of the line and check ‘swap’.

12. Open Survey Viewer: run Surveyviewer.exe (start menu) Drag window over to the bridge monitor. Click « start » on the menu bar and resize the window or go to HyPack « help » - broadcasting Survey windows over the network to Survey Viewer.

13. Label Mini DV tapes on the front with. VECTOR2011-13 TRANSECT1

Label Mini DV tapes on the side with a unique id for archiving: 500 series for 2009-65.

14. Type in filename (Vector2011-13 TransectXX.avi) for PowerDirector.

Make sure it is set to Capture from a DV camcorder (first tab).
Change destination folder to F:\VECTOR2011-13
Choose video settings: Digital device format (DV-AVI standard format).
Do not choose “time limit,” “size limit,” or “non real time.”

15. Check video window in PowerDirector for an image, this also supplies video to the monitor for the winch crew. If there is no image, press “input select” on the Canopus conversion unit, and look for a blue light on “Analog In”.

16. Check for time on video display. If no time display in top left corner, check that there is power to the main GPS; check connections.

17. Check the depth reading on video display. If the depth reading is wrong reset by:

Pressing the red “text” button on the DOE rack mount OSD (bottom unit)
<cntrl> X (exits program)
Type “ZD” <enter> (to zero the depth)
Type “run” <enter>
Press the red “data” button to switch back to the main screen

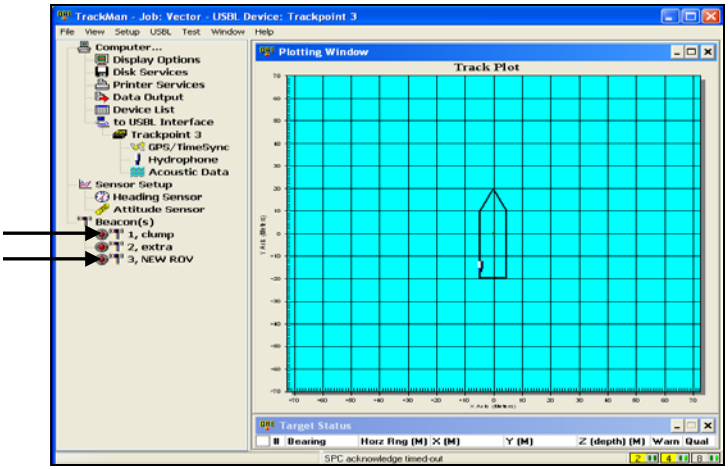
18. Type the overlay text.

Use the arrow keys to initiate the cursor
Type “2009-65 TRANSECT 1”
<cntrl> K to get rid of the cursor

19. Zoom Survey window to operating scale approximately when scale bar = 20 meters)

<u>Transducer pole in water</u>

20. Turn on ROV and clump beacons by clicking once on the stop light icons.



ROV over-the-side

21. Record the time when "ROV in H_2O" in DailyLog.

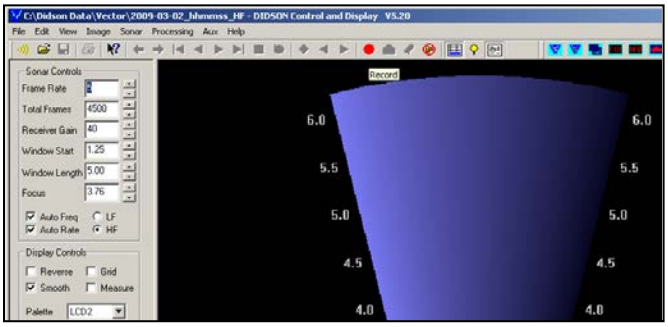
22. Turn on ArcLight. This must be in the water when turned on.

23. **Activate the scanning sonar** by unchecking the "HOLD" on Imagenix software.

Clump weight over the side, pilot returns to the lab (local control), ROV dives, clump weight follows, ROV on bottom

24. Start HyPack trackpoint logging, when the ROV is on bottom by clicking the icon: 

25. Start Didson sonar recording by clicking on the record button: ●

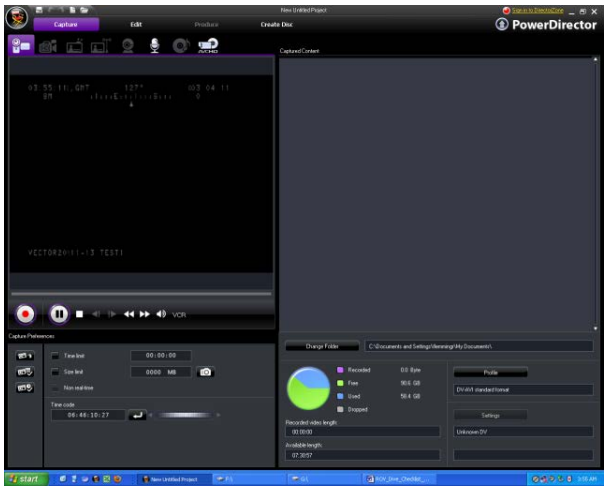


Didson settings: Auto Frequency and Auto Rate should be turned on. Gain should be set at 40. If recording is not staying on, check Image-> Capture ->Record Options -> choose Continuous, then choose N Minutes per file = to 60 or less if short transects.

26. Start video tape recording onto MiniDV tapes using the record button on the deck.

27. Start video recording onto the Raidon with PowerDirector. Confirm the blue lights are lit up on the Raidon. You may need to press stop or play to get the picture to appear.

Click on record (big red target) just before transect start to recording.



Start transect

28. Record Transect start in DailyLog. Use F5 in HyPack to mark the spot and F6 to rename the start point.

29. Record visual observations by speaking into audio feed.

End transect

30. Record Transect end in Daily Log and with F5 and F6 in HyPack.

Retrieve clump weight, ROV looks at umbilical and follows

31. Stop video tape recording and rewind the tape. Slide the SAVE tab to the right

32. Stop video capture onto DROBO hard drive in PowerDirector by pressing stop.

33. Stop HyPack trackpoint logging.

34. Stop Didson sonar recording.

ROV at the surface, LED's and rear light will remain on, pilot moves to deck (remote control)

35. Turn off ArcLight when ROV is at the surface. It must remain off for 20 minutes.

36. Lower lasers to the Didson box.

37. Stop scanning sonar with Imagenix software by checking "HOLD".

Retrieve ROV

38. Record ROV out of water in Daily Log.

39. Pan HyPack Survey to next survey line and refresh the Survey View for the bridge. This will allow the bridge to plan travel to the next site.

40. Check trackpoint .RAW files

41. Move .avi on DROBO E:\VECTOR2011-13 to video sub-directory

Retrieve transducer pole

42. Turn TrackPoint beacons off – one at a time.

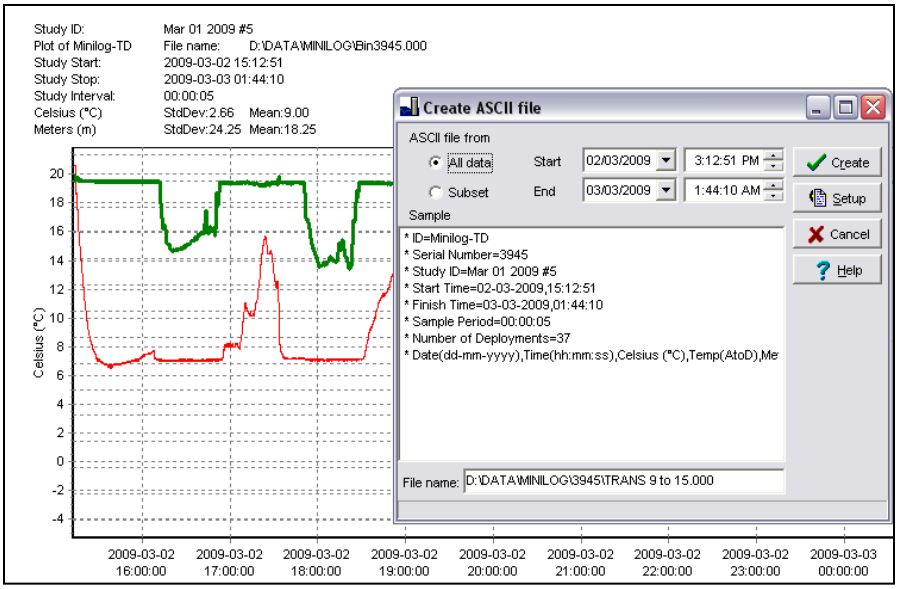
End of day

43. Close Didson software prior to powering down the ROV.

44. Power down the ROV using the Phantom HP DOE rack mount unit, 3 switches.

45. Download data from Minilog unit.

- Start…Minilog software, place minilog in receptacle.
- Choose Minilog...Load Data. The display should say 'Downloading data'.
- Choose yes to review graph.



- To convert data…In the graph view click Create ASCII subset tile: 
- Choose All data, type a File name by date. NOV06, then click on Create to export the file.

- Choose yes to view the data file.

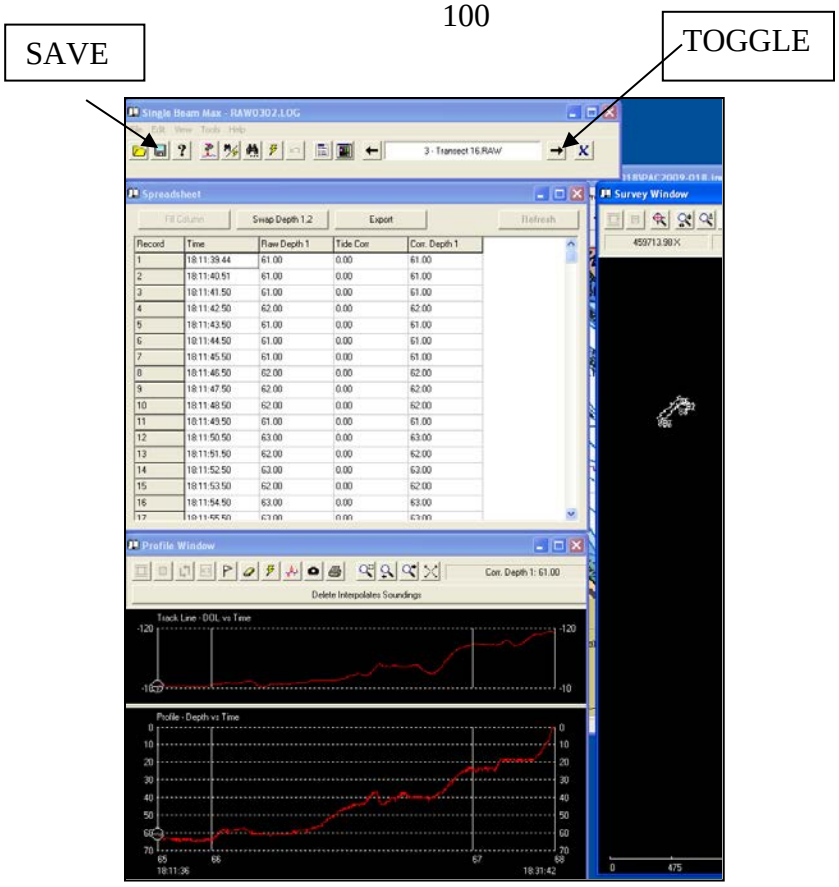
Close down minilog.

46. Charge the clump weight transponder. Remove the transponder from the clump weight wire, bring into the lab and through the dummy plug on the bottom, recharge in the lab overnight.

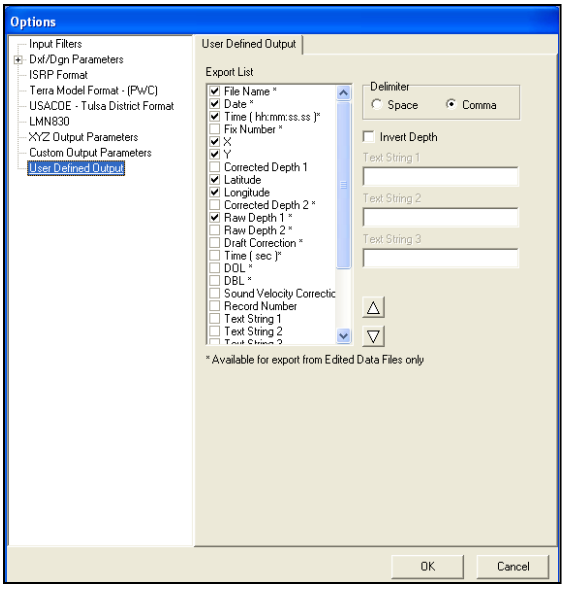
47. Charge radios. Ensure that the ship's radios as well as the science radios are firmly plugged into their chargers – look for the red light.

48. Export TrackPoint from HyPack.

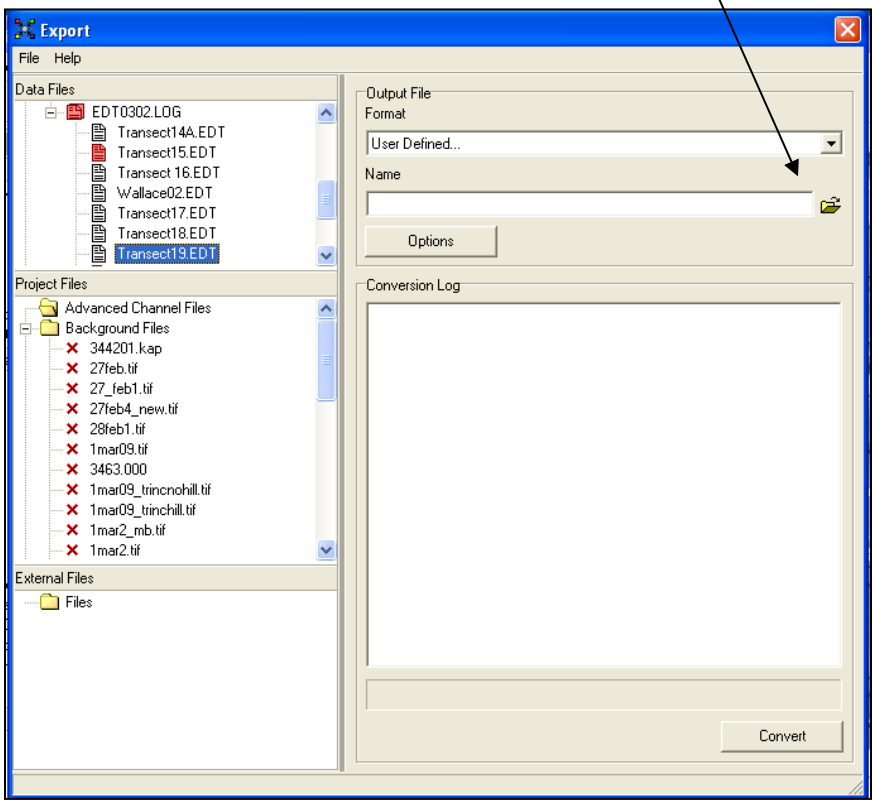
- In Administrator window, select Processing, Single Beam Editor
- In Single Beam Editor window, select File, Open
- Navigate to C:\HYPACK2009\Projects\VECTOR2009-065\RAW
- Open the current day's trackpoint .LOG file
- Click on Select All .RAW files
- In the Corrections window, accept defaults, click OK.
- In the Read parameters window, click OK if parameters are as follows:
    - Echo: ROV Depth and Heading
    - Heading: ROV Depth and Heading
    - Tide: None
    - Depth Conversion: None
    - Nav: Trackman ROV
    - Heave: None
    - Check"Ignore depth before 1st.
- The Single Beam Max window will open, you can toggle through the files to view each transect. Click on the Save icon and select Yes to All button. Close this window.



- If you want to smooth the transect, choose Smooth from Profile Window. Smooth by around 10.
- Return to the Administrator window, choose Final Products…Export.
- In the Export Window, scroll to Edited Data Files, right click to uncheck the Enabled feature on the files you do not wish to export. Export one .EDT file at a time. If you "Enable" more than one file, all will be merged into a single file.
- Next, click Options…choose Used Defined Output, verify the current file export settings include: File Name, Date, Time, X, Y, Latitude, Longitude and Raw Depth 1. Click OK.



- Click on the folder icon to navigate to the C:\HYPACK2008\Projects\PAC2009-018\exported folder and name the new file with Transect#. Click on the Convert button. Repeat for each individual "Transect#.EDT" file as displayed in figure below.



Copy the TrackPoint text files to an USB stick and transfer to GIS computer.

49. **Move Didson files** to daily file directory, after 3 days move off the laptop.

Converting TransectX.txt files to Feature Classes

Copy .txt files to: C:\DATA\Surveys\Video\2009_Nov_ROV\trackpoints\trackpoint_dump

Make sure previous trackpoints .txt files have been moved to completed folder or deleted.

Open the ArcMap project sg.mxd (….2009_Nov-ROV)

Open the tool box window, look down the list and expand (+) the ROV_NOV_Vector65 directory

Double-click the Convert Transect.txt to Feature Class

- message will say "This tool has no parameters", click OK.

NB: This script will copy a header file to trackpoints \ with_header, append the track records to it, create an XY event layer and copy the features to trackpoints.gdb. To check, add the new points to sg.mxd.

*You can doubleclick "Importtransects.py" for the same result but there is no feedback.

Exporting Transect lines to Nobletech, HyPack and Regulus

In ArcGIS open Toolbox -> Data -> GIS Scripts -> Export Shp4ROV

Select layer to export

Select features

Export to text using Nobletec of HyPack tool.

For HyPack, it should be in UTM, Zone 10 (for S. West Coast).

For Nobletec: WGS84

In Name box choose TName

Depth: Num

Output: Name.txt

Exporting Tracklines to Regulus

Open attribute table. If there are no coordinates, add a field, then choose Calculate Geometry then (choose start Lat, Start Long, End Lat, End Long etc.).

Then export the table by choosing

->options

->Export (Export to txt file).

Find txt file, change extension to .csv, open with excel, format it to look like other regulus files with start points then end points.

Appendix 3. Video Viewing Checklist for logging Fish, Habitat and Field of View Entries

Set Up

Open Avlog software

- Under **Files** select open and then select the particular transect video file you will view
- Under **Files** select "Log File" and name a file, which corresponds to the transect/site. You will need to open this file throughout the viewing.
- Select **Edit Species** button and type in the species codes you expect to see, based on the tansect notes. Click **Okay** to save. The Edit Species button can be used at any time.
- Press Play to start the video, or sometimes a combination of play and pause
- Select **Set Time** and set the time on the pop up to match the time on the video. Click **Okay** to save.
- Select the **Off Bottom** button if the view is on the bottom. This will change the button to **On Bottom**
- Start viewing the tape by pressing play. When you get to the start of the transect, select the **Transect** button. Record the transect number in the **Transect Name** area, and toggle **Begin**.
- You are now ready to start viewing.

Fish Entries

- For species of commercial value, and all rockfish, provide as much detail as possible in the species entry. For a species like the ratfish, indicating the count and horizontal plane is enough.
- When you spot a fish make an entry when the fish first appears on the screen. Press pause, or select the appropriate species button. Selecting the species button will pause the screen until the species entry pop up is closed. You can use the **Other** button for any species not assigned a button. Write over the *Other* with the species code.
- Measure the distance the fish is from the center line. Take a ruler and measure in centimetres how far the fish is from a line splitting the screen in half from top to bottom (MD). Measure the distance of the lasers on the screen in centimetres (ML). Use the known laser distance (AL) and convert this into an actual fish distance (AD).
-

For example, a fish is 5.5cm measured distance (MD) from the centerline, and the lasers are measured to be 1.5cm apart (ML). The real distance of the lasers is 10cm (AL). The ratio of MD:AD is the same as ML:AL. To find Actual fish distance (AD) follow this equation.

- AD = MD * AL / ML

This is recorded as the **Range** on the species entry.

- Indicate under **Horizontal Position** whether the fish is on the port or starboard side of the centerline. If it is right on the line toggle **Center** and there should not be a range associated with this entry.
- If there is only one specimen on the screen leave the **N** at 1. If there is more than one individual of the species increase **N** to the appropriate number. When there is more than one fish, leave the **Range** blank, and the **Horizontal Position** Null, unless of the fish are on the same horizontal plane.
- Select okay at this point, unless the fish is in line with the lasers.
- Play the tape until the fish is in the same plane as the lasers (or close to it). Press pause to freeze the frame at this point. Measure the fish length (MF) and measure the laser distance (ML). Like finding the actual distance the fish is from the center line, find the actual fish size (AF) with the known laser distance (AL)
    - AF = MF * AL / ML

This number is recorded under **Size** on the species entry. If there is more than one individual record the average fish length for the species entry.

- If the species entry box has already been closed, you will need to open the file and add in further information. The data is recorded in the following format
  Time,Code,Transect,Species,Count,Pan,Length,Range,PS,PB,BT,RL,CX,Comment

There are no spaces between the fields, and if a **Comment** is more than one word, use quotations around the words. Now save the file and close it. The log file must be closed before further entries are made from the Dvlog. There is no warning from the Dvlog software when the file is open so **make sure you save and close the file.**

Throughout the Dive

- Periodically check the time on the Avlog with the time on the video. If it becomes different, reset the time with the **Set Time** button to match the video. Be sure to do this when you stop mid way through a dive and then restart.
- When the camera view is not on the bottom, click the **On Bottom** button to **Off Bottom**. Ensure you switch it back when the camera view returns to the bottom.
- If you turn off the player and computer mid dive when you go to restart you will need to run through the set up steps again. When you select the same file to log data into it will load the Dvlog software based on the last entry.

End of the Dive

- When you reach the end of the Transect select the **Transect** button and toggle **End**. Select Okay to save the entry.

Habitat Entries

- Each time the video enters a new habitat use the **Substrate** button to indicate the new habitat. You will need to do this at the start of every dive/transect, and then anytime there is a change in habitat throughout the dive. This information is recorded in a separate log file, and the viewing for these entries should be done separately than the fish viewing. Go through the Set Up section to get started. Use the species buttons for entries of corals, invertebrates or other features you would like to indicate in the habitat file.
- Toggle the appropriate features of the habitat, and fill in the appropriate biocover code. Click **Okay** to save the entry.
- When you encounter a habitat feature you would like to note, like a wall of anemones or a bed of scallops, use the species entry to indicate this information and save it into the habitat file.

Field of View

- Every 30 seconds, record the Field of View, unless the ROV is off the bottom.
- Measure Viewing width (VW) and measure the laser distance (ML). Like finding the fish length, The Field of View (FoV) with the known laser distance (AL) is found by:
    - FoV = VW * AL / ML

Appendix 4 AVLog Video Review Software

Software: Peter Withler (pwithler@shaw.ca)
Documentation: Jonathan Martin

AVLog is a program created for the scientific review of underwater video footage of fish/invertebrates and their habitat. It reads a variety of video file formats which are used to store video on hard-drives, CDs and DVDs.

Video logs created with AVLog are simple ASCII text files, which are comma delimited and easily imported to spreadsheets or databases.

Please direct any questions regarding software operation to Peter Withler.

Installation of AVLog

Simply unzip the contents of the compressed archive into an empty directory, and link to the executable with a shortcut. No other installation is required.

Instructions for using AVLog

Run AVLog.exe. The interface will look like this:

The Time Counter indicates no input by displaying “00:00:00”, and the Play controls at bottom are inactive (Will not work). The only button enabled is “Edit Species”.

1) If you already know the six species/taxa present during the video, these can be entered now. These can be changed at any time during the video. Clicking on the “Edit Species” button will cause the following window to appear:

Names for each of the 9 species buttons can be entered in this window. These can be text or numeric, as needed. Bear in mind though that the labels entered will appear in the logfile created during the video review. I use Department of Fisheries and Oceans numeric species code system (Gillespie 1993) for database integration, for example.

The “Other” button should be left as “Other” to act as a wildcard allowing on-the-run specification.

When this is done, click “OK” to save button labels. This will result in the species buttons being labeled, but not yet enabled.

2) From the File menu click the Open item and use the dialog box to select the file or group of files you wish to review. Note that when multiple files are selected, they will be played in alphabetical order. This assumes a file naming system based on time of opening the file.

The window should now look roughly as follows:

Note that the control buttons are enabled (will work now), and both the Time Counter above the control buttons indicates the time elapsed on the video. The “Time” windows both default to the File Elapsed Time. Note also that the species buttons have been labeled, but are still grayed out.

3) Next, specify the location and name of the video log file to be created by AVLog by pulling down the File tab and selecting “Log File”. Do not attempt to create a log file on a read-only device such as a DVD.

This will produce an explorer window enabling the selection of a filename and location.

The files produced (.vlg files) are comma-delimited, ASCII text files. Once a filename is selected, the program will return to the main window, with the “SetTime” and “On/Off Bottom” buttons enabled:

The “On/Off Bottom” button is included because a file often begins before the camera touches down on the bottom. When touchdown occurs, we use this button to make a note of the fact. Conversely, if we are traveling along, we click it again to denote “Off Bottom” so that these segments are not included in our overall transect length.

Next, press the “Play” button on either the deck or the program window. This will start the video feed to the window to obtain the time code and start the syncing process.

Clicking the “Set Time” button will allow you to sync the program/log with the file. This can either be done with the time stamp recorded embedded on the digital media (if enabled and set properly), or with an overlaid data stamp, or with some other time cue on the video.

The time will be adjusted automatically to compensate for playback/search/forward etc. and each event (species/edit species/transect/substrate) will have a time code associated with it. When playing multiple files sequentially, the time will be automatically corrected for each subsequent file.

Use the up/down arrows to sync the time code with the video or enter values manually.

Click “OK” to proceed.

Note that the time is synced with the time overlaid on the video, and the “Transect”, “Substrate” and “Species” buttons are now enabled. The Time Counter above the row of green control buttons still indicates time elapsed in the video.

4) The appropriate transect information may now be entered by clicking the “Transect” button. This feature (below) allows for the labeling of transects with a name or number, as well as beginning or end codes. When finished, click “OK” to return.

5) Next, habitat characteristics are added using the “Substrate” button. We use a system of codings adapted from Pacunski and Palsson (2001) for substrate, relief, and complexity. Dominant biocover can be entered as either a description or a species code, and provided with a thickness code. The window appears as follows:

The parameters can be selected to match habitat in the video, and the numeric codes for each parameter (Alongside each name) will be added to the video log. Any species event entered from here on will have the selected habitat parameters associated with it, until they are changed with another click of the “Species” button. These can be changed as often as required to record changes in the habitat. If the program is stopped during the middle of a transect, upon restarting the previously-entered substrate information will be preserved, and re-entered upon opening of the log file (“filename.vlg”).

6) The video may now be reviewed. Every event opens, writes to, and closes the logfile within the working of the program, so it is possible to edit the logfile while working in the program.

7) When a Species event is entered by clicking the appropriate species button, the following window will appear:

This enables the range and size of the species observed to be indicated. Since the software was developed for horizontal strip/belt transects, from a forward-looking camera we used range to be “Range from Centerline” and added an input for “Horizontal Position”. Measurements are unitless, but we often use decimeters for ranges in this version of the software, and centimeters for size. An “N” window is provided for enumerating schools of individuals which occur at a single time.

There is a provision for a comment of up to 45 characters. The species button label can also be changed if need be; this is a feature for the “Other” button, so any species or identifier can be entered.

8) The log file (“filename.vlg”) is fairly self-explanatory, but has a column in it labeled “Code”. These codes are largely for the program itself to use, but are coded as follows:

1: Time Code Set
2: Transect Start
3: Transect End
4: Substrate Codes Set
5: Species Event
6: On Bottom
7: Off Bottom
8: Shutdown (Preserves time stamp when program is closed)

References

Gillespie, G. 1993. An updated list of the fishes of British Columbia, and those of interest in adjacent waters, with numeric code designations. Can. Tech. Rep. Fish. Aquat. Sci. 1918: 116 p.

Pacunski, R. E. and W. A. Palsson. 2001. Macro- and micro-habitat relationships of adult and sub-adult rockfish, lingcod and kelp greenling in Puget Sound. In: Puget Sound Research '01. Puget Sound Water Quality Action Team, Olympia, WA

Appendix 5 ROV Transect Processing

Editing of Track point text files exported from HyPack Navigational Software.

a. **Import Text Files**. This is done using the Script: 'ImportTrackpoints.py'.
   i. Rename transect text files to follow the format "Transect#.txt". In some cases a single transect may have been captured in two or more text files.
   ii. Ensure that each row in the text files contains a comma separated value for the transect file name ie "Transect#.txt".
   iii. Open ImportTrackpoints.py by right clicking the file and selecting "Edit using IDLE" (Python must be installed on your system, it is included with ArcGIS 9.3)
   iv. Modify User Defined variables by editing the following lines in the script:
      1. Confirm the coordinate system used and edit the following line: gp.OutputCoordinateSystem = r"Coordinate Systems\Projected Coordinate Systems\UTM\WGS 1984\WGS 1984 UTM Zone 10N.prj"
      2. Working path location: path = r"C:\data\..." This is where the track point text files are located.
      3. Destination geodatabase (worksPace): wkspc = r"C:\DATA\...\....gdb"
      4. Check that the column headings match comma separated columns in the ROV text files and that there is at minimum a field for X, Y, depth, time, date, and a field to uniquely distinguish the transect name (values of which are stored in the format "Transect#.txt"). Change this line accordingly: columnheaders = "x,y,depth,time,date,fname"
   v. Run the module in python by selecting "Run --> Run Module" from the menu bar.
   vi. The output will be one feature class for each transect text file in the input directory.
   vii. Using the Arc Tool Box, merge the track point feature classes together into one feature class using the merge tool ("_All.shp").
   viii. Use the point to line script http://arcscripts.esri.com/details.asp?dbid=15945 to create a line that can be used as an editing guide in step 3. The script can be added as a tool in ArcToolbox.
   ix. In some circumstances the text file will not have been created properly in the first place due to an error exporting from HyPack. The data must be recovered from the HyPack RAW files. See appendix "export from raw.py"

b. **Trim to start/end times as imported from HyPack targets**. The goal in this step is to delete track points that have time attributes before or after the transect start and end times.
    i. Targets (waypoints with time information) are recorded in the HyPack software at the beginning and end of each transect. This data can only be exported from HyPack in dxf format. Import the points using the Import from Cad tool in ArcToolbox. Add <Point> to project, join to <TxtProp> on <EntID>; display the labels attribute, in this case time, will be attached to a point beside actual waypoint. Extra targets are occasionally collected; start and end points can be distinguished by position relative to track points and time. An error in target position of a few meters has been noticed; the time recorded appears to be accurate. In the absence of target points, start / end time can be found in the dive log.
    ii. If dxf files are not provided, data can be extracted from the hyPack *.TGT files. Open the *.TGT file with Microsoft excel and follow the next steps.
        1. Initially, all information for each record will be displayed in one cell and will have values separated by a sPace. Open all *.TGT files then copy and paste all records into one new worksheet.
        2. Select the first column in the table and Find the text to columns tool for your version of excel. On Page 1 of 3 select “Delimited”. On Page 2 of 3 select “SPace” as the delimiter. Leave checked the check box for Treat consecutive delimiters as one. On Page 3 of 3 all columns can be left as general. Select finish.
        3. Insert a new row at the top of the table which will be populated to contain column headings. Name the columns.
        4. Save the table as an excel spreadsheet and add it to ArcMap.
        5. On the source tab in the table of contents, right click the table and select Display XY Data. Set the X and Y fields to the UTM coordinate fields and set the coordinate system to be the same as the transect data (eg WGS_1984_UTM_Zone_10N)
    iii. The DXF files do not come with attributes to state which points are associated with which dive. Knowing which DXF point to use when trimming a particular set of dive track points comes down to spatial location and time attributes.
    iv. Track points from each dive should be deleted based on the start and end time in the DXF point attributes. Delete track points at the beginning of the dive that have a time stamp before the start time in the DXF point attributes. Delete track points at the end of the dive that have a time stamp after the end time in the DXF point attribute.

One way to do this would be to label the track points based on time and label the DXF points based on time so the user can easily see which (if any) track points need to be deleted.

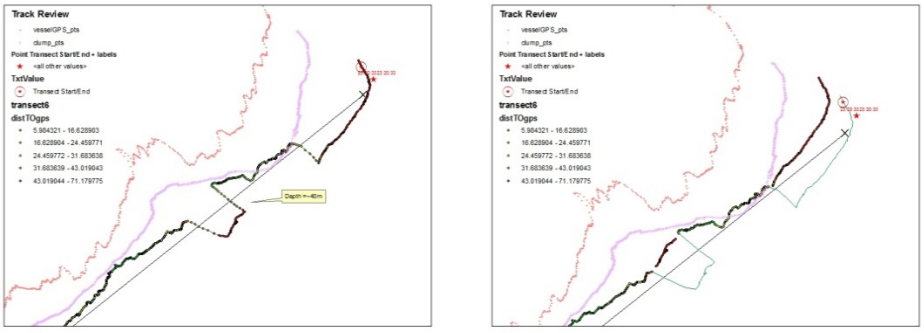
c. **Edit/Correct outliers and obvious tracking errors.** The track points are not always accurate and some may have to be moved or deleted. Editing is done in order to modify the track points to match a path one would expect the ROV to have actually taken. Add the clump tracking line, the boat tracking line, and the line created from the Convert Points to Line script 'http://arcscripts.esri.com/details.asp?dbid=15945' to an ArcMap session in order to help make judgment calls.

Guidelines for editing:

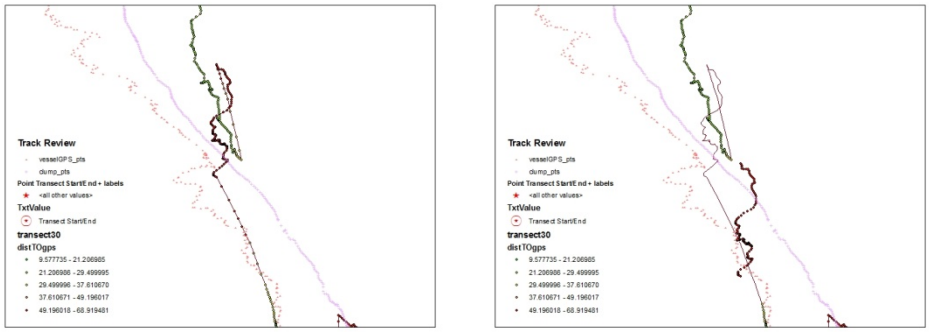
- ROV position is tracked with a hydro-acoustic system in which a hydrophone pole held under the surface beneath the vessel communicates acoustically with a transponder on the ROV. This system undergoes continual modification and improvement, both between and during surveys; but, it is subject to various errors. Notably, bottom characteristics that scatter or reflect acoustic energy, such as steep rock walls, will affect positional accuracy.

Some of these erroneous positions can be identified and corrected as follows.

Note that the ROV position is calculated using two different formulas depending on whether the ROV is inside or outside of a 45 degree cone down from the Hydrophone - positions calculated while outside of the cone seem to be precise relative to each other, but are 'offset' by up to 20m away from the hydrophone. These offsets, shifts or jumps, are identified by a straight line of points, usually perpendicular to the direction of travel, sPaced about 2m apart; as opposed to accurate track points which are usually very close together.



Appendix Figure A. Example 1 of offset error (left) and corrected trackline (right)



Appendix Figure B. Example 2 of offset error (left) and corrected trackline (right)

A graphic representation of the distance of each point from the vessel can be used to help identify this sort of error.

i. Add a new field to the trackpoint layer ("_All.shp") called 'DistToGPS', format Double.
ii. Join the Vessel GPS points to "_All.shp" using a field created in each feature class called datetime. The date time field should be set to [datefield]&"_"&[timefield]. If only the time field is used to join the tables, there may be incorrect joins. (153 of the Jan 2010 records are duplicate times.)
iii. Using the field calculator, set the 'DistToGPS' field in "_All.shp" to = Sqr((([transect.x] - [vesselGPS.x])*([transect.x] - [vesselGPS.x]))+(([transect.y] - vesselGPS.y])*([transect.y] - [vesselGPS.y])))
iv. The DistToGPS field can then be used to color the track point symbology for visual reference, keeping in mind the two different ways measurements are calculated based in the angular cone from the GPS.

    - If a non linear path is observed by the ROV and the ROV is 25 to 30 meters away from the clump, the unusual path is most likely the ROV being pulled back by the tether a few meters

    - The typical speed of the ROV is about 0.4 - 0.8kt, or 1/4 to 1/2 meter per second. (Maximum operational speed over smooth bottom is less than 2 knots, top speed is about 3 knots). The ROV will move more slowly when ascending or descending

    - The HyPack software can perform a user defined level of track point averaging during recording. If this averaging is reduced (for faster real-time position display), or the ROV moves slowly, the result is track lines which appear jagged or 'scribbled'.

- ROV heading, if available from internal compass, can be helpful.

- The goal is to achieve a position with less than 5 meters error. Note that these point positions will be used to generate a line which will be smoothed, below, and then to calibrate a route derived from that line based on time.

d. **Create Lines, smooth.**

i. Create lines from the edited points using the 'Convert Points to Line – Generic Tool' toolbox which can be downloaded from: http://arcscripts.esri.com/details.asp?dbid=15945. In order for the output lines to be separated from one another as distinct records, specify the [transect name] field as the "line field" parameter. If no new points have been added during editing, the default sort order will be correct; otherwise, use the time field to control the order in which points are used.

ii. Use the smooth line tool with the PAEK smoothing algorithm and a 2 meter tolerance to generate a Smoothed Transect Lines.

e. **Create Routes, calibrate measures with time (date-time).**

The date and time attributes in the cleaned transect points feature class will be used to calibrate routes on the Smoothed Transect Lines feature class. Before calibration the date and time attributes in the transect points feature class must be converted from a conventional formatted date time (eg 3/11/2010 11:58:59.111) to a double numeric format. (Where the number to the left of the decimal represents the day of the year after December 30, 1899 and the number to the right of the decimal represents time, with 0 being 12:00:00 AM and .5 being 12:00:00 PM. This is how dates are stored by ArcGIS in the underlying database. See the ArcGIS Desktop Help topic – SQL Reference for more information).

When the ROV is operated while time passes through GMT midnight (4pm, or 5 pm during daylight savings), the transect will actually be finished on the next day. The numeric date time field needs to remain consecutive; therefore the records where times are past GMT midnight should have the date field ahead one day.

i. Create a route using the create route tool. Parameters:
Measure source will be set as length, and then calibrated to the Date time field in the next steps. No measure factor or measure offset. Environment settings: M resolution .00000001, M Tolerance .00000001 , XY Resolution leave blank, XY tolerance .00000001

ii. Ensure the field containing the date in the transect points feature class table is in the ArcMap "Date" format. To check, open the table in ArcMap and right click the date field header to view its properties.

iii. Ensure the field containing the time in the transects table is in the ArcMap "String" or text format and matches the formatting HH:MM:SS (Hours, minutes, seconds)

iv. Add a new field. Name: DT, Type: Double
In some circumstances it is possible to simply field calculate the new double numeric date time field to equal the date field, and then calculate the DT field once again to equal itself plus the time field.
Step one: [DT] = [date field]
Step two: [DT] = [DT]+[time field].

In some circumstances time will be stored in 24 hour format. In these circumstances, create a new date type field and field calculate it to =
[date_] & " " & FormatDateTime(Mid ([time_],1,8),3).
This converts the values into a 12 hour time system and they can be used in the above steps.

Alternatively, open the field calculator for the new DT field and select the advanced check box and enter the following code:
Pre-Logic VBA Script Code:

```
Dim DateField
Dim TimeField
DateField = [date_]
TimeField = [time]

Dim Date
Dim HourSeconds
Dim MinuteSeconds
Dim Seconds
Dim Result
Date = Int(DateField )
HourSeconds = (Mid(TimeField,1,2))*60*60
MinuteSeconds = (Mid(TimeField,4,2))*60
Seconds = Mid(TimeField,7,(Len(TimeField)-6))
Result = Date + ((HourSeconds + MinuteSeconds + Seconds)/86400)
```

Output Field:

```
Result
```

The lines DateField = [date_] and TimeField = [time] in the code above declare variables to store the field names so that they do not need to be changed multiple times in the script.

v. Set route identifier field in the transect line feature class within the routes tab of the feature class properties in ArcMap (Feature Class Properties -> Routes Tab -> Set Route Identifier). The route identifier field will be the transect identifier.

vi. Open the Calibrate Routes tool and use the following Parameters
Input Route Feature: Transect Line (with m and RCA spatial join)
Route Identifier Field: fname
Input Point Features: transects
Point Identifier Field: fname
Measure Field: DT
Output Feature Class: ____
Measure Calculation Method: Distance
Search Radius: 0
All checks on
Environment variables: XY tolerance .00000001

vii. Once the routes have been calibrated turn on the hatching from the hatch tab and turn on the display of route measure anomalies on the route tab. These tabs are accessed in the layer properties window and are both helpful in identifying potential errors. The route measure anomalies may show errors for an entire route where “measures do not increase”. In these cases the hatches display must be used to confirm the route measures are increasing.

viii. Rectify any track points that may be causing the errors and recreate and recalibrate the routes from scratch using the cleaned track points.

ix. Add all fields not marked as unnecessary in the B3 and B3a tables under the PACGFVideo update section (Section 5). The field types can be found in the PACGFVideo database.

x. Using Microsoft Excel, create a table containing the same fields in the previous step and an ‘fname’ field populated with the transect name in the format “transectX.txt” which can be used to join this table to the transect lines feature class. The data to populate the fields can be found in the locations described in the PACGFVideo update section.

xi. Join the excel table to the transect lines feature class based on the ‘fname’ field.

xii. Field calculate the fields in the transect lines feature class to equal those of the joined excel table.

f. **Attribute with transect #, in/out RCA information**

i. Add Rockfish_Conservation_Areas.shp (http://www.canbcdw.Pac.dfo-mpo.gc.ca/ows/metadata/RockfishConservationAreas.htm) to the data frame in ArcMap. The transect data most likely is in

WGS_1984_UTM_Zone_10N. Rockfish_Conservation_Areas.shp is in NAD_1983_BC_Environment_Albers so a geographic transformation window will be displayed. Select NAD_1983_To_WGS_1984_1

ii. Right click the smoothed and calibrated transects line layer in the TOC and select joins and relates and then select Join. Use the following parameters. “What do you want to join to this layer?:” select: “ Join data from another layer based on spatial location.” “Each line will be given all the attributes of the polygon that:” select “is closest to it.”

iii. Create a new field called RCAInOut of type text. Click Selection from the menu bar, and choose select by location. Select features from transects that that are “completely within” the RCA shapefile. Field Calculate selected records to “In”. Switch selection and calc records to “Out”.

iv. Check visually for exceptions such as transects that start or end just outside of an RCA boundary by re-selecting “Out” transects that intersect RCA’s, zooming to the selected features, and correcting the RCAInOut attribute as required.

Create route event tables based on video review database

a. Within the AMR video review database, ideally there will be one Transect Records table containing records with Transect Indicator Codes 1 through 9 (species observations, habitat observations, and ROV related data). A separate table should contain records with Transect Indicator Code 10 (field of view observations). Refer to the PACGFVideo Review database section of this document under “B4 Transect Records Table” and “B7 Field of View Records Table” to create the appropriate table field structure in order to save time during the PACGFVideo database update.

   i. In the transect records table, add the following fields of type Long Integer: ‘EVENT_ID’, ‘RECORD_ID’, ‘SPECIES_RECORD_ID’, ‘HABITAT_RECORD_ID’, ‘FIELD_OF_VIEW_RECORD_ID’. Add a field of type numeric double: ‘DT’.

   ii. Populate the RECORD_ID in the transect records table with consecutive numeric values starting after the largest existing ‘RECORD_ID’ value in the B4_TRANSECT_RECORDS table of the PACGFVideo access database. If done within ArcMap, select all records and use the following code in the field calculator, changing lStart to the next highest value:

```
'=========================
'rec_Number.cal
'Author: Ianko Tchoukanski
'http://www.ian-ko.com
```

```
'=========================
Static rec As Long
Static i As Long
Dim lStart As Long
Dim lInterval As Long
'================
'adjust start value and interval below
lStart = 1
lInterval = 1
'================
If (i = 0) Then
 rec = lStart
Else
 rec = rec + lInterval
End If
i = i + 1

__esri_field_calculator_splitter__
Rec
```

iii. In order to create events from the event tables in the AMR video review database, the ‘DT’ field must be populated. The ‘EVENT_ID’ field can be populated at the same time.

iv. Date information from the dive logs - transects.xls, or dailylog.xls - must first be joined to the time information in the video review tables. Open the AMR video review MS Access database. (The following 3 steps could also be accomplished by exporting the table to a geodatabase and using table joins in ArcMap)

v. Ensure there is a transect records table and Field of View table. Create a new table called “diveday” which contains the following Fields: ‘Day’ of type Date/Time containing the dive date, one called ‘Dive’ of type Double with the Dive Number (transect number), and one field called ‘EVENT_ID’.

Create a new SQL query similar to below (table or field names may have to be updated). One could also use the query design wizard. The goal is to have the date field from the diveday table joined to the target table based on the transect number (one to many).

```
SELECT diveday.Day, diveday.Dive, diveday.EVENT_ID, [Field of View].* INTO FofView
```

FROM diveday INNER JOIN [Field of View] ON diveday.Dive=[Field of View].Transect
ORDER BY [Field of View].ID;

Create a new field called “dt” of type double in newly created table and set it to equal the days and time since December 30, 1899. This calculation can be done in ArcMap using the field calculator using the same code as in section 1e.
UPDATE DayTimeFishLog SET DayTimeFishLog.dt = DayTimeFishLog!Daytime;

Again, ensure that the correct date is recorded for transects which pass through GMT midnight (4pm, or 5 pm during daylight savings). The numeric date time field needs to remain consecutive; therefore the records where times are past GMT midnight should have the date field moved ahead one day.

vi. Once the transect records table is completed, the Species and Habitat observations can be exported out into their own tables. Create new tables AMRVR_FishLog, and AMRVR_HabLog where Transect Indicator ID or Code is equal to 5 or 4 respectively.

vii. The HabLog and Field of View tables contain observations which represent a segment of the path taken by the ROV, so a “To” field must be created to go along with the “From” or original DT (numeric date time since December 30, 1899) field. Create a new double numeric field called “dtTo” in the HabLog and Field of View tables. Store the tables in an Access or geodatabase *.mdb and use the provided “FromTo” program to populate the “dtTo” fields. Each record’s [dtTo] attribute (except the last record) will be populated with the next records [dtFrom] field. In the programs parameters set the sort field to “RECORD_ID” and ensure that once processed the time field attributes are still in consecutive order and grouped by transect.

viii. FISH LOG:
Open the Make Route Event Layer tool and use the following parameters:
Input Route Features: Calibrated Line feature class
Route identifier Field: Field containing name of transect
Input Event Table: [AMRVR_FishLog]
Route Identifier Field: Field containing name of transect

Event Type: Point
Measure Field: Date time double numeric field denoting days and time since Dec. 30 1899
Click check box to generate a field for locating errors and review the results.

ix. HAB LOG:
Open the Make Route Event Layer tool and use the following parameters:
Input Route Features: Calibrated Line feature class
Route identifier Field: Field containing name of transect
Input Event Table: [AMRVR_HabLog]
Route Identifier Field: Field containing name of transect
Event Type: Line
From-Measure Field: Date time double numeric field
To-Measure Field: Date time double numeric field (created step 2. viii.)
Click box to generate a field for locating errors and review the results.

x. FIELD OF VIEW:
Open the Make Route Event Layer tool and use the following parameters
Input Route Features: Calibrated Line feature class
Route identifier Field: Field containing name of transect
Input Event Table: [Fish log, hab log, or field of view]
Route Identifier Field: Field containing name of transect
Event Type: Line
From-Measure Field: Date time double numeric field
To-Measure Field: Date time double numeric field
Click box to generate a field for locating errors and review the results.

xi. Export each event layer to a feature class: Right click, data, export.

xii. Add a new “name” field of type text to each and make sure the name corresponds to the transects name field values in the smoothed calibrated route feature class.

Create line with Z to calculate actual distance travelled

a. Using the 3D analyst toolbar, select Create/Modify Tin, then click on Create TIN From Features.
b. Under the Layers list, select the cleaned transect points. Under height source, select the depth field. Set triangulate as to: mass points. Select a name and output location for the TIN that is to be created.
c. Open the Surface Length tool in the toolbox under 3D Analyst, Functional Surface, Surface Length.
d. Set the Input Surface to the TIN previously created. Set the input feature class to the smoothed transect line feature class. Ensure there is a name for an output Surface Length Field. The resultant feature class will contain a new field with attributes for the actual distance the ROV traveled across the ocean floor as well as poly line shape length.

Create area swept polygons from field of view

a. The" field of view" field units are stored as cm and need to be converted into meters. Create a new field called [FofV_m]. Using the field calculator, set the new field to equal [Field of view field] / 100
b. The buffer tool distance parameter creates a radius, whereas the file of view value is the total width, equivalent to a diameter. A new field should be created to equal half of the Field Of View in meters. Create a new field called FofV_m_div2. Using the field calculator, set the new field to equal [FofV_m] / 2

    Open the buffer tool and use the following parameters:
    Input Features: [FOFVIEWEvents]
    Output...
    Set Distance as Field: FofV_m_div2
    Dissolve Type: List (choose name field)

Format output for easy PacGFVideo database upload

a. ** Note that columns indicated as "Historical Field" in field description are fields where EVENT_ID < 336 (Previous to February 2009 Survey)
b. Spatial files should include the same ID fields and values as will be contained in the PacGFVideo database where applicable.

B2 Research Trip Table

- One record for each survey trip.

- **'TRIP_ID'** should start at the next consecutive value.
- **'DATE_START'** start of trip
- **'DATE_END'** end of trip
- **'VEHICLE_ID'** identifies submersible used, from C_Vehicle_Type
- **'VESSEL_ID'** identifies ship platform, from C_Vessel
- '**CREW_VESSEL_ID'** no longer used
- **'CONTRACTOR_ID'** no longer used, from C_Contractor
- **'DESCRIPTION'** general description of trip purpose, area, etc.

B3 Video Event Table

- One record for each transect.

- **'TRIP_ID'** corresponds to the id in B2_Research Trip
- **'EVENT_ID'**s should start at the next consecutive value based on the most recent Dive's 'EVENT_ID'. There is one unique 'EVENT_ID' corresponding to each transect.
- **'EVENT_ID_NAME'** will always be "1" unless there are multiple transects for a particular dive. For instance, the second transect of a dive would be "2"
- **'PARENT_EVENT_ID'** is be the numeric value of a transect number. For instance the PARENT_EVENT_ID of "Transect1" would be "1"
- **'PARENT_EVENT_ID_NAME'** is the transect number in the following format: "Transect#"
- **'CAMERA_EVENT_DATE'** will be the same as the Date Column listed in the Daily Log excel sheet. Microsoft Access date field format for 'CAMERA_EVENT_DATE' is in the format MM/DD/YYYY
- **'START_PARENT_EVENT_TIME'** will be from the 'Time In Water' column in the Daily Log excel sheet. Format: 1/14/2010 5:04:00 PM (M/DD/YYYY)
- **'END_PARENT_EVENT_TIME'** will be from the 'ROV out of water' column in the Daily Log excel sheet
- **'START_EVENT_TRANSECT'** will be from the 'Transect Start Time' column in the Daily Log excel sheet.

- **'END_EVENT_TRANSECT'** will be from the 'Transect End Time' column in the Daily Log excel sheet.
- **'LEAVE_SURFACE_TIME'** Leave blank (refers to manned submersible operations)
- **'ARRIVE_SURFACE_TIME'** Leave blank (refers to manned submersible operations)
- **'VEHICLE_SUBTYPE_ID'** can be referenced in the C_Vehicle_Subtype table.
- **'SITE_NAME'** is from the 'Location' column in the Daily Log Excel Sheet
- **'BLOCK'** does not apply to most transects. There may be a 'BLOCK' designation for some transects, for example, those paired with longline sets.
- **'Latitude_text'** is unnecessary; this field should be deleted from PACGFVideo
- **'Longitude_text'** is unnecessary; this field should be deleted from PACGFVideo
- **'Latitude'** numeric latitude in decimal degrees. Track line centroid Y value - can be obtained using the 'Feature to Point' tool available only at the ArcINFO license level. For ArcVIEW users, set the data frame to a geographic coordinate system (WGS_84), add a double field called 'centroid_lat' to the smoothed transect lines table, right click field heading and Calculate Geometry, Property: Y Coordinate of Centroid, check Use Coordinate System of Data Frame.
- **'Longitude'** numeric longitude in decimal degrees. Trackline centroid X value.
- **'PORT_OBSERVER_ID'** Leave blank (refers to manned submersible operations)
- **'STARBOARD_OBSERVER_ID '**Leave blank (refers to manned submersible operations)
- **'VEHICLE_PILOT_ID'** can be looked up as 'Crew_ID' in C_Crew table based on name in Pilot column of Daily Log excel spreadsheet
- **'TAPE_ARCHIVE'** is unnecessary; this field should be deleted from PACGFVideo
- **'Geological_unit_cde'** is unnecessary; this field should be deleted from PACGFVideo
- **'Event_Comments'** can be taken from the 'notes' column in the Daily Log excel sheet

B3a Tape Archive Table

- One record for each transect.

- **'EVENT_ID'** corresponds to the EVENT_ID from B3 Transect Records.
- **'DIGITAL_TAPE_ID's** should start at the next consecutive value based on the most recent transects 'DIGITAL_TAPE_ID'. There is one 'DIGITAL_TAPE_ID' for each tape. Most transects are captured on one tape, rarely a longer transect will require two tapes.
- **'DIGITAL_TAPE_NAME'** can be taken from the 'Tape #' column in the transects daily log excel sheet.
- '**MEDIA_TYPE_ID'** can be referenced in the 'C_Media_type' table. Common procedure is type 12, Master: Digital video .avi; Copy: Mini DV
- 'BACKUP_COPY_MADE_IND' 1 for yes.
- **'MASTER_LOCATION'** to be recorded as media is filed.

B4 Transect Records Table

- One record for each observation. This corresponds to the spatial transect observation feature class where the 'TRANSECT_INDICATOR_ID' field or 'CODE' field contains all values: 0 through 10.

- **'EVENT_ID'** corresponds to the EVENT_ID from B3 Transect Records
- **'RECORD_ID'** will be consecutive from last entry
- **'TRANSECT_INDICATOR_ID'** can be taken from corresponding 'CODE' field in the "Fishlog" and "Hablog" tables, they are based on the video review software
    - Valid codes are:

0	Time period before official transect start (not used since 2007)
1	Time code set (in review software)
2	Transect start
3	Transect end
4	Substrate codes set (habitat observation)
5	Species event (observation)
6	ROV On bottom
7	ROV Off bottom
8	Shutdown (video review software)
9	Video stream missing
10	Field of view recorded

- **'TIME'** will be in GMT
- **'Latitude_text'** is unnecessary
- 'Longitude_text' is unnecessary
- **'Latitude'** numeric latitude in decimal degrees
- **'Longitude'** numeric longitude in decimal degrees (don't forget "-" for West.)
- **'E'** is unnecessary
- **'N'** is unnecessary
- 'PRIMARY_SUBSTRATE_ID', 'SECONDARY_SUBSTRATE_ID', 'PRIMARY_BIOCOVER_ID', 'SECONDARY_BIOCOVER_ID', 'BIOCOVER_THICKNESS_ID', 'RELIEF_ID', 'COMPLEXITY_ID' These fields will now all be stored in B6 Habitat Records Table (previously in this table, B4 Transect Records), and so would be redundant if stored here.
- **'SALINITY'** through **'BEARING'** are unnecessary as this data is not collected during ROV surveys.
- **'FIELD_OF_VIEW'** is unnecessary, (now stored in B7)
- **'COMMENTS'** is unnecessary, in fish log or hab log (now stored in B5, B6 or B7)
- 'Original_DVL_indicator' unnecessary
- 'Original_CTD_indicator' unnecessary
- 'Original_VideoLog_indicator' unnecessary

B5 Species Records Table

- One record for each observation. This corresponds to the spatial transect observation feature class where the 'TRANSECT_INDICATOR_ID' field is equal to 5 (Fish Log species observations).

'RECORD_ID' will be the same as the Record ID in B4_TRANSECT_RECORDS table.
'SPECIES_RECORD_ID' consecutive from largest entry (table not ordered this way, find largest value)
'SPECIES_ID' from 'species' column in fish log
'PAN' from 'Pan' column in fish log
'RANGE' from 'Range' column in fish log
'Range_Unit_id'
C_Units 1 = cm
'LENGTH' from Length column in fish log
'Length_Unit_id' referenced from the C_'Units' table
'COUNT' from 'Count' column in fish log
'PRIMARY_SUBSTRATE_ID', 'SECONDARY_SUBSTRATE_ID', 'PRIMARY_BIOCOVER_ID', 'SECONDARY_BIOCOVER_ID', 'BIOCOVER_THICKNESS_ID', 'RELIEF_ID', 'COMPLEXITY_ID' These fields are all stored in B6 Habitat Records Table (previously in B4 Transect Records), and so would be redundant if stored here. The justification for including them here would be for convenience in relating species observations to habitat observations without further querying.
'COMMENTS' 'Comment' column in Fish Log

B6 Habitat Records Table

- One record for each observation. This corresponds to the spatial transect observation feature class where the 'TRANSECT_INDICATOR_ID' field is equal to 4 (Habitat Log observations).

'RECORD_ID' will be the same as the Record ID in B4_TRANSECT_RECORDS table.
'HABITAT_RECORD_ID' consecutive from largest entry (table not ordered this way, find largest value)
'PRIMARY_SUBSTRATE_ID' 'PS' column in HABLOG
'SECONDARY_SUBSTRATE_ID' (not used after 2007)
'PRIMARY_BIOCOVER_ID' 'PB' column in HABLOG
'SECONDARY_BIOCOVER_ID' (not used after 2007)
'BIOCOVER_THICKNESS_ID' 'BT' column in HABLOG
'RELIEF_ID' 'RL' column in HABLOG
'COMPLEXITY_ID' 'CX' column in HABLOG
'COMMENTS' 'Comment' column in HABLOG

B7 Field of View Records Table

- One record for each observation. This corresponds to the spatial transect observation feature class where the ‘TRANSECT_INDICATOR_ID’ field is equal to 10 (Field of View Log observations).

‘RECORD_ID’ will be the same as the Record ID in B4_TRANSECT_RECORDS table.
‘FIELD_OF_VIEW_RECORD_ID’ consecutive from last entry
‘DISTANCE_BETWEEN_LASERS’ from ‘Distance Between Lasers’ column in AMR field of View Table
‘DBL_UNIT_ID’ units used for distance between lasers field C_Units 1 = cm
‘FIELD_OF_VIEW’ field of view width from ‘field of view cm’ column in fish log
‘FOV_UNIT_ID’ units used for field of view field
C_Units 1 = cm
‘COMMENTS’ ‘Comment’ column in AMR field of view table

Appendix 6. Python Scripts

```
# ---------------------------------------------------------------------------
# ImportTrackpoints.py
# Created on: Nov 8, 2009, aboard the CCGS Vector
# Rob Flemming
#
# Edited 2 Sept, 2010 - Headerfile not necessary
#
# Place transect files in directory defined below as 'path',
# create a folder in that directory called 'with_header'
#
# Check that columnheaders are appropriate for the data that has been exported from HyPack
# ---------------------------------------------------------------------------

# Import system modules
import arcgisscripting, os, traceback, sys, time

#optional - time the script
t1 = time.time()

#create the geoprocessing object
gp = arcgisscripting.create(9.3)

#USER DEFINED VARIABLES
gp.OutputCoordinateSystem = r"Coordinate Systems\Projected Coordinate Systems\UTM\WGS
1984\WGS 1984 UTM Zone 10N.prj"

path = r"C:\DATA\SURVEYS\VIDEO\CRM_transect_processing\trackpoint_dump"
wkspc = r"C:\DATA\SURVEYS\VIDEO\CRM_transect_processing\trackpoint_dump\trackpoints.gdb"
columnheaders = "x,y,depth,time,date,fname"
#

try:

  #PROCESS: Import all txt files to feature classes
  #get list of files
  dirlist = os.listdir(path)
  for tf in dirlist:
    if tf.endswith(".txt"):

      #define the variables
      transectfile = path + os.sep + tf
      finishfile = path + os.sep + "with_header" + os.sep + tf
      outlyr = tf.rstrip('.txt') + "_layer"
      outfc = outlyr.rstrip('_layer')

      #if there is no '\with_header' directory yet, make one
      if not os.path.isdir(path + os.sep + "with_header"):
        os.mkdir(path+ os.sep + "with_header")
```

```
      gp.Addmessage("Copying " + transectfile + " to " + finishfile + " with column headers.")

      #Open, and create, the finishfile
      ff = open(finishfile,'a')
      #Write the header info
      ff.write(columnheaders + "\n")

      tt = open(transectfile,'r')

      #Read everything in the transectfile and write it into the finishfile
      ff.write(tt.read())

      #tidy
      ff.close()
      tt.close()


      # Process: Make XY Event Layer...
      gp.Addmessage("Making XY Event Layer " + outlyr)
      #gp.MakeXYEventLayer_management(finishfile, "X", "Y", outlyr)

      # Process: Copy Features...
      gp.worksPace = wkspc
      gp.Addmessage("Copying " + outlyr + " to " + outfc + " in <trackpoints.gdb>")
      #gp.CopyFeatures_management(outlyr, outfc, "", "0", "0", "0")

    else:
      pass


#>>>THE END<<<

  #PLAY a SOUND
  import winsound
  winsound.PlaySound('SystemExit', winsound.SND_ALIAS)

  t2 = time.time()
  t = t2 - t1
  print "Script ran in " + str(int(t/3600)) + " hours, " + str(int(t%3600/60)) + " minutes, " + str(t%60) + "
seconds"

#<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
#serious error handling...
except:
  # Get the traceback object
  #
  tb = sys.exc_info()[2]
  tbinfo = traceback.format_tb(tb)[0]
```

```
 # Concatenate information together concerning the error into a
 #  message string
 #
 pymsg = tbinfo + "\n" + str(sys.exc_type)+ ": " + str(sys.exc_value)

 # Return python error messages for use with a script tool
 #
 gp.AddError(pymsg)

 # Print Python error messages for use in Python/PythonWin
 #
 t = time.localtime()
 print "The exception time is (or was!) " , t[3] , ":" , t[4] , " and " , t[5] , " seconds"
 print pymsg

# ---------------------------------------------------------------------------
# CalcDistToGPS.py
# Created on: Tue Nov 24 2009 11:43:00 AM
#  (initially generated by ArcGIS/ModelBuilder)
# Rob Flemming
# Runs through all transect feature classes from 'first' to 'last'
# as parameters entered in ArcToolbox
# ---------------------------------------------------------------------------

# Import system modules
import sys, string, os, arcgisscripting, traceback

# Create the Geoprocessor object
gp = arcgisscripting.create(9.3)

gp.overwriteoutput = 1 #table views won't be deleted without this

#set paths etc.
tp_file = r"C:\DATA\SURVEYS\VIDEO\2009_NOV_ROV\trackpoints\trackpoints.gdb\transect" #tnum
will be appended to this
vgps_name = "vesselGPS_pts49to114"
vgps = r"C:\DATA\SURVEYS\VIDEO\2009_NOV_ROV\trackpoints\trackpoints.gdb" + os.sep +
vgps_name


# Script arguments...
tfirst = int(sys.argv[1])
tlast = int(sys.argv[2])

tnum = tfirst

try:
  while tnum <= tlast:

    transect_fc = tp_file + str(tnum)
```

```
    # Process: Join transect points to Vessel GPS points...
    if gp.exists(transect_fc):
      gp.Addmessage("Joining transect#" + str(tnum) + " to Vessel GPS points")
      #Add the field to update
      gp.Addfield_management(transect_fc,"distTOgps","DOUBLE")
      #Make table views
      gp.MakeTableView_management(transect_fc,"tnum_view")
      gp.MakeTableView_management(vgps,"vgps_view")
      #Join the tables
      gp.AddJoin_management("tnum_view","time","vgps_view","time_","KEEP_COMMON")
      #Calculate the field
      expression = "Sqr(([transect" + str(tnum) + ".x] - [" + vgps_name + ".X])*([transect" + str(tnum) +
".x] - [" + vgps_name + ".X]) + ([transect" + str(tnum) + ".y] - [" + vgps_name + ".Y])*([transect" +
str(tnum) + ".y] - [" + vgps_name + ".Y]))"
      gp.CalculateField_management("tnum_view", "distTOgps",expression)

    else:
      gp.Addmessage("There is no transect#" + str(tnum) + " featureclass")

    tnum = tnum + 1

    #take care of run away while loops during testing!
    if tnum > 1000:
      break


#<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
<<<<<<<<<<<<<<
#serious error handling...
except:
  # Get the traceback object
  #
  tb = sys.exc_info()[2]
  tbinfo = traceback.format_tb(tb)[0]

  # Concatenate information together concerning the error into a
  #  message string
  #
  pymsg = tbinfo + "\n" + str(sys.exc_type)+ ": " + str(sys.exc_value)

  # Return python error messages for use with a script tool
  #
  gp.AddError(pymsg)

  # Print Python error messages for use in Python/PythonWin
  #
  t = time.localtime()
  print "The exception time is (or was!) " , t[3] , ":" , t[4] , " and " , t[5] , " seconds"
  print pymsg
```

```
# ---------------------------------------------------------------------------
# ImportFromRAW.py  - for now just to a text file
# Created on: Nov 27, 2009
# Rob Flemming
# ---------------------------------------------------------------------------

# Import system modules
#import arcgisscripting, re, os, traceback, shutil, sys, time
import os, traceback, re, shutil, string, sys, time

# Create the Geoprocessor object
#gp = arcgisscripting.create(9.3)

#gp.OutputCoordinateSystem = r"Coordinate Systems\Projected Coordinate Systems\UTM\WGS
1984\WGS 1984 UTM Zone 10N.prj"

path = r"C:\DATA\GIS\scripts\import_from_HyPackRAWs\filestoimport"
headerfile = path + os.sep + "secxyfile.txt" # this is a text file containing the headers "seconds, x, y"
device = "POS 0"

try:


  #PROCESS: Import all txt files to feature classes
  #get list of files
  dirlist = os.listdir(path)
  for rawf in dirlist:
    if re.search(".RAW",rawf):

      #define the variables
      rawfile = path + os.sep + rawf
      finishfile = rawfile + ".txt"

      #Copy the raw file to a file named rawf, and add the transect file to that
      gp.Addmessage("Importing " + rawfile )
      shutil.copyfile(headerfile, finishfile)

      ff = open(finishfile,'a')
      rr = open(rawfile,'r')

      #METHOD: if the line starts with 'device' then append the rest of it to the finishfile
      #ff.write(tt.read())
      for line in rr:
        if device in line:
          newline = line
          ff.write(line[6:15] + ", " + line[16:26] + ", " + line[27:38]+ "\n")

      ff.close()
      rr.close()

      # Process: Make XY Event Layer...
```

```
    #gp.Addmessage("Making XY Event Layer " + outlyr)
    #gp.MakeXYEventLayer_management(finishfile, "X", "Y", outlyr)

    # Process: Copy Features...
    #gp.worksPace = r"C:\GIS\2009_Vector065_ROV\trackpoints\trackpoints.gdb"
    #gp.Addmessage("Copying " + outlyr + " to " + outfc + " in <trackpoints.gdb>")
    #gp.CopyFeatures_management(outlyr, outfc, "", "0", "0", "0")

   else:
    pass


#>>>THE END<<<

 #PLAY a SOUND
 #import winsound
 #winsound.PlaySound('SystemExit', winsound.SND_ALIAS)

 t = time.localtime()
 print "The time is (or was!) " , t[3] , ":" , t[4] , " and " , t[5] , " seconds"

#<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
#serious error handling...
except:
 # Get the traceback object
 #
 tb = sys.exc_info()[2]
 tbinfo = traceback.format_tb(tb)[0]

 # Concatenate information together concerning the error into a
 #  message string
 #
 pymsg = tbinfo + "\n" + str(sys.exc_type)+ ": " + str(sys.exc_value)

 # Return python error messages for use with a script tool
 #
#  gp.AddError(pymsg)

 # Print Python error messages for use in Python/PythonWin
 #
 t = time.localtime()
 print "The exception time is (or was!) " , t[3] , ":" , t[4] , " and " , t[5] , " seconds"
 print pym
```

Appendix 7. PacGFVideo.mdb database organization. Fields in PacGFVideo.mdb Database where ROV data are stored:

Table_name	Field_name	Field_id	Field_type	Field_description
A2_Query_documentation	Query_Name	1	nvarchar	Name of query
A2_Query_documentation	Query_Name	1	sysname	Name of query
A2_Query_documentation	Query_Description	2	nvarchar	Description of query specs.
A2_Query_documentation	Query_Description	2	sysname	Description of query specs.
B2_RESEARCH_TRIP	TRIP_ID	1	int	Unique id given to a video based research trip.
B2_RESEARCH_TRIP	DATE_START	2	smalldatetime	Start date of research trip - mm/dd/yyyy.
B2_RESEARCH_TRIP	DATE_END	3	smalldatetime	End date of research trip - mm/dd/yyyy.
B2_RESEARCH_TRIP	VEHICLE_ID	4	smallint	Type of vehicle used to transport video camera - see C_Vehicle_Type.
B2_RESEARCH_TRIP	VESSEL_ID	5	smallint	Vessel used to transport vehicle type - see C_Vessel.
B2_RESEARCH_TRIP	CREW_VESSEL_ID	6	smallint	Vessel used to accomodate research crew - see C_Vessel.
B2_RESEARCH_TRIP	CONTRACTOR_ID	7	smallint	Company contracted to assist in research - see C_Contractor.
B2_RESEARCH_TRIP	DESCRIPTION	8	nvarchar	Short description given to research trip.
B2_RESEARCH_TRIP	DESCRIPTION	8	sysname	Short description given to research trip.
B3_VIDEO_EVENT	TRIP_ID	1	int	Unique id given to a video based research trip.
B3_VIDEO_EVENT	EVENT_ID	2	int	Unique id given to a video event during which the camera gear is employed.
B3_VIDEO_EVENT	EVENT_ID_NAME	3	nvarchar	Name given to the transect during which the camera gear is deployed.
B3_VIDEO_EVENT	EVENT_ID_NAME	3	sysname	Name given to the transect during which the camera gear is deployed.
B3_VIDEO_EVENT	PARENT_EVENT_ID	4	int	Unique parent id given to a video event during which the camera gear is employed.
B3_VIDEO_EVENT	PARENT_EVENT_ID_NAME	5	nvarchar	Name given to the dive during which the camera gear is deployed.
B3_VIDEO_EVENT	PARENT_EVENT_ID_NAME	5	sysname	Name given to the dive during which the camera gear is deployed.
B3_VIDEO_EVENT	CAMERA_EVENT_DATE	6	smalldatetime	Date of video event - mm/dd/yyyy.
B3_VIDEO_EVENT	START_PARENT_EVENT_TIME	7	datetime	Time/date at beginning of video gear deployment
B3_VIDEO_EVENT	END_PARENT_EVENT_TIME	8	datetime	Time/date at end of video gear deployment
B3_VIDEO_EVENT	START_EVENT_TRANSECT	9	datetime	Time/date of transect start.

Table_name	Field_name	Field_id	Field_type	Field_description
B3_VIDEO_EVENT	END_EVENT_TRANSECT	10	datetime	Time/date of transect end.
B3_VIDEO_EVENT	LEAVE_SURFACE_TIME	11	datetime	Time/date video equipment left the water surface.
B3_VIDEO_EVENT	ARRIVE_SURFACE_TIME	12	datetime	Time/date video equipment appeared at the water surface.
B3_VIDEO_EVENT	VEHICLE_SUBTYPE_ID	13	smallint	Unique subtype of vehicle used to transport video equipment - see C_Vehicle_Subtype.
B3_VIDEO_EVENT	SITE_NAME	14	nvarchar	Unique name given to research site.
B3_VIDEO_EVENT	SITE_NAME	14	sysname	Unique name given to research site.
B3_VIDEO_EVENT	BLOCK	15	nvarchar	Unique block id given to research site.
B3_VIDEO_EVENT	BLOCK	15	sysname	Unique block id given to research site.
B3_VIDEO_EVENT	PORT_OBSERVER_ID	20	smallint	Observer in port position - see C_Crew.
B3_VIDEO_EVENT	STARBOARD_OBSERVER_ID	21	smallint	Observer in starboard position - see C_Crew.
B3_VIDEO_EVENT	VEHICLE_PILOT_ID	22	smallint	Vehicle pilot - see C_Crew.
B3_VIDEO_EVENT	TAPE_ARCHIVE	23	nvarchar	Unique id to identify archive of tapes used in transect - data table: B3a_TAPE_ARCHIVE
B3_VIDEO_EVENT	TAPE_ARCHIVE	23	sysname	Unique id to identify archive of tapes used in transect - data table: B3a_TAPE_ARCHIVE
B3_VIDEO_EVENT	Geological_unit_cde	24	smallint	Unique id indicating geological unit assigned to survey grid cell - see C_Geological_Unit.
B3_VIDEO_EVENT	USABILITY_CODE		smallint	"dbo_C_Usability" points to the USABILITY table in GFBio
B4_TRANSECT_RECORDS	EVENT_ID	1	int	Unique id given to a video event during which the camera gear is employed.
B4_TRANSECT_RECORDS	RECORD_ID	2	int	Unique id given to each record of time.
B4_TRANSECT_RECORDS	TRANSECT_INDICATOR_ID	3	smallint	Indicates portions of transect or type of observation- see C_Transect_indicator
B4_TRANSECT_RECORDS	TIME_	4	datetime	Unique time of each record.
B4_TRANSECT_RECORDS	LATITUDE	9	float	The latitudinal position in decimal degrees of the video equipment
B4_TRANSECT_RECORDS	LONGITUDE	10	float	The longitudinal position in decimal degrees of the video equipment
B4_TRANSECT_RECORDS	SALINITY	20	float	Salinity measurement (PSU) at transect time record.
B4_TRANSECT_RECORDS	TEMPERATURE	21	float	Temperature measurement in degrees celcius at transect time record.
B4_TRANSECT_RECORDS	DEPTH	22	float	Depth in meters ([salt water, m]) at transect time record from CTD instrument.
B4_TRANSECT_RECORDS	ALTERNATE_DEPTH	23	float	Depth in meters from an alternate instrument

Table_name	Field_name	Field_id	Field_type	Field_description
				other than CTD.
B4_TRANSECT_RECORDS	PRESSURE	25	float	Pressure measurement (Strain Gauge [db]) at transect time record.
B4_TRANSECT_RECORDS	CONDUCTIVITY	26	float	Conductivity measurement(S/m) at transect time record.
B4_TRANSECT_RECORDS	VELOCITY	27	float	Velocity (mm/sec) at transect time record.
B4_TRANSECT_RECORDS	HEADING	30	float	Heading measurement.
B4_TRANSECT_RECORDS	ALTITUDE_OFF_BOTTOM	31	float	Altitude off bottom(meters)
B4_TRANSECT_RECORDS	BEARING	32	float	Bearing (degrees) at transect time record.
B4_TRANSECT_RECORDS	COMMENTS	34	nvarchar	Comments from video observations.
B4_TRANSECT_RECORDS	COMMENTS	34	sysname	Comments from video observations.
B4_TRANSECT_RECORDS	Original_DVL_indicator	35	tinyint	Indicator(1) that record(Lat, Long, Velocity, Heading,Altitude off bottom) is from original data source files
B4_TRANSECT_RECORDS	Original_CTD_indicator	36	tinyint	Indicator(1) that record(Temp, Depth, Pressure, Conductivity) is from original data source files
B4_TRANSECT_RECORDS	Original_VideoLog_indicator	37	tinyint	Indicator(1) that record(Substrate,Biocover,Relief, Complexity) is from original data source files
B4_TRANSECT_RECORDS	REVIEWER_ID		smallint	"dbo_C_Reviewer" points to the EMPLOYEE table in GFBIo
B5_SPECIES_RECORDS	RECORD_ID	1	int	Unique id given to each record of time.
B5_SPECIES_RECORDS	SPECIES_RECORD_ID	2	int	Unique id given to each species observed.
B5_SPECIES_RECORDS	SPECIES_ID	3	varchar	Unique species id - see C_Species.
B5_SPECIES_RECORDS	PAN	4	varchar	Indicates position of fish S=Starboard, P=Port.
B5_SPECIES_RECORDS	RANGE	5	smallint	Distance in feet from the centerline.
B5_SPECIES_RECORDS	Range_Unit_id	6	smallint	units of range - See C_Units
B5_SPECIES_RECORDS	LENGTH	7	smallint	Estimated length of individual or average of estimated lengths of group
B5_SPECIES_RECORDS	Length_Unit_id	8	smallint	units of length - See C_Units
B5_SPECIES_RECORDS	COUNT_	9	int	Number of individuals observed
B5a_MEDIA_SAMPLES	RECORD_ID	1	int	Unique id given to each record of time.
B5a_MEDIA_SAMPLES	MEDIA_ID	2	int	Unique id given to digital media.
B5a_MEDIA_SAMPLES	MEDIA_START_TIME	3	datetime	Actual start time of digital media.
B5a_MEDIA_SAMPLES	MEDIA_DURATION	4	smallint	Duration of video in seconds.
B5a_MEDIA_SAMPLES	SPECIES_OBSERVED	5	varchar	Description of species observed in media.
B5a_MEDIA_SAMPLES	HABITAT_DESCRIPTION	7	varchar	General description of habitat observed in media.
B5a_MEDIA_SAMPLES	DEPTH	9	int	Depth in meters.

Table_name	Field_name	Field_id	Field_type	Field_description
B5a_MEDIA_SAMPLES	FILE_NAME	10	varchar	Unique file name to identify media.
B5a_MEDIA_SAMPLES	MEDIA_TYPE_ID	13	smallint	Type of digital media.
B5a_MEDIA_SAMPLES	MEDIA_FILE	15	image	Actual file linked in field, accessed by double click on record.
B6_HABITAT_RECORDS	RECORD_ID	1	int	Relate to B4_TRANSECT_RECORDS (from 2009, time and location refer to beginning of continuous observation, i.e. change in habitat)
B6_HABITAT_RECORDS	HABITAT_RECORD_ID	2	int	Unique Id given to each habitat observation
B6_HABITAT_RECORDS	PRIMARY_SUBSTRATE_ID	3	int	The primary substrate observed - see C_Substrate_Type.
B6_HABITAT_RECORDS	SECONDARY_SUBSTRATE_ID	4	int	The secondary substrate observed - see C_Substrate_Type.
B6_HABITAT_RECORDS	PRIMARY_BIOCOVER_ID	5	int	The primary biocover observed - see C_Biocover_Type.
B6_HABITAT_RECORDS	SECONDARY_BIOCOVER_ID	6	int	The secondary biocover observed - see C_Biocover_Type.
B6_HABITAT_RECORDS	BIOCOVER_THICKNESS_ID	7	int	The percentage of biocover thickness observed - see C_Biocover_Thickness_Type.
B6_HABITAT_RECORDS	RELIEF_ID	8	int	The type of relief observed - see C_Relief_Type.
B6_HABITAT_RECORDS	COMPLEXITY_ID	9	int	The degree of complexity observed - see C_Complexity.
B7_FIELD_OF_VIEW_RECORDS	RECORD_ID	1	int	Relate to B4_Transect_Records (from 2009, instantaneous observation at 30 second interval)
B7_FIELD_OF_VIEW_RECORDS	FIELD_OF_VIEW_RECORD_ID	2	int	Unique Id given to each field of view observation
B7_FIELD_OF_VIEW_RECORDS	DISTANCE_BETWEEN_LASERS	3	float	Distance between lasers (Phantom ROV fixed at 10 cm) measured on screen
B7_FIELD_OF_VIEW_RECORDS	DBL_UNIT_ID	4	smallint	Units of distance between Lasers - See C_Units
B7_FIELD_OF_VIEW_RECORDS	FIELD_OF_VIEW	5	float	Field of view (width visible across transect)
B7_FIELD_OF_VIEW_RECORDS	FOV_UNIT_ID	6	smallint	Units of Field of view - see C_Units
C_Biocover_Thickness_Type	Biocover_Thickness_ID	1	smallint	Unique id indicating the percentage of biocover thickness observed.
C_Biocover_Thickness_Type	Biocover_Thickness_Description	2	nvarchar	Description of the percentage of biocover thickness.
C_Biocover_Thickness_Type	Biocover_Thickness_Description	2	sysname	Description of the percentage of biocover thickness.
C_Biocover_Type	Biocover_ID	1	smallint	Unique id indicating the biocover observed.
C_Biocover_Type	Biocover_Type	2	nvarchar	The type of biocover observed.

Table_name	Field_name	Field_id	Field_type	Field_description
C_Biocover_Type	Biocover_Type	2	sysname	The type of biocover observed.
C_Biocover_Type	Biocover_Description	3	char	Description of the biocover observed.
C_Complexity	Complexity_ID	1	smallint	Unique id indicating the degree of complexity observed.
C_Complexity	Complexity_Name	2	nvarchar	The name given to the ranges of complexity observed.
C_Complexity	Complexity_Name	2	sysname	The name given to the ranges of complexity observed.
C_Complexity	Complexity_Description	3	nvarchar	The description of the degree of complexity observed.
C_Complexity	Complexity_Description	3	sysname	The description of the degree of complexity observed.
C_Contractor	CONTRACTOR_ID	1	smallint	Unique id given to company contracted to assist in research.
C_Contractor	Contractor_Name	2	nvarchar	Name of contractor.
C_Contractor	Contractor_Name	2	sysname	Name of contractor.
C_Contractor	Contractor_Contact	3	nvarchar	Main contact of contractor.
C_Contractor	Contractor_Contact	3	sysname	Main contact of contractor.
C_Contractor	Contractor_Address	4	nvarchar	Address of contractor.
C_Contractor	Contractor_Address	4	sysname	Address of contractor.
C_Contractor	Contractor_Phone	5	nvarchar	Phone number of contractor.
C_Contractor	Contractor_Phone	5	sysname	Phone number of contractor.
C_Contractor	Contractor_Web_Address	6	nvarchar	Internet link of contractor.
C_Contractor	Contractor_Web_Address	6	sysname	Internet link of contractor.
C_Crew	Crew_ID	1	smallint	Unique id given to research crew member.
C_Crew	Last_Name	2	nvarchar	Last name of research crew member.
C_Crew	Last_Name	2	sysname	Last name of research crew member.
C_Crew	First_Name	3	nvarchar	First name of research crew member.
C_Crew	First_Name	3	sysname	First name of research crew member.
C_Crew	Position	4	nvarchar	Position or title of research crew member.
C_Crew	Position	4	sysname	Position or title of research crew member.
C_Crew	Photo	7	image	Image of crew member
C_Historic_Habitat_codes	Habitat_id	1	int	Unique habitat id.
C_Historic_Habitat_codes	Habitat_Description	2	nvarchar	Unique habitat description.
C_Historic_Habitat_codes	Habitat_Description	2	sysname	Unique habitat description.
C_Media_type	Media_type_id	1	tinyint	Unique id for type of digital media.
C_Media_type	Media_type_description	2	varchar	Description of type of digital media.
C_Media_type	Serial	3	nvarchar	Serial Number of Media type (when applicable)
C_Media_type	Serial	3	sysname	Serial Number of Media type (when applicable)

Table_name	Field_name	Field_id	Field_type	Field_description
C_Media_type	Total_GB	4	smallint	Total (binary) Gigabytes of storage sPace available (when applicable)
C_Relief_Type	Relief_ID	1	smallint	Unique id given to each relief type observed.
C_Relief_Type	Relief_Type	2	varchar	The range of relief types.
C_Relief_Type	Relief_Description	3	varchar	Description of the range of relief types.
C_Substrate_Type	Substrate_ID	1	smallint	Unique id given to substrate observed.
C_Substrate_Type	Substrate_Type	2	varchar	Type of substrate observed.
C_Substrate_Type	Substrate_Description	3	varchar	Description of type of substrate observed.
C_Vehicle_Subtype	Vehicle_Subtype_ID	1	smallint	Unique id given to the subtype of vehicle used to transport video equipment.
C_Vehicle_Subtype	Vehicle_Description	2	nvarchar	Description of the subtype of vehicle used to transport video equipment.
C_Vehicle_Subtype	Vehicle_Description	2	sysname	Description of the subtype of vehicle used to transport video equipment.
C_Vehicle_Type	VEHICLE_ID	1	smallint	Unique id of vehicle used to transport video camera.
C_Vehicle_Type	VEHICLE_DESCRIPTION	2	nvarchar	Description of vehicle used to transport video camera.
C_Vehicle_Type	VEHICLE_DESCRIPTION	2	sysname	Description of vehicle used to transport video camera.
C_Vessel	VESSEL_ID	1	smallint	Unique id of vessel used to transport vehicle type.
C_Vessel	VESSEL_NAME	2	nvarchar	Name of vessel used to transport vehicle type.
C_Vessel	VESSEL_NAME	2	sysname	Name of vessel used to transport vehicle type.
C_Vessel	VESSEL_DESCRIPTION	3	nvarchar	Description of vessel used to transport vehicle type.
C_Vessel	VESSEL_DESCRIPTION	3	sysname	Description of vessel used to transport vehicle type.
P2_HISTORIC_TRIP	DIVE_ID	1	int	Unique id given to a video based research trip.
P2_HISTORIC_TRIP	DIVE_NO	2	int	Unique id give to dive by research team.
P2_HISTORIC_TRIP	DIVE_DATE	4	smalldatetime	Date of research trip - mm/dd/yyyy.
P2_HISTORIC_TRIP	TIME	5	smalldatetime	Time of research trip - mm/dd/yyyy.
P2_HISTORIC_TRIP	SITE_NAME	8	nvarchar	Unique name assigned to site by research team.
P2_HISTORIC_TRIP	SITE_NAME	8	sysname	Unique name assigned to site by research team.
P2_HISTORIC_TRIP	SITE_NO	9	nvarchar	Unique number assigned to site by research team.
P2_HISTORIC_TRIP	SITE_NO	9	sysname	Unique number assigned to site by research team.
P2_HISTORIC_TRIP	MAX_DEPTH	10	nvarchar	Maximum depth for each dive(meters).

Table_name	Field_name	Field_id	Field_type	Field_description
P2_HISTORIC_TRIP	MAX_DEPTH	10	sysname	Maximum depth for each dive(meters).
P2_HISTORIC_TRIP	VEHICLE_TYPE	11	smallint	Type of vehicle used to transport video camera - see C_Vehicle_Type.
P2_HISTORIC_TRIP	VEHICLE_SUBTYPE	12	smallint	Unique subtype of vehicle used to transport video equipment - see C_Vehicle_Subtype.
P2_HISTORIC_TRIP	PILOT	13	smallint	Vehicle pilot - see C_Crew.
P2_HISTORIC_TRIP	OBSERVER_PORT	14	smallint	Observer in port position - see C_Crew.
P2_HISTORIC_TRIP	OBSERVER_STARBOARD	15	smallint	Observer in starboard position - see C_Crew.
P3_HISTORIC_TRANSECT_COUNTS	DIVE_ID	1	int	Unique id given to a video based research trip.
P3_HISTORIC_TRANSECT_COUNTS	TRANSECT_ID	2	int	Unique id given to a video based research transect.
P3_HISTORIC_TRANSECT_COUNTS	TRANSECT	3	float	Unique id give to transect by research team.
P3_HISTORIC_TRANSECT_COUNTS	OBSERVER	4	int	Port or starboard observer - see C_Crew.
P3_HISTORIC_TRANSECT_COUNTS	SIDE_INDICATOR	5	char	P=PORT S=STARBOARD.
P3_HISTORIC_TRANSECT_COUNTS	DEPTH	6	float	Depth in meters.
P3_HISTORIC_TRANSECT_COUNTS	HABITAT_ID	7	int	Unique habitat id - see C_Historic_Habitat_codes
P3_HISTORIC_TRANSECT_COUNTS	SPECIES_ID	8	varchar	Unique species id - see C_Species.
P3_HISTORIC_TRANSECT_COUNTS	SPECIES_COUNT	9	float	Count of species observed.
P3_HISTORIC_TRANSECT_HABITAT	DIVE_ID	1	int	Unique id given to a video based research trip.
P3_HISTORIC_TRANSECT_HABITAT	TRANSECT_HABITAT_ID	2	int	Unique id given to a video based research transect with habitat data.
P3_HISTORIC_TRANSECT_HABITAT	TRANSECT	4	float	Unique id give to transect by research team.
P3_HISTORIC_TRANSECT_HABITAT	SIDE_INDICATOR	6	nvarchar	P=PORT S=STARBOARD.
P3_HISTORIC_TRANSECT_HABITAT	SIDE_INDICATOR	6	sysname	P=PORT S=STARBOARD.
P3_HISTORIC_TRANSECT_HABITAT	DEPTH	7	float	Depth in meters.
P3_HISTORIC_TRANSECT_HABITAT	VISIBILITY	9	float	Range of visibility.
P3_HISTORIC_TRANSECT_HABITAT	HABITAT_ID	11	float	Unique habitat id - see C_Historic_Habitat_codes
P3_HISTORIC_TRANSECT_HABITAT	TEMPERATURE	14	float	Water temperature in Celcius.
P3_HISTORIC_TRANSECT_HABITAT	REMARKS	16	nvarchar	Science staff remarks.
P3_HISTORIC_TRANSECT_HABITAT	REMARKS	16	sysname	Science staff remarks.
P4_HISTORIC_IMAGES	IMAGE_ID	1	int	Unique id given to each historic image.
P4_HISTORIC_IMAGES	IMAGE_NAME	2	char	Original image name.
P4_HISTORIC_IMAGES	DIVE_ID	3	int	Unique id given to a video based research trip.
P4_HISTORIC_IMAGES	IMAGE_DESCRIPTION	4	char	Short desciption of image from original scanned slides.
P4_HISTORIC_IMAGES	IMAGE_FILE	5	image	Link to image from scanned 1984 slides.

Appendix 8 PacGFVideo structure (before October 2015):