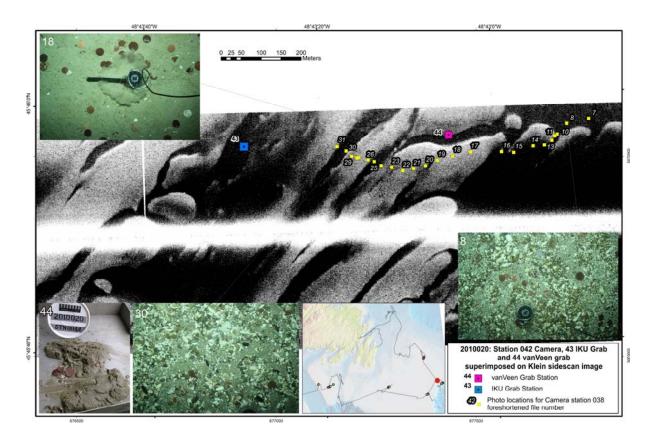


## **GEOLOGICAL SURVEY OF CANADA OPEN FILE 6943**

## Hudson 2010020 Expedition: A Geological and Geophysical Survey for Geohazard Assessment on Grand Banks, Newfoundland and Labrador

M.Z. Li, E.L. King, O. Brown, G. Cameron, P. Fraser, S. Hayward, D. Manning, S. Merchant, P. Meslin, R. Murphy, R. Pike, and A. Robertson



2011



Canada

Natural Resources Ressources naturelles Canada





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## 2011

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Publications in this series have not been edited; they are released as submitted by the author.

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Appendix 1 List of (a) all stations, (b) camera stations, and (c) grab and core stations obtained in Hudson 2010020.

Appendix 2 List of all sidescan/seismic survey lines for Hudson 2010020 cruise. The listed

columns are line number, start and end times, and the record and DVD numbers of the seismic, sidescan, Huntec and Knudsen sonar data respectively.

Appendix 3 All still photos (in wallet format) taken in camera stations of Hudson 2010020.

Appendix 4 Geological and biological descriptions and positional notes of seabed photographs of camera stations conducted on Hudson 2010020.

#### 1.0 Cruise Summary Sheet

Ship	CCG	S HUDSON		
Cruise Number		2010020		
Duration		4 - 18 June, 2010		
Survey Are	eas	Grand Banks, Newfoundland		

#### **Type of Data Collected**

- 1. Station Work: a) Surficial van Veen grab samples, b) large bucket IKU grabs, c) resin peels from IKU grabs, d) still photography and video data, e) piston cores and f) dredge samples.
- 2. On Line Survey Work: a) Huntec DTS seismics; b) airgun seismics; c) Klein 3000 sidescan sonar, and d) Knudsen 3.5 and 12 kHz sounder data.

#### **Summary of Accomplishments**

- 1. Completed geological sampling and geophysical survey at 7 study areas spanning the entire Grand Banks region.
- 2. A total of 62 stations were occupied, including 6 camera stations, 7 camera/video transects, 23 van Veen grab stations, 8 IKU grab stations with 5 resin peels, 2 dredge stations, and 16 piston cores.
- 3. 700 km geophysical survey lines plus 1900 km of 3.5 kHz penetration sounder data

Scientific Staff		
Li, Michael	GSCA	Chief scientist
King, Edward	GSCA	Co-chief scientist
Brown, Owen	GSCA	sam ple processing/data curation
Cameron, Gordon	GSCA	data processing/QC/interpretation
Fraser, Paul	GSCA	naviga tion, trackpoint, data management
Hayward, Scott	GSCA	GIS, navigation
Learning, Fred	Geoforce	Huntec
Manning, Desmond	GSCA	seism ic systems, electronics
Merchant, Susan	GSCA	sa mple processing/data curation
Meslin, Patrick	GSCA	sidescan, electronics systems
Murphy, Bob	GSCA	sam pling (coring, IKU grabs)
Pike, Ryan	Geoforce	sampling (coring, IKU grabs)
Robertson, Angus	GSCA	cam era, sample processing, data curation
MacLeod, Leith	SMU	sam pling/watchkeeping
Neilson, Helen	volunteer	sampling/data processing
Paitich, Olivia	Dalhousie	sampling/watchkeeping
Pellerin, Amy	Dalhousie	sampling/watchkeeping
Pitts, Matthew	Acadia	sam pling/watchkeeping
Rand, Albert	Dalhousie	sampling/watchkeeping
Reid, Marla	Dalhousie	sampling/watchkeeping

## Salamtifia Staff

## Ship's Personnel

Naugle, William D		Commanding Officer
Beaudoin, Marie-Josee	Chief Officer	
Bernard, Wayne W		Second Officer
Allen, Eric J		Third Officer
Fraser, Ian M		Chief Engineer
Van Der Baaren, Richa	ard	Senior Engineer
Marceau, Julien P		First Engineer
Curry, Alexander J		Second Engineer
Macdonald, Trevor P		Third Engineer
Cantle, Keith	Logist	ics Officer
Ward, James A	_	Electrical Officer
Lucas, Arnold (Joe) J		Electrical Technician
O'quinn, Edward		Boatswain
Baglole, Vernon		Leading Seaman
Maclellan, Donald G		Leading Seaman
Sallans, Brent M		Leading Seaman
Ward, Andrew G		Leading Seaman
Bagnell, Grant	Seam	an
Baker, John G	Seam	an
Chisholm, Gerald C		Seaman
Demerchant, Andrew (	(Jay)	Seaman
Johnson, Donald B		Seaman
Reeves, Matthew J		Seaman
Almeda, Virgilio A		Oiler
Haley, John F	Oiler	
Hadley, Randall W		Chief Cook
Macdonald, Barry J		Storekeeper
Whittle, Jeffrey A		Storekeeper
Parker, Robin G		Assistant Cook
Leppard, Denise		Cook/Steward
Antoft, Tim	Stewar	
Cameron, Ronald J		Steward
Cooper, Denise E		Steward
Donovan, Evelyn R		Steward

#### 2.0 Introduction (Li, King)

Assessments of seabed conditions and hazards, and improving regional knowledge of sediment transport processes and bedform distribution and mobility on the Grand Banks are two of the key objectives of the Geoscience for East Coast Offshore Development (GECOD) project, in the ESS Offshore Geoscience Program. Areas of high potential of bedform mobility on Grand Banks have been identified by comparing existing information on sediment type and bedform distribution with seabed disturbance predictions from previous modelling exercises and proposed pipeline routes (Li and King, 2009). These identified hot spots guided selection of case study areas for which seabed sampling and geophysical surveys would be conducted to obtain new data of bedform distribution and sediment composition over targeted bedforms. A geological and geophysical expedition (Hudson 2009044) was conducted in 2009 to collect cores, seabed samples, and geophysical data for identifying the geological conditions of the seabed and shallow sub-surface for purposes of map production and geohazard assessment (King, in preparation). Cores, seabed samples, and geophysical data were successfully collected during the 2009 expedition. However, mid-cruise termination of the expedition due to unforeseen circumstances resulted in cancelation of half of the science program, including all the planned mid-shelf operations. The overall purpose of the 2010 expedition was to make up for the lost shiptime in the 2009 cruise, and to fulfill the scientific goal of assessing seabed conditions and geohazards on Grand Banks through seabed sampling, imaging, and geophysical surveys in highpriority areas.

The Hudson 2010020 expedition to the Grand Banks region has three main objectives: (1) to improve knowledge of distribution, metrics and sediment composition of bedforms in identified areas of high bedform mobility, (2) to establish new and extend existing serial sidescan coverages at selected sites for bedform mobility assessment, and (3) to study foundation conditions and geologic framework through geophysical surveys and core sampling with a focus on potential pipeline corridors.

The CCGS Hudson was mobilized on June 3<sup>rd</sup> 2010 and left BIO in the afternoon of June 4<sup>th</sup>. The ship docked in St. John's on June 18<sup>th</sup>, terminating this 14 day cruise. Under the direction of Captain William Naugle, the ship's officers and crew did an excellent job in assisting our surveys and sampling. The scientific team included 11 GSCA staff, 2 staff from Geoforce, 6 co-op students, and 1 volunteer. The general work platform on Hudson 2010020 was to undertake grab sampling, seabed photography, and coring in the daytime and run seismic/sidescan surveys in the night. The cruise roster is shown in Table 2-1 and each staff's responsibility is listed in the Cruise Summary Sheet. This platform worked reasonably well. Since the selected study sites are widely distributed from St. Pierre Bank through central Grand Bank to southeastern and northeastern Grand Bank (Figure 2-1), the deployment or retrieval of geophysical gear occurred beyond normal ships crew shift hours on several occasions.

#### Table 2-1 Hudson 2010020 Cruise Roster

0600-1000	1000-1400	1400-1800	1800-2200	2200-0200	0200-0600
Li	Li	King (0400-0800)			King (0400-0800)
Murphy	Murphy	Murphy	Manning	Manning	Manning
Pike	Pike	Pike	Meslin	Meslin	Meslin
Robertson	Robertson	Robertson	Learning	Learning	Learning
Brown	Brown	Brown (0600- 1600)			
	Cameron	Cameron			
	Merchant	Merchant			
Paitich			Paitich		
Reid			Reid		
	Pellerin			Pellerin	
	Pitts			Pitts	
		MacLeod			MacLeod
		Rand			Rand
Neilson (0400- 1200)					Neilson (0400- 1200)
Fraser	Fraser				
		Hayward	Hayward		

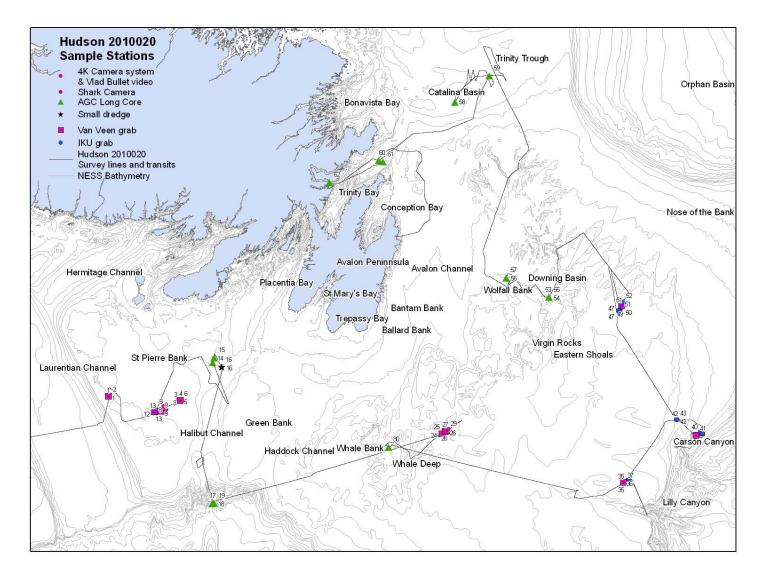


Fig. 2-1: Overview of sampling and camera stations in various case-study areas occupied during Hudson 2010020 expedition.

Weather was good through most of the expedition. However, a major storm on June 15<sup>th</sup> forced cancelation of daytime sampling and altered the nighttime geophysical survey plan. Seabed samples, cores, photographs, videos and geophysical survey lines were obtained from 7 study areas spanning the western, central, eastern and northern Grand Banks (Figure 2-1 and Figure 2-2). These sampling and survey activities targeted various bedforms, potential geohazard features, strategic mapping and stratigraphic sampling locations to help establish sediment types and foundation conditions in the study areas. A total of 62 stations were occupied, including 6 camera stations, 7 camera/video transects, 23 van Veen grab stations, 8 IKU grab stations with 5 resin peels, 2 dredge stations, and 16 piston cores (see the list of all stations in Appendix 1a). Seabed photos, video transects, seabed samples, and sidescan/seismic survey data collected in 5 geographic areas will contribute to establish the distribution, characteristics, and mobility of targeted bedforms under variable geological and oceanographic setting. The dredge samples, piston cores, and over 700 km geophysical survey data (plus 1900 km of 3.5 kHz penetration sounder) will contribute to our study of the foundation conditions and geologic framework in the region. All stations and comments are given in Appendix 1a, and all sidescan/seismic survey lines are listed in Appendix 2. This report is intended to provide a description of the day-to-day activities, an overview of the technical aspects of the equipment and methods used, and a summary of the preliminary results.

#### 3.0 Navigation (Fraser, Hayward)

Primary GPS information for the cruise was provided by a Novatel DL-V3 GPS system and a Thales ADU5 Positional and attitude determination GPS system. Prior to 21:36 UTC of day 165 (June 14, 2010), the Novatel system was used as the primary GPS. The ADU5 was used as the primary GPS from that point until the end of the cruise. The change was made due to unexplained dropouts in the positional information output by the Novatel system.

NMEA sentences from the primary GPS receiver were combined with NMEA sentences from the Knudsen 12 kHz sounder, the ship's log, the ship's gyro, and the Trackpoint II USBL acoustic positioning system for distribution throughout the ship serially at 9600 baud. Selected sentences were rebroadcast throughout the ship at 4800 baud. In addition to the serial distribution, the GSC Navigation Net system (GSC IO Portal) was used to add metadata and a time stamp to each NMEA sentence. These sentences were then rebroadcast as multicast packets over the ship's network. Real time offset positions for the ship's central reference point (centre of stern) and other selected locations (e.g. coring and camera locations) were calculated and distributed as multicast packets using the GSC Survey Manager software. The GSC Navigation Net data was logged using the GSC Nav Net Master Logger. The GSC Nav Net Hudson Time server was used to synchronize the clocks of all data logging and display computers. All data logging and display computers were running the Dimension4 network time client software to enable the time synchronization.

Four Regulus systems were used on the ship to view and log the serial navigation data. The systems were set up in the Drawing Office, the Winch Room, the Forward Lab, and the GP Lab. Due to some bugs/issues with the most current Regulus software release all four systems were

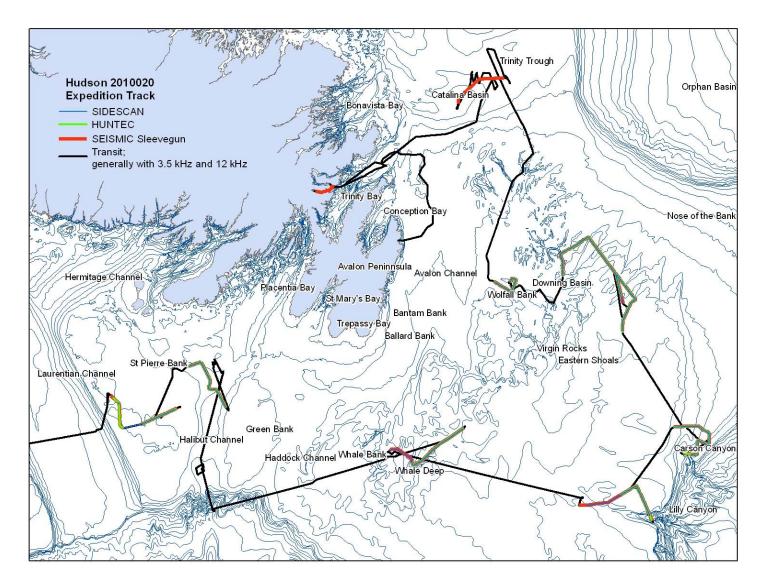


Fig. 2-2 Overview of geophysical survey lines collected during Hudson 2010020 expedition.

running on a previous release, build 28894.

Navigation data were provided to all computers that were used to digitize and log seismic data. The sleevegun digitizer received the primary GPS antenna position serially at 4800 baud, which allowed the GPS antenna positions to be written to the sleevegun SEG-Y file trace headers. The Trackpoint II USBL acoustic positioning system was used to calculate positions for the sidescan sonar and the Huntec DTS tow fish. An acoustic beacon operating in responder mode was used on the sidescan, while a transponder beacon was used on the Huntec. The Trackpoint data was cleaned and processed in real time using the GSC USBL RT Processor. GSC Nav Net NMEA Formatter was then used to reformat the cleaned Trackpoint data into simulated GPS NMEA sentences (\$GPGGA). The simulated GPS sentences were then sent to the sidescan computer via a serial port and to the Huntec digitizer via a virtual serial port. This allowed the Trackpoint acoustic beacon positions to be written to the Sidescan and Huntec files.

The Trackpoint II acoustic positioning system was also used to provide positions for the 4k Camera system and the Shark marine video camera. The Trackpoint data was again cleaned and processed in real time, then the program GSC Nav Net JPEG Merge was used to write processed Latitudes and Longitudes to the JPEG metadata.

Cruise navigation data was cleaned and merged using custom tools in ArcGIS to generate A format files and shapefiles from the raw NMEA E format files and from the GSC Nav Net real time offset locations file. These files were archived and merged on a daily basis.

#### 4.0 Equipment

The following is a list of equipment utilized in this mission:

van Veen grab IKU grab AGC long piston corer small refurbished dredge 4K camera Shark Marine System (video/still camera system) DGPS navigation Trackpoint II USBL acoustic positioning system Klein sidescan with trackpoint and Chesapeake system 6 cubic inch and 40 cubic inch (backup only) sleeve guns Huntec DTS with trackpoint. ED at Sea laptop

The operation and performance of some of these equipments are described in the next few sections.

#### 4.1 Seabed Sampling (Modified from Pike, Murphy and Brown)

#### 4.1.1 van Veen grab

A medium size van Veen grab sa mpler (Fig. 4-1) was us ed to collect small bulk samples. The components of the grab include:

- 1) van Veen grab
- 2) Hydro cast winch with cable
- 3) Boom and block in winch room
- 4)  $2\frac{1}{2}$  shackles
- 5) 1 1ton swivel
- 6) Sampling Tools (small shovels, trowels, pails, bags, vials, electrical tape, markers, tape measure, deck sheets, etc)

The ship's crew along with GSCA sampling technicians operate the Van Veen Grab from the winch room. The van Veen is attached to the Hydro cast winch and cable using 2 1/2" shackles and 1 1ton swivel. This cable is then fed through the Snatch Block attached to the boom. van Veen is armed by GSCA sampling technicians. The boom is extended out through the large hydraulic doors in the winch room. During this time one of the ships crew and one GSCA sampling technician are harnessed to the ship and help to steady the van Veen during deployment and recovery. The winch driver will receive a water depth from GSCA staff and then lower the grab to the ocean floor. On bottom will be called the moment the grab reaches the seafloor. Once on the bottom, the van Veen's arming pin will fall out as the weight is taken off of it. The van Veen will then close as it is raised off the ocean bottom. Once brought back aboard the van Veen is opened and sampled by GSCA staff. A digital photograph of each sample, with a station sign in the background was taken. General description of the sample followed the photograph. Then both a surface and blended sub sample were taken with a spoon and placed into vials, buckets or plastic bags. In addition to the general sample description, a 'Nav Element' was created in Regulus systems at the moment 'on bottom' is called. The time the sampler reached the bottom, the position, water depth and the planned station name were logged on the log sheet.

The van Veen grab sampler worked well and retrieved suitable bottom sediment samples. A total of 23 van Veen grab samples were collected. The station numbers of the van Veen grabs, along with their position, water depth and targeted bedform or geohazard feature, are listed in Appendix 1b. The surface subsamples from each grab samples have been submitted to GSCA SedLab for grain size analysis.



Fig. 4-1 Photograph of the van Veen grab sampler used in this cruise.

#### 4.1.2 IKU grab

The GSCA uses an Institutt for Kontinentalsokkel Undersøkelser (IKU) grab (Fig. 4-2a) to obtain large volume of bottom sediment samples for a variety of analyses. The grab used was 1.0 m<sup>3</sup>. A retrieved grab fully loaded with sand can weigh somewhere in the order of 3400 kg (it is approximately 680 kg empty). Considering that this operation takes place on a mobile platform, extreme caution must be maintained at all times, as well the issue of the foredeck crane being too short for such an application causes added danger.

The IKU grab include the following components:

- 1) IKU Grab Sampler
- 2) Raytheon Sounder
- 3) Large snatch block and cradle
- 4)  $2\frac{3}{4}$  shackles
- 5) 1 1ton swivel
- 6) Pengo Winch with 19mm stainless steel cable
- 7) Starboard crane (to support and guide Large Snatch block)
- 8) Sampling Tools (small shovels, trowels, pails, bags, vials, electrical tape, markers, tape measure, deck sheets, etc)

#### Deployment procedures:

The ship's crew along with GSCA sampling technicians operate the IKU Grab from the foredeck. The Grab is attached to the Pengo winch wire with 2 <sup>3</sup>/<sub>4</sub>" shackles and the 1 ton swivel. This cable is then fed through the large snatch block which safely changes the direction of the cable from a horizontal to a vertical one. Grab is hoisted over the rail, and then lowered to rail height where crew can reach over to arm it. All hoisting operations are controlled from the winch house. Water depth is accurately determined using ship sounder, position over multibeam data, or chart (ideally all three). Bridge gives the signal to lower grab. Grab is lowered slowly to ocean bottom. When the grab contacts the bottom, the jaws open slightly which in turn releases the trip. When the grab makes contact with the bottom, the snatch block may pivot suddenly in a quick sideways arc when signaling that the hoist wire has slackened for a brief instant (just before the ship's drift picks up on the slightly slackened cable) It is at this point the ship's position and time is recorded by the watch keeper using a Regulus computer in the Forward lab. The Grab can now be hoisted to the surface. During retrieval the upward force generated by the hoisting cable running through the block system on the foredeck crane, forces the jaws to close which in turn traps the sediment inside to be retrieved. A crewmember will keep watch on the returning cable and signal when the grab becomes visible in the water column. The same crewmember will call out surface as the grab breaks the surface. This will provide the signal to winchman to slow the rate of cable return. The grab is then brought carefully over the starboard rail, lowered onto the deck. Once fully secured the ship's boatswain will signal that the grab and its contents can now be safely approached for processing. At this point the contents may be photographed, described and subsampled. Digital photographs were taken of the IKU grab sample surface. A general description of the grab surface (grab fullness, sediment type,



Fig. 4-2 Photographs of (a) the large IKU grab sampler used in this mission, (b) vertical profile cut into the IKU sample, and (c) box-core trays pushed into the IKU grab sample.

biological species, etc.) was written on the logging sheet along with other essential station information (time on bottom, the position, water depth and the planned station name etc). A surface sample (0-3 cm) was then taken using a 40 dram vial for grain size analysis. The determination of the shallow sub-surface sedimentary structures was accomplished by either profiling or box coring. A cross-section profile is cut in the profiling approach (Fig. 4-2b). The profile will be photographed, described, and sub-sampled sometimes for grain size analysis of bedding. In the boxing core approach, two or more box cores were collected by pushing wedgeshaped rectangular aluminum trays into the IKU sample (Fig. 4-2c). The standard trays were 30 x 30 cm. When the grab was full, larger 30 x 40 cm (deep) trays were also used. The bottom tray was pushed in first and followed by the cover tray at an angle to tightly close the top of the bottom tray. Sand around the trays was dug out to render the retrieval of the push-tray cores. One core was oriented left - right (port to starboard) and the other one front to back to resolve 3dimensional structures. The position and orientation of these box cores were also recorded on the logging sheet. After the IKU sample processing is completed, any remaining sediment is returned to the ocean during the re-arming phase for the next station.

The box core trays retrieved from IKU samples were carried to the GP Lab where they were processed to produce Epoxy resin peels. Details of box core tray samples preparation and resin peel production can be found in (Li and King, 2006). The resin relief peels can be examined for variation of grain size and bedding structures which can be interpreted for mobile layer depth, the type of bedforms that produce the observed sedimentary structures, and the environment in which the bedforms were formed.

#### 4.1.3 Piston corer

The piston coring system used was the AGC Long Corer (Fig. 4-3). This device obtains a core sample with an ID of 99.2 mm and an OD of 106 mm. Barrel lengths for this system are 10 ft (305cm) and the system is typically rigged to a maximum of 5 barrels. During this cruise the system was rigged with three to five barrels depending upon the seismic interpretation of the sediment. The core head is 3m long, 0.6m in diameter and weighs approximately 3000 lb (1350Kg). Each barrel has an ID of 4 1/4" (10.8cm), a 3/8" (9.5mm) wall thickness, and exterior couplings secured by set screws. The liner was a CAB plastic in 10 ft (305cm) length. A split piston with O-rings and a variable orifice size (split piston orifice used was either 5/64" to 7/64" in size) was used and a standard core catcher was used at all coring sites. In addition, a sock was added to those sites that were believed to have a sandy bottom. The trip arm for the core system also supported a 4.25" (10.8cm) diameter gravity corer with a single 7ft (2.14m) 10" barrel and 300 lb (135 kg) head comprised of circular lead weights. The piston corer is designed for recovering relatively long cores and is the tool of choice for sampling sediment sections at several metres depth below the sediment surface. However, it is not an ideal tool for sampling the upper metre of sediment; in many cases the piston corer will disturb or bypass this interval entirely. The trigger weight corer is a complementary tool, for it samples the upper one to two metres with a minimum of disturbance or shortening.



Fig. 4-3 Piston corer being deployed off the starboard bow of the CCGS Hudson. Photo courtesy of Brian Todd

Components of corer system

- 1) AGC Long Corer
- 2) A rotating core-head cradle
- 3) Trigger weight corer
- 4) Small hydraulic core winch on foredeck
- 5) Trip arm
- 6) Pengo wire
- 7) Pengo wire clamps
- 8) Core barrels
- 9) Barrel couplings
- 10) Cutter
- 11) Sample Catcher
- 12) Core liner
- 13) AGC long corer piston
- 14) Mono rail system
- 15) 2 1ton chain hoists
- 16) Hydraulic core winch x 2 outside the half height
- 17) Half height processing container

#### Deployment procedures

The corer uses the ship's Pengo winch with a  $\frac{3}{4}$ " wire cable, the starboard foredeck crane and GSCA trawl block to deploy and retrieve the corer. This has been the preferred method for a great many years, however in recent years they have shortened the foredeck crane from 30' to 24' thus making the coring operation more difficult. Crew rigs the core to the desired length along the starboard side of the ship. Core liner is then placed in side the core barrels and taped together. Sample catcher and cutter are attached. Trip arm is attached to top of core head using Pengo wire clamps. In deploying the piston corer, the boom's runner was attached to a lifting ring on the side of the corer headweight. The boom and a 1 <sup>1</sup>/<sub>4</sub>" bull rope were used to gently lift the head weight and slide the attached barrels off the starboard rail. The whole system was boomed up until the corer was near vertical with its lower end in the water and its upper end at deck working level. The trigger weight corer is hoisted over the side using the small coring winch on the foredeck and attached to the trigger arm. AGC Long corer is now armed. After removing the trip arm safety pin, the corer was moved with the ship's boom away from the side of the ship. It was then lowered to the sea floor. When the trigger weight corer touches seabed, the AGC Long corer is triggered. The triggering is automatic and is signaled by a recoil in the coring cable as the heavy corer started to fall freely. At this signal the winch and boom operator will stop the downward descent of the coring cable. The system is set up to allow the corer and piston to fall together while gathering downward momentum for penetrating the seabed. Just above the sediment surface, the freefall loop was exhausted and the piston was arrested. The corer continued moving downward, sliding past the piston while coring the sea floor sediment. The Corer is then carefully recovered to deck to be broken down.

The recovered corer is handled on deck using a system that includes a rotating core-head cradle, outboard support brackets, a monorail transport system with 2 one ton chain hoists, a lifting

winch and a processing half-height container. Each recovered core is broken down at the barrel joints and moved to the processing half-height container via the monorail, where each 10ft (305cm) section of liner is extruded from the barrel and cut in half and labeled. Shear strength and constant volume measurements of the cores are then performed in the GP Lab. The processed core sections are stored upright in a cool air-conditioned room in the ship's hold. When the ship returns to the Bedford Institute of Oceanography, the cores are transferred to the GSC Sample and Core Repository.

#### 4.2 Camera Systems (modified from contribution of Robertson, Meslin)

#### 4K Camera System

The 4K (4000 m depth capability) camera system was designed and built at GSCA in 2008 and was modified during early 2010 for the summer season (Fig. 4-4). The system takes high definition still photos of the seabed when the camera is within a couple of metres altitude of the seabed. A new camera was housed in the underwater pressure case for the 2010 season (Canon EOS Rebel T2i 18 megapixel digital SLR coupled to a 28 mm Canon lens). Two Canon flashes housed within pressure cases provided the illumination. A Benthos stainless steel compass fin with a Ritchey yacht compass hung below the camera on a 2 m stainless cable attached to a magnetic plunger switch. This switch activated the camera shutter when the camera was lowered near the seabed cancelling the ping from a 12 kHz pinger mounted on the sled. A Deep Sea Power & Light 12 volt battery provided the power for the flash units and camera.

The digital Canon EOS Rebel camera was set at fixed manual focus with multi pattern metering. Exposure was set at  $1/30^{\text{th}}$  of a second and the F-stop was set at F/16 with no exposure compensation.

All of the components were bolted within a rugged powder coated aluminum roll cage that weighed approximately 250 kg. The camera was deployed from the winch room on the upper deck using the same wire/winch configuration as that of the van Veen grab sampler. Two scientific staff members and two crew members worked together to operate the camera. At each station, the camera was lifted to about 1.5 m off the deck and a shot was taken of the cruise and station number label. The camera sled was then lowered to the seabed using the hydrostatic winch while listening to the 12 kHz ping set at 1 Hz intervals. A 12 kHz Raytheon sounder was monitored during the bottom drops in order to follow the pinger location and provide an audible alert of seabed touch downs. The Raytheon paper recorder was also monitored in order to reference the camera height above the seabed visually. The ships sounders and the 12 kHz Knudsen had to be turned off while running the camera transects due to interference with the



Fig. 4-4 Photograph of the 4K Camera System used in Hudson 2010020 mission.

same frequencies. Usually 10-15 stills were taken at normal camera stations. Several tens of stills were taken at transect camera stations. Twelve stations (0001, 0003, 0008, 0009, 0013, 0020, 0026, 0035, 0038, 0042, 0045 & 0051) were visited during the mission using the 4K sled with successful stills and video at each. PDF files of wallet format photos for all stations are included in Appendix 3. Selected photos were also presented in 6.0 Preliminary Results section where the photos were described and their positions superimposed on sidescan sonar images. Detailed geological and biological descriptions as well as positional note for each photo are given in Appendix 4.

#### VLADCam Bullet HD Video

A Sony HDR-CX 520 high definition camcorder was at the heart of the VLADCam Bullet system. The underwater pressure housing was honed from a Catalina S30 Scuba air cylinder. The view port was constructed of a flat 1.25" thick acrylic plate with one face o-ring seal and attached with 5 radial bolts to the valve end of the cylinder. The non-valve end was bored and a circular plug was built with two piston o-rings. The system was machined during 2009 and tested to depths over 2000m

The camera was self powered by large capacity Sony NP-FH100 lithium ion batteries and the video data was recorded on 32 GB Sony HG Duo memory sticks. Approximately 8 GB per hour were produced when the camera was set at the highest HD-FH setting. The removable memory sticks allowed for a relatively quick turn around time of approximately 10 minutes between station dives.

The camera was set to auto focus and auto white balance for the majority of the dives. The seafloor was lit under a Deep Sea Power & Light (DSPL) high intensity Matrix LED drawing just 44 watts and producing light at a high colour temperature of 6800° K. The camera appeared to be very stable and show good colours under the LED which approached true daylight colour temperatures. This light was powered on the 4K sled by the DSPL 12 volt deep ocean battery system.

Due to the autonomous nature of the camera it was mounted on the 4K Camera sled. The VLADCam Bullet accompanied all dives of the 4K still sled providing useful continuous video transects of evolving bed features.

#### Shark Marine Live View Camera

This camera system was redesigned over the 2009-2010 winter after initial use during Hudson mission 2009044. The camera was modified by Peter Pledge and Patrick Meslin at GSCA in order to have SD video live, HD video captured at the seabed for post viewing, still capture ability and zoom. The lighting provided by two 250 watt halogen bulbs and bottom scales illuminated by two red lasers were part of the original design.

The deck unit was upgraded with a touch control screen and mini computer. This allowed control of the camera at the seabed in order to snap still photos and zoom. The camera used was the

Sony HD HDR-CX 520 as used in the VLADCam Bullet. The accompanying winch unit was upgraded with a new 300 m cable and new electric hydraulic pump motor which worked well.

The system was used on one dive at station 0031 and the live signal was transmitted from the winch room to the forward lab to be viewed on the 40" Sony monitor. It worked quite well although there was expected degradation via the split transmission to the Sony screen. The touch screen had a delay when buttons were pressed so no still snaps were taken. The HD video that was reviewed was quite good although further testing might show that advanced LED lighting could have benefits.

#### Subsea Positioning via USBL

An Applied Acoustics 915 HD beacon was attached to the 4K camera sled and Shark Marine sled and was tracked using an ORE Trackpoint II deck unit and transducer lowered on a ram beneath the vessel. GSCA NavNet Master Logger software version 1.9.4 was used in conjunction with GSCA NavNet USBL RT v1.2. to record the raw and processed USBL positions which were used to plot the start/end of a camera transect and the position of each still photographs in GIS. Appendix 4 lists the time, position as well as geological and biological description of each still photograph for camera stations conducted on Hudson 2010020.

Processed USBL was successfully merged for most stations with the deck unit set to calculated mode. Thrusting by the vessel was kept to a minimum as the resulting aeration in the water would block acoustic paths. This position information was embedded into the 4K still photos using GSCA NavNet JPEG Merge version 1.3. A .par file was provided to the navigation team as a guide for 10 second navigation for the HD video.

Trackpoint navigation data were not available for stations 01 due to a survey manager crash. Ships antenna position was used for the bottom pictures (no metadata injected into photos). For station 13 the depth settings were changed at the topside USBL control in the GP lab from calculated to telemetry which resulted in a slightly different string being broadcast throughout the vessel. The JPEG merge software failed to accept this slightly different string so USBL position was not available for this station as well. We have used the winch room position data injected into photos for station 13. Post-cruise plotting of still photo position in ArcGIS also found erroneous positions with the Trackpoint USBL data. Through consultations among camera technician, the Navigation technician, and co-chief scientist (King), corrections and interpolation were made with the path of the camera on the seabed using the adjacent stills locations (in Arc) recognizing that all the other positions from these and other stations generally result in a fairly smooth, accurate instrument path across the seabed. Taking into account the time difference between shots and the path, we are confident that the "new" positions are within 10 to 15 m of true. These corrections as well as comments on navigation methods were added to the updated Hudson 2010020 Photo Description file (Appendix 4). The position correction technique included the following steps:

1. Review the ED input .txt (eg. Cruise ID 2010020 -Stn 0009 -ED input.txt) for duplicate time or positional rows.

- 2. Load individual .txt files into a text editor and format for GIS input. (If several stations are available at the time, merge each .txt file for each station in the same text editor operation).
- 3. View in ArcMap superimposed on the current ship's antenna
- 4. Check for realistic offsets from the antenna position
- 5. Identify probable erroneous positions
- 6. Edit (move) erroneous points to a "better" location if this is deemed possible; if not make a note in a comments field as to the suspected error
- 7. Add, in the comments field, the nature of the change and possibly the suspected cause
- 8. Update the positional coordinate fields in ArcMap (usually a Hawths Tools or similar tool; "Table Tools...Add X-Y to Table)
- 9. Update/correct the time field if necessary (preferably an interpolation)
- 10. Copy and paste the updated coordinates into the current "master" photo stills spreadsheet (at appropriate photo rows)
- 11. Check that copy and paste have functioned properly... this can be a very unreliable function from arc to excel.
- 12. Even if no changes are made, make a note as to the method of positioning on the instrument (eg. processed USBL) in the master excel table.

#### HD Video Editing, Backup & Display

Video editing was done using Sony Picture Motion software version 5.0.02.11130. The software automatically split the files at approximately 16 minute intervals so there were numerous files per station put into a RAW folder. Four of the stations (stations 0001, 0003, 0008 & 0009) were then edited so as to display only seafloor footage eliminating deck footage, the descent and ascent. It became evident that even after editing there could be several split files per station so further editing was abandoned until more sophisticated software could be sourced.

The files were stored on Lacie 1TB external hard drives, one to be kept with the chief scientist and one to be archived with GSCA curation.

Both the HD video and 4K stills were displayed minutes following the dives on a 40" Sony Bravia EX4B monitor mounted in the forward lab. The chief investigator was able to quickly analyze the imagery for bedform information and surface lithology in order to help target sample sites. The continual video helped to connect the intervals of seabed between high resolution stills giving a good representation of spatial variance.

#### 4.3 Sidescan and Seismic (Manning and Meslin)

#### 4.3.1 Sidescan (Meslin)

The Klein 3000 sidescan sonar was used on the Hudson 2010020 cruise. It is a digital system with paper record provided by a network-connected EPC 1086NT thermal imaging printer. Data was acquired with SonarPro 11.3, stored in .xtf and .sdf files and backed up to both an external

hard drive and a network-based RAID system. Upon consultation with the co-chief scientist (King) and data processing staff, alternate configurations for the EPC 1086NT thermal printer were studied in order to obtain a paper printout of higher quality. The configuration agreed upon was:

- 16 greyscale levels
- 150 lines per inch
- each line printed twice (line repeat = 2, giving an effective 75 lines per inch)
- contrast at 100

These configuration changes are applied on the thermal imaging printer itself.

The SonarPro software was provided with more accurate towfish GPS coordinates using data from the Trackpoint II USBL system. As it proved problematic to connect the SonarPro computer to the ship network (to receive the data feed from the Trackpoint II system) and to print on the EPC 1086NT simultaneously, a secondary computer was used to capture the data feed and convert it to GPS coordinates useable by SonarPro. This networking problem requires further investigation. Some tracking difficulties occurred early on in the trip, likely due to the extreme proximity of the two tracked targets (sidescan and Huntec). Further developments of this system, such as the possibility of sending towfish depth data directly from the Klein 3000 system to the Trackpoint II for higher accuracy, could be interesting.

Data was acquired at 100kHz and 500kHz at a 150m range (300m swath). Paper record covers the 100kHz data. The towfish was deployed with a neutral buoyancy package and depressor weight from a remotely controlled Markey winch with 800m of cable. The towfish was towed at between 10 and 30 metres above the seabed at most times however reached over 100 meters (and out of the sidescans tracking range) in deeper waters when the maximum depth of the towfish was reached.

Experience has shown that occasional communication glitches between the SonarPro software and the EPC printer can bring the entire system down and make a full reboot of the Klein 3000 system, printer and SonarPro software necessary. To circumvent this, producing the printout from playback data rather than from real-time data was tested. Using a secondary copy of the SonarPro software running simultaneously on the computer, it was discovered that crashes became far less frequent and less damaging, only taking down the copy of SonarPro playing back data and no longer affecting data acquisition. The EPC 1086NT also proved capable of printing at approximately 10-15x real-time speed, allowing the printout of a full night of survey data in an hour or less. On the first night of survey (June 5th) the umbilical cable of the sidescan fish was torn out by what may have been fishing gear. The fish was brought back onboard and, after the damaged cable was replaced by a spare, showed no further sign of damage and was redeployed.

High quality images of the seabed both in digital and paper record were obtained. Appendix 2 lists all sidescan/seismic survey lines on Hudson 2010020. Excel files listing all the survey lines, all records and DVDs, and the summary of survey distances for geophysical parameters for Hudson 2010020 expedition were provided to GSCA Curation.

#### 4.3.2 Sleeve gun seismic reflection system (Manning)

A 10 in<sup>3</sup> sleeve gun with inserts to further reduce it to 6 in<sup>3</sup> was towed from an outrigger on the port side of the Hudson for this survey. The single gun was suspended from a Norwegian buoy at an approximate depth of 1.5 meters.

Air was supplied to the gun by an enclosed Price W2 Air Gun Master compressor driven by a 200 HP electric motor. The frequency of the motor was controlled using a Cutler Hammer SV9000 frequency control unit. Supplied air pressure for this cruise was reduced from 1800 psi to 1350 psi for best results.

A Teledyne streamer, deployed using hydraulic powered winch, was towed from another outrigger on the starboard side of the ship. This streamer was refitted in 2007. A 27 ft. dead section at the head is followed by a 150 ft. active section with a further 16 ft. dead section at the tail. The active section contains 48 Teledyne B-1 acceleration canceling hydrophone cartridges in six groups that are summed and amplified before being digitized and logged. Two coils at the extremes of the active section control two Digicourse 5010 Digibirds used in maintaining the desired tow depth for the streamer. Desired depth was 1 to 2 meters depending on surface conditions. A survey log speed of five knots was found to achieve the best depth control for the streamer.

Streamer analogue data was amplified and logged to GSCDigs number 6. Channel 1 was used for raw data. A second feed went to a TSS annotator and through an 80 Hz High Pass Filter before a hard copy was made using an EPC 2086 Graphic Recorder.

The 6 in<sup>3</sup> sleeve gun performed well and did not need to be changed out for the duration of the cruise. No down time was incurred due to equipment failure or required maintenance for the seismic reflection system. Daily checks and maintenance were carried out on the compressor, air lines and the winch.

The schematic of Fig. 4-5 illustrates the equipment setup.

#### 4.3.3 Huntec DTS (Manning)

The GSCA Huntec DTS was used with the Boomer as the sound source throughout the cruise.

Raw internal data we re collected on channel 1 of GSC DIGS 5 while the r aw external was recorded to channel 2 of that unit. Data were annotated, filtered and displayed on an EPC 9802. Band pass filters were set to 1500 Hz (High Pass) and 10 KHz (low pass). Internal and external data were displayed on channels A and B respectively

The GSCA-MITS (Chan 1A) timing for the Huntec DTS was supplied by the GSCA-MITS. To keep the Huntec from interfering with the Air Gun Data, the time interval and corresponding EPC delay (Chan 1B), was adjusted as needed. The GSCA-MITS (Chan 1A) also provides the trigger for the GSC Digs Data handling system.

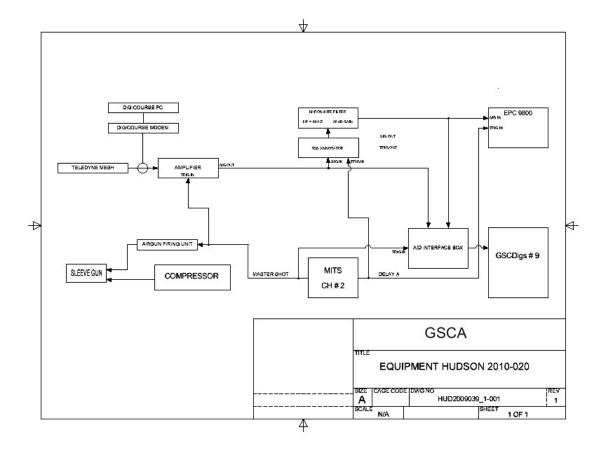


Fig. 4-5 Schematic illustrating the setup of the sleeve gun seismic reflection system.

Several problems with the Huntec DTS resulted in lost time in the collection of data. The system remained in the water for 5.5 hours collecting data on the internal channel only as the external channel had been lost. A further 6.75 hours was lost where no data was collected. Lost time due to weather coincided with trouble shooting and repair time otherwise the lost time numbers would undoubtedly have been higher.

#### 4.4 Station Data and ED\_AT\_SEA (Brown, Merchant, King, Li)

Station data were kept in three ways on this cruise: filling the paper station logging sheet during station holding, entering detailed station information to Excel files, and input of required station data into the Expedition Database (ED) using the ED\_AT\_SEA application. As various activities were carried out at each station, station sheets were logged capturing basic information (station number, time and day of year, water depth, depth sounder type, latitude/longitude, and geographic location) as well as information specific to each station type, i.e. information particular to camera, grab, AGC Long Core and dredge stations (camera types, number of

pictures taken, start and stop time/lat/long, grab type, general description, grab fullness, subsamples taken, core length and number of sections, dredge distance, etc.). It was also found that writing down the planned station name (if available) on the log will greatly help the scientists to quickly relate station activities with targeted bedforms and geohazard features. Of primary importance was the completion of all of the relevant parts of each individual station sheet as close to the completion of the station as possible. This made it considerably easier for subsequent data entry into the local database using ED\_AT\_SEA.

For logging various station sheets, several features in REGULUS were utilized to capture latitude and longitude for each station. The planned stations were entered into REGULUS in advance of each days activities. Each individual target station was then brought up on screen (in the menu option 'Nav Elements') as the station was approached. When the station was conducted (and 'on bottom' declared), one of the station watchers simply pressed 'Ctrl-e' on the keyboard to create a 'Nav Element' which could be opened at a later time to retrieve the latitude and longitude captured for that station. The time and water depths were captured from the main REGULUS screen at the time of the call 'on bottom'. Of note was the importance (to avoid confusion) of all REGULUS terminals to be set to the same latitude/longitude format, whether it is decimal degrees, degrees-decimal minutes, etc. This avoided the confusion of having multiple formats recorded on the station sheets and the necessity for the ED\_AT\_SEA data entry to move between different boxes in which to enter the lat/long information (as it converts degrees minutes to the mandatory decimal degrees format).

During periods when stations were spread apart in time (1 - 2 hours) or when technical difficulties were being resolved, data were entered into an Excel file and the local Expedition Database (ED) using the ED\_AT\_SEA application. A comprehensive Excel file was created to capture detailed information from both the logging sheets and front-deck activities. The information in this Excel file was edited, simplified and presented as list of all stations in Appendix 1a. As some of the information remained the same between stations, it made sense to wait and enter, for example, an entire day's stations into ED\_AT\_SEA perhaps a day or two later. ED\_AT\_SEA reports (Station, Grabs, Cores, Dredges, Cameras, Subsamples) were submitted to the senior scientist as interim reports midway through and on completion of the cruise for quality control. Backups were done at the end of each data entry session and on return to BIO. Then the data were eventually corrected and signed off by the chief scientist, and the final backup was submitted to the ED Data Manager (B. Szlavko) for upload into the main ED database.

Files of all navigation events were downloaded and saved. These files were processed to derive the information of time and positions of all still photographs for each camera station in this expedition. Excel spreadsheets were also created to keep track of sub-sample collections, down-core summary of piston cores, core sample storage in the refrigerated container, and a listing of all on-board testing for physical properties.

#### **5.0 Cruise Itinerary** (Li and King)

The following is a daily account of activities on Hudson 2010020. All times in this itinerary are in Universal Time Coordinated (UTC) unless specified as Atlantic Daylight-saving Time (ADT). ADT is three hours earlier than UTC. Scientific targets or objectives for all stations and geophysical survey lines are briefly described. More detailed descriptions of targets or scientific objectives are given in the results sections.

#### June 4, Year Day (YD) 155, Friday

Boarded ship at ~ 11:00. Conducted safety briefing and tour 11:30 - 13:00. After the repair of the winch hydraulics system, departed BIO at 18:00. On transit to western Grand Banks for the rest of the day.

#### June 5, YD156, Saturday

11:00-15:30 winch	Conducted safety and operation procedure drills at all activity areas: IKU/piston core/van Veen operation, sample and core processing and logging, camera and room operation, and Geophysical Lab operation.		
19:30	Arrived at western St. Pierre Bank area (Fig. 2-1).		
20:03	Station 01 4K camera was conducted at the planned station SP1. The objective was sediment texture and bedform types on western St. Pierre Bank.		
20:32	Station 02 van Veen grab was conducted at the planned station SP2. The objective was sediment texture and bedform types on western St. Pierre Bank.		
21:08	Geophysical gear was deployed for night surveys on western St Pierre Bank.		
22:15-23:28	Geophysical survey line 01 on western St Pierre Bank.		
23:28-02:09	Geophysical survey line 02 on western St Pierre Bank.		
June 6, YD157, Sunday			

- 02:09-02:39 Geophysical survey line 03 on central St Pierre Bank.
- 02:42-04:44 Geophysical gear shut down for French territory.
- 04:57-09:00 Geophysical survey line 04 on central St Pierre Bank.

The objective of sidescan data of lines 1-4 was to obtain new and repeat geophysical data for understanding bedform distribution and bedform mobility assessment. The sub-bottom data of these lines was collected to investigate the nature of the suspected low-stand modified morainal bank, to investigate the extension of tunnel valleys under St. Pierre Bank, and to better image and delineate Miocene prograding sand sheets.

- 09:23 All geophysical gear was on deck. On transit to daytime sampling site.
- 10:07 Arrived at daytime sampling site on eastern St. Pierre Bank (Fig. 2-1).
- 10:17- 0:28 Conducted Station 03 4K camera at the planned station SP3 across sandwaves superimposed megaripples on eastern St. Pierre Bank.
- 10:56-12:26 Collected four van Veen grabs (Stations 04-07) at the planned station SP3 at various morphological locations over sandwaves and megaripples on eastern St. Pierre Bank.
- 12:27-13:56 Transit from eastern St. Pierre Bank to central St. Pierre Bank (Fig. 2-1).
- 13:57-14:07 Conducted Station 08 4K camera at planned station SP4 over sandwaves with 3D megaripples in the troughs of sandwaves on central St. Pierre Bank
- 16:00-16:45 4K camera was deployed (Station 09) and a van Veen grab (Station 10) was collected at the planned station SP6 over large wave ripples near an isolated sandwave at this central St. Pierre Bank site.
- 17:55 Returned to planned station SP4 to collect a van Veen grab (Station 11) at this location.
- 19:15-19:36 A van Veen grab (Station 12) and a 4K camera (Station 13) were conducted at the planned station SP5 over 2D megaripples at this central St. Pierre Bank site.
- 19:57 Daytime sampling completed and on transit to start of nighttime geophysical surveys.

#### June 7, YD158, Monday

- 00:31 Geophysical gear was deployed for night surveys in St. Pierre Basin (Fig. 2-1).
- 00:59-02:28 Geophysical survey line 05 in St. Pierre Basin.
- 02:28-05:52 Geophysical survey line 06 in St. Pierre Basin.
- 05:52-09:00 Geophysical survey line 07 in St. Pierre Basin.

The objectives of lines 5-7 were to better delineate bedrock stratigraphy and structure for mapping purposes, to identify the extent of a late pro-glacial

	sediment wedge, to identify shallow gas anomlies, and to delineate extent and stratigraphy of complex multiple till units.
09:37	All geophysical gear was on deck. On transit to daytime sampling site.
12:29	Arrived at daytime sampling site in St. Pierre Basin.
12:48	A piston core (Station 14) was collected at the planned station PC1 with the objective of penetrating and sampling the condensed/unconformable section ES and the glacimarine deposit beneath.
16:33 till.	A piston core (Station 15) was collected at the planned station PC3 with the objective of characterizing the red mud and underlying unit which may be "soft"
20:03-20:15	A dredge sample (Station 16) was collected at the planned station DR-S to obtain sample from till at this location.
20:38 surve	Daytime sampling completed and on transit to start of nighttime geophysical ys.

22:31-02:00 Survey line 7a Knudsen 3.5 KHz and 12 KHz data collected on transit.

#### June 8, YD159, Tuesday

- O3:29 Arrived at the start of geophysical survey lines in southern Halibut Channel (Fig. 2-1). The original purpose was to investigate open and buried channels. Planned survey was curtailed by heavy sea state (~Beaufort 4) and sustained 30kt winds. Only Knudsen 3.5 KHz and 12 KHz systems were run.
- 03:37-07:50 Seven Knudsen 3.5 and 12 KHz lines (lines 08-14) were collected in southern Halibut Channel.

Sub-Bottom data from lines 7a to 14 were collected to map the extent and nature of late-glacial over-deepened meltwater channels, evidence for a sub-glacial catastrophic flood.

- 09:04 Started transit to the coring site on Halibut Channel Fan.
- 11:18 A piston core (Station 17) was collected at the planned station PC4 with the target of sandy terrace on canyon overbank.
- 15:13 A piston core (Station 18) was collected at the planned station PC5 with the target of levee crest on canyon overbank.

- 18:41 A piston core (Station 19) was collected at the planned station PC6 with the target of levee on canyon overbank. Geophysical survey line 14a with Knudsen data was run from 13:03-18:30 to provide siesmo-stratigraphic continuity between cores and with original coring target on 2006048 Huntec profile (N.B. very convoluted track).
- 19:44 Started transit to central Grand Bank site.

#### June 9, YD160, Wednesday

- 09:44 Arrived at the sampling site on central Grand Bank (Fig. 2-1).
- 10:05-10:51 A transect using Shark Marine camera (Station 20) was conducted at the planned station CB7 that targeted a variety of bedforms including large wave ripples, megaripples, and sandwaves.
- 12:09 An IKU grab (Station 21) was taken at planned station CB12 over sandwaves.
- 13:55 Another IKU grab (Station 22) was taken at planned station CB10 that also targeted sandwaves.
- 15:02-16:14 Three van Veen grabs were collected at Stations 23-25. Station 23 was at planned station CB11 and the target was large wave ripples. Station 24 was at planned station CB8 and the target was megaripples. Station 25 was at planned station CB9 that also targeted megaripples.
- 16:15-16:29 Short transit to northeast to another sampling site on central Grand Bank.
- 17:04-18:20 A 4K camera (Station 26) was conducted at the planned station CB1 that targeted egaripples, sandwaves and possibly large wave ripples.
- 18:52–19:55 Three van Veen grabs were collected at Stations 27-29. Station 27 was at the planned station CB5 and the target was large wave ripples. Station 28 was at the planned station CB4 and the target was megaripples. Station 29 was at the planned station CB3 and the target was sandwave flank.
- 20:02 Started transit to start of nighttime surveys.
- 21:16 Arrived at the start of geophysical survey lines on central Grand Bank. Geophysical gear was deployed.
- 21:43-00:20 Geophysical survey line 15 on central Grand Bank.

#### June 10, YD161, Thursday

- 00:20-04:07 Geophysical survey line 16 on central Grand Bank.
- 04:07-04:39 Geophysical survey line 17 on central Grand Bank.
- 04:39-05:03 Geophysical survey line 18 on central Grand Bank.
- 05:03-09:00 Geophysical survey line 19 on central Grand Bank.

The objectives of these survey lines were to obtain new and repeat geophysical data for understanding bedform distribution and bedform mobility assessment; specifically to cross a 2006048 sidescan traverse to establish any bedform differences in a 5 year span. Lines 17-19 tracked through glacial and Holocene filled basins along suspected tunnel valleys to augment sparse coverage for improved mapping of the muds, to cross piston core target from an additional direction, and also to delineate buried glacial deposits and Mesozoic/Cenozoic contacts and structure.

- 09:31 Night surveys completed and all geophysical gear on deck.
- 10:02 After a short transit, arrived at the coring site on Whale Bank (Fig. 2-1).
- 10:44 A piston core (Station 30) was collected at the planned station PC7. The target was glacimarine in latest event.
- 12:01 Coring completed. Started long transit to Lilly Canyon area.
- 13:39-22:54 Knudsen 3.5 KHz and 12 KHz systems were run during the transit. This was designated as geophysical survey line 20. The purpose of this line was to identify outliers of buried glacimarine mud for mapping purposes and to delineate sand ridges and their magnitude.
- 21:29 Arrived at the start of geophysical survey lines in Lilly Canyon area (Fig. 2-1).
- 22:43 All geophysical gear was deployed.
- 23:02-01:33 Geophysical survey line 21 in Lilly Canyon area.

#### June 11, YD162, Friday

- 01:33-05:18 Geophysical survey line 22 in Lilly Canyon area.
- 05:18-09:46 Geophysical survey line 23 in Lilly Canyon area.

The goals of lines 21-23 were to obtain new and repeat geophysical data for understanding bedform distribution and bedform mobility assessment, especially with respect to possible canyon-feeding process. Sub-bottom data will help to delineate Neogene structure and stratigraphy, to investigate the nature of the very elongated westward extention of Lilly Canyon and to cross the canyon head to investigate possible Quaternary processes.

- 10:17 Night surveys completed and all geophysical gear on deck. On transit to sampling site.
- 12:18 Arrived at Lilly Canyon area sampling site.
- 12:42-13:15 Shark Marine camera transect (Station 31) was conducted at the planned station L1S/L1E. The targets were sand waves, large wave ripples, and pits.

Original plan was to use the live view from camera to determine positions of sampling. However the quality of live view was poor and play back of video had to be used to identify seabed features and determine sampling locations.

15:12		A van Veen grab (Station 32) was collected at the added station 162VV-1. The target was large wave ripples identified at 13:08 of the Shark Marine video.
15:31	targe	A van Veen grab (Station 33) was collected at the added station 162VV-2. The t was megaripples identified at 12:57 of the Shark Marine video.
16:18		An IKU grab (Station 34) was collected at the added station 162IKU-1. The target was sandwave trough identified at 13:05 of the Shark Marine video.
16:29		Started short transit to the next sampling site in the Lilly Canyon area.
17:29		Arrived at the second sampling site.
17:43-1	8:28	4K camera transect (Station 35) was conducted at the planned station L2S/L2E. The targets were megaripples and pits.
18:47	Statio	An IKU grab (Station 36) was collected at the added planned station 162IKU. The target was gravel patches and megaripples determined from the video data of 35.
19:36	Statio	A van Veen grab (Station 37) was collected at the added planned station 162VV. The target was sandy patches over megaripples determined from the video data of 35.
19:44		Sampling completed and started transit to Carson Canyon area.
23:29		Arrived at the start of geophysical survey lines in Carson Canyon area (Fig. 2-1). All geophysical gear deployed at 23:44.

23:44-02:30 Geophysical survey line 24 in Carson Canyon area.

#### June 12, YD163, Saturday

- 02:30-05:01 Geophysical survey line 25 in Carson Canyon area.
- 05:01-06:15 Geophysical survey line 26 in Carson Canyon area.
- 06:15-07:41 Geophysical survey line 27 in Carson Canyon area.
- 07:41-09:00 Geophysical survey line 28 in Carson Canyon area.

The objectives of lines 24-28 were to obtain new and repeat geophysical data for understanding bedform distribution and bedform mobility assessment, specifically to conduct repeat sidescan survey over bedforms of different types. Sub-bottom data were collected to establish the extent and transport directions of the large megaripple field feeding the canyon, to delineate Neogene structure and contacts, and to investigate the nature of possible Quaternary fill in the canyon head.

- 09:27 Night surveys completed and all geophysical gear on deck. Planned survey lines were altered to avoid fishing lines and gear.
- 09:29 Started transit to the sampling site. Arrived at the sampling site at 11:44.
- 12:00-12:40 4K camera transect (Station 38) was conducted at the planned station C1S/C1E. The targets were high amplitude 2D megaripples, sand ribbons and transition to 3D megaripples. This is a possible 2010 winter lander deployment site.
- 14:48-15:13 A van Veen grab (Station 39) and an IKU grab (Station 40) were collected at the planned station C3 and adjusted planned station C3Adj respectively. The target was megaripples for both stations.
- 16:29 A van Veen grab (Station 41) was collected at the adjusted planned station C2. The target was sand ribbon.
- 16:33-17:59 Short transit to another sampling site (Fig. 2-1) about 22 km to north of the Carson Canyon head.
- 18:18-18:45 4K camera transect (Station 42) was conducted at the planned station C4S/C4E. The targets were large wave ripples, megaripples and bands of sandwaves.

19:11	large	An IKU grab (Station 43) was collected at planned station C5. The target was wave ripples and megaripples in sandwave trough.
19:50	was	A van Veen grab (Station 44) was collected at the planned station C6. The target sandwave flank.
20:00		Daytime sampling in the Carson Canyon area completed. On transit to the start of geophysical survey lines in the westernmost Jeanne'darc basin area (east of Downing Basin; Fig. 2-1) on northeastern Grand Bank.

#### June 13, YD164, Sunday

- 01:43 Arrived at the start of geophysical survey lines.
- 01:56 All geophysical gear deployed.
- 02:03-03:05 Geophysical survey line 29 completed.
- 03:05-05:06 Geophysical survey line 30 completed.
- 05:06-05:33 Geophysical survey line 31 completed.
- 05:33-09:00 Geophysical survey line 32 completed.

The objective of lines 29-32 was to conduct repeat sidescan survey over bedforms in a rare area where surveying had been conducted (for iceberg scour characterization). Sub-bottom surveys were to obtain data from an area with none, to delineate Meso/Cenozoic stratigraphic contacts and structure for mapping purposes, to delineate the moribund sand ridges and their relationship to large erosional valleys cut into the bedrock, and to differentiate sand ridge sands from bedrock features where existing surficial map lacks credibility.

- 09:28 Night surveys completed and all geophysical gear on deck.
- 09:20 Transit to the NE Grand Bank sampling site.
- 11:44 Arrived at the NE Grand Bank sampling site (Fig. 2-1).
- 12:04-13:24 4K camera transect (Station 45) was conducted at the planned station NM3S/NM3E. The targets were ice scour, cobbles, sandwaves, large wave ripples, and possibly megaripples.
- 13:56 A van Veen grab (Station 46) was collected at planned station NM4. The targets were small megaripples, sandwaves and cobbles.

14:14-14:21	Small dredge sample (Station 47) collected at planned station NM4. The aim was to collect boulders/cobbles towards a baseline for cosmogenic dating in the future.	
15:01 not	An IKU grab (Station 48) was collected at planned station NM5. The target was identified.	
16:27	A van Veen grab (Station 49) was collected at planned station NM8. The target was southeastern flank of a sand ridge.	
16:48	A van Veen grab (Station 50) was collected at planned station NM9. The target was coarse sand in sandwave trough on the SE flank of a sand ridge.	
17:22-17:54	4K camera transect (Station 51) was conducted at the planned station NM7S/NM7E. The planned transect was to start on lag and continue to sand ridge sand. Sharp contact was expected.	
18:41	An IKU grab (Station 52) was collected at planned station NM6. The target was 3D megaripples.	
18:45	Daytime sampling completed. On a short transit to the start of nighttime surveys in the same area.	
19:48	Arrived at the start of geophysical survey lines. All geophysical gear deployed at 20:11.	
20:14-23:07	Geophysical survey line 33.	
23:07-03:41	Geophysical survey line 34.	
June 14, YD165, Monday		
03:41-05:00	Geophysical survey line 35.	
05:00-06:56	Geophysical survey line 36.	
06:56-07:42	Geophysical survey line 37.	

- 07:42-08:01 Geophysical survey line 38.
- 08:01-09:00 Geophysical survey line 39.

The objectives of lines 33-39 were the same as lines 29-32. Additional goals were to follow the thalwegs of glacimarine-filled tunnel valleys for mapping purposes and to establish potential coresites for much-lacking chronology.

09:26	Night surveys completed and all geophysical gear on deck.
09:29	On transit to the coring site in Downing Basin (Fig. 2-1). Knudsen system was run during transit and coring and geophysical line 39a was collected 09:00-14:25.
10:41	Arrived at the coring site.
11:01	A piston core (Station 53) was collected at the planned station DB1. The targets were base of late glacial maxima and till tongue in Downing Basin area.
12:13	A piston core (Station 54) was collected in second attempt at the planned station DB1.
13:48	A piston core (Station 55) was collected in third attempt at the planned station DB1.
14:20	Coring at planned station DB1 completed. Started short transit to western Downing Basin with Knudsen 3.5 KHz and 12 KHz running.
14:25-17:43	Four Knudsen 3.5 and 12 KHz lines (lines 40-43) were collected in transit to western Downing Basin.
17:43-21:55	Geophysical line 44 was collected. Digital general log shows that only Knudsen data were collected for most part of this line, and that other geophysical systems were on at 21:36.
17:44	Arrived at the coring site in western Downing Basin (Fig. 2-1).
18:31	A piston core (Station 56) was collected at the planned station DB5. The targets were base of late glacial maxima and till tongue in Downing Basin area.
20:08	A piston core (Station 57) was collected in second attempt at the planned station DB5.
20:26	Coring in Downing Basin area completed. The start of nighttime survey was close by and survey could start once the last piston core was processed.
21:36	All geophysical gear deployed.
21:55-22:23	Geophysical survey line 45 completed in western Downing Basin area.
22:23-22:46	Geophysical survey line 46 completed.
22:46-00:05	Geophysical survey line 47 completed.

### June 15, YD166, Tuesday

- 00:05-00:34 Geophysical survey line 48 completed.
- 00:34-01:00 Geophysical survey line 49 completed.
- 01:00-02:11 Geophysical survey line 50 completed.

The objectives of lines 45-50 were to identify glacial unit stratigraphic contacts, to identify coring sites, to delineate shallow gas and paleo-current moats, and to establish the geometry of deposits from a late glacial re-advance in the western end of the basin.

Wind was forecast to build up to 40 knots by mid-night ADT and this condition was not suitable for full geophysical surveys. Decision was made to stop geophysical survey early and start transit to Trinity Trough area (Fig. 2-1) on Northeastern Newfoundland Shelf. Only Knudsen systems will be run on the transit.

- 02:22 Huntec and sidescan on deck, and trackpoint up. Transit started.
- 03:10-07:10 Survey line 51 with Knudsen data only was collected in transit.
- 09:00 Storm further built up with strong winds up to 50 knots and seas up to 5-7 m. Day time sampling program was cancelled. Only Knudsen data were collected along regional transit lines in Trinity Trough area (Fig. 2-1).
- 09:20-02:23 Six Knudsen survey lines (lines 52-57) were collected as transit to new area and to establish glacial mud distribution and relations for potential coring sites proximal to the Downing Moraine complex

#### June 16, YD167, Wednesday

02:23-09:10 Four survey lines (lines 58-61) of Knudsen and airgun were collected.

Survey lines 58-61 were designed to wait out storm with 3.5 kHz operating, to establish the morphology and deposit of a large glacial catastrophic failure of the distal Trinity Moraine face and stratigraphic relations with glacimarine sediment there.

Marine forecast was 30 knots wind from south, veers to west 25 knots in the afternoon, then builds up to northwest wind 35 knots in the evening. Limited condition for sampling and full geophysical surveys still not possible. Two piston cores were collected while Knudsen surveys were conducted simultaneously.

10:32	A piston core (Station 58) was collected at the planned station TT1 in the Trinity Trough area. The targets were disconformity at 2.5m, with ice scours and possible flood horizon; till at 8 m.
20:20	A piston core (Station 59) was collected at the planned station TT3. The targets were distal to upper till tongue.
13:12-21:00	Eight Knudsen survey lines (lines 62-66, 69-71) were collected. Lines 67 and 68 were skipped.

As marine forecast indicated that wind would build up to 35 knots and seas up to 3-5 m in the evening, decided to steam to Trinity Bay to conduct surveys and sampling in the sheltered coastal area.

21:55 Started transit to Trinity Bay. Only Knudsen data will be collected.

# June 17, YD168, Thursday

21:55-13:10	Knudsen data collected along survey lines 72 to 75.
	Lines 72-75 were collected during transit to Trinity Bay. The purpose was to cross large moraine field to establish metrics.
10:04	A piston core (Station 60) was collected at the planned station TB1 in Trinity Bay (Fig. 2-1). The targets were late GM to 3m; 16m to till; possible IRD layer.
12:25	A piston core (Station 61) was collected at the planned station TB2. The targets were basal GM; 7m to till.
13:10-16:44	Knudsen data collected along survey line 76.
	The purpose of line 76 and line 77 below was to seek storm shelter, yet be poised for planned coring, to augment bedrock and Quaternary sediment stratigraphy and to investigate nearshore conditions with respect to typical fjord hazards and to site a core for addressing outer Trinity Bay glaciamarine provenance questions.
16:19	Entered Random Sound. Knudsen survey was used to search for a coring site.
16:58	A piston core (Station 62) was collected at an added station in Random Sound. The objective was to sample the glacimarine section for provenance and C-14 dating purposes.
18:07	Core was successful. Started 1 NM transit north to the start of geophysical survey that will survey across core site and then up the SW Arm of Random Sound.

18:32 Arrived at the start of the survey line. Sleevegun and Huntec were deployed. Sidescan was not deployed due to deep waters.
18:42-21:18 Geophysical survey line 77 (Sleevegun and Huntec) completed.
21:52 All geophysical gear was on deck. Started transit to St. John's. Docked in St. John's at 09:30 on June 18<sup>th</sup>.

### 6.0 Preliminary Results (Li, King, Cameron)

#### 6.1 Geological and geophysical activities on St. Pierre Bank

St. Pierre Bank is located on western Grand Banks, about 120 km offshore of the southwestern coast of Newfoundland (Fig. 2-1). Proposed shelf-crossing pipelines from Newfoundland to US market likely will cross this bank. Targeted bedforms in this study area include large wave ripples (LWR), megaripples, sand waves and W-form sand waves. Four geophysical survey lines (lines 1-4 of Appendix 2) and thirteen sampling and camera stations were conducted on St. Pierre Bank (Fig. 6-1-1).

A camera station (Station 1) and a van Veen grab (Station 2) were undertaken in 65 m depth on western St. Pierre Bank (Figs. 6-1-1 and 6-1-2). The scientific objective was to obtain information of sediment texture and bedform types on western St. Pierre Bank. Camera was deployed at 156/2003 (day and UTC time) and stopped at 156/2013 (full camera station description in Appendix 1b). A total of 15 still photos were taken with the video data (see wallet format photos for all stations in Appendix 3). The photos show that the seabed was bioturbated grey fine-medium sand with abundant shell fragments and sand dollars (detailed description given in Appendix 4). The grab sample shows fine to medium buff colored sand with gravel lag and shell fragments (see full information of samples and cores in Appendix 1c). The gravels are mm to 3 cm in size (pebbles) and rounded to sub-rounded in shape.

One camera (Station 3) and four van Veen grab (Stations 4-7) stations were undertaken at the planned station SP3 on eastern St. Pierre Bank (Figs. 6-1-1and 6-1-3). The targets were curvilinear sandwaves with superimposed megaripples in 73 m depth. The sidescan image in the background in Fig. 6-1-3 demonstrates the troughs (dark tone) and low-relief crests (the lighter tone) of sandwaves. Degraded megaripples are superimposed on the sandwaves. 4K camera was deployed at 157/1017 and stopped at 157/1028 along an E-W drift. A total of 12 still photos (Fig. 6-1-4; Appendix 3) were taken with the video data. Pictures 8-12 (Fig. 6-1-3; Fig. 6-1-4) show that the seabed in the trough and on the western flank of sandwaves was predominantly covered (75 to 90%) by shell fragments and sub-angular pebbles and cobbles that are algae (lithothamnian) encrusted and with mixed lithologies. Beneath this gravelly lag is fine-medium grey sand. Seabed of upper flanks and rest areas of sandwaves is characterized by bioturbated fine-medium grained grey sand with a few sand dollars (pictures 13, 14, 16 and 18). Gravel was largely absent in these photos. No small ripples are present in these photos, suggesting that tidal

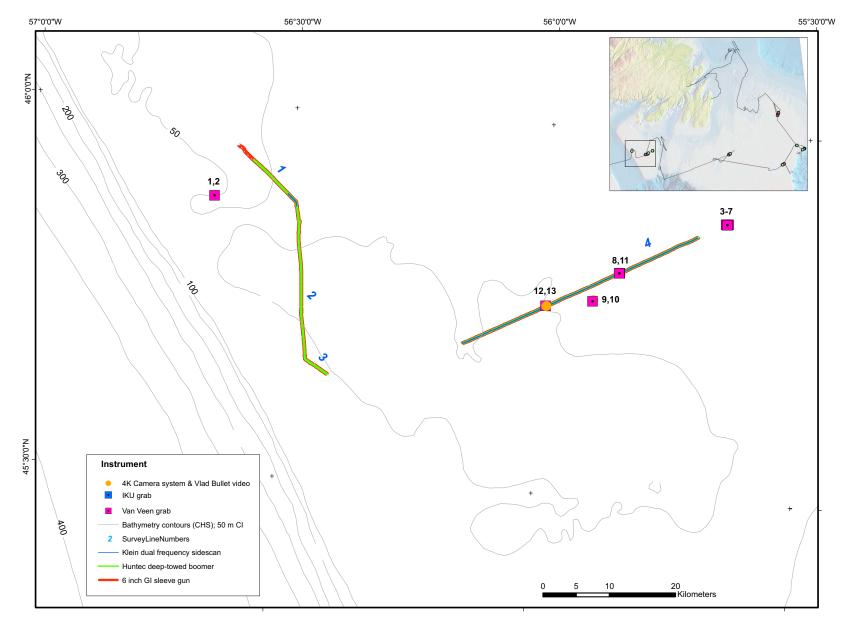


Fig. 6-1-1: Location map of all stations and survey lines on St. Pierre Bank.



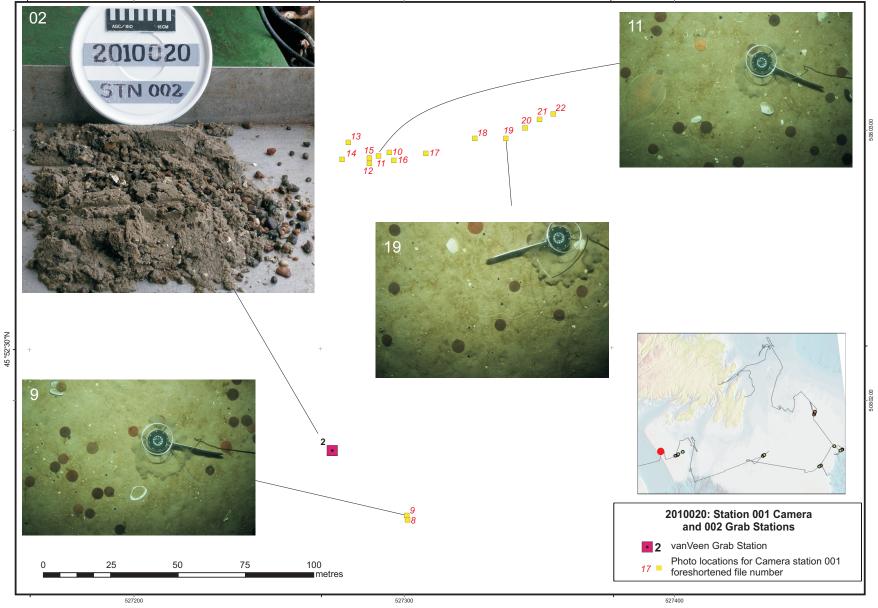
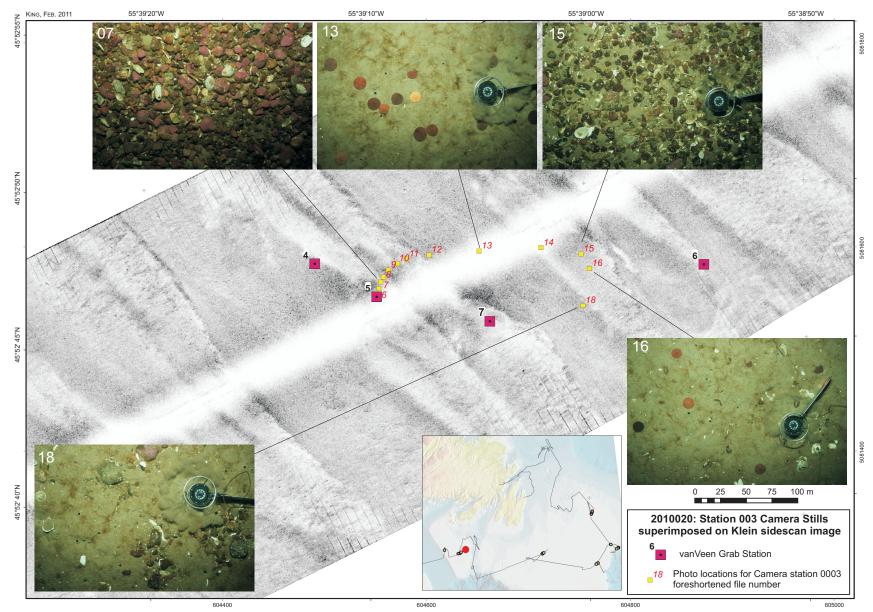
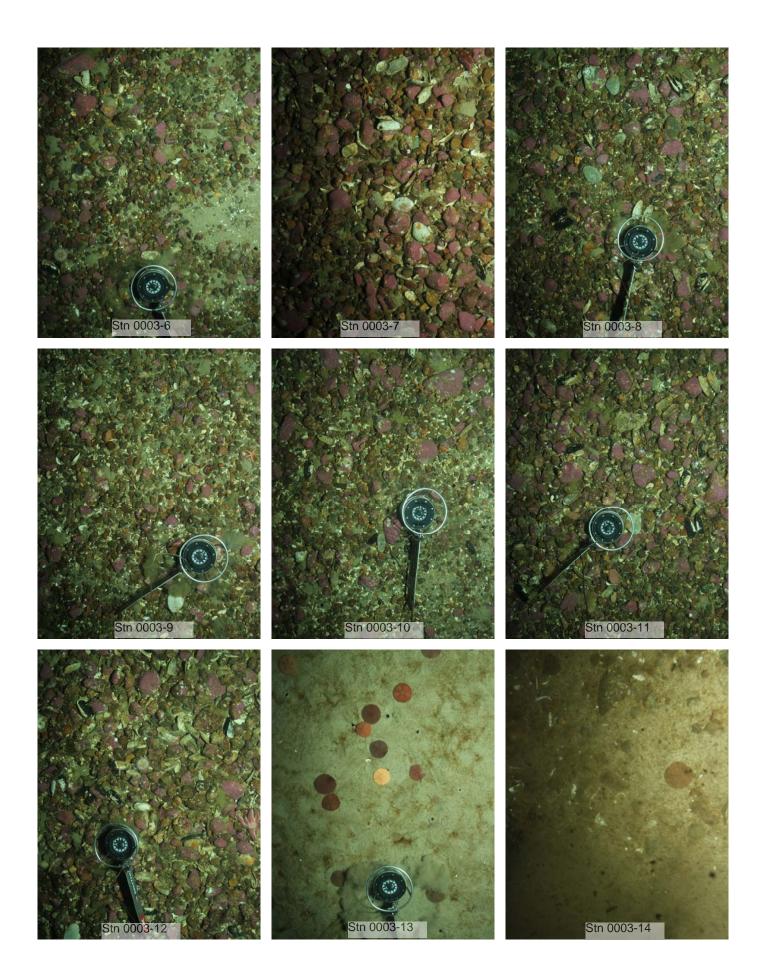


Fig. 6-1-2 Selected photographs from camera Station 01 and deck photo of van Veen grab sample of Station 02 from eastern St. Pierre Bank. The locations of photos from Station 01 are not USBL navigation but rather ship's antenna. Geographic location is red dot on index map.



6-1-3 Selected photographs from camera Station 03 across bedforms superimposed on USBL-positioned Klein sidescan data from cruise 2007016. The dark tone and the lighter tone of the background sidescan image mark troughs and very low-relief crests of sandwaves respectively. Geographic location is red dot on index map.



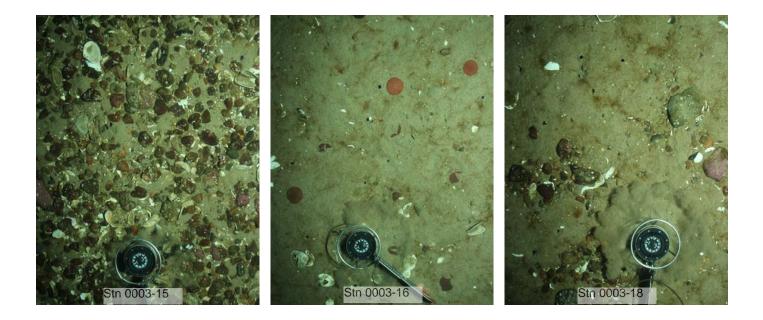


Fig. 6-1-4 Still photographs taken at Station 03 on eastern St. Pierre Bank.

current alone under quiescent summer condition is not strong enough to mobilize the fine to medium sand sediment at this site. Pictures 14 and 18 show bioturbated fine-medium grained grey sand with some subangular pebbles and cobbles. Degraded megaripples are likely superimposed on the sandwaves. This may account for the considerable textural variation within the lighter toned crest areas, exposing the lag gravel in the troughs of megaripples (eg. photos 6, 7 and 15). The four van Veen grabs (Stations 4-7) targeted different morphological locations over sandwaves. The collected samples (Fig. 6-1-5) show that sediments on sandwave crest (Stations 05 and 06) are fine sand or medium sand with minor amount of gravel, while sediment in sandwave trough and on lower western flank (Stations 04 and 07) is medium to coarse sand with abundant gravel.

The central St. Pierre Bank sampling site is approximately 20 km to the WSW of the eastern St. Pierre Bank sampling site described above (Fig. 6-1-1). A camera station (Station 08) and a van Veen grab station (Station 11) were undertaken at the eastern part of the sampling site (Fig. 6-1-6). The targets were sandwaves with 3D megaripples in their troughs in 57 m depth. The camera station started at 157/135722 and stopped at 157/140723. A total of 14 still photos (Appendix 3) were taken with the video data. Selected seabed photographs from Station 08 (Fig. 6-1-6) indicate that seabed is completely covered by algae encrusted subangular to subrounded cobbles and pebbles (photos 7, 12 and 18). Several photos show that gravelly sand could be beneath the lag of cobbles and pebbles (photos 3 and 15). The grab sample at Station 11 recovered algae encrusted cobbles and large pebbles with fresh smaller pebbles. The camera and grab stations were superimposed on USBL-positioned Klein sidescan data from Cruises 2007016 and 2010020 in Fig. 6-1-6. The 2010020 sidescan data were subject to excessive thermocline noise, but register an even-textured seabed with relatively high backscatter. The bedforms in the 2007 sidescan data have subtle textural differences and are small linear sandwaves with a NNW-SSE orientation (arrows emphasize orientation and spacing). Any trace of the subtle bedforms registered in 2007 data is no longer present in 2010 data. Perhaps the textural contrast in the 2007 data is between the dense pebbles and the mixed cobbles and finer pebbles as demonstrated by the photos of Station 08.

The camera Station 09 and van Veen grab Station 10 were conducted at the central part of the sampling site in 56 m depth on central St. Pierre Bank (Figs. 6-1-1 and 6-1-7). The targets were large wave ripples near an isolated sandwave as identified from the sidescan data in Fig. 6-1-7. The camera station started at 157/160048and stopped at 157/161039. A total of 12 still photos (Appendix 3) were taken with the video data. The photographs (Fig. 6-1-7) are nearly identical to nearby Stations 8 and 11, showing that seabed was either completely covered by densely packed cobbles and pebbles encrusted by lithothamnian (photos 10 and 12) or mixed lithothamnian-encrusted cobbles and pebbles with finer pebbles not covered by lithothamnian (photos 9 and 13). Sandy substrate beneath the gravel lag is partially exposed in some of the photos. The algae encrusting on cobbles and larger pebbles are stable while smaller pebbles without algae are intermittently mobile at these sampling sites. The grab sample collected at Station 10 reveals a coarse sand matrix covered by the gravel lag as shown by the photos.

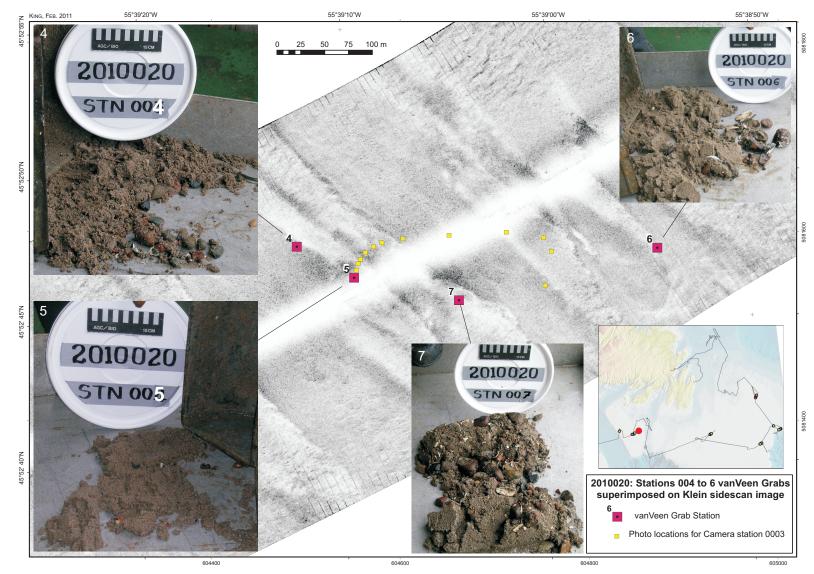


Fig. 6-1-5 Photographs of van Veen grab samples of Stations 04-07 from eastern St. Pierre Bank, superimposed on USBL-positioned Klein sidescan data from Cruise 207016. The aim of the station was to sample a sandwave trough and crest and the megaripple field and potentially one from the large wave ripple field. Location is red dot on index map.

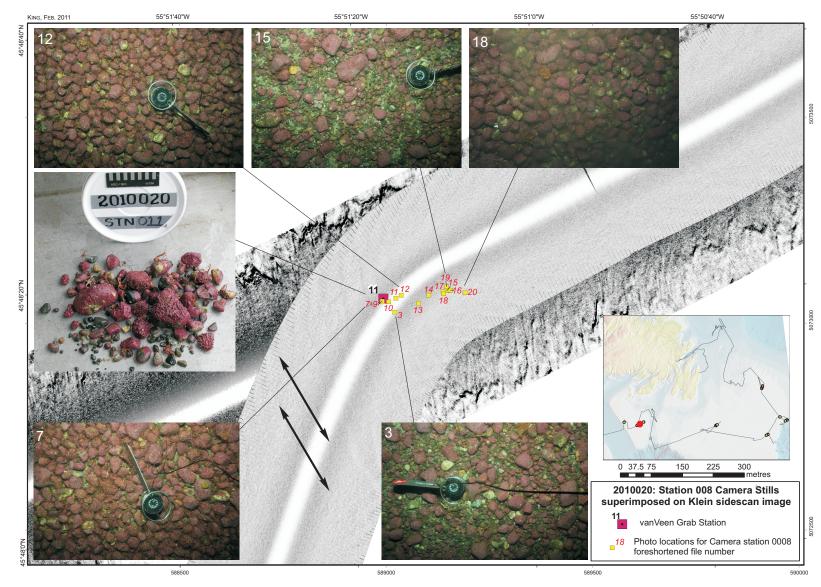


Fig. 6-1-6 Selected seabed photographs from camera Station 08 and deck photograph of grab sample from Station 11, across bedforms imaged in Klein sidescan data from Cruise 2007016 and 2010020 (USBL-positioned in background). Geographic location is red dot on index map.

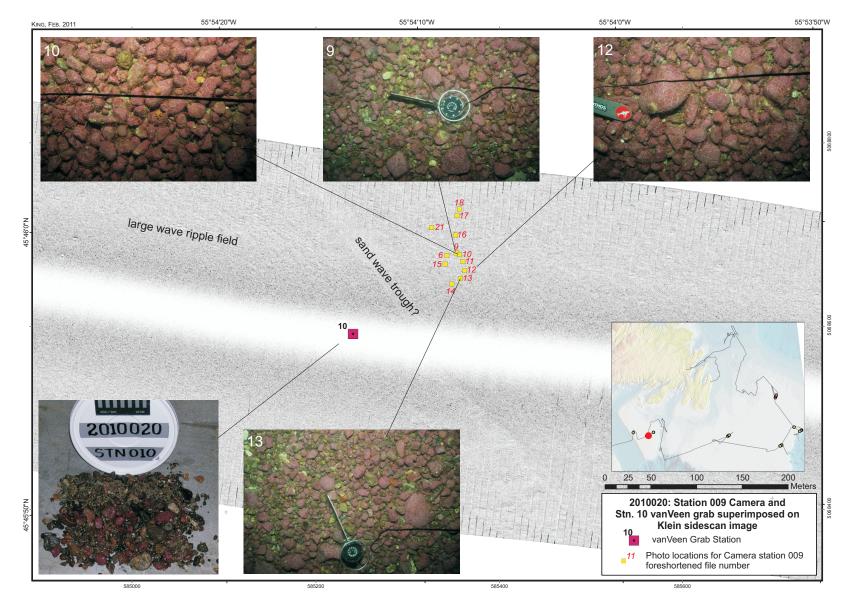


Fig. 6-1-7 Selected seabed photographs from camera Station 09 and deck photograph of grab sample from Station 10, across bedforms imaged in Klein sidescan data from Cruise 2007016 and 2010020 (USBL-positioned in background). Geographic location is red dot on index map.

The last two stations conducted on central St. Pierre Bank were camera station 13 and van Veen grab station 12 that were about 7 km west of stations 09 and 10 (Fig. 6-1-1). The target was 3D megaripples in 56 m depth. The camera station started at 157/193636 and stopped at 157/194625. A total of 10 still photos (Appendix 3) were taken with the video data. Seabed photos (Fig. 6-1-8) again demonstrate algae encrusted pebbles with variable mixing of smaller pebbles without algae encrusting. Photos 11 and 12 also show a band of very fine gravel which might have been mobilized by waves. The sidescan image indeed shows degraded large wave ripples on the outer beams as well as low-relief 3D megaripples (Fig. 6-1-8). The grab sample recovered a variety of sub-rounded and sub-angular pebbles and a few cobbles with minor buff colored medium to course sand in a matrix. The implication is that sand from the megaripples has migrated.

Four geophysical survey lines (lines 1-4 of Appendix 2) were conducted in the St. Pierre Bank study area (Fig. 6-1-1). The objective of sidescan data along these lines was to obtain new and repeat geophysical data for understanding bedform distribution and bedform mobility assessment on St. Pierre Bank. The sub-bottom data of these lines was collected to investigate the nature of the suspected low-stand modified morainal bank, to investigate the extension of tunnel valleys under St. Pierre Bank, and to better image and delineate Miocene prograding sand sheets.

## 6.2 Geophysical survey and coring in St. Pierre Basin

St. Pierre Basin is a 150 m deep basin that is defined to the west by St. Pierre Bank and to the south by Halibut Channel and Green Bank respectively (Fig. 2-2). Three geophysical survey lines (lines 5-7; Appendix 2 and Fig. 6-2-1) were conducted. The objectives were to better delineate bedrock stratigraphy and structure for mapping purposes, to identify the extent of a late pro-glacial sediment wedge, to identify shallow gas anomlies, and to delineate extent and stratigraphy of complex multiple till units.

Two piston cores (Stations 14 and 15) and one dredge sample (Station 16) were obtained from the St. Pierre Basin area (Fig. 6-2-1). The targets of the piston cores were several facies of the late glacimarine muds and were for lithological and dating purposes (Appendix 1a). Core 14 was taken at 46.2703 -55.2210 in 168 m depth. It recovered 692 cm core length (Appendix 1c). Core 15 was taken at 46.3170 -55.2031 in 166 m depth. The recovered core length at station 15 was 360 cm. Location and penetration of these cores, superimposed on sub-bottom profiles, are shown in Fig. 6-2-2. The Huntec seismic profile shows a thick, multi-facies stratified glacimarine mud section over till in the vicinity of the southern extent of the Burin Moraine. The glacial section has been eroded at the seabed. The unconformity is found below 190 water depth, well below the marine low-stand.

The dredge sample of Station 16 was collected at planned station DR-S to obtain till sample at this location (Appendix 1a). The dredge started at 158/2003 46.2278 -55.0967 in 140 m depth, and stopped at 158/2015 46.2282 -55.0975. Lithological description was performed (Cameron and King). The dredge consists of the following:

• 3 coarse sandstone cobbles, rounded, soft-moderate harness, carboniferous in age?

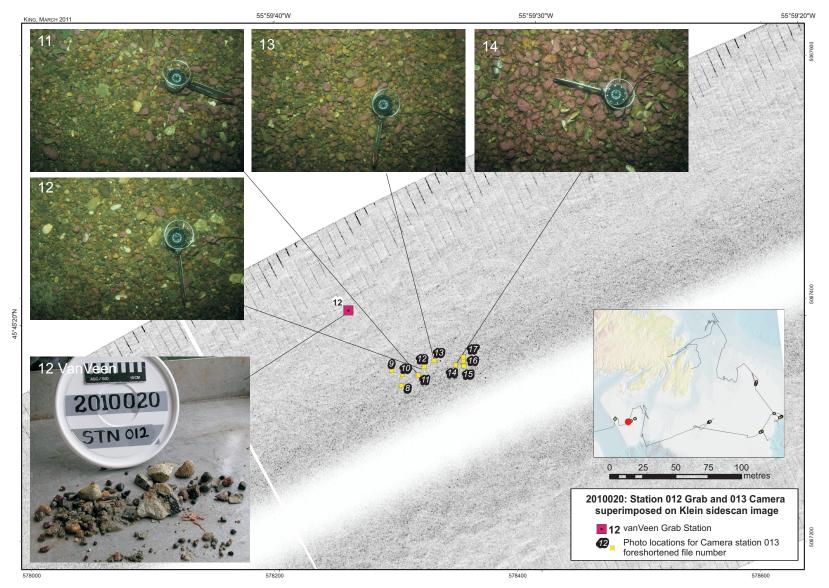


Fig. 6-1-8 Selected seabed photographs from camera Station 13 and deck photograph of grab sample of Station 12, across bedforms imaged in USBL-positioned Klein sidescan data from Cruise 2007016. Photo locations are winch room positions rather than USBL, as for most other camera stations. Geographic location is red dot on index map.

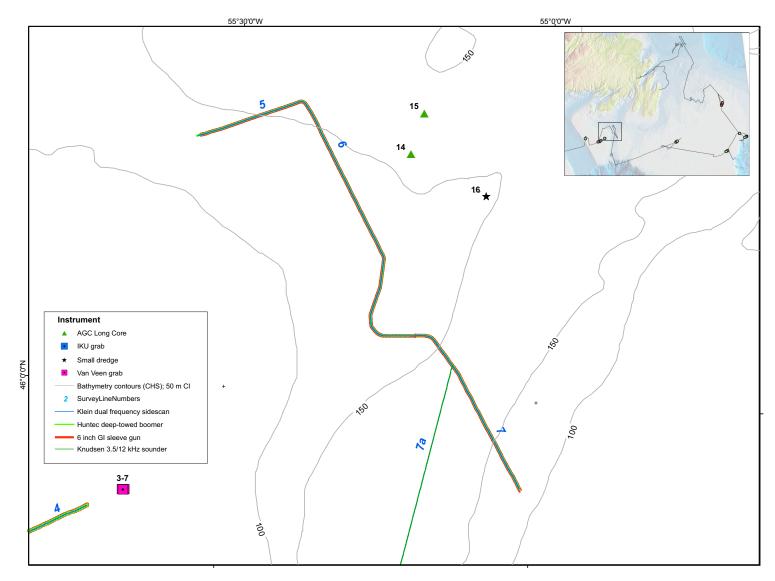


Fig. 6-2-1 Location map of all stations and survey lines in St. Pierre Basin.

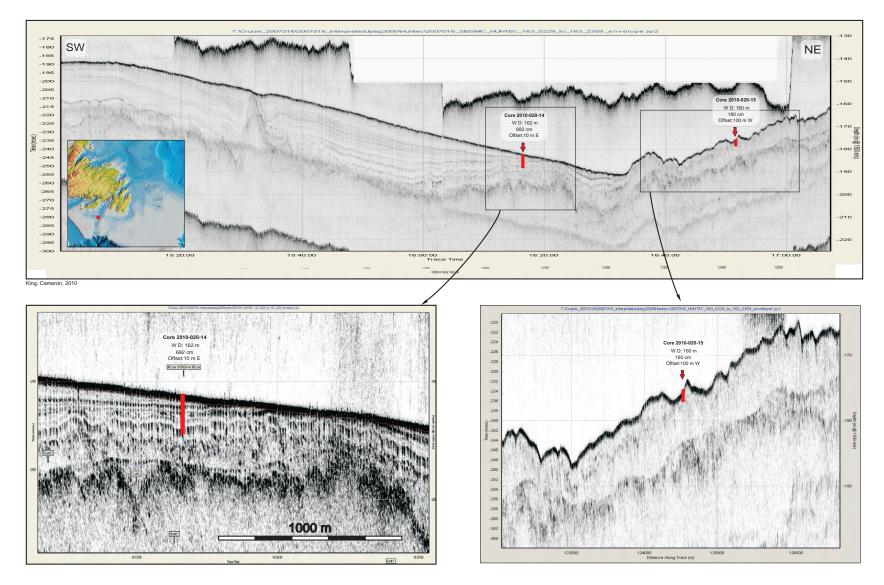


Fig. 6-2-2 Piston core Stations 14 & 15 situated on a Huntec seismic profile from cruise 207016 in St. Pierre Basin. They show a thick, multi-facies stratified glacimarine mud section over till in the vicinity of the southern extent of the Burin Moraine and were taken to target several facies of the late glacimarine muds, together with nearby core 15, and for lithological and dating purposes. The glacial section has been eroded at the seabed. The unconformity is found below 190 water depth, well below the marine low-stand.

- 1 granite cobble, sub-rounded
- 1 slate, sub-angular, soft-moderate
- 4 red mudstones (meta-sediment) sub-rounded, moderately hard
- 30 dark gray quartzites, a few have laminations, hard

The entire dredge sample will be submitted for cosmogenic dating.

#### 6.3 Coring on Halibut Channel Fan

Seven Knudsen survey lines (lines 7-14) were collected in Halibut Channel and three piston cores (Stations 17-19) were obtained on the Halibut Fan (Fig. 6-3-1). The objective of Knudsen sub-bottom data was to map the extent and nature of late-glacial overdeepened meltwater channels, evidence for a sub-glacial catastrophic flood. The piston cores were collected to address geohazard and process issues on submarine fans (Appendix 1a) for the sub-project East Coast Deep-Water Geoscience Knowledge (lead by David Piper). The location and penetration of these cores are superimposed on Huntec seismic profile in Fig. 6-3-2. The piston core of Station 17 was collected at 44.8979 -55.1246 in 1870 m depth that targeted the channel on one of the main thalwegs of the canyon system. A total of 6.37 m core was recovered (Appendix 1c). The piston core of Station 18 was collected at 44.9008 -55.1067 in 1756 m depth that targeted the leve of the canyon system. The recovered core was 10.37 m. The last of the three piston cores was from Station 19 at 44.902588 -55.1010 in 1786 m depth. The target was the over-bank deposit of the canyon system. The total recovered core length was 13.93 m at this station.

#### 6.4 Geological and geophysical activities on central Grand Bank

Central Grand Bank is located about 225 km south of St. John's in water depths of 80-100 m (Fig. 2-1). The proposed southern route of shelf-crossing pipeline from Hibernia to Newfoundland will likely go through this case study area. A full range of bedforms of large wave ripples, megaripples, and sandwaves exists on central Grand Bank. Five geophysical survey lines (lines 15-19 of Appendix 2) and eleven sampling and camera stations were conducted on central Grand Bank (Fig. 6-4-1).

A camera station (Station 20), two IKU grabs (Stations 21 and 22) and three van Veen grabs (Stations 23-25) were conducted at the first sampling site on central Grand Bank (Figs. 6-4-1 and 6-4-2). The camera transect of Station 20 followed a SW-NE drift that started at 160/100546 and stopped at 160/105132. A total of 48 still photos (Fig. 6-4-2; Appendix 3) were taken with the video data. The camera transect was designed to cross a variety of bedforms including large wave ripples, megaripples, and sandwaves. The Trackpoint positioned sidescan data depicts the occurrence of 2D megaripples and irregular sand waves, and the clear transition from sand to gravelly sand on the sand waves (Fig. 6-4-2). Examination of the seabed photos collected at Station 20 (Fig. 6-4-2 and Appendix 3) indicates that photos 7-11 show dominantly sandy sediment but seabed became more gravelly starting with photos 13. This agrees with the transition from lighter to darker tones shown by the sidescan data in Fig. 6-4-2. Across the

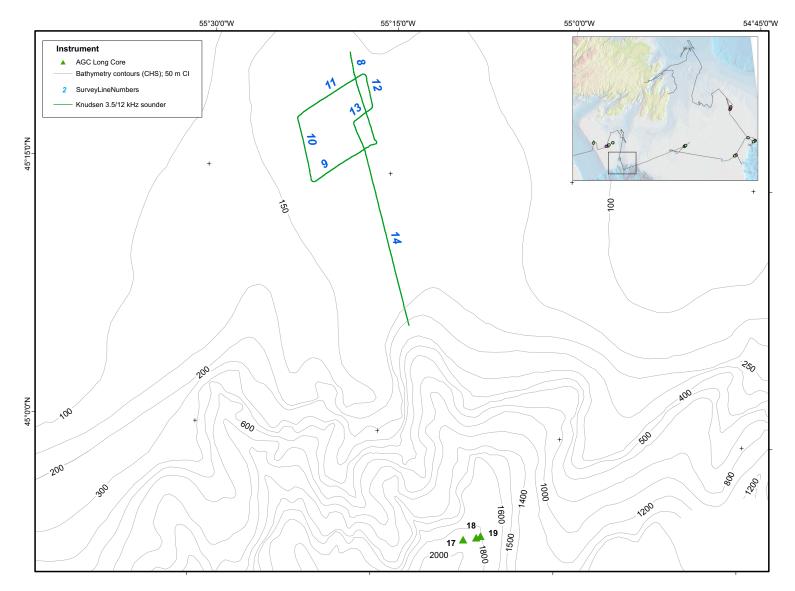


Fig. 6-3-1 Location map of all stations and survey lines in Halibut Channel and on Halibut Fan, western Grand Banks.

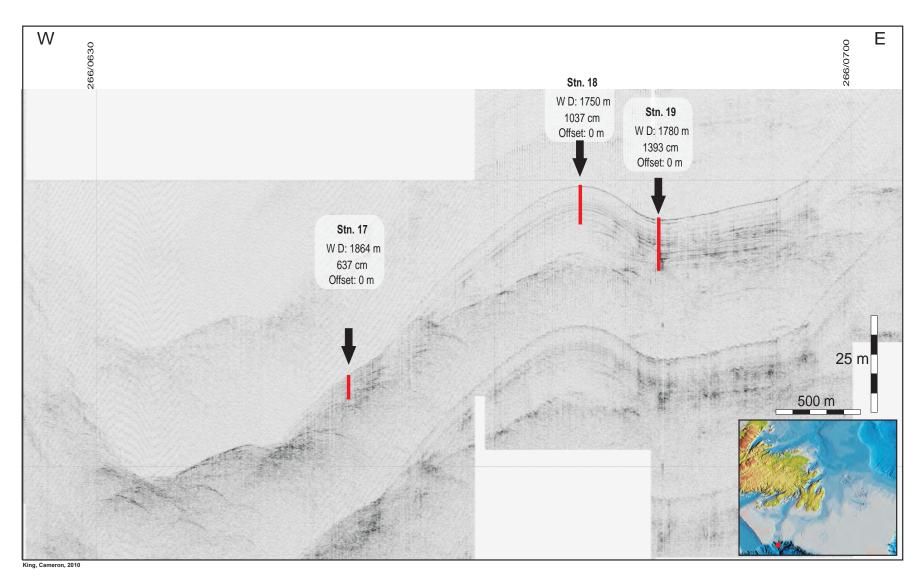


Fig. 6-3-2 2006048 Huntec profile used to site 2010020 core stations 17, 18 and 19 in between 1750 and 1860 m water depth on the Halibut Fan. These were taken for D. Piper's interests on the fan. They targeted channel, levee and over-bank deposits on one of the main thalwegs of the canyon system.

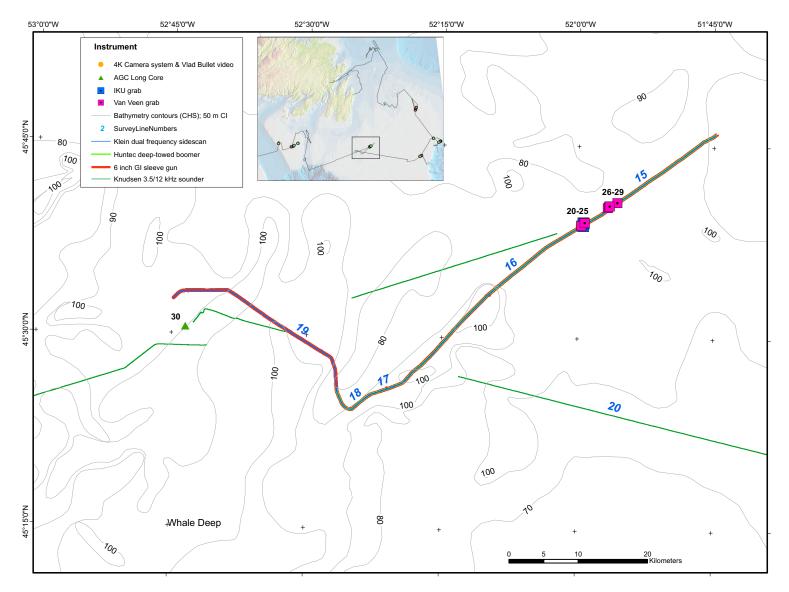


Fig. 6-4-1: Location map of all stations and survey lines on central Grand Bank.

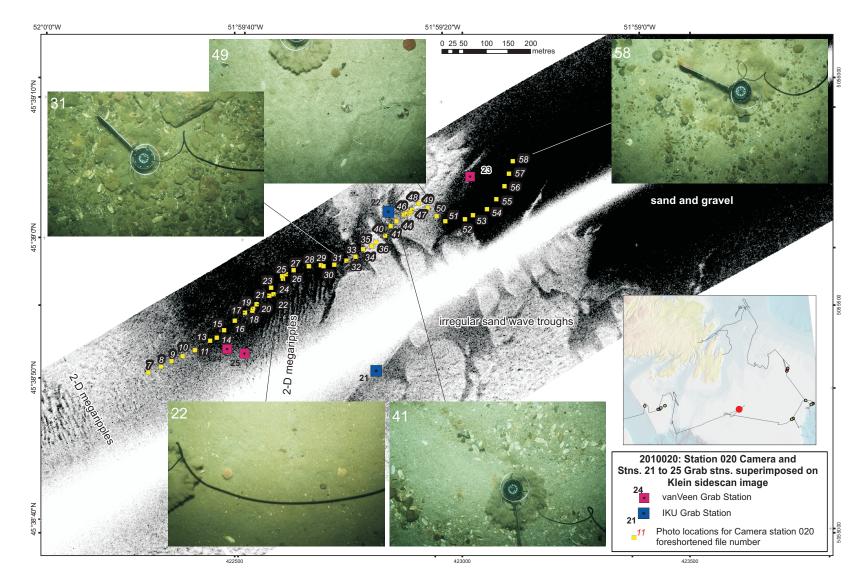


Fig. 6-4-2 Selected photographs from camera Station 20 and locations of grab stations 21-25 set in the USBL-positioned sidescan image on central Grand Bank. The sidescan data depicts 2D megaripples, irregular sand waves, and the sand wave sand (light tone) and gravel (darker tone) components. Grabs sample illustrations are shown in the following figure. Location is red dot on index map.

central megaripple field, most of the seabed photos show thin gravelly sand (photo 31) over megaripple flanks and troughs and only a few photos (22) show complete sand cover close to crests of megaripples. Over the irregular sand waves, sediment on the lighter-tone sand wave flanks was dominantly sand (photos 35 and 36 in Appendix 3) and seafloor becomes gravelly sand on the troughs of these irregular sand waves (photos 33 and 34 in Appendix 3). The transistion from sand to mixed sand and gravel, corresponding to the sidescan tone in Fig. 6-4-2, is clearly demonstrated by photos 49 and 58. Photo 41 depicts large wave ripples in a sand wave trough.

The IKU grab of Station 21 was taken at planned station CB12 over sandwaves. The IKU grab of Station 22 was taken at planned station CB10 that also targeted sandwaves. Figure 6-4-3 indicates that Station 21 probably was over lighter-tone sediment on the sand wave flank while Station 22 landed over dark-tone coarser sediment in the sand wave trough. Photograph of the IKU sample (Fig. 6-4-4a) suggest that sediment at station 21 was medium to coarse sand with shell hash and nearly free of gravel. Cross section cut into IKU sample (Fig. 6-4-4b) does not show any sedimentary bedding and this is confirmed with the epoxy peel (Fig. 6-4-4c) which shows structureless sand with shells and shell hash. Sediment at station 22 was medium sand with fine shell hash, and some gravel up to 5cm (Fig. 6-4-5a). Cross-section profile reveals an anoxic layer at 20 cm below surface (Fig. 6-4-5b). Epoxy peel (Fig. 6-4-5c) shows massive sand with occasional shell fragments.

The van Veen grab of Station 23 was obtained at planned station CB11 with large wave ripples as the target (Fig. 6-4-3) and the sample photograph shows well sorted, fine to medium sand with fine shell hash throughout and scarce shell halves on surface. Van Veen grabs at Stations 24 and 25 were both taken over megaripples (Fig. 6-4-3) and the sample photographs show that sediment at both stations was fine to medium sand with shell fragments and some pebbles.

The second sampling site on central Grand Bank was located about 5 km northeast of the previous sampling site (Fig. 6-4-1). One camera transect (Station 26) and three van Veen grabs (Stations 27-29) were conducted at this sampling site (Fig. 6-4-6). The camera transect was a steady west to east drift that started at 160/170449 and stopped at 160/182055. A total of 86 still photos (Fig. 6-4-6; Appendix 3) were taken with the video data. The camera transect was designed to cross megaripples, sand waves and possibly large wave ripples. The dark-tone patch (lower left one third) of the sidescan data in Fig. 6-4-6 represents the sand wave trough with superimposed 2D megaripples. Seabed photos show that the seafloor was dominantly gravel and boulder lag with <25% sand (photo 22 of Fig. 6-4-6; most of photos 4-39 in Appendix 3). The sharp changes from gravel domination to sand domination in adjacent seabed photos (e.g. photos 29 and 28, and photos 39 and 41 in Appendix 3) suggest transition from flanks to troughs of the 2D megaripples superimposed in the sand wave trough. Photo 46 in Fig. 6-4-6 shows either a trough in the megaripple or a shelly large wave ripple.at the sand/gravel transition. The light tone of the sidescan data represents the sand wave lank with dominantly sandy seabed with variable shell and sand dollar content (photos 46, 85 and 97 in Fig. 6-4-6; also photos 45-97 in Appendix 3 ). Locally the sand on the sand wave flank was worked into small wave ripples that have degraded under the summer fair-weather conditions (photos 56 and 57 in Appendix 3). The additional variation of backscatter intensity on the sand wave flank is likely due to the low (5%;

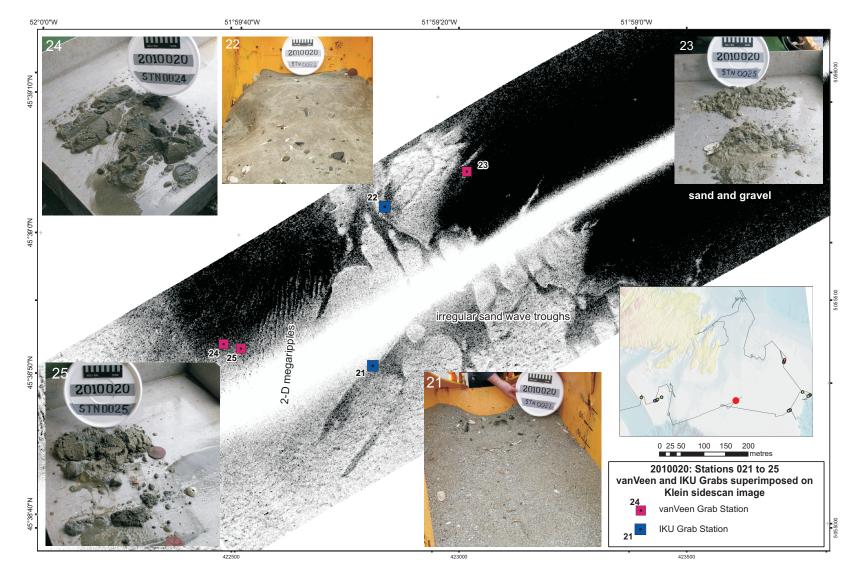


Figure 6-4-3. Photographs of seabed samples from stations 21-25 superimposed on USBL-positioned sidescan image on central Grand Banks. Sampling results complement the photographs in the previous figure. Perhaps the samples are biased towards the sandier content in comparison to the photographs. Location is red dot on index map.





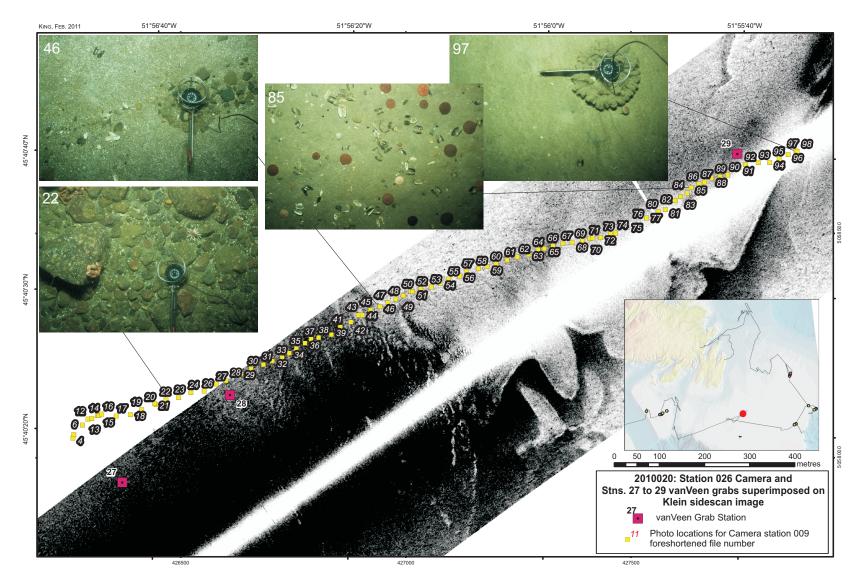


Fig. 6-4-6 Selected photographs from camera Station 26 and locations of grab stations 27-29 on central Grand Bank. The stations were superimposed on the USBLpositioned sidescan image collected on Hudson2010020. The sidescan data depicts sand wave trough (dark-tone patch of lower left one third) with 2D megaripples, sand wave flank (light tone of upper right half), and irregular sand waves (central part). Grabs sample illustrations are shown in the following figure. Location is red dot on index map.

photos 52-58 and 96-97 in Appendix 3) and increased (15-20%; photos 80-93 in Appendix 3) shell abundance in the otherwise dominantly sandy sediment.

Part of the video data collected at Station 26 was analyzed during the cruise. Following features were observed from this initial video analysis (all time was UTC):

- 17:09:49 Mostly gravel/pebble lag; sometimes alternate with sandy patches.
- 17:18:52 A large band of sand.
- 17:33:21 Sandy patches become more frequent and continuous; degraded large wave ripples identified.
- 17:34:09 Gravel ripples with sand in troughs.
- 17:34:20 Start of continuous sand with little gravel lag
- 17:42:49 Observed degraded wave ripples
- 17:57:12 Shell abundance started to increase.

The van Veen grab of Station 27 was obtained at planned station CB5 that targeted large wave ripples. The recovered sample (Fig. 6-4-7) shows fine-medium grained sand with abundant fine shell hash overlain by a gravel lag of subangular pebbles and small cobbles up to 6 cm. The van Veen grab of Station 28 was obtained over megaripples in the sand wave trough. The recovered sample was medium to course sand with shell hash throughout and surficial lag of pebbles and cobbles up to 13 cm. van Veen grab of Station 29 was collected on the light-tone sand wave flank (Fig. 6-4-7). The sample photo shows fine grained sand with organics, disbursed shell hash, and only a few small pebbles up to 3 to 4.5 cm.

The last sampling activity on central Grand Bank was a piston core at Station 30, located about 60 km west of the sampling site (Fig. 6-4-1). The core was collected at the planned station PC7 and the target was glacimarine in latest events (Appendix 1a). The location and penetration of the core are superimposed on Huntec and airgun profiles in Fig. 6-4-8. The core was collected at 45.5095 -52.7239 in 126 m depth. A total of 6.13 m core was recovered (Appendix 1c). The core penetrated Holocene age mud, but did not reach the targeted top of latest glacimarine deposition, here at about 8 m below seabed.

Five geophysical survey lines (lines 15-19: Appendix 2 and Fig. 6-4-1) were conducted in the central Grand Bank area. The objectives of these survey lines were to obtain new and repeat geophysical data for understanding bedform distribution and bedform mobility assessment; specifically to cross a 2006048 sidescan traverse to establish any bedform differences in a 5 year span. Lines 17-19 tracked through glacial and Holocene filled basins along suspected tunnel valleys to augment sparse coverage for improved mapping of the muds, to cross piston core target from an additional direction, and also to delineate buried glacial deposits and Mesozoic/Cenozoic contacts and structure.

#### 6.5 Geological and geophysical activities in Lilly Canyon area

Lilly Canyon area is located on southeastern Grand Bank, about 380 km southeast of St. John's

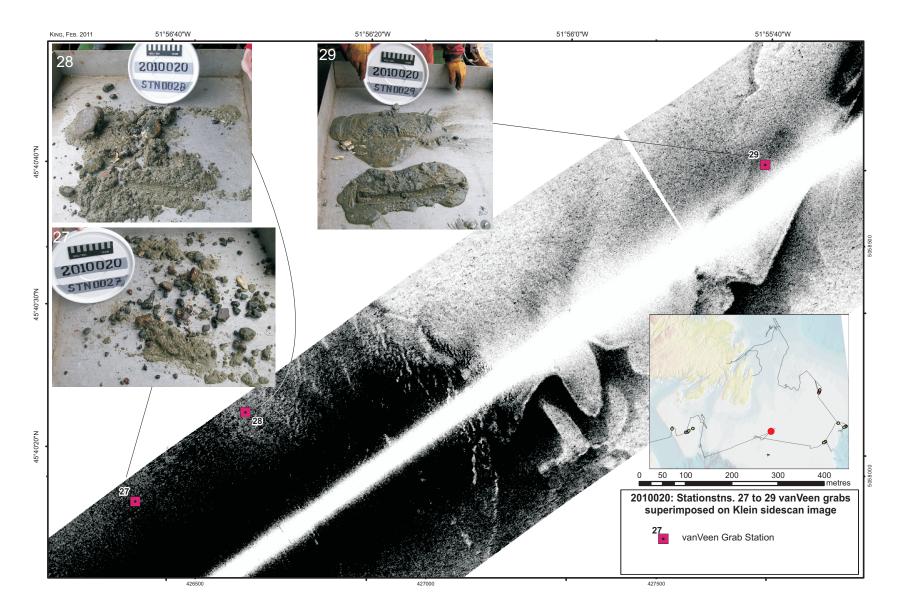


Figure 6-4-7. Photographs of seabed samples from stations 27-29 on central Grand Banks superimposed on USBL-positioned sidescan image. Sampling results complement the photographs in the previous figure. Location is red dot on index map.

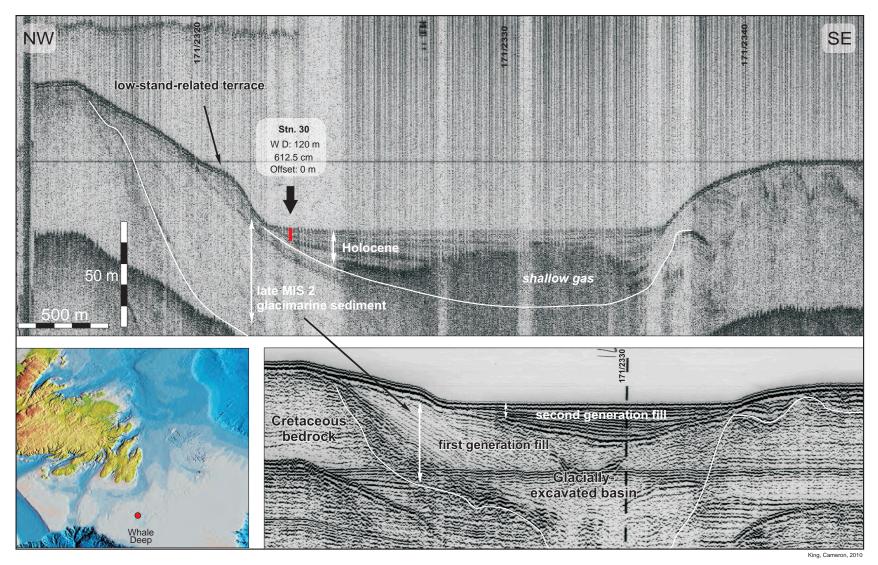


Fig. 6-4-8 Piston core Station 30 situated on cruise 86017 Huntec (upper) and Air Gun (lower) profiles. The core penetrates Holocene age mud, not reaching the targeted top of latest glacimarine deposition, here at about 8 below seabed. The first generation glacimarine basin infill records late-stage proximal glacial plume deposition. The stratigraphic situation is similar to western Whale Deep where 18ka and older stratified glacimarine sediments have been sampled.

(Fig. 2-1). Lilly Canyon is largely oriented west to east and extends from about 3000 m on the slope to as shallow as 70 m onto SE Grand Bank. This area is under intermediate seabed disturbance (shear stress) but lies to the immediate north of South Shoal, the most energetic area for the Grand Banks region. Active resuspension and transport of sediment could occur in this area under the influence of storms and Labrador Current. The advection of sediment is intercepted by the canyons. The sediment fed into the canyons could work as erosion agent and serve as sources for turbidity current events on the floors of the canyons. These are potential geoconstraints to deep-water oil and gas operations and slope-crossing pipelines. Targeted bedforms in this study area include large wave ripples (LWR), megaripples, and sand waves. Three geophysical survey lines (lines 21-23 of Appendix 2) and seven sampling and camera stations were conducted at the Lilly Canyon area (Appendix 1a and Fig. 6-5-1).

A camera station (Station 31), two van Veen grabs (Stations 32 and 33) and one IKU grab (Station 34) were conducted at the first sampling site of the Lilly Canyon study area (Figs. 6-5-1 and 6-5-2). The Shark Marine video camera was used at Station 31 and the targets were sandwaves, large wave ripples and pits. The transect followed a NE-SW drift that started at 162/124249 and stopped at 162/131557. No still photos were taken and the video data were stored on a Lacie 1TB external hard drive that was archived with GSCA curation.

Positions of sampling stations (32-34) were not previously decided based on sidescan data. The plan was to use the live view from the Shark Maine video camera to more precisely determine positions of sampling. However the quality of live view was poor due to split signals, and play back of video after the completion of the camera station 31 had to be used to identify seabed features and determine sampling locations. The following was the results of the initial analysis of the video data collected at Station 31 (all time was UTC):

Before 12:55	pebbles and boulders with shells; gravels were encrusted with red algae.
12:56	seabed became more sandy with shell hash; possibly on a sand wave flank.
12:57-13:01	alternating gravelly seabed and sandy seabed; possibly over megaripples.
13:05	abundance of gravel increased; possibly in a sand wave trough.
13:08	observed large wave ripples with gravels in their troughs

Based on this initial analysis of the Shark Marine video data of Station 31, two van Veen grabs and one IKU grab stations were selected. Van Veen grab of Station 32 was collected at the added station 162VV-1 and the target was large wave ripples identified at 13:08 of the video data. The first attempt only recovered 2cm of shell hash with gravel from 2mm to 60cm. Sample was discarded. Second attempt recovered 10 cm of shell hash with gravel up to 11cm (photo 32, Fig. 6-5-2). A van Veen grab was collected at Station 33 at added station 162VV-2 that targeted megaripples identified at 12:57 of the video data. The first attempt was slightly off of the target (Fig. 6-5-2) and recovered 10 cm shell hash with sand and gravel. Second attempt was at the target position but no sample was recovered. The IKU grab of Station 34 was obtained at the added station 162IKU-1 and the target was sandwave trough identified at 13:05 of the Shark Marine video data. Recovery was partial as jaws were wedged open 10cm by cobbles (photo 34, Fig. 6-5-2). Material recovered consisted of fine to medium sand and 45 percent gravel lag. Shell material was on surface. Sand component is similar from top to 15cm below surface. Fine grain

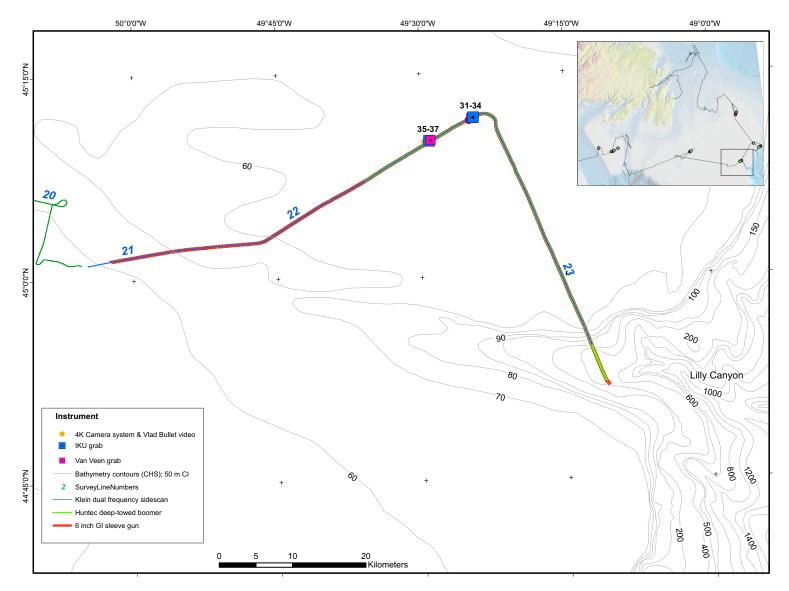


Fig. 6-5-1: Location map of all stations and survey lines of the Lilly Canyon study area on southeastern Grand Bank.

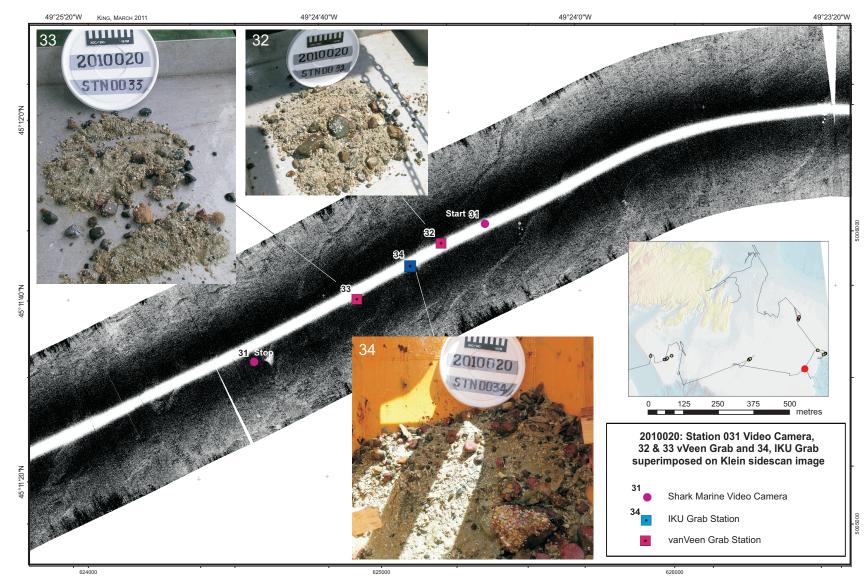


Fig. 6-5-2 Camera Station 31 and grab stations 32-34, from west of Lilly Canyon, in about 68 m water depth superimposed on USBL corrected Klein sidescan. Target bedforms were sand wave troughs, possible large wave ripples and pits. Shark Marine camera was used and no still photos were collected. The photographs of samples show pebbly sand with some shell. Coral growth on cobbles suggests long-term stability of that component. Location is red dot on index map.

hash was imbedded with sand. Gravel is small pebbles to cobbles, most encrusted with lithothamnian, cobbles rounded to semi rounded. Algae encrusting on large pebbles and cobbles suggests long-term stability of these particles. More lithological and biological descriptions of the IKU sample can be found in Appendix 1c. Sub-sample of cobbles was collected for lithological analysis (by Cameron and King) and the results show that the dredge consists of the following:

- 19 granite, sub-rounded
- 17 quartzite, sub-rounded
- 2 sandstone, rounded
- 1 gneiss, sub-rounded

The entire sample will be submitted for cosmogenic dating.

The second sampling site in the Lilly Canyon area was located about 6 km to the southwest of the previous sampling site (Fig. 6-5-1). Three stations were occupied at this site: 4K camera at Station 35, an IKU grab at Station 36 and a van Veen grab at Station 37 (Appendix 1a and Fig. 6-5-3). The camera transect followed a SW-NE drift that started at 162/174344 and stopped at 162/182807. A total of 45 still photos (Fig. 6-5-2; Appendix 3) were taken with the video data. The camera transect was designed to cross megaripples on the flank of a gravel patch in the general vicinity of subtle sand wave troughs (as depicted by the sidescan data in Fig. 6-5-3). The dark tone on the sidescan corresponds to stable (lithothamnian-coated) cobbles with abundant shell hash matrix and fairly diverse life-forms (photos 4 and 20). The pebbles do not have pervasive coral coating, suggesting periodic mobility, if even just enough to turn them. An isolated very thin sandy patch (photo 14) has shell hash in small wave ripples. The light tone on sidescan is sand dominated with abundant sand dollars (photo 48 with pervasive bioturbation) and some shell hash. Sea cucumbers are abundant at the sand-gravel transition (photo 39). All still photos of Station 35 can be found in Appendix 3 and more geological and biological descriptions of photos are in Appendix 4.

The IKU grab of Station 36 was taken at the added station 162IKU and the target was megaripples in gravel patches determined from the video data of Station 35 (Appendix 1a). The large grab (Fig. 6-5-4) recovered abundant shelly sand with some pebbles and quahaugs (photo 36, upper left) at least 30 cm thick. The peel (upper left) shows little apparent stratigraphy. The thickness of sand is apparently incongruous with the observation of a stable cobble-rich lag in some of the photos of the previous figure. Perhaps the IKU grab penetrated a thin lag or this surficial horizon is not a lag but rather post-glacial ice-rafted detritus. The van Veen grab of Station 37 was taken over the sandy patch and also targeted megaripples (Fig. 6-5-4). The recovered sample shows well sorted buff colored medium sand mixed with pebbles and shells as per the photographs in the previous figure.

Three geophysical survey lines (lines 21-23; Appendix 2 and Fig. 6-5-1) were conducted in the Lilly Canyon area. The goals of these survey lines were to obtain new and repeat geophysical data for understanding bedform distribution and bedform mobility assessment, especially with respect to possible canyon-feeding process. Sub-bottom data will help to delineate Neogene

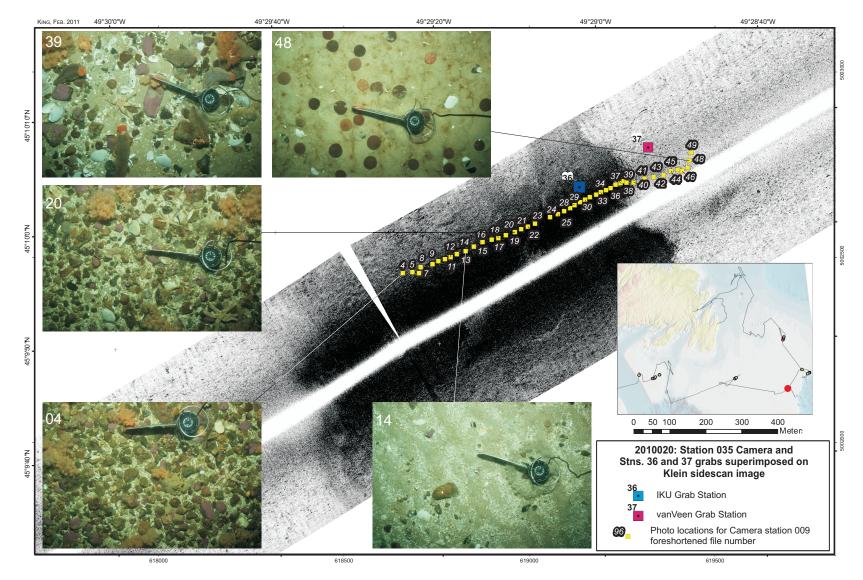


Fig. 6-5-3 Selected photographs from camera Station 35 and locations of grab stations 36 and 37 near Lilly Canyon, superimposed on USBL-positioned Klein sidescan data. Photos of samples are in the following figure. The dark tone of the sidescan imagery corresponds to stable (lithothamnian-coated) cobbles with abundant shell hash matrix and fairly diverse life-forms (photos 4 and 20) in the sand wave trough. The light tone on sidescan indicates sand dominated with abundant sand dollars (photo 48 with pervasive bioturbation) and some shell hash. Location is red dot on index map.

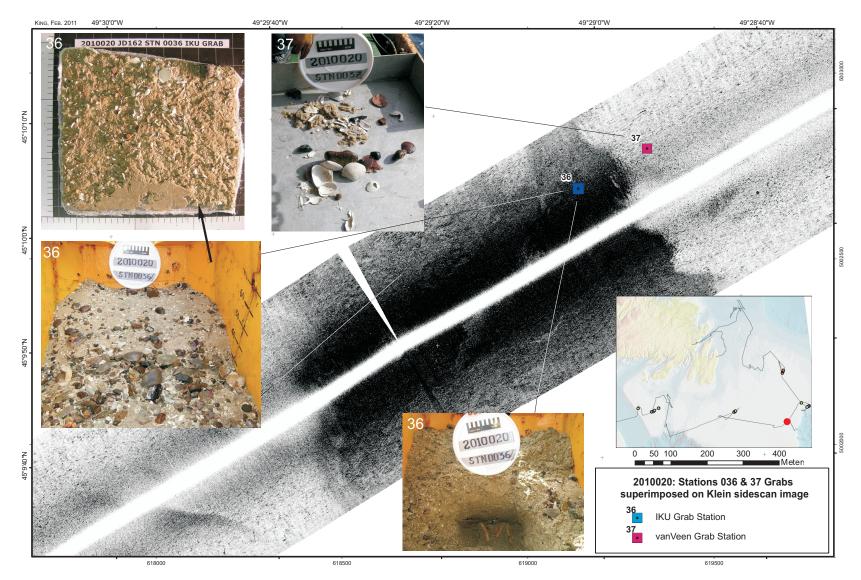


Fig. 6-5-4. Photographs of seabed samples from stations 36 and 37 near Lilly Canyon, superimposed on USBL-positioned sidescan image. The large grab (IKU) of station 36 was taken in gravel patches, possibly over megaripples. The IKU grab recovered abundant shelly sand with some pebbles and quahaugs (photo 36, upper left) at least 30 cm thick. The peel from the IKU grab sample (upper left) shows little apparent stratigraphy. The van Veen grab of Station 37 was taken over the sandy patch and also targeted megaripples. The recovered sample shows a pebble-sand-shell mix as per the photographs in the previous figure. Location is red dot on index map.

structure and stratigraphy, to investigate the nature of the very elongated westward extention of Lilly Canyon and to cross the canyon head to investigate possible Quaternary processes.

## 6.6 Geological and Geophysical Activities in Carson Canyon Area

Carson Canyon area is located about 80 km to the northeast of the Lilly Canyon on southeastern Grand Bank (Fig. 2-1). Caron Canyon is largely oriented northwest to southeast, and extends from about 3000 m on the slope to as shallow as 100 m onto SE Grand Bank. This area is under intermediate seabed disturbance (shear stress). Active resuspension and transport of sediment could occur in this area under the influence of storms and Labrador Current. Similar to Lilly Canyon, the advection of sediment is fed into the canyon and could serve as sources for turbidity current events on the floor of the canyon. A recent comprehensive assessment of present GSCA sidescan holdings for the Grand Banks region established that one of the most active and well developed, large bedform field (about 130 km<sup>2</sup>) occurs just north of Carson Canyon in greater than 150 m water depth. The objectives of the activities in the Carson Canyon area are thus to obtain seabed photographs and samples to characterize the morphology and sediment composition of a suite of bedforms, and to conduct new and repeat geophysical surveys for improved knowledge of the distribution, morpho-metrics and mobility of bedforms in this area. This information will facilitate the selection of sites for instrumented lander deployment that would be carried out in the winter of 2010-11. Targeted bedforms in this study area include large wave ripples (LWR), megaripples, sand waves and sand ribbons. Five geophysical survey lines (lines 24-28, Appendix 2) and eight sampling and camera stations were conducted at the Carson Canyon area (Appendix 1a and Fig. 6-6-1).

A camera station (Station 38), a van Veen grab (Station 39) and a IKU grab (Station 40) were conducted at the first sampling site of the Carson Canyon study area (Figs. 6-6-1 and 6-6-2). The 4K camera transect of Station 38 followed a SE-NW drift that started at 163/120016 and stopped at 163/124044. A total of 42 still photos (Fig. 6-6-2; Appendix 3) were taken with the video data. The targets were high amplitude 2D megaripples, sand ribbons and transition to 3D megaripples. The USBL positioned Klein sidescan data in Fig. 6-6-2 demonstrates that the seafloor is dominated with medium scale megaripples (with approximately 10 m wavelength), part of a large contour-parallel bedform field apparently driven by the Labrador current. The field is locally flanked with sand ribbons (upper part of the sidescan image in Fig. 6-6-2). The seabed photos show that sediment on the megaripples (and likely also over the sand ribbons) are sand with abundant, highly turbative sand dollars and variable shell content. Photo 22 shows a current normal shelly band, oriented NW to SE, roughly normal to the southerly and southwesterly Labrador Current in this area. This is thought to be the edge of a megaripple trough. The shell content alternates from very low to moderate from photo to photo (photo 23 to 11 in Fig. 6-6-2 and also see all photos in Appendix 3). This indeed corresponds with the higher concentration of shells in megaripple troughs versus megaripple flanks.

The van Veen grab of Station 39 was taken at adjusted planned station C3 and the target was megaripples. The recovered sample shows well sorted fine to medium sand (station 39 photo in Fig. 6-6-2). The IKU grab of Station 40 was taken at adjusted planned station C3 with

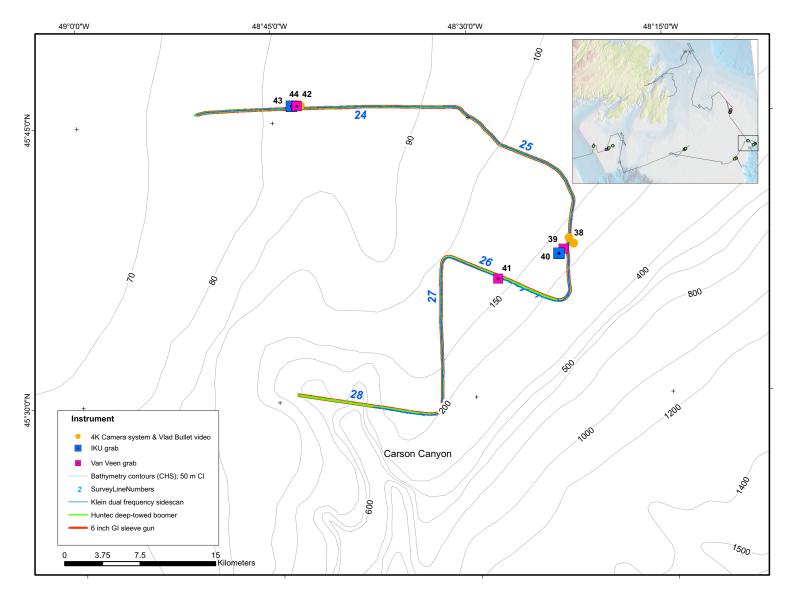


Fig. 6-6-1: Location map of all stations and survey lines of the Carson Canyon study area on southeastern Grand Bank.



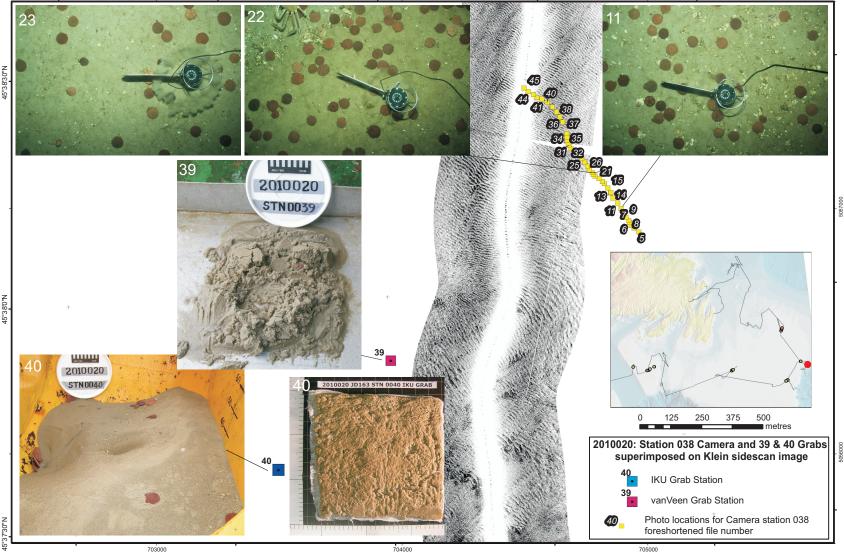


Fig. 6-6-2 Selected seabed photographs from camera Station 38 and deck photographs of grab samples from Stations 39 and 40 north of Carson Canyon, in about 180 m water depth, superimposed on USBL positioned Klein sidescan data. Location is red dot on index map.

megaripples as the target. The sample photo in Fig. 6-6-2 shows that the top 20cm is clean, buff coloured medium sand with a few sand dollars. An anoxic layer is found at the bottom 20 to 30cm. The resin peel taken from the IKU grab (Fig. 6-6-2) displays low-angle stratification that extends as deep as 15-20 cm below sediment surface. This could represent a mobile sediment layer produced by the migration of megaripples during the last major sediment transport event. A van Veen grab was taken at Station 41 at the adjusted planned station C2 (Fig. 6-6-1). The target was sand ribbon in a field of well developed megaripples (Fig. 6-6-3). The sample was taken within a large megaripple field, driven by the Labrador Current. The perturbations on the 2-D megaripples are likely sand ribbons. The feature on the left is not parallel to the others and may be a modified iceberg scour. The recovered sediment was clean fine to medium sand with few pebbles (see photo in Fig. 6-6-3).

The second sampling site was located about 30 km northwest of the first sampling site described above (Fig. 6-6-1). A camera station (Station 42), a IKU grab (Station 43) and a van Veen grab (Station 44) were conducted at this sampling site (Figs. 6-6-4). The 4K camera transect of Station 42 followed an east to west drift that started at 163/181801 and stopped at 163/184532. A total of 24 still photos (Fig. 6-6-4; Appendix 3) were taken with the video data. The targets were were large wave ripples, megaripples and bands of sandwaves. The Klein sidescan data in Fig. 6-6-4 demonstrates that the seafloor is characterized by large curvilinear sand wave troughs (dark tone) and thin barchan-like crests at this sampling site. Careful examination of the sidescan data (not shown in figure) also shows occurrence of large wave ripples in sand wave troughs. Orientations of barchan-like features suggest a SW dominant flow direction, perhaps reflecting the dominant direction of the Labrador Current in this area. Seabed photos from the camera transect confirm that the dark tones on the sidescan arise from the very shelly but also pebbly seabed (photos 8 and 30), while the light are sand with very little shell, except for sand dollars (photo 18). This is further substantiated by the collected grab samples. The van Veen grab of Station 44 was obtained from a sand wave flank (Fig. 4-6-4) and shows clean well sorted medium sand with sand dollars and minor shell hash. The IKU grab of Station 43 (Fig. 6-6-5), in contrast, was collected in a sand wave trough and demonstrates that sediment in sand wave troughs is medium sand with abundance of pebbles and shell hash. A peel was attempted but failed due to the high content of shells. But the cross-section (Fig. 6-6-5) shows the dominance of shells at the seabed, a ca. 15 cm homogeneous but shelly sand layer over another shelly lag. This suggests a mobile layer of at least 15 cm.

Five geophysical survey lines (lines 24-28, Appendix 2 and Fig. 6-6-1) were conducted in the Carson Canyon area. The objectives of these survey lines were to obtain new and repeat geophysical data for understanding bedform distribution and bedform mobility assessment, specifically to conduct repeat sidescan survey over bedforms of different types. Sub-bottom data were collected to establish the extent and transport directions of the large megaripple field feeding the canyon, to delineate Neogene structure and contacts, and to investigate the nature of possible Quaternary fill in the canyon head.

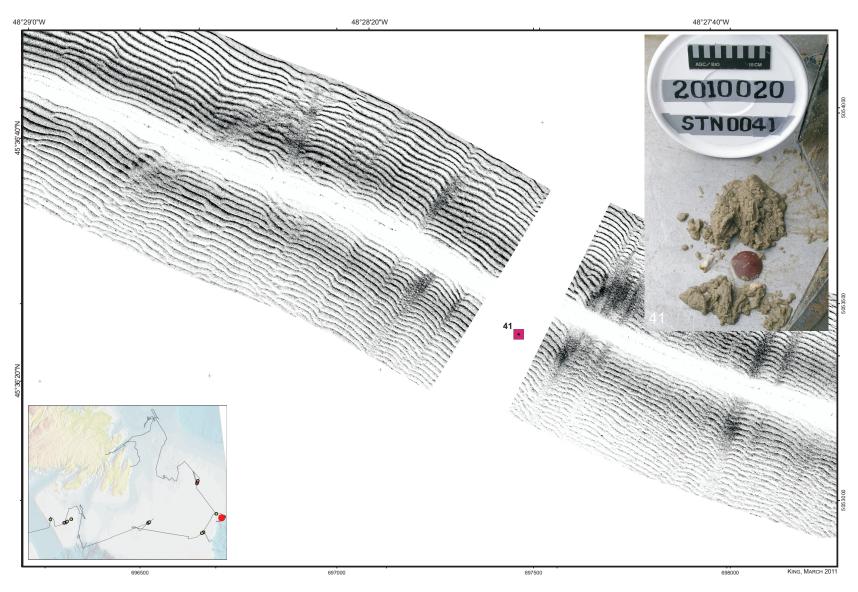


Fig. 6-6-3 Photograph of van Veen grab sample from Station 041, from the Carson Canyon area, in about 150 m water depth, superimposed on USBL positioned Klein sidescan data. This is within a large megaripple field, driven by the Labrador Current. Note the perturbations on the 2-D megaripples attaining a ribbon-like attribute. The feature on the left is not parallel to the others and may be a modified iceberg scour. Location is red dot on index map.

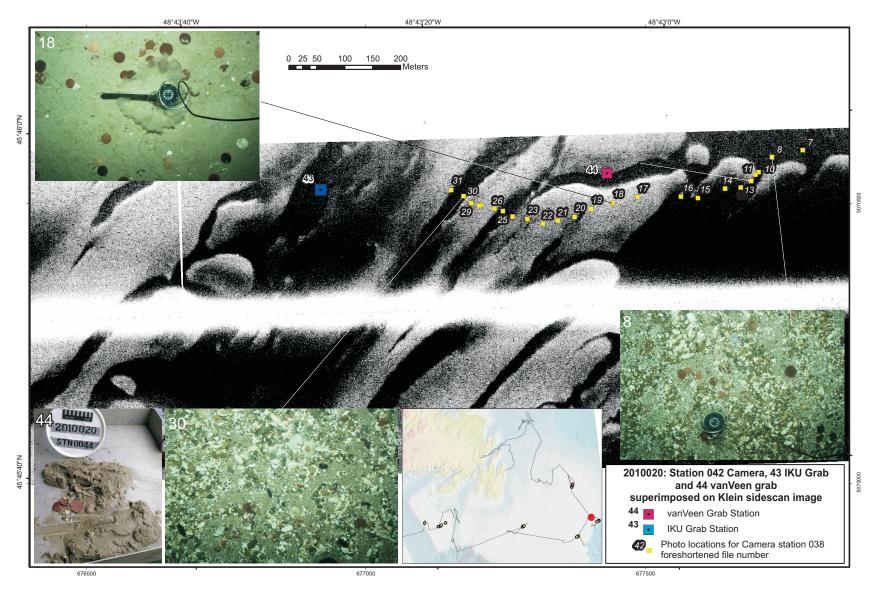


Fig. 6-6-4 Selected seabed photographs from camera Station 42 and a deck photograph of the grab sample from Station 44 northeast of Carson Canyon, in about 90 m water depth, superimposed on USBL positioned Klein sidescan data. Sampling results of Station 43 IKU grab are shown in the next figure. Location is red dot on index map.

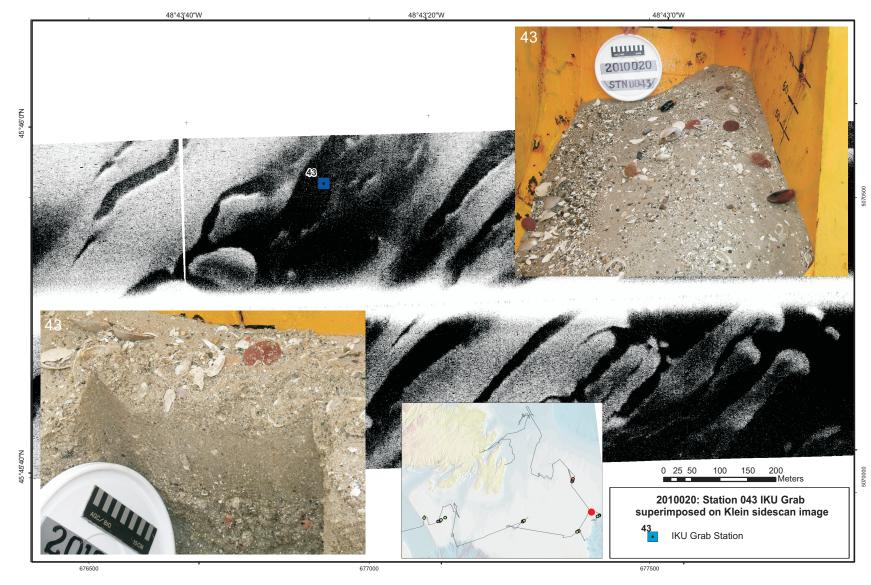


Fig. 6-6-5 Photographs of IKU grab sample from Station 043, northeast of Carson Canyon, in about 90 m water depth, superimposed on USBL positioned Klein sidescan data. The IKU sample and cross section show dominance of shells at the seabed, a ca. 15 cm homogeneous but shelly sand layer over another shelly lag. This suggests a mobile layer of at least 15 cm. Location is red dot on index map.

## 6.7 Geological and geophysical activities in Downing Basin area

This study area is in the east of Downing Basin on northeastern Grand Bank, about 240 km southeast of St. John's, in water depths of 80-100 m (Fig. 2-1). The area is in the westernmost Jeanne'darc basin area where oil is in production and significant natural gas sources have been established. Any potential shelf-crossing pipelines will start from this area. Seabed disturbance is low to moderate. There are various interesting seabed and bedform features. These include ice scour, cobbles, sandwaves, large wave ripples, and possibly megaripples. A total of 17 full geophysical survey lines (lines 29-39 and 44-50 of Appendix 2; Fig. 6-7-1), eight sampling and camera stations, and five piston cores were conducted in the Downing Basin area (Fig. 6-7-1). Ten Knudsen 3.5 and 12 KHz lines (lines 39a-43 and 51-56) were also collected in transit between coring stations (Appendix 2; Fig. 6-7-1).

A 4K camera transect was conducted at Station 45 and the targets were ice scour, cobbles, sandwaves, large wave ripples, and possibly megaripples (Appendix 1a). The transect followed a SW-NE drift that started at 164/120449 and stopped at 164/132448. A total of 76 still photos (Fig. 6-7-2; Appendix 3) were taken with the video data. This is at the site of repeat sidescan and new multibeam coverage (by GSCA, Gary Sonnichsen) over a modern iceberg scour (to the immediate left of the start of dredge station 47). Though not visible on the sidescan data collected in this mission, 3-D megaripples and other megaripples were identified on an earlier survey (Cruise 2001038). Seabed photos collected along the camera transect mostly show cobbles and pebbles of mixed lithologies with shell fragments (photos 48 and 70, Fig. 6-7-2). However, some photos show that the seabed in some patches was covered dominantly by shell hash with minor gravel (photo 32; also photos 27-35 and 40-42 in Appendix 3). This is the likely cause of the dark- and light-tone parches shown by the sidescan data in Fig. 6-7-2. Photos 29 and 42 in Appendix 3 indeed also show gravel large wave ripples with shell hash in their troughs.

A van Veen grab was collected at Station 46 and the targets were small megaripples and sand and cobbles on sandwaves. Fig. 6-7-2 suggests that the grab was likely collected from the floor of an iceberg scour. The recovered sample was sandy gravel (Fig. 6-7-2), and the larger gravel is greater than 4 cm and encrusted with barnacles. The IKU grab of Station 48 was collected over a dark-tone patch at the start of the camera transect (Fig. 6-7-2) and revealed that the seabed was covered with gravel lag over well sorted medium sand with fine shell hash throughout. An attempt of peel failed but the cross-section did not show any apparent vertical sedimentary structure.

The dredge sample of Station 47 was obtained at planned station NM4 and the aim was to collect boulders and cobbles towards a baseline for cosmogenic dating in the future (Appendix 1a). The dredge started at 164/141405 46.8459N 49.4926W in 81 m depth, and stopped at 164/142127 46.8457N 49.4898W. Sample recovered by the dredge was assorted cobbles and boulders up to 25cm (granite, shales, volcanics, burrowed carbonates and gneiss), some covered with lithothamnian and some larger boulders covered with barnacles (see photo in Fig. 6-7-2 and additional photos in Appendix 3). Lithological description was performed (Cameron and King). The dredge consists of the following:

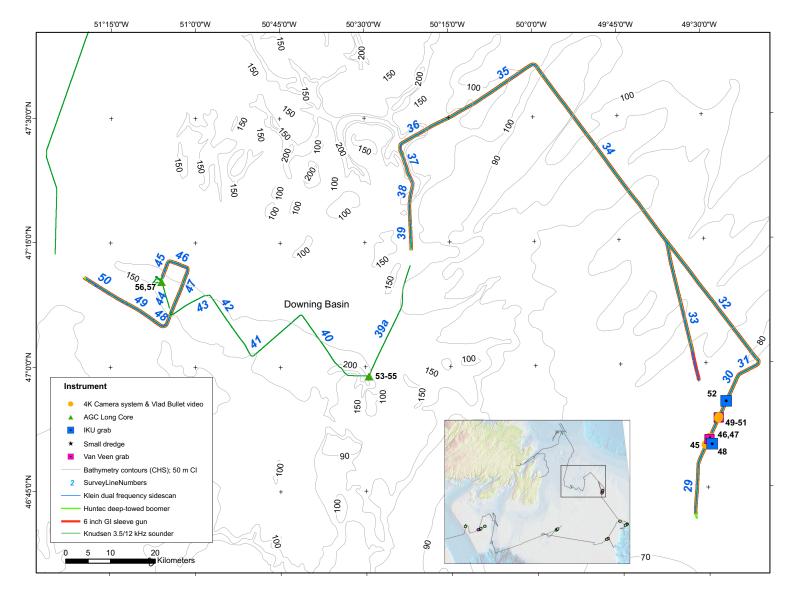


Fig. 6-7-1: Location map of all stations and survey lines of the Downing Basin study area on northeastern Grand Bank.

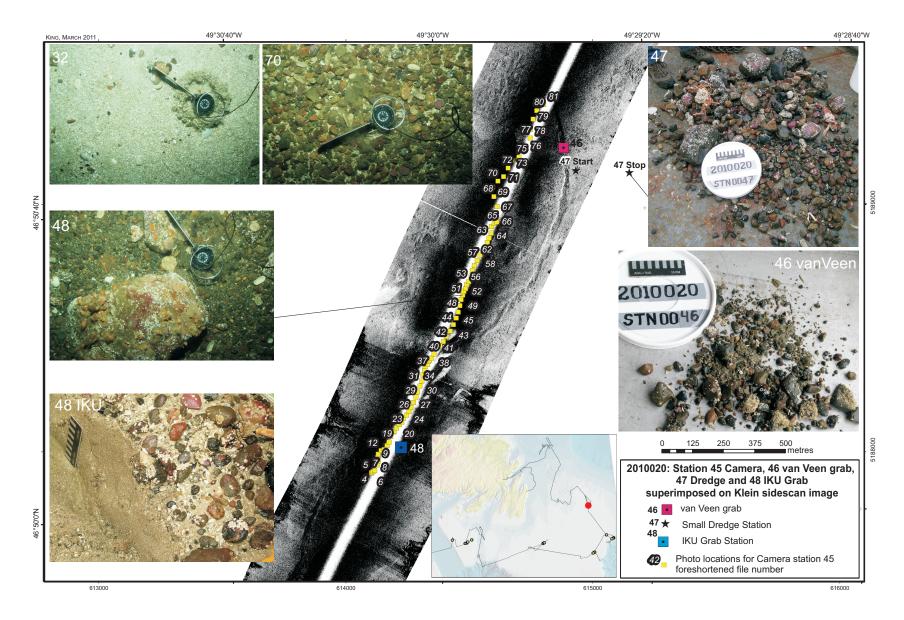


Fig. 6-7-2 Selected seabed photographs from camera Station 45 and deck photographs of grab samples from Stations46, 47 and 48 in Downing Basin area, in about 75 m water depth, superimposed on USBL positioned Klein sidescan data. Location is red dot on index map.

- 18 granites, pink, gray and one coarse grained, sub-rounded, 2 are large cobbles
- 1 limestone, sub-rounded
- 36 quartzites, sub-rounded to sub-angular, hard, 4 are large cobbles
- 2 conglomerated, metamorphosed, hard, sub-rounded, hard
- 1 intrusive mafic, dark green, hard
- 2 gneiss, large cobbles, hard

The entire dredge sample will be submitted for cosmogenic dating.

Two van Veen grabs and a camera transect were conducted at stations 49, 50 and 51 respectively (Figs. 6-7-1 and 6-7-3) to target small bedforms along the major transition from gravel to sand on a large sand ridge flank. A 4K camera transect at Station 51 followed a SW-NE drift that started at 164/172221 and stopped at 164/175421. A total of 37 still photos (Fig. 6-7-3 and Appendix 3) were taken with the video data. The objective was to image the gravelly lag deposit in the sand ridge trough and the transition to sandy sediment on the sand ridge flank. The photographs show a contiguous gravel lag with shell hash in the sand ridge trough in the south (photo 8), transitioning to patchy sand on the gravel (possibly small bedforms; photo 22), and then contiguous sand (> 1 m thickness on sub-bottom profiler) with occasional shells on the sand ridge flank (photos 29 and 32). Note the pebble in photo 32 is probably ice rafted. Examination of the complete list of photos in Appendix 3 (also photo description in Appendix 4) confirms this pattern, and further shows that the abrupt transition from gravel to sand starts from photo 24.

The van Veen grab of Station 49 was taken in the sand ridge trough (Fig. 6-7-3) and the recovered sample shows well sorted medium sand overlain by gravel lag (up to 10cm in size). Larger gravel particles are encrusted. In contrast, van Veen grab of Station 50 was on the sand ridge flank and the recovered sample shows clean, well sorted medium sand with little gravel (see photo in Fig. 6-7-3).

An IKU grab was taken at Station 52 that is about 4 km to the northeast of the van Veen grab Station 51 (Fig. 6-7-1). The planned target was 3D megaripples, though the sidescan data collected from this mission did not show this bedform feature. This station is still over the light-tone sand ridge sand and the recovered sample was indeed medium to coarse buff colour sand with very few gravel and shell fragments (Fig. 6-7-4a). A box core for resin peels was collected. The cross-section left from the box core shows that the top 20 cm is medium to coarse sand that is overlain a coarser layer with shells and pebbles from 20 to 48 cm (Fig. 6-7-4b). The texture and sedimentary structure in the resin peel (Fig. 6-7-4c) confirm this vertical variation: the top 15-20 cm shows low-angle stratifications that is overlain on a shelly and gravelly lag layer. This structure likely suggests a mobile sediment layer at least 20 cm thick, produced from the last major sediment mobilization event in this area.

Three attempts were made to obtain piston cores at the planned station DB1 (Stations 53-55, Fig. 6-7-1). The target was lower facies of the glacimarine sediment to date deglaciation of the basin. Station 53 was taken at 46.980630 -50.489720 in 160 m depth (Fig. 6-7-5). It recovered only 39 cm core length (Appendix 1c). Station 54 was a second attempt made at the planned station DB1. The core was taken at 46.980892 -50.490302 and recovered 48 cm core length. A third and final

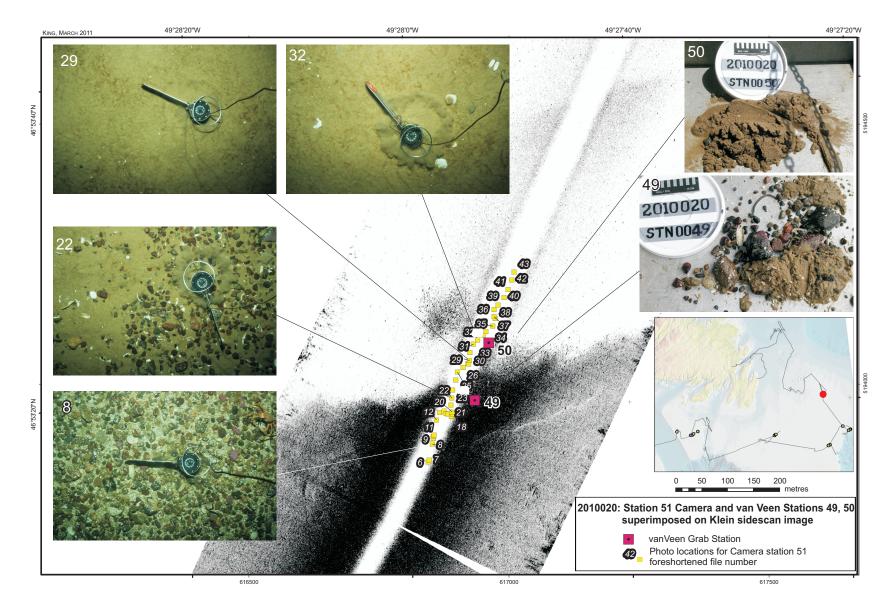


Fig. 6-7-3 Selected seabed photographs from camera Station 51 and deck photographs of grab samples from Stations 49 and 50 in Downing Basin area, in about 75 m water depth, superimposed on USBL positioned Klein sidescan data. Location is red dot on index map.

80

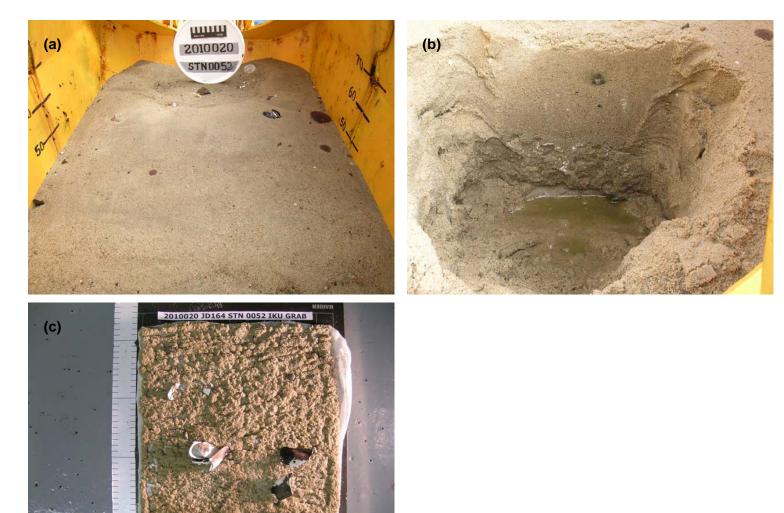


Fig. 6-7-4 Photographs of (a) IKU grab sample, (b) cross-section profile, and (c) epoxy peel from Station 52 on NE Grand Bank.

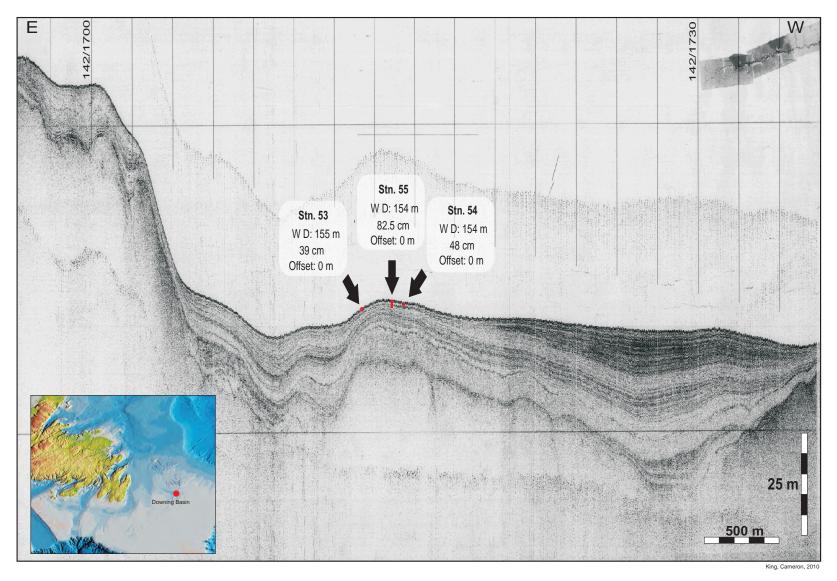


Fig. 6-7-5 Cruise 77011 Huntec profile across 2010020 Piston core stations 53, 54 & 55. The target was lower facies of the glacimarine sediment, to date deglaciation of the basin. A persistent sand lag prevented sufficient penetration of the corer.

attempt was made at Station 55, taken at 46.980945 -50.490179. A slightly longer core of 82.5 cm length was recovered. Examination of the recovered core of Station 53 indicates fine sand with fine sandy mud. This persistent sand lag prevented sufficient penetration of the corer at these stations.

Two piston core stations (Stations 56 and 57) were conducted at the planned station DB5 with the objectives of coring the base of late glacial maxima and till tongue in Downing Basin area (Fig. 6-7-1). Station 56 was taken at 47.172116 -51.099792 in 168 m depth and recovered 64 cm long core of fine muddy sand (Fig. 6-7-6 and Appendix 1c). A second attempt was made to obtain longer core at Station 57 taken at 47.172677 -51.100111 in 163 m depth. Again the sandy lag prevented core penetration and only 10 cm core was recovered at the second attempt.

A total of 17 full geophysical survey lines (lines 29-39 and 44-50 of Appendix 2; Fig. 6-7-1), were obtained in the Downing Basin area. The objective of lines 29-39 was to conduct repeat sidescan survey over bedforms in a rare area where surveying had been conducted (for iceberg scour characterization). Sub-bottom surveys were to obtain data from an area with none, to delineate Meso/Cenozoic stratigraphic contacts and structure for mapping purposes, to delineate the moribund sand ridges and their relationship to large erosional valleys cut into the bedrock, and to differentiate sand ridge sands from bedrock features where existing surficial map lacks credibility. Additional goals of lines 33-39 were to follow the thalwegs of glacimarine-filled tunnel valleys for mapping purposes and to establish potential coresites for much-lacking chronology.

The objectives of lines 44-50 were to identify glacial unit stratigraphic contacts, to identify coring sites, to delineate shallow gas and paleo-current moats, and to establish the geometry of deposits from a late glacial re-advance in the western end of the basin.

## 6.8 Geophysical survey and coring in Trinity Trough and Trinity Bay areas

Trinity Trough is a broad erosional trough on the southern margin of the Northeast Newfoundland Shelf, extending from the coast of central Newfoundland to the shelf edge at approximately 250 m depth (Fig. 2-1). Trinity Bay is a large bay on the northeastern coast of Newfoundland, about 70 km northwest of St. John's. The geohazard and geologic framework issues in these study areas include glacial mud distribution, the morphology and deposit of a large glacial catastrophic failure of the distal Trinity Moraine face, disconformities due to ice scours and possible flood horizons, extend and age of till tongues, bedrock and Quaternary sediment stratigraphy and fjord hazards in Trinity Bay. Four airgun and Knudsen survey lines (lines 58-61), one airgun and Huntec survey line (line 77), and twenty Knudsen 3.5 and 12 KHz lines (lines 51-57, 62-66, 69-71, and 72-76) were conducted in these study areas (Appendix 2; Fig. 6-8-1; Fig. 6-8-2). Five piston cores were also collected, two in Trinity Trough and three in Trinity Bay (Appendix 1; Figs. 6-8-1 and 6-8-2).

Two piston core stations (Stations 58 and 59) were conducted in the Trinity Trough area (Fig. 6-8-1). The location and penetration of these cores are superimposed on seismic profiles in Figs. 6-

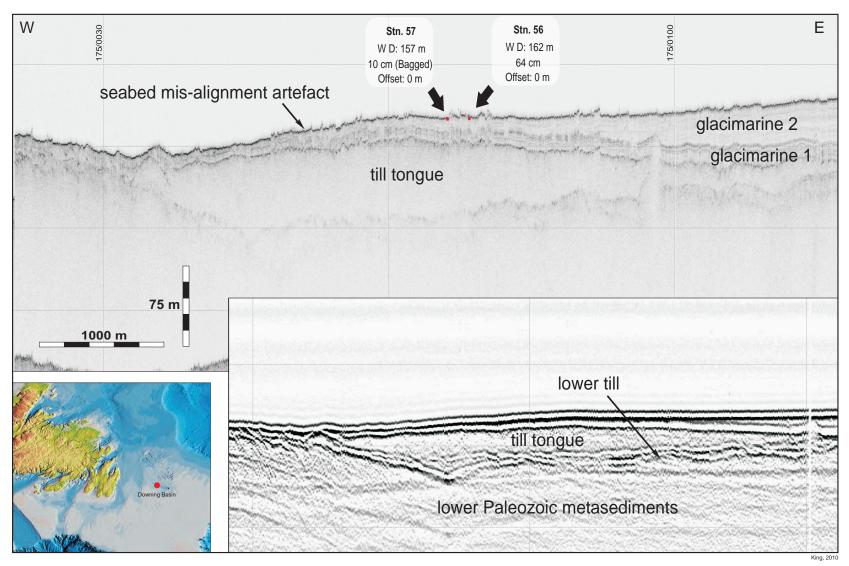


Fig. 6-7-6 Cruise 2003033 Huntec (upper) and Sleevegun (lower, same extent) profiles across 2010020 stations 56 & 57. The sleevegun shows eastward dipping Lower Paleozoic strata with a thin overlying till followed by a thick till wedge (till tongue). The Huntec profile show two stratified glacimarine units over the till tongue. The sampling objective was to reach the till tongue for C-14 dating purposes. A sandy lag at the seabed hampered penetration on both coring attempts.

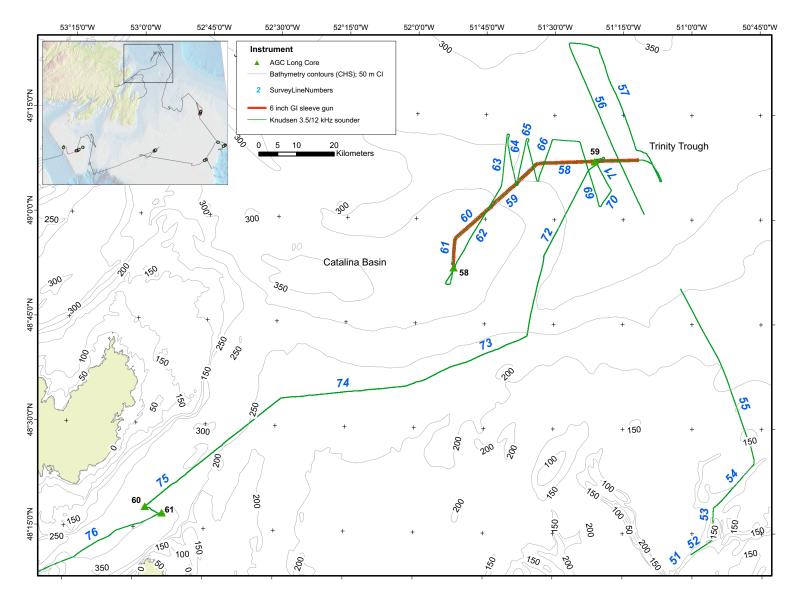


Fig. 6-8-1: Location map of piston core stations and survey lines of the Trinity Trough study area on Northeastern Newfoundland Shelf.

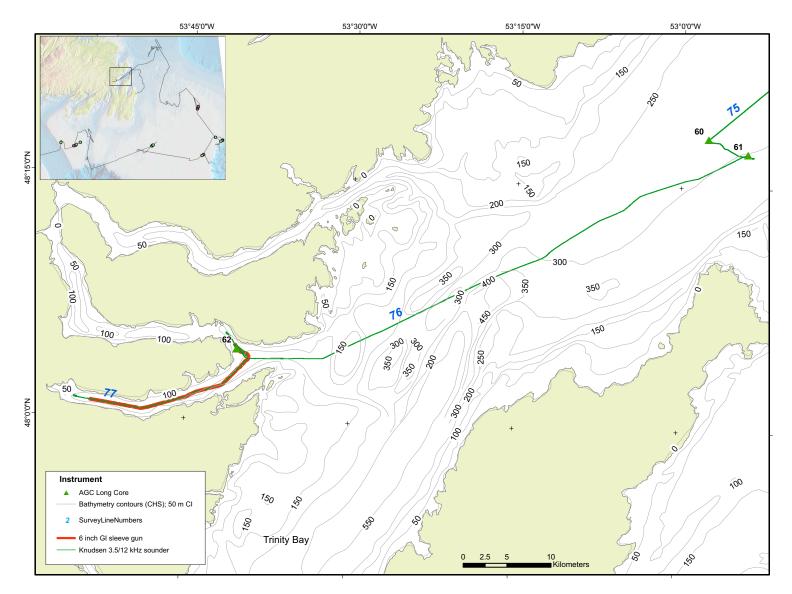


Fig. 6-8-2: Location map of piston core stations and survey lines of the Trinity Bay study area on the northeastern coast of Newfoundland.

8-3 and 6-8-4. The piston core of Station 58 was collected at 48.8836 -51.8637 in 346 m depth (Fig. 6-8-3) and the targets were disconformity at 2.5m with ice scours and possible flood horizon and till at a deeper level. The seismic profile shows eastward dipping Lower Paleozoic strata beneath a thick till and blanket of glacimarine sediment in two facies. The buried iceberg-scoured horizon may mark a significant calving event and the coring objective was to reach it for C-14 dating purposes. A total of 568.5 cm core was recovered (Appendix 1c). The core was barren of macro fossil material. The piston core of Station 59 was collected at 49.1398 -51.3536 in 331 m depth (Fig. 6-8-4) and the objective here was to sample the glacimarine section distal to a mass failure on the moraine, to confirm findings from a 89006 core, and for further C-14 dating. A total of 689 cm core was recovered (Appendix 1c).

Three piston core stations were conducted in the Trinity Bay area, two at the mouth of Trinity Bay and one in Random Sound of central Trinity Bay (Fig. 6-8-2). The location and penetration of the piston cores of Stations 60 and 61 are superimposed on Huntec seismic profile in Fig. 6-8-5. The objective here was to sample the glacimarine section for C-14 dating purposes in order to reconstruct the pattern and chronology of deglaciation. The two different glacimarine pulses demonstrated by the seismic data in Fig. 6-8-5, reflect changes which may represent advances or changes in provenance. Other cores in the area show red and grey alternations suspected to represent sediment source out of Trinity Bay and more directly from the western (central) Newfoundland ice cap. The piston core of Station 60 was collected at 48.3002 -52.9600 in 280 m depth (Fig. 6-8-5). A total of 724 cm core was recovered (Appendix 1c). The piston core of Station 61 was collected at 48.2854 -52.8993 in 312 m depth (Fig. 6-8-5). A total of 452.5 cm core was recovered at this station (Appendix 1c).

The last sampling activity of the expedition was the piston coring at Station 62 in Random Sound of central Trinity Bay. Fig. 6-8-6 demonstrates the location and penetration of the piston core at this station superimposed on the 3.5 kHz seismic profile. The objective was to sample the glacimarine section both for provenance and for C-14 dating purposes to aid the reconstruction of the deglaciation pattern. The piston core station was conducted at 48.0728 -53.6725 in 156 m depth. A total of 505.5 cm core was recovered (Appendix 1c).

As shown by Figs. 6-8-1 and 6-8-2, four airgun and Knudsen survey lines, one airgun and Huntec survey line (line 77), and twenty Knudsen 3.5 and 12 KHz lines were conducted in the Trinity Trough and Trinity Bay areas (Appendix 2). The objective of the four airgun and Knudsen survey lines (lines 58-61) was to establish the morphology and deposit of a large glacial catastrophic failure of the distal Trinity Moraine face and stratigraphic relations with glacimarine sediment there. Knudsen survey lines 51-57 were collected in transit to establish glacial mud distribution and relations for potential coring sites proximal to the Downing Moraine complex. The Knudsen survey lines 62-66 and 69-71 (lines 67 and 68 were skipped) were collected in the outer Trinity Trough area in transits between coring stations as the storm conditions limited other sampling and full geophysical survey operations. Knudsen survey lines 72 to 75 were collected during transit from Trinity Trough to Trinity Bay (Fig. 6-8-1). The purpose was to cross large moraine field to establish metrics. Knudsen survey line 76 and the airgun and Huntec survey line 77 were collected in Trinity Bay (Fig. 6-8-2). The objectives were to seek storm shelter, yet be poised for planned coring, to augment bedrock and Quaternary sediment stratigraphy, to

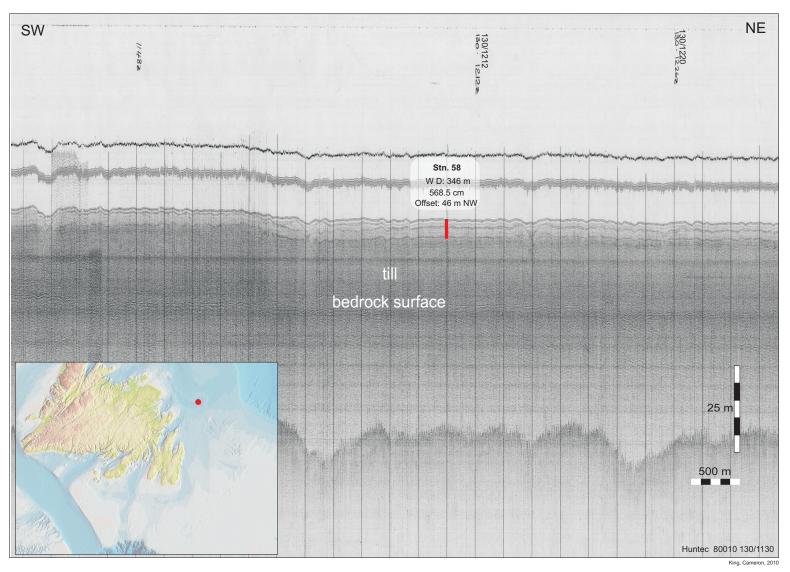


Fig. 6-8-3 Cruise 2003033 Huntec (upper) and sleevegun (lower, same extent) profiles across 2010020 Station 58 in Trinity Trough area. The profile shows eastward dipping Lower Paleozoic strata beneath a thick till and blanket of glacimarine sediment in two facies. The buried iceberg-scoured horizon may mark a significant calving event and the sampling objective was to reach it for C-14 dating purposes. The core was barren of macro fossil material.

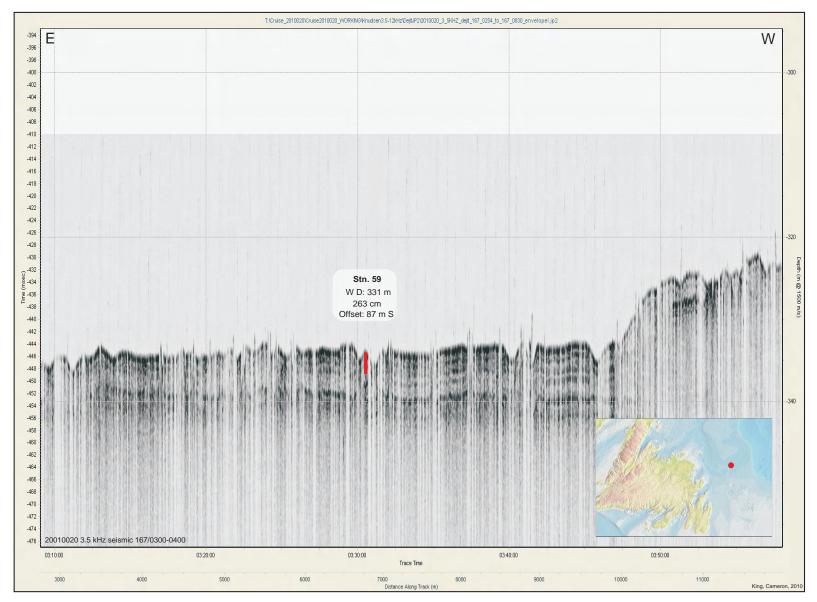


Fig. 6-8-4 Location of piston core 59 on 3.5 kHz seismic traverse outside the Trinity Moraine. The objective here was to sample the glacimarine section distal to a mass failure on the moraine, to confirm findings from a 89006 core and for further C-14 dating.

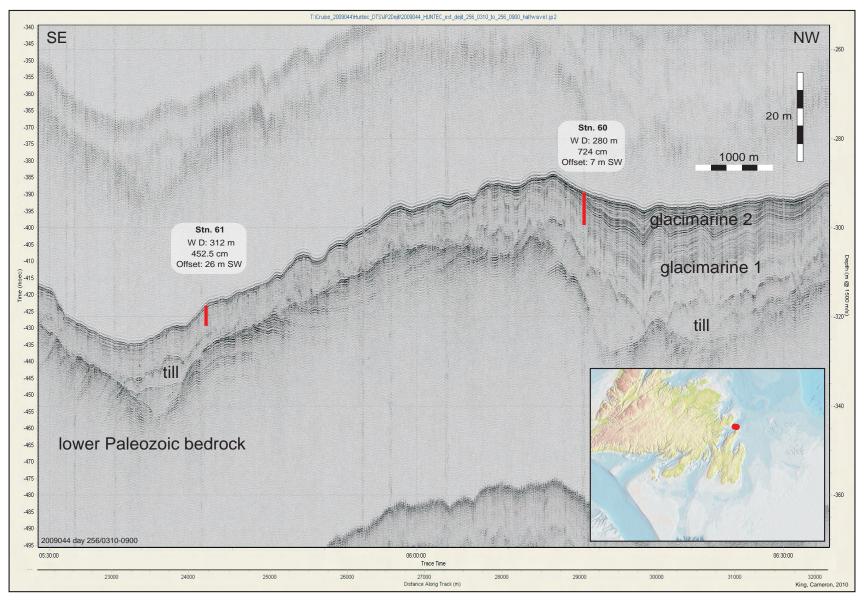


Fig. 6-8-5 Location of piston cores 60 and 61 across a Cruise 2009044 Huntec boomer seismic traverse at the mouth of Trinity Bay. The objective here was to sample the glacimarine section for C-14 dating purposes in order to reconstruct the pattern and chronology of deglaciation. The two different glacimarine pulses reflect changes which may represent advances or changes in provenance. Other cores in the area show red and grey alternations suspected to represent sediment source out of Trinity Bay and more directly from the western (central) Newfoundland ice cap.

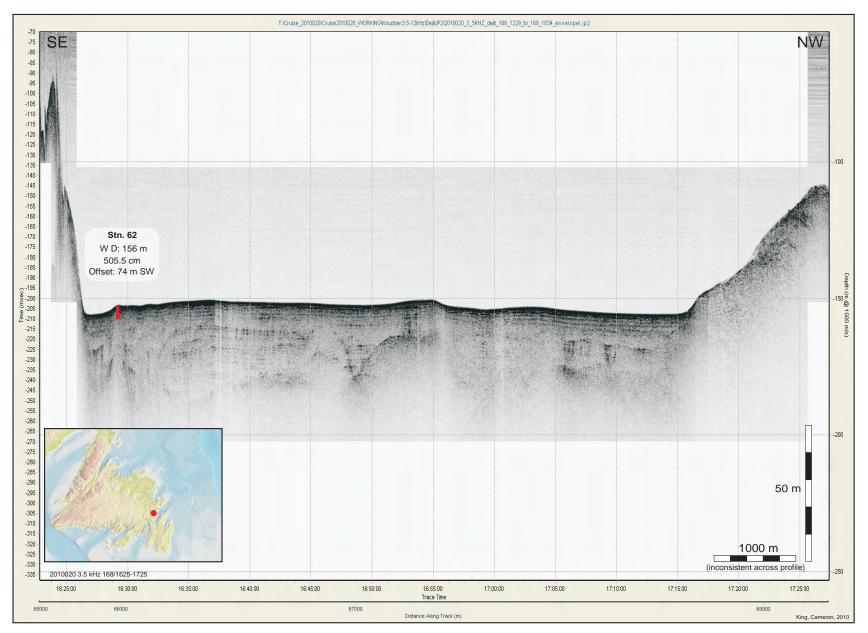


Fig. 6-8-6 Location of piston core 62 on 3.5 kHz seismic traverse in Random Sound of central Trinity Bay. The objective here was to sample the glacimarine section both for provenance (mainly colour) and for C-14 dating purposes, mainly to aid reconstruction of the deglaciation pattern.

investigate nearshore conditions with respect to typical fjord hazards, and to site a core for addressing outer Trinity Bay glaciamarine provenance questions.

## Acknowledgments

We would like to thank Captain William Naugle and the crew of Hudson for their excellent assistance and cooperation on this cruise. We also would like to thank Kate Jarrett for her assistance in getting the data and samples of this expedition into GSCA database and curation. This report benefitted from the review by Calvin Campbell. This project is jointly supported by GSC Offshore Geoscience Program (through the Geoscience for East Coast Offshore Developments project) and the Program of Energy Research and Development (PERD, through the Seabed Disturbance and Bedform Mobility as Constraints to Shelf-Crossing Pipelines project).

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Li, M. Z. and King, E. L., 2006. Hudson 2004037 Cruise Report: Geohazards in the Sable Island Bank Area, Scotian Shelf, Open File 5077, 117 p.

Li, M. Z. and King, E. L., 2009. Project 2.21 Seabed disturbance and bedform mobility - project progress, initial results and 09-10 activities. Presentation at 2009 PERD Pipeline Program meeting, Calgary, Feb 26-27, 2009.

Appendix 1: List of (a) all stations, (b) camera stations, and (c) grab and core stations obtained in Hudson 2010020.

Appendix 1a: List of all stations.

						Depth	
Station Num Sta	tation Type	<b>Operation Comment</b>	Day_UTC	Latitude	Longitude	Corrected Geogrphic Location	Comment
							Planned station SP1; sediment texture and bedform types on
	nera and video	start of transect	156200355	45.875689	-56.648485		western St. Pierre Bank
0001 4K Cam	nera and video	end of transect	156201315	45.875780	-56.647511	Grand Banks of Newfoundland - St. Pierre Bank	
							Planned station SP2; sediment texture and grain size on
0002 Van Vee	en grab	on bottom	156203229	45.874660	-56.648571	68 Grand Banks of Newfoundland - St. Pierre Bank	western St. Pierre Bank
							Planned station SP3 across sandwaves with superimposed
	nera and video	start of transect	157101707	45.880043	-55.652867	73 Grand Banks of Newfoundland - St. Pierre Bank	megaripples on eastern St. Pierre Bank
0003 4K Cam	mera and video	end of transect	157102816	45.880074	-55.649875	Grand Banks of Newfoundland - St. Pierre Bank	
00041/1 1/	<b>-</b> -	an hattan	457405004	45 070007	55 050404	74 Orand Danks of New found and Ot Diama Dank	Planned station SP3 at various morphological locations over
0004 Van Vee	en grab	on bottom	157105631	45.879887	-55.653464	74 Grand Banks of Newfoundland - St. Pierre Bank	sandwaves and megaripples on eastern St. Pierre Bank.
		an hattan	457440444	45.070500		71 Grand Banks of Newfoundland - St. Pierre Bank	Planned station SP3 at various morphological locations over
0005 Van Vee	en grab	on bottom	157113444	45.879583	-55.652687	7 I Grand Banks of Newfoundiand - St. Pierre Bank	sandwaves and megaripples on eastern St. Pierre Bank.
	on arch	on bottom	157114843	45.879822	-55.648548	72 Grand Banks of Newfoundland - St. Pierre Bank	Planned station SP3 at various morphological locations over sandwaves and megaripples on eastern St. Pierre Bank.
0006 Van Vee	engrab		157114045	45.079022	-33.040340		Planned station SP3 at various morphological locations over
0007 Van Vee	on arab	on bottom 2nd attempt	157122606	45.879373	-55.651258	71 Grand Banks of Newfoundland - St. Pierre Bank	sandwaves and megaripples on eastern St. Pierre Bank.
	engrab		137 122000	45.079575	-33.031230		planned station SP4 over sandwaves with 3D megaripples in
0008 4K Cam	nera and video	start of transect	157135722	45.805558	-55.854701	57 Grand Banks of Newfoundland - St. Pierre Bank	the troughs of sandwaves
	nera and video	end of transect	157140723	45.805673	-55.852093	Grand Banks of Newfoundland - St. Pierre Bank	
			107 1407 20	40.00007.0	-00.002000		planned station SP6 over large wave ripples near an isolated
0009 4K Cam	nera and video	start of transect	157160048	45.766612	-55.902885	56 Grand Banks of Newfoundland - St. Pierre Bank	sandwave
	nera and video	end of transect	157161039	45.767086	-55.902328	Grand Banks of Newfoundland - St. Pierre Bank	
			101 101000	10.101000	00.002020		planned station SP6 over large wave ripples near an isolated
0010 Van Vee	en grab	on bottom	157164508	45.765621	-55.903782	56 Grand Banks of Newfoundland - St. Pierre Bank	sandwave
	Join grad						planned station SP4 over sandwaves with 3D megaripples in
0011 Van Vee	en grab	on bottom 3rd attempt	157175545	45.805370	-55.854705	58 Grand Banks of Newfoundland - St. Pierre Bank	the troughs of sandwaves
0012 Van Vee	en grab	on bottom	157191519	45.755638	-55.993724	56 Grand Banks of Newfoundland - St. Pierre Bank	planned station SP5 over 2D megaripples
	nera and video	start of transect	157193636	45.754987	-55.993085	56 Grand Banks of Newfoundland - St. Pierre Bank	planned station SP5 over 2D megaripples
	nera and video	end of transect	157194625	45.755209	-55.992440	56 Grand Banks of Newfoundland - St. Pierre Bank	
							planned station PC1 with the objective of penetrating and
							sampling the condensed/unconformable section ES and the
0014 AGC Lo	ong Core	on bottom	158124852	46.270354	-55.220969	168 Grand Banks of Newfoundland - St. Pierre Basin	glacimarine deposit beneath
							planned station PC3 with the objective of characterizing the red
0015 AGC Lo	ong Core	on bottom	158163353	46.317010	-55.203055	166 Grand Banks of Newfoundland - St. Pierre Basin	mud and underlying unit which may be "soft" till
0016 Small dr	0	start of transect	158200311	46.227814	-55.096737	146 Grand Banks of Newfoundland - St. Pierre Basin	planned station DR-S to obtain sample from till at this location
0016 Small dr	Iredge	end of transect	158201545	46.228167	-55.097508	149 Grand Banks of Newfoundland - St. Pierre Basin	
							planned station PC4 with the target of sandy terrace on canyon
0017 AGC Lo	ong Core	on bottom	159111847	44.897929	-55.124634	1866 Grand Banks of Newfoundland - Halibut Channel Fan	overbank
							planned station PC5 with the target of levee crest on canyon
0018 AGC Lo	ong Core	on bottom	159151308	44.900785	-55.106668	1756 Grand Banks of Newfoundland - Halibut Channel Fan	overbank
	_						planned station PC6 with the target of levee on canyon
0019 AGC Lo	ong Core	on bottom	159184106	44.902588	-55.101016	1786 Grand Banks of Newfoundland - Halibut Channel Fan	overbank
0000 44 0		start of the set of	100100510	45 0 4750	F4 000740		planned station CB7 targeting a variety of bedforms including
	nera and video	start of transect	160100546	45.647521	-51.996716		large wave ripples, megaripples, and sandwaves
	nera and video	end of transect	160105132	45.651683	-51.987001		slanned station CD10 such asystems
0021 IKU gral		on bottom	160120947	45.647461	-51.990590		planned station CB12 over sandwaves
0022 IKU gral		on bottom 3rd attempt	160135044	45.650601	-51.990307		planned station CB10 that also targeted sandwaves
0023 Van Vee	en grab	on bottom 2nd attempt	160150238	45.651333	-51.988095	95 Grand Banks of Newfoundland - Central Grand Bank	planned station CB11 and the target was large wave ripples

						Depth		
Station Num	Station Type	<b>Operation Comment</b>	Day_UTC	Latitude		orrected	Geogrphic Location	Comment
0024	Van Veen grab	on bottom	160154227	45.647854	-51.994796	100	Grand Banks of Newfoundland - Central Grand Bank	planned station CB8 and the target was megaripples
0025	Van Veen grab	on bottom	160161415	45.647773	-51.994307	100	Grand Banks of Newfoundland - Central Grand Bank	planned station CB9 that also targeted megaripples
	-							planned station CB1S/CB1E that targeted megaripples,
0026	4K Camera and video	start of transect	160170449	45.672205	-51.946704	89	Grand Banks of Newfoundland - Central Grand Bank	sandwaves and possibly large wave ripples
0026	4K Camera and video	end of transect	160182055	45.678023	-51.926222	94	Grand Banks of Newfoundland - Central Grand Bank	
0027	Van Veen grab	on bottom	160185241	45.671166	-51.945293	90	Grand Banks of Newfoundland - Central Grand Bank	planned station CB5 and the target was large wave ripples
0028	Van Veen grab	on bottom 2nd attempt	160193220	45.672930	-51.942268	92	Grand Banks of Newfoundland - Central Grand Bank	at the planned station CB4 and the target was megaripples
0029	Van Veen grab	on bottom	160195512	45.677869	-51.927901	99	Grand Banks of Newfoundland - Central Grand Bank	at the planned station CB3 and the target was sandwave flank
0030	AGC Long Core	on bottom	161104412	45.509532	-52.723920	126	Grand Banks of Newfoundland - Whale Deep	planned station PC7; the target was glacimarine in latest event
	Shark Camera	start of transect	162124249	45.192447	-49.414202	76	Grand Banks of Newfoundland - Lilly Canyon	planned station L1S/L1E and targets were sandwaves, large wave ripples, and pits.
0031	Shark Camera	end of transect	162131557	45.196543	-49.404058		Grand Banks of Newfoundland - Lilly Canyon	
0032	Van Veen grab	on bottom 2nd attempt	162151202	45.195972	-49.405985	74	Grand Banks of Newfoundland - Lilly Canyon	At the added station 162VV-1; Target was large wave ripples identified at 13:08 of the Shark Marine video
								At the added station 162VV-2; Target was megaripples
0033	Van Veen grab	on bottom 2nd attempt	162155847	45.194309	-49.409698	73	Grand Banks of Newfoundland - Lilly Canyon	identified at 12:57 of the Shark Marine video
0034	IKU grab	on bottom	162161839	45.195299	-49.407361	74	Grand Banks of Newfoundland - Lilly Canyon	At the added station 162IKU-1; Target was sandwave trough identified at 13:05 of the Shark Marine video
0035	4K Camera and video	start of transect	162174344	45.165699	-49.489906	73	Grand Banks of Newfoundland - Lilly Canyon	planned station L2S/L2E; Targets were megaripples and pits.
0035	4K Camera and video	end of transect	162182807	45.168511	-49.480204		Grand Banks of Newfoundland - Lilly Canyon	
0036	IKU grab	on bottom	162184716	45.167631	-49.484008	74	Grand Banks of Newfoundland - Lilly Canyon	At the added station 162IKU; Target was gravel patches and megaripples determined from the video data of Station 35
0037	Van Veen grab	on bottom	162193649	45.168566	-49.481630	74	Grand Banks of Newfoundland - Lilly Canyon	At the added station 162VV; Target was sandy patches over megaripples determined from the video data of Station 35
								planned station C1S/C1E; Targets were high amplitude 2D
0038	4K Camera and video	start of transect	163120016	45.635608	-48.370290	183	Grand Banks of Newfoundland - Carson Canyon	megaripples, sand ribbons and transition to 3D megaripples
0038	4K Camera and video	end of transect	163124044	45.641000	-48.375990		Grand Banks of Newfoundland - Carson Canyon	
0039	Van Veen grab	on bottom	163144856	45.630999	-48.383384	175	Grand Banks of Newfoundland - Carson Canyon	At adjusted planned station C3 (C3Adj); Target was megaripples
0040	IKU grab	on bottom	163151350	45.627130	-48.389429	175	Grand Banks of Newfoundland - Carson Canyon	At adjusted planned station C3 (C3Adj); Target was megaripples
0041	Van Veen grab	on bottom	163162903	45.606280	-48.467760	157	Grand Banks of Newfoundland - Carson Canyon	At the adjusted planned station C2 (C2Adj); Target was sand ribbon
						. 51		planned station C4S/C4E; Targets were large wave ripples,
0042	4K Camera and video	start of transect	163181801	45.765912	-48.713688	94	Grand Banks of Newfoundland - Carson Canyon	megaripples and bands of sandwaves
	4K Camera and video	end of transect	163184532	45.765701	-48.722143	54	Grand Banks of Newfoundland - Carson Canyon	
0012								planned station C5; Target was large wave ripples and
0043	IKU grab	on bottom	163191107	45.765622	-48.724760	94	Grand Banks of Newfoundland - Carson Canyon	megaripples in sandwave trough
	Van Veen grab	on bottom 2nd attempt	163195050	45.765729	-48.718253		Grand Banks of Newfoundland - Carson Canyon	planned station C6; Target was sandwave flank
	4K Camera and video	start of transect	164120449	46.835075	-49.503787		Grand Banks of Newfoundland - N.W. of Downing Basin	planned station NM3S/NM3E; Targets were ice scour, cobbles, sandwaves, large wave ripples, and possibly megaripples
0045	4K Camera and video	end of transect	164132448	46.850531	-49.492706		Grand Banks of Newfoundland - N.W. of Downing Basin	
0046	Van Veen grab	on bottom 2nd attempt	164135618	46.846447	-49.493107	81	Grand Banks of Newfoundland - N.W. of Downing Basin	planned station NM4; Targets were small megaripples, sandwaves and cobbles

	Depth											
Station Num	Station Type	<b>Operation Comment</b>	Day_UTC	Latitude	Longitude	Corrected	Geogrphic Location	Comment				
								planned station NM4; The aim was to collect boulders and				
0047	Small dredge	start of transect	164141405	46.845863	-49.492580	81	Grand Banks of Newfoundland - N.W. of Downing Basin	cobbles towards a baseline for cosmogenic dating in the future				
0047	Small dredge	end of transect	164142127	46.845749	-49.489755		Grand Banks of Newfoundland - N.W. of Downing Basin	a la sua a di séculta di batta di Tanan é a sé la 10 di sub di sa 10 si di seculta si di seculta si				
0048	IKU grab	on bottom	164150114	46.835900	-49.502136	81	Grand Banks of Newfoundland - N.W. of Downing Basin	planned station NM5; Target not initially identified but was collected over a dark-tone patch shown by the sidescan				
0040			104130114	40.000900	-43.302 130	01	Crand Banks of Newfoundiand - N.W. of Downing Basin	Planned station NM8; Target was southeastern flank of a sand				
0049	Van Veen grab	on bottom	164162723	46.888949	-49.465072	82	Grand Banks of Newfoundland - N.W. of Downing Basin	ridge				
								Planned station NM9; Target was coarse sand in sandwave				
0050	Van Veen grab	on bottom	164164855	46.889941	-49.464698	84	Grand Banks of Newfoundland - N.W. of Downing Basin	trough on the SE flank of a sand ridge				
								Planned station NM7S/NM7E; Transect was to start on lag and				
0051	4K Camera and video	start of transect	164172221	46.888019	-49.466381	82	Grand Banks of Newfoundland - N.W. of Downing Basin	continue to sand ridge sand.				
0051	4K Camera and video	end of transect	164175421	46.891242	-49.464130		Grand Banks of Newfoundland - N.W. of Downing Basin					
0050		an hattan	101101100	40,000044	40 440507	0.5	Grand Danks of Newfoundland NIM, of Devicing Dasin	Disposed station NMC: Target was 2D magnitudes				
0052	IKU grab	on bottom	164184106	46.922244	-49.442527	85	Grand Banks of Newfoundland - N.W. of Downing Basin	Planned station NM6; Target was 3D megaripples. Planned station DB1. Targets were base of late glacial maxima				
0053	AGC Long Core	on bottom	165110114	46.980630	-50.489720	160	Grand Banks of Newfoundland - Downing Basin	and till tongue in Downing Basin area.				
0000	ACC LONG COIC	on bollom	103110114	40.000000	-30.403720	100		Planned station DB1. Targets were base of late glacial maxima				
0054	AGC Long Core	on bottom	165121300	46.980892	-50.490302	160	Grand Banks of Newfoundland - Downing Basin	and till tongue in Downing Basin area.				
	ŭ							Planned station DB1. Targets were base of late glacial maxima				
0055	AGC Long Core	on bottom	165134859	46.980945	-50.490179	161	Grand Banks of Newfoundland - Downing Basin	and till tongue in Downing Basin area.				
								Planned station DB5; Targets were base of late glacial maxima				
	AGC Long Core	on bottom	165183134	47.172116	-51.099792		Grand Banks of Newfoundland - Downing Basin	and till tongue in Downing Basin area.				
0057	AGC Long Core	on bottom	165200825	47.172677	-51.100111	163	Grand Banks of Newfoundland - Downing Basin	Second attempt at planned station DB5.				
								Planned station TT1 in the Trinity Trough area. Targets were				
0059	AGC Long Core	on bottom	167103254	48.883608	-51.863747	246	Grand Banks of Newfoundland - Trinity Trough	disconformity at 2.5m, with ice scours and possible flood horizon: till at 8 m				
	AGC Long Core	on bottom	167202032	49.139849	-51.353627		Grand Banks of Newfoundland - Trinity Trough	Planned station TT3. Targets were distal to upper till tongue.				
0039			107202032		-01.000027	551		Planned station TB1 in Trinity Bay; Targets were late GM to				
0060	AGC Long Core	on bottom	168100405	48.300226	-52.960033	280	Grand Banks of Newfoundland - Mouth of Trinity Bay	3m;16m to till; possible IRD layer.				
	AGC Long Core	on bottom	168122540	48.285351	-52.899330		Grand Banks of Newfoundland - Mouth of Trinity Bay	Planned station TB2; Targets were basal GM; 7m to till.				
								At an added station in Random Sound. The objective was to				
								sample the glacimarine section for provenance and C-14 dating				
0062	AGC Long Core	on bottom	168165817	48.072831	-53.672501	156	Grand Banks of Newfoundland - Random Sound	purposes.				

# Appendix 1b Camera Stations Report

Expedition Code: 2010020

# Chief Scientist:

2	20100	- 0						
Station Number	Camera Type	Film Type	Start Day / Time (UTC)	Start Latitude / Longitude	Orientation Type	Stop Day / Time (UTC)	Stop Latitude / Longitude	Comments
0001	4K Camera System	Digital Image	156 / 2003	45.875689 -56.648485	Vertical	1562013	45.875780 -56.647511	Planned station SP1, 4K plus Vladcam Bullet, Sony HDR CX520, 10 digital images plus video.
0003	4K Camera System	Digital Image	157 / 1017	45.880043 -55.652867	Vertical	1571028	45.880074 -55.649875	Planned station SP3, 4K plus Vladcam Bullet, sony HDR CX520, 12 digital images plus video.
0008	4K Camera System	Digital Image	157 / 1357	45.805558 -55.854701	Vertical	1571407	45.805673 -55.852093	Planned station SP4, 4K plus Vladcam Bullet, Sony HDR CX520, 10 digital images plus video.
0009	4K Camera System	Digital Image	157 / 1600	45.766612 -55.902885	Vertical	1571610	45.767086 -55.902328	Planned station SP6, 4K plus Vladcam Bullet, Sony HDR CX520, 10 digital images plus video.
0013	4K Camera System	Digital Image	157 / 1936	45.754987 -55.993085	Vertical	1571946	45.755209 -55.992440	Planned station SP5, 4K plus Vladcam Bullet, Sony HDR CX520, 10 digital images plus video.
0020	4K Camera System	Digital Image	160 / 1005	45.647521 -51.996716	Vertical	1601051	45.651683 -51.987001	Planned station CB7S CB7E, 4K plus Vladcam Bullet, Sony HDR CX520, 42 digital images plus video.
0026	4K Camera System	Digital Image	160 / 1704	45.672205 -51.946704	Vertical	1601820	45.678023 -51.926222	Planned station CB1S-CB1E, 4K plus Vladcam Bullet, Sony HDR CX520, 77 digital images plus video.
0031	Other	Digital Video	162 / 1242	45.192447 -49.414202	Vertical	1621315	45.196543 -49.404058	Planned station LIS/LIE, layback from original sidescan imagery, Shark Marine Camera, target drift site transect from lat 45.19590400 and long 49.40478300 to lat 45.19167200 and long 49.41637000, assumed 3.5 min and played with light control at time 1313, no digital stills.
0035	4K Camera System	Digital Image	162 / 1743	45.165699 -49.489906	Vertical	1621828	45.168511 -49.480204	Planned station L2E, 4K plus Vladcam Bullet, Sony HDR CX520, 45 digital images plus video.
0038	4K Camera System	Digital Image	163 / 1200	45.635608 -48.370290	Vertical	1631240	45.641000 -48.375990	Planned station C1S-C1E, 4K plus Vladcam Bullet, Sony HDR CX520, 41 digital images plus video.
0042	4K Camera System	Digital Image	163 / 1818	45.765912 -48.713688	Vertical	1631845	45.765701 -48.722143	Planned station C4S and C4E, the seismic record info entered is for site C4S, C4E site is based on 85005 Sidescan 930956, 4K plus Vladcam Bullet, Sony HDR
0045	4K Camera System	Digital Image	164 / 1204	46.835075 -49.503787	Vertical	1641324	46.850531 -49.492706	CX520, 27 digital images plus video. Planned station NM3S, 4K plus Vladcam Bullet, camera switched to a Sony HDR CX550, 76 digital
0051	4K Camera System	Digital Image	164 / 1722	46.888019 -49.466381	Vertical	1641754	46.891242 -49.464130	images plus video. Planned station NM7S to NM7E, 4K plus Vladcam Bullet using Sony HDR CX550, 34 digital images plus video.

Total Camera Stations: 13

Appendix 1c Core / Grab Samples Report

Expedition: 2010020

Station

Number

0002

0004

0005

#### Chief Scientist: Subcore Sample (If Any) Day / Time Latitude Water Corer Core No. of App. Depth (mtrs) Length (cm) (UTC) Type Type Longitude Penn. (cm) Length (cm) Sections Location Comments Grab 156 / 2032 45.874660 68.00 0 0 Grand Banks of Newfoundland -Planned station SP2, 10cm recovered, fine St. Pierre Bank to med buff colored sand with gravel lag -56.648571 (mm to 3cm), sand is clean quartz rich, pebbles sand is clean quartz rich, pebbles rounded to sub rounded, shells with some shell fragments, propeller clam, worm tube and anoxic layering. Planned station SP3, 7cm recovered, med to 0 0 Grand Banks of Newfoundland -157 / 1056 45.879887 74.00 Grab St. Pierre Bank coarse sand with gravel up -55.653464 to 30mm, with sandlances and sanddollars. 157 / 1134 0 Grand Banks of Newfoundland -Planned station SP3, 5cm recovered, partial Grab 45.879583 71.00 0 St. Pierre Bank washout, fine sand with -55.652687

			-33.032087				St. I lefte Balik	minor gravel and small shell.
0006	Grab	157 / 1148	45.879822 -55.648548	72.00	0	0	Grand Banks of Newfoundland - St. Pierre Bank	Planned station SP3, 10cm recovered, partial washout, fine sand with gravel up to 7mm, pebbles, sandlances, shells and small crab.
0007	Grab	157 / 1226	45.879373 -55.651258	71.00	0	0	Grand Banks of Newfoundland - St. Pierre Bank	Planned station SP3, first attempt 1 pebble 90x45x55mm recovered, second attempt 15cm recovery, coarse pebble buff colored sand (variety of rounded pebbles up to 75mm) with gravel lag on top and minor shell hash.
0010	Grab	157 / 1645	45.765621 -55.903782	56.00	0	0	Grand Banks of Newfoundland - St. Pierre Bank	Planned station SP6, grab partially open on retrieval, 7cm recovered, pebble lag with variety of sub- angular pebbles (up to 8cm and many encrusted with pink algae) with minor coarse sand, shell hash, brittle stars and worm tube.
0011	Grab	157 / 1755	45.805370 -55.854705	58.00	0	0	Grand Banks of Newfoundland - St. Pierre Bank	Planned station SP4, first attempt did not trip, second attempt 2 sub rounded pebbles encrusted with pink algae (photographed but not kept). Third attempt 10cm recovery, sub rounded pebbles up to 13cm with a couple of cobbles, no sand and 17 brittle stars, smaller clean pebbles possibly under the larger pebbles

Core / Grab Samples Report

Expedition: 2010020

## Chief Scientist:

Lapeur	1011. 201										Chief Scienti	51.
		Subcore										
Station Number	1	(If Any) Type	Day / Time (UTC)	Latitude Longitude	Water Depth (mtrs)	Corer Length (cm)	App. Penn. (cm)	Core Length	(cm)	No. of Sections	Location	Comments
0012	Grab		157 / 1915	45.755638 -55.993724	56.00			0		0	Grand Banks of Newfoundland - St. Pierre Bank	Planned station SP5, jaws slightly open upon recovery, pebble lag with a variety of sub rounded and sub angular lithothamnion encrusted pebbles up to 7cm with minor buff colored medium to course sand and minor shell hash.
0014	Piston		158 / 1248	46.270354 -55.220969	168.00	915	610	692		5	Grand Banks of Newfoundland - St. Pierre Basin	TWC returned to the surface with broken and deformed barrel clamp and no barrel. TWC topmost lead weight possibly cut by PC cutter as it had a deformed and cut edge.
		Trigger						0				
0015	Piston		158 / 1633	46.317010 -55.203055	166.00	915	360	180		2	Grand Banks of Newfoundland - St. Pierre Basin	Planned site PC3, apparent penetration of TWC was 30cm but only 2 cobbles (approx 15cm) and mud scraped from cutter were recovered.
		Trigger						0				
0016	Dredge		158 / 2003	46.227814 -55.096737	146.00			0		0	Grand Banks of Newfoundland - St. Pierre Basin	Planned station DR-S, off bottom 158/2015 46.228167N 55.097508W.
0017	Piston		159 / 1118	44.897929 -55.124634	1870.00	1525	850	637		5	Grand Banks of Newfoundland - Halibut Channel Fan	Fine to medium sand in AB transitioning to mud in BC, shell at CD top.
		Trigger						65.5				
0018	Piston		159 / 1513	44.900785 -55.106668	1756.00	1525	1500	1037		7	Grand Banks of Newfoundland - Halibut Channel Fan	Planned site PC5, very gassy core, small pressure relief holes drilled in two sections, CC prime extruded due to expansion and placed in end caps.
		Trigger						123				placed in end caps.
0019	Piston		159 / 1841	44.902588 -55.101016	1786.00	1525	1224	1393		9	Grand Banks of Newfoundland - Halibut Channel Fan	Planned site PC6, very gassy mud core, sediment extruding as barrels were taken apart, core catcher cutter lost on retrieval.
		Trigger						27.5				
0021	IKU Grab		160 / 1209	45.647461 -51.990590	98.00			46	0	-	rand Banks of Newfoundland - entral Grand Banks	Planned station CB12, coarse sand with shell hash, whole mussel shells, some gravel on surface, polychete, heartshells, shrimp anthropod, tube shells, brittle stars with scales, brittle star darkly patterned throughout, vertical peel taken from centre of E.
		Peel						38				01 <i>D</i> .

Peel

Expedit	ion: 201									Chief Scientist	t:
Station Number	Sample Type	Subcore (If Any) Type	Day / Time (UTC)	Latitude Longitude	Water Depth (mtrs)	Corer Length (cm)	App. Penn. (cm)	Core Length (cm)	No. of Sections	Location	Comments
0022	IKU Grab		160 / 1350	45.650601 -51.990307	95.00			30	0	Grand Banks of Newfoundland - Central Grand Banks	Planned station CB10, 1st attempt grab returned to surface with rock wedged in jaws, sample washed out, nil retrieved in 21 attempt, 3 <sup>rd</sup> attempt medium sand with fine shell hash, few mussel shells, anoxic layerin 20 cm below surface, surface shows some gravel up to 5cm.
		Peel						28			
0023	Grab		160 / 1502	45.651333 -51.988095	95.00			0	0	Grand Banks of Newfoundland - Central Grand Banks	Planned station CB11, 1st attempt 3cm fine med sand with fine shell hash. 2nd attempt 10cm of well sorted, fine to medium sand with fine shell hash throughout and scarce shell halves on surface.
0024	Grab		160 / 1542	45.647854 -51.994796	100.00			0	0	Grand Banks of Newfoundland - Central Grand Banks	Planned station CB8 VV, 6cm of slow draining very fine sand with shell fragment abundant shell hash and some pebbles (largest pebble 8x6x2.5cm).
0025	Grab		160 / 1614	45.647773 -51.994307	100.00			0	0	Grand Banks of Newfoundland - Central Grand Banks	Planned station CB9 VV, 10cm of fine sand with fine pebbles up to 10mm (minor larger pebbles), one juvenile crab, several sanddollars and scant shell valves.
0027	Grab		160 / 1852	45.671166 -51.945293	90.00			0	0	Grand Banks of Newfoundland - Central Grand Banks	Planned station CB5 VV, 6cm of fine grained sand with abundant fine shell hash overlain by a gravel lag of subangular large pebbles and small cobbles up to 60mm, minor broken shells of various species and one juvenile crab.
0028	Grab		160 / 1932	45.672930 -51.942268	92.00			0	0	Grand Banks of Newfoundland - Central Grand Banks	Planned station CB4 VV, 1st attempt one cobble recovered, photographed and discarded. 2nd attempt 15cm of medium to course sand with shell hash throughout and surfical lag of pebbles and cobbles up to 13cm.

Core / Grab Samples Report

Expedition: 2010020

## Chief Scientist:

LAPCU	201									Chief Scientis	01.
Station Number	•	Subcore (If Any) Day Type (UTC	/ Time Latitude C) Longitude	Water Depth (mtrs)	Corer Length (cm)	App. Penn. (cm)	Core Length (		No. of Sections	Location	Comments
0029	Grab	160 / 1	955 45.677869 -51.927901	99.00			0		0	Grand Banks of Newfoundland - Central Grand Banks	Planned station CB3 VV, 3cm of fine grained sand with organics, disbursed shell hash, a few small pebbles up to 3 to 4.5cm and shell debris on top.
0030	Piston	161 / 1	044 45.509532 -52.723920	126.00	915	885	612.5		4	Grand Banks of Newfoundland - Whale Deep	Planned site AC7, base of TWC sandy silt, base of PC fine muddy sand trapped on sock immediately above catcher, odorous gas observed in sections BC and CD and small holes drilled in liner to relieve pressure.
		Trigger					39				-
0032	Grab	162 / 1	512 45.195972 -49.405985	74.00			0		0	Grand Banks of Newfoundland - Lilly Canyon	Planned station 162 VV Target 1, 1st attempt 2cm of shell hash with gravel from 2mm to 60cm, sample discarded. 2nd attempt 10 cm of shell hash with gravel up to 11cm.
0033	Grab	162 / 1	537 45.194373 -49.409366	73.00			0		0	Grand Banks of Newfoundland - Lilly Canyon	Planned station Stn162 VV Target 2, 1st attempt ship not in target box, recovered 10cm shell hash with sand and gravel. 2nd attempt ship in target box but there was no sample recovery.
0034	IKU Grab	162 / 16	518 45.195299 -49.407361	74.00		2:	5	0		Grand Banks of Newfoundland - Lilly Canyon	Partial recovery as jaws were wedged open 10cm by cobbles, material recovered consisted of 45 percent lag, fine to medium sand, shell material on surface, fine grain hash imbedded with sand, gravel is small pebbles to cobbles, most encrusted with lithothamnian, cobbles rounded to semi rounded, lithology is variable including layered granite, gneiss, limestone, one burrowed, buff sandstone, sand component is similar from top to 15cm below surface, biology is assorted bivalves and gastropods, many encrusted with carbonate and some bored, two types of scallops, branched pink coral, branched and encrusted bryozones, brittle stars, pink and orange sponge or tunicate, small urchins, barnicles, stemmed plant, one litre pail collected for lithology.

Expedi	ition: 201									Chief Scientis	t:
Station Number	1	Subcore (If Any) Type	Day / Time (UTC)	Latitude Longitude	Water Depth (mtrs)	Corer Length (cm)	App. Penn. (cm)	Core Length (cm)	No. of Sections	Location	Comments
0036	IKU Grab		162 / 1847	45.167631 -49.484008	74.00			35	0	Grand Banks of Newfoundland - Lilly Canyon	Planned site 162IKU, clean medium buff coloured sand with numerous pebbles, abundance of whole and broken shell material, course section with shell hash, biological encrusted shells, bryozones, sponges, urchins, sanddollars, star fish, surface and propeller clams, sand predominately quartz, lacking silt or fine grain fraction.
		Peel						21			
0037	Grab		162 / 1936	45.168566 -49.481630	74.00			0	0	Grand Banks of Newfoundland - Lilly Canyon	Planned station 162 VV, 3cm well sorted med grained buff coloured sand (predominatly quartz), 11 pebbles of various lithologies, abundant sand dollars, abundant whole and broken shells, ocean cohog and one sea cucumber.
0039	Grab		163 / 1448	45.630999 -48.383384	175.00			0	0	Grand Banks of Newfoundland - Carson Canyon	Planned station C3 adjusted, 10 cm well sorted fine to medium sand with 2 sanddollars and 3 sandlances
0040	IKU Grab		163 / 1513	45.627130 -48.389429	175.00			35	0	Grand Banks of Newfoundland - Carson Canyon	Planned site C3 Adj IKU, the top 20cm is clean, buff coloured medium sand, few sanddollars, the bottom 20 to 30cm is anoxic layering.
		Peel						27			lavering.
0041	Grab		163 / 1629	45.606280 -48.467760	157.00			0	0	Grand Banks of Newfoundland - Carson Canyon	Planned station C2 adjusted, 2cm of very fine clean sand with two pebbles (20mm and 25mm) and one sanddollar.
0043	IKU Grab		163 / 1911	45.765622 -48.724760	94.00			40	0	Grand Banks of Newfoundland - Carson Canyon	Planned site C5, buff colour clean medium grain sand, quartz rich with an abundance of shell hash, pebbles 2 to 3cm or smaller, sanddollars, urchins, gooeyducks, cohogs, scallop shells, 10cm down the sand changes from clean buff colour to greyish colour and smells of rotton eggs, and is less well sorted, a peel was attempted but failed.

Core / Grab Samples Report

Core / Grab Samples Report

Subcore

Expedition: 2010020

## Chief Scientist:

Station Number	-	(If Any) Type	Day / Time (UTC)	Latitude Longitude	Water Depth (mtrs)	Corer Length (cm)	App. Penn. (cm)	Core Length (cm)	No. of Sections	Location	Comments
0044	Grab		163 / 1950	45.765729 -48.718253	93.00			0	0	Grand Banks of Newfoundland - Carson Canyon	Planned station C6 VV, 1st attempt did not trip, 2nd attempt 10cm clean well sorted quartz rich buff coloured med sand with minor pebbles 2cm and greater, minor shell hash, cohog and sanddollars
0046	Grab		164 / 1356	46.846447 -49.493107	81.00			0	0	Grand Banks of Newfoundland - N.W. of Downing Basin	Planned station NM4, 1st attempt did not trip. 2nd attempt 4cm of 80 percent gravel(up to 7cm) and 20 percent sand. Larger gravel (4cm and up) is encrusted.
0047	Dredge		164 / 1414	46.845863 -49.492580	81.00			0	0	Grand Banks of Newfoundland - N.W. of Downing Basin	Planned station NM4, off bottom at 1641421 46.845749N 49.489755W, one third full of assorted cobbles and boulders up to 25cm (granite, shales, volcanics, burrowed carbonates and gneiss), some covered with lithothamnian and some larger boulders covered with barnacles. Juvenile snow crabs (one with barnacles), sponge or tunicate, several grass corals, rare bivalves, rare urchins. and one brittle star.
0048	IKU Grab		164 / 1501	46.835900 -49.502136	81.00				0	Grand Banks of Newfoundland - N.W. of Downing Basin	Planned site NM5, jaws opened 4.5cm, partial washout at center jaw opening, 30 percent gravel lag over clean well sorted medium sand with fine shell hash throughout, unsuccessfull attempt at recovering a peel sample.
0049	Grab		164 / 1627	46.888949 -49.465072	82.00			0	0	Grand Banks of Newfoundland - N.W. of Carson Canyon	Planned station NM8, 5cm of clean well sorted medium sand overlain by gravel lag (up to 10cm), larger gravel is encrusted, 1 juvenile crab, brittle star, and 3 sandlances.
0050	Grab		164 / 1648	46.889941 -49.464698	84.00			0	0	Grand Banks of Newfoundland - N.W. of Carson Canyon	Planned station NM9, 10cm of clean well sorted medium grained buff coloured sand with several pebbles up to 30mm, sanddollars and 3 sandlances.
0052	IKU Grab		164 / 1841	46.922244	85.00			48	0	Grand Banks of Newfoundland - N.W. of Carson Canyon	Planned site NM6, surface is medium to coarse buff colour sand with lithic fragments, not well sorted, sugary, very few pebbles, sanddollars, few shells, some broken, 20 to 48cm coarse layer of shells, pebbles, gooeyduck, worm.

Peel

Core / Grab Samples Report

Subcore

Expedition: 2010020

## Chief Scientist:

Station Number	Sample Type	(If Any) Type		Latitude Longitude	Water Depth (mtrs)	Corer Length (cm)	App. Penn. (cm)	Core Length (cm)	No. of Sections	Location	Comments	
0053	Piston		165 / 1101	46.980630 -50.489720	160.00	915	0	39	1	Grand Banks of Newfoundland - Downing Basin	Planned site DB1, sand between liner and barrel in TWC, recovered 39cm of fine sand with fine sandy mud in the cutter.	
0054	Piston		165 / 1213	46.980891 -50.490302	160.00	915	180	48	1	Grand Banks of Newfoundland - Downing Basin	Planned site DB1, redeployment at same location as 0053.	
		Trigger						0				
0055	Piston		165 / 1348	46.980945 -50.490179	161.00	915	150	82.5	1	Grand Banks of Newfoundland - Downing Basin	Planned site DB1.	
		Trigger						0				
0056	Piston		165 / 1831	47.172116 -51.099792	168.00	915	190	64	1	Grand Banks of Newfoundland - Downing Basin	Planned site DB5, fine muddy sand recovered in PC.	
		Trigger						0				
0057	Piston		165 / 2008	47.172677 -51.100111	163.00	915	0	10	0	Grand Banks of Newfoundland - Downing Basin	Planned site DB5, 10cm bagged when it fell out of the base of the core.	
	Trigger							0				
0058	Piston		167 / 1032	48.883608 -51.863747	346.00	915	915	568.5	4	Grand Banks of Newfoundland - Trinity Trough	Planned site TT1, stiff silty mud at base, 6cm nose cone.	
		Trigger						151				
0059	Piston		167 / 2020	49.139849 -51.353627	331.00	915	689	263	2	Grand Banks of Newfoundland - Trinity Trough	Target site TT3, TWC transition from red brown to olive grev at surface.	
		Trigger						86				
0060	Piston		168 / 1004	48.300226 -52.960033	280.00	915	915	724	5	Grand Banks of Newfoundland - Mouth of Trinity Bay	Planned site TB1, residual evidence of a very fine muddy sand at base of TWC, fine muddy sand at top of PC.	
0061	Piston		168 / 1225	48.285351 -52.899330	312.00	915	610	452.5	3	Grand Banks of Newfoundland - Mouth of Trinity Bay	Planned site TB2, 1 rock and 5cm sediment in TWC, till on outside of PC cutter.	
Trigger								5				
0062	Piston		168 / 1658	48.072831 -53.672501	156.00	915	875	505.5	4	Grand Banks of Newfoundland Random Sound	PC surface is gravelly sand transitioning to mud.	
г	Fotal Nu	mber of	Subcores:	18								
			e Stations:	49								
r · · · · · · · · · · · · · · · · · · ·												

Appendix 2: List of all sidescan/seismic survey lines for Hudson 2010020 cruise. The listed columns are line number, start and end times, and the record and DVD numbers of the seismic, sidescan, Huntec and Knudsen sonar data respectively.

	2010020 LINES												
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Line	Start	End	Seismic	Sleevegun	Seism	ic Huntec	Sideso	an Klein	12 KHz***	3.5 KHz***		
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	-				J.					-			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	1	156/2215	156/2328	1	1	1	1	1	1	1			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	2	156/2328	157/0209	1	1	1	1			1			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	3	157/0209	157/0239	1	1	1	1			1			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	4	157/0457	157/0900	1	1	1	1	2, 3, 4	1	1			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	5	158/0059	158/0228	2	1	2	2	5	2	1			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	6	158/0228	158/0552	2	1	2	2	5	2,3	1			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	7		158/0900	2	1	2	2	5	3				
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$											*		
$ \left  \begin{array}{c c c c c c c c c c c c c c c c c c c $						-			-				
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	-												
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$													
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$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$													
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$													
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$				1		-				1	*		
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$				3	1	3	2	6	1	2			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$						-		-					
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	 -				-			-					
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$								-	-				
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$													
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	 -			Ű	•	•	-	0, 1,0	Ŭ				
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	-			4	2	5	3	9	6	-			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$								-					
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$				4		-	-	9	,				
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$						-	-	-		2			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	25		163/0501	5	2	6	4	10	8,9	2			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	26	163/0501	163/0615	5	2	6	4	10					
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	27	163/0615	163/0741	5	2	6	4	10	9				
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	28	163/0741	163/0900	5	2	6	4	10	9				
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	29	164/0203	164/0305	6	3	7	5	11	10	2			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	 30						5	11	10				
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	 -			6	3	7	5		-	2			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$								,					
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$					-	-	-	_					
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	-				-	,	-	-	,				
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$						-	-						
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	 				-	-	-	-					
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$						-	-						
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	 					-	-						
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$				1	3	9	6	13	12		*		
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	 												
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$													
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$									l				
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$													
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$				8	3	10	7						
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$								14	13				
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$													
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$													
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$													
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$													
51         166/0311         166/0710         3           52         166/0921         166/0945         3           53         166/0945         3         3           54         166/1011         3         3           55         166/114         33         3           56++         166/1159         3         3           57         166/1715         33         3													
52         166/0921         166/0945         3           53         166/0945         166/1011         3           54         166/1011         166/1104         3           55         166/1104         3         3           56++         166/1159         3         3           57         166/1715         3         3													
53         166/0945         166/1011         3           54         166/1011         166/1104         3           55         166/1104         3         3           56++         166/1159         3         3           57         166/1715         3         3													
54         166/1011         166/1104         3           55         166/1104         166/1159         3           56++         166/1159         166/1715         3           57         166/1715         3													
55         166/1104         166/1159         3           56++         166/1159         166/1715         3           57         166/1715         3													
56++         166/1159         166/1715         3           57         166/1715         167/0223         9         3													
57 166/1715 167/0223 9 3	56++		166/1715							3			
58 167/0223 167/0454 9 3	57		167/0223	9						3			
	58	167/0223	167/0454	9						3			

	59	167/0454	167/0706	9						3		
	60	167/0706	167/0815	9						3		
	61	167/0815	167/1312	9						3		
	62	167/1312	167/1432							3		
	63	167/1432	167/1518							3		
	64	167/1518	167/1530							3		
	65	167/1530	167/1641							3		
	66	167/1641	167/1822							3		
	67	SKIPPED										
	68	SKIPPED										
-	69	167/1822	167/1919							3		
	70	167/1919	167/1936							3		
	71	167/1936	167/2100							3		
	72	167/2155	168/0015							4		
	73	168/0015	168/0319							4		
	74	168/0319	168/0650							4		
	75	168/0650	168/1310							4		
	76	168/1310	168/1644							4		
	77	168/1842	168/2118	10		11	8			4		
	* post proc	essed: data	exist but no	ot on DVD	archive; deji	ttered to d	date (deiitter	ina shou	ld improve	quality)		
					ween digital						<u> </u>	
		***Many line numbers associated with 3.5/12 kHz data, while being operated as the only geophysical instrument, are relatively meaningless with respect to day/time and line configuration as they also include continous recording on										
	station											
	+data gap	between lin	es 50 and 5	1 and betw	veen 51 and	52; possi	bly 3.5 kHz	not recor	ded			
	• •											
	++D92 with data gap between 166/1325 and 1425											

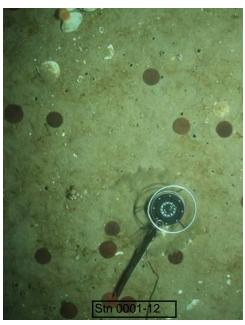
Appendix 3 All still photos (in wallet format) taken in camera stations of Hudson 2010020.

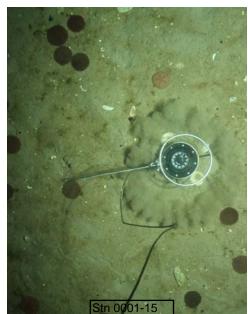




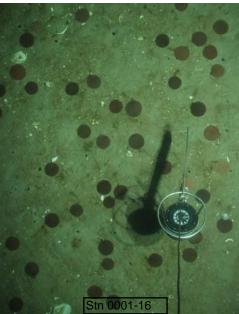


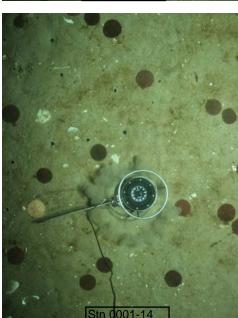


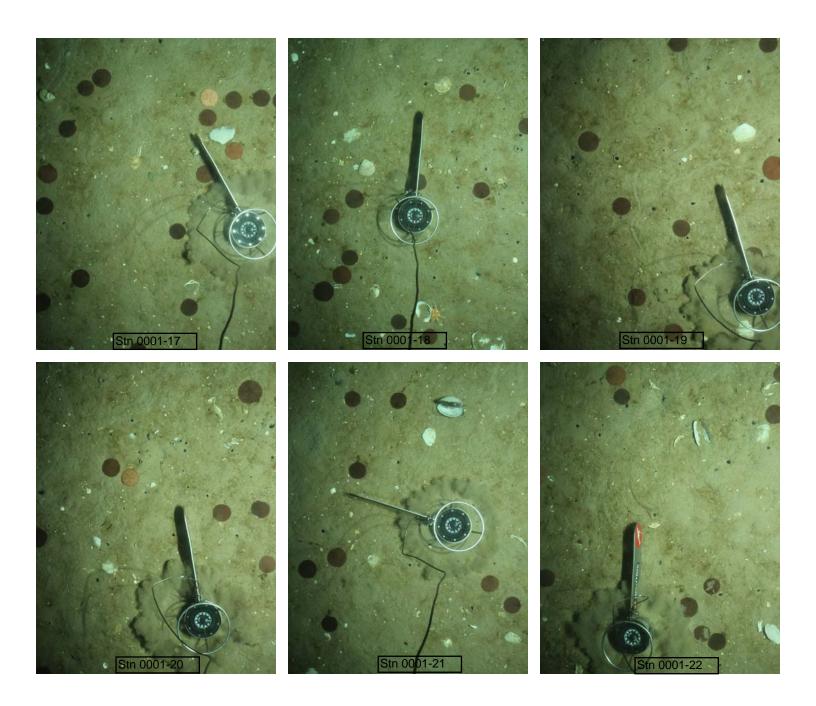


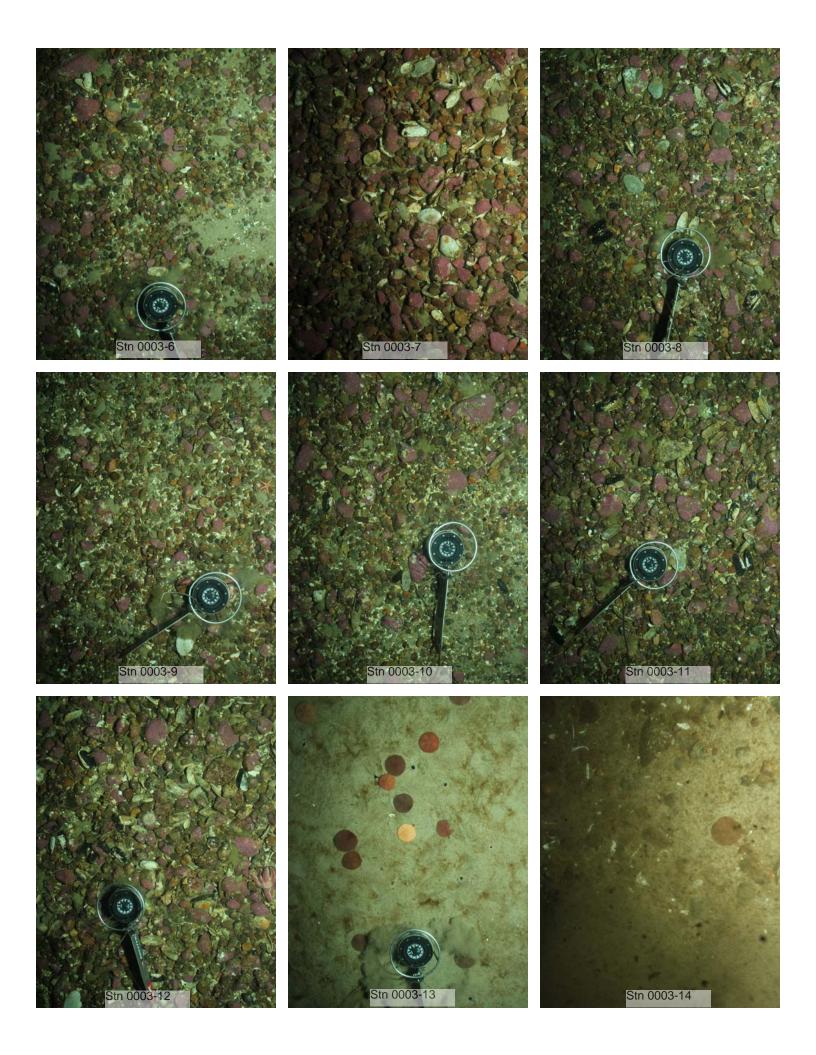


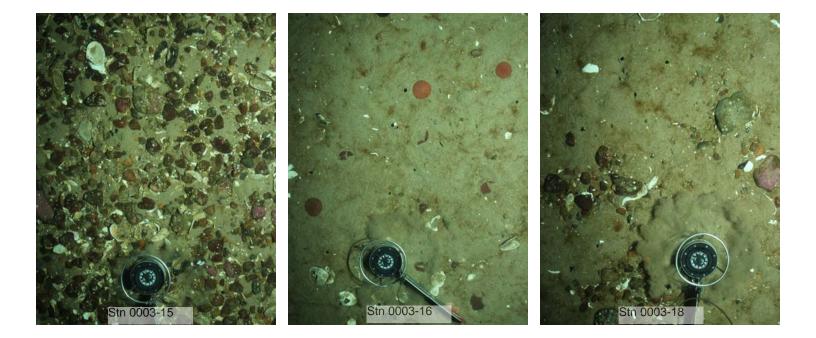


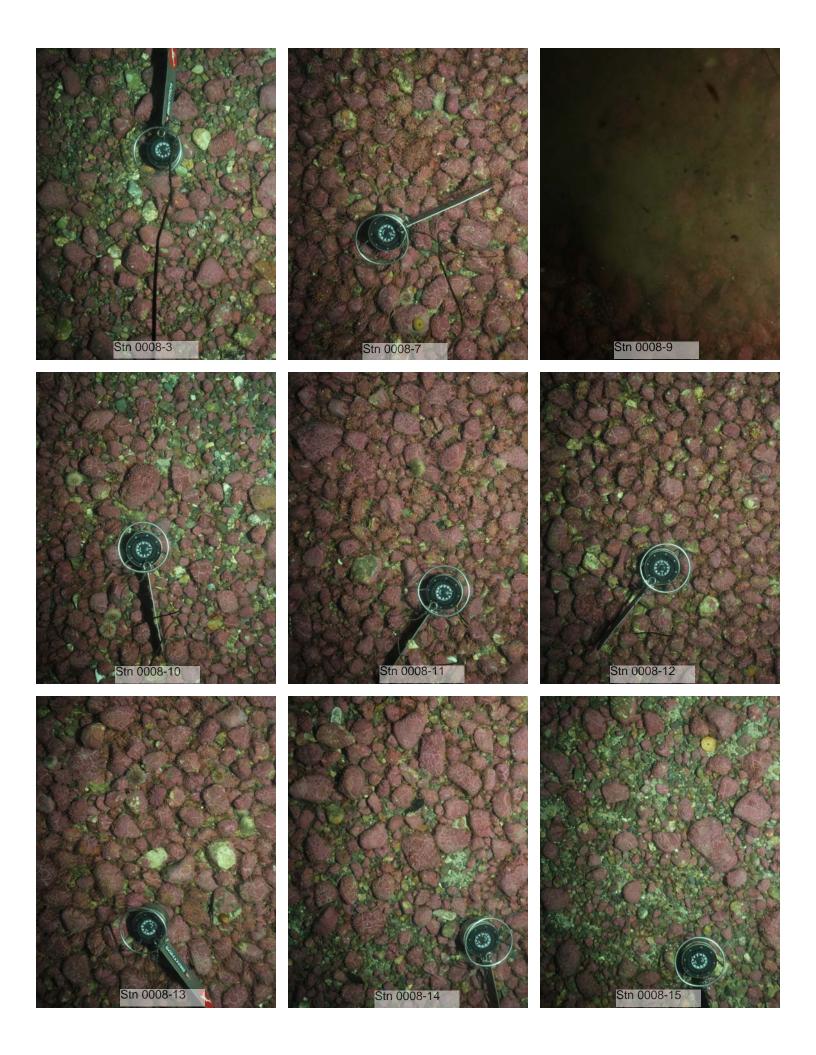


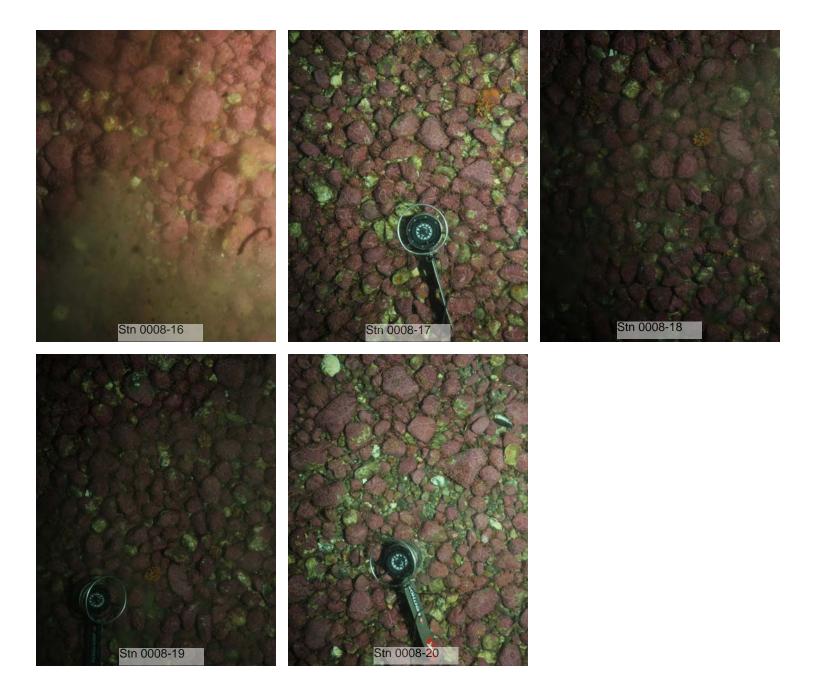


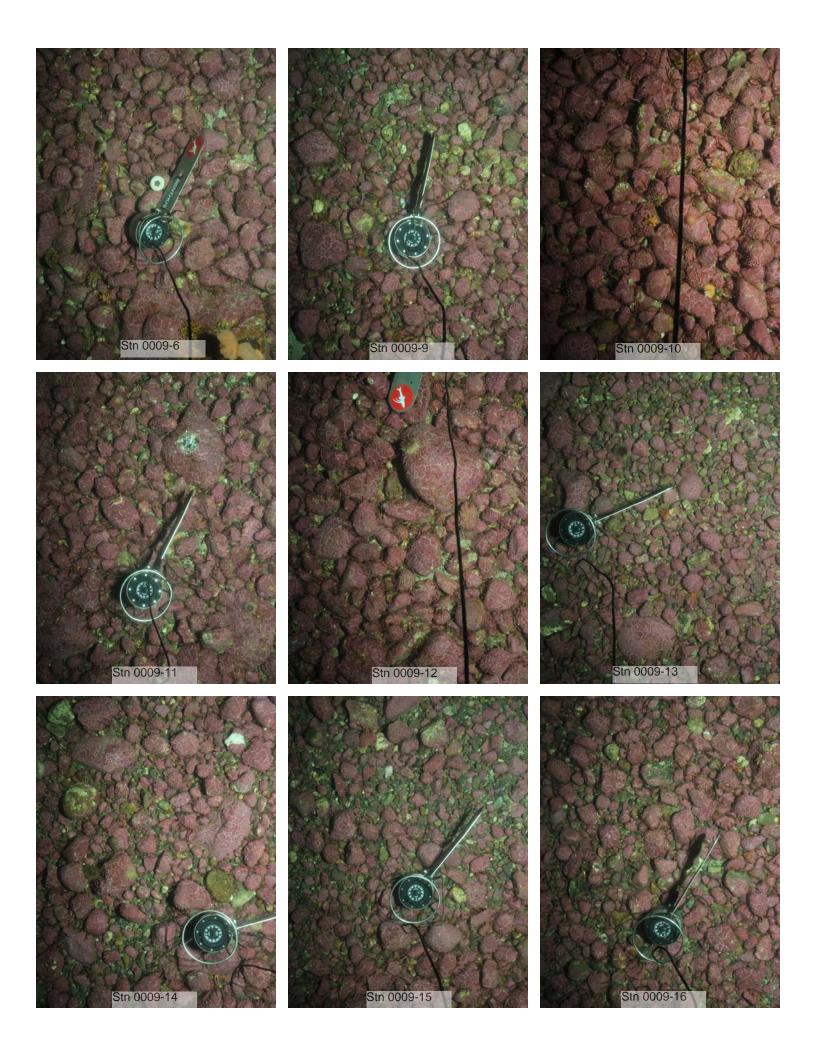




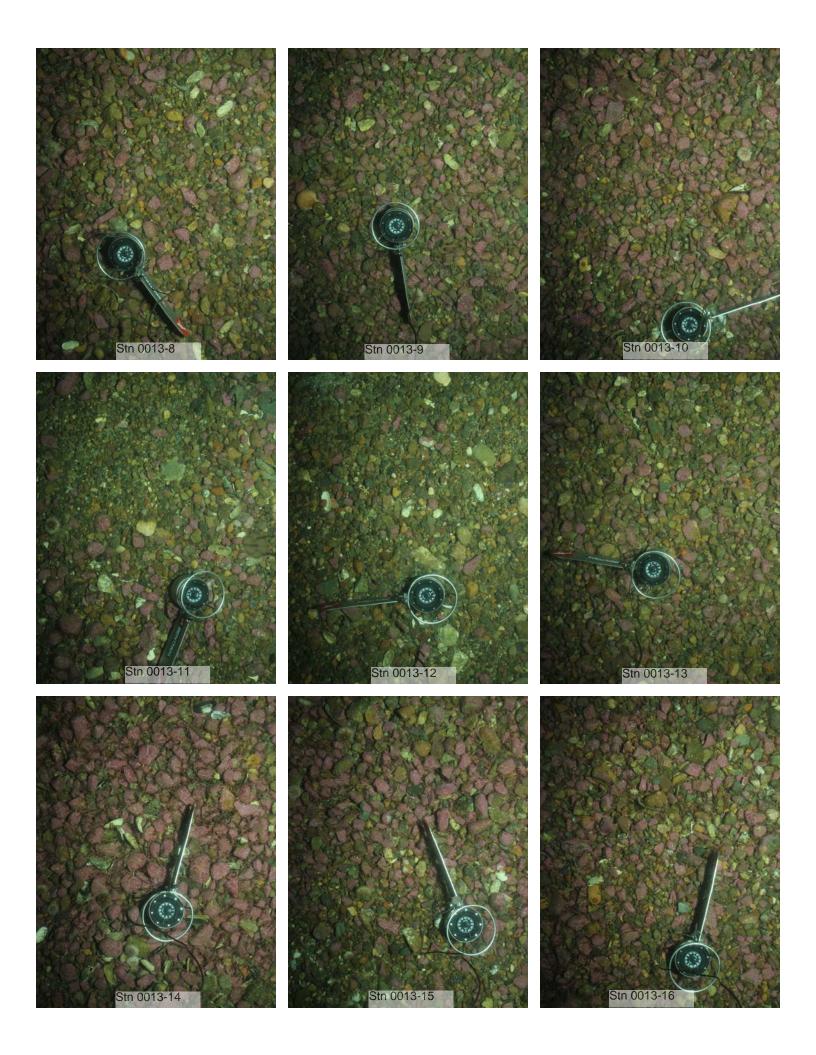




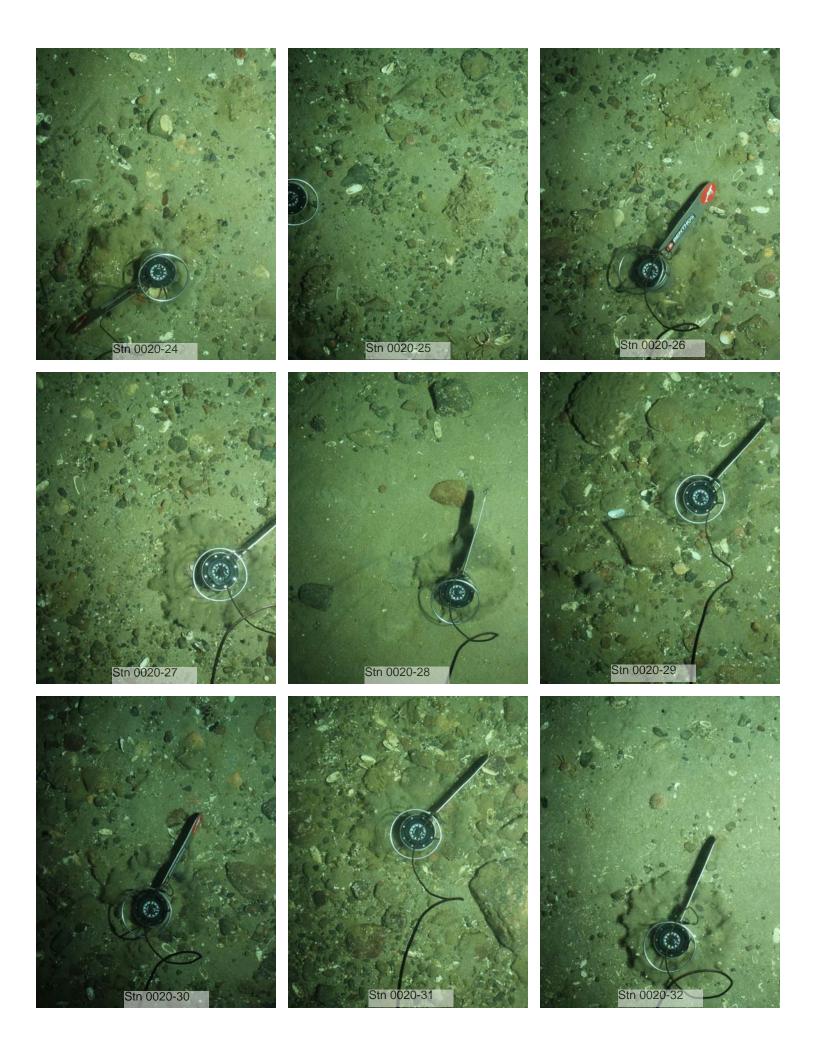


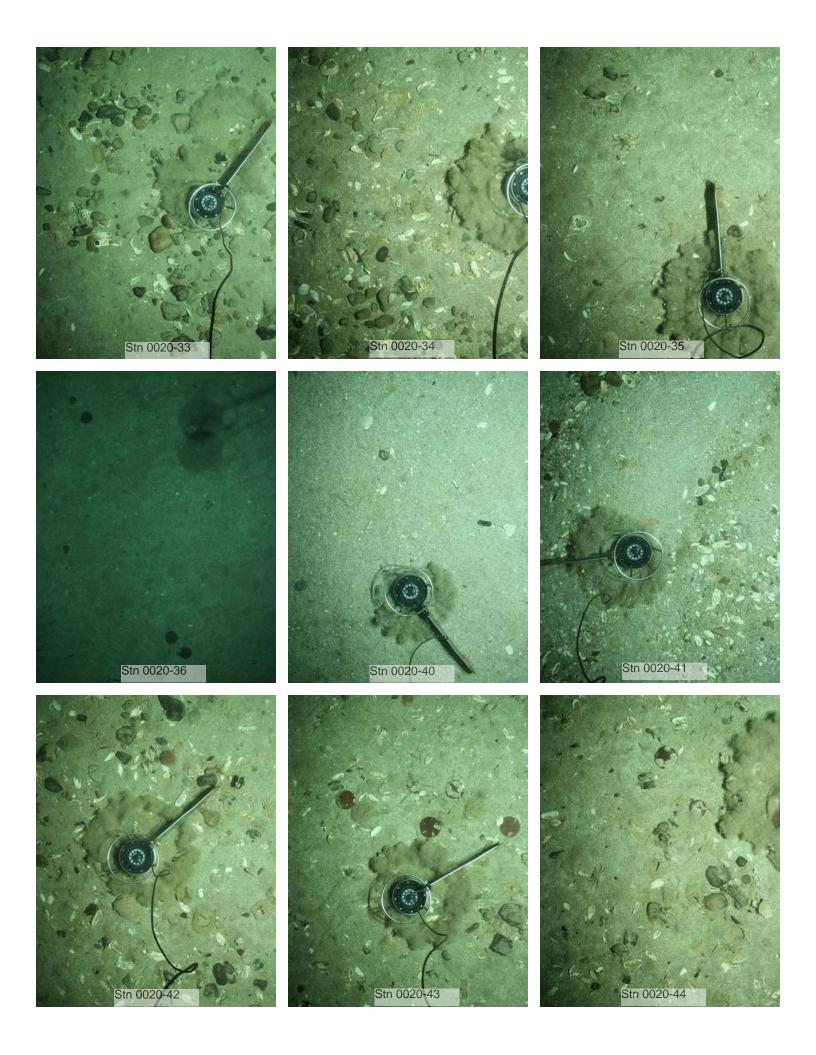


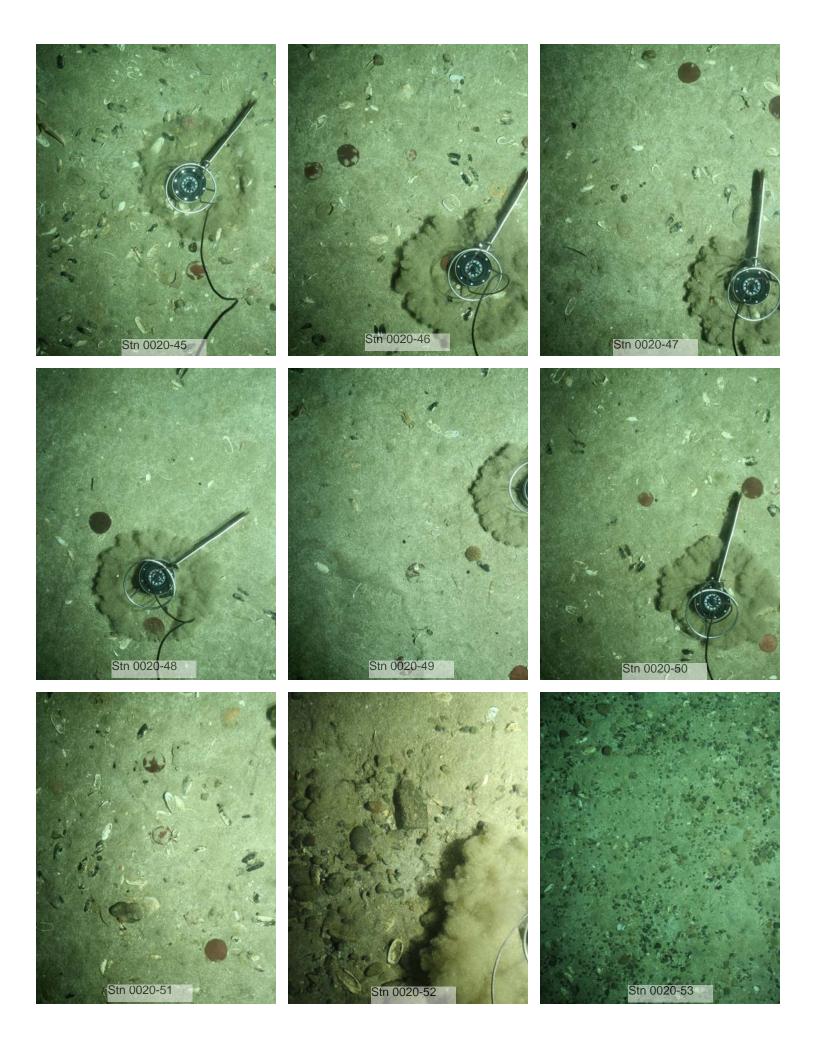


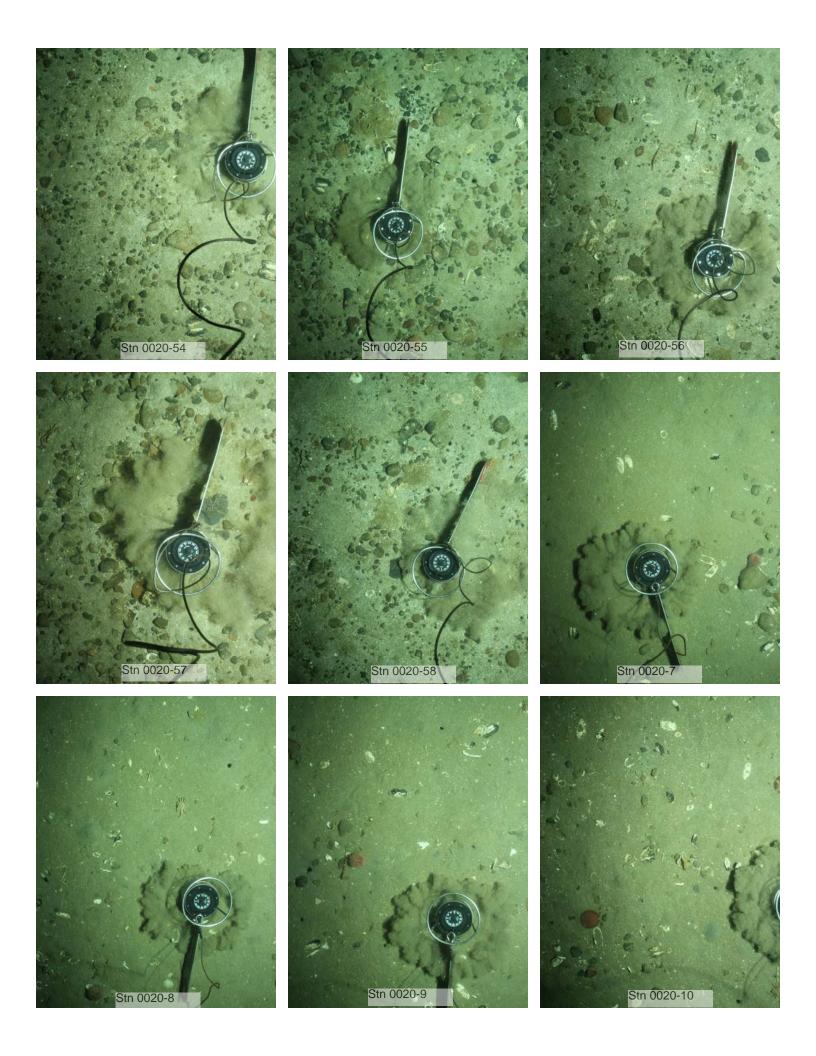


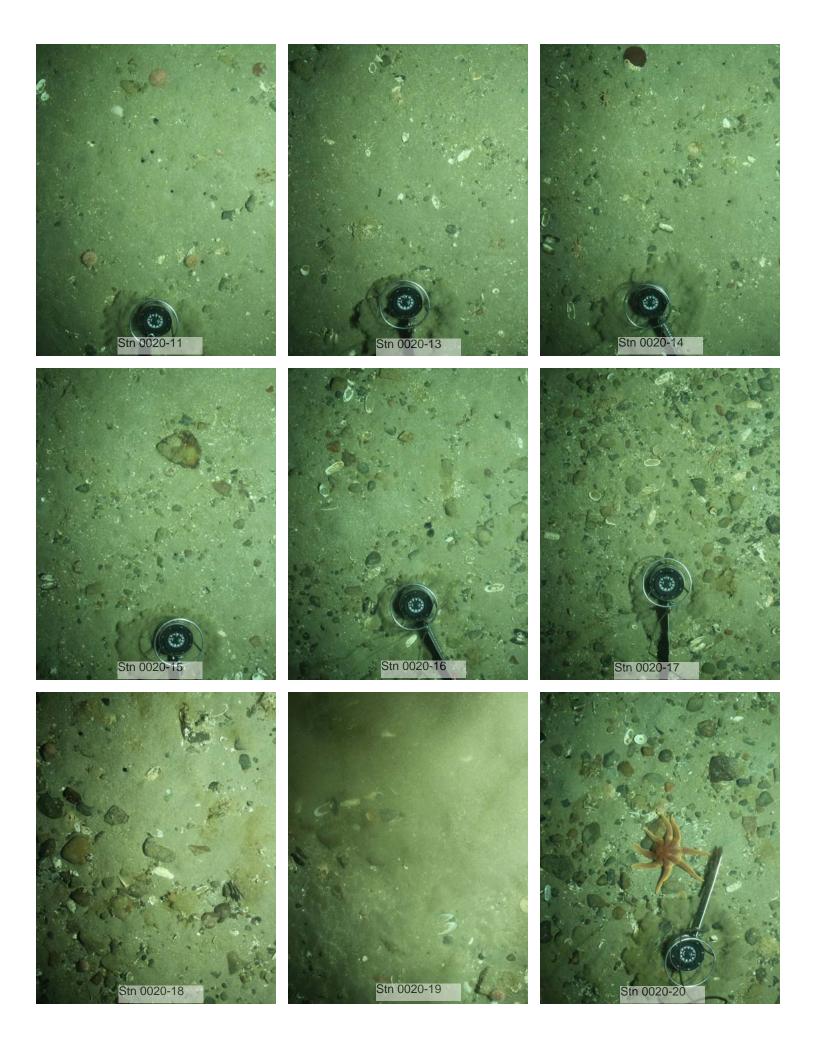




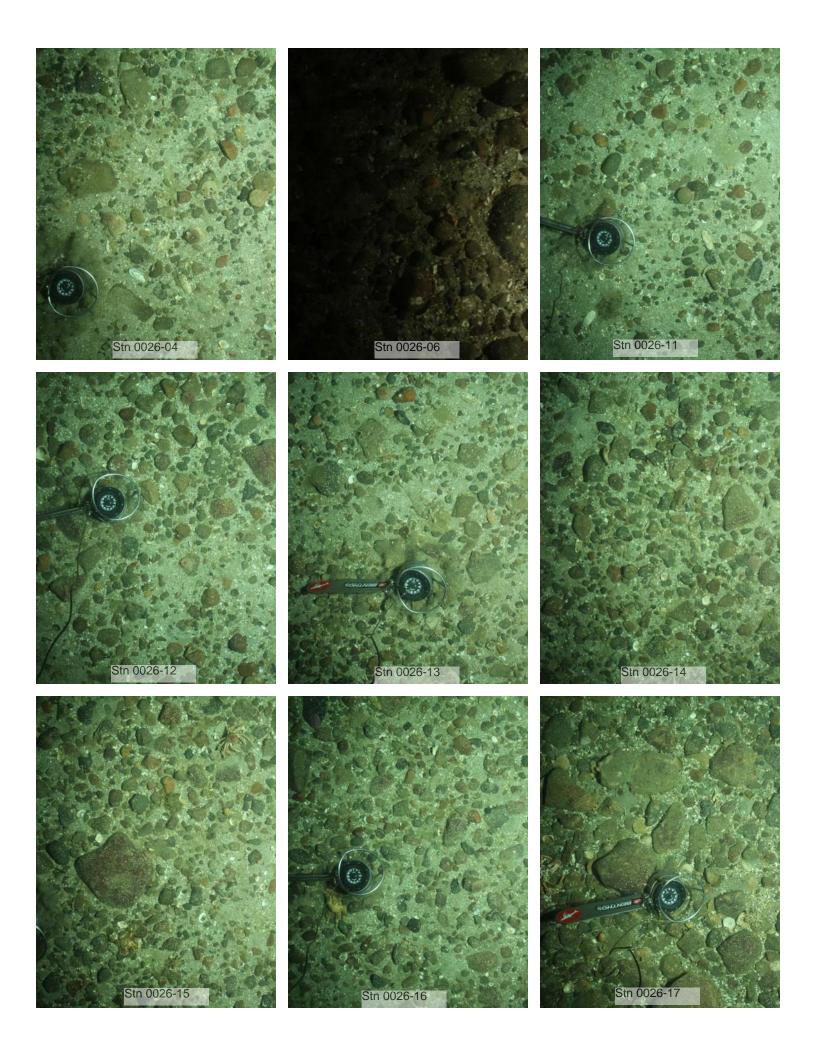


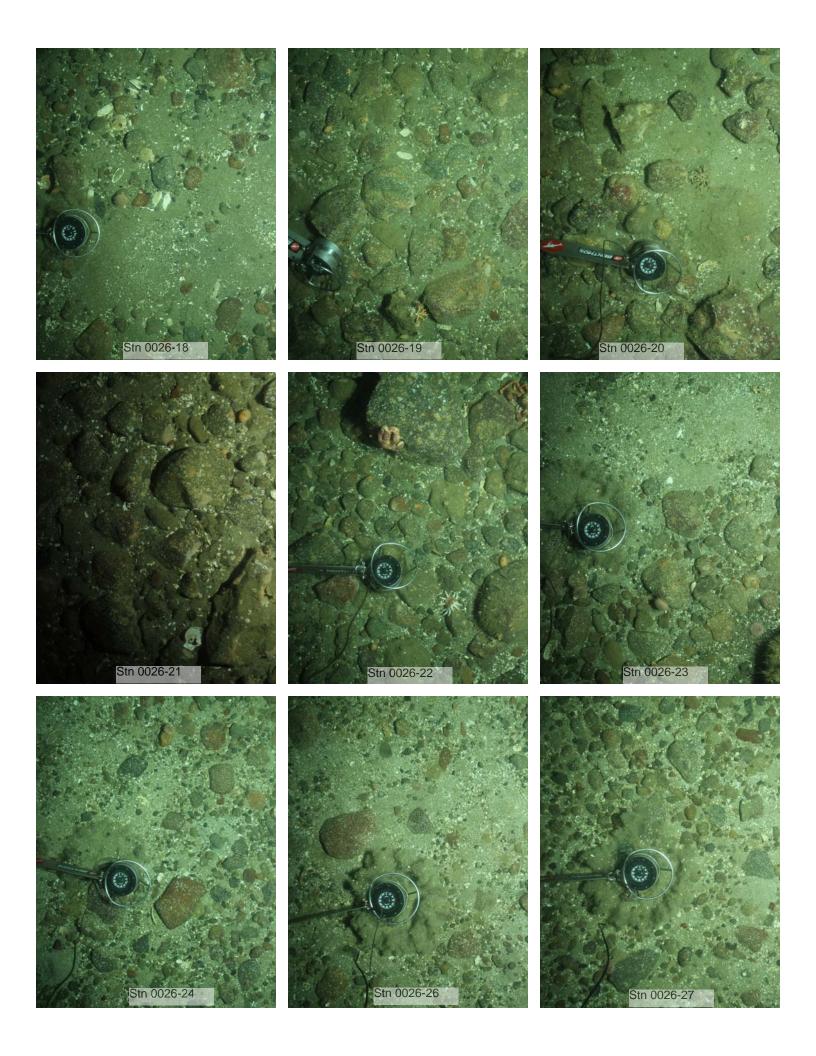


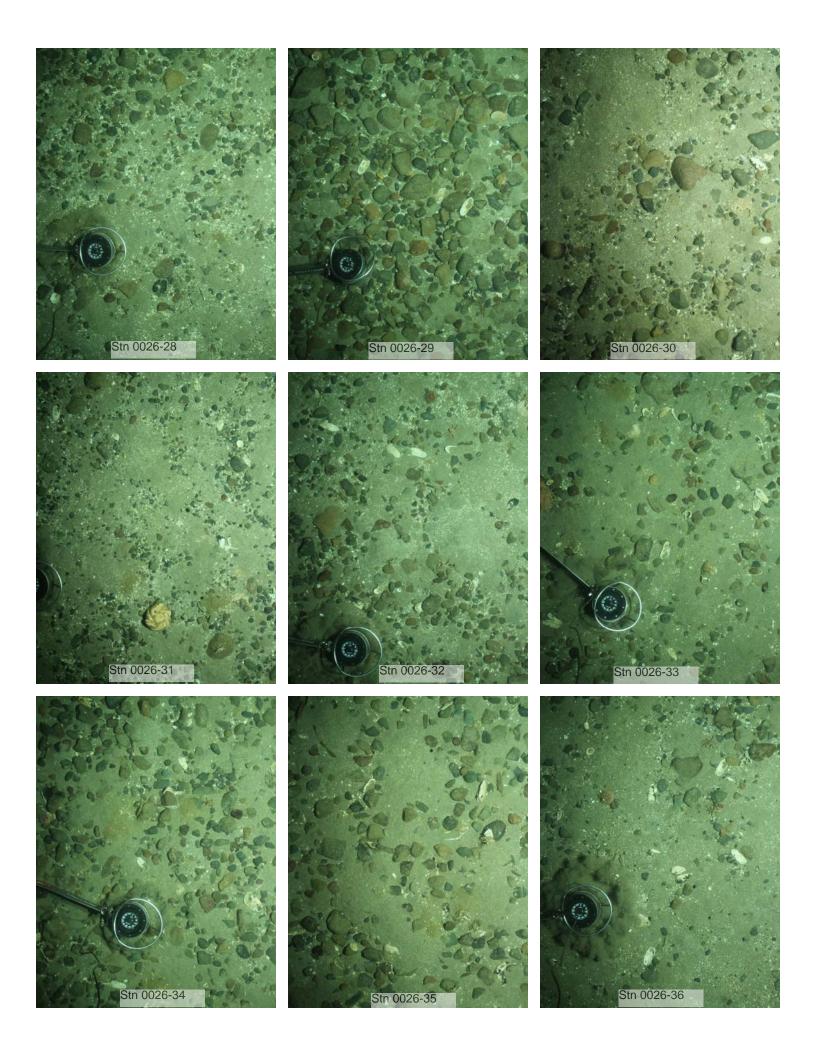


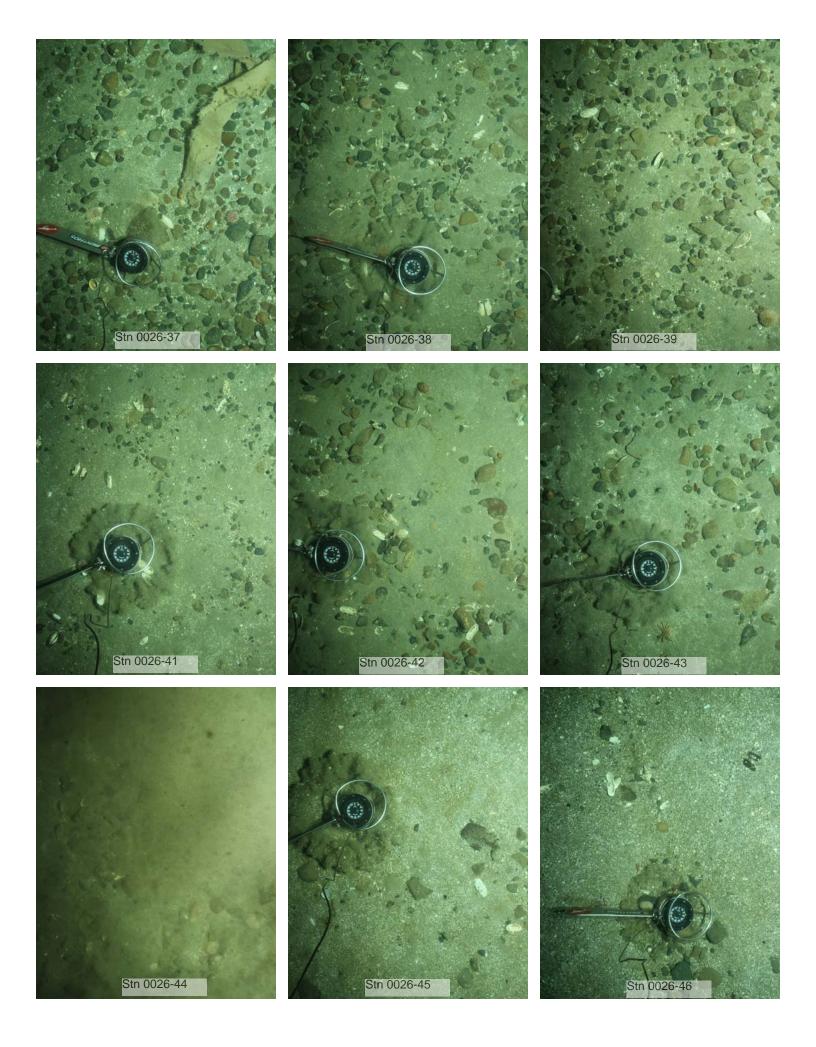


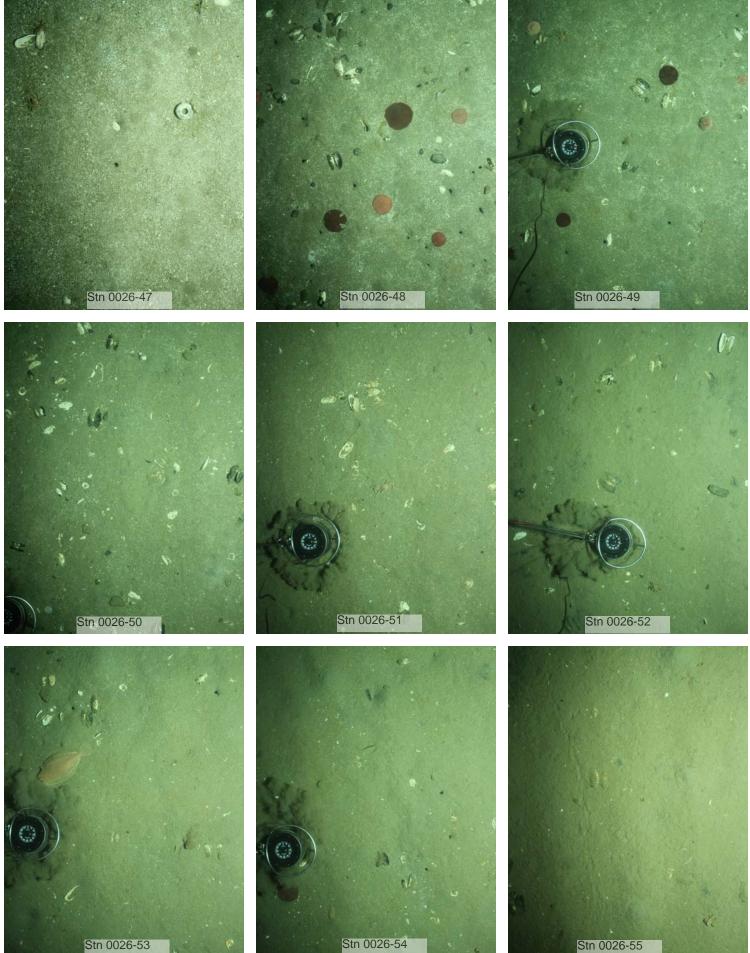






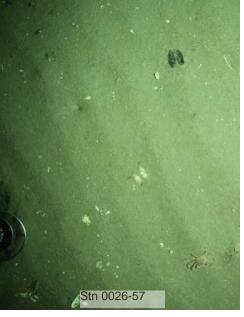


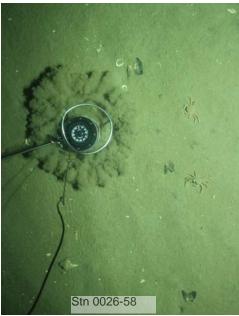




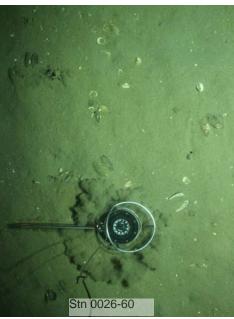
Stn 0026-55

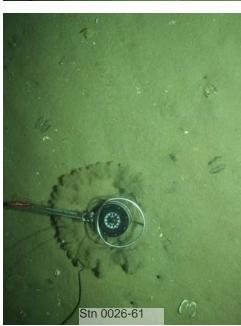














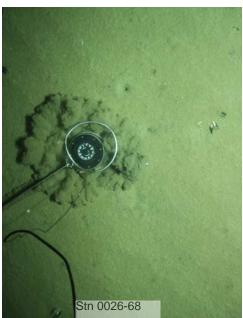


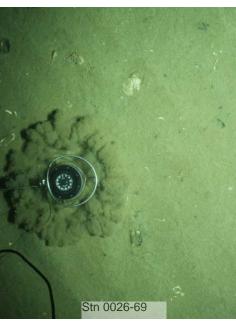






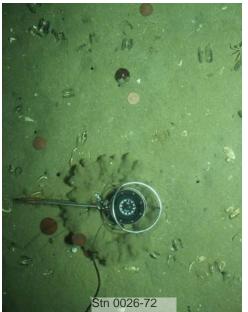




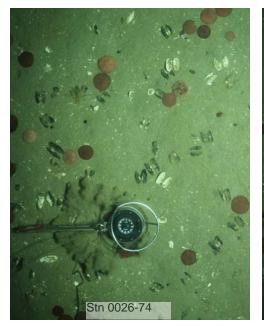


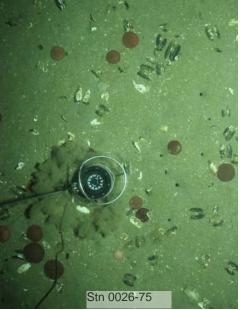


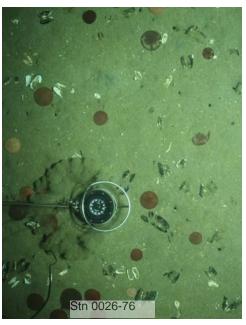


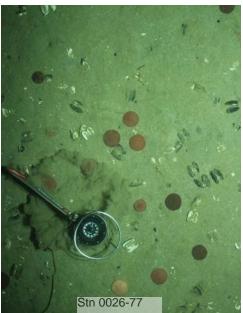




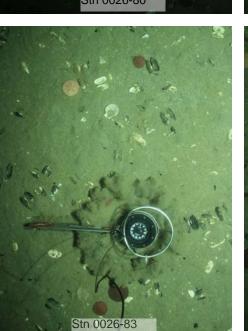


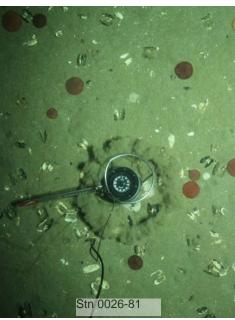


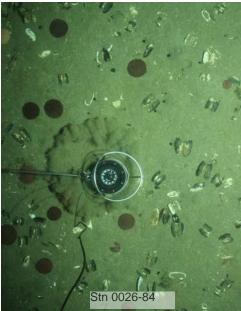


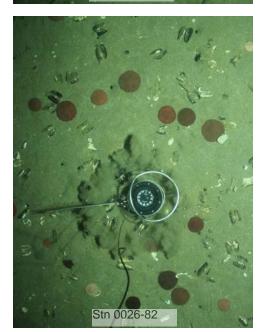


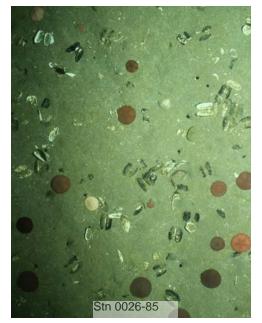


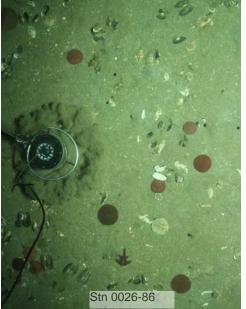










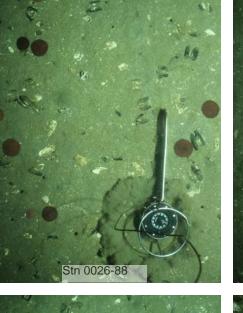




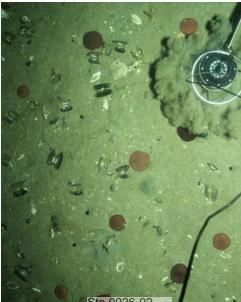






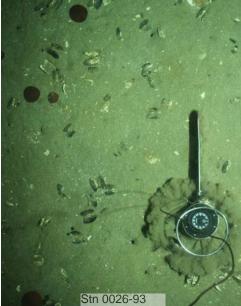


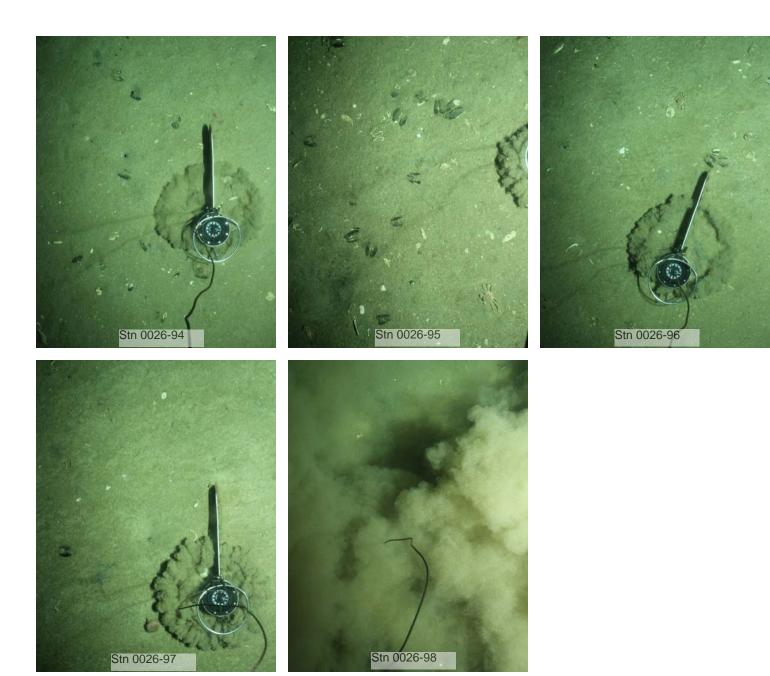


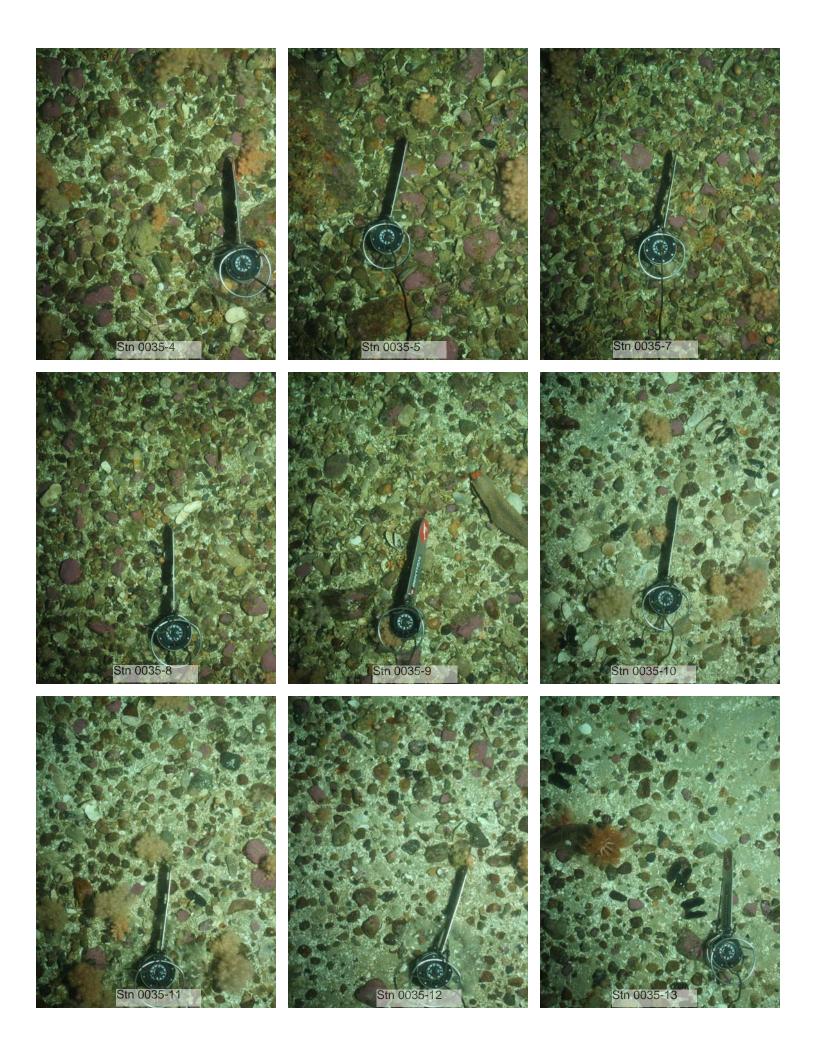


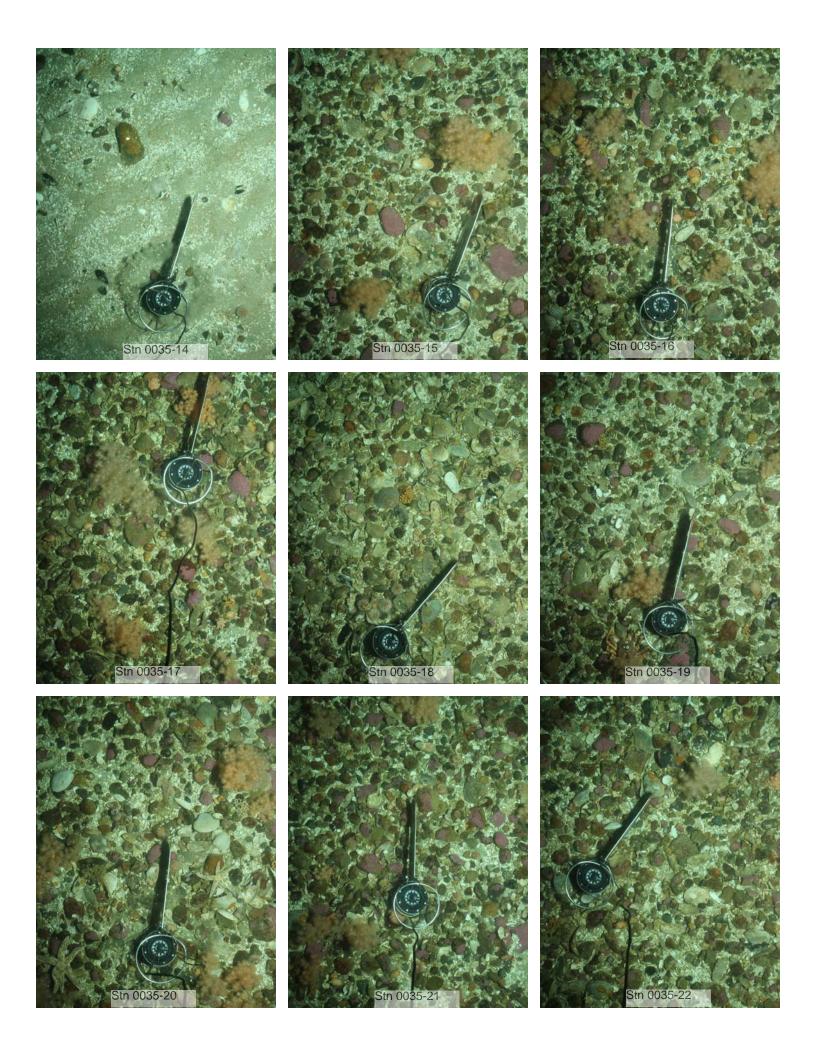




















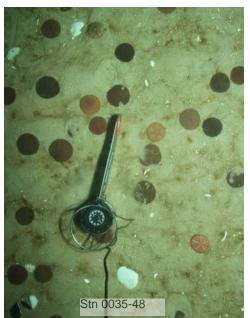


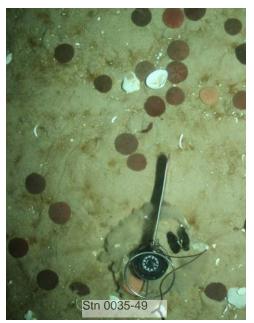








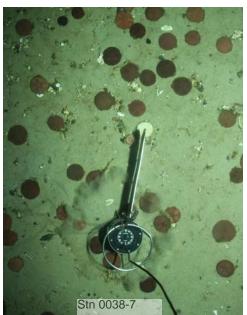










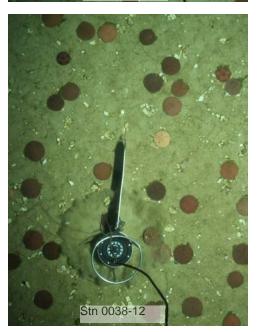












Stn 0038-9

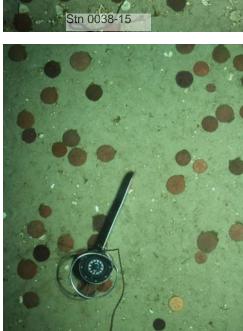












Stn 0038-18



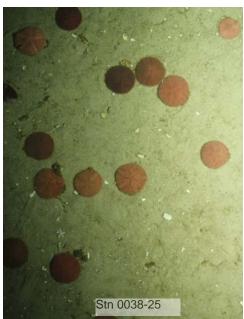








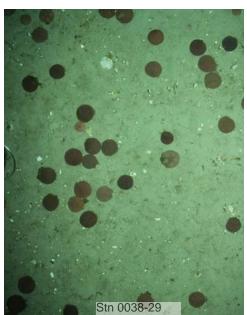






















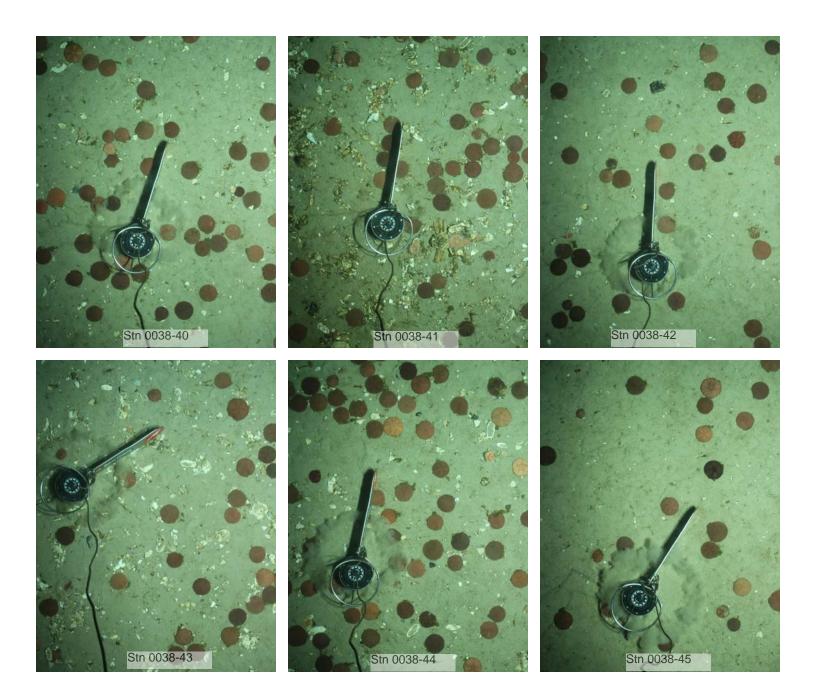










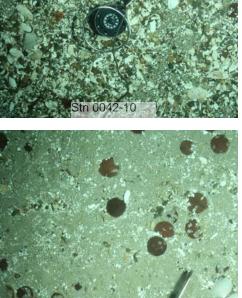










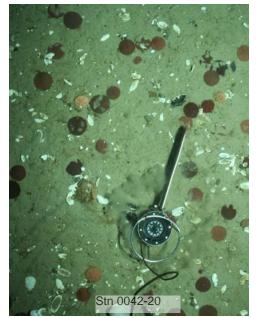








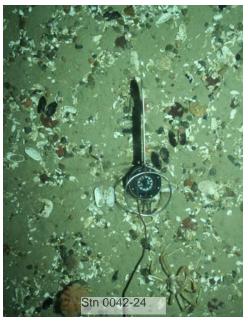


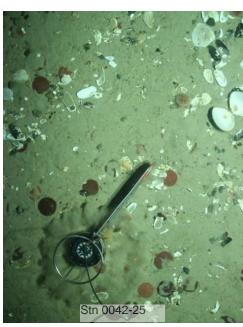








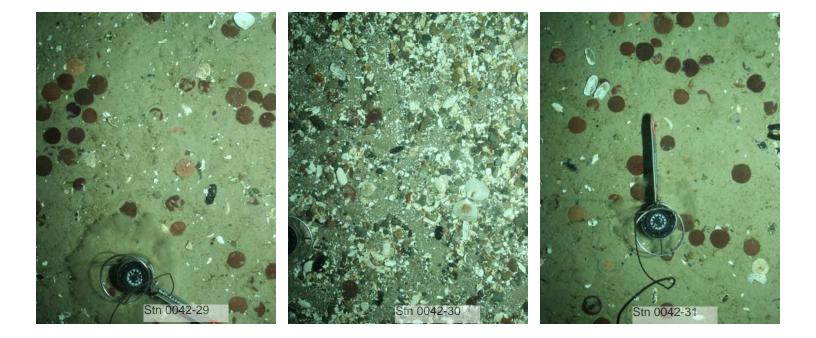


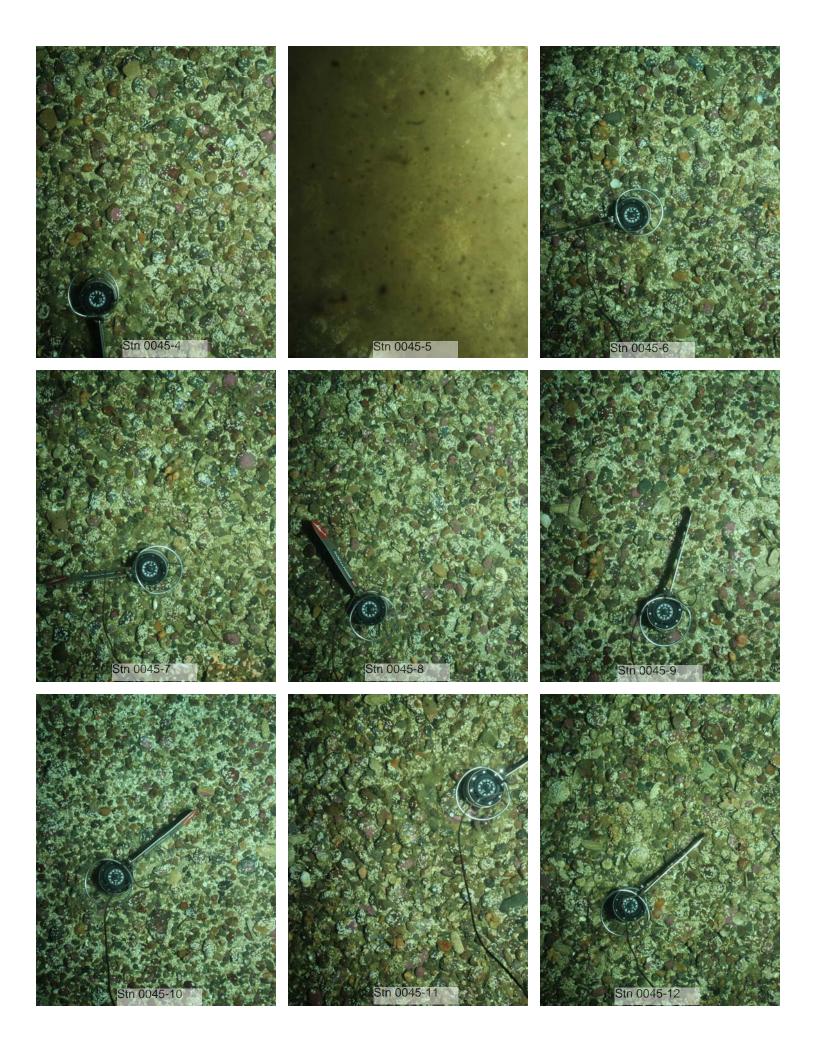




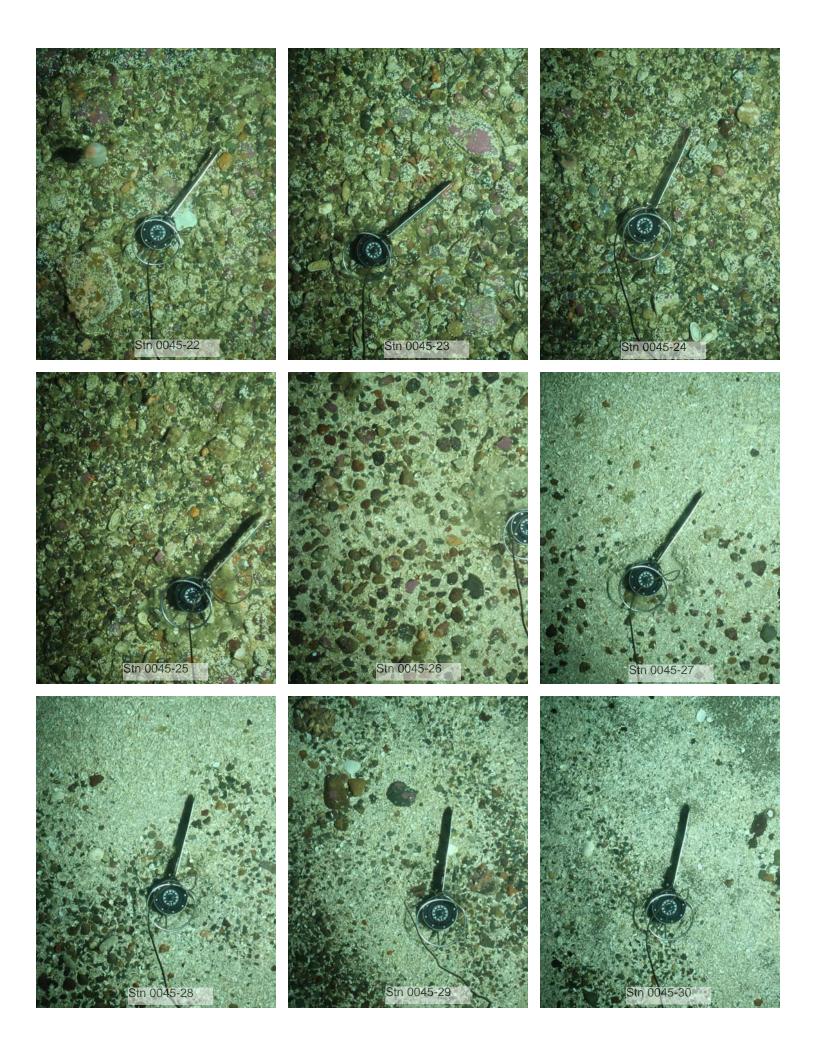


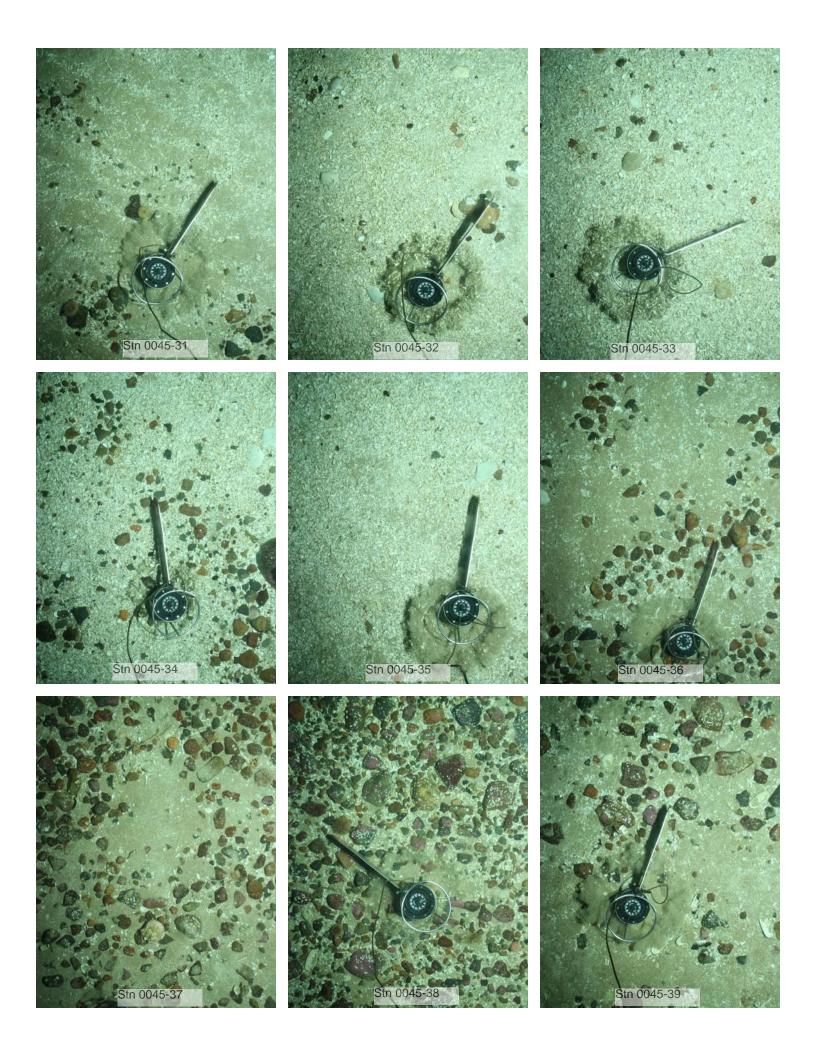


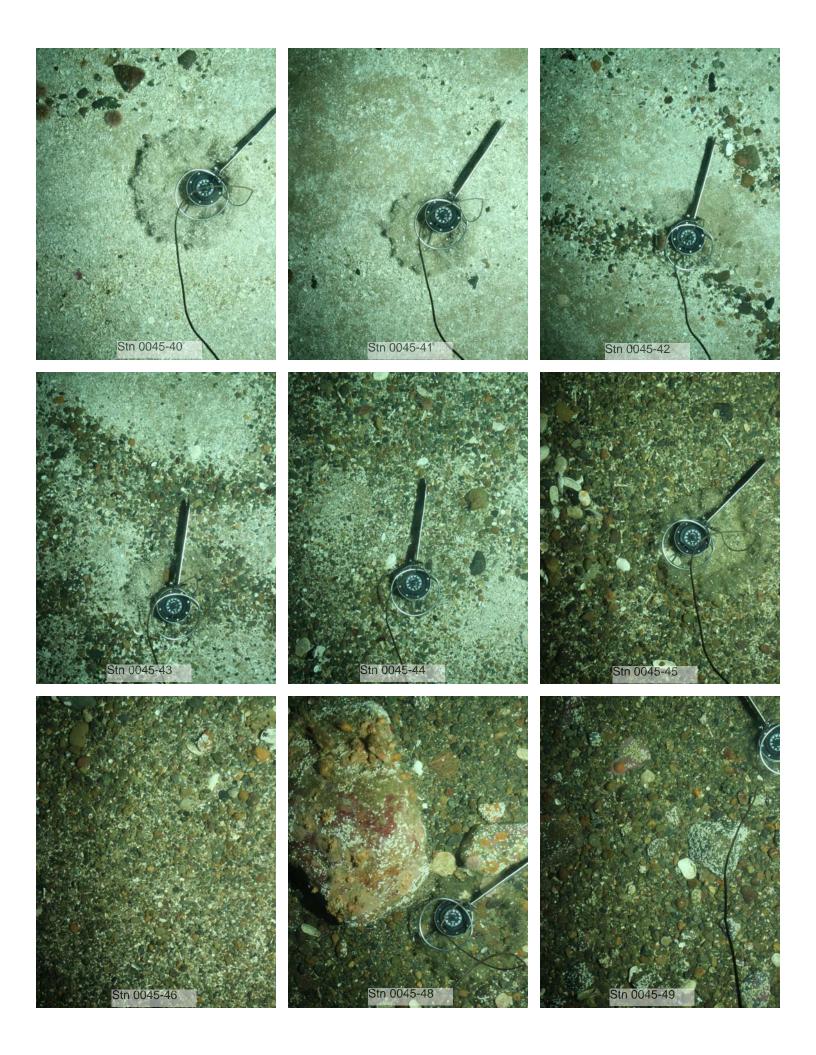


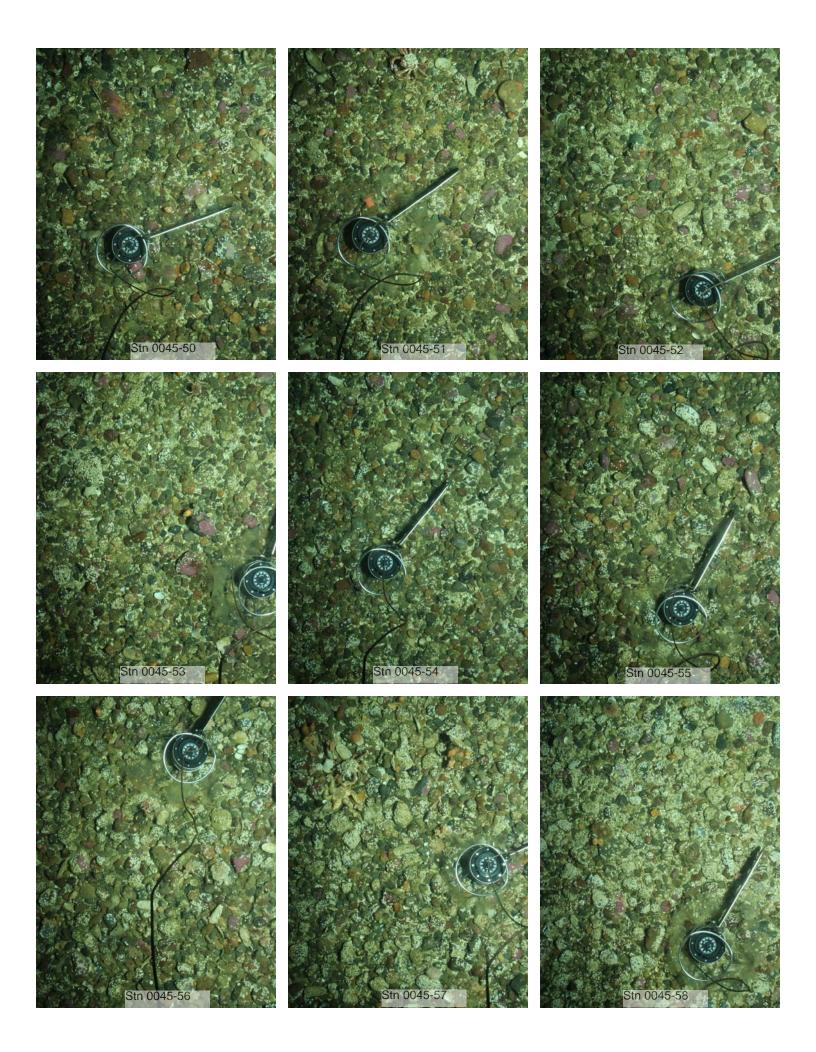














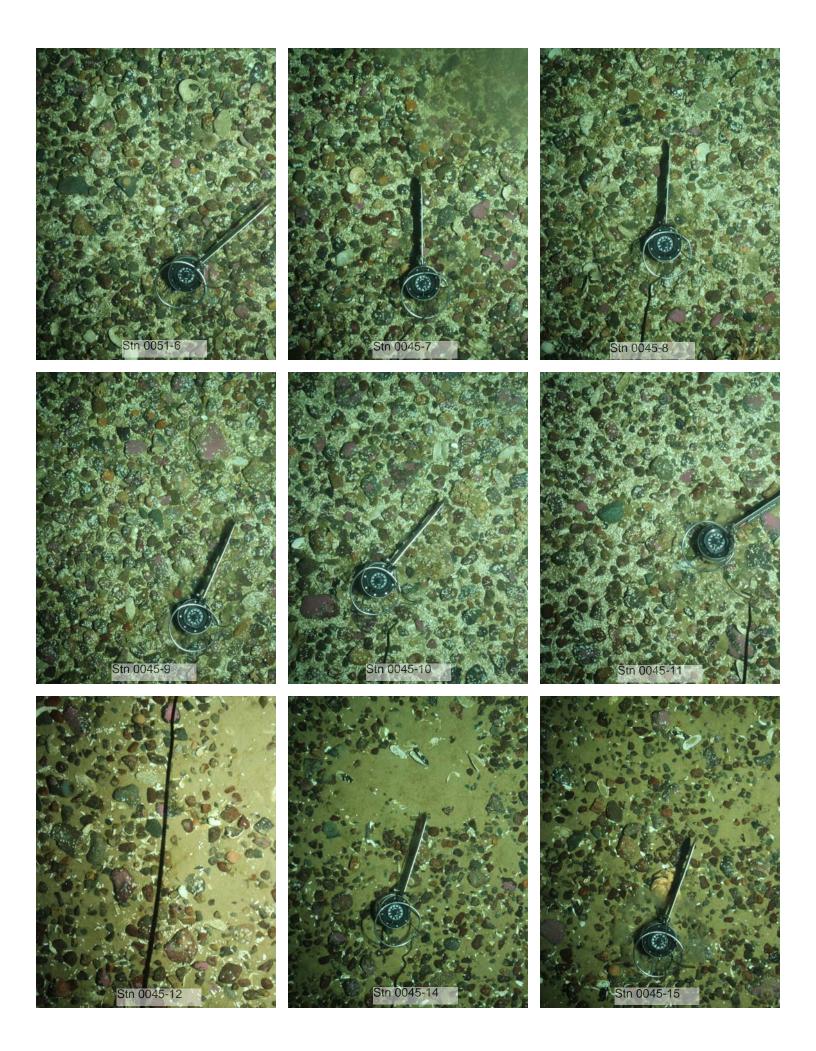


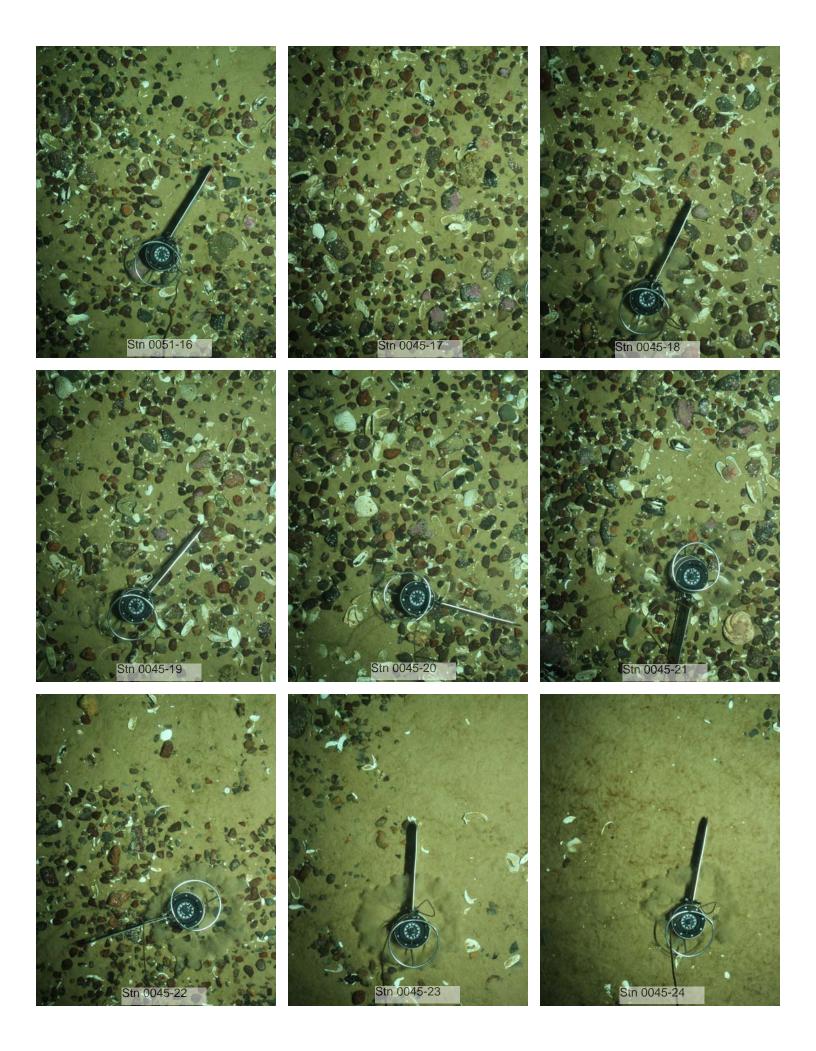


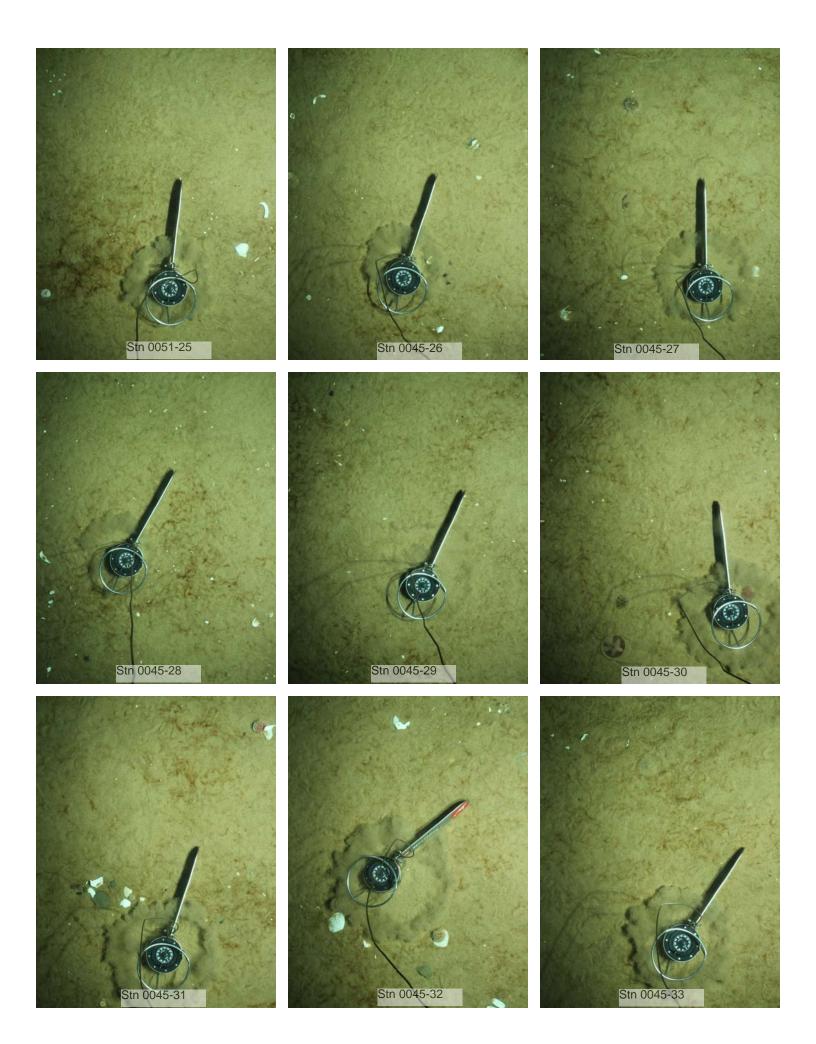


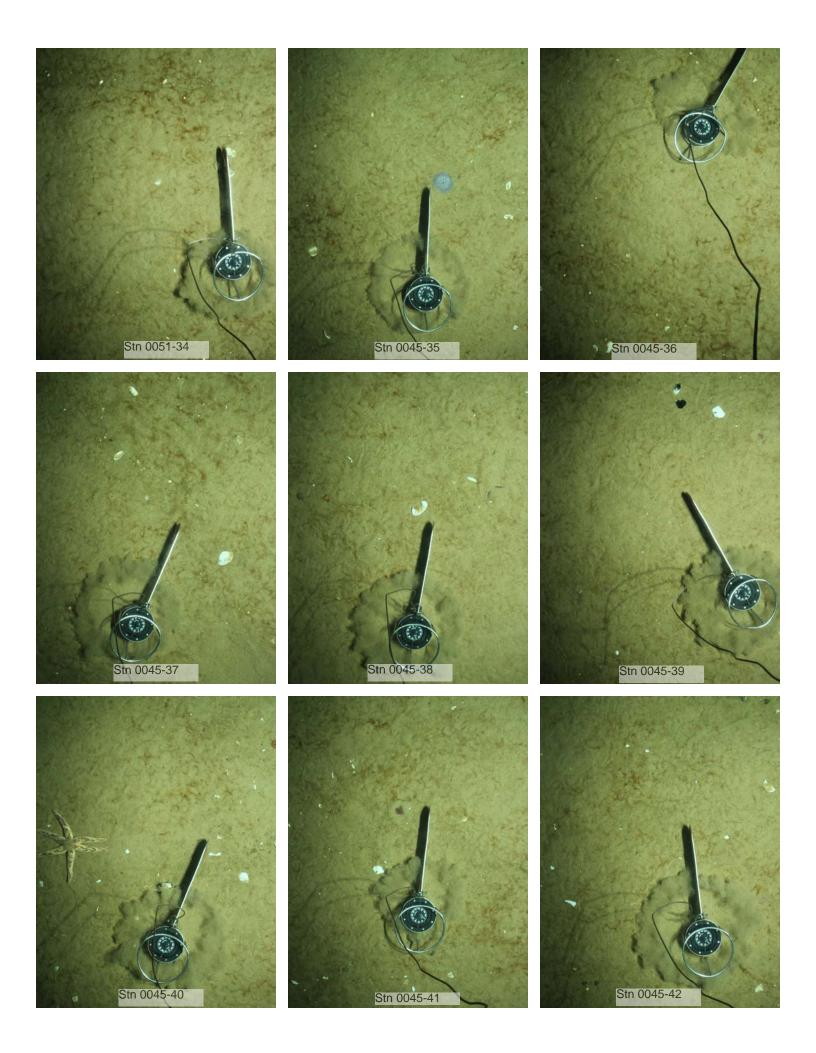














Appendix 4: Geological and biological descriptions and positional notes of seabed photographs of camera stations conducted on Hudson 2010020.

## Appendix 4.

												DUOTO
EXPED CD	NUM		NUM_PHOTOS PHOTO			PHOTO LONG G		VATER PHOTO_FILE	PHOTO Position COMMENTS	GEOLOGY	BIOLOGY	PHOTO DESCRIBED BY
	NON	NOW		SDO_OTTE		THOTO_LONG O				Sand. Bioturbated fine-med grain grey sand with brown organic floc, 5-	Sand dollars, waved whelk, hermit crabs, brittle star,	DESCRIBED BI
2010020	0001	28	15 1	1 2001	45.874430	-56.648210	200302	65 Stn 0001 008 inc	Antenna Position Nav	10% Shell fragments, abundant burrow holes	camoflaged winter skate	COOP Student onboard
										Sand. Bioturbated fine-med grain grey sand with brown organic floc, 5-		
2010020	0001	28	15 2	2 2001	45.874443	-56.648215	200309	65 Stn 0001 009.jpc	Antenna Position Nav	10% Shell fragments, abundant burrow holes	sand dollars, sea urchins, siphon holes	COOP Student onboard
										Sand. Bioturbated fine-med grain grey sand with brown organic floc, 5-		
2010020	0001	28	15 3	3 2001	45.875655	-56.648292	200316	65 Stn 0001 010.jpc	Antenna Position Nav	10% Shell fragments, few burrow holes	sand dollars	COOP Student onboard
										Sand. Bioturbated fine-med grain grey sand with brown organic floc, 5-		
2010020	0001	28	15 4	4 2001	45.875641	-56.648343	200323	65 Stn 0001 011.jpc	Antenna Position Nav	10% Shell fragments, abundant burrow holes	sand dollars, burried skate, siphon holes	COOP Student onboard
										Sand. Bioturbated fine-med grain grey sand with brown organic floc, 5-		
2010020	0001	28	15 5	5 2001	45.875618	-56.648387	200330	65 Stn 0001 012.jpg	Antenna Position Nav	10% Shell fragments, abundant burrow holes	hormathiidae, sand dollars, siphon holes	COOP Student onboard
										Sand. Bioturbated fine-med grain grey sand with brown organic floc, 5-		
2010020	0001	28	15 6	6 2001	45.875689	-56.648485	200355	65 Stn 0001 013.jpg	Antenna Position Nav	10% Shell fragments, few burrow holes	sand dollars, siphon holes	COOP Student onboard
										Sand. Bioturbated fine-med grain grey sand with brown organic floc, 5-		
2010020	0001	28	15 7	7 2001	45.875630	-56.648514	200509	65 Stn 0001 014.jpg	Antenna Position Nav	10% Shell fragments, abundant burrow holes	sand dollars, siphon holes	COOP Student onboard
										Sand. Bioturbated fine-med grain grey sand with brown organic floc, 5-		
2010020	0001	28	15 8	8 2001	45.875637	-56.648384	200617	65 Stn 0001 015.jpg	Antenna Position Nav	10% Shell fragments, few burrow holes	sand dollars, siphon holes	COOP Student onboard
										Sand. Bioturbated fine-med grain grey sand with brown organic floc, 10-		
2010020	0001	28	15 9	9 2001	45.875627	-56.648268	200720	65 Stn 0001 016.jpg	Antenna Position Nav	15% Shell fragments, abundant burrow holes	sand dollars, siphon holes, hermit crabs	COOP Student onboard
										Sand. Bioturbated fine-med grain grey sand with brown organic floc, 5-		
2010020	0001	28	15 10	2001	45.875650	-56.648119	200823	65 Stn 0001 017.jpg	Antenna Position Nav	10% Shell fragments, few burrow holes	sand dollars, siphon holes	COOP Student onboard
										Sand. Bioturbated fine-med grain grey sand with brown organic floc, 10-		
2010020	0001	28	15 11	1 2001	45.875698	-56.647883	200925	65 Stn 0001 018.jpg	Antenna Position Nav	15% Shell fragments, abundant burrow holes	sand dollars, siphon holes	COOP Student onboard
										Sand. Bioturbated fine-med grain grey sand with brown organic floc, 5%		
2010020	0001	28	15 12	2 2001	45.875698	-56.647737	201021	65 Stn 0001 019.jpg	Antenna Position Nav	Shell fragments, abundant burrow holes	sand dollars, siphon holes, velatida	COOP Student onboard
										Sand. Bioturbated fine-med grain grey sand with brown organic floc, 5-		
2010020	0001	28	15 13	3 2001	45.875732	-56.647642	201124	65 Stn 0001 020.jpg	Antenna Position Nav	10% Shell fragments, abundant burrow holes	sand dollars, siphon holes	COOP Student onboard
										Sand. Bioturbated fine-med grain grey sand with brown organic floc, 5-		
2010020	0001	28	15 14	4 2001	45.875760	-56.647575	201222	65 Stn 0001 021.jpg	Antenna Position Nav	10% Shell fragments, few burrow holes	sand dollars, siphon holes	COOP Student onboard
										Sand. Bioturbated fine-med grain grey sand with brown organic floc, 5-		
2010020	0001	28	15 15	5 2001	45.875780	-56.647511	201320	65 Stn 0001 022.jpg	Antenna Position Nav	10% Shell fragments, few burrow holes	sand dollars, siphon holes	COOP Student onboard
									Processed USBL Nav but navigation spike; location adjusted to with			
2010020	0003	23	12 1	1 2001	45.879655	-55.652658	101713	73 Stn 0003 006.jpg	10 m by interpolating instrument path	algae encrusted cobbles of mixed lithologies. Some shell fragments.	encrusting sponge	COOP Student onboard
0040000			10		15 070710	55 050004	101710	70 01 0000 007	Processed USBL Nav but navigation spike; location adjusted to with			
2010020	0003	23	12 2	2 2001	45.879713	-55.652631	101743	73 Stn 0003 007.jpg	10 m by interpolating instrument path; also adjusted time by 30 sec	encrusted cobbles of mixed lithologies. Shell fragments.	branching coral, purple encrusting sponge,	COOP Student onboard
0040000	0003		12 3		15 070750	55 050507	404000			Gravel with sand. Fine-med grained grey sand. 75% subangular gravel		
2010020	0003	23	12 3	3 2001	45.879759	-55.652597	101822	73 Stn 0003 008.jpg	Processed USBL Nav	and algae encrusted cobbles of mixed lithologies. Shell fragments.	rough barnacles, purple encrusting sponge,	COOP Student onboard
										Oracluith and Fire and arrived arrived 00% automatics athle		
2010020	0003	23	12 4	4 2001	45.879820	-55.652532	101921	72 540 0002 000 inc	Processed USBL Nav	Gravel with sand. Fine-med grained grey sand. 90% subangular pebbles and algae encrusted cobbles of mixed lithologies. Some shell fragments		COOP Student onboard
2010020	0003	23	12 4	+ 2001	45.679620	-55.652552	101921	73 Stri 0003 009.jpg		in Gravel with sand. Fine-med grained grey sand. 90% subangular gravel	. rough barnacles, purple encrusting sponge,	COOP Student onboard
2010020	0003	23	12 5	5 2001	45.879877	-55.652417	102023	72 Stp 0002 010 ipc	10 m by interpolating instrument path	and algae encrusted cobbles of mixed lithologies. Shell fragments.	branching coral, purple encrusting sponge,	COOP Student onboard
2010020	0003	23	12 0	2001	45.079077	-55.052417	102023	73 Stil 0003 010.jpg	To m by interpolating instrument path	Gravel. Fine-med grained grey sand. 90% subangular gravel and algae	branching coral, purple enclusuing sponge,	COOF Student onboard
2010020	0003	23	12 F	6 2001	45.879914	-55.652301	102127	72 Stp 0002 011 inc	Processed USBL Nav	encrusted cobbles of mixed lithologies. Shell fragments.	purple encrusting sponge	COOP Student onboard
2010020	0003	23	12 0	2001	45.07 55 14	-55.052501	102127	73 Stil 0003 011.jpg	Processed USBL Nav but navigation spike; location adjusted to with		sea urchin, barnacles, six armed sun star, purple	COOF Student onboard
2010020	0003	23	12 7	7 2001	45.879947	-55.652017	102222	73 Stn 0003 012.jpc		encrusted cobbles of mixed lithologies. Shell fragments.	encrusting sponge	COOP Student onboard
2010020	0000	23	12 1	2001	-0.0/ 00+/	00.002017		70/001 0000 012.jpg		Sand. Bioturbated fine-med grained grey sand. Some organic floc. Some		
2010020	0003	23	12 8	3 2001	45.879972	-55.651384	102427	73 Stn 0003 013 inc	Processed USBL Nav	burrow holes.	sand dollars	COOP Student onboard
2010020	0000	25	12 (	2001	10.01 0012	00.001004	. 52-721	. 5 0 11 0000 0 10.jpg		Sand. Bioturbated fine-med grained grey sand. Some organic floc. Few		SSST Olddoni onbodiu
2010020	0003	23	12 9	9 2001	45.879993	-55.650603	102544	73 Stn 0003 014.inc	Processed USBL Nav	subangular cobbles. Some burrow holes.	sand dollars	COOP Student onboard
										Sand and gravel. Gravelly sand. Fine-med grained grey sand. 60%		
										subangular gravel and algae encrusted cobbles of mixed lithologies.		
2010020	0003	23	12 10	2001	45.879932	-55.650097	102625	73 Stn 0003 015.inc	Processed USBL Nav	Shell fragments.	rough barnacles, purple encrusting sponge,	COOP Student onboard
									Processed USBL Nav but navigation spike; location adjusted to with			
2010020	0003	23	12 11	1 2001	45.879804	-55.649993	102721	73 Stn 0003 016.jpg		holes. Shell fragments	snow crab, sand dollars, siphon holes	COOP Student onboard
								- 11 0		Sand and gravel. Sand with gravel. Bioturbated fine-med grained grey	•	
2010020	0003	23	12 12	2 2001	45.879479	-55.650085	102823	73 Stn 0003 018.jpc	Processed USBL Nav	sand. Few subangular cobbles and pebbles. Some burrow holes.	hormathiidae, barnacles, purple encrusting sponge	COOP Student onboard
										Gravel. Algae encrusted subangular to subrounded cobbles and pebbles		
2010020	0008	32	14 1	1 2001	45.805069	-55.854357	135729	57 Stn 0008 003.jpg	Processed USBL Nav	completely covering fine-med grain grey sand bed. Few shell fragments		COOP Student onboard
										Gravel. Algae encrusted subangular to subrounded cobbles and gravel.		
2010020	0008	32	14 2	2 2001	45.805320	-55.854744	135825	57 Stn 0008 007.jpg	Processed USBL Nav: identical position recorded as for picture 3	Few shell fragments	purple encrusting sponge, sea urchins, cerianthiidae,	COOP Student onboard
										Gravel. Algae encrusted subangular to subrounded cobbles and gravel.		
2010020	0008	32	14 3	3 2001	45.805320	-55.854744	135825	57 Stn 0008 009.jpg	Processed USBL Nav: identical position recorded as for picture 2	Few shell fragments. Silt cloud from disturbance by camera.		COOP Student onboard
										· · · · ·		

1	STATION EXPOSI	URES NUM_PHOTO	SIPHOTO			F		ATER PHOTO_FILE				РНОТО
EXPED_CD	NUMNUM	IN_GROUP	NUM	SDO_GTYPE	PHOTO_LAT	PHOTO_LONG	GMT DE	PTH NAME	PHOTO_Position COMMENTS	GEOLOGY	BIOLOGY	DESCRIBED BY
2010020	0008	32 1	4 4	2001	45.805303	-55.854542	135925	57 Stn 0008 010.jpg	Processed USBL Nav	Gravel. Algae encrusted subangular to subrounded cobbles and pebbles completely covering fine-med grain grey sand bed. Few shell fragments		COOP Student onboard
										Gravel. Algae encrusted subangular to subrounded cobbles and gravel.		
2010020	0008	32 1	4 5	2001	45.805373	-55.854317	140024	57 Stn 0008 011.jpg	10 m by interpolating instrument path	Few shell fragments	polymastiidae	COOP Student onboard
2010020	0008	32 1	4 6	2001	45.805433	-55.854147	140139	57 Stn 0008 012.jpg	Processed USBL Nav	Gravel. Algae encrusted subangular to subrounded cobbles and gravel	purple encrusting sponge, sea urchins, polymastiidae purple encrusting sponge, sea urchins, cerianthiidae,	COOP Student onboard
2010020	0008	32 1	4 7	2001	45.805262	-55.853607	140243	57 Stn 0008 013.jpg	Processed USBL Nav	Gravel. Algae encrusted subangular to subrounded cobbles and gravel	polymastiidae	COOP Student onboard
2010020	0008	32 1	4 8	2001	45.805433	-55.853290	140408	57 Stn 0008 014.jpg	Processed USBL Nav	Gravel. Algae encrusted subangular to subrounded cobbles and pebbles completely covering fine-med grain grey sand bed. Few shell fragments	purple encrusting sponge, sea urchins, polymastiidae	COOP Student onboard
2010020	0008	32 1	4 9	2001	45.805522	-55.852676	140513	57 Stn 0008 015.ipg	Processed USBL Nav	Gravel. Algae encrusted subangular to subrounded cobbles and pebbles overlying fine-med grain grey sand bed. Few shell fragments	purple encrusting sponge	COOP Student onboard
										Gravel. Algae encrusted subangular to subrounded cobbles and pebbles		
2010020	0008	32 1	4 10	2001	45.805535	-55.852617	140517	57 Stn 0008 016.jpg	Processed USBL Nav	Few shell fragments. Silt cloud from disturbance by camera. Gravel. Algae encrusted subangular to subrounded cobbles and gravel.	purple encrusting sponge, sea urchins purple encrusting sponge, branching coral, sea	COOP Student onboard
2010020	0008	32 1	4 11	2001	45.805505	-55.852840	140617	57 Stn 0008 017.jpg	Processed USBL Nav	Few shell fragments	urchins, polymastiidae	COOP Student onboard
2010020	0008	32 1	4 12	2001	45.805455	-55.852828	140622	57 Stn 0008 018.jpg	Processed USBL Nav	Gravel. Algae encrusted subangular to subrounded cobbles and gravel Gravel. Algae encrusted subangular to subrounded cobbles and gravel.	purple encrusting sponge, branching coral,	COOP Student onboard
2010020	0008	32 1	4 13	2001	45.805613	-55.852736	140623	57 Stn 0008 019.ipa	Processed USBL Nav	Silt cloud from disturbance by camera.	purple encrusting sponge, polymastiidae	COOP Student onboard
										Gravel. Algae encrusted subangular to subrounded cobbles and gravel.	<u>parpre enteren ig openige, perjuisen ette</u>	
2010020	0008	32 1	4 14	2001	45.805477	-55.852157	140730	57 Stn 0008 020.jpg	Processed USBL Nav	Few shell fragments.	purple encrusting sponge, polymastiidae	COOP Student onboard
2010020	0009	23 1	2 1	2001	45.766382	-55.902446	160053	56 Stp 0009 006 ipg	Processed USBL Nav	Gravel. Algae encrusted subangular to subrounded cobbles and gravel. Small boulder.	purple encrusting algae, red soft coral, branching cora	COOP Student onboard
2010020	0009	23	2 1	2001	43.700302	-55.902440	100055	50 Stil 0009 000.jpg	FIOLESSED USBE Nav		purple encrusting algae, red son coral, branching cora	COOP Student Onboard
2010020	0009	23 1	2 2	2001	45.766407	-55.902306	160203	56 Stn 0009 009.jpg	Processed USBL Nav	Gravel. Algae encrusted subangular to subrounded cobbles and gravel	purple encrusting algae, sea urchin	COOP Student onboard
0040000				0004	15 300000	55 000007	400005	50 01 0000 040 1			purple encrusting algae, sea urchin, bubble gum	
2010020	0009	23 1	2 3	2001	45.766388	-55.902267	160205	56 Stn 0009 010.jpg	Processed USBL Nav Processed USBL Nav but navigation spike; location adjusted to within	Gravel. Algae encrusted subangular to subrounded cobbles and gravel	coral?	COOP Student onboard
2010020	0009	23 1	2 4	2001	45.766321	-55.902216	160257	56 Stn 0009 011.jpg		Gravel. Algae encrusted subangular to subrounded cobbles and gravel	purple encrusting algae, sea urchin, rough sun star	COOP Student onboard
									Processed USBL Nav but navigation spike; location adjusted to within			
2010020	0009	23 1	2 5	2001	45.766227	-55.902198	160357	56 Stn 0009 012.jpg		Gravel. Algae encrusted subangular to subrounded cobbles and gravel	purple encrusting algae, sea urchin	COOP Student onboard
2010020	0009	23 1	2 6	2001	45.766159	-55.902252	160401	56 Stn 0009 013.jpg		Gravel. Algae encrusted subangular to subrounded cobbles, gravel and pebbles	purple encrusting algae, sea urchins anemone	COOP Student onboard
2010020	0000			2001	1011 00100	00.002202	100101	000000000000000	to may incorporating inclusion paul	Gravel. Algae encrusted subangular to subrounded cobbles, gravel and		ooor olddoll olloodid
2010020	0009	23 1	2 7	2001	45.766103	-55.902376	160511	56 Stn 0009 014.jpg	Processed USBL Nav	pebbles. Shell fragments	purple encrusting algae, sea urchin	COOP Student onboard
2010020	0009	23 1	2 8	2001	45.766300	-55.902473	160615	56 Stp 0000 015 ipg	Processed USBL Nav	Gravel. Algae encrusted subangular to subrounded cobbles, gravel and pebbles. Shell fragments	purple energeting algae, see urghin	COOP Student onboard
2010020	0009	23	2 0	2001	43.700300	-55.902473	100015	56 Stil 0009 015.jpg	Processed USBL Nav	Gravel. Algae encrusted subangular to subrounded cobbles, gravel and	purple encrusting algae, sea urchin purple encrusting algae, sea urchin, northern sea star,	COOP Student onboard
2010020	0009	23 1	2 9	2001	45.766580	-55.902317	160727	56 Stn 0009 016.jpg	Processed USBL Nav	pebbles. Shell fragments	anemone	COOP Student onboard
2040000	0000		2 10	0001	AE 200777	EE 000001	160805	E6 Sta 0000 017 -	Drassand USDL Nov	Gravel. Algae encrusted subangular to subrounded gravel and pebbles.		COOD Student aska
2010020	0009	23 1	2 10	2001	45.766777	-55.902291	160835	30 Stn 0009 017.jpg	Processed USBL Nav	Shell fragments Gravel. Algae encrusted subangular to subrounded cobbles, gravel and	purple encrusting algae, sea urchin	COOP Student onboard
2010020	0009	23 1	2 11	2001	45.766838	-55.902256	160949	56 Stn 0009 018.jpg	Processed USBL Nav	pebbles. Shell fragments	purple encrusting algae, sea urchin	COOP Student onboard
										Gravel. Gravel. Algae encrusted subangular gravel and pebbles. Shell	purple encrusting algae, sea urchin, small bubble gum	
2010020	0009	23 1	2 12	2001	45.766655	-55.902649	161049	56 Stn 0009 021.jpg	Processed USBL Nav	fragments Gravel. Subangular to subrounded gravel and pebbles. Approx. 25%	coral?	COOP Student onboard
2010020	0013	20 1	0 1	2001	45.755076	-55.993169	193642	56 Stn 0013 008.ipg	Winch Rm Position Nav	algae encrusted. Shell fragments	sea urchin	COOP Student onboard
										Gravel. Subangular to subrounded gravel and pebbles. Approx. 40%		
2010020	0013	20 1	0 2	2001	45.755187	-55.993272	193813	56 Stn 0013 009.jpg	Winch Rm Position Nav	algae encrusted. Shell fragments Gravel. Subangular to subrounded gravel and pebbles. Approx. 40%	sea urchins, sea scallop	COOP Student onboard
2010020	0013	20 1	0 3	2001	45.755157	-55.993156	193916	56 Stn 0013 010 ipg	Winch Rm Position Nav	algae encrusted. Shell fragments	sea urchins	COOP Student onboard
			-							Gravel. Subrounded pebbles and 25% algae encrusted gravel. Shell		
2010020	0013	20 1	0 4	2001	45.755153	-55.99299	194011	56 Stn 0013 011.jpg	Winch Rm Position Nav	fragments	sea urchin	COOP Student onboard
2010020	0013	20 1	0 5	2001	45.755213	-55.992928	194113	56 Stn 0013 012 ing	Winch Rm Position Nav	Gravel. Subrounded pebbles and 10% algae encrusted gravel. Shell fragments	sea star or sun star	COOP Student onboard
2010020	0010	20		2001	-0.7 002 10	00.332320	104110	30/04/ 00/13 0/2.jpg		Gravel. Subrounded to subangular gravel. Approx. 40% algae encrusted.		
2010020	0013	20 1	0 6	2001	45.755259	-55.992818	194223	56 Stn 0013 013.jpg	Winch Rm Position Nav	Shell fragments	anemone	COOP Student onboard
2010020	0013	20 1	0 7	2001	45.755225	-55,992592	194325	56 Stp 0012 014 in a	Winch Rm Position Nav	Gravel. Subrounded to subangular gravel. Approx. 40% algae encrusted. Shell fragments	sea urchins	COOP Student onboard
2010020	0013	20 1	0 7	2001	45.755225	-55.992592	194325	50 Stn 0013 014.jpg	WINCH KIT FOSILION NAV	Shell fragments Gravel. Subrounded to subangular gravel and cobbles. Approx. 75%	sea urchins	COOP Student onboard
2010020	0013	20 1	0 8	2001	45.755215	-55.992502	194427	56 Stn 0013 015.jpg	Winch Rm Position Nav	algae encrusted. Shell fragments	hermit crab, sea urchins	COOP Student onboard

	STATIONIEXPOS	SURES NUM_PHO	OSIPHOTO			PHOTO \	VATER PHOTO FILE				РНОТО
EXPED_CD	NUM NUM	IN_GROUP			PHOTO_LAT		DEPTH NAME	PHOTO_Position COMMENTS	GEOLOGY	BIOLOGY	DESCRIBED BY
									Gravel. Subangular to subrounded gravel and pebbles. Approx. 75%		
2010020	0013	20	10	9 200	1 45.755252	2 -55.99251 194529	56 Stn 0013 016.jpg	Winch Rm Position Nav	algae encrusted. Shell fragments	anemone	COOP Student onboard
2010020	0013	20	10 1	0 200 <sup>-</sup>	1 45.75528	8 -55.992511 194631	56 Sta 0012 017 inc	Winch Rm Position Nav	Gravel. Subangular to subrounded gravel and pebbles. Approx. 30% algae encrusted. Shell fragments	sea urchin	COOP Student onboard
2010020	0013	20	10 1	0 200	45.75520	5 -55.992511 194631	56 Stri 0013 017.jpg	Which Riff Position Nav	Sand with gravel. Fine-med grain grey sand, 5-10% Shell fragments, 5%		COOP Student onboard
2010020	0020	62	48	1 200	1 45.647370	-51,996998 100540	104 Stn 0020 007.jpc	Processed USBL Nav	large pebbles and small cobbles	green sea urchin	COOP Student onboard
									Sand with gravel. Bioturbated fine-med grain grey sand, 10-15% Shell	g	
2010020	0020	62	48	2 200 <sup>-</sup>	1 45.647485	5 -51.996651 100642	104 Stn 0020 008.jpg	Processed USBL Nav	fragments, 5% large pebbles, small crab and burrow hole	snow crab, green sea urchin	COOP Student onboard
									Sand with gravel. Bioturbated fine-med grain grey sand, 10-15% Shell		
2010020	0020	62	48	3 200	1 45.647594	4 -51.996354 100746	104 Stn 0020 009.jpg	Processed USBL Nav	fragments, 5% large pebbles, sea urchant and sand dollar	green sea urchin	COOP Student onboard
									Sand with gravel. Bioturbated fine-med grain grey sand, 15% Shell fragments, 5% large pebbles, small crabs, sand dollars, small conch		
2010020	0020	62	48	4 200	1 45.647706	6 -51,996044 100848	104 Stp 0020 010 ipc	Processed USBL Nav	ragments, 5% large peobles, small crabs, sand dollars, small conch	snow crab, sand dollar	COOP Student onboard
2010020	0020	02	40	4 200	43.047700	-51.330044 100040	104 011 0020 010.jpg		Sand with gravel. Bioturbated fine-med grain grey sand, 10% Shell	show crab, sand donar	COOI Student Onboard
									fragments and hash, 5% pebbles, sea urchants and sand dollars,		
2010020	0020	62	48	5 200 <sup>-</sup>	1 45.647819	9 -51.995697 100946	104 Stn 0020 011.jpg	Processed USBL Nav	multiple burrow holes	green sea urchins, sand dollars, siphon holee	COOP Student onboard
									Sand with gravel. Med-large grain grey sand, 15% Shell fragments and		
2010020	0020	62	48	6 200	1 45.648008	8 -51.995273 101100	104 Stn 0020 013.jpg	Processed USBL Nav	hash, 10% large pebbles, small crab, sand dollar	snow crab, sand dollar	COOP Student onboard
2010000	0020	62	48	7 000	1 45.648077	7 -51,995088 101124	104 8 0000 04 1	Dresseed LICRI New	Sand with gravel. Fine-med grain grey sand, 15% shell fragments and	anous araba, agond dellar	COOD Student and a
2010020	0020	62	48	7 200	45.648077	7 -51.995088 101124	104 Stn 0020 014.jpg	Processed USBL Nav	hash, 10% pebbles, coral encrusted sand dollar, small crabs, worm Sand with gravel. Fine-med grain grey sand, 10% shell fragments and	snow crabs, sand dollar snow crabs, sand dollars, encrusting breadcrumb	COOP Student onboard
2010020	0020	62	48	8 200-	1 45.648222	2 -51.994885 101206	104 Stp 0020 015 ipc	Processed USBL Nav	hash. 10% pebbles, small cobble, small crabs	sponge?	COOP Student onboard
2010020	0020	02	-0-	200	+5.0+0222	51.334003 101200	104 Out 0020 010.jpg		Sand with gravel. Fine-med grain grey sand, 10% shell fragments and		
2010020	0020	62	48	9 200 <sup>-</sup>	1 45.648409	9 -51.994584 101306	104 Stn 0020 016.jpg	15 m by interpolating instrument path	hash, 15-20% pebbles		COOP Student onboard
									Sand with gravel. Fine-med grain grey sand, 10-15% shell fragments an	d	
2010020	0020	62	48 1	0 200	1 45.648571	1 -51.994304 101440	104 Stn 0020 017.jpg	Processed USBL Nav	hash, 25-30% med-large pebbles	snow crabs	COOP Student onboard
									Sand with gravel. Fine-med grain grey sand, 10-% shell fragments and		
2010020	0020	62	48 1	1 200'	1 45.648618	8 -51.994098 101556	104 Stn 0020 018.jpg	Processed USBL Nav	hash, small cobbles, 15% pebbles	colus spp, few barncales	COOP Student onboard
2010020	0020	62	48 1	2 200-	45.648651	1 -51.994079 101604	101 Str. 0020 010 inc	Processed USBL Nav	Sand with gravel. Fine-med grain grey sand, 5% shell fragments and hash, small cobble, few pebbles, sea urchin	green sea urchin	COOP Student onboard
2010020	0020	02	40 1.	2 200	43.04003	1 -51.994079 101804	104 501 0020 019.jpg	Plocessed USBL Nav	Sand with gravel. Fine-med grain grey sand, 15% shell fragments and	green sea urchin	COOP Student onboard
2010020	0020	62	48 1	3 200-	1 45.648748	8 -51.993977 101722	104 Stn 0020 020.ipc	Processed USBL Nav	hash, 25% med-large pebbles, cobbles,	solaster endeca, snow crab	COOP Student onboard
2010020	0020	02	10	200	101010110		101 001 0020 020,000		Sand with gravel. Fine-med grain grey sand, 2% shell fragments and		CCCI Cladolit Clibbala
2010020	0020	62	48 1	4 200 <sup>-</sup>	1 45.648918	8 -51.993624 101844	104 Stn 0020 021.jpg	Processed USBL Nav	hash, cobbles, 2% pebbles	sand dollars, green sea urchins	COOP Student onboard
									Sand with gravel. Fine-med grain grey sand, 2% shell fragments and		
2010020	0020	62	48 1	5 2001	1 45.648944	4 -51.993509 101926	104 Stn 0020 022.jpg	Processed USBL Nav	hash, two cobbles, few pebbles	green sea urchin, snow crab	COOP Student onboard
0040000	0020				1 45.649074		404.00 0000 000 :		Sand with gravel. Fine-med grain grey sand, 2% shell fragments and		
2010020	0020	62	48 1	6 200 <sup>-</sup>	1 45.649074	4 -51.993575 102046	104 Stn 0020 023.jpg	Processed USBL Nav	hash, 15% med-large pebbles Sand with gravel. Fine-med grain grey sand, 10% shell fragments and	green sea urchins, siphon holes, mosaic worms	COOP Student onboard
2010020	0020	62	48 1	7 200	1 45.649252	2 -51,993249 102214	104 Stn 0020 024 inc	Processed USBL Nav	hash, 25-30% med-large pebbles, cobbles	green sea urchins, snow crabs, siphon holes	COOP Student onboard
2010020	0020	02	40 1	200	45.043252	-51.555245 102214	104 011 0020 024.jpg		Sand with gravel. Fine-med grain grey sand, 5% shell fragments and	green sea urchins, show crabs, siphor noies	COOI Student Onboard
2010020	0020	62	48 1	8 200	1 45.649302	2 -51.993271 102234	104 Stn 0020 025.jpc	Processed USBL Nav	hash, 45-50% med-large pebbles, small cobbles	retracted)	COOP Student onboard
									Sand with gravel. Fine-med grain grey sand, 15% shell fragments and	snow crab, green sea urchin, sessile tunicates (sea	
2010020	0020	62	48 1	9 200'	1 45.649347	7 -51.993168 102320	104 Stn 0020 026.jpg	Processed USBL Nav	hash, 45-50% med-large pebbles, small and large cobbles	peaches?)	COOP Student onboard
									Sand with gravel. Fine-med grain grey sand, 10% shell fragments and		
2010020	0020	62	48 2	0 200'	1 45.649428	8 -51.992949 102428	104 Stn 0020 027.jpg	Processed USBL Nav	hash, 40% med-large pebbles		COOP Student onboard
2010020	0020	62	48 2	1 200	1 45.649505	5 -51.992521 102554	104 Stn 0020 029	Processed USBL Nav	Sand with gravel. Fine-med grain grey sand, little shell fragments and hash, few med-large pebbles, small and large cobbles		COOP Student onboard
2010020	0020	02	40 Z	200	40.049303	-01.992021 102004	104 Jun 0020 028.jpg		Sand with gravel. Fine-med grain grey sand, 15% shell fragments and	green sea urchins, caberea ellisii, sessile ascidean	SOOF Student onboard
2010020	0020	62	48 2	2 200-	1 45.649532	2 -51,992190 102708	104 Stn 0020 029.ipc	Processed USBL Nav	hash, 40% med-large pebbles, small and large cobbles	(sea grapes?)	COOP Student onboard
0				230				,	Sand with gravel. Fine-med grain grey sand, 10% shell fragments and		
2010020	0020	62	48 23	3 200	1 45.649508	8 -51.992111 102714	104 Stn 0020 030.jpc	Processed USBL Nav	hash, 20% small-large pebbles, small and medium cobbles	sea scallops, branching coral,	COOP Student onboard
									Sand with gravel. Fine-med grain grey sand, 25% shell fragments and		
2010020	0020	62	48 24	4 200	1 45.649541	1 -51.991807 102824	104 Stn 0020 031.jpg	Processed USBL Nav	hash, 40-50% med-large pebbles small -large cobbles	3	COOP Student onboard
0010075			10 -	-		51 001 107	1010 0000 000		Sand with gravel. Fine-med grain grey shell sand, 25% shell fragments		
2010020	0020	62	48 2	5 200'	1 45.649621	1 -51.991467 102938	104 Stn 0020 032.jpg	Processed USBL Nav	and hash, 10% med-large pebbles	snow crabs, green sea urchins	COOP Student onboard
2010020	0020	62	48 2	6 200 <sup>-</sup>	1 45.649702	2 -51.991213 103042	104 Stn 0020 022 inc	Processed USBL Nav	Sand with gravel. Fine-med grain grey shell sand, 25% shell fragments and hash, 30% med-large pebbles		COOP Student onboard
2010020	0020	02	40 Z	200	+0.049702	-01.991210 100042	104 Jun 0020 033.jpg		Sand with gravel. Fine-med grain grey shell sand, 40% shell fragments		SOOF Student Onboard
2010020	0020	62	48 2	7 200	1 45.649856	6 -51,991002 103154	104 Stn 0020 034.ipc	Processed USBL Nav	and hash. 10% med-large pebbles	snow crabs	COOP Student onboard
				200					Sand with gravel. Fine-med grain grey shell sand, 5% shell fragments		
2010020	0020	62	48 2	8 200	1 45.649918	8 -51.990766 103252	104 Stn 0020 035.jpc	Processed USBL Nav	and hash, 2% med-large pebbles	snow crabs	COOP Student onboard
									Fine-med grain grey shell sand, 1% shell fragments and hash, rare		
2010020	0020	62	48 2	9 200	1 45.649994	4 -51.990644 103342	104 Stn 0020 036.jpg	Processed USBL Nav	pebbles	sand dollars	COOP Student onboard

г – т	STATIONIEXP	OSURES NUM F	PHOTOSIP				PHOTO	WATER PHOTO FILE			PHOTO	
EXPED_CD	NUM NUM				D_GTYPE P	HOTO_LAT		DEPTH NAME	PHOTO_Position COMMENTS	GEOLOGY BIOLOGY	DESCRIBED BY	3Y
										Fine-med grain grey shell sand, 5% shell fragments and hash, few med.		
2010020	0020	62	48	30	2001	45.650133	3 -51.990386 103500	104 Stn 0020 040.jpg	Processed USBL Nav	pebbles	COOP Student of	t onboard
										Sand with gravel. Fine-med grain grey sand, 30% shell fragments and		
2010020	0020	62	48	31	2001	45.650315	-51.990235 103610	104 Stn 0020 041.jpg	g Processed USBL Nav	hash, 5-10% small-large pebbles, large wave ripples green sea urchi	ns, snow crabs COOP Student c	t onboard
										Sand with gravel. Fine-med grain grey shell sand, 40% shell fragments		
2010020	0020	62	48	32	2001	45.650413	-51.990073 103708	104 Stn 0020 042.jp	g Processed USBL Nav	and hash, 5% med-large pebbles snow crabs, gre	en sea urchins COOP Student of	t onboard
0040000			40		0004	45 05055	51 000070 100000	404.00 0000.040.		Sand with gravel. Fine-med grain grey shell sand, 15% shell fragments		
2010020	0020	62	48	33	2001	45.650551	-51.989873 103820	104 Stn 0020 043.jpg	g Processed USBL Nav	and hash, 5% small-large pebbles, cobbles Sand with gravel. Fine-med grain grey shell sand, 25% shell fragments	een sea urchins, snow crabs COOP Student of	( onboard
2010020	0020	62	48	34	2001	45.650562	-51.989794 103834	104 Stp 0020 044 ip	Processed USBL Nav	and hash, 5-10% small-large pebbles, cobbles	ow crabs COOP Student c	t onboard
2010020	0020	02	40	34	2001	45.650562	-51.989794 103834	104 Stil 0020 044.jpg	g Processed USBL Nav	Sand with gravel. Fine-med grain grey shell sand, 20% shell fragments	DW Crabs COOP Student C	Onboard
2010020	0020	62	48	35	2001	45.650589	-51,989698 103856	104 Stp 0020 045 ip	Processed USBL Nav	and hash, 5-10% small-large pebbles sand, 20% shell haghlends sand dollars, sn	ow crabs COOP Student of	t onboard
2010020	0020	02	-10		2001	40.000000	01.505000 100000	104 Oti 10020 040.jp		Fine-med grain grey shell sand, 5% shell fragments and hash, very few		· onbourd
2010020	0020	62	48	36	2001	45.650608	-51.989682 103906	104 Stn 0020 046.ip	Processed USBL Nav	small-med pebbles sand dollars	COOP Student of	t onboard
		-								Fine-med grain grey shell sand, 5% shell fragments and hash, very few		
2010020	0020	62	48	37	2001	45.650648	-51.989643 103924	104 Stn 0020 047.jp	Processed USBL Nav	small-med pebbles sand dollars	COOP Student of	t onboard
									<u> </u>	Fine-med grain grey shell sand, 5% shell fragments and hash, rare		
2010020	0020	62	48	38	2001	45.650763	-51.989456 104032	104 Stn 0020 048.jpg	Processed USBL Nav	pebbles sand dollars	COOP Student of	t onboard
2010020	0020	62	48	39	2001	45.650689	-51.989202 104142	104 Stn 0020 049.jpg	Processed USBL Nav	Fine-med grain grey shell sand, 2% shell fragments and hash sand dollars, gr	een sea urchins, snow crabs COOP Student of	t onboard
										Fine-med grain grey shell sand, 10% shell fragments and hash, very few		
2010020	0020	62	48	40	2001	45.650524	-51.988944 104250	104 Stn 0020 050.jpg	Processed USBL Nav	small-med pebbles sand dollars	COOP Student of	t onboard
											d dollars, siphon holes, small bolocera	
2010020	0020	62	48	41	2001	45.650426	5 -51.988699 104356	104 Stn 0020 051.jp	g Processed USBL Nav	few small-med pebbles, cobble tuediae	COOP Student of	t onboard
										Sand with gravel. Fine-med grain grey shell sand, 5% shell fragments		
2010020	0020	62	48	42	2001	45.650473	-51.988146 104510	104 Stn 0020 052.jp	g Processed USBL Nav	and hash, 30% small-large pebbles, cobble	COOP Student of	t onboard
										Sand with gravel. Fine-med grain grey shell sand, 5% shell fragments		
2010020	0020	62	48	43	2001	45.650553	-51.987926 104616	104 Stn 0020 053.jpg	g Processed USBL Nav	and hash, 40-50% small-large pebbles snow crabs	COOP Student of	t onboard
0040000			48	44	0004	45 05007	51 007500 101710	404.00 0000.054.		Sand with gravel. Fine-med grain grey shell sand, 5% shell fragments		
2010020	0020	62	48	44	2001	45.650674	-51.987536 104718	104 Stn 0020 054.jpg	g Processed USBL Nav	and hash, 40-50% small-large pebbles	COOP Student of	( onboard
2010020	0020	62	48	45	2001	45.650876	-51.987274 104826	101 Sta 0020 055 in	Processed LISPL Nov	Sand with gravel. Fine-med grain grey shell sand, 3% shell fragments and hash, 40-50% small-large pebbles green sea urchi	ns COOP Student c	t onboord
2010020	0020	62	48	45	2001	45.650876	-51.987274 104826	104 Stn 0020 055.jpg	g Processed USBL Nav	Sand with gravel. Fine-med grain grey shell sand, 10% shell fragments	is COOP Student of	i onboard
2010020	0020	62	48	46	2001	45.651134	-51.987048 104932	104 Stp 0020 056 ip	Processed USBL Nav	and hash, 35% small-large pebbles snow crabs	COOP Student of	t onboard
2010020	0020	02	40	40	2001	45.05115-	-51.987048 104932	104 Stil 0020 050.jp	g Flocessed USBL Nav	Sand with gravel. Fine-med grain grey shell sand, 5% shell fragments		Unboard
2010020	0020	62	48	47	2001	45.651378	-51,986925 105046	104 Stp 0020 057 ip	Processed USBL Nav	and hash, 35-40% small-large pebbles, cobbles she and she in agrice it is snow crabs	COOP Student of	t onboard
2010020	0020	02	40	77	2001	43.031370	-51.500325 105040	104 Otti 0020 007.jp		Sand with gravel. Fine-med grain grey shell sand, 5% shell fragments		Onboard
2010020	0020	62	48	48	2001	45.651629	-51.986823 105142	104 Stn 0020 058 in	Processed USBL Nav	and hash, 35% small-large pebbles, cobbles	COOP Student of	t onboard
2010020	0020	02	.0		2001	10.001020	011000020 100112	101 001 0020 0000	g 110000000 00221101	Gravel with sand. Fine-med grained grey sand, Approx. 25% subangular		· onboard
											n, snow crabs, hormathidae, sea	
2010020	0026	102	86	1	2001	45.672034	-51.946706 170456	89 Stn 0026 004.ip	Processed USBL Nav	fragments scallop	COOP Student of	t onboard
										Gravel with sand. Fine-med grained grey sand. 40% subangular cobbles		
2010020	0026	102	86	2	2001	45.672108	-51.946691 170500	89 Stn 0026 006.jpg	Processed USBL Nav	and pebbles of mixed lithologies. Shell fragments throughout	COOP Student of	t onboard
										Gravel with sand. Fine-med grained grey sand, Approx. 25% subangular		-
										gravel and cobbles of mixed lithologies. Some shell hash and shell		
2010020	0026	102	86	3	2001	45.672307	-51.946448 170604	89 Stn 0026 011.jpg	Processed USBL Nav	fragments	COOP Student of	t onboard
										Gravel with sand. Fine-med grained grey sand. 40% subangular gravel		
										and a few cobbles of mixed lithologies. Shell hash and shell fragments		
2010020	0026	102	86	4	2001	45.672422	-51.946287 170638	89 Stn 0026 012.jp	g Processed USBL Nav		n, snow crabs, hormathidae COOP Student of	t onboard
										Gravel with sand. Fine-med grained grey sand, Approx. 25% subrounded		
				_						gravel and subangular cobbles of mixed lithologies. Some shell hash and		
2010020	0026	102	86	5	2001	45.672433	3 -51.946176 170704	89 Stn 0026 013.jp	g Processed USBL Nav		mathiidae, stalked ascidean COOP Student of	ι onboard
										Gravel with sand. Fine-med grained grey sand, Approx. 50% subrounded		
2010000	0000	100	00		0004	45 670 400	E1 046007 470700	80 Stm 0000 04 1	Processed LICPL Marci	pebbles and few subangular cobbles of mixed lithologies. Some shell		4 onh'
2010020	0026	102	86	Ŭ	2001	45.672489	-51.946027 170726	89 Stn 0026 014.jp	g Processed USBL Nav	hash and shell fragments green sea urchi	n, snow crabs, COOP Student of	unpoard
										Gravel with sand. Fine-med grained grey sand, Approx. 60% subangular gravel and few subangular cobbles of mixed lithologies. Some shell hash snow crab, buc	vinidae. 6 armod soastar, groon soa	
2010020	0026	102	86	7	2001	45.672490	-51.945979 170736	90 Stn 0026 015 in	Processed USBL Nav	and shell fragments	COOP Student c	t onboard
2010020	0026	102	ØØ	1	2001	43.072490	-51.945979 170736	09 301 0026 015.jp	J FIDUESSED USDL NAV	Gravel with sand. Fine-med grained grey sand, Approx. 50% subangular	COOP Student of	, onboard
										gravel with sand. Fine-med grained grey sand, Approx. 50% subangular gravel and cobbles of mixed lithologies. Some shell hash and shell		
2010020	0026	102	86	Q	2001	45.672520	-51.945898 170756	89 Stn 0026 016 in	Processed USBL Nav		r, green sea urchin, COOP Student c	t onhoard
2010020	0020	102	00	0	2001	-10.012020	-31.8-3080 170730	03 011 0020 010.jp		b alfieu seasia		Jibbalu
1										Gravel with sand. Fine-med grained grey sand, Approx. 60% subangular branching coral	snow crabs, sea scallon, sea peach	
2010020	0026	102	86	9	2001	45.672487	-51,945490 170908	89 Stn 0026 017 in	Processed USBL Nav	cobbles and gravel of mixed lithologies. Shell hash and shell fragments green sea urchi		t onboard
20.0020	0020			<u> </u>	2001	.0.0.2401	5110101000	30 00. 0020 011.jp				

VICATO         VICATO        VICATO </th <th></th> <th></th> <th></th> <th>NUM_PHOTOS PHOTO</th> <th></th> <th></th> <th>РНОТО</th> <th>WATER PHOTO_FILE</th> <th></th> <th></th> <th></th> <th>РНОТО</th>				NUM_PHOTOS PHOTO			РНОТО	WATER PHOTO_FILE				РНОТО
NOME         OPE         OPE <td>EXPED_CD</td> <td>NUM NUM</td> <td>1</td> <td>N_GROUP NUM</td> <td>SDO_GTYPE PHOT</td> <td>O_LAT PHOTO_LONG</td> <td>GMT</td> <td>DEPTH NAME</td> <td>PHOTO_Position COMMENTS</td> <td>GEOLOGY</td> <td>BIOLOGY</td> <td>DESCRIBED BY</td>	EXPED_CD	NUM NUM	1	N_GROUP NUM	SDO_GTYPE PHOT	O_LAT PHOTO_LONG	GMT	DEPTH NAME	PHOTO_Position COMMENTS	GEOLOGY	BIOLOGY	DESCRIBED BY
2 https://         0 mode         1 mode         1 mode         0 mode         1 m	2010020	0026	102	86 10	2001 45.6	572519 -51.94508	4 171006	89 Stn 0026 018.jpg	g Processed USBL Nav			COOP Student onboard
ATTOC         ACC         ACC </td <td>2010020</td> <td>0026</td> <td>102</td> <td>86 11</td> <td>2001 45.6</td> <td>572622 -51.94475</td> <td>9 171100</td> <td>89 Stn 0026 019.jpg</td> <td>g Processed USBL Nav</td> <td></td> <td>sea peach, branching coral, blood star, snow crabs</td> <td>COOP Student onboard</td>	2010020	0026	102	86 11	2001 45.6	572622 -51.94475	9 171100	89 Stn 0026 019.jpg	g Processed USBL Nav		sea peach, branching coral, blood star, snow crabs	COOP Student onboard
Section         Gold	2010020	0026	102	86 12	2001 45.6	572722 -51.94435	1 171208	89 Stn 0026 020.jpg	g Processed USBL Nav	cobbles of mixed lithologies. Some shell hash and shell fragments	retracted anemones	
1000	2010020	0026	102	86 13	2001 45.6	572746 -51.94439	6 171210	89 Stn 0026 021.jpg	g Processed USBL Nav			
Some         Some <th< td=""><td>2010020</td><td>0026</td><td>102</td><td>86 14</td><td>2001 45.6</td><td>672835 -51.94407</td><td>5 171308</td><td>89 Stn 0026 022.jpg</td><td>9 Processed USBL Nav</td><td>gravel and cobbles of mixed lithologies. Some shell fragments.</td><td></td><td>COOP Student onboard</td></th<>	2010020	0026	102	86 14	2001 45.6	672835 -51.94407	5 171308	89 Stn 0026 022.jpg	9 Processed USBL Nav	gravel and cobbles of mixed lithologies. Some shell fragments.		COOP Student onboard
201000         0.00         0.00         0.00         4.67277         5.1 4437         17527         0.00         0.003 102         Start and guest. There of gates grows and they are start. Spece and									-	sharply transitioning to sand mixed with 70% gravel and cobbles of mixe		
210000         006         102         08         102         08         0.000	2010020	0026	102	86 15	2001 45.6	572877 -51.94372	1 171408	89 Stn 0026 023.jpg	g Processed USBL Nav		green sea urchins, sea peach, small white barncales	COOP Student onboard
OND         OND <td>2010020</td> <td>0026</td> <td>102</td> <td>86 16</td> <td>2001 45.6</td> <td>-51.94337</td> <td>1 171512</td> <td>89 Stn 0026 024.jpg</td> <td>g Processed USBL Nav</td> <td>gravel and cobbles of mixed lithologies. Some shell fragments.</td> <td>green sea urchin, snow crab, small white barnacles</td> <td>COOP Student onboard</td>	2010020	0026	102	86 16	2001 45.6	-51.94337	1 171512	89 Stn 0026 024.jpg	g Processed USBL Nav	gravel and cobbles of mixed lithologies. Some shell fragments.	green sea urchin, snow crab, small white barnacles	COOP Student onboard
2010         000         110         00         110         000         1100         000         1100         0000         000         000         000<	2010020	0026	102	86 17	2001 45.6	673003 -51.94299	4 171606	89 Stn 0026 026.jp	Processed USBL Nav		snow crabs, small white barnacles	COOP Student onboard
Alticolog         Outs         Unit         Unit         Color Status         Color Status         Processed USB. Nov         Nucleat and grants. Finances grants grant with 2Ns stargular to spece section. nov cale, and with spece section. Nov cale, and with stargular to spece section. Nov cale, and with stargular to spece section. Nov cale, and with spece sectio									-	Gravel with sand. Fine-med grained grey sand with 50% subangular to		
Sand and growl. Proceed gravel. Proceed gravel. Proceed gravel model, substrated process.         Sand and growl. Proceed gravel model, substrated proceed gravel, substrated process.         Sand and growl. Proceed gravel, substrated process.         Sand and growl. Proceed gravel, substrated proceed gravel, substrated process.         Sand and gravel. Proceed gravel, substrated process.         Sand and gravel. Proceed gravel, substrated process.         Sand and gravel. Proceed gravel, substrated proceed gravel, substrated process.         Sand and gravel. Proceed gravel, substrated process.	2010020	0026	102	06 40	2001 45 4	3731/7 51 0/004	5 171710	80 Stn 0026 027	Processed LISBI Nov			COOP Student onboard
1000         100         100         6, 5/720         5, 16/200         17, 100         100	2010020	0020	102	00 18	2001 45.0	-51.94204	5 171712	09 501 0020 027.jpi	J FIDLESSED USDLINAV		green sea urchin, show crab, smail white barnacles	COOP Student onboard
211000         0.02         6.6         7.9         201         4.5.7.32         5.1.5.2.37         7.1100         89 Sty 0.02 0.028, 0.02         Percensel USE, Nov         and alte fingments												
1000         000         000         0.00	2010020	0026	102	86 19	2001 45.6	673223 -51.94236	7 171800	89 Stn 0026 028.jpg	Processed USBL Nav	and shell fragments	snow crabs, sessile tunicate (sea grape?)	COOP Student onboard
201020         0.02         1.02         4.6         2.0         4.6.7335         5.1.91486         17100         4.8         Docessed USB, Nav         Standard gravel. Fine-med grained graves draw th 25% subarguith         oncor cuba, sau cubins, sea scalings         CCOP Subard roboard           201020         0.02         1.02         6.8         2.2         2.00         4.6.7346         1.914166         172000         6.8         1.02         1.02         6.8         1.02         1.02         6.8         1.02         1.02         6.8         1.002         0.02         1.02         6.8         1.002         0.02         1.02         8.9         1.002         0.02         1.02         6.8 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>												
Start and grant.         Final And grant.         Final And grant.         Start and grant.<	2010020	0026	102	86 20	2001 45 6	673353 -51,94196	5 171910	89 Stn 0026 029 in	Processed USBL Nav		snow crabs, sea urchins, sea scallops	COOP Student onboard
Jonde         1/2         2/2         2/2         4.67/36 <sup>1</sup> 1/2/10         8/8         0.000 01/10         9/8         Stand and gravel. Fine-med grained grave and with 25% subarguing         orn crabs, a mod sessint, small anenoma         COOP Sludent onboard           201002         0.002         1.02         6.8         2.2         2.001         4.67/36 <sup>1</sup> 1/2/20         8/8         50.002 032, p         Pocessed USBL Nav         Sand and gravel. Fine-med grained grave and with 25% subarguing         row crabs, a mod sessint, small anenoma         COOP Sludent onboard           201002         0.002         1.02         6.8         2.4         2.001         4.67/36 <sup>1</sup> 1.12/20         8/8         No.026 032, p         Pocessed USBL Nav         Sand and gravel. Fine-med grained grave and with 25% subarguing         row crabs, green sea urbin         COOP Sludent onboard           201002         0.002         1.02         8         2.4         2.001         4.67/378         1.94/077         1.72/46         8         Sno 0005 Jpp         Pocessed USBL Nav         Sand and gravel. Fine-med grained grave and with 45% subarguing         row crabs, green sea urbin         COOP Sludent onboard           201002         0.002         1.02         8         2.001         4.67/3787         1.94/077         1.72/46         8         Sno 0005 Jp	2010020			20	2001 40.0	01.04100		0020 020.jp				2.5.6. etadoni onboalu
201002         0.026         1/2         86         2/2         2/01         4.5/7349          5/10000         000000         00000         000000         0000	2010020	0026	102	86 21	2001 45.6	673461 -51.94166	1 172000	89 Stn 0026 030.jpg	Processed USBL Nav		snow crabs	COOP Student onboard
201002         0.02         102         88         23         200         4.6.73950         -1.5.9416         17.220         89.500.026 0.025 0.026         Processed USBL Nav         gravel and problem of model fibrologies. Some shell fragments         catale green sea urchin         COOP Sludent onbaad           201002         0.02         102         88         24         200         46.673950         -1.940         85         no.026 0.035, processed USBL Nav         gravel fibrologies. Some shell fragments         activide         COOP Sludent onbaad           201002         0.02         102         88         24         200         45.673787         17.2446         85         no.026 0.035, processed USBL Nav         gravel fibrologies. Some shell fragments         activide         COOP Sludent onbaad           201002         0.02         102         86         27         2001         45.673787         17.2466         85         no.026 0.035, processed USBL Nav         subcondo gravel fibrologies. Some shell fragments         activide         COOP Sludent onbaad           201002         0.02         102         86         28         no.026 0.035, processed USBL Nav         subcondo gravel fibrologies. Some shell fragments         activide         GOOP Sludent onbaad           201002         0.02         10.2         86	2010020	0026	102	86 22	2001 45.6	673549 -51.94131	5 172108	89 Stn 0026 031.jp	Processed USBL Nav		snow crabs, 6 armed seastar, small anemone	COOP Student onboard
Uncertain         Solid and gravel. Fine-med graining drey sand with 2% sub angular gravel and pebble of mode linkogles. Some shell tagments. Solid and gravel. Fine-med graining drey sand with 2% sub angular gravel. Fine-med graining drey sand with 2% sub angular betwortable. Some shell tagments. Solid and gravel. Fine-med graining drey sand with 2% sub angular gravel. Fine-med graining drey sand with 2% sub angular betwortable. Some shell tagments. Solid and gravel. Fine-med graining drey sand with 2% sub angular gravel. Fine-med graining drey sand with 2% sub angular betwortable. Some shell tagments. Solid and gravel. Fine-med graining drey sand with 2% sub angular betwortable. Some shell tagments. Solid and gravel. Fine-med graining drey sand with 2% sub angular gravel of mode linkogles. Some shell tagments. Some shell tagm	2010020	0026	102	86 23	2001 45 6	573615 -51 94106	1 172200	89 Stn 0026 032 in	Processed USBL Nav		snow crabs, green sea urchin	COOP Student onboard
Space         Space <th< td=""><td>2010020</td><td></td><td></td><td>20 23</td><td>2001 40.0</td><td>01.04100</td><td></td><td>0020 002.jp</td><td></td><td></td><td></td><td>2.5.0. Gradoni onbould</td></th<>	2010020			20 23	2001 40.0	01.04100		0020 002.jp				2.5.0. Gradoni onbould
2010/20         0026         112         68         25         2001         45.87387         717244         89 Sh 0026 033,pp         Processed USBL Nav         grand angreel. Fine-med grand the 25% us angular to 55% us ang	2010020	0026	102	86 24	2001 45.6	673690 -51.94077	9 172258	89 Stn 0026 033.jpg	Processed USBL Nav		actiniidae	COOP Student onboard
2010/20         0006         112         86         26         2001         45.673/67         5.19.407/7         77.268         85.80 n026 035,pp         Processed USEL Nav         Sand and arget relimend granted granted mittagets.         Sand and arget relimend granted mittagets.         Sand and gravel mittagets.         Sand and gr	2010020	0036	100	96 97	2001 45 4	570707 E1 0 4057	170404	80 Str. 0026 024 -	Processed LISPI, New		anow aroba, groop and wrahin	COOD Student onb
2010/20         00/26         10/2         86         22         2001         45.673873         51.940377         172468         95 No 026 03.5 jp         Processed USEL Nav         subrounded gravel of mixed ithologies. Some shell fragments         onsw crabs. some or crabs.         COOP Student onboard           201020         00/26         10/2         86         27         2001         45.673984         172646         89 Sin 0.026 03.5 jp         Processed USEL Nav         Sand and gravel. Fine-med grained gravel of mixed ithologies. Some shell fragments         green sea urchin, snow crabs         COOP Student onboard           201020         00/26         10/2         86         28         2001         45.674065         51.939960         17274         89 Sin 0.026 03.5 jp         Processed USEL Nav         Sand and gravel. Fine-med grained grave so with 0.075 sto angular green sea urchin, snow crabs         COOP Student onboard           201002         00/26         10/2         86         29         2.001         45.67407         172802         89 Sin 0.026 03.9 jp         Processed USEL Nav         Sand dar gravel. Fine-med grained gravel of mixed ithologies. Some shell fragments         green sea urchin, snow crabs         COOP Student onboard           201002         00/26         10/2         80         30         2000         89 Sin 0.026 04.1 jp         Processed USEL Nav	2010020	0026	102	80 25	2001 45.6	-51.94057	1/2404	89 Stn 0026 034.jp	J FIOCESSED USBL NAV		snow crabs, green sea urchin	COOP Student onboard
2010020         0028         102         86         27         2001         45.673984         -51.940143         172604         88         N0026 036, jp         Processed USBL Nav         subtrande gravel fine-med grained gravel fine-med gravel gravel fine-med grained gravel fine-med gravel gravel dravel fine-med gravel gravel fine-med gravel gravel fine-med	2010020	0026	102	86 26	2001 45.6	673873 -51.94037	7 172458	89 Stn 0026 035.jpg	Processed USBL Nav		snow crabs, small white barnacles	COOP Student onboard
Sand and gravel							4					
$\frac{1}{201002}$	2010020	0026	102	86 27	2001 45.6	573984 -51.94014	3 172604	89 Stn 0026 036.jp	g Processed USBL Nav		green sea urchin, snow crabs	COOP Student onboard
201002         002         102         86         28         2001         45.674065         -51.939960         172704         89         Stn 026 037,jpg         Processed USBL Nav         Sand and gravel, Fine-med grained grey sand with 45%, sub angular to subrounded gravel of mixed lithologies. Some shell fragments         green sea urchin, small white barnacles         COOP Student onboard           201002         0026         102         86         29         2001         45.674097         -51.939390         172904         89         Sin 026 038,jpg         Processed USBL Nav         Sand and gravel, Fine-med grained grey sand with 40% sub angular to subrounded gravel of mixed lithologies. Some shell fragments         green sea urchin, snow crabs         COOP Student onboard           201002         0026         102         86         31         2001         45.674167         -51.939390         172904         89         Sin 026 049,jpg         Processed USBL Nav         Sand and ang travel, Fine-med grained grey sand with 45% sub angular to subrounded gravel of mixed lithologies. Some shell fragments         green sea urchin, snow crabs         COOP Student onboard           2010020         0026         102         86         31         2001         45.674167         -51.938948         173006         89         Sin 026 042,jpg         Processed USBL Nav         Sand and gravel, Fine-med grained grey sand with 35% sub angular to subr												
201000         0026         102         86         29         2001         45.674097         -51.939747         172802         85 N0026 038, jp         Processed USBL Nav         subrounded gravel of mixed lithologies, Some shell fragments         green sea urchin, snow crabs         COOP Student onboard           201002         0.026         1.02         86         30         2.001         45.674167         -51.939390         172904         89 Stn 0026 039, jp         Processed USBL Nav         Sand and gravel. Fine-med grained grey sand with 0% sub angular to subrounded gravel of mixed lithologies. Some shell fragments         green sea urchin         COOP Student onboard           201002         0.026         1.02         86         31         2.001         45.674318         -51.939391         173006         89 Stn 0026 043, jp         Processed USBL Nav         Sand and gravel. Fine-med grained grey sand with 0% sub angular to subrounded grey sand with 35% sub angular to subrounded grey sand with 35% sub angular to subrounded gravel of mixed lithologies. Some shell fragments snow crabs         some crabs         COOP Student onboard           2010020         0.026         1.02         86         34         7.302         89 Stn 0026 043, jp         Processed USBL Nav         Sand and gravel. Fine-med grained grey sand with 35% sub angular to subrounded gravel of mi	2010020	0026	102	86 28	2001 45.6	674065 -51.93996	0 172704	89 Stn 0026 037.jpg	Processed USBL Nav	torn cloth	green sea urchin, small white barnacles	COOP Student onboard
2010020       0026       102       86       30       2001       45.674167       -51.939390       172904       89       Stm 026 039.jpg       Processed USBL Nav       Sand and gravel. Fine-med grained grey sand with 40% sub angular to subrounded gravel of mixed lithologies. Some shell fragments       gene       COOP Student onboard         2010020       0026       102       86       31       2001       45.674318       -51.939393       173006       89       Stm 026 041.jpg       Processed USBL Nav       Sand and gravel. Fine-med grained grey sand with 10% sub angular to subrounded gravel of mixed lithologies. S-10%, shell fragments       COOP Student onboard         2010020       0026       102       86       32       2001       45.674416       -51.938844       173056       89       Sm 026 042.jpg       Processed USBL Nav       Subrounded gravel of mixed lithologies. Some shell fragments       snow crabs       snow crabs       Some drained grey sand with 35% sub angular to subrounded gravel of mixed lithologies. Some shell fragments       snow crabs       COOP Student onboard         2010020       0026       102       86       33       2001       45.674564       -51.938864       173202       89       Stm 0026 043.jpg       Processed USBL Nav       Sand and gravel of mixed lithologies. Some shell fragments       snow crabs       Sono crabs       Som odra dravel of mixed lithologies. Son	0040000	0000	4.00		0004 45 4	54 0007	470000	00 Ota 0000 000 :	Deserved LIGDI New			
2010020         0026         102         86         30         200         45.674167         -51.93939         17204         89         Stn 0026 039,jpg         Processed USBL Nav         Stand and gravel. Fine-med grained grey sand with 10% sub angular to subrounded gravel of mixed lithologies. Some shell fragments         green sea urchin         COOP Student onboard           2010020         0026         1002         86         31         2011         45.674318         -51.939138         173006         89         Stn 0026 041,jpg         Processed USBL Nav         Stand and gravel. Fine-med grained grey sand with 35% sub angular to subrounded gravel of mixed lithologies. 10% shell fragments         some crabs         COOP Student onboard           2010020         0026         102         86         33         2001         45.67416         -51.93884         173006         89         Stn 0026 042,jpg         Processed USBL Nav         Stn dand gravel. Fine-med grained grey sand with 35% sub angular to snow crabs         snow crabs         snow crabs         COOP Student onboard           2010020         0026         102         86         33         2001         45.674568         -51.93864         173202         89         Stn 0026 042,jpg         Processed USBL Nav         Stn dand gravel. Fine-med grained grey sand with 35% sub angular to subrounded gravel of mixed lithologies. Some shell fragments         snow cra	2010020	0026	102	86 29	2001 45.6	5/409/ -51.939/4	/ 1/2802	89 Stn 0026 038.jp	J Processed USBL Nav		green sea urchin, snow crabs	COOP Student onboard
2010020       0026       102       86       31       2001       45.674318       -51.939138       173006       89       Stn 0026 041,jpg       Processed USBL Nav       Subrounded gravel of mixed ithologies, 5-10% shell fragments       snow crabs       COOP Student onboard         2010020       0026       102       86       32       2001       45.674416       -51.93844       173026       89       Sno 026 042,jpg       Processed USBL Nav       Sand and gravel, Fine-med grained grey sand with 35% sub angular to       snow crabs       COOP Student onboard         2010020       0026       102       86       33       2001       45.674568       -51.93844       173026       89       Sno 026 043,jpg       Processed USBL Nav       Sand and gravel, Fine-med grained grey sand, with 35% sub angular to       snow crabs, see peach       COOP Student onboard         2010020       0026       102       86       34       2001       45.674564       -51.938454       173208       89       Sno 026 043,jpg       Processed USBL Nav       Sand and gravel Proto coluded with suspende fine grained grey sand, with 3764       snow crabs       COOP Student onboard         2010020       0026       102       86       34       2001       45.674564       -51.938264       173208       89       Sn 0026 043,jpg       Processed	2010020	0026	102	86 30	2001 45.6	674167 -51.93939	0 172904	89 Stn 0026 039.jp	Processed USBL Nav		green sea urchin	COOP Student onboard
2010020       0026       102       86       32       2001       45.674416       -51.938844       173058       89       Stn 0026 042.jpg       Processed USBL Nav       Sand and gravel. Fine-med grained grey sand with 35% sub angular to subrounded gravel of mixed lithologies. 10% shell fragments       snow crabs       COOP Student onboard         2010020       0026       102       86       33       2001       45.674568       -51.938634       173028       89       Stn 0026 043.jpg       Processed USBL Nav       Sand and gravel. Fine-med grained grey sand with 35% sub angular to subrounded gravel of mixed lithologies. Some shell fragments       snow crabs, sea peach       COOP Student onboard         2010020       0026       102       86       34       2001       45.674564       -51.938516       173208       89       Stn 0026 043.jpg       Processed USBL Nav       Sand and gravel. Fine-med grained grey sand with 5% sub angular to subrounded fine grained grey sand, behind it can distinguish gravel of mixed lithologies.       snow crabs.       cOOP Student onboard         2010020       0026       102       86       34       2001       45.674665       -51.938279       173202       89       Stn 0026 045.jpg       Processed USBL Nav       Sand and gravel. Fine-med grained grey sand with 5% sub angular to subrounded gravel of mixed lithologies. Some shell fragments, abundant subrounded gravel of mixed lithologies. Some shell fragments, a												
2010020       0026       102       86       32       2001       45.674566       -51.938644       17302       89       Stn 0026 042.jpg       Processed USBL Nav       Stand and gravel of mixed lithologies. 10% shell fragments       snow crabs       COOP Student onboard         2010020       0026       102       66       33       2001       45.674568       -51.938644       173202       89       Stn 0026 043.jpg       Processed USBL Nav       Stand and gravel of mixed lithologies. 50% sha angular to snow crabs       snow	2010020	0026	102	86 31	2001 45.6	574318 -51.93913	8 173006	89 Stn 0026 041.jpg	g Processed USBL Nav			COOP Student onboard
2010020       0026       102       86       33       2001       45.674558       -51.938634       173202       89       Stn 0026 043.jpg       Processed USBL Nav       Sand and gravel of mixed lithologies. Some shell fragments       snow crabs, sea peach       COOP Student onboard         2010020       0026       102       86       34       2001       45.674564       -51.938616       173208       89       Stn 0026 043.jpg       Processed USBL Nav       Sand and gravel. Photo clouded with suspended fine grained grey sand, behind it can distinguish gravel of mixed lithologies. Some shell fragments       momental sine strained grey sand with 5% sub angular to subrounded gravel of mixed lithologies. Some shell fragments, abundant subrounded gravel of mixed lithologies. Some shell fragments, abundant       snow crabs       coop Student onboard         2010020       0026       102       86       35       2001       45.674665       -51.938279       173202       89       Stn 0026 045.jpg       Processed USBL Nav       Sand with gravel. Fine-med grained grey sand with 5% sub angular to subrounded gravel of mixed lithologies. Some shell fragments, abundant       snow crabs       snow crabs       coop Student onboard         2010020       0026       102       86       35       2001       45.674665       -51.938279       173202       89       Stn 0026 045.jpg       Processed USBL Nav       snow crabs       snow cr	2010020	0026	102	86 32	2001 45.6	674416 -51.93884	4 173058	89 Stn 0026 042.jpg	Processed USBL Nav	 subrounded gravel of mixed lithologies. 10% shell fragments	snow crabs	COOP Student onboard
2010020       0026       102       86       34       2001       45.674564       -51.938516       173208       89       Store 026       Store0												
2010020       0026       102       86       34       2001       45.674665       -51.938279       17308       89       Stn 0026 044.jpg       Processed USBL Nav       behind it can distinguish gravel of mixed lithologies       Stand with gravel. Fine-med grained gravs and with 5% sub angular to subrounded gravel of mixed lithologies. Some shell fragments, abundant       Stand with gravel. Fine-med grained grave of mixed lithologies. Some shell fragments, abundant       snow crabs       COOP Student onboard         2010020       0026       102       86       35       2001       45.674665       -51.938279       173302       89       Stn 0026 045.jpg       Processed USBL Nav       subrounded gravel of mixed lithologies. Some shell fragments, abundant       snow crabs       COOP Student onboard         2010020       0026       102       86       35       2001       45.674665       -51.938279       173302       89       Stn 0026 045.jpg       Processed USBL Nav       Sand with gravel. Fine-med grained grave sand with 5% sub angular to subrounded gravel of mixed lithologies. Some shell fragments, abundant       snow crabs       COOP Student onboard         001020       0026       102       86       35       2001       45.674665       -51.938279       173302       89       Stn 0026 045.jpg       Processed USBL Nav       Sand with gravel of mixed lithologies. Some shell fragments, abundant       snow crabs <td>2010020</td> <td>0026</td> <td>102</td> <td>86 33</td> <td>2001 45.6</td> <td>574558 -51.93863</td> <td>4 173202</td> <td>89 Stn 0026 043.jp</td> <td>Processed USBL Nav</td> <td></td> <td>snow crabs, sea peach</td> <td>COOP Student onboard</td>	2010020	0026	102	86 33	2001 45.6	574558 -51.93863	4 173202	89 Stn 0026 043.jp	Processed USBL Nav		snow crabs, sea peach	COOP Student onboard
2010020       0026       102       86       35       2001       45.674665       -51.938279       173302       89       Sto 026 045.jpg       Processed USBL Nav       subrounded gravel of mixed lithologies. Some shell fragments, abundant       snow crabs       COOP Student onboard         0       0       0       0       0       0       0       0.026 045.jpg       Processed USBL Nav       Shell hash       snow crabs       Snow crabs       COOP Student onboard         0       0.026 045.jpg       0.026 045.jpg       Processed USBL Nav       Snow crabs       Snow crabs       Snow crabs       COOP Student onboard	2010020	0026	102	86 34	2001 45.6	674564 -51.93851	6 173208	89 Stn 0026 044.jpg	Processed USBL Nav			COOP Student onboard
2010020       0026       102       86       35       2001       45.674665       -51.938279       173302       89       Stn 0026 045.jpg       Processed USBL Nav       shell hash       snow crabs       cOOP Student onboard         0												
Sand with gravel. Fine-med grained grey sand with 5% sub angular to subrounded gravel of mixed lithologies. Some shell fragments, abundant	0040000	0000	400		0004 45 4	54 0000	470000	0000 0000 015	Deserved LIGDL New			
subrounded gravel of mixed lithologies. Some shell fragments, abundant	2010020	0026	102	86 35	2001 45.6	5/4665 -51.93827	9 173302	89 Stn 0026 045.jp	g Processed USBL Nav		snow crabs	COOP Student onboard
	2010020	0026	102	86 36	2001 45.6	674734 -51.93801	8 173402	89 Stn 0026 046.jpg	Processed USBL Nav			COOP Student onboard

No. 10.         No. 10. <t< th=""><th>5</th><th>STATIONIEXPO</th><th>SURES NUM_P</th><th>HOTOSIPH</th><th></th><th></th><th>PHOTO W</th><th>ATER PHOTO_FILE</th><th></th><th></th><th>РНОТО</th></t<>	5	STATIONIEXPO	SURES NUM_P	HOTOSIPH			PHOTO W	ATER PHOTO_FILE			РНОТО
2002         604         90         64         92         64/245         61/207         71/26         80         00						GTYPE PHOTO			PHOTO Position COMMENTS	GEOLOGY BIOLOGY	DESCRIBED BY
2010         201         201         2010         2										Sand. Fine-med grained grey sand with some shell fragments, abundant	
2000         00         10         01         20         6.67.00         6.67.00         6.07.00	2010020	0026	102	86	37	2001 45.67	4812 -51.937797 173456	89 Stn 0026 047.jp	g Processed USBL Nav	shell hash , burrow hole snow crabs	COOP Student onboard
Drove         Dis         Dis </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Sand, trace gravel. Fine-med grained grey sand with 5% shell fragments,</td> <td></td>										Sand, trace gravel. Fine-med grained grey sand with 5% shell fragments,	
40000         000 </td <td>2010020</td> <td>0026</td> <td>102</td> <td>86</td> <td>38</td> <td>2001 45.67</td> <td>4889 -51.937573 173602</td> <td>89 Stn 0026 048.jp</td> <td>g Processed USBL Nav</td> <td>abundant shell hash, a few pebbles, multiple burrow holes siphon holes, sand dollars</td> <td>COOP Student onboard</td>	2010020	0026	102	86	38	2001 45.67	4889 -51.937573 173602	89 Stn 0026 048.jp	g Processed USBL Nav	abundant shell hash, a few pebbles, multiple burrow holes siphon holes, sand dollars	COOP Student onboard
The rest of the second secon										Sand, trace gravel. Fine-med grained grey sand with 5% shell fragments,	
DODE         ONE         ONE <td>2010020</td> <td>0026</td> <td>102</td> <td>86</td> <td>39</td> <td>2001 45.67</td> <td>4957 -51.937357 173658</td> <td>89 Stn 0026 049.jp</td> <td>g Processed USBL Nav</td> <td>abundant shell hash,a few pebbles, multiple burrow holes green sea urchin, sand dollars, snow crabs</td> <td>COOP Student onboard</td>	2010020	0026	102	86	39	2001 45.67	4957 -51.937357 173658	89 Stn 0026 049.jp	g Processed USBL Nav	abundant shell hash,a few pebbles, multiple burrow holes green sea urchin, sand dollars, snow crabs	COOP Student onboard
20100         00         10         0         0.4         0.00         1.4         0.00         1.40         0.00 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Sand, trace gravel. Fine-med grained grey sand with 10-15% shell</td> <td></td>										Sand, trace gravel. Fine-med grained grey sand with 10-15% shell	
Sold         Col         Sold	2010020	0026	102	86	40	2001 45.67	5033 -51.937135 173756	89 Stn 0026 050.jp	g Processed USBL Nav	fragments and hash	COOP Student onboard
Description         OPEN         IF and Proceeding last gray box with fix gat ingorem         processing l	2010020	0026	102	86	41	2001 45.67	5037 -51.937093 173800	89 Stn 0026 051.jp	g Processed USBL Nav	Sand. Fine-med grained grey sand with 5% shell fragments snow crab	COOP Student onboard
Description         OPEN         IF and Proceeding last gray box with fix gat ingorem         processing l											
27000         068         19         4         200         6.02         9.02         6.02         9.02         6.02         9.02         6.02         9.02         6.02         9.02         6.02         9.02         6.02         9.02         6.02         9.02         0.02         9.02         0.02         9.02         0.02         9.02         0.02         9.02         0.02         9.02         0.02         9.02         0.02         9.02         0.02         9.02         0.02         9.02         0.02         9.02         0.02         9.02         0.02         9.02         0.02         9.02         0.02         9.02         0.02         9.02         0.02<	2010020	0026	102	86	42	2001 45.67	5089 -51.936856 173900	89 Stn 0026 052.jp	g Processed USBL Nav	Sand, trace gravel. Fine-med grained grey sand with 5% shell fragments snow crabs	COOP Student onboard
21032         0.05         0.0         4         2.0         4.000000000000000000000000000000000000	2010020	0026	102	86	43	2001 45.67	5138 -51.936556 173956	89 Stn 0026 053.jp	g Processed USBL Nav	Sand. Fine-med grained grey sand with 5% shell fragments pleuornectidae	COOP Student onboard
00000         000         100         86         46         50.000 (0.0)         100         86.0         00.000 (0.0)         000         0.00	2010020	0026	102	86	44	2001 45.67	5215 -51.936304 174056	89 Stn 0026 054.jp	g Processed USBL Nav	Sand. Fine-med grained grey sand with 5% shell fragments sand dollar	COOP Student onboard
00000         000         100         86         46         50.000 (0.0)         100         86.0         00.000 (0.0)         000         0.00											
20030         000         100         66         47         200         4.67745         4.6000000000000000000000000000000000000	2010020	0026	102	86	45	2001 45.67	5294 -51.936070 174158	89 Stn 0026 055.jp	g Processed USBL Nav	Sand. Bioturbated fine-med grained grey sand with <5% shell fragments snow crab	COOP Student onboard
20030         000         100         66         47         200         4.67745         4.6000000000000000000000000000000000000											
20000         0100         0100         0100         0100         0100         0100         0100         0100         0100         0000 <t< td=""><td>2010020</td><td>0026</td><td>102</td><td>86</td><td>46</td><td>2001 45.67</td><td>5360 -51.935758 174256</td><td>89 Stn 0026 056.jp</td><td>g Processed USBL Nav</td><td>Sand. Fine-med grained grey sand with 5% shell fragments, wave ripples snow crab</td><td>COOP Student onboard</td></t<>	2010020	0026	102	86	46	2001 45.67	5360 -51.935758 174256	89 Stn 0026 056.jp	g Processed USBL Nav	Sand. Fine-med grained grey sand with 5% shell fragments, wave ripples snow crab	COOP Student onboard
20000         0100         0100         0100         0100         0100         0100         0100         0100         0100         0000 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>											
201000         COD         Fight Rest Rest Rest Park Park Park Park Park Park Park Park	2010020	0026	102	86	47	2001 45.67	5452 -51.935574 174356	89 Stn 0026 057.jp	g Processed USBL Nav	Sand. Fine-med grained grey sand with 5% shell fragments, wave ripples snow crab	COOP Student onboard
Parton         Parton<										Sand. Fine-med grained grey sand with 5% shell fragments, wave	
Del 1000         OB         IOD         IND         A 6.7536         A 6.7536         A 6.7536         A 6.7536         A 6.7536         A 6.7537         COOP Budge         COOP Budge           201002         0.000         1.00         4.8         2.001         0.000         0.00 </td <td>2010020</td> <td>0026</td> <td>102</td> <td>86</td> <td>48</td> <td>2001 45.67</td> <td>5512 -51.935229 174458</td> <td>89 Stn 0026 058.jp</td> <td>g Processed USBL Nav</td> <td>ripples, bioturbation by conch shell buccinidae</td> <td>COOP Student onboard</td>	2010020	0026	102	86	48	2001 45.67	5512 -51.935229 174458	89 Stn 0026 058.jp	g Processed USBL Nav	ripples, bioturbation by conch shell buccinidae	COOP Student onboard
201002         0.02         102         85         2001         46.75502         11701         69510.026.0051         0.00         0.000         0.001										Sand. Bioturbated fine-med grained grey sand with black blotches, some	
201020         002         192         86         61         2004         45.75400         45.75200         45.75400         45.75200         <	2010020	0026	102		49	2001 45.67	5556 -51.934978 174556	89 Stn 0026 059.jp	g Processed USBL Nav	shell fragments snow crab	COOP Student onboard
2010/02         606         502         66         2001         45.9754         41.94134         77466         88 pt mode         Marked State         COOP State           2010/02         0056         152         86         52         0011         45.9754         41.93478         98 pt mode         99 pt soft with 55 soft fingments         toro crb.         COOP State           2010/02         0056         152         86         52         0011         45.97539         41.95548         18.987         State         State         State         Coop State         COOP State         COOP State         COOP State         State         State         State         State         COOP State         COOP State         State         State         State         State         COOP State         COOP State         COOP State         COOP State         State         State         COOP State         COOP State         COOP State         State         COOP State         State         State         COOP State	2010020	0026	102	86	50			89 Stn 0026 060.jp	g Processed USBL Nav	Sand. Fine-med grained grey sand with 10% shell fragments snow crabs	COOP Student onboard
201022         0026         102         86         32         2011         45.57580         6133386         177686         88.00026 60.002         Processed USB. Nov         Band. Free-red granding you and with 054 shall fragments         mov critis         COOP Budde           201002         0026         102         86         52         20101         50002 <td< td=""><td>2010020</td><td>0026</td><td></td><td>86</td><td>51</td><td>2001 45.67</td><td>5690 -51.934418 174800</td><td>89 Stn 0026 061.jp</td><td>g Processed USBL Nav</td><td>Sand. Fine-med grained grey sand with 5% shell fragments sand dollar</td><td>COOP Student onboard</td></td<>	2010020	0026		86	51	2001 45.67	5690 -51.934418 174800	89 Stn 0026 061.jp	g Processed USBL Nav	Sand. Fine-med grained grey sand with 5% shell fragments sand dollar	COOP Student onboard
2210020         0005         102         85         4207         45.875800         61.80580.31         755.86         65.800.025         01.92	2010020	0026	102	86	52	2001 45.67	5754 -51.934129 174858	89 Stn 0026 062.jp	g Processed USBL Nav	Sand. Fine-med grained grey sand with 10% shell fragments	COOP Student onboard
201020         0.025         1/2         96         50         20.753         60.95         Nov         Sand         Fine-med grand gruy sand with 5% shell fragments         nove orab         COOP Student           201020         0.026         1.02         6.6         2.00         4.677634         4.133322         17555         68         50.002 66.02         Sand         Fine-med grand gruy sand with 5% shell fragments, nyme         sone crabs         COOP Student           201020         0.026         1.02         6.6         2.00         4.677634         4.133227         17556         68         Sin 0.026 66.8 p.P         Processed USB. Nav         Sand         Fine-med grand gruy sand with 5% shell fragments, nyme         core crabs         COOP Student           201020         0.026         1.02         6.6         2.00         4.677634         4.133287         17566         69 Sin 0.026 07.0 p.P         Processed USB. Nav         Sand         Fine-med graind gruy sand with 5% shell fragments, nyme         core crabs         COOP Student           201020         0.026         1.02         64         6.67628         4.138278         17756         69 Sin 0.026 072.pp         Processed USB. Nav         Sand Hint fragments, new         sand Hint fragments, new         sand Hint fragments, new         core crabs         c	2010020	0026	102	86	53	2001 45.67	5805 -51.933806 174956	89 Stn 0026 063.jp	g Processed USBL Nav	Sand. Fine-med grained grey sand with 5% shell fragments snow crab	COOP Student onboard
201020         0.025         1/2         96         50         20.753         60.95         Nov         Sand         Fine-med grand gruy sand with 5% shell fragments         nove orab         COOP Student           201020         0.026         1.02         6.6         2.00         4.677634         4.133322         17555         68         50.002 66.02         Sand         Fine-med grand gruy sand with 5% shell fragments, nyme         sone crabs         COOP Student           201020         0.026         1.02         6.6         2.00         4.677634         4.133227         17556         68         Sin 0.026 66.8 p.P         Processed USB. Nav         Sand         Fine-med grand gruy sand with 5% shell fragments, nyme         core crabs         COOP Student           201020         0.026         1.02         6.6         2.00         4.677634         4.133287         17566         69 Sin 0.026 07.0 p.P         Processed USB. Nav         Sand         Fine-med graind gruy sand with 5% shell fragments, nyme         core crabs         COOP Student           201020         0.026         1.02         64         6.67628         4.138278         17756         69 Sin 0.026 072.pp         Processed USB. Nav         Sand Hint fragments, new         sand Hint fragments, new         sand Hint fragments, new         core crabs         c	2010020	0026	102	86	54	2001 45.67	5900 -51.933533 175058	89 Stn 0026 064.jp	g Processed USBL Nav	Sand. Fine-med grained grey sand with 10% shell fragments snow crabs	COOP Student onboard
201022         0.02         102         86         57         2001 45.67634         -51.832537         175354         89         00.02 0.07         Max         State         Processed USBL Nav         Processed USB	2010020	0026	102	86	55	2001 45.67	5930 -51.933352 175158	89 Stn 0026 065.jp	g Processed USBL Nav	Sand. Fine-med grained grey sand with 5% shell fragments snow crabs	COOP Student onboard
210020         0.038         102         as         57         2.00         46.67634         -19.32867         17356         as         bits         0.002 80 drag         processed USE. Nav         processed USE. Nav         processed USE. Nav         bits         bits         conv crabs         conv crabs         conv         conv        <	2010020	0026	102	86	56	2001 45.67	5984 -51.933115 175256	89 Stn 0026 066.jp	g Processed USBL Nav	Sand. Fine-med grained grey sand with 10% shell fragments snow crab	COOP Student onboard
201022         002         102         86         200         45.678056         17456         88         No 200 68.9.p         Processed USEL Nav         Sand, Fine-med grained gray sand win 8 we shall fragments, types         common cabs         COOP Student           2010020         0026         1102         88         64         2001         45.678038         -51.932260         17556         89 Sin 0026 68.9.p         Processed USEL Nav         Sand, Fine-med grained gray sand win 8 we shall fragments, types         porthalias, sand value, sand win 5 we shall fragments, types         porthalias, sand value, sand win 5 we shall fragments, types         porthalias, sand value, sand win 6 we shall fragments, types         porthalias, sand value, sand win 6 we shall fragments, types         porthalias, sand value, sand win 6 we shall fragments, types         porthalias, sand value, sand win 7 we shall fragments, types         porthalias, sand value, sand win 7 we shall fragments, types         porthalias, sand value, sand win 7 we shall fragments, types         porthalias, sand value, sand win 10% shall fragments, types         coOP Student           2010020         0026         102         86         62         2001         45.67825         -51.931471         17556         89 Sin 0026 07.2.p         Processed USEL Nav         multiple burver holes, tod value dyne y and win 10% shall fragments, and dollars, sand value, sand walue, sand win 10% shall fragments, winch bles         and dollars. coor value, sand value, sand value, sand value, sa										Sand. Fine-med grained grey sand with 5% shell fragments, ripples	
210102         0028         1102         86         58         2001         45.57669         17.528         89.58.0026 0026, phonesed USBL Nav         Sund. Fine-med grained gray and with Set Mal Tagments, role         composition         com	2010020	0026	102	86	57	2001 45.67	6034 -51.932837 175354	89 Stn 0026 067.jp	g Processed USBL Nav	present snow crabs	COOP Student onboard
2010020         002         6         9         2010         45.676.069         51.93227         17.602         69.50         000.050, proceed         Stand. Fine-med grained grey sand with 54 shell fragments. replate         and with a few back blocks.         coords         coords         coords         coords         coords         first and with a few back blocks.         coords         coords         coords         coords         first and with a few back blocks.         coords         coords         coords         coords         first and with a few back blocks.         coords         coords         sand dalars, snow crabs.         coords         coords         sand dalars, snow crabs.         coords         sand dalars, snow crabs.         coords         sand dalars.         sand dalars.         coords         sand dalars.         sand dalars.         coords         sand dalars.         sand									-	Sand. Fine-med grained grey sand with a few shell fragments, burrow	
210020         0026         102         86         59         2001         45.67608         51.332278         175602         88 is no.026 (no.9, p)         Processed USBL Nav         Sand Biotrutated fine-md grained gray sand with a tew lack blochts         soportalise, sand collars, snow crabs         COOP Student           2010020         0006         102         86         60         2001         45.67615         51.33108         17570         88 is no.026 073,pp         Processed USBL Nav         Sand Biotrutated fine-md grained gray sand with 10% shell figures         aportalise, sand dollars, snow crabs         COOP Student           2010020         0026         102         86         62         2001         45.676128         51.931767         17576         88 is no.026 073,pp         Processed USBL Nav         multiple burnow holes         sand dollars, now crabs, sight no.86         COOP Student           2010020         0026         102         86         62         2001         45.67628         51.931767         17586         88 is no.026 073,pp         Processed USBL Nav         multiple burnow holes         sand dollars	2010020	0026	102	86	58	2001 45.67	6059 -51.932569 175458	89 Stn 0026 068.jp	g Processed USBL Nav	hole, ripples present	COOP Student onboard
201002         0026         112         86         60         200         45.676137         -51.93267         17266         89.50.026.070.pg         Processed USBL Nav         Sand. Biourbated fine-med grained gray sand with 5% shell fragments. Sind. Biourbated fine-med grained gray sand with 5% shell fragments.         aporthaidae, sand dollars, snow crabs         COOP Student           2010020         0026         102         66         62         2001         45.676157         -51.93176         17356         89.50.026.071.pg         Processed USBL Nav         Sand. Biourbated fine-med grained gray sand with 5% shell fragments. multiple burnow holes.         sind dollars, snow crabs         COOP Student           2010020         0026         102         66         63         2001         45.676235         -51.931477         178564         89.50.026.071.pg         Processed USBL Nav         multiple burnow holes.         drain dollars, snow crabs.         COOP Student           2010020         0026         102         86         64         2001         45.676235         -51.93147         178564         89.50.026.075.pg         Processed USBL Nav         multiple burnow holes.         60 and dollars.         snod dollars.         s										Sand. Fine-med grained grey sand with a few shell fragments, ripples	
2010020         0026         102         86         61         200         45.676151         -51.331893         175700         89         60.0026 071,po         Processed USBL Nav         Sand Bloutbade fine-med grained gray sad with a few black blotches.         COOP Students           2010020         0026         102         86         62         2001         45.676157         -51.331766         175756         88         50.0026 072,po         Processed USBL Nav         Sand with shells. Fine-med grained gray sad with 10% shell fragments.         sand dollars, snow crabs. sphon holes         COOP Students           2010020         0026         102         86         63         2001         45.676157         -51.331767         17556         89         50.0026 072,pp         Processed USBL Nav         Sand with shells. Fine-med grained gray sand with 3% shell fragments.         sand dollars, snow crabs. sphon holes         COOP Students           2010020         0026         102         86         64         2001         45.67634         -51.33149         17590         89 Sm 0026 075,pp         Processed USBL Nav         Sand with shells. Fine-med grained gray sand with 5% shell fragments.         sand dollars         COOP Students         sand dollars         COOP Students         sand dollars         COOP Students         sand with shells. Fine-med grained gray sand with 5% shell fragments	2010020	0026	102	86	59	2001 45.67	6089 -51.932279 175602	89 Stn 0026 069.jp	g Processed USBL Nav	present snow crabs	COOP Student onboard
2010020         0026         102         86         61         200         45.676151         -51.331893         175700         89         60.0026 071,po         Processed USBL Nav         Sand Bloutbade fine-med grained gray sad with a few black blotches.         COOP Students           2010020         0026         102         86         62         2001         45.676157         -51.331766         175756         88         50.0026 072,po         Processed USBL Nav         Sand with shells. Fine-med grained gray sad with 10% shell fragments.         sand dollars, snow crabs. sphon holes         COOP Students           2010020         0026         102         86         63         2001         45.676157         -51.331767         17556         89         50.0026 072,pp         Processed USBL Nav         Sand with shells. Fine-med grained gray sand with 3% shell fragments.         sand dollars, snow crabs. sphon holes         COOP Students           2010020         0026         102         86         64         2001         45.67634         -51.33149         17590         89 Sm 0026 075,pp         Processed USBL Nav         Sand with shells. Fine-med grained gray sand with 5% shell fragments.         sand dollars         COOP Students         sand dollars         COOP Students         sand dollars         COOP Students         sand with shells. Fine-med grained gray sand with 5% shell fragments									-		
2010/2020         0026         102         66         2010         45.676151         -51.913766         175706         88         Store 0026         OCDP Studen         Store 0027	2010020	0026	102	86	60	2001 45.67	6137 -51.932067 175656	89 Stn 0026 070.jp	g Processed USBL Nav	Sand. Bioturbated fine-med grained grey sand with 5% shell fragments aporrhaidae, sand dollars, snow crabs	COOP Student onboard
2010020         0026         102         86         200         45.676157         -51.931471         77556         89         No.026 072,pg         Processed USBL Nav         Sand with shells. Fine-heed grained gray sand with 10% shell regments, and dollars, snow crabs. siphon holes         COOP Studen           2010020         0026         102         86         63         2001         45.67625         -51.931477         175854         89         Sin 0026 073,pg         Processed USBL Nav         Sand with shells. Fine-heed grained gray and with 15% shell regments, and dollars         and dollars, snow crabs. siphon holes         COOP Studen           2010020         0026         102         86         64         2001         45.676256         -51.931437         175864         89         Sin 0026 073,pg         Processed USBL Nav         Sand with shells. Fine-hee, for alraid gray and with 15% shell regments, and dollars         and dollars         sand dollars         sand dollars         sand dollars         sand dollars         sand dollars         sand dollars         cOOP Studen           2010020         0026         102         86         2001         45.67646         -51.930681         180202         89         Sin 0026 077,pg         Processed USBL Nav         Sand dollars         sand dollars         sand dollars         sand dollars         sand dollars										Sand. Bioturbated fine-med grained grey sand with a few black blotches,	
2010020         0026         102         86         62         2001         45.676157         -51.931766         175756         89         Should out and the state of the state o	2010020	0026	102	86	61	2001 45.67	6151 -51.931983 175700	89 Stn 0026 071.jp	g Processed USBL Nav	5% shell fragments	COOP Student onboard
2010020         0026         102         86         63         2001         45.676235         -51.931477         175864         88         Sin 0026 07.jpg         Processed USBL Nav         Sand with shells Fine-med grained grey sand with 19% shell fragments, sand dollars, snow crabs, siphon holes         COOP Studen           2010020         0026         102         86         64         2001         45.676235         -51.931431         175950         88         Sin 0026 07.jpg         Processed USBL Nav         Sand with shells Fine-med grained grey sand with 15% shell fragments, sand dollars         sand dollars, snow crabs, siphon holes         COOP Studen           2010020         0026         102         86         65         2001         45.676364         -51.931007         180056         89         Sin 0026 07.jpg         Processed USBL Nav         multiple burrow holes, los of and dollars         sand dollars         sand dollars         COOP Studen           2010020         0026         102         86         66         2001         45.676364         -51.930681         18002         89         Sin 0026 07.jpg         Processed USBL Nav         multiple burrow holes, los of and dollars         sand dollars         COOP Studen           2010020         0026         102         86         67         2001         45.676694											
2010020         0026         102         86         63         2001         45.676235         -51.931477         17.884         89         Sin 0026 0026         Sin of the second se	2010020	0026	102	86	62	2001 45.67	6157 -51.931766 175756	89 Stn 0026 072.jp	g Processed USBL Nav	multiple burrow holes sand dollars, snow crabs	COOP Student onboard
2010020         0026         102         86         63         2001         45.676235         -5.19.31437         175854         89         Structure of the structur									-		
2010020         0026         102         86         4         2011         175950         89 Stn 0026 075,jpg         Processed USBL Nav         Stand with shells. Fine-med grained grey sand with 15% shell fragments, sand dollars         sand dollars, san urchins         COOP Studen           2010020         0026         102         86         65         2001         45.676584         -51.931043         175950         89 Stn 0026 075,jpg         Processed USBL Nav         multiple buffers, med grained grey sand with 15% shell fragments, sand dollars         sand dollars         sand dollars         cCOOP Studen           2010020         0026         102         86         66         2001         45.676664         -51.9300681         180202         89 Stn 0026 075,jpg         Processed USBL Nav         multiple buffers, bloc of sand dollars         sand dollars         sand dollars         cCOOP Studen           2010020         0026         102         86         67         2001         45.676666         -51.930461         180258         89 Stn 0026 077,jpg         Processed USBL Nav         fragments, bloc of sand dollars         sand dollars         sand dollars         sand dollars         cCOOP Studen           2010020         0026         102         86         68         2001         45.676694         -51.930133         180414	2010020	0026	102	86	63	2001 45.67	6235 -51.931477 175854	89 Stn 0026 073.jp	g Processed USBL Nav		COOP Student onboard
2010020         0026         102         86         64         2001         45.676258         -51.931343         175950         89 Sm 0026 074,jpg         Processed USBL Nav         multiple burrow holes, lots of sand dollars         sand dollars         sand dollars         sand dollars         sand dollars         sand dollars         COOP Studen           2010020         0026         102         86         65         2001         45.676384         -51.931007         180056         89 Sm 0026 075,jpg         Processed USBL Nav         Sand with shells. Fine-med grained grey sand with 15% shell fragments, sand dollars								- //			
2010020         0026         102         86         65         2001         45.676364         -51.931007         180056         89         Stn 0026 075.jpg         Processed USBL Nav         Sand with shells. Fine-med grained grey sand with 15% shell fragments, multiple burrow holes, lots of sand dollars         sand dollars         COOP Student           2010020         0026         102         86         66         2001         45.676487         -51.930681         180202         89         Sin 0026 076.jpg         Processed USBL Nav         Sand with shells. Fine-med grained grey sand with 15% shell sand dollars         sand dollars         coop Student           2010020         0026         102         86         67         2001         45.676664         -51.930461         180228         89 Stn 0026 077.jpg         Processed USBL Nav         Finand with shells. Fine-med grained grey sand with 15% shell sand dollars         sand dollars         coop Student           2010020         0026         102         86         68         2001         45.676694         -51.930133         180414         89 Stn 0026 077.jpg         Processed USBL Nav         Sand with shells. Fine-med grained grey sand with 15% shell sand dollars         sand dollars         coop Student           2010020         0026         102         86         68         2001         45.676738 </td <td>2010020</td> <td>0026</td> <td>102</td> <td>86</td> <td>64</td> <td>2001 45.67</td> <td>6258 -51.931343 175950</td> <td>89 Stn 0026 074.jp</td> <td>g Processed USBL Nav</td> <td></td> <td>COOP Student onboard</td>	2010020	0026	102	86	64	2001 45.67	6258 -51.931343 175950	89 Stn 0026 074.jp	g Processed USBL Nav		COOP Student onboard
2010020         0026         102         86         65         2001         45.676364         -51.93007         180056         89         Sin 0026 075,jpg         Processed USBL Nav         multiple burrow holes, lots of sand dollars         sand dollars         coord         Sand dollars         sand dollars         coord         COOP Student           2010020         0026         102         86         66         2001         45.676487         -51.930681         180202         89         Sin 0026 077,jpg         Processed USBL Nav         Sand with shells. Fine-med grained grey sand with 15% shell         sand dollars         coord         coord         COOP Student           2010020         0026         102         86         67         2001         45.676696         -51.930461         180205         89         Sin 0026 077,jpg         Processed USBL Nav         Sand with shells. Fine-med grained grey sand with 15% shell         sand dollars         coord         sand dollars         sand dollars         sand dollars         sand dollars         coord         coord         coord         coord         coord         coord         coord									-	Sand with shells. Fine-med grained grey sand with 15% shell fragments,	
2010020         0026         102         86         66         2001         45.676487         -51.930681         180202         89 Sh 0026 07.jpg         Processed USBL Nav         Sand with shells. Fine-med grained grey sand with 15% shell         sand dollars         coord           2010020         0026         102         86         67         2001         45.676487         -51.930681         180202         89 Sh 0026 077.jpg         Processed USBL Nav         Sand with shells. Fine-med grained grey sand with 15% shell         sand dollars         coord         Sand with shells. Fine-med grained grey sand with 15% shell         sand dollars         coord         coord         Sand with shells. Fine-med grained grey sand with 15% shell         sand dollars         coord         coord         sand dollars         sand dollars         coord         coord         sand dollars         sand dollars         sand dollars         coord         coord         sand dollars         sand dollars         coord         coord         sand dollars         sand dollars         coord         coord         sand dollars         sand dollars         sand dollars         sand dollars         coord         sand dollars         sand dollars         sand dollars         coord         coord         sand dollars         sand dollars         coord         coord         sand dolars         sand doll	2010020	0026	102	86	65	2001 45.67	6364 -51.931007 180056	89 Stn 0026 075.ip	g Processed USBL Nav		COOP Student onboard
2010020       0026       102       86       66       2001       45.676487       -51.930681       180202       89 Stn 0026 076.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand dollars       cOOP Studen         2010020       0026       102       86       67       201       45.676694       -51.930461       180258       89 Stn 0026 077.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand dollars       COOP Studen         2010020       0026       102       86       68       2001       45.676694       -51.930133       180414       89 Stn 0026 080.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand dollars       COOP Studen         2010020       0026       102       86       69       2001       45.676738       -51.92925       180458       89 Stn 0026 081.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand dollars       COOP Studen         2010020       0026       102       86       70       2001       45.676912       -51.929455       180026       89 Stn 0026 083.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand dollars       cOOP Studen											
2010020       0026       102       86       67       2011       45.676566       -51.930461       180258       89       Stn 0026 077.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand dollars       sand dollars       cCOOP Studen         2010020       0026       102       86       68       2001       45.676694       -51.930133       180414       89       Stn 0026 080.jpg       Processed USBL Nav       Sand with shells. Dark image, appears to be fine-med grained grey sand with 15% shell       sand dollars, snow crabs       COOP Studen         2010020       0026       102       86       69       2001       45.676738       -51.929925       180458       89       Stn 0026 081.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand dollars       sand dollars       cOOP Studen         2010020       0026       102       86       69       2001       45.676738       -51.929925       180458       89       Stn 0026 081.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand dollars       cOOP Studen         2010020       0026       102       86       70       2001       45.677071       -51.929454       89       Stn 0026 083.jpg       Processed USBL Nav       Sand w	2010020	0026	102	86	66	2001 45.67	6487 -51.930681 180202	89 Stn 0026 076.ip	g Processed USBL Nav		COOP Student onboard
2010020       0026       102       86       67       2001       45.676566       -51.930461       180258       89       Stn 0026 007.jpg       Processed USBL Nav       Sand with shells. Dark image, appears to with 15% shell shells. Since-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand with shells. Fine-med grained grey sand with 15% shell       Sand dollars			- 1						· · · · · · · · · · · · · · · · · · ·		
2010020       0026       102       86       68       2001       45.676694       -51.930133       180414       89       Stn 0026 080.jpg       Processed USBL Nav       Sand with shells. Dark image, appears to be fine-med grained grey sand with 15% shell       sand dollars, snow crabs       COOP Studen         2010020       0026       102       86       69       2001       45.676738       -51.929925       180458       89       Stn 0026 081.jpg       Processed USBL Nav       Fragments, lots of sand dollars       sand dollars       sand dollars       COOP Studen         2010020       0026       102       86       70       2001       45.676912       -51.929646       180600       89       Stn 0026 082.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand dollars       COOP Studen         2010020       0026       102       86       71       2001       45.676912       -51.929646       180600       89       Stn 0026 083.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand dollars       COOP Studen         2010020       0026       102       86       71       2001       45.677001       -51.929304       180702       89       Stn 0026 083.jpg       Processed USBL Nav       Sand w	2010020	0026	102	86	67	2001 45.67	6566 -51,930461 180258	89 Stn 0026 077.in	g Processed USBL Nav		COOP Student onboard
2010020       0026       102       86       68       2001       45.676694       -51.930133       180414       89       Stn 0026 080.jpg       Processed USBL Nav       with 15% shell fragments, multiple burrow holes       sand dollars, snow crabs       COOP Studen         2010020       0026       102       86       69       2001       45.676738       -51.929925       180458       89       Stn 0026 081.jpg       Processed USBL Nav       fragments, insultiple burrow holes       sand dollars, snow crabs       COOP Studen         2010020       0026       102       86       69       2001       45.676738       -51.929925       180458       89       Stn 0026 081.jpg       Processed USBL Nav       fragments, insultiple burrow holes       sand dollars       sand dollars       COOP Studen         2010020       0026       102       86       70       2001       45.676912       -51.929925       180600       89       Stn 0026 082.jpg       Processed USBL Nav       fragments, iots of sand dollars       sand dollars       cOOP Studen         2010020       0026       102       86       71       2001       45.677001       -51.929345       180702       89       Stn 0026 083.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand do							100200				E E E E E E E E E E E E E E E E E E E
2010020       0026       102       86       69       2001       45.676738       -51.929925       180458       89       Stn 0026 081.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand dollars       COOP Studen         2010020       0026       102       86       70       2001       45.676738       -51.929925       180458       89 Stn 0026 081.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand dollars       COOP Studen         2010020       0026       102       86       71       2001       45.677001       -51.929495       180702       89 Stn 0026 083.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand dollars       COOP Studen         2010020       0026       102       86       71       2001       45.677001       -51.929495       180702       89 Stn 0026 083.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand dollars       COOP Studen         2010020       0026       102       86       72       2001       45.677075       -51.929495       180702       89 Stn 0026 083.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand dollars       C	2010020	0026	102	86	68	2001 45.67	6694 -51,930133 180414	89 Stn 0026 080.in	g Processed USBL Nav		COOP Student onboard
2010020       0026       102       86       69       2001       45.676738       -51.929925       180458       89 Stn 0026 081.jpg       Processed USBL Nav       fragments,lots of sand dollars       sand dollars       cOOP Studen         2010020       0026       102       86       70       2001       45.676738       -51.929646       180600       89 Stn 0026 082.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell       sand dollars       COOP Studen         2010020       0026       102       86       71       2001       45.67701       -51.929495       180702       89 Stn 0026 083.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell fragments       sand dollars       COOP Studen         2010020       0026       102       86       71       2001       45.677075       -51.929495       180702       89 Stn 0026 083.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell fragments       sand dollars       COOP Studen         2010020       0026       102       86       72       2001       45.677075       -51.929304       89 Stn 0026 084.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15-20% shell       sand dollars, snow crabs, siphon holes       COOP Studen								22 2 3020 000.jp			
2010020       0026       102       86       70       2001       45.676912       -51.929646       180600       89 Stn 0026 082.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell fragments, lots of sand dollars       sand dollars       COOP Student         2010020       0026       102       86       71       2001       45.677001       -51.92949       180702       89 Stn 0026 083.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell fragments       sand dollars       COOP Student         2010020       0026       102       86       71       2001       45.677007       -51.929304       89 Stn 0026 083.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell fragments       sand dollars       COOP Student         2010020       0026       102       86       72       2001       45.677075       -51.929304       89 Stn 0026 084.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15-20% shell       sand dollars, snow crabs, siphon holes       COOP Student         2010020       0026       102       86       72       2001       45.677075       -51.929304       89 Stn 0026 084.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15-20% shell       sand dollars, snow crab	2010020	0026	102	86	69	2001 45.67	6738 -51,929925 180458	89 Stn 0026 081 in	g Processed USBL Nav		COOP Student onboard
2010020       0026       102       86       70       2001       45.676912       -51.929496       180600       89 Stn 0026 082.jpg       Processed USBL Nav       fragments,lots of sand dollars       sand dollars       cOOP Student         2010020       0026       102       86       71       2001       45.677001       -51.929495       180702       89 Stn 0026 083.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell fragments       sand dollars       COOP Student         2010020       0026       102       86       71       2001       45.677075       -51.929495       180702       89 Stn 0026 083.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell fragments       sand dollars       COOP Student         2010020       0026       102       86       72       2001       45.677075       -51.929304       89 Stn 0026 083.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15-20% shell       sand dollars, snow crabs, siphon holes       COOP Student         2010020       0026       102       86       72       2001       45.677075       -51.929304       89 Stn 0026 084.jpg       Processed USBL Nav       fragments       sand dollars       sand dollars, snow crabs, siphon holes       COOP Student </td <td>20.0020</td> <td>0020</td> <td></td> <td></td> <td></td> <td>2001 10.01</td> <td>011020020 100400</td> <td>20 001 0020 00 1.jp</td> <td></td> <td></td> <td>e ser etadent enboard</td>	20.0020	0020				2001 10.01	011020020 100400	20 001 0020 00 1.jp			e ser etadent enboard
2010020       0026       102       86       71       2001       45.677001       -51.929495       180702       89       Stn 0026 083.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15% shell fragments       sand dollars       COOP Student         2010020       0026       102       86       72       2001       45.677075       -51.929304       180804       89       Stn 0026 084.jpg       Processed USBL Nav       Sand with shells. Fine-med grained grey sand with 15-20% shell fragments       sand dollars, snow crabs, siphon holes       COOP Student         2010020       0026       102       86       72       2001       45.677075       -51.929304       180804       89       Stn 0026 084.jpg       Processed USBL Nav       Fragments       sand dollars, snow crabs, siphon holes       COOP Student	2010020	0026	102	86	70	2001 45.67	6912 -51 929646 180600	89 Stn 0026 082 in	g Processed USBL Nav		COOP Student onboard
2010020 0026 102 86 72 2001 45.677075 -51.929304 180804 89 Stn 0026 084.jpg Processed USBL Nav Sand with shells. Fine-med grained grey sand with 15-20% shell sand dollars, snow crabs, siphon holes COOP Studen	2010020	0020	102	00	10	2001 45.07	-51.523040 100000	55 0tr 0020 002.jp			COOL Student Onboald
2010020 0026 102 86 72 2001 45.677075 -51.929304 180804 89 Stn 0026 084.jpg Processed USBL Nav Sand with shells. Fine-med grained grey sand with 15-20% shell sand dollars, snow crabs, siphon holes COOP Studen	2010020	0026	102	86	71	2001 45 67	7001 -51 929/05 180702	89 Stn 0026 082 in	Processed USBL Nav	Sand with shells. Fine-med grained gray sand with 15% shell fragments leand dollare	COOP Student onboard
2010020 0026 102 86 72 2001 45.677075 -51.929304 180804 89 Stn 0026 084.jpg Processed USBL Nav fragments sand dollars, snow crabs, siphon holes COOP Studen	2010020	0020	102	00		2001 43.07	01.020400 100702	00 011 0020 000.jp	3		
	2010020	0026	102	86	72	2001 45.67	7075 -51 020304 100004	80 Stn 0026 094 in	g Processed LISBL Nav		COOP Student onboard
2010020 0026 102 86 73 2001 45.677182 -51.929197 180854 89 Stn 0026 085.jpg Processed USBL Nav Sand with shells. Fine-med grained grey sand with 15% shell fragments sand dollars, siphon holes COOP Studen	2010020	0020	102	00	12	2001 45.07	1015 -51.828504 100004	03 001 0020 064.jp	y I IOCESSED USDE INAV	regiments satu donais, show crabs, siphor moles	COOF Student Onboald
	2010020	0026	102	86	73	2001 45 67	7182 -51 929197 180954	89 Stn 0026 085 in	Processed USBL Nav	Sand with shells. Fine-med grained gray sand with 15% shell fragments leand dollars, sinhon holes	COOP Student onboard
	2010020	0020	102	00	15	2001 40.07	102 -01.020101 100004	53 0tri 0020 000.jp	g I TOODSEU OODE NAV		SOOT Student onboald

	STATIONIEXP	OSURES NUM	PHOTOSIPH	юто			PHOTO W	ATER PHOTO FILE				РНОТО
EXPED_CD	NUM NUM				_GTYPE PH	HOTO_LAT		EPTH NAME	PHOTO_Position COMMENTS	GEOLOGY	BIOLOGY	DESCRIBED BY
2010020	0026	102	86	74	2001	45.677251	-51.928976 181000	89 Stn 0026 086.jpg	g Processed USBL Nav	Sand with shells. Fine-med grained grey sand with 10% shell fragments	sand dollars	COOP Student onboard
2010020	0026	102	86	75	2001	45.677297	-51.928822 181056	89 Stn 0026 087 ind	g Processed USBL Nav	Sand with shells. Fine-med grained grey sand with 10% shell fragments	sand dollars,	COOP Student onboard
2010020			00		2001				-	Sand with shells. Fine-med grained grey sand with 15-20% shell		ooor oladolii oliboala
2010020	0026	102	86	76	2001	45.677380	-51.928622 181202	89 Stn 0026 088.jpg	g Processed USBL Nav	fragments	sand dollars	COOP Student onboard
2010020	0026	102	86	77	2001	45.677407	-51.928384 181300	89 Stn 0026 089.jp	g Processed USBL Nav	Sand with shells. Fine-med grained grey sand with 15-20% shell fragments and hash	sand dollars	COOP Student onboard
									•	Sand with shells. Fine-med grained grey sand with 15-20% shell		
2010020	0026	102	86	78	2001	45.677446	-51.928162 181358	89 Stn 0026 090.jpg	g Processed USBL Nav	fragments and hash Sand with shells. Fine-med grained grey sand with 15% shell fragments	sand dollars, snow crabs	COOP Student onboard
2010020	0026	102	86	79	2001	45.677598	-51.927838 181502	89 Stn 0026 091.jpg	g Processed USBL Nav	and hash	sand dollars, siphon holes	COOP Student onboard
0040000	0000	102	86	80	0004	45.077050	54 007054 404000	00 01- 0000 000 in	- Deserved LIODI, New	Sand with shells. Fine-med grained grey sand with 10% shell fragments and hash		
2010020	0026	102	86	80	2001	45.677653	-51.927651 181602	89 Stn 0026 092.jpg	g Processed USBL Nav	and nash Sand with shells. Fine-med grained grey sand with 15% shell fragments	sand dollars	COOP Student onboard
2010020	0026	102	86	81	2001	45.677695	-51.927294 181702	89 Stn 0026 093.jpg	g Processed USBL Nav	and hash	sand dollars	COOP Student onboard
2010020	0026	102	86	82	2001	45.677695	-51.926971 181804	89 Stn 0026 094 in	g Processed USBL Nav	Sand with shells. Fine-med grained grey sand with 5% shell fragments, burrow holes	sand dollars, siphon holes	COOP Student onboard
2010020	0020	102	00	02	2001	43.077033	-51.520371 101004	03 011 0020 034.jpt			Sand dollars, siphon noies	COOL Student Onboard
2010020	0026	102	86	83	2001	45.677770	-51.926701 181900	89 Stn 0026 095.jpg	g Processed USBL Nav	Sand with shells. Fine-med grained grey sand with 10% shell fragments	snow crabs	COOP Student onboard
2010020	0026	102	86	84	2001	45.677854	-51,926445 182002	89 Stn 0026 096.ip	g Processed USBL Nav	Sand with shells. Fine-med grained grey sand with 5% shell fragments	snow crabs	COOP Student onboard
										Sand with shells. Fine-med grained med sand with some shell fragments		
2010020	0026	102	86	85	2001	45.677930	-51.926226 182104	89 Stn 0026 097.jpg	g Processed USBL Nav	a few ripples Sand with shells. Image clouded with med-fine grained sand and shell	sea urchin	COOP Student onboard
2010020	0026	102	86	86	2001	45.677922	-51.926196 182112	89 Stn 0026 098.jpg	g Processed USBL Nav	hash		COOP Student onboard
										Gravel with shell sand. 40% shell fragments and hash, 50-60% small-	red soft coral, branching coral, asteriidae, encrusting purple sponge, sea peach, cerianthidae, breadcrumb	
2010020	0035	53	45	1	2001	45.165621	-49.490102 174345	73 Stn 0035 004.jpg	g Processed USBL Nav	large pebbles and cobbles Gravel with shell sand. 10-15% shell fragments and hash, 80-90% small	sponge, snow crab, buccinidae, - red soft coral, solasteridae, sea peach, purple	COOP Student onboard
2010020	0035	53	45	2	2001	45.165633	-49.489788 174447	73 Stn 0035 005.jpg	g Processed USBL Nav	large pebbles and cobbles	encrusting sponge, sea urchin, branching coral,	COOP Student onboard
									-		sea peach, red soft coral, branching coral, purple	
2010020	0035	53	45	3	2001	45.165616	-49.489559 174537	73 Stn 0035 007 ind	Processed USBL Nav	Gravel with shell sand. Fine-med grain grey sand, 15-20% shell fragments and hash, 80-90% small-large pebbles	encrusting sponge, large sessile tunicate with 2 siphons, snow crabs	COOP Student onboard
				0						Gravel with shell sand. Fine-med grain grey sand, 10-15% shell	branching coral, sea peach, cerianthidae, sea urchins,	
2010020	0035	53	45	4	2001	45.16576	-49.489489 174543	73 Stn 0035 008.jpg	g Processed USBL Nav	fragments and hash, 80-85% small-large pebbles	purple encrusting sponge, red soft coral, purple and orange encrusting sponge,	COOP Student onboard
2010020	0035	53	45	5	2001	45.165828	-49.489093 174649	73 Stn 0035 009.jpg	g Processed USBL Nav	Gravel with shell sand. Fine-med grain grey sand, 15-20% shell fragments and hash, 80-90% small-large pebbles	orange footed sea cucumber, branching coral, snow crab, sea urchin	COOP Student onboard
0040000	0035	53	45	6	0004	45 405000	-49,488884 174751	70 01- 0005 010 -	Deserved LIODI, New	Gravel with shell sand. Fine-med grain grey sand, 50% shell fragments	red soft coral, purple encrusting sponge, sea peach,	COOP Student onboard
2010020	0035	53	45	6	2001	45.165903	-49.488884 174751	73 Sth 0035 010.jpg	g Processed USBL Nav	and hash, 40% small-large pebbles Sand and gravel. Fine-med grain grey sand, 35% shell fragments and	sea urchin, snow crab red soft coral, sea urchins, snow crabs, purple	COOP Student onboard
2010020	0035	53	45	7	2001	45.165949	-49.488652 174853	73 Stn 0035 011.jpg	g Processed USBL Nav	hash, 65-70% small-large pebbles and cobbles	encrusting sponge,	COOP Student onboard
2010020	0035	53	45	8	2001	45.165991	-49.488456 174953	73 Stn 0035 012 in	Processed USBL Nav	Sand and gravel. Fine-med grain grey sand, 35% shell fragments and hash. 65% small-large pebbles and cobbles	red soft coral, sea peaches, purple encrusting sponge.	COOP Student onboard
										Sand and gravel. Fine-med grain grey sand, 25% shell fragments and	orange footed sea cucumber, purple encrusting	
2010020	0035	53	45	9	2001	45.166055	-49.488244 175053	73 Stn 0035 013.jpg	g Processed USBL Nav	hash, 45% small-large pebbles and cobbles Sand with gravel. Fine-med grain grey sand, 50% shell fragments and	sponge, cerianthidae, sea urchin,	COOP Student onboard
2010020	0035	53	45	10	2001	45.166127	-49.487942 175201	73 Stn 0035 014.jpg	g Processed USBL Nav	 hash, 2% small-medium pebbles and cobble	orange encrusting sponge, sea urchin, sea peach	COOP Student onboard
2010000	0035	53	45	11	2001	45.16623	-49.487652 175307	72 8 0005 045		 Gravel with shell sand. Fine-med grain grey sand, 15% shell fragments and hash, 85% small-large pebbles and cobbles		
2010020	0035	53	45	11	2001	45.16623	-49.487652 175307	73 Stn 0035 015.jpg	g Processed USBL Nav	and hash, 85% small-large pebbles and cobbles Gravel with shell sand. Fine-med grain grey sand, 5-15% shell fragment	red soft coral, purple encrusting sponge, cerianthidae, s red soft coral, sea peaches, purple encrusting sponge,	COUP Student onboard
2010020	0035	53	45	12	2001	45.166332	-49.487354 175409	73 Stn 0035 016.jpg	g Processed USBL Nav	and hash, 85-95% small-large pebbles	branching coral, pink boring sponge,	COOP Student onboard
2010020	0035	53	45	13	2001	45.166398	-49.487045 175511	73 Stn 0035 017.jpg	g Processed USBL Nav	Gravel with shell sand. Fine-med grain grey sand, 5-15% shell fragment and hash, 85-95% small-large pebbles	encrusting sponge, pink boring sponge, cerianthidae,	COOP Student onboard
2010020	0035	53	45	14	2001	45.166432	-49.486811 175613	73 Stn 0035 018.ipd	g Processed USBL Nav	Gravel with shell sand. Fine-med grain grey sand, 40% shell fragments and hash, 60% small-large pebbles	sea urchins, branching coral, purple encrusting sponge.	COOP Student onboard
									•	Gravel with shell sand. Fine-med grain grey sand, 15% shell fragments	red soft coral, snow crab, branching coral, pink boring	
2010020	0035	53	45	15	2001	45.16649	-49.486546 175713	73 Stn 0035 019.jpg	g Processed USBL Nav	and hash, 70% small-large pebbles Gravel with shell sand. Fine-med grain grey sand, 35% shell fragments	sponge, cerianthidae, sea urchins, red soft coral, asteriidae, branching coral, sea urchin,	COOP Student onboard
2010020	0035	53	45	16	2001	45.166562	-49.486239 175815	73 Stn 0035 020.jpg	g Processed USBL Nav	 and hash, 45% small-large pebbles	purple encrusting sponge,	COOP Student onboard
2010020	0035	53	45	17	2001	45.166632	-49.486017 175915	73 Stn 0025 024 in	g Processed USBL Nav	 Gravel with shell sand. Fine-med grain grey sand, 10-25% shell fragments and hash, 80-90% small-large pebbles	red soft coral, sea peach, purple encrusting sponge, cerianthidae.	COOP Student onboard
2010020	0035	53	45	17	2001	40.100032	-49.400017 175915	/ 3 3 3 1 0 0 3 5 0 2 1. jp	Y FINCESSED USDL NAV	mayments and nash, ou-sul% smail-large peoples	cenanulluae,	COOP Student onboard

						BHOTO IN	VATER PHOTO FILE				РНОТО
EXPED CD	NUMNUM	SURES NUM_					DEPTH NAME	PHOTO Position COMMENTS	GEOLOGY	BIOLOGY	DESCRIBED BY
	TTO MITTO M	IN_01		000_01					Gravel with shell sand. Fine-med grain grey sand, 10-25% shell	sea peach, red soft coral, purple encrusting sponge,	DECONIDED DI
2010020	0035	53	45	18	2001 45,16669	-49.485791 180011	73 Stn 0035 022 ing	Processed USBL Nav	fragments and hash, 80-90% small-large pebbles		COOP Student onboard
2010020	0000	00	-0	10	2001 40.10000	45.466751 100011	10 Bin 0000 022.jpg		Gravel with shell sand. Fine-med grain grey sand, 10-25% shell	red soft coral, cerianthiidae, breadcrumb sponge, sea	COOL Olddeni Choolaid
2010020	0035	53	45	19	2001 45,166	7 -49.485547 180115	73 Stn 0035 023 ind	Processed USBL Nav	fragments and hash. 80-90% small-large pebbles	urchin, actiniidae.	COOP Student onboard
2010020	0000		45	13	2001 43.100	7 -49.403047 100115	73 Stil 0033 023.jpg	TIOCESSED CODE Nav	Gravel with shell sand. Fine-med grain grey sand, 10-15% shell	sea urchins, purple encrusting sponge, sand dollars,	COOL Student Onboard
2010020	0035	53	45	20	2001 45,1669	6 -49.485031 180311	72 Sta 0025 024 in a	Processed USBL Nav	fragments and hash, 35-40% small-large pebbles, cobbles		COOP Student onboard
2010020	0035	55	45	20	2001 45.1669	6 -49.465031 180311	73 Stri 0035 024.jpg	PIOCESSED USBL Nav	Gravel with shell sand. Fine-med grain grey sand, 75% shell fragments	show crabs, actinidae, red solt corai	COOP Student onboard
2010020	0035	53	45	21	2001 45,1669	78 -49.484754 180415	70 04- 0005 005 1	Processed USBL Nav	and hash, 15% small-large pebbles, cobbles		COOP Student onboard
2010020	0035	53	45	21	2001 45.1669	8 -49.484754 180415	73 Stn 0035 025.jpg	Processed USBL Nav			COOP Student onboard
									Gravel with shell sand. Fine-med grain grey sand, 45% shell fragments		
2010020	0035	53	45	22	2001 45.16704	6 -49.484534 180513	73 Stn 0035 026.jpg	Processed USBL Nav	and hash, 35% small-medium pebbles		COOP Student onboard
										red soft coral, purple encrusting sponge, stalked	
									Gravel with shell sand. Fine-med grain grey sand, 10-25% shell	tunicate (sea grape?), sand dollar, sea urchin,	
2010020	0035	53	45	23	2001 45.16712	-49.484329 180613	73 Stn 0035 027.jpg	Processed USBL Nav	fragments and hash, 80-90% small-large pebbles, cobbles		COOP Student onboard
									Gravel with shell sand. Fine-med grain grey sand, 30-35% shell	red soft coral, purple encrusting sponge, sea urchin,	
2010020	0035	53	45	24	2001 45.16719	98 -49.484174 180713	73 Stn 0035 028.jpg	Processed USBL Nav	fragments and hash, 65-70% small-large pebbles, cobbles	cerianthidae,	COOP Student onboard
									Gravel with shell sand. Fine-med grain grey sand, 25-35% shell		
2010020	0035	53	45	25	2001 45.16726	5 -49.483991 180813	73 Stn 0035 029.jpg	Processed USBL Nav	fragments and hash, 65-75% small-large pebbles, cobbles	red soft coral, snow crab, purple encrusting sponge,	COOP Student onboard
						1 1 1			Gravel with shell sand. Fine-med grain grey sand, 45% shell fragments	red soft coral, sea peach, purple encrusting sponge,	
2010020	0035	53	45	26	2001 45.16732	-49.483815 180911	73 Stn 0035 030.ing	Processed USBL Nav	and hash, 55% small-large pebbles	cerianthidae,	COOP Student onboard
				-					Gravel with shell sand. Fine-med grain grey sand, 45% shell fragments	red soft coral, purple encrusting sponge, branching	
2010020	0035	53	45	27	2001 45,167;	-49.483647 181009	73 Stn 0035 031 ing	Processed USBL Nav	and hash, 55% small-large pebbles		COOP Student onboard
2310020	0000					101000			Gravel with shell sand. Fine-med grain grey sand, 20-25% shell	red soft coral, purple encrusting sponge, sea peach,	
2010020	0035	53	45	28	2001 45.16743	3 -49.483435 181113	73 Stn 0035 022 ing	Processed USBL Nav	fragments and hash, 75-80% small-large pebbles		COOP Student onboard
2010020	0035	55	40	20	2001 45.1074	-49.463433 181113	73 Stil 0035 032.jpg	FIOLESSED USBLINAV	Gravel with shell sand. Fine-med grain grey sand, 25-35% shell		COOF Student onboard
2010020	0035	53	45	29	2001 45.16749	-49.483262 181213	72 840 0025 022	Processed USBL Nav	fragments and hash, 65-70% small-large pebbles	red soft coral, branching coral, sea urchin, sea peach,	COOD Student onk
2010020	0035	53	45	29	2001 45.16749	-49.483262 181213	73 Stn 0035 033.jpg	Processed USBL Nav			COOP Student onboard
									Gravel with shell sand. Fine-med grain grey sand, 25-35% shell	red soft coral, purple encrusting sponge, sea peach,	
2010020	0035	53	45	30	2001 45.16754	4 -49.483093 181315	73 Stn 0035 034.jpg	Processed USBL Nav	fragments and hash, 65-70% small-large pebbles, cobbles	sea urchin, snow crab	COOP Student onboard
									Gravel with shell sand. Fine-med grain grey sand, 30% shell fragments		
2010020	0035	53	45	31	2001 45.16759	98 -49.48292 181415	73 Stn 0035 035.jpg	Processed USBL Nav	and hash, 25% small-large pebbles, cobbles	red soft coral, sea urchin,	COOP Student onboard
									Gravel with shell sand. Fine-med grain grey sand, 10-15% shell	sea urchin, orange footed sea cucumber, purple	
2010020	0035	53	45	32	2001 45.16766	4 -49.482762 181517	73 Stn 0035 036.jpg	Processed USBL Nav	fragments and hash, 1% medium-large pebbles	encrusting sponge, snow crab, actiniidae, sea peach,	COOP Student onboard
									Sand with gravel. Fine-med grain grey sand, 15% shell fragments and		
2010020	0035	53	45	33	2001 45.16770	6 -49.482587 181619	73 Stn 0035 037.jpg	Processed USBL Nav	hash, 5% medium-large pebbles		COOP Student onboard
			-						Sand with gravel. Fine-med grain grey sand, 15-20% shell fragments an	d	
2010020	0035	53	45	34	2001 45.16774	49.482467 181721	73 Stn 0035 038 ing	Processed USBL Nav	hash, 5% medium-large pebbles		COOP Student onboard
2010020	0000	00	10	0.	2001 1011011	101102101 101121	10 Etti 0000 000.jpg			red soft coral, orange footed sea cucmber, purple	eeer etadelit etibedid
									Sand and gravel. Fine-med grain grey sand, 20% shell fragments and	encrusting sponge, 6 armed seastar, snow crab, sea	
2010020	0035	53	45	35	2001 45.16772	4 -49.48238 181817	72 Stp 0025 020 ipg	Processed USBL Nav	hash, 15-25% small-large pebbles, cobbles		COOP Student onboard
2010020	0033	55	40	35	2001 45.10772	4 -49.48238 181817	73 Stil 0035 039.jpg	FIOLESSED USBL Nav			COOF Student Onboard
2010020	0035	53	45	36	2001 45.1677	7 -49.48213 181917	72 840 0005 040	Breesenad LISBI New	Sand with gravel. Fine-med grain grey sand, 5-10% shell fragments and		COOP Student onboard
2010020	0035	ರಿತ	45	30	2001 45.1677	7 -49.48213 181917	7.3 Stn 0035 040.jpg	Processed USBL Nav	hash, 3% medium-large pebbles, cobbles and sand dollars		COOP Student onboard
									Sand with gravel. Fine-med grain grey sand, 5-10% shell fragments and		
2010020	0035	53	45	37	2001 45.16780	05 -49.481753 182019	73 Stn 0035 041.jpg	Processed USBL Nav	hash, sand dollars	urchins, hormanthiidae,	COOP Student onboard
									Sand. Fine-med grain grey sand, 3% shell fragments and hash, sand		
2010020	0035	53	45	38	2001 45.16783	4 -49.481447 182117	73 Stn 0035 042.jpg	Processed USBL Nav	dollars		COOP Student onboard
									Sand with gravel. Fine-med grain grey sand, 5% shell fragments and	sand dollars, orange footed sea cucumber, sea	
2010020	0035	53	45	39	2001 45.16788	88 -49.481103 182221	73 Stn 0035 043.jpg	Processed USBL Nav	hash, cobbles and sand dollars	urchins	COOP Student onboard
									Sand with gravel. Fine-med grain grey sand, 2% shell fragments and		
2010020	0035	53	45	40	2001 45.1679	-49.480842 182319	73 Stn 0035 044.jpg	Processed USBL Nav	hash, cobbles and sand dollars	sand dollars, sea urchins,	COOP Student onboard
						1 1			Sand with gravel. Fine-med grain grey sand, 2% shell fragments and		
2010020	0035	53	45	41	2001 45.1680 <sup>-</sup>	7 -49.480615 182417	73 Stn 0035 045 ing	Processed USBL Nav	hash, sand dollars	sand dollars	COOP Student onboard
2010020	0000					101100010 102411			Sand. Fine-med grain grey sand, 2% shell fragments and hash, sand		erer etadent enbourd
2010020	0035	53	45	42	2001 45,1679	-49.480465 182517	73 Stn 0035 046 inc	Processed USBL Nav	dollars	sea urchins, sand dollars	COOP Student onboard
2010020	0030		40	-12	40.10/9		75 Out 0055 040.jpg		Sand. Fine-med grain grey sand, 2% shell fragments and hash, sand		
	1 1	53	45	43	2001 45.1680	40 400075 400047	72 Sta 0025 047	Breasand USBI New	dollars	aand dellara	COOD Student onk
2040000	0005		45	43	2001 45.16805	58 -49.480275 182617	73 Stn 0035 047.jpg	Processed USBL Nav		sand dollars	COOP Student onboard
2010020	0035	55							Sand. Fine-med grain grey sand, 2% shell fragments and hash, sand		
							73 Stn 0035 048.ipg	Processed USBL Nav	dollars	sand dollars, sea urchins	COOP Student onboard
2010020		53	45	44	2001 45.1682	8 -49.480216 182715					
2010020	0035	53							Sand. Fine-med grain grey sand, 4% shell fragments and hash, sand		
			45 45		2001 45.1682 2001 45.16840			Processed USBL Nav	Sand. Fine-med grain grey sand, 4% shell fragments and hash, sand dollars	sand dollars	COOP Student onboard
2010020 2010020	0035	53 53		45	2001 45.16840	.49.480136 182819	73 Stn 0035 049.jpg				
2010020	0035	53		45		.49.480136 182819				sand dollars	COOP Student onboard
2010020 2010020	0035	53 53	45	45	2001 45.16840	.49.480136 182819	73 Stn 0035 049.jpg		dollars	sand dollars branched coral fragments, small anemones, abundant	
2010020 2010020	0035	53 53 52	45	45	2001 45.16840	17 -49.480136 182819 14 -48.370196 120029	73 Stn 0035 049.jpg 183 Stn 0038 004.jpg	Processed USBL Nav	dollars Sand with shells. Fine grained grey sand, 15% shell fragments	sand dollars branched coral fragments, small anemones, abundant sand dollars branched coral fragments, small anemones, abundant	
2010020 2010020 2010020	0035 0035 0038	53 53	45 42	45	2001 45.16840 2001 45.63540	17 -49.480136 182819 14 -48.370196 120029	73 Stn 0035 049.jpg	Processed USBL Nav	dollars	sand dollars branched coral fragments, small anemones, abundant sand dollars branched coral fragments, small anemones, abundant sand dollars	COOP Student onboard
2010020 2010020 2010020	0035 0035 0038 0038	53 53 52	45 42	45 1 2	2001 45.16840 2001 45.63540	17         -49.480136         182819           14         -48.370196         120029           51         -48.370452         120154	73 Stn 0035 049.jpg 183 Stn 0038 004.jpg	Processed USBL Nav Processed USBL Nav	dollars Sand with shells. Fine grained grey sand, 15% shell fragments	sand dollars branched coral fragments, small anemones, abundant sand dollars branched coral fragments, small anemones, abundant sand dollars branched coral fragments, small anemones, abundant	COOP Student onboard

													PHOTO
EXPED CD	TATION EXPOSU		NUM_PHOTOS PHOTO	SDO GTVPE	PHOTO LAT P			DEPTH N		PHOTO Position COMMENTS	GEOLOGY	BIOLOGY	DESCRIBED BY
EXFED_CD		'		3DO_GTIFE	FILOTO_LAT F	HOTO_LONG	Givit L			FIGTO_FOSIGIT COMMENTS	GEOLOGI	branched coral fragments, leptasterias, small	DESCRIBED BI
2010020	0038	52	42 4	2001	45.635764	-48.370679	120400	102 0	to 0029 007 ing	Processed USBL Nav	Sand with shells. Fine grained grey sand, 5% shell fragments	anemones, abundant sand dollars	COOP Student onboard
2010020	0036	52	42 4	2001	45.0557.04	-40.370079	120400	103 3	an 0038 007.jpg	FIDCESSED USBL INAV	Sand with shells. Fille grained grey sand, 5 % shell haginents	branched coral fragments, small anemone, abundant	
2010020	0038	52	42 5	2001	45.635835	-48.37071	120458	102 0	to 0020 000 in a	Processed USBL Nav	Sand with shells. Fine grained grev sand, 5% shell fragments	sand dollars	COOP Student onboard
2010020	0036	52	42 3	2001	45.655655	-40.3/0/1	120436	103 3	an 0036 006.jpg	PIOCESSED USBL Nav	Sand with shells. Fine grained grey sand, 5% shell hagments		COOP Student onboard
0040000		5.0	40		15 005004	10 070050	100000	4000				branched coral fragments, leptasterias, small	
2010020	0038	52	42 6	2001	45.635964	-48.370853	120600			Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	anemones, abundant sand dollars, hermit crab	COOP Student onboard
2010020	0038	52	42 7	2001	45.636281	-48.371098	120758	183 S	tn 0038 010.jpg	Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	branched coral fragments, abundant sand dollars	COOP Student onboard
												branched coral fragments, small anemones, abundar	
2010020	0038	52	42 8	2001		-48.371266				Processed USBL Nav	Sand with shells. Fine grained grey sand, 15% shell fragments	sand dollars	COOP Student onboard
2010020	0038	52	42 9	2001	45.636668	-48.371504	120956	183 S	tn 0038 012.jpg	Processed USBL Nav	Sand with shells. Fine grained grey sand, 5% shell fragments	branched coral fragments, abundant sand dollars	COOP Student onboard
												branched coral fragments, leptasterias, snow crab,	
2010020	0038	52	42 10	2001	45.636868	-48.37162	121054	183 S	tn 0038 013.jpg	Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	abundant sand dollars	COOP Student onboard
2010020	0038	52	42 11	2001	45.636876	-48.371592	121058	183 S	tn 0038 014.jpg	Processed USBL Nav	Sand with shells. Fine grained grey sand, 5% shell fragments	branched coral fragments, abundant sand dollars	COOP Student onboard
												branched coral fragments, leptasterias, abundant	
2010020	0038	52	42 12	2001	45.637044	-48.37176	121154	183 S	tn 0038 015.jpg	Processed USBL Nav	Sand with shells. Fine grained grey sand, 15% shell fragments	sand dollars	COOP Student onboard
												branched coral fragments, abundant sand dollars,	
2010020	0038	52	42 13	2001	45.637216	-48.371928	121256	183 S	tn 0038 016.ipg	Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	small sea cauliflower?	COOP Student onboard
		-										branched coral fragments, small anemone, abundant	
2010020	0038	52	42 14	2001	45.637293	-48.372032	121342	183 5	tn 0038 017 ing	Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	sand dollars	COOP Student onboard
2010020	0038	52	42 15			-48.372182				Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	abundant sand dollars	COOP Student onboard
2010020	0038	52	42 16			-48.372388				Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	abundant sand dollars	COOP Student onboard
2010020	0038	52	42 10	2001	45.037500	*40.372300	121004	103 3	an 0038 019.jpg	FIDCESSED USBLINAV	Sanu with shells. Fine grained grey sand, <5% shell haghletits		COOF Student onboard
0040000		50	10 17		15 007500	10 070 17 1	101050	4000				anemone, abundant sand dollars, branched coral	
2010020	0038	52	42 17	2001	45.637566	-48.372474	121656	183 S	th 0038 020.jpg	Processed USBL Nav	Sand with shells. Fine grained grey sand, 5% shell fragments	fragments	COOP Student onboard
												anemone, abundant sand dollars, branched coral	
2010020	0038	52	42 18	2001	45.63763	-48.372545	121758	183 S	tn 0038 021.jpg	Processed USBL Nav	Sand with shells. Fine grained grey sand, 10% shell fragments	fragments	COOP Student onboard
											Sand with shells. Fine grained grey sand, 10% shell fragments	snow crab, anemones, abundant sand dollars,	
2010020	0038	52	42 19	2001		-48.372681	121900			Processed USBL Nav	concentrated in top right corner	branched coral fragments	COOP Student onboard
2010020	0038	52	42 20	2001	45.637883	-48.372772	122004	183 S	tn 0038 023.jpg	Processed USBL Nav	Sand with shells. Fine grained grey sand, 10% shell fragments	branched coral fragments, abundant sand dollars	COOP Student onboard
												anemone, abundant sand dollars, branched coral	
2010020	0038	52	42 21	2001	45.638022	-48.372916	122058			Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	fragments	COOP Student onboard
2010020	0038	52	42 22	2001	45.638026	-48.37293	122102	183 S	tn 0038 025.jpg	Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	leptasterias, abundant sand dollars	COOP Student onboard
												snails, abundant sand dollars, small anemone.	
2010020	0038	52	42 23	2001	45.638158	-48.373065	122154	183 S	tn 0038 026.ipg	Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	branched coral fragments	COOP Student onboard
2010020	0038	52	42 24	2001		-48.37325	122256	183 S	tn 0038 027 ing	Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	abundant sand dollars	COOP Student onboard
2010020	0038	52	42 25			-48.373379				Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	snow crab, abundant sand dollars	COOP Student onboard
2010020	0038	52	42 26			-48.373425		183 5	tn 0038 020 ipg	Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	abundant sand dollars, branched coral fragments	COOP Student onboard
2010020	0038	52	42 20			-48.373587				Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	abundant sand dollars	COOP Student onboard
2010020	0038	52	42 27			-48.373708				Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	abundant sand dollars	COOP Student onboard
2010020	0038	52	42 20			-48.373746				Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	abundant sand dollars	COOP Student onboard
2010020	0036	52	42 28	2001	45.636746	-40.3/3/40	122030	103 3	an 0036 032.jpg	PIOCESSED USBLINAV			COOP Student onboard
0040000		50	10 00		15 000057	10 070705	400000	4000			Sand with shells. Fine grained grey sand, 5% shell fragments,	small anemone, abundant sand dollars, branched	
2010020	0038	52	42 30	2001	45.638857	-48.373795	122800	183 S	tn 0038 033.jpg	Processed USBL Nav	concentrated in right half	coral fragments	COOP Student onboard
												anemone, abundant sand dollars, branched coral	
2010020	0038	52	42 31	2001	45.638947	-48.373793	122900	183 S	tn 0038 034.jpg	Processed USBL Nav	Sand with shells. Fine grained grey sand, 10% shell fragments	fragments	COOP Student onboard
												anemone, abundant sand dollars, small crabs	
2010020	0038	52	42 32		45.639096	-48.373815	123002			Processed USBL Nav	Sand with shells. Fine grained grey sand, 5% shell fragments	branched coral fragments	COOP Student onboard
2010020	0038	52	42 33	2001	45.639522	-48.374004	123206	183 S	tn 0038 036.jpg	Processed USBL Nav	Sand with shells. Fine grained grey sand, 5% shell fragments	anemone, abundant sand dollarsleptasterias	COOP Student onboard
												snow crab, abundant sand dollars, branched coral	
2010020	0038	52	42 34	2001	45.639714	-48.37413	123258	183 S	tn 0038 037.jpg	Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	fragments	COOP Student onboard
2010020	0038	52	42 35	2001	45.639909	-48.3743	123356			Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	sand dollars	COOP Student onboard
2010020	0038	52	42 36			-48.374499				Processed USBL Nav	Sand with shells. Fine grained grey sand, <5% shell fragments	abundant sand dollars, branched coral fragments	COOP Student onboard
2010020	0038	52	42 37			-48.374765				Processed USBL Nav	Sand with shells. Fine grained grey sand, 5% shell fragments	abundant sand dollars, branched coral fragments	COOP Student onboard
2010020		32		2001	.0.040200							snow crab, anemones, abundant sand dollars,	coor oreaching on board
2010020	0038	52	42 38	2001	45.640383	-48.375037	123708	183 0	to 0038 0/11 inc	Processed USBL Nav	Sand with shells. Fine grained grey sand, 15% shell fragments	branched coral fragments	COOP Student onboard
2010020	0038	52	42 30			-48.375284		103 3	to 0028 042 inc	Processed USBL Nav	Sand with shells. Fine grained grey sand, 15% shell fragments	abundant sand dollars, branched coral fragments	COOP Student onboard
	0038					-48.375284						abundant sand dollars, branched coral fragments	COOP Student onboard
2010020		52						183 5	ui 0038 043.jpg	Processed USBL Nav	Sand with shells. Fine grained grey sand, 15% shell fragments		
2010020	0038	52				-48.375745				Processed USBL Nav	Sand with shells. Fine grained grey sand, 10% shell fragments	abundant sand dollars, anemone	COOP Student onboard
2010020	0038	52	42 42	2001	45.640799	-48.375952	124058	183 S	tn 0038 045.jpg	Processed USBL Nav	Sand with shells. Fine grained grey sand, <1% shell fragments	abundant sand dollars	COOP Student onboard
				1				1			Sand, shells and gravel. Fine-med grain grey sand, 45% shell fragments		
2010020	0042	32	24 1	2001	45.766043	-48.713639	181813	94 S	tn 0042 007.jpg	Processed USBL Nav	and hash, 35% small-medium pebbles	sand dollars, deceased urchins	COOP Student onboard
											Sand, shells and gravel. Fine-med grain grey sand, 45% shell fragments		
2010020	0042	32	24 2	2001	45.765948	-48.714349	181951	94 S	tn 0042 008.jpg	Processed USBL Nav	and hash, 35% small-medium pebbles	sand dollars	COOP Student onboard
								1			Sand, shells and gravel. Fine-med grain grey sand, 45% shell fragments		
2010020	0042	32	24 3	2001	45,765708	-48,71467	182147	94 S	tn 0042 010 ing	Processed USBL Nav	and hash. 25% small-medium pebbles	sand dollars, bivalve	COOP Student onboard
2010020			2. 0	2001	.0 00. 00	10.1.1401					Sand, shells and gravel. Fine-med grain grey sand, 45% shell fragments		CCS: Cladon choodid
2010020	0042	22	24 4	2001	45,765672	-48,714739	182249	04 0	to 0042 011 in ~	Processed USBL Nav	and hash. 10% small-medium pebbles	snow crab, anemones, sun star, bivalves, sand dollar	re COOP Student enhand
2010020	0042	32	24 4	2001	40.700072	-40./14/39	102249	94 3	ui uu42 ui i.jpg	I IUGESSEU UODL INAV	anu nash, 1070 smairmedium peoples	show crap, anemories, sun star, pivalves, sand dollar	a coor student onboard

	STATIONIEXPO	SURES NUM P	HOTOSIPH	ото			PHOTO W	ATER PHOTO_FILE				РНОТО
EXPED_CD	NUM NUM				GTYPE P	HOTO_LAT		PTH NAME	PHOTO_Position COMMENTS	GEOLOGY	BIOLOGY	DESCRIBED BY
2010020	0042	32	24	5	2001	45.76557	7 -48.714836 182343	94 Stn 0042 012.jp	pg Processed USBL Nav	Shelly sand. Fine-med grain grey sand, 5% shell fragments and hash	urchin, sand dollars	COOP Student onboard
2010020	0042	32	24	6	2001	45.765473	3 -48.715085 182445	94 Stn 0042 013.jp	pg Processed USBL Nav	 Shelly sand. Fine-med grain grey sand, 10% shell fragments and hash	urchin, sand dollars	COOP Student onboard
2010020	0042	32	24	7	2001	45.765461	-48.71545 182547	94 Stn 0042 014.jp	pg Processed USBL Nav	 Shelly sand. Fine-med grain grey sand, 15% shell fragments and hash	abundant sand dollars	COOP Student onboard
2010020	0042	32	24	8	2001	45.765324	4 -48.716082 182743	94 Stn 0042 015.jp	pg Processed USBL Nav	Shelly sand. Fine-med grain grey sand, 15% shell fragments and hash, 5% small-medium pebbles Shelly sand. Fine-med grain grey sand, 15% shell fragments and hash.	abundant sand dollars	COOP Student onboard
2010020	0042	32	24	9	2001	45.765346	-48.716465 182841	94 Stn 0042 016.jp	pg Processed USBL Nav	5% small-medium pebbles	abundant sand dollars	COOP Student onboard
2010020	0042	32	24	10	2001	45.765362	2 -48.717461 183051	94 Stn 0042 017.jp	pg Processed USBL Nav	Shelly sand. Fine-med grain grey sand, 10% shell fragments and hash	abundant sand dollars, siphon holes	COOP Student onboard
2010020	0042	32	24	11	2001	45.765275	5 -48.718048 183151	94 Stn 0042 018.jp	pg Processed USBL Nav	Shelly sand. Fine-med grain grey sand, 5% shell fragments and hash	abundant sand dollars, siphon holes	COOP Student onboard
2010020	0042	32	24	12	2001	45.765195	5 -48.718539 183247	94 Stn 0042 019.jp	pg Processed USBL Nav	 Shelly sand. Fine-med grain grey sand, 15% shell fragments and hash	sand dollars	COOP Student onboard
2010020	0042	32	24	13	2001	45.765073	3 -48.718927 183343	94 Stn 0042 020.jp	pg Processed USBL Nav	Shelly sand. Fine-med grain grey sand, 10% shell fragments and hash	abundant sand dollars, siphon holes, urchin	COOP Student onboard
2010020	0042	32	24	14	2001	45.765019	-48.719311 183443	94 Stn 0042 021.jp	pg Processed USBL Nav	Shelly sand. Fine-med grain grey sand, 5% shell fragments and hash. Some small pebbles	abundant sand dollars, siphon holes	COOP Student onboard
2010020	0042	32	24	15	2001	45.764985	5 -48.719662 183539	94 Stn 0042 022.jp	pg Processed USBL Nav	Shelly sand. Fine-med grain grey sand, 5% shell fragments and hash. Some small pebbles Shelly sand. Fine-med grain grey sand, 5% shell fragments and hash.	sand dollars	COOP Student onboard
2010020	0042	32	24	16	2001	45.765059	-48.720024 183645	94 Stn 0042 023.jp	pg Processed USBL Nav	Somely sand. Fine-med grain grey sand, 5% shell fragments and hash. Some small pebbles Sand, shells and gravel. Fine-med grain grey sand, 30% shell fragment	sand dollars	COOP Student onboard
2010020	0042	32	24	17	2001	45.765107	-48.720351 183747	94 Stn 0042 024.jp	pg Processed USBL Nav	and hash Sand, shells and gravel. Fine-med grain grey sand, 30% shell fragment Sand, shells and gravel. Fine-med grain grey sand, 10% shell fragment	snow crab, urchin, soft corral, sand dollars	COOP Student onboard
2010020	0042	32	24	18	2001	45.765201	-48.720572 183845	94 Stn 0042 025.jp	pg Processed USBL Nav	and hash	s sand dollars, urchin	COOP Student onboard
2010020	0042	32	24	19	2001	45.765246	6 -48.72077 183947	94 Stn 0042 026.jp	pg Processed USBL Nav	Shelly sand. Fine-med grain grey sand, 5% shell fragments and hash	sand dollars	COOP Student onboard
2010020	0042	32	24	20	2001	45.765308	3 -48.721059 184041	94 Stn 0042 027.jp	pg Processed USBL Nav	Shelly sand. Fine-med grain grey sand, 5% shell fragments and hash	urchins, sand dollars	COOP Student onboard
2010020 2010020	0042 0042	32 32	24 24	21 22	2001 2001	45.765297	7 -48.721117 184145 4 -48.72129 184245	94 Stn 0042 028.jp	pg Processed USBL Nav	Shelly sand. Fine-med grain grey sand, 5% shell fragments and hash Shelly sand.	abundatnt sand dollars, ses star	COOP Student onboard COOP Student onboard
2010020	0042	32	24	22	2001	45.765463		94 Stn 0042 029.jp	pg Processed USBL Nav	Snelly sand. Sand, shells and gravel.		COOP Student onboard
2010020	0042	32	24	23	2001	45.765563			pg Processed USBL Nav	Shelly sand.		COOP Student onboard
2010020	0042	32	24	24	2001	45.765563	3 -48.721747 184449	94 Stn 0042 031.j	pg Processed USBL Nav		*	COOP Student onboard
0040000	00.45		70		0004	10 00 1005	40 500700 400500			Gravel and small cobbles of mixed lithologies. Abundant barnacle grow		
2010020	0045	96	76	1	2001	46.834985	-49.503738 120502	83 Stn 0045 004.jp	pg Processed USBL Nav	and some shell fragments	peach, white crust,	COOP Student onboard
2010020	0045	96	76	2	2001	46.835	5 -49.503699 120506	83 Stn 0045 005.jp	pg Processed USBL Nav	Gravel and small cobbles of mixed lithologies. Poor visibility due to sitt Gravel and small cobbles of mixed lithologies. Abundant barnacle grow		COOP Student onboard
2010020	0045	96	76	2	2001	46.835033	-49.503645 120522	92 Str. 0045 006 in	pg Processed USBL Nav	and some shell fragments	crabs, purple encrusting sponge,	COOP Student onboard
2010020	0045	90	76	3	2001	40.035033	5 -49.503645 120522	63 Stri 0045 006.j	pg Plocessed USBL Nav	and some shell fragments	sea peach, small white barnacles, purple and pink	COOP Student onboard
										Oracial and small askelses of mixed lithelesise. Abundant bernards may		
2010020	0045	96	76	4	2001	46.83507	-49.50355 120538	00 Ctm 0045 007	Droppood LICRI Nov	Gravel and small cobbles of mixed lithologies. Abundant barnacle grow and some shell fragments		COOP Student onboard
2010020	0045	90	70	4	2001	40.83507	-49.00000 120538	03 301 0045 007.J	pg Processed USBL Nav		sponge	COUP Student onboard
2010020	0045	96	76	5	2001	46.835264	4 -49.503415 120650	83 Stn 0045 008.jr	pg Processed USBL Nav	Gravel and small cobbles of mixed lithologies. Abundant barnacle grow and some shell fragments	h purple encrusting sponge, small white barnacles, snow crabs, seastar, cerianthiidae	COOP Student onboard
2010020	0045	96	76	6	2001	46.83542	2 -49.50336 120752	83 Stn 0045 009.jp	pg Processed USBL Nav	 Gravel and small cobbles of mixed lithologies. Abundant barnacle grow and some shell fragments	th purple encrusting sponge, small white barnacles, snow crabs, cerianthiidae, small solasteriidae,	COOP Student onboard
2010020	0045	96	76	7	2001	46.835567	7 -49.503364 120850	83 Stn 0045 010.ir	pg Processed USBL Nav	Gravel and small cobbles of mixed lithologies. Abundant barnacle grow and some shell fragments	th purple encrusting sponge, small white barnacles, snow crabs, hydroids.	COOP Student onboard
2010020	0045	96	76	8	2001	46.835678	-49.503347 120950		pg Processed USBL Nav	Gravel and small cobbles of mixed lithologies. Abundant barnacle grow and some shell fragments		COOP Student onboard
2010020	0045	96	76	9	2001	46.835793	-49.503185 121052	,	pg Processed USBL Nav	Gravel and small cobbles of mixed lithologies. Abundant barnacle grow and some shell fragments		COOP Student onboard
2010020	0045	96	76	10	2001	46.835825			pg Processed USBL Nav	Gravel and small cobles of mixed lithologies. Abundant barnacle grow and some shell fragments	th	COOP Student onboard
	0045	96	76	11	2001	46.835962				Gravel and small cobles of mixed lithologies. Abundant barnacle grow and some shell fragments	h	
2010020							2 -49.50287 121254		pg Processed USBL Nav	Gravel and small cobbles of mixed lithologies. Abundant barnacle grow	th	COOP Student onboard
2010020	0045	96	76	12	2001	46.836103	3 -49.502762 121350		pg Processed USBL Nav	 and some shell fragments Gravel and small cobbles of mixed lithologies. Abundant barnacle grow	h	COOP Student onboard
2010020	0045	96	76	13	2001	46.836298	3 -49.502661 121456	83 Stn 0045 016.jp	pg Processed USBL Nav	and some shell fragments		COOP Student onboard

	STATIONIEXPO	SURES NUM_P	HOTOSIPH	юто			PHOTO \	VATER PHOTO FILE				PHOTO
EXPED_CD	NUM NUM	IN_GRO			_GTYPE P	HOTO_LAT		DEPTH NAME	PHOTO_Position COMMENTS	GEOLOGY	BIOLOGY	DESCRIBED BY
										Gravel and small cobbles of mixed lithologies. Abundant barnacle growth		
2010020	0045	96	76	14	2001	46.836462	2 -49.502499 121604	83 Stn 0045 017.jp	g Processed USBL Nav	and some shell fragments		COOP Student onboard
										Gravel and small cobbles of mixed lithologies. Abundant barnacle growth		
2010020	0045	96	76	15	2001	46.836471	1 -49.502492 121608	83 Stn 0045 018.jp	g Processed USBL Nav	and some shell fragments		COOP Student onboard
										Gravel and small cobbles of mixed lithologies. Abundant barnacle growth		
2010020	0045	96	76	16	2001	46.836608	3 -49.502364 121700	83 Stn 0045 019.jp	g Processed USBL Nav	and some shell fragments		COOP Student onboard
										Gravel and small cobbles of mixed lithologies. Abundant barnacle growth		
2010020	0045	96	76	17	2001	46.836719	-49.502207 121804	83 Stn 0045 020.jp	g Processed USBL Nav	and some shell fragments		COOP Student onboard
										Gravel and small cobbles of mixed lithologies. Abundant barnacle growth		
2010020	0045	96	76	18	2001	46.836831	1 -49.502074 121904	83 Stn 0045 021.jp	g Processed USBL Nav	and some shell fragments		COOP Student onboard
										Gravel and small cobbles of mixed lithologies. Abundant barnacle growth		
2010020	0045	96	76	19	2001	46.836952	2 -49.501985 122000	83 Stn 0045 022.jp	g Processed USBL Nav	and some shell fragments		COOP Student onboard
										Gravel and small cobbles of mixed lithologies. Abundant barnacle growth		
2010020	0045	96	76	20	2001	46.837079	-49.501805 122104	83 Stn 0045 023.jp	g Processed USBL Nav	and some shell fragments		COOP Student onboard
										Gravel and small cobbles of mixed lithologies. Abundant barnacle growth		
2010020	0045	96	76	21	2001	46.83721	1 -49.501671 122202	83 Stn 0045 024.jp	g Processed USBL Nav	and some shell fragments		COOP Student onboard
										Gravel and small cobbles of mixed lithologies. Abundant barnacle growth		
2010020	0045	96	76	22	2001	46.837353	3 -49.50157 122302	83 Stn 0045 025.jp	g Processed USBL Nav	and some shell fragments		COOP Student onboard
									-	Gravel and small cobbles of mixed lithologies. 50% shell fragments and		
2010020	0045	96	76	23	2001	46.837524	4 -49.501429 122358	83 Stn 0045 026.jp	g Processed USBL Nav	hash, barnicle growth		COOP Student onboard
									-	Shell hash and pebbles. 85% shell hash, 15% small cobbles and pebbles		
2010020	0045	96	76	24	2001	46.837717	-49.501304 122508	83 Stn 0045 027.jp	g Processed USBL Nav	or mixed lithologies		COOP Student onboard
										Shell hash and pebbles. 65% shell hash, 25% small cobbles and pebbles		
2010020	0045	96	76	25	2001	46.837909	-49.501199 122608	83 Stn 0045 028.jp	g Processed USBL Nav	or mixed lithologies		COOP Student onboard
										Shell hash and pebbles. 65% shell hash, a few small cobbles and 15%		
2010020	0045	96	76	26	2001	46.838115	5 -49.501075 122710	83 Stn 0045 029.jp	g Processed USBL Nav	pebbles or mixed lithologies		COOP Student onboard
										Shell hash and pebbles. 85% shell hash, 15% small cobbles and pebbles		
2010020	0045	96	76	27	2001	46.838301	1 -49.500955 122812	83 Stn 0045 030 ip	g Processed USBL Nav	or mixed lithologies		COOP Student onboard
2010020	0010	00			2001	10.000001		00 001 00 10 0001	g Hoodood COBEMAN	Shell hash and pebbles. 60% fine-med grained grey sand, 30% shell		eeer etadent enbeard
2010020	0045	96	76	28	2001	46.838519	-49.500888 122912	83 Stn 0045 031 in	g Processed USBL Nav	hash, cobbles and pebbles, ripples visible		COOP Student onboard
2010020		96	76	29	2001	46.838687			g Processed USBL Nav	Shell hash and pebbles. 95% shell hash, a few shell fragments		COOP Student onboard
2010020		96	76	30	2001	46.838822			g Processed USBL Nav	Shell hash and pebbles. 95% shell hash, a few shell fragments		COOP Student onboard
2010020	0040	50	10	00	2001	40.000022	45.566776 125114	00 001 0040 000.jp		Shell hash, rare pebbles. 70% shell hash, 25% small cobbles and large		
2010020	0045	96	76	31	2001	46.838906	6 -49.500665 123218	83 Stn 0045 034 in	g Processed USBL Nav	pebbles of mixed lithologies		COOP Student onboard
2010020		96	76	32	2001	46.838998			g Processed USBL Nav	Shell hash and pebbles. 95% shell hash, a few shell fragments		COOP Student onboard
2010020	0043	30	10	52	2001	40.030330	-49.300303 123322	05 0til 0045 055.jp	g Trocessed CODE Nav	Sand and gravel. 60% fine grained grey sand, 15% shell fragments and		
2010020	0045	96	76	33	2001	46.839047	7 -49.500558 123420	92 Stp 0045 026 ip	g Processed USBL Nav	hash, 20% small cobbles and large pebbles of mixed lithologies		COOP Student onboard
2010020	0043	30	10	55	2001	40.033047	-49.300330 123420	05 0til 0045 050.jp	g Trocessed CODE Nav	Gravel with sand. 55% fine-med grained grey sand, 40% small cobbles		
2010020	0045	96	76	34	2001	46.839137	7 -49.500421 123520	83 Stn 0045 037 in	g Processed USBL Nav	and large pebbles of mixed lithologies		COOP Student onboard
2010020	0043	30	10	34	2001	40.053157	-49.300421 123320	05 0til 0045 057.jp	g Trocessed CODE Nav	Gravel with sand. 70% cobbles and pebbles of mixed lithologies and		COOL Student Onboard
2010020	0045	96	76	35	2001	46.839275	-49.500283 123622	92 Stp 0045 029 ip	g Processed USBL Nav	abundant barnicle growth, 30% shell hash		COOP Student onboard
2010020	0045	90	76	35	2001	40.039273	-49.500263 123622	63 Stri 0045 036.jp	y Processed USBL Nav	Gravel with sand. 70% fine-med grained sand, 15% cobbles and pebbles		COOP Student onboard
2010020	0045	96	76	36	2001	46.839557	-49.499962 123820	00 0+- 0045 000	Bernard HODI New	of mixed lithologies, shell fragments and hash		COOP Student onboard
2010020	0045	96	76	30	2001	46.839557	-49.499962 123820	83 Stn 0045 039.jp	g Processed USBL Nav	or mixed lithologies, shell fragments and hash		COOP Student onboard
	00.45		70	07	0004	40.00070						
2010020	0045	96	76	37	2001	46.839724	4 -49.499773 123918	83 Stn 0045 040.jp	g Processed USBL Nav	Shell hash, rare pebbles. 95% shell hash, a few cobbles and pebbles		COOP Student onboard
001000-	00.15	00		38	0004	40.0000-	40.400500 40.400	00 0+- 00 15 0 1	Deserved LIODI, New			
2010020	0045	96	76	38	2001	46.839901	1 -49.499599 124022	83 Stn 0045 041.jp	g Processed USBL Nav	Shell hash, rare pebbles. 95% shell hash, a few cobbles and pebbles		COOP Student onboard
										Shelly sand with pebbles. Fine grained brownish sand and shell hash,		
0040555	00.45		70			10.010/				35% small cobbles and pebbles of mixed lithologies arranged in ripple		
2010020	0045	96	76	39	2001	46.840107	7 -49.499408 124122	83 Stn 0045 042.jp	g Processed USBL Nav	pattern		COOP Student onboard
										Shelly sand with pebbles. Fine grained brownish sand and shell hash,		
										15% small cobbles and pebbles of mixed lithologies arranged in ripple		
2010020	0045	96	76	40	2001	46.840343	3 -49.499224 124224	83 Stn 0045 043.jp	g Processed USBL Nav	pattern		COOP Student onboard
										Shelly sand with pebbles. 65% pebbles of mixed lithologies, 15%		
2010020	0045	96	76	41	2001	46.840573	3 -49.499071 124336	83 Stn 0045 044.jp	g Processed USBL Nav	brownish sand and shell hash, shell framents		COOP Student onboard
										Fine gravel. 85% pebbles of mixed lithologies, 10% shell hash and		
2010020	0045	96	76	42	2001	46.840794	4 -49.498958 124432	83 Stn 0045 045.jp	g Processed USBL Nav	fragments		COOP Student onboard
										Fine gravel. 90% pebbles of mixed lithologies, 10% shell hash and		
2010020	0045	96	76	43	2001	46.841019	9 -49.498863 124528	83 Stn 0045 046.jp	g Processed USBL Nav	fragments		COOP Student onboard
		· · · · · · · · · · · · · · · · · · ·								Gravel and cobbles. Very large cobble or small boulder, 50% pebbles of		
2010020	0045	96	76	44	2001	46.841237	7 -49.498788 124638	83 Stn 0045 048.jp	g Processed USBL Nav	mixed lithologies, barnicles, shell fragments		COOP Student onboard
		1								Gravel and cobbles. 70% pebbles of mixed lithologies, 10% cobbles with		
2010020	0045	96	76	45	2001	46.841413	3 -49.498694 124740	83 Stn 0045 049.jp	g Processed USBL Nav	abundant barnicle growth, shell framents		COOP Student onboard
2010020										Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020										Gravel. Cobbles and pebbles of mixed infologies, abundant barnicle		

	STATIONIEXPO	SURES NUM_	PHOTOSIPHO	TO		PHOTO V	ATER PHOTO_FILE			РНОТО
EXPED CD	NUMNUM				YPE PHOTO LAT		EPTH NAME PHOTO Position COMMENTS	GEOLOGY	BIOLOGY	DESCRIBED BY
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	47	2001 46.841649	-49.498544 124946	83 Stn 0045 051.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	48	2001 46.841767	-49.498466 125050	83 Stn 0045 052.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	49	2001 46.84189	-49.498354 125150	83 Stn 0045 053.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	50	2001 46.842097	-49.49824 125252	83 Stn 0045 054.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	51	2001 46.842282	-49.498167 125352	83 Stn 0045 055.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	52	2001 46.842467	-49.49804 125452	83 Stn 0045 056.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	53	2001 46.842656	6 -49.497902 125558	83 Stn 0045 057.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	54	2001 46.84284	-49.497736 125702	83 Stn 0045 058.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	55	2001 46.84298	49.497588 125800	83 Stn 0045 059.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	56	2001 46.843136	6 -49.49744 125900	83 Stn 0045 060.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	57	2001 46.84329	-49.497338 130002	83 Stn 0045 061.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	58	2001 46.843458	3 -49.497239 130058	83 Stn 0045 062.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	59	2001 46.843647	-49.497143 130206	83 Stn 0045 063.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	60	2001 46.843883	49.497108 130312	83 Stn 0045 064.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	61	2001 46.843973	49.496958 130412	83 Stn 0045 065.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	62	2001 46.844035	-49.496822 130518	83 Stn 0045 066.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, abundant barnicle		
2010020	0045	96	76	63	2001 46.844598	49.496782 130720	83 Stn 0045 067.jpg Processed USBL Nav	growth, shell fragments		COOP Student onboard
2010020	0045	96	76	64	2001 46.844972	-49.496951 130830	83 Stn 0045 068.jpg Processed USBL Nav	Gravel. Cobbles and pebbles of mixed lithologies, shell fragments		COOP Student onboard
2010020	0045	96	76	65	2001 46.845303	-49.496995 130926	83 Stn 0045 069.jpg Processed USBL Nav	Gravel. Cobbles and pebbles of mixed lithologies, shell fragments		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, shell fragments and		
2010020	0045	96	76	66	2001 46.845529	-49.496724 131034	83 Stn 0045 070.jpg Processed USBL Nav	hash		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, shell fragments and		
2010020	0045	96	76	67	2001 46.845695	-49.496418 131130	83 Stn 0045 071.jpg Processed USBL Nav	hash		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, shell fragments and		
2010020	0045	96	76	68	2001 46.845987	-49.496158 131232	83 Stn 0045 072.jpg Processed USBL Nav	hash		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, shell fragments and		
2010020	0045	96	76	69	2001 46.846269	-49.495951 131332	83 Stn 0045 073.jpg Processed USBL Nav	hash, abundant barnicle growth		COOP Student onboard
								Gravel. Cobbles and pebbles of mixed lithologies, shell fragments,		
2010020	0045	96	76	70	2001 46.846399	-49.495569 131430	83 Stn 0045 075.jpg Processed USBL Nav	abundant barnicle growth		COOP Student onboard
								Gravel. Pebbles and cobbles of mixed lithologies, shell fragments and		
2010020	0045	96	76	71	2001 46.8467	-49.495181 131544	83 Stn 0045 076.jpg Processed USBL Nav	some hash		COOP Student onboard
	1		1					Shell hash and pebbles. 70% shell hash, 30% small cobbles and large		
2010020	0045	96	76	72	2001 46.847078	-49.494965 131654	83 Stn 0045 077.jpg Processed USBL Nav	pebbles of mixed lithologies		COOP Student onboard
								Shell hash and pebbles. 40% shell hash, 50% small cobbles and large		
2010020	0045	96	76	73	2001 46.847391	-49.49494 131756	83 Stn 0045 078.jpg Processed USBL Nav	pebbles of mixed lithologies, shell fragments		COOP Student onboard
				-				Gravel with sand. 80% cobbles and pebbles of mixed lithologies, 20%		See Should
2010020	0045	96	76	74	2001 46.847767	-49.494791 131858	83 Stn 0045 079.jpg Processed USBL Nav	shell hash and fragments		COOP Student onboard
								Fine gravel. 85% cobbles and pebbles of mixed lithologies, 15% shell		
2010020	0045	96	76	75	2001 46.84807	-49.494573 131956	83 Stn 0045 080.jpg Processed USBL Nav	hash and fragments		COOP Student onboard
520				-				Fine gravel. 80% cobbles and pebbles of mixed lithologies, 20% shell		Shodad
2010020	0045	96	76	76	2001 46.84827	-49.494209 132058	83 Stn 0045 081.jpg Processed USBL Nav	hash and fragments		COOP Student onboard
20.0020	00.0							Gravel with shelly sand. 70% cobbles and pebbles of mixed lithologies		
2010020	0051	51	37	1	2001 46.887914	-49.466285 172236	83 Stn 0051 006.jpg Processed USBL Nav	30% shell hash and fragments, abundant barnicle growth		COOP Student onboard
2010020	0001	01	01		-0.007314	172200		Gravel with shelly sand. 60% cobbles and pebbles of mixed lithologies		
2010020	0051	51	37	2	2001 46.887953	-49.466252 172246	83 Stn 0051 007.jpg Processed USBL Nav	40% shell hash and fragments, abundant barnicle growth		COOP Student onboard
2010020	0001	51	51	-				Gravel with shelly sand. 60% cobbles and pebbles of mixed lithologies		
2010020	0051	51	37	3	2001 46.888228	-49.46616 172354	83 Stn 0051 008.jpg Processed USBL Nav	40% shell hash and fragments, abundant barnicle growth		COOP Student onboard
2010020	0001		01	~	-0.000220	40.40010 172004				ooor oluden onboard

	STATIONIEXPOS	URES IN	UM PHOTOS PH	ото	-			PHOTO	WATERIE	HOTO FILE			РНОТО
EXPED CD	NUMNUM		GROUP NU		GTYPE	РНОТО LAT	PHOTO LONG		DEPTH N		PHOTO Position COMMENTS	GEOLOGY BIOLOGY	DESCRIBED BY
												Gravel with shelly sand. 60% cobbles and pebbles of mixed lithologies,	
2010020	0051	51	37	4	2001	46.888324	-49.466138	172424	83.5	tn 0051 009 ing	Processed USBL Nav	40% shell hash and fragments, abundant barnicle growth	COOP Student onboard
2010020	0001	01	01	-	2001	40.000024	+0.400100	172424	00 0	an 0001 000.jpg	The cost of the	Gravel with shelly sand. 60% cobbles and pebbles of mixed lithologies,	
2010020	0051	51	37	5	2001	46.888357	-49.466136	172432	83.5	tn 0051 010 ing	Processed USBL Nav	40% shell hash and fragments, abundant barnicle growth	COOP Student onboard
2010020	0001	0.	0.	3	2001	10.000001	101100100		00 0	arooorononpg		Gravel with shelly sand. 60% cobbles and pebbles of mixed lithologies,	
2010020	0051	51	37	6	2001	46.888378	-49.466118	172440	83 9	tn 0051 011 ing	Processed USBL Nav	40% shell hash and fragments, abundant barnicle growth	COOP Student onboard
2010020	0001	01	01		2001	40.000070	40.400110	172440	00 0	anooonon.jpg		Gravel with shelly sand. 50% fine-med grained brown sand, 50% cobbles	
2010020	0051	51	37	7	2001	46.888644	-49,466042	172552	83 6	to 0051 012 ind	Processed USBL Nav	and pebbles of mixed lithologies with barnicle growth	COOP Student onboard
2010020	0001	51	51	'	2001	40.000044	-43.400042	172002	0.5 C	u10001012.jpg	Tiocessed CODE IVav	Sand and gravel. 50% fine-med grained brown sand, 50% cobbles and	
2010020	0051	51	37		2001	46.888767	-49.46596	172648	020	to 0051 014 ipg	Processed USBL Nav	pebbles of mixed lithologies with barnicle growth	COOP Student onboard
2010020	0051	51	31	0	2001	40.000707	-49.40390	172040	03 0	an 0051 014.jpg	FIDCESSED USBL INAV	Sand and gravel. 50% fine-med grained brown sand, 50% cobbles and	COOF Student onboard
2010020	0051	51	37	0	2001	46.888793	-49.465845	172748	0.2	to 0051 015 ing	Processed USBL Nav	pebbles of mixed lithologies with barnicle growth	COOP Student onboard
2010020	0051	51	31	9	2001	40.000793	-49.400040	1/2/40	030	un 0051 015.jpg	PIOCESSED USBL Nav	Sand and gravel. 50% fine-med grained brown sand, 50% cobbles and	COOP Student onboard
2010020	0051	51	37	10	2001	46.888752	-49.465795	172846	0.2	to 0051 016 ing	Processed USBL Nav	pebbles of mixed lithologies with barnicle growth	COOP Student onboard
2010020	0051	51	37	10	2001	40.000/52	-49.465795	172040	030	un 005 i 0 i 6.jpg	PIOCESSED USBL Nav	Sand and gravel. 50% fine-med grained brown sand, 50% cobbles and	COOP Student Onboard
0040000	0054	- 1			0004	40.000740	10 105750	170000					
2010020	0051	51	37	11	2001	46.888742	-49.465759	172906	83 5	tn 0051 017.jpg	Processed USBL Nav	pebbles of mixed lithologies with barnicle growth	COOP Student onboard
												Sand and gravel. 50% fine-med grained brown sand, 50% cobbles and	
2010020	0051	51	37	12	2001	46.888701	-49.465672	173006	83 5	tn 0051 018.jpg	Processed USBL Nav	pebbles of mixed lithologies with barnicle growth	COOP Student onboard
												Sand and gravel. 50% fine-med grained brown sand, 50% cobbles and	
2010020	0051	51	37	13	2001	46.888742	-49.465627	173100	83 5	tn 0051 019.jpg	Processed USBL Nav	pebbles of mixed lithologies with barnicle growth	COOP Student onboard
												Sand and gravel. 50% fine-med grained brown sand, 50% cobbles and	
2010020	0051	51	37	14	2001	46.888775	-49.465645	173202	83 5	tn 0051 020.jpg	Processed USBL Nav	pebbles of mixed lithologies with barnicle growth	COOP Student onboard
												Sand and gravel. 60% fine-med grained brown sand, 40% cobbles and	
2010020	0051	51	37	15	2001	46.888893	-49.465675	173258	83 5	tn 0051 021.jpg	Processed USBL Nav	pebbles of mixed lithologies with barnicle growth	COOP Student onboard
												Sand and gravel. 70% fine-med grained brown sand, 30% cobbles and	
2010020	0051	51	37	16	2001	46.889009	-49.465646	173358	83 5	tn 0051 022.jpg	Processed USBL Nav	pebbles of mixed lithologies with barnicle growth	COOP Student onboard
												Sand and gravel. 85% fine-med grained brown sand, 15% pebbles of	
2010020	0051	51	37	17	2001	46.889148	-49.465626	173456	83 5	tn 0051 023.jpg	Processed USBL Nav	mixed lithologies and shell fragments	COOP Student onboard
												Sand, rare gravel. 95% fine-med grained brownish grey sand, a few	
2010020	0051	51	37	18	2001	46.889326	-49.465535	173600	83 5	tn 0051 024.jpg	Processed USBL Nav	pebbles of mixed lithologies and shell fragments	COOP Student onboard
2010020	0051	51	37	19	2001	46.889459	-49.465495	173654	83 5	tn 0051 025.jpg	Processed USBL Nav	Sand. Fine-med grained brownish grey sand, a few shell fragments	COOP Student onboard
2010020	0051	51	37	20	2001	46.889537	-49.465352	173754	83 5	tn 0051 026.jpg	Processed USBL Nav	Sand. Fine-med grained brownish grey sand, a few shell fragments	COOP Student onboard
2010020	0051	51	37	21	2001	46.889602			83 5	tn 0051 027.jpg	Processed USBL Nav	Sand. Fine-med grained brownish grey sand, a few shell fragments	COOP Student onboard
2010020	0051	51	37	22	2001	46.889598	-49.465205	173902			Processed USBL Nav	Sand. Fine-med grained brownish grey sand, a few shell fragments	COOP Student onboard
2010020	0051	51	37	23	2001	46.889659					Processed USBL Nav	Sand. Fine-med grained brownish grey sand, a few shell fragments	COOP Student onboard
2010020	0051	51	37	24	2001	46.889798					Processed USBL Nav	Sand. Fine-med grained brownish grey sand, a few shell fragments	COOP Student onboard
2010020	0051	51	37	25	2001	46.889935					Processed USBL Nav	Sand. Fine-med grained brownish grey sand, a few shell fragments	COOP Student onboard
2010020	0051	51	37	26	2001	46.890009					Processed USBL Nav	Sand. Fine-med grained brownish groy sand, a few shell fragments	COOP Student onboard
2010020	0051	51	37	27	2001	46.89009					Processed USBL Nav	Sand. Fine-med grained brownish groy sand, a few shell fragments	COOP Student onboard
2010020	0051	51	37	28	2001	46.890156					Processed USBL Nav	Sand. Fine-med grained brownish grey sand, a few shell fragments	COOP Student onboard
2010020	0051	51	37	29	2001	46.890244					Processed USBL Nav	Sand. Fine-med grained brownish grey sand, a few shell fragments	COOP Student onboard
2010020	0051	51	37	30	2001	46.890378					Processed USBL Nav	Sand. Fine-med grained brownish grey sand, a few shell fragments	COOP Student onboard
2010020	0051	51	37	31	2001	46.890412					Processed USBL Nav	Sand. Fine-med grained brownish grey sand, a few shell fragments	COOP Student onboard
2010020	0051	51	37	32	2001	46.890412	-49.464544				Processed USBL Nav	Sand. Fine-med grained brownish grey sand, a few shell fragments	COOP Student onboard
2010020	0051	51	37	32	2001	46.890531	-49.464438				Processed USBL Nav	Sand. Fine-med grained brownish grey sand, a rew shell ragments	COOP Student onboard
2010020	0051	51	37	33	2001	46.89061					Processed USBL Nav		COOP Student onboard COOP Student onboard
	0051	51	37	34	2001	46.890736	-49.464282					Sand. Fine-med grained brownish grey sand, a few shell fragments	COOP Student onboard
2010020	0051	51	37						83 5	th 0051 041.jpg	Processed USBL Nav Processed USBL Nav	Sand. Fine-med grained brownish grey sand, a few shell fragments	COOP Student onboard
2010020 2010020		51	3/	36 37	2001 2001	46.891031 46.891173					Processed USBL Nav Processed USBL Nav	Sand. Fine-med grained brownish grey sand, a few shell fragments	
2010020	0051	51	3/	31	2001	46.891173	-49.464012	175438	83 5	ui 0051 043.jpg	FIDCESSED USBL INAV	Sand. Fine-med grained brownish grey sand, a few shell fragments	COOP Student onboard