



**FINAL FIELD REPORT**  
***CCGS VECTOR / CGSL OTTER BAY***  
**North Coast Surveys**

**31 July – 21 August, 2006**



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*CGSL Otter Bay*

## INTRODUCTION

The main objectives supporting the 2006 multibeam survey campaign on the north coast were to continue with NRCAN’s ongoing interest to map specific areas for geological and habitat research, and to support new charting initiatives in preparation for the Gateway Project, which involves the eventual bulk shipment of crude oil out of Kitimat. In addition to detailed multibeam bathymetry with the *CCGS Vector*’s Kongsberg EM1002 multibeam sounder, 3.5 kHz sub-bottom profiles and magnetometer data were collected onboard *Vector* when feasible. This survey program was unique in that it involved the coordination of a second vessel, the *CGSL Otter Bay*, with its Kongsberg EM3002 multibeam sounder. It was intended that the two vessels work in close proximity to each other, with *Otter Bay* sounding areas typically less than 50 metres in depth.

### LIST OF STAFF (SURVEY OPERATIONS)

Staff	Organization	Dates
Dave Gartley	CHS	July 31 - Aug. 14
Knut Lyngberg	CHS	July 31 - Aug. 21
George Schlagintweit (HIC)	CHS	July 31 - Aug. 21
Brent Seymour	CHS	Aug. 14 - 21
Al Thomson	CHS	Aug. 14 - 21
Dave Thornhill	CHS	July 31 - Aug. 21

Kim Conway	NRCAN	July 31 - Aug. 11
Kim Picard	NRCAN	July 31 - Aug. 11
Alex Shaw	NRCAN	Aug. 14 - 21

Ian Gastonguay	DND	July 31 - Aug. 14
Valerie Schenk	DND	Aug. 14 - 21



*David Thornhill onboard CGSL Otter Bay, with dinner.*

## LIST OF EQUIPMENT

Equipment	CCGS Vector	CGSL Otter Bay
Multibeam	Kongsberg EM1002	Kongsberg EM3002
	Frequency: 95 kHz	Frequency: 300 kHz
	Swath angle: 120° (111 beams)	Swath angle: 120° (160 beams)
	Fore / aft beam width: 2.4°	Fore / aft beam width: 1.5°
MBES Processing software	HIPS/SIPS CARIS (Ver.6.0)	HIPS/SIPS CARIS (Ver.6.0)
Surface Sound Speed Sensor	AML Smart SV&T	AML Smart SV&T
Velocity Profiler	1 AML SVP Plus	1 AML SVP Plus
	1 Brooke Ocean MVP	
Motion Sensor / MBES GPS	APPLANiX POSMV (Ver.4)	APPLANiX POSMV (Ver.4)
	Trimble GPS	Trimble GPS
Auxiliary GPS	Novatel RT-20	Novatel RT-20
Differential GPS Corrections	Primary: CCG radio beacons	Primary: CCG radio beacons
	Secondary: CDGPS service	Secondary: CDGPS service
Magnetometer	Marine Magnetics (SeaSPY)	
Sub-bottom profiler	ORE 140	
	Frequency: 3.5 kHz	
Tide Gauge	Hartley Bay Installation: Sutron / Paros bubbler gauge	
	x2 scuba tanks (3000psi each) for air pressure	

## PLANNING

Rob Hare, Manager of Hydrographic Surveys Division, chaired a pre-survey planning and coordination meeting in the winter of 2006, in which all stakeholders were invited to address areas of interest, financial issues, and partnering opportunities. The outcomes from that meeting (and follow-up meetings) provided the necessary information for Rob to prepare the Field Project Instructions, which served to provide the necessary direction required by the three Hydrographers in Charge (HIC) to oversee their respective portion of the work. Logistical planning for the north coast surveys was then mostly addressed by Peter Milner, HIC of the first portion of the survey program. Peter looked after ensuring the vessels were provisioned with the necessary stationary supplies, patch tests were conducted, and that all equipment was functioning properly.

## CHRONOLOGY OF EVENTS

<u>DATE</u>	<u>OPERATIONS</u>
July 31	Conway, Lyngberg, Gastonguay, and Schlagintweit flew up to Prince Rupert to meet the ship. HIC Milner, along with hydrographers Woolley and McDonald flew home on the return flight. The <i>Vector</i> was being provisioned all day, and departed at 20:00 for Hartley Bay. HIC Schlagintweit called a meeting in the evening, to ensure all hydrographic staff were apprised of the next three week's hydrographic activities.
Aug. 1	<i>Vector</i> arrived at Hartley Bay at 07:00. Lyngberg, Conway and Schlagintweit installed a tide gauge while <i>Vector</i> sounded in Wright Sound. These multibeam activities were primarily intended to map the immediate vicinity of where the BC Ferries MV <i>Queen of the North</i> sank, along with the wreck itself. As CGSL <i>Otter Bay</i> had also arrived in Hartley Bay, Lyngberg switches posts with Thornhill, who returns to <i>Vector</i> .
Aug. 2-3	Multibeam operations were conducted in NTS map-sheet 103B16 in Hecate Strait. Sea conditions were excellent. <i>Otter Bay</i> spent her time sounding in Otter Passage and the south-easterly shore of Fin Island.
Aug. 4	After completing the 103B16 sounding block by noon, the hydrographers were switched on <i>Otter Bay</i> before <i>Vector</i> commenced sounding operations in NTS map-sheet 103G02 (central Hecate Strait). <i>Otter Bay</i> was deployed northward, to commence mapping a large area containing depths less than 50m off the northerly limits of Banks Island (Browning Entrance).
Aug. 5-7	<i>Vector</i> continued sounding operations in NTS map-sheet 103G02. During the afternoon of August 7 <sup>th</sup> , <i>Vector</i> found herself in the middle of Hecate Strait, running NE to the sheltered waters of Browning Entrance due to a building storm coming out of the south-east. Due to the breaking seas, the emergency escape hatch on the aft deck allowed as much as a thousand litres of sea-water to spill through, - directly onto one of the engine's generators. Fortunately, the Second Engineer was able to respond in time by switching generators, however by doing so he put himself at considerable risk of electrocution. A Hazardous Occurrence Incident Report was filed as a result.
Aug. 8	All personnel on <i>Vector</i> needed a rest after taking a beating during yesterday's storm. Anchored in the shelter of Browning Entrance at 19:30, the crew pulled anchor at 03:30 in the morning in order to commence sounding operations in Principe Channel. <i>Vector</i> met up with <i>Otter Bay</i> by mid-morning to exchange hydrographers, do fuelling and laundry. <i>Vector</i> spent the rest of day sounding the northerly portion of Principe Channel. <i>Otter Bay</i> had been actively sounding Browning Entrance during the day, securing in Kitkatla at night.

- Aug. 9            *Vector* continued sounding Principe Channel all day, while *Otter Bay* spent day sounding Browning Entrance.
- Aug. 10           *Vector* broke off sounding at 11:00 to exchange captains in Browning Entrance. Began steaming for the Hecate Strait survey area (NTS map-sheet 103G02), when a water leak in the engine’s cooling system was discovered. Leak was found to be serious, and *Vector* altered her course by 180 degrees and steamed for Prince Rupert. Replacement parts were ordered, to be flown in on tomorrow’s first flight. Initial reports suggested that the engine would not be repaired until Monday the 14<sup>th</sup>. *Otter Bay* continued sounding Browning Entrance all day.
- Aug. 11           Kim Conway and Kim Picard made arrangements to ‘jump ship’, as there was no sense waiting around in Prince Rupert until Monday for their scheduled flight home; they deserted *Vector* and her compliment at 16:00. FINNING mechanics worked on *Vector*’s main engine all day, and all was repaired by 18:00. Lines were tossed at 19:30, enroute for Hecate Strait. *Otter Bay* continued sounding Browning Entrance all day.
- Aug. 12           Plans were quickly changed in the late evening while steaming for the survey grounds, when *Vector* was requested to respond to a SAR call. An overdose victim from Kitkatla required immediate transport to Prince Rupert. Being relatively near Kitkatla at the time of the call, *Vector* retrieved the victim and then headed for Prince Rupert until the much faster CCG cutter *Point Henry* met up to receive the patient. *Vector* arrived at the survey grounds at 11:00, and sounded for the rest of the day. The MVP stopped working, and it was due to Dave Gartley’s stubborn resolve to make it work that he finally succeeded. We speculate that the effects of the storm – excessive vibration and salt water around the electronics – may have caused faults within the electronic junction box. *Otter Bay* broke off sounding operations in Browning Entrance at noon, to begin steaming towards Prince Rupert.
- Aug. 13           *Vector*’s smart-sensor intake got plugged with a plastic bag in the wee hours of the morning, and thankfully Dave Thornhill was on-hand to quickly remedy the situation by switching the SIS sound-speed-sensor input from SENSOR to PROFILE mode until the bag was removed. Sounding operations continued until 21:30, at which time the survey was stopped in order to provide the necessary time to return to Prince Rupert. *Otter Bay* arrived in Prince Rupert by noon, such that Gordon Allison could ensure *Otter Bay*’s oil would be changed.
- Aug. 14           *Vector* was secured at Prince Rupert’s CCG base by 07:30. On her way to town, *Otter Bay* conducted a small revisory survey, to obtain the position and least depth of a wreck in Porpoise Channel. Upon re-uniting in Prince Rupert, *Otter Bay* / *Vector* hydrographers made their exchange, did groceries and laundry. *Otter Bay* was enroute for their survey area by mid afternoon. After the *Vector* crew change and grocery loading, a diver from

Adams Diving did a maintenance dive on the cow-catcher. His work provided the following outcomes:

- Removal of approximately 8 large bull-kelp fronds.
- Replacement of the forward starboard bolt which was loose, with a longer (custom machined by Al Thorn) bolt. The other three bolts were tight.
- Cleaned what he could from smart-sensor intake.
- Photographed entire cow catcher installation, intakes, bow thrusters, shaft, and zincs. He also took some videos. All photographs / video transferred to lab computer and then viewed with diver and captain.

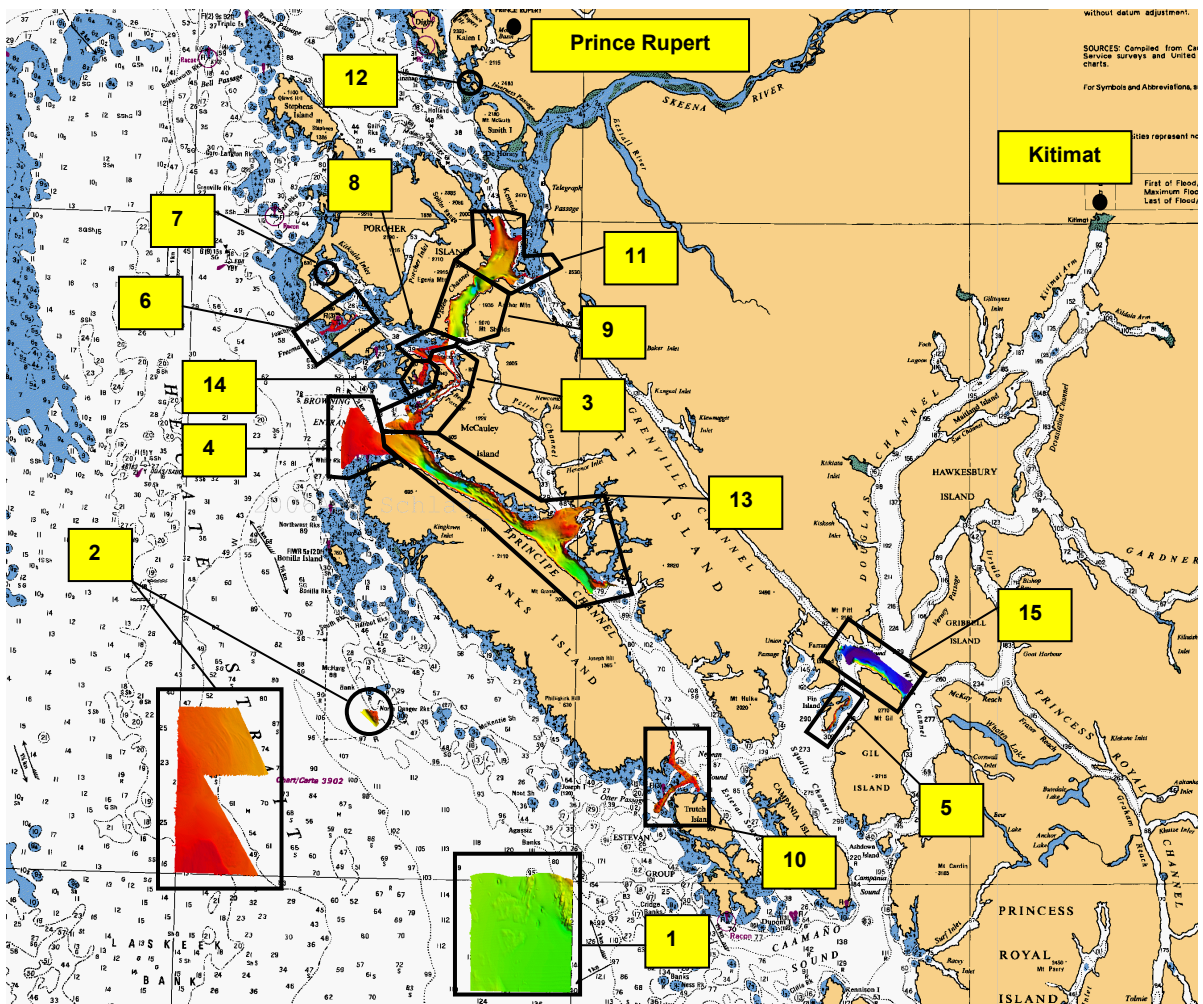
*Vector* was away from the dock at 19:30, enroute for the Hecate Strait survey area (NTS map-sheet 103G02).

*Vector* began steaming for the Hecate Strait survey grounds in the evening.

- Aug. 15 Seas were building all morning due to a gale, and sounding operations were discontinued at 10:00. Principe Channel became *Vector's* back-up survey area. As the gales were pounding in from the north-west, *Otter Bay* chose to survey the sheltered waters of Beaver Passage all day.
- Aug. 16 Gales continued in Hecate Strait all day, so after completing the Principe Channel survey area (Principe North), *Vector* commenced sounding Ogden Channel. *Otter Bay* spent her day sounding Schooner Passage.
- Aug. 17 *Vector* completed sounding Ogden Channel at 15:00, so after re-fuelling *Otter Bay*, she headed back out to once again attempt to complete the survey block in central Hecate Strait. *Otter Bay* sounded around Kitkatla Islands all day.
- Aug. 18 Relatively calm seas permitted *Vector* to sound in central Hecate Strait all day. *Otter Bay* continued to work in amongst the Kitkatla Islands.
- Aug. 19 Sounding operations were discontinued in Hecate Strait at 02:30 due to building seas. Although a small portion of this project area was left incomplete, it was finished by HIC E. Sargent and his team the following week. After exchanging hydrographer Thornhill with Lyngberg from the *Otter Bay*, *Vector* steamed north to Arthur Passage to commence sounding there (MBES project Porcher Island East). *Otter Bay* was able to complete the large sounding block in Browning Entrance.
- Aug. 20 *Vector* sounded in Arthur Passage all day, finishing the project at 22:30. *Otter Bay* conducted a revisory investigation of a reported shoal in Kitkatla Inlet, before commencing a survey of Freeman Passage.
- Aug. 21 *Vector* was secured alongside the wharf in Prince Rupert at 07:30. Ernest Sargent arrived on the flight Schlagintweit departed on, to continue as HIC for the third portion of the North Coast Surveys. *Otter Bay* completed sounding Freeman Passage.

## PROJECTS

#	Project	Primary Purpose of Survey
1	2006 103B16 (NTS map-sheet)	Completion of map-sheet 103B16 (NTS grid) for NRCAN
2	2006 103G02 (NTS map-sheet)	Completion of map-sheet 103G02 (NTS grid) for NRCAN
3	2006 Beaver Passage	Completion of 2005 Petrel Channel MBES Survey – inshore areas
4	2006 Browning Entrance	New charting - proximity to proposed shipping route
5	2006 East Fin Island	New charting - choke point in proposed shipping route
6	2006 Freeman Passage	Chart updating – survey of opportunity
7	2006 Kitkatla Inlet Shoal	Chart maintenance - revisory survey investigation
8	2006 Kitkatla Islands	Chart updating – survey of opportunity
9	2006 Ogden Channel	Chart updating – survey of opportunity
10	2006 Otter Passage	Chart updating – survey of opportunity
11	2006 Porcher Island East	Chart updating – survey of opportunity
12	2006 Porpoise Channel Wreck	Chart maintenance - revisory survey investigation
13	2006 Principe North	New charting –proposed shipping route
14	2006 Schooner Passage	Chart updating – survey of opportunity
15	2006 Wright Sound	Proposed shipping route / precise location of <i>MV Queen of the North</i>

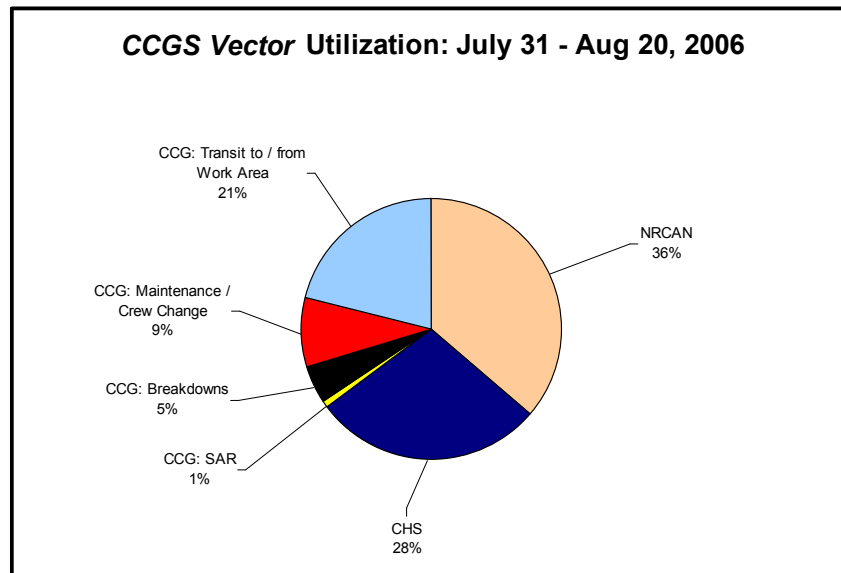


## PROJECT SUMMARY AND STATISTICS

#	Project Name	CHSDir #(s)	Vessel(s)	Sdg. Days	Area (km <sup>2</sup> )
1	2006 103B16 (NTS map-sheet)	5026030	Vector	4	337.6
2	2006 103G02 (NTS map-sheet)	5026035	Vector	11	306.8
3	2006 Beaver Passage	5026295	Otter Bay	6	27.2
4	2006 Browning Entrance	5026034	Otter Bay	9	43.7
5	2006 East Fin Island	5026303	Otter Bay	1	2.8
6	2006 Freeman Passage	5026301	Otter Bay	2	5.1
7	2006 Kitkatla Inlet Shoal	5026334	Otter Bay	1	0.1
8	2006 Kitkatla Islands	5026292	Otter Bay	2	5.0
9	2006 Ogden Channel	5026300	Vector	1	42.6
10	2006 Otter Passage	see note	Otter Bay	2	15.9
11	2006 Porcher Island East	5026299	Vector	2	40.2
12	2006 Porpoise Channel Wreck	5026320	Otter Bay	1	0.0
13	2006 Principe North	5026293	Vector / Otter Bay	10	151.6
14	2006 Schooner Passage	5026313	Otter Bay	3	5.5
15	2006 Wright Sound	5026335	Vector	1	32.1
				Total:	<b>1016.2</b>

**Note:** 2006 Otter Passage survey was combined with the 2006 Otter Channel and 2006 Nepean Sound surveys, to become the 2006 Nepean Sound MBES project (HIC: E. Sargent).

## VECTOR TIME UTILIZATION RECORD



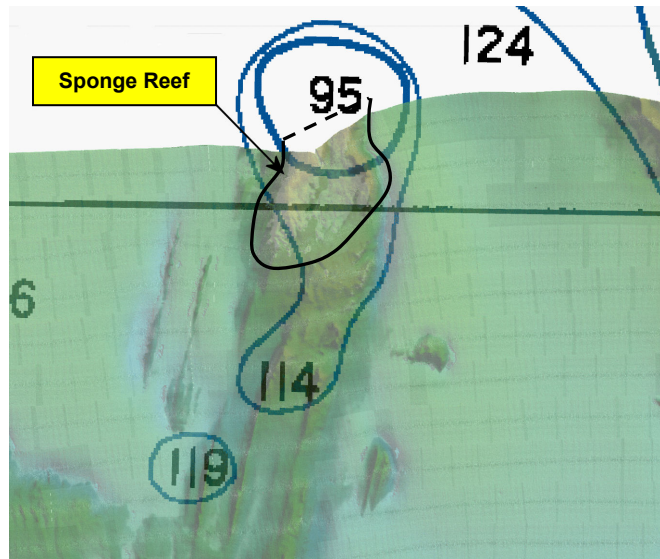
It should be noted in the above graph that CHS and NRCAN projects have shared interests; however the work is distinguished by which organization has a greater interest in the data.

## DISCOVERIES

Five Notices to Mariners that were promulgated as a result of finding significant and previously uncharted hazards to navigation while surveying during this period. The following three discoveries provided an added reward to the hydrographic staff:

### 1) Another Sponge Reef is found in Hecate Strait

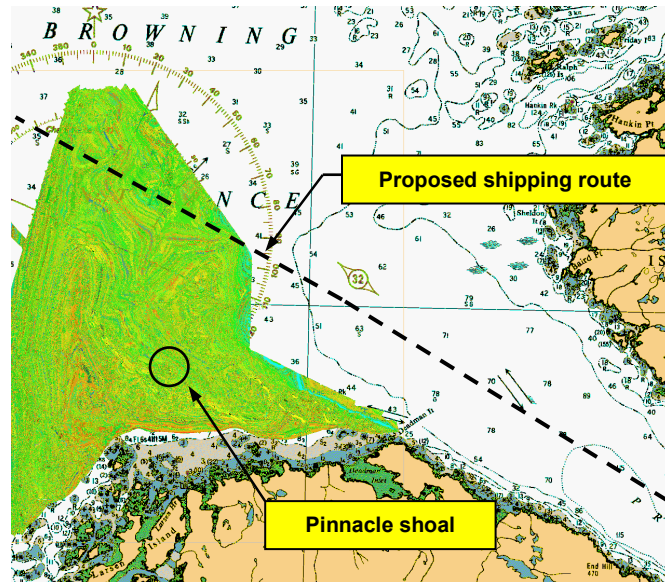
With the benefit of backscatter imagery (and Kim Conway's interpretation skills), a sponge reef was found at the northerly limits of the 2006103B16 multibeam project. This reef is situated to the southeast of what was previously known to be the Hecate Strait North Sponge Reef area (west of Banks Island - chart 3724).



*Sponge reef on shoal outcrop*

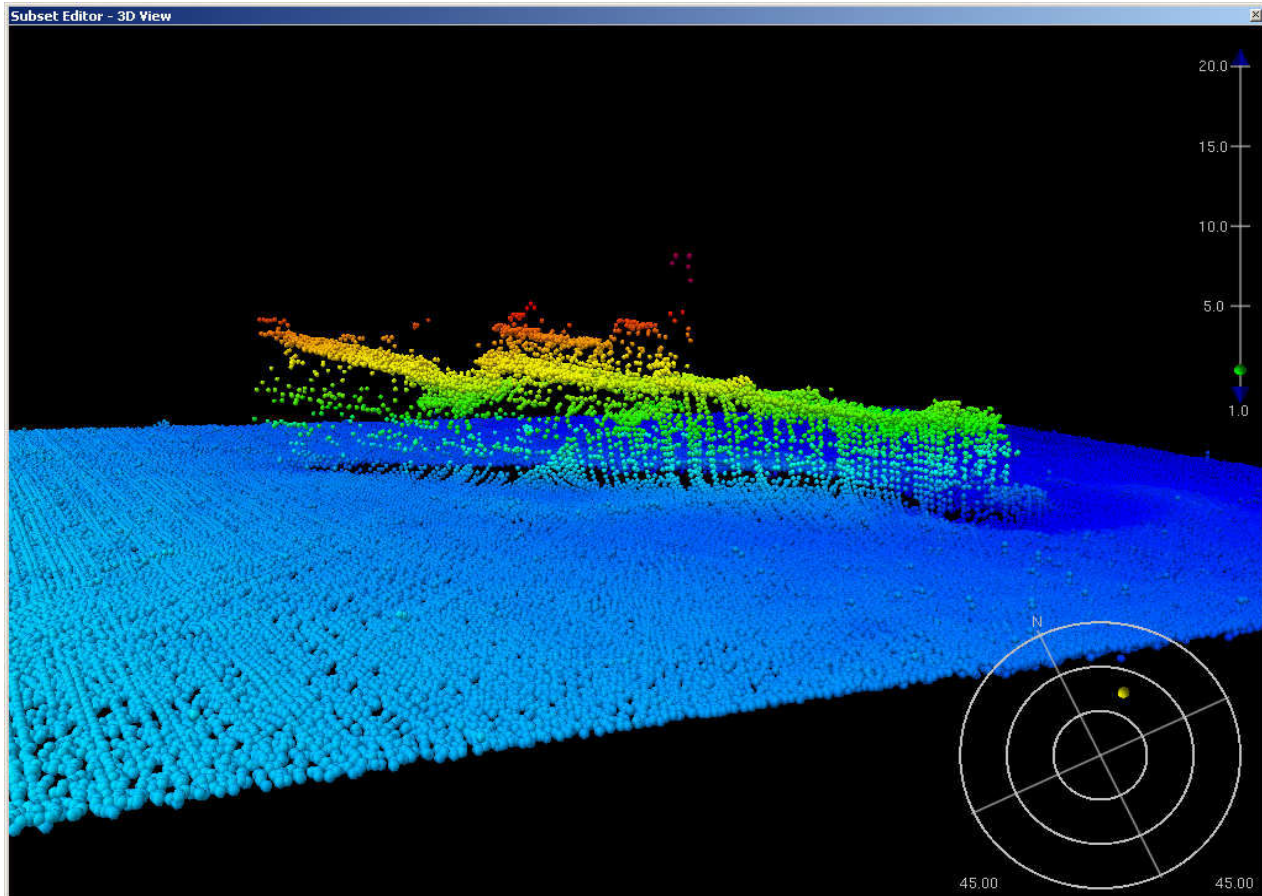
### 2) A Pinnacle Shoal is found near Proposed Shipping Channel

Situated on a relatively featureless seabed approximately 3.5 Km from the proposed (Priority #1) Gateway Project shipping channel, a pinnacle 14.6m shoal was found in waters previously charted to be 35m deep. This shoal is located on the southerly side of Browning Entrance, at the north-westerly approach to Principe Channel (chart 3927). A Notice to Mariners was issued as a result of finding this shoal.



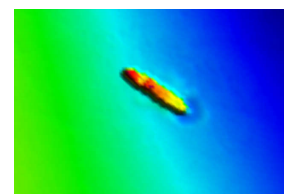
*Pinnacle Shoal found relative to proposed shipping route*

3) A Wreck is found at the North end of Principe Channel



*EM3002 Acoustic Imagery of Unidentified Wreck*

Sitting proud on the seabed at a depth of 85m, this vessel is approximately 61m (200ft) long, 11.6m (38ft) wide, and 13.8m (45ft) high. Its identity is unknown, and all relevant information has been forwarded to the Receiver of Wrecks. A Notice to Mariners was also issued for this wreck (chart 3927).



*View from above*

## RECOMMENDATIONS

1. **OFI-2007-P001:** Due to various unforeseen circumstances while in the field, survey plans may change at a moments notice. As a result, areas previously not considered for survey operations may be surveyed with little if any planning or preparations. To ensure the hydrographic team is able to respond to any eventuality, it would be beneficial if one of the computers on the surveys platform was loaded with;
  - TCWL Tools software, for creation of prediction and/or pseudo-tide files
  - all regional tidal constituent files
2. **OFI-2007-P002:** During the storm *Vector* experienced on August 7<sup>th</sup>, there were occasions that the Moving Vessel Profiler (MVP) on the aft deck became completely immersed in salt water. Shortly thereafter, the MVP began malfunctioning. Upon closer inspection, it was found that salt water had gotten inside the military bayonet connector (base of electronic junction box), as well as into the yellow remote hand-operated winch controller. Although the MVP is designed to operate in an exposed environment, certain conditions have proven otherwise. To ensure this situation may not re-occur, it would be prudent to have some watertight covers (and spares) fabricated for the MVP's electronic junction box and hand controller. Furthermore, providing these covers are made, the MVP needs to be clearly labelled for the benefit of all users, informing users to put the covers on prior to conditions which suggest potential exposure to salt water.
3. **OFI-2007-P003:** Despite the various computer screens in *Vector's* lab continuously monitoring every sensor applicable to hydrographic multibeam operations, it would appear almost ironic that the real-time under-keel depth is not prominently displayed. Although depth is displayed on various screens, the font size of the depth value is relatively small, usually presented along with a plethora of other sensor data. There are times when the hydrographer needs to know what the under-keel depth is without delay. It would therefore be beneficial if a screen could be set up in a prominent area of the lab with the real-time under-keel depth presented in a bold font size at least 5cm in height.
4. **OFI-2007-P004:** One of NRCAN's expectations during multidisciplinary hydrographic operations is the acquisition of 3.5 kHz sub-bottom profiler and magnetometer data. To ensure this expectation may be fully appreciated with the benefit of high-quality data, it would be beneficial for all operators of this equipment to be given a presentation in advance by the technical authority of this equipment. To understand first-hand the purpose for the data, how and to whom they are ultimately presented (the deliverables), and to be sensitized regarding operational do's and don'ts would go a long way to augment the operating instructions that presently exist. It may be appropriate to have such a presentation delivered during the hydrographic training week in the spring.

## CONCLUSIONS

With her 24hr operational capability, *CCGS Vector* is a highly productive platform for multibeam operations. Coupled with *CGSL Otter Bay*'s shallow water capability, an enthusiastic hydrographic team and very accommodating officers and crew, this survey was not only highly productive but it was an absolute pleasure to be a part of. The survey schedule was kept flexible, thereby optimizing data quality by mapping the seabed for geological and habitat research in Hecate Strait during calm conditions, and mapping the sheltered shipping routes or other navigable passageways when the sea-state in exposed areas was unfavourable. Despite a large, shallow area in the middle of Hecate Strait (2006103G02) that had to be surveyed by *CCGS Vector*, a total of over 1000 square kilometres of seabed was mapped in only 21 days.



*Evening sounding in central Hecate Strait  
(Conditions otherwise known as 'Schlagintweit Heaven')*