Cruise Report for the DFO/SponGES CCGS *Martha L. Black* Oceanographic Mission (MLB2017001), August 31 to September 7, 2017

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Cruise Report for the DFO/SponGES CCGS *Martha L. Black* Oceanographic Mission (MLB2017001), August 31 to September 7, 2017

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ABSTRACT

Beazley, L., Pham, C., Murillo, J., and Kenchington, E. 2017. Cruise Report for the DFO/SponGES CCGS *Martha L. Black* Oceanographic Mission (MLB2017001), August 31 to September 7, 2017. Can. Tech. Rep. Fish. Aquat. Sci. 3242: vi + 42p.

A collaborative oceanographic mission between Fisheries and Oceans Canada (DFO) and the EU-funded Horizon 2020 SponGES (Deep-Sea Sponge Grounds Ecosystems of the North Atlantic: an integrated approach towards their preservation and sustainable exploitation) project took place between August 31 and September 7, 2017 on the Canadian Coast Guard Ship (CCSG) *Martha L. Black*. During this mission sampling was conducted in Emerald and LaHave Basins on the Scotian Shelf, where dense sponge grounds formed by the glass sponge *Vazella pourtalesi* occur. The primary sampling tool was the remotely operated vehicle ROPOS (Remotely Operated Platform for Ocean Science), owned and operated by the Canadian Scientific Submersible Facility (CSSF). Over the course of this mission a total of 20 operations were conducted, the data from which will serve to provide insight into this species' basic biology (reproduction, population genetic structure, and growth), biogeochemical cycling, environmental setting, and on the impacts of anthropogenic activity and ability to recover from disturbance. This report provides the details of each operation and data collected.

RÉSUMÉ

Beazley, L., Pham, C., Murillo, J., and Kenchington, E. 2017. Rapport d'expédition de la mission océanographique du MPO et du SponGES à bord du NGCC *Martha L. Black* (MLB2017001), du 31 août au 7 septembre 2017. Can. Tech. Rep. Fish. Aquat. Sci. 3242: vi + 42p.

Une mission océanographique de collaboration entre Pêches et Océans Canada (MPO) et le projet SponGES financé par l'UE dans le cadre d'Horizon 2020 (Deep-Sea Sponge Grounds Ecosystems of the North Atlantic: an integrated approach towards their preservation and sustainable exploitation) s'est déroulée entre le 31 août et le 7 septembre 2017 à bord du navire de la Garde côtière canadienne (NGCC) *Martha L. Black*. Lors de cette mission, des travaux d'échantillonnage ont été effectués dans le bassin d'Émeraude et le bassin de LaHave de la plate-forme Néo-Écossaise, où se trouvent des lits d'éponges denses formés par l'éponge siliceuse *Vazella pourtalesi*. Le principal outil d'échantillonnage utilisé pour mener ces travaux fut le véhicule téléguidé ROPOS (pour Remotely Operated Platform for Ocean Sciences), détenu et exploité par l'Établissement canadien des submersibles scientifiques. Au cours de cette mission, 20 opérations ont été menées au total. Les données recueillies dans le cadre de ces opérations serviront à fournir un aperçu de la biologie fondamentale de cette espèce (reproduction, structure génétique de la population et croissance), de son cycle biogéochimique et de son cadre environnemental, ainsi que des effets de l'activité anthropique sur l'espèce et de la capacité de celle-ci à se rétablir après une perturbation. Ce rapport fournit les détails de chaque opération et des données recueillies.

Mission Objectives

The main objective of this mission was to collect information on the dense sponge grounds formed by the unique glass sponge *Vazella pourtalesi* in Emerald Basin, Scotian Shelf. These sponge grounds are a case study area for the EU-funded Horizon 2020 SponGES (Deep-sea Sponge Grounds Ecosystems of the North Atlantic: an integrated approach towards their preservation and sustainable exploitation; http://www.deepseasponges.org/). The overarching goal of the SponGES project is to develop an integrated ecosystem-based approach to preserve and sustainably use deep-sea sponge ecosystems of the North Atlantic. Data and information on the biogeochemical cycling of the *Vazella* sponge grounds, as well as information on their basic biology (reproduction, population genetic structure, growth) and the impact that anthropogenic activities have on this unique ecosystem would be collected over the 4-year duration of the SponGES project (2016 to 2020).

The main location for sampling the *Vazella pourtalesi* sponge grounds was at a station located inside Fisheries and Oceans Canada's (DFO) Sambro Bank *Vazella* closure (DFO, 2015). This closure was implemented in 2013 under DFO's 2009 Policy for Managing the Impact of Fishing on Sensitive Benthic Areas and is closed to all bottom fishing. Here, dense sponge grounds were determined to be present based on a previous camera survey conducted by DFO in 2011. At this location, the majority of sampling for the SponGES project was planned, including *in situ* benthic chamber incubations, sponge collections, and a benthic lander deployment. Other sites were planned outside of the closure to survey the impacts of trawling to this sensitive benthic habitat.

A secondary objective of the mission was to collect data on the distribution and recoverability of the reef-building coral *Lophelia pertusa* in the Stone Fence and other sensitive benthic fauna within and outside DFO's *Lophelia* Coral Conservation Area (LCCA; DFO, 2015). The LCCA is a 15-km^2 DFO Sensitive Benthic Area Closure that restricts all bottom fishing activities. This location is host to the only known reef-building coral in Canada, *Lophelia pertusa*. Information collected in this area was to satisfy the objectives of a Fisheries and Oceans Canada (DFO) Strategic Program for Ecosystem-Based Research and Advice (SPERA) project awarded to L. Beazley & E. Kenchington (DFO-Maritimes). Unfortunately due to poor weather conditions, no sampling could be conducted in this area and the objectives for the *Lophelia* Coral Conservation Area (LCCA) were not met. Approvals to conduct research in both the Sambro Bank *Vazella* closure and the *Lophelia* CCA were granted by DFO's Ecosystem Management Branch and can be found in Appendix A of this report.

Vessel and Sampling Equipment

The mission was originally scheduled to take place on the Canadian Coast Guard Ship (CCGS) *Hudson* based out of the DFO Maritimes Region. Due to a delay in *Hudson*'s refit this vessel was unavailable for the mission, and the mission took place on the CCGS *Martha L. Black*. This vessel was built in 1986 and is considered a light ice breaker/major buoy tender (http://www.ccg-gcc.gc.ca/Fleet/CCGS-Martha-L-Black). The vessel is based out of DFO's Quebec Region and operates primarily in the Gulf of St. Lawrence and Estuary. Total length of the vessel is 83 m, while its breadth is 16.2 m. A total of 20 berths were allocated to science staff for this mission.

The main sampling equipment for this mission was the remotely operated vehicle ROPOS (Figure 1; Remotely Operated Platform for Ocean Science; www.ropos.com), owned and operated by the not-for-profit Canadian Scientific Submersible Facility (CSSF). The ROPOS was configured to operate to 1000 m depth. Due to interference with the crane on the *Martha L. Black*, ROPOS could not outfit its normal Launch and Recovery System (LARS) on the vessel, which, as determined during the mission, limited operations to times where good weather conditions prevailed (< 20 kt winds and sea state < 2 m).

Figure 1. Remotely Operated Vehicle ROPOS. Photo credit DFO.

Other sampling equipment on the mission included a SeaBird (SBE) 25 CTD with 5-L Niskin bottles owned and operated by DFO staff and a benthic lander owned by the Royal Netherlands Institute for Sea Research (NIOZ). The lander would be deployed to measure the environmental characteristics of the *Vazella* sponge grounds.

Voyage Track & Major Work Locations

The mission was originally scheduled to depart from the Provincial Energy Ventures Terminal (http://www.provincialenergy.com) in Sydney, Nova Scotia on Wednesday, August 30, 2017. However, the mission was delayed and departed at approximately 1400 on Thursday, August 31. Planned were two major work locations where sampling would be conducted: Work Location 1: Stone Fence & Eastern Slope, and Work Location 2: Emerald Basin. Due to poor weather, sampling was conducted only at Work Location 2. The planned mission track is shown in Figure 2 panel A, while the actual cruise track is shown in Figure 2 panel B. Poor weather was experienced upon leaving the Sydney harbour and was forecasted to occur over the entire eastern Scotian Shelf for the first few days of the mission. The vessel proceeded to the first major work location, the Stone Fence and Eastern Scotian Slope, where it waited for an operable weather window for ROPOS. Approximately 24 hours of ROPOS operations were planned at five stations at this work location. Unfortunately the weather did not improve enough to deploy ROPOS, and the objectives at this location were therefore not met. The vessel then proceeded to Work Location 2: Emerald Basin to conduct operations at the main sampling station, SB_01. Note that a Notice to Mariners (see Appendix B) was submitted to NOTSHIP Sydney to notify the pelagic fishing fleet (which is prominent in the area during these months) of our presence in Emerald Basin.

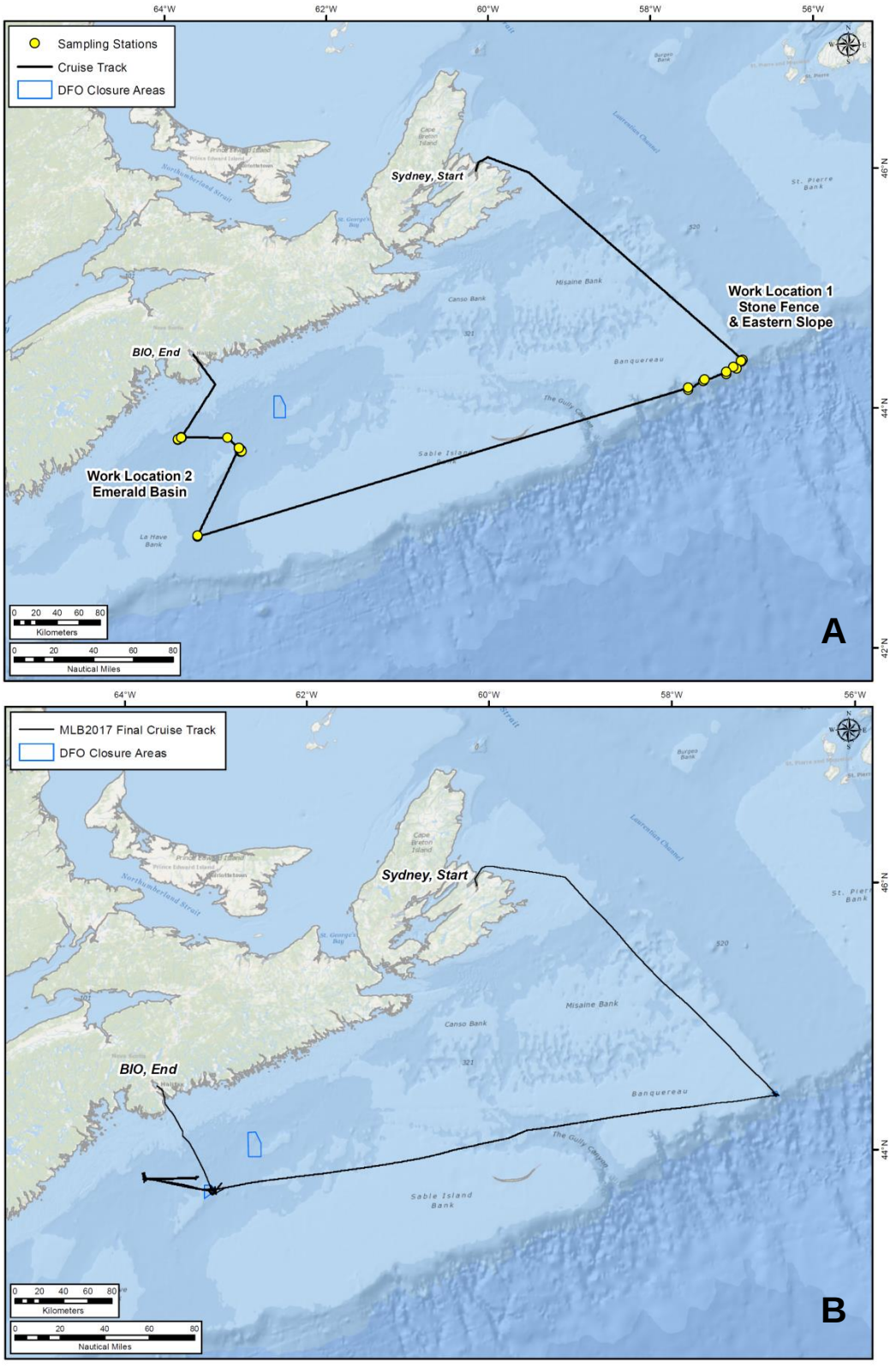

Figure 2. A) Planned work locations and cruise track for the MLB2017001 mission: B) Actual cruise track. Note that sampling was not conducted at the Stone Fence & Eastern Slope (Work Location 1 in A) due to inoperable weather.

Cruise Participants

A total of 20 scientific staff from various Canadian and international organizations participated in the mission (Table 1). This team consisted of 3 Fisheries and Oceans Canada (DFO) members from the Maritimes Region, 8 Canadian Scientific Submersible Facility (CSSF) ROPOS personnel, 1 participant from the Ocean Tracking Network (OTN) based at Dalhousie University, Nova Scotia Canada, and 8 international participants from various European organizations that are partners of the EU-funded Horizon 2020 SponGES project: Royal Netherlands Institute for Sea Research (NIOZ), University of Amsterdam (UVA), Institute of Marine Research, Azores (IMAR), University of Bergen (UiB), and the Spanish National Research Council (CSIC), Spain. Additionally, samples were collected for the following SponGES partners that did not directly participate in the mission: Dr. Kate Hendry, University of Bristol (UB), Dr. Javier Cristobo, Spanish Institute of Oceanography (IEO), Mr. Erik Wulz, Wageningen University (WU), Dr. Ana Riesgo, Natural History Museum of London (NHM), Dr. Ana Colaço, Institute of Marine Research, Azores (IMAR), and Dr. Ute Hentschel, Helmholtz Centre for Ocean Research Kiel (GEOMAR).

The chief scientist of the mission was Ms. Lindsay Beazley, Aquatic Science Biologist from DFO Maritimes and based at the Bedford Institute of Oceanography.

Table 1. Cruise participants, affiliation, and role for the MLB2017001 mission. *Lindsay Beazley (DFO-Maritimes) was chief scientist.

Name	Affiliation	Role
Benjamin, Robert	DFO-Maritimes	GIS/Data management
Beazley, Lindsay*	DFO-Maritimes	Chief scientist
MacDonald, Barry	DFO-Maritimes	Data logger/Lab collections
Pham, Chris	Institute of Marine Research, Azores	IRLS/WP6 Specialist
Bart, Martijn	University of Amsterdam	Benthic chambers
Van de Ven, Clea	University of Amsterdam	Benthic chambers
Maldonado, Manuel	Spanish National Research Council	Benthic chambers
Lopez-Acosta, Maria	Spanish National Research Council	Benthic chambers
Xavier, Joana	University of Bergen	Lab collections
Pratt, Joseph	Ocean Tracking Network	Data logger/OTN Mooring Specialist
Mienis, Furu	Royal Netherlands Institute for Sea Research	Lander/Chambers
Hanz, Ulrike	Royal Netherlands Institute for Sea Research	Lander/Chambers
Morgan, Ray	ROPOS	ROPOS operations
Tamburri, Keith	ROPOS	ROPOS operations
Lee, Jonathan	ROPOS	ROPOS operations
Milne, Peter	ROPOS	ROPOS operations
Brake, Barry	ROPOS	ROPOS operations
Lockhart, Peter	ROPOS	ROPOS operations
Hannaford, Michael	ROPOS	ROPOS operations
Girard, Luke	ROPOS	ROPOS operations

Detailed Summary of Operations

A total of 20 operations were conducted in Emerald and LaHave Basins between September 2nd and 7th, 2017 (see Figure 3 and Table 2). Of these, 7 were ROPOS deployments, 10 were CTD casts with water collection, 2 related to the recovery and re-deployment of an OTN acoustic mooring, and 1 was the deployment of the NIOZ benthic lander. Table 3 contains a summary of the samples collected for the different SponGES primary investigators and projects. Operations are listed in order by their Consecutive Operation Number (i.e. the event number assigned to each gear deployment), or CON. The next section of this report provides a summary of the operations conducted at each station, including the objectives, achievements, and a summary of the samples collected. Sections are divided by major sampling gear.

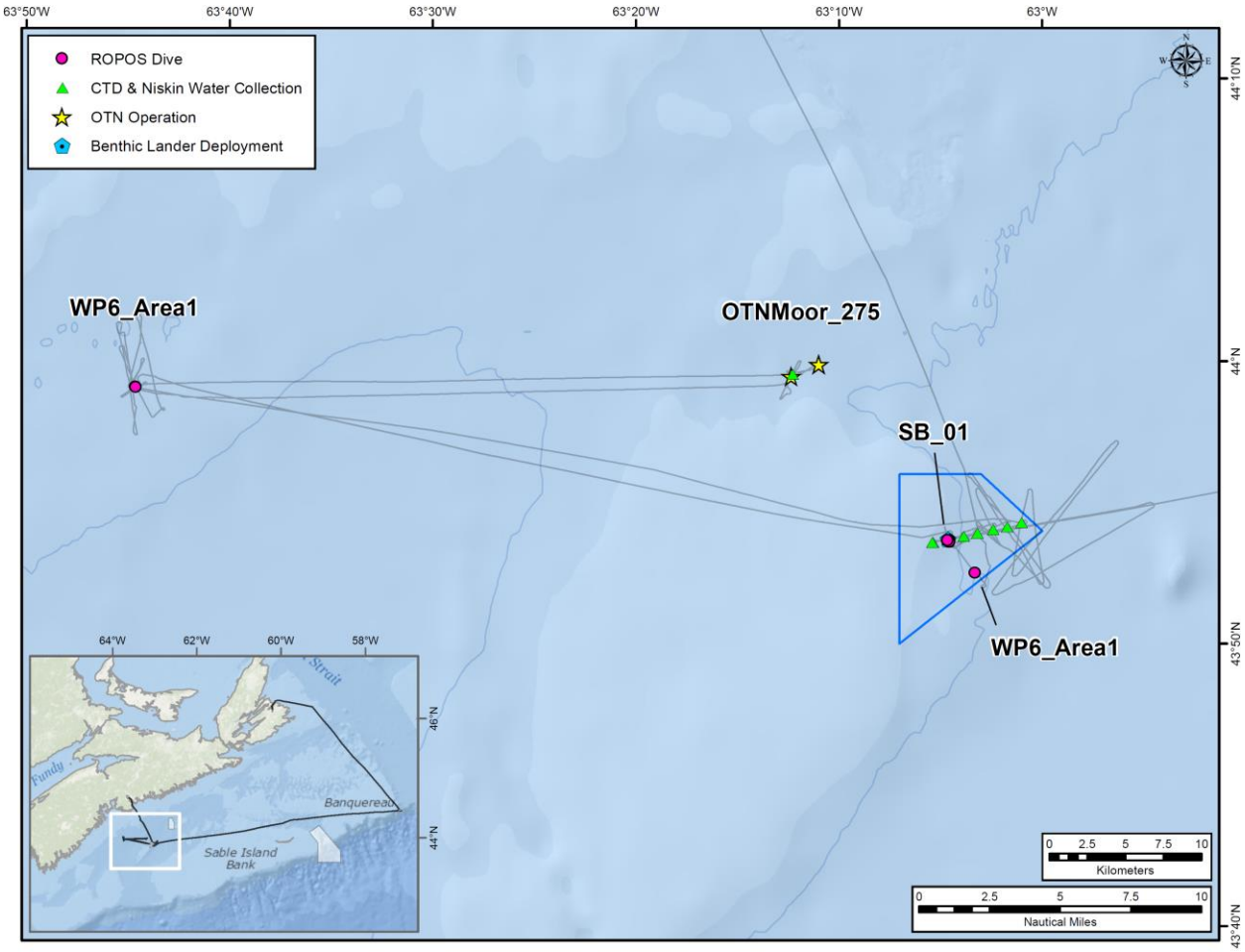

Figure 3. Location of operations conducted during the MLB2017001 mission. Labels indicate the station name. All operations were conducted to sample the *Vazella pourtalesi* sponge grounds in Emerald and LaHave Basins.

Table 2. Summary of operations conducted during the MLB2017001 mission. Operations are listed in order by their Consecutive Operation Number (Con).

Con	Operation	Station	Location	Objectives
001	CTD & Niskin	SB_CTD1	Sambro Bank Closure	CTD cast and water in gradient inside and outside sponge grounds.
002	CTD & Niskin	SB_CTD1	Sambro Bank Closure	CTD cast and water in gradient inside and outside sponge grounds.
003	CTD & Niskin	SB_CTD2	Sambro Bank Closure	CTD cast and water in gradient inside and outside sponge grounds.
004	ROPOS	SB_01	Sambro Bank Closure	*In situ* incubations; collections.
005	ROPOS	SB_01	Sambro Bank Closure	*In situ* incubations; collections.
006	ROPOS	SB_01	Sambro Bank Closure	*In situ* incubations; collections.
007	ROPOS	SB_01	Sambro Bank Closure	*In situ* incubations; collections.
008	CTD & Niskin	SB_CTD2	Sambro Bank Closure	CTD cast and water in gradient inside and outside sponge grounds.
009	CTD & Niskin	SB_CTD3	Sambro Bank Closure	CTD cast and water in gradient inside and outside sponge grounds.
010	CTD & Niskin	SB_CTD4	Sambro Bank Closure	CTD cast and water in gradient inside and outside sponge grounds.
011	CTD & Niskin	SB_CTD5	Sambro Bank Closure	CTD cast and water in gradient inside and outside sponge grounds.
012	CTD & Niskin	SB_CTD6	Sambro Bank Closure	CTD cast and water in gradient inside and outside sponge grounds.
013	CTD & Niskin	SB_CTD7	Sambro Bank Closure	CTD cast and water in gradient inside and outside sponge grounds.
014	ROPOS	WP6_Area2	LaHave Basin	Trawling impacts.
015	OTN Mooring	OTN_Moor275	Emerald Basin	OTN mooring recovery.
016	OTN Mooring	OTN_Moor275	Emerald Basin	OTN mooring deploy.
017	CTD & Niskin	OTNMoor_275	Emerald Basin	CTD cast and water collection near mooring for metagenomics.
018	ROPOS	WP6_Area2	LaHave Basin	Trawling impacts.
019	Lander Deploy	SB_01	Sambro Bank Closure	Benthic lander deployment.
020	ROPOS	WP6_Area1	Sambro Bank Closure	Trawling impacts.

Table 3. Summary of samples collected for the different SponGES projects and leads. Biological replicates equate to whole individuals, while technical replicates are subsamples from biological replicates.

Sample Purpose/Lead	Total Number of Samples Collected
	Samples for Preservation
1. Genomics (NHM)	*Vazella sponge grounds:* • 25 biological replicates; between 2 and 3 technical replicates (58 samples total).
2. Phylogenetics (UiB)	*Vazella sponge grounds:* • 25 biological replicates; between 1 and 2 technical replicates (43 samples total). *OTN Mooring:* • 31 biological replicates; 1 technical replicate (31 samples total).
3. Silicon Isotope Analysis (UB)	*Vazella sponge grounds:* • 16 biological replicates; 1 technical replicate (16 samples total).

4. Stable Isotope Analysis (IMAR)	*Vazella sponge grounds:*
	• 3 clumps of sponges with associated data:
	  ○ 1 suction sample per clump.
	  ○ Associated fauna of clump.
	  ○ 3 attempted sediment push cores (only 1 successful for 1 clump).

5. Metagenomics/ Transcriptomics (GEOMAR)	*Vazella sponge grounds:*
	• 8 biological replicates; technical replicates from each in:
	  ○ Frozen in -80˚ freezer (32 samples total).
	  ○ 2.5% glutaraldehyde (8 samples total).
	  ○ 12.5% glutaraldehyde and cacodylate **when possible** (6 samples total).
	  ○ Frozen extra biomass, when possible (4 samples total).
	• 10 biological replicates; 1 technical replicate frozen in

	-80˚C for extra biomass.
	
	• 5 sediment samples.
	• 3 Niskin water collections with 4 technical replicates:
	  o 12, 2L water filters total.
	
	OTN Mooring:
	
	• 12 biological replicates; 1 technical replicate in each:
	  o Frozen in -80˚ freezer (8 samples total).
	  o 2.5% glutaraldehyde and cacodylate (4 samples total).
	• 4 bacterial swabs.
	• 1 Niskin water collection; 2 technical replicates (CTD and Niskin deployment).

6. Reproduction (NHM)	*Vazella sponge grounds:*
	
	• 25 biological replicates; 1 technical replicate in each:
	  o Fixative 1 (25 samples total).
	  o Bouin's (25 samples total).
	  o Paraformaldehyde (25 samples total).

7. Associated Fauna/Biodiversity (IEO)	*Vazella sponge grounds:*
	
	• 25 biological samples associated with the sponge grounds collected for barcoding (100% anhydrous ethyl alcohol), taxonomy (formalin and frozen).
	
	OTN Mooring:
	
	• 9 biological samples associated with the OTN mooring.
	  o 6 preserved in 100% anhydrous ethyl alcohol.
	  o 3 preserved in formalin.

8. Morphology (IEO)	*Vazella sponge grounds:* • 25 samples collected for morphology.
	Samples for *Ex Situ* Experiments
9. Environmental Stressors (WU)	27 *Vazella* sponges
10. Silicate Uptake (CSIC)	11 *Vazella* sponges
	***In Situ* Incubations**

11. Silicate Uptake	5 *in situ* incubations (4 sponges, 1 rock)
12. Carbon and Nitrogen Uptake	3 *in situ* incubations (2 sponges, 1 control with no sponge)

1. ROPOS Operations

Station SB_01

Station SB_01 represented the main sampling station and incubation site for the mission and is considered the **Pristine Site** for the SponGES project. This location was selected because it is inside DFO's Sambro Bank *Vazella* closure implemented in 2013, and had a notable concentration of *Vazella* sponges (over 400 live sponges recorded over 1 km) as discovered in the analysis of a video transect collected from the area by DFO in 2011.

A total of four (4) ROPOS dives were conducted at Station SB_01 during the mission (see Figure 4). A summary of the data collected on each dive is given below.

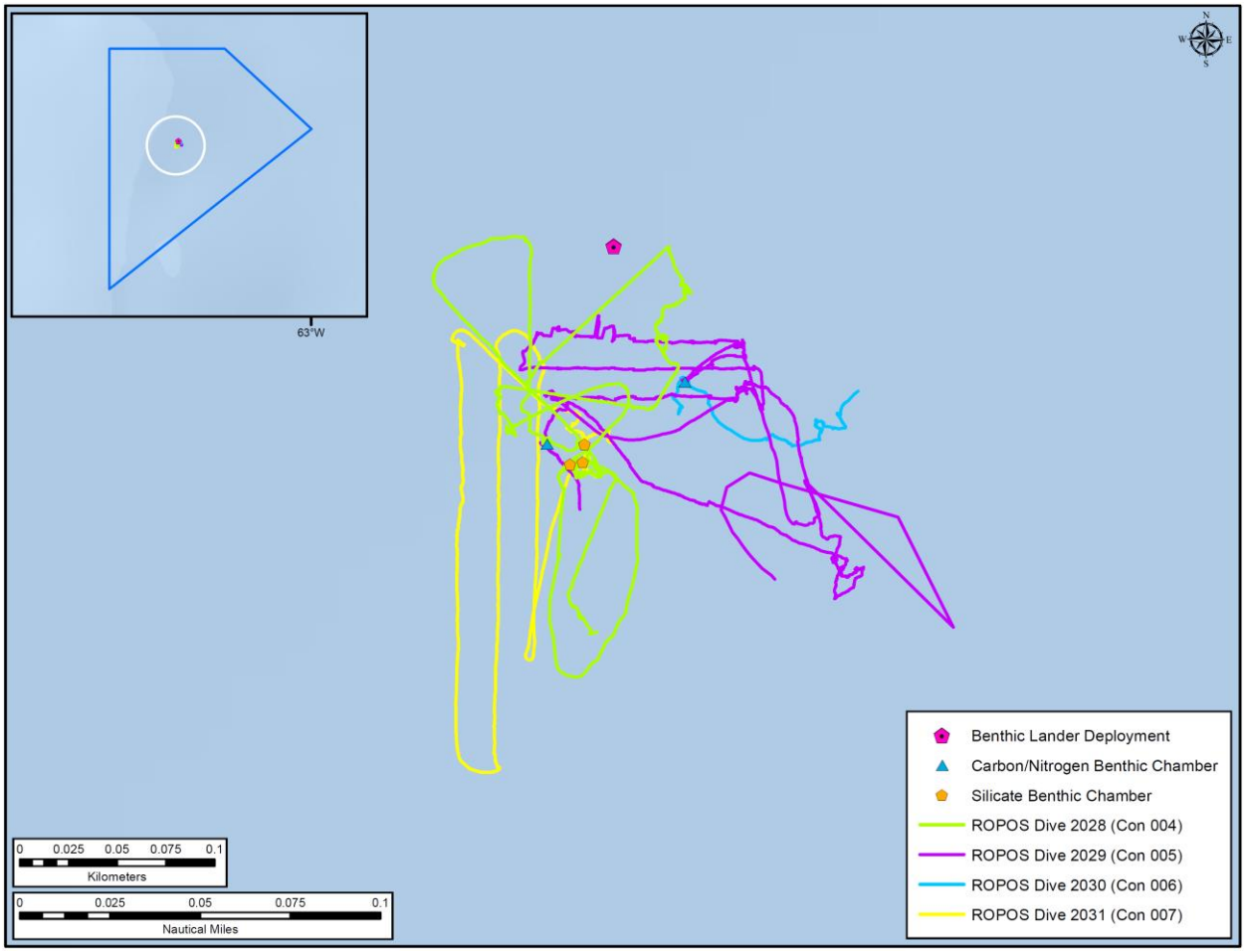

Figure 4. Location of ROPOS Dives 2028 through 2031 made at Station SB_01, the main sampling and incubation site for the MLB2017001 mission. The five incubation chambers deployed on ROPOS Dive 2028 (4) and 2029 (1), and the benthic lander are also shown.

ROPOS Dive 2028 (Con 004)

The objectives of this dive were to deploy and incubate *Vazella* sponges to determine this species' role in carbon, nitrogen, and silicate cycling, and to collect *Vazella* to subsequently preserve in the lab for various SponGES protocols.

Prior to deployment ROPOS was outfitted with 4 benthic chambers (1 to measure carbon/nitrogen update and 3 to measure silicate uptake) and two swing-arm bioboxes for sponge collection. Due to a rough launch one chamber (Figure 5) became dislodged by the ROV upon entry into the water. As a result the first objective of this dive was to search for the chamber and determine whether it was operable. The ROV searched in a grid-like pattern over the location where the chamber was lost from the ROV and found it in approximately 1 hour. The chamber appeared in working condition and a suitable sponge was sought and incubated (see Table 4 for coordinates of incubation). A single sponge was incubated in each of the chambers designed to measure silicate uptake.

The remaining time on this dive was spent collecting *Vazella* sponges in the swing-arm bioboxes to preserve in the laboratory for genomics, transcriptomics, barcoding, silicon isotope analysis, and reproduction. A total of 12 sponges were collected for this purpose (see Table 5). The 4 Niskin bottles of ROPOS were closed at the seabed to collect bottom water that was subsequently filtered. From this, organic carbon, total nitrogen, and d13C and d15N stable isotopes and pigments content from the water will be determined. The ROV was recovered and the chambers were left on the seabed to incubate.

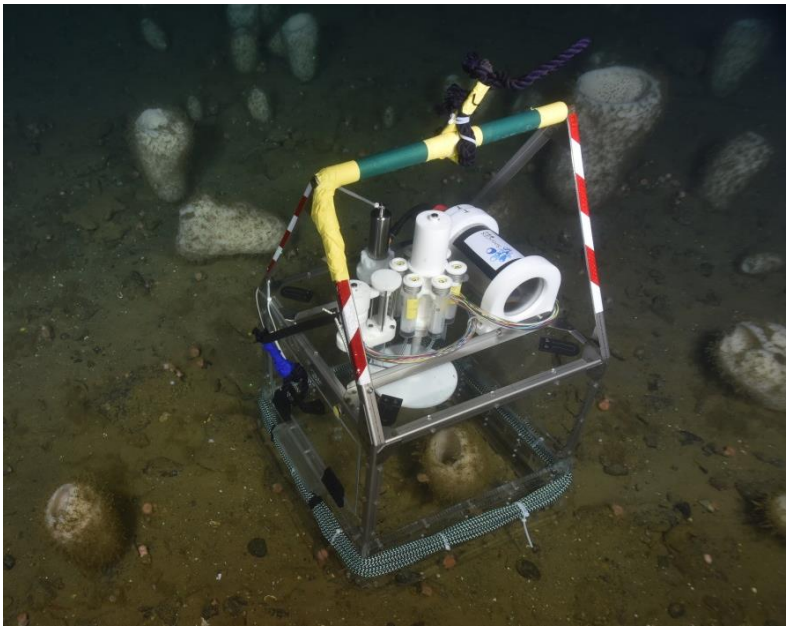

Figure 5. Benthic chamber incubating a *Vazella* sponge to collect data on nutrient cycling. Photo credit SponGES.

Table 4. Summary of metadata associated with ROPOS Dive 2028 (Con 004). Note that position, time, and depth are from ROPOS.

Con	Station	Operation	Action	JDayGMT	Depth (m)	Longitude (DD)	Latitude (DD)
004	SB_01	ROPOS 2028	On Bottom	245223939	154.16	-63.0766	43.8948
			Carbon/Nitrogen Chamber Start	245234711	158.45	-63.0774	43.8940
			Silicate Chamber #3 Start	246005001	158.78	-63.0771	43.8940
			Silicate Chamber #4 Start	246012007	161.54	-63.0771	43.8939
			Silicate Chamber 5-6 Start	246022059	161.77	-63.0772	43.8939
			Off Bottom	246030219	155.33	-63.0771	43.8931

Table 5. Summary of samples collected on ROPOS Dive 2028, Con 004.

Sample Type	Comment
Sponges for Preservation	12 sponges were collected to preserve in the laboratory for genomics, transcriptomics, barcoding, silicon isotope analysis, and reproduction.
Water Collection	4 ROPOS Niskin bottles (4.5 L each) closed at bottom and filtered.

ROPOS Dive 2029 (Con 005)

The objectives of this dive were to 1) deploy and incubate a sediment control in a carbon/nitrogen chamber and recover the carbon/nitrogen chamber that was deployed and left incubating on Dive 2028, 2) take DSCs of the PVC frame over sponges to accompany the *in-situ* incubation work and allow for upscaling the nutrient cycling data to the community, 3) collect sponges, sediment, and water for metagenomics to measure the bacteria associated with the Pristine *Vazella* sponges, and 4) collect sponges for *ex-situ* experiments.

Once the carbon/nitrogen chamber incubation commenced (Table 6), the PVC-DSC transect commenced where the PVC grid was placed over sponges and in the field of view of ROPOS, and over 70 DSCs were taken.

For metagenomics, four sponges were collected and 4 replicate bottom-water samples using the ROPOS Niskin bottles. However, only 1 push core sample was successful out of 10 attempts, therefore sample collection for metagenomics at the Pristine Site had to be re-done during a later dive (Table 7).

Ten (10) sponges were collected for *ex-situ* experiments.

At the end of this dive, the carbon/nitrogen chamber deployed on the previous dive was recovered.

Table 6. Summary of metadata associated with ROPOS Dive 2029 (Con 005). Note that position, time, and depth are from ROPOS.

Con	Station	Operation	Action	JDayGMT	Depth (m)	Longitude (DD)	Latitude (DD)
005	SB_01	ROPOS 2029	On Bottom	246071947	160.27	-63.0761	43.8945
			Carbon/Nitrogen Chamber Start	246073714	163.64	-63.0765	43.8943
			Off Bottom	246125453	153.88	-63.0774	43.8940

Table 7. Summary of samples collected on ROPOS Dive 2029, Con 005.

Sample Type	Comment
Sponges for Preservation	4 sponges were collected for metagenomics. These were subsampled for all other SponGES protocols.
Sediment Push Core	10 attempts were made to push core near the location of where sponges were collected for metagenomics, but only 1 was successful.
Water Collection	4 ROPOS Niskin bottles (4.5 L each) closed at bottom and filtered for metagenomics.
Sponges for *Ex-Situ* Experiments	10 sponges were collected for *ex-situ* experiments.

ROPOS Dive 2030 (Con 006)

The objectives of this dive were to recover the carbon/nitrogen chamber deployed and left to incubate on the previous dive (2029, Con 005), and re-attempt collections for metagenomics, particularly the sediment push cores that were previously unsuccessful. See Table 8 for the metadata associated with this operation.

A total of nine (9) sponges were collected, four of which were processed for metagenomics and other SponGES protocols (Table 9). The remaining five were put into a tank in a refrigerated container for *ex-situ* experiments. Five push cores were successfully collected on this dive, which were processed for metagenomics and sediment grain size characterization. At the conclusion of this dive the carbon/nitrogen chamber previously deployed on ROPOS Dive 2029 was recovered.

Table 8. Summary of metadata associated with ROPOS Dive 2030 (Con 006). Note that position, time, and depth are from ROPOS.

Con	Station	Operation	Action	JDayGMT	Depth (m)	Longitude (DD)	Latitude (DD)
006	SB_01	ROPOS 2030	On Bottom	246152203	161.14	-63.0755	43.8942
			Off Bottom	246172736	160.58	-63.0766	43.8942

Table 9. Summary of samples collected on ROPOS Dive 2030, Con 006.

Sample Type	Comment
Sponges for Preservation	4 sponges were collected for metagenomics. These were subsampled for all other SponGES protocols.
Sediment Push Core	3 push cores were successfully collected for metagenomics and sediment grain size.
Water Collection	4 ROPOS Niskin bottles (4.5 L each) closed at bottom and filtered for metagenomics.
Sponges for *Ex-Situ* Experiments	5 sponges were collected.

ROPOS Dive 2031 (Con 007)

The objectives of this dive (Table 10) were to 1) recover the three silicate chambers deployed on the first dive in this area (ROPOS Dive 2028, Con 005), 2) collect sediment push cores to assess the macrofauna biodiversity associated with the sponge grounds (SponGES Work Package 2 - WP2), and 3) collect a DSC and video gridded transect for SponGES Work Package 6 (WP6), which would serve as a control at the Pristine Site for which the impacted areas could be compared.

During this dive six (6) sponges were collected for the *ex-situ* experiments (Table 11). Of the five push cores attempted only four were successful. Water was collected with the ROPOS Niskin bottles at the bottom and was subsequently filtered.

Ultimately this dive had to be cut short due to deteriorating weather. The three silicate chambers and their incubated sponges were successfully recovered prior to ROPOS leaving the seabed.

Table 10. Summary of metadata associated with ROPOS Dive 2031 (Con 007). Note that position, time, and depth are from ROPOS.

Con	Station	Operation	Action	JDayGMT	Depth (m)	Longitude (DD)	Latitude (DD)
007	SB_01	ROPOS 2031	On Bottom	246194612	158.28	-63.0770	43.8941
			Off Bottom	246234632	157.64	-63.0771	43.8939

Table 11. Summary of samples collected on ROPOS Dive 2031, Con 007.

Sample Type	Comment
Sediment Push Core	4 push cores were successfully collected. These were processed for biodiversity (WP2).
Water Collection	4 ROPOS Niskin bottles (4.5 L each) closed at bottom and filtered.
Sponges for *Ex-Situ* Experiments	6 sponges were collected.

Station WP6_Area2

On July 5th 2017, the DFO multispecies survey caught a 73.14 kg catch of *Vazella pourtalesi* northeast of the Sambro Closure in LaHave Basin in a relatively lightly fished area. The objective of the ROPOS operation here was to collect video and photographic data and *Vazella pourtalesi* samples for WP6 – Threats and Impacts. Here, the ROV ROPOS planned to follow the trawl mark for up to 3.75 km and record the effects of the trawling to the remaining sponges and community. This site would serve to satisfy Task 6.2 to quantify incidental damage from a trawl to the sponge grounds.

Although only a single ROPOS operation was planned at this station, two ROPOS dives were made (Figure 6). The second was to recover benthic chambers left on the seabed the day before that could not be recovered by ROPOS due to deteriorating weather.

ROPOS Dive 2032 (Con 014)

A total of 3 benthic chambers were deployed on this dive, one chamber to measure carbon and nitrogen uptake, and one to measure silicate uptake (Table 12).

Upon reaching the seabed it was noted there were few *Vazella* present. The first objective was to find suitable sponges to incubate. A suitable sponge was found for the carbon/nitrogen chamber, while in the silicate chambers one sponge was incubated while the other was fitted with a rock which would serve as a control. After the chambers were deployed and incubating the ROV began the search for the trawl line. The two door marks were found with an estimated distance between them of 40 m. The ROV then followed the door marks to the beginning of the trawl, and then proceeded southwest in the centre of the door marks (i.e. 20 m from each door) where the impact of the nets was presumably occurred.

It was noted that the impact of the trawl to the seabed was not striking, and it was difficult to tell if the ROV was following the trawl's path. It was decided to make a grid pattern with the ROV, 50 m following the door, then 50 m in the middle, then 50 m on the other side of the door mark (Figure 6). The speed of the ROV was 0.5 kts.

The ROV operators noted that the weather was deteriorating and operations would need to be cut short. The ROV then proceeded back northeast towards the chambers and along a control line outside the door marks. The speed of the ROV on the control line was 0.7 kts. Unfortunately the ROV had to be recovered prior to reaching the

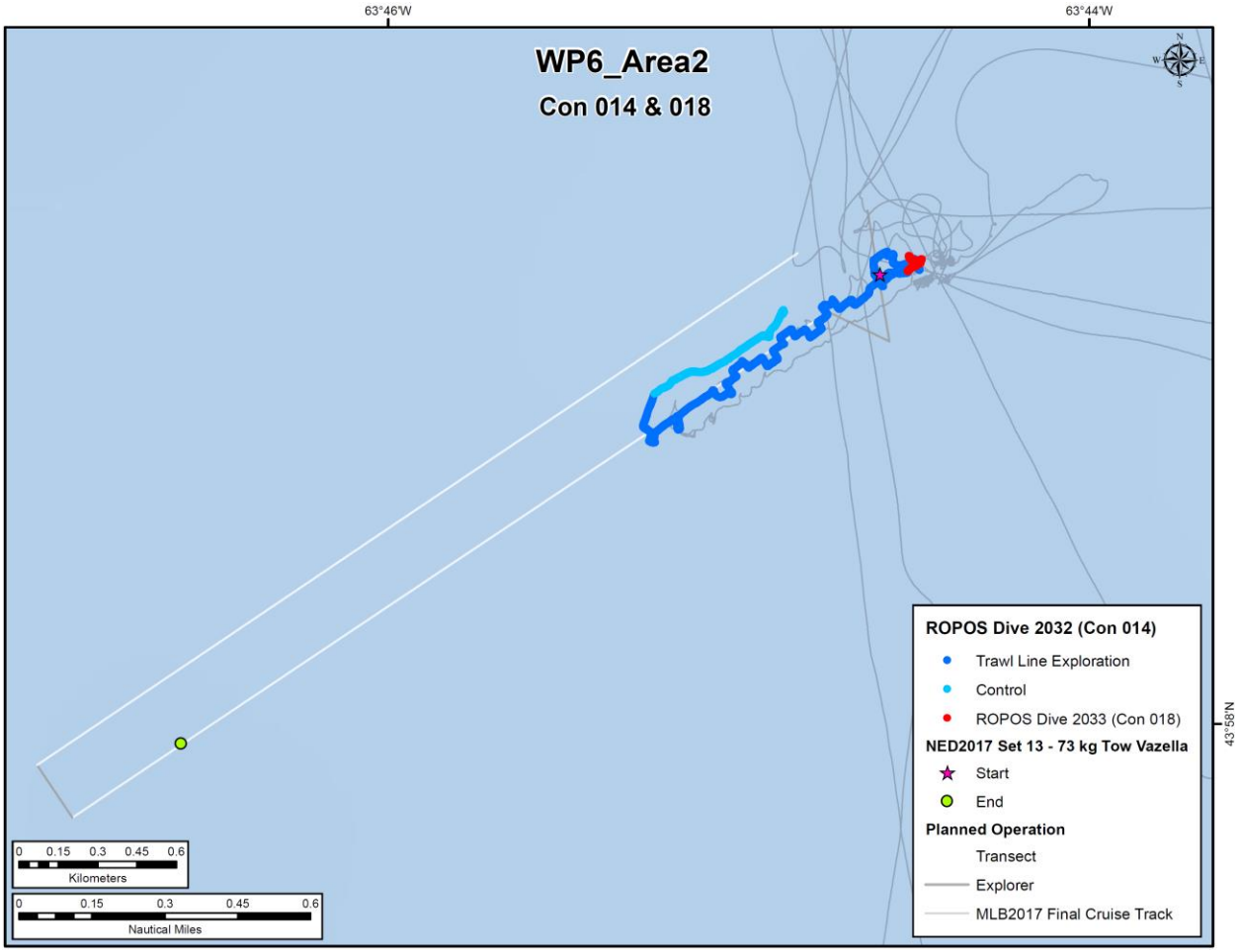

Figure 6. ROPOS Dive 2032 (Con 014) and 2033 (Con 018). Due to poor ROPOS operating conditions the operation had to be aborted and the chambers left on the seabed until their recovery the following day (Con 018, red).

chambers, and the chambers were left on the seabed until recovered on ROPOS Dive 2033. Note that no samples were collected on this dive.

Table 12. Summary of metadata associated with ROPOS Dive 2032. Note that position, time, and depth are from ROPOS.

Con	Station	Operation	Action	JDayGMT	Depth (m)	Longitude (DD)	Latitude (DD)
014	WP6_Area2	ROPOS 2032	On Bottom	248073823	182.02	-63.7413	43.9821
			Carbon/Nitrogen Chamber Start (sponge)	248084938	185.20	-63.7418	43.9821
			Silicate Chamber Start (sponge)	248095303	185.41	-63.7415	43.9824
			Silicate Chamber Start (rock)	248103926	184.94	-63.7415	43.9823
			Silicate Control Start	248140403	184.92	-63.7538	43.9778
			Off Bottom	248144018	180.92	-63.7486	43.9798

ROPOS Dive 2033 (Con 018)

The objective of this dive was to recover the three chambers and incubated sponges left at this station on ROPOS Dive 2032 (Con 014; see Figure 6). See Table 13 for associated metadata. This was a short operation, and only one other sample collection was made to collect an unknown, finger-like sponge for taxonomic purposes (Table 14).

Table 13. Summary of metadata associated with ROPOS Dive 2033. Dive was made solely to recover chambers deployed on ROPOS Dive 2032, Con 014. Note that position, time, and depth are from ROPOS.

Con	Station	Operation	Action	JDayGMT	Depth (m)	Longitude (DD)	Latitude (DD)
018	WP6_Area2	ROPOS 2033	On Bottom	249121507	185.68	-63.7417	43.9826
			Off Bottom	249144934	180.27	-63.7415	43.9823

Table 14. Summary of samples collected on ROPOS Dive 2033, Con 018.

Sample Type	Comment
Samples Collected for Taxonomy	1 finger-like sponge was collected for taxonomic purposes.

Station WP6_Area1

The objectives of the ROPOS operation at Station WP6_Area1 were to collect video and photographic data and *Vazella pourtalesi* samples for WP6 – Threats and Impacts. This site would serve to satisfy Task 6.2 on assessing whether trawling has induced a change in community composition, and Task 6.4, on testing the assumption of poor recovery trajectories of sponge grounds following various impact levels.

The dive was designed as a 1 km x 0.5 km orthogonal grid pattern through zones of different trawling intensity. Sponge sample collection was planned for Explorer Mode segment Waypoint5 to Waypoint4 and would serve as our **Impacted Site** for the SponGES project. Sample collection for a stable isotope analyses also planned for this dive.

ROPOS Dive 2034 (Con 020)

Prior to this operation the bridge informed the chief scientist that due to the prevailing currents the vessel would not be able to move in the direction of west to east as planned, and preferred to move east to west. The chief scientist therefore decided to start the operation at WP6 and move to WP5 and so-on, as the middle segments of this operation were the most important for sample and data collection (see Figure 7).

Upon reaching the seabed the ROV proceeded to move from Waypoint6 to Waypoint5 in 'Transect Mode' where a speed of 0.3 kts and constant height (~1 m) above bottom was maintained. The ROV was stopped once to collect what appeared to be a rare sponge (later identified as cf. *Phakellia*). DSC images were taken every minute without stopping the ROV.

Upon reaching Waypoint5, the ROV changed directions and headed towards Waypoint4 in Explorer Mode, where the ROV operated at a speed of 0.5 kts. Samples were first collected for stable isotope analyses. This involved targeting three different clumps of preferably 3 sponges, and suctioning the surface of the sponges with the suction sampler for 5 minutes. Then sponges were collected for *ex-situ* experiments and for various preservation protocols.

Unfortunately the weather increased to over 20 kts before the Explorer Mode segment could be completed, so it was decided to cut this line short and try to complete another Transect Mode line. The ROV was not able to maintain a Transect Mode speed and was shortly thereafter recovered as conditions became inoperable.

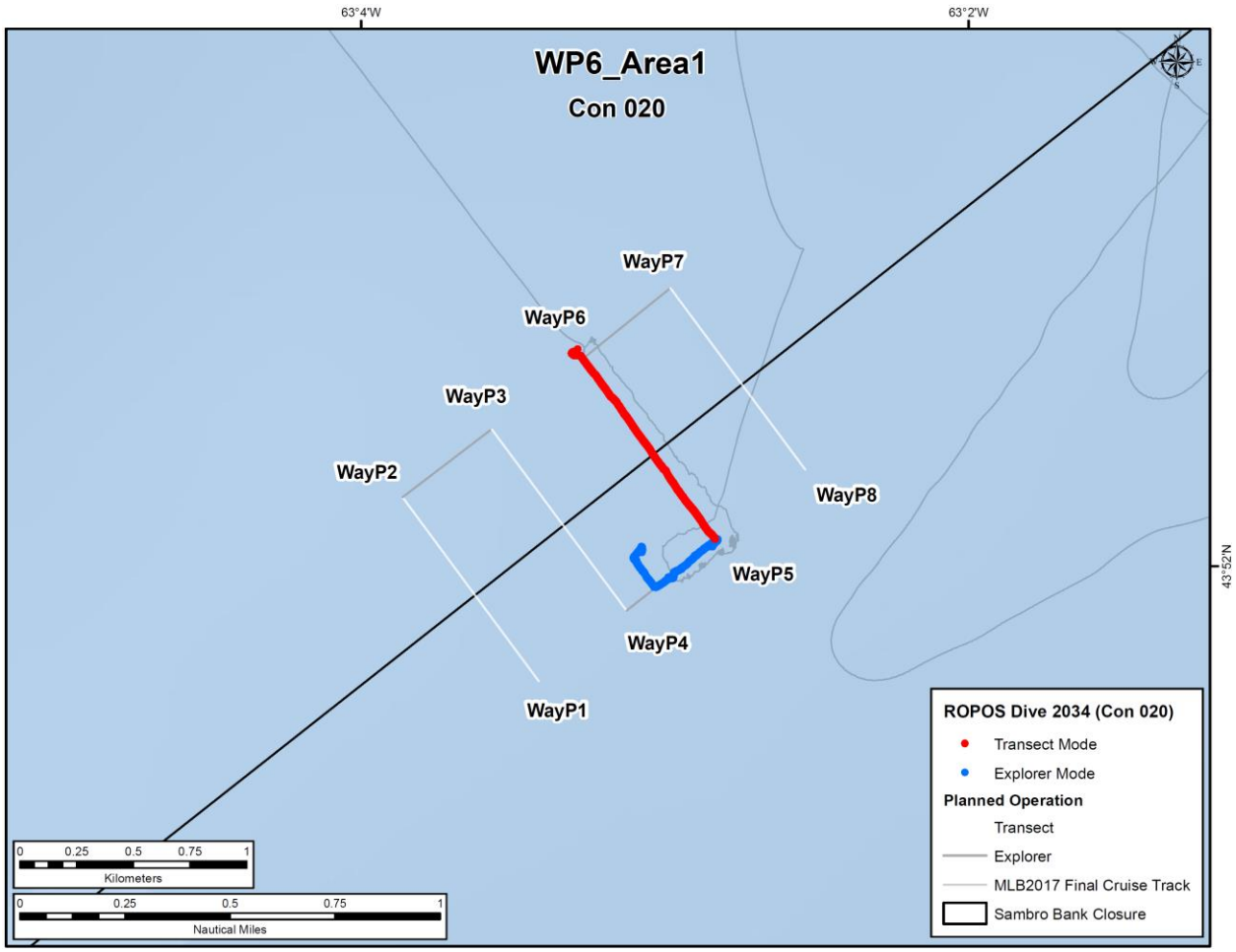

Figure 7. ROPOS Dive 2034, Con 020. 'Transect Mode' line Waypoint6 (WayP6) to Waypoint5 (WayP5) was completed and 'Explorer Mode' line Waypoint5 (WayP5) to Waypoint4 (WayP4) partially completed as shown by the original transect design.

See Tables 15 and 16 for a summary of the metadata associated with this dive and samples collected.

Table 15. Summary of metadata associated with ROPOS Dive 2034 (Con 020). Note that position, time, and depth are from ROPOS.

Con	Station	Operation	Action	JDayGMT	Depth (m)	Longitude (DD)	Latitude (DD)
020	WP6_Area1	ROPOS	On Bottom	249201901	219.87	-63.0549	43.8752
			Transect Mode Start	249202821	221.41	-63.0545	43.8749
			Explorer Mode Start	249220522	217.13	-63.0472	43.8677
			Off Bottom	250020023	188.42	-63.0512	43.8673

Table 16. Summary of samples collected on ROPOS Dive 2034, Con 020.

Sample Type	Comment
Stable Isotope Analyses	3 clumps of *Vazella* sponges were targeted. The sponge surfaces of each clump were suction sampled for 5 minutes and the clumps collected.
Sediment Push Core	3 sediment push cores were collected for stable isotopes, one per stable isotope clump. 1 sediment push core was collected for metagenomics.
Water Collection	4 ROPOS Niskin bottles (4.5 L each) closed at bottom and filtered for metagenomics.
Sponges for *Ex-Situ* Experiments	20 sponges were collected.
Sponges for Preservation	4 sponges were collected for metagenomics from the 'Impacted Site'. These were also subsampled for other purposes.
Samples for Taxonomy	1 unknown *Phakelia*-like sponge and 1 clump of zoanthids were collected.

2. Benthic Lander

A benthic lander owned by the Royal Netherlands Institute for Sea Research (NIOZ) was deployed Sept. 6, 2017 in the *Vazella* sponge grounds at Station SB_01 (see Figure 8 and Table 17). Video surveys of this area with ROPOS revealed that this station was suitable for a long-term lander deployment, as the density of sponges was high and the presence of large rocks and boulders which could potentially hinder the release mechanism was low.

This benthic lander (see Figure 9) sits 2.20 m high off the seabed and is equipped with 7 different devices designed to measure the physical oceanographic conditions within the *Vazella* sponge grounds, including a current metre, HD camera, and sediment trap. The fluorescence sensor was not operable prior to deployment. The lander will be recovered after approximately 1 year of data collection.

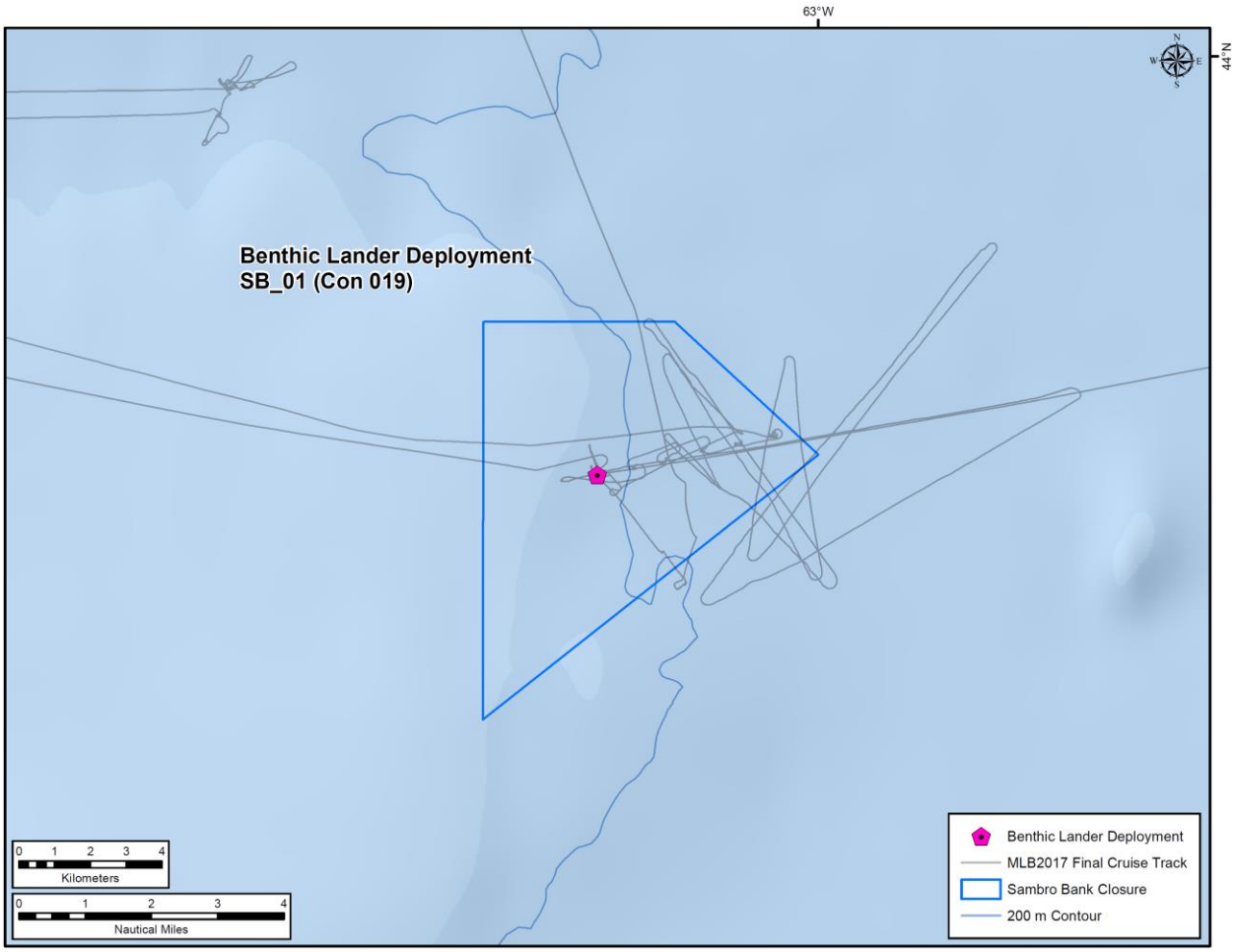

Figure 8. Location of the benthic lander deployment at Station SB_01 in the Sambro Bank Closure. This deployment was Con 019.

Table 17. Summary of metadata associated with the NIOZ lander deployment made at Station SB_01 in the Sambro Bank Closure. Metadata are of ship's position and sounding.

Con	Station	Operation	JDayGMT	Depth (m)	Longitude (DD)	Latitude (DD)
019	SB_01	Lander Deployment	249191903	150.23	-63.0769	43.8949

Figure 9. Benthic lander owned by NIOZ. Shown situated on the cargo hold doors, where it was temporarily secured prior to deployment. Photo credit DFO.

3. OTN Mooring Recovery

In the summer of 2016, the Ocean Tracking Network (OTN) discovered heavy biofouling by *Vazella* on their acoustic mooring line that runs from Halifax to the shelf break. Over the course of following the fall, winter, and spring the biofouling *Vazella* were collected from these acoustic moorings to study population structure, reproduction, and kinship between sponges within and between moorings.

For the MLB2017001 mission it was planned to recover a mooring that was cleared of its biofouling *Vazella* approximately 1 year ago. This provided the opportunity to collect new recruits that settled up to one year ago, giving a more accurate measure of the growth rate of this species. Joseph Pratt, a mooring technician with the OTN was onboard to recover this mooring.

Originally Mooring 276 was targeted for recovery. This mooring station was chosen as it is located in an area predicted to be densely populated with *Vazella* sponges, but also because moorings at this latitude were heavily biofouled when serviced last year. During the operation J. Pratt was unable to get a signal from Mooring 276 to release it. Other stations were attempted (277), but a signal was still not heard. It was concluded that the ship was likely interfering with connection between the OTN transducer and the mooring release, so the fast rescue craft (FRC) of the vessel was deployed while the vessel moved offsite. With this, Mooring 276 still would not release, suggesting a problem with the release itself. Mooring 275 was eventually released and recovered in the FRC (see Figure 10 and Table 18).

Once the mooring reached the vessel pictures were taken of the attached fauna (Figure 11 and Table 19). Forty-three (43) *Vazella* sponges had settled on the mooring, the maximum height of which was 2.7 cm. The sponges on two mooring sides were spatially mapped following a protocol previously developed at BIO to determine the settlement distances between kin (Beazley et al., in prep.). These sponges were removed from the mooring and preserved in ethanol, while others were preserved in a glutaraldehyde solution and frozen in the -80˚C freezer for metagenomics. Four sterile swabs were used to collect bacteria samples from the mooring surface for metagenomics.

Note that a CTD and water collection was also made at this station for metagenomics. Water was collected from bottom and was filtered, but unfortunately the cast (temperature and salinity data) did not store in the SBE 25 CTD.

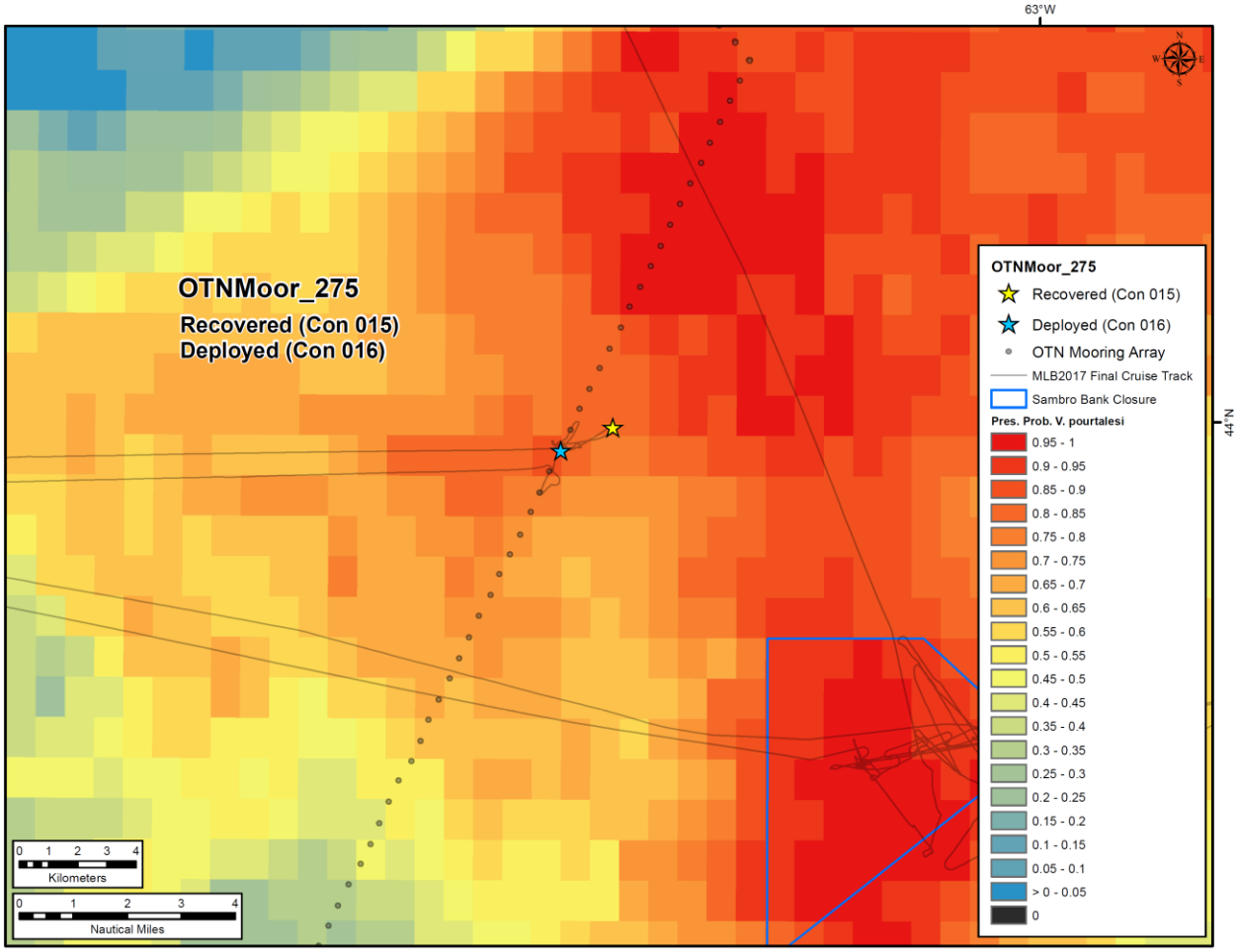

Figure 10. Location of the OTN mooring operations at Station OTNMoor_275. The OTN Mooring 275 was recovered (Con 015) and another mooring system was deployed (Con 016) in its place. Also shown is the predicted presence probability raster of *Vazella pourtalesi* and presence and absence of *Vazella* in Beazley et al. (2016).

Table 18. Summary of metadata associated with the OTN mooring recovery and deployment made at Station OTNMoor_275. Metadata are of ship's position and sounding.

Con	Station	Operation	JDayGMT	Depth (m)	Longitude (DD)	Latitude (DD)
015	OTNMoor_275	OTN Recovery	248204213	176.1	-63.1830	43.9983
016	OTNMoor_275	OTN Deployment	248210425	176.1	-63.2052	43.9912

Table 19. Summary of samples collected from OTN Mooring 275.

Sample Type	Comment
Sponges for Preservation	31 *Vazella* sponges were collected and preserved in ethanol for a kinship analysis. 16 samples were collected for metagenomics/ transcriptomics, 12 *Vazella* plus 4 bacterial swabs.
Samples for Taxonomy	Associated fauna (several taxa) were sampled from the mooring and preserved in ethanol and formalin.

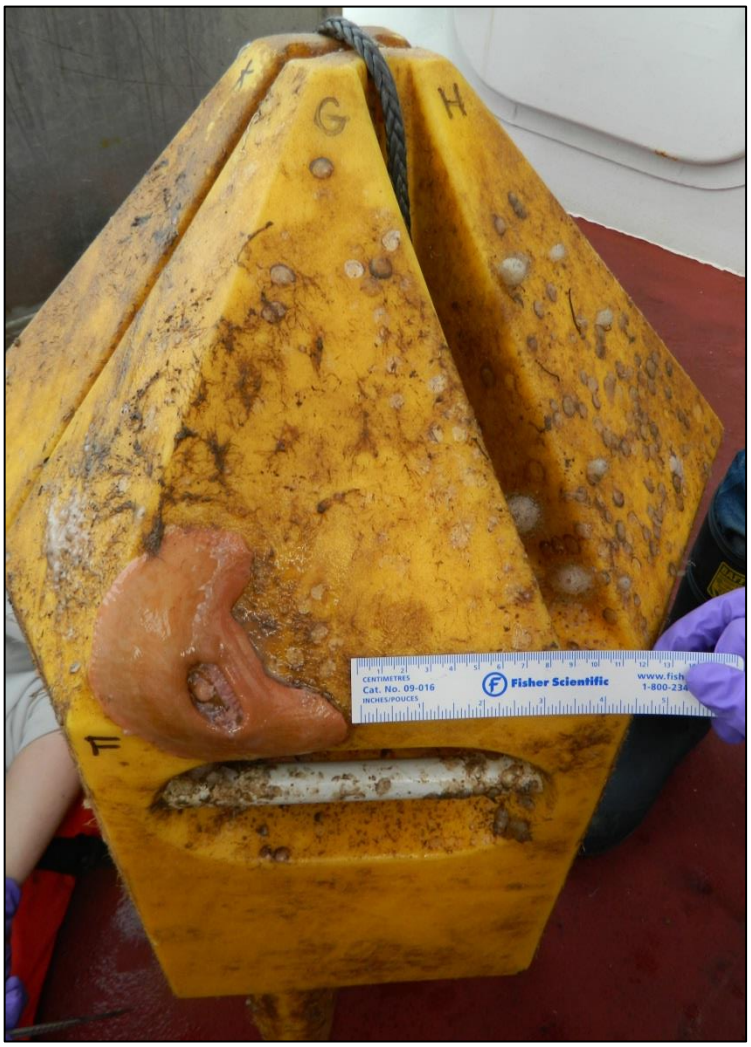

Figure 11. OTN Mooring 275 after recovery. Several *Vazella* sponges and other associated fauna are visible. Photo credit DFO.

4. CTD Deployments & Water Collection

During times of poor weather when ROPOS could not deploy, CTD casts were made in a gradient across the sponge grounds (Figure 12; Table 20). A total of 10 CTD casts were made, but not all were successful in terms of data storage or water collection (see Table 21). The location of CTD stations were chosen based on a probability of occurrence of *Vazella pourtalesi* predicted from random forest (see Beazley et al. (2016) and background map in Figure 12) and available presence and absence data of this species. CTD stations were spread approximately 1 km apart and ran in a west to east direction, with those located in the west presumably in more densely-populated *Vazella* areas and those in the east in less densely-populated areas.

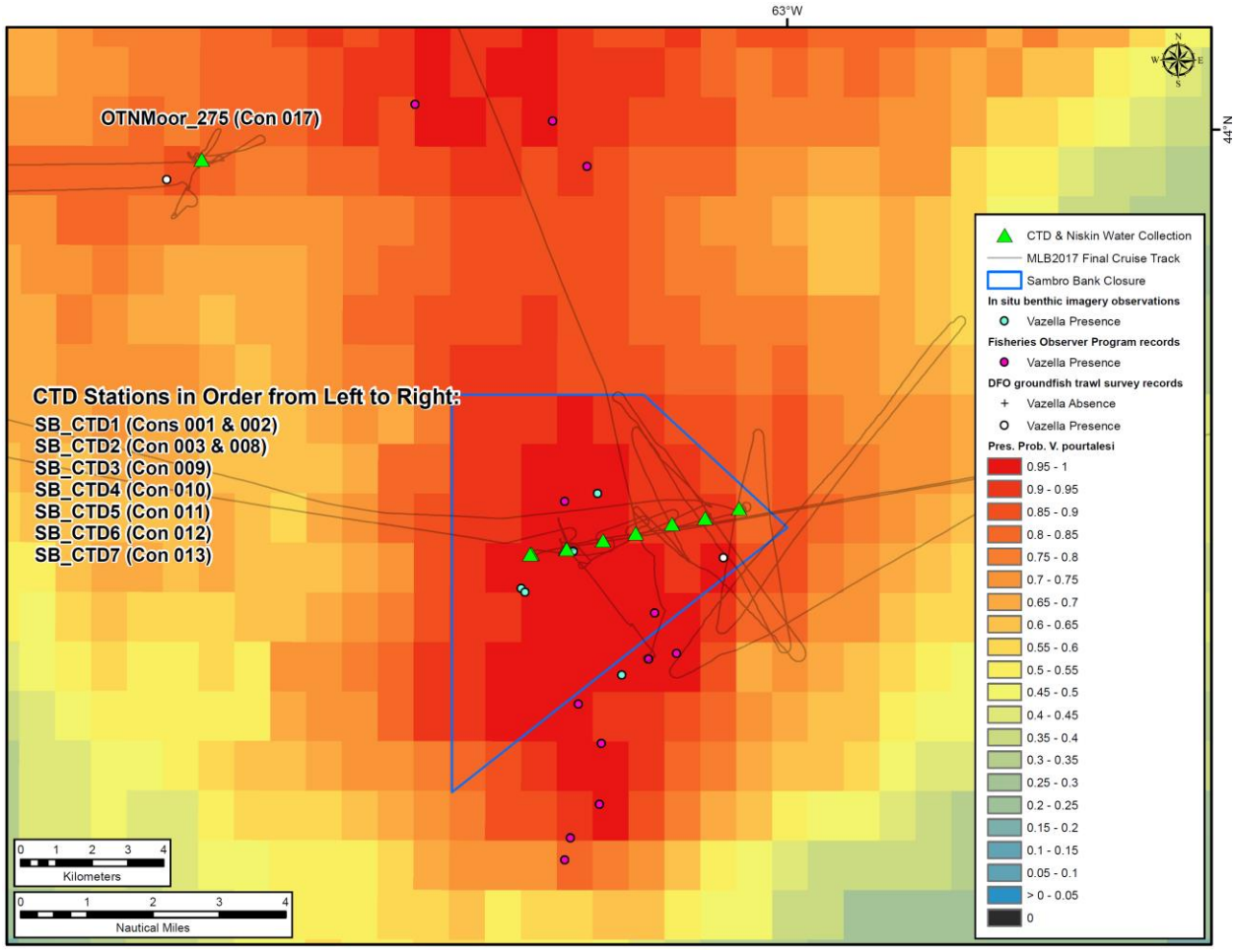

Figure 12. Location of CTDs and water collection (via Niskin bottles) in the Emerald Basin area. Also shown is the predicted presence probability raster of *Vazella pourtalesi* and presence and absence of *Vazella* in Beazley et al. (2016).

Table 20. Summary of metadata associated with CTD operations. Metadata are of ship's position and sounding.

Con	Station	Operation	JDayGMT	Depth (m)	Longitude (DD)	Latitude (DD)
001	SB_CTD1	CTD & Niskin	245193323	145.7	-63.0890	43.8933
002	SB_CTD1	CTD & Niskin	245195925	145.6	-63.0895	43.8933
003	SB_CTD2	CTD & Niskin	245210529	150.8	-63.0771	43.8946
008	SB_CTD2	CTD & Niskin	247183521	152.9	-63.0768	43.8946
009	SB_CTD3	CTD & Niskin	247194759	217.7	-63.0641	43.8968
010	SB_CTD4	CTD & Niskin	247203447	224.4	-63.0528	43.8985
011	SB_CTD5	CTD & Niskin	247214233	233.6	-63.0400	43.9009
012	SB_CTD6	CTD & Niskin	247222307	239.3	-63.0287	43.9023
013	SB_CTD7	CTD & Niskin	247230841	242.5	-63.0168	43.9048
017	OTNMoor_275	CTD & Niskin	248222653	183.1	-63.2042	43.9923

Table 21. Summary of success of CTD operations and data/samples collected.

Con	Station	Operation	Summary of Operation & Data/Sample Collection
001	SB_CTD1	CTD & Niskin	CTD cast successful; no water collection.
002	SB_CTD1	CTD & Niskin	Water collected at bottom and filtered for various components. CTD cast successful.
003	SB_CTD2	CTD & Niskin	Water collected at bottom and filtered for various components. Cast did not download properly; cast had to be redone.
008	SB_CTD2	CTD & Niskin	Water collected at 20 and 50 m from bottom and filtered for various components. CTD cast successful.
009	SB_CTD3	CTD & Niskin	Water collected at bottom and filtered for various components. CTD cast successful.
010	SB_CTD4	CTD & Niskin	Water collected at 20 and 50 m from bottom and filtered for various components. CTD cast successful.
011	SB_CTD5	CTD & Niskin	Water collected at bottom and filtered for various components. CTD cast successful.
012	SB_CTD6	CTD & Niskin	Water collected at 20 and 50 m from bottom and

			filtered for various components. CTD cast successful.
013	SB_CTD7	CTD & Niskin	Water collected at bottom and filtered for various components. CTD cast successful.
017	OTNMoor_275	CTD & Niskin	Bottom water collected at location of mooring for metagenomics. Two, 2-L replicates from the sample bottle were filtered. Cast did not store; no temp. or sal. data. Second Niskin bottle water filtered.

ACKNOWLEDGMENTS

We thank Keith Levesque (Research Vessel Coordinator, DFO-Quebec Region) for coordinating the provision of the CCGS *Martha L. Black* and logistics for this mission, and Ray MacIsaac (Senior Oceans Biologist, DFO-Gulf Region) his assistance in coordinating the mission prior to departure. We thank Keith Tamburri (Assistant Manager of ROPOS) and the rest of the ROPOS team for all their assistance in planning and executing the complicated sampling operations using ROPOS. We also thank the crew of the CCGS *Martha L. Black*. We also thank H. Vandermeulen and E. Baker (both of DFO) for their review of this report.

Funding for this mission was received from the International Governance Strategy (IGS) fund of the Department of Fisheries and Oceans Canada Project "Marine Biological Diversity Beyond Areas of National Jurisdiction (BBNJ): 3-Tiers of Diversity (Genes-Species-Communities)" to E. Kenchington, and from the EU-funded Horizon 2020 SponGES Project (Project Coordinator Hans Tore Rapp, University of Bergen).

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Appendix A – Letters of Approval to Conduct Scientific Research in DFO's Closure Areas

In order to conduct scientific research within any of DFO's closure areas, the risk to the surrounding ecosystem by the proposed scientific activities must be assessed by DFO's Oceans and Coastal Management Division (OCMD). The process involves submitting an application to conduct scientific research in question to OCMD, where it then undergoes review.

The following provides notices of approval for conducting research in the *Lophelia* Coral Conservation Area and the Sambro Bank *Vazella* Closure, granted to E. Kenchington by Annette Daley, the Acting Regional Director of the Ecosystem Management Branch at DFO. The applications were considered an extension from those submitted in 2016 for a previous cruise (Hud2016-019). Also shown is the approval granted to E. Kenchington to collect samples for scientific purposes in the closures as granted under the *Fisheries Act*.

Lophelia Coral Conservation Area (LCCA)

Fisheries and Oceans Canada | Pêches et Océans Canada

PO Box 1006
Dartmouth, NS
B2Y 4A2

MAY 0 8 2017

Ellen Kenchington
Ecosystem Research Division
Fisheries and Oceans Canada
Bedford Institute of Oceanography

Dear Dr. Kenchington,

The Oceans and Coastal Management Division has discussed the upcoming research mission to the Lophelia Coral Conservation Area. We understand the purpose of this research is to collect data and information in support of the recently approved SPERA proposal "Evaluation of the Effectiveness of a Coral Conservation Area After a Decade of Closure to Bottom-Contact Fishing Gears and Exploration of Coral Community Distribution". This research will support the EU-funded SponGES (Grant Agreement no. 679849) and ATLAS (Grant Agreement no. 678760) projects.

We have determined that given the similarities of this upcoming program with the 2015 research efforts in the same area, namely using a Remotely Operated Vehicle to understand the distribution and condition of corals within and adjacent to the closure, a similar conclusion can be reached regarding the impacts and benefits of this research. Therefore, the notice of approval sent in June 2015, can be considered valid for the upcoming mission.

Thank you for your support of coral conservation in our region. We request that any significant changes to the program in terms of its objectives or sampling approaches be discussed with the Oceans and Coastal Management Division. If you have any questions please contact Derek Fenton at derek.fenton@dfo-mpo.gc.ca (902-403-2548).

Sincerely,

[redacted]

Annette Daley
A/Regional Director
Ecosystem Management Branch
Maritimes Region

Canada

DFO Vazella Sponge Closures

Fisheries and Oceans Canada | Pêches et Océans Canada

PO Box 1006
Dartmouth, NS
B2Y 4A2

MAY 0 8 2017

Ellen Kenchington
Ecosystem Research Division
Fisheries and Oceans Canada
Bedford Institute of Oceanography

Dear Dr. Kenchington,

The Oceans and Coastal Management Division has discussed the upcoming research mission to the Vazella Conservation Areas in July with your lab. We understand the purpose of this research is to collect data and information on the *Vazella pourtalesi* sponge grounds of Emerald Basin on the Scotian Shelf for the recently approved SPERA proposal "Evaluation of the Effectiveness of a Two Sponge Conservation Areas in the Maritimes Region: Identifying Patterns of Dispersal, Connectivity, and Recovery Potential of the Russian Hat Sponge *Vazella pourtalesi*". This research will support the EU-funded SponGES (Grant Agreement no. 679849) and ATLAS (Grant Agreement no. 678760) projects.

We have determined that given the similarities of this upcoming program with the 2016 research efforts, namely using a Remotely Operated Vehicle and other sampling technologies to understand the distribution and ecological function of the sponge grounds, a similar conclusion can be reached regarding the impacts and benefits of this research. Therefore, the letter of approval sent on June 30th 2016, can be considered valid for the upcoming mission.

Thank you for your support of sponge conservation in our region. We request that any significant changes to the program in terms of its objectives or sampling approaches be discussed with the Oceans and Coastal Management Division. If you have any questions please contact Derek Fenton at derek.fenton@dfo-mpo.gc.ca (902-403-2548).

Sincerely,

[redacted]

Annette Daley
A/Regional Director
Ecosystem Management Branch
Maritimes Region

Canada

DFO Fisheries Authorization

Fisheries and Oceans Canada / Pêches et Océans Canada

Document No: 11393261

REGISTRATION(S) AND/OR FISHING LICENCE(S)

Page 1 of 4

This document authorizes the registration card holder and/or licence holder to engage in fishing and related activities on the Atlantic coast of Canada subject to the provisions of the Fisheries Act and Regulations made thereunder.

This licence and/or registration is issued under the authority of the Minister of Fisheries and Oceans Canada.

FIN 7-000153-26

FISHERIES AND OCEANS CANADA
REGIONAL DIRECTOR SCIENCE
1 CHALLENGER DRIVE, BIO
DARTMOUTH, NS, NS
B2Y 4A2

CALENDAR YEAR 2014
ISSUANCE DATE: MAY 26, 2014

HOMEPORT
11804 DARTMOUTH

Licence(s) - 2014

Licence #	Species	Areas	Licence Type	Gear Permitted	Amt	VRN	LOA
323354	ITEMS UNSPECIFIED			UNKNOWN	600		

TO BE OPERATED BY ANY SCIENCE STAFF OFFICER (PROJECT OFFICER) AUTHORIZED BY THE REGIONAL DIRECTOR SCIENCE BRANCH, MARITIMES REGION TO CONDUCT RESEARCH AS DEFINED ON A SIGNED FISHERIES RESEARCH NOTICE.

DESIGNATED OPERATOR STATUS

SCIENTIFIC/EDUCATIONAL AND LIVE FISH TRANSFER LICENCE

PURSUANT TO SECTIONS 52 AND 56 OF THE FISHERY (GENERAL) REGULATIONS, THIS LICENCE AUTHORIZES THE REGIONAL DIRECTOR, SCIENCE BRANCH, MARITIMES REGION, FISHERIES AND OCEANS CANADA (DFO), BIO, 1 CHALLENGER DRIVE, DARTMOUTH, NS, B2Y 4A2, PHONE: 426-3489, AND PERSONS WORKING UNDER HIS SUPERVISION, TO COLLECT, HOLD, AND/OR OBSERVE FINFISH, SHELLFISH, MARINE MAMMALS AND MARINE PLANTS FOR RESEARCH AND EDUCATIONAL PURPOSES, AND TRANSPORT LIVE FISH AND SHELLFISH TO DFO FACILITIES SUBJECT TO THE FOLLOWING CONDITIONS:

1. THAT THE AREA OF OPERATION BE LIMITED TO THOSE AREAS WHERE THE MARITIMES REGION HAS A RESEARCH MANDATE;

2. THAT AQUATIC ORGANISMS BE COLLECTED OR OBSERVED BY ANY MEANS NORMALLY USED IN THE COURSE OF SCIENTIFIC RESEARCH ON AQUATIC LIFE;

3. THAT THIS LICENCE DOES NOT AUTHORIZE COLLECTIONS OF MOLLUSCAN SHELLFISH OR ANY OTHER SPIECES OF FISH WHERE FISHING IS PROHIBITED DUE TO CONTAMINATED AREAS THAT HAVE BEEN CLOSED BY PROHIBITION ORDER;

4. THAT SAMPLING OR OBSERVATIONS BE CONDUCTED FROM ANY PLATFORM, SUCH AS FISHING VESSELS PARTICIPATING IN RESEARCH PROJECTS, AIRPLANES, HELICOPTERS, GOVERNMENT RESEARCH AND PATROL VESSELS OR SUBMERSIBLES, REQUIRED FOR THE PURPOSE OF THE RESEARCH PROGRAM;

5. THAT ANY UNATTENDED GEAR MUST HAVE CLEAR MARKINGS ON IT IDENTIFYING THE LICENCE NUMBER, FISHERIES RESEARCH NUMBER AND CONTACT PERSON WITH AN EMERGENCY CONTACT NUMBER AND ANY LOBSTER/CRAB TRAPS MUST HAVE A DFO SCI/EXP TAG ATTACHED;

6. THAT THE DIRECTOR, CONSERVATION & PROTECTION, DARTMOUTH, NS, LICENSING, DARTMOUTH, N.S., AND THE AREA CHIEF, CONSERVATION & PROTECTION, IN THE AREA OF WHICH A GIVEN RESEARCH PROJECT IS TO TAKE PLACE, BE ADVISED IN ADVANCE OF THE FISHING, SAMPLE COLLECTION, AND/OR TRANSFER ACTIVITY, BY MEANS OF A "MARITIMES REGION FISHERIES RESEARCH NOTICE" AUTHORIZED BY THE REGIONAL DIRECTOR, SCIENCE BRANCH, MARITIMES REGION OR HIS REPRESENTATIVE;

7. THAT A COPY OF THIS LICENCE AND THE SIGNED FISHERIES RESEARCH NOTICE (FRN) MUST BE CARRIED ABOARD ANY PLATFORM INCLUDING RESEARCH VESSELS, FISHING VESSELS PARTICIPATING IN RESEARCH PROJECTS, AND AIRCRAFT USED TO PERFORM SCIENTIFIC RESEARCH, AND BY PERSONNEL WORKING UNDER THE DIRECTION OF THE SCIENCE BRANCH, DFO, MARITIMES REGION, WHILE PERFORMING FISHERIES RESEARCH ACTIVITIES IN THE FIELD;

8. THAT THE TRANSFER OF SALMONIDS MUST MEET THE REGIONAL FISH HEALTH POLICY GUIDELINES (RFHPG) AS WELL AS TEST NEGATIVE FOR ANY PATHOGENS LISTED UNDER THE FISH HEALTH PROTECTION REGULATIONS (FHPR) INCLUDING THE INFECTIOUS SALMON ANAEMIA VIRUS (ISAV) EXCEPT THOSE GOING INTO AN APPROVED QUARANTINE FACILITY;

9. THAT ANIMALS, AND ANY WASTE PRODUCTS IN CONTACT WITH THE ANIMALS, PLACED INTO QUARANTINE

It is a condition of this licence that the registration holder/licencee sign all pages of this document.

[redacted]

23/6/2016
DATE

Fisheries and Oceans Canada | Pêches et Océans Canada

Document No: 11393261

Page 2 of 4

REGISTRATION(S) AND/OR FISHING LICENCE(S)

This document authorizes the registration card holder and/or licence holder to engage in fishing and related activities on the Atlantic coast of Canada subject to the provisions of the Fisheries Act and Regulations made thereunder.

This licence and/or registration is issued under the authority of the Minister of Fisheries and Oceans Canada.

FIN 7-000153-26

FISHERIES AND OCEANS CANADA
REGIONAL DIRECTOR SCIENCE
1 CHALLENGER DRIVE, BIO
DARTMOUTH, NS, NS
B2Y 4A2

CALENDAR YEAR 2014
ISSUANCE DATE: MAY 26, 2014

HOMEPORT
11804 DARTMOUTH

Licence #	Species	Areas	Licence Type	Gear Permitted	Amt	VRN	LOA

SHALL BE DISPOSED OF IN A STERILE MANNER ON COMPLETION OF THE RESEARCH PROJECT, EXCEPT WHERE LIVE RELEASE IS AUTHORISED UNDER AN INDIVIDUAL SECTION 56 F(G)R TRANSFER LICENCE ISSUED PURSUANT TO RISK ASSESSMENT BY THE INTRODUCTIONS AND TRANSFERS COMMITTEE FOR THE RECEIVING WATERS.

10. THAT THIS LICENCE DOES NOT AUTHORIZE:
- TRANSFERS FROM OUTSIDE OF CANADA,
- TRANSFERS OF SHELLFISH INTO THE WATERS OF CAPE BRETON OR EEL LAKE, YARMOUTH COUNTY,
- TRANSFERS OF FINFISH FROM SHELBURNE HARBOUR OR SEAL ISLAND CAPE BRETON,
- TRANSFERS OF FISH TO, OR FROM, AREAS THAT TEST POSITIVE OR HAVE TESTED POSITIVE FOR AEREMONAS SALMONICIDA, THE CAUSATIVE AGENT FOR FURUNCULOSIS, OR FOR THE INFECTIOUS SALMON ANAEMIA (ISA) VIRUS, FOR THE DURATION OF THIS LICENCE OR DURING THE PAST TWO YEARS,
- TRANSFERS OF SHELLFISH FROM THE MARIE-JOSEPH MUSSEL GROWING AREA, ARICHAT, WHITEHEAD OR JEDDORE;
- TRANSFERS OF OYSTERS (CRASSOSTREA VIRGINICA) FROM CAPE BRETON WATERS, FROM ASPY BAY TO THE CANSO CAUSEWAY, INCLUSIVE OF BRAS D'OR LAKE AND ST. PATRICK'S CHANNEL, EXCEPT INTO APPROVED QUARANTINE FACILITIES.

11. THE LICENCE HOLDER IS REQUIRED TO MAINTAIN HARD COPY OR ELECTRONIC COPY RECORDS OF TRANSFER ACTIVITIES. RECORDS SHALL INCLUDE THE NUMBER OF LIVE FISH TRANSFERRED, THE SPECIES OF LIVE FISH TRANSFERRED, THE DATE(S) IN WHICH EACH TRANSFER OCCURRED, THE OCCURRENCE OF MORTALITIES (PRE-TRANSFER, DURING THE TRANSFER AND POST TRANSFER) AND THE SOURCE LOCATION. RECORDS ARE TO BE UPDATED IMMEDIATELY UPON COMPLETION OF TRANSFERS AND SHALL BE SUBMITTED TO THE CHAIR OF THE NOVA SCOTIA INTRODUCTIONS AND TRANSFERS COMMITTEE BY DECEMBER 15, 2014.

12. THAT THIS LICENCE IS VALID FROM THE DATE OF ISSUE TO DECEMBER 31, 2019.

NOTE:
NOTHING IN THIS LICENCE SHALL BE CONSTRUED AS AUTHORITY UNDER THE SPECIES AT RISK ACT (SARA) TO KILL, HARM, HARASS, CAPTURE OR TAKE AN INDIVIDUAL OF A WILDLIFE SPECIES THAT IS LISTED AS "EXTIRPATED", "ENDANGERED" OR "THREATENED" AS IDENTIFIED IN SCHEDULE 1 OF SARA. IF THE ACTIVITY AUTHORIZED IN THIS LICENCE IS EXPECTED TO INTERACT WITH AN "EXTIRPATED", "ENDANGERED" OR "THREATENED" SPECIES, AN APPLICATION FOR A SECTION 73 SARA PERMIT CAN BE FOUND AT WWW.SARAREGISTRY.GC.CA AND SUBMITTED TO THE DFO SPECIES AT RISK MANAGEMENT DIVISION AT XMARSARA@DFO-MPO.GC.CA. FOR MORE INFORMATION ON SARA, INCLUDING A LIST OF PROTECTED SPECIES, PHONE 1-866-891-0771, VISIT WWW.SARAREGISTRY.GC.CA, OR CONTACT DFO SPECIES AT RISK MANAGEMENT DIVISION AT XMARSARA@DFO-MPO.GC.CA OR 902-426-4164.

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[redacted]

23/6/2016
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Canada

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7AAAA1F00A Document No: 11393261

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FISHERIES AND OCEANS CANADA
REGIONAL DIRECTOR SCIENCE
1 CHALLENGER DRIVE, BIO
DARTMOUTH, NS, NS
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CALENDAR YEAR 2014
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HOMEPORT
11804 DARTMOUTH

Licence #	Species	Areas	Licence Type	Gear Permitted	Amt	VRN	LOA

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9. THAT ANIMALS, AND ANY WASTE PRODUCTS IN CONTACT WITH THE ANIMALS, PLACED INTO QUARANTINE SHALL BE DISPOSED OF IN A STERILE MANNER ON COMPLETION OF THE RESEARCH PROJECT, EXCEPT WHERE LIVE RELEASE IS AUTHORISED UNDER AN INDIVIDUAL SECTION 56 F(G)R TRANSFER LICENCE ISSUED PURSUANT TO RISK ASSESSMENT BY THE INTRODUCTIONS AND TRANSFERS COMMITTEE FOR THE RECEIVING WATERS.

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- TRANSFERS OF FISH TO, OR FROM, AREAS THAT TEST POSITIVE OR HAVE TESTED POSITIVE FOR AEREMONAS SALMONICIDA, THE CAUSATIVE AGENT FOR FURUNCULOSIS, OR FOR THE INFECTIOUS SALMON ANAEMIA (ISA) VIRUS, FOR THE DURATION OF THIS LICENCE OR DURING THE PAST TWO YEARS,
- TRANSFERS OF SHELLFISH FROM THE MARIE-JOSEPH MUSSEL GROWING AREA, ARICHAT, WHITEHEAD OR JEDDORE;
- TRANSFERS OF OYSTERS (CRASSOSTREA VIRGINICA) FROM CAPE BRETON WATERS, FROM ASPY BAY TO THE CANSO CAUSEWAY, INCLUSIVE OF BRAS D'OR LAKE AND ST. PATRICK'S CHANNEL, EXCEPT INTO APPROVED QUARANTINE FACILITIES.

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23/6/2016
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Appendix B – Notice to Mariners for Emerald Basin in the Event of Heavy Fishing

During the months of August and September, pelagic fishing for swordfish and tuna is prevalent in Emerald Basin. The exact location of where fishing vessels may occur within the Basin is hard to predict year to year as the location of fish depends greatly on the patterns in water temperature. Our ideal sampling location for our upcoming cruise on the *Martha L. Black* would be within DFO's Emerald Basin closure where the *Vazella* sponge grounds are most dominant. During the Hudson2016-019 mission, in which sampling was conducted in this closure, a significant loss of time due to the presence of pelagic fishing vessels was incurred. As a result, for this upcoming mission we shifted our main sampling location to the Sambro Bank closure, located southwest of the Emerald Bank closure. Based on past fishing data this area appeared to be less fished than the Emerald Bank closure, although fishing still occurs here and the potential for interactions exists. Advice from DFO colleagues suggested we submit a Notice to Mariners declaring ourselves as a hazard to navigation while we are stationary in the Sambro Bank Closure. This notice was submitted to NOTSHIP Sydney on August 11, 2017 (see Notice to Mariners below).

“Benthic Sampling in Emerald Basin Using Tethered Remotely Operated Vehicle”

Maritimes Region

Area:
DFO’s Sambro Bank *Vazella* Sponge Closure, Emerald Basin, Nova Scotia

Description:

Hazard to Navigation – Use of Tethered Remotely Operated Vehicle for Benthic Sampling on CCGS *Martha L. Black*
Location- 43º 53.688 N 63º 04.632 W
At this location a tethered remotely operated vehicle will be continuously deployed on station from the CCGS *Martha L. Black* over the period of 7 days to collect samples from the seabed. During this time **the vessel will remain on site with the vehicle in the water, representing a hazard to navigation.**

Duration:
Sampling will occur from Sept. 1, 2017 to Sept. 7, 2017.

Contacts:

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