

# **Cruise Report in Support of Maritimes Region Research Project ‘Use of Passive Acoustics to Quantify Fish Biodiversity and Habitat Use’: Ocean Observation Systems in the Gully MPA and Scotian Shelf 2023**

Laurence H. De Clippele, Jinshan Xu, Claude Nozères, Fred Whoriskey, Jay Barthelotte, Kirk Phelan, Barry MacDonald, Camille Lirette, Ellen Kenchington

Ocean and Ecosystem Sciences Division  
Maritimes Region

Fisheries and Oceans Canada  
Bedford Institute of Oceanography  
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Canada B2Y 4A2

2024

## **Canadian Manuscript Report of Fisheries and Aquatic Sciences 3288**



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Canadian Manuscript Report of  
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2024

CRUISE REPORT IN SUPPORT OF MARITIMES REGION RESEARCH PROJECT ‘USE OF  
PASSIVE ACOUSTICS TO QUANTIFY FISH BIODIVERSITY AND HABITAT USE’:  
OCEAN OBSERVATION SYSTEMS IN THE GULLY MPA AND SCOTIAN SHELF 2023

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## ABSTRACT

De Clippele, L.H., Xu, J., Nozères, C., Whoriskey, F., Barthelotte, J., Phelan, K., MacDonald, B., Lirette, C., Kenchington, E. 2024. Cruise Report in Support of Maritimes Region Research Project ‘Use of Passive Acoustics to Quantify Fish Biodiversity and Habitat Use’: Ocean Observation Systems in the Gully MPA and Scotian Shelf 2023. Can. Manuscr. Rep. Fish. Aquat. Sci. 3288: iii + 14 p.

The Department of Fisheries and Oceans in collaboration with the University of Glasgow and the Ocean Tracking Network successfully deployed three benthic landers in the Sambro Bank Sponge Conservation Area and the Gully Marine Protected Area in the autumn of 2022 and recovered them in the summer of 2023. These landers were equipped with camera systems and passive acoustic receivers to record the soundscapes on *Vazella pourtalesii* sponge and sea pen grounds. This document provides the necessary background information for the recovery mission (KOP2023664) and provides updates on data extraction.

## RÉSUMÉ

De Clippele, L.H., Xu, J., Nozères, C., Whoriskey, F., Barthelotte, J., Phelan, K., MacDonald, B., Lirette, C., Kenchington, E. 2024. Cruise Report in Support of Maritimes Region Research Project ‘Use of Passive Acoustics to Quantify Fish Biodiversity and Habitat Use’: Ocean Observation Systems in the Gully MPA and Scotian Shelf 2023. Can. Manuscr. Rep. Fish. Aquat. Sci. 3288: iii + 14 p.

Le ministère des Pêches et des Océans, en collaboration avec l'Université de Glasgow et l'Ocean Tracking Network, a déployé avec succès trois modules de descente benthiques dans la zone de conservation des éponges du banc Sambro et la zone de protection marine du Gully à l'automne 2022 et les a récupérés à l'été 2023. Ces modules sont munis de systèmes de caméras et de récepteurs acoustiques passifs pour enregistrer les paysages sonores sur les terrains d'éponges de *Vazella pourtalesii* et de plumes de mer. Ce document fournit les informations générales nécessaires la mission de récupération (KOP2023664) et fournit des mises à jour sur l'extraction de données.

## INTRODUCTION

The Canadian Coast Guard (CCG) facilitated four at-sea missions to recover and deploy scientific equipment, departing and returning from the Bedford Institute of Oceanography (BIO) in Dartmouth, Nova Scotia. Over the duration of the project, those missions successfully completed twelve operations: six lander deployments (September 2021, October 2022) and six lander recoveries (May 2022, July 2023) and completed the core activities planned for each mission. Details on the research objectives and the technical operations of the landers that were deployed in September 2021, recovered in May 2022 and redeployed in October 2022 are provided by Kenchington et al. (2021a) and De Clippele et al. (2023). Data associated with that report are deposited in an online open access data repository which provides the necessary background information for the mission (HUD2021-048) and data collected in 2021 for the three CTD casts and photos acquired along transects using a drop camera system (4K Camera) to characterize the benthic habitats (Kenchington et al., 2021b).

Upon recovery of the landers in July 2023, the data were extracted from the instruments and the lander and data collection devices were serviced. Details of the data collection from the 2022-2023 recovery and of the research objectives are provided in this report.

This research project is registered as part of the Department of Fisheries and Oceans (DFO) internal network software, DMApps, under Project 835 (“Use of Passive Acoustics to Quantify Fish Biodiversity and Habitat Use”) and was approved by DFO management. The project is a collaboration between DFO, the University of Glasgow, the University of Liverpool, the Ocean Tracking Network (OTN) and the iAtlantic project. The iAtlantic project is funded by the European Union’s Horizon 2020 research and innovation programme under Grant Agreement no. 818123 and formally ends in March 2024. The principal investigators associated with the project are provided in Table 1.

**Table 1.** List of Principal Investigators (PIs) Responsible for Research Deliverables.

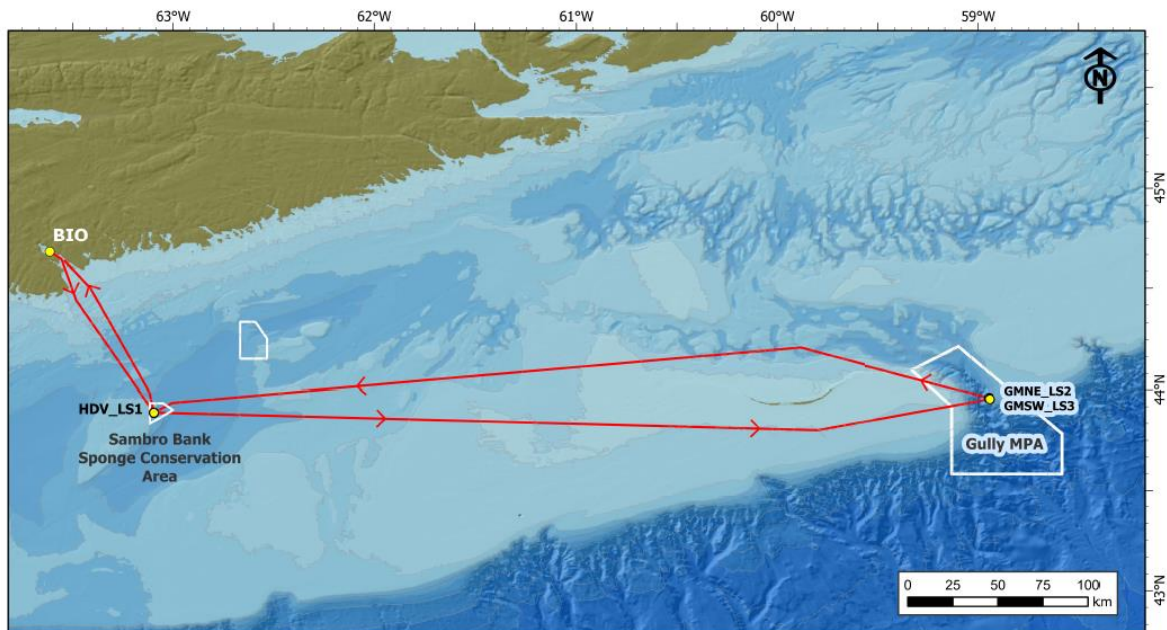
<b>Name</b>	<b>Institution</b>	<b>Role</b>
Dr. Laurence De Clippele	University of Glasgow	PI, Fish Acoustics, Image analysis
Dr. Jinshan Xu	DFO-BIO	PI, Marine Mammal Acoustics
Prof. Murray Roberts	University of Edinburgh	iAtlantic Co-ordinator
Dr. Fred Whoriskey	Ocean Tracking Network	OTN Acoustic Receivers
Prof. George Wolff	University of Liverpool	PI, Sediments
Dr. Christian Mohn	Aarhus University	PI, Physical Oceanography
Dr. Ellen Kenchington	DFO-BIO	Project Lead

All maps shown in this report were created in ArcGIS using a NAD83 UTM 20N projection.

## LANDER RECOVERY MISSION DETAILS (JULY 2023)

### CCGS *Kopit Hopson 1752* (KOP2023664)

The CCGS *Kopit Hopson 1752*, formerly known as the CCGS *Edward Cornwallis*, is a Martha L. Black-class icebreaker of the Canadian Coast Guard. She serves as a light icebreaker and buoy tender on the east coast of Canada. The Commanding Officer for the mission (KOP2023664) was Captain Brown of the Canadian Coast Guard. Captain Brown and his crew, together with Rena Sicord (Planning Officer), Gillian Williams (Regional Operations Centre (ROC) Officer) and Jay Barthelotte (DFO Vessel Co-ordinator) were instrumental to the success of this mission. Barry MacDonald (DFO) was the Chief Scientist for the mission with support from Jinshan Xu (DFO).



**Figure 1.** Stylized cruise track (red) for KOP2023664, 27-30 July 2023. The locations of the *Sambro Bank Sponge Conservation Area* and the *Gully Marine Protected Area (MPA)* are labelled. The route progressed from the Bedford Institute of Oceanography (BIO) in Dartmouth to the Gully MPA to Sambro Bank and back as indicated by the arrows.

The overall objective of the KOP2023664 recovery mission (27-30 July 2023) was to recover three benthic landers, one from the Sambro Bank Sponge Conservation Area and

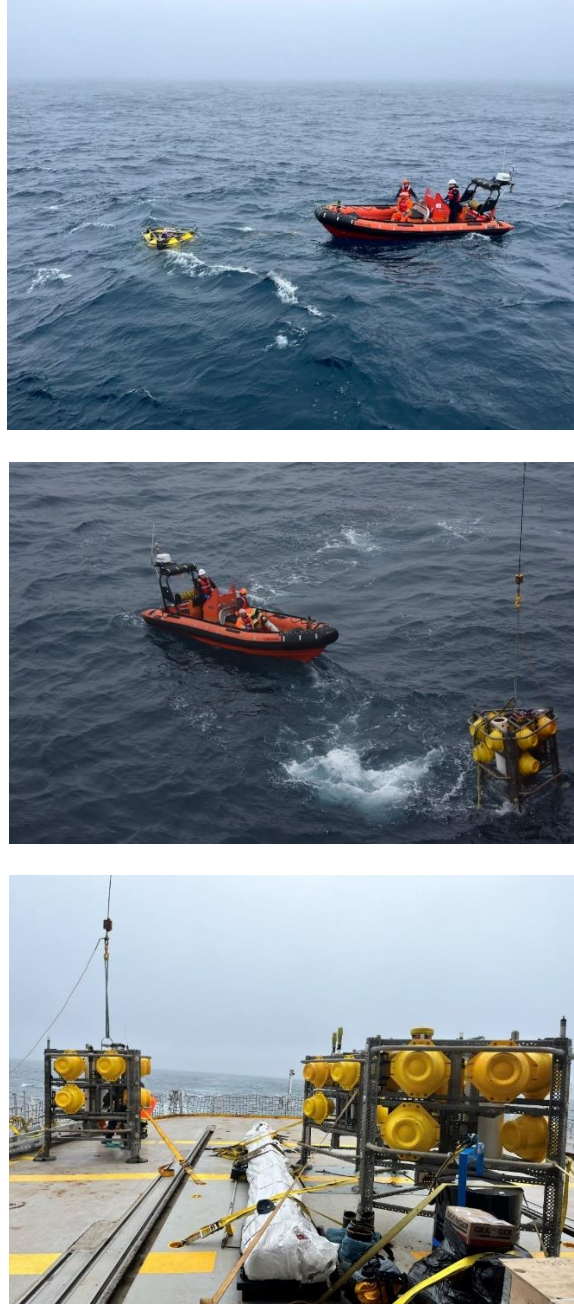
two from The Gully Marine Protected Area (Figure 1), which were deployed in October 2022. The landers were equipped with passive acoustic monitoring (PAM) recorders (SoundTrap and AMAR), Ocean Tracking Network (OTN) Acoustic Receivers, temperature, salinity and current sensors, a camera system and sediment traps (De Clippele et al., 2023). Permits to undertake scientific research in the Gully MPA and the Sambro Bank Sponge Conservation Area are shown in Annex 1 and Annex 2, respectively.

The mission successfully completed three operations which are summarized in Table 2 and illustrated in Figure 2. The date/time, latitude/longitude and depth were recorded along with other metadata.

**Table 2.** Time and Location of the Lander Recovery Operations.

<b>Station</b>	<b>Mooring No.</b>	<b>Date</b>	<b>Time (GMT)</b>	<b>Latitude (DM)</b>	<b>Longitude (DM)</b>	<b>Sounder Depth (m)</b>
GMNE LS2	M2237	28/07/2023	19:55	43 57.6190N	058 56.8660W	356
GMSW LS3	M2238	28/07/2023	21:40	43 57.3210N	058 56.6810W	325
HDV LS1	M2236	29/07/2023	17:35	43 53.261N	063 05.914W	154





**Figure 2.** Photos of the lander recovery operations at sea. An acoustic release triggers the lander's surfacing (top panel). The lander is then hooked to the Fast Response Craft (FRC) and towed back to the ship (middle panel). The lander is then placed, and secured, on board the ship (lower panel).

## PRELIMINARY RESULTS FROM RECOVERY MISSION

The list of data collected from the landers with associated comments are provided in Table 3.

**Table 3.** Overview of Lander Data Collections (2022-2023). Important information for interpreting biological and acoustic observations was collected from the associated instrumentation. Quality assurance and control were assessed, and the Principal Investigators (PIs) indicated (see Table 1).

<b>Instrumentation</b>	<b>Data Associated with Instrumentation</b>	<b>QA/QC Status</b>	<b>PI</b>	<b>Comments</b>
Sentinel V ADCP	Speed and direction of currents profiles	Completed	Jinshan Xu Christian Mohn	Successful data collection.
Sentinel ADCP WHS300	Speed and direction of currents profiles	Completed	Christian Mohn Jinshan Xu	Successful data collection.
Infinity AEM-USB (2)	2-D current and T	Completed	Jinshan Xu Christian Mohn	Successful data collection.
Seabird CTD (3)	Conductivity, temperature, and depth	Completed	All	Stopped earlier than planned; One stopped in Nov 2022; the other two stopped in Feb 2023.
Technicap PPS 4/3 Sediment Trap	Particle flux data (POM)	Completed	George Wolff	Successful data collection.

<b>Instrumentation</b>	<b>Data Associated with Instrumentation</b>	<b>QA/QC Status</b>	<b>PI</b>	<b>Comments</b>
ST500 (SN 5512)- HDV_LS1	Acoustic. Starting at 00:58, 144 kHz, 300 s (6 min) for 900 s (15 min) period	Completed	Jinshan Xu, Laurence De Clippele	Successful data collection in general, stopped early on May 25,2023.
ST4300 (SN 6062) HDV_LS1	Four-channel acoustic. Starting at 00:58, 32kHz, 240s (4.0 min) for 1800 s (30 min) period	Completed	Jinshan Xu Laurence De Clippele	Successful data collection in general, stopped as expected on March 23,2023 due to small battery package.
Star-Oddi digital compass logger (SN SCL0033)	Temperature, pressure, heading	Completed	Jinshan Xu	Successful data collection.
ST500 (SN 5470)	Acoustic. Starting at 00:58, 288kHz, 288s (4.8 min) for 900 s (15 min) period	Completed	Jinshan Xu, Laurence De Clippele	Successful data collection in general, stopped early on Feb 20 <sup>th</sup> , 2023.
ST600 (SN 6436)	Acoustic. Starting at 00:58, 192 kHz, 288s (4.8 min) for 900 s (15 min) period	Completed	Jinshan Xu, Laurence De Clippele	Successful data collection.

<b>Instrumentation</b>	<b>Data Associated with Instrumentation</b>	<b>QA/QC Status</b>	<b>PI</b>	<b>Comments</b>
AMAR (772)	Four-channel Acoustic. Acoustic. 750 s @ 32kHz, 130 s @ 256 kHz, 30 min	Completed	Jinshan Xu, Laurence De Clippele	Successful data collection.
Sony DSC-RX0 Lander Cameras (3)	L1_Vazella HSD = 11827 photos (246.4 days, ~8 months)  L2_Gully_Pennatulacea = 12054 photos (251.1 days, ~10 months)  L3_Gully_Halipteridae = 9107 photos (189.7 days, ~6 months)	Completed Drift time checked	Laurence De Clippele, Claude Nozères	Successful data collection.
OTN acoustic receivers	Presence of OTN tagged fish	Completed	Fred Whoriskey	Successful data collection.

Image collection was hugely successful with 32,988 photos taken while the landers were on the seabed. Photos were taken every 30 minutes. At lander site 1 (LS1; Figure 3A), the *Vazella pourtalesii* Sponge Site at Sambro Bank, 11,827 photos were taken, spanning a period of 246.4 days, from October 7, 2022 to June 10, 2023 (~8 months). At lander site 2 (LS2; Figure 3B), the ‘Pennatulacea Gully Site’, 12,054 photos were collected over 251.1 days, from October 5, 2022 to July 28, 2023 (~10 months). At lander site 3 (LS3; Figure 3C), the ‘Halipteridae Gully Site’ 9,107 images were collected, spanning a period of 189.7 days, from October 5, 2022 to April 13, 2023 (~6 months).

The images were annotated for motile fauna (e.g., fish, decapod crustaceans, echinoderms, and molluscs) in BIIGLE (<https://biigle.de/>), a web tool for image annotation. A total of 22 fish species were observed. Observations of motile species presences varied between the sites, with 90% of images from lander site 1, 17% from lander site 2, and 54% from lander site 3 having species annotated. The list of taxa present per site are summarized in Table 4, with photo examples of all types to be shown in a subsequent annotation report.

**Table 4.** Examples of Taxa Annotated in Images by Lander Site (L1, L2, L3).

Type	Taxon	L1	L2	L3
Fish	American Plaice ( <i>Hippoglossoides platessoides</i> )	x		
Fish	Atlantic Cod ( <i>Gadus morhua</i> )	x	x	
Fish	Atlantic Codling ( <i>Lepidion eques</i> )			x
Fish	Atlantic Halibut ( <i>Hippoglossus hippoglossus</i> )		x	
Fish	Blackbelly Rosefish ( <i>Helicolenus dactylopterus</i> )	x	x	x
Fish	Buckler Dory ( <i>Zenopsis conchifer</i> )	x		
Fish	Cusk ( <i>Brosme brosme</i> )		x	x
Fish	Fourbeard Rockling ( <i>Enchelyopus cimbrius</i> )	x		
Fish	Girard's Hagfish ( <i>Myxine limosa</i> )	x	x	x
Fish	Haddock ( <i>Melanogrammus aeglefinus</i> )	x	x	
Fish	Kaup's Arrowtooth Eel ( <i>Synaphobranchus kaupii</i> )		x	x
Fish	Longhorn Sculpin ( <i>Myoxocephalus octodecemspinosus</i> )	x		
Fish	Marlin-Spike Grenadier ( <i>Nezumia bairdii</i> )		x	x
Fish	Monkfish ( <i>Lophius americanus</i> )	x		x
Fish	Ocean Pout ( <i>Zoarces americanus</i> )	x		
Fish	Pollock ( <i>Pollachius virens</i> )	x		x
Fish	Redfish ( <i>Sebastes cf. fasciatus</i> )	x	x	x
Fish	Silver Hake ( <i>Merluccius bilinearis</i> )	x		x
Fish	Silver Roughy ( <i>Hoplostethus mediterraneus</i> )			x
Fish	Snailfish (Liparidae)*			x
Fish	Thorny Skate ( <i>Amblyraja radiata</i> )		x	
Fish	White or Red Hake ( <i>Urophycis</i> spp.)	x	x	x
Crab	<i>Cancer</i> spp. ( <i>C. borealis</i> , <i>C. irroratus</i> )	x	x	x
Crab	<i>Homola minima</i>	x	x	x
Crab	<i>Lithodes maja</i>		x	x
Crab	Munididae	x		
Crab	Paguroidea	x	x	x
Isopod	<i>Aega psora</i> *		x	
Isopod	<i>Syscenus infelix</i>		x	x
Lobster	<i>Homarus americanus</i>	x		
Shrimp	<i>Atlantopandalus propinquus</i>		x	x
Shrimp	Caridea	x		x
Shrimp	<i>Eusergestes arcticus</i>		x	
Shrimp	Pandalidae		x	

<b>Type</b>	<b>Taxon</b>	<b>L1</b>	<b>L2</b>	<b>L3</b>
Shrimp	<i>Pandalus</i> sp.	x	x	
Shrimp	<i>Pandalus borealis</i>	x		
Sea star*	<i>Coronaster briareus</i>	x		
Sea star	<i>Henricia</i> sp.	x	x	
Sea star	<i>Hippasteria phrygiana</i>		x	x
Sea star	<i>Poraniomorpha hispida</i>	x		
Sea star	<i>Pteraster militaris.</i>	x		
Sea star	<i>Sclerasterias tanneri</i>	x		
Sea star	<i>Stephanasterias albula</i>	x		
Bobtail squid	<i>Rossia</i> sp.	x	x	x
Limpet	<i>Diodora cayenensis</i>	x		
Nudibranch*	<i>Aldisa zetlandica</i> *	x		
Nudibranch*	<i>Ziminella salmonacea</i> *			x
Octopus	<i>Bathypolypus bairdii</i>	x		x

\*= tentative identifications

The OTN receivers picked up the presence of Atlantic halibut, bluefin tuna, swordfish, blue shark, and Atlantic salmon, within ~500 m of the landers. There were also two unqualified detections. More information can be found on the OTN website: <https://members.oceantrack.org/project?ccode=SPONGE> .

A



B



C



**Figure 3.** An example photo from each of the Landers. A: LS1, Sambro bank *Vazella pourtalesii* Sponge Site; B: LS 2, Gully Pennatulacea Site; C: LS 3, Gully Halipteridae Site.

## REFERENCES

- De Clippele, L.H., Xu, J., Mohn, C., Wolff, G., Blackbird, S., Whoriskey, F., Barthelotte, J., Phelan, K., MacDonald, B., Lirette, C., Kenchington, E. 2023. Cruise Report in Support of Maritimes Region Research Project ‘Use of Passive Acoustics to Quantify Fish Biodiversity and Habitat Use’: Ocean Observation Systems in the Gully MPA and Scotian Shelf 2022. Can. Manusc. Rep. Fish. Aquat. Sci. 3260: iv + 42 p.
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- Kenchington, E., Lirette, C., and De Clippele, L. H. 2021b. Cruise Report in Support of Maritimes Region Research Project: Use of Passive Acoustics to Quantify Fish Biodiversity and Habitat Use, Mendeley Data, version 1. <https://data.mendeley.com/datasets/wcs8mjt27d/1>



## ANNEX 1: GULLY MPA PERMIT



Fisheries and Oceans Pêches et Océans  
Canada Canada

PO Box 1006  
Dartmouth, NS  
B2Y 4A2

**File / Référence**  
GMPA-2022-04

July 13, 2022

Dear Dr. Ellen Kenchington:

**RE: Gully Marine Protected Area (MPA) Activity Approval**

I am pleased to inform you that your request to deploy two benthic landers to conduct biodiversity and habitat use research in the Gully MPA for one day between August 19 and August 29, 2022 has been approved under Section 6(1) of the *Gully MPA Regulations*. Information provided in the application submitted on June 16, 2022 (attached) demonstrates compliance with the regulatory conditions that must be met for issuance of Ministerial Approval. Any changes to the approved activities that have not been described in the submitted and approved plan must be discussed with Marine Planning and Conservation (MPC) prior to commencement.

While in the MPA, you will be expected to comply with all applicable federal legislation. In particular, we would like to emphasize that holding a Ministerial Approval issued pursuant to the *Gully MPA Regulations* and the *Oceans Act* does not satisfy the requirements of the *Species at Risk Act* or the *Fisheries Act*. Neither does the MPA Approval given here substitute for any permits or licences required under those statutes. It is your responsibility to ensure any necessary authorizations are acquired prior to undertaking the approved MPA activities.

To support conservation and protection of the MPA ecosystem, you are asked to adhere to the following requests while undertaking the approved research:

1. Advise Fishery Officer Brad Pye by phone (902-499-0923) and by follow-up email ([brad.pye@dfo-mpo.gc.ca](mailto:brad.pye@dfo-mpo.gc.ca) and [regulations.xmar@dfo-mpo.gc.ca](mailto:regulations.xmar@dfo-mpo.gc.ca)) at least 72 hours before the activity begins so that they are aware an activity will be occurring in the MPA. Please ensure you have the vessel and captain information ready to be shared when contacting DFO C&P.
2. Decrease vessel speed to 10 knots or less when operating in the MPA as per the General Guidelines for MPAs published by the Canadian Coast Guard in Section 5A of the Annual Edition Notices to Mariners (<https://www.notmar.gc.ca>).
3. Maintain a watch during daylight hours for turtles, marine mammals and marine debris (e.g., abandoned fishing gear, plastics, other garbage or pollutants). Report any marine mammal collisions, entanglements, distressed or dead animals to the marine animal emergency hotline (1-866-567-6277), or via VHF channel 16. Sightings of Northern Bottlenose, Sowerby's beaked, Blue or North Atlantic Right whales including location, date, and photos should be reported to [XMARwhalesightings@dfo-mpo.gc.ca](mailto:XMARwhalesightings@dfo-mpo.gc.ca). Also, provide any sightings information to Marine Planning and Conservation (MPC).

- 2 -

4. Report environmental emergencies or other incidents, including unintentional discharges and mammal collisions, to the Canadian Coast Guard within two hours of the occurrence. Notify MPC as soon as possible and file an incident report.
5. Report any sea turtle sightings to the turtle hotline (1-888-729-4667). Sightings of sea turtles including date, location, species, condition, and photos should be submitted at <http://seaturtle.ca/turtle-sighting/>
6. Provide a post-activity report to MPC that details MPA arrival and departure dates & times, and outlines operations undertaken within the MPA.

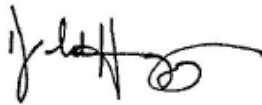
We have enclosed a set of templates and instructions to assist with the documentation being sought in the requests attached to this Approval. The activity report, sightings data, and incident notifications should be submitted to Tanya Pelrine in MPC at:

Tanya Pelrine  
Fisheries and Oceans Canada  
Bedford Institute of Oceanography  
1 Challenger Dr., B500  
Dartmouth, NS  
B2Y 2V9

Phone: (902) 402-2578  
E-mail: [Tanya.Pelrine@dfo-mpo.gc.ca](mailto:Tanya.Pelrine@dfo-mpo.gc.ca)

Please confirm with Tanya Pelrine that you have received this letter, and feel free to follow-up anytime should you have any questions or need further clarification.

Yours sincerely,



Donald Humphrey  
A/Director, Oceans & Aquaculture Management  
Aquatic Ecosystem Branch  
Maritimes Region

Attachments:  
Approved Activity Plan  
Activity and Incident Report Template

## ANNEX 2: SAMBRO SPONGE CONSERVATION AREA PERMIT



Fisheries and Oceans Canada / Pêches et Océans Canada

P.O. Box 1006  
Dartmouth, NS B2Y 4A2

August 16, 2022

Dr. Ellen Kenchington  
Research Scientist  
Science Branch  
Bedford Institute of Oceanography  
Fisheries and Oceans Canada, Maritimes Region

Dear Dr. Kenchington:

**RE: 2022 Activities in Sambro Bank Sponge Conservation Area**

The Marine Planning and Conservation (MPC) section of Fisheries and Oceans Canada (DFO), Maritimes Region, have reviewed your activities being conducted in August 2022 in the Sambro Sponge Conservation Area. Your proposal to conduct sampling has been reviewed to be consistent with the goals and objectives of the conservation area and broader conservation planning in the region. I am pleased to inform you that we support this activity.

MPC requests any substantial changes to the program, such as alterations in sampling station locations, be provided prior to sailing. It remains your responsibility to meet legal requirements associated with the planned and approved activities. Ensure that all necessary permits, authorizations and consents required under other applicable federal legislation and regulations are acquired prior to undertaking the approved activity.

Thank you for continuing sponge research activity and advancing our understanding of these valuable ecosystems in our region. If you have any questions, please do not hesitate to contact me at 902-403-2548 or [Derek.Fenton@dfo-mpo.gc.ca](mailto:Derek.Fenton@dfo-mpo.gc.ca).

Yours sincerely,

Derek Fenton  
Section Head  
Marine Planning and Conservation  
Maritimes Region, Fisheries and Oceans Canada  
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