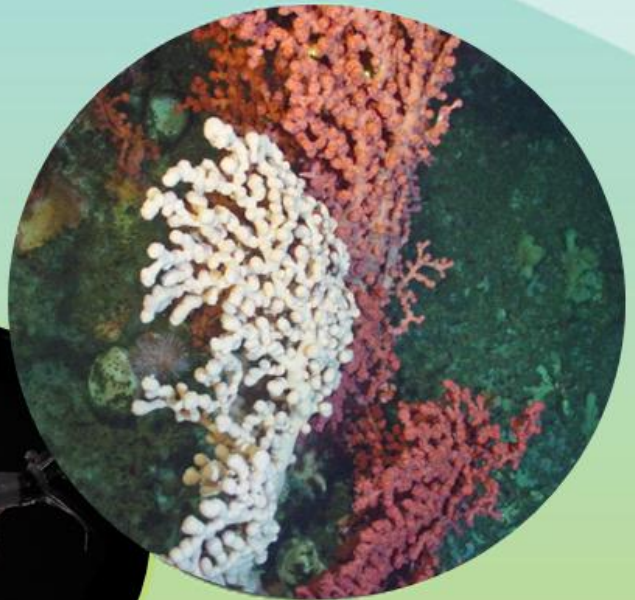




Canada's oceans
A natural resource, a national treasure

The Gully Marine Protected Area

10 Years of Progress





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DFO/2014-1926

Cat. No. Fs104-33/2014

ISBN: 978-1-100-54755-8

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The Gully Marine Protected Area: A Decade in Review

The Gully (Figure 1) is a spectacular one-of-a-kind canyon ecosystem on Canada's east coast containing a remarkable diversity of marine life. The designation of the Gully as a Marine Protected Area (MPA) in 2004 marked a pivotal moment for oceans management in Atlantic Canada, resulting in the dedicated protection of the diverse marine life found in the canyon. This includes vulnerable cold-water corals, many different species of fish and mammals, and an endangered population of northern bottlenose whales. The purpose of this report is to highlight progress and summarize the efforts made with respect to meeting the objectives set out for the MPA. Particular attention is devoted to exciting and informative research collaborations, management activities, and outreach undertaken since 2004.

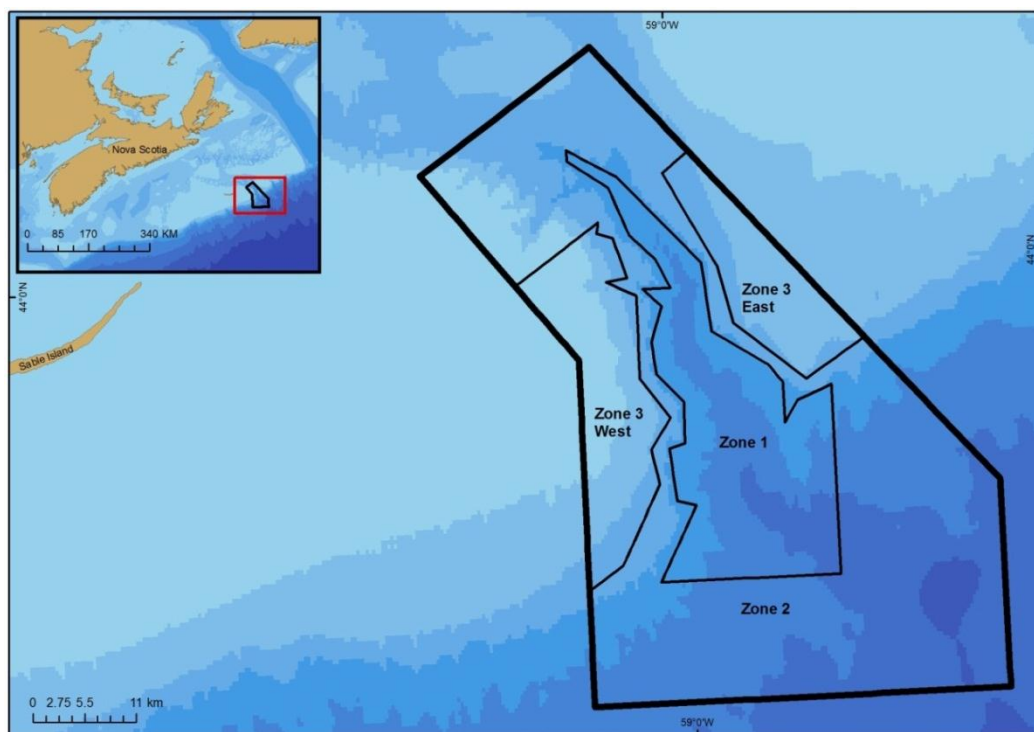


Figure 1. The Gully MPA is located approximately 200 km off of the coast of Nova Scotia and is divided into three management zones, each with a different level of protection.

The Management Plan

The Gully MPA Management Plan (the Plan) was developed in the years following designation. The Plan interprets and supports the MPA Regulations by providing managers, regulators, users, and the public with guidance on how to safeguard and manage the MPA (DFO 2008). All actions are guided by an overarching vision:

To protect the marine ecosystem of the Gully MPA for future generations by providing effective programs for management, conservation, research, monitoring, and stewardship.

The Plan outlines a set of principles and approaches, a series of objectives related to conservation, management, stewardship, research, and a range of priority issues and actions

covering a period of five years. Since the publication of the Plan in 2008, Fisheries and Oceans Canada (DFO) has undertaken a variety of activities in support of the vision and MPA objectives. These include ensuring enforcement and compliance with the MPA Regulations; managing research and tourism through an application and evaluation process; developing an ecosystem monitoring program; engaging in education and outreach efforts; and, evaluating and reporting on progress and the effectiveness of management activities. The MPA management team is stationed at the Bedford Institute of Oceanography (BIO) in Dartmouth, Nova Scotia.

OBJECTIVES FOR THE GULLY MPA (2008)

Conservation Objectives

- Protect the health and integrity of the Gully ecosystem:
 - Protect the natural biodiversity of the Gully.
 - Protect the physical structure of the Gully and its physical and chemical properties.
 - Maintain the productivity of the Gully ecosystem.

Management and Stewardship Objectives

- Establish effective management of the Gully MPA:
 - Promote collaboration among all users, regulators and other interests.
 - Involve stakeholders and the general public in the management of the MPA.
 - Establish co-operative agreements with responsible regulatory authorities to meet objectives for the MPA.
 - Ensure human activities within the MPA are consistent with Regulations and the conservation objectives.
 - Monitor and evaluate the design, management, and effectiveness of the MPA on a regular basis to ensure that it is meeting defined objectives.
- Promote stewardship activities:
 - Increase understanding of the Gully ecosystem among regulators, user groups and the public.
 - Promote active participation and engagement in management.

Research and Monitoring Objectives

- Increase our understanding of the Gully and the potential for human impacts on the ecosystem.
- Foster collaboration and communication among managers and natural social scientists.
- Provide managers with accurate and timely information on the state of the Gully ecosystem and potential threats to conservation and management objectives.

Working with Stakeholders

The period leading up to MPA establishment involved collaboration with many stakeholders including federal and provincial authorities, industry groups, the academic community and environmental organizations. Cooperation has continued in the ten years since the MPA was established and much of the site's success can be attributed to the extraordinary support provided in that time. Maintaining and expanding existing partnerships, like the ones described in the remainder of this report, while at the same time building new ones, will be vital for the next decade.

Management of the Gully MPA is further guided by expert advice received from the Gully Advisory Committee (GAC), a multi-stakeholder body that was formalized after the MPA

Regulations were passed. The GAC comprises active and engaged representatives from regulatory bodies, universities, environmental groups, fisheries, the oil and gas industry, and aboriginal governments and organizations. Regular meetings of the GAC provide opportunities for DFO and stakeholders to present updates, share information, and make recommendations for MPA decision-making.

Protecting the Canyon: Surveillance and Compliance

The Gully MPA Regulations restrict certain human activities and make ongoing protection a top priority. General prohibitions laid out in the Regulations make it illegal for any person to disturb, damage, destroy or remove any living marine organism or any part of its habitat in the MPA. These restrictions include the seabed and extend into the subsoil to a depth of 15 metres. The Regulations also prohibit depositing, discharge and dumping in the MPA and vicinity if negative impacts are likely.

Human activities that occur in the MPA include:

- Commercial fishing in Zones 2 and 3 for halibut, swordfish, tuna, and shark
- The passage of ships in compliance with the *Canada Shipping Act*
- Activities carried out by the Government of Canada for national security, safety, law enforcement, and emergency response
- Research, monitoring and other activities given approval under the Regulations

As the lead federal authority for the Gully MPA, DFO is responsible for ensuring that the Regulations are respected and enforced. DFO has worked internally and with other government agencies plus industry stakeholders to promote MPA compliance. Within DFO, the Gully has provided an unprecedented opportunity for various Branches to work together towards a shared conservation outcome. Managing fisheries has been central to this effort. Fleets that operate in and near the Gully have clauses placed in their licence conditions to explain and reinforce the MPA harvest restrictions. Fishery Officers conduct aerial surveillance during regular patrol flights, and the At-Sea Observer Program has third-party monitors placed on vessels to document fishing activities. Fisheries logbooks are scrutinized and fishing vessel movements are tracked via satellite monitoring systems to ensure compliance.

DFO scientists have developed innovative software tools that integrate all of these information sources for automated detection of suspicious activity. Managers use these tools to quickly evaluate activity levels and to identify potential infractions. Fortunately, only a small number of fisheries non-compliance issues have been detected since designation and overall compliance appears to be high.

The Canadian Coast Guard's Annual Notice to Mariners provides information about the Gully MPA. For example, mariners are to avoid discharges within 50 km of the MPA. Mariners are also asked to avoid the MPA when operating nearby. If an MPA transit is absolutely necessary, mariners are instructed to decrease speed with the goal of reducing acoustic disturbance and lessening the risk of wildlife collisions. In addition, vessel operators are directed to report interactions with whales and accidents to the Coast Guard's Marine Communications and Traffic Services Centre.

Several other federal departments have supported implementation of the MPA in matters related to shipping. Transport Canada has played a significant role in the regulation of marine

transportation around the Gully with the notable creation of ballast exchange zones that were designed to avoid exchanges occurring within the MPA. Environment Canada works with Transport Canada to conduct pollution flights as part of the National Aerial Surveillance Program. The Department of National Defence also contributes to MPA surveillance with routine aircraft and vessel patrols.

Since 1998, the Canada-Nova Scotia Offshore Petroleum Board has been contributing to Gully protection with a policy that restricts oil and gas exploration in the area (CNSOPB 2014). The Board also works with DFO to ensure that hydrocarbon proponents in adjacent waters meet all requirements of the MPA Regulations. For example, industry proponents are required to demonstrate regulatory compliance through their expanded environmental assessments. Additional safeguards are implemented at-sea with enhanced mitigation measures and effects monitoring programs. Oil and gas companies have also developed voluntary codes of conduct that restrict personnel, vessels and aircraft from travelling in the MPA (e.g., EnCana 2014; ExxonMobil 2014).

Human Activities In and Around the MPA

Human activities in and around the Gully are the major focus of protected area management. Activities that are allowed in the MPA are managed and closely monitored. Some activities, like marine transportation, are not prevented by the MPA Regulations but are nonetheless tracked for other types of regulatory compliance. Individual research and monitoring efforts are a special case and have been well documented. For example, to assist managers, scientific trip plans always include MPA occupancy dates and these researchers are also obligated to provide detailed reports on their time spent in the Gully. Appendix A describes the scientific programs that have been granted approval under the MPA Regulations since designation. Other activities profiled here include selected fisheries, marine transportation, tourism, and hydrocarbon exploration in neighbouring waters.

Fishing

For decades the Gully has been an important fishing ground for many coastal communities in Nova Scotia, providing a reliably productive area for several commercial species. As provided for in the MPA Regulations, a limited number of fisheries have continued to take place within the Gully MPA (Zones 2 and 3). As part of fishing license conditions, participants in these fisheries are required to report data on their activities to DFO. The location and level of fishing activity (landings and effort) within Zones 2 and 3 has been monitored to provide an ongoing evaluation of the potential impacts. As similar monitoring and reporting occurred prior to the MPA being designated, general comparisons and trends can be described. For halibut fishing, the level of fishing activity within the Gully has varied each year, with significantly lower levels experienced in the mid-2000s, followed by an increase in recent years to levels experienced before the MPA was established. The areas targeted for fishing have remained largely consistent, with the northwestern corner showing most of the activity. Altogether, there is a limited overall physical footprint from this fishing activity within the MPA. Regarding the swordfish and tuna fisheries, fishing landings and effort was highly variable, with an overall drop compared with the levels seen prior to designation. This may be due to a number of factors, including region-wide changes in fishing patterns.

Marine Transportation

The Gully Regulations permit the transit of commercial marine vessel traffic (e.g., cargo vessels)

through the MPA. Vessel activity and the related impacts that could occur are being monitored by DFO. Preliminary research has also been conducted on the number of vessels transiting through the area, with approximately 40 vessels transiting per month between February 2010 and February 2011.

Tourism

At the time of MPA designation, tourism potential and operations were largely non-existent due to its offshore location. However, tourism companies have begun operating vessel-based tours to Sable Island, now a National Park Reserve. These tours occasionally spend time in the Gully to observe marine mammals and seabirds. Three tours to Sable Island and the Gully were conducted under approval in June of 2011, 2012, and 2013. Academic researchers sailed on these trips to collect cetacean sightings and images of northern bottlenose whales for photographic identification. Gully communications materials were distributed and in 2011, visitors filled out a survey provided by DFO to summarize their experience in the MPA. DFO engaged the GAC to develop guidelines for visitor activities, including vessel handling near whales.

Oil and Gas

Oil and gas activities are not allowed to occur within the Gully, but interest in exploration in areas adjacent to the MPA continues. Currently, the level of oil and gas activity in adjacent areas is low however the Call for Bids process administered by the CNSOPB could lead to greater interest. As the Regulations apply to activities outside the MPA that could affect the canyon ecosystem, any potential activities in the surrounding lands are evaluated for their impact on the Gully ecosystem, with input from DFO and stakeholders.

Advancing our Understanding of the Gully Ecosystem

The Gully has been an area of interest for researchers for many years, and decades of scientific activity in this large submarine canyon were instrumental in supporting its designation as an MPA. Scientific research and monitoring activities continue to play a critical role in its management, as will be described in the forthcoming Gully MPA Monitoring Plan. Research increases the understanding of important physical, chemical, and complex biological processes in the Gully ecosystem. Monitoring these processes provides managers with accurate and timely information on the state of the ecosystem as well as potential threats.

Research and monitoring activities in the Gully MPA are conducted by universities, government agencies, industry, and non-government organizations, and provide opportunities for collaboration and co-operation between these various groups. Dedicated resources, including under DFO's Oceans Action Plan and Health of the Oceans initiatives (2006-2013), have helped increase our understanding of this complex deep-sea ecosystem. The value and net impact of these investments was recognized in 2012 during the 50th Anniversary of BIO's founding. A team of Gully researchers representing many disciplines received a decadal Crystal Award for excellence in fundamental and applied marine science. Examples of these research and monitoring efforts are described below, and many will continue to be supported under the new National Conservation Plan.

Appendix A outlines the general activity approval process required for researchers and others to conduct activities within the Gully MPA and includes a list of all approved activities that have occurred in the MPA over the last ten years. The References section includes publications

associated with Gully MPA research during this period.

Seabed mapping

The Canadian Hydrographic Service and the Geological Survey of Canada conducted several multibeam surveys in the Gully between 1996 and 2011. Measurements of the ocean bottom, including its depth and surficial composition, are now available for approximately 90% of the MPA (Figure 2). Geologists have used this information and additional data sources to interpret and classify the seabed characteristics of the Gully. This has revealed a complex and dynamic environment that subsequently influences the distribution of many bottom organisms inhabiting the canyon.

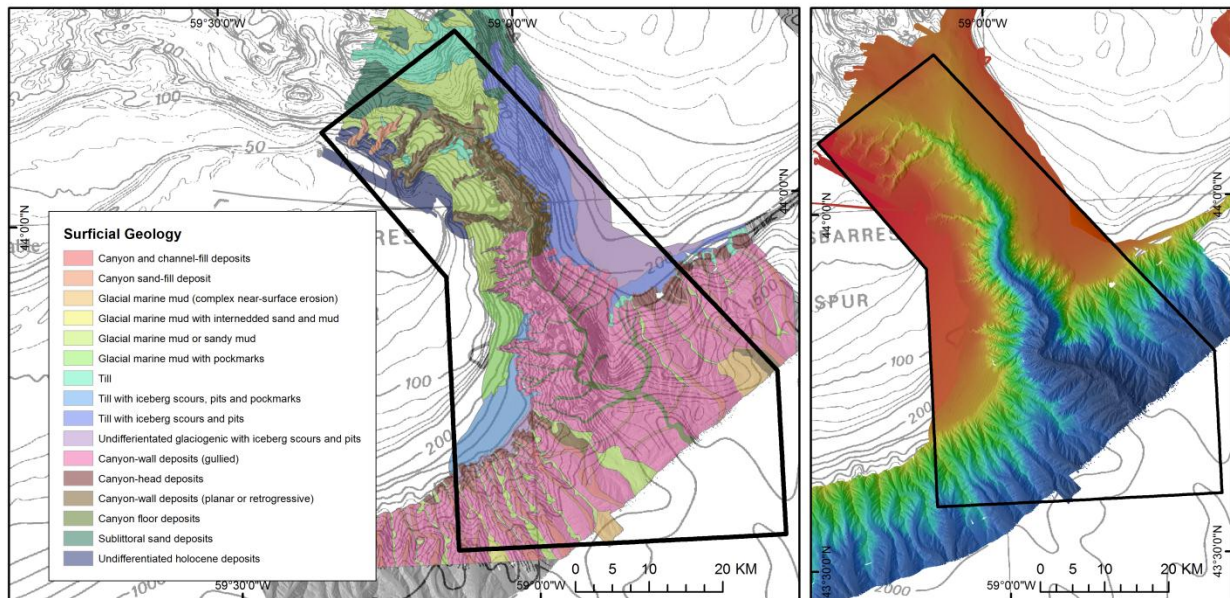


Figure 2. Left: The seafloor of the Gully is composed of various sediment and deposit types ranging from fine sand to bedrock (Cameron et al. 2008). Right: The bathymetry of the Gully determined using most of the available multibeam data.

Oceanography

DFO scientists at the Bedford Institute of Oceanography (BIO) have been studying the physical, chemical and biological properties of seawater in the Gully for decades. Much has been learned about the circulation patterns, chemistry, nutrients, microbes and plankton occurring in the canyon and surrounding areas. Water characteristics are now sampled each spring and fall at the same location in the MPA as part of the Atlantic Zone Monitoring Program (Government of Canada 2013). In 2006 and 2007 a study was conducted that deployed sensors in the Gully to measure its conductivity, temperature, depth, salinity, pressure, and current. The researchers were surprised to find that the currents in the Gully were so strong that they knocked the current meters down (Greenan et al. 2013).

Benthic research

Marine scientists started documenting seabed organisms in the Gully as early as the 1880s when deep-water coral catches were common in the offshore fishery. Prior to Gully MPA designation, 12 species of coral from 10 families were known to occur in the area. These

numbers were determined by interviewing fishermen and scientists, studying museum collections and reviewing relevant literature (Harrison and Fenton 1998). Today, benthic ecologists study seabed communities using deep-water camera systems and sampling instruments lowered from research vessels. Researchers employ systems developed at the Bedford Institute of Oceanography to study the floor of the Gully. As well, underwater vehicles like ROPOS (Remotely Operated Platform for Ocean Sciences), have been used to extend visual surveys and specimen sampling to canyon depths reaching 2.5 kilometres. There were a total of 70 taxa collected in these surveys including 27 new records for The Gully MPA. Three taxa were new Canadian records, and a file clam was discovered, which was new to science. A single ROPOS observation in 2007 uncovered 11 new records of coral species within the Gully (Cogswell *et al.* 2009). The Gully is now recognized as having the highest diversity of corals in Atlantic Canada, with over 30 species identified.



Trawl surveys

Government research vessels have undertaken bottom trawl surveys in the Gully for more than 25 years as part of a region-wide fish and invertebrate monitoring program. Everything caught in the trawl is identified, weighed and measured. Sex, age and condition are recorded and stomachs are routinely sampled for prey analysis. Bottom trawl surveys have been infrequent in the Gully since designation.

Between 2007 and 2010, four meso-pelagic trawl research cruises were conducted in the Gully to study animals living throughout the water column of the canyon. Samples were collected at depths between 250 and 1750 metres using a mid-water trawl. These were the first Canadian deep-water surveys in over twenty years and among the first to sample at such depths within a canyon globally.



For crustaceans, over 68 species were collected in the pelagic waters during three summer surveys in the canyon. At least 17 species were new records in Canadian waters. Catches were dominated by small non-commercial species such as lanternfish, krill and juvenile squid. Many deep-water specimens were examined including rare species, species not previously recorded in Canadian waters and species new to science. Ongoing analysis is expanding our knowledge of the food chain that supports the large predators found in the Gully.

Whale studies

Researchers in the Biology Department at Dalhousie University began studying whales of the Gully in 1986. With more than 16 different species of whales and dolphins reported to occur in the canyon (Hooker et al. 1999; Whitehead 2013), the Gully has been identified as an area of high cetacean diversity in eastern Canada. Northern bottlenose whales have become the focus of cetacean research in the MPA. These whales are resident in the Gully throughout the year and Zone 1 of the MPA, along with the adjacent Shortland and Haldimand canyons, have been identified as Critical Habitat for the Endangered Scotian Shelf population. Northern bottlenose whale photo-identification research (which involves identifying individual whales from photographs of markings on their back and dorsal fins) has been ongoing since the 1980s and is the longest-running beaked whale population study anywhere in the world (Whitehead and Wimmer 2005; Whitehead 2013). Through this work, it is known that the population consists of about 130 individuals, the majority of which have been photographed and catalogued (O'Brien 2013).



Photograph taken by Catalina Gomez-Salazar

Whale research has been ongoing in the Gully for several decades, with sighting observations collected by the Whitehead Lab at Dalhousie University since 1986. Some interesting results have come out of this research, including some remarkable trends in sighting rates of the elusive Sowerby's beaked whale (pictured here). Prior to 1994, there were no sighting records for these rare whales in the Gully. Eight Sowerby's beaked whale sightings were recorded between 1995 and 2000 (*e.g.*, Hooker and Baird 1999). Since then, the number of Sowerby's beaked whale sightings in the Gully has increased at an incredible rate of 21% per year, with 87 sightings in 2011 and 2012 (Whitehead 2013). Whitehead (2013) suggests that the increase in Sowerby's whale presence in the Gully may be attributed to the reduction in human activity in the area resulting from the designation of the MPA.

In addition to the photo-identification work, studies of surface behaviour using high-definition video (O'Brien 2013), studies of feeding behaviour and habitat use using acoustic recorders (Moors 2013), studies of diving behaviour using time-depth recorders and acoustic suction-cup tags, and biopsy sampling have also been conducted on northern bottlenose whales in the past ten years (Appendix A). We now understand that these animals spend much of their lives in

complete darkness near the bottom of the canyon where they hunt and feed on squid. More recently, DFO scientists at BIO have been conducting long-term passive acoustic monitoring studies to better understand how a variety of whale species (including baleen whales, beaked whales, sperm whales and dolphins) are using the canyon throughout the year. This also helps to characterize the acoustic environment of the Gully and monitor changes over time.

Seabird surveys

The Canadian Wildlife Service places seabird observers on research vessels and other opportunistic platforms to collect data on seabird distribution and densities throughout eastern Canada. Many scientific expeditions to the Gully have benefitted by having a seabird specialist aboard. Observers with the Eastern Canada Seabirds at Sea program keep watch in the wheelhouse and follow a monitoring protocol during transits and oceanographic transects (Gjerdrum et al. 2008). Visual scans for birds are also conducted when vessels are stopped. Since 2006, over 1500 kilometres have been surveyed in the MPA and 24 seabird species have been observed. Eight species (dovekies, greater shearwaters, black-legged kittiwakes, murrelets, storm-petrels, northern fulmars, herring gulls and great black-backed gulls) made up the vast majority of the sightings, and the Gully is one of the most important foraging areas for these species in Atlantic Canada (Gjerdrum 2011).

Hydrocarbon exploration monitoring

Research and monitoring have been prompted by uncertainty surrounding the environmental impacts of oil and gas exploration near the Gully. The Centre for Offshore Oil and Gas Environmental Research (COOGER) coordinated an interdisciplinary study in 2003 as part of an effects monitoring program for a pair of nearby seismic surveys. As reported in Lee et al. (2005), this major collaborative project involved mammal observations as well as underwater measurements of sounds produced during seismic exploration surveys and biological sounds.

Contaminant monitoring

The oceanographic processes that occur within the Gully can lead to contaminant retention and accumulation, which could potentially cause negative impacts on the ecosystem. Government, industry, and academic sampling programs have targeted various components of the Gully ecosystem over the years. Water samples, sediment grabs, and animal tissues have all been examined for a variety of chemicals. The sources of contaminants in the Gully include atmospheric precipitation, river-borne contaminants that get transferred through currents, the shelf edge water exchange, and human induced sources, such as oil and gas activities or marine transportation (DFO 2009). Studies have found a decrease in the amount of large plastic debris, dissolved lead and zinc, but the amount of small plastics, dissolved copper, chromium, iron, vanadium, and zinc has remained stable over the period from 1996-2003 (DFO 2009). Studies have shown that there has been an increase in 4,4'-DDE and trans-nonachlor (pesticides used in crops) in northern bottlenose whales in the Gully (Yeats et al. 2008). More research is needed to determine the effects of contaminants on the Gully ecosystem.

How is the Gully Ecosystem Doing? Developing Long-Term Ecosystem Indicators and Monitoring

Monitoring a range of indicators and threats in the Gully MPA is necessary to guide and ensure that appropriate management measures are in place to realize the area's Conservation Objectives. A recommended approach to ecosystem monitoring was prepared by the Canadian

Science Advisory Secretariat in 2010 (DFO 2010). The Gully ecosystem monitoring framework proposed by DFO Science included a suite of 47 indicators: 29 for monitoring the ecosystem and an additional 18 for monitoring human pressures in and around the MPA. A workshop was held in 2012 to provide a scientific peer review of available data and to evaluate the adequacy of existing protocols and procedures to address the indicators in the Gully ecosystem monitoring plan and framework. The outputs of this workshop have been used to inform the development of the Gully MPA Monitoring Plan, which is under development.

How is the Management Team Doing?

It is important to regularly review the effectiveness of the MPA to track progress and determine if the management objectives are being met. In order for a review of MPA effectiveness to be complete, there has to be consideration of all components of the MPA (ecological, social, and governance). The social and governance components of the MPA were reviewed using a framework for evaluating MPA management effectiveness for a three year span from April 1, 2007 to March 31, 2010. There were a total of 50 indicators in the framework that addressed: 1) stakeholder interactions; 2) education, stewardship and outreach efforts; 3) research, monitoring, and other permitted activities; 4) management planning; 5) human and financial resource capacity; and 6) surveillance and enforcement. The review was conducted by DFO with input from the Gully Advisory Committee and a report was finalized (OCMD 2014). This evaluation helped to identify the strengths and weaknesses of Gully MPA management, and served to highlight priority issues that should be addressed to improve management performance. For example, the MPA scored high marks for Advisory Committee engagement, education and outreach, research, and human use monitoring efforts. However, the report also called for more engagement of MPA users, better reporting on achievements, and the development and implementation of an ecosystem monitoring program. These findings have been used to help guide work planning for the site and have informed revisions to the Gully MPA Management Plan. The intent is to repeat this evaluation every 5 years as part of the regular adaptive management cycle.

Bringing the Canyon to the Public

The Gully has provided a wealth of material for engaging and informing Canadians about the wonders of the seas around us. The MPA also demonstrates some of what's being done to protect Canada's marine natural heritage. Education and outreach activities help to achieve the management and stewardship objectives in the Management Plan. The Gully has been highlighted at several public events, including the annual World Oceans Day event on the Halifax Waterfront and the BIO open house that occurs every five years. BIO is also home to the Gully Theatre which is seen by thousands of visitors each year. DFO staff members have delivered many Gully presentations to students spanning grade school through university-level classes.

A variety of communications material is distributed to the public at all of these events. Materials produced since designation include the Gully Management Plan (DFO 2008), a brochure/poster, a banner that is displayed at public events, a DVD with video footage of underwater coral, a video highlighting the whales that use the canyon, the Gully website, a colouring book, and temporary tattoos. The Gully was also featured in a traveling museum exhibit entitled *Creatures of the Abyss* that has been toured to natural history museums around the world. Outreach

during the MPA's first decade was clearly focused on traditional offsite approaches and virtual immersion. There are plans to enhance outreach efforts in the MPA's second decade. Exciting new approaches are underway owing to the controlled growth of sustainable tourism in the MPA. Indications from early expeditions confirm that once-in-a-lifetime visits offer an exceptional opportunity for interpretation and education.

Contributions to Professional Practice

When the Gully was declared as the first Oceans Act MPA in the Atlantic, it quickly became a testbed for offshore MPA policy and management in Canada. The site also attracted attention from overseas as a result of its deep-water location in Canada's 200 mile Exclusive Economic Zone. At the time of designation, very few countries had taken the pioneering steps necessary to designate and actively manage MPAs in the open ocean. In fact, most of the global experience and much of the available guidance pertained to inshore and coastal sites rather than distant water MPAs. Many methods and management measures—regulatory, scientific and technical—were trialed in the Gully, making it a developmental prototype for distant water MPAs and DFO's MPA Program. The lessons and best practices were also shared widely with stakeholders, including the Gully Advisory Committee, government peers, and the broad community of interest in attendance at regional workshops and Canadian conferences where Gully progress was presented.

The Gully's first decade proved both challenging and rewarding for the MPA management team as it dealt with the pressures posed by commercial fisheries, shipping, invasive research, and hydrocarbon exploration in adjacent waters. Another critical undertaking for employees was to confront the offshore realities of biophysical characterization and ecological monitoring. Staff worked throughout the decade to translate the MPA objectives into tangible actions, to convert the Regulations into practical management measures, and to streamline day to day oversight and administration into a set of efficient procedures. A noteworthy but easily overlooked contribution from this time period is the direct hands-on experience gained by dozens of staff members, interns, and graduate students.

As one of the best studied canyon ecosystems in the world, the Gully already had a wide audience in scientific circles. Many countries and organizations beyond Canada's borders took notice when the MPA was being established and wanted to know how Canada was confronting challenges common to offshore jurisdictions. Making it an MPA extended the academic and professional reach into the fields of marine conservation biology and protected area law and policy. Selected presentations illustrate the range of learning that has been accumulated and the lessons shared over the decade.

- 2004. Offshore Challenges and Integrated Management of the Gully MPA. Paper presented at the sixth Coastal Zone Canada Conference, St. John's, Newfoundland.
- 2005. Designing Management Measures to Protect Cold-Water Corals off Nova Scotia, Canada. Paper presented at the third International Symposium on Deep-Sea Corals, Miami, Florida, United States (Breeze and Fenton 2007).
- 2006. The Gully: A Shelf Edge Marine Protected Area in Atlantic Canada. Invited paper presented at the first International Conference on Marine Nature Conservation in Europe, Stralsund, Germany.

- 2006. Hydrographic Applications in the Gully Marine Protected Area. Paper presented at the Canadian Hydrographic Conference, Halifax, Nova Scotia.
- 2007. Designing and Applying Offshore Boundaries in the Gully Marine Protected Area. Invited paper presented at the sixth International Conference on the Science and Management of Protected Areas, Wolfville, Nova Scotia.
- 2008. The Gully Case Study on Canadian Marine Protected Areas. Commissioned paper presented at the International Workshop on Protected Areas Law and Policy, Ottawa, Ontario (VanderZwaag and Macnab 2011).
- 2009. Research Trawl Surveys in Offshore MPAs – Can we reconcile knowledge gains and disturbance potentials? Paper presented at the second International Marine Protected Areas Congress, Washington DC, United States (MPA News 2009).
- 2012. Surveillance and Enforcement in the Gully MPA. Invited case study presented at the Global MPA Enforcement Conference, San Francisco, California, United States.
- 2012. Using science to inform management: Acoustic monitoring of the Gully MPA. Paper presented at the Sustainable Ocean Management and Development Conference, Halifax, Nova Scotia.

Looking Ahead to the Next Decade of Protection

The Gully remains a focal point for scientific research and the MPA continues to be a model for the oversight and administration of offshore MPAs. May 2014 marks the ten year anniversary of the designation of the Gully as an MPA — an achievement to be celebrated. The efforts in managing the Gully have demonstrated how an integrated and collaborative approach to offshore MPA management can be realized. The designation and operation of the Gully MPA has led to the formation of numerous partnerships with various government organizations, especially for surveillance. Maintaining and enhancing the relationships that have been built between stakeholders, government and industry members of the GAC will also be crucial.

Looking ahead to the next ten years of protection, there will be a continuation of the compliance monitoring and surveillance work, building on existing efforts and continuing to use the suite of tools to monitor human activities in the Gully. New tools and technologies will be explored and applied, such as using satellite-based systems for tracking vessels and continued deployment of instruments to record anthropogenic noise inputs. The imperative to pay especially close attention to anthropogenic pressures on Northern bottlenose whales was reinforced when Zone 1 of the MPA was declared critical habitat under the *Species at Risk Act* (Canada Gazette 2010).

With the forthcoming release of the Gully Ecosystem Monitoring Plan, a suite of ecological indicators will be measured, monitored, and reported to provide a means of helping adapt and respond to management priorities. These will aim to highlight the benefits of the MPA and to provide early warning signals of issues within the Gully environment. The Management Plan for the Gully is also being updated for release in 2014 to reflect management priorities that will be addressed in the next five years. The revised Plan will update policies and guidance to help manage existing and emerging human activities in the Gully. Management actions will be monitored, evaluated, and communicated, as they have been here, in future progress reports.

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Appendix A: Approved activities from 2004 to 2013

The Gully MPA Regulations stipulate that anyone proposing to conduct any activity within the MPA that is not included in the list of excepted activities must submit a detailed activity application for Ministerial consideration and approval. The Gully MPA management team recognizes the importance of limiting destructive and invasive activities in the MPA, while also encouraging activities that provide a valuable contribution toward MPA management objectives. Activity applications are reviewed by DFO to assess environmental impacts, cumulative effects, and the adequacy of the proposed mitigation measures. The GAC, and other subject matter experts as needed, are also asked to review activity applications and to voice any comments or concerns about proposed work. DFO considers all input and advises the activity proponent of any changes required to meet the regulatory conditions required for Ministerial approval. Anyone who receives approval to conduct activities in the Gully MPA is asked to submit a post-activity report to specify the dates, locations, and outcomes of the operations conducted. This Appendix lists submitted MPA activity plans that were approved between 2004 and 2013.

Study / activity name	Organization	Purpose	Date(s)
RV summer survey	DFO Maritimes Science	To obtain information on species distribution, abundance weight, condition, maturity, sex and age.	2004-2007
Northern bottlenose whale acoustic and photo identification	Dalhousie University	To build on information related to the northern bottlenose whale population in the Gully and to obtain information about the behaviors of the whales in the MPA.	2005-2007
Atlantic Zone Monitoring Program (AZMP)	DFO Oceans Sciences Division	To collect seawater chemistry and zooplankton data, as well as backscatter measurements of the macrozooplankton as part of the AZMP.	2005-2013
Oceanographic characterization of the Gully	DFO Oceans Sciences Division	To obtain a set of concurrent physical, biological and chemical observations over a full year that provide quantitative information on spatial and temporal variability in key aspects of the Gully's oceanography and lower trophic levels.	2006-2007
Optical benthic survey	DFO Ecological Research Division	Video and still imagery was collected with remotely operated vehicles to study the abundance and distribution of organisms that live on the ocean floor, including deep water corals.	2006-2011
Multibeam data collection	Canadian Hydrographic Services	To collect multibeam bathymetric data along with associated seabed and water column data for deep portions of the Gully MPA.	2006
Survey of the mesopelagic and bathypelagic nekton and micronekton of the Gully MPA	DFO Environmental Research	To collect seawater samples to characterize the bacterial population structure and function at the Gully depth.	2007-2008

Study / activity name	Organization	Purpose	Date(s)
Whale photo identification and videographic studies	Dalhousie University	To build on information related to the northern bottlenose whale population in the Gully and to obtain information about the behaviors of the whales in the MPA.	2010-2011
Passive acoustic monitoring	DFO (Ecosystem Management and Ocean Science Division)	To gain information about Scotian Shelf northern bottlenose whales and other vocal marine mammal species within the Gully MPA through passive acoustic techniques and whale identification.	2010-present
Marine mammal visual and acoustic surveys	Defence Research and Development Canada (DRDC) Atlantic	To conduct concurrent visual and passive acoustic surveys of the Gully and nearby shelf-edge areas for the presence of cetaceans in order to collect data on bottlenose whales, characterize acoustics, and develop acoustic monitoring techniques.	2011
Water and plankton sampling	Woods Hole Oceanographic Institute	To study the impacts of ocean acidification on marine ecosystems.	2011
Measuring body condition, reproductive status, foraging and anti-predator behaviour of Scotian Shelf bottlenose whales.	University of St. Andrews	To develop and ground-truth methods to track the bottlenose whale body condition, to understand their capacity to adjust foraging and anti-predator behaviors in response to their condition, and to understand the consequences of fluctuations in body condition in terms of the reproductive status and success of individual animals.	2011, 2013
Tour to Sable Island and the Gully MPA	Sacajawea Tours	To provide the public with an opportunity to experience the Gully, conduct seabird and whale watching, and contribute sightings and photo identification data to Dalhousie University's whale research program.	2011-2013
Bacterial characterization in the Gully	COOGER (DFO)	To collect seawater samples to characterize bacterial populations of Gully by depth using genomic assays.	2013